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RMC-8355

NI RMC-8355

User Manual

September 2012
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Electromagnetic Compatibility Information

This hardware has been tested and found to comply with the applicable regulatory requirements and limits for electromagnetic compatibility (EMC) as indicated in the hardware's Declaration of Conformity (DoC)[1]. These requirements and limits are designed to provide reasonable protection against harmful interference when the hardware is operated in the intended electromagnetic environment. In special cases, for example when either highly sensitive or noisy hardware is being used in close proximity, additional mitigation measures may have to be employed to minimize the potential for electromagnetic interference.

While this hardware is compliant with the applicable regulatory EMC requirements, there is no guarantee that interference will not occur in a particular installation. To minimize the potential for the hardware to cause interference to radio and television reception or to experience unacceptable performance degradation, install and use this hardware in strict accordance with the instructions in the hardware documentation and the DoC[1].

If this hardware does cause interference with licensed radio communications services or other nearby electronics, which can be determined by turning the hardware off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the antenna of the receiver (the device suffering interference).
- Relocate the transmitter (the device generating interference) with respect to the receiver.
- Plug the transmitter into a different outlet so that the transmitter and the receiver are on different branch circuits.

Some hardware may require the use of a metal, shielded enclosure (windowless version) to meet the EMC requirements for special EMC environments such as, for marine use or in heavy industrial areas. Refer to the hardware's user documentation and the DoC[1] for product installation requirements.

When the hardware is connected to a test object or to test leads, the system may become more sensitive to disturbances or may cause interference in the local electromagnetic environment.

Operation of this hardware in a residential area is likely to cause harmful interference. Users are required to correct the interference at their own expense or cease operation of the hardware.

Changes or modifications not expressly approved by National Instruments could void the user's right to operate the hardware under the local regulatory rules.

[1] The Declaration of Conformity (DoC) contains important EMC compliance information and instructions for the user or installer. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

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Chapter 1
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About This Manual

The *NI RMC-8355 User Manual* contains information about installing, configuring, using, and maintaining the NI RMC-8355.

Conventions

The following conventions appear in this manual:

» The **»** symbol leads you through nested menu items and dialog box options to a final action. The sequence **Options»Settings»General** directs you to pull down the **Options** menu, select the **Settings** item, and select **General** from the last dialog box.

This icon denotes a note, which alerts you to important information.

This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash. When this symbol is marked on a product, refer to the *Read Me First: Safety and Electromagnetic Compatibility* for information about precautions to take.

bold Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

italic Italic text denotes variables, emphasis, a cross-reference, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.

`monospace` Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.

`monospace bold` Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.

Related Documentation

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

- *CompactPCI Specification PICMG 2.0 R 3.0*
- *PXI Hardware Specification, Revision 2.1*
- *PXI Software Specification, Revision 2.1*
- ANSI/IEEE Standard 1014-1987, *IEEE Standard for a Versatile Backplane Bus: VMEbus*
- ANSI/VITA 1-1994, *VME64*
- *NI-VISA User Manual*
- *NI-VISA Programmer Reference Manual*
- *Read Me First: Safety and Electromagnetic Compatibility*, National Instruments

1

Getting Started

This chapter describes the key features of the NI RMC-8355 and lists the kit contents and optional equipment you can order from National Instruments.

Unpacking

Carefully inspect the shipping container and the NI RMC-8355 for damage. Check for visible damage to the metal work. Check to make sure all hardware and switches are undamaged. If damage appears to have been caused during shipment, file a claim with the carrier. Retain the packing material for possible inspection and/or reshipment.

What You Need to Get Started

The NI RMC-8355 kit contains the following items:

- ❑ NI RMC-8355 rack mount controller
- ❑ *NI RMC-8355 User Manual*
- ❑ Windows recovery CD/DVD (not included in the RT version)
- ❑ Rack mount kit
- ❑ Bracket for rear cable retention
- ❑ AC power cable (refer to Table 1-1 for a list of AC power cables)
- ❑ 23–36 VDC 3-pin connector (ships with the DC option)

Table 1-1. AC Power Cables

Power Cable	Reference Standards
Standard 120 V (USA)	ANSI C73.11/NEMA 5-15-P/IEC83
Switzerland 220 V	SEV
Australia 240 V	AS C112
Universal Euro 230 V	CEE (7), II, IV, VII IEC83
North America 240 V	ANSI C73.20/NEMA 5-15-P/IEC83
United Kingdom 230 V	BS 1363/IEC83
Japan 100 V	ANSI C73.11/NEMA 5-15-P/IEC83

The unit comes with the standard 120 V (USA) cable. If you have the incorrect AC power cable, contact National Instruments.

NI RMC-8355 Overview

The NI RMC-8355 is a rugged 1U PC-based controller for remote control of PXI chassis. The controller provides leading-edge processing power with Intel Xeon 5620 processors, high disk bandwidth with hardware RAID support, high I/O bandwidth with a PCI Express 2.0 x16 and x8 slot, and up to 48 GB of RDIMM ECC memory per processor.

Key Features

The NI RMC-8355 offers the performance of a high-end PC in a compact 1U rack-mountable form factor for controlling a PXI or PXI Express system using a National Instruments remote controller.

Mainboard Features

CPU

- Dual Intel Xeon E5620 2.4 GHZ, 80 W, LGA1366 (second processor optional upgrade)

Chipset

- Intel 5520 chipset, including the 5520 (North Bridge) and ICH10R (South Bridge)

Memory

- 3 GB RDIMM ECC DDR3 memory standard (3 × 1 GB)
- Maximum memory supported: 48 GB registered ECC DDR3-800/1066 in 6 DIMM sockets (per processor)

Slots

- One PCI Express 2.0 x16 slot
- One PCI Express 2.0 x8 slot (requires a custom PCI Express bracket)

Note The x8 bottom slot requires a custom bracket and supports only half-height cards.

Video

- Matrox G200eW 16 MB DDR2 (max resolution 1280 × 1024)

HDD

- 1 × 500 GB or 2 × 500 GB SATA (3 Gbps) hard drive JBOD/RAID0/1
- Upgrade option: 1 × 300 GB or 2 × 300 GB SATA (3 Gbps) SSD JBOD/RAID0/1

DVD-R/W

- Front removable slim slot load DVD-R/W drive

Onboard LAN

- 2 × Intel 82576 Gigabit Ethernet controller

Onboard I/O

- PS/2 keyboard port
- PS/2 mouse port
- Serial port
- VGA port
- Two USB 2.0 ports (rear)
- Two USB 2.0 ports (front)
- Two RJ-45 ports

Power Supply

- Supports redundant AC and DC power supplies

Fan

- Accessible and hot swappable fans

Power Management Features

- ACPI/ACPM power management
- Main switch override mechanism
- Wake-On-LAN (WOL) header
- Wake up on keyboard/mouse from Soft-Off
- Power-on mode from AC power recovery

Front Panel LEDs

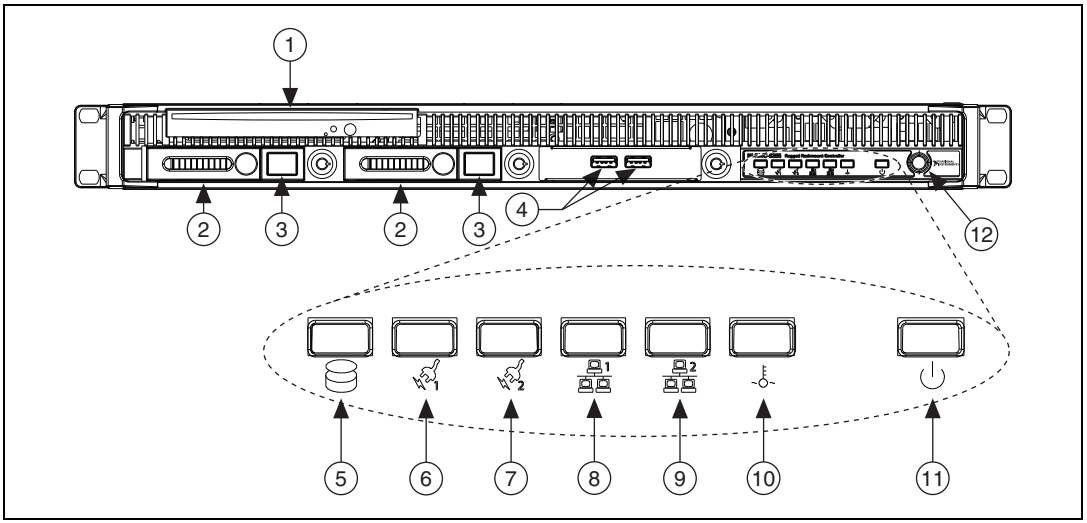
- Power indicator
- Power shuttle indicators
- LAN status indicators
- HDD indicator
- System temp (overheat) and fan (fail) warning indicator

System Management

- Monitoring for CPU and chassis environment
- CPU thermal trip support
- +5 V standby alert LED
- Fan speed control

NI RMC-8355 Description

Figure 1-1 shows the key features of the NI RMC-8355 front panel. For detailed information about the NI RMC-8355 rear panel, refer to Chapter 3, *I/O Information*.



1 DVD R/W Drive	7 Power Shuttle 2 Indicator
2 Hard Drives	8 LAN1 Status Indicator
3 Hard Drive Ejector Buttons	9 LAN2 Status Indicator
4 USB Ports	10 System Temp and Fan Warning Indicator
5 Hard Drive Activity Indicator	11 Power Indicator
6 Power Shuttle 1 Indicator	12 Power Switch

Figure 1-1. Front View of the NI RMC-8355

The front panel includes the following LEDs:

- **Hard drive activity indicator**—Glows when there is hard drive activity.
- **Power shuttle indicators**—Glow when power shuttles are powered on.
- **LAN status indicators**—Flash when there is activity on LAN1 or LAN2.
- **Overheat/fan fail indicator**
  - Off—Normal
  - On—Overheat
  - Flashing—Fan failure warning
- **Power indicator**—Glows when the NI RMC-8355 is powered on.

Upgrade/Optional Equipment

Memory Upgrades

You can upgrade the NI RMC-8355 memory to a maximum of 96 GB (48 GB per processor).

Note A 32-bit operating system such as Windows XP Pro addresses a maximum of 4 GB.

The NI RMC-8355 supports tri-channel DDR-3 SDRAM registered memory in four 240-pin RDIMM sockets. The NI RMC-8355 is compatible with ECC memory.

Note Supported RDIMM sizes are 1 GB, 4 GB, and 8 GB.

Note National Instruments has tested and verified that the DDR-3 RDIMMs we offer work with the NI RMC-8355. We recommend you purchase your DDR-3 RDIMM modules from National Instruments. Other off-the-shelf DDR-3 RDIMM modules are not guaranteed to work properly.

Upgrade Options

Table 1-2 lists upgrade options available for the NI RMC-8355.

Table 1-2. NI RMC-8355 Upgrade Options

Orderable P/N	Description
782116-01	Spare optical drive for NI RMC-8355
782117-01	Spare 250 GB SSD and drive bay for NI RMC-8355
782314-01	Spare 500 GB HDD and drive bay for NI RMC-8355
782301-01	PCI Express plug-in video card with dual digital display outputs
782302-01	Rack mount rails for NI RMC-8355
782544-01	Spare/replacement AC power supply for NI RMC-8355
782545-01	Spare/replacement DC power supply for NI RMC-8355
782547-01	DC power cable for NI RMC-8355
782546-01	Spare/replacement fan for NI RMC-8355
782567-1024	1 GB RAM replacement/upgrade for NI RMC-8355

Table 1-2. NI RMC-8355 Upgrade Options (Continued)

Orderable P/N	Description
782567-4096	4 GB RAM replacement/upgrade for NI RMC-8355
782567-8192	8 GB RAM replacement/upgrade for NI RMC-8355
782596-01	Dual CPU Upgrade, Intel Xeon E5620

National Instruments Software

National Instruments hardware and software work together to help you make the most of your PXI Express 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 includes 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 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 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 multichassis 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 Help* and the `readme.txt` file in the NI-VISA directory. For more information, visit `ni.com/visa`.

2

Installation and BIOS Setup

This chapter describes how to install, configure, and use the NI RMC-8355.

Before connecting the NI RMC-8355 to a power source, read this chapter and the *Read Me First: Safety and Electromagnetic Compatibility* document included with your NI RMC-8355.

Safety Information

Caution Before undertaking any troubleshooting, maintenance, or exploratory procedure, carefully read the following caution notices.

Caution Product functionality can be disrupted if the knurled thumbscrews on the back of the top cover are subjected to Electrostatic Discharge (ESD). To prevent damage, you must employ industry-standard ESD prevention measures during installation, maintenance, and operation.

Caution Overloading the circuits may damage supply wiring. Do not exceed the ratings on the equipment nameplate when connecting equipment to the supply circuit.

Note Tighten the thumbscrew for the top panel cover with a tool after both initial installation and subsequent access.

Caution To avoid risk of explosion, do not replace the battery (JBAT1) with an incorrect battery type. Dispose of used batteries according to the battery instructions.

This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.

- **Chassis Grounding**—The NI RMC-8355 requires a connection from the premise wire safety ground to the NI RMC-8355 chassis ground. The earth safety ground *must* be connected during use of this equipment to minimize shock hazards. Refer to the *Connecting Safety Ground* section for instructions on connecting safety ground.
- **Mechanical Loading**—To avoid a hazardous load condition, be sure the mechanical load is even when rack mounting the equipment.

- **Live Circuits**—Operating personnel and service personnel must *not* remove protective covers when operating or servicing the NI RMC-8355. Adjustments and service to internal components must be undertaken by qualified service technicians. During service of this product, the mains connector to the premise wiring must be disconnected. Dangerous voltages may be present under certain conditions; use extreme caution.
- **Explosive Atmosphere**—Do *not* operate the chassis in conditions where flammable gases are present. Under such conditions, this equipment is unsafe and may ignite the gases or gas fumes.
- **Parts Replacement**—Service this equipment only with parts that are exact replacements, both electrically and mechanically. Contact National Instruments for replacement part information. Installation of parts with those that are not direct replacements may cause harm to personnel operating the chassis. Furthermore, damage or fire may occur if replacement parts are unsuitable.
- **Modification**—Do *not* modify any part of the NI RMC-8355 from its original condition. Unsuitable modifications may result in safety hazards.

Chassis Cooling Considerations

The NI RMC-8355 is designed to operate on a bench or in an instrument rack. Determine how you want to use the NI RMC-8355 and follow the appropriate installation instructions.

Caution If installed in a closed or multiunit rack assembly, the rack environment operating ambient temperature may be greater than room ambient temperature. Therefore, install the equipment in an environment compatible with the maximum ambient operating temperature (Tma) specified in Appendix A, *Specifications*.

Providing Adequate Clearance

Apertures in the front and rear of the chassis facilitate power supply and motherboard cooling. Air enters through the front of the chassis and exits through the fans on the rear of the chassis. Place the NI RMC-8355 on a bench top or in an instrument rack so that the fans (air outlets) and the air inlet apertures in the front and rear of the chassis have adequate ventilation. Keep other equipment a minimum of 76.2 mm (3 in.) away from the air outlets on the rear of the chassis.

Installation

Follow these steps to connect devices to the NI RMC-8355:

1. Connect a keyboard and mouse to the appropriate connectors on the NI RMC-8355 rear panel.
2. Connect the VGA monitor video cable to the VGA connector on the rear panel.
3. (Optional) To boot into LabVIEW RT, connect the network cable to LAN jack 1 on the rear panel. (Refer to Figure 3-1, *NI RMC-8355 Rear Panel Layout*, for the location of LAN jack 1.)
4. Connect the USB and serial devices as necessary to the NI RMC-8355 front and rear panel ports.

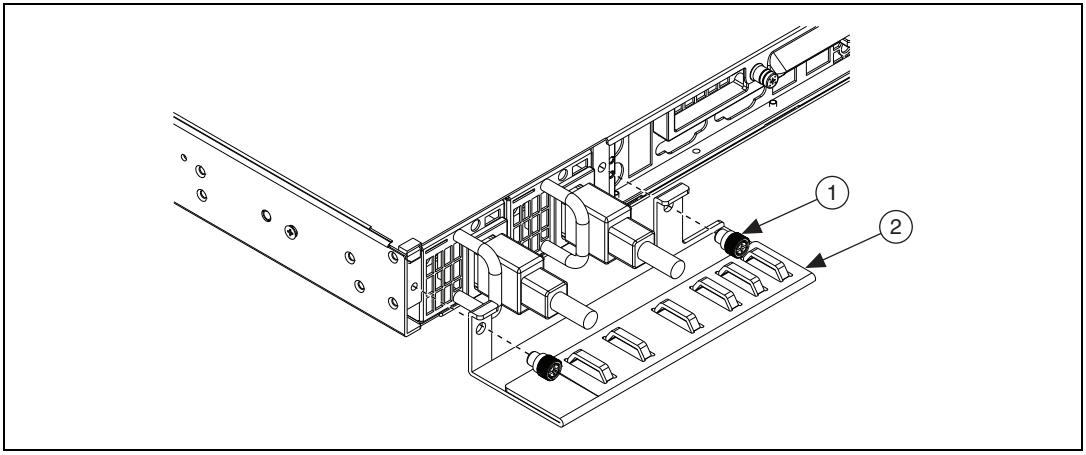
Caution To minimize shock hazard, make sure the electrical power outlet you use to power the NI RMC-8355 has an appropriate earth safety ground. Refer to the *Connecting Safety Ground* section for more information.

Caution Use the DC power cable provided with DC power supplies for VDC input.

5. Connect the AC power cable to the AC inlet on the rear panel and to an AC power outlet. For more information, refer to the *Connecting to Power Source* section.
6. For the DC option, connect the DC positronic connector to the DC inlet on the rear panel and wire to a DC power source.
7. Power on the NI RMC-8355.
8. Verify that the NI RMC-8355 boots. If it does not boot, refer to the *What if the NI RMC-8355 does not boot?* section of Chapter 5, *Troubleshooting*.

Cable Retention Bracket

The NI RMC-8355 includes a cable retention bracket. Install the bracket with the retaining screws, as shown in Figure 2-1.



1 Retaining Screw (x2)	2 Cable Retention Bracket

Figure 2-1. Cable Retention Bracket

Connecting Safety Ground

The NI RMC-8355 is designed with a three-position NEMA 5-15 style plug for the U.S. that connects the ground line to the chassis ground. To minimize shock hazard, make sure the electrical power outlet you use to power the chassis has an appropriate earth safety ground.

Note The NI RMC-8355 also includes a grounding screw (8-32 thread size nut) on the back of the chassis. (The nut is not supplied with the NI RMC-8355.)

Connecting to Power Source

Attach input power through the rear AC/DC inlet using the appropriate AC/DC power cable supplied.

Caution Overloading the circuits may damage supply wiring. Do not exceed the ratings on the equipment nameplate when connecting equipment to the supply circuit.

Caution To completely remove power, you *must* disconnect the AC/DC power cable.

Caution For a DC power supply, provide a 20 A max overcurrent protection device external to the equipment.

The power switch allows you to power on the chassis or place it in standby mode. Push the power switch to the On position (if not already on). Observe that all fans become operational and the power indicator is lit.

BIOS Setup

This section describes all main BIOS setup options.

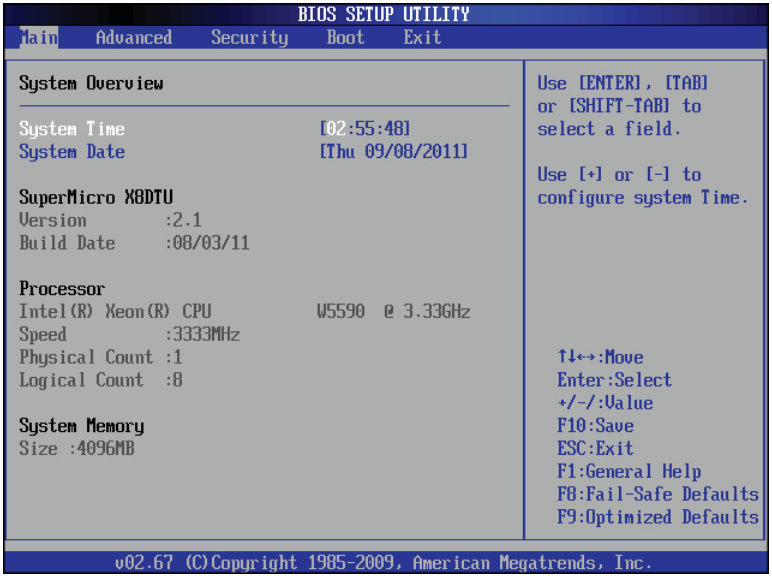
To enter the BIOS menu, press <Del>. Use the up and down arrow keys to move among the different settings in each menu. Use the left and right arrow keys to change the options for each setting.

Press <Esc> to exit the CMOS setup menu. The next section describes in detail how to navigate through the menus.

To access submenus, highlight a menu item and press <Enter>.

Main BIOS Setup Menu

When you first enter the AMI BIOS Setup Utility, you will enter the Main BIOS setup screen. You always can return to the Main setup screen by selecting the **Main** tab at the top of the screen. The Main BIOS setup screen is shown below. (The processor and memory values in the image below may not accurately reflect your system configuration.)



System Overview

The following BIOS information displays on the System Overview screen.

System Time/System Date

These items display the system time and date. Highlight **System Time** or **System Date** using the arrow keys. The date is displayed in MM/DD/YY format. The time is displayed in HH:MM:SS format.

Note The time is in the 24-hour format. For example, 5:30 p.m. appears as 17:30:00.

SuperMicro X8DTU

Version

This item displays the BIOS revision used in your system.

Build Date

This item displays the date when this BIOS was completed.

Processor

The AMI BIOS automatically displays the status of the processor in your system.

CPU Type

This item displays the type of processors used in the motherboard.

Speed

This item displays the speed of the processor(s) the BIOS detects.

Physical Count

This item displays the number of processors installed in your system, as the BIOS detects.

Logical Count

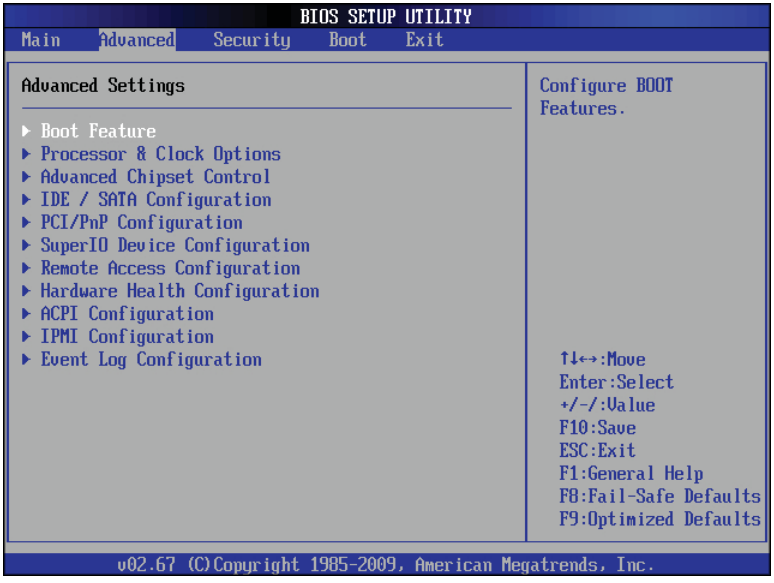
This item displays the number of CPU cores installed in your system, as the BIOS detects.

System Memory

This item displays the system's available memory size.

Advanced Setup Configurations

Use the arrow keys to select **Boot Setup** and press <Enter> to access the submenu items. The Advanced BIOS setup screen is shown below.



Boot Features

Quick Boot

If enabled, this option skips certain tests during POST to reduce the time needed for system boot. The options are **Enabled** and **Disabled**.

Quiet Boot

Use this option to choose the bootup screen display between POST messages or the OEM logo. Select **Disabled** to display the POST messages. Select **Enabled** to display the OEM logo instead of the normal POST messages. The options are **Enabled** and **Disabled**.

Add On ROM Display Mode

This item sets the display mode for the Option ROM. The options are **Force BIOS** and **Keep Current**.

Bootup Num Lock

Use this feature to select the power-on state for the Num Lock key. The options are **Off** and **On**.

Wait for F1 If Error

This forces the system to wait until you press the <F1> key if an error occurs. The options are **Disabled** and **Enabled**.

Hit Del Message Display

Select **Enabled** to display **`Press DEL to run Setup`** during POST. The options are **Enabled** and **Disabled**.

Interrupt 19 Capture

Interrupt 19 is the software interrupt that handles the boot disk function. When this item is set to **Enabled**, the ROM BIOS of the host adaptors "captures" Interrupt 19 at bootup and allows the drives attached to these host adaptors to function as bootable disks. If this item is set to **Disabled**, the ROM BIOS of the host adaptors does not capture Interrupt 19, and the drives attached to these adaptors do not function as bootable devices. The options are **Enabled** and **Disabled**.

Power Configuration

Watchdog Function

If enabled, the watchdog timer allows the system to reboot when it is inactive for more than 5 minutes. The options are **Enabled** and **Disabled**.

Power Button Function

If set to **Instant_Off**, the system powers off immediately as soon as you press the power button. If set to **4_Second_Override**, the system powers off when you press the power button for 4 seconds or longer. The options are **Instant_Off** and **4_Second_Override**.

Restore on AC Power Loss

Use this feature to set the power state after a power outage. Select **Power-Off** for the system power to remain off after a power loss. Select **Power-On** for the system power to be turned on after a power loss. Select **Last State** to allow the system to resume its last state before a power loss. The options are **Power-On**, **Power-Off**, and **Last State**.

Processor and Clock Options

Use this submenu to configure the processor and clock settings.

CPU Ratio

Select **Manual** to manually configure the ratio between the CPU core clock and FSB frequency. Select **Auto** to allow the BIOS to configure the CPU ratio automatically. The options are **Auto** and **Manual**.

Clock Spread Spectrum

Select **Enable** to enable Clock Spread Spectrum support, which allows the BIOS to monitor and attempt to reduce, whenever needed, the level of electromagnetic interference the components cause. The options are **Disabled** and **Enabled**.

Hardware Prefetcher[1]

If set to **Enabled**, the hardware prefetcher prefetches streams of data and instructions from the main memory to the L2 cache forward or backward to improve CPU performance. The options are **Disabled** and **Enabled**.

[1] Available when the CPU supports this option.

Adjacent Cache Line Prefetch[1]

The CPU prefetches the cache line for 64 bytes if this option is set to **Disabled**. The CPU fetches both cache lines for 128 bytes as comprised if **Enabled**.

DCU Prefetcher[1]

Select **Enabled** to activate Level 1 Data Prefetcher to enhance system performance. For better performance of your DP server, refer to the specifications for the applications installed on your server to enable or disable this feature. The options are **Enabled** and **Disabled**.

Data Reuse Optimization[1]

Select **Enabled** to maximize Data Reuse support to enhance system performance for DP platforms. For better performance of your DP server, refer to the specifications of your applications installed in your server to enable or disable this feature. The options are **Enabled** and **Disabled**.

MPS and ACPI MADT Ordering

Use this feature to configure the multiprocessor specification (MPS) and ACPI settings for your motherboard. Select **Modern Ordering** if using Windows XP or later on the motherboard. Select **Legacy Ordering** if using Windows 2000 or earlier. The options are **Modern Ordering** and **Legacy Ordering**.

Intel Virtualization Technology[1]

Select **Enabled** to use the Virtualization Technology feature to allow one platform to run multiple operating systems and applications in independent partitions, creating multiple "virtual" systems in one computer. The options are **Enabled** and **Disabled**.

Note If you change this setting, you must power off and restart the system for the change to take effect. Refer to the Intel Web site (`intel.com`) for detailed information.

[1] Available when the CPU supports this option.

Execute-Disable Bit Capability[1]

Set to **Enabled** to enable the Execute Disable Bit, which allows the processor to designate areas in the system memory where an application code can execute and where it cannot, thus preventing a worm or a virus from flooding illegal codes to overwhelm the processor or damage the system during an attack. The default is **Enabled**. (Refer to the Intel (`intel.com`) and Microsoft (`microsoft.com`) Web sites for more information.)

Intel AES-NI[2]

If this feature is set to **Enabled**, Intel AES-NI adds new encryption features to help accelerate AES software application, providing code authorization and signature verification to improve system performance. The default is **Disabled**. (Refer to the Intel (`intel.com`) and Microsoft (`microsoft.com`) Web sites for more information.)

Simultaneous Multithreading[1]

Set to **Enabled** to use the simultaneous multithreading technology for increased CPU performance. The options are **Disabled** and **Enabled**.

Active Processor Cores

Set to **Enabled** to use a processor's second core and beyond. (Refer to the Intel Web site (`intel.com`) for more information.) The options are **All**, **1**, **2**, **3**, **4**, and **5**.

Intel EIST Technology

Enhanced Intel SpeedStep Technology (EIST) allows the system to adjust processor voltage and core frequency automatically to reduce power consumption and heat dissipation. (Refer to the Intel Web site (`intel.com`) for more information.) The options are **Disable** (**Disable GV3**) and **Enable** (**Enable GV3**).

Intel TurboMode Technology

Select **Enabled** to use the turbo mode to boost system performance. The options are **Enabled** and **Disabled**.

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[1] Available when the OS and CPU support this option.

C1E Support

Select **Enabled** to use the Enhanced Halt State feature. C1E significantly reduces CPU power consumption by reducing CPU clock cycle and voltage during a halt state. The options are **Disabled** and **Enabled**.

Intel C-State Tech

If this item is set to **Enabled**, the system automatically sets the C-State to either C2, C3, or C4 state. The options are **Disabled** and **Enabled**.

C-State Package Limit Setting

If this item is set to **Auto**, the AMI BIOS automatically sets the limit on the C-State package register. The options are **Auto**, **C1**, **C3**, **C6**, and **C7**.

C1 Auto Demotion

When this item is set to **Enabled**, the CPU conditionally demotes C3, C6, or C7 requests to C1 based on un-core auto-demote information. The options are **Disabled** and **Enabled**.

C3 Auto Demotion

When this item is set to **Enabled**, the CPU conditionally demotes C6 or C7 requests to C3 based on un-core auto-demote information. The options are **Disabled** and **Enabled**.

ACPI T State

Select **Enabled** to report processor throttling in Advanced Configuration and Power Interface (ACPI). The options are **Disabled** and **Enabled**.

Advanced Chipset Control

The items included in the **Advanced Settings** submenu are listed below:

CPU Bridge Configuration

CPU Revision

This item displays the CPU revision number.

Current QPI Frequency

This item displays current QPI frequency.

Current Memory Frequency for CPU1/ CPU2

This item displays current CPU memory frequency for CPU1/CPU2.

Memory Reference Code Rev.

This item displays the memory reference code revision number.

QPI Reference Code Rev.

This item displays the revision number of the QPI reference code for the motherboard.

Request Transaction ID[1]

QuickPath Interconnect (QPI) is the connection between the CPUs and the I/O hubs (IOHs). Processing a transaction in the QPI required a transaction ID, which an agent (CPU1, CPU2, or the IOH) assigns. Each agent is allocated a number of transaction IDs based on the QPI IO bandwidth and the Request Transaction ID (RTID) setting (32–24–32 or 32–16–40). Once transaction IDs are allocated to an agent, it assigns a transaction ID to an event so it can be processed in the QPI. Select **Balanced** to allocate transaction IDs to an agent based on the 32–24–32 setting. Select **IO Bias** to allocate RTIDs based on the 32–16–40 setting. The options are **Balanced** and **IO Bias**.

QPI Links Speed

Use this feature to select the data transfer speed for QPI. The options are **Slowmode** and **Full-Speed**.

QPI Frequency

Use this feature to select the desired QPI frequency. The options are **Auto**, **4.800 GT**, **5.866GT**, and **6.400 GT**.

QPI L0s and L1

Select **Enabled** to set QPI power to a lower state. The motherboard automatically selects L0s and L1. The options are **Disabled** and **Enabled**.

[1] Available for the Intel Xeon 5600 platform only.

Memory Frequency

This feature forces a DDR3 frequency slower than what the system has detected to desired setting. The available options are **Auto**, **Force DDR-800**, **Force DDR-1066**, **Force DDR-1333**, and **Force SPD** (for memory modules with Serial Presence Detect capability).

Memory Mode

Select **Independent** to make all DIMMs available to the operating system. Select **Channel Mirroring** to maintain two identical copies of all data in Channel 1 and Channel 2 memory modules for data security. Select **Lockstep** for the motherboard to use two areas of memory to run the same set of operations in parallel. Select **Sparing** for a preset threshold of correctable errors to be used to trigger fail-over. The spare memory is put online and used as active memory in place of the failed memory. This option is supported by Intel 5600 Series processors only. The options are **Independent**, **Channel Mirroring**, and **Lockstep**.

Demand Scrubbing

This option is a memory error correction scheme in which the processor writes corrected data back into the memory block from where the processor read it. The options are **Enabled** and **Disabled**.

Patrol Scrubbing

This option is the memory error correction scheme that works in the background looking for and correcting resident errors. The options are **Enabled** and **Disabled**.

Throttling—Closed Loop/Throttling—Open Loop

Throttling improves reliability and reduces power in the processor by automatic voltage control during processor idle states. Available options are **Disabled** and **Enabled**.

North Bridge Configuration

Use this feature to configure Intel IOH settings.

NB Revision

This item indicates the North Bridge chipset revision number.

Intel I/OAT

The Intel I/O Acceleration Technology (I/OAT) significantly reduces CPU overhead by leveraging CPU architectural improvements, freeing resources for more other tasks. The options are **Disabled** and **Enabled**.

Direct Cache Access (DCA) Technology

This feature works in conjunction with the Intel I/O Acceleration Technology (I/OAT) to accelerate the performance of the TOE device. When this feature is set to **Enabled**, it enhances overall system performance by providing direct cache access for data transferring. The options are **Enabled** and **Disabled**.

DCA Prefetch Delay

A DCA Prefetcher is used with TOE components to prefetch data to shorten execution cycles and maximize data processing efficiency. Prefetching too frequently can saturate the cache directory and delay necessary cache accesses. This feature reduces or increases the frequency the system prefetches data. The options are **[8]**, **[16]**, **[24]**, **[32]**, **[40]**, **[48]**, **[56]**, **[64]**, **[72]**, **[80]**, **[88]**, **[96]**, **[104]**, **[112]**, and **[120]**.

Intel VT-d

Select **Enabled** to enable Intel Virtualization Technology support for Direct I/O VT-d by reporting the I/O device assignments to VMM through the DMAR ACPI tables. This feature offers fully protected I/O resource sharing across the Intel platforms, providing greater reliability, security and availability in networking and data sharing. The options are **Enabled** and **Disabled**.

Active State Power Management

Select **Enabled** to use the power management for signal transactions between the PCI Express L0 and L1 Links. Select **Enabled** to configure PCI Express L0 and L1 Link power states. The options are **Disabled** and **Enabled**.

IOH PCI Express Max Payload Size

Some add-on boards perform faster with coalesce, which limits the payload size to 128 B. Other boards have a payload size of 256 B, which inhibits coalesce support. Refer to your add-on board documentation for the desired setting. The options are **256B** and **128B**.

Slot SXB2/SXB3 Width

Use this feature to change the link width of a PCI slot as specified to support a riser or add-on board installed in the slot. The options are **x4x4**, **x8**, and **Auto**.

Slot SXB1 Width

Use this feature to change the link width of a PCI slot as specified to support a riser or add-on board installed in the slot. The options are **x4x4x4x4**, **x4x4x8**, **x8x4x4**, **x8x8**, **x16**, and **Auto**.

South Bridge Configuration

Use this feature to configure Intel ICH South Bridge settings.

USB Functions

Use this feature to enable or disable onboard USB support. The options are: **Disabled** and **Enabled**.

Legacy USB Support

Select **Enabled** to use legacy USB devices. If this item is set to **Auto**, legacy USB support is enabled automatically if a legacy USB device is installed on the motherboard, and vise versa. The settings are **Disabled**, **Enabled**, and **Auto**.

Port 60h/64h Emulation

Select **Enabled** to enable 60h/64h emulation for complete USB keyboard support for operating systems that are not compatible with USB devices. The options are **Enabled** and **Disabled**.

USB 2.0 Controller[1]

This feature displays the current USB controller on the motherboard.

USB 2.0 Controller Mode

Use this setting to select the USB 2.0 controller mode. The options are **Hi-Speed** (480 Mbps) and **Full Speed** (12 Mbps).

[1] Available when the USB Functions item is disabled.

BIOS EHCI Hand-Off

Select **Enabled** to support BIOS Enhanced Host Controller Interface to provide a workaround solution for an operating system without EHCI hand-off support. When enabled, the EHCI interface changes from BIOS controlled to OS controlled. The options are **Disabled** and **Enabled**.

IDE/SATA Configuration

When you select this submenu, the AMI BIOS automatically detects the presence of the IDE or floppy devices and displays the following items.

SATA#1 Configuration

If **Compatible** is selected, SATA#1 is set to a legacy compatibility mode. Select **Enhanced** to set SATA#1 to the native SATA mode. The options are **Disabled**, **Compatible**, and **Enhanced**.

Configure SATA#1 As

Use this feature to select the drive type for SATA#1. The options are **IDE**, **RAID**, and **AHCI**. (When **RAID** is selected, **ICH RAID Code Base** appears. When **AHCI** is selected, **SATA AHCI** is available.)

ICH RAID Code Base[1]

Select **Intel** to enable the Intel SATA RAID firmware to configure the Intel SATA RAID settings. Select **Adaptec** to enable Adaptec SATA RAID firmware to configure Adaptec SATA RAID settings. The options are **Intel** and **Adaptec**.

SATA AHCI[2]

Select **Enable** to enable the Serial ATA Advanced Host Interface function. (Be careful when using this option. This feature is for advanced programmers only.)

SATA#2 Configuration[3]

Selecting **Enhanced** sets SATA#2 to native SATA mode. The options are **Disabled** and **Enhanced**.

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[1] Available when **RAID** is selected.

[2] Available when **AHCI** is selected.

[3] Available when **IDE** is selected.

IDE Detect Timeout (Sec)

Use this feature to set the timeout value in seconds for the BIOS to detect the ATA and ATAPI devices installed in the system. The options are **0**, **5**, **10**, **15**, **20**, **25**, **30**, and **35**.

Primary IDE Master/Slave, Secondary IDE Master/Slave, Third IDE Master, and Fourth IDE Master

Use these settings to set the Primary IDE Master/Slave, Secondary IDE Master/Slave, and Third and Fourth IDE Master slot parameter. Press <Enter> to access the submenu screen for detailed options for these items. Set the correct configurations accordingly. The submenu includes the following items.

Type

Use this item to select the type of device connected to the system. The options are **Not Installed**, **Auto**, **CD/DVD**, and **ARMD**.

LBA/Large Mode

Logical Block Addressing (LBA) is a method of addressing data on a disk drive. In LBA mode, the maximum drive capacity is 137 GB. For drive capacities over 137 GB, your system must be equipped with a 48-bit LBA mode addressing support. If not, contact your manufacturer or install an ATA/133 IDE controller card that supports 48-bit LBA mode. The options are **Disabled** and **Auto**.

Block (Multisector Transfer)

Block Mode boosts the IDE drive performance by increasing the amount of data transferred. When not in Block Mode, data transfer is limited to 512 bytes of data per interrupt. Block Mode allows transfers of up to 64 KB per interrupt. Select **Disabled** to allow data to be transferred to and from the device one sector at a time. Select **Auto** to allow data transfer to and from the device occur multiple sectors at a time if the device supports it. The options are **Auto** and **Disabled**.

PIO Mode

The IDE Programmable I/O (PIO) Mode programs timing cycles between the IDE drive and programmable IDE controller. As the PIO mode increases, the cycle time decreases. The options are **Auto**, **0**, **1**, **2**, **3**, and **4**.

Select **Auto** to allow the AMI BIOS to detect the PIO mode automatically. Use this value if you cannot determine the IDE disk drive support.

Select 0–4 to allow the AMI BIOS to use PIO mode 0–4, for data transfer rates of 3.3–16.6 Mbytes/s. Refer to Table 2-1 for PIO mode options.

Table 2-1. PIO Mode Options

Option	PIO Mode	Maximum Transfer Rate
0	PIO Mode 0	3.3 Mbytes/s
1	PIO Mode 1	5.2 Mbytes/s
2	PIO Mode 2	8.3 Mbytes/s
3	PIO Mode 3	11.1 Mbytes/s
4	PIO Mode 4	16.6 Mbytes/s

DMA Mode

Select **Auto** to allow the BIOS to detect IDE DMA mode automatically when you cannot determine the IDE disk drive support. The options are **Auto**, **SWDMAn**, **MWDMAn**, and **UDMAn**. Refer to Table 2-2 for DMA mode options.

Table 2-2. DMA Mode Options

Option	DMA Mode	Maximum Transfer Rate
SWDMA 0	Single-word DMA 0	2.1 Mbytes/s
SWDMA 1	Single-word DMA 1	4.2 Mbytes/s
SWDMA 2	Single-word DMA 2	8.3 Mbytes/s
MWDMA 0	Multiword DMA 0	4.2 Mbytes/s
MWDMA 1	Multiword DMA 1	13.3 Mbytes/s
MWDMA 2	Multiword DMA 2	16.6 Mbytes/s
UDMA 0	Ultra DMA 0	16.6 Mbytes/s
UDMA 1	Ultra DMA 1	25 Mbytes/s
UDMA 2	Ultra DMA 2	33.3 Mbytes/s
UDMA 3	Ultra DMA 3	44.4 Mbytes/s
UDMA 4	Ultra DMA 4	66.6 Mbytes/s

Table 2-2. DMA Mode Options

Option	DMA Mode	Maximum Transfer Rate
UDMA 5	Ultra DMA 5	100 Mbytes/s
UDMA 6	Ultra DMA 6	133 Mbytes/s

SMART for Hard Disk Drives

Self-Monitoring Analysis and Reporting Technology (SMART) can help predict impending disk drive failures. Select **Auto** to allow the AMI BIOS to detect hard disk drive support automatically. Select **Disabled** to prevent the AMI BIOS from using SMART. Select **Enabled** to allow the AMI BIOS to use SMART to support the hard disk drive. The options are **Disabled**, **Enabled**, and **Auto**.

32-Bit Data Transfer

Select **Enabled** to enable 32-bit IDE data transfer. The options are **Enabled** and **Disabled**.

PCI/PnP Configuration

Clear NVRAM

This feature clears the NVRAM during system boot. The options are **No** and **Yes**.

Plug & Play OS

Selecting **Yes** allows the OS to configure Plug & Play devices. (This is not required for system boot if your system OS supports Plug & Play.) Select **No** to allow the AMI BIOS to configure all devices in the system.

PCI Latency Timer

This feature sets the latency timer of each PCI device installed on a PCI bus. Select **64** to set the PCI latency to 64 PCI clock cycles. The options are **32**, **64**, **96**, **128**, **160**, **192**, **224**, and **248**.

PCI IDE Bus Master

When this feature is enabled, the BIOS uses PCI bus mastering for reading/writing to IDE drives. The options are **Disabled** and **Enabled**.

SR-IOV Supported

Select **Enabled** to enable Single Root I/O Virtualization (SR-IOV) support, which works with the Intel Virtualization Technology to allow multiple operating systems to run simultaneously within a single computer. These systems run via natively shared PCI Express devices to enhance network connectivity and performance. The options are **Enabled** and **Disabled**.

PCI Express Slot from SXB1/PCI Express Slot from SXB2/ PCI Express Slot from SXB3

Select **Enabled** to enable the PCI Express SXB1 slot, PCI Express SXB2 slot, or PCI Express SXB3 slot. This option also can enable option ROMs to boot the computer using a network interface from these slots. (You can configure SXB1, a x16 slot, into two x8 slots. You can configure SXB2, a x8 slot, into two x4 slots.) The options are **Enabled** and **Disabled**.

Onboard LAN Option ROM Select

Select **iSCSI** to use iSCSI option ROMs to boot the computer using a network device. Select **PXE** to use PXE option ROMs to boot the computer using a network device. The options are **iSCSI** and **PXE**.

Load Onboard LAN1 Option ROM/Load Onboard LAN2 Option ROM

Select **Enabled** to enable the onboard LAN1 or LAN2 Option ROM, to boot the computer using a network interface. The options for Load Onboard LAN1 and Load Onboard LAN 2 are **Enabled** and **Disabled**.

Boot Graphics Adapter Priority

Use this feature to select the priority graphics adapter for system boot. The options are **Onboard VGA** and **Offboard VGA**.

Super IO Device Configuration

Serial Port1 Address/Serial Port2 Address

This option specifies the serial port 1 and serial port 2 base I/O port address and interrupt request address. Select **Disabled** to prevent the serial port from accessing any system resources. When this option is set to **Disabled**, the serial port physically becomes unavailable. Select 3F8/IRQ4 to allow

the serial port to use 3F8 as its I/O port address and IRQ 4 as the interrupt address. The options for Serial Port1 are **Disabled**, **3F8/IRQ4**, **3E8/IRQ4**, **2E8/IRQ3**. The options for Serial Port2 are **Disabled**, **2F8/IRQ3**, **3E8/IRQ4**, and **2E8/IRQ3**.

Serial Port 2 Attribute

Use this feature to set COM 2 as a normal serial port or virtual COM port for Serial Over LAN (SOL). The options are **SOL** and **COM**.

Remote Access Configuration

Remote Access

Use this feature to enable the remote access feature. The options are **Disabled** and **Enabled**. If remote access is set to **Enabled**, the following items display.

Serial Port Number

Use this feature to select which serial port to use for console redirection. The options are **COM 1** and **COM 2**.

Serial Port Mode

Use this feature to set the serial port mode for console redirection. The options are **115200 8, n, 1**; **57600 8, n, 1**; **38400 8, n, 1**; **19200 8, n, 1**; and **9600 8, n, 1**.

Flow Control

Use this feature to set the flow control for console redirection. The options are **None**, **Hardware**, and **Software**.

Redirection After BIOS POST

Select **Disabled** to turn off console redirection after Power-On Self-Test (POST). Select **Always** to keep console redirection active all the time after POST.

Note Some operating systems may not support this setting.

Select **Boot Loader** to keep console redirection active during POST and when the Boot Loader is booting. The options are **Disabled**, **Boot Loader**, and **Always**.

Terminal Type

Use this feature to select the target terminal type for console redirection. The options are **ANSI**, **VT100**, and **VT-UTF8**.

VT-UTF8 Combo Key Support

Select **Enabled** to enable a terminal keyboard to send commands from a remote console. The options are **Enabled** and **Disabled**.

Sredir Memory Display Delay

This feature defines the length of time in seconds to display memory information. The options are **No Delay**, **Delay 1 Sec**, **Delay 2 Sec**, and **Delay 4 Sec**.

Hardware Health Event Monitoring

Use this feature to monitor system health and review the status of each item as displayed.

CPU Overheat Alarm

Caution Any temperature that exceeds the CPU threshold temperature the CPU manufacturer predefines may result in CPU overheating or system instability. When the CPU temperature reaches this predefined threshold, the CPU and system cooling fans run at full speed. To avoid possible system overheating, be sure to provide adequate airflow to your system.

Use this option to select the CPU Overheat Alarm setting, which determines when the CPU OH alarm is activated to warn of possible CPU overheating.

The options are:

- **Early Alarm**—Select this setting for the CPU overheat alarm (including the LED and the buzzer) to be triggered as soon as the CPU temperature reaches the CPU overheat threshold, as the CPU manufacturer predefines.
- **Default Alarm**—Select this setting for the CPU overheat alarm (including the LED and the buzzer) to be triggered when the CPU temperature reaches about 5 ºC above the threshold temperature, as the CPU manufacturer predefines, to give the CPU and system fans additional time needed for CPU and system cooling. For both alarms, take immediate action as described below.

CPU 1 Temperature/CPU 2 Temperature/System Temperature

This feature displays current CPU and system temperature readings. The following items are displayed for your reference only.

CPU1 Temperature/CPU2 Temperature

Intel has upgraded the CPU thermal technology that reports absolute temperatures (Celsius/Fahrenheit) to a more advanced feature in its newer processors. The basic concept is that each CPU is embedded with unique temperature information the motherboard can read. This temperature threshold or temperature tolerance is assigned at the factory. It is the baseline on which the motherboard takes action during different CPU temperature conditions (that is, by increasing CPU fan speed, triggering the overheat alarm, and so on). Because CPUs can have different temperature tolerances, the installed CPU now can send information to the motherboard regarding its temperature tolerance, and not the other way around. This results in better CPU thermal management.

National Instruments has leveraged this feature by assigning a temperature status to certain thermal conditions in the processor (low, medium, and high). This makes it easier to understand the CPU temperature status, rather than by seeing a temperature reading such as 25 ºC. The CPU temperature feature displays the CPU temperature status as the BIOS detects it:

- **Low**—This level is the normal operating state. The CPU temperature is well below the CPU temperature tolerance. The motherboard fans and CPU run normally as configured in the BIOS (Fan Speed Control).

  User intervention: No action required.

- **Medium**—The processor is running warmer than normal. This is a precautionary level and generally means there may be factors contributing to this condition, but the CPU still is within its normal operating state and below the CPU temperature tolerance. The motherboard fans and CPU run normally as configured in the BIOS. The fans may adjust to a faster speed depending on the Fan Speed Control settings.

  User intervention: No action is required. However, consider checking the CPU fans and chassis ventilation for blockage.

- **High**—The processor is running hot. This is a caution level, because the CPU temperature tolerance has been reached or exceeded and may activate an overheat alarm.

  User intervention: If the system buzzer and Overheat LED has activated, take action immediately by checking the system fans, chassis ventilation, and room temperature to correct any problems.

Notes To prevent damage to the CPU, the system may shut down if it runs hot for a long period.

The above information is for your reference only. For more information about thermal management, refer to the Intel Web site at `intel.com`.

System Temperature

This feature displays the system temperature in degrees Celsius and Fahrenheit as the BIOS detects it.

Fan 1–Fan 8 Reading

This feature displays the fan speed readings from fan interfaces Fan 1 through Fan 8.

Fan Speed Control Modes

Use this feature to decide how the system controls the onboard fan speeds. The CPU temperature and fan speed are correlative. When the CPU on-die temperature increases, the fan speed also increases for effective system cooling. Select **Full Speed/FS** to allow the onboard fans to run at full speed for maximum cooling. The FS setting is recommended for special system configuration or debugging. Select **Performance/PF** for better system cooling. The PF setting is recommended for high-power-consuming and high-density systems. Select **Balanced/BL** for the onboard fans to run at a speed that balances the needs between system cooling and power saving. The BL setting is recommended for regular systems with normal hardware configurations. Select **Energy Saving/ES** for best power efficiency and maximum quietness. The options are: **Full Speed/FS**, **Performance/PF**, **Balanced/BL**, and **Energy Saving/ES**.

Voltage Monitoring

This feature monitors the following voltages: CPU1 Vcore, CPU2 Vcore, CPU1 DIMM, CPU2 DIMM, 5 V, 5 VSB, 12 V, –12 V, 3.3 Vcc, 3.3 VSB, VBAT, and Vtt.

ACPI Configuration

Use this feature to configure Advanced Configuration and Power Interface (ACPI) power management settings for your system.

High-Precision Event Timer

Select **Enabled** to activate the High-Precision Event Timer (HPET), which produces periodic interrupts at a much higher frequency than a real-time clock (RTC) produces in synchronizing multimedia streams. This provides smooth playback and reduces dependency on other timestamp calculation devices, such as an *x*86 RDTSC Instruction embedded in the CPU. The High-Precision Event Timer replaces the 8254 Programmable Interval Timer. The options are **Enabled** and **Disabled**.

ACPI Aware O/S

Select **Yes** to enable ACPI support for an OS that supports ACPI. Select **No** to disable ACPI support for an OS that does not support ACPI. The options are **Yes** and **No**.

ACPI APIC Support

Select **Enabled** to include the ACPI APIC Table Pointer in the Root System Description Table (RSDT) pointer list. The options are **Enabled** and **Disabled**.

APIC ACPI SCI IRQ

When this item is set to **Enabled**, the system supports APIC ACPI SCI IRQ. The options are **Enabled** and **Disabled**.

Headless Mode

Use this feature to enable the system to function without a keyboard, monitor, or mouse attached. The options are **Enabled** and **Disabled**.

ACPI Version Features

Use this feature to select the ACPI version. The options are **ACPI v1.0**, **ACPI v2.0**, and **ACPI v3.0**. Refer to the ACPI Web site (`acpi.info`) for further explanation.

NUMA Support

Select **Enabled** to use the Non-Uniform Memory Access feature to improve CPU performance. The options are **Disabled**, **Enabled**, and **NUMA** for SLES 11 (SUSE Linux Enterprise Server 11).

WHEA Support

Select **Enabled** to enable Windows Hardware Error Architecture (WHEA) support, which provides a common infrastructure for the system to handle hardware errors on Windows platforms. This reduces system crashes due to hardware errors and enhances system recovery and health monitoring. The default setting is **Enabled**.

IPMI Configuration (Not Supported)

Intelligent Platform Management Interface (IPMI) is a set of common interfaces that IT administrators can use to monitor system health and to manage the system as a whole. For more information about the IPMI specifications, refer to the Intel Web site (`intel.com`).

IPMI Firmware Revision (Not Supported)

This item displays the current IPMI firmware revision.

Status of BMC Working (Not Supported)

The Baseboard Management Controller (BMC) manages the interface between system management software and platform hardware. This item displays the current BMC controller status.

View BMC System Event Log

This feature displays the BMC System Event Log (SEL). It shows the total number of entries of BMC system events. To view an event, select an entry number and press <Enter> to display the following information:

- Total number of entries
- SEL entry number
- SEL record ID
- SEL record Type
- Event timestamp
- Generator ID
- Event message format version
- Event sensor type
- Event sensor number
- Event directory type
- Event data

Clear BMC Event Log

Select **OK** and press <Enter> to clear the BMC system log. Select **Cancel** to keep the BMC system log. The options are **OK** and **Cancel**.

Set LAN Configuration

Caution Any cleared information is unrecoverable. Be sure you no longer need any data stored in the log before clearing the BMC event log.

Use this feature to configure the IPMI LAN adapter with a network address as shown in the following items.

Channel Number

Enter the channel number for the SET LAN Config command. This initially is set to **[1]**.

Channel Number Status

This item displays the channel status for the channel number selected above: **`Channel Number is OK`** or **`Wrong Channel Number`**.

IP Address Source

Use this feature to decide how an IP address is assigned to a client computer or network device. Select Dynamic Host Configuration Protocol (DHCP) to allow a client (computer or device) to obtain an IP address from a DHCP server that manages a pool of IP addresses and network information on a “request and grant” basis. On timeout (or lease expiration), you can reassign the IP address assigned to the client to a new client. Select **Static** (static allocation) to allow the host server to allocate an IP address based on a table containing MAC Address/IP Address pairs that are manually entered (probably by a network administrator). Only clients with a MAC address listed in the MAC/IP Address Table are assigned an IP address. The IP address allocated to the client is on a longer term basis than that assigned by the DHCP mentioned in the other option. The options are **DHCP** and **Static**.

IP Address

The BIOS automatically enters the IP address of this machine; however, it may be overwriiten. IP addresses are six two-digit hexadecimal numbers.

Subnet Mask

This item displays the current subnet mask setting for your IPMI connection. The value of each three-digit number separated by dots should not exceed 255.

Gateway Address

The BIOS automatically enters the Gateway address of this machine; however, it may be overwritten. IP addresses are six two-digit hexadecimal numbers separated by dots.

Mac Address

The BIOS automatically enters the Mac address of this machine; however, it may be overwritten. Mac addresses are six two-digit hexadecimal numbers separated by dots.

Event Log Configuration

View Event Log

Use this option to view the system event log.

Mark All Events as Read

This option marks all events as read. The options are **OK** and **Cancel**.

Clear Event Log

This option clears the Event Log memory of all messages. The options are **OK** and **Cancel**.

PCI Express Error Log

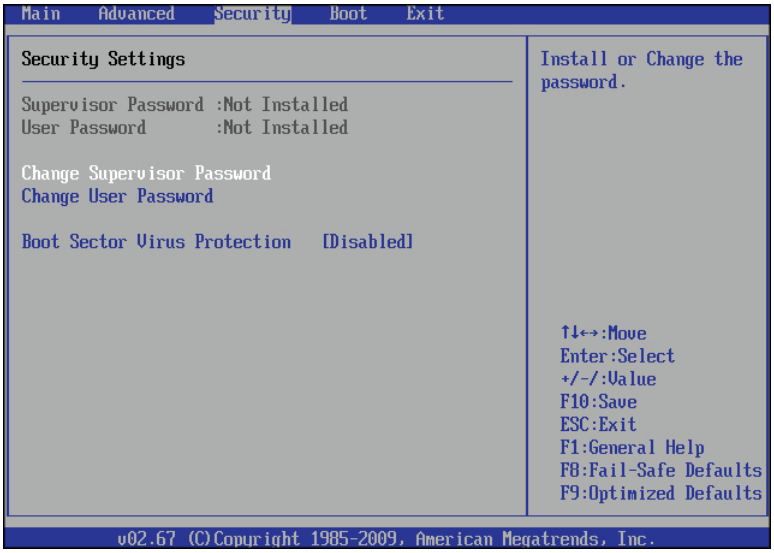
Use this option to enable PCI Express error (PERR) logging. The options are **Yes** and **No**.

Memory Error Log

Use this option to enable memory error logging. The options are **Yes** and **No**.

Security Settings

The AMI BIOS provides a Supervisor and User password. If you use both passwords, you must set the Supervisor password first.



Supervisor Password

This item indicates whether a supervisor password has been entered for the system. **Not Installed** means a supervisor password has not been used.

User Password

This item indicates whether a user password has been entered for the system. **Not Installed** means that a user password has not been used.

Change Supervisor Password

Select this feature and press <Enter> to access the **Security** menu, and then enter a new supervisor password.

User Access Level[1]

Select **Full Access** to grant the user full access to the Setup Utility, and change setup settings. Select **View Only** to allow the user to access the setup utility to view the settings without making changes. Select **Limited** to allow the user to change selected settings such as date and time. Select **No Access** to prevent the user from accessing the Setup Utility.

Change User Password

Select this feature and press <Enter> to access the submenu, and then enter a new user password.

Clear User Password[2]

Use this item to clear a user password after it has been entered.

Password Check

Use this item to check a password after it has been entered. The options are **Setup** and **Always**.

Boot Sector Virus Protection

If this feature is enabled, the AMI BIOS displays a warning when any program (or virus) issues a disk format command or attempts to write to the boot sector of the hard disk drive. The options are **Enabled** and **Disabled**.

Clear User Password[1]

Use this item to clear a user password after it has been entered.

Password Check

This item allows you to check a password after it has been entered. The options are **Setup** and **Always**.

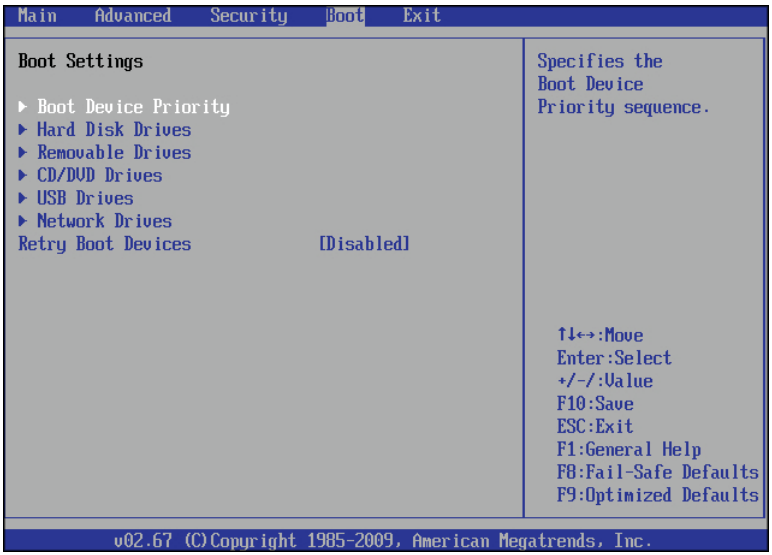
---

[1] Available when a supervisor password is set.

[2] Available only when a user password is set.

Boot Configuration

Use this feature to configure boot settings.



Boot Device Priority

Use this feature to specify the priority sequence of boot devices, including the first boot device, second boot device, and so on. The options are **Removable Devices**, **Hard Drive**, **CD/DVD**, **USB**, **Network**, and **Disabled**.

Hard Disk Drives

Use this feature to specify the boot sequence from all available hard disk drives. The settings are **Disabled** and a list of all hard disk drives that have been detected (that is, **1st Drive**, **2nd Drive**, **3rd Drive**, and so on).

Removable Drives

Use this feature to specify the boot sequence from available removable drives. The settings are **1st boot device**, **2nd boot device**, and **Disabled**.

CD/DVD Drives

Use this feature to specify the boot sequence from available CD/DVD drives.

USB Drives

Use this feature to specify the boot sequence from available USB drives.

Network Drives

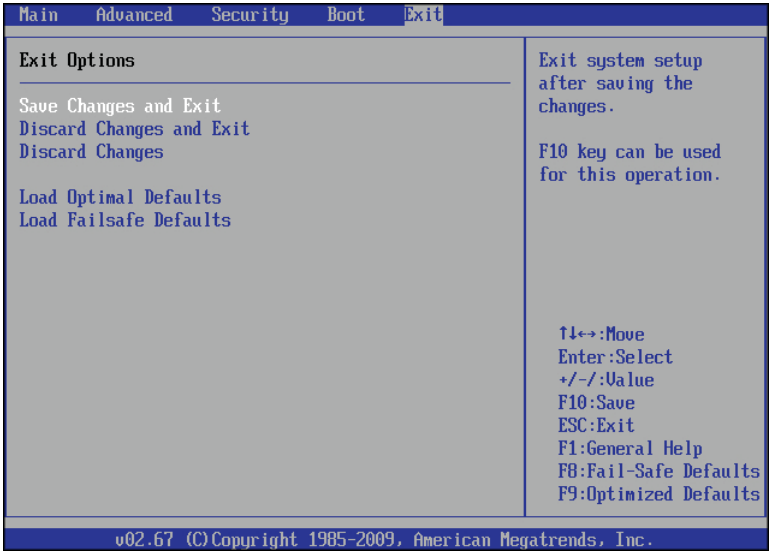
Use this feature to specify the boot sequence from available network drives.

Retry Boot Devices

If this feature is enabled, the system continues to search for the next boot device if the current boot device is not available. The options are **Enabled** and **Disabled**.

Exit Options

Select the **Exit** tab on the AMI BIOS Setup Utility screen to enter the Exit BIOS Setup screen.



Save Changes and Exit

When you have completed the system configuration changes, select this option to leave the BIOS Setup Utility and reboot the computer so that the new system configuration parameters can take effect. Select **Save Changes and Exit** from the **Exit** menu and press <Enter>.

Discard Changes and Exit

Select this option to quit the BIOS Setup Utility without making any permanent changes to the system configuration and reboot the computer. Select **Discard Changes and Exit** from the **Exit** menu and press <Enter>.

Discard Changes

Select this option and press <Enter> to discard all changes and return to the AMI BIOS Utility.

Load Optimal Defaults

To set this feature, select **Load Optimal Defaults** from the **Exit** menu and press <Enter>. Then select **OK** to allow the AMI BIOS to automatically load optimal defaults to the BIOS Settings. The optimal settings are designed for maximum system performance, but may not work best for all computer applications.

Load Fail-Safe Defaults

To set this feature, select **Load Fail-Safe Defaults** from the **Exit** menu and press <Enter>. The fail-safe settings are for maximum system stability, but not maximum performance.

BIOS Error Beep Codes

Errors may occur during the Power-On Self-Test (POST) routines, which are performed each time the system is powered on.

Nonfatal errors are those which, in most cases, allow the system to continue the boot-up process. The error messages normally appear on the screen.

Fatal errors do not allow the system to continue the boot-up procedure. If a fatal error occurs, consult with your system manufacturer about possible repairs.

Table 2-3. BIOS Error Beep Codes

Beep Code	Error Message	Description
One beep	Refresh	Circuits have been reset. (Ready to power up.)
Five short beeps and one long beep	Memory error	No memory is detected in the system.

Table 2-3. BIOS Error Beep Codes (Continued)

Beep Code	Error Message	Description
Eight beeps	Display memory read/write error	Video adapter is missing or has faulty memory.
One high pitch and one low pitch (siren-like alarm)	System overheat	System is overheating.

OS Reinstallation and Recovery

Caution Recovering the OS using the hard drive-based recovery or the OS recovery CD/DVD erases the contents of your hard disk. Before recovering the OS, back up any files you want to keep.

The NI RMC-8355 includes a preinstalled OS from the factory. The NI RMC-8355 also includes two methods of restoring/reinstalling the OS to your system.

- Hard drive-based recovery stores a factory backup on a separate portion of your hard drive, allowing you to restore your server without additional media.

Note The hard drive recovery hot key is <F4>. To access the hard drive-based recovery tool, press and hold <F4> when video first appears during the boot process.

- The NI RMC-8355 also ships with an OS recovery CD/DVD you can use to reinstall your operating system onto your hard drive.

  If you need to reinstall your operating system, you can use the included OS recovery CD/DVD. Boot the NI RMC-8355 using the OS recovery CD/DVD to recover the OS.

Note You also may need to update or reinstall software after using the OS reinstallation CD/DVD to recover your OS. The OS reinstallation CD/DVD may contain drivers that are older or newer than the factory-installed version of the OS and may not contain the latest RAID drivers. To ensure you have the latest drivers, go to `www.intel.com` and install the Intel Rapid Storage Technology (Intel RST) RAID software package.

Note After you reinstall or recover your OS, you may find shortcuts on the desktop that require you to install specific drivers or software (for example, video drivers). Due to driver and software packaging, it was not possible to preinstall this software during the OS installation.

Cleaning

Caution *Always* disconnect the AC/DC power cable before cleaning or servicing the chassis.

Exterior Cleaning

Cautions Avoid getting moisture inside the chassis during exterior cleaning, especially through the top vents.

Do *not* wash the front- or rear-panel connectors or switches. Cover these components while cleaning the chassis.

Do *not* use harsh chemical cleaning agents; they may damage the chassis. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Clean the exterior surfaces of the chassis with a dry lint-free cloth or a soft-bristle brush. Do *not* use abrasive compounds on any part of the chassis.

Rack Mounting

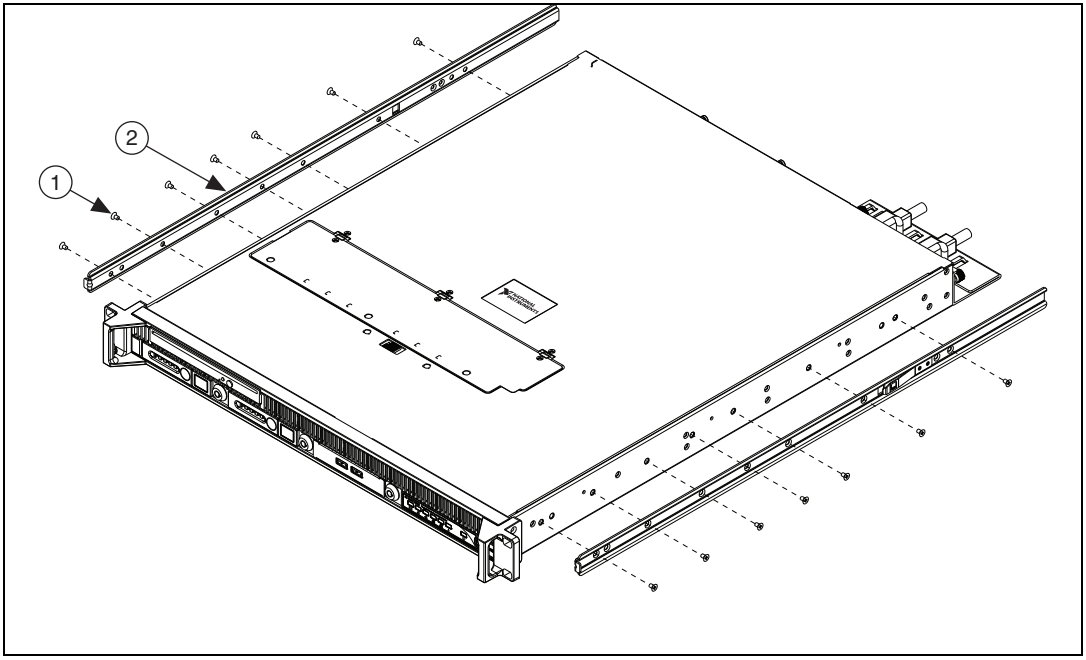
Caution When mounting the equipment in the rack, do not create a hazardous condition due to uneven mechanical loading.

The NI RMC-8355 rack mounting hardware includes:

- One pair of inner slides to be installed on the chassis.
- One pair of outer slides to be installed in the rack.
- Two pairs of brackets (4 in. and 12 in.) for attaching the outer slides to racks of different depths.
- Bag of assorted fasteners.

Installing the Inner Slides

Install the inner slides to the NI RMC-8355 as shown in Figure 2-2.

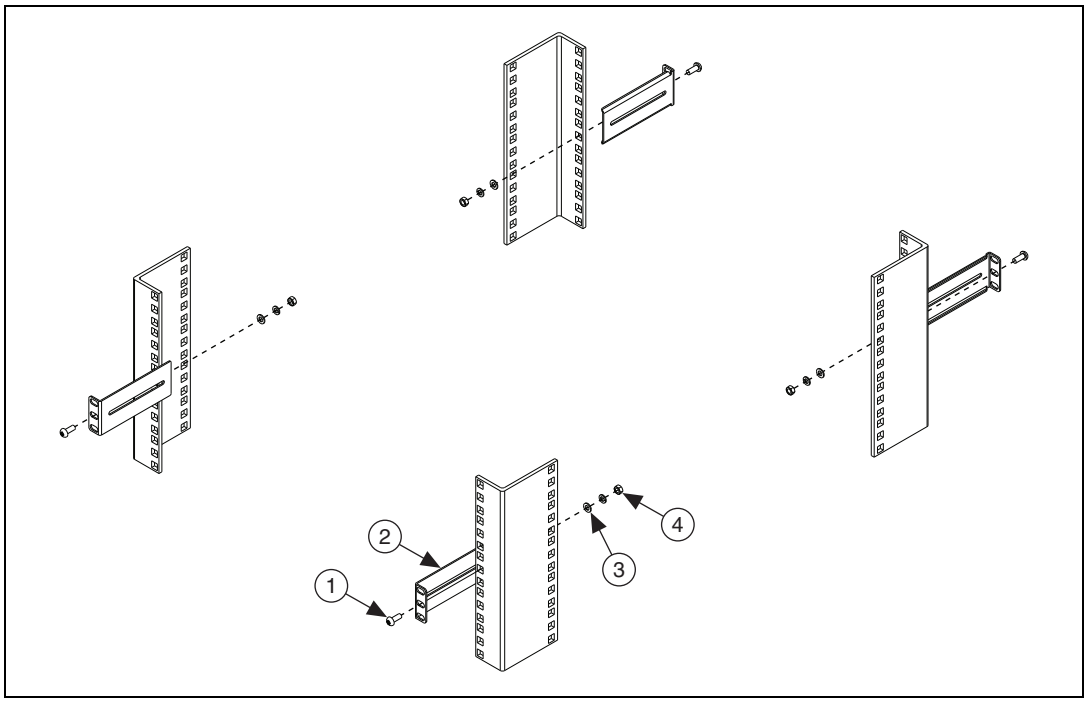


1 Retaining Screw (x14)	2 Inner Slide

Figure 2-2. Installing Inner Slides

Installing the Slide Mounting Brackets in the Rack

Install the slide mounting brackets in the rack as shown in Figure 2-3.

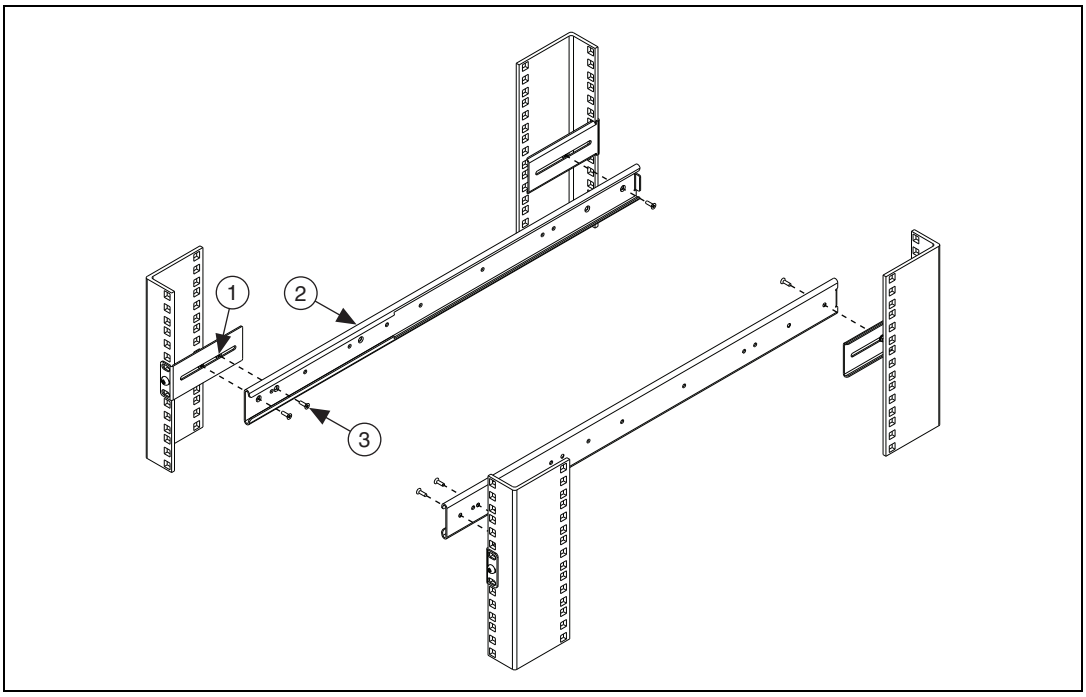


1	Retaining Screw (x4)	3	Washer (x8)
2	Slide Mounting Bracket (x4)	4	Nut (x4)

Figure 2-3. Installing Slide Mounting Brackets in Rack

Installing the Outer Slides in the Rack

Install the outer slides in the rack as shown in Figure 2-4.



1 Nut (x6)	2 Outer Slide	3 Retaining Screw (x6)

Figure 2-4. Installing Outer Slides in Rack

Installing the Chassis into the Rack

Push the inner slides, attached to the chassis, into the grooves of the outer slides in the rack and slide the NI RMC-8355 into the rack, as shown in Figure 2-5.

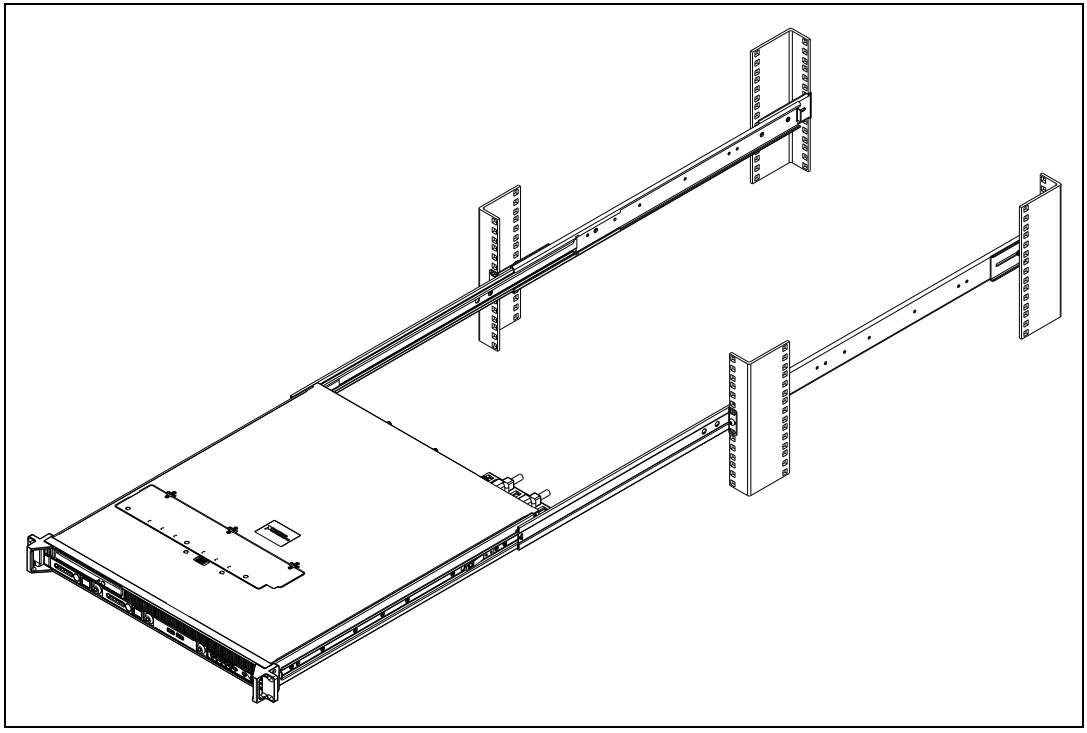


Figure 2-5. Installing NI RMC-8355 in Rack

3

I/O Information

This chapter describes the NI RMC-8355 I/O connectors.

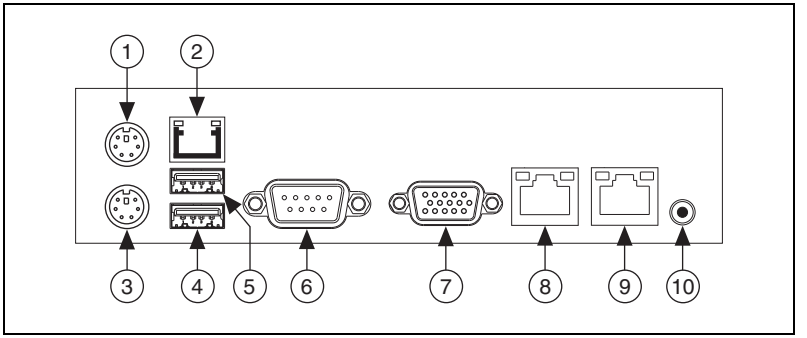
Rear Panel Connectors

Table 3-1 lists various peripherals and their corresponding NI RMC-8355 external connectors, bus interfaces, and functions.

Table 3-1. NI RMC-8355 Peripherals Overview

Peripheral	External Connector	Description
Keyboard	PS/2 (5-pin Din)	PS/2-style keyboard
Mouse	PS/2 (5-pin Din)	PS/2-style mouse
USB	USB 4-pin Series A stacked receptacle	USB 2.0 capable
USB	USB 4-pin Series A stacked receptacle	USB 2.0 capable
IPMI	IPMI dedicated LAN	Not supported
Serial	COM1 (9-pin DSUB)	16550 RS-232 serial port
Video	VGA (15-pin DSUB)	Matrox G200eW graphics controller
Ethernet	LAN (RJ45)	10/100/1000 Ethernet connection
Ethernet	LAN (RJ45)	10/100/1000 Ethernet connection

Figure 3-1 shows the rear panel layout of the NI RMC-8355.



1	PS/2 Mouse Connector	6	Serial Port
2	IPMI Dedicated LAN (Not Supported)	7	VGA Port
3	PS/2 Keyboard Connector	8	LAN 1
4	USB Port 0	9	LAN 2
5	USB Port 1	10	UID Switch/LED (Not Supported)

Figure 3-1. NI RMC-8355 Rear Panel Layout

PS/2

Figure 3-2 shows the location and pinouts for the PS/2 keyboard and mouse connectors on the NI RMC-8355. Table 3-2 lists and describes the PS/2 connector signals.

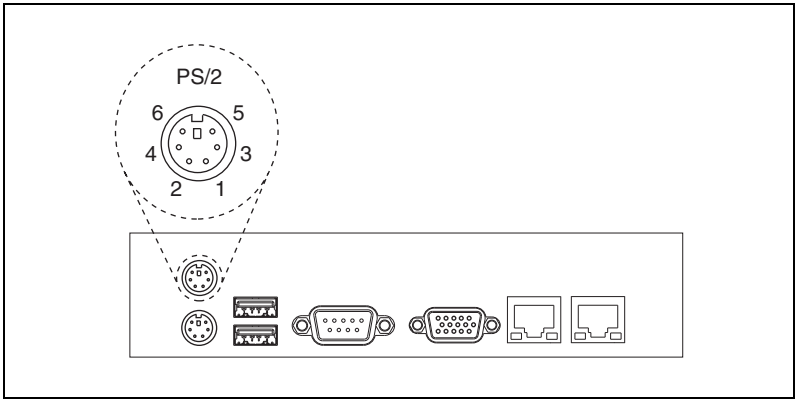


Figure 3-2. PS/2 Connector Location and Pinout

Table 3-2. PS/2 Connector Signals

Pin	Signal Name	Signal Description
1	DATA	Data Keyboard
2	NC	Data Mouse
3	GND	Ground
4	VCC	VCC
5	CLK	Clock Keyboard
6	NC	Clock Mouse

Universal Serial Bus

Figure 3-3 shows the location and pinouts for the Universal Serial Bus (USB) connectors on the NI RMC-8355. Table 3-3 lists and describes the USB connector signals.

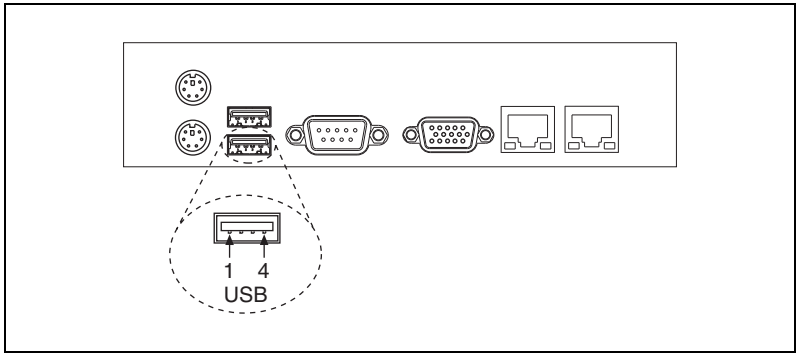


Figure 3-3. USB Connector Location and Pinout

Table 3-3. USB Connector Signals

Pin	Signal Name	Signal Description
1	VCC	Cable Power (+5 V)
2	–Data	USB Data–
3	+Data	USB Data+
4	GND	Ground

Serial

Figure 3-4 shows the location and pinouts for the serial connector on the NI RMC-8355. Table 3-4 lists and describes the serial connector signal.

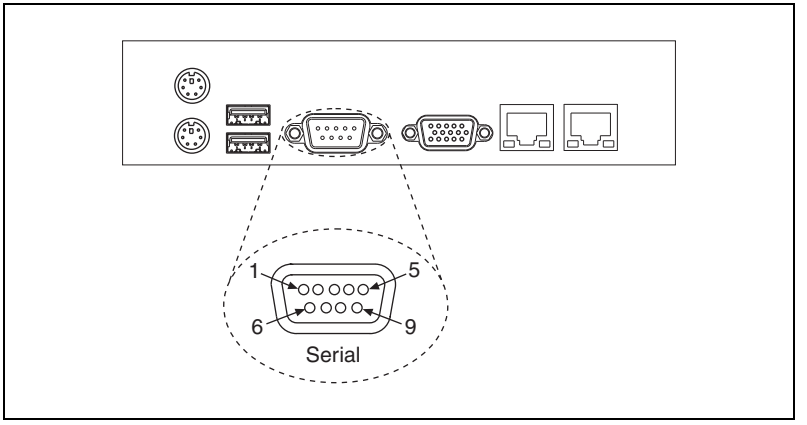


Figure 3-4. Serial Connector Location and Pinout

Table 3-4. Serial Connector Signals

Pin	Signal Name	Signal Description
1	DCD*	Data Carrier Detect
2	SIN*	Receive Data
3	SOUT*	Transmit Data
4	DTR*	Data Terminal Ready
5	GND	Ground
6	DSR*	Data Set Ready
7	RTS*	Ready to Send
8	CTS*	Clear to Send
9	RI*	Ring Indicator

VGA

Figure 3-5 shows the location and pinouts for the VGA connector on the NI RMC-8355. Table 3-5 lists and describes the VGA connector signals.

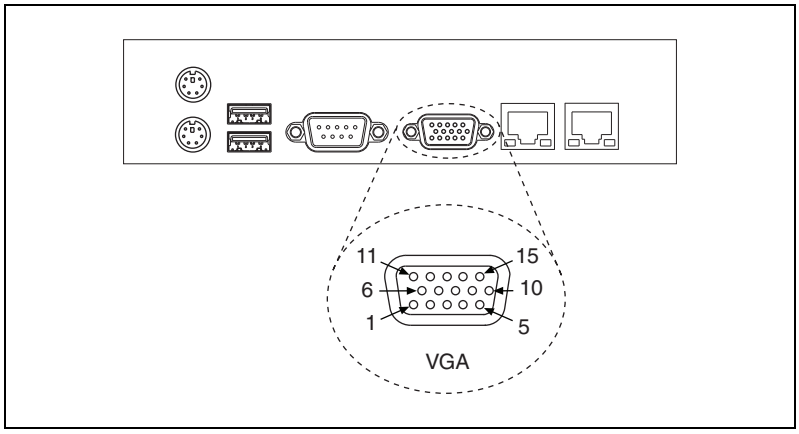


Figure 3-5. VGA Connector Location and Pinout

Table 3-5. VGA Connector Signals

Pin	Signal Name	Signal Description
1	R	Red
2	G	Green
3	B	Blue
4	NC	Not Connected
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	+5V	5 V
10	GND	Ground
11	NC	Not Connected
12	SD	Serial Data
13	HSync	Horizontal Sync
14	VSync	Vertical Sync
15	SC	Serial Clock

Ethernet

Figure 3-6 shows the location and pinouts for the Ethernet connectors on the NI RMC-8355. Table 3-6 lists and describes the Ethernet connector signals.

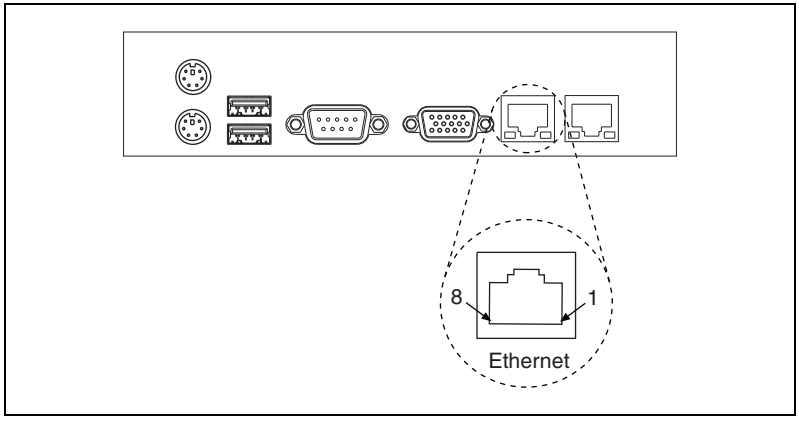


Figure 3-6. Ethernet Connector Location and Pinout

Table 3-6. Ethernet Connector Signals

Pin	Signal Name	Signal Description
1	D0P	Differential Pair 0+
2	D0N	Differential Pair 0–
3	D1P	Differential Pair 1+
4	D2P	Differential Pair 2+
5	D2N	Differential Pair 2–
6	D1N	Differential Pair 1–
7	D3P	Differential Pair 3+
8	D3N	Differential Pair 3–

MXI-Express Connectors

Refer to your MXI-Express hardware user manual for connector information.

Note The NI RMC-8355 BIOS supports only 188 PCI buses by default. For large multichassis systems requiring more than 188 PCI buses, use the NI MXI-Express BIOS Compatibility Software to work around this limitation on Windows. At this time, there is no workaround available for systems running LabVIEW RT. To access the NI MXI-Express BIOS Compatibility Software, search for *MXI-Express BIOS Compatibility Software* at `ni.com/drivers`.

4

Common Configuration Questions

This chapter answers common configuration questions you may have when using the NI RMC-8355.

General Questions

What do the LEDs on the NI RMC-8355 front panel mean?

The power indicator lights when the main power is turned on. The LAN status LEDs flash to when there is activity on LAN1 and LAN2. The hard drive LED lights when there is hard drive activity on the NI RMC-8355. For more information, refer to Figure 1-1, *Front View of the NI RMC-8355*.

How do I check the configuration of the memory, hard drive, time/date, and so on?

You can view these parameters in the BIOS setup. To enter the BIOS setup, reboot the NI RMC-8355 and press <Delete> during the memory tests. Refer to the *BIOS Setup* section of Chapter 2, *Installation and BIOS Setup*, for more information.

Can I use the internal SATA drive and an external hard drive at the same time?

Yes.

What RAID modes are supported?

The NI RMC-8355 supports only RAID 0 and 1.

Does the NI RMC-8355 support a PCI card?

No, the NI RMC-8355 can support only PCI Express cards while using a riser card (provided).

What is the shortcut key to get to the boot menu while the BIOS is going through POST?

The shortcut key is <F11>.

Boot Options

What devices can I boot from?

The NI RMC-8355 can boot from the following devices:

- The internal SATA hard drive
- The internal CD-ROM drive
- A network PXE server on the same subnet
- An external USB mass storage device such as a USB hard drive or CD-ROM

Note You should enable Legacy USB support to boot from USB devices. Refer to the *BIOS Setup* section of Chapter 2, *Installation and BIOS Setup*, for more information.

- An external USB floppy drive

Note There are some limitations when booting from a USB device. Windows XP can be installed from a USB CD-ROM, but earlier versions of Windows cannot. The NI RMC-8355 BIOS configures the USB devices so that they will work in a DOS environment.

How do I configure the controller to boot from these devices?

Press <Delete>, enter the BIOS, and select **Boot**. Set the order by device type and set the order for the devices listed within the device type. Refer to *BIOS Setup* in Chapter 2, *Installation and BIOS Setup*, for more information.

Chassis Configuration

How do I set up the NI RMC-8355 to work with my PXI chassis?

Configuration of the PXI system is handled through Measurement & Automation Explorer (MAX), included with the software pre-installed on your NI RMC-8355. MAX creates the `pxisys.ini` file, which defines the layout and parameters of your PXI system.

The configuration steps for single or multiple-chassis systems are the same. In MAX, select **Help»Help Topics»PXI** to configure your chassis.

The PXI specification allows many combinations of PXI chassis and system modules. To assist system integrators, the manufacturers of PXI chassis and system modules must document the capabilities of their products. The minimum documentation requirements are contained in `.ini` files, which consist of ASCII text. System integrators, configuration utilities, and device drivers can use these `.ini` files.

The capability documentation for the chassis is contained in a `chassis.ini` file provided by the chassis manufacturer. The information in this file is combined with information about the system controller to create a single system initialization file called `pxisys.ini` (PXI System Initialization). The NI RMC-8355 uses MAX to generate the `pxisys.ini` file from the `chassis.ini` file.

Device drivers and other utility software read the `pxisys.ini` file to obtain system information. For detailed information about initialization files, refer to the PXI specification at `www.pxisa.org`.

Upgrade Information

How do I upgrade system memory?

Refer to the *Upgrading Memory* section in Appendix B, *Hardware Configuration*.

How to I upgrade my hard drive or solid state disk?

Refer to the *Upgrading and Replacing Hard Disk Drives* section of Appendix B, *Hardware Configuration*.

How do I flash a new BIOS?

To see if the latest BIOS is available, go to `ni.com/downloads/`.

Where do I get the latest software drivers?

The latest National Instruments software is available from `ni.com/downloads/`.

What upgrade options are available for the RMC-8355?

Table 4-1 lists the available upgrade options.

Table 4-1. NI RMC-8355 Upgrade Options

Orderable P/N	Description
782116-01	Spare optical drive for NI RMC-8355
782117-01	Spare 250 GB SSD and drive bay for NI RMC-8355
782314-01	Spare 500 GB HDD and drive bay for NI RMC-8355
782301-01	PCI Express plug-in video card with dual digital display outputs
782302-01	Rack mount rails for NI RMC-8355
782544-01	Spare/replacement AC power supply for NI RMC-8355
782545-01	Spare/replacement DC power supply for NI RMC-8355
782547-01	DC power cable for NI RMC-8355
782546-01	Spare/replacement fan for NI RMC-8355
782567-1024	1 GB RAM replacement/upgrade for NI RMC-8355
782567-4096	4 GB RAM replacement/upgrade for NI RMC-8355
782567-8192	8 GB RAM replacement/upgrade for NI RMC-8355
782596-01	Dual CPU upgrade, Intel Xeon E5620

5

Troubleshooting

This chapter answers common troubleshooting questions you may have when using the NI RMC-8355.

What if the NI RMC-8355 does not boot?

Several problems can cause a controller not to boot. Here are some things to look for and possible solutions.

Things to Notice:

- Which LEDs come on? The power indicator LED should stay lit. The hard disk drive LEDs should blink during boot as the disk is accessed.
- What appears on the display? Does it hang at some particular point (BIOS, Operating System, and so on)? If nothing appears on the screen, try a different monitor. Does your monitor work with a different PC? If it hangs, note the last screen output that you saw for reference when consulting National Instruments technical support.
- What has changed about the system? Did you recently move the system? Was there electrical storm activity? Did you recently add a new module, memory chip, or piece of software?
- Has the system overheated? If the Overheat/FanFail LED is lit, this indicates overheating. Unplug the AC power cord from the controller and allow it to cool down before powering it on again.
- Has any memory been installed in the unsupported slots? (Refer to the *Memory Upgrades* section in Chapter 1, *Getting Started*, for more information.)

Things to Try:

- Make sure the NI RMC-8355 is plugged in to a working power source.
- Remove the power supply and reinsert it.
- Remove any nonessential cables or devices.
- Make sure the CPU and memory modules are properly seated in their slots.
- Clear the CMOS. (Refer to the *CMOS Clear (JBT1)* section of Appendix B, *Hardware Configuration*.)

- Recover the hard drive on the NI RMC-8355. (Refer to the *OS Reinstallation and Recovery* section of Chapter 2, *Installation and BIOS Setup*.)
- Remove memory from unsupported slots.

My NI RMC-8355 boots fine until I get to Windows, at which point I cannot read the screen. This may include garbled output, white screen, black screen, or an out of synch message from the monitor.

This problem usually results from having the video card output set past the limits of the monitor. You will need to boot Windows in Safe Mode. To do this, reboot the NI RMC-8355. As Windows begins to boot, hold down <F8>. You should now be able to reset the video driver to lower settings. Try setting the resolution to 640 × 480 and the refresh rate to 60 Hz. Once you reboot, you can raise these values again, using the test option in Windows. These settings are accessible through the **Advanced** tab of the **Display** item in the **Control Panel**. Alternately, you can try a different monitor, preferably a newer and larger one.

My system boots fine as long as a particular module is not in my chassis.

The most common cause of this is a damaged module. Try the module in a different chassis or with a different controller. Also, remove any external cables or terminal blocks connected to the system. If the module does not work in these cases, it is likely damaged. Contact the module manufacturer for further troubleshooting.

Refer to the KnowledgeBase or product manuals section at `ni.com` for more information specific to the chassis and module with which you are having difficulties.

How do I set Windows to prompt me before shutting down when I press the power button?

Select **Start»Control Panel»Power Options** to open the **Power Options Properties** window. Select the **Advanced** tab. In the **Power buttons** section, select **Ask me what to do** from the pull-down menu. When this is selected, Windows prompts you to cancel, shut down, or restart when you press the power button.

A

Specifications

This appendix lists the NI RMC-8355 electrical, mechanical, and environmental specifications.

Electrical

AC Input

Input voltage range..... 100–240 VAC

Operating voltage range ..... 90–264 VAC

Input frequency ..... 50/60 Hz

Operating frequency range..... 47–63 Hz

Current rating ..... 4–2 A max (480 W max single power supply)

Power disconnect ..... The AC power cable provides main power disconnect. Depressing the front panel power switch enables or inhibits the internal power supply.

DC Input

Input ..... 23–36 V, 16–8 A ±10%

Current rating ..... +12 V –41 A
+5 VSB 0–3 A

DC output..... 360 W (max)

Note The connection to a DC mains supply is considered an energy hazard and must not be in an operator access area. The DC product must be located in a Restricted Access Location.

Caution Use the DC power cable provided with DC power supplies for VDC input.

Caution Using the NI RMC-8355 in a manner not described in this document may impair the protection the NI RMC-8355 provides.

Mainboard

Socket	LGA 1366 (dual socket)
Chipset	Intel 5520 chipset
Memory slots	Twelve 240-pin DIMM DDR3 slots, three channel 800/1066 96 GB max memory (six slots and 48 GB per processor)
PCI Express	One PCI Express 2.0 x16 slot and one PCI Express 2.0 x8 slot
SATA	Two SATA ports compliant with the Serial-ATA 2.0 specification.
USB ports	Four USB 2.0 ports
Keyboard	PS/2 keyboard port
Mouse	PS/2 mouse port
Video	VGA port, onboard Matrox G200eW 16 MB DDR2 (max resolution 1280 × 1024)
Serial	One RS-232 serial port
LAN	Two RJ45 LAN jacks
Onboard LAN controller	Intel 82576 Dual-Port Gigabit Ethernet controller

CPU

CPU	Xeon E5620 Quad Core
Clock speed	2.40 GHz
Max turbo frequency	2.66 GHz
Intel Smart Cache	12 MB
Package	LGA 1366

Hard Disk Drive

Capacity ..... 300 (SSD)/500 (HDD) GB in one or two-drive configurations for maximum capacity of 600 GB/1 TB

Interface ..... Serial-ATA 2 (3 Gbps via ICH10R controller)

Memory

Standard memory ..... 1 GB (128 M × 72 bit), DDR-III SDRAM, RDIMM ECC 800/1066 MHz

4 GB memory upgrade (64-bit OS) ..... 4 GB (128 M × 72 bit), DDR-III SDRAM, RDIMM ECC 800/1066 MHz

8 GB memory upgrade (64-bit OS) ..... 8 GB (512 M × 72 bit), DDR-III SDRAM, RDIMM ECC 800/1066 MHz

Notes Six memory slots per CPU.

Maximum RAM per CPU is 48 GB (6 × 8 GB).

Standard shipping memory is 3 GB per CPU (3 × 1 GB).

Mechanical

Overall dimensions (standard chassis)

- Height..... 1U
- Width ..... 432 mm (17.0 in.)
- Depth..... 533 mm (21.0 in.)

Weight..... 8.1 kg (17.8 lbs)

Shock and Vibration

Mechanical Shock	
Operating	30 g, 11 ms

Test Procedures	Standard
Operating	IEC 68-2-27
Non-operating	IEC 68-2-27

Operational Random

Frequency (Hz)	Vibration Level
5–350	0.0002 g^2/Hz
350–500	–3 dB/octave
500	0.00014 g^2/Hz
Total g_{rms} = 0.31	

Non-Operational Random

Frequency (Hz)	Vibration Level
5–100	0.02 g^2/Hz
100–200	–3 dB/octave
200–350	0.01 g^2/Hz
350–500	–3 dB/octave
500	0.007 g^2/Hz
Total g_{rms} = 2.46	

Random Vibration Test Procedures

Test	Standard
Operating	IEC 68-2-64
Non-operating	IEC 68-2-64

Environmental

Caution If installed in a closed or multiunit rack assembly, the rack environment operating ambient temperature may be greater than room ambient temperature. Therefore, install the equipment in an environment compatible with the maximum ambient temperature (Tma) the manufacturer specifies.

Operating temperature (Single Xeon) .... 0 to 50 °C (CPU turbo mode off)
(Tested in accordance with IEC-60068-2-1.)

Operating temperature (Single Xeon) .... 0 to 45 °C (CPU turbo mode on)
(Tested in accordance with IEC-60068-2-1.)

Operating temperature (Dual Xeon).....0 to 45 °C (CPU turbo mode off)
(Tested in accordance with IEC-60068-2-1.)

Operating temperature (Dual Xeon).....0 to 40 °C (CPU turbo mode on)
(Tested in accordance with IEC-60068-2-1.)

Storage temperature ..... –40 to 70 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity (tested in accordance with IEC-60068-2-56)

- Operating ..... 10 to 90% noncondensing
- Nonoperational (storage) ..... 5 to 95% noncondensing

Operating location..... Indoor use only

Maximum altitude ..... 3,000 m

Installation Category.....II

Pollution Degree 2

Acoustic Emissions

Sound pressure level (at operator position)

Minimum .....56.3 dBA

Maximum .....67.2 dBA

Sound power

Minimum .....62.1 dBA

Maximum .....73.8 dBA

Safety

This product is designed to meet the requirements of the following standards of safety for information technology equipment:

- IEC 60950-1, EN 60950-1
- UL 60950-1, CSA 60950-1

Caution Overloading the circuits may damage supply wiring. Do not exceed the ratings on the equipment nameplate when connecting equipment to the supply circuit.

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

Note For EMC compliance, operate this device with shielded cabling.

CE Compliance CE

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit `ni.com/environment/weee`.

Battery Replacement and Disposal

Battery Directive This device contains a long-life coin cell battery. If you need to replace it, use the Return Material Authorization (RMA) process or contact an authorized National Instruments service representative. For more information about compliance with the EU Battery Directive 2006/66/EC about Batteries and Accumulators and Waste Batteries and Accumulators, visit `ni.com/environment/batterydirective`.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

B

Hardware Configuration

This appendix describes how to configure and upgrade the NI RMC-8355 hardware.

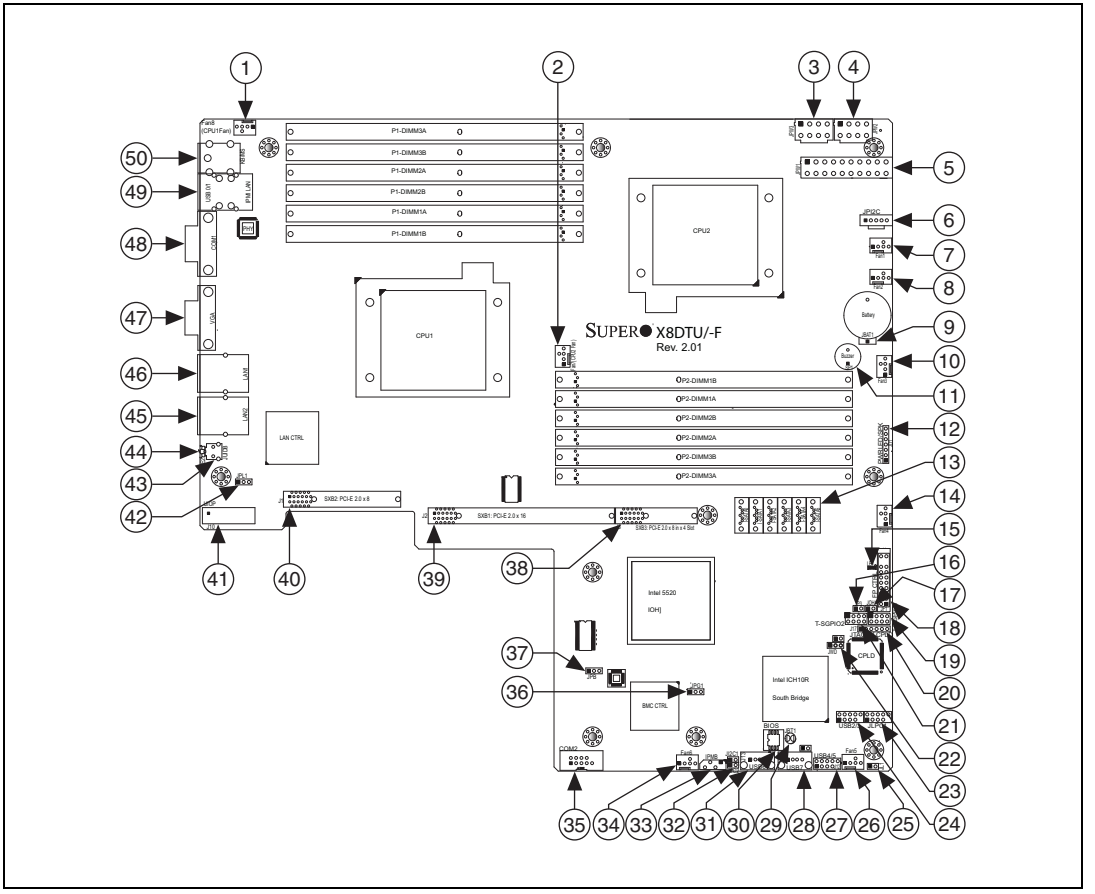
Caution: Hazardous Voltage Area

No user (operator) serviceable parts are inside the NI RMC-8355.

The hardware configuration and upgrade procedures described in this appendix *must* be performed only by a qualified service technician.

Disconnect the power cord before servicing.

Figure B-1 shows the key features of the NI RMC-8355 mainboard.



1 Fan8	14 Fan4	27 J12, USB4/5	40 J1
2 Fan7	15 LE1	28 J14, USB7	41 J10/UIOP
3 JPW3	16 JP3	29 JBT1	42 JPL1
4 JPW2	17 JOH1	30 BIOS	43 JUIDB
5 JPW1	18 JF1	31 J13, USB6	44 LE2
6 JPI²C	19 T-SGPIO1	32 JI²C1, JI²C2	45 LAN2
7 Fan1	20 J17	33 IPMB (Not Supported)	46 LAN1
8 Fan2	21 T-SGPIO1	34 Fan6	47 VGA
9 JBAT1	22 JWD	35 COM2	48 COM1
10 Fan3	23 JLPC1	36 JPG1	49 USB0/1
11 SP1	24 USB2/3	37 LAN1	50 Keyboard/Mouse
12 JD1	25 JL1	38 J3	
13 I-SATA0–5	26 Fan5	39 J2	

Figure B-1. NI RMC-8355 Mainboard Layout

Note Jumpers not identified are for test purposes only.

Caution To avoid risk of explosion, do not replace the battery (JBAT1) with an incorrect battery type. Dispose of used batteries according to the battery instructions.

Table B-1. Jumper Descriptions

Jumper	Description	Default Setting
JBT1	CMOS clear	Refer to *CMOS Clear (JBT1)*
JI^{2}C1/JI^{2}C2	SMB to PCI Express slots	Off (disabled)
JPG1	VGA enable	Pins 1–2 (enabled)
JPL1	LAN1/2 enable	Pins 1–2 (enabled)
JWD	Watchdog	Pins 1–2 (reset)

Cautions To prevent damage to the power supply or motherboard, use a power supply with a 20-pin and two 8-pin power connectors. Be sure to connect these connectors to the 20-pin (JPW1) and two 8-pin (JPW2, JPW3) power connectors on the motherboard. Failure to do so voids the manufacturer warranty on your power supply and motherboard.

To provide adequate power to the add-on cards installed on the motherboard, connect the UIOP PWR connector to the power supply for these cards to work properly.

Note When the LE1 LED is on, the onboard power connection is on. Be sure to unplug the power cables before removing or installing components.

Table B-2. Connector Descriptions

Connector	Description
COM1/COM2	COM1/COM2 serial port/header
Fan1–Fan8	System/CPU fan headers (fans 7–8 are CPU fans)
IPMB	IPMB I^{2}C header (for an IPMI card) (not supported)
JD1	Speaker/power LED header (pins 4–7 are for the speaker)
JF1	Front panel control connector
JL1	Chassis intrusion header
JOH1	Overheat LED header

Table B-2. Connector Descriptions (Continued)

Connector	Description
JPI^{2}C	Power supply SMBbus I^{2}C header
JPW1	20-pin ATX main power connector
JPW2/JPW3	8-pin secondary power connector (refer to caution above)
JUIDB	Rear unit identifier switch
LAN1/2	Gigabit Ethernet (RJ45) ports
I-SATA0–I-SATA5	SATA ports (Intel south bridge)
T-SGPIO-1/T-SGPIO-2	Serial general-purpose input/output headers
UIOP	Universal I/O riser card power connector (required for add-on cards) (refer to caution above)
USB0/1	Universal serial bus (USB) ports (back panel)
F/P USB 2/3, 4/5, 6, 7	Front panel-accessible USB headers
VGA	Video port

Table B-3. LED Descriptions

LED	Description
LE1	Onboard standby PWR warning LED indicator
LE2	Unit identifier LED

Front Control Panel Connector (JF1)

JF1 contains header pins for various control panel buttons and indicators on the front panel. These connectors are for use with National Instruments server chassis. Refer to Figure B-2 for descriptions of the various control panel buttons and LED indicators. Refer to the following section for descriptions and pin definitions.

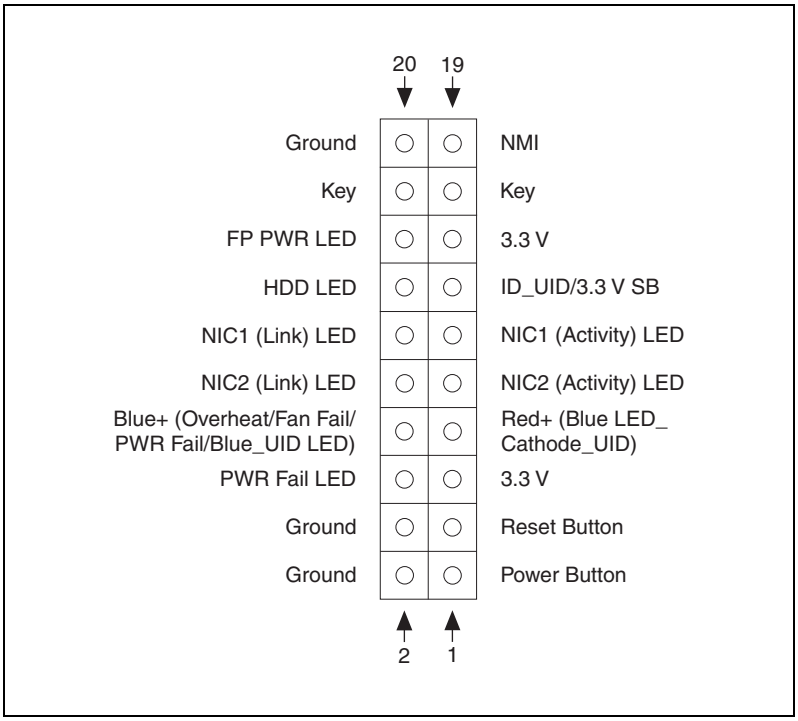


Figure B-2. JF1 Header Pins

Pin Definitions

NMI Button

The nonmaskable pin interrupt (NMI) button header is on pins 19 and 20 of JF1. Refer to the following table for pin definitions.

Table B-4. NMI Button Pin Definitions

Pin	Definition
19	Control
20	Ground

Power LED

The power LED connection is on pins 15 and 16 of JF1. Refer to Table B-5 for pin definitions.

Table B-5. Power LED Pin Definitions

Pin	Definition
15	+5 V
16	Ground

HDD LED/UID Switch

The HDD/UID LED connection is on pins 13 and 14 of JF1. Attach a hard drive LED cable to these pins to display disk activity status for any hard drive activities on the system, including serial ATA activity. Connect a UID switch cable to use a UID switch connection. The front UID switch works in conjunction with the UID LED on pins 7–8. Refer to Table B-6 for pin definitions.

Table B-6. HDD LED/UID Pin Definitions

Pin	Definition
13	UID switch/3.3 V
14	HDD active

NIC1/NIC2 LED Indicators

The network interface controller (NIC) LED connection for GLAN port 1 is on pins 11 and 12 of JF1, and the LED connection for GLAN port 2 is on pins 9 and 10. Attach the NIC LED cables to display network activity. Refer to Tables B-7 and B-8 for pin definitions.

Table B-7. NIC1 (GLAN1) LED Pin Definitions

Pin	Definition
11	NIC activity
12	NIC link

Table B-8. NIC2 (GLAN2) LED Pin Definitions

Pin	Definition
9	NIC activity
10	NIC link

Overheat (OH)/Fan Fail/PWR Fail/UID LED

Connect an LED cable to pins 7 and 8 of JF1 to use the overheat (OH)/ fan fail/power fail and UID LED connections. The red LED on pin 7 provides warnings of an overheat, fan failure, or power failure. The blue LED on pin 8 works as the front panel UID LED indicator. The red LED takes precedence over the blue LED by default. Refer to Tables B-9 and B-10 for pin definitions and LED statuses.

Table B-9. Overheat/Fan Fail/Power Fail/Blue_UID LED Pin Definitions

Pin	Definition
7	Blue LED cathode (UID)
8	Overheat/fan fail/power fail/ UID LED

Table B-10. Overheat/Fan Fail/Power Fail LED Status

Pin 7	Pin 8	Red LED	Blue LED
Low	High	On: overheat/fan fail/ PWR fail Solid on: overheat Fast blinking: fan fail Slow blinking: power fail	Off
High	Low	Off (system normal)	On (UID LED)
High	High	Off	Off

Power Fail LED

The power fail LED connection is on pins 5 and 6 of JF1. Refer to Table B-11 for pin definitions.

Table B-11. Power Fail LED Pin Definitions

Pin	Definition
5	3.3 V
6	PWR fail LED

Reset Button

The reset button connection is on pins 3 and 4 of JF1. Attach the connection to a hardware reset switch on the computer case. Refer to Table B-12 for pin definitions.

Table B-12. Reset Button Pin Definitions

Pin	Definition
3	Reset
4	Ground

Power Button

The power button connection is on pins 1 and 2 of JF1. Momentarily contacting both pins powers on/off the system. This button works in conjunction with the power-off setting in the BIOS Advanced submenu. Refer to Tables B-13 and B-14 for pin definitions.

Table B-13. Power Button Pin Definitions

Pin	Definition
1	Signal
2	+3 V standby

Table B-14. Power Button Power On/Off Settings

PWR_Off Setting In BIOS	PWR Activity on Motherboard
PWR_Off set to instant off	To power on: power is turned on immediately To power off: power is turned off immediately
PWR_Off set to 4-second suspend	To power on: power is turned on immediately To power off: short both pins for 4 seconds or longer to turn off power

Connecting Cables

ATX Main Power (JPW1) and Processor (JPW2/3) Power Connectors

The motherboard includes a 20-pin ATX main power supply connector (JPW1) and two 8-pin CPU power connectors (JPW2/JPW3). These power connectors meet the SSI EPS 12 V specification.

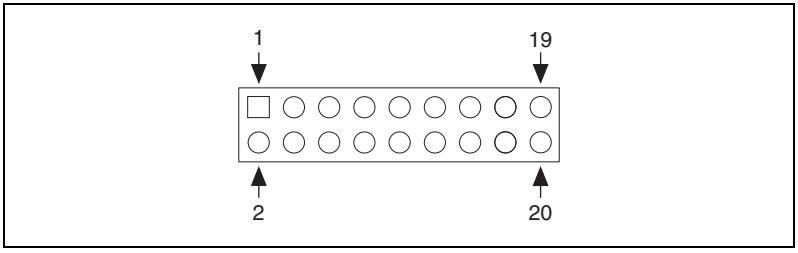


Figure B-3. ATX Main Power Connector

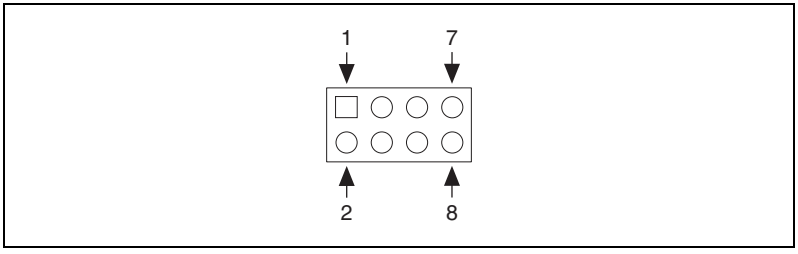


Figure B-4. CPU Power Connector

Caution To prevent damage to your power supply or motherboard, use a power supply with a 20-pin and two 8-pin power connectors. Be sure to connect these power connectors to the 20-pin and two 8-pin power connectors on your motherboard for adequate power supply to your system. Failure to do so voids the manufacturer warranty on your power supply and motherboard.

You must connect the ATX main power connector and CPU power connectors at JPW2/JPW3 to your power supply. Refer to Tables B-15 and B-16 for pin definitions.

Table B-15. 20-Pin Main Power Connector Pin Definitions

Pin	Definition	Wire Color	Pin	Definition	Wire Color
1	+3.3 Vdc	Orange	11	+3.3 Vdc	Orange
2	+3.3 Vdc	Orange	12	–12 Vdc	Blue
3	Ground	Black	13	Ground	Black
4	+5 Vdc	Red	14	PS on	Green
5	Ground	Black	15	Ground	Black
6	+5 Vdc	Red	16	Ground	Black
7	Ground	Black	17	Ground	Black
8	PWR_OK	Gray	18	–5 Vdc	White
9	+5 Vdc VSB standby voltage	Purple	19	+5 Vdc	Red
10	+12 Vdc	Yellow	20	+5 Vdc	Red

Table B-16. 12 V 8-Pin Power Connector Pin Definitions

Pins	Definition
1–4	Ground
5–8	+12 V

UIO Riser Card Power Connector (J10)

The universal I/O power connector (UIOP) at J10 provides power for riser cards installed on the motherboard. Refer to Table B-17 for pin definitions.

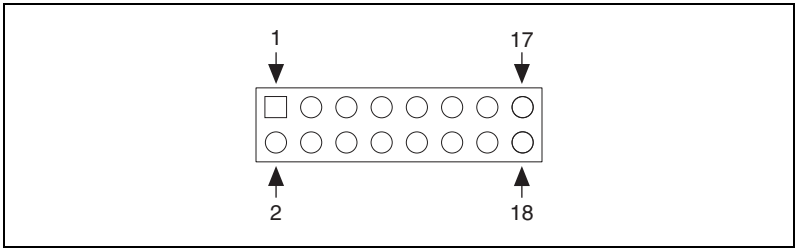


Figure B-5. Universal I/O Power Connector (J10)

Table B-17. Universal I/O Power Connector Pin Definitions

Pin	Definition	Pin	Definition
B1	P5V	A1	P3V3
B2	P5V	A2	P3V3
B3	P5V	A3	P3V3
B4	P5V	A4	P3V3
B5	P5V	A5	P3V3
B6	P5V	A6	P3V3
B7	P5V	A7	P3V3
B8	P5V	A8	P3V3
B9	P5V	A9	P3V3
B10	P5V	A10	P3V3
B11	N12V	A11	P3V3
B12	P3V3 standby	A12	P3V3
B13	P3V3 standby	A13	P12V
B14	Ground	A14	P12V
B15	Ground	A15	P12V
B16	Ground	A16	P12V

Table B-17. Universal I/O Power Connector Pin Definitions (Continued)

Pin	Definition	Pin	Definition
B17	Ground	A17	P12V
B18	Ground	A18	Ground

Chassis Intrusion Header (JL1)

A chassis intrusion header is at JL1 on the motherboard. Attach an appropriate cable from the chassis to inform you of a chassis intrusion when the chassis is opened. Refer to Table B-18 for pin definitions.

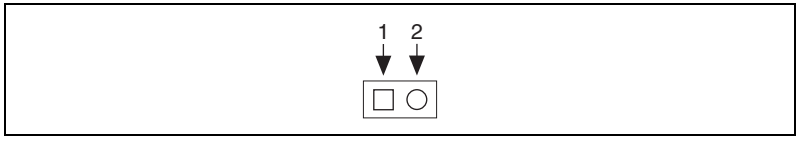


Figure B-6. Chassis Intrusion Header (JL1)

Table B-18. Chassis Intrusion Header Pin Definitions

Pin	Definition
1	Intrusion input
2	Ground

Fan Headers (Fan1–Fan8)

The NI RMC-8355 has six chassis/system fan headers (Fan1 to Fan6) and two CPU fan headers (Fan7/Fan8) on the motherboard. These 4-pin fan headers are backward compatible with the traditional 3-pin fans. However, fan speed control is available for 4-pin fans only. A hardware monitoring setting in the BIOS controls the fan speeds. (The default setting is **Disabled**.) Refer to Table B-19 for pin definitions.

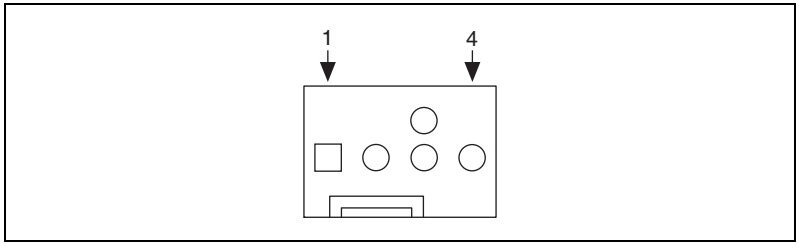


Figure B-7. Fan Header (Fan1–Fan8)

Table B-19. Fan Header Pin Definitions

Pin	Definition
1	Ground
2	+12 V
3	Tachometer
4	PWR modulation

Speaker/Power LED Header (JD1)

On the JD1 header, pins 1–3 are for power LED indication, and pins 4–7 are for the speaker. Refer to Table B-20 for speaker pin definitions. The speaker connector pins (4–7) are for use with an external speaker. To use the onboard speaker, close pins 6–7 with a jumper.

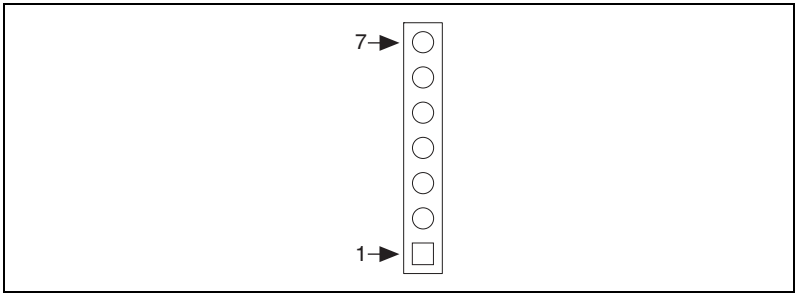


Figure B-8. Speaker/Power LED Header (JD1)

Table B-20. Speaker/Power LED Pin Definitions

Pins	Definition
1–3	Power LED
4–7	External speaker
6–7	Internal speaker

T-SGPIO Headers (TSGPIO-1/TSGPIO-2)

Two serial-link general-purpose input/output (SGPIO) headers (TSGPIO-1/T-SGPIO-2) on the motherboard support serial link interfaces for the onboard SATA connectors. Refer to Table B-21 for pin definitions.

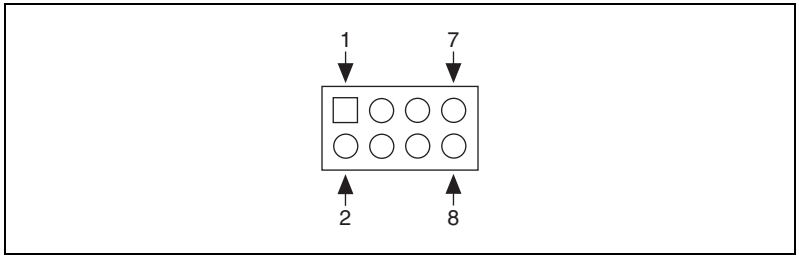


Figure B-9. T-SGPIO Header (TSGPIO-1/T-SGPIO-2)

Table B-21. T-SGPIO Pin Definitions

Pin	Definition
1	No connection
2	No connection
3	Ground
4	Data
5	Load
6	Ground
7	Clock
8	No connection

Overheat/Fan Fail LED Header (JOH1)

The JOH1 header connects an LED indicator to warn of chassis overheating or fan failure. This LED blinks when a fan failure occurs. Refer to Table B-22 for pin definitions.

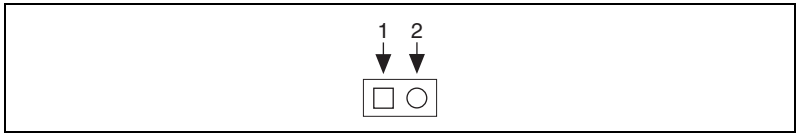


Figure B-10. Overheat/Fan Fail LED Header (JOH1)

Table B-22. Overheat/Fan Fail LED Pin Definitions

Pin	Definition
1	5 VDC
2	Overheat active

Table B-23. Overheat/Fan Fail LED States

State	Message
Solid	Overheat
Blinking	Fan fail

Power SMB (I^2C) Connector (JPI^{2}C)

The power system management bus (I^2C) connector (JPI^{2}C) monitors power supply, fan, and system temperatures. Refer to Table B-24 for pin definitions.

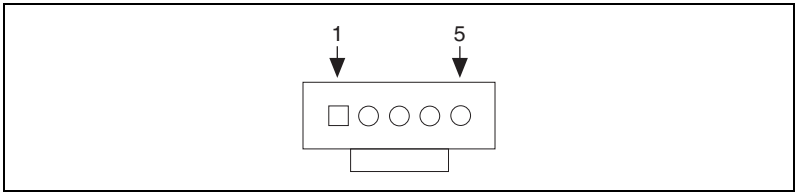


Figure B-11. Power SMB (I^2C) Connector (JPI^{2}C)

Table B-24. Power SMB (I^2C) Pin Definitions

Pin	Definition
1	Clock
2	Data
3	Power fail
4	Ground
5	+3.3 V

Jumper Settings

Explanation of Jumpers

To modify the motherboard operation, you can use jumpers to choose between optional settings. Jumpers create shorts between two pins to change the connector function, as shown in Figure B-12. Pin 1 is identified with a square solder pad on the printed circuit board. Refer to Figure B-1 for jumper locations.

Note On two-pin jumpers, *closed* means the jumper is on and *open* means the jumper is off the pins.

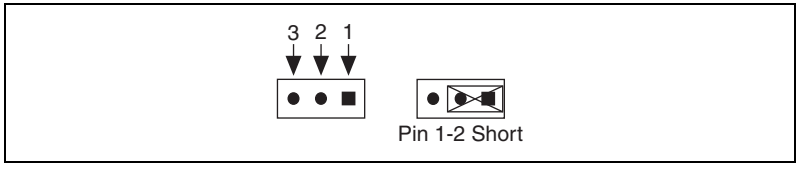


Figure B-12. Jumper Example

GLAN Enable/Disable (JPL1)

JPL1 enables or disables GLAN port1/GLAN port2 on the motherboard. Refer to Table B-25 for jumper settings. The default setting is **Enabled**.

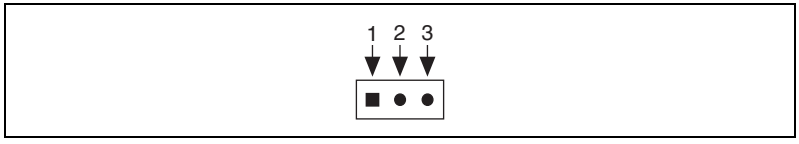


Figure B-13. GLAN Enable/Disable Jumper (JPL1)

Table B-25. IGLAN Enable/Disable Jumper Settings

Pins	Setting
1–2	Enabled (default)
2–3	Disabled

CMOS Clear (JBT1)

JBT1 clears the CMOS. Instead of pins, this jumper has contact pads to prevent accidental CMOS clearing. To clear the CMOS, use a metal object such as a small screwdriver to touch both pads at the same time to short the connection. Always remove the AC power cord from the system before clearing the CMOS.

Note For an ATX power supply, you must completely shut down the system, remove the AC power cord, and then short JBT1 to clear CMOS.

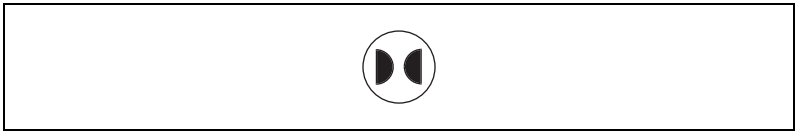


Figure B-14. CMOS Clear Jumper (JBT1)

Watchdog Enable/Disable (JWD)

Watchdog is a system monitor that can reboot the system when a software application hangs. Close pins 1-2 on the JWD jumper to reset the system if an application hangs. Close pins 2-3 to generate a nonmaskable interrupt (NMI) signal for the application that hangs. Refer to Table B-26 for jumper settings. You also must enable watchdog in the BIOS.

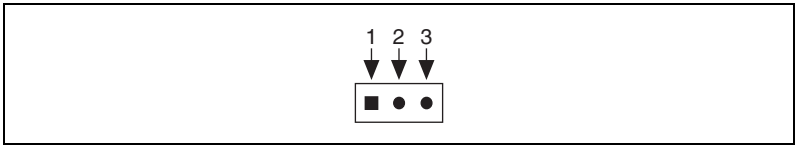


Figure B-15. Watchdog Enable/Disable Jumper (JWD)

Table B-26. Watchdog Enable/Disable Jumper Settings

Pins	Definition
1–2	Reset (default)
2–3	NMI
Open	Disabled

I²C Bus to PCI Express Slots (JI²C1/JI²C2)

Use jumpers JI²C1 and JI²C2 to connect the system management bus (I²C) to PCI Express slots. The default setting is open to disable the connection. Refer to Table B-27 for jumper settings.

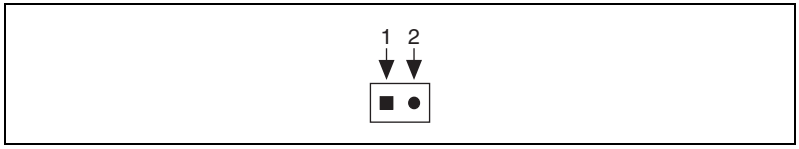


Figure B-16. I²C Bus to PCI Express Slot Jumpers (JI²C1 and JI²C2)

Table B-27. I²C Bus to PCI Express Slot Jumper Settings

Jumper Setting	Definition
Closed	Enabled
Open	Disabled (default)

VGA Enable (JPG1)

Use jumper JPG1 to enable or disable the onboard VGA connection. The default position is on pins 1 and 2 to enable VGA. Refer to Table B-28 for jumper settings.

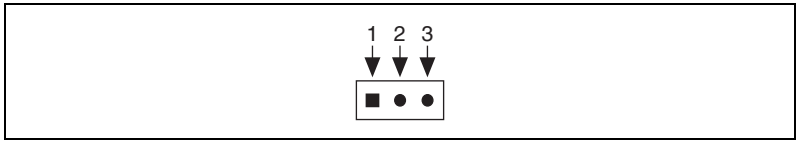


Figure B-17. VGA Enable Jumper (JPG1)

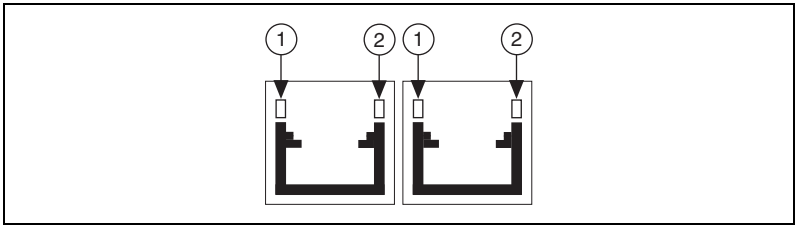
Table B-28. VGA Enable Jumper Settings

Pins	Definition
1–2	Enabled (default)
2–3	Disabled

Onboard Indicators

GLAN LEDs (LAN1/LAN2)

There are two GLAN ports (LAN1/LAN2) on the motherboard. Each Gigabit Ethernet LAN port has two LEDs. The yellow LED (right) indicates activity, while the link LED (left) may be green, amber, or off to indicate the connection speed. Refer to Tables B-29 and B-30 for status information.



1 Link Indicator LED 2 Activity Indicator LED

Figure B-18. GLAN LEDs (LAN1/LAN2)

Table B-29. GLAN Activity Indicator LED Statuses

Color	Status
Off	Inactive
Blinking yellow	Active

Table B-30. GLAN Link Indicator LED Statuses

Color	Status
Off	No connection or 10 Mbps
Green	100 Mbps
Amber	1 Gbps

Onboard Power LED (LE1)

An onboard power LED is at LE1 on the motherboard. When this LED is on, the system is on. Be sure to turn off the system and unplug the power cord before removing or installing components. Refer to Table B-31 for status information.

Table B-31. Onboard Power LED Indicator Statuses

Color	Status
Off	System off (power cable not connected)
Solid green	System on
Green flashing quickly	ACPI S1 state
Green flashing slowly	ACPI S3 (STR) state

Serial ATA and PCI Express Connections

Serial ATA Ports (JS1–JS6)

Six Serial ATA Ports (I-SATA0–I-SATA5) are at JS1–JS6 on the motherboard. These ports provide serial link signal transmission, which is faster than traditional parallel ATA. Refer to Table B-32 for pin definitions.

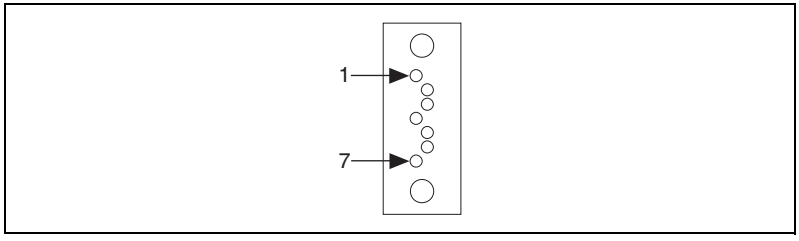


Figure B-19. I-SATA Connector (JS1–JS6)

Table B-32. Serial ATA Pin Definitions

Pin	Definition
1	Ground
2	TX_P
3	TX_N
4	Ground

Table B-32. Serial ATA Pin Definitions (Continued)

Pin	Definition
5	RX_N
6	RX_P
7	Ground

PCI Express Generation 2 Slots (J1–J3)

Three PCI Express generation 2 slots are at SXB1/SXB2/ SXB3 (J1–J3) on the motherboard. SXB1 is a x8 slot, SXB2 is a x16 slot, and SXB3 is a x24 slot.

Upgrading Memory

The mainboard supports dual xeon with six 240-pin RDIMM ECC DDR-III SDRAM slots with maximum memory size of 48 GB per processor.

Figure B-1 shows the DIMM location on the main board.

Note Memory upgrades are available from National Instruments under the following orderable part numbers:

- 1 × 1 GB DDR3 RAM for NI RMC-8355 (1 × 1 GB RDIMM)
- 1 × 4 GB DDR3 RAM for NI RMC-8355 (1 × 4 GB RDIMM)
- 1 × 8 GB DDR3 RAM for NI RMC-8355 (1 × 8 GB RDIMM)

782567-1024	1 GB RAM replacement/upgrade for NI RMC-8355
782567-4096	4 GB RAM replacement/upgrade for NI RMC-8355
782567-8192	8 GB RAM replacement/upgrade for NI RMC-8355

Memory Installation

Note Check the National Instruments Web site (`ni.com`) for recommended memory modules.

Caution Exercise extreme care when installing or removing DIMM modules to prevent any possible damage. Also, note that the memory is interleaved to improve performance.

DIMM Installation

For best memory performance, install memory modules of the same type and speed in the memory slots as indicated in the tables below.

Complete the following steps to install DIMMs:

1. Starting with P1-DIMM 1A, insert a DIMM module into its slot. Note the notch along the bottom of the module to prevent inserting the DIMM module incorrectly.
2. Gently press down on the DIMM module until it snaps into place in the slot.
3. Repeat for the desired number of modules.

Memory Population for Optimal Performance For a Motherboard with One CPU (CPU1) Installed						
	Branch 0		**Branch 1**		**Branch 2**	
3 DIMMs	P1 DIMM1A		P1 DIMM2A		P1 DIMM3A	
6 DIMMs	P1 DIMM1A	P1 DIMM1B	P1 DIMM2A	P1 DIMM2B	P1 DIMM3A	P1 DIMM3B

Memory Population for Optimal Performance For a Motherboard with One CPU (CPU2) Installed						
	Branch 0		**Branch 1**		**Branch 2**	
3 DIMMs	P2 DIMM1A		P2 DIMM2A		P2 DIMM3A	
6 DIMMs	P2 DIMM1A	P2 DIMM1B	P2 DIMM2A	P2 DIMM2B	P2 DIMM3A	P2 DIMM3B

Memory Population for Optimal Performance For a Motherboard with Two CPUs Installed												
	CPU1						**CPU2**					
	Branch 0		**Branch 1**		**Branch 3**		**Branch 0**		**Branch 1**		**Branch 3**	
6 DIMMs	1A		2A		3A		1A		2A		3A	
12 DIMMs	1A	1B	2A	2B	3A	3B	1A	1B	2A	3B	3A	3B

Memory Support

The NI RMC-8355 supports up to 96 GB registered ECC DDR3 800 MHz/1066 MHz in 12 DIMMs. (Refer to `ni.com` for the recommended memory list.)

Memory Support for the Motherboard with 5600 Processors Installed

Note Memory speed support depends on the type of CPU used.

1.5 V DIMMs

Tables B-33 and B-34 list the memory support for 1.5 V DIMMs.

Note Mixing 1.35 V and 1.5 V DIMMs is not recommended.

Table B-33. 1.5 V RDIMM Population for the Motherboard with 5600 Processors Installed

DIMM Slots per Channel	DIMMs Populated per Channel	DIMM Type	Speeds in MHz	Ranks per DIMM*
3	1	Registered DDR3 ECC	800,1066,1333	SR or DR
3	1	Registered DDR3 ECC	800,1066†	QR
3	2	Registered DDR3 ECC	800,1066, 1333	SR and DR
3	2	Registered DDR3 ECC	800‡	SR, DR, and QR

* DIMMs can be in any combination of SR (single rank), DR (dual rank), and QR (quad rank).

† The 1333 MHz RDIMMs run at 1066 MHz (BIOS automatic downgrading).

‡ The 1333/1066 MHz RDIMMs run at 800 MHz (BIOS automatic downgrading).

Table B-34. 1.5 V UDIMM Population for the Motherboard with 5600 Processors Installed

DIMM Slots per Channel	DIMMs Populated per Channel	DIMM Type	Speeds in MHz	Ranks per DIMM*
3	1	Unbuffered DDR3 ECC/ Non-ECC	800,1066,1333	SR or DR
3	2	Unbuffered DDR3 ECC/ Non-ECC	800,1066, 1333†	SR and DR

* DIMMs can be in any combination of SR (single rank), DR (dual rank), and QR (quad rank).
† 1333 MHz for two DIMMs per channel is supported with unbuffered ECC DIMMs only.

1.35 V DIMMs

Tables B-35 and B-36 list the memory support for 1.35 V DIMMs.

Note Mixing 1.35 V and 1.5 V DIMMs is not recommended.

Table B-35. 1.35 V RDIMM Population for the Motherboard with 5600 Processors Installed

DIMM Slots per Channel	DIMMs Populated per Channel	DIMM Type	Speeds in MHz	Ranks per DIMM*
3	1	Registered DDR3 ECC	800,1066,1333	SR or DR
3	1	Registered DDR3 ECC	800†	QR
3	2	Registered DDR3 ECC	800,1066‡	SR and DR
3	2	Registered DDR3 ECC	800**	SR, DR, and QR

* DIMMs can be in any combination of SR (single rank), DR (dual rank), and QR (quad rank).
† The 1333/1066 MHz QR RDIMMs run at 800 MHz (BIOS automatic downgrading).
‡ The 1333 MHz SR/DR RDIMMs run at 800 MHz (BIOS automatic downgrading).
** The 1333/1066 MHz SR/DR/QR RDIMMs run at 800 MHz (BIOS automatic downgrading).

Table B-36. 1.35 V UDIMM Population for the Motherboard with 5600 Processors Installed

DIMM Slots per Channel	DIMMs Populated per Channel	DIMM Type	Speeds in MHz	Ranks per DIMM*
3	1	Unbuffered DDR3 ECC	800,1066,1333	SR or DR
3	2	Unbuffered DDR3 ECC	800,1066, 1333[2]	SR and DR

* DIMMs can be in any combination of SR (single rank), DR (dual rank), and QR (quad rank).

† 1333 MHz for two DIMMs per channel is supported with unbuffered ECC DIMMs only.

System Memory Allocation and Availability

Table B-37 lists possible system memory allocation and availability.

Table B-37. System Memory Allocation and Availability

System Device	Size	Physical Memory Available (4 GB Total System Memory)
Firmware hub flash memory (system BIOS)	1 MB	3.99 GB
Local APIC	4 KB	3.99 GB
Area reserved for the chipset	2 MB	3.99 GB
I/O APIC (4 KB)	4 KB	3.99 GB
PCI enumeration area 1	256 MB	3.76 GB
PCI Express (256 MB)	256 MB	3.51 GB
PCI enumeration area 2 (if needed) (aligned on 256 MB boundary)	512 MB	3.01 GB
VGA memory	16 MB	2.85 GB
TSEG	1 MB	2.84 GB
Memory available for the OS and other applications	—	2.84 GB

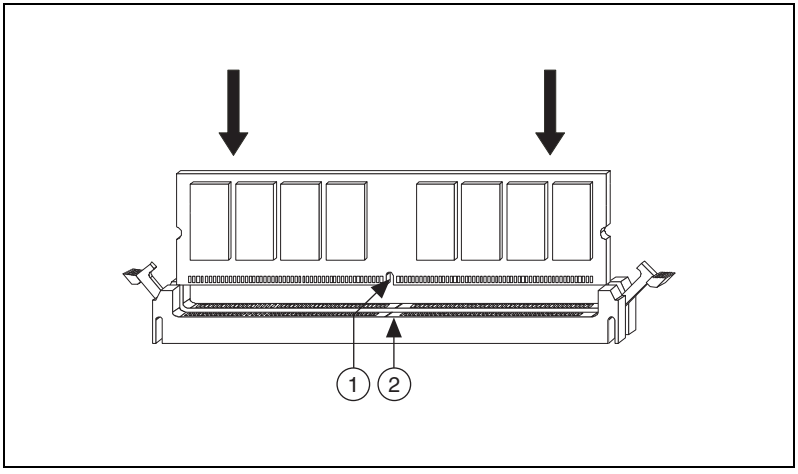
Note Due to memory allocation to system devices, the amount of memory that remains for operational use is reduced when you use 4 GB of RAM. The reduction in memory availability is disproportional.

For Microsoft Windows users, Microsoft implemented a design change in Windows XP with Service Pack 2 (SP2) and Windows Vista. This change is specific to the Physical Address Extension (PAE) mode behavior, which improves driver compatibility. For more information, refer to the Microsoft KnowledgeBase article at `http://support.microsoft.com/kb/888137`.

Installing DDR Modules

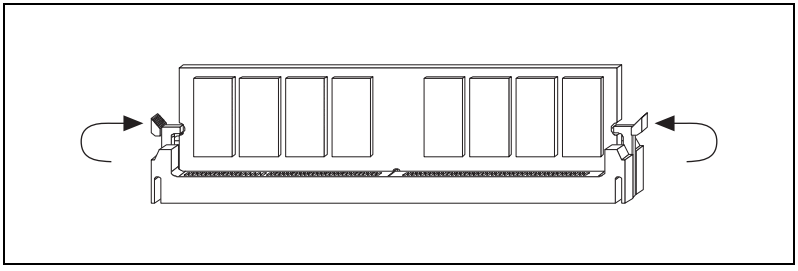
Follow these steps to install DDR modules:

1. Press the cover release buttons on the top of the NI RMC-8355.
2. Push the cover backward to remove it.
3. Align the notch in the center of the DDR DIMM module with the key on the DIMM slot. Insert the module vertically into the slot and push it in until the pins are fully inserted, as shown below.



1 Notch	2 Key

4. When the module is fully inserted, the plastic clip at each side of the slot automatically closes, as shown below.



5. Replace the NI RMC-8355 cover by sliding the cover forward. Make sure the safety lock fits firmly.

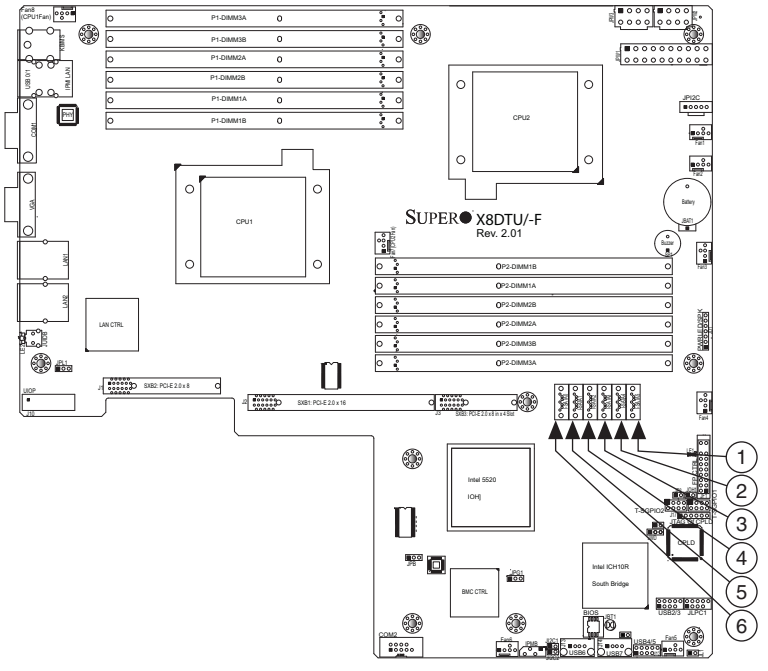
Removing DDR Modules

Follow these steps to remove DDR modules:

1. Open the plastic clips on both sides of the module.
2. Remove the module from the slot.

Upgrading and Replacing Hard Disk Drives

Figure B-20 shows the NI RMC-8355 SATA connector locations.



1	I-SATA5	2	I-SATA4	3	I-SATA3	4	I-SATA2	5	I-SATA1	6	I-SATA0

Figure B-20. NI RMC-8355 SATA Connectors

I-SATA Connectors: I-SATA0–I-SATA5

The ICH10R south bridge supports six Serial ATA connectors (I-SATA0–I-SATA5).

SATA connectors are high-speed Serial ATA interface ports. Each supports Serial ATA data rates of 300 MB/s. All connectors are fully compliant with Serial ATA 2.0 specifications. Each Serial ATA connector can connect to one hard disk.

Figure B-21 shows the I-SATA0–I-SATA5 connector.

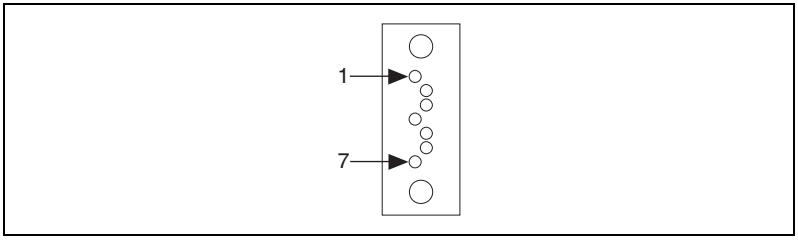


Figure B-21. I-SATA0–I-SATA5 Connector

Hard Drive Part Numbers

Use the part numbers in Table B-38 to order a spare/upgrade hard drive.

Table B-38. Hard Drive Part Numbers

Part Number	Description
782117-01	Spare 250 GB SSD and drive bay for NI RMC-8355
782314-01	Spare 500 GB HDD and drive bay for NI RMC-8355

C

Intel SATA RAID Utility for Intel ICH10R

This appendix describes the Intel SATA RAID utility for Intel ICH10R.

Intel RAID Configuration Utility

The Intel RAID Configuration utility is an embedded BIOS utility for creating, managing, and deleting arrays from the controller BIOS and initializing drives.

To run the Intel RAID Configuration utility, press <Ctrl-I> when the following message appears during system startup:

```
Press <CTRL-I> to enter Configuration Utility...
```

The main menu appears. To select an option from this or any menu, browse with the arrow keys to highlight an option and press <Enter>. In some cases, selecting an option displays another menu. To return to the previous menu at any time, press <Esc>.

Intel HostRAID Configurations

The following types of Intel HostRAID configurations are supported:

- **RAID0 (Data Striping)**—RAID0 writes data in parallel, interleaved (“striped”) sections between two hard drives. RAID0 doubles the data transfer rate (over a single hard drive) to enhance system performance. To use RAID0, two or more hard drive disks are required.
- **RAID1 (Data Mirroring)**—Use RAID1 to copy identical data from one disk drive to another. By doing so, a “mirror” of source data is created to enhance data security. To use RAID1, two or more hard drive disks are required, and the second drive must be the same size or larger than the first drive.

Configuring the AMI BIOS for SATA RAID Settings

Note Press <Del> during system bootup to enter the BIOS Setup Utility.

Follow these steps to configure the AMI BIOS for SATA RAID settings:

1. Use the arrow keys to select the **Advanced** menu from the menu bar and press <Enter> to enter the **Advanced** menu.
2. In the **Advanced** menu, scroll down to **IDE/SATA Configuration** and press <Enter> to enter the **IDE/SATA Configuration** submenu.
3. Once in the **IDE/SATA Configuration** submenu, scroll down to **Configure SATA#1 as** and press <Enter>. The Options window displays.
4. From the Options window, select **RAID** and press <Enter>.
5. Press <Esc> to return to the previous menu. Use the arrow keys to select **Exit** from the menu bar at the top and press <Enter> to enter the **Exit** submenu.
6. From the **Exit** submenu, select **Save Changes and Exit** and press <Enter> to save the changes and exit the BIOS. The system reboots.
7. After the system exits from the BIOS Setup Utility, the system automatically reboots. When the system is rebooting, press <Ctrl> and <I> simultaneously to enter the Intel HostRAID utility.

Creating a RAID0 Volume

Follow these steps to create a RAID0 volume:

1. Select **Create RAID Volume** from the main menu and press <Enter>.
2. Specify a name for the RAID0 set and press <Tab> or <Enter> to go to the next field. (To select the previous menu, press <Esc>.)
3. When **RAID Level** is highlighted, use the up and down arrow keys to select **RAID0 (Stripe)** and press <Enter>.
4. When **Disks** is highlighted, press <Enter> to select the HDD to configure for RAID.
5. Use the up and down arrow keys to highlight a drive and press the space bar to select it. A triangle appears to confirm the drive selection.
6. When **Stripe Size** is highlighted, use the up and down arrow keys to select the stripe size for your RAID0 and press <Enter>.

Note Stripe size is 4–128 KB for RAID0. For a server, use a lower stripe size; for a multimedia system, use a higher stripe size. The default stripe size is 128 KB.

7. Press <Enter> when the **Create Volume** item is highlighted. A warning message displays, indicating that all data on the selected disks will be lost.
8. At the **`Are you sure you want to create this volume (Y/N)`** prompt, press <Y> to create the RAID volume or <N> to return to the **Create Volume** menu.

Creating a RAID1 Volume

Follow these steps to create a RAID1 volume:

1. Select **Create RAID Volume** from the main menu and press <Enter>.
2. Specify a name for the RAID1 set and press <Tab> or <Enter> to go to the next field. (To select the previous menu, press <Esc>.)
3. When **RAID Level** is highlighted, use the up and down arrow keys to select **RAID1 (Mirror)** and press <Enter>.
4. When **Disks** is highlighted, press <Enter> to select the HDD to configure for RAID.
5. Use the up and down arrow keys to highlight a drive and press the space bar to select it. A triangle appears to confirm the drive selection.
6. When **Capacity** is highlighted, press <Enter> to specify the disk capacity to configure for RAID1.
7. Press <Enter> when **Create Volume** is highlighted. A warning message displays, indicating that all data on the selected disks will be lost.
8. At the **`Are you sure you want to create this volume (Y/N)`** prompt, press <Y> to create the RAID volume or <N> to return to the **Create Volume** menu.

Recovery

Use this feature to create the recovery volume by copying data from a designated master drive to a designated recovery drive.

Note A recovery drive is a backup drive to store data copied from the original (master) drive. A master drive is the original drive containing the source files to be copied to the recovery drive.

Follow these steps to create a recovery drive:

1. Select **Create RAID Volume** from the main menu and press <Enter>. The Create Volume Menu screen appears.

2. Specify a name for the recovery disk drive and press <Enter>.
3. When **RAID Level** is highlighted, use the up and down arrow keys to select **Recovery** and press <Enter>.
4. When **Select Disks** is highlighted, press <Enter> to select the HDD to create the recovery volume.
5. On the **Select Disks** screen, use the up and down arrow keys to select a drive to use as your master drive and press <Tab> to configure it as your master drive. Use the arrow keys to select your recovery drive and press the space bar to configure it. Press <Enter> to complete the disk selection.
6. When **RAID Capacity** is highlighted, enter your RAID volume capacity and press <Enter>. The default setting is the maximum capacity allowed.
7. When **Sync** is highlighted, use the up and down arrow keys to select the **Continuous** or **On Request** update policy. If you select **Continuous**, data on the master drive is copied to the recovery drive automatically as long as both drives are connected to the system. If you select **On Request**, data on the master drive is copied to the recovery drive when you request it.
8. Press <Enter> when the **Create Volume** item is highlighted. A warning message displays, indicating that all data on the selected disks will be lost.
9. At the **`Are you sure you want to create this volume (Y/N)`** prompt, press <Y> to create the RAID volume or <N> to return to the **Create Volume** menu without making changes.

Deleting a RAID Volume

Caution Be sure to back up your data before deleting a RAID set. You will lose all data on the drives when deleting a RAID set. You also will lose the recovery image.

Follow these steps to delete a RAID volume:

1. From the main menu, select **Delete RAID Volume** and press <Enter>.
2. Use the up and down arrow keys to select the RAID set to delete and press <Del>. A warning message displays.
3. At the **`Are you sure you want to delete this volume (Y/N)`** prompt, press <Y> to delete the RAID volume or <N> to return to the **Delete Volume** menu.

Resetting to Non-RAID

Caution Be careful when you reset a RAID volume HDD to a non-RAID HDD. Resetting a RAID HDD or RAID volume reformats the disk drive and deletes the internal RAID structure and contents.

Follow these steps to reset a RAID volume HDD to non-RAID:

1. From the main menu, select **Reset Disks to Non-RAID** and press <Enter>.
2. Use the up and down arrow keys to highlight the RAID set drive to reset and press the space bar to select it.
3. Press <Enter> to reset the RAID set drive. A warning message displays.
4. Press <Y> to reset the drive or <N> to return to the main menu.

Recovery Volume Options

Note A recovery drive is a backup drive to store data copied from the original (master) drive. A master drive is the original drive containing the source files to be copied to the recovery drive.

Follow these steps to select a recovery volume option:

1. From the main menu, select **Recovery Volume Options**.
2. When **Recovery Volume Options** is highlighted, press <Enter>.
3. To boot from a recovery disk only, select **Enable Only Recovery Disk** and press <Enter>.

Note If a recovery disk is available, its RAID volume recovery support is enabled, and the master disk is disabled.

4. To boot from the master disk that contains the original data sources only, select **Enable Only Master Disk** and press <Enter>.

Note If a master disk is available, its RAID volume recovery support is enabled, and the recovery disk is disabled. Any change in steps 3 or 4 stops automatic synchronization between the master and recovery drives.

5. Press <Esc> to return to the main menu.

Exiting the Intel Matrix Storage Manager Utility

Follow these steps to exit the Intel Matrix Storage Manager utility:

1. From the main menu, select **Exit** and press <Enter>.
2. A warning message appears. At the prompt, press <Y> to delete the drive or <N> to return to the main menu.

D

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Glossary

Symbol	Prefix	Value
p	pico	10^{-12}
n	nano	10^{-9}
µ	micro	10^{-6}
m	milli	10^{-3}
k	kilo	10^{3}
M	mega	10^{6}
G	giga	10^{9}
T	tera	10^{12}

Symbols

°	Degrees
Ω	Ohms
%	Percent

A

A	Amperes
A/D	Analog-to-digital. Most often used as *A/D converter.*
AC	Alternating Current
ACPI	Advanced Configuration and Power Management Interface
ANSI	American National Standards Institute
API	Application Programming Interface—A standardized set of subroutines or functions along with the parameters that a program can call.

APIC	Advanced Programmable Interrupt Controller
ASCII	American Standard Code for Information Exchange
ASIC	Application-Specific Integrated Circuit
ATA	The specification formulated in the 1980s that defines the IDE drive interface.

B

B	Bytes
BIOS	Basic Input/Output System—BIOS functions are the fundamental level of any PC or compatible computer. BIOS functions embody the basic operations needed for successful use of the computer's hardware resources.

C

C	Celsius
CAS	Column Address Strobe
CMOS	Complementary Metal Oxide Semiconductor—A process used in making chips.
COM	Communications port
CPU	Central Processing Unit
CSA	Carrier Serving Area

D

D/A	Digital-to-analog—Most often used as an abbreviation for a D/A converter (also known as DAC).
DC	Direct Current
DDR	Double Data Rate
DIMM	Dual In-line Memory Module

DMA	Direct Memory Access—A method by which data is transferred between devices and internal memory without intervention of the central processing unit.
DMI	Desktop Management Interface
DRAM	Dynamic RAM (Random Access Memory)—Storage that the computer must refresh at frequent intervals.

E

ECC	Error-Correcting Code
EDO RAM	Extended Data Output RAM—A type of random access memory (RAM) chip that improves the time to read from memory on faster microprocessors such as the Intel Pentium.
EEPROM	Electronically Erasable Programmable Read Only Memory
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
EPP	Enhanced Parallel Port

F

FCC	Federal Communications Commission

G

GB	Gigabytes of memory
GPIB	General Purpose Interface Bus (IEEE 488)

H

HDD	Hard Disk Drive
Hz	Hertz; cycles per second

I

I/O	Input/output—The techniques, media, and devices used to achieve communication between machines and users.
IDE	Integrated Drive Electronics—Hard disk and built-in controller.
IEEE	Institute of Electrical and Electronics Engineers
IRQ*	Interrupt signal
ISA	Industry Standard Architecture—The original PC bus architecture, specifically the 16-bit AT bus.

K

KB	Kilobytes of memory

L

LAN	Local Area Network—Communications network that serves users within a confined geographical area. It is made up of servers, workstations, a network operating system, and a communications link.
LCD	Liquid Crystal Display—A display technology using polarizing filters and liquid crystal cells.
LED	Light-emitting diode

M

MAX	Measurement & Automation Explorer
MB	Megabytes of memory
MPS	Multiprocessor Specification
MTBF	Mean Time Between Failure
MTTR	Mean Time to Repair
MXI	Multisystem eXtension Interface

N

NI-DAQ	The National Instruments software for data acquisition instruments.
NI-VISA	The National Instruments implementation of the VISA standard—An interface-independent software that provides a unified programming interface for VXI, GPIB, and serial instruments.

P

PCI	Peripheral Component Interconnect. The PCI bus is a high-performance 32-bit or 64-bit bus with multiplexed address and data lines.
PEF	Platform Event Filter
PIO	Programmed Input/Output
POSC	Power On Self Configuration
POST	Power On Self Test
PXI	PCI eXtensions for Instrumentation—An open implementation of CompactPCI that adds electrical features that meet the high-performance requirements of instrumentation applications by providing triggering, local buses, and system clock capabilities. PXI also offers two-way interoperability with CompactPCI products.

R

RAM	Random Access Memory—The computer's primary workspace.
RAS	Row Address Strobe
RMS	Root Mean Squared
RTC	Real Time Clock—An electronic circuit that maintains the time of day and also can provide timing signals for timesharing operations.

S

SATA	Serial-ATA. *See also* ATA.
SCSI	Small Computer System Inteface
SDRAM	A form of dynamic RAM memory that is about 20% faster than EDO RAM. SDRAM interleaves two or more internal memory arrays so that while one array is being accessed, the next one is being prepared for access. SDRAM-II is a faster version of SDRAM technology.
SO-DIMM	Small Outline Dual In-line Memory Module
SPD	Serial Presence Detect EEPROM
SRAM	Static RAM—A memory chip that requires power to hold its content. It does not require refresh circuitry as a dynamic RAM chip, but it does take up more space and uses more power.

U

UDMA	Ultra Direct Memory Access. *See also* DMA.
USB	Universal Serial Bus

V

V	Volts
VGA	Video Graphics Array—The minimum video display standard for all PCs.
VISA	Virtual Instrument Software Architecture—A single interface library for controlling GPIB, VXI, RS232, and other types of instruments. VISA has been standardized by the VXI *Plug&Play* Systems Alliance.
VME	Versa Module Eurocard
VXI	VME eXtensions for Instrumentation

W

W	Watts
WDT	Watchdog Timer

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