PCI

PCI-7041 User Manual

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FCC/Canada Radio Frequency Interference Compliance
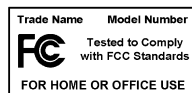
Determining FCC Class

The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations). Depending on where it is operated, this product could be subject to restrictions in the FCC rules. (In Canada, the Department of Communications (DOC), of Industry Canada, regulates wireless interference in much the same way.)

Digital electronics emit weak signals during normal operation that can affect radio, television, or other wireless products. By examining the product you purchased, you can determine the FCC Class and therefore which of the two FCC/DOC Warnings apply in the following sections. (Some products may not be labeled at all for FCC; if so, the reader should then assume these are Class A devices.)

FCC Class A products only display a simple warning statement of one paragraph in length regarding interference and undesired operation. Most of our products are FCC Class A. The FCC rules have restrictions regarding the locations where FCC Class A products can be operated.

FCC Class B products display either a FCC ID code, starting with the letters **EXN**, or the FCC Class B compliance mark that appears as shown here on the right.

Consult the FCC Web site at `http://www.fcc.gov` for more information.

Trade Name	Model Number
FC	Tested to Comply with FCC Standards
FOR HOME OR OFFICE USE	

FCC/DOC Warnings

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual and the CE Marking Declaration of Conformity*, may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC).

Changes or modifications not expressly approved by National Instruments could void the user's authority to operate the equipment under the FCC Rules.

Class A
Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Department of Communications

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Class B
Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
• Consult the dealer or an experienced radio/TV technician for help.

Canadian Department of Communications

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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Readers in the European Union (EU) must refer to the Manufacturer's Declaration of Conformity (DoC) for information* pertaining to the CE Marking compliance scheme. The Manufacturer includes a DoC for most every hardware product except for those bought for OEMs, if also available from an original manufacturer that also markets in the EU, or where compliance is not required as for electrically benign apparatus or cables.

To obtain the DoC for this product, click **Declaration of Conformity** at `ni.com/hardref.nsf/`. This Web site lists the DoCs by product family. Select the appropriate product family, followed by your product, and a link to the DoC appears in Adobe Acrobat format. Click the Acrobat icon to download or read the DoC.

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* The CE Marking Declaration of Conformity will contain important supplementary information and instructions for the user or installer.

Conventions

The following conventions are used in this manual:

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

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. This font 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, and code excerpts.

`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.

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1

Introduction

This manual contains detailed instructions for installing and configuring the National Instruments PCI-7041. The PCI-7041 is a multifunction I/O board with an embedded processor. Use LabVIEW RT and NI-DAQ to create embedded, real-time applications that run on the PCI-7041.

Overview

The PCI-7041/6040 RT Series board is a plug-in PCI board with an embedded processor and measurement functionality. The PCI-7041, LabVIEW Real-Time (RT), and measurement software, such as NI-DAQ, provide an easy-to-use system for real-time applications.

Three subcomponents make up the PCI-7041: the processor board, the I/O daughterboard, and the accessory board, as shown in Figure 1-1. The following section explains each subcomponent in further detail.
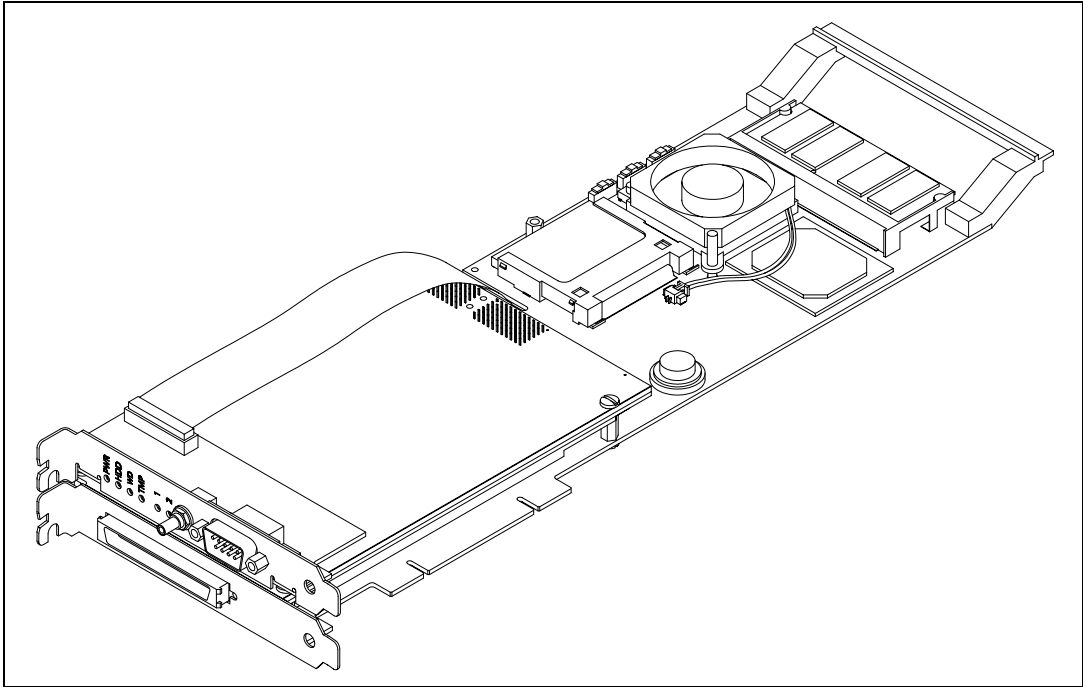
Figure 1-1. PCI-7041 RT Series Board

Hardware Description

Processor Board

The PCI-7041 processor board is the platform on which LabVIEW RT executes. Figure 1-2 shows the major components of this board, including the following:

- A high-performance Pentium III microprocessor
- An Intel 440MX chipset
- SDRAM for main memory
- Flash memory for the BIOS
- CompactFlash for nonvolatile application and data storage
- RS-232 serial port circuitry
- An FPGA (Field Programmable Gate Array)
- Two National Instruments miniMITE ASICs
- Fast SRAM for communication to the host computer

There are also several buses on the processor board, including the following:

- GTL bus running at 100 MHz between the microprocessor and chipset
- Memory bus running at 100 MHz between the chipset and SDRAM
- Embedded PCI bus running at 33 MHz between the chipset, miniMITE B, and daughterboard
- Host PCI bus running at a maximum of 33 MHz between the miniMITE A and the host system
- IDE bus between the chipset and CompactFlash
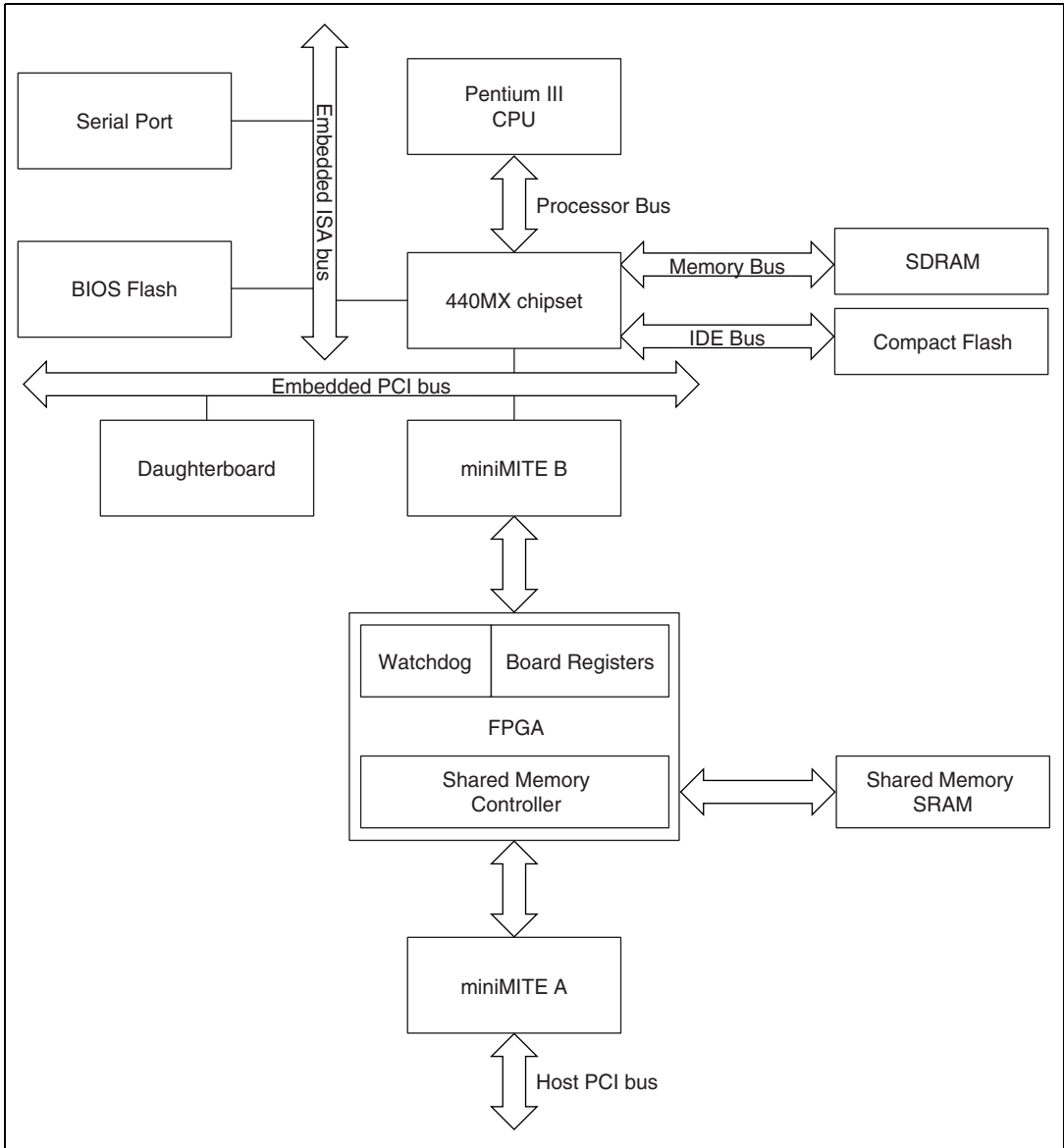- ISA bus between the chipset and BIOS

Figure 1-2. PCI-7041 Processor Board Diagram

I/O Daughterboard

The PCI-7041 daughterboard provides the I/O functionality. The daughterboard is a National Instruments PXI device with some mechanical modifications to allow it to connect to the processor board. You can expect the same high performance and features from the daughterboard that you do from the standard version of the device. Refer to the *LabVIEW Help*, available by selecting **Help»Contents and Index** in LabVIEW, and Chapter 2, *PCI-7041 Installation and Configuration*, for more information about hardware and software configuration.

Accessory Board

The accessory board brings some I/O signals out from the PCI-7041. These include the following:

* RS-232 serial port
* SMB Watchdog timer
* LEDs

Use of the accessory board is optional. If you do not need any of the above I/O, you may leave the accessory board disconnected.

Refer to the following sections for information about the serial port, watchdog timer, and LEDs.

Communication to the Host

The PCI-7041 communicates with the host computer by way of shared memory. The shared memory is accessible from both the host PCI bus and the PCI-7041 embedded PCI bus. LabVIEW manages this shared memory and provides various methods for using it. For example, the PCI-7041 can be accessed as if it were a device on your network. LabVIEW exports the PCI-7041 to the network on which the host computer resides. This means that LabVIEW functions such as VI server and TCP/IP will work with the PCI-7041. The PCI-7041 can even act as a Web server to send data across the Internet. You also can access the shared memory directly using the shared memory VIs in LabVIEW. Refer to the *LabVIEW RT User Manual* for more information about communicating with the PCI-7041.

CompactFlash

The PCI-7041 has a CompactFlash module for nonvolatile application and data storage. You can store LabVIEW VIs on the CompactFlash. These VIs can optionally be made to execute at startup. You also can log data to the CompactFlash. Refer to the *LabVIEW RT User Manual* for more information about configuring startup applications.

Memory

The main memory on the PCI-7041 is a single 144-pin SO-DIMM that is socketed for easy upgrade. You can replace the SO-DIMM that ships with the PCI-7041 with up to 128 MB of 10 ns SDRAM. For information about adding RAM by replacing the SO-DIMM, refer to Appendix A, *Specifications*.

Watchdog Timer

The PCI-7041 features a programmable timer known as a watchdog. You can use the watchdog timer to monitor your LabVIEW application and trigger an alert if something causes the software to stop running. In such a case, you may need to alert the operator and shut down equipment to protect people and machines. The watchdog lights an LED to signal that a problem has occurred, optionally resets the board, and optionally asserts the watchdog I/O signal on the accessory board. The I/O signal can be programmed to be high or low asserted or open collector.

The watchdog works as follows: You initially choose a timeout period longer than your software loop time. The timer starts counting, and your software must continually reset the watchdog before the timeout period elapses. Each time the counter is reset, it starts counting again at the beginning. If the counter reaches the timeout period, which happens because the software is hung and cannot reset the counter, the watchdog expires and takes the actions it was configured to take. For more information, refer to the *LabVIEW RT User Manual*.

CPU Temperature Monitor

The CPU (Pentium III microprocessor) temperature is monitored in hardware. If the temperature exceeds the CPU's rated operating temperature range, the board goes into reset and remains there until the power is cycled. An LED also lights to indicate what has happened. This condition should not occur as long as the board is operated within its specified operating range, and as long as the CPU fan is running. For more information, refer to Appendix A, *Specifications*.

LEDs

Six LEDs on the accessory board report the PCI-7041 status. They are as follows:

- **POWER (PWR)**—Lights when the board is powered on and has come out of reset

- **Drive (HDD)**—Lights when the CompactFlash is accessed

- **Watchdog (WD)**—Lights when the watchdog timer has expired, which indicates a problem has occurred with the software

- **CPU Temperature Monitor (TMP)**—Lights if the CPU temperature exceeds its safe operating range and the board is in reset

- **USER 1 (1)**—Available for your own use

- **USER 2 (2)**—Available for your own use

Refer to the *LabVIEW RT User Manual* for more information about programming these LEDs.

RTSI

The real-time system integration (RTSI) bus directly connects measurement devices for precise synchronization of functions. The PCI-7041 provides all RTSI functionality. The RTSI bus allows you to connect the PCI-7041 to any other RTSI device regardless of whether the other device is an RT Series device or standard DAQ device.

The RTSI connections are made with a connector on the top edge of the PCI-7041 and a RTSI cable available from National Instruments. Refer to your daughterboard user manual for information about how to use the RTSI signals.

Serial Port

The PCI-7041 has one serial port, available on the accessory board. It is a standard RS-232 serial port such as the one in your desktop computer. You can read and write to the port from within LabVIEW RT using NI-VISA. The NI-VISA resource name is ASRL1:INSTR. Refer to the *LabVIEW RT User Manual* for more information.

Switches

There are three slide switches and one pushbutton switch on the PCI-7041. Figure 1-3 shows their location. The switches are labeled on the opposite side of the board. They are not accessible from outside the computer, so you must remove the computer cover to use them.
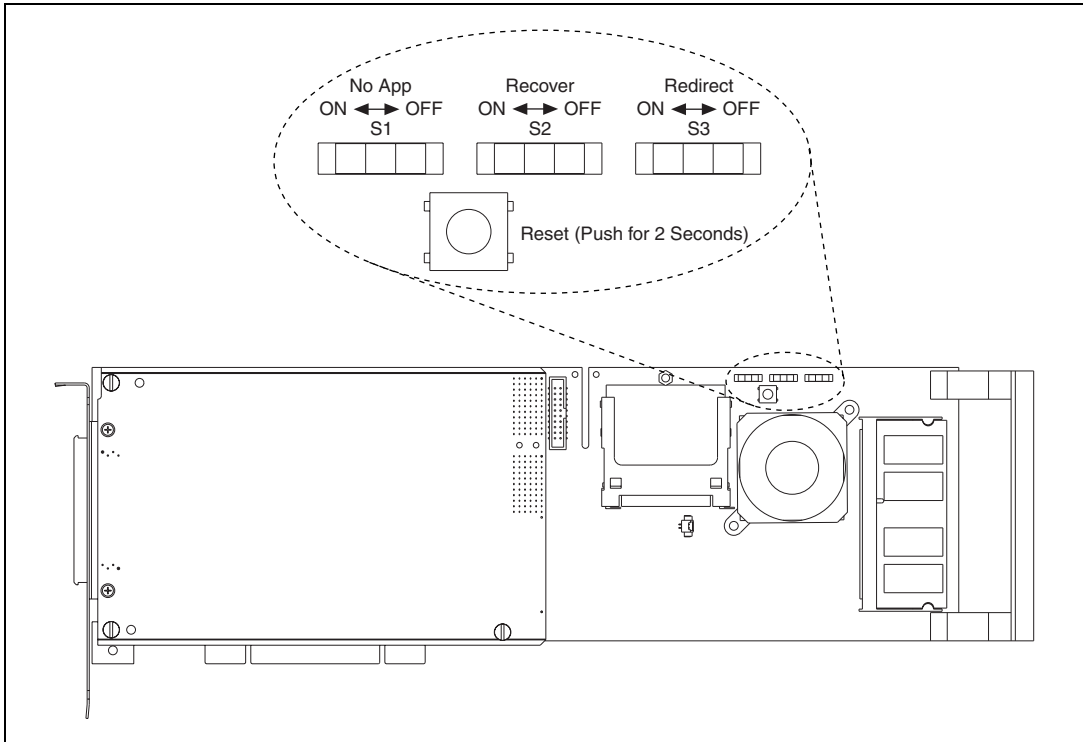

Figure 1-3. PCI-7041 Switches

The Reset pushbutton resets and reboots the board. To use the button, push it for at least two seconds and then release it. If you connect the accessory board to the PCI-7041, you can use the **POWER** LED to know how long to push the button. Hold in the button until the **POWER** LED goes out, then release the button. You also can reset the board from software on the host computer. Use whichever method is more convenient to reset the PCI-7041.

Switch S1 is the No App switch. LabVIEW RT provides a way to load a startup application on the CompactFlash, which begins execution as soon as the board powers on and boots. The No App switch disables this startup

application. If the board is booted with the No App switch in the On (left) position (refer to Figure 1-3), no startup application runs. For more information on startup applications, refer to the *LabVIEW RT User Manual*.

Switch S2 is the Safe Mode switch, referred to as the Recover switch on the board. Normally, the PCI-7041 boots and runs LabVIEW RT from the CompactFlash. If the CompactFlash becomes corrupted, the Safe Mode switch puts the board into safe mode, which allows you to reload the software onto the CompactFlash. To put the board into safe mode, set the Safe Mode switch to the On (left) position (refer to Figure 1-3) and reset the board.

Switch S3 is the Redirect switch. Setting this switch to the On (left) position and resetting the board causes the PCI-7041 to output boot status and software status messages to the accessory board serial port. To view these messages, connect the serial port to your computer's serial port via a serial crossover (null modem) cable. Use a terminal program such as Hyperterm and open a connection to the computer serial port with the following settings: 9,600 Baud, 8 data, 1 stop, no flow control. Be sure to set the Redirect switch to the Off (right) position (refer to Figure 1-3) if you plan to use the serial port for any reason other than to see these messages. Setting this switch to On causes the PCI-7041 to boot more slowly than normal.

Battery

The battery on the PCI-7041 keeps the clock running when the board is powered off. It is a sealed Lithium battery that should last five years or more. If you need to replace it, contact National Instruments. The battery manufacturer is Tadiran (`www.tadiranbat.com`), and the part number is TL-5186.

National Instruments Software

National Instruments has developed several software kits you can use with the PCI-7041. The software is already installed on your flash drive.

The PCI-7041 is specifically designed to use LabVIEW RT. For more information, refer to the *LabVIEW RT User Manual* and the *PCI E Series User Manual*.

2

PCI-7041 Installation and Configuration

This chapter contains instructions for installing and configuring the PCI-7041.

⚠️ **Caution** Electrostatic discharge can damage several components on the PCI-7041. To avoid such damage in handling the board, touch the antistatic plastic package to a metal part of your computer before removing the module from the package.

📝 **Note** Install LabVIEW Real-Time (RT) and NI-DAQ before you install the PCI-7041. Refer to Chapter 2, *Installation*, of the *LabVIEW Real-Time User Manual* for information about installing LabVIEW RT and NI-DAQ.

PCI Installation

Complete the following steps to install the PCI-7041.

1. Power off and unplug your computer.

2. Remove the computer cover.

3. Make sure there are no lit LEDs on the motherboard. If any are lit, wait until they go out before continuing the installation.

4. Remove the expansion slot cover on the back panel of the computer.

5. Insert the PCI-7041 into a 5 V or 3.3 V PCI slot. Gently rock the board to ease it into place. It might be a tight fit, but do not force the board into place.

6. Screw the mounting bracket of the PCI-7041 to the back panel rail of the computer.

7. Install the accessory board according to the *Accessory Board Installation* section (optional).

8. Visually verify the installation. Make sure the boards are not touching other boards or components and are fully inserted in the slots.

9. Replace the cover.

10. Plug in and power on your computer.

Accessory Board Installation

If you decide to use the accessory board, you must connect it to the PCI-7041 by plugging the included cable into the appropriate connectors as shown in Figure 2-1.

Complete the following steps to install the PCI-7041 accessory board.

1. Connect the ribbon cable to the accessory board. The connectors are keyed to ensure correct orientation.

2. Find a place in your computer for the accessory board. The board needs an open I/O window in the back panel rail of the computer on either side of the PCI-7041. The accessory board does not actually need a PCI slot; it just needs the I/O window.

3. Slide the cable into the cutout on the PCI-7041 to place the accessory board on the side opposite the connector on the PCI-7041.

4. Place the accessory board in the desired location and screw the accessory board mounting bracket into the computer back panel rail.

5. Connect the cable to the PCI-7041.

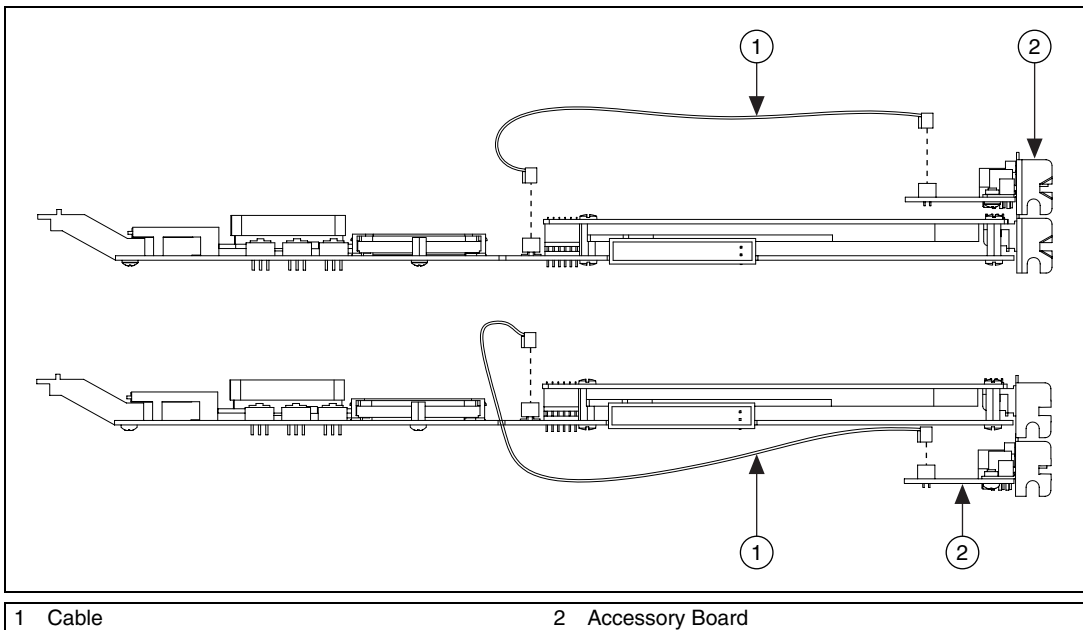The PCI-7041 is installed. You are now ready to configure the software.

| 1 | Cable | 2 | Accessory Board |

Figure 2-1. Connecting the PCI-7041 Accessory Board

Board Configuration

After you install the PCI-7041, double-click the **Measurement &
Automation** icon on your desktop. MAX finds the PCI-7041 and any other
NI devices you have in your system. The PCI-7041 appears in MAX as
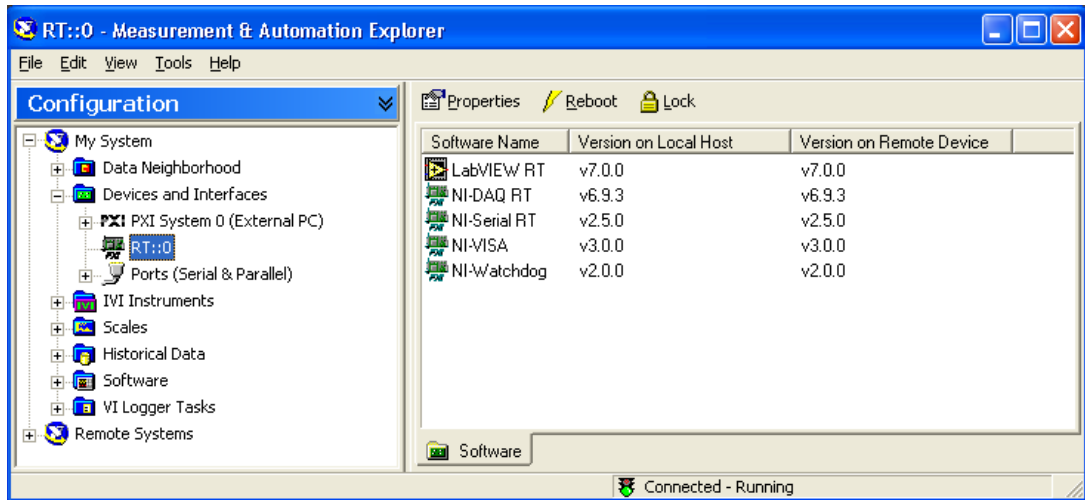shown in Figure 2-2.

Figure 2-2. Measurement & Automation Explorer

Notice that MAX assigns separate system numbers to each PCI-7041 in
your system. You need the system number of your PCI-7041 to download
and run LabVIEW RT VIs on your PCI-7041. You can change the system
number for each PCI-7041 using MAX. To access the DAQ daughterboard
on a PCI-7041 in your LabVIEW RT VIs, you need its device number.
The DAQ daughterboard on each PCI-7041 is always assigned as device
number 1.

Downloading Software to an Embedded System

Your embedded system comes preconfigured with LabVIEW Real-Time
software and real-time drivers from National Instruments. The state of the
embedded system should be **Connected-Running** in the MAX status bar.
You can install or upgrade the LabVIEW Real-Time software using the
Software tab.

To view the software installed on the embedded system, select the **Software** tab. The first column of the Software tab displays a list of your local and embedded software. The second column lists any version available on your local host to install on the embedded system. The third column displays the version, if any, of all embedded software. The Software tab also tells you when you need to update the software versions on the embedded system.

- If your local software version is more recent than your embedded version, or if you do not have software installed on your embedded system, the icon that appears to the left of the software name displays an exclamation point.

- If the local version and the embedded version are the same, the icon displays the normal icon that represents the software.

- If the embedded version is more recent than the local version, or if you do not have software installed on your local machine, the name of the software appears in gray.

Complete the following steps to install or upgrade the software on the embedded system:

1. Select your embedded system from the configuration tree. Click the **Software** tab.

2. In the configuration view, right-click inside the **Software** tabbed panel. Select **Install software** from the pop-up menu.

3. The Select software to download dialog box appears. Enable or disable the checkboxes to choose the software you want to install to the embedded system. Click **OK** to begin the software download.

Note   If you attempt the install a software version that is not compatible with what currently exists on the embedded system, you are asked to confirm your decision to download. Additionally, if you are installing LabVIEW to an embedded system that already hosts a version of LabVIEW, you are required to uninstall the previous version before updating the embedded system.

4. When installation is complete, click **Yes** when prompted to reboot the embedded system.

5. Select your embedded system from the configuration tree. The system state in the status bar should now be **Connected-Running**.

Embedded DAQ Configuration

Use Embedded DAQ Configuration to configure the DAQ daughterboard in the embedded system. To launch Embedded DAQ Configuration, right-click the embedded system and choose **NI-DAQ Configuration** from the menu.

DAQ-related configuration includes settings such as analog input polarity and range, analog input mode, and so on. You also can configure virtual channels, SCXI, and DAQ accessories. You can modify these settings through MAX or LabVIEW RT and NI-DAQ.

Locking System Configuration

After you configure the embedded system, you can lock the system configuration with a password to prevent others on your network from changing the configuration. In addition, a host PC on the network cannot target LabVIEW Real-Time to the embedded system without a password unless the host is in the RT Target: Access list.

Complete the following steps to lock the system configuration:

1. Select your embedded system in the configuration tree and click the **Lock/Unlock** button in the toolbar. The Locking System Configuration dialog box appears.

2. Enter and retype a password.

3. Click **OK** to lock the system configuration. Your system is locked if the **Lock/Unlock** button appears pressed.

You must click the **Lock/Unlock** button in MAX and enter the correct password to unlock the system configuration.

Installing CompactFlash Memory

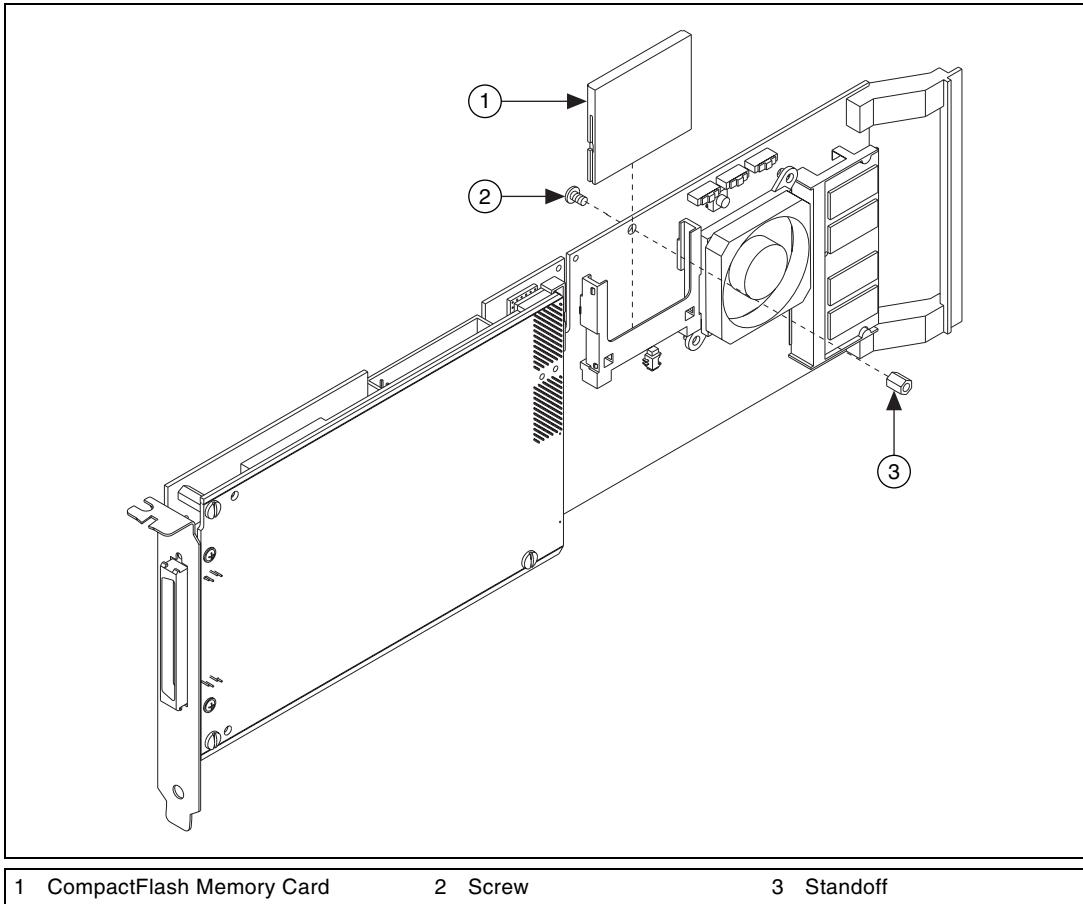This section describes how to install and remove CompactFlash memory.

| 1 | CompactFlash Memory Card | 2 | Screw | 3 | Standoff |

Figure 2-3. Installing CompactFlash Memory

To install the CompactFlash memory, refer to Figure 2-3 and complete the
following steps:

1. Power off the computer.
2. Insert the CompactFlash into the Compact Flash slot on the PCI-7041.
3. Insert the screw through the rear of the PCI-7041.
4. Assemble the standoff as shown and tighten the screw.

To remove the CompactFlash memory, power off the computer and reverse
these steps.

A

Specifications

This appendix lists the PCI-7041 specifications.

Processor

Processor .... Intel Pentium III

Processor clock speed .... 700 MHz

Processor bus speed .... 100 MHz

Memory... 32 MB DRAM (expandable to
128 MB) user-programmable
10 ns, SDRAM, 3.3 V,
144-pin SO-DIMM

Memory bus speed .... 100 MHz

On-chip cache .... 32 KB

L2 cache .... 256 KB

Floating-point unit................................. Yes

Host-Embedded Communication

Shared Memory

Type .... SRAM

Size.. 512 KB, user-available

Bus Interface

Type .... 3.3 V or 5 V PCI Slave, Master

Watchdog

Counter width.. 16 bits

Time base .... Selectable, 480 ns to 15.7 ms

Timeout period ....480 ns to 17.2 min

Available timeout actions ....Light LED, reset board, assert
trigger

Trigger polarity......................................High, low, open collector

Pull-up resistor on trigger ....4.7 KΩ

Trigger connector type............................SMB

CompactFlash

Type I or II, 32 MB minimum

LEDs (Accessory Board)

Power, Drive (HDD Activity), Watchdog, CPU Temperature Monitor,
User 1, User 2

Switches

Reset, No App, Safe Mode (Recover), Console Redirect

Serial Port

RS-232

Battery

Tadiran TL-5186, sealed lithium, 3.6 V, 400 mAH, >5 year expected
lifetime

Power Requirement

PCI-7041 with 6040E

+5 VDC (±5%)

MAX..4.0 A

Typical.....................................3.5 A

+12 VDC (±5%) ....80 mA

–12 VDC (±5%) ....12 mA

Note   Excludes power consumed through V_{CC} available at the 6040E I/O connector.
I/O connector power available is +4.65 to +5.25 VDC at 1 A.

Physical

Dimensions (Not Including Connectors)

PCI-7041 .... 31.2 by 11.2 cm (12.3 by 4.4 in.),
One PCI slot

Accessory board..................................... 3.8 by 10.7 cm (1.5 by 4.2 in.),
One I/O window on computer
back rail

Environment

Operating temperature............................ 0 to 50 °C

Storage temperature .... –20 to 70 °C

Relative humidity................................... 10 to 90%, noncondensing

RTSI

Refer to the *RTSI* section of Chapter 1, *Introduction*, for information about
real-time system integration.

I/O Daughterboard

Refer to the appropriate I/O device manual for more information about I/O
daughterboard specifications.

Adding RAM

To add RAM to the PCI-7041, remove the unit from the computer. Remove
the SO-DIMM currently in the socket and add the new SO-DIMM to the
SO-DIMM socket. National Instruments recommends the following types
of SO-DIMMs for use with the PCI-7041 (SDRAM):

- 32 MB $4 MB \times 64$ SO-DIMMs—10 ns, 1.05 in. max

- 64 MB $8 MB \times 64$ SO-DIMMs—10 ns, 1.05 in. max

- 128 MB $16 MB \times 64$ SO-DIMMs—10 ns, 1.05 in. max

Note   National Instruments has tested and verified that the SO-DIMMs we carry work with
the PCI-7041. We recommend you purchase your SO-DIMM modules from National
Instruments. Other off-the-shelf SO-DIMM modules are not guaranteed to work properly.

B

LED Indicators

This appendix describes how to interpret the status of the PCI-7041 by reading the LEDs.

Interface Status and Access LEDs

POWER (PWR)

When lit, the **POWER** LED indicates that the power is on and the PCI-7041 is out of reset.

Drive (HDD)

The **HDD** LED indicates when an access to the CompactFlash is occurring.

Watchdog (WD)

When lit, the **Watchdog** LED indicates something has caused the software to stop running.

✎ **Note** For this monitoring to occur, you must include the Watchdog VIs in your LabVIEW code.

CPU Temperature Monitor (TMP)

When lit, the **CPU Temperature Monitor** LED indicates the temperature has exceeded the CPU's rated operating temperature range and the PCI-7041 has been reset.

USER 1 (1)

The **USER 1** LED is user programmable via LabVIEW. Refer to the *LabVIEW RT User Manual* for more information.

USER 2 (2)

The **USER 2** LED is user programmable via LabVIEW. Refer to the *LabVIEW RT User Manual* for more information.

C

Technical Support and Professional Services

Visit the following sections of the National Instruments Web site at ni.com for technical support and professional services:

- **Support**—Online technical support resources include the following:
  - **Self-Help Resources**—For immediate answers and solutions, visit our extensive library of technical support resources available in English, Japanese, and Spanish at ni.com/support. These resources are available for most products at no cost to registered users and include software drivers and updates, a KnowledgeBase, product manuals, step-by-step troubleshooting wizards, hardware schematics and conformity documentation, example code, tutorials and application notes, instrument drivers, discussion forums, a measurement glossary, and so on.
  - **Assisted Support Options**—Contact NI engineers and other measurement and automation professionals by visiting ni.com/ask. Our online system helps you define your question and connects you to the experts by phone, discussion forum, or email.
- **Training**—Visit ni.com/custed for self-paced tutorials, videos, and interactive CDs. You also can register for instructor-led, hands-on courses at locations around the world.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, NI Alliance Program members can help. To learn more, call your local NI office or visit ni.com/alliance.

If you searched ni.com and could not find the answers you need, contact your local office or NI corporate headquarters. Phone numbers for our worldwide offices are listed at the front of this manual. You also can visit the Worldwide Offices section of ni.com/niglobal to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Glossary

Prefix	Meaning	Value
n-	nano-	10^{-9}
μ-	micro-	10^{-6}
m-	milli-	10^{-3}
k-	kilo-	10^{3}
M-	mega-	10^{6}
G-	giga-	10^{9}

Symbols

°	degrees
Ω	ohms
%	percent

A

A	amperes
ASIC	application-specific integrated circuit

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
cache	small portion of high-speed memory used for temporary storage of frequently used data
CMOS	Complementary Metal Oxide Semiconductor—a process used in making chips
CompactFlash	a removable storage device for nonvolatile application and data storage

D

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
DRAM	Dynamic RAM (Random Access Memory)—storage that the computer must refresh at frequent intervals

E

EEPROM	Electronically Erasable Programmable Read Only Memory
EMC	Electromagnetic Compatibility
EMI	electromagnetic interference

F

FCC	Federal Communications Commission
flash memory	a type of EEPROM

FPGA	Field-Programmable Gate Array—fundamentally, an FPGA is a semi-conductor device that contains a large quantity of gates (logic devices), which are not interconnected, and whose function is determined by a wiring list, which is downloaded to the FPGA. The wiring list determines how the gates are interconnected, and this interconnection is performed dynamically by turning semiconductor switches on or off to enable the different connections.

G

g_{RMS}	a measure of random vibration—the root mean square of acceleration levels in a random vibration test profile
GTL	Gunning Transceiver Logic—a high-speed signaling technology used for the processor-side bus in Intel-based systems

H

high asserted	signaling convention where a positive voltage indicates a TRUE or 1 condition, and 0 V indicates FALSE or 0
host	the computer in which the PCI-7041 resides
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
in.	inches
interrupt	a means for a device to request service from another device
interrupt level	the relative priority at which a device can interrupt
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.
LED	light-emitting diode
low asserted	signaling convention where 0 V indicates a TRUE or 1 condition, and a positive voltage indicates FALSE or 0

M

m	meters
master	a functional part of a PCI device that initiates data transfers on the PCI backplane. A transfer can be either a read or a write.
MB	megabytes of memory
miniMITE	a National Instruments PCI interface ASIC
MTBF	mean time between failure
MTTR	mean time to repair

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

O

open collector	signaling technology that allows more than one driver to control an I/O line. Each driver may drive the line to 0 V, but must not drive a high voltage. A pull-up resistor pulls the line high when all drivers are in a high-impedance state.

P

PCI	Peripheral Component Interconnect—the PCI bus is a high-performance 32-bit or 64-bit bus with multiplexed address and data lines.
peripheral	any hardware device connected to a computer, such as a monitor, keyboard, printer, plotter, disk or tape drive, graphics tablet, scanner, mouse, and so on
POSC	Power On Self Configuration
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
resource	hardware settings used by devices in a computer system, including ISA interrupt level, DMA channel, and I/O address
RMS	root mean squared. *See* g_{RMS}.
RS-232	an asynchronous serial data transmission standard. RS-232 links between equipment are normally limited to 50 ft (16 m). Also referred to as RS-232C.
RTC	Real Time Clock—an electronic circuit that maintains the time of day, and also can provide timing signals for timesharing operations
RTSI	the National Instruments timing bus that connects DAQ devices directly, by means of connectors on top of the devices, for precise synchronization of functions

S

s	seconds
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.
slave	a functional part of a PXI device that detects data transfer cycles initiated by a PXI bus master and responds to the transfers when the address specifies one of the device's registers
SO-DIMM	Small Outline Dual In-line Memory Module
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.

T

TCP/IP	Transmission Control Protocol/Internet Protocol—a connection-oriented, reliable protocol, while IP is a connectionless protocol. It is standardized by RFC793.

V

V	Volts
VI Server	mechanism for controlling VIs and LabVIEW applications programmatically. Can also be used to control VIs or LabVIEW applications remotely.

W

W	Watts
watchdog	a programmable timer that triggers an alert if something causes the software to stop running

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