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RT Series

DAQ Device User Manual

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FCC/Canada Radio Frequency Interference Compliance*

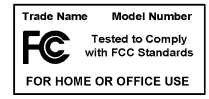
Determining FCC Class

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 labelled 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.



The curious reader can consult the FCC web site `http://www.fcc.gov` for more information.

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 Mark 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

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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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* Certain exemptions may apply in the USA, see FCC Rules §15.103 **Exempted devices**, and §15.105(c). Also available in sections of CFR 47.

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

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About This Manual

This manual contains information about the RT Series Data Acquisition (DAQ) devices and working with LabVIEW Real-Time (RT). The RT Series DAQ hardware consists of the following devices:

- PCI-7030/6040E
- PCI-7030/6030E
- PCI-7030/6533
- PXI-7030/6040E
- PXI-7030/6030E
- PXI-7030/6533

The RT Series DAQ family of devices are multifunction I/O boards with an embedded processor. Use LabVIEW RT and NI-DAQ to create embedded, real-time applications that run on the RT Series DAQ device.

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 **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 tip, which alerts you to advisory information.
	This icon denotes a note, which alerts you to important information.
bold	Bold text denotes items that you must select or click on 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.

Related Documentation

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

- *LabVIEW Real-Time User Manual*
- *LabVIEW Real-Time Release Notes*
- *LabVIEW Real-Time Help*, available by selecting **Help»LabVIEW Real-Time Help**
- *Getting Started with LabVIEW*
- *LabVIEW User Manual*
- *LabVIEW Measurements Manual*
- *LabVIEW Help*, available by selecting **Help»Contents and Index**
- *LabVIEW Application Builder Release Notes*
- *PID Control for G Reference Manual*

Refer to the hardware user manual for the specific I/O device attached to your RT Series device for more information about the I/O portion of your hardware. For example, if you are using the PXI-7030/6040E, refer to the *PXI E Series User Manual* for information on the 6040E daughterboard.

1

Introduction

This chapter describes the RT Series DAQ devices, lists what you need to get started, explains how to unpack your RT Series DAQ device, and describes the software you need to use.

About the RT Series

The RT Series DAQ devices are multifunction DAQ devices with an embedded processor. The RT Series DAQ device, LabVIEW Real-Time (RT), and NI-DAQ provide an easy-to-use system for real-time applications.

Each RT Series DAQ device is made up of the following parts: a processor board and a DAQ daughterboard. The processor board contains a microprocessor that runs real-time, embedded LabVIEW RT applications. The RT Series DAQ device provides the same high-performance data acquisition as other National Instruments DAQ devices. For example, the PXI-7030/6040E contains a DAQ device that is equivalent to the PXI-6040E.

This manual does not contain detailed information about the DAQ component of the RT Series DAQ devices. Refer to the appropriate DAQ hardware user manual for more information about optional equipment and custom cabling for your DAQ device. Table 1-1 lists the appropriate DAQ device user manual for each of the RT Series DAQ devices.

Table 1-1. RT Series DAQ Device and Corresponding DAQ Device Manual

RT Series DAQ Device	DAQ Manual
PXI-7030/6040E	*PXI E Series User Manual*
PXI-7030/6030E	*PXI E Series User Manual*
PXI-7030/6533	*DIO 6533 User Manual*
PCI-7030/6040E	*PCI E Series User Manual*
PCI-7030/6030E	*PCI E Series User Manual*
PCI-7030/6533	*DIO 6533 User Manual*

What You Need to Get Started

To set up and use your RT Series DAQ device, you need the following:

- ❑ One of the following devices:
  - PXI-7030/6*XXX*
  - PCI-7030/6*XXX*
- ❑ This manual
- ❑ Hardware user manual for your DAQ daughterboard, shown in Table 1-1
- ❑ LabVIEW RT
- ❑ *LabVIEW Real-Time User Manual*
- ❑ *LabVIEW Real-Time Release Notes*
- ❑ NI-DAQ and the NI-DAQ documentation installed with the software
- ❑ Your computer

Unpacking

Your RT Series DAQ device is shipped in an antistatic package to prevent electrostatic damage to the device. Electrostatic discharge can damage several components on the device. To avoid such damage in handling the device, take the following precautions:

- Ground yourself by using a grounding strap or by holding a grounded object.
- Touch the antistatic package to a metal part of your computer chassis before removing the device from the package.
- Remove the device from the package and inspect the device for loose components or any other sign of damage. Notify National Instruments if the device appears damaged in any way. Do *not* install a damaged device into your computer.
- Never touch the exposed pins of connectors.

Software Programming Choices

Use the RT Series DAQ devices with LabVIEW RT and NI-DAQ. Because NI-DAQ is included with LabVIEW RT, install NI-DAQ during the LabVIEW RT installation. Refer to the *LabVIEW Real-Time Release Notes* for specific information about LabVIEW RT and NI-DAQ version compatibility. Refer to Chapter 2, *Installation and Configuration*, for information about installing your RT Series hardware.

2

Installation and Configuration

This chapter explains how to install and configure your RT Series DAQ hardware.

Installing the Hardware

You can install the RT Series DAQ device in any available expansion slot in your computer or PXI chassis. To reduce noise, however, leave as much room as possible between the RT Series DAQ device and other devices and hardware. The following are general installation instructions. Refer to your computer user manual or technical reference manual for specific instructions and warnings about installing hardware.

Note Install LabVIEW Real-Time (RT) and NI-DAQ before you install your RT Series DAQ device. 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 your RT Series PCI device.

1. Turn off and unplug your computer.
2. Remove the cover to your computer.
3. Make sure there are no lighted LEDs on your motherboard. If any are lit, wait until they go out before continuing your installation.
4. Remove the expansion slot cover on the back panel of the computer.
5. Insert the RT Series DAQ board into a 5 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 RT Series DAQ board to the back panel rail of the computer.
7. Visually verify the installation. Make sure the board is not touching other boards or components and is fully inserted in the slot.
8. Replace the cover.
9. Plug in and turn on your computer.

Your RT Series DAQ device is installed. You are now ready to configure your software.

PXI Installation

Complete the following steps to install your RT Series PXI board.

1. Turn off and unplug your computer.
2. Choose two adjacent unused PXI slots in your system.
3. Remove the filler panels for the slots you have chosen.
4. Insert the RT Series DAQ board into the 5 V PXI slots. Use the injector/ejector handle to fully insert the board into the chassis.
5. Screw the front panel of the RT Series DAQ board to the front panel mounting rail of the system.
6. Plug in and turn on your computer.

Your RT Series DAQ device is installed. You are now ready to configure your software.

Board Configuration

Because of the National Instruments standard architecture for data acquisition and the PCI and PXI bus specifications, the RT Series DAQ devices are completely software configurable.

The PCI RT Series DAQ devices are fully compatible with the industry standard *PCI Local Bus Specification* Revision 2.0. The PXI RT Series DAQ devices are fully compatible with the *PXI Specification* Revision 1.0. This compatibility allows the PCI or PXI system to automatically perform all bus-related configurations and requires no user interaction.

DAQ-related configuration includes such settings 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 Measurement & Automation Explorer (MAX) or through LabVIEW RT and NI-DAQ.

After you install your RT Series DAQ device, double-click the Measurement & Automation Explorer icon on your desktop. MAX finds the RT Series DAQ device and any other DAQ devices you have in your system and assigns device numbers to them. The RT Series DAQ device appears in MAX as shown in Figure 2-1.

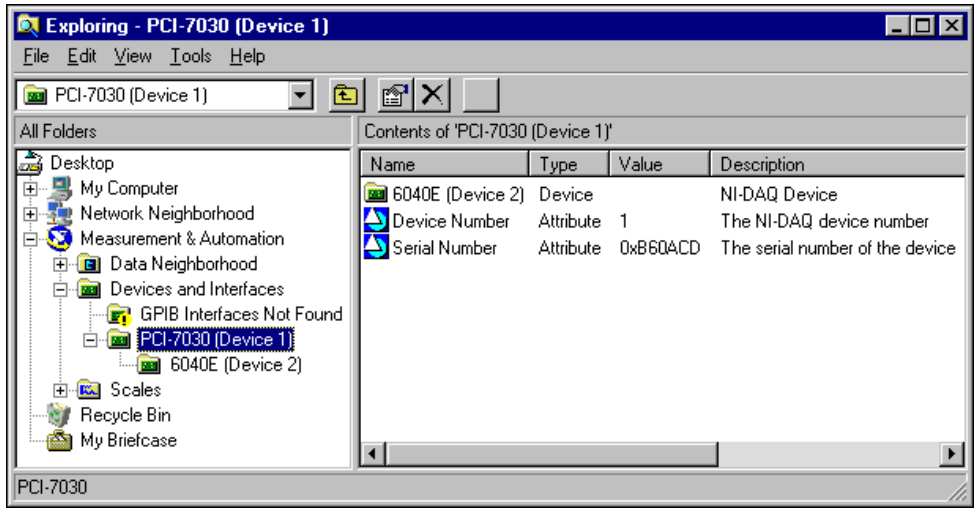


Figure 2-1. Measurement & Automation Explorer

Notice that MAX assigns separate device numbers to the PCI/PXI-7030 device and the DAQ daughterboard, as shown in Figure 2-1. The DAQ daughterboard is shown as a separate device under the 7030 processor board. However, the daughterboard has a device number that is different from the 7030 processor board.

You need the device numbers of your RT Series DAQ hardware to download and run LabVIEW RT VIs to your RT Series DAQ devices.You can change device numbers and other configuration settings for the devices using MAX. Changes to these settings do not take effect on the RT Series DAQ device until you reset the device.

You can test the resources of the 7030 processor board using MAX. However, you cannot test resources or run test panels for the DAQ daughterboard. Even though the daughterboard is configured using the host PC, the daughterboard is actually located on the local PCI bus of the RT Series processor board. Therefore, only LabVIEW RT applications targeted to the 7030 processor board can access the DAQ daughterboard, and the resource configuration of the daughterboard cannot be tested from the host PC. You do not need to test the resource configuration, because National Instruments configures the DAQ daughterboard, and the resources do not change. In addition, applications run on the host PC cannot access the DAQ

daughterboard directly, even though the DAQ daughterboard is configured as a separate device. Only LabVIEW RT applications targeted to the RT Series DAQ device can access the DAQ daughterboard.



Tip If you want to test whether the DAQ daughterboard is working, run any DAQ example that ships with LabVIEW RT.

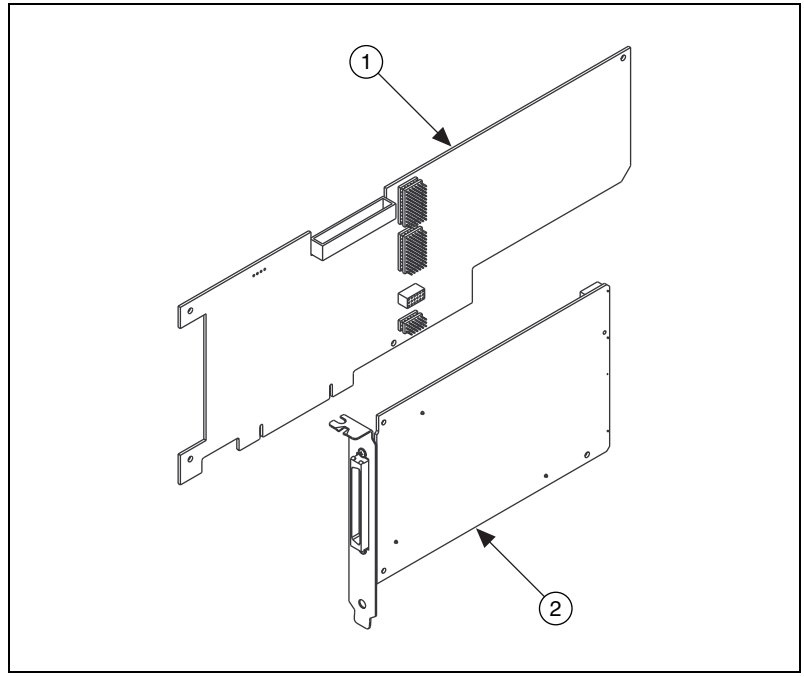
To save the configuration information, select **Tools»NI-DAQ Configuration»Save Configuration As**. Then close MAX.

3

Hardware Overview

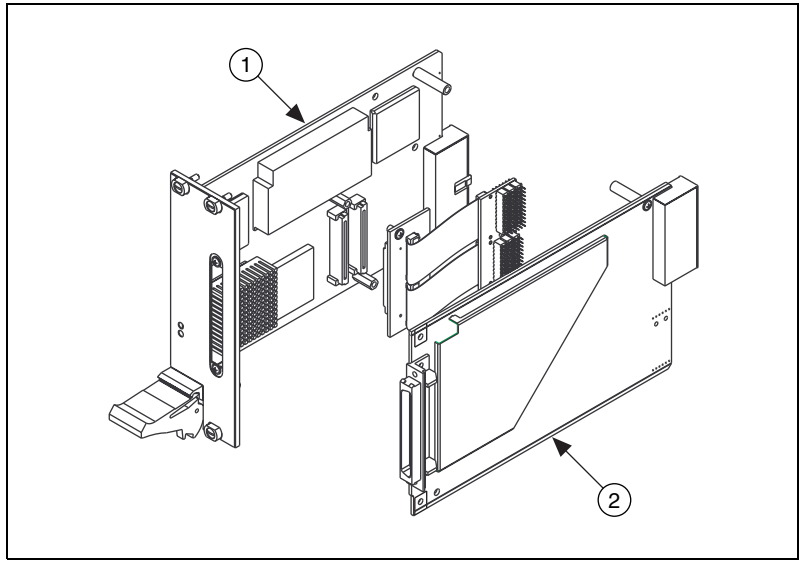
This chapter describes the PCI and PXI RT Series DAQ hardware. You can find most of the hardware information you need in your DAQ device user manual. Table 1-1, *RT Series DAQ Device and Corresponding DAQ Device Manual*, lists the DAQ device user manuals for the RT Series DAQ devices.

As shown in Figures 3-1 and 3-2, a DAQ daughterboard attaches to the processor board, and together they form the RT Series DAQ hardware. The following sections describe the components that make up the RT Series DAQ hardware.



1	Processor Board	2	DAQ Daughterboard

Figure 3-1. PCI RT Series Data Acquisition Hardware



1	Processor Board	2	DAQ Daughterboard

Figure 3-2. PXI RT Series Data Acquisition Hardware

Processor Board

The 7030 processor board contains a microprocessor and support circuitry, as shown in Figure 3-3. The support circuitry includes a chipset with PCI controller and ISA bridge, main memory (DRAM), L2 cache (SRAM), and BIOS. The RT Engine software uses this embedded processor system for its execution platform.

The DAQ daughterboard resides on the embedded PCI bus, as shown in Figure 3-3, providing a high-performance system for communication between the software running on the processor and the DAQ daughterboard.

The processor board also holds the shared memory that communicates between the host system and the embedded processor. Refer to the *Host to RT Series DAQ Device Communication* section of this chapter and to Chapter 3, *Software Overview*, of the *LabVIEW Real-Time User Manual*, for more information about using shared memory in your applications.

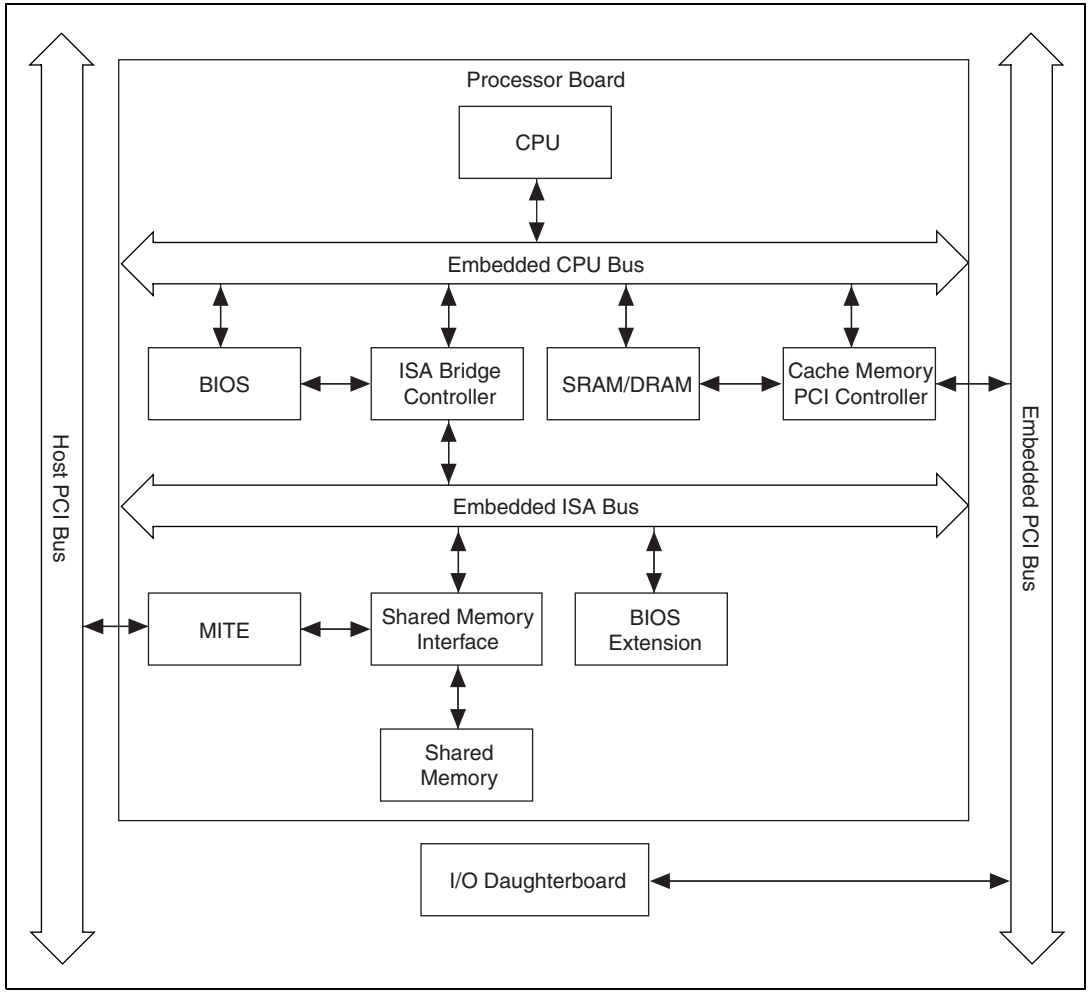


Figure 3-3. RT Series Processor Board Diagram

DAQ Daughterboard

The daughterboard in the RT Series system provides the DAQ functionality. Each daughterboard is a National Instruments DAQ device with some mechanical modifications to allow it to connect to the processor board. You can expect the same high performance and specifications from the daughterboard that you do from the standard version of the device. For example, the PCI/PXI-7030/6040E boards have the same DAQ characteristics as the PXI-6040E. Refer to the appropriate daughterboard manual for specifications, cabling requirements, and accessory information. Table 1-1, *RT Series DAQ Device and Corresponding DAQ Device Manual*, lists the corresponding manual for each available daughterboard. Refer to the DAQ section of the *LabVIEW Help*, available by selecting **Help»Contents and Index** in LabVIEW, for more information about hardware and software configuration.

Host to RT Series DAQ Device Communication

The computer where you install the RT Series DAQ device is the host computer. The RT Series DAQ device communicates to the host computer where it resides through shared memory on the 7030 processor board. Both the host computer and the embedded processor have access to the shared memory. The memory is allocated for various tasks. For example, the RT Development System on the host uses part of the shared memory for downloading software to the device. Some memory space also is allocated to the user for passing data between the host computer and the processor board.

RTSI

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

The RTSI connections are made across the PXI trigger bus for the PXI RT Series devices. For PCI RT Series devices, the connection is made with a connector on the top edge of the device and a RTSI cable available from National Instruments. Refer to your daughterboard user manual for

information about how to use the RTSI signals. Table 1-1, *RT Series DAQ Device and Corresponding DAQ Device Manual*, lists the corresponding manual for each available daughterboard.

LEDs

The RT Series processor board has two LEDs. You can use these LEDs to indicate the state of your running application. On the PXI-7030 device, the LEDs are visible on the front panel. Because the LEDs are located along the top edge of the device on the PCI-7030, you must remove the cover from the case of your computer to view them.

The red LED turns on during a portion of the reset of the RT Series DAQ device. Also, the red LED turns on and remains lit if the RT Engine detects an internal error. You can control both the red LED and a second green LED from LabVIEW RT applications to provide status information.

You can use the RT Board LEDs VI located on the **Functions»RT»RT Series DAQ»RT Board Utilities** palette in your application to control each LED independently. You can turn each LED on, off, or toggle its state. Refer to the *LabVIEW Real-Time Help*, available by selecting **Help»LabVIEW»Real-Time Help**, for more information about the RT Board LEDs VI.

4

LabVIEW RT Programming

This chapter provides an overview of using LabVIEW Real-Time (RT) and your RT Series DAQ hardware.

Targeting LabVIEW RT and Downloading VIs

In LabVIEW RT, select **Operate»Switch Execution Target** to access the **Select Target Platform** dialog box, shown in Figure 4-1.



Figure 4-1. Select Target Platform Dialog Box

Use the pull-down menu to select where you want to run VIs. When you select a target platform, the RT Development System downloads any VI you subsequently run to that target platform. Selecting **Host PC (LabVIEW for Windows)** makes LabVIEW RT behave like LabVIEW for Windows on the host PC.

Any RT Series DAQ device that you configure with Measurement & Automation Explorer (MAX) appears in the pull-down menu. The menu selection for each device displays the device number, for example, **DAQ::1**, where 1 is the device number. Click the **Reset device** checkbox in the **Select Target Platform** dialog box to reset the RT Series DAQ device. Any VIs you previously downloaded to the RT Series DAQ device are aborted and unloaded from memory. Click **Configure** in the

Select Target Platform dialog box to launch MAX and configure your RT Series DAQ devices.

Resetting the RT Series DAQ Device

Resetting the RT Series DAQ device is necessary only after you first turn on the system or if communication with the RT Engine cannot be established or has been lost. Also, reset the device when you change the DAQ configuration information for the RT Series DAQ device.

Creating Stand-Alone Executables

Use the Application Builder, included in the LabVIEW RT Professional Development System, to create stand-alone LabVIEW RT applications. Refer to the *LabVIEW Real-Time User Manual* and the *LabVIEW Application Builder Release Notes* for more information about the Application Builder.

Note If you have the LabVIEW RT Full Development System, you can purchase the Application Builder upgrade.

Embedded Applications

Because the RT Series DAQ hardware has no media storage device, you cannot permanently embed applications on the hardware. You must launch applications on the host and target them to the RT Series DAQ device.

Command-Line Arguments

You can use command-line arguments to disable the **Select Target Platform** dialog box and explicitly specify a target for the application. You can use the parameters in a batch file, or shortcut, from your Windows StartUp folder to automatically launch RT Engine VIs when your host PC is booted. For example, create a Windows shortcut with the following shortcut target:

```
c:\mybuiltapp.exe -target DAQ::1 -quithost
```

This command line automatically downloads and runs `mybuiltapp` on device 1 and closes the RT Development System on the host PC.

To disable the **Select Target Platform** dialog box, specify the target platform in the command line argument of your built executable using `-target`. For example,

`c:\mybuiltapp_rtengine.exe -target DAQ::3` (for device 3)

or to run the application on the host PC,

`c:\mybuiltapp_host.exe -target host`

You also can reset the specified device using `-reset`. For example,

`c:\mybuiltapp_rtengine.exe -target DAQ::3 -reset`

To disconnect the host PC from the RT Engine after all VIs are downloaded and leave the RT Engine VIs running, use `-quithost`. For example,

`c:\mybuiltapp_rtengine.exe -target DAQ::3 -quithost`

Programming LabVIEW RT

Because you run LabVIEW RT applications on hardware platforms that do not have all the components of a computer, LabVIEW RT lacks some LabVIEW features when targeted to the RT Engine. For example, there is no disk drive on the RT Series DAQ device, therefore, the RT Engine does not support file I/O when targeted to the RT Series DAQ device. The RT Engine does not support the following LabVIEW features on RT Series DAQ hardware:

- ActiveX
- Datalogging
- Dialog boxes
- Ethernet
- File I/O
- Instrument I/O: VISA, 488, RS-232/Serial
- Printing
- Profiler
- Programmatic Menu Bar

Note If you attempt to download to and run on your target platform a VI that has any of the unsupported functionality listed above, the VI still executes. Unsupported functions do not work and return standard LabVIEW error codes.

Real-Time Programming

This section provides an overview of real-time programming using your RT Series DAQ hardware.

Running a VI at Time-Critical Priority without the RT Development System

Instead of using TCP/IP or VI Server to communicate data to a host PC application, you can maximize real-time VI performance on RT Series DAQ devices by peeking and poking data to shared memory. Peeking, or reading directly from shared memory, and poking, or writing directly to shared memory, are common programming techniques and do not require the VI to yield significant processor time. You can create deterministic control loops that run in excess of 1 kHz when you peek and poke data to shared memory. Refer to Chapter 3, *Software Overview*, of the *LabVIEW Real-Time User Manual* for more information about TCP/IP and VI Server.



Note Windows NT does not support peeking and poking to shared memory on the PC. However, because the shared memory is located on the RT Series DAQ device, Windows NT does support peeking and poking to this shared memory.

Use of Shared Memory

Using peek and poke VIs to write directly to shared memory offers the best performance. Because you can access shared memory both from a host LabVIEW application and from an embedded LabVIEW RT VI, you can write a control loop program that does not have to slow down significantly or yield to communicate with the host system. Many such examples are in the `examples\RT\RT Control (7030).llb` library.

Configuration Issues

The RT Development System downloads the RT Engine to the RT Series DAQ hardware and sends configuration information when you reset the hardware. If you make any change to the device configuration information from MAX, you must reset the RT Series DAQ hardware for the changes to take effect.

LabVIEW RT also supports virtual channels, SCXI, and DAQ accessories on the RT Series DAQ hardware, but their descriptions download to the device when the device is reset. If you add a new channel or change the parameters of a channel using MAX, you must reset the RT Series DAQ

hardware for these changes to take effect. However, unlike virtual channels, you can set device parameters or accessory configuration information programmatically inside a VI without running MAX. Therefore, you can programmatically change these parameters in your VI without resetting the hardware.

Refer to your NI-DAQ documentation and the DAQ section of the *LabVIEW Help*, available by selecting **Help»Contents and Index,** for more information about configuration.

RT Series DAQ VIs

RT Series DAQ VIs are available on the **Functions»RT»RT Series DAQ** palette. Refer to the *LabVIEW Real-Time Help*, available by selecting **Help»LabVIEW Real-Time Help**, for more information about the LabVIEW RT VIs.

In addition to the RT Series DAQ VIs, LabVIEW RT includes the PID Control Toolset, which includes functions for PID and Fuzzy Logic control. The Fuzzy Controller VI requires information for a specific designed fuzzy controller loaded from its corresponding data file (`*.fc`). Because the RT Engine does not support file I/O, you must save this information as the default values of the front panel controls of the Fuzzy Controller VI before attempting to use it on the RT Series DAQ device. Refer to the *PID Control for G Reference Manual* for more information about the PID Control and Fuzzy Logic VIs.

A

Specifications

This appendix lists the specifications of the embedded processor system.

Processor

Processor ..... AMD 486 DX5
32-bit architecture

Processor clock speed ..... 133 MHz

CPU bus speed ..... 33 MHz

Memory ..... 8 MB DRAM user-programmable
60 ns, EDO, 5 V,
72-Pin SODIMM

On-chip cache ..... 16 KB write-back

L2 cache ..... 256 KB write-back

Floating-point unit..... Yes

Host-Embedded Communication

Shared Memory

Type ..... SRAM

Size..... 1 KB user available

Bus Interface

Type ..... PCI Slave

Power Requirement

PCI-7030 only
(without daughterboard) .....1.9 A at +5 VDC (±5%)

PXI-7030 only
(without daughterboard) .....2.0 A at +5 VDC (±5%)

Note To calculate the total power requirement, add the processor board requirement from this section to the I/O board requirement given in the I/O board manual.

Physical

Dimensions (Not Including Connectors)

PCI-7030.....312.9 by 160.5 cm
(12.3 by 4.2 in.)
One PCI slot

PXI-7030 .....16 by 10 cm
(6.3 by 3.9 in.)
Two PXI slots

Environment

Operating temperature .....0 to 55 °C

Storage temperature.....–20 to 70 °C

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

RTSI

Refer to the *RTSI* section of Chapter 3, *Hardware Overview* for information about real-time system integration.

I/O Daughterboard Specifications

Refer to the appropriate I/O device manual, listed in Table 1-1, *RT Series DAQ Device and Corresponding DAQ Device Manual*, for more information about I/O daughterboard specifications.

B

Technical Support Resources

Web Support

National Instruments Web support is your first stop for help in solving installation, configuration, and application problems and questions. Online problem-solving and diagnostic resources include frequently asked questions, knowledge bases, product-specific troubleshooting wizards, manuals, drivers, software updates, and more. Web support is available through the Technical Support section of `ni.com`

NI Developer Zone

The NI Developer Zone at `ni.com/zone` is the essential resource for building measurement and automation systems. At the NI Developer Zone, you can easily access the latest example programs, system configurators, tutorials, technical news, as well as a community of developers ready to share their own techniques.

Customer Education

National Instruments provides a number of alternatives to satisfy your training needs, from self-paced tutorials, videos, and interactive CDs to instructor-led hands-on courses at locations around the world. Visit the Customer Education section of `ni.com` for online course schedules, syllabi, training centers, and class registration.

System Integration

If you have time constraints, limited in-house technical resources, or other dilemmas, you may prefer to employ consulting or system integration services. You can rely on the expertise available through our worldwide network of Alliance Program members. To find out more about our Alliance system integration solutions, visit the System Integration section of `ni.com`

Worldwide Support

National Instruments has offices located around the world to help address your support needs. You can access our branch office Web sites from the Worldwide Offices section of `ni.com`. Branch office Web sites provide up-to-date contact information, support phone numbers, e-mail addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or National Instruments corporate. Phone numbers for our worldwide offices are listed at the front of this manual.

Glossary

B

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 hardware resources.
bus	the group of conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion vehicle to which I/O or other devices are connected. Examples of PC buses are the ISA and PCI bus.

C

cache	high-speed processor memory that buffers commonly used instructions or data to increase processing throughput
channel	Pin or wire lead to which you apply or from which you read the analog or digital signal. Analog signals can be single-ended or differential. For digital signals, you group channels to form ports. Ports usually consist of either four or eight digital channels.

D

DAQ	data acquisition—(1) collecting and measuring electrical signals from sensors, transducers, and test probes or fixtures and inputting them to a computer for processing; (2) collecting and measuring the same kinds of electrical signals with A/D and/or DIO boards plugged into a computer, and possibly generating control signals with D/A and/or DIO boards in the same computer

device	Instrument or controller that is addressable as a single entity and controls or monitors real-world I/O points. A device is often connected to the host computer through some type of communication network or can be a plug-in device. For data acquisition (DAQ) applications, a DAQ device is inside your computer or attached directly to the parallel port of your computer. Plug-in boards, PCMCIA cards, and devices such as the DAQPad-1200, which connects to your computer's parallel port, are all examples of DAQ devices. SCXI modules are distinct from devices, with the exception of the SCXI-1200, which is a hybrid.
DIO	digital input/output
DRAM	dynamic RAM

I

ISA	industry standard architecture

L

LED	Light-emitting diode.

R

resource locking	a technique whereby a device is signaled not to use its local memory while the memory is in use from the bus

T

TCP/IP	Transmission Control Protocol/Internet Protocol
trigger	any event that causes or starts some form of data capture

V

VISA — virtual instrument software architecture—a new driver software architecture developed by National Instruments to unify instrumentation software GPIB, DAQ, and VXI. It has been accepted as a standard for VXI by the VXIplug&play Systems Alliance.

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