

Using Desktop PCs as RT Targets with the Real-Time Module

The Real-Time Module can execute applications on real-time (RT) targets running a real-time operating system, including a desktop PC converted to an RT system. This document describes the three methods you can use to configure a desktop PC as an RT target and contains information about installing software on the desktop PC.



Note (LabVIEW Users) Refer to the *Getting Started with the LabVIEW Real-Time Module* document for exercises you can complete to familiarize yourself with the LabVIEW Real-Time Module.



Note (LabWindows/CVI Users) Refer to the *LabWindows/CVI Real-Time Module Help* section of the *LabWindows/CVI Help* for more information about using LabWindows™/CVI™ with RT targets.

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System Requirements

To configure a desktop PC as an RT target, ensure that the PC meets the following requirements:

- Processor based on the x86 architecture.
- Supported Ethernet chipset, the Ethernet device from the *Real-Time Deployment License Bundle for Standard PCs*, or a supported Ethernet card.
- Formatted hard drive or boot partition on the desktop PC with the FAT32 or Reliance file system. Because Windows Vista requires the NTFS file system, you cannot install RT Module software on the same partition as Windows Vista.
- 3.5 inch floppy drive or bootable USB port on the desktop PC.



Note Refer to the National Instruments Web site at ni.com/info and enter the info code `etspc` for up-to-date information about supported hardware and the specific desktop PC specifications that National Instruments recommends.

Getting Started

You can configure a desktop using a utility USB drive, a boot disk, or a format disk. Each method uses the following common steps. Complete the following steps to prepare the desktop PC for configuration as an RT target:

1. If the desktop PC does not include a motherboard with a supported Ethernet chipset, install a supported Ethernet card or the Ethernet device included with the *Real-Time Deployment License Bundle for Standard PCs* in an available PCI slot of the PC.
2. Ensure that the hard drive on which you plan to run the real-time OS is configured as the master drive. The Real-Time Module cannot boot on a hard drive configured as a slave drive. Refer to the hard drive documentation for information about configuring the drive as a master drive.
3. Connect a monitor and keyboard to the desktop PC to display and respond to BIOS configuration utility prompts.



Note National Instruments recommends that you remove from the desktop PC any PCI boards not supported by the Real-Time Module to reduce the possibility of resource conflicts. For example, remove sound cards, SCSI adapters, and modems from the desktop PC.

4. Turn on the desktop PC and access the BIOS configuration utility.



Note BIOS configurations and configuration interfaces for desktop PCs vary among different manufacturers and system models. Consult the motherboard or system manual for information about accessing and configuring the BIOS settings of the desktop PC.

5. Modify the BIOS settings.
 - a. Set the boot configuration.
 - If you want to boot from a utility USB drive, set the boot configuration to use a USB drive as the first boot device. Depending on the BIOS, you might also have to adjust the USB compatibility mode to boot from a USB drive.
 - If you want to boot from a bootable floppy disk or a format disk, set the boot configuration to use the floppy drive as the first boot device.
 - b. Disable any unnecessary integrated peripherals that use an interrupt request line (IRQ). For example, disable unused serial ports or integrated sound on the desktop PC.
 - c. If you do not plan to use USB, disable legacy USB support.
6. Save the configuration changes and exit the BIOS configuration utility.

Refer to the following sections for specific steps to boot the desktop PC using the method you select.

Configuring a Desktop PC Using a Utility USB Drive

You can use a utility USB drive in the following ways:

- Boot from the USB drive every time.
- Use the USB drive to format the hard drive. After you format the hard drive, the RT target boots directly from the hard drive.

Create a desktop PC utility USB drive using NI Measurement & Automation Explorer (MAX). Select **Tools»RT Disk Utilities»Create Desktop PC Utility USB Drive** in MAX to create the utility USB drive.

Boot from the USB Drive

You can use a utility USB drive to boot from the USB drive and launch the Real-Time Module software on the hard drive of the desktop PC. If there is no Real-Time Module software installed on the hard drive, the utility USB drive boots the PC into safe mode, where you can install software.

After you finish the steps in the *Getting Started* section, complete the following steps to configure a desktop PC to boot using a utility USB drive.

1. Insert the utility USB drive into an empty USB port on the desktop PC and reboot the desktop PC.
2. Select the **Boot using software installed on the hard-disk** option from the utility USB drive menu. The desktop PC boots into the real-time operating system or into safe mode. Refer to the *Installing Software* section for information about installing the Real-Time Module software on the hard drive if the PC boots into safe mode.

Format a Drive or Partition

You can use a utility USB drive to configure a desktop PC to boot into the real-time operating system directly from the hard drive. The format option of the utility USB drive repartitions and reformats the hard drive and installs files to the desktop PC to allow you to start the PC without a boot disk or USB drive.



Caution The format option of the utility USB drive overwrites the hard drive boot sector and master boot record, erasing all pointers to data on the drive. If you have a dual-boot configuration, the changes to the master boot record remove the ability to boot into the secondary operating system.

After you finish the steps in the *Getting Started* section, complete the following steps to format the hard drive and configure a desktop PC using a utility USB drive.

1. Insert the utility USB drive into an empty USB port on the desktop PC and reboot the desktop PC.
2. Select the **Format hard disk** option from the utility USB drive menu, choose a file system, and follow the directions on the screen.

Formatting with the Reliance File System

Reliance is a transactional file system that provides data integrity in the event of a power interruption. If a FAT-formatted RT target reboots or powers down during application execution due to power loss or user intervention, data corruption can occur. The Reliance file system maintains data integrity in such cases. Refer to the Datalight Web site at www.datalight.com for more information about the Reliance file system.

After formatting with the Reliance file system, remove the utility USB drive and reboot the desktop PC to boot into the real-time operating system. The desktop PC boots into safe mode the first time the system boots from the hard drive. Refer to the *Installing Software* section for information

about installing the Real-Time Module software on the hard drive if the PC boots into safe mode.

Formatting with the FAT32 File System

Format with the FAT file system if you need to maintain compatibility with existing FAT-formatted systems.

After formatting with the FAT file system, remove the utility USB drive and reboot the desktop PC to boot into the real-time operating system. The desktop PC boots into safe mode the first time the system boots from the hard drive. Refer to the [Installing Software](#) section for information about installing the RT Module software on the hard drive if the PC boots into safe mode.

Configuring a Desktop PC Using a Boot Disk

You can use a boot disk to launch the Real-Time Module software that you install on the hard drive of a desktop PC. If there is no Real-Time Module software installed on the hard drive, the desktop PC boots into safe mode.

Create a desktop PC boot disk using NI Measurement & Automation Explorer (MAX). Select **Tools»RT Disk Utilities»Create Desktop PC Boot Disk** in MAX to create the desktop PC boot disk.



Note You cannot create a boot disk with Windows Vista. You also cannot use a boot disk with a Reliance-formatted hard drive or partition. When you need to use a boot disk with a Reliance-formatted hard drive or partition, you can use a utility USB drive instead.

After you finish the steps in the [Getting Started](#) section, insert the desktop PC boot disk in the floppy drive and reboot the desktop PC. The desktop PC boots into the real-time operating system or into safe mode. Refer to the [Installing Software](#) section for information about installing the Real-Time Module software on the hard drive if the PC boots into safe mode.

Configuring a Desktop PC Using a Format Disk

You can use a format disk to configure a desktop PC to boot into the real-time operating system directly from the hard drive. The format disk repartitions and reformats the hard drive and installs files to the desktop PC to allow you to start the PC without a boot disk.

Create a desktop PC format disk using NI Measurement & Automation Explorer (MAX). Select **Tools»RT Disk Utilities»Create Desktop PC Format Hard Drive Disk** in MAX to create the desktop PC format disk.



Note You cannot create a format disk with Windows Vista. You also cannot use a format disk with a Reliance-formatted hard drive or partition. When you need to use a format disk with a Reliance-formatted hard drive or partition, you can use a utility USB drive instead.



Caution A format disk overwrites the hard drive boot sector and master boot record, erasing all pointers to data on the drive. If you have a dual-boot configuration, the changes to the master boot record remove the ability to boot into the secondary operating system.

After you finish the steps in the *Getting Started* section, complete the following steps to configure a desktop PC using a format disk.

1. Insert the desktop PC format disk in the floppy drive and reboot the PC.
2. Follow the directions that appear on the screen.
3. Remove the desktop PC format disk from the floppy drive and reboot the desktop PC to boot into the real-time operating system. The desktop PC boots into safe mode the first time the system boots from the hard drive. Refer to the *Installing Software* section for information about installing the Real-Time Module software to the hard drive when the PC boots into safe mode.

Installing Software

Complete the following steps to install software on the desktop PC.

1. Boot the desktop PC into the real-time operating system. The desktop PC loads with the basic real-time operating system and a null IP address of 0 . 0 . 0 . 0.



Tip You can connect a monitor to the desktop PC to display startup messages.

2. Open MAX on another computer in the same subnet and expand the **Remote Systems** category. MAX lists the desktop PC as 0 . 0 . 0 . 0 in the **Remote Systems** category.
3. Click on the 0 . 0 . 0 . 0 entry to access the **Network Settings** tab.
4. Enter a name for the RT target in the **Name** text box.
5. Set the network configuration options of the RT target in the **IP Settings** section and click the **Apply** button. Refer to the *Configuring Network Settings* book, accessible by browsing to **MAX Remote Systems Help»LabVIEW Real-Time Target Configuration»Configuring Network Settings** from the Contents tab of the *MAX Help* for information about configuring network settings.
6. Reboot the RT target. The RT target appears in the **Remote Systems** category with the assigned name.

7. Expand the RT target in the **Remote Systems** category and select the **Software** category.
8. Click the **Add/Remove Software** button in the toolbar to launch the LabVIEW Real-Time Software Wizard.
9. Install the Real-Time software and device drivers that you require on the RT target.

Installing Multiple-CPU Support

To take advantage of parallel processing on a multiple-CPU system, use the LabVIEW Real-Time Software Wizard in MAX to install the NI RT Extensions for SMP. Refer to the *MAX Help* for information about using the LabVIEW Real-Time Software Wizard. Refer to the *LabVIEW Help* or *LabWindows/CVI Help* for information about optimizing RT applications for multiple-CPU systems.



Note Single-CPU systems perform best without the NI RT Extensions for SMP. Also, some applications, such as those that consist mainly of single-point I/O, can achieve lower latency using a single CPU without the NI RT Extensions for SMP. Refer to the National Instruments Web site at ni.com/info and enter the info code `rt_smp` for more information about optimizing RT applications for systems with multiple CPUs.

Resources

Refer to the NI Web site at ni.com/info and enter the info code `et_spc` for more information about using desktop PCs as RT targets.

LabVIEW Users

- Refer to the `readme_RT.html` file on the LabVIEW Real-Time Module installation media for information about known issues regarding the use of desktop PCs as RT targets.
- Refer to the *Getting Started with the LabVIEW Real-Time Module* document for exercises you can complete to familiarize yourself with the LabVIEW Real-Time Module.
- Refer to the *LabVIEW Help* for more information about the LabVIEW Real-Time Module features. Access the *LabVIEW Help* from LabVIEW by selecting **Help»Search the LabVIEW Help**.

LabWindows/CVI Users

- Refer to the `CVIRTReadme.html` file on the LabWindows/CVI Real-Time Module installation media for information about known issues regarding the use of desktop PCs as an RT targets.
- Refer to the *Getting Started with the LabWindows/CVI Real-Time Module* for exercises you can complete to familiarize yourself with the LabWindows/CVI Real-Time Module.
- Refer to the *LabWindows/CVI Real-Time Help* for more information about the LabWindows/ Real-Time Module features. Access the *LabWindows/CVI Help* from LabWindows/CVI by selecting **Help»Contents**.

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