

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

The LabVIEW Real-Time Module can execute VIs on RT targets running a real-time operating system. This document contains important information about configuring a desktop PC as an RT target and information about installing software on the desktop PC.

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.

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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 *LabVIEW Real-Time Deployment License Bundle for Standard PCs*, or a supported Ethernet card.
- Formatted hard drive or 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.

Configuring a Desktop PC Using a Utility USB Drive

Use a utility USB drive to configure a desktop PC to boot from the USB drive or to format the hard drive of the desktop PC and then permanently install the RT Module software on the hard drive of the desktop PC.

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

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

Complete the following steps to configure a desktop PC to boot using a utility USB drive.

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 *LabVIEW Real-Time Deployment License Bundle for Standard PCs* in an available PCI slot of the PC.
2. 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 LabVIEW Real-Time Module to reduce the possibility of resource conflicts. For example, remove sound cards, SCSI adapters, and modems from the desktop PC.

3. 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.

4. Set the boot configuration to use a USB drive as the first boot device.
5. 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.
6. Save the configuration changes and exit the BIOS configuration utility.
7. Insert the utility USB drive into an empty USB port on the desktop PC and reboot the desktop PC.
8. 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 RT Module software on the hard drive if the PC boots into safe mode.

Format a Drive or Partition

Use a utility USB drive to permanently install the RT Module software on the hard drive of the desktop PC. A format option of the utility USB drive resets a previously formatted and partitioned hard drive and installs files to the desktop PC to allow you to start the PC without a boot disk.



Caution The format utility 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.

Complete the following steps to format the hard drive and configure a desktop PC using a utility USB drive.

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 *LabVIEW Real-Time Deployment License Bundle for Standard PCs* in an available PCI slot of the PC.
2. 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 any PCI boards not supported by the LabVIEW Real-Time Module to reduce the possibility of resource conflicts. For example, remove sound cards, SCSI adapters, and modems from the desktop PC.

3. 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.

4. Set the boot configuration to use a USB drive as the first boot device.
5. 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.
6. Save the configuration changes and exit the BIOS configuration utility.
7. Insert the utility USB drive into an empty USB port on the desktop PC and reboot the desktop PC.
8. 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 website at 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 RT Module software on the hard drive if the PC boots into safe mode.

Formatting with the FAT 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 RT Module software that you install on the hard drive of a desktop PC. If there is no RT Module software installed on the hard drive, the desktop PC boots into safe mode, where you can install software.

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.

Complete the following steps to configure a desktop PC using a boot disk.

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 *LabVIEW Real-Time Deployment License Bundle for Standard PCs* in an available PCI slot of the PC.
2. 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 LabVIEW Real-Time Module to reduce the possibility of resource conflicts. For example, remove sound cards, SCSI adapters, and modems from the desktop PC.

3. 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.

4. Set the boot configuration to use the floppy drive as the first boot device.
5. Disable legacy USB support.
6. 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.
7. Save the configuration changes and exit the BIOS configuration utility.

8. 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 RT 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 permanently install the RT Module software on the hard drive of the desktop PC. A format disk resets a previously formatted and partitioned 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 can use a format disk to format with the FAT file system only. To format with the Reliance file system, you must use a utility USB drive.



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.

Complete the following steps to configure a desktop PC using a format disk.

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 *LabVIEW Real-Time Deployment License Bundle for Standard PCs* in an available PCI slot of the PC.
2. Connect a monitor and keyboard to the desktop PC to display and respond to BIOS configuration utility and format prompts.



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

3. 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.

4. Set the boot configuration to use the floppy drive as the first boot device.
5. Disable legacy USB support.
6. 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.
7. Save the configuration changes and exit the BIOS configuration utility.
8. Insert the desktop PC format disk in the floppy drive and reboot the PC.
9. Follow the directions that appear on the screen.
10. 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 RT Module software to the hard drive if 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 LabVIEW Real-Time software and device drivers that you require on the RT target. Refer to the NI Web site at ni.com/info and enter the info code `etspc` for the latest information about supported software.

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 *Optimizing RT Applications for Multiple-CPU Systems* book of the *LabVIEW 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 `rtsmp` for further details 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 `etspc` for more information about using desktop PCs as RT targets.
- Refer to the `readme_RT.html` file on the LabVIEW Real-Time Module installation CD 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**.

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