

RELEASE NOTES

LabVIEW™ Embedded Development Module

Version 1.0

Contents

Introduction	1
Prerequisites	3
LabVIEW Embedded Edition	3
System Requirements.....	3
Installation.....	3
LabVIEW Embedded Development Module Example Targets.....	4
Embedded Development Module Documentation	7
Where to Go for Support.....	7

Introduction

The LabVIEW Embedded Development Module 1.0 enables you to port LabVIEW to new targets, including non-NI hardware. Porting LabVIEW involves creating a target, customizing the build process, porting the run-time environment, and customizing the editing environment for the new target.

You use utilities and modify plug-in VIs for a specific target. Customizing the build process involves editing the VIs that control code generation, compilation, linking, and downloading. Each step of customizing the build process has a set of plug-in VIs that define the behavior. The LabVIEW C Code Generator is in the LabVIEW executable, which you access with a VI server call with parameters that control the code generation settings and includes such things as endianness, memory model, and guard code removal. The compilation and linking VIs script your C compiler to do the work of building the executable. You can customize the **Build Settings**

dialog box to add extra options to control the linker. For example, you can define the executable format the linker generates. The download VIs control the transfer of the executable from the desktop PC to the embedded device. The VIs for all of these steps are located in the following directory:



labview embedded\resource\LabVIEW Targets\embedded\x

where x is the name of the target.

The run-time environment consists of code containing such things as communications, data manipulation, and timing functions. The run-time environment is distributed in source code form. To port the run-time library to a new OS, you copy OS-specific folders from a similar existing OS to a new folder with the new OS name. You then modify these files to work on the new OS. The main features that require porting are serial communications, TCP/IP, time functions, events, threads, critical sections, and `printf` output. You can port the rest of the run-time code by modifying the code in `LVDefs_plat.h` and `LVSysIncludes.h`, which contains macros and constants that might change when going from one OS to another.

Elemental I/O Nodes provide a mechanism for portable I/O. You use the Elemental I/O Device Editor to define the I/O characteristics of a board and VIs that govern the behavior of the various types of Elemental I/O Nodes, such as analog input (AI), analog output (AO), digital input (DI), digital output (DO), digital bank input (DBI), digital bank output (DBO), and pulse width modulation output (PWMO) nodes. For each type of I/O, the user creates a VI that actually performs the I/O and a VI that configures the operation. You can implement the actual I/O VI using an Inline C Node in which I/O register operations are performed. The configuration VI implements a user interface so the user can configure parameters, such as channel, that can vary from one node to another. You can customize the LabVIEW palettes and target syntax checking for each target so users can avoid using features the target does not support. For example, you can remove the TCP/IP VIs for targets without Ethernet connectivity.

Target syntax determines the supported and unsupported features for a specific target. You receive a broken **Run** button when you use an unsupported feature for a target. Target syntax checking is useful when importing VIs that might contain unsupported features. LabVIEW loads a configuration file you create with a utility when you switch to a different target that contains the target syntax checking for that target.

Prerequisites



Note You must have the ability to build, download, run, and debug a “hello, world” application on the target outside of LabVIEW before you attempt to port LabVIEW to a new target.

To use the Embedded Development Module, you should be knowledgeable about the following:

- Your target
- LabVIEW and C
- A C compiler toolchain for your target

LabVIEW Embedded Edition

The Embedded Development Module uses LabVIEW 7.1 Embedded Edition, which is a special edition of LabVIEW 7.1 that installs in a separate directory and does not interfere with LabVIEW 7.1 Base, Full, or Professional development systems.

System Requirements

The Embedded Development Module has the following requirements:

- A desktop computer with Windows 2000/XP
- LabVIEW 7.1 Embedded Edition (included)
- NI-VISA 3.1 or later (available for download at ni.com)

Refer to the *LabVIEW Release Notes*, available by selecting **Start» Programs» National Instruments» LabVIEW 7.1 Embedded Edition» LabVIEW Manuals** and opening `relnote.pdf`, for standard LabVIEW development system requirements.

Installation

Complete the following steps to install the LabVIEW Embedded Development Module.

1. Log on as an administrator or as a user with administrator privileges.
2. Insert the LabVIEW 7.1 Embedded Edition CD and follow the instructions that appear on the screen.
3. Insert the LabVIEW Embedded Development Module CD and follow the instructions that appear on the screen.

You must activate the LabVIEW Embedded Development Module to obtain the example targets. Refer to the *Activation Instructions for National Instruments Software* document for activation instructions.

LabVIEW Embedded Development Module Example Targets

The LabVIEW Embedded Development Module includes several example targets. Use the example targets as a starting point when you create new embedded targets. The target directory hierarchy is designed to allow for code reuse. Example targets are located in the following directory:



labview embedded\resource\LabVIEW Targets\Embedded

It is important to select an appropriate example target to use as a template when you create a new embedded target. Use the target that is closest to the target and toolchain you are creating. If you are using a GNU C/C++-based (gcc) toolchain, you might want to use an eCos target. If you are using a VxWorks-based toolchain with different hardware, you might want to use a VxWorks subtarget.

The different example targets have different implementations. When you are implementing a feature for a new embedded target, look for an existing implementation in an existing target.

The following table lists some of the implementation features for the example targets. Use this table to find an example of a feature you are implementing for a new target.

Target Name	Instrumental Debugging	On Chip Debugging	Pre-Built Runtime Library	Static Memory Model	Memory Mapping	Elemental I/O
Code Generation Only	No	No	No	Yes	No	No
Axiom CMD565, eCos ROM Image	No	No	No	Yes	No	Yes
Axiom CMD565, eCos RAM Image	Serial	No	No	Yes	No	Yes
Unix Console	TCP	No	Yes	No	No	No
Axiom CMD565, VxWorks RAM Image	No	iSYSTEM iC3000	No	Yes	No	Yes

Target Name	Instrumental Debugging	On Chip Debugging	Pre-Built Runtime Library	Static Memory Model	Memory Mapping	Elemental I/O
Axiom CMD565, VxWorks ROM Image	No	No	No	Yes	Yes	Yes
Axiom CMD565, VxWorks Module	Serial	WindRiver WTX	No	Yes	No	Yes
Intel IXDP425, VxWorks RAM Image	No	WindRiver VisionICE II	No	Yes	No	Yes
Intel IXDP425, VxWorks ROM Image	No	No	No	Yes	No	Yes
Intel IXDP425, VxWorks Module	TCP	No	No	Yes	No	Yes
VxWorks Simulation	TCP	No	No	Yes	No	No
Windows Console Application	TCP	No	Yes	Yes	No	No

Example Targets System Requirements

The Embedded Development Module example targets have the following requirements:

Target Name	Hardware Requirements	Software Requirements
Code Generation Only	None	None
Axiom CMD565, eCos ROM Image	Axiom CMD-565 Development Board	Cygwin 1.5.x eCos 2.0 PowerPC toolchain
Axiom CMD565, eCos RAM Image	Axiom CMD-565 Development Board	Cygwin 1.5.x eCos 2.0 PowerPC toolchain
Unix Console	None	Cygwin 1.5.x with gcc package
Axiom CMD565, VxWorks RAM Image	Axiom CMD-565 Development Board iSYSTEM iC3000ActiveEmulator	Wind River Tornado 2.2.1 VxWorks 5.5.1 BSP for CMD565 iSYSTEM winIDEA
Axiom CMD565, VxWorks ROM Image	Axiom CMD-565 Development Board	Wind River Tornado 2.2.1 VxWorks 5.5.1 BSP for CMD565
Axiom CMD565, VxWorks Module	Axiom CMD-565 Development Board	Wind River Tornado 2.2.1 VxWorks 5.5.1 BSP for CMD565

Target Name	Hardware Requirements	Software Requirements
Intel IXDP425, VxWorks RAM Image	Intel IXDP425/IXCDP1100 Development Platform Wind River visionICE II JTAG emulator	Wind River Tornado 2.2.1 VxWorks 5.5.1 BSP for IXDP425 Wind River visionCLICK with EST API
Intel IXDP425, VxWorks ROM Image	Intel IXDP425/IXCDP1100 Development Platform	Wind River Tornado 2.2.1 VxWorks 5.5.1 BSP for IXDP425
Intel IXDP425, VxWorks Module	Intel IXDP425/IXCDP1100 Development Platform	Wind River Tornado 2.2.1 VxWorks 5.5.1 BSP for IXDP425 TFTP Server
VxWorks Simulation	None	Wind River Tornado 2.2.1 VxWorks 5.5.1 (Optional) ULIP Ethernet driver
Windows Console Application	None	One of the following: Visual Studio 6.0 Visual Studio .NET Visual C ++ Toolkit 2003 version 1.01 and Core SDK Platform

Contact the respective vendors for more information about their hardware and software products.

Refer to ecos.sourceware.org/getstart.html for information about downloading and installing eCos.

The VxWorks Development Kit for the LabVIEW Embedded Development Module includes the Tornado 2.2.1 integrated development environment and evaluation run-times for VxWorks 5.5.1 for the purpose of demonstrating the features, performance, and capabilities of these Wind River products in association with the Labview Embedded Development Module. Refer to windriver.com/alliances/eval-cd/ and click **VxW for LabVIEW Embedded Development Module Evaluation Kit** to receive the VxWorks Development Kit. Refer to windriver.com for more information about Wind River's Device Software Optimization products, including VxW real time operating systems and Tornado, an integrated development environment.

Embedded Development Module Documentation

The Embedded Development Module includes the following documentation in addition to this document:

- The *LabVIEW Embedded Development Module Porting Guide*, available by selecting **Start»Programs»National Instruments»LabVIEW 7.1 Embedded Edition»LabVIEW Manuals** and opening `EMB_Porting_Guide.pdf`, contains the information you need to port LabVIEW to a new target. Some of this information also is available in the *LabVIEW Help*, available by selecting **Help»VI, Function & How-To Help**.
- The readme file, available by selecting **Start»Programs»National Instruments»LabVIEW 7.1 Embedded Edition»Readme** and opening `readme_EMB.html`, contains known issues.
- The *LabVIEW Help*, available by selecting **Help»VI, Function, & How-To Help**, contains reference information about LabVIEW palettes, menus, tools, VIs, function, and for step-by-step instructions for using LabVIEW features.

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at ni.com/support and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 0 662 45 79 90 0,
Belgium 32 0 2 757 00 20, Brazil 55 11 3262 3599,
Canada 800 433 3488, China 86 21 6555 7838,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 385 0 9 725 725 11, France 33 0 1 48 14 24 24,
Germany 49 0 89 741 31 30, India 91 80 51190000,
Israel 972 0 3 6393737, Italy 39 02 413091, Japan 81 3 5472 2970,
Korea 82 02 3451 3400, Lebanon 961 0 1 33 28 28,
Malaysia 1800 887710, Mexico 01 800 010 0793,
Netherlands 31 0 348 433 466, New Zealand 0800 553 322,

Norway 47 0 66 90 76 60, Poland 48 22 3390150,
Portugal 351 210 311 210, Russia 7 095 783 68 51,
Singapore 1800 226 5886, Slovenia 386 3 425 4200,
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
Sweden 46 0 8 587 895 00, Switzerland 41 56 200 51 51,
Taiwan 886 02 2377 2222, Thailand 662 992 7519,
United Kingdom 44 0 1635 523545

National Instruments, NI, ni.com, and LabVIEW are trademarks of National Instruments Corporation. Refer to the *Terms of Use* section on ni.com/legal for more information about National Instruments trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering National Instruments products, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your CD, or ni.com/patents.