Multiple Board Programming Using ispVM® System-DlxConnect

Introduction

This technical note describes the methodologies available for programming Lattice devices on multiple printed circuit boards (gang programming). The first section of this document describes how to use the ispVM-DLxConnect software to accomplish this task. The second section describes an alternate methodology using command line features and syntax. The ispVM-DLxConnect is a software tool that provides gang programming support using multiple USB connections. This software can be used to program and verify Lattice devices in chains on as many as eight printed circuit boards. In command line mode, as many as 16 printed circuit boards can be programmed. With either method, each board requires a JTAG port that is connected to the Lattice ispDOWNLOAD® USB port cable.

DLxConnect Programmer

The ispVM-DLxConnect is a stand-alone software tool that provides gang programming support using multiple USB connections. This software tool allows you to program and verify Lattice devices in chains on as many as eight printed circuit boards in either serial or parallel programming mode.

Figure 1. DLxConnect Programmer User Interface
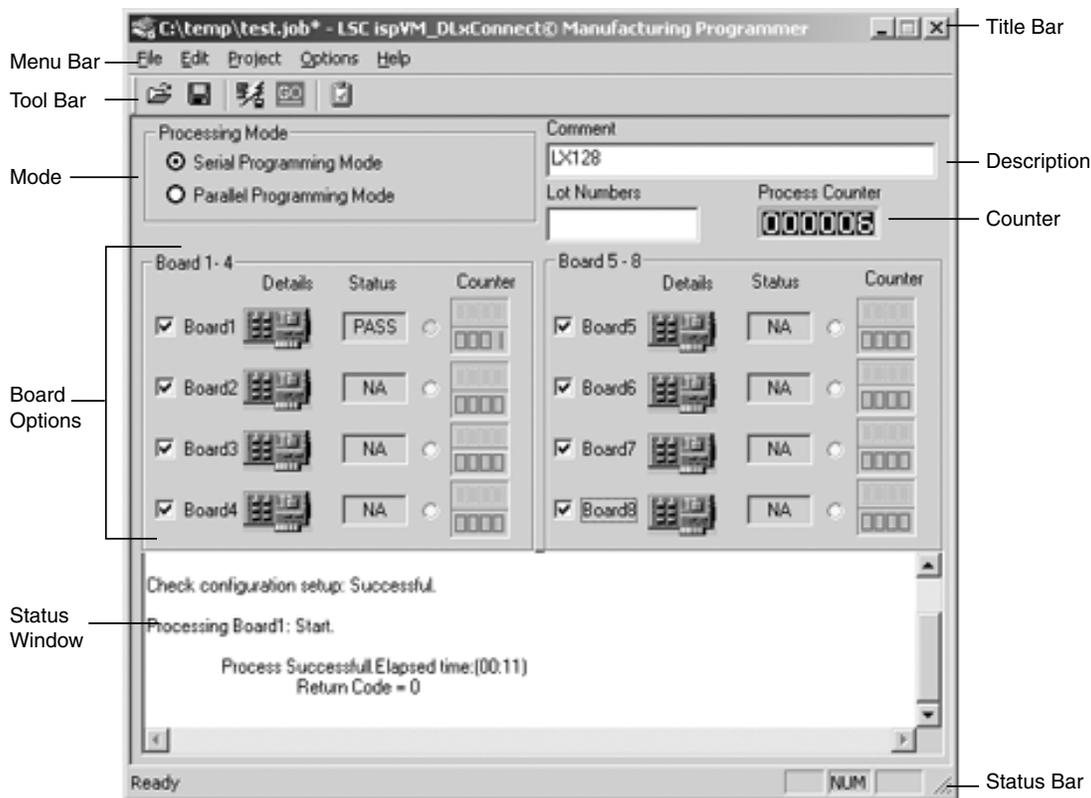
Running the ispVM-DLxConnect Programmer

In order to use the ispVM-DLxConnect program or command line feature, you must install the ispVM System v.14.2.1 or later. This software is available with Lattice ispLEVER® software (v.4.0 or later) or it may be downloaded from the Lattice web site at www.latticesemi.com/software.

You can access the ispVM-DLxConnect Programmer through the ispVM System software. From the toolbar select **ispTOOLS > ispVM-DLx Connect**. The **ispVM-DLxConnect Programmer** opens, displaying the options for configuring up to eight boards.

Setting Up the Circuit Boards

The ispVM-DLxConnect Programmer allows you to set up as many as eight printed circuit boards for serial or parallel programming modes. The process to set up the boards is the same for both modes. The following steps need to be followed before programming.

Setting the Processing Mode

Set the processing mode to the **Serial Programming** or **Parallel Programming** mode. Serial Programming Mode will program each board one at a time. In Parallel Programming Mode, the software allows you to program all boards at the same time. Both modes require a separate USB connection for each board. A total of eight boards are allowed.

Job Description

If you want to assign a description to the programming job, type your description or comment in the **Comment** text box. You can also add a lot number in the **Lot Numbers** box.

Selecting Channels

The next step is to select the channels that will be active for programming the boards. There are two ways to select the boards (or channels) to be activated for programming. To select channels, select each board that you want to use in the main window (Figure 1). Or go to **Edit > Select Active Channel** and select the board number you wish to activate. Repeat this command for each board to be used. To activate all eight boards, select **All**.

Unselecting Channels

To unselect channels from the main window, clear the board selections you do not wish to use. Or go to **Edit > Select Active Channel > All** to clear all selections or to deselect previously selected boards individually.

Figure 2. Board Setup Dialog
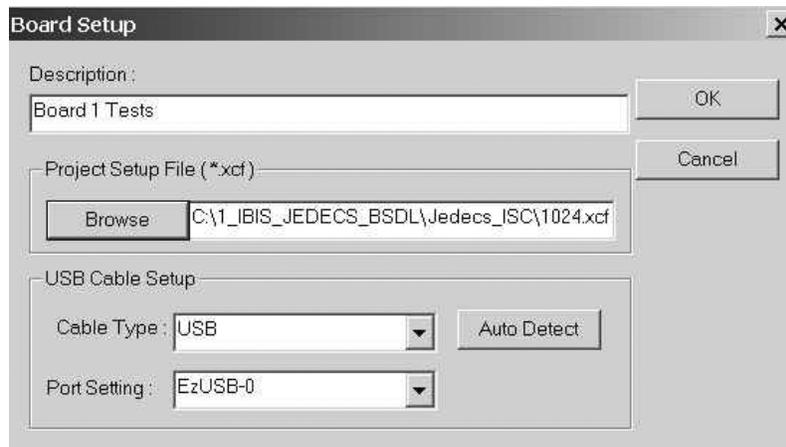
Board Setup

Each individual board must be set up before it is programmed. To set up a board, each board must point to its individual configuration file. If it is in parallel mode, each USB port setting needs to be configured. To set up each board individually, click the highlighted board icon below the **Details** column in the main window (Figure 1).

In the Board Setup dialog box (Figure 2), type a name or description for the selected board in the **Description** box. Under Project Setup File(*.xcf), click the **Browse** button and navigate to the chain file (.xcf) to be used for programming the board. Under **USB Cable Setup**, you can do one of the following to set up the USB cable: click on **Auto Detect** to automatically fill in the cable setup information or select the cable type and port setting from the drop-down lists. Depending on how many USB cables you connect to the computer, the software will automatically detect them and put them in the drop-down list of the **Port Setting**.

Programming the Circuit Boards

Downloading Design Files

Once you have configured the programming mode and board options, the boards are ready to be programmed. To start downloading the design files, choose **Project > Download** or click the **GO** button on the toolbar.

The software will begin downloading the design files to the selected boards using the chain files specified. After the process has finished, each selected board displays PASS or FAIL in the status box.

Note: If a problem exists in the USB connection, the software will stop the downloading process. If this happens, check the **Status** window to locate the board or boards with the problem.

Resetting Counters

The ispVM-DLxConnect main window has two types of counters. The process counter is the counter for the whole programming job. The other counters are for individual board processes. The green counter counts the number of times the process passed while the red counter counts the number of times the process failed. You can reset the process counter, all counters, or selected board counters.

You can reset the process counter by going to **Edit > Reset Counter > Process Counter**. To reset the process counter including all the individual board process counters, choose **Edit > Reset Counter > All Counters**. You can also reset selected individual board process counters by going to **Edit > Reset Counters** and select the board counter you want to reset. Repeat this command for each additional board counter you wish to reset. The software resets each selected counter to 000000.

Clearing the Log Files and Status Windows

The ispVM System keeps a time-stamped log of software operations in an ASCII text file called the ispVM_DLxConnect.log. If you want to clear the log file, go to **Edit > Clear Log File**. The status window displays status messages about configurations, errors and results of the downloading process. The status window is the output pane across the bottom of the ispVM-DLxConnect Programmer interface. If you want to clear this window, right-click inside the status window and choose **Clear Status Window**.

Saving a Setup

Saving your current programming job ensures all the selected options for the entire process as well as the configurations for each board will be saved. When you save the options for the whole setup as a project file (*.job), you save the boards in order of their connections, as well as their chain files. This allows you to load the same setup file for future programming sessions. To save a programming setup, go to **File > Save As**. In the dialog box, type a title for the JOB file, choose a directory then click **OK**.

Note: Once you unplug the USB cables from the system, the saved job file may not work if the cables are not plugged in in the same order as they were originally plugged in. Also, if the PC is turned off and then turned back on, the USB port setup may not be the same during power-up. To fix this, either plug in the USB cables in the same order as the previous job file or reenter the USB ports in the **Port Settings** of the **Board Setup** dialog box in the main window. For more information, see the Selecting From Multiple USB Cables section of this document.

Command Line for Multiple Board Programming

Multiple boards can be programmed using the command line. Through the creation of a batch file, up to 16 boards can be programmed. Below are the syntax and options needed to create the command to program multiple boards.

You can create a command for each board pointing to a specific USB port, then combine these commands into a batch file.

Running the ispVM System from the Command Line

The ispVM System uses a keyword preceded by a hyphen for each command line argument. Use the syntax and options in the command descriptions below to run the ispVM System from the command line. Command line examples and return code descriptions follow below.

The format of the ispVM System command is as follows:

```
<drive>:\ispVM.exe [ -help | < -infile < input file path >
[ < -logfile < log file path > ]
< -processtype < turbo | sequential >
usb [-portaddress < Ezusb-0 | Ezusb-1 | Ezusb-2 | Ezusb-3 | Ezusb-4 | Ezusb-5 | ...Ezusb-16] >]
```

Command Line Examples

To process a Chain in Turbo Mode

```
ispVM.exe -infile c:\chain0.xcf -processtype turbo -cabletype usb -portaddress Ezusb-0
ispVM.exe -infile c:\chain1.xcf -processtype turbo -cabletype usb -portaddress Ezusb-1
ispVM.exe -infile c:\chain2.xcf -processtype turbo -cabletype usb -portaddress Ezusb-2
```

To process a Chain in Turbo Mode using Shorthand Notation and Position Insensitive Arguments

```
ispvm.exe -pt turbo -infile c:\chain0.xcf  -ct usb -pa Ezusb-0
ispvm.exe -pt turbo -infile c:\chain1.xcf  -ct usb -pa Ezusb-1
ispvm.exe -pt turbo -infile c:\chain2.xcf  -ct usb -pa Ezusb-2
```

Note: For command line options, make sure that the .xcf file for each board points to the correct USB cable. If you turn off the PC and turn it back on, the USB port setup may not be the same during power-up. Plug in the USB cables in the same order of the portaddress option from the example above. Plug in the board with the chain0.xcf file first, followed by the board with chain2.xcf, and finally the board with chain2.xcf file. For more information, see the Selecting from Multiple USB Cables section of this document.

Selecting from USB Multiple Cables

The ispVM System recognizes as many as 16 USB cables plugged into the same PC. The ispVM System will detect all available cables in the order in which they were plugged in.

The first cable plugged into the PC will be assigned port Ez-USB-0. The second USB cable will be assigned port Ez-USB-1, and so on. If the PC is turned off and then later turned back on, the assigned ports may change, since the PC will detect the cables based on the USB port address instead of the order in which they were plugged into the PC. The selected cable is stored in the ispVM.ini file. Since the USB cable port assignments may change during power-up, you might have to reselect the USB cable in the **Cable and I/O Port Setup** dialog box.

Related Literature

• *In-System Programming Usage Guidelines for ispJTAG Devices*

• Lattice Technical Note #TN1019, *Using ispMACH 4000 Devices in Multiple JTAG Voltage Environments*

• Lattice Application Note #AN6062, *Using ispVM System to Program ispPAC Devices*

Technical Support Assistance

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