

PROM FILE FORMATTER

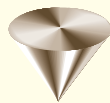
REFERENCE/USER GUIDE



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Trademark Information

Introduction

The PROM File Formatter provides a graphical user interface that allows you to format BIT files into a PROM file compatible with Xilinx and third-party PROM programmers. It is also used to concatenate multiple bitstreams into a single PROM file for daisy chain applications. In addition, the PROM File Formatter enables you to take advantage of the Xilinx FPGA reconfiguration capability, as you can store several applications in the same PROM file.

PROM files are also compatible with the Hardware Debugger. You can therefore use the Hardware Debugger to download a PROM file to a single FPGA or to a daisy chain of FPGA devices.

The PROM File Formatter replaces the MakePROM program on the PC. MakePROM can be used to format PROM files on a workstation.

What Is a Xilinx PROM File?

A Xilinx PROM file consists of one or more data streams. In this context, a data stream represents all the configuration data required to implement a given application. Each data stream contains one or more BIT files and once saved, will have a separate preamble and length count. Figure 1-2 illustrates the structure of a PROM file.

The PROM file can be formatted in one of three industry standard formats: Intel MCS-86, Tektronix TEKHEX, and Motorola EXORmacs.

Note: You can also format BIT files into a HEX format file. This file type is not considered a PROM file since you cannot use it to program PROM devices. A HEX format file is ordinarily used as input to user-defined processes or programs.

You can store PROM files in PROM devices or on your computer. In turn, you can use the files to program your FPGA devices either from

a PROM device on your board or from your computer using a serial or parallel cable. Refer to your *Development System User Guide* for more information.

Configuration Data Stream Box

The Configuration Data Stream box, or workspace in the PROM File Formatter window, represents the structure of your PROM file. It consists of one or more data streams.

- A data stream consisting of one BIT file contains data to configure a single device.
- A data stream consisting of more than one BIT file contains data to configure a group of devices connected in daisy chain fashion.

The PROM File Formatter uses horizontal arrows to indicate the relationships between files in a single data stream. Each arrow represents a link in the configuration bitstream to the next device in the chain.

Before programming a daisy chain of FPGA devices, you must first concatenate the configuration BIT files together. Each BIT file corresponds to an FPGA in the daisy chain.

The following figure exemplifies the structure of a typical PROM file designed to configure a single daisy chain of devices in master mode. Data Stream #1 configures a daisy chain of two devices. Data Stream #2 reconfigures the same daisy chain.

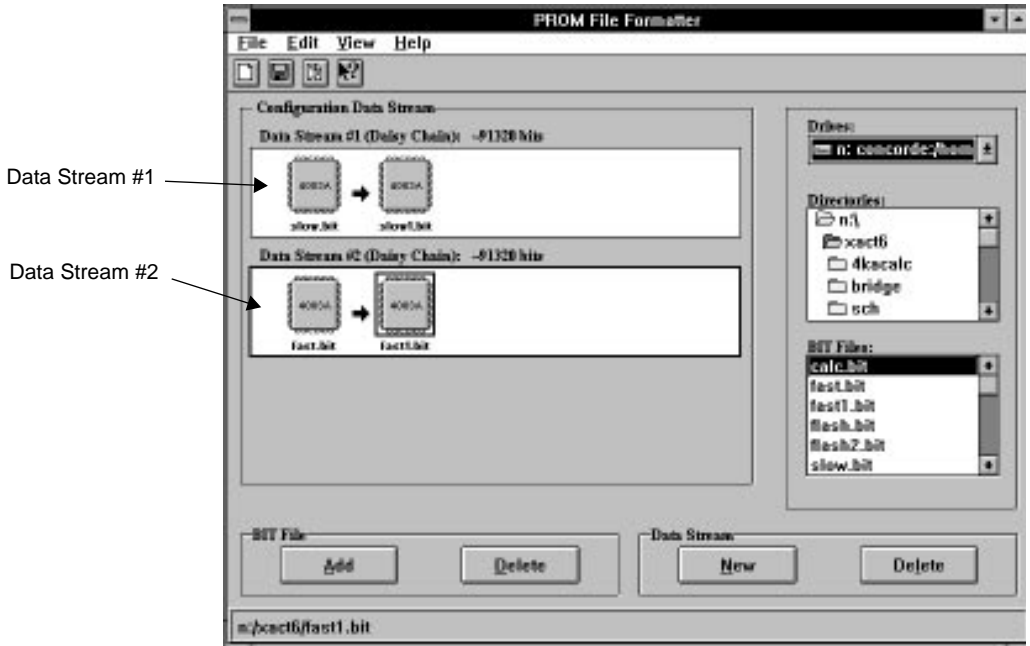


Figure 1-1 Reconfiguration Data Streams

Implementing Your Applications

A PROM file contains data to configure one FPGA device, or one or more groups of FPGA devices concatenated in daisy chain fashion. The PROM file also takes advantage of the Xilinx SRAM-based FPGA's unique logic reconfiguration capability, as it allows you to store different data streams corresponding to different applications in the same file.

The following table summarizes the various ways of structuring a PROM file.

Table 1-1 Configuration Data Stream Combinations

Number of Applications	Number of FPGA Devices to Configure	Number of Data Streams and BIT files
Single Application	Single device	One data stream with a single BIT file.
	Daisy chain of devices	One data stream with multiple BIT files.
	Multiple daisy chains of devices ^a	Multiple data streams with multiple BIT files in each data stream. Each data stream includes configuration data for a different daisy chain of devices.
Multiple Applications	Single device	Multiple data streams with a single BIT file in each data stream.
	Daisy chain of devices	Multiple data streams with multiple BIT files in each data stream. Each data stream represents a different application.

a. This type of application can be implemented with a byte-wide PROM only. Each data stream will use a different start-up address in the PROM file.

The following figure exemplifies the structure of a byte-wide PROM file loaded in master mode and designed to configure three daisy chains of devices. Data Stream #1 is for a daisy chain of two devices. Data Stream #2 is for a second daisy chain of two devices. Data Stream #3 is for a single device.

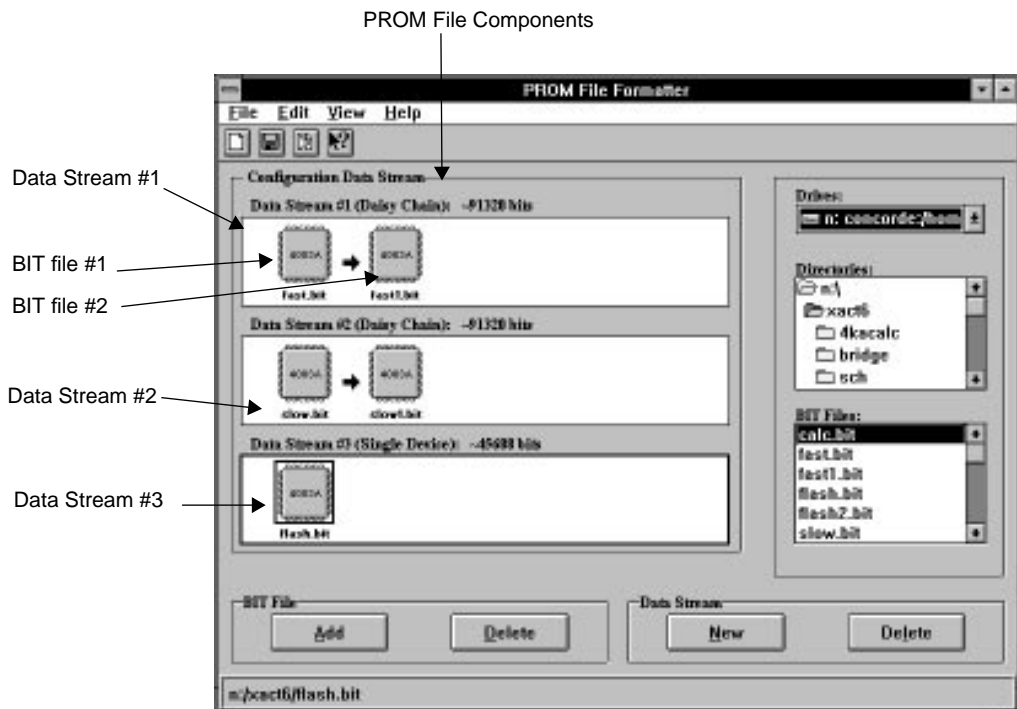


Figure 1-2 Configuration Data Streams for Multiple Daisy Chains

Single Application PROM Files

There are three different types of configuration data streams.

- To implement an application for a single device, use a data stream containing a single BIT file. Data Stream #3 in Figure 1-2 shows a configuration data stream for a single device.
- To implement an application for a group of FPGA devices connected together in a daisy chain, use a single data stream containing multiple BIT files, that is, one BIT file for each device in the daisy chain. Data Stream #2 in Figure 1-2 shows a configuration data stream for a single daisy chain of devices.
- To implement an application for several groups of daisy chained devices, you must build one data stream per daisy chain. Figure 1-2 is an example of a PROM file for multiple daisy chains

of devices. This type of implementation is valid for byte-wide PROMs only, which can be set for different start-up addresses.

Multiple Application PROM Files

The Xilinx SRAM FPGA technology allows you to design multiple applications for a single device or for a set of devices. Each data stream in the PROM File Formatter Configuration Data Stream box represents a different configuration or application for the same device or daisy chain of devices.

To implement several applications for a single device, build a PROM file made of several data streams. In this case, each data stream contains a single BIT file. To implement several applications for a group of daisy chained devices, use several data streams containing multiple BIT files. Each data stream programs the group of devices for a different application.

Note: The number of BIT files within each data stream must be the same.

Refer to Figure 1-1 for an example of a PROM file designed for multiple applications. In this figure, Data Stream #1 configures the daisy chain of devices with the “Slow” application. Data Stream #2 configures the same daisy chain with the “Fast” application. You can easily switch to the next application by reprogramming the FPGA from a PROM file formatted for multiple applications.

Configuration Setups

For information on setups for configuring FPGA devices and daisy chains for a single application, refer to *The Programmable Logic Data Book*. For information on setups to support multiple applications, see the “Multiple Configuration Setups” appendix.

Getting Started

This chapter explains how to invoke the PROM File Formatter. It describes the main screen and the three major tasks you can perform: create, save, and split PROM files. In addition, it outlines the features of the online help tool.

Starting and Exiting the PROM File Formatter

The PROM File Formatter is a Windows-based application that can be accessed two ways.

- To use the PROM File Formatter from within the Xilinx Design Manager, press the PROM File Formatter button, shown in Figure 2-1, in the toolbox of that program.



Figure 2-1 PROM File Formatter Button

- If you installed the PROM File Formatter as a stand-alone tool, the PROM File Formatter icon is in the XACTstep program group in the Program Manager window. To invoke the PROM File Formatter, double-click on the PROM File Formatter icon in the XACTstep program group. For information on how to create program icons, refer to your *Getting Started & Installation Guide*.

To exit the PROM File Formatter, select **File** → **Exit** from the menu bar.

Using the PROM File Formatter Interface

The PROM File Formatter consists of the elements described in this section.

Main Window

The PROM File Formatter Main Window, shown in Figure 2-2, is displayed when you invoke the PROM File Formatter. By default, the main window displays a workspace, a menu bar, a toolbar, and a status bar. You can hide the toolbar and the status bar by toggling the Toolbar or Status Bar entries from the View menu.

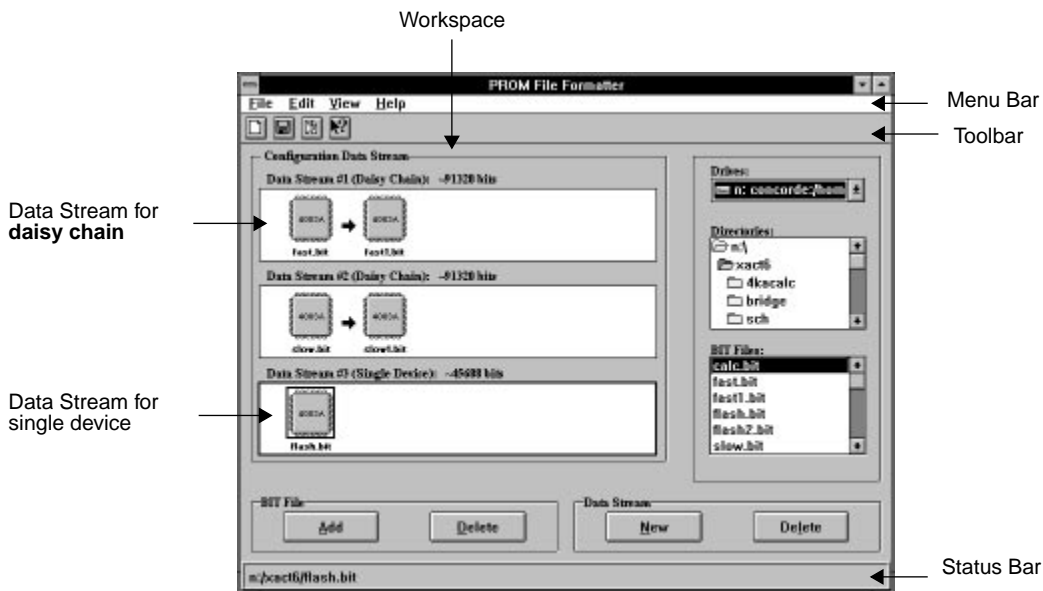


Figure 2-2 PROM File Formatter Main Window

Workspace

The workspace, shown in the previous figure, is used to create and format one or more BIT files into a PROM file. It consists of the Configuration Data Stream area, selection boxes, and command buttons.

Menu Bar

The menu bar is located at the top of the PROM File Formatter window. It includes the File, Edit, View, and Help menus. You can also select menu commands by typing the letter underlined in the menu command while pressing the Alt key down. Refer to the chapter titled “Command Reference” for information on the menu commands.

Toolbar

The toolbar is located at the top of the screen below the menu bar. It displays several buttons, which you can use to specify commands directly. The toolbar offers an alternative to the menu commands. To get a short description of a toolbar button, park the mouse pointer over the button. After about 2 seconds, a small pop-up text box appears giving more information about that button. This button is called Tool Tips. The Tool Tips utility displays the name of the button function while the status bar repeats the information.



Figure 2-3 New Toolbar Button

The New button clears data from the Configuration Data Stream screen, allowing you to build a new PROM file.



Figure 2-4 Save PROM Toolbar Button

The Save PROM button displays a dialog box that allows you to define the PROM file settings and save the current data.



Figure 2-5 Split PROM Toolbar Button

The Split PROM button displays the Split PROM dialog box that allows you to split PROM files across multiple serial PROMs.



Figure 2-6 Help Toolbar Button

The Help button invokes context-sensitive help.

Status Bar

The status bar is located at the bottom of the PROM File Formatter window. It provides command and processing status information as well as additional help information about the toolbar buttons.

Commands and Dialog Boxes

You control the PROM File Formatter by selecting commands from the menu or the toolbar. Most commands display dialog boxes on which you specify information and options.

All dialog boxes have an OK button and a Cancel button. Moreover, most dialog boxes also have a Help button and some have a Network button provided you are using Windows for Workgroups.

- Click on the **OK** button to exit the dialog box and process the information defined on the dialog box.
- Click on the **Cancel** button to exit the dialog box without processing the information defined on the dialog box.
- Click on the **Help** button to get context-sensitive help for the current dialog box.
- Click on the **Network** button to access your network drives. This button is available on Windows for Workgroups installations only.

Selecting Commands and Dialog Box Options

To choose a menu item, a toolbar button, or a dialog box option, you can use the mouse or the keyboard.

Using the Mouse

1. Move the mouse cursor over the object you want to select: a toolbar button, a menu option, or a dialog box option; then, click on the left mouse button to select the object.

If you clicked on a toolbar button, a list box or a dialog box appears. If you clicked on a menu, menu options are displayed and you must select a menu option.

2. To cancel out of a dialog box without selecting anything, select the Cancel button or double-click on the upper left corner of the dialog box.
3. To get help, click on the Help button on the dialog box.

Using the Keyboard

You can use the keyboard to select objects on your screen, such as a dialog box button or a menu option.

1. To select a dialog box option, use the **Tab** key to position the cursor on that object and highlight it. Press the **Enter** key to process the selection.

To cancel out of a dialog box without selecting anything, press the **Escape** key.

2. To choose a menu and display its options, press the **Alt** key and the appropriate underlined letter key corresponding to the menu you want. For example press **Alt-F** to select the File menu.
3. Use the arrow keys to scroll down the list of options in a menu or list box. Press **Enter** when the option you want to use is highlighted or, in the case of a menu item, press the underlined letter corresponding to the menu option you want. For example, press the **N** key to select the New command of the File menu.
4. To get help, press the **Alt** key down and type the letter **H**.

Software Operations

You use the PROM File Formatter to create, save, and split PROM files for use with a PROM programmer.

Creating a New PROM File

When you open the PROM File Formatter, the PROM File Formatter main window is displayed. This window is the workspace in which you create and format your PROM files.

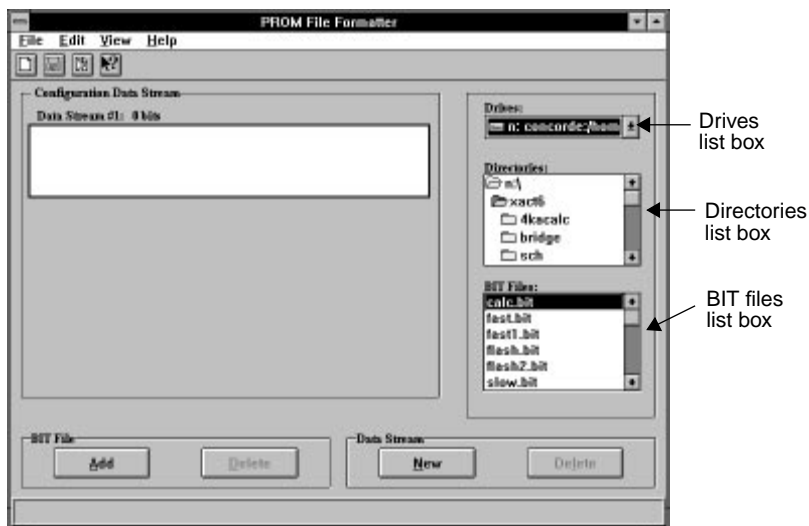


Figure 2-7 PROM File Formatter Main Window

The workspace includes the Configuration Data Stream box in which you create data streams. When you start up the program, the Configuration Data Stream box includes an empty data stream. When you add files to the data stream, the concatenation of files is indicated by horizontal arrows.

The right side of the screen lists the Directories, Drives, and BIT Files list boxes that you use to locate and select BIT files.

- Drives list box

Click on this box to browse and select the drive from which you wish to load the BIT files.

- Directories list box

Click on this box to browse the directory structure and locate the directory that contains the BIT files you want to open.

- BIT Files list box

Click on this box to locate and select the BIT files that you wish to concatenate into the data stream. To select the BIT file, double-click on the file you want with the left mouse button or press the Enter key.

The lower part of the window includes four command buttons that you can use to build the stream of data.

- Use the Add button and the Delete button in the BIT Files group box to insert and remove BIT files.
- Use the New button and the Delete button in the Data Stream group box to insert and remove data streams.

Refer to the chapter, “Formatting Files,” for more information.

Saving a PROM File

After creating and editing your PROM file, select the Save PROM option from the File menu. The Save PROM dialog box is displayed. Complete this dialog with the appropriate settings, such as PROM type and file format, then save the file.

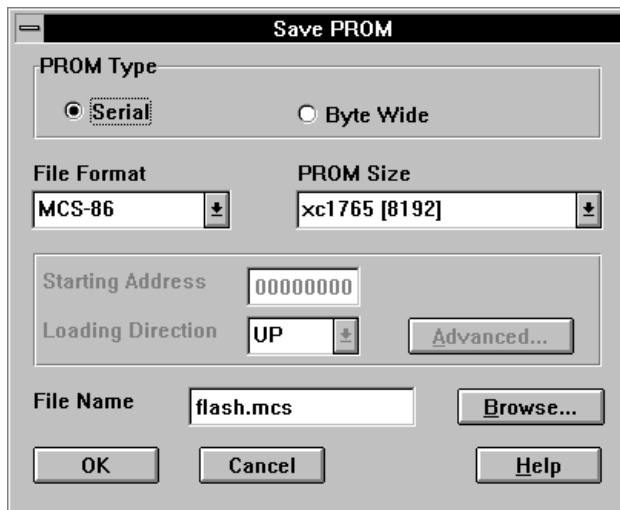


Figure 2-8 Save PROM Dialog Box

Refer to the chapter, “Formatting Files,” for more information.

Splitting a PROM File

To split an existing PROM file, select **File** → **Split PROM** from the menu bar. An Open File dialog box is displayed, allowing you to select the file to be split. After you click on the OK button, the Split PROM File dialog box is displayed. Use this dialog box to split a large PROM file into smaller PROM files for specific PROM devices. The input file must be a serial PROM file in either the MCS-86, the TEKHEX, or the EXORmacs format. Refer to the chapter, “Reformatting Files,” for more information.

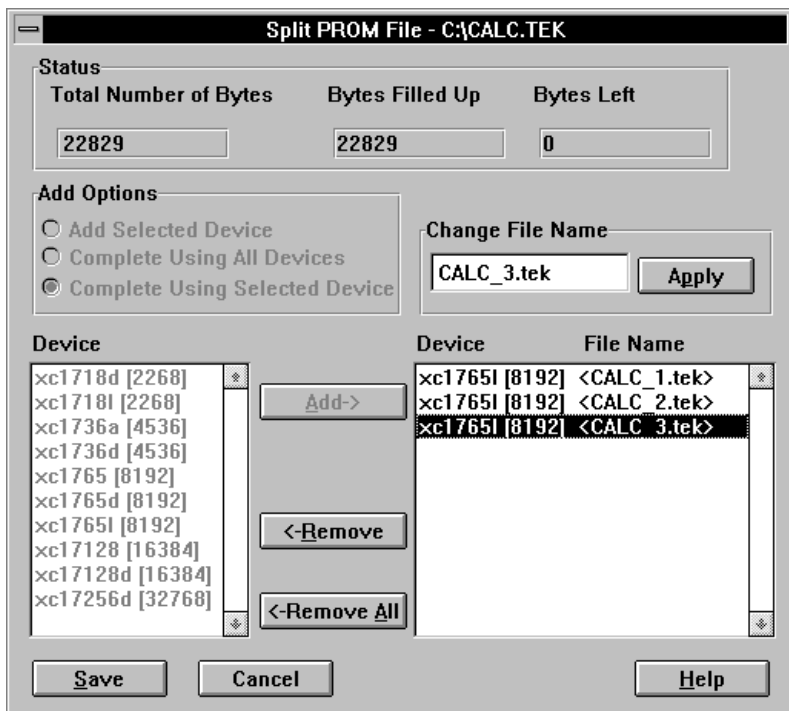


Figure 2-9 Split PROM File Dialog Box

Using the Online Help and Tutorial

The PROM File Formatter includes an online help tool that you can invoke from the menu bar, the toolbar, and the dialog boxes. It also includes an online tutorial that demonstrates the program features.

Online Help

You can access the online help home page by selecting Contents from the Help menu.

Context-sensitive help refers to the online help available from a dialog box that you are currently using, the help available for a menu command, or the help available for a screen object.

- To get context-sensitive help for the current dialog box, either click on the dialog box Help button or press down the Alt key while typing the letter H on your keyboard.
- To get context-sensitive help for a menu item, press the F1 function key on your keyboard while selecting the menu item.
- To get help on a screen object, namely a window, a part of the screen, a toolbar or control panel button, click on the Help icon displayed on the toolbar. The mouse cursor changes to a large question mark that you can drag onto the object you want. After positioning the symbol on the appropriate object, press the left mouse button. The help tool displays the corresponding Help page.



Figure 2-10 Help Button

Online Tutorial

To access the online tutorial, select Tutorial from the Help menu. The tutorial page is displayed. Follow the instructions on your screen to view definitions, procedures, and demonstrations of the procedures.

Formatting PROM Files

This chapter explains how to configure one or more BIT files into a PROM file and how to define and save your PROM file settings.

Creating a PROM File

Creating a PROM file consists of adding BIT files and data streams to the Configuration Data Streams box in your workspace. A data stream can contain one or more BIT files. A data stream that contains multiple files is referred to as a daisy chain. Each data stream has a separate header that specifies the length of that data stream.

After you add a file to a data stream, the approximate size of that data stream is displayed on top of the data stream frame and is preceded by a tilde sign (~). The exact size is displayed only when you save the PROM file.

Using the PROM File Formatter Main Window

From the PROM File Formatter main window, you can use the following list boxes:

Drives List Box

Click on this box to browse and select the drive from which you wish to load the BIT files.

Directories List Box

Click on this box to browse the directory structure and locate the directory that contains the BIT files you want to open.

BIT Files List Box

Click on this box to select the BIT files that you are adding to the data stream. To select the BIT file, double-click once on the file with the left mouse button.

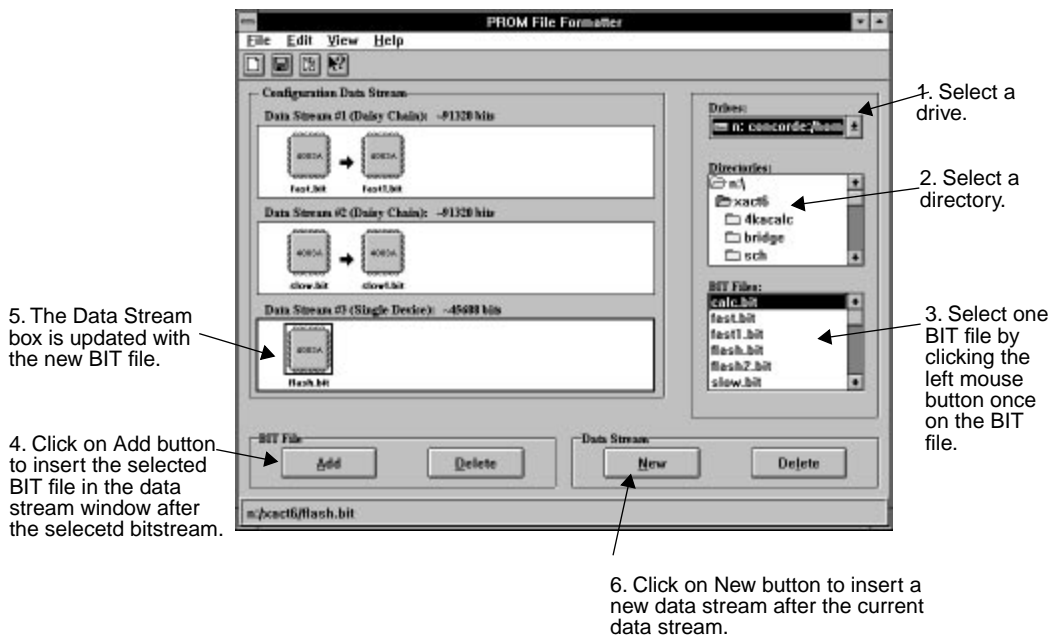


Figure 3-1 PROM File Formatter Main Window

To add and delete objects from the data stream, you can use the following buttons located at the bottom of the PROM File Formatter main window:

BIT File Buttons

- **Add button:** This button adds the selected BIT file after the currently selected BIT file in the current data stream. To add the file, you can also double-click on the File or press the Enter key.
- **Delete button:** This button deletes the selected BIT file from the current data stream.

Data Stream Buttons

- New button: This button adds a data stream after the current data stream.
- Delete button: This button deletes the current data stream.

Building the PROM File

To build the PROM file, add BIT files to the data streams in the Configuration Data Stream box.

Adding a BIT File to an Existing Data Stream

When you add a BIT file, the new BIT file is added after the currently selected BIT file in the current data stream. If no BIT file is selected in the current data stream, the new BIT file is appended at the end of the current data stream.

1. To add a BIT file to a data stream, select a BIT file from the file browser using the drive and directory boxes to locate the file.

You can only select one BIT file at a time.
2. Click on the **Add** button in the BIT File box at the bottom of the screen to add the selected file to the data stream. Alternatively, you can double-click on the file name in the BIT Files list box to add the BIT file.
3. Repeat steps 1 and 2 until you have added all the files you want for your daisy chain application.

Adding a New Data Stream

When you add a data stream, the new data stream is placed either after the currently selected data stream. This button is disabled if no data stream is selected.

1. To add a data stream after a specific data stream, click in the desired data stream window to select the data stream.
2. Click on the Data Stream **New** button.

The PROM File Formatter inserts an empty data stream after the selected data stream.

Note: To delete a data stream or a BIT file, select the appropriate object and press the **Delete** key on your keyboard or the appropriate Delete button at the bottom of the screen.

Editing the PROM File or Data Stream

After building a data stream, you can edit it by adding and deleting files or changing the sequence of the files in your data stream. You can add and delete data streams as well as change their sequence.

Note: The cut and paste functions described below have separate clipboards for the BIT files and the data streams. This feature allows you to store a BIT file and a data stream at the same time.

Editing a Data Stream

To change the order or number of BIT files in a data stream, follow these instructions.

1. Select a file within the data stream by clicking on it with the left mouse button. Alternatively, you can use the left and right arrow keys to navigate within a data stream. Use the Up and Down arrow keys to move from one data stream to another.
2. To add a file after the selected file, select a BIT file from the BIT Files list box and click on the **Add** button in the BIT Files group box or double-click the left mouse button on the BIT file.
3. To delete the currently selected BIT file in your data stream, click on the **Delete** button.
4. To remove the selected file from your data stream and temporarily store it on the clipboard, select the **Cut File** option from the Edit menu.
5. To paste the file you stored on the clipboard into your data stream after or before the selected file, select **Paste File** from the Edit menu, then select the desired Paste File option: **Before Selected** file or **After Selected** file.

Editing Multiple Data Streams

To change the order or number of data streams in the Configuration Data Streams box, follow these instructions.

1. Select a data stream on your screen by clicking on it with the left mouse button.
2. To add an empty data stream after the selected data stream, click on the **New** button in the Data Stream group box.
3. To delete the currently selected data stream, click on the **Delete** button in the Data Stream group box.
4. To remove the selected data stream from your screen and temporarily store it on the clipboard, select the **Cut Data Stream** option from the Edit menu.
5. To paste the data stream stored on the clipboard after or before the selected data stream, select **Paste Data Stream** from the Edit menu, then select the desired Paste Data Stream option: **Before Selected** data stream or **After Selected** data stream.

Saving the PROM File

After creating the configuration bitstream, select the **Save PROM** command from the File menu to save the PROM file. The Save PROM dialog box appears. Use this dialog box to select and save the attributes of your PROM file, namely, its format, size, starting address (byte wide PROMs only), and name.

Note: The device type and size information is provided for error-checking purposes, enabling you to check whether the file fits the device you are targeting. This information is not saved to the file.

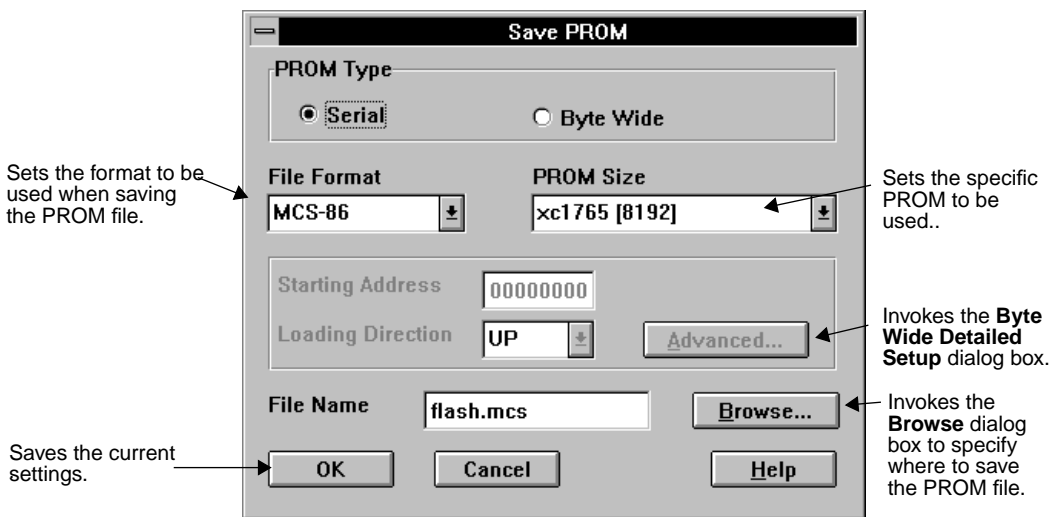


Figure 3-2 Save PROM Dialog Box

Completing the Save PROM Dialog Box

Xilinx recommends that you first decide which PROM type and which PROM file format you will be using. Some PROM formats support larger file sizes than others. The following table shows the capacity of each of the PROM formats supported by the PROM File Formatter.

Table 3-1 PROM Formats and Sizes

Format	Number of Addresses (Bytes)	Total Number of Bits
TEKHEX	65,536	524,288
MCS-86	1,048,576 ^a	8,388,608
EXORmacs	16,777,216	134,217,728
HEX	No limit	No limit

a. This size applies to the Up loading direction only. The Down loading direction is limited to 64 K.

PROM Type Radio Button

By default, the Serial radio button is selected. If you are targeting byte wide PROMs, click on the Byte Wide radio button. Xilinx PROMs are serial devices.

File Format List Box

Click on the down arrow to the right of the File Format list box to view the available formats: TEKHEX, MCS-86, EXORmacs, and HEX. If you choose a format that does not support the size of your PROM file, the message box shown in Figure 3-3 is displayed. In this case, you must return to the Save PROM screen and select a different PROM format. The message box tells you the valid formats available for your data size.



Figure 3-3 Inadequate Format Message Box

PROM Size List Box

Click on the down arrow to the right of the PROM Size list box to view available device sizes. The list displays the sizes for either serial or byte wide PROMs depending on the PROM Type selected. The PROM File Formatter automatically selects the smallest single device PROM size that fits.

If you select a serial PROM type smaller than necessary to hold the PROM data, the PROM File Formatter prompts you to either select a larger PROM or to split the data across multiple PROMs using the Split PROM function. See Figure 3-4.

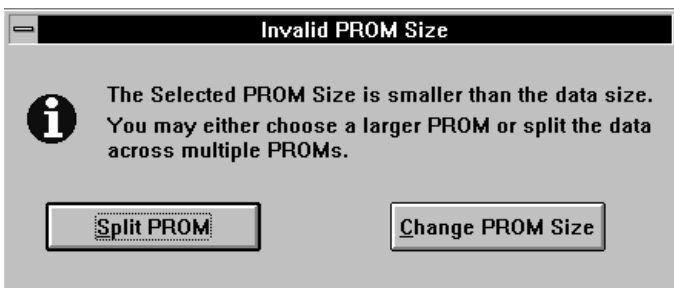


Figure 3-4 Invalid PROM Size Message Box

If none of the available PROM sizes fit your device, a message box prompts you to split the PROM file.

Starting Address and Loading Direction Boxes

These options are available if you select the byte wide PROM type. To change the starting address and loading direction of your byte wide PROM file, edit the Starting Address field. To select the loading direction you want, use the Loading Direction pull-down list box.

If you click on the Advanced button, the Byte Wide PROM Detailed Setup dialog box is displayed. See Figure 3-5. This dialog box enables you to set the Starting Address and Loading Direction for each data stream in your PROM file. Select the data stream in the dialog box to change either parameter for that data stream.

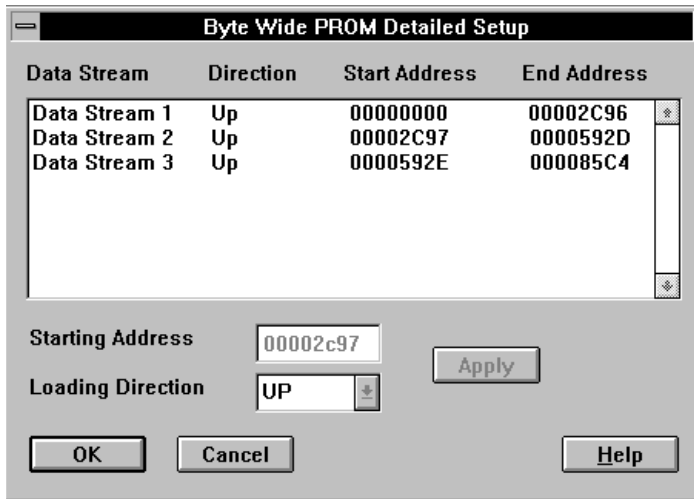


Figure 3-5 Byte Wide Detailed Setup Dialog Box

File Name Box

To change the file name, enter a new file name in the File Name box. To change the disk drive and directory, or to select an existing file name, click on the Browse button. The Browse command displays the Browse dialog box. The Browse dialog box allows you to change the file name, directory, and drive to which the file will be saved.

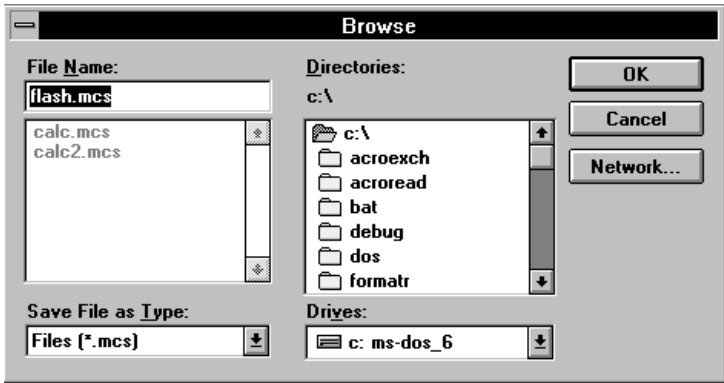


Figure 3-6 Browse Dialog Box

Saving a PROM File for a Serial PROM

To save a PROM file for a serial PROM device, follow these instructions:

1. Select **Save PROM** from the File menu or click on the toolbar Save PROM button.



Figure 3-7 Save PROM Toolbar Button

The Save PROM dialog box is displayed as shown in Figure 3-8.

2. Check that the Serial radio button is selected in the Save PROM dialog box. This button is selected by default.
3. Choose a PROM file format compatible with your PROM programmer by clicking on the down arrow in the File Format list box.
4. Click on the down arrow of the PROM Size list box to view available device sizes and select a device size that fits your data file.

Note: The PROM File Formatter automatically selects the smallest PROM that can contain the data file.

If you select a serial PROM type smaller than necessary to hold the PROM data, the PROM File Formatter prompts you to either select a larger PROM or to split the data across multiple PROMs using the Split PROM function.

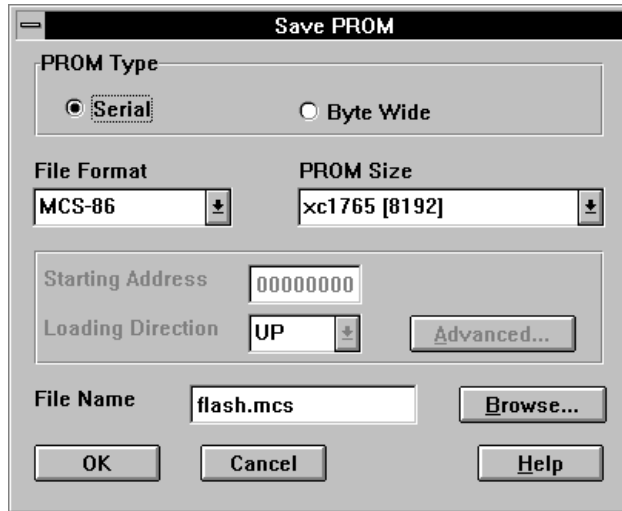


Figure 3-8 Save PROM Dialog Box (Serial PROM)

- To change the design file name, click on the **File Name** box of the Save PROM dialog box and type in a new name.
To use an existing file name or to save to a different path, click on **Browse**. This selection displays the Browse dialog box.
- Click on the **OK** button to save the PROM data.

Saving a PROM File for a Byte Wide PROM

To save a PROM file for a byte-wide PROM device, follow these instructions:

- Select **Save PROM** from the File menu or click on the Save PROM toolbar button to display the Save PROM dialog box.



Figure 3-9 Save PROM Toolbar Button

2. Click on the **Byte Wide** radio button in the Save PROM dialog box.
3. Choose a PROM file format compatible with your PROM programmer by clicking on the down-arrow in the File format list box.
4. Click on the down arrow of the PROM Size list box to view available device sizes and select a device size that can fit your data file.

The PROM File Formatter displays only PROM sizes with sufficient capacity to hold the PROM data.

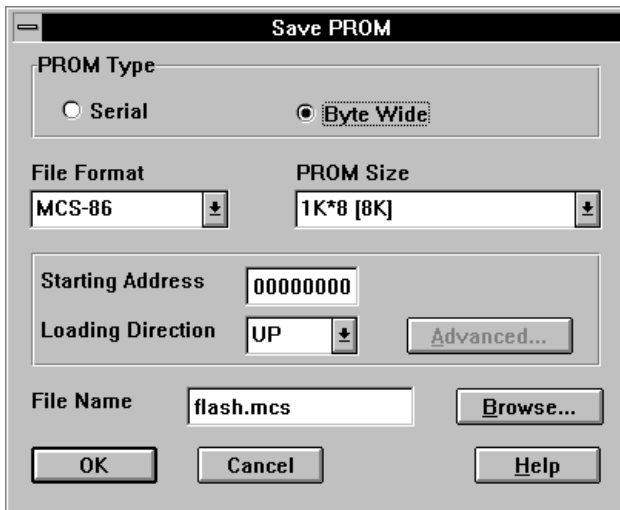


Figure 3-10 Save PROM Dialog Box (Byte Wide PROM)

5. To change the direction in which the data is stored in the PROM:
 - Choose the Up direction if you want to store the data starting at a low address and load it in the upward direction.

- Choose the Down direction, if you want to store the data starting at a high address and load it in the downward direction.
6. To set different starting addresses for your data streams, click on the **Advanced** button using the left mouse button and edit the starting address for each data stream in the PROM file. Make sure the addresses do not overlap.

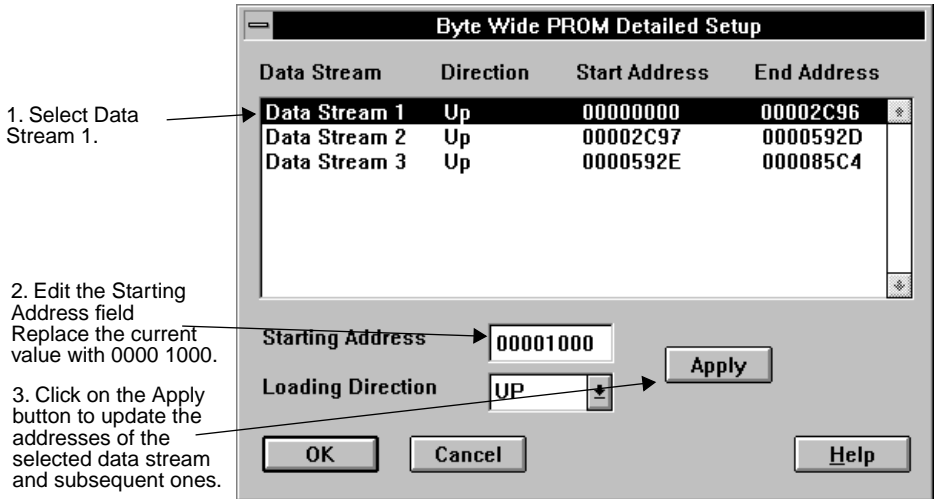


Figure 3-11 Changing the Starting Address of a Data Stream

After clicking on the Apply button, the Start and End addresses of the current data stream and those of subsequent data streams loaded in the same direction are updated.

Note that the addresses of data streams 1, 2, and 3 have been updated

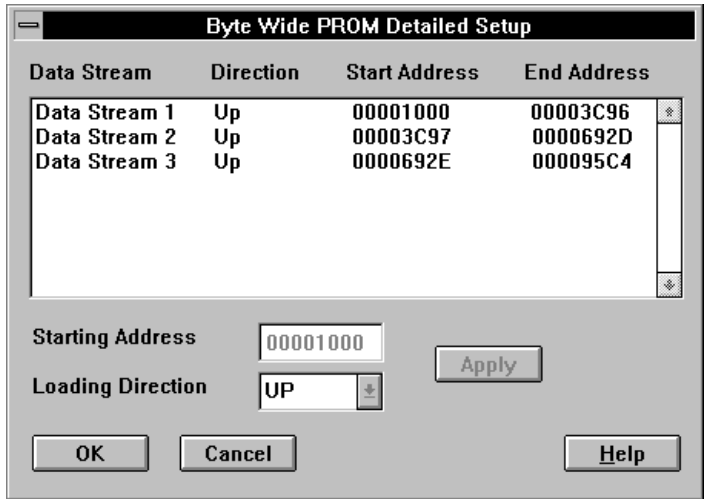


Figure 3-12 Updating the Data Stream Starting Addresses

- To change the design file name, click **OK** to return to the Save PROM window, then click in the **File Name** box of the Save PROM window and type in a new name.

To use an existing file name or to save to a different path, click on **Browse**. This selection displays the Browse dialog box.

- Click on the **OK** button to save the PROM data.

Reformatting PROM Files

This chapter addresses how to reformat an existing PROM file into smaller files to fit it into multiple serial PROM devices. You can use the Split PROM command to split PROM files.

Splitting PROM Files

You can retarget existing MCS, EXO, or TEK files to multiple serial PROM devices by splitting your PROM file into smaller files. To split a large file that you are attempting to save into multiple serial PROM files, refer to the procedure “Splitting the Current Data into Multiple PROM files,” later in this chapter. You can only target serial PROMs when splitting a PROM file, whether the original file is in serial or byte wide format.

Using the Split PROM Dialog to Retarget a PROM File

Use the Split PROM dialog box to retarget a PROM file to multiple serial PROM devices. There are two ways of accessing the Split PROM dialog box to retarget a PROM file:

- If you want to retarget an existing PROM file, select the Split PROM option immediately after invoking the PROM File Formatter. This option invokes a file selection dialog box from which you select the file to be split.
- If you try to save a PROM file into a PROM device that is too small, an error message box appears. When you select the Split PROM option from this message box, the Split PROM dialog box is displayed.

Note: You can only retarget MCS, TEK, and EXO file formats. You cannot retarget a HEX file because you cannot use this format to

program a PROM device. Use HEX files for user-defined processes or programs.

Splitting the Current Data into Multiple PROM Files

You may need to reformat the current data file that you are attempting to save into smaller files that fit into your PROM devices by retargeting the file to multiple serial PROMs.

1. After selecting the appropriate BIT files for the desired data streams, select the **Save PROM** command from the File menu.
2. Select the **Serial** radio button in the PROM Type group box.
3. Select a serial PROM size smaller than adequate to hold the PROM data. This selection causes the Invalid PROM Size dialog box to appear, allowing you to select the Split PROM function.

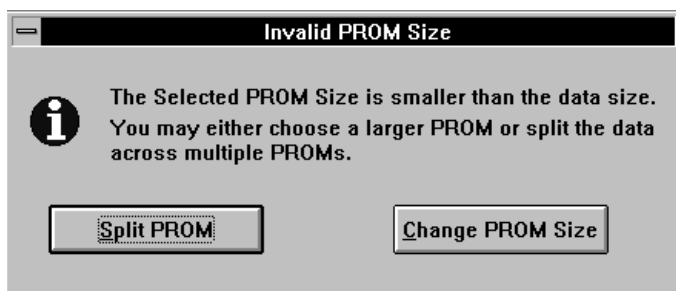


Figure 4-1 Invalid PROM Size Dialog Box

4. Click on the **split PROM** button in the Invalid PROM Size dialog box and follow the instructions for retargeting a PROM file to multiple serial PROMs.

Retargeting an Existing PROM File to Multiple Serial PROMs

You can use the PROM File Formatter to retarget existing MCS, EXO, or TEK files to multiple serial PROM devices by splitting your PROM file into smaller files.

1. Select the **Split PROM** command from the File menu or click on the toolbar Split PROM button to display a file selection dialog box in which you specify the PROM file.



Figure 4-2 Split PROM Toolbar Button

After opening the selected file, the PROM File Formatter displays the Split PROM File dialog box, shown in Figure 4-3.

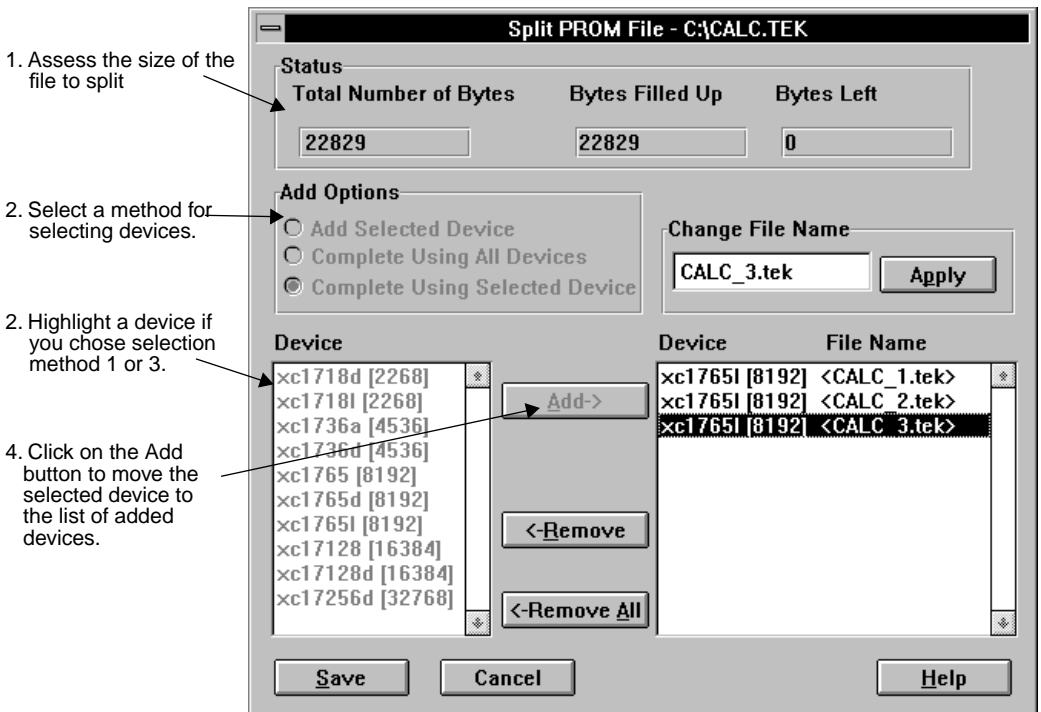


Figure 4-3 Split PROM File Dialog Box

The Status box, at the top of the dialog box, provides information on the status of the current PROM file allocation.

- The Total Number of Bytes box indicates the size of the PROM file you are splitting or total number of bytes to be allocated.
 - The Bytes Filled Up box indicates the number of bytes already allocated to a device.
 - The Bytes Left box indicates the number of bytes that still need to be allocated.
2. Click on the radio button for one of the following device selection methods and select the devices you need from the serial PROM list, in the left-hand side list box. This list provides the PROM name and PROM size expressed in bytes.
 - Add Selected Device: Adds one instance of the device type that you select in the Device list box. To complete this operation, select a device type in the left-hand side device list box column and click on the **Add** button.
 - Complete Using All Devices: Automatically selects the minimum number of serial PROMs required to contain the data. To complete this operation, click on the **Add** button.
 - Complete Using Selected Device: Adds the appropriate number of devices of the type you select in the Device list box. To complete this operation, you must also select a device type in the left-hand side column and click on the **Add** button.

After you click on the Add button, the selected PROM devices are moved to the right-hand side Device list box, which displays the target PROMs in the order in which the PROM file is to be split.

Note: After creating a list of devices, you can edit that list by removing devices from the right-hand side column or by adding devices using any of the above device selection methods.

Each file is assigned a default file name in the form of an appended `_1`, `_2`, ... suffix to the first five characters of the input file name. For example, if the original file name is `design.mcs` and the PROM file is split into three smaller PROM files, they will be named as follows: `design_1.mcs`, `design_2.mcs`, and `design_3.mcs`.

3. To change the name of one of the split files, select a PROM part number in the right-hand side Device list box and edit the entry displayed in the Change File Name text box.

4. After editing the file name, click on the **Apply** button.

The new name appears next to the part number.

5. Click on the **Save** button to split the PROM file using the settings you just defined. The Save button is grayed out and cannot be used until you have allocated all the bytes of your PROM file.

When you click on the Save button, the split files and a PDR report file are saved in the design directory. The PDR report lists all the data streams and BIT files used to construct the PROM file as well as the load direction and PROM file splitting information.

Menu Command Reference

This chapter lists and describes all the commands available in the main window of the PROM File Formatter. The commands are listed in alphabetical order. When applicable, the corresponding toolbar button is included in the command description.

Menus

The PROM File Formatter has four menus, which are described in the following sections.

File Menu

The File menu contains commands to clear data from the main screen, save the PROM file, split the PROM file, and exit the PROM File Formatter. To access the File menu with the keyboard, press the letter F, underlined in the menu name, while holding down the Alt key. Press the underlined letter corresponding to the menu option you want. The commands on the File menu are the following:

<u>N</u> ew	Clears the data from the configuration screen.
Save <u>P</u> ROM	Saves the current PROM file.
Split <u>P</u> ROM	Prompts you for the file to split then opens the Split PROM dialog box.
<u>E</u> xit	Exits the PROM File Formatter program.

Edit Menu

The Edit menu includes commands to cut and paste files and data streams in the Configuration Data Stream box. To access the Edit menu with the keyboard, press the letter E, underlined in the menu name, while holding down the Alt key. Press the underlined letter corresponding to the menu option you want.

Cut <u>F</u> ile	Cuts the selected BIT file and stores it on the BIT file clipboard.
Cut <u>D</u> ata Stream	Cuts the selected data stream and stores it on the data stream clipboard.
<u>P</u> aste File	Inserts the file stored on the BIT file clipboard in the data stream.
<u>P</u> aste Data Stream	Inserts the data stream stored on the data stream clipboard.

View Menu

The View menu includes commands to display special screen areas, and customize the waveform. To access the File menu with the keyboard, press the letter V, underlined in the menu name, while holding down the Alt key. Press the underlined letter corresponding to the menu option you want.

<u>T</u> oolbar	Toggles the toolbar on or off.
<u>S</u> tatus Bar	Toggles the status bar on or off.

Help Menu

The Help menu contains commands that enable you to access online help for the Hardware Debugger. To access the File menu with the keyboard, press the letter H, underlined in the menu name, while holding down the Alt key. Press the underlined letter corresponding to the menu option you want.

<u>C</u> ontents	Lists online help topics.
<u>S</u> earch for Help On	Searches for specific topics.
<u>T</u> utorial	Invokes the interactive tutorial.
<u>A</u> bout PROM File Formatter	Displays the program version.

Alphabetical Listing of Commands

The following commands are available in the menus of the PROM File Formatter's graphical user interface.

About PROM File Formatter (Help Menu)

Use this option to display information about the version number of the PROM File Formatter.

Contents (Help Menu)

Use this option to display a dialog box that lists the contents of the Help facility.



Figure 5-1 Help Toolbar Button

Double-click on the Help toolbar button to display the Contents page of the Help facility. To get help on a screen object, namely a window, a part of the screen, a toolbar or control panel button, click on the Help icon displayed on the toolbar. The mouse cursor changes to a large question mark that you can drag onto the object you want. After positioning the symbol on the appropriate object, press the left mouse button. The help tool displays the corresponding Help page.

Cut Data Stream (Edit Menu)

Use this command to remove a data stream and temporarily store it on the clipboard. This command is available only if there is a selected data stream.

Cut File (Edit Menu)

Use this command to remove a file from a data stream and temporarily store it on the clipboard. This command is available only if there is a selected file. To duplicate a BIT file multiple times, you must first cut it, then paste it back to create as many copies as needed.

Exit (File Menu)

Use this command to exit from the PROM File Formatter program. If you are in the process of creating a PROM file, the program prompts you to save the current data.

New (File Menu)

Use this command to clear the data currently loaded in the Configuration Data Stream box located on the PROM File Formatter main window.



Figure 5-2 New Toolbar Button

Once you have removed the old data from the workspace, you can start building a new PROM file. If you click on New while you are in the process of creating a data stream, a warning message informs you that the current data will be lost.

Paste Data Stream (Edit Menu)

Use this command to insert the cut data stream into the Configuration Data Stream box. If there is a selected data stream, the command prompts you to paste either before or after the selected data stream.

- Before Selected

Click on this option to paste the data stream that is on the clipboard before the selected data stream.

- After Selected

Click on this option to paste the data stream that is on the clipboard after the selected data stream.

Paste File (Edit Menu)

Use this command to paste the file that is on the clipboard into the Configuration Data Stream box. If there is a selected file, the command prompts you to either paste before or after the selected file.

- Before Selected

Click on this option to paste the file that is on the clipboard before the selected file.

- After Selected

Click on this option to paste the file that is on the clipboard after the selected file.

Save PROM (File Menu)

After formatting the configuration bitstream, use the Save As command to define and save additional settings for the PROM file.



Figure 5-3 Save PROM Toolbar Button

Save PROM Dialog Box Options

When you select the Save PROM command, the Save PROM dialog box is displayed, as shown in Figure 5-4. The Save PROM dialog box allows you to define the type, format, and size of the PROM file for use with the selected device.

Additional selection dialog boxes are available from the Save PROM dialog box.

- To invoke the Byte Wide PROM Detailed Setup dialog box, click on the Advanced button of the Save PROM dialog box. This dialog box allows you to change the start-up addresses and loading directions of byte wide PROM files.
- To invoke the Browse dialog box, click on the Browse button of the Save PROM dialog box. This dialog box allows you to change the name and path of your PROM file.

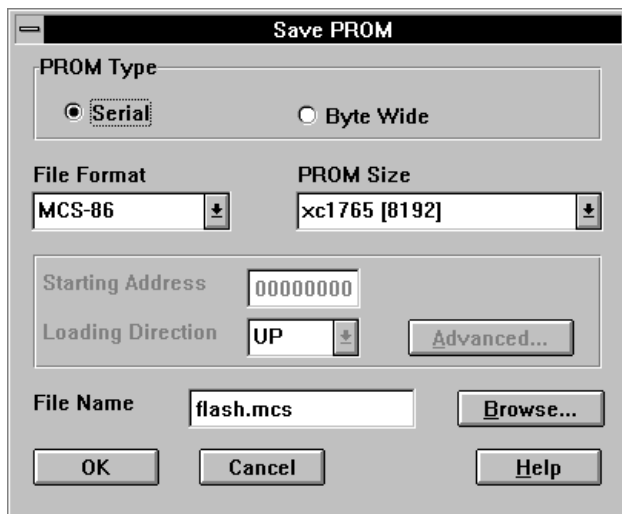


Figure 5-4 Save PROM Dialog Box

The Save PROM dialog box includes the following options:

- PROM Type radio buttons
By default, the Serial radio button is selected. If you are targeting byte wide PROMs, click on the Byte Wide radio button. Xilinx PROMs are serial devices.
- File Format list box
Click on the down arrow to view the available formats: TEKHEX, MCS-86, EXORMacs, and HEX. If you choose a format that does not support the size of your PROM file, the Inadequate Format message box is displayed. In this case, you must return to this screen and select a different PROM format.
- PROM Size list box
Click on the down arrow to view available device sizes. The list displays the sizes for either serial or byte wide PROMs depending on the PROM Type selected.

Note: The PROM File Formatter automatically selects the smallest single PROM that will fit.

For a serial PROM, if you select a PROM size smaller than your data size, the Invalid PROM Size message box is displayed from which you can select either to change the PROM size or to split your PROM file. If your data exceeds the size of all available serial PROMs, you are prompted to split your PROM file or to cancel the save operation.

If you are targeting a byte wide PROM and the data size is larger than the maximum data size that your selected PROM format can support, a message box is displayed informing you that the PROM format is inadequate for your data size, and you are asked to select a different PROM format.

- Starting Address and Loading Direction boxes

These options are available if you selected the Byte Wide PROM type. To change the starting address of your byte wide PROM file, type in the Starting Address field. To select the loading direction, use the Loading Direction pull-down list box.

If you click on the Advanced button, the Byte Wide PROM Detailed Setup dialog box is displayed. It enables you to set the Starting Address and Loading Direction for each data stream in your PROM file.

- File Name box

You can change the file name by typing a new file name in the File Name box. To change the drive and directory, or to select an existing file name, click on the Browse button. The Browse command displays the Browse dialog box.

- OK button

Click on **OK** to save the PROM file using the name in the File Name box. At the same time, a report file with the same file name and a .pdr extension is created with information on the PROM.

The PDR report lists all the data streams and BIT files used to construct the PROM file as well as the load direction and PROM file splitting information.

If the selected PROM device is smaller than the data size or if the specified format is inadequate for the data size, the file cannot be saved and an error message is displayed.

Byte Wide PROM Detailed Setup Dialog Box Options

Use the Byte Wide PROM Detailed Setup dialog box to specify the loading direction and the starting address of multiple data streams in a single composite PROM file. Access this window by selecting the Byte Wide format on the Save PROM dialog box, and clicking on the Advanced button.

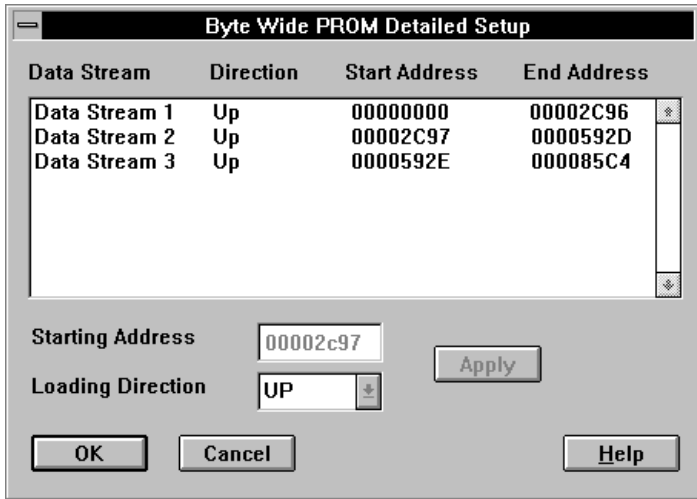


Figure 5-5 Byte Wide PROM Detailed Setup Dialog Box

The Byte Wide PROM Detailed Setup dialog box includes the following options:

- Data Stream box
Highlight the data stream whose address you need to modify in the Data Stream box. Once you have highlighted a data stream, the Starting Address and the Loading Direction fields located below the list box are activated and can be modified.
- Starting Address and Loading Direction boxes
Edit the starting address box and select the loading direction as needed.

- Apply button

Click on this button to update the data stream list box with the changes you have made.

If you choose to define the address and loading direction for only the first data stream in the design, the software updates the addresses of the subsequent data streams provided these are contiguous and have the same loading direction as the first data stream.

- OK button

When you click on the OK button, the software checks for overlapping addresses. Data streams that have overlapping addresses are highlighted and an error dialog box informs you of the problem.

- Cancel button

If you click on Cancel, the file is closed without saving the new starting address and loading direction information.

Browse Dialog Box Options

When you click on the Browse button on the Save PROM dialog box, the Browse dialog box is displayed. Use this dialog box to display a list of existing file names and select an existing file name for the PROM file.

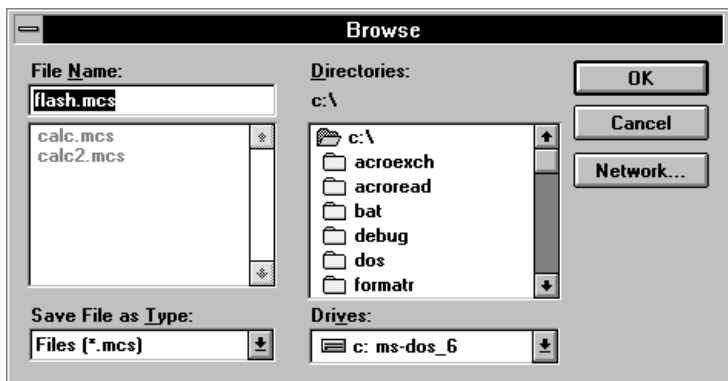


Figure 5-6 Browse Dialog Box

The Browse dialog box includes the following options:

- File Name box

The default file name is shown in the File Name box. It is based on the file name of the first file in the first data stream, and has the appropriate file extension.

The extension of the file is either MCS, TEK, EXO, or HEX depending on the PROM format chosen.

- Directory

The directory is the default directory that was chosen at the time the data stream was created.

- OK button

Click on OK to return to the Save PROM dialog box to save the PROM file using the new name you have selected.

- Cancel button

Click on Cancel to return to the Save PROM dialog box without using the new file name.

Search for Help On (Help Menu)

Use this option to display the Search dialog box from which you can locate a particular Help topic.

Split PROM (File Menu)

Use this command to retarget a PROM file to multiple serial PROM devices.



Figure 5-7 Split PROM Toolbar Button

To retarget an existing PROM file, select the Split PROM option immediately after invoking the PROM File Formatter. The Select PROM File to Split dialog box is displayed. Once you specify the name of the PROM file to split, the Split PROM File dialog box is

displayed. This dialog box is also displayed if you attempt to save a PROM file into a PROM device that is too small.

Split PROM File Dialog Box Options

Use this dialog box to retarget a PROM file to multiple serial PROM devices. You can only split MCS, TEK, and EXO file formats. This function is not available for HEX files.

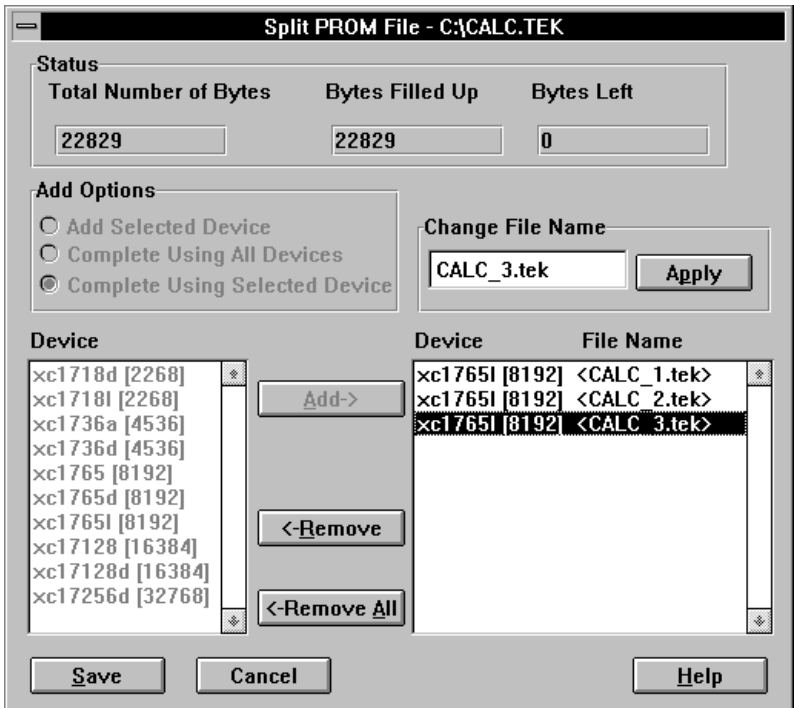


Figure 5-8 Split PROM File Dialog Box

The Split PROM File dialog box includes the following options:

- Status box
 - The Status box provides information on the status of the PROM file allocation.

- The Total Number of Bytes box displays the size of the input PROM file and represents the total number of bytes to be allocated.
- The Bytes Filled Up box indicates the number of bytes already allocated to a device.
- The Bytes Left box indicates the number of bytes that still need to be allocated.
- Add Options group box

Click on the radio button for one of the following device selection methods and select the devices you need:

- Add Selected Device: Adds one instance of the device type that you select in the Device list box.
- Complete Using All Devices: Automatically selects the minimum number of serial PROMs required to contain the data.
- Complete Using Selected Device: Adds the appropriate number of devices of the type you select in the Device list box.

You must click on the Add button to add the selected devices to the list of target devices.

Note: After adding devices manually or automatically, you can edit the list of devices in the right-hand column by removing or adding additional devices.

- Device list boxes

The left-hand list box displays the serial PROM list, which provides a listing of available PROMs and corresponding PROM sizes. The right list box displays the selected PROMs in the order in which the PROM is to be formatted.

- Change File Name box

By default, the name displayed in this box is applied to the PROM device you select in the Device list box.

To change the name of one of the split files, select the corresponding PROM part number in the right-hand Device list box and then edit the entry displayed in the Change File Name

text box. After editing the file name, click on the Apply button. The new name appears next to the part number.

- Save button

The Save button is grayed out until you have allocated all the bytes of your PROM file. When you click on the Save button, the split files and a PDR report file are saved in the design directory.

Status Bar (View Menu)

Use this command to display or hide the status bar, located at the bottom of the PROM File Formatter window. The status bar provides command and processing information.

Toolbar (View Menu)

Use this command to display or hide the toolbar located at the top of the PROM File Formatter window. The toolbar displays several buttons, which you can use to specify commands directly. Use the toolbar as an alternative to the menu commands.



Figure 5-9 New Toolbar Button

The New button clears data from the Configuration Data Stream screen, allowing you to build a new PROM file.



Figure 5-10 Save PROM Toolbar Button

The Save PROM button displays a dialog box that allows you to define the PROM settings and save the current data.



Figure 5-11 Split PROM Toolbar Button

The Split PROM button displays the Split PROM dialog box that allows you to retarget existing PROM files to multiple serial PROMs.



Figure 5-12 Help Toolbar Button

The Help button invokes context-sensitive help. When you click on this button, the cursor changes into a large question mark, allowing you to select an object, such as a command button or a toolbar icon. When you double-click on the Help button, the first page of the PROM File Formatter help is displayed.

Tutorial (Help Menu)

Use this option to invoke the interactive tutorial. Once the tutorial page is displayed, follow the instructions on your screen to view definitions, procedures, and demonstrations of the procedures.

Glossary of Terms

The following terms are defined to help you understand the PROM File Formatter terminology used in this manual.

byte wide PROM

A PROM that is read one byte at a time. Contrast with the serial PROM, which is read one bit at a time.

daisy chain

In the context of the PROM File Formatter, a data stream used to configure a set of devices that are connected in series such that the DOUT pin of a device in the daisy chain is connected to the DIN pin of the next device. You can generate a daisy chain data stream by concatenating two or more bitstreams together using the PROM File Formatter.

data stream

In the context of the PROM File Formatter, a data stream is a collection of one or more concatenated BIT files used to implement a single user application. To implement multiple applications, concatenate data streams — one data stream per application — to form a multiple data stream PROM file that allows you to reprogram a single FPGA or a daisy chain.

EXORmacs (Motorola)

A PROM file format supported by the Xilinx tools. Its maximum address is 16,777,216. This format supports PROM files of up to $(8 \times 16,777,216) = 134,217,728$ bits.

hexadecimal format (HEX)

A simple text dump of the PROM data in HEX format. It has unlimited data capacity.

loading direction

The direction in which data is stored on your PROM. In the Up direction, the data is stored in ascending order, starting at a low address. In the Down direction, the data is stored in descending order, starting at a high address.

MCS-86 (Intel)

An Intel PROM format supported by the Xilinx tools. Its maximum address is 1,048,576. This format supports PROM files of up to $(8 \times 1,048,576) = 8,388,608$ bits.

menu bar

The area located at the top of the PROM File Formatter main window that provides access to the menus. It includes the File, Edit, View, and Help menus.

PROM

A programmable read only memory.

PROM file

A file consisting of one or more BIT files (bitstreams) formatted into a standard PROM file format. If generated using the PROM File Formatter, the file is formatted in one of three industry-standard formats: Intel MCS-86, Tektronics TEKHEX, or Motorola EXORmacs. The PROM file includes headers that specify the length of the bitstreams, as well as all the framing and control information necessary to configure the FPGAs. It can be used to program one or more devices.

PROM File Formatter

The program used to format one or more bitstreams into an MCS-86, TEKHEX, EXORmacs, or HEX format.

serial PROM

A PROM whose data is read serially, one bit at a time. Contrast with byte wide PROM.

status bar

An area located at the bottom of a window that provides information about the commands that you are about to select or that are being processed.

TEKHEX (Tektronix)

A Tektronix PROM format supported by Xilinx. Its maximum address is 65,536. This format supports PROM files of up to $(8 \times 65,536) = 524,288$ bits.

toolbar

The area located under the menu bar at the top of your window. It contains a series of buttons that you click on to execute some of the most commonly used commands. These buttons constitute an alternative to the menu commands.

workspace

The workspace is displayed when you open the PROM Formatter. It consists of a frame and an empty data stream. Use this space to create and format one or more daisy chains into a PROM file. When you add files into the data stream, the horizontal arrows indicate the order in which the files are concatenated.

Keyboard Commands

Use the following keyboard commands to navigate and select objects on the PROM File Formatter screen and to navigate in the Help tool.

Summary of Keyboard Commands

The following table is a summary of the PROM File Formatter keyboard commands.

Table B-1 Keyboard Commands

Key	Action
Tab	Traverse objects forward and highlight them
Shift-Tab	Traverse objects backward and highlight them
Enter	Activate a selection button or a highlighted item in a list
Delete	Delete the selected file or data stream
Arrow keys	Scroll up or down inside selection boxes, including menus
Alt-Character	Select a menu or button on the main screen
Esc	Deselect a menu or exit a Help window

Multiple Configuration Setups

This appendix describes programming setups that you can use to support multiple applications in a system. It covers three possible scenarios.

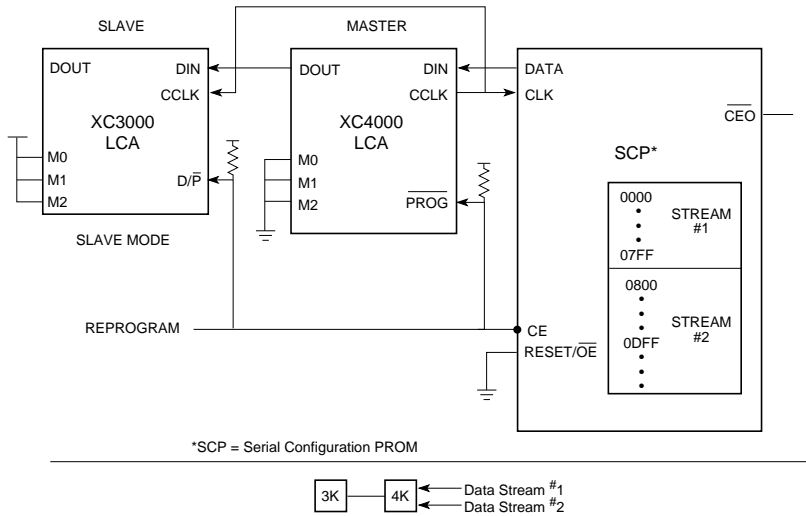
- Reconfiguring a daisy chain from a serial PROM for multiple functions
- Reconfiguring a single device or daisy chain for multiple functions from a parallel EPROM
- Configuring multiple device daisy chains from one parallel EPROM

Reconfiguring a Daisy Chain from a Serial PROM

You can download multiple applications to a single device or to a daisy chain of multiple devices in master serial mode from a serial PROM device. The master serial mode forces you to reconfigure your FPGAs with the applications in a fixed sequence, the sequence in which the data streams are saved in the FPGA.

1. Use the PROM File Formatter to build a PROM file that includes a separate data stream for each application that you wish to implement in the FPGA or daisy chain. Save it in serial PROM format. Each data stream will have its own header and length count, which the FPGA or daisy chain uses to determine when it has read in all the data for a given application.
2. Burn the PROM file into a serial PROM device using a PROM programmer.
3. If you are configuring a daisy chain, build the daisy chain of devices, ensuring you connect the DOUT output of each slave

device to the DIN input of the next device. Refer to the connections given in Figure C-1.



X6530

Figure C-1 Reconfiguration Setup for a Daisy Chain (Serial PROM)

Note: In the example in Figure C-1, data stream #1 starts at address 0000 and data stream #2 starts at address 0800.

4. If you want to configure a single device, connect the serial PROM directly to the FPGA; if you want to configure a daisy chain, connect the PROM to the master device of the daisy chain.
5. Power up the daisy chain of devices.

The PROM's internal address counters are reset upon power-up. The FPGA or daisy chain reads the length count in the first data stream and clocks the serial PROM a length count number of times to configure the FPGA or daisy chain with the first application. At the end of the first configuration cycle, the PROM internal address pointer is left pointing to the end of the first data stream.

6. Reconfigure the daisy chain by pulling the PROG pin of XC4000 and XC5200 devices Low for at least 300 ns; pull the D/P pin Low

for at least 6 μ s (microseconds) on XC3000, XC3000A, and XC2000 devices.

This action causes the FPGA or daisy chain to read the next data stream in the PROM.

7. If the PROM has been configured for active High Reset, you must tie the $\overline{OE}/\overline{RESET}$ pin to GND; if the PROM has been programmed for active Low Reset, tie the OE/ \overline{RESET} pin to VCC.

Note: Do not use this procedure if there is any chance that your system might be reset before you try to reprogram the FPGAs with the second configuration. Any accidental system resets can cause the PROM's internal address counter to be reset to 0 also, which makes it point back to the first data stream

Reconfiguring a Single Device or Daisy Chain from a Parallel PROM

You can program a single device or daisy chain with multiple configurations loaded from a parallel PROM. This method allows you to select the desired application in any order by selecting the appropriate start address.

Planning the PROM Structure

1. Use the PROM File Formatter to build a PROM file that includes one data stream for each daisy chain that needs to be configured.
2. Determine the total number of bytes required for the largest data stream.
3. Compute the number of address bits required to address this number of bytes. For example, if the size of the largest data stream is 25,000 bytes, then 15 address bits are needed to address them.
4. Use the remaining high order bits as the external select bits to select the data stream for the desired application.

Saving the PROM File

1. Select the byte wide PROM format.

2. Click on the **Advanced** button to select the starting address for each data stream.
3. Select the starting address for each data stream in the PROM file such that the desired data stream can be selected out of 2^n data streams by asserting n address bits.

For example, if data streams for two ($2^n=2^2=4$) different applications are stored in the PROM, select the starting addresses for the two applications such that they differ by two address bits ($n=2$) — typically the two high order bits.

4. Save the PROM file.

Implementing the Setup

1. Burn the PROM file into a parallel PROM device using a PROM programmer.
2. Connect the components on your board as shown in Figure C-2.

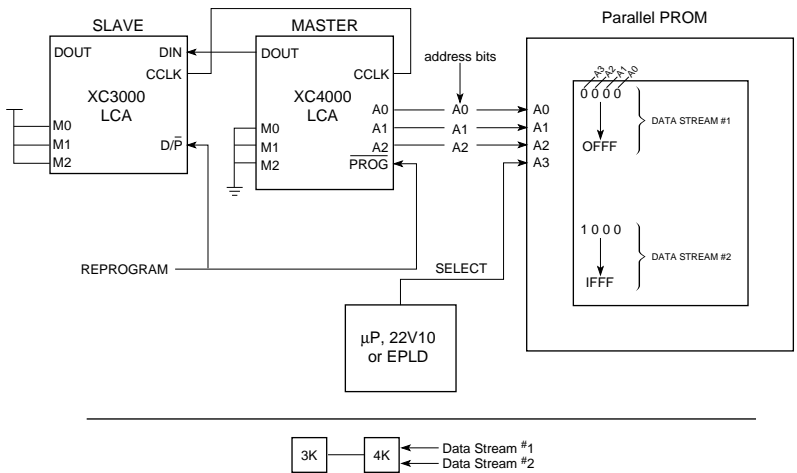


Figure C-2 Reconfiguration Setup for a Daisy Chain (Parallel PROM)

3. To control the n address bits, you can use either a microcontroller or a state machine implemented in a 22V10 PAL or XC7000 EPLD.

4. To reconfigure the daisy chain, pull the PROG pin of XC4000 and XC5000 devices Low for at least 300 μ s; pull the D/P pin Low for at least 6 μ s on XC3000, XC3000A, and XC2000 devices.

Example

This example explains how to use a microcontroller or PAL device to configure four daisy chains using four data streams stored on the parallel PROM. The largest daisy chain is 12,500 bytes long.

Because the largest of these daisy chains requires 12,500 bytes of configuration bits, 14 address bits are required to address the data ($2^{14}=16,384$ bytes). You must use two external selection bits to select each of the four data streams individually. Use the two high order bits of each data stream starting address for this purpose (bits 14 and 15).

Figure C-1 Data Stream Addressing

Data Stream	Select Bits	Starting Address	Ending Address
1	00	00 00000000000000	00 11111111111111
2	01	01 00000000000000	01 11111111111111
3	10	10 00000000000000	10 11111111111111
4	11	11 00000000000000	11 11111111111111

To configure the FPGA daisy chain on power-up with the first application, the microcontroller/EPLD/PAL must drive the two high order address bits to 00 to select data stream #1 for the first application. To reconfigure FPGA or daisy chain for application #4, drive the two high order address bits to 11 and assert the appropriate REPROGRAM signal.

Configuring Multiple Device Daisy Chains from One Parallel PROM

Some applications might require that you store the configuration data for multiple daisy chains of FPGAs on the same parallel PROM device. To implement such a setup, use additional logic to address

the different daisy chains, to hold all unconfigured daisy chains in reset mode, and to tristate the configured daisy chains while another chain is being configured.

Planning the PROM Structure

1. Use the PROM File Formatter to build a PROM file that includes one data stream for each daisy chain that needs to be configured.
2. Determine the total number of bytes required for the largest data stream.
3. Compute the number of address bits required to address this number of bytes. For example, if the size of the largest data stream is 25,000 bytes, then 15 address bits are needed to address them.
4. Use the remaining high order bits as the external select bits to select the data stream for the desired application.

Saving the PROM File

1. Select the byte wide PROM format.
2. Click on the **Advanced** button to select the starting address for each data stream.
3. Select the starting address for each data stream in the PROM file such that the desired data stream can be selected out of 2^n data streams by asserting n address bits.

For example, if data streams for two ($2^n=2^1$) different applications are stored in the PROM, select the starting addresses for the two applications such that they differ by only one address bit ($n=1$) — typically the high order address bit.

4. Save the PROM file.

Implementing the Setup

1. Burn the PROM file into a parallel PROM device using a PROM programmer.
2. Connect the components on your board as shown in Figure C-3.

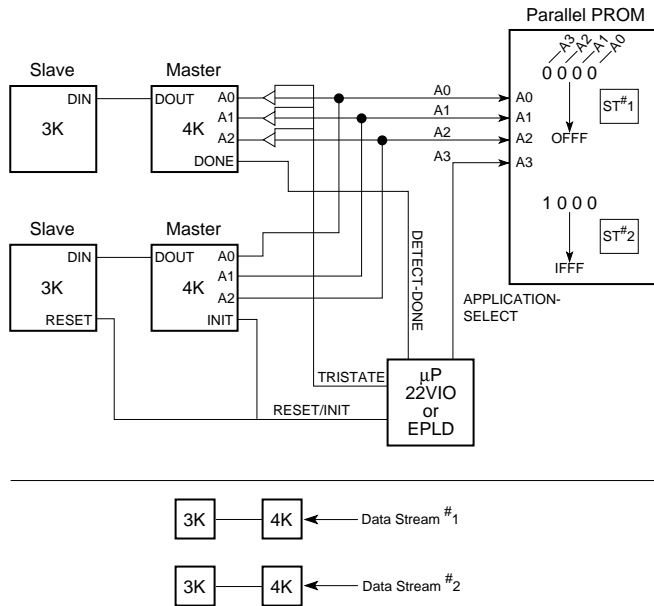


Figure C-3 Configuration Setup for Multiple Device Daisy Chains

3. To control the n address, select bits, you can use either a microcontroller or a state machine implemented in a 22V10 PAL or XC7000 EPLD.
4. As each daisy chain is being configured, use the microcontroller or the state machine to hold unconfigured daisy chains in reset mode by pulling RESET/INIT Low and to tristate the address lines leading to all configured daisy chains.
5. Use the microcontroller to hold the second daisy chain in reset mode while you configure the first daisy chain. Keep the second daisy chain in Reset mode until the DONE signal of the first daisy chain goes High. When the DONE signal goes High, the first daisy chain has completed configuration.
6. When the DONE signal for the first device goes High, the address pins of the master device in the first daisy chain must be tristated while the second chain is allowed to configure. This step prevents contention with the active outputs of the first daisy chain.

Example

This example explains how to use a microcontroller or PAL device to configure four daisy chains using four data streams stored on the parallel PROM. The size of the largest data stream is 2,500 bytes.

Because the largest of these daisy chains requires 12,500 bytes of configuration bits, 14 address bits are required to express the size of the data ($2^{14}=16,384$ bytes). You must use two external selection bits to select one out of the four data streams. Use the two high order bits of each data stream starting address for this purpose.

Figure C-2 Data Stream Addressing

Data Stream	Select Bits	Starting Address	Ending Address
1	00	00 00000000000000	00 11111111111111
2	01	01 00000000000000	01 11111111111111
3	10	10 00000000000000	10 11111111111111
4	11	11 00000000000000	11 11111111111111

1. To configure daisy chain #1 on power-up, the microcontroller or PAL must drive the two high order address bits to 00 to select data stream #1 for the first application.
2. Use the microcontroller or PAL to hold the other three unconfigured daisy chains in Reset mode by pulling RESET/INIT Low.

To hold an XC3000A device in Reset mode, hold the Reset pin Low; for the XC4000 and XC5200 devices, hold the INIT pin Low.

3. When the DONE pin goes High on the first daisy chain, the daisy chain is configured. The microcontroller/EPLD/PAL must respond by tristating the address lines leading to the master device of the first daisy chain. The controller also drives the 01 value on the high-order address bits to select the second data stream, then releases Reset on the second daisy chain so that it can configure.
4. Repeat the previous step for the third daisy chain after DONE goes High on the second daisy chain, this time tristating the

address pins on both the first and second daisy chain, driving a value of 10 on the high order address bits, and releasing the Reset on the third daisy chain.

5. For the fourth daisy chain, after DONE goes High on the third daisy chain, tristate the address pins on the first, second, and third daisy chains, drive a value of 11 on the high order address bits, and release Reset on the fourth daisy chain.

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