# ARM® AMBA® Designer ADR-400

**Revision: r3p4**

## User Guide

ARM®


ARM DUI 0333O (ID092413)

# ARM AMBA Designer ADR-400
## User Guide



### Release Information

**Change history**

| Date | Issue | Confidentiality | Change |
|---|---|---|---|
| 18 May 2006 | A | Non-Confidential | First release for r0p0 |
| 19 May 2006 | B | Non-Confidential | Minor technical corrections |
| 20 September 2006 | C | Non-Confidential | Updated for r2p0 |
| 21 March 2007 | D | Non-Confidential | First release for r2p1 |
| 24 July 2007 | E | Confidential | Second release for r2p1 |
| 09 January 2008 | F | Confidential | First release for r2p2 |
| 27 November 2008 | G | Confidential | First release for r2p3 |
| 22 April 2009 | H | Confidential | Second release for r2p3 |
| 24 November 2009 | I | Confidential | First release for r3p0 |
| 03 February 2010 | J | Non-Confidential | Second release for r3p0 |
| 29 September 2011 | K | Non-Confidential | First release for r3p1 |
| 14 March 2012 | L | Non-Confidential | Second release for r3p1 |
| 14 December 2012 | M | Non-Confidential | First release for r3p2 |
| 20 March 2013 | N | Non-Confidential | First release for r3p3 |
| 24 September 2013 | O | Non-Confidential | First release for r3p4 |

### Proprietary Notice



### Confidentiality Status

This document is Non-Confidential. The right to use, copy and disclose this document may be subject to license restrictions in accordance with the terms of the agreement entered into by ARM and the party that ARM delivered this document to.

### Product Status

The information in this document is final, that is for a developed product.

**Web Address**

`http://www.arm.com`

# Contents
# ARM AMBA Designer ADR-400 User Guide

# Chapter 1
# Getting Started with AMBA Designer

This chapter contains topics to introduce you to some of the AMBA Designer concepts and explain how to launch the Canvas, the *Graphical User Interface* (GUI) of AMBA Designer. It contains the following sections:

## 1.1 About AMBA Designer suite

AMBA Designer tools enable you to create AMBA-compliant systems. AMBA Designer supports CoreLink and CoreSight™ devices that use AMBA protocols.

AMBA Designer supports IP-XACT versions 1.2 and 1.4.

AMBA Designer supports the following design tasks:

- Configuring CoreLink and CoreSight devices.
- Generating RTL for the configured devices.
- Optimizing the AMBA interconnects.
- Stitching together interconnects and CoreLink or CoreSight components into an AMBA-compliant system with IP-XACT stitching.

AMBA Designer generates configurations that are compatible across platforms, and can generate the RTL Verilog files and the associated *Out Of Box* (OOB) testbenches for verifying the RTL.

In the AMBA Designer Canvas, you can configure IP components and use them to create systems using a graphical representation that shows the components, their ports, and the connections between ports.

You can also use AMBA Designer from the command line in batch mode.

### 1.1.1 See also

**Tasks**

- For requirements, see the *ARM® AMBA® Designer ADR-400 Installation Guide*.
- For information on which protocol an interconnect or device supports, see the *Release Note* for the IP bundle.
- For information about which interconnect and device is compatible with which IP-XACT version, see the *ARM® AMBA® Designer ADR-400 Release Note*.
- *Starting AMBA Designer Canvas* on page 1-5.
- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Configuring an AMBA 4 component and generating RTL for it* on page 4-2.
- *Stitching* on page 6-12.
- *Setting general IP-XACT preferences* on page 7-4.

**Reference**

- *AMBA Designer batch mode for component configuration* on page 1-7.
- *AMBA Designer Canvas overview* on page 8-2.
- *Launch parameters for AMBA Designer Canvas* on page 9-2.
- *AMBA Designer batch mode commands* on page 9-3.

**AMBA protocol and AMBA Design Kit documentation**

- *ARM® AMBA® AXI and ACE Protocol Specification* (ARM IHI 0022).
- *ARM® AMBA® APB Protocol Specification* (ARM IHI 0024).
- *ARM® AMBA® 3 AHB-Lite Protocol Specification* (ARM IHI 0033).
- *ARM® AMBA® Design Kit Technical Reference Manual* (ARM DDI 0243).

## 1.2 AMBA Designer workflow

This section describes the general flow for configuring components and creating systems. Peripherals and interconnects in SoC systems are highly configurable. To speed up the flow, consider the component and interconnect configurations that you might require before you use the tools.

Prerequisites

- Install the required ARM IP bundles and register them with AMBA Designer. For instructions and prerequisites, see the relevant *Supplement* documents to the *ARM® AMBA® Designer User Guide*.
- To generate RTL, you must have the required tools installed. For information on which tools are required for a particular IP bundle, see the *Release Note* for the IP bundles.

Figure 1-1 shows a typical design flow when you use AMBA Designer Canvas. The overall workflow is the same for AMBA 2, AMBA 3, and AMBA 4 components.

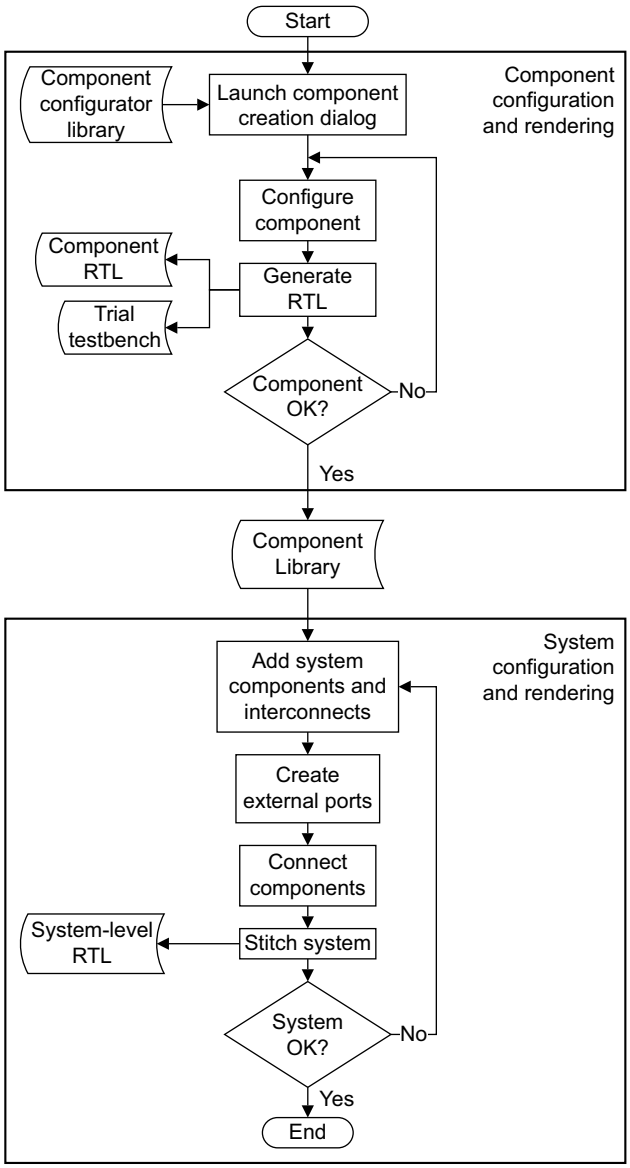



**Figure 1-1 Design flow with AMBA Designer Canvas**

You can configure all components with AMBA Designer in the following ways:

- Setting parameters in the Configurator Window in the Canvas.
- Loading a batch XML configuration file in the Configurator Window in the Canvas.
- From the XML configuration file in batch mode.

**Note**

You can only configure one component at a time both in the Canvas and in batch mode. In batch mode, you can use the XML configuration file from the command line or in scripts. However, batch mode only configures one component at a time.

### 1.2.1 See also

**Tasks**

- For instructions and prerequisites for a particular IP bundle, see the relevant *Supplement* documents to the *ARM® AMBA® Designer User Guide*.
- For information on which tools are required for a particular IP bundle, see the *Release Note* for the IP bundles.
- For information about the tool versions that you require for a particular AMBA Designer release, see the *ARM® AMBA® Designer ADR-400 Release Note*.
- *ARM® AMBA® Designer ADR-400 Installation Guide*.
- *Starting AMBA Designer Canvas* on page 1-5.
- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Configuring an AMBA 2 or AMBA 3 component from an XML configuration file* on page 3-11.
- *Configuring an AMBA 4 component and generating RTL for it* on page 4-2.
- *Generating AMBA 2 or AMBA 3 components in batch mode* on page 3-10.
- *Rendering AMBA 4 components in batch mode* on page 4-8.
- *Adding components to a new system* on page 6-2.

## 1.3 Starting AMBA Designer Canvas

You can carry out the majority of tasks in AMBA Designer in the GUI called the Canvas.

1. Ensure that the UNIX environment is ready AMBA Designer.

   Enter one of the following commands depending on the system shell you use:

   Bourne `source <AMBA_Designer_install_directory>/etc/setup.sh`

   C-Shell `source <AMBA_Designer_install_directory>/etc/setup.csh`

2. Start the Canvas.

   `adcanvas`

   - To launch the Canvas with a blank Diagram Window, do not specify any option argument.
   - To launch the Canvas and to open a specific, existing, system, use the following command:

   `adcanvas <filename.adg>`

   The Canvas is now ready for use. The Configurators Window shows the list of components that are available for configuration.

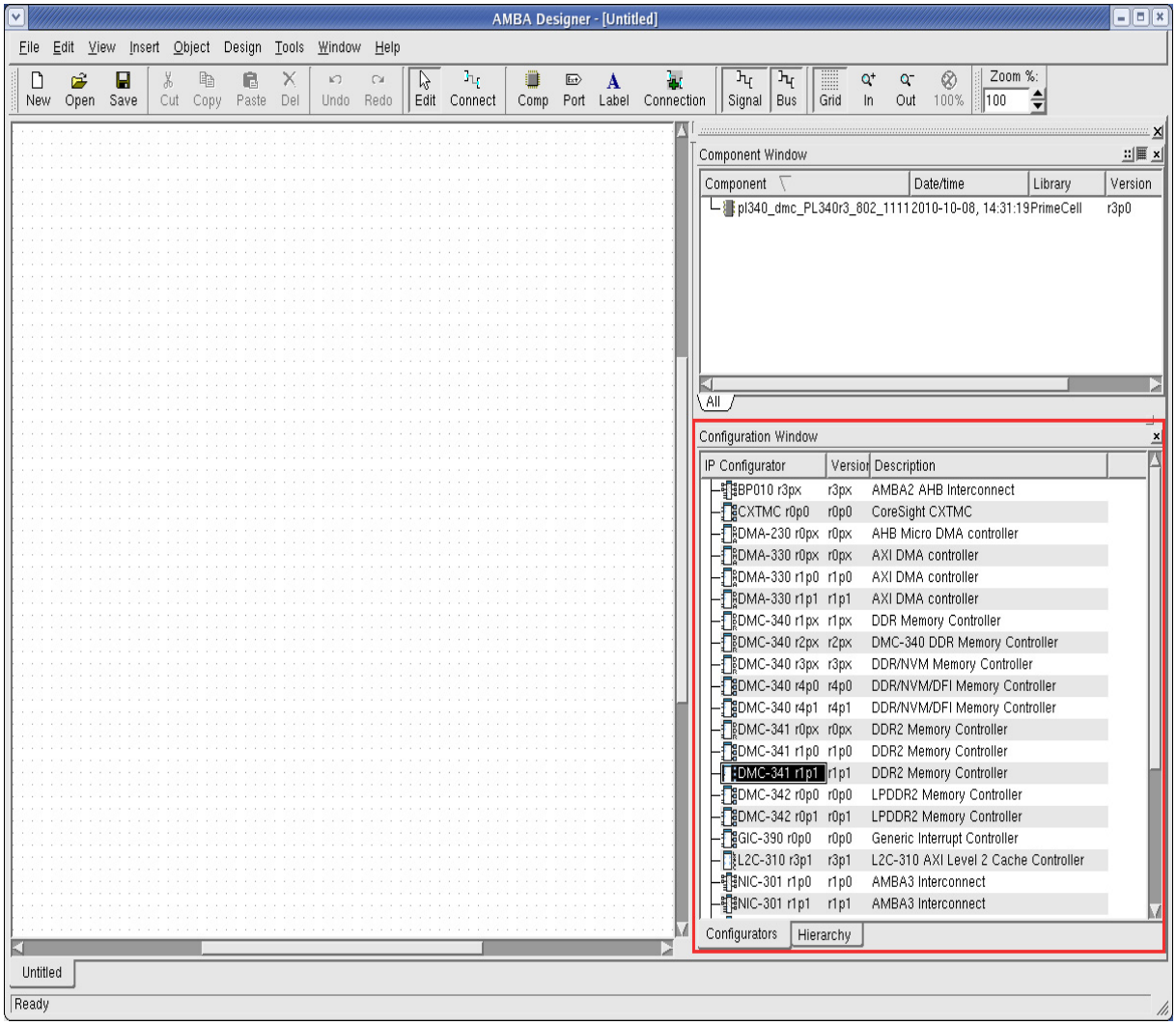



**Figure 1-2 AMBA Designer Canvas window - first use**

AMBA Designer starts in Edit Mode by default.

### 1.3.1 See also

**Tasks**

- For instructions about setting up the environment, see the *ARM® AMBA® Designer ADR-400 Installation Guide*.

**Reference**

- *AMBA Designer Canvas overview* on page 8-2.
- *AMBA Designer Canvas modes* on page 8-6.
- *Launch parameters for AMBA Designer Canvas* on page 9-2.

## 1.4 AMBA Designer batch mode for component configuration

AMBA Designer batch mode is available for all licensed IP. Batch mode makes it possible to delete the relatively large RTL file when it is not used, and regenerate it from the smaller XML configuration file when necessary. Other users can use the configuration file in other AMBA Designer installations if they have the license for a suitable AMBA Designer release.

AMBA Designer provides several options for the generation of RTL. You can use these from the command line, too:

- Generate RTL.
- Generate RTL and simulate.
- Generate RTL and synthesize.
- Generate RTL, simulate, and synthesize.

You can choose simulation and synthesis settings:

- The simulator that AMBA Designer uses.
- Enable or disable *Open Verification Library* (OVL) assertions.
- Use or do not use *Logical Equivalence Checking* (LEC).

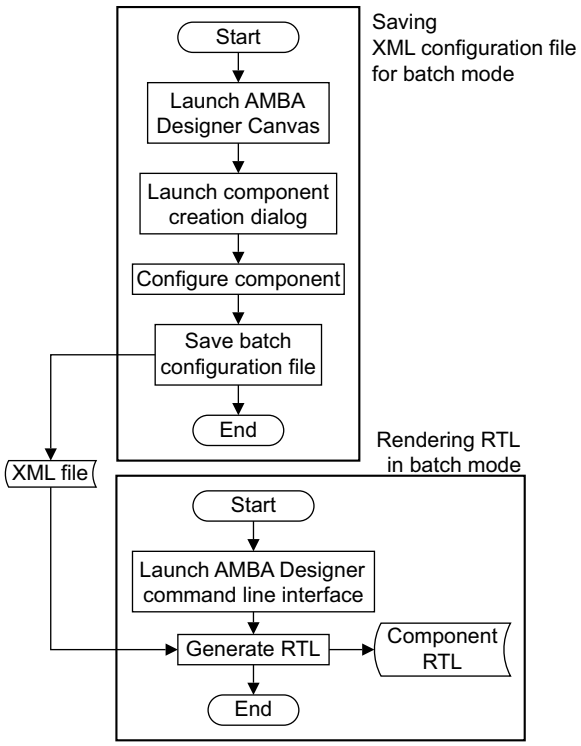



**Figure 1-3 Design flow with AMBA Designer in batch mode**

### 1.4.1 See also

**Tasks**

- *Creating a configuration file for AMBA 2 or AMBA 3 components* on page 3-9.
- *Generating AMBA 2 or AMBA 3 components in batch mode* on page 3-10.
- *Saving a batch configuration XML file for AMBA 4 components* on page 4-6.
- *Rendering AMBA 4 components in batch mode* on page 4-8.

**Reference**

- *AMBA Designer batch mode commands* on page 9-3.

## 1.5 Getting AMBA Designer help

You can use the command line interface to find information about AMBA Designer, see Table 1-1.

**Table 1-1 AMBA Designer help from the command line**

| Option | Example usage | Description |
|---|---|---|
| `-v` or `--version` | `adcanvas --version` | Print the version of the tool without starting it |
| `-h`, `--help` | `adcanvas --help` | Print the usage information |

### 1.5.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5.

**Reference**

- *Launch parameters for AMBA Designer Canvas* on page 9-2.
- *AMBA Designer batch mode commands* on page 9-3.

# Chapter 2
# Conventions and Feedback

This chapter describes the typographical conventions and how to give feedback:

**Typographical conventions**

The following typographical conventions are used:

`monospace` Denotes text that can be entered at the keyboard, such as commands, file and program names, and source code.

`mono`space Denotes a permitted abbreviation for a command or option. The underlined text can be entered instead of the full command or option name.

*`monospace italic`*
Denotes arguments to commands and functions where the argument is to be replaced by a specific value.

**`monospace bold`**
Denotes language keywords when used outside example code.

***italic*** Highlights important notes, introduces special terminology, denotes internal cross-references, and citations.

**bold** Highlights interface elements, such as menu names. Also used for emphasis in descriptive lists, where appropriate, and for ARM® processor signal names.

**Feedback on this product**

If you have any comments or suggestions about this product, contact your supplier and give:

- Your name and company.

- The serial number of the product.
- Details of the release you are using.
- Details of the platform you are using, such as the hardware platform, operating system type and version.
- A small standalone sample of code that reproduces the problem.
- A clear explanation of what you expected to happen, and what actually happened.
- The commands you used, including any command-line options.
- Sample output illustrating the problem.
- The version string of the tools, including the version number and build numbers.

**Feedback on content**

If you have comments on content then send an e-mail to `errata@arm.com`. Give:

- The title.
- The number, ARM DUI 0333O.
- If viewing online, the topic names to which your comments apply.
- If viewing a PDF version of a document, the page numbers to which your comments apply.
- A concise explanation of your comments.

ARM also welcomes general suggestions for additions and improvements.

ARM periodically provides updates and corrections to its documentation on the ARM Information Center, together with knowledge articles and *Frequently Asked Question*s (FAQs).

**Other information**

- *ARM Information Center*, `http://infocenter.arm.com/help`
- *ARM Technical Support Knowledge Articles*, http://infocenter.arm.com/help/topic/com.arm.doc.faqs
- *Support and Maintenance*, http://www.arm.com/support/services/support-maintenance.php
- *ARM® Glossary*, http://infocenter.arm.com/help/topic/com.arm.doc.aeg0014-/index.html

# Chapter 3
# Configuring AMBA 2 and AMBA 3 Components

This chapter describes how to configure an IP component before you can use your licensed IP bundle in an AMBA-compliant system design. It contains the following sections:

## 3.1 Prerequisites for creating a component

Prerequisites:

- You require the relevant AMBA Designer license.
- You must have installed and registered the relevant IP bundle.

### 3.1.1 See also

**Tasks**

- For information about the registration script for the IP, see the *Release Note* of the IP bundle.
- *FlexNet for ARM® Tools License Management Guide* (ARM DUI 0209).
- *ARM® AMBA® Designer ADR-400 Installation Guide*.
- *Starting AMBA Designer Canvas* on page 1-5.
- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Configuring an AMBA 2 or AMBA 3 component from an XML configuration file* on page 3-11.

**Reference**

- *Launch parameters for AMBA Designer Canvas* on page 9-2.

## 3.2 Configuring an AMBA 2 or AMBA 3 component in the Canvas

1. Make sure that the AMBA Configuration Window is visible in AMBA Designer Canvas. If it is not visible, select **Window → Configuration Window** from the main menu.

   Make sure that the **Configurators** tab is active. See Figure 3-1.

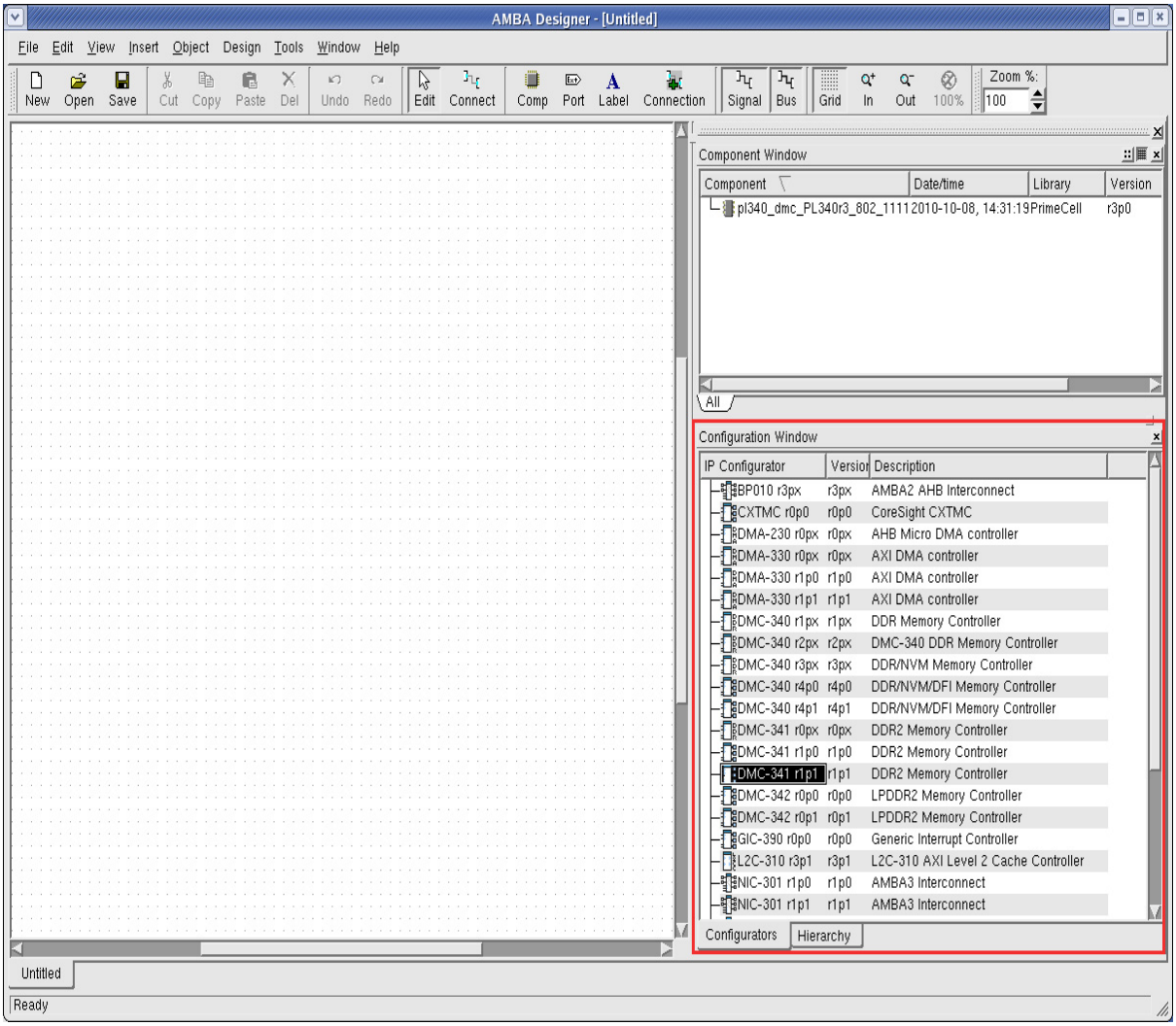



**Figure 3-1 AMBA Configuration Window**

2. Double-click the name of the component in the AMBA Configuration Window.

   A component configurator window appears. Figure 3-2 on page 3-4 shows an example.

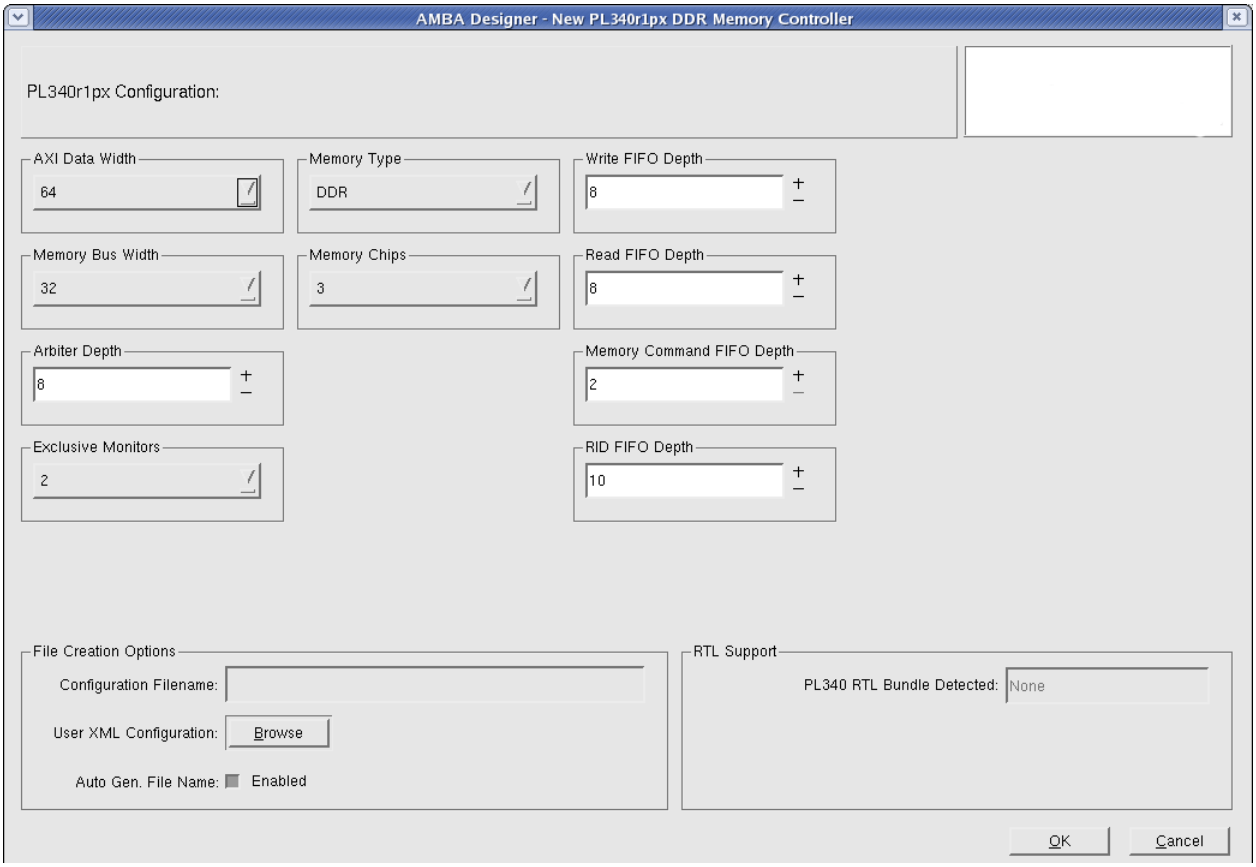



**Figure 3-2 Example Configurator Window of an AMBA 3 component**

3. Fill in the necessary configuration information.

   To complete the configuration in the Canvas, select the appropriate tabs and buttons for the available options.

4. To complete the configuration, click **OK**.

5. A component instance appears in the Canvas.

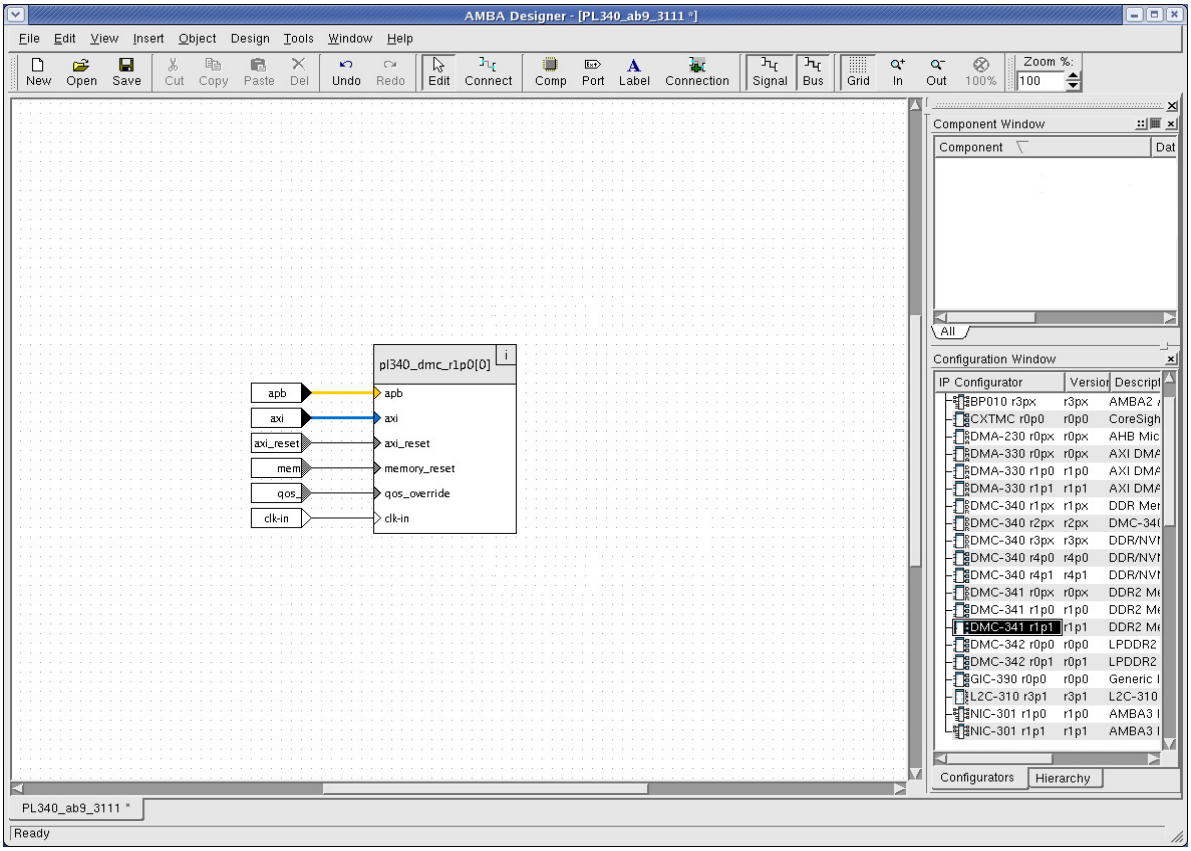



**Figure 3-3 Example new AMBA 3 component**

6. To save an XML configuration file, right-click the component in the Canvas, and select **Design → Save <*component_name*> Batch Mode Config...**.

   Canvas saves the component configuration in your work space.

Before you can use it in a system and stitch it, you must generate the RTL for the component and add it to the Component Library.

### 3.2.1 See also

**Tasks**

- *Generating RTL for an AMBA 2 or an AMBA 3 component* on page 3-6.
- *Adding an AMBA 2 or AMBA 3 component to the Component Library* on page 3-8.
- *Configuring an AMBA 2 or AMBA 3 component from an XML configuration file* on page 3-11.
- *Reconfiguring an AMBA 2 or AMBA 3 component* on page 3-13.

**Reference**

- For specific configuration information for your chosen component, see the relevant *Supplement* document to the *ARM® AMBA® Designer User Guide*.

## 3.3 Generating RTL for an AMBA 2 or an AMBA 3 component

You can only generate RTL for a component after you have configured it.

Prerequisites:

- If you require LEC, make sure that the appropriate location for your chosen LEC tool is configured. For instructions, see the *Release Note* for the IP bundle.
- If the device supports *Open Verification Library* (OVL) assertions, you can, if required, simulate using OVL assertions. For information about how to install OVL, see the *Release Note* for the IP bundle.

  **Note**

  It is not necessary to install or enable OVL assertions to simulate any of the examples supplied with the IP bundles.

1. Right-click the component in the Diagram Window, and select **Design → *<component_name>* RTL Design Flow Manager...**.

   The RTL Design Flow Manager dialog box appears. See Figure 3-4.

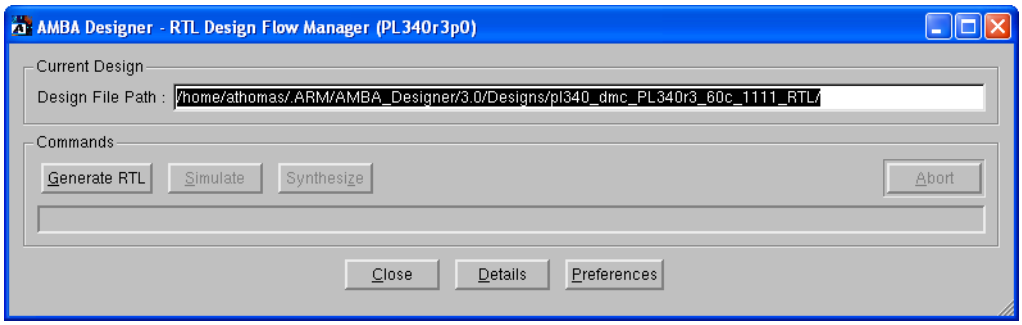



**Figure 3-4 Example RTL Design Flow Manager dialog box**

2. Click **Generate RTL**.

   The Commands pane of the RTL Design Flow Manager shows a progress bar.

3. To simulate and synthesize the generated component RTL in the current RTL Design Flow Manager session, leave the dialog box open.

   Otherwise, end the current RTL Design Flow Manager session by clicking **Close**.

4. (Optional) Run the simulation:
   a. Ensure that the RTL simulation settings are appropriately configured.
   b. Click **Simulate** in the RTL Design Flow Manager dialog box.

      The simulate RTL process starts. The progress bar in the Commands pane of the RTL Design Flow Manager dialog box displays the progress.

      To see more information, click the **Details** tab.
   c. To synthesize the generated component RTL in the current RTL Design Flow Manager session, leave the dialog box open.

      Otherwise, end the current RTL Design Flow Manager session by clicking **Close**.

5. (Optional) Run the synthesis:
   a. To use LEC, select it in the RTL preferences.
   b. Click **Synthesize** in the RTL Design Flow Manager dialog box.

The synthesizing process starts. The progress bar in the Commands pane of the RTL Design Flow Manager dialog box displays the progress.

To see more information, click the **Details** tab.

c. Click **Exit** to close the RTL Design Flow Manager dialog box.

You must add the component to the Component Library before you can stitch it.

### 3.3.1 See also

**Tasks**

- For instructions about preparing for LEC, see the *Release Note* for the IP bundle.
- For information about how to install OVL, see the *Release Note* for the IP bundle.
- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Adding an AMBA 2 or AMBA 3 component to the Component Library* on page 3-8.

## 3.4 Adding an AMBA 2 or AMBA 3 component to the Component Library

You can only add a component to the Component Library after you have configured it and generated RTL for it.

1. Right-click the component on the Canvas and select **Design → Add <*component_name*> to Component Library...**.

   Progress dialogs appear to show the status of the process.

2. If the dialog does not close, check the error messages in the Output Window, and correct the configuration errors.

The component is now ready to be stitched. You can also save its configuration for later batch processing.

### 3.4.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Generating RTL for an AMBA 2 or an AMBA 3 component* on page 3-6.
- *Creating a configuration file for AMBA 2 or AMBA 3 components* on page 3-9.
- *Generating AMBA 2 or AMBA 3 components in batch mode* on page 3-10.

## 3.5 Creating a configuration file for AMBA 2 or AMBA 3 components

You can save an XML file with the configuration information to use it to configure another component in the Canvas or in batch processing mode.

You must have configured the component before you can save a batch configuration file for it.

1. Right-click the component on the canvas, and then select **Design → Save <*component_name*> Batch Mode Config...**.
2. Navigate to the location where the XML configuration file is to be stored and click **Save**.

### 3.5.1 See also

**Tasks**

- *Generating AMBA 2 or AMBA 3 components in batch mode* on page 3-10.
- *Configuring an AMBA 2 or AMBA 3 component from an XML configuration file* on page 3-11.

**Reference**

- *AMBA Designer batch mode commands* on page 9-3.

## 3.6 Generating AMBA 2 or AMBA 3 components in batch mode

AMBA Designer batch mode is available for all licensed IPs.

Prerequisites:

- You must have the relevant AMBA Designer license.
- The IP bundle must have been installed and registered.
- The RTL preferences must have been set.
- The XML configuration file must be available.

1. Ensure that the UNIX environment has been set up for AMBA Designer.

   Enter one of the following commands depending on the system shell you use.

   ```
   Bourne    source <AMBA_Designer_install_directory>/etc/setup.sh
   C-Shell   source <AMBA_Designer_install_directory>/etc/setup.csh
   ```

2. Launch AMBA Designer from the command line in batch mode:

   ```
   adcanvas -b <file>.xml -<product> [options]
   ```

### 3.6.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Creating a configuration file for AMBA 2 or AMBA 3 components* on page 3-9.

**Reference**

- *AMBA Designer batch mode commands* on page 9-3.

## 3.7 Configuring an AMBA 2 or AMBA 3 component from an XML configuration file

1. Double-click the name of the component in the **Configuration Window**.

   A component configurator window appears.

2. To load the XML file for the configuration, click **Browse**, navigate to the location where the batch configuration file is stored, and then click **Open**.

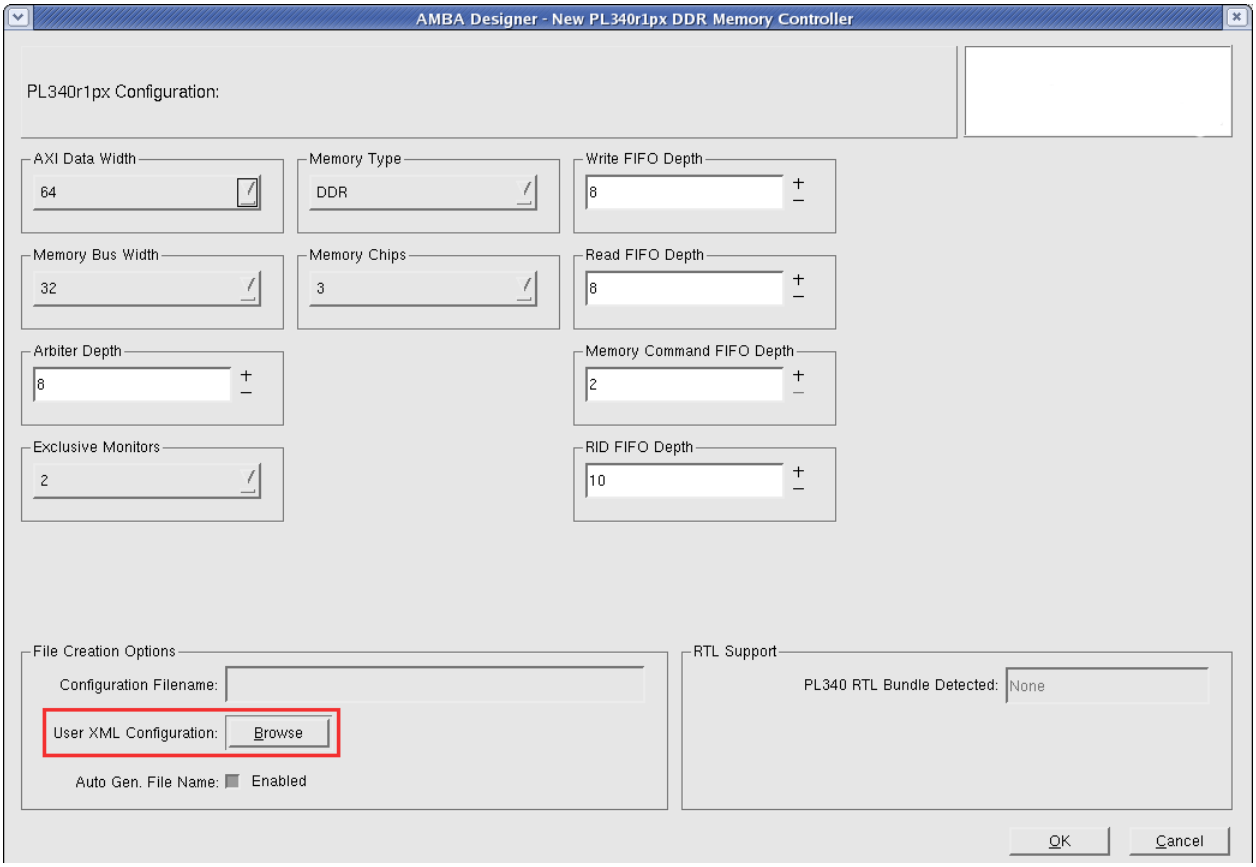



**Figure 3-5 Browse button in the Configurator Window**

**Note**

The Configuration Window shows the default settings for all parameters rather than the values imported from the XML file.

3. Click **OK**. A new tab appears in the Diagram Window with the new component part displayed.

4. To re-open the Configurator Window, right-click the component in the Diagram Window, and then select **Design → Reconfigure new <*component_name*>**.

5. Check the values that have been loaded from the XML file.

   If no changes are necessary, click **Cancel**.

   If you have modified any parameter values, click **OK** to save the changes.

You must generate the RTL for the component and add the component to the Component Library before you can stitch it.

### 3.7.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Generating RTL for an AMBA 2 or an AMBA 3 component* on page 3-6.
- *Adding an AMBA 2 or AMBA 3 component to the Component Library* on page 3-8.
- *Reconfiguring an AMBA 2 or AMBA 3 component* on page 3-13.

**Reference**

- For specific configuration information for your chosen component, see the relevant *Supplement* document to the *ARM® AMBA® Designer User Guide*.

## 3.8 Reconfiguring an AMBA 2 or AMBA 3 component

1. To open the component configuration window, do one of the following:
   - Right-click the component on the Canvas to display the context-sensitive menu and select **Design → Reconfigure component**.
   - Right-click the component in the Component Window and select **Reconfigure component**.
2. Change the parameters as required and select **OK**.
3. Right-click the component in the Diagram Window, and select **Design → <*component_name*> RTL Design Flow Manager...**.

   The RTL Design Flow Manager dialog appears.
4. Rerun the RTL generation, simulation, and synthesis as required.
5. To add the reconfigured component to the Component Library, right-click it, and then select **Design → Add component to the library**.
6. To make sure that the instances of the component are updated in all open projects in the Canvas, close and reload the projects that contain this component.
   a. Select **File → Close** from the menu.
   b. Right-click on the background of the Component Window and select **Refresh Component List**.
   c. To reopen the updated component, drag it from the Component Window onto the Canvas.

      To reopen an existing system, select it from **File → Open**.

### 3.8.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Generating RTL for an AMBA 2 or an AMBA 3 component* on page 3-6.

**Reference**

- For specific configuration information for your chosen component, see the relevant *Supplement* document to the *ARM® AMBA® Designer User Guide*.

# Chapter 4
# Configuring AMBA 4 Components

You must create a component configuration before you can use your licensed IP in an AMBA-compliant system design. It contains the following sections:



For information on prerequisites, see *Prerequisites for creating a component* on page 3-2.

## 4.1 Configuring an AMBA 4 component and generating RTL for it

1. Make sure that the AMBA Configuration Window is visible in AMBA Designer Canvas. If it is not visible, select **Window → Configuration Window** from the menu.

   Make sure that the **Configurators** tab is active. See Figure 4-1.

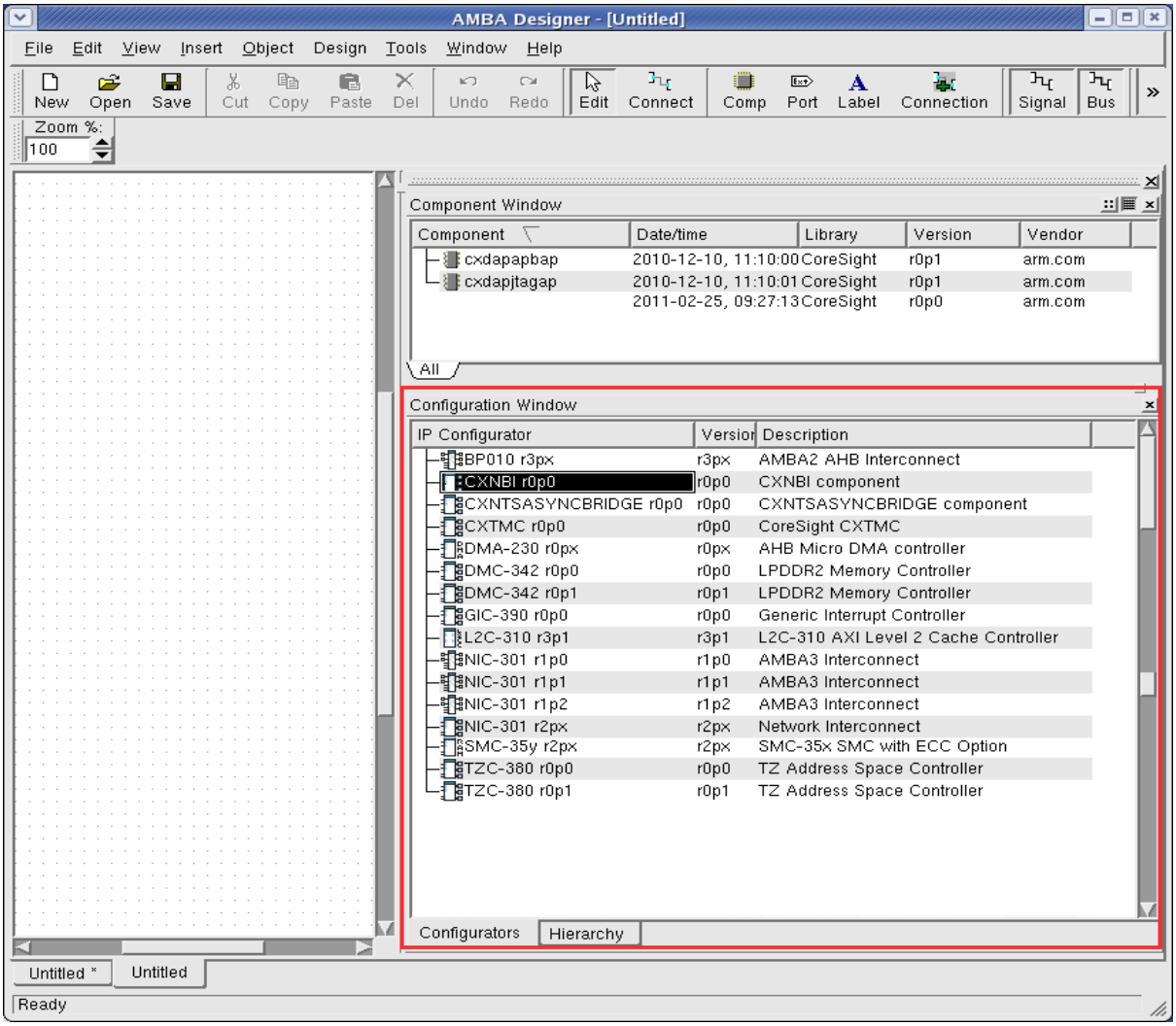



**Figure 4-1 AMBA Configurator Window - AMBA 4**

2. Double-click the name of the component in the AMBA Configuration Window.

   A component Configurator Window appears. Figure 4-2 on page 4-3 shows an example of a Configurator Window.

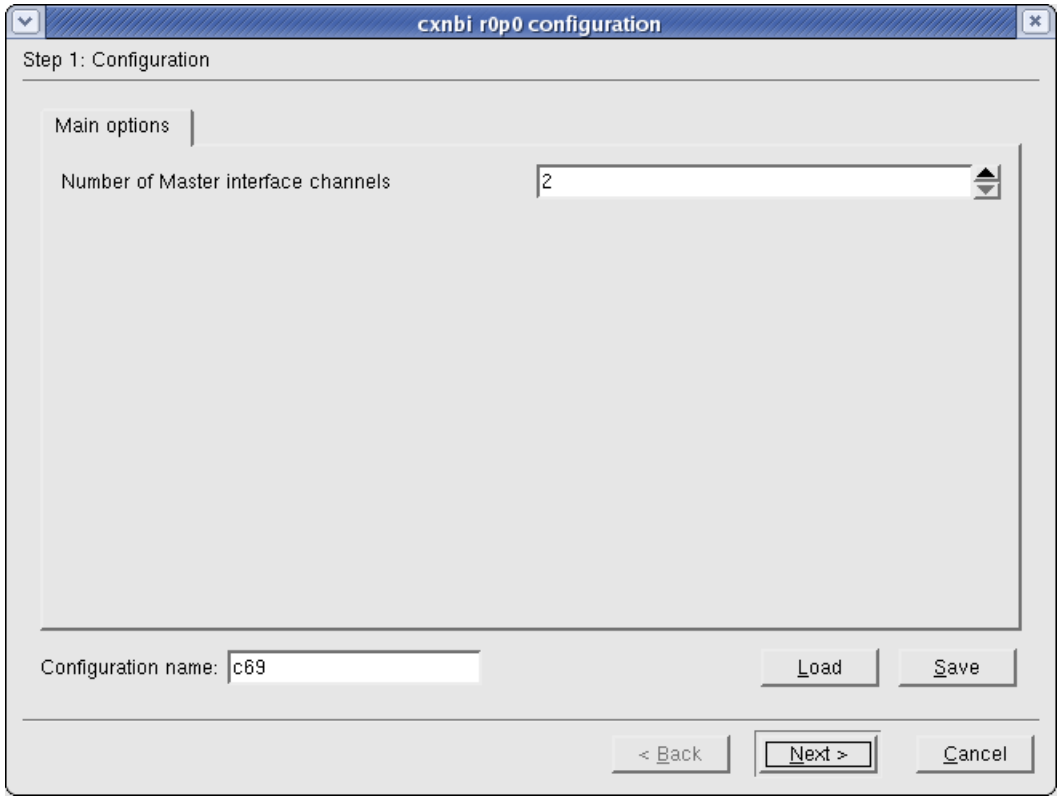



**Figure 4-2 Example configurator window for an AMBA 4 components**

3. Fill in the necessary configuration information in the Configurator Window.

   Components might have more than one configuration tab or pane. To complete the configuration, select the appropriate tabs and buttons for all available options.

4. To complete the configuration, click **Next**.

   The RTL rendering dialog appears, see Figure 4-3 on page 4-4.

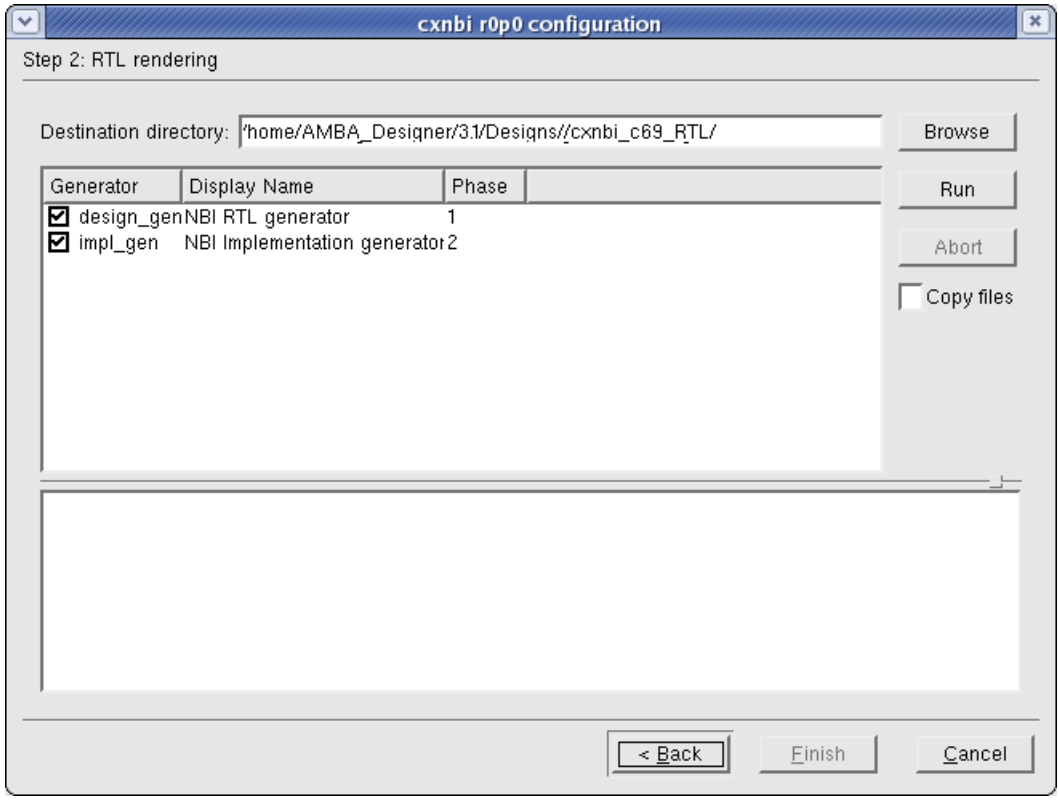



**Figure 4-3 Example RTL generation window for AMBA 4 components**

5. Some IPs support copying the files that are not configuration-dependent to the destination directory. If the IP supports this feature, click **Browse** to select the directory.

6. Select the generators to run. By default all available generators are enabled.

   Each AMBA 4 IP includes generators that define what is rendered for the IP during RTL generation. The IP might support simulation or synthesis, or the generation of other files, for example synthesis constraints. For information on what is supported, see the *Release Note* for the IP bundle.

7. If you want AMBA Designer to copy the files that are not configuration-dependent into the destination directory, select **Copy files**.

   By default, this option is disabled and AMBA Designer references the IP files from their original location and does not copy them into the destination directory of the component.

8. Click **Run** to generate the RTL for the IP.

   The lower part of the RTL rendering dialog shows the output of the rendering scripts when they are running.

9. When the component RTL has been rendered, click **Finish** to close the configuration window.

   The configured and rendered component is added to the Component Window.

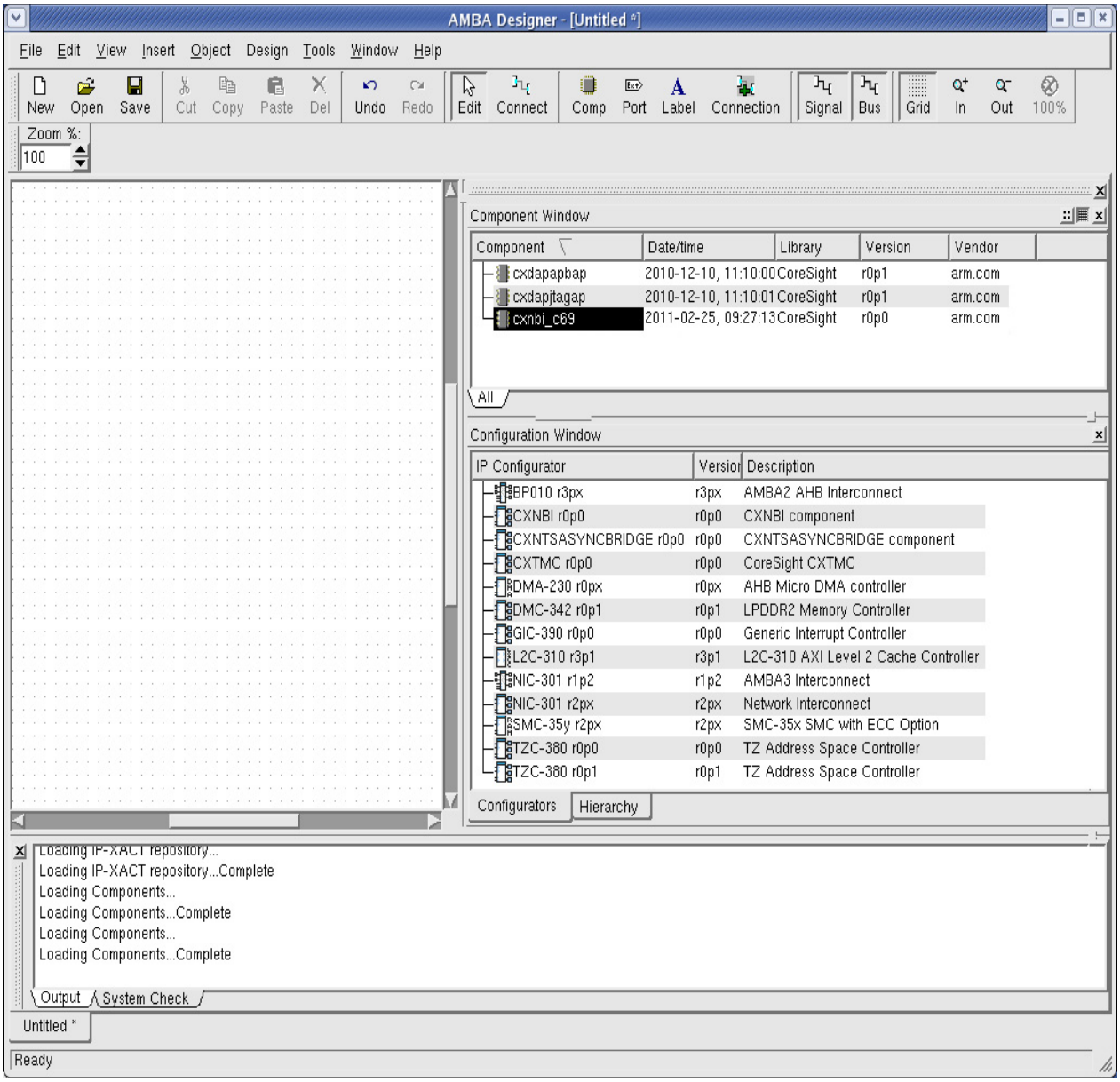



**Figure 4-4 Example new AMBA 4 component**

## 4.2 Saving a batch configuration XML file for AMBA 4 components

1. To open the component configuration window, do one of the following:
   - Double-click the component name in the AMBA Configuration Window to start a new component configuration.
   - Right-click the component in the Component Library and select **Reconfigure Component** to start a component configuration from a saved one.
2. Ensure that the parameters are set as required.
3. If required, update the name for the XML configuration in the Configuration name field. See Figure 4-5.

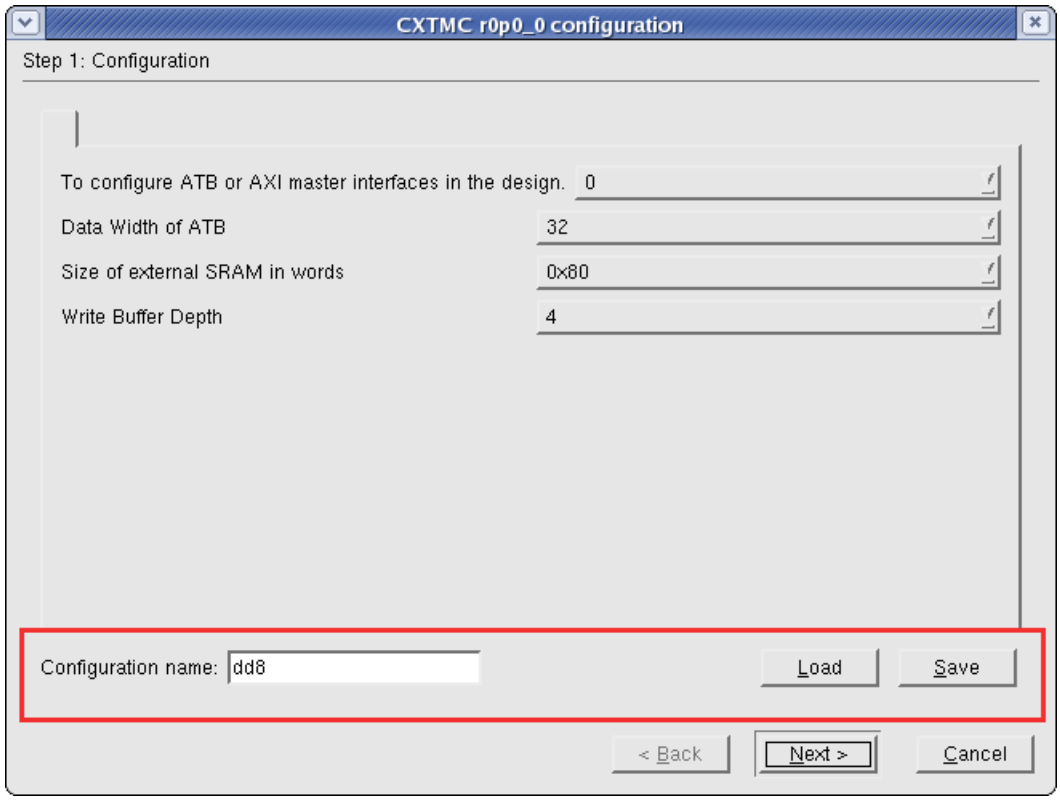



**Figure 4-5 Configuration file name for AMBA 4 batch mode**

4. Select **Save**, browse to the location where you want to save the configuration file, and select **OK**.
5. Select **Cancel** to close the component configuration window.

## 4.3 Finding out the phase number of a generator for an AMBA 4 component

In some cases, it can be useful not to run all generators for an IP, only specific ones, in batch mode. To run only some of the generators, you must know their phase number to give it as a command line argument. The number of generators depends on the IP bundle and each generator has a phase number that you can check in AMBA Designer.

To find out the phase numbers for the generators of a particular IP:

1. Right-click the component on the canvas and select **Reconfigure component**.
2. Click **Next** to open the RTL configuration dialog.
3. Note down the phase numbers that you require.
4. Click **Cancel** to exit the dialog without changing any settings.

### 4.3.1 See also

**Reference**

- *AMBA Designer batch mode commands* on page 9-3.

## 4.4 Rendering AMBA 4 components in batch mode

AMBA Designer batch mode is available for all licensed IPs. For AMBA 4 components, RTL is rendered by a set of generators associated with the IP. For most common cases, the default setting is appropriate. By default, all generators run and they create all necessary files for the IP. In certain cases, however, it is useful to run only some of the generators. For information on what generators are available for a IP component, see the *Release Note* for the IP bundle.

Prerequisites for rendering AMBA4 components in batch mode:

- Make sure that the XML configuration file is available before starting batch mode.
- You require the relevant AMBA Designer license.
- You require the IP bundle installed.
- You can use generators to generate synthesis constraints or other files that are required for a component. Check the phase number associated with each generator.

1. Launch AMBA Designer from the command line in batch mode and include the XML file name and the IP name in the command.
   - Use the following command to execute all generators and to render the RTL for the IP:
     `adcanvas -b <file>.xml -<IP_name> -gen`
     Where `<file>.xml` is the name of the batch configuration file and `<IP_name>` contains the release version, for example `XYZr1p2`.
   - Typically, all generators that are associated with the IP are run. To use only one of the generators, enter its phase number as a command-line argument:
     `adcanvas -b <file>.xml -gen -phase <num> -<IP_name>`
     For example:
     `adcanvas -b example.xml -gen -phase 1 -CXTMCr0p0`
   - If you want AMBA Designer to copy the IP files to the destination directory instead of referencing them from their original location, use the `copyfiles` argument:
     `adcanvas -b <file>.xml -<IP_Name> -gen -copyfiles`

### 4.4.1 See also

**Tasks**

- *Configuring an AMBA 4 component and generating RTL for it* on page 4-2.
- *Saving a batch configuration XML file for AMBA 4 components* on page 4-6.
- *Finding out the phase number of a generator for an AMBA 4 component* on page 4-7.

**Reference**

- *AMBA Designer batch mode commands* on page 9-3.

## 4.5 Reconfiguring an AMBA 4 component

1. To open the component configuration window, do one of the following:
   - Right-click the component on the Canvas and select **Design → Reconfigure component**.
   - Right-click the component in the Component Window and select **Reconfigure component**.

     **Note**

     This option is available only when the system in the Canvas has already been saved.
2. Update the configuration parameters as required.

   **Note**

   By default, the component is reconfigured, the configuration name is kept, and the new configuration replaces the old configuration in the Component Library. If you want to save the modified configuration with a different name, make sure that you change the name in the configuration window.
3. Click **Next**.
4. To regenerate the RTL, run the generators by clicking **Run**.
5. Click **Finish**.

The reconfigured component is added to the Component Library.

### 4.5.1 See also

**Tasks**

- *Configuring an AMBA 4 component and generating RTL for it* on page 4-2.

**Reference**

- For specific configuration information for your chosen component, see the relevant *Supplement* document to the *ARM® AMBA® Designer User Guide*.

# Chapter 5
# Configuring Bus Matrices and Interconnects

This chapter provides an overview of how to configure and render ARM bus matrices and interconnects and how to modify them. It contains the following section:

- *Configuring and rendering bus matrices and interconnects* on page 5-2.

## 5.1 Configuring and rendering bus matrices and interconnects

This is an overview. For IP-specific instructions on how to generate bus matrices and interconnects, see the AMBA Designer supplement documents.

1. Make sure that the AMBA Configuration Window is visible in AMBA Designer Canvas. If it is not visible, select **Window → Configuration Window**.

   Make sure that the **Configurators** tab is active.

2. Double-click the name of the bus matrix or interconnect in the AMBA Configuration Window.

   The component configurator window appears.

3. To configure the bus matrix or interconnect, fill in the necessary configuration information.

   Select the appropriate tabs and buttons for the available options.

4. Create the address map and the interconnect. These step is different for each bus matrix and interconnects. Follow the instructions in the AMBA Designer Supplement document for the IP.

5. Generate the bus matrix or interconnect.

6. Generate the RTL.

7. Add the generated bus matrix or interconnect to the Component Library.

### 5.1.1 See also

**Tasks**

- *ARM® PrimeCell AHB Bus Matrix BP010 Supplement to ADR-400 AMBA® Designer User Guide*.
- NIC-301, for revisions:

  **r1p2 and earlier** *ARM® AMBA® NIC-301 Network Interconnect Supplement to ADR-400 AMBA® Designer User Guide*.

  **r2p0 onwards** *ARM® CoreLink™ NIC-301 Network Interconnect Supplement to ADR-400 AMBA® Designer User Guide.*

# Chapter 6
# Creating and Configuring a System

This chapter describes how you can create and configure an AMBA-compliant system. It contains the following sections:

## 6.1 Adding components to a new system

Add component instances to the current system in the Canvas in one of the following ways:

- Drag them from the Component Window onto the Canvas.
- Use the context-sensitive menu in the Diagram Window:
  1. Right-click the **Diagram Window** to open the context-sensitive menu.
  2. Select **Add Component...**. The Select Component dialog box appears.
  3. Choose the component from the list.
     You can type a name for the component in the Instance Name (Optional): field.
  4. Click **OK**.
  5. Position the component in the Diagram Window.

     **Note**

     You cannot place a component on top of another object in a system.
- Select **Insert → Add Component...** in the main menu and use the Select Component dialog box to add your chosen component.

## 6.2 Creating external ports

You must create external ports for all connections that are to be brought up to the top level during stitching. To achieve this, start from either a component port or the main menu.

From a component port:

1. Right-click on a component port and select **Create External Port**.

   AMBA Designer automatically connects an appropriately named external port connector and connecting wire to the component port.

2. Drag the external connector to the position you require and left-click.

From the main menu do one of the following:

- Select **Insert → Add External Port...**.
  1. Select the port type, enter a name for the external port, and then click **OK**.
  2. The external port is added to the Canvas. You can connect it to a component port later.

  or:

- Select **Insert → Add Connection...**.
  1. Select the component that you want to create an external port for from the Component Instance A list.
  2. Select Create External Port from the Component Instance B list.
  3. Click the **OK** button to create the external port.

     **Note**

     AMBA Designer automatically generates the external port name. If you require a specific name then use one of the other methods.

## 6.3 Connecting components

You can connect ports graphically in the Diagram Window or by selecting the start and end point from port lists.

When you are connecting components, you must observe the following rules:

- You must connect bus interface port outputs to bus interface port inputs of the same type.
- You must connect signal port outputs to signal port inputs.

**Note**

To create a bit-slice connection, first create a full-width connection between two ports by selecting **Tools → IP-XACT Connections**, and then edit the connection. For instructions, see *Changing a full-width connection to a bit-slice connection* on page 6-9.

To connect ports graphically:

1. Make sure that the Canvas is in Connect mode by clicking **Connect** in the toolbar.
2. Place the cursor over the first port to be connected. The cursor changes to the Connect Ports Mode cursor and the port is highlighted.
3. Left-click the port and move the cursor to the second port to be connected.

   The Canvas automatically creates an orthogonal wire when you move the cursor to the second port. To complete the connection, place the cursor over the second port to be connected, and when the port is highlighted, left-click the mouse to complete the connection. You can cancel the connection by pressing Esc any time before left-clicking the second port connection.

   **Note**

   If you attempt to connect ports that are not of the correct types, the connection is not made.
4. To move a connection line or change the names that AMBA Designer automatically generates for a connection, switch to Edit mode by clicking **Edit** in the toolbar.
5. To move a connection line, left-click it, grab a control point, and then shift the line.
6. To rename a connection, right-click it, then select **Rename**.

   Edit the name field and click **OK**.

To connect ports by selecting them from lists:

1. Make sure that the Canvas is in Edit mode by clicking **Edit** in the toolbar.
2. Right-click on an empty section of the Diagram Window and select **Add Connection...**. The Create IP-XACT Connection dialog box appears, see Figure 6-1 on page 6-5.

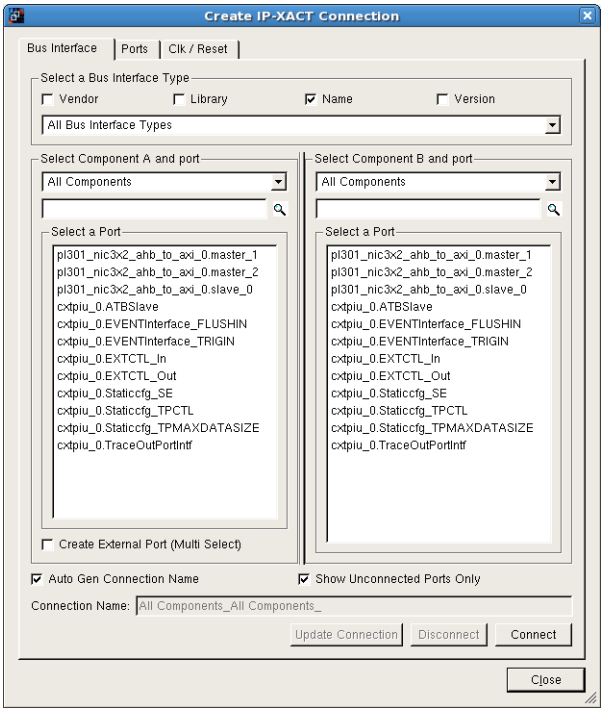



**Figure 6-1 Create IP-XACT Connection**

The **Bus Interface** tab enables you to connect the bus interfaces and create external ports.

3. To create a connection:
   a. Select a port in the left-hand Select a Port pane.
   b. Select a port in the right-hand Select a Port pane.
   c. Click **Connect** to connect the selected ports.

4. To create external bus interface ports:
   a. Select **Create External Port (Multi Select)**.
   b. Press the **Ctrl** key and select one or more ports in the left-hand Select a Port pane.
   c. Click **Connect** to create an external port for each of the selected ports.

Table 6-1 shows the settings you can use to filter the ports to display and name a bus interface connection.

**Table 6-1 Create IP-XACT Connection, Bus Interface settings**

| Option | Description |
|---|---|
| **Auto Gen Connection Name** | When selected, AMBA Designer assigns a name for the connection.<br>When deselected, you can enter a name for the connection. However, you cannot enter a name if **Create External Port (Multi Select)** is selected. |
| **Show Unconnected Ports Only** | When selected, the Select a Port pane displays unconnected ports only. |
| Connection Name | Displays the name of the connection. |
| **Select a Bus Interface Type** | |
| **Vendor** | When selected, the drop-down list displays the vendor name. |
| **Library** | When selected, the drop-down list displays the library name. |

**Table 6-1 Create IP-XACT Connection, Bus Interface settings (continued)**

| Option | Description |
|---|---|
| **Name** | When selected, the drop-down list displays the product name. |
| **Version** | When selected, the drop-down list displays the product version. |
| **Select Component A and port** | |
| Select a Port | Displays bus interfaces. To filter the results, you can:<br>• Use the Select Component A and port drop-down list.<br>• Enter text in the Select Component A and port search box.<br>• Use the Select Bus Interface Type drop-down list. |
| **Create External Port (Multi Select)** | When selected, you can select multiple bus interfaces and create an external port for each interface. |
| **Select Component B and port** | |
| Select a Port | Displays bus interfaces. To filter the results, you can:<br>• Use the Select Component B and port drop-down list.<br>• Enter text in the Select Component B and port search box.<br>• Use the Select Bus Interface Type drop-down list. |

The **Ports** tab enables you to connect ports, tie-off ports to fixed values, and create external ports.

5. To create a connection:
   a. Select a port in the left-hand Select a Port pane.
   b. Set the left-hand Left and Right fields to select which bits of the port you require.

      **Note**

      This step is only applicable to multi-bit ports, that is, when the Left or Right fields display nonzero values.

   c. Select a port in the right-hand Select a Port pane.
   d. Set the right-hand Left and Right fields to select which bits of the port you require. The bit width must match that chosen in step b.

      **Note**

      This step is only applicable to multi-bit ports.

   e. Click **Connect** to connect the selected ports.
6. To tie a port to a fixed value:
   a. Select a port in the left-hand Select a Port pane. You must select an input port.
   b. Click **Enable**.
   c. Set the left-hand Left and Right fields to select which bits of the port you require.

      **Note**

      This step is only applicable to multi-bit ports, that is, when the Left or Right fields display nonzero values.

   d. Enter a value in the Value field. The value sets the tie-off value and must be appropriate to the bit width you chose in step c.
   e. Click **Connect** to tie off the port.

7. To change a tie-off input port value:
   a. Select an input port in the left-hand Select a Port pane. The right-hand Select a Port pane displays the tie-off value.
   b. Click on the tie-off value in the right-hand pane.
   c. Enter a value in the Value field. The value must be appropriate to the bit width that the Left and Right fields display.
   d. Click **Update Connection** to update the tie-off value.
8. To remove a tie-off input port value:
   a. Select an input port in the left-hand Select a Port pane. The right-hand Select a Port pane displays the tie-off value.
   b. Click on the tie-off value in the right-hand pane.
   c. Click **Disconnect** to remove the tie-off.
9. To create external ports:
   a. Select **Create External Port (Multi Select)**.
   b. Press the **Ctrl** key and select one or more ports in the left-hand Select a Port pane.
   c. Click **Connect** to create an external port for each of the selected ports.

The **Clk/Reset** tab enables you to connect clocks, connect resets, and create external ports.

10. To connect clocks:
    a. Set the Select Clk or Reset port type drop-down list to CLK.
    b. Press the **Ctrl** key and select one or more clock ports in the Select Ports to connect pane.
    c. Click **Connect** to connect the selected clocks.
11. To connect clocks to an external clock port:
    a. Set the Select Clk or Reset port type drop-down list to CLK.
    b. Press the **Ctrl** key and select one or more clock ports in the Select Ports to connect pane.
    c. Select an external clock port from the Select destination port drop-down list.
    d. Click **Connect** to connect the selected clocks to the selected external clock port.
12. To connect resets:
    a. Set the Select Clk or Reset port type drop-down list to RESET.
    b. Press the **Ctrl** key and select one or more reset ports in the Select Ports to connect pane.
    c. Click **Connect** to connect the selected resets.
13. To connect resets to an external reset port:
    a. Set the Select Clk or Reset port type drop-down list to RESET.
    b. Press the **Ctrl** key and select one or more reset ports in the Select Ports to connect pane.
    c. Select an external reset port from the Select destination port drop-down list.
    d. Click **Connect** to connect the selected resets to the selected external reset port.

### 6.3.1 See also

**Tasks**

- *Creating external ports* on page 6-3.
- *Changing a full-width connection to a bit-slice connection* on page 6-9.
- *Setting general IP-XACT preferences* on page 7-4.

**Reference**

- *Component ports* on page 10-6.
- *External ports* on page 10-11.
- *Connections in a system* on page 10-12.

## 6.4 Changing a full-width connection to a bit-slice connection

By default, the port signals are full bit-width connections, that is, no bit-slices have been specified. To make a bit-slice connection from a signal port to other component or external ports:

1. In the main menu, select **Tools → IP-XACT Connections...**.

   The IP-XACT Connections dialog box appears and lists all the IP-XACT connections for the system.

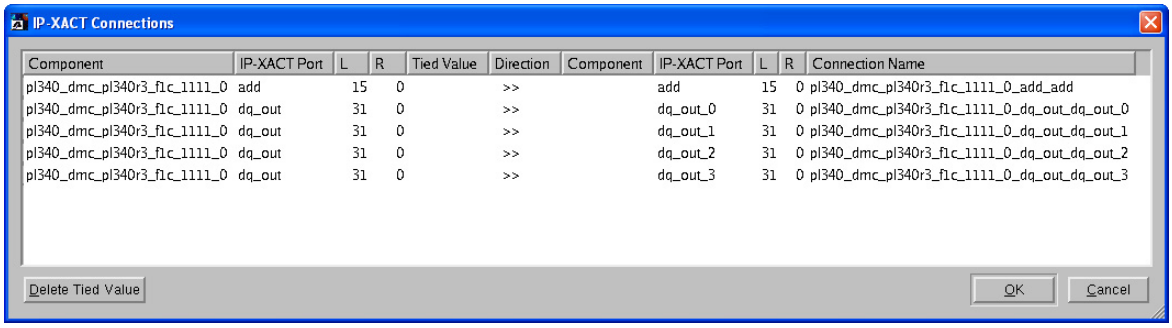



**Figure 6-2 IP-XACT Connections listing before editing**

2. To create a bit-slice, edit the L and R values in the port listing to define the bit range required for each bit-slice.

   **Note**

   The following ad-hoc connections are not supported:
   - Signals from external bus interfaces.
   - Non-contiguous bit-slicing of two ad-hoc signals connected together.

   Figure 6-3 shows the edited IP-XACT connections for the system.

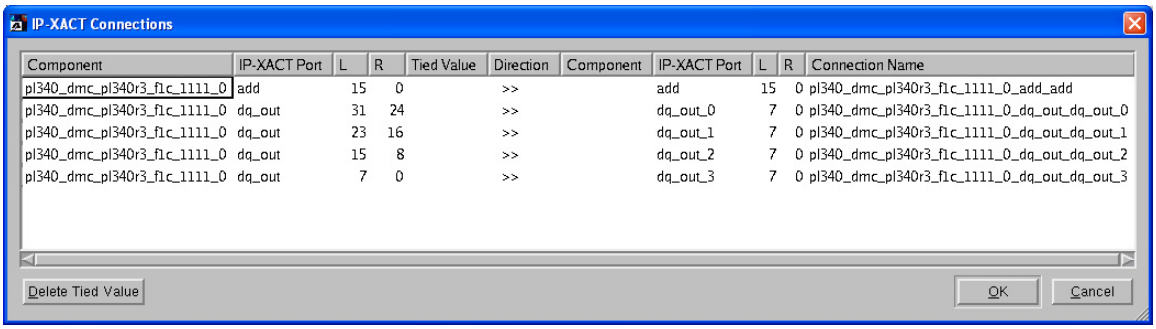



**Figure 6-3 IP-XACT Connections listing after editing**

3. Click **OK** to save the new L and R signal port values and close the IP-XACT Connections dialog box. Figure 6-4 on page 6-10 shows the sliced connection.

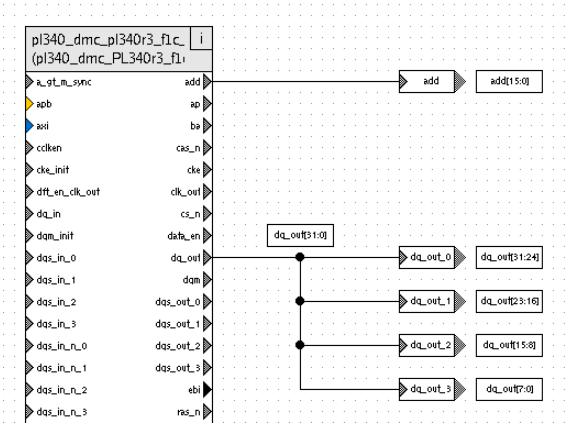



**Figure 6-4 Multiple bit-slice connections**

### 6.4.1 See also

**Tasks**

- *Setting general IP-XACT preferences* on page 7-4.

## 6.5 Tying off input ports

1. Right-click the input port to tie off and select **Create Tied Value**.
   The IP-XACT Connections dialog box is displayed. See Figure 6-5.

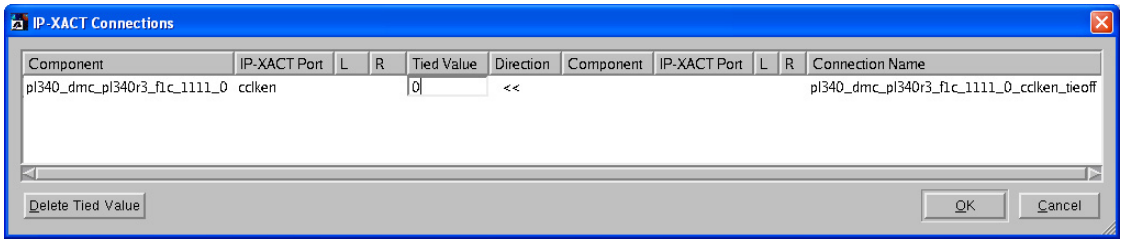



**Figure 6-5 IP-XACT Connections dialog box**

2. By default, the port is given a tied value of 0.
   To change the default tied value for a port:
   a. Left-click the port listing below the Tied Value header.
   b. In the text entry field that appears, enter the new tied value.
   To delete a tied value, click the port in the list and then click **Delete Tied Value**.
3. To finalize the settings and to close the dialog box, click **OK**.

The color of the tied-off port is solid light green.

### 6.5.1 See also

**Tasks**

- *Setting general IP-XACT preferences* on page 7-4.

## 6.6 Stitching

**Note**

- You can only stitch one system at a time.
- AMBA Designer does not support stitching third-party IP-XACT components.
- AMBA Designer stitches systems that comply with IP-XACT. In particular, bus interface connections must be wired point-to-point connections and no bus interface fanout is supported. For example, on the NIC-301 AMBA Interconnect APB master interfaces, AMBA Designer extracts each individual APB slave slot so that you can stitch each of these slots individually.

1. In the main menu, select **Design → IP-XACT RTL Stitching...**.

   AMBA Designer displays the AMBA Designer - RTL Design Flow Manager dialog box.

2. Click **Preferences** to open the Stitcher Preferences dialog box. For information on the stitching settings, see *Stitching parameters* on page 6-14.

   Make the necessary changes and click **OK**.

   **Note**

   - If the **Auto Add Stitched System to Component Library** flag is selected in the **IP-XACT Stitching** tab, the system is automatically added to the Component Library when you close the dialog box. Otherwise, no action is taken.
   - To bring all the unconnected signal ports in the system up to the top level, select **Export all unconnected** in the AMBA Designer - RTL Design Flow Manager Preferences dialog box.

3. In the AMBA Designer RTL Design Flow Manager dialog box, click **Stitch RTL** to start the process.

4. Click **Close** to close the AMBA Designer - RTL Design Flow Manager dialog box.

If the **Auto Add Stitched System to Component Library** flag was set in the Preferences dialog, the new component representing the stitched system is added to the Component Library. It appears in the Component Window with a system icon and the name you gave it when you saved it. Figure 6-6 shows the example system saved as `NIC_301_PL340`.

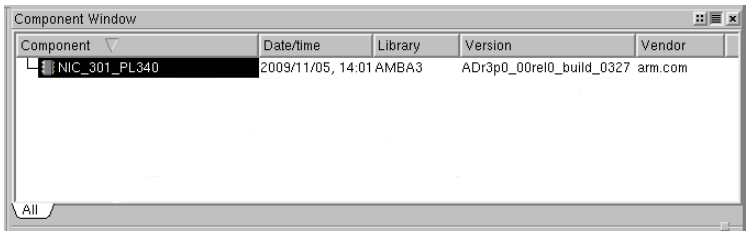



**Figure 6-6 Saved stitched system in Component Window**

IP stitching generates reports in the following directory during the stitching process:

`/home/<user>/.ARM/AMBA_Designer/3.0/Designs/<SysName>_RTL/`

The reports depend on the components that you include in your design.

### 6.6.1 See also

**Tasks**

- *Stitching parameters* on page 6-14.
- *Recreating a stitched system from exported configuration files* on page 6-16.
- *Using stitched systems as components* on page 6-18.
- *Reconfiguring a stitched system* on page 6-19.
- *Setting general IP-XACT preferences* on page 7-4.

## 6.7 Stitching parameters

Stitching parameters can be only set from the RTL Design Flow Manager Preferences dialog that is available when you have started IP-XACT stitching. For instructions, see *Stitching* on page 6-12.

**Table 6-2 IP-XACT stitching settings**

| Option | Description |
|---|---|
| **IP-XACT_Stitching** | |
| Ignore IP-XACT Bus Definitions VLNV Version Fields | When selected, bus interface version fields on components are not compared against bus definition versions when checking for bus compatibility. |
| Run IP-XACT Stitching Process in Verbose Mode | When selected, an extended messaging mode is used that provides additional progress information. |
| Create verbose comments in the generated RTL | When selected, basic comments are added to the RTL during the stitching process. |
| Run IP-XACT Stitching Process in Strict Mode | When selected, forces a strict strategy to be used when stitching. This is useful for IP-XACT design verification, and the following policies apply:<br>• Failure when an invalid default value is detected for input or bidirectional signals, in IP-XACT component definitions.<br>• Failure when connected signals do not have the same size, or the same left and right bits.<br>• Additional warning messages are output. |
| Output VC file | When selected, a *<design name>*.vc file is generated at the same location as the top-level *<design name>*.v file. The .vc file contains references to all the .v files, directories, and other directory dependencies, and you can use it to compile the entire design. |
| Auto Add Stitched System to Component Library | When selected, AMBA Designer adds the stitched system to the Component Library. |
| Absolute path for .v files in generated IP-XACT file | When selected, the generated IP-XACT file includes the absolute path to the .v files instead of the relative path. |
| **Signal Options** | |
| Use instance names in nets | When selected, the instance name of the components being connected are used as part of the net name.<br>**Note**<br>If you require this option then you must also select **Export all unconnected** in the Signal Options pane. |
| Export all unconnected | When selected, all the unconnected signal ports are exported to the top level of the design. This is equivalent to manually creating external ports for all the unconnected signal ports in the design.<br>**Note**<br>Only signal ports, not bus interface ports, are exported to the top level of the design. |

**Table 6-2 IP-XACT stitching settings (continued)**

| Option | Description |
|---|---|
| **Bus Interface Options** | |
| Export all unconnected | When selected, all the unconnected bus interfaces are exported to the top level of the design. This is equivalent to manually creating external ports for all the unconnected bus interfaces in the design. |
| **Stitcher Plugins** | |
| System Configuration Export | When selected, AMBA Designer outputs the system configuration files and a script file `render.csh` into a subdirectory called `<SysName>_config`. You can then move the content of the subdirectory to some other system on which AMBA Designer and other required IP and licences are installed to recreate the system there by executing `render.csh`.<br>For instructions, see *Recreating a stitched system from exported configuration files* on page 6-16. |

### 6.7.1 See also

**Tasks**

- *Setting general IP-XACT preferences* on page 7-4.

## 6.8 Recreating a stitched system from exported configuration files

**Note**

- You must have the IP bundle and appropriate versions of AMBA Designer and other EDA tools installed on the system on which you want to recreate the stitched system from configuration files.
- You cannot use the `render.csh` script to rerender components that have not been originally rendered in AMBA Designer, even if they were used in a system. Reconfigure such systems outside AMBA Designer, and then add them to the Component Library.

1. Run the `render.csh` script by specifying a destination directory for the design as a command-line argument:

   `render.csh <SysName>_config <target_directory>`

   The full hierarchical system is recreated in the target directory.

2. Open the system in AMBA Designer:

   `adcanvas <SysName>_config/<SysName>.adg`

3. You can now use and modify the system in AMBA Designer.

### 6.8.1 See also

**Tasks**

- For instructions and prerequisites for a particular IP bundle, see the relevant *Supplement* document to the *ARM® AMBA® Designer User Guide*.
- For information on which tools are required for a particular IP bundle, see the *Release Note* for the IP bundle.
- For information about the tool versions that you require for a particular AMBA Designer release, see the *ARM® AMBA® Designer ADR-400 Release Note*.
- *ARM® AMBA® Designer ADR-400 Installation Guide*.
- *Starting AMBA Designer Canvas* on page 1-5.
- *Adding a component to the default Component Library from the command line* on page 11-5.

**Reference**

- *AMBA Designer batch mode commands* on page 9-3.

## 6.9 Adding labels to the project

1. Right-click the spot in the Diagram Window where you want to place the label, and then select **Add Label**.
2. Edit and format the label as required and click **OK**.

## 6.10 Using stitched systems as components

You can add stitched systems to the Component Library. This is done automatically if you enable the **Auto Add Stitched System to Component Library** option in the is stitching preferences. You can then use such hierarchical components or subsystems in more complex systems the same way as you use simple components.

### 6.10.1 See also

**Tasks**

- *Stitching parameters* on page 6-14.
- *Adding a component to the Component Library from an IP-XACT XML file* on page 11-4.
- *Adding a component to the default Component Library from the command line* on page 11-5.

## 6.11 Reconfiguring a stitched system

**Note**

If you reconfigure a subcomponent in a stitched system, you must restitch not only that subsystem, but also all intermediate and top-level systems that include the reconfigured subcomponent. You must restitch hierarchical systems in a bottom-up fashion, starting with the lowest-level component that changed.

1. To open the configuration window for the hierarchical component, do one of the following:
   - Right-click the component in the Canvas, and then select **Design → Reconfigure Component**.
   - Right-click the component in the Component Window, and then select **Reconfigure component**.
2. Change the system as required and save it.
3. Restitch in a bottom-up fashion all interim subsystems and systems from the level on which you changed the component to the top level.

### 6.11.1 See also

**Tasks**

- *Reconfiguring an AMBA 2 or AMBA 3 component* on page 3-13.
- *Reconfiguring an AMBA 4 component* on page 4-9.
- *Using stitched systems as components* on page 6-18.
- *Missing port in subcomponent* on page 13-5.

## 6.12 Replacing a component in the system

You can replace a component with another one in the system design. AMBA Designer attempts to reconnect all connections to the same ports of the new component. If the same port does not exist, AMBA Designer deletes the connection. The tool preserves the size of the component.

**Caution**

Use this option with care. It might adversely affect the design of your system.

1. Right-click the component in the Diagram Window, and select **Replace Selected Components...**.
2. Select the replacement component from the list and click **OK**.

**Note**

When you replace a component, the bit-slice connections and tie-off values of the old component are not kept for the new component.

# Chapter 7
# AMBA Designer General Reference

This chapter describes the general configuration options for AMBA Designer, both in the Canvas and in batch mode. It contains the following sections:

## 7.1 AMBA Designer Preferences dialog

Use the AMBA Designer Preferences dialog box to configure preferences about the tool in general.

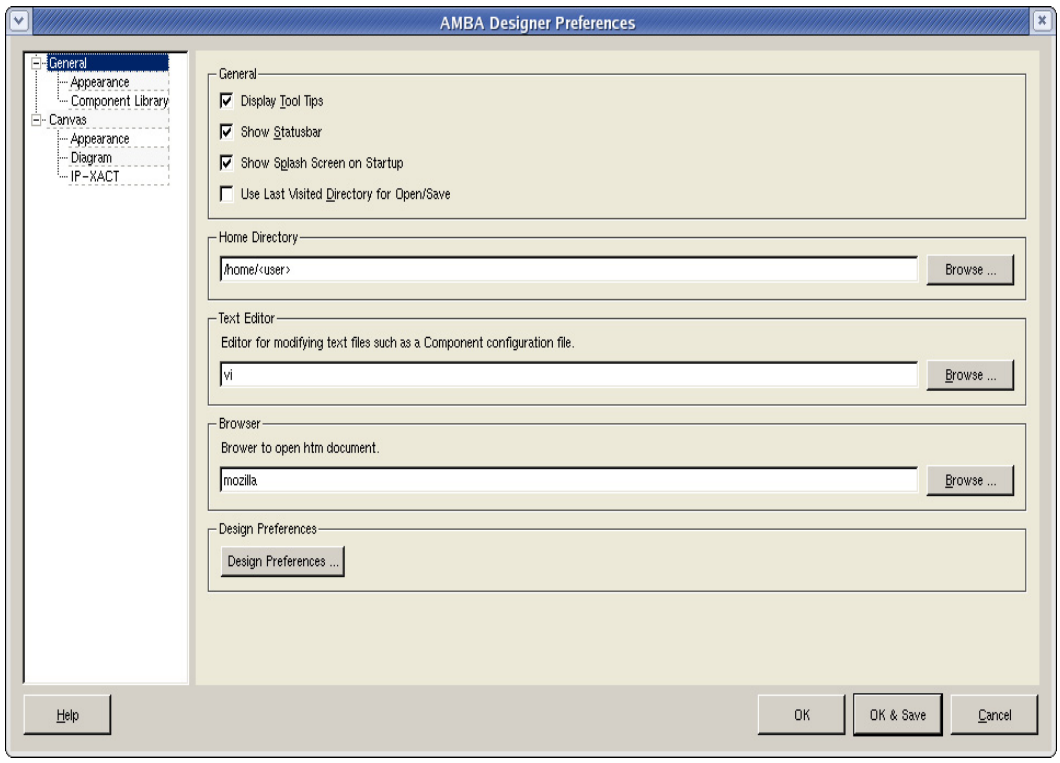



**Figure 7-1 AMBA Designer Preferences dialog box**

1. Select **File → Preferences...**.

   This opens the AMBA Designer Preferences dialog box.

2. Click **General** in the left-hand pane to set the following:
   - Home directory.
   - Text editor.
   - Browser to open the htm files.

3. Click **General → Design Preferences** in the left-hand pane to set the following:

   **Note**

   AMBA Designer only supports absolute paths.

   - Global and user preferences.
   - Path to the generated design model.
   - Path to the generated component file.
   - Path to the configuration file.

4. Click **General → Component Library** in the left-hand pane to set the following:
   - Working directory for component configuration files.
   - List of additional locations with component configuration files.

5. Click **Canvas** in the left-hand pane to set the following:
   - Output messages saved in a text file.

- Reload projects on a startup.
- Saving options, such as creating a subdirectory for a new project automatically or generating backup files, autosave.

6. Change the appropriate items in the right-hand pane and then click **OK**.

### 7.1.1 See also

**Tasks**

- *Setting general IP-XACT preferences* on page 7-4.
- *Setting drawing preferences in AMBA Designer Canvas* on page 8-11.
- *Customizing the appearance of AMBA Designer Canvas* on page 8-12.

**Reference**

- *Paths to relative directories* on page 13-4.

## 7.2 Setting general IP-XACT preferences

1. To set general IP-XACT preferences, select **File → Preferences → IP-XACT**.

   You can set the following options:

   - Suppress IP-XACT Repository warning messages.

     **Caution**

     Use this option with care.

   - Bus Definitions Paths.

     Specifies where the tool searches for the bus definition files. Click **Edit** to display the IP-XACT Directories dialog box and enter the directory paths.

   - IP-XACT Files.

     Lists the IP-XACT files according to certain filters: bus definition, component, and design files are listed separately.

### 7.2.1 See also

**Tasks**

- *Stitching* on page 6-12.
- *Stitching parameters* on page 6-14.
- *Viewing the IP-XACT properties of a component* on page 10-3.
- *Adding a component to the Component Library from an IP-XACT XML file* on page 11-4.

**Reference**

- *Design Preferences dialog* on page 7-5.
- *Files and directories used by AMBA Designer* on page 7-8.

## 7.3 Design Preferences dialog

From the AMBA Designer Preferences, you can also edit the project preferences in the **Design Preferences...** dialog, see Figure 7-2.

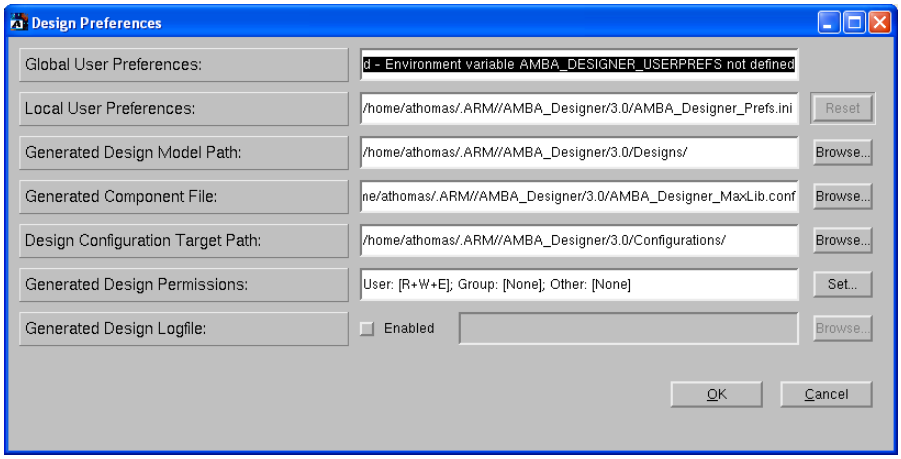



**Figure 7-2 General Design Preferences dialog box**

To change the defined path or file, perform one of the following actions:

- Enter the new directory path in the associated field then click **OK** to save the preferences and close the Design Preferences dialog box.
- Click **Browse...** to open a file browser dialog box. Use this dialog box to:
  1. Navigate to the appropriate directory or file.
  2. Select the appropriate directory or file.
  3. Click **OK** to close the file browser dialog box.
  4. Click **OK** to save the preferences, and close the Design Preferences dialog box.

The preferences are:

**Global User Preferences**

The path to the location of the global preferences.

**Local User Preferences**

The path to the location of your local preferences.

**Generated Design Model Path**

After you configure an AMBA component, AMBA Designer generates the IP-XACT component and saves it in this directory.

**Note**

AMBA Designer only supports absolute paths.

During the RTL generation process, the tools create the relevant RTL directory structure for the AMBA component in this directory. AMBA Designer uses this directory structure to save the RTL files that it generates.

### Generated Component File

AMBA Designer uses the Component Library file to store the configured components in the AMBA Designer Component Library. The configuration process for AMBA components consists of the tools writing the resultant IP-XACT and Verilog files to the Generated Design Model Path directory.

This file contains the library configuration entry information for generated components that you have added to the IP-XACT Component Library.

### Design Configuration Target Path

This directory contains the design configuration files. These files contain the parameter, address, and sparse information that AMBA Designer uses to generate the AMBA component.

**Note**

AMBA Designer only supports absolute paths.

### Generated Design Permissions

This field enables you to apply file protection bits, and optionally, assign a default group. The tools use these settings each time you generate new RTL for a component or system. The field provides a summary of the permissions for the following categories:

- User.
- Group.
- Other.

It also shows the name of the user group. To change these permissions, click **Set...**. This opens the AMBA Designer - Generated Design File Permissions dialog box. See Figure 7-3.

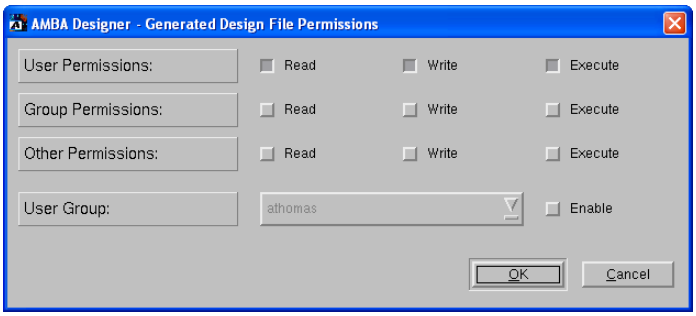



**Figure 7-3 Generated Design File Permissions dialog box**

Use this dialog box to change:

- The permissions for each of the categories.
- The user group. You can select this from the drop-down list.

**Note**

- The Linux OS restricts the list of groups available to those groups that you, the current user, are subscribed to.
- These settings only apply to newly-generated IP. If you change these settings between sessions for RTL generation, the tools do not apply them retrospectively.

**Generated Design Logfile**

The path to the location of the generated logfile. To enable this option, select the check box, and specify the path to the location where the log files are to be stored.

**Note**

AMBA Designer only supports absolute paths.

### 7.3.1 See also

**Tasks**

- *Setting general IP-XACT preferences* on page 7-4.

## 7.4 Files and directories used by AMBA Designer

Table 7-1 shows the files and directories used by AMBA Designer.

**Table 7-1 Files and directories used by AMBA Designer**

| Name | Description | Setting | Default location |
|---|---|---|---|
| AMBA_Designer_Prefs.ini | AMBA Designer preferences file | *AMBA Designer Preferences dialog* on page 7-2 | /home/*<user>*/.ARM/AMBA_Designer/*3.0* |
| .conf | AMBA Designer component library | *Adding a Component Library .conf file to the preferences* on page 11-7 | Default Component Library: $home/*<user>*/.ARM/AMBA_Designer/*3.0*/AMBA_Designer_MaxLib.conf<br>You define the location of the other .conf files. |
| | Files generated during stitching | *Stitching parameters* on page 6-14 | /home/*<user>*/.ARM/AMBA_Designer/3.0/Designs/<SysName_RTL> |
| .xml | Configuration file for batch configuration and RTL generation | • *Creating a configuration file for AMBA 2 or AMBA 3 components* on page 3-9<br>• *Saving a batch configuration XML file for AMBA 4 components* on page 4-6 | You define the location when you save the XML file. |
| .adg | Project file for a stitched system | - | You define the location when you save the project file. |
| .xml | IP-XACT file for the stitched system | *Stitching parameters* on page 6-14 | /home/*<user>*/.ARM/AMBA_Designer/3.0/Designs/<component_name>_RTL/logical/<component_name>/ipxact |
| .vc | Output VC Verilog file.[a] | | /home/*<user>*/.ARM/AMBA_Designer/3.0/<SysName_RTL>/logical/<SysName>/verilog |
| *<SysName>*_config | Directory into which AMBA Designer exports configuration files and a render.csh file for the <SysName> system | | You define the location before stitching the system in AMBA Designer.<br>For instructions, see *Stitching parameters* on page 6-14. |
| render.csh | Script generated by AMBA Designer. You can use it to recreate the stitched system | | When stitching export is enabled, AMBA Designer creates this script while it creates and populates *<SysName>*_config with configuration files during stitching. |

a. More than one VC Verilog file is created for interconnects.

### 7.4.1 See also

**Tasks**

- *Setting general IP-XACT preferences* on page 7-4.

## 7.5 Changing the permissions of generated files

**Note**

- The Linux OS restricts the list of groups available to those groups that you, the current user, are subscribed to.
- These settings only apply to newly-generated IP. If you change these settings between sessions for RTL generation, the tools do not apply them retrospectively.

1. Select **File → Preferences...**.

   This opens the AMBA Designer Preferences dialog box.

2. To change these permissions, for the files that AMBA Designer generates, click **General → Design Preferences → Generated Design Permissions → Set...**.

   This opens the AMBA Designer - Generated Design File Permissions dialog box. See Figure 7-4.

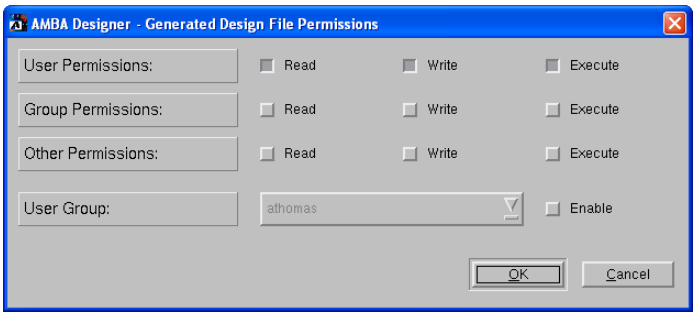



**Figure 7-4 Generated Design File Permissions dialog box**

   Use this dialog box to change:
   - The permissions for each of the categories.
   - The user group. You can select this from the drop-down list.

   Change the appropriate items in the right-hand pane and then click **OK**.

3. Click **OK** to save the changes in the preferences.

### 7.5.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5.

**Reference**

- *AMBA Designer Canvas overview* on page 8-2.

## 7.6 Enabling logging

1. Select **File → Preferences...**.

   This opens the AMBA Designer Preferences dialog box.

2. To change these permissions, for the files that AMBA Designer generates, click **General → Design Preferences → Generated Design Log File**. and select the **Enabled** option.

3. Click **Browse...**, navigate to the location where you want to store the log files, and click **Save**.

4. Click **OK** to save the changes in the preferences.

### 7.6.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5.

**Reference**

- *AMBA Designer Canvas overview* on page 8-2.

# Chapter 8
# AMBA Designer Canvas Reference

This chapter describes the AMBA Designer Canvas reference. It contains the following sections:

## 8.1 AMBA Designer Canvas overview

AMBA Designer Canvas is a graphical application that you can use to create new systems and load and modify existing systems. A system can consist of connected components and existing systems. You create and edit systems using the Canvas interface. This interface shows the components, ports, and connections between the ports. You can add external ports for a system, and add labels to annotate the diagram. Figure 8-1 shows the main Canvas window.

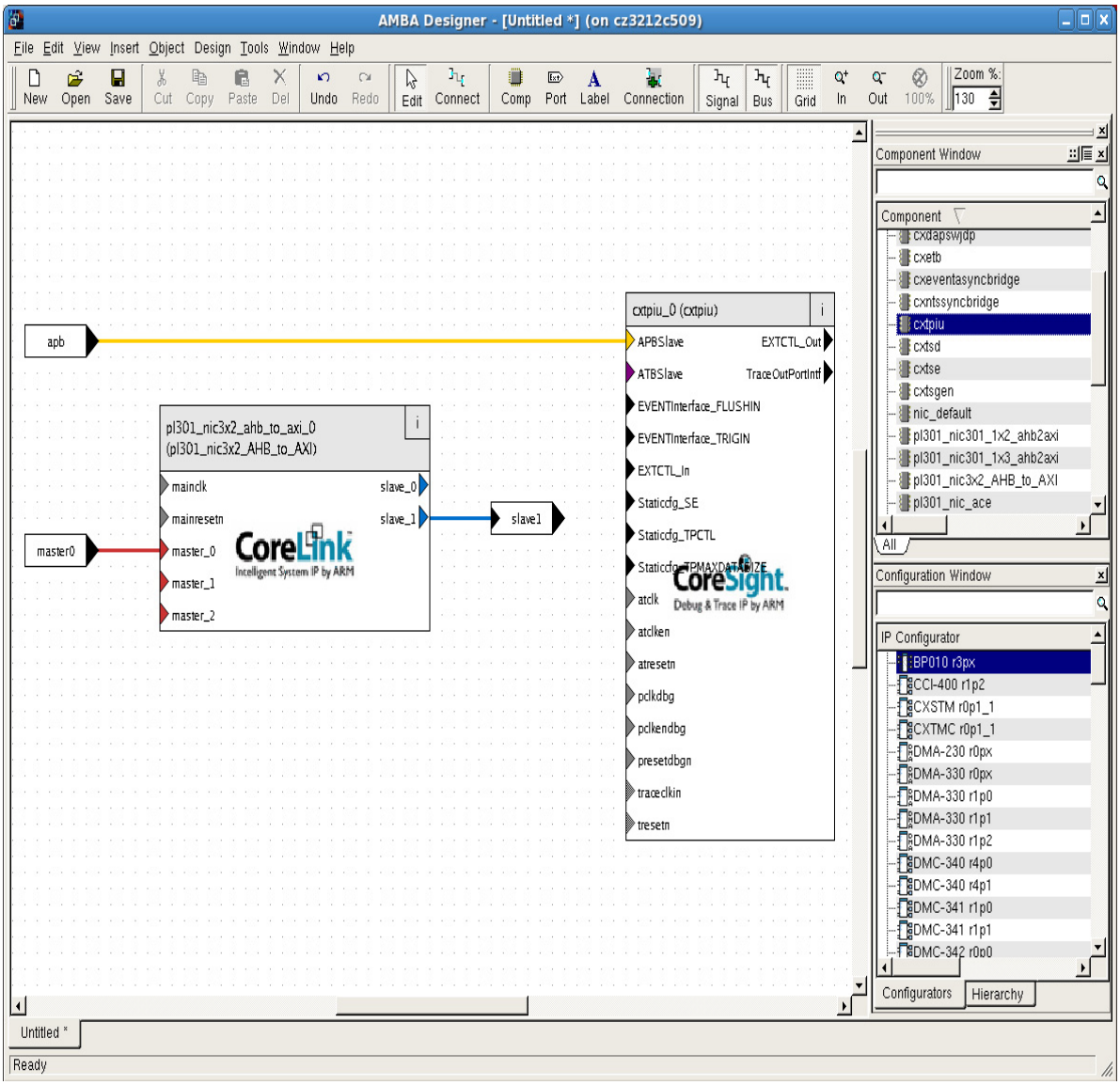



**Figure 8-1 Combined Canvas window**

You can select the windows that appear. Not all windows appear in the default view.

Table 8-1 shows the main parts of the GUI.

**Table 8-1 User interface elements**

| Element | Description | Undockable |
|---|---|---|
| Title bar | The title bar of the application window contains the name of the application, the name of the current system being edited, and the state of the project. If you modified the system and did not yet save it, an asterisk is displayed to the right of the system name. | No |
| Main menu | The main menu presents commands with their corresponding keyboard shortcuts. | No |
| Toolbar | The toolbar contains buttons for frequently-used features. | No |
| Component Window | This window contains a list of all the components available for use in your system.<br>You can:<br>• View the components as a list or as icons.<br>• Add tabs to show only certain components by filtering them by type.<br>• Enter text in its search box, to find specific components. | No |
| Configuration Window | This window contains tabs for AMBA component configurators and the design hierarchy of the components and external ports in the current system. You can enter text in its search box, to find configurators and hierarchies. | No |
| Parameter Window | This window contains all the parameters of the selected component.<br>**Note**<br>This applies only to legacy components. This window does not display IP-XACT component parameters. | No |
| Diagram Window | This window contains a graphical representation of the system. If the system is small, the window can display the entire system. For large systems, the view is of a small portion of the total system. There is no limit to the size of the system other than the limits imposed by the operating system or computer hardware.<br>The Diagram Window behaves in a similar way to a block diagram editor, or flow-charting tool. Use this window to:<br>• Place components.<br>• Place external ports.<br>• Connect the objects together.<br>Figure 8-1 on page 8-2 shows a Diagram Window containing an example system. | No |
| Output Window | This window appears below the Diagram Window and displays system console output and system check information.<br>The Output Window displays system console output and system check information. | Yes |
| Status bar | The status bar displays information about menu items, commands, buttons, and components.<br>If you:<br>• Select a menu on the menu bar and use the up and down keys to select a menu item, Canvas displays a short description of what the action does in the status bar.<br>• Place the cursor over a toolbar button, Canvas displays a short description of the button action in the status bar.<br>• Place the cursor over a component in the Diagram Window, the status bar shows the instance name, the component name, and the type of component. | No |

**Table 8-1 User interface elements (continued)**

| Element | Description | Undockable |
|---|---|---|
| Master Output Window | This window shows the complete system console output and system check information from the start of a session. | No |
| Tools Window | The Component Window, AMBA Configuration Window, and Parameter Window comprise the tools window. See Figure 8-1 on page 8-2. | Yes |
| Projects tab | The tabs below the Diagram Window list the projects that are currently loaded. If only one project is open, only one tab is displayed. Clicking on a tab displays the Diagram Window and Tools Window for that project. | No |
| Context-sensitive menus | When you right-click in the Diagram Window, a context-sensitive menu appears. The menu depends on what you have selected before you right-click:<br>• If you have not selected a component, the general context-sensitive menu appears. The entries duplicate the functionality of the main menus.<br>• If you have selected a component, the component context-sensitive menu appears. | No |

### 8.1.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5.
- *Customizing the tabs in the Component Window* on page 11-3.

**Reference**

- *AMBA Designer batch mode for component configuration* on page 1-7.
- *Mouse cursors, tool tips, and status information* on page 8-7.
- *AMBA Designer Canvas shortcuts* on page 8-9.
- *Launch parameters for AMBA Designer Canvas* on page 9-2.

## 8.2 Working in the Design Window

**Moving the view port in the Design Window**

1. Change to Edit mode
2. Press and hold Ctrl and move the view port with the mouse within the system diagram.

The limits to the movement are the same as the limits for the scroll bars.

**Zooming** You can zoom the diagram in or out within the range of 10%-500%. When zooming out, the contents of the components change as the size of the components become smaller. Canvas attempts to display the most important information about objects when zooming out. You can hover the mouse cursor over an object to display its name in the status bar.

To access the zoom feature, press Shift+Ctrl, and use the left or right mouse buttons to zoom in or out.

**Selecting objects**

- To select a single object, left-click the object in the Diagram Window.
- To select multiple objects, make selections while holding down Ctrl.

  You can also use the lasso feature to select several objects. Click and drag the mouse to select all objects within the lasso rectangle. Canvas includes any object that is partially contained within the bounding rectangle in your selection.
- To select all objects, select **Edit → Select All** or lasso the entire system.
- To clear the selection list, click in the background area of the Diagram Window.
- To remove a single object from the selection list, hold down Ctrl, and left-click the object.

**Drag-and-drop**

Drag-and-drop is supported for components in the Component Window.

**Change display options**

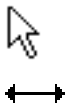
You can disable the display of the object type, port list, and subcomponent list in the Canvas preferences settings:

- General appearance.
- Canvas appearance.

## 8.3 AMBA Designer Canvas modes

AMBA Designer operates in the modes that Table 8-2 shows.

**Table 8-2 AMBA Designer Canvas modes**

| Cursors | Mode | Description |
|---|---|---|
|  | Edit | For normal editing, for example, for adding, moving, cutting, copying, pasting, and deleting |
|  | Movement | For moving system components around within the Diagram Window using the mouse |
| - | Connect | For connecting ports of components and external ports |

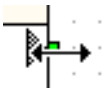
The cursor appearance changes to indicate the mode. In Connect Mode for example, moving the cursor over a valid connection port outlines the port in a green shaded pattern, and the cursor changes to the connect icon.

To exit Connect Mode and return to Edit Mode, press Esc. To temporarily enter Connect Mode while in Edit Mode, hold down Shift, with no component selected, and make a connection.

## 8.4 Mouse cursors, tool tips, and status information

Table 8-3 shows all the cursors that the Diagram Window uses. The cursor column shows what the actual cursor looks like. The typical usage column shows how the cursor looks in typical use.

**Table 8-3 Mouse cursors**

| Cursor | Typical usage | Description |
|---|---|---|
|  | - | This is the standard selection cursor. Moving this cursor over an object and clicking on the object selects that object. You can also use this cursor to lasso multiple objects. |
|  |  | This is the drag-and-drop cursor. If the component is in the Diagram Window, Canvas displays the object under the cursor. |
|  | - | This is the cursor for movement mode. |
|  |  | This is the general cursor for actions that are invalid or not applicable. |
|  |  | This is one of the eight resize cursors. There is one cursor for each of the compass points and corners. |
|  |  | This is the cursor for selecting ports. Clicking on a port of a component selects that port and deselects all other ports. |
|  |  | This is the start connection cursor. If in connection mode, before you start a connection, this cursor appears when over a valid port. |
|  |  | This is the end connection cursor. When you have started a connection and not yet completed it, this cursor appears over a valid end port. |
|  |  | This cursor appears when you move a connection end point. This cursor appears when you select and place items. |
|  |  | This is the move connection line cursor. This cursor appears when you select points and manually place them. |

Canvas displays the standard tool tips and status information in the Status Bar whenever you select a menu item using the up-down keys, or hover the cursor over a toolbar button. Hovering the cursor over an object in the Diagram Window displays information in the Status Bar.

### 8.4.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5.

**Reference**

- *AMBA Designer Canvas overview* on page 8-2.
- *AMBA Designer Canvas shortcuts* on page 8-9.

## 8.5 AMBA Designer Canvas shortcuts

Table 8-4 shows the keyboard shortcuts for AMBA Designer Canvas.

**Table 8-4 AMBA Designer Canvas shortcuts**

| Key | Action |
|---|---|
| Ctrl+N | **File → New** |
| Ctrl+O | **File → Open** |
| Ctrl+S | **File → Save** |
| Ctrl+F4 | **File → Close** |
| Ctrl+P | **File → Print** |
| Ctrl+Q | **File → Exit** |
| Ctrl+Z | **Edit → Undo** |
| Ctrl+Y | **Edit → Redo** |
| Ctrl+X | **Edit → Cut** |
| Ctrl+C | **Edit → Copy** |
| Ctrl+V | **Edit → Paste** |
| Ctrl+D | **Edit → Duplicate** |
| Del | **Edit → Delete** |
| Ctrl+A | **Edit → Select All** |
| Ctrl+Shift+S | **Edit → Edit Mode** |
| Ctrl+Shift+C | **Edit → Connect Ports Mode** |
| Ctrl+G | **View → Grid** |
| Ctr + + | **View → Zoom In** |
| Ctrl + – | **View → Zoom Out** |
| Ctrl+1 | **View → Set Zoom to 100%** |
| Ctrl+F | **View → Zoom to Fit** |
| Ctrl+R | **View → Center on Selected Object(s)** |
| Ctrl+I | **View → Center Diagram** |
| Ctrl + Page Down | **Window → Next Window** |
| Ctrl + Page Up | **Window → Previous Window** |
| F1 | **Help → AMBA Designer (ADR-400) User Guide** |

### 8.5.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5.

**Reference**

- *Mouse cursors, tool tips, and status information* on page 8-7.

## 8.6 Setting drawing preferences in AMBA Designer Canvas

1. Select **File → Preferences...**.

   This opens the AMBA Designer Preferences dialog box.

2. Select **Canvas → Diagram** in the left-hand pane to set the following:

   **Grid options**

   Visibility, snapping to grid, grid spacing.

   **Draw Diagram with Color**

   Force Canvas to draw the diagram using only black, gray, and white.

   **Auto arrange ports when resizing component**

   Set the tool to move ports automatically if the component is made smaller. Ports move back to their original positions when the component is made larger.

   **Select Background Color...**

   Change the default white background to some other color.

## 8.7 Customizing the appearance of AMBA Designer Canvas

1. Select **File → Preferences...**.
   This opens the AMBA Designer Preferences dialog box.
2. Select **General** in the left-hand pane to set the following:
   - Tooltip visibility.
   - Status bar visibility.
   - Splash screen visibility.
   - Last Visited Directory for Open/Save.

   Click **General → Appearance** in the left-hand pane to set the following:
   - Tool Bar options (icon size and text labels).
   - Font settings.
3. Change the appropriate items in the right-hand pane and then click **OK**.

### 8.7.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5
- *Changing the permissions of generated files* on page 7-9.
- *Customizing the tabs in the Component Window* on page 11-3

**Reference**

- *AMBA Designer Canvas overview* on page 8-2.

## 8.8 Clearing recent file history list in AMBA Designer Canvas

**Note**

You cannot cancel this operation after you have clicked **Clear Recent File History List**.

1. Launch the preferences dialog.
2. Click **Clear Recent File History List** to clear the recent file list that appears under the main File menu.

### 8.8.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5.

**Reference**

- *Changing the permissions of generated files* on page 7-9.
- *AMBA Designer Canvas overview* on page 8-2.

# Chapter 9
# AMBA Designer Command Line Reference

This chapter describes the AMBA Designer command line options. It contains the following sections:

## 9.1 Launch parameters for AMBA Designer Canvas

Table 9-1 shows the available command line options for AMBA Designer Canvas.

**Table 9-1 Command line options for AMBA Designer Canvas**

| Option | Example usage | Description |
|---|---|---|
| `--background color` | `adcanvas --background 8000` | Set the default background color and an application palette. Light and dark shades are calculated based on the new palette. |
| `--button color` | `adcanvas --button 8000` | Set the default button color. |
| `--cmap` | `adcanvas --cmap` | Install a private color map on an 8-bit display. |
| `--display display_option` | `adcanvas --display $DISPLAY` | Set the X display. The default is `$DISPLAY`. |
| `--font new_font` | `adcanvas --font arial` | Set the application font. |
| `--foreground color` | `adcanvas --foreground 8000` | Set the default foreground color. |
| `--geometry new_geometry` | `adcanvas --geometry new_geometry` | Set the client geometry of the main window. |
| `--maxlib component library` | `adcanvas --maxlib mymaxlib.conf` | Start Canvas with the specified library file loaded. |
| `--ncols count` | `adcanvas --ncols 216` | Limit the number of colors allocated in the color cube on an 8-bit display. If the count is 216, a 6×6×6 color cube is used, that is, six levels of red, blue, and green. For other values, the system uses a cube approximately proportional to a 2×3×1. |
| `--visual Truecolor` | `adcanvas --visual Truecolor` | Force the application to use TrueColor on an 8-bit display. |
| `-n`, `--nomaxlib` | `adcanvas --nomaxlib`<br>`adcanvas -n` | Start Canvas without loading any components. |
| `<file>.adg` | `adcanvas mySystem.adg` | Start Canvas with the specified file open. The specified file must be a `*.adg` file. |

### 9.1.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5.

## 9.2 AMBA Designer batch mode commands

Table 9-2 shows the available batch mode command line options for AMBA Designer Canvas.

**Table 9-2 Command line options for AMBA Designer in batch mode**

| Option | Example usage | Description |
|---|---|---|
| `-b` | `adcanvas -b <file>.xml -<product> [options]` | Start Canvas in batch mode.<br>*product* is the product code for an AMBA component. See the *ARM® AMBA® Designer ADR-400 Release Note* for the list of product codes. |
| `-copyfiles` | `adcanvas -b <file>.xml -<product> [-copyfiles]` | Copy the files that are not configuration-dependent into the destination directory of the IP. |
| `-gen`, `-generate` | `adcanvas -b <file>.xml -<product> [-gen]` | Generate RTL only. |
| `-all` | `adcanvas -b <file>.xml -<product> [-all]` | Generate RTL, simulate, and synthesize. This is the default behavior. |
| `--addcomp` | `adcanvas --addcomp <file>.xml [--loc user\|central]` | Add a configured IP-XACT component to the default Component Library, `~/.ARM/AMBA_Designer/3.0/AMBA_Designer_MaxLib.conf`.<br>If you use the `--loc` optional option:<br>• With `user` option specified, then the configured IP-XACT component is added to the default component library: `~/.ARM/AMBA_Designer/3.0/AMBA_Designer_MaxLib.conf`.<br>• With `central` option specified, then the configured IP-XACT component is added to: `$AD_HOME/ADCL/etc/all_conf_files.adcl`. |
| `--addconfigurator` | `adcanvas --addconfigurator <file>.xml [--loc user\|central]` | • Add the IP-XACT configurator of a component to `$AD_HOME/ADCL/etc/all_conf_files.adcl`.<br>If you use the `--loc` optional option:<br>— With `user` option specified, then the IP-XACT configurator of a component is added to the default component library: `~/.ARM/AMBA_Designer/3.0/AMBA_Designer_MaxLib.conf`.<br>— With `central` option specified, then the IP-XACT configurator of a component is added to: `$AD_HOME/ADCL/etc/all_conf_files.adcl`.<br>• Add a symbolic link to the IP-XACT file of the component in `$AD_HOME/AMBADesigner/etc/ip_links`. |
| `--removecomp` | `adcanvas --removecomp <file>.xml [--loc user\|central]` | Remove a configured IP-XACT component from the default Component Library, `~/.ARM/AMBA_Designer/3.0/AMBA_Designer_MaxLib.conf`.<br>If you use the `--loc` optional option:<br>• With `user` option specified, then the configured IP-XACT component is removed from the default component library: `~/.ARM/AMBA_Designer/3.0/AMBA_Designer_MaxLib.conf`.<br>• With `central` option specified, then the configured IP-XACT component is removed from: `$AD_HOME/ADCL/etc/all_conf_files.adcl`. |

**Table 9-2 Command line options for AMBA Designer in batch mode (continued)**

| Option | Example usage | Description |
|---|---|---|
| `--removeconfigurator` | `adcanvas --removeconfigurator <file>.xml [--loc user\|central]` | • Remove the IP-XACT configurator of a component from `$AD_HOME/ADCL/etc/all_conf_files.adcl`.<br>If you use the `--loc` optional option:<br>— With `user` option specified, then the IP-XACT configurator of a component is removed from the default component library: `~/.ARM/AMBA_Designer/3.0/AMBA_Designer_MaxLib.conf`.<br>— With `central` option specified, then the IP-XACT configurator of a component is removed from: `$AD_HOME/ADCL/etc/all_conf_files.adcl`.<br>• Remove the symbolic link to the IP-XACT file of the component from `$AD_HOME/AMBADesigner/etc/ip_links`. |
| AMBA 2 or AMBA 3 components, bus matrices or network interconnects | | |
| `-sim`, `-simulate` | `adcanvas -b <file>.xml -<product> [-sim]` | Generate RTL and simulate. |
| `-syn`, `-synth`, `-synthesise` | `adcanvas -b <file>.xml -<product> [-syn]` | Generate RTL and synthesize. |
| `-ovl`, `-noovl` | `adcanvas -b <file>.xml -<product> [-ovl]` | Enable or disable OVL assertions during simulation.<br>The default is to use predefined preferences. |
| `-lec`, `-nolec` | `adcanvas -b <file>.xml -<product> [-lec]` | Enable or disable LEC of synthesized netlist against RTL.<br>The default is to use predefined preferences. |
| AMBA 4 components | | |
| `-gen -phase` | `adcanvas -b <file>.xml -<product> -gen -phase <num>` | Call a specific generator for an IP based on the phase number.<br>See *Finding out the phase number of a generator for an AMBA 4 component* on page 4-7 for the simulator options. |
| Stitched systems | | |
| `render.csh` | `render.csh <directory>` | Recreate a stitches system for which configuration files had been exported into `<directory>`.<br>See *Recreating a stitched system from exported configuration files* on page 6-16. |

## 9.2.1 See also

**Tasks**

- *Starting AMBA Designer Canvas* on page 1-5.
- *Finding out the phase number of a generator for an AMBA 4 component* on page 4-7.

# Chapter 10
# Components, Ports, and Connections

This chapter describes the objects in AMBA Designer and what you can do with them. It contains the following sections:

## 10.1 Component instances

Figure 10-1shows a component instance as it appears in the Diagram Window.

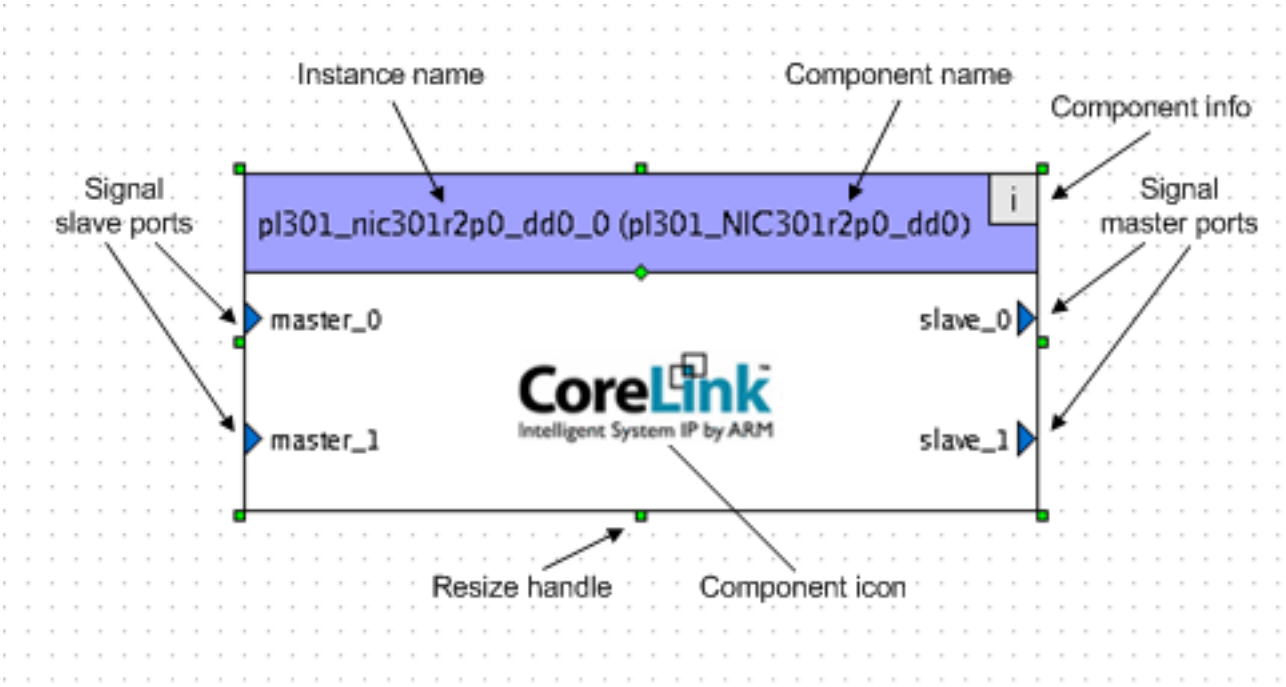



**Figure 10-1 Component description**

The title bar shows the instance name of the component and the component name in parentheses.

**component**

The object visible in the Component Window, a configuration for an IP bundle.

**component instance**

The object visible on the Canvas. You connect this component instance to instances of other components, for example to stitch them together into an AMBA-compliant system with IP-XACT stitching.

### 10.1.1 See also

**Tasks**

- *Viewing the IP-XACT properties of a component* on page 10-3.
- *Viewing and editing the IP-XACT model parameters of a component instance* on page 10-4.

**Reference**

- *Component ports* on page 10-6.
- *External ports* on page 10-11.
- *Connections in a system* on page 10-12.

## 10.2 Viewing the IP-XACT properties of a component

You can inspect the IP-XACT properties of a configured component in AMBA Designer:

1. Right-click the component in the Component Window and select **IP-XACT Properties...**.
2. Use the following tabs to inspect the IP-XACT parameter settings:

   **Bus Interfaces**

   Generic properties and bus signals for each bus.

   **Parameters**

   Top-level or component IP-XACT parameters.

   **Note**

   You cannot modify these parameters from the **IP-XACT Properties** dialog. If you require different top-level parameters, you must reconfigure the component or create a new component configuration.

   **Signals** Signal name, direction, left and right connection widths, the export state, and whether the signal is assigned to a bus interface.

   Check the **Show Unassigned Signals Only** option to show unassigned signals only in the dialog box.
3. Click **OK** to close the dialog.

### 10.2.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Configuring an AMBA 2 or AMBA 3 component from an XML configuration file* on page 3-11.
- *Reconfiguring an AMBA 2 or AMBA 3 component* on page 3-13.
- *Configuring an AMBA 4 component and generating RTL for it* on page 4-2.
- *Reconfiguring an AMBA 4 component* on page 4-9.
- *Setting general IP-XACT preferences* on page 7-4.
- *Viewing and editing the IP-XACT model parameters of a component instance* on page 10-4.

**Reference**

- *Adding a component to the Component Library from an IP-XACT XML file* on page 11-4.

## 10.3 Viewing and editing the IP-XACT model parameters of a component instance

You can inspect and edit the IP-XACT properties of a component instance in AMBA Designer.

1. Right-click the component in the Canvas and select **Component IP-XACT Properties...**.
2. Use the tabs to inspect the IP-XACT parameter settings:

   **Bus Interfaces**

   Generic properties and bus signals for each bus.

   **Model Params**

   These are IP-XACT parameters that AMBA Designer translates directly to Verilog parameters.

   You can modify these parameters from the Canvas.

   **Note**

   Modifying model parameters is an advanced feature to override the default IP-XACT model parameters for one instance of the component. Depending on the component, you can safely modify some model parameters in this dialog for instantiation. However, other model parameters require that you reconfigure and rerender the component. Make sure that you thoroughly understand the IP-XACT file of the component before you modify model parameters for an instance.

   **Signals** Signal name, direction, left and right connection widths, the export state, and whether the signal is assigned to a bus interface.

   Check the **Show Unassigned Signals Only** option to show unassigned signals only in the dialog box.
3. Use the tabs to inspect the IP-XACT parameter settings.
4. If changes are required to a model parameter:
   a. Select the **Model Params** tab.
   b. Select the parameter from the list, and click the **Edit (advanced)** button.
   c. Enter the new parameter value and click **OK**.
5. Click **OK** to save the changes and to close the **IP-XACT Properties** dialog.

### 10.3.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Configuring an AMBA 2 or AMBA 3 component from an XML configuration file* on page 3-11.
- *Reconfiguring an AMBA 2 or AMBA 3 component* on page 3-13.
- *Configuring an AMBA 4 component and generating RTL for it* on page 4-2.
- *Reconfiguring an AMBA 4 component* on page 4-9.
- *Setting general IP-XACT preferences* on page 7-4.
- *Viewing the IP-XACT properties of a component* on page 10-3.

**Reference**

- *Stitching* on page 6-12.
- *Stitching parameters* on page 6-14.
- *Adding a component to the Component Library from an IP-XACT XML file* on page 11-4.

## 10.4 Viewing the hierarchical structure of a component

1. Drag the component from the Component Window to the Diagram Window.
2. Click the **Hierarchy** tab in the Configuration Window.

   The component is displayed as the root node of the tree and the tree includes all its components and external ports. For an example, see Figure 10-2.

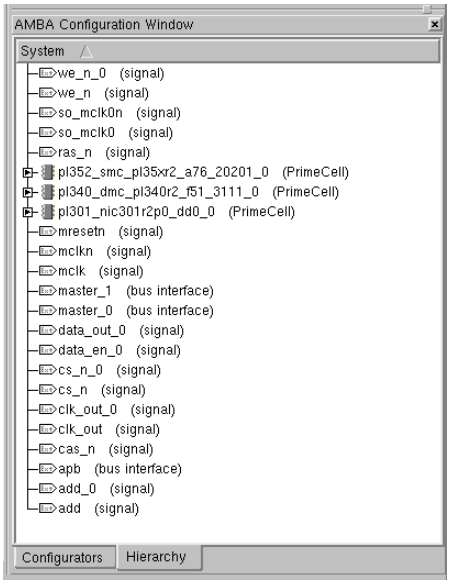



**Figure 10-2 Hierarchy tab**

3. You can also navigate in the component as it is visible in the Diagram Window from the element tree in the **Hierarchy** tab:
   - Left-click an object in the **Hierarchy** tab to highlight and center the object in the Diagram Window for easy location.
   - Right-click an object in the **Hierarchy** tab to display a context-sensitive menu containing command options specific to the object type.

## 10.5 Component ports

**Note**

AMBA Designer does not support IP-XACT Phantom ports.

AMBA Designer supports the following port types:

**Bus interface** Solid colors.

**Signal** Shaded colors.

Ports can be master or slave ports. Master bus interface ports always point out of the component, output ports, and slave interface bus ports always point into the component, input ports.

Figure 10-3 shows an example for each component port type as a master and a slave, respectively.

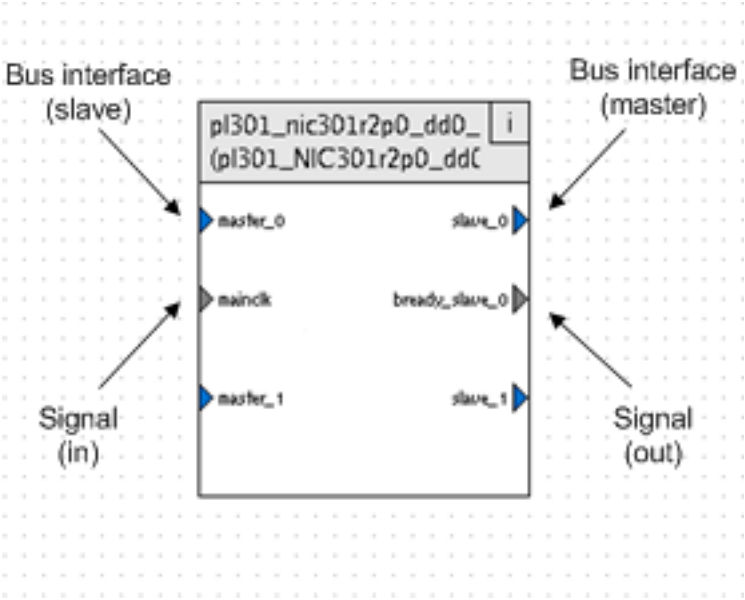



**Figure 10-3 Component port types**

You can move component ports around the edges of the component.

Table 10-1 lists the color scheme that the Canvas uses for component ports.

**Table 10-1 Port colors**

| Color | Component type or visibility in the Canvas |
|---|---|
| Yellow | APB |
| Dark cyan | AXI3 |
| Green | AXI4 |
| Cyan | ACE |
| Magenta | ACE-Lite |
| Dark magenta | ATB |

**Table 10-1 Port colors (continued)**

| Color | Component type or visibility in the Canvas |
|---|---|
| Dark green | Unhidden disabled port |
| Light green | Tied-off input port |
| Black | General port color that AMBA Designer uses if there is no color reserved for the type or status |

### 10.5.1 See also

**Tasks**

- *Creating external ports* on page 6-3.
- *Connecting components* on page 6-4.
- *Changing a full-width connection to a bit-slice connection* on page 6-9.
- *Tying off input ports* on page 6-11.
- *Stitching* on page 6-12.
- *Hiding and unhiding signal or bus connections in a design* on page 10-13.

## 10.6 Enabling and disabling ports

In some cases, you might not use certain ports, or you might not require connections to certain ports. Because the tools check that all ports are connected, these ports cause an error or warning message.

- To change the status of a port, right-click it in the Diagram View, and then select **Enable/Disable Port**.
- To disable all unconnected ports in the component, right-click an empty area of the component, and then select **Disable All Unconnected Ports**.

AMBA Designer Canvas grays out disabled ports.

### 10.6.1 See also

**Tasks**

- *Creating external ports* on page 6-3.
- *Connecting components* on page 6-4.
- *Changing a full-width connection to a bit-slice connection* on page 6-9.
- *Tying off input ports* on page 6-11.
- *Stitching* on page 6-12.
- *Hiding and unhiding signal or bus connections in a design* on page 10-13.

## 10.7 Hidden component ports

Hidden ports are unused ports that are not visible in the Canvas by default. For example, all signals that are part of a component bus interface are hidden.

You can use, connect, and tie off such signals in an ad-hoc manner by first unhiding the required signal port, and then using the normal connection and tie-off methods. Unhidden ports are solid dark grey in the Canvas.

Hidden component ports are invisible in the Canvas by default. You can unhide them so that they appear in the component outline

### 10.7.1 See also

**Tasks**

- *Creating external ports* on page 6-3.
- *Connecting components* on page 6-4.
- *Changing a full-width connection to a bit-slice connection* on page 6-9.
- *Tying off input ports* on page 6-11.
- *Stitching* on page 6-12.
- *Hiding and unhiding signal or bus connections in a design* on page 10-13.

## 10.8 Hiding and unhiding ports

Restrictions:

- If a component has both a bus interface and a signal with the same name, then you cannot unhide the signal to show it on the Canvas for use as an ad-hoc connection.
- Hidden ports are not made visible when connections are made visible, see *Hiding and unhiding signal or bus connections in a design* on page 10-13.
- If you unhide a single physical port that is mapped to multiple bus interfaces in a component IP-XACT file, the component that represents this IP-XACT file in the Canvas shows the physical port mapped to the first bus interface and displays the physical port only once.

Hiding ports:

- To hide a port, right-click it the Design View and select **Hide Port**.
- To hide all disabled ports, right-click an empty area in the component and select **Hide All Disabled Ports**.

Revealing hidden ports:

- To reveal a port, right-click an empty area in the component, select **Unhide Port**, select the port from the list, and then click **OK**.

### 10.8.1 See also

**Tasks**

- *Creating external ports* on page 6-3.
- *Connecting components* on page 6-4.
- *Changing a full-width connection to a bit-slice connection* on page 6-9.
- *Tying off input ports* on page 6-11.
- *Stitching* on page 6-12.
- *Hiding and unhiding signal or bus connections in a design* on page 10-13.

## 10.9 External ports

External ports connect hierarchical systems. A system that you intend to instantiate within a higher-level system must have external ports. A top-level system or a flat system typically does not have external ports.

When you instantiate a stitched system as a component, each external port appears as a port.

### 10.9.1 See also

**Tasks**

- *Creating external ports* on page 6-3.

## 10.10 Connections in a system

AMBA Designer supports the following connection types:

- Bus connections.
- Signal connections, also called ad-hoc connections.

You can convert full-width, bit-wide, connections to bit-slice connections.

*Rules that apply to connections of signal ports*:

If the unhidden port is a signal that is part of a bus interface, the following rules control how the connections are shown in the Canvas:

- If the port is left unconnected, but the bus interface is connected, the signal is connected according to the original bus interface connection.
- If the port is connected through an ad-hoc connection, the resulting Verilog code connects the signal first according to this new connection, and then the original bus interface connection.
- If the port is tied-off, the new tie-off takes precedence over the original bus interface connection and the resulting Verilog code ties off the signal.

### 10.10.1 See also

**Tasks**

- *Changing a full-width connection to a bit-slice connection* on page 6-9.
- *Hiding and unhiding signal or bus connections in a design* on page 10-13.

## 10.11 Hiding and unhiding signal or bus connections in a design

You can hide and unhide component ports and connections in the active project in the Diagram Window.

Hiding and revealing connections:

- To change the visibility all signal ports and signal connections, click the toggle button **Signal** in the main toolbar.
- To change the visibility of all bus ports and bus connections, click the toggle button **Bus** in the main toolbar.

# Chapter 11
# AMBA Designer Component Library

This chapter describes the Component Library and describes how to manage it in the AMBA Designer Canvas. It contains the following sections:

## 11.1 Setting Component Library preferences

1. Open the General area of the AMBA Designer Preferences dialog box.
2. Specify where the tool searches for the Component Library files. AMBA Designer uses the components in these files to fill the list in the Component Window. You can choose from the following options:
   - Use current directory. This is the directory in which AMBA Designer starts. This is the default setting.
   - Use the specified directory.
   - Use the location of the current AMBA Designer project, `*.adg`, file for the working directory.
3. If you changed the preferences, refresh the Component Window:
   a. Select **File** → **Close** from the menu.
   b. Right-click on the background of the Component Window and select **Refresh Component List**.
   c. To reopen the updated component, drag it from the Component Window onto the Canvas.

**Note**

The system diagrams that are currently open are not updated automatically. You must close and reload affected systems to see changes in the Component Library components.

### 11.1.1 See also

**Tasks**

- *Adding a component to the Component Library from an IP-XACT XML file* on page 11-4.
- *Adding a Component Library .conf file to the preferences* on page 11-7.

## 11.2 Customizing the tabs in the Component Window

You can configure the Component Window tabs to organize the components.

**Note**

You cannot edit or delete the **All** tab. You can disable the **All** tab, and any custom tab, so that they do not appear in the Component Window, by unchecking them in the Window Tabs panel.

1. Right-click the background of the Component Window, or next to the tabs, and select **Manage Tabs...**.

   The Component Window Tab Manager dialog box appears. See Figure 11-1.

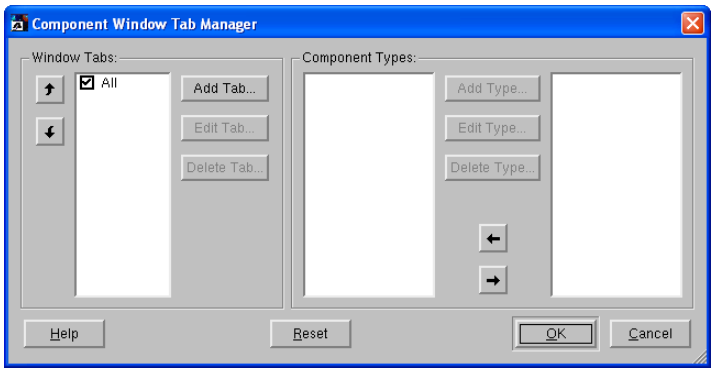



**Figure 11-1 Component Window Tab Manager**

2. Add or remove tabs, or change their order as necessary.

   Click **Reset** to set the component tabs back to their original configuration. If you have added custom tabs, **Reset** disables them without deleting them.

3. Click **OK** to finalize the changes.

## 11.3 Adding a component to the Component Library from an IP-XACT XML file

If you have a configured ARM IP-XACT XML component file, you can use the component in AMBA Designer by adding it to the Component Library.

**Note**

AMBA Designer only supports adding configured ARM IP-XACT components to the Component Library.

1. Start the Component Library Repository Wizard from **Tools → Add IP-XACT Component to Component Library...**.
2. Enter or browse to the directory where the IP-XACT (`xml`) source for the component is located and click **Next** to display the next dialog box in the Wizard. Select the Component Library Repository to add the component to. You can choose to enter either the absolute or relative path to the Component Library Repository location or click **Browse** to locate it.
3. Click **Next** to display the next dialog box in the Wizard. This provides a summary of the source and destination to be used.
4. If the information is correct, click **Finish** to add the IP-XACT component to the Component Library. If it is necessary to change any entries, click **Back** to display the required dialog box. You can cancel the Wizard at any time by clicking **Cancel** in any of the dialog boxes.

   **Note**

   If the destination is a new Component Library, you are given the option to add the library to your preferences.

### 11.3.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Generating RTL for an AMBA 2 or an AMBA 3 component* on page 3-6.
- *Setting general IP-XACT preferences* on page 7-4.
- *Adding a component to the default Component Library from the command line* on page 11-5.

**Reference**

- For specific configuration information for your chosen component, see the relevant *Supplement* document to the *ARM® AMBA® Designer User Guide*.

## 11.4 Adding a component to the default Component Library from the command line

If you have an ARM IP-XACT XML component file, you can use the component in AMBA Designer by adding it to the default Component Library, MaxLib.

**Note**

AMBA Designer only supports adding ARM IP-XACT components to the Component Library.

- Use the following command from the UNIX prompt:

  `adcanvas --addcomp <file>.xml`

  Where `<file>.xml` is the name of the IP-XACT configuration file for the IP.

### 11.4.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Generating RTL for an AMBA 2 or an AMBA 3 component* on page 3-6.
- *Setting general IP-XACT preferences* on page 7-4.
- *Adding a component to the Component Library from an IP-XACT XML file* on page 11-4.

**Reference**

- For specific configuration information for your chosen component, see the relevant *Supplement* document to the *ARM® AMBA® Designer User Guide*.

## 11.5 Removing a component from the Component Library

**Note**

The component is only removed from the Component Library. The configuration file and RTL that you generated are not deleted. However, it is the Component Library entry that stitched systems use. If the component was used in a stitched system, the system can no longer reference it.

1. Right-click the component in the Component Window and select **Remove Component from the Component Library**.

## 11.6 Adding a Component Library .conf file to the preferences

1. Select **File** → **Preferences**.
2. Select **Component Library** in the left-hand pane.
3. Click **Add** below the list of configuration files.
4. Navigate to the `.conf` file and click **OK**.
5. Make sure that the order of the configuration files is correct. If more than one configuration files are in the list for a component, AMBA Designer uses the first one and ignores the second one.

### 11.6.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Generating RTL for an AMBA 2 or an AMBA 3 component* on page 3-6.

**Reference**

- For specific configuration information for your chosen component, see the relevant *Supplement* documents to the *ARM® AMBA® Designer User Guide*.

# Chapter 12
# Migrating from AMBA Designer r2px

This chapter describes how to migrate designs from AMBA Designer r2px. It contains the following sections:

## 12.1 Migrating components configured in AMBA Designer r2px

Add and reconfigure the legacy component:

1. To add a component configured in AMBA Designer version r2px, run the following script:

   ```
   $AD_HOME/etc/MigrateADr2toADr3.csh
   ```

   After running the script, the component appears in the Component Library and you can drag and drop it into the Diagram Window to connect, stitch, and save in the new `.adg` file format.

2. Load the component definition, `.xml`, that you created in AMBA Designer r2px into the Configuration Window for the same component.

   **Note**

   For the NIC-301 r2 configurator, you can locate and load the component definition, `.xml`, by selecting **File → Open...** from the main menu of the component configuration window. For all other IP, click **Browse** in the File Creation Options pane of the configurator window.

3. Click **OK** to generate the new component configuration and close the Configuration Window.

4. In the Diagram Window, right-click the generated component and select **Reconfigure**.

5. Save the new component configuration, or follow the normal steps to render the component.

### 12.1.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.

## 12.2 Migrating old systems to AMBA Designer r3px

AMBA IP-XACT components now have a one-to-one mapping with the RTL. This is not the case for systems that use `.mxp` files created in AMBA Designer r2px versions, and you cannot open these directly.

1. Convert the `.mxp` system file to an `.adg` file by migrating the components using the method that *Migrating components configured in AMBA Designer r2px* on page 12-2 describes.
2. Re-instantiate and reconnect the migrated components in the Canvas.

### 12.2.1 See also

**Tasks**

- *Replacing a component in the system* on page 6-20.
- *Setting general IP-XACT preferences* on page 7-4.
- *Viewing the hierarchical structure of a component* on page 10-5.

# Chapter 13
# Troubleshooting AMBA Designer

This chapter describes the solutions to some common problems. It contains the following sections:

## 13.1 Invalid components

In Figure 13-1, the NewP component has a NOT symbol around the component icon. This indicates that the component is not available for use. This can occur if the component is missing from the Component Library, or AMBA Designer cannot create it.

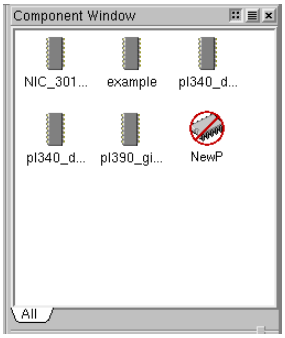



**Figure 13-1 Component Window with bad component**

To fix an invalid component, check that the IP-XACT file on your system is valid, for example by comparing it to the IP-XACT file that was delivered with the IP bundle. If necessary, re-import the IP-XACT file to your system and restart AMBA Designer Canvas.

### 13.1.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Adding components to a new system* on page 6-2.
- *Setting general IP-XACT preferences* on page 7-4.

## 13.2 Support for more than one IP revision

AMBA Designer does not support switching between multiple versions of the same IP-XACT component. To use different versions of the same component, include the version string in the component name to differentiate them. For example, Figure 13-2 shows two versions of the DMC (PL340) in the Component Window.

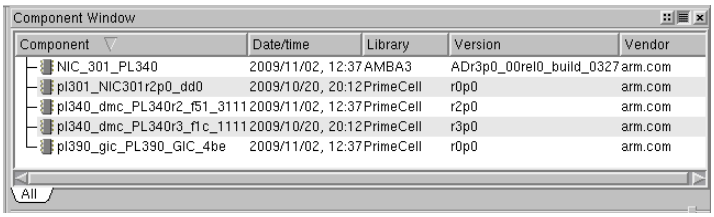



**Figure 13-2 Component Window with versions in list view**

### 13.2.1 See also

**Tasks**

- *Configuring an AMBA 2 or AMBA 3 component in the Canvas* on page 3-3.
- *Adding components to a new system* on page 6-2.
- *Setting general IP-XACT preferences* on page 7-4.

## 13.3 Paths to relative directories

AMBA Designer only supports absolute paths. Make sure that you do not use relative paths in the AMBA Designer Preferences dialog.

### 13.3.1 See also

**Reference**

- *AMBA Designer Preferences dialog* on page 7-2.

## 13.4 Missing port in subcomponent

If you remove any ports from a subcomponent that is itself a system or a standalone component, or modify its associated `.adg` file, then an error message is generated when higher level components are refreshed in AMBA Designer. Figure 13-3 shows this error message.

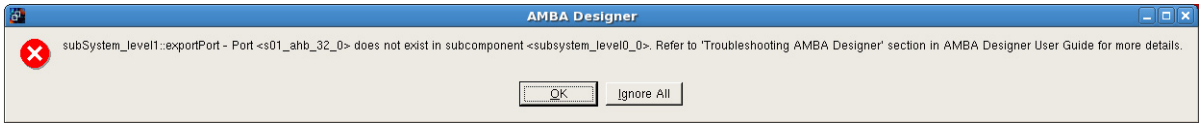



**Figure 13-3 Subcomponent error message**

If the immediate higher level component of which this subcomponent is a part is not currently open in AMBA Designer then the error message is not generated. This delay in displaying the message can lead to a false assumption that the hierarchy is valid.

ARM recommends that if the message is generated, or you have modified the `.adg` file, then you must restitch that subcomponent and all the components of which it is a part. See *Reconfiguring a stitched system* on page 6-19.

# Appendix A
# **License Text**

This appendix contains the license text for reference purposes. It contains the following section:

## A.1 Verilog Parser copyright notice

ARM acknowledges and thanks the respective owners for the Verilog Parser software that AMBA Designer uses:

```
/*
 * Copyright (c) 1992, Bakul Shah <bvs@BitBlocks.com>
 * All Rights Reserved.
 *
 * Permission to use, copy, modify, distribute or sell this software and
 * its documentation for any purpose is hereby granted without fee, subject
 * to the following conditions.
 *
 * 1. The above copyright, this list of conditions and the following
 *    disclaimer must appear UNCHANGED in all copies of the software and
 *    related documentation, and their derivative works or modified
 *    versions
 *
 * 2. Binary distribution must be accompanied by documentation that
 *    reproduces the above copyright, this list of conditions and the
 *    following disclaimer.
 *
 * 3. Any modifications to the source code must be clearly marked as such.
 *
 * 4. The author's name may not be used to endorse or promote products
 *    derived from this software without specific prior written permission.
 *
 * This software is provided by the author AS IS. The author DISCLAIMS
 * any and all warranties of merchantability and fitness for a particular
 * purpose. In NO event shall the author be LIABLE for any damages
 * whatsoever arising in any way out of the use of this software.
 */
```

# Appendix B
# **Revisions**

This appendix describes the technical changes between released issues of this book.

**Table B-1 Differences between issues A to F**

| Change | Location |
|---|---|
| No revision history recorded | - |

**Table B-2 Differences between issue F and issue G**

| Change | Location |
|---|---|
| Removed references to SoC Designer and SoC Designer Simulator | Throughout book |
| Removed references to cycle accurate modeling | |
| Removed references to Microsoft Windows | |
| Moved all third-party EDA tool specific content to introduction | |
| Removed references to *Bandwidth Monitoring Components* (BMCs) | |
| Added information on third-party tools | EDA tools |
| Added information on third-party software | |
| Removed *Installation* chapter and moved information to separate book | *ARM® AMBA® Designer Installation Guide* |
| Removed description of MemMap dialog | - |
| Changed description of Component Wizard | Using the Components Wizard |

**Table B-2 Differences between issue F and issue G (continued)**

| Change | Location |
|---|---|
| Changed description of command line options | AMBA Designer batch mode commands |
| Added reference content for canvas | - |
| Removed **What's This** from the Help menu | Section Help menu |
| Removed **IP-XACT Properties...** from the Component Context menu | Component context-sensitive menu |
| Removed description of System Properties dialog | |
| Added reference content for keyboard shortcuts | *AMBA Designer Canvas shortcuts* on page 8-9 |

**Table B-3 Differences between issue G and issue H**

| Change | Location | Affects |
|---|---|---|
| Changed the description for the Help menu to match the new functionality | Section Help menu | r2p3 |
| Added bullet points stating that hierarchical IP stitching is not supported, and that you must specify default tie-off values in binary format and not in hexadecimal format | Section Limitations | |

**Table B-4 Differences between issue H and issue I**

| Change | Location | Affects |
|---|---|---|
| Removed all references to the Component Wizard. Use of this tool is now subject to an additional license agreement | - | r3p0 |
| Removed all references to dummy components. IP-XACT 1.4 is now supported natively | Throughout book | |
| Removed all references to component models because they are no longer supported | | |
| Described all the new IP-XACT component features added to Preferences, the main and context-sensitive menus, the toolbar and existing and new dialog boxes | | |

**Table B-5 Differences between issue I and issue J**

| Change | Location | Affects |
|---|---|---|
| Removed all references to generic IP stitching | Throughout book | r3p0 |
| Note added, the **Hierarchy Window** option controls the display of the AMBA Configuration Window | | |
| Updated the location of the preferences `.ini` file | - | |
| Updated the keyboard shortcuts | *AMBA Designer Canvas shortcuts* on page 8-9 | r0p0 |

**Table B-6 Differences between issue J and issue K**

| Change | Location | Affects |
|---|---|---|
| Book has been restructured | Throughout book | All |
| Updated product number to ADR-400 | Document title and references | r3p1 |
| Added information about AMBA 4 components | Chapter 4 *Configuring AMBA 4 Components* | |
| Added information about exporting stitched components | *AMBA Designer batch mode commands* on page 9-3 | |
| Added information about command options -copyfiles and --addconfigurator | *AMBA Designer batch mode commands* on page 9-3 | |

**Table B-7 Differences between issue K and issue L**

| Change | Location | Affects |
|---|---|---|
| Added information about editing model parameters | *Viewing and editing the IP-XACT model parameters of a component instance* on page 10-4 | r3p1 |

**Table B-8 Differences between issue L and issue M**

| Change | Location | Affects |
|---|---|---|
| Updated the following option commands:<br>`--addcomp`<br>`--addconfigurator`<br>`--removecomp`<br>`--removeconfigurator` | Table 9-2 on page 9-3 | r3p2 |

**Table B-9 Differences between issue M and issue N**

| Change | Location | Affects |
|---|---|---|
| Added information about a new method for creating an external port connection for a component. | *Creating external ports* on page 6-3 | r3p3 |
| Added description of reason why error message might appear when updating system subcomponents. | *Missing port in subcomponent* on page 13-5 | r3p0 |

**Table B-10 Differences between issue N and issue O**

| Change | Location | Affects |
|---|---|---|
| Additional features in the Create IP-XACT Connection dialog | *Connecting components* on page 6-4 | r3p4 |
| Added requirement to select the **Export all unconnected** option when using the **Use instance names in nets** stitching option | Table 6-2 on page 6-14 | r3p0 |
| Added Bus Interface Options pane | | r3p4 |
| Added search box for the Component Window and Configuration Window | Table 8-1 on page 8-3 | |
| Added port colors for AXI4, ACE, ACE-Lite, and ATB | Table 10-1 on page 10-6 | |