

# ICE-100B Emulator User's Guide

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## Regulatory Compliance

The ICE-100B emulators are designed to be used solely in a laboratory environment. The emulators are not intended for use as a consumer end product or as a portion of a consumer end product. The emulator board is an open system design which does not include a shielded enclosure and therefore may cause interference to other electrical devices in close proximity. This board should not be used in or near any medical equipment or RF devices.

The ICE-100B emulators have been certified to comply with the essential requirements of the European EMC directive 2004/108/EC and therefore carries the “CE” mark.

The ICE-100B emulators have been appended to Analog Devices, Inc. EMC Technical File (EMC TF) referenced **DSPTOOLS1**, issue 2 dated June 4, 2008 and was declared CE compliant by an appointed Notified Body (No.0673) as listed below.

Notified Body Statement of Compliance: is Z600ANA2.034 dated May 18, 2009.



Issued by: Technology International (Europe) Limited  
56 Shrivenham Hundred Business Park  
Shrivenham, Swindon, SN6 8TY, UK

The ICE-100B emulators contain ESD (electrostatic discharge) sensitive devices. Electrostatic charges readily accumulate on the human body and equipment and can discharge without detection. Permanent damage may occur on devices subjected to high-energy discharges. Proper ESD precautions are recommended to avoid performance degradation or loss of functionality. Store unused emulators in the protective shipping package.



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# PREFACE

Thank you for purchasing the ICE-100B emulator. The ICE-100B emulator is used in conjunction with the CrossCore<sup>®</sup> Embedded Studio and VisualDSP++<sup>®</sup> development environments to create, test, and debug advanced processor application software on Analog Devices Blackfin<sup>®</sup> processors.

The ICE-100B emulator provides state-of-the-art support for JTAG-compliant Analog Devices processors. Key features of the ICE-100B emulator include:

- Plug-n-Play, USB 2.0 compliant
- High-speed USB device
- USB bus-powered device
- Windows<sup>®</sup> 7, Windows Vista, or Windows XP SP2 operation
- Multiple processor I/O voltage support:
  - 1.8V, 2.5V, and 3.3V compliance
- Multiprocessor support
- JTAG clock operation of 5 MHz

Analog Devices carries a wide range of in-circuit emulation products. To learn more about Analog Devices emulators, go to:  
[http://www.analog.com/en/processors-dsp/software-and-reference-designs/content/tools\\_product\\_overview/fca.html](http://www.analog.com/en/processors-dsp/software-and-reference-designs/content/tools_product_overview/fca.html).

## Purpose of This Manual

# Purpose of This Manual

The *ICE-100B Emulator User's Guide* provides directions for installing the ICE-100B hardware and software on your PC. The manual also describes how to configure and use the ICE-100B components.

## Intended Audience

This manual is intended to help the customer understand the features and operation of the ICE-100B emulator so they can start using CrossCore Embedded Studio (CCES) and VisualDSP++.

## Manual Contents

The manual consists of:

- Chapter 1, [“Getting Started” on page 1-1](#)  
Provides software and hardware installation procedures, PC system requirements, and basic board information.
- Chapter 2, [“Hardware Description” on page 2-1](#)  
Provides information on hardware aspects of the ICE-100B emulator.
- Chapter 3, [“Support” on page 3-1](#)  
Provides technical support contact information.
- Chapter 4, [“References” on page 4-1](#)  
Provides information about different resources available for developing an application based on an Analog Devices processor.



# Technical Support

You can reach Analog Devices processors and DSP technical support in the following ways:

- Post your questions in the processors and DSP support community at EngineerZone<sup>®</sup>:  
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- Submit your questions to technical support directly at:  
<http://www.analog.com/support>
- E-mail your questions about processors, DSPs, and tools development software from **CrossCore Embedded Studio** or **VisualDSP++<sup>®</sup>**:

Choose **Help > Email Support**. This creates an e-mail to [processor.tools.support@analog.com](mailto:processor.tools.support@analog.com) and automatically attaches your **CrossCore Embedded Studio** or **VisualDSP++** version information and `license.dat` file.

- E-mail your questions about processors and processor applications to:  
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- In the **USA only**, call **1-800-ANALOGD** (1-800-262-5643)
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- Send questions by mail to:  
Processors and DSP Technical Support  
Analog Devices, Inc.  
Three Technology Way

## Product Information

P.O. Box 9106  
Norwood, MA 02062-9106  
USA

## Product Information

Product information can be obtained from the Analog Devices Web site and the CCES online help.

### Analog Devices Web Site

The Analog Devices Web site, [www.analog.com](http://www.analog.com), provides information about a broad range of products— analog integrated circuits, amplifiers, converters, and digital signal processors.

To access a complete technical library for each processor family, go to [http://www.analog.com/processors/technical\\_library](http://www.analog.com/processors/technical_library). The manuals selection opens a list of current manuals related to the product as well as a link to the previous revisions of the manuals. When locating your manual title, note a possible errata check mark next to the title that leads to the current correction report against the manual.

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provides access to books, application notes, data sheets, code examples, and more.

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## EngineerZone

EngineerZone is a technical support forum from Analog Devices. It allows you direct access to ADI technical support engineers. You can search FAQs and technical information to get quick answers to your embedded processing and DSP design questions.




Use EngineerZone to connect with other DSP developers who face similar design challenges. You can also use this open forum to share knowledge and collaborate with the ADI support team and your peers. Visit <http://ez.analog.com> to sign up.

## Notation Conventions

Text conventions used in this manual are identified and described as follows.


Example	Description
<b>Close</b> command ( <b>File</b> menu)	Titles in in bold style reference sections indicate the location of an item within the CrossCore Embedded Studio's menu system (for example, the <b>Close</b> command appears on the <b>File</b> menu).
{this   that}	Alternative required items in syntax descriptions appear within curly brackets and separated by vertical bars; read the example as <i>this</i> or <i>that</i> . One or the other is required.
[this   that]	Optional items in syntax descriptions appear within brackets and separated by vertical bars; read the example as an optional <i>this</i> or <i>that</i> .

## Notation Conventions

Example	Description
[this,...]	Optional item lists in syntax descriptions appear within brackets delimited by commas and terminated with an ellipsis; read the example as an optional comma-separated list of <i>this</i> .
.SECTION	Commands, directives, keywords, and feature names are in text with letter gothic font.
<i>filename</i>	Non-keyword placeholders appear in text with italic style format.
	<b>Note:</b> For correct operation, ... A Note provides supplementary information on a related topic. In the online version of this book, the word <b>Note</b> appears instead of this symbol.
	<b>Caution:</b> Incorrect device operation may result if ... <b>Caution:</b> Device damage may result if ... A Caution identifies conditions or inappropriate usage of the product that could lead to undesirable results or product damage. In the online version of this book, the word <b>Caution</b> appears instead of this symbol.
	<b>Warning:</b> Injury to device users may result if ... A Warning identifies conditions or inappropriate usage of the product that could lead to conditions that are potentially hazardous for device users. In the online version of this book, the word <b>Warning</b> appears instead of this symbol.

# 1 GETTING STARTED

This chapter provides the information needed to begin using Analog Devices ICE-100B emulators.

 Analog Devices emulators are not intended to be used in a production environment.

This chapter includes the following sections.

- [“Contents of Emulator Package” on page 1-2](#)  
Provides a list of components shipped with the emulator.
- [“PC Configuration” on page 1-2](#)  
Describes the minimal PC requirements.
- [“ICE-100B Installation Tasks” on page 1-2](#)  
Provides a step-by-step procedure for setting up the emulator hardware and describes how to connect the emulators to your target board.
- [“Configurator Software” on page 1-8](#)  
Describes the target configurator utility.
- [“JTAG Frequency” on page 1-9](#)  
Provides information on JTAG frequency limitations.
- [“Troubleshooting and Warranty” on page 1-9](#)  
Points to an Engineer-to-Engineer Note for troubleshooting advice and warranty information.

# Contents of Emulator Package

The ICE-100B emulator package contains the following items.

- ICE-100B emulator
- 2-meter USB standard-A to mini-B cable

## PC Configuration

For correct operation of the ICE-100B emulator, your computer must have the minimal configuration:

- Windows XP SP2 or later, Windows Vista, or Windows 7
- CrossCore Embedded Studio 1.0.0 or VisualDSP++ 5.0 Update 7 (or higher)

## ICE-100B Installation Tasks

Perform the following tasks to install your ICE-100B emulator safely. Follow the instructions in presented order to ensure correct operation of your software and hardware.

1. [Installing the Emulator Software](#)
2. [Configuring and Connecting the JTAG Interface](#)
3. [Verifying Driver Installation and Attaching to an Emulation Target](#)
4. [Applying Power to the Emulator](#)

### Installing the Emulator Software

Install CCES 1.0.0 or VisualDSP++ 5.0 Update 7 (or higher) on your computer. The software installation includes the USB driver needed for the ICE-100B emulator hardware.

Refer to the *Installation Quick Reference Card* for details.

**Note:** If you connect to the ICE before installing the software, the Windows driver wizard may not find the emulator driver.

[Configuring and Connecting the JTAG Interface](#) is next.

## Configuring and Connecting the JTAG Interface

1. Select the operating voltage of the target processor's JTAG interface. The ICE-100B emulator ships with a jumper (JP1) on positions 1 and 3, and 2 and 4 (default). Refer to [Table 1-1](#) and [Figure 1-2](#).

Table 1-1. Operating Voltage

Target Voltage	JP1 Settings (Installed Jumpers)
3.3 volts	1 and 3, 2 and 4
2.5 volts	1 and 2, 3 and 4
1.8 volts	3 and 5, 2 and 4

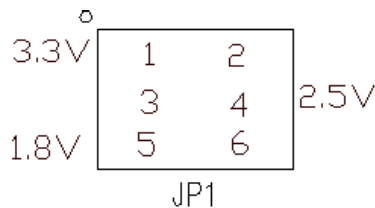


Figure 1-1. JP1 Pinout

2. Ensure that JP2 does not have a jumper across the pins when using VisualDSP++ or CrossCore Embedded Studio. Refer to [Table 1-2](#). There may be a jumper hanging off one pin; this does not impact operation.


Table 1-2. JP2 Settings

JP2 Settings	Tool Chain
Uninstalled	VisualDSP++ or CCES
Installed	GNU tool chain for Blackfin processors



3. Connect one side of the provided USB cable to the ICE-100B emulator and another side to a USB port of your computer.

Verifying Driver Installation and Attaching to an Emulation Target is next.

 Before connecting to a target, see the power-up/down procedures in [“Applying Power to the Emulator”](#) on page 1-7.

### Verifying Driver Installation and Attaching to an Emulation Target

Before using the ICE-100B emulator, verify that the driver software is installed properly.

1. Open the Windows **Device Manager** and verify that the ICE-100B emulator appears under **ADI Development Tools**, as shown in [Figure 1-2](#).

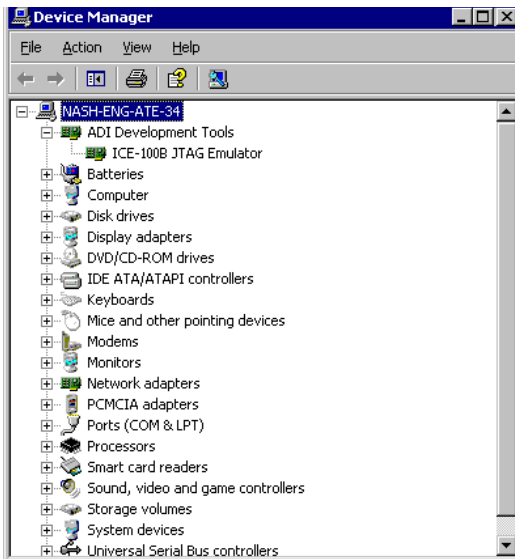


Figure 1-2. Verifying Driver Installation

2. Connect the 14-pin header (J1) of the ICE-100B emulator to the target board via the JTAG interface as follows.

The 14-pin connector is keyed at pin 3 on the emulator connector to ensure that the signals mate correctly with the 14-pin target emulation header. The target board should also have pin 3 of the JTAG interface connector cut. Refer to [Figure 1-3](#) for J1 pinout information.

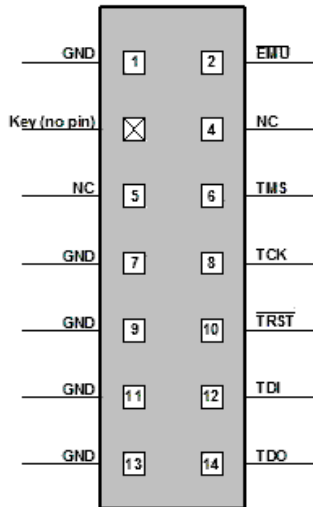


Figure 1-3. J1 Pinout

[Applying Power to the Emulator](#) is next.

## Applying Power to the Emulator

To power up the ICE-100B emulator:

1. Apply power to the target board.
2. If not already, connect the USB port of the computer to the emulator.

The ICE-100B is a bus-powered device, so this step powers the emulator.

## Configurator Software

3. If the emulator is not connected to the target, connect the devices as described in [“Verifying Driver Installation and Attaching to an Emulation Target”](#).
4. Invoke CrossCore Embedded Studio or VisualDSP++.

### To power down the ICE-100B emulator:

1. Shut down (exit) CrossCore Embedded Studio or VisualDSP++.
2. Disconnect the USB cable between the emulator and the PC.
3. Power down the target board.



The PWR LED (power LED) lights green when power is applied and the board is not in hibernate state.

4. The emulator can now be removed from the target.

For custom processor boards still in design, refer to an Engineer-to-Engineer Note, *“Analog Devices JTAG Emulation Technical Reference (EE-68)”*, available from the Analog Devices Web site. This document is a technical reference for implementing the JTAG interface on your target.

Now the emulator hardware is ready to be used in conjunction with CCES or VisualDSP++ to debug a processor target system. Refer to [“Configurator Software”](#) for more information.

## Configurator Software

CrossCore Embedded Studio and VisualDSP++ development software require a description of your *platform* (JTAG chain). The platform definition is necessary for the software to communicate with the hardware through the emulator.

The VisualDSP++ and CCES include the target configurator utility to configure and test your emulator hardware. The target configurator pro-

vides emulator detection and JTAG I/O voltage selection. Use the ICE Test (part of the target configurator) to test the target. If any errors are encountered, the errors are reported immediately and the test ends. Each error message recommends a solution to the problem.

Refer to the online help for information about “target configurator”, “JTAG frequency”, and “ICE test”.

## JTAG Frequency

The ICE-100B emulator supports JTAG clock operation at 5 MHz. There is a relationship between the JTAG frequency and the core clock frequency of the processor. The core clock should be at least twice the JTAG frequency in order for the JTAG interface to operate properly. On newer Analog Devices processors, the core clock is a variable set by switches or by software.



If the core/JTAG clock relation is not followed, scan failures may prevent the emulator from connecting to the processor.

## Troubleshooting and Warranty

To provide comprehensive troubleshooting advice and warranty information for all emulator and EZ-KIT Lite products, Analog Devices maintains an Engineer-to-Engineer Note. *Emulator and EZ-KIT Lite Evaluation System Troubleshooting Guide (EE-175)* is available online at: <http://www.analog.com>.

The EE-Note can be used to resolve most installation, connection, and software issues affecting the use of Analog Devices in-circuit emulators (ICEs) and EZ-KIT Lite evaluation systems, avoiding the need to return the suspected faulty emulator or EZ-KIT Lite board. Please carry out all troubleshooting steps outlined in this document before contacting Analog Devices Processor Tools Support.

## Troubleshooting and Warranty

Also included in the EE-Note, complete warranty and return material authorization (RMA) information for emulators and EZ-KIT Lite products. In general, emulators less than one year old are within warranty, and repairs within that period are free of charge, but there are some limitations to this warranty coverage. For details, see the note.

# 2 HARDWARE DESCRIPTION

This chapter describes the hardware design of the ICE-100B emulator and includes the following sections:

- [“LEDs” on page 2-1](#)  
Describes LEDs which inform you of the emulator’s status.
- [“Resetting the Target” on page 2-2](#)  
Describes how to reset the target.
- [“Custom Processor Boards” on page 2-3](#)  
Describes concerns regarding board lay out.
- [“Mechanical Specifications” on page 2-4](#)  
Provides dimensional information.

## LEDs

Three LEDs are located on the ICE-100B emulator (refer to [Figure 2-1](#)):

- PWR LED - The Power LED signifies that the ICE is powered.
- MON LED - The Monitor LED signifies that the ICE is configured over USB.
- STAT LED - The Status LED signifies that the ICE is ignoring the EMU signal.

## Resetting the Target

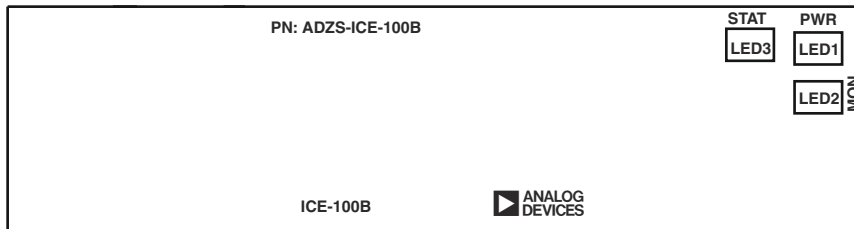


Figure 2-1. LED Positions - Top of Emulator Board

## Resetting the Target

When debugging remotely, the ability to reset the target can be very useful. Reset the target via the software or by soldering a wire from the ICE-100B emulator to the target.

To solder a wire from the ICE-100B emulator to the target:

- Two solder points labeled **RESET** (reference designator P3) are located near the JTAG connector (J1) and USB connector (P1) on the ICE-100B (see [Figure 2-2](#)).
- For an active low version ( $\sim$ RESET), solder a wire between the square pad (pin 1) of P3 and  $\sim$ RESET input signal of the target.
- For an active high version (RESET), solder a wire between the round pad (pin 2) and RESET input signal of the target.



Figure 2-2 shows a portion of the ICE-100B emulator.

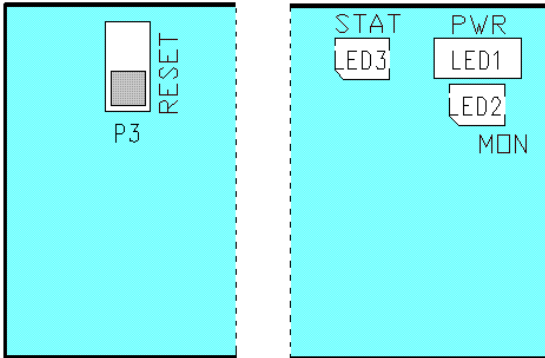


Figure 2-2. Resetting the Target

To reset the target via the software, use the **Reset Target** command.

- CCES users choose **Target > Debug > Reset Target**.
- VisualDSP++ users choose **Debug > Reset Target**.

The **Reset Target** command sends a reset pulse of the specified reset time duration to the target and opens the **Reset Target Options** dialog box. See the online help for the dialog box description.

## Custom Processor Boards

When designing a custom processor board using Analog Devices processors and DSPs, special care must be taken to ensure that the JTAG interface is designed and laid out correctly. If the board is not designed correctly, communication via the JTAG port may not work. Another side effect may be that the interface works, but you are not able to run at the highest possible JTAG clock frequency. The JTAG clock frequency is

## Mechanical Specifications

dependant on the particular Analog Devices processor, as well as the delay characteristics of the custom processor board.

To ensure that the custom board's JTAG interface is designed and laid out correctly, refer to Engineer-to-Engineer Note, *Analog Devices JTAG Emulation Technical Reference (EE-68)*, available from the Analog Devices Web site. This document is a technical reference for implementing the JTAG interface on your target.

## Mechanical Specifications

The outer dimensions of the ICE-100B emulator are 2.99" x 0.785". The height of the JTAG connector (J1) is approximately 0.310". The tallest component on the top is 0.235", and the tallest component on the bottom is 0.045". Refer to [Figure 2-3](#).

Care must be taken when locating a custom target JTAG interface connector, that no components are taller than about 0.15" if located under the emulator.



If there are any concerns that emulator components may short to the target board, an insulator should be used to provide protection.

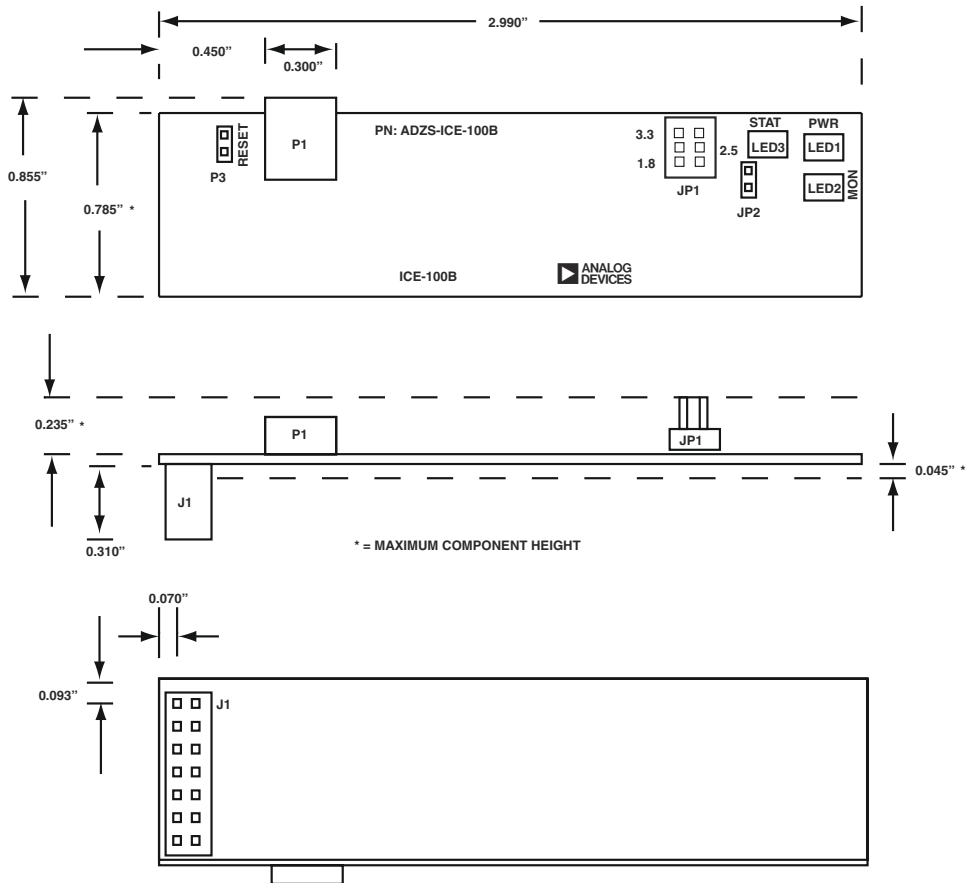


Figure 2-3. ICE-100B Emulator Dimensions (in inches)

## Mechanical Specifications

# 3 SUPPORT

Analog Devices provides free technical support.

## Technical Support

For technical support, visit the Embedded Processing and DSP Technical Support page at:

<http://www.analog.com/support>.

From there you can:

- Access the EngineerZone DSP Support Forum where Analog Devices support team members and other designers exchange ideas and answer questions
- Search our vast Knowledge Base containing application notes, data sheets, code examples, manuals, and more
- Contact our Technical Support team directly by filling out the support form

Alternately, you can contact Technical Support directly as follows:

- For tools issues, send a description of the problem by e-mail to:  
[processor.tools.support@analog.com](mailto:processor.tools.support@analog.com)
- For processor issues, send a description of the problem by e-mail to the Application Engineering group at:  
[processor.support@analog.com](mailto:processor.support@analog.com) (World wide support)

# Quality Assurance

Analog Devices is committed to providing quality products and services. To continually provide this quality, please contact our Quality Assurance Department directly if you have any concerns at (603) 883-2430, Monday through Friday during normal business hours, or via e-mail at: [processor.tools.support@analog.com](mailto:processor.tools.support@analog.com).

Our Quality Assurance manager will listen to your concerns and provide a timely and effective solution.

# 4 REFERENCES

This section describes documentation resources helpful in your application development.

- For information on designing the interface between an Analog Devices processor and the emulation header on your custom processor target board, refer to Engineer-to-Engineer Note, *Analog Devices JTAG Emulation Technical Reference (EE-68)*, available from the Analog Devices Web site.
- For information on the architecture and system interface of the Analog Devices processor, refer to the appropriate Analog Devices processor's hardware reference manual.
- For processor timing specification and other hardware design information, refer to the appropriate processor's data sheet.
- For complete information on software development tools (assembler, compiler, linker, and so on), refer to documentation included with CrossCore Embedded Studio or VisualDSP++. This information is available in the online help and PDF format in the `Docs` folder.
- For information about your development platform, refer to your operating system manuals and hardware system manuals.

- For information about digital signal processing theory and applications, consult:
  - Higgins. *Digital Signal Processing In VLSI*. Prentice-Hall, 1990.
  - Oppenheim and Schaffer. *Digital Signal Processing*. Prentice-Hall, 1975.



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