

ICE-1500 Emulator

User Guide

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Regulatory Compliance

The ICE-1500 emulators are designed to be used solely in a laboratory environment. The emulators are not intended for use as consumer end products or as a portion of consumer end products. The emulator boards are open system designs which do not include shielded enclosures and therefore may cause interference to other electrical devices in close proximity. These boards should not be used in or near any medical equipment or RF devices.



The emulator contains 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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1 Preface

Thank you for purchasing the ICE-1500 emulator. The emulator is used in conjunction with the CrossCore[®] Embedded Studio or development environments to create, test, and debug advanced processor application software on Analog Devices SHARC[®]/SHARC+[®]/SHARC-FX[®] processor families.

The emulator provides state-of-the-art support for JTAG-compliant Analog Devices processors.

Key features of the emulator include:

- Plug-n-Play, USB 2.0 compliant
- High-speed USB device
- USB bus-powered device
- Multiple processor I/O voltage support: 1.8V and 3.3V compliance
- Multiprocessor support
- JTAG/SWD clock operation of 5 MHz on the ICE-1500

To learn more about Analog Devices emulators, go to <http://www.analog.com/processors/tools>.

Purpose of This Manual

The *ICE-1500 Emulator User Guide* provides directions for installing the emulator hardware and software on your PC.

Intended Audience

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

Manual Contents

The manual consists of:

- Chapter 1, [Getting Started](#)

Provides software and hardware installation procedures, PC system requirements, and basic board information.

- Chapter 2, [Hardware Description](#)

Provides information on hardware aspects of the emulator.

- Chapter 3, [Support](#)

Provides technical support contact information.

- Chapter 4, [References](#)

Provides information about different resources available for developing an application based on an Analog Devices processor.

What's New in this Manual

This is revision 1.0 of the *ICE-1500 Emulator User Guide*.

The updates to the manual include:

- Modifications and corrections based on errata reports against the previous manual revision

For the latest version of this manual, refer to the Analog Devices Web site.

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[®]:

<http://ez.analog.com/community/dsp>

- 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* :

Choose *Help > Email Support*. This creates an e-mail to processor.tools.support@analog.com and automatically attaches your CrossCore Embedded Studio version information and `license.dat` file.

- E-mail your questions about processors and processor applications to:

processor.tools.support@analog.com

processor.china@analog.com

- Contact your Analog Devices sales office or authorized distributor. Locate one at:

<http://www.analog.com/adi-sales>

- Send questions by mail to:

Analog Devices, Inc.

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USA

Product Information

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

Analog Devices Website

The Analog Devices website, <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. 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.

Also note, MyAnalog.com is a free feature of the Analog Devices website that allows customization of a web page to display only the latest information about products you are interested in. You can choose to receive weekly e-mail notifications containing updates to the web pages that meet your interests, including documentation errata against all manuals. MyAnalog.com provides access to books, application notes, data sheets, code examples, and more.

Visit MyAnalog.com to sign up. If you are a registered user, just log on. Your user name is your e-mail address.

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. Additional conventions, which apply only to specific chapters, can appear throughout this document.

<i>Example</i>	<i>Description</i>
<i>File > Close</i>	Titles in bold style indicate the location of an item within the CrossCore Embedded Studio IDE's menu system (for example, the <i>Close</i> command appears on the <i>File</i> 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> .
[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 letter gothic font and italic style format.
NOTE:	<i>NOTE:</i> For correct operation, ... A note provides supplementary information on a related topic. In the online version of this book, the word <i>NOTE:</i> appears instead of this symbol.
CAUTION:	<i>CAUTION:</i> Incorrect device operation may result if ... <i>CAUTION:</i> 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 <i>CAUTION:</i> appears instead of this symbol.
ATTENTION:	<i>ATTENTION:</i> 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 devices users. In the online version of this book, the word <i>ATTENTION:</i> appears instead of this symbol.

2 Getting Started

This chapter provides the information needed to begin using Analog Devices emulators.

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

This chapter includes the following sections.

- [Contents of Emulator Package](#)
Provides a list of components shipped with the emulator.
- [PC Configuration](#)
States the minimal PC requirements.
- [Emulator Installation](#)
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](#)
Describes the target configurator utility.
- [JTAG/SWD Frequency](#)
Provides information on JTAG/SWD frequency limitations.
- [Troubleshooting and Warranty](#)
Points to an Engineer-to-Engineer Note for troubleshooting advice and warranty information.

Contents of Emulator Package

The ICE-1500 emulator package contains the following items:

- ICE-1500 emulator
- USB standard-A to Type-C cable
- 6-inch 0.05" cable assembly

PC Configuration

For correct operation of the emulator, your computer must have the minimal configuration:

- Windows 7, 10, 11
- CrossCore Embedded Studio 2.12.0 (or higher)

Emulator Installation

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

- [Installing the Emulator Software](#)
- [ICE-1500: Configuring Operating Voltage of the JTAG/SWD Interface](#)
- [Verifying Driver Installation and Attaching to an Emulation Target](#)
- [Applying Power to the Emulator](#)

Installing the Emulator Software

1. Install CCES 2.12.0 (or higher) on your computer. The software installation includes the USB driver needed for the emulator hardware.

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

ICE-1500: Configuring Operating Voltage of the JTAG/SWD Interface

1. Determine the operating voltage of the JTAG/SWD interface for the target processor.

ADDITIONAL INFORMATION: The ICE-1500 emulator ships configured to connect to a 3.3V target. The jumpers are installed on positions 1 and 2 of P6 by default. Refer to the *Operating Voltage* table and *P6 Pin-out* figure for other voltage configurations.

Table 2-1: Operating Voltage

<i>Target Voltage</i>	<i>P6 Settings (Installed Jumpers)</i>
3.3 V	1 and 2(default)
1.8 V	2 and 3

Verifying Driver Installation and Attaching to an Emulation Target

Before using the emulator, verify that the driver software is installed properly.

1. Open the Windows *Device Manager* and verify that the ICE-1500 emulator appears under *CrossCore Tools*, as shown in the *Verifying Driver Installation* figure.

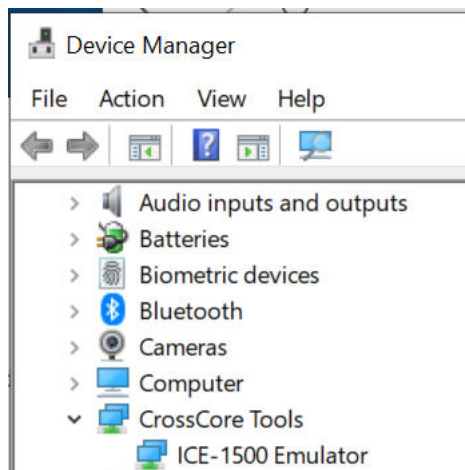
ADDITIONAL INFORMATION:

Figure 2-1: Verifying Driver Installation

2. When connecting to a 10-pin header on a target board, connect to the 6" cable when using the ICE-1500. The 10-pin housing is keyed to ensure that the signals mate correctly with the 10-pin target emulation header. The target board should also have keyed housing. Refer to the *P1 Pinout* for the P1 and cable pinout information.

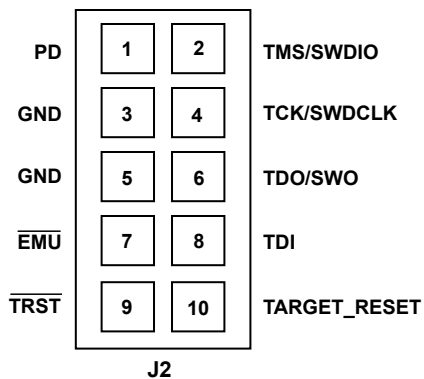
ADDITIONAL INFORMATION:

Figure 2-2: P1 Pinout

Applying Power to the Emulator

1. To power up the emulator:
 - a. Apply power to the target board.
 - b. Connect the USB cable between the emulator and the PC.

ADDITIONAL INFORMATION: The emulator is a bus-powered device, so this step powers the emulator.

- c. If the emulator is not connected to the target, connect the devices as described in [Verifying Driver Installation and Attaching to an Emulation Target](#).
- d. Invoke CrossCore Embedded Studio.

ADDITIONAL INFORMATION: Now the emulator hardware is ready to be used in conjunction with CCES to debug a processor target system. Refer to [Configurator Software](#) for more information.

2. To power down the emulator:
 - a. Shut down (exit) CrossCore Embedded Studio.
 - b. Disconnect the USB cable between the emulator and the PC.
 - c. Power down the target board.
 - d. 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/SWD Emulation Technical Reference (EE-68)*", available from the Analog Devices website. This document is a technical reference for implementing the JTAG/SWD interface on your target.

Configurator Software

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

CrossCore Embedded Studio development software include the target configurator utility to configure and test your emulator hardware. The target configurator provides emulator detection and JTAG/SWD I/O voltage. Use the ICE Test (part of the target configurator) to test the connection with 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/SWD voltage*, *JTAG/SWD frequency*, and *ICE test*.

JTAG/SWD Frequency

The ICE-1500 emulator supports JTAG/SWD clock operation at 5 MHz. There is a relationship between the JTAG/SWD frequency and core clock frequency of the processor. The core clock should be at least twice the JTAG/SWD frequency in order for the JTAG/SWD interface to operate properly. On newer Analog Devices processors, the core clock is a variable set by software.

NOTE: If the core/JTAG/SWD 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 evaluation system products, Analog Devices maintains two engineer-to-engineer notes:

- *"Emulator and Evaluation Hardware Troubleshooting Guide for VisualDSP++ Users (EE-175)"*
- *"Emulator and Evaluation Hardware Troubleshooting Guide for CCES Users (EE-356)"*

Both EE-notes are 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 evaluation systems, avoiding the need to return a suspected faulty emulator or evaluation board. Please carry out all troubleshooting steps outlined in this document before contacting Analog Devices Processor Tools Support.

Also included in the EE-note, complete warranty and return material authorization (RMA) information for emulators and evaluation 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 EE-note.

3 Hardware Description

This chapter describes the hardware design of the ICE-1000/ICE-2000 emulator and includes the following sections:

- [LED](#)
Describes the LED which inform you of the emulator's status.
- [Resetting the Target](#)
Describes how to reset the target.
- [Custom Processor Boards](#)
Describes concerns regarding board lay out.
- [Mechanical Specifications](#)
Provides dimensional information.

LED

There is one multicolored LED located on the emulator. It is labeled Status.

- Green – signifies that the ICE is powered, configured, and ready to invoke a CCES or VisualDSP++ session.
- Magenta – signifies that the ICE is operating in JTAG mode. The LED blinks during USB activity between the host PC and the emulator.
- Cyan – signifies that the ICE is operating in SWD mode. The LED blinks during USB activity between the host PC and the emulator.
- Yellow – signifies that there is an issue with the EMU signal on the target board and therefore this signal will be ignored by the emulator.

Connectors

There is one connector on the ICE-1500. This connects to the 6" ribbon cable that comes with the emulator package. The ribbon cable connects to a 0.05" 10-pin connector on the target board and supports JTAG/ and SWD mode.

Resetting the Target

When debugging remotely, the ability to reset the target can be very useful. In order to use this feature, the `RESET` signal from the target board should be connected to pin 10 of the 10-pin debug connector. This is an active low signal and is toggled through software. To reset the target through the software, use the *Reset Target* command.

To reset the target through the software, use the Reset Target command.

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

The *Reset Target* command sends a reset pulse of the specified duration to the target. The reset duration is configured by choosing *Target > Settings > Reset Target Options*. See the online help for more information. .

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/SWD interface is designed and laid out correctly. If the board is not designed correctly, communication via the JTAG/SWD 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/SWD clock frequency. The JTAG/SWD clock frequency is dependent on the particular Analog Devices processor, as well as the delay characteristics of the custom processor board.

To ensure that JTAG/SWD interface of the custom board is designed and laid out correctly, refer to the engineer-to-engineer note, "*Analog Devices JTAG/SWD Emulation Technical Reference (EE-68)*", available from the Analog Devices website. This document is a technical reference for implementing the JTAG/SWD interface on your target.

4 Support

Analog Devices provides free technical support.

Technical Support

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

Quality Assurance

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

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

5 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 the engineer-to-engineer note, "*Analog Devices JTAG/SWD Emulation Technical Reference (EE-68)*", available from the Analog Devices website.
- For information on the architecture and system interface of the Analog Devices processor, refer to the appropriate Analog Devices processor hardware reference manual.
- For processor timing specification and other hardware design information, refer to the appropriate processor 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 CCES 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.