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WIND RIVER

Wind River® ICE SX for Wind River® Workbench

HARDWARE REFERENCE

2.6.1

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Wind River ICE SX for Wind River Workbench Hardware Reference , 2.6.1

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1 Overview

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1.1 Introduction

This document is designed to help you understand the Wind River ICE SX, the Wind River high performance emulation system. The Wind River On-Chip Debugging solution includes Wind River ICE SX and Wind River Workbench, a software tool for hardware and RTOS bring-up. Together, these products provide a fully integrated hardware and software solution that can be used for board bring-up, Flash programming, and production and testing.

The Wind River ICE SX allows developers to perform source-level debug activities such as watching memory and controlling large numbers of registers. It allows users to shorten development cycles, even for extremely complex applications.

This document outlines information that is specific to the Wind River ICE SX. It includes some information on performing functions with the ICE unit using Wind River Workbench. For detailed information about the debugger, please refer

to the *Wind River Workbench User's Guide* and the *Wind River Workbench for On-Chip Debugging User Tutorials*.

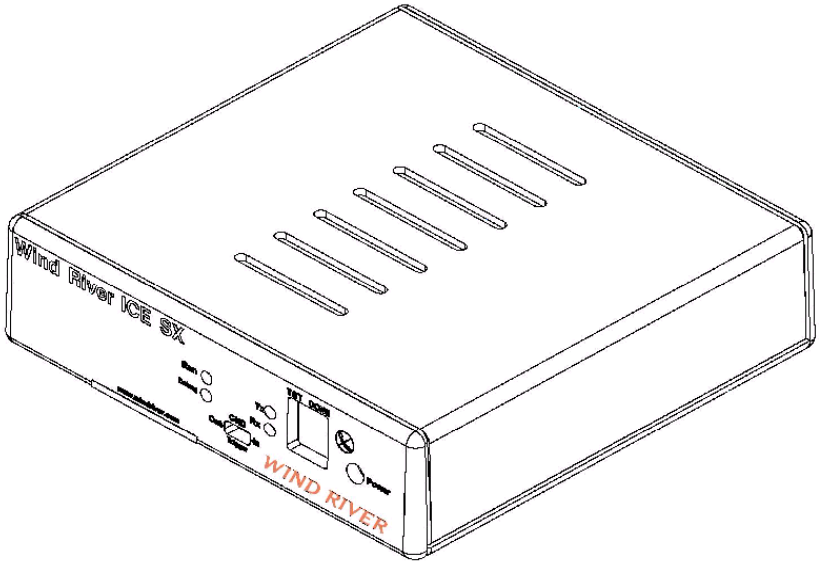
1.2 System Overview

The Wind River ICE SX lets you control a target by utilizing the On-Chip Debugging (OCD) services embedded in the microprocessor of that target. It operates effectively as a standalone system, communicating with the OCD services resident in the microcode of the chip.

When accessed, the OCD services in the chip provide complete control of the microprocessor, and all interaction between the Wind River ICE SX and the target runs exclusively through the OCD connection. This means that the emulation system is effective for the entire development process, even before board-level peripherals are stable.

The Wind River ICE SX includes full high-speed Ethernet support, as well as networking support for shared and remote debugging.

Figure 1-1 **Wind River ICE SX**



1.3 Features

The Wind River ICE SX includes the following features:

Multi-Core Debugging

The Wind River ICE SX lets you debug multiple devices on a scan chain through the use of JTAG Server. Several commands have been implemented that let you initialize multiple processors and start and stop all devices simultaneously. Multiple debug sessions can be active at the same time.

JTAG Server

The Wind River ICE SX JTAG Server provides the ability to control and manipulate multiple devices on a single scan chain ring. JTAG Server is a development tool that can access any device on the scan chain ring. Field-programmable gate arrays (FPGAs), electronically programmable logic devices (EPLDs), and other programmable devices can be loaded, eliminating the need for multiple device programmers and emulation hardware.

High-Performance JTAG

The Wind River ICE SX eliminates slow download times and run control when developing with On-Chip Debugger (OCD) microprocessors. Performance is improved due to hardware logic that caches common JTAG scan chains.

High-Speed Ethernet Connection

The Wind River ICE SX provides download speeds of up to 100KB per second, depending on the target. This is considerably faster than many other available products.

On-Chip Debug Target Control

The Wind River ICE SX allows you to start and stop the target, set internal hardware and software breakpoints, take a target snapshot, reset the target, step one statement or instruction into function calls, and step over or out of a function.

Built-In Hardware Diagnostics

The Wind River ICE SX includes a comprehensive suite of RAM tests, scope loops, and CRC tests.

Additional Custom Registers

The ICE unit supports 32 custom register groups, which results in a total of 960 custom registers.

Target Console Port

The Wind River ICE SX includes a target console port, which permits remote monitoring of applications and the serial port by channeling the serial port up through the network.

Remote Boot

In normal operation, the Wind River ICE SX boots from system files located in the flash filesystem. The ICE unit is also capable of booting from firmware using TFTP from a remote host. The only configuration required is the server IP address. This means that a group of developers could manage the Wind River ICE SX firmware from a single server, with everyone in this group booting remotely from this server. Configuration files can also be loaded remotely, allowing a group to manage all of its ICE files from a central location.

Static Boot

In this mode, a default target driver is loaded automatically when the Wind River ICE SX unit is booted. Multiple target drivers can also be automatically loaded at boot. The whole process is controlled by a **bootapps.lst** file, which is similar to an **autoexec.bat** file. This file can either be generated by the ICE unit, or edited on a host and copied into the flash filesystem.

Dynamic Boot

This is the default mode for the ICE unit. Without the **bootapps.1st** file, no applications are loaded. Target drivers can be manually loaded using the **Load** command, or can be loaded using Wind River Workbench, which automatically loads the target driver required by the target specified in the Workbench **Target Manager** view. If a target driver is not found, the Wind River ICE SX searches for it on the default TFTP server, and boots remotely.

Wind River ICE SX Firmware Update Emulation

For backward compatibility, you can send new firmware to the ICE unit using the Firmware Update Utility in Wind River Workbench. After the update, the ICE unit defaults to a static boot of the firmware that was just updated.

1.4 Safety Information

You should observe some basic safety precautions when using the Wind River ICE SX. Following these precautions helps avoid injury and prevents damage to the ICE unit and any products connected to it. To avoid hazardous

conditions, use this product only as specified. For the purposes of this document, warning and caution symbols denote the following:

WARNING: Warning statements indicate conditions that could result in injury or loss of life and describe how to avoid them.

CAUTION: Caution statements indicate conditions that could result in damage to this product or other property and describe how to avoid them.

Precautions to Avoid Injury

WARNING: Do not operate in wet or damp environments or outside the recommended operating conditions. This product is intended for indoor use only.

Use only the power cord specified for this product, and use a properly grounded power outlet.

Do not operate this product in an explosive atmosphere.

Do not operate the product if it is damaged. Have a qualified service person inspect damaged equipment before use.

Precautions to Avoid Property Damage

CAUTION: Take precautions against electrostatic discharge, as it may damage some components.

Use care in handling, as delicate components can be easily damaged.

Provide proper ventilation to prevent the product from overheating.

1.5 Layout Drawings

1.5.1 Personality Module Direct Connection

Figure 1-2 **Isometric View**

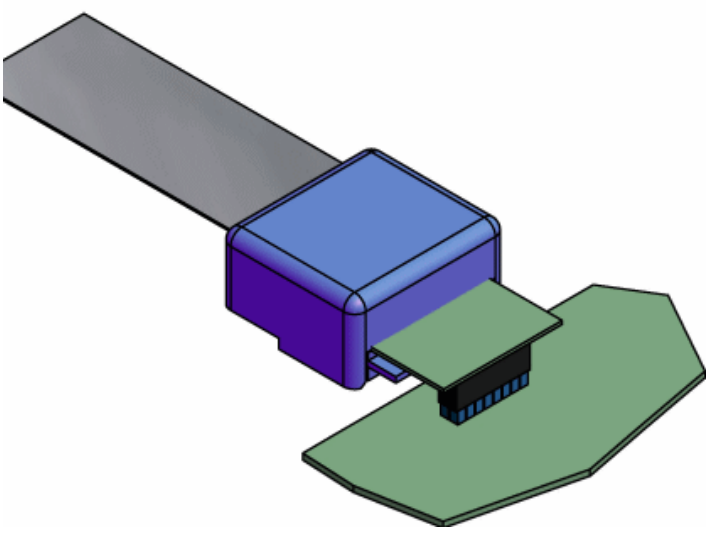


Figure 1-3 **Personality Module -- Front**

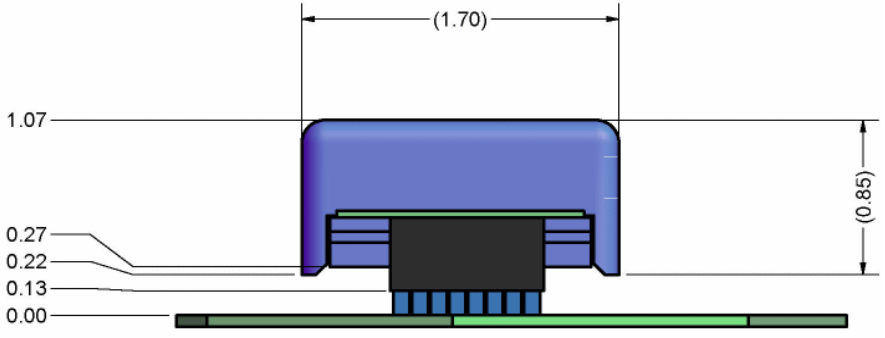


Figure 1-4 **Personality Module -- Side**

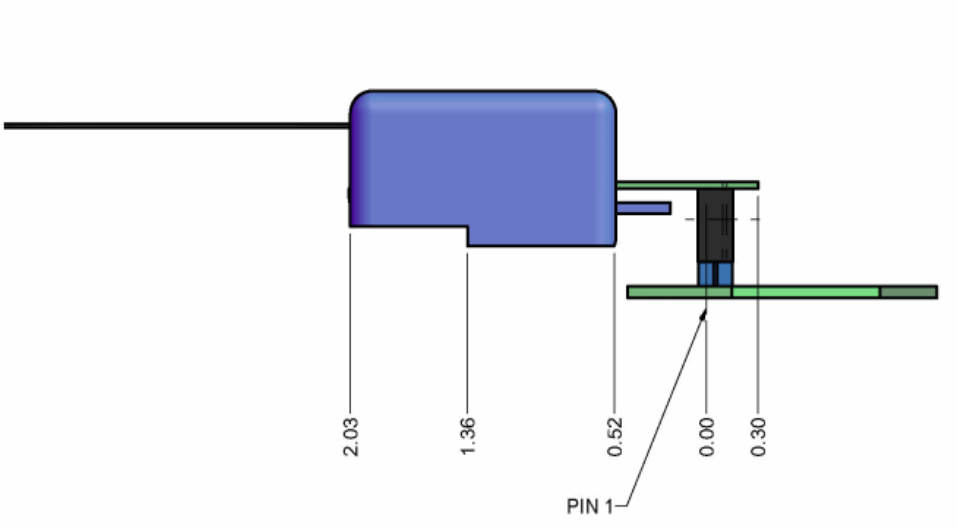
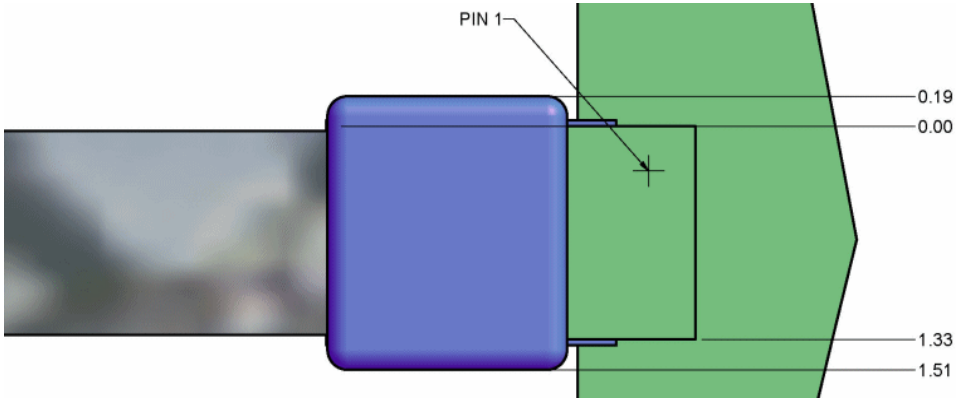


Figure 1-5 **Personality Module -- Top**



1.5.2 Personality Module Connected with Extender Cable

Figure 1-6 **Isometric View**

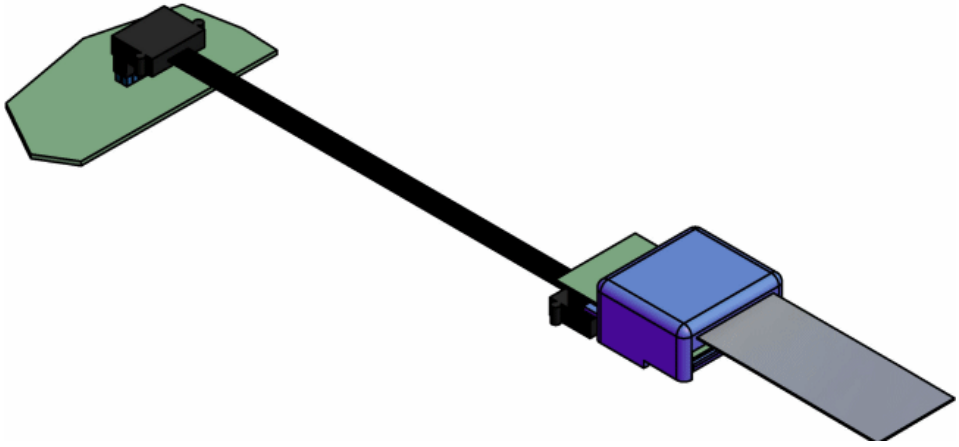


Figure 1-7 **Extender Cable -- Side**

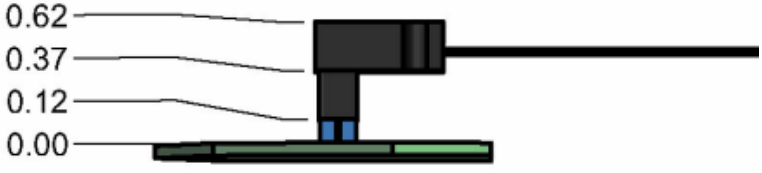
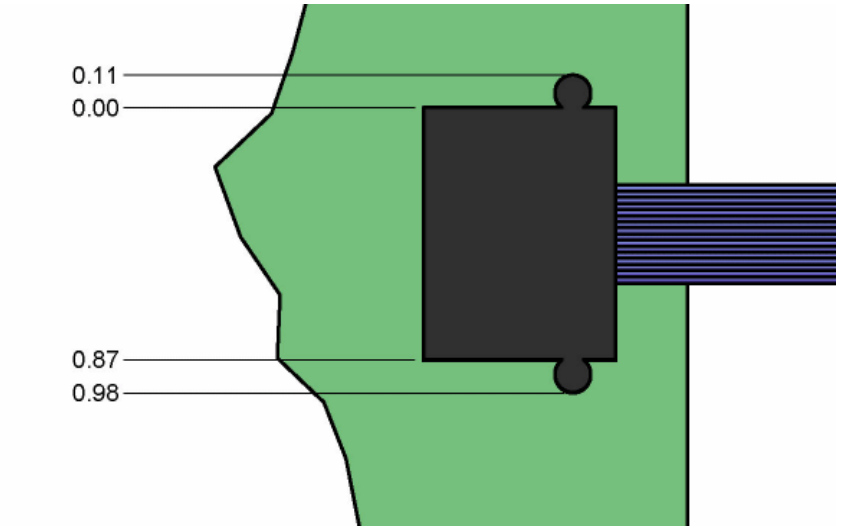


Figure 1-8 **Extender Cable -- Top**



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2.1 Introduction

This chapter describes all of the hardware that is included with the Wind River ICE SX, and explains how to connect it to the target and host.

For the ICE unit to function correctly, there are three connection components you will need to address:

- Connecting the Wind River ICE SX to a target
- Connecting the Wind River ICE SX to a host
- Applying power

This chapter discusses each of these hardware components and provides some general information about the ICE hardware.

2.2 Components Included with Wind River ICE SX

The following list describes all of the components included with the Wind River ICE SX shipment. If any components are missing from your shipment, please contact Wind River Customer Support.

- ICE unit connected to an architecture-specific personality module
- 1 Trigger IN/OUT cable
- 1 OCD extender cable
- 1 right-angle adapter
- 2 RS-232 serial cables
- 2 9-Pin RS-232 adapters
- 2 25-Pin RS-232 adapters
- 5-pin circular DIN power supply with grounding cable

In addition, your shipment may include adapters that you can use to modify the personality module so it can connect properly to the target. Inclusion of these adapters is dependent on your target architecture.

2.3 Unpacking Information



CAUTION: Handle the ICE unit with caution and take measures to prevent electrostatic discharge.

Remove the Wind River ICE SX from its protective anti-static bag and place it on a desk or bench so that it is not covered. Remove any packing materials to ensure proper cooling. The ICE unit operates without requiring additional cooling.

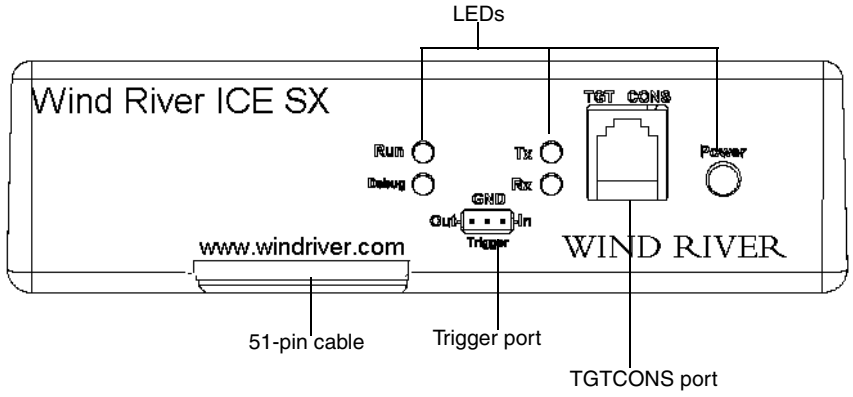
2.4 Wind River ICE SX Description

This section describes all the features that are physically located on the ICE unit. The descriptions are high-level, and is meant to be used strictly as a method of becoming familiar with the unit.

2.4.1 Front Panel

Figure 2-1 shows a labeled diagram of the front panel of the ICE unit. Use this diagram to help locate the components that are described in this section.

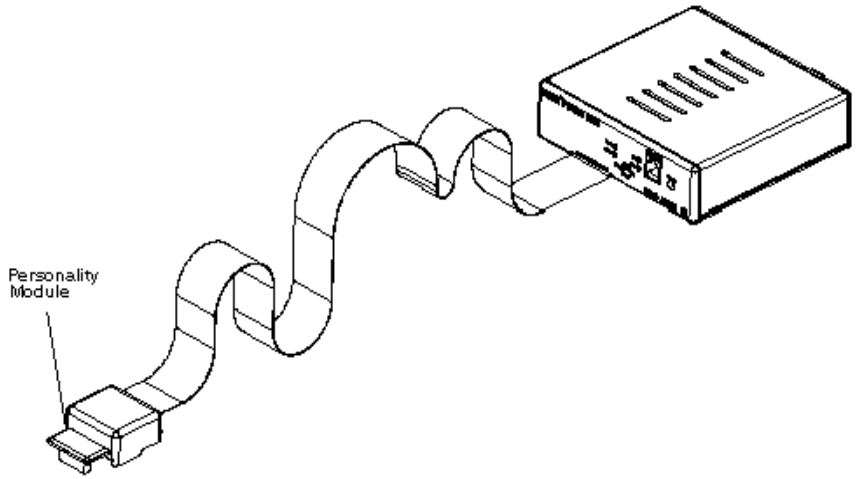
Figure 2-1 **Front Panel of Wind River ICE SX**



51-Pin Cable

The Wind River ICE SX is shipped with a 51-Pin cable already attached to it. On one end, the cable connects to a 51-Pin control bus on the ICE. The other end of the cable terminates in a personality module, as shown in Figure 2-2.

Figure 2-2 **Personality Module**



This personality module is specific to the architecture of the target board to which you are connecting the Wind River ICE SX. You can change the personality module, if necessary, by removing it from the connector at the end of the 51-Pin cable and replacing it with a different personality module. For instructions on how to change a personality module, see *2.8 Changing the Personality Module*, p.33.

Wind River ICE SX LEDs

There are five LEDs located on the front panel of the Wind River ICE SX unit, as shown in Figure 2-1. Table 2-1 describes the function of each of these LEDs.

Table 2-1 **LED Descriptions**

LED	Description
Run	When illuminated, this LED indicates the processor on the target board is in normal execution mode, which is typically the case when code is running on the target.

Table 2-1 **LED Descriptions**

LED	Description
Debug	When this LED is lit, background mode communications have been established with the target microprocessor through the standard reset sequence. In this state, the Wind River ICE SX is ready to begin working with the target. If the LED is flashing, the ICE is in error mode. You will need to rectify this problem before the ICE unit can begin working with the target.
Tx	When this LED is lit, the Wind River ICE SX is transmitting data to the host computer.
Rx	When this LED is lit, the Wind River ICE SX is receiving data from the host computer.
Power	When illuminated, this LED indicates that the power supply is connected to the ICE unit and the power switch is in the ON position. If the LED is green, it indicates that ICE is in normal operation mode, and if it is amber, it indicates that it is in Reset mode. Reset mode simply means that the ICE unit is going through its initialization sequence.

Target Console Port

The Target Console Port, labeled TGTCONS on the front of the ICE unit, is an optional connection only. Use this port to provide serial communication over a network when the Wind River ICE SX is not directly connected to your host.

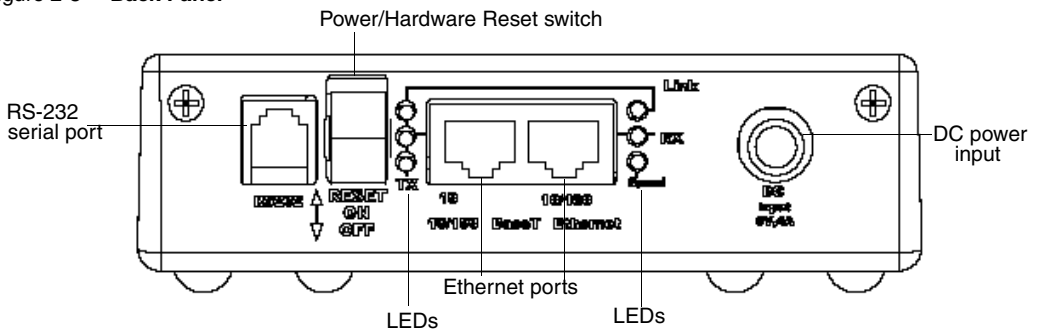
Trigger In/Out

The Trigger In/Out port on the front of the Wind River ICE SX unit is a three pin connector. Wind River provides a Trigger In/Out cable that attaches to this connector on one end and has three flying leads on the other. Use the ground pin of this connector to ground the ICE unit and your target. Information about grounding a target is available in *2.7.1 Grounding the Target*, p.23. The Trigger In and Trigger Out pins provide input and output interfaces for external hardware.

2.4.2 Back Panel

Figure 2-3 shows the back panel of the ICE unit. Use this diagram to locate the components that are described in this section.

Figure 2-3 **Back Panel**



RS-232 Serial Port

This is a standard RS-232 port that is used to establish a serial channel between the Wind River ICE SX and the host computer. This connection is required to configure the ICE for network operation. For information on making the physical connection between Wind River ICE SX and the host, please refer to *2.6 Connecting Wind River ICE SX to a Host*, p.19. For information on configuring ICE for network operation, please refer to *3. Configuring Wind River ICE SX for Network Operation*.

Power/Hardware Reset Switch

This is a three position rocker switch that turns power on to the ICE unit. When the switch is all the way in the downward position, the power is off. When the switch is in the middle position, the power is on. The top most switch position is on a spring so that the switch can only be clicked to that position for a moment. Clicking the switch once in the upper position performs a hard reset of the ICE unit.

Ethernet Ports

There are two Ethernet ports on the back panel of the Wind River ICE SX. One port is 10BaseT only; the second port automatically detects the port speed and uses

either 10BaseT or 100BaseT, depending on network speed. Use either of these ports to connect the Wind River ICE SX to the network.

LEDs

The back panel of the Wind River ICE SX unit includes six LEDs, aligned vertically in two rows of three, one on either side of the two Ethernet ports. The three beside the 10BaseT port describe activity that is occurring on that port, and the three beside the 10/100BaseT port describe activity that is occurring on that port. Both groups of LEDs perform identical functions; which ones are lit depends on which Ethernet port is being used. Table 2-2 describes the functions of these LEDs.

Table 2-2 **Back Panel LEDs**

LED	Description
Link	This LED indicates that a physical connection to a network has been made.
TX	This LED indicates that information is being transferred from the Wind River ICE SX back to the network.
RX	This LED indicates that information is being received by the ICE unit from the network.

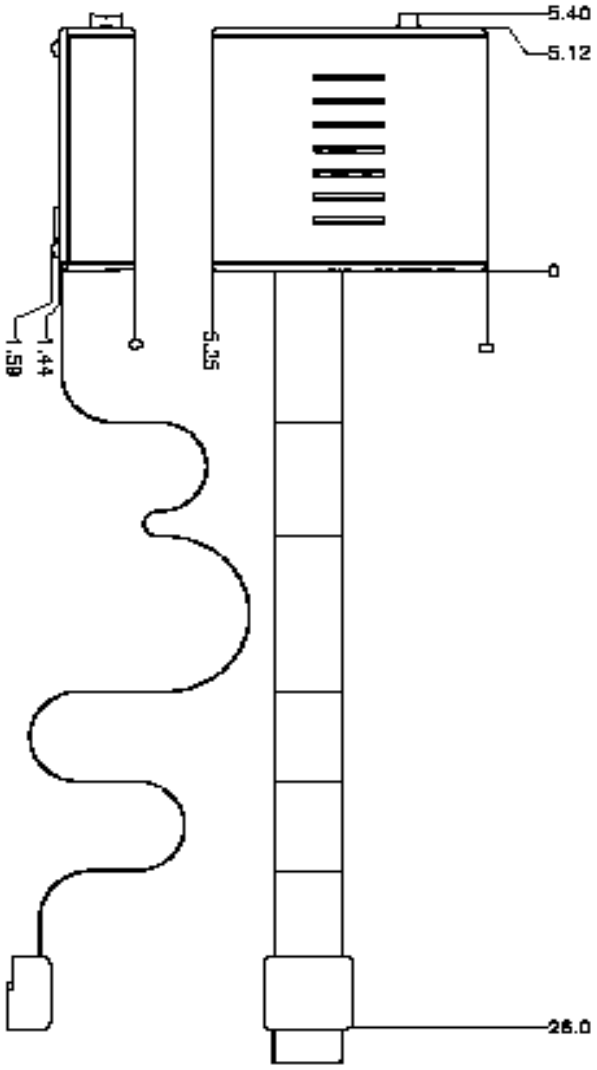
DC Power Input

This is the connector for the power supply. Information on connecting power can be found in *2.7 Applying Power*, p.23.

2.5 Layout Drawings

Figure 2-4 shows the dimensions for the Wind River ICE SX unit. All dimensions are in inches unless otherwise noted.

Figure 2-4 **Layout Drawings**



2.6 Connecting Wind River ICE SX to a Host

You must properly connect the ICE unit to a host computer for it to function correctly. You will need to make both a serial connection and an Ethernet connection if the ICE unit is going to be used on a network. You should make the serial connection first, since this connection is used to set up the network connections. Once you have set up networking for your Wind River ICE SX, the serial connection is no longer necessary. Please see *3. Configuring Wind River ICE SX for Network Operation* for more information.

Make all the host connections from the back of the ICE unit. Figure 2-3 shows the back of the unit.

2.6.1 Serial Connections

NOTE: Use the serial connection to set up network communications for the ICE. This connection cannot be used for debugging.

To set up a serial connection:

1. Connect the RS-232 serial cable that was shipped with your unit to the RS-232 serial port on the back of the ICE unit.

NOTE: This is not the TGTCONS port located on the front of the Wind River ICE SX unit. The correct serial port to use is located on the back of the ICE.

2. Connect the serial cable to either the 9-Pin or 25-Pin RS-232 adapters included with the shipment. Use the adapter that correctly mates with the COM port you want to use on your PC.
3. Connect the serial cable to the host computer's COM port using either the 9-pin or 25-pin adapters. Figure 2-5, Figure 2-6, and Figure 2-7 show the pins that are actually used for the RS-232 Port on the Wind River ICE SX rear panel, the 25-pin adapter, and the 9-pin adapter.

Figure 2-5 **RS-232 Port (Rear Panel)**

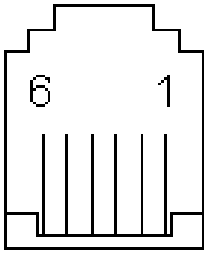


Table 2-3 **RS-232 Pin Scheme**

Pin #	Host	Target (ICE)
Pin 2	Transmit	Receive
Pin 3	Receive	Transmit
Pin 5	Ground	Ground

Figure 2-6 **25-Pin Female Adapter**

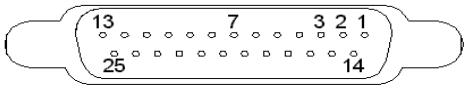


Table 2-4 **25-Pin Female Adapter Pin Scheme**

Pin #	Host	Target (ICE)
Pin 2	Transmit	Receive
Pin 3	Receive	Transmit
Pin 7	Ground	Ground

Figure 2-7 **9-Pin Female Adapter**



Table 2-5 **9-Pin Female Adapter Pin Scheme**

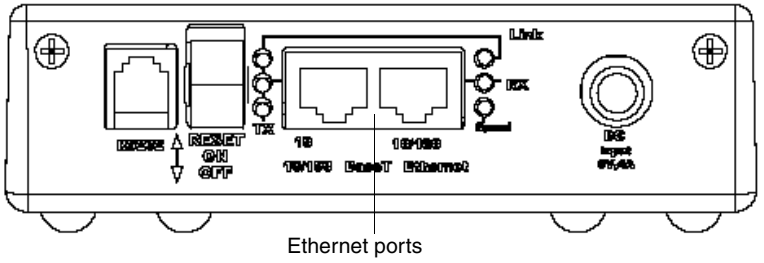
Pin #	Host	Target (ICE)
Pin 3	Transmit	Receive
Pin 2	Receive	Transmit
Pin 5	Ground	Ground

2.6.2 **Ethernet Connections**

NOTE: At this stage, you are making a physical connection between the ICE unit and the network. For this connection to be functional, the ICE must be correctly configured for network operation using the serial connection. Please refer to *3. Configuring Wind River ICE SX for Network Operation* for more information.

Connect the Ethernet cable to the Ethernet port you want to use on the back of the ICE unit. The emulator has both a 10BaseT-only Ethernet port and a second port that automatically detects the port speed and then uses either 10BaseT or 100BaseT, depending on the network speed. Either port can be used to connect.

Figure 2-8 **Wind River ICE SX Ethernet Ports**



Connect the other end of the Ethernet cable to the network device.

NOTE: To connect directly to your PC network card, you need to use a cross-over cable. To connect directly to a network device, such as a hub, a regular Ethernet cable can be used.

NOTE: If no Ethernet cable is connected when the power switch on the ICE unit is turned on, it defaults to 10BaseT operation. To use the 100BaseT connection, you must perform a power-up sequence by rocking the **RESET** switch on the back of the ICE. In addition, if you switch from 10BaseT to 100BaseT while the unit is on, you must power cycle the ICE before you can use the 100BaseT connection.

2.7 Applying Power

To power the Wind River ICE SX and your target, complete the following steps.

1. Ground ICE and your target.
2. Connect ICE to your target.
3. Connect the ICE power supply to your ICE unit and turn it on.
4. Connect your target power supply to your target board and turn it on.

2.7.1 Grounding the Target

CAUTION: Proper grounding may be necessary to prevent damage to the Wind River ICE SX and the target board.

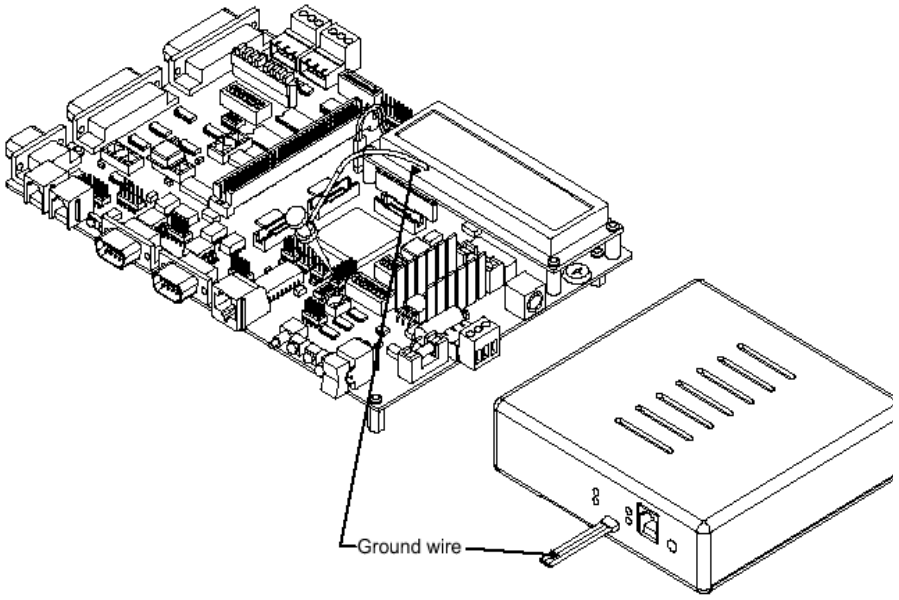
When connecting the ICE to a target board, damage can occur if the two devices are not at similar voltage potentials. These potential differences occur when the AC and DC grounds on the target do not have a common reference. Following the steps in this section references all of the DC logic grounds to the AC grounds gracefully, and prevents damage to either the ICE unit or the target board.

1. Ensure that the **ON/OFF/RESET** switch on the back of the ICE unit is in the **OFF** position.

NOTE: The power switch on the ICE unit should remain in the **OFF** position until all target connections have been made. Following the sequence of the sections in this chapter ensures that all the connections are made and power is applied in the correct order.

2. Connect the supplied Trigger In/Out cable to the Trigger port on the front of the ICE unit. The cable has a three-pin female connector on one end and three flying leads on the other. Two of the three leads have white sleeves at the end and are labeled TRIG IN and TRIG OUT respectively. The third lead has a black sleeve and is labeled GND.
3. Connect the male pin of the supplied ground cable to the ground wire of the trigger cable. This is the flying lead with the black sleeve labeled GND.
4. Connect the female contact of the ground cable to the target. You may use the supplied test clip to simplify this process.

Figure 2-9 **Wind River ICE SX Ground Connection**



Leave the ground clip in place until all of the connections have been made between the Wind River ICE SX and the target, and power has been applied to both devices. Keep in mind that if you disconnect the ICE from the target, you must repeat this process the next time it is connected.

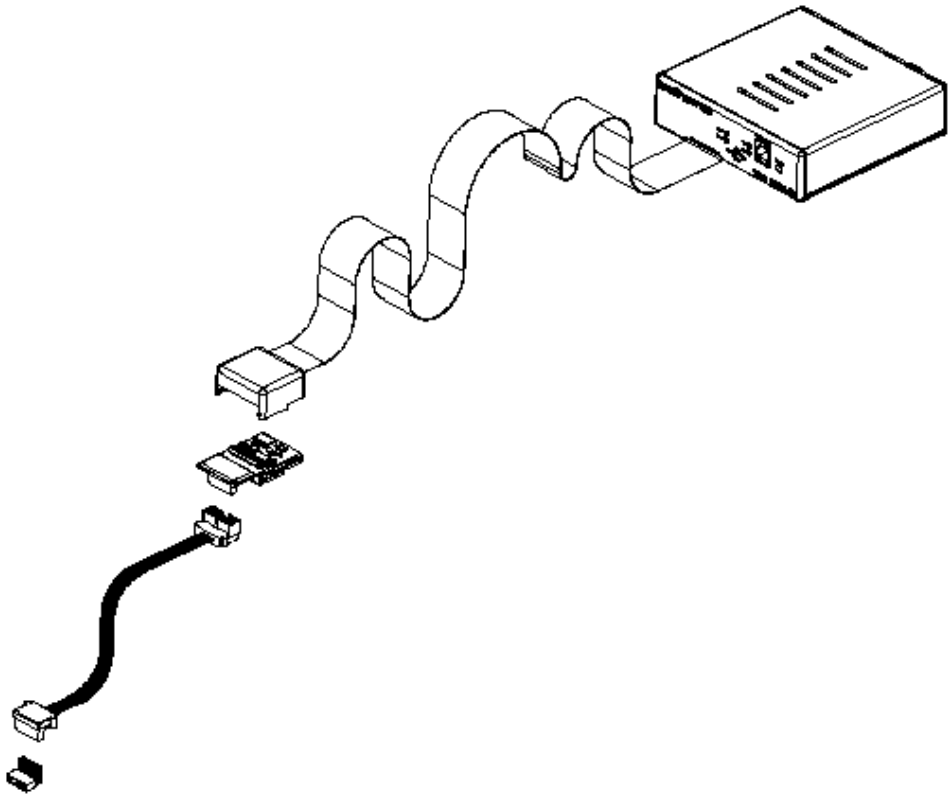
2.7.2 Connecting Wind River ICE SX to a Target

Once you have connected the Wind River ICE SX to the host, and equalized the ground potential between the ICE and the target, you can connect the ICE to the target.

The ICE connects to the target via a 51-pin cable that is pre-attached to the unit at the factory. At the end of this cable is a personality module that mates with the OCD port on the target.

All target-side connections attach to the front of the ICE unit. Figure 2-10 shows the general connection scheme of the unit.

Figure 2-10 **Connection Scheme**

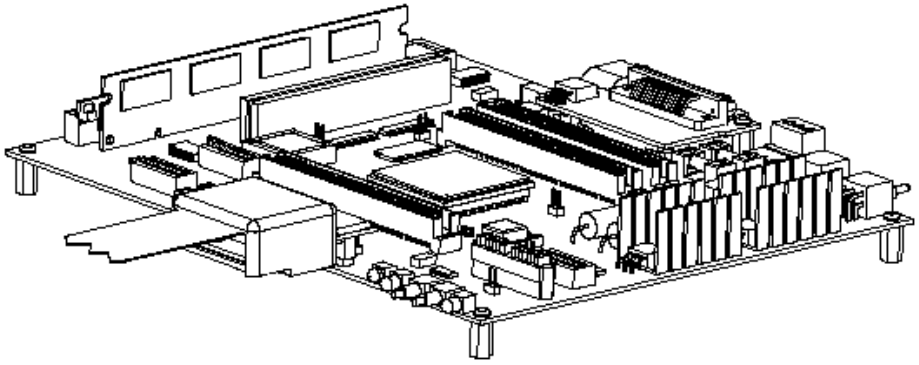


Connecting the Personality Module to the OCD Port

Connect the personality module to the target's OCD port. Pin 1 of the personality module is labeled on its underside to help ensure that it is properly aligned with Pin 1 of the OCD port.

WARNING: Make sure that Pin 1 of the ICE personality module is connected to Pin 1 of the OCD port on the target board. Plugging this device in backwards could result in permanent damage to the target.

Figure 2-11 **Connecting the Personality Module**



The OCD connector on the target is dependent on the processor family, and for this reason the personality module on the Wind River ICE SX is specific to the processor family being used. In some cases, an adapter may be shipped with ICE that makes connecting to the target easier.

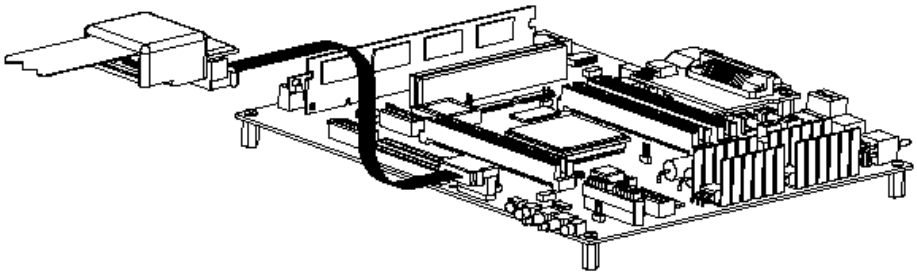
Target Connection Options: Right Angle Connector and OCD Extender Cable

For the highest possible performance, Wind River recommends that you make a direct connection between the ICE personality module and the OCD port on the target board. If it is not possible to make a direct connection due to target system setup, you can use the supplied right angle connector or the OCD extender cable.

The right angle connector is designed for cases where a more vertical connection scheme is required than the personality module connection allows for. To use the right angle connector, identifiable in the shipment as a 0.1" on-center socket with gold plated 0.025" square metal pins at a right angle, connect the right angle connector's male pins to the personality module. Then connect it to the OCD port on the board—the female sockets on the connector mate with the OCD development port header. Be sure to verify proper pin 1 alignment between the personality module and the development port header.

If making a direct connection or using the right angle connector is impossible, the OCD cable can be used as a bridge between the personality module and the OCD development port. To use the OCD extender cable, connect the OCD cable's male header to the female header of the personality module. Then connect the cable's female header with the OCD development port on the board, as shown in Figure 2-12.

Figure 2-12 **Wind River ICE SX Connected To The Target Via OCD Extender Cable**



NOTE: This extender cable affects the signal quality of the debug interface. When using this cable you must operate the debug interface at lower frequencies to avoid intermittent operation. If you encounter mechanical difficulties when connecting to the target, first try using the right angle adapter provided.

Serial (RS-232) Target Connections

In situations where the ICE is not connected directly to your host computer during configuration, a serial channel can be opened with the target using the TGTCONS port on the front of the ICE unit.

To use this function, you must configure the Wind River ICE SX for network operation. Please refer to *3. Configuring Wind River ICE SX for Network Operation* for more information.

The purpose of this section is to describe how to make the physical connections between the TGTCONS port on the ICE unit and the target. The following steps explain how to use this function.

1. Connect one end of one of the RS-232 cables into the TGTCONS port on the front of the ICE unit.
2. Connect the other end of the cable into either the 9- or 25-pin female D subminiature adapter.
3. Take the second RS-232 cable included with the shipment and plug it into the serial port on the target.

4. Connect the other end of the cable that is connected to the target to either the 9- or 25-pin male D subminiature adapter. Make sure that you choose the same type of adapter (either 9 or 25 pins) as was used in Step 2.
5. Connect the two 9- or 25-pin D subminiature adapters together to complete the connection between the target and the ICE unit.

The following figures show the pins that are actually used in the TGTCONS port, the 25-pin adapter, and the 9-pin adapter.

Figure 2-13 **TGTCONS Port**

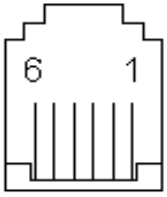


Table 2-6 **TGTCONS Port Pin Scheme**

Pin #	Host (ICE)	Target
Pin 3	Transmit	Receive
Pin 2	Receive	Transmit
Pin 5	Ground	Ground

Figure 2-14 **25-Pin Male Adapter**

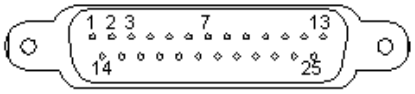


Table 2-7 **25-Pin Male Adapter Pin Scheme**

Pin #	Host (ICE)	Target
Pin 2	Transmit	Receive
Pin 3	Receive	Transmit
Pin 7	Ground	Ground

Figure 2-15 **9-Pin Male Adapter**

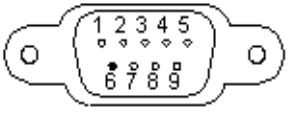


Table 2-8 **9-Pin Male Adapter Pin Scheme**

Pin #	Host (ICE)	Target
Pin 3	Transmit	Receive
Pin 2	Receive	Transmit
Pin 5	Ground	Ground

2.7.3 Connecting Power

Before applying power, ensure that the Wind River ICE SX has been properly connected to the host and the target, and that steps have been taken to ensure proper grounding.

The Wind River ICE SX includes a power supply that converts standard 110 -240 VAC 50/60Hz to 5V DC at 6A. The DC input connection is located on the back panel of the ICE unit. The power supply is fused with a 5mm x 20mm, 2A, 250V fuse

WARNING: The power supply contains no user serviceable parts and should not be disassembled. To avoid electrical shock and possible loss of life, do not disassemble the power supply.

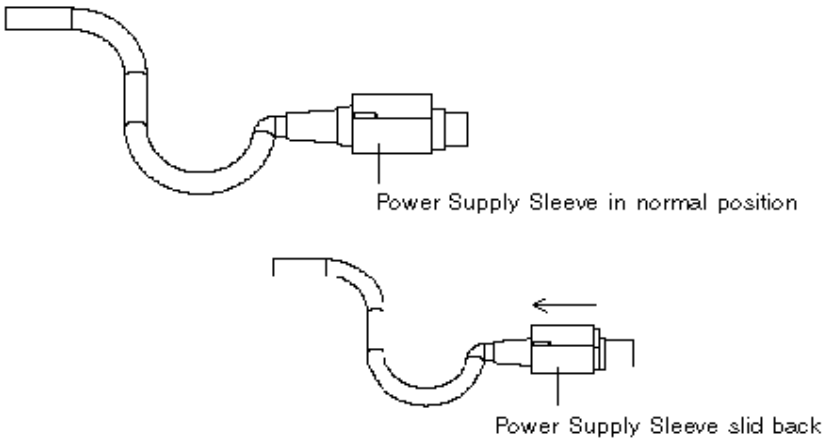
See Table 2-9 for Wind River-specified part numbers.

Table 2-9 **Wind River ICE SX Part Numbers**

Wind River Part Number	Description
PWR-R00010-001	Power Supply
CAB-R00003	Power Cord, United States
CAB-R00004	Power Cord, European
CAB-R00005	Power Cord, United Kingdom
CAB-R00018	Power Cord, Israel

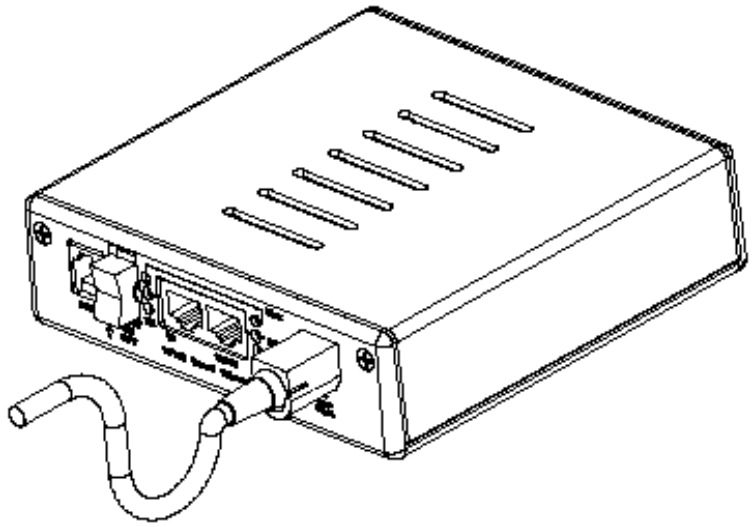
The ICE power connection is a standard 5-pin circular DIN connection with a locking mechanism. Slide back the sleeve on the 5-pin connector as shown in Figure 2-16.

Figure 2-16 **Power Supply Locking Mechanism**



With the sleeve slid back, plug the supply into the DC input connector on the back of the ICE unit. Release the sleeve, locking the power supply into place, as shown in Figure 2-17.

Figure 2-17 **Wind River ICE SX With Power Supply**



Power the ICE unit by moving the power switch on the back of the unit to the **ON** position—the middle position on the three-position rocker switch. The **Power** LED on the front of the ICE unit illuminates, turning amber for a few seconds while it goes through its power-up sequence, and then green, indicating that it is ready. The illumination of this LED indicates that power has been successfully applied to the unit.

To use the Wind River ICE SX with a target board, you will also need to apply power to the target board being used. For information on applying power to the target, see the documentation included with your target.

2.8 Changing the Personality Module

CAUTION: Before attempting to change the personality module on the ICE unit, make sure that the power on the Wind River ICE SX is **OFF**, and that it is disconnected from the power supply. In addition, please disconnect your ICE unit from your target board.

To change the target architecture the Wind River ICE SX communicates with, there are a number of steps that you must take. This section describes how to replace the personality module.

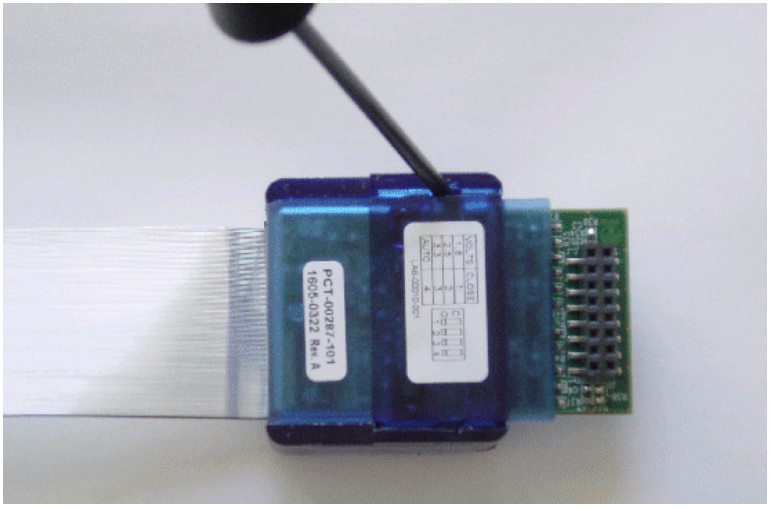
To change the personality module and replace it with another:

1. Remove the personality module using a small screwdriver to unlatch the module.

   On the underside of the target end of the 51-pin cable, you will see a small rectangular cover that clips the module into place.

   Pry the module out of its position by gently pushing the screwdriver into the open grooves located on the sides of the cover, as shown in Figure 2-18.

Figure 2-18 **Using a Screwdriver to Remove the Personality Module**



The personality module is released.

2. To attach a new personality module, align the front edge of the module's rectangular cover with the front edge of the target end of the 51-pin cable.

   The glossy teal label on the personality module should be facing away from you.

   When the front edges are aligned, as shown in Figure 2-19, the grooves on both the rectangular cover and the 51-pin cable are also aligned.

Figure 2-19 **Aligning the Personality Module**



3. Press both thumbs on each side of the cover, and snap the personality module into place.

   When inserting, it is helpful to press down on both sides of the cover with equal force. When the module is properly inserted, it snaps into place and is solidly attached to the cable.

After you have successfully changed your personality module, return to *2.7 Applying Power*, p.23, for information about making the physical connections between Wind River ICE SX and your target board.

3

Configuring Wind River ICE SX for Network Operation

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3.1 Introduction

The Wind River ICE SX provides full Ethernet support and is designed to operate on any TCP/IP network. The following list describes some of the advantages to using an ICE on a network.

Remote Access to Wind River ICE SX

When properly connected to a network via the Ethernet port, the ICE becomes a separate functional component on that network. It can be accessed by any PC or workstation that is included on the LAN, thus allowing for remote operation.

High Speed Communication

The Ethernet channel used to connect Wind River ICE SX to the host PC or workstation has a much higher bandwidth than any other communications medium supported by the ICE. The result is that download and debugging times are significantly faster.

3.2 I/O Ports on Wind River ICE SX

The ICE has several ports that you can use to communicate with a host computer or a network. Their use is described in *3.5 Configuring Wind River ICE SX for Network Operation*, p.47.

RS-232 Port (Back of ICE Unit)

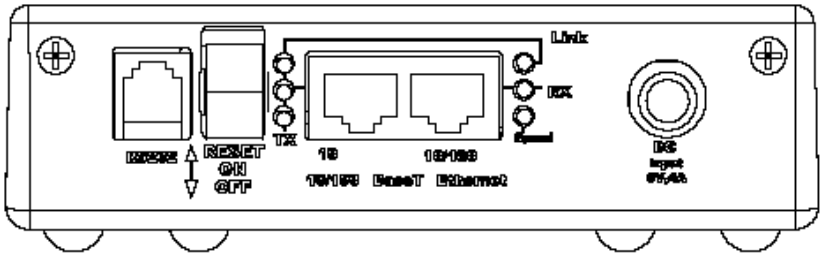
This port lets you make a direct serial connection between the Wind River ICE SX and a host computer. Over this connection, you configure the Wind River ICE SX for networking and are able to issue low-level emulator commands, including many network commands.

Ethernet Ports

Two Ethernet ports are available on the back of the ICE unit, labelled 10BaseT and 10/100BaseT respectively. Either of these ports can be used to make Ethernet connections.

The three ports are shown in Figure 3-1.

Figure 3-1 **Rear View of Wind River ICE**



3.3 Networking Overview

For the Wind River ICE SX to function correctly on your network, you must program the non-volatile memory (NVRAM) in the ICE unit with specific network information to make it visible on your network.

This section explains some of the networking concepts you need to understand to decide how you want to configure the ICE unit. In addition to IP addressing, this section describes netmasks, routing, default routing, and several of the Wind River ICE SX protocols.

If you are already familiar with these concepts, you may skip to *3.5 Configuring Wind River ICE SX for Network Operation*, p.47.

3.4 IP Addressing

An IP address is an identification number used by network software to locate a device on that network. The network uses the IP address to direct data to a specific device. IP addresses differ from Media Access Controller (MAC, or Ethernet) addresses in that IP addresses are specific to the protocol being used, TCP/IP in this case. Also, MAC addresses contain no information about where a network device is located, whereas IP addresses do.

The IP address is assigned locally, and must be unique to a particular network. They are 32-bit numbers, usually written as four sets of numbers separated by periods, such as 255.255.255.255.

The Wind River ICE SX can determine its IP address in one of four ways:

- Dynamic Host Configuration Protocol (DHCP)
- Manual programming
- Reverse Address Resolution Protocol (RARP)
- Bootstrap Protocol (BOOTP)

Programming the IP address manually means you enter and store the IP address in the ICE unit's NVRAM.

Some network administrators use a central database to maintain the IP addresses of all of the nodes on their network. In this case, when a network node boots up, it queries the database via the network to determine its IP address. The Wind River ICE SX supports the DHCP, RARP, and BOOTP protocols, but you

must program it to use the proper protocol. This protocol programming is only necessary once, and it is stored in the ICE unit's NVRAM.

The following sections explain how each of the methods work.

Dynamic Host Configuration Protocol

The Dynamic Host Configuration Protocol (DHCP) is the simplest method of assigning an IP address to the ICE unit. The only requirement is that the network that you are working on must have a DHCP server.

Using the DHCP protocol, when a client device on the network is booted, it broadcasts a request for address information. The DHCP server takes that request and assigns a new address for a specified time period (usually a number of days, depending on how the network administrator has it configured) and sends this address to the client along with any other required configuration information. The additional information might include gateway, netmasks, or any required routing information, depending on how the network is set up. This packet of information is acknowledged by the client and used to set up its configuration.

While an IP address is leased to a client, it will not be reallocated by the DHCP server. In addition, every time a client requests an IP address, the DHCP server attempts to assign it the same address every time. The client can extend its lease with additional requests. It can also send a message to the DHCP server before the lease expires telling it that it no longer needs an address and releasing it.

Manual Programming

Manually assigning an IP address to the Wind River ICE SX is a very simple process, although the risk of user error is higher than with automated processes. In this case, you enter the IP address and other potentially required information manually over a serial connection to the ICE. The information is stored in the unit's non-volatile memory (NVRAM), so reprogramming this information is not necessary unless your network configuration changes (for example, if your network administrator reconfigures your network.)

Reverse Address Resolution Protocol

With the Reverse Address Resolution Protocol (RARP), when a device on the network is booted, it broadcasts a packet containing its MAC (Ethernet) address to

all other nodes on the network and requests address information. The RARP server responds with a correct address packet, which is received by the client. The client, in this case the Wind River ICE SX, extracts the IP address information from the address packet.

With RARP, the Wind River ICE SX can only extract the IP address from the address packet that is sent by the server. Any additional required information, such as gateways or netmasks, must still be entered manually.

The IP address sent by the RARP server may be a static IP address for the ICE unit, or it may be one that is sent from a pool of addresses that your network administrator has set up to be available for users. If this is the case, a new IP address may be assigned to your ICE unit every time you boot the unit. Regardless of which method your network administrator has set the RARP server to use, it is transparent to the ICE user.

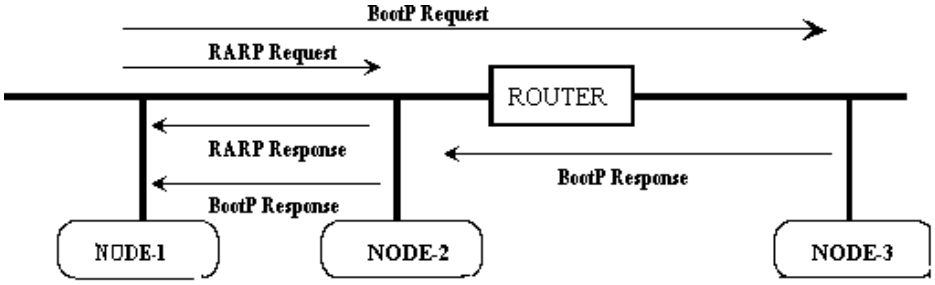
Bootstrap Protocol (BOOTP)

The Bootstrap protocol (BOOTP) functions very similarly to RARP. However, it is capable of transmitting more than just the IP address to the networked device. With BOOTP, the basic operation is the same, in that a packet containing the device's MAC (Ethernet) address is broadcast by the network device that is booting to all other nodes on the network. The BOOTP server receives this request and responds with a packet of address information. The device on the network receives this packet and extracts the necessary information from it, including the IP address.

The main advantage that BOOTP has over RARP is that it can provide more than just the IP address to the Wind River ICE SX. Information about the gateways and netmasks that are set up on the network can also be passed to the ICE unit, eliminating the need for users to manually enter this information.

In addition, BOOTP uses a higher layer protocol which can be passed through routers. Figure 3-2 shows how BOOTP and RARP work.

Figure 3-2 **RARP and BOOTP Network Transactions**



RARP

In this example, when Node 1 on the network is booted, it sends a RARP request containing its MAC (Ethernet) address. Node 2 on the network contains a database which maps MAC addresses to IP addresses, and is therefore able to respond to Node 1's request for IP information. Note that in this case the RARP request does not pass through the router.

BOOTP

In this case, when Node 1 on the network is booted, it sends a BOOTP request containing its MAC address. In this case, the request goes to Node 2, and also passes through the router and goes to Node 3. Both Node 2 and Node 3 respond to this request. Since Node 2 contains the database that maps MAC addresses to IP addresses, it responds to Node 1 with the correct address packet. Node 3 issues a response to Node 1 saying that it cannot provide the requested information.

3.4.1 Netmasks and Routing

TCP/IP networks can be subdivided into multiple logical networks using routers. Netmasks are used to identify which of the physical networks a network node resides on. A netmask is a 32-bit number that is used to separate an IP address into two logical parts—a network address and a host address. The router uses a netmask to determine which physical network a host resides on. In larger network environments where routers are used, it may be necessary to program a netmask and set up a routing method on the Wind River ICE SX. This is only necessary if you want to access the ICE from a host computer that is on a different network than the ICE unit resides on, and the two networks are separated by a router. For

example, this may be the case if the ICE is set up in a laboratory and you want to try to access it from your office.

Bridges are not the same as routers, and they require no special configuration on the ICE unit.

If the environment requires that your Wind River ICE SX be separated from the host computer by a router, then the ICE has to be configured to anticipate the router. This can be done in one of two ways:

- Programming a routing table into the ICE unit's NVRAM.
- Configuring the ICE to dynamically determine its routing table using a Routing Information Protocol (RIP).

Separating an IP Address into Host and Network Parts

An IP address can be separated into its host and network parts by performing a logical AND of the IP address with the netmask.

For example, if the IP address is 192.9.200.02 (0xC009C802) and the netmask is 255.255.0.0 (0xFFFF0000), then performing a logical AND of the two addresses shows that the network portion of the IP address is 192.9.0.0. That means that on that network (the 192.9.0.0 network), the host is located at 0.0.200.02.

When the Wind River ICE SX sends a packet, it performs this calculation to determine if the address the packet is being sent to is on the same network as the ICE. If it is not on the same network, the ICE knows that it needs to consult its routing table to determine the IP address of a router that can forward the packet to the correct network.

Sending a Packet on the Same Network

If the IP address of the ICE unit is 192.9.200.02 and it wants to send a packet to 192.9.200.230, and the netmask is 255.255.0.0, then the calculation reveals that both addresses are on the 192.9.0.0 network. Consequently, there is no need to send the request through a router and the packet can be sent directly.

Sending a Packet on Different Networks

If the IP address of the ICE unit is 192.9.200.02 and it wants to send a packet to 192.10.201.3, and the netmask is 255.255.0.0, then the calculation reveals that the ICE unit is on a different network than the intended recipient of the packet. The Wind River ICE SX consults its routing tables to determine which IP address is

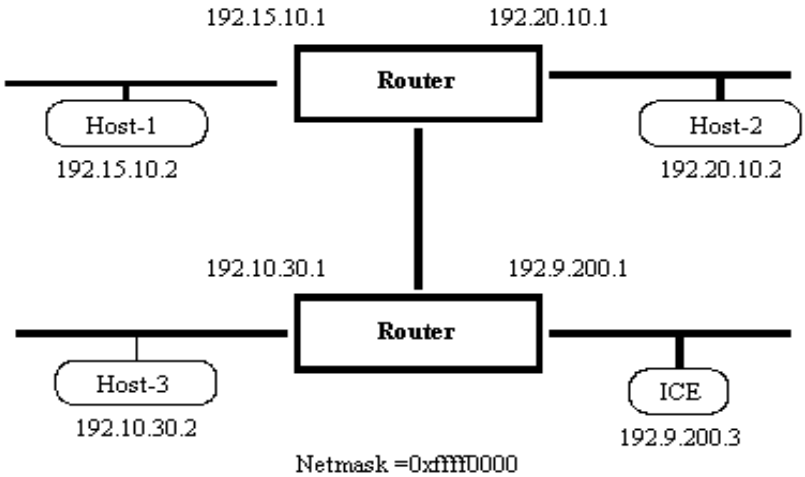
needed to find a router that can reach the 192.10.0.0 network that the intended recipient is located on.

Routing Tables

Routing tables are arranged as pairs of network addresses and IP addresses. The ICE releases a packet that has a network address of X. If the ICE is not on network X, it consults its routing tables, which takes the packet and readdresses it to Y. Y is a packet that includes all of the information from X but is addressed to a router on the network that the ICE is on. The router takes the information from packet Y and checks to see if it is on a network that is directly connected to it. If it is not, it sends it on to another router, which repeats the process. The packet continues to be sent from router to router until one of the routers discovers that the original packet X is addressed to a segment that is directly connected to it. This process can usually be completed in a few hops between routers unless some kind of Wide Area Network (WAN) lies between the Wind River ICE SX and the desired recipient.

The concept of routing and routing tables can be explained using the following example. Figure 3-3 shows a sample network containing four network nodes (the Wind River ICE SX and three hosts) and two routers.

Figure 3-3 **Sample Network**



The sample network consists of four separate networks that are connected by routers, and the netmask is 255.255.0.0 (0xFFFF0000). The ICE must be set up with a routing table that allows it to communicate with any of the three hosts. Since the ICE does not require a router to communicate with a device on the 192.9.0.0 network, because it is located on that network, three address pairs must be included in the routing table to account for the three other networks. The routing table for this network is shown in Table 3-1.

Table 3-1 **Sample Routing Table**

To get to an IP address on this network	Send to the router at this IP address
192.10.0.0	192.9.200.1
192.15.0.0	192.9.200.1
192.20.0.0	192.9.200.1

As shown in the table, the Wind River ICE SX only needs to know the IP address of one router to deliver a packet anywhere on the network. This is because ICE is only responsible for getting the packet to the next IP address.

If you want the ICE to send a packet to Host 3, it first checks to see whether Host 3 resides on the 192.9.0.0 network. Since it does not, the ICE consults the routing table and determines that to send to an IP address on the 192.10.0.0 network, it must address the packet to the 192.9.200.1 router. The router at that address receives the packet, determines that Host 3 is directly connected to it, and sends it to Host 3.

If you want the ICE to send a packet to Host 2, it first checks to see whether Host 2 resides on the 192.9.0.0 network. Since it does not, the ICE consults the routing table and determines that to send to an IP address on the 192.20.0.0 network, it needs to address the packet to the 192.9.200.1 router. The router at that address receives the packet and determines that the 192.20.0.0 network is not directly connected to it, so it forwards the packet on to the second router. The second router receives it, determines that Host 2 is directly connected to it, and forwards the packet to Host 2.

How Wind River ICE SX Determines Routing Tables

There are two ways that the ICE can determine its routing tables. The first is to program the routes directly into the ICE unit's NVRAM. Using this method, there is enough storage provided for up to ten routes to be stored. With this method, the

information must be changed any time the routing information changes on the network.

The Wind River ICE SX is also capable of dynamically determining its routing tables. This is done by enabling the dynamic routing option and storing it in the ICE unit's NVRAM. In this mode, ICE sends out a special packet called a RIP request when it boots up. When a router receives this request, it sends the routing table information back to the Wind River ICE SX. As routing information changes, the routers broadcasts this information to any devices on the appropriate logical networks. ICE captures these packets and update the routing tables as needed. Dynamic routing is typically used on networks with a large number of routers.

Default Route

In situations where Wind River ICE SX would only have to send to one router to find any other node on the network, as was the case in the routing tables example, a shortcut is available. The default route is the address of the router that is used when all other routing attempts do not show a clear path to the destination network. Using this method, if ICE cannot determine a router to send a packet to, it sends it to the default router on the assumption that the router is able to find the destination network. In the example shown previously, the default route could be set at 192.9.200.1 and the routing table left blank. In that case, if ICE cannot find an address it sends the packet to 192.9.200.1 on the assumption that the router can find the correct destination address.

3.4.2 Servers, Protocols, and Service Ports

Almost all network products use a client-server architecture. A client performs the actions of getting user input, transporting the input to a server, and awaiting a response from the server. A server waits for the client input, carries out necessary actions based on the input, and returns a response to the client. Wind River ICE SX is based on a scalable client-server architecture and a number of network servers are provided within the ICE unit. The servers carry out the actions of various client programs which run on host computers, either PCs or workstations. The most common client program is a source level debugger.

All network servers must have a way of identifying themselves, and this is typically accomplished through the use of service ports. On a TCP/IP network, a service port is a 16-bit number that is encapsulated in each packet so that the receiver can determine which program, client or server the packet should be delivered to. Each server is identified by three items:

- the IP address of the node it runs on
- the type of protocol it uses
- the service port within the protocol it uses

Wind River ICE SX implements several servers. Some are based on connection oriented protocols called STREAMS. Others are based on connection-less protocols called DATAGRAMS. Many of the servers use well known protocols and ports, such as Telnet, while others use ports that are specific to the manufacturer of a product, such as a source-level debugger.

The following table describes the server, protocol type and port numbers used by various servers on ICE.

Table 3-2 **Servers, Protocols, and Ports used by Wind River ICE SX**

Server	Protocol	Port	Description
Telnet Port	STREAM	23	Standard TCP/IP Telnet Server capabilities
TGTCONS Port	STREAM	1232	Target Console port
SHELLD	STREAM	1233	Control Port

Since Wind River ICE SX can be used for multi-core debugging, an additional set of servers are launched for every set of application firmware that is in use. The following table describes the servers, protocols, and ports that are assigned for each additional set of firmware that is launched.

Table 3-3 **Servers, Protocols, and Ports for Each Set of Firmware**

Server	Protocol	Port	Description
ESTD#	STREAM	1*mn*4	STREAM based debugger
TCPD#	STREAM	1*mn*5	STREAM based debugger, or OCD API 3.x
LOADD#	STREAM	1*mn*6	Target console port
WRS#	STREAM	1*mn*7	Wind River specific tools

- The # values for each of the servers listed in Table 3-3 start with #=0 and increase sequentially for each set of application firmware that is loaded.
- The *m* values for each of the port numbers listed in Table 3-3 start with *m*=2 and increase sequentially when the *n* value rolls over 9.

- The *n* values for each of the port numbers listed in Table 3-3 start with *n*=3 and increase sequentially for each set of application firmware that is loaded.

For example, the first application firmware that is loaded would have the **ESTD0** server on port 1234, and the second set of firmware that is loaded would have the **ESTD1** server on port 1244.

You can view the various processes and their associated port numbers by issuing a **PS** (Process Status) command from a **>NET>** prompt in the **Terminal** view.

The following shows the result of a **PS** command when you have made a serial connection to the Wind River ICE SX but have not yet connected to a target:

```
>NET>ps

NAME            TSK_ID      TYPE      PRIORITY   STATE
-------------------------------------------------------------------------

 TGTCONS        *00000025   PrmServ    00000190   ConnWait  0.0.0.0 (1232)
 SHELLD         *00000026   PrmProc    00000065   ConnWait  0.0.0.0 (1233)

             * = Tapable with comtap

>NET>
```

The following shows the result of a **PS** command after connecting the ICE to a PPC750FX target:

```
>NET>ps

NAME           TSK_ID    TYPE       PRIORITY  STATE
-------------------------------------------------------------------------
 TGTCONS      *00000025  PrmServ    00000190  ConnWait  0.0.0.0 (1232)
 SHELLD       *00000026  PrmProc    00000065  ConnWait  0.0.0.0 (1233)
 PPC6XX        00000106              00000180  running
 UJD           00000123  PrmServ    00000210  running
 ESTD0        *00000128  PrmServ    00000200  Connected to 255.0.11.4 (1271)
 TCPD0        *00000130  PrmServ    00000200  ConnWait  0.0.0.0 (1235)
 LOADD0       *00000132  PrmServ    00000210  ConnWait  0.0.0.0 (1236)
 TVIO0        *00000134  PrmServ    00000190  ConnWait  0.0.0.0 (1237)

            * = Tapable with comtap
>NET>
```

Note that in the above output, the IP address and port number listed for the **ESTD0** server is that of the host connected to the Wind River ICE SX.



NOTE: In the above example, although the ICE is connected to a PPC750FX target, the firmware file is listed as PPC6xx; this is because PPC6xx and PPC7xx targets use the same firmware **.bin** file.

Additional servers can be added to Wind River ICE SX as additional applications are ported to be used with the ICE solution. Simple Flash firmware updates can make these servers available.

3.5 Configuring Wind River ICE SX for Network Operation

When you first receive your ICE unit, you must correctly program the hardware for network operation.



NOTE: Until you configure the ICE for network operation, it will not be visible on your network.

You must configure the ICE unit for network operation before you can access it on your network, regardless of whether the physical connections have been made.

The ICE contains a special boot mode that includes an Ethernet Setup (**ETHSETUP**) menu, which facilitates programming site specific network information into its non-volatile memory (NVRAM). This section describes the **ETHSETUP** menu.

Before you configure the Wind River ICE SX for network operation, make sure that you have correctly installed the Wind River Workbench software and made serial connections between ICE and the host computer, and that power has been applied to the ICE unit as described in *2. Hardware Setup*.



NOTE: You do not need to have the Wind River ICE SX connected to a target in order to configure it for network operation. However, being connected to a target does not prevent you from configuring the ICE.

Before configuring the ICE for network operation, make sure you have the following information:

- Know how you want to determine your IP address (the four available methods are described in *3.4 IP Addressing*, p.37).
- If you are planning to program the IP address manually, make sure that you know the address that you intend to assign to your unit (this information can be obtained from your system administrator).
- Know how you want to determine your netmask (either entering it manually or by using one of the protocols that can provide the netmask).

- Know how you want to set up routing on the ICE unit (no routing, manually entering tables, or dynamic routing).
- If you plan to manually enter a routing table, make sure that you know the routing tables to be programmed.
- If you plan to use a default route, make sure you know what that should be for your network.



NOTE: Details about each of these items are available in *3.3 Networking Overview*, p.37. In addition, you may need to contact your network administrator to find out the specific addresses for your network.

3.5.1 Opening a Serial Connection to Wind River ICE SX

You can configure the ICE for network operation over a direct serial connection between Wind River ICE SX and a host computer.



NOTE: Establish serial connections with Wind River ICE SX using Wind River Workbench. From this point on, this chapter assumes that you have installed Wind River Workbench on your host computer. For information on Wind River Workbench, see the *Wind River Workbench User's Guide*.

To establish a serial connection with the Wind River ICE SX, use the following steps.

1. Make a physical serial connection between the Wind River ICE SX and the host computer. Information about how to make this connection is available in *2. Hardware Setup*.
2. Make sure that the power supply is attached to the ICE unit, but that the power switch is in the OFF position.
3. Launch Wind River Workbench using the method for your host operating system.

For Linux/Solaris hosts:

From your installation directory, enter the command **./startWorkbench.sh**.

For Windows hosts:

Select **Start > All Programs > Wind River > Wind River Workbench** *version*.

4. If this is the first time you have opened Workbench, the **Welcome** screen appears. Click **Workbench**.

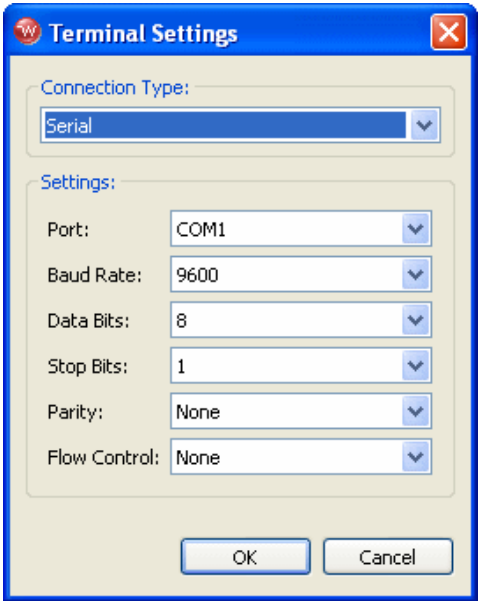
   Workbench opens showing the **Quick Target Launch** dialog.

5. In the **Quick Target Launch** dialog, click **Close**.
6. In the Workbench toolbar, select **Window > Show View > Terminal**.

   The **Terminal** view opens.

7. In the **Terminal** view, click the **Settings** button.

   The **Terminal Settings** dialog appears.



8. Make sure **Connection Type** is set to **Serial**, and select the options that apply to the serial port Wind River ICE SX is connected to.
9. When you have finished defining the port, click **OK**.

The **Terminal** view now displays an open connection.



NOTE: If you are having difficulty getting the serial connection to open properly, check to make sure that you have no other software running that is attempting to utilize that port. For example, Palm Pilot HotSync software maintains an open connection to the serial port whenever it is active.

Once you have opened a serial connection, you can begin to configure the Wind River ICE SX for network operation.

3.5.2 The Ethsetup Menu

Now that you have opened a serial connection, turn the Wind River ICE SX power switch to the **ON** position. After a second or two, the ICE runs through a series of internal tests to ensure all the hardware and firmware in the unit is functioning correctly. As the tests are run, they are displayed in the **Terminal** view in Wind River Workbench. The output resembles the following:

```
*******************************************************************************
Wind River ICE Ethernet Platform
Copyright © Wind River Systems, Inc. 1999-2004.  All rights reserved
*******************************************************************************
Firmware Type Wind River ICE BSP  Version 2.0a  Created On: Oct 22 2004
16:07:17

Configuring TCP/IP Network Suite:
   IP Address..... NVRAM = 255.255.255.255
   Netmask........ NVRAM = 0xFFFF0000
   Default Gateway None
   Routing........ Disabled
   MAC Address.... 00:A0:1E:00:3C:71

Supervisory command mode enabled..................... PASSED
Pseudo device initialization......................... PASSED
TFTP device initialized.............................. PASSED
Device inititalized.................................. PASSED
Starting TCP/IP on PORT A 10BaseT.................... PASSED
Starting TCP/IP on PORT B 100BaseT................... PASSED
Initializing FFS Driver.............................. PASSED
FFS disk initialized  26408 Kbytes free.............. PASSED
FFS disk      0 percent fragmented................... PASSED
Disk volume 45.0.0 initialization.................... PASSED
Starting TCP TGTCONS   server TGTCONS [ 1232] ....... PASSED
Setting TGTCONS baud rate to 9600.................... PASSED
Starting WRS shell server............................ PASSED
Wind River ICE System Shell - Type HELP for list of commands

>NET>
```

At the conclusion of these tests, a **>NET>** prompt appears in the **Terminal** view.

At the **>NET>** prompt, type **ETHSETUP**. The following information is displayed:

```
>NET>ethsetup

                                    Ethernet Setup Mode

Select from the operations below
     1. Display Basic IP parameters  2. Modify Basic IP parameters
     3. Display Routing parameters   4. Modify Routing parameters
     5. Display Server parameters    6. Modify Server parameters
     7. View ethernet address        8. Save parameters
     9. Exit setup mode             10. Port A/B select
    11. Advanced Options

Make a selection:
```

The Ethernet Setup menu presents a list of options you can use to configure the Wind River ICE SX for network operation. Any of the eleven options can be selected by entering its number and pressing **ENTER**. The available options are described below.

Display Basic IP Parameters

Selecting this option displays how the ICE unit is currently set up to acquire its IP address, netmask, and default route. When you select this option, and the Wind River ICE SX is set to acquire its IP address using DHCP, the **Terminal** view displays the following output:

```
Make a selection: 1
System DNS name is: ICE
System IP address will be determined using DHCP
DHCP retry delay is LINEAR
System netmask will be determined using DHCP
System will not use a Default Gateway

Select from the operations below
     1. Display Basic IP parameters  2. Modify Basic IP parameters
     3. Display Routing parameters   4. Modify Routing parameters
     5. Display Server parameters    6. Modify Server parameters
     7. View ethernet address        8. Save parameters
     9. Exit setup mode             10. Port A/B select
    11. Advanced Options

Make a selection:
```

Modify Basic IP Parameters

Option 2 lets you modify how the ICE unit acquires its IP address, netmask, and default route. Answering a series of questions lets you modify how ICE is configured.For more information on this option, see *Programming the IP Address, Netmask, and Default Gateway*, p.53.

Display Routing Parameters

Option 3 lets you display the routing information that is currently set up on the Wind River ICE SX unit. It also displays any routing tables that are currently programmed into the NVRAM of the ICE unit.

Modify Routing Parameters.

Option 4 lets you modify how Wind River ICE SX acquires its routing tables, and lets you program any routes into the NVRAM. For more information on using this option, see *Setting Up Routing*, p.60.

Display Server Parameters

Option 5 lets you view the IP port numbers used by the servers that are in use on the ICE unit. These are the ports that the servers listen to for client connections.

Modify Server Parameters

Option 6 lets you modify the IP port numbers that are listened to by the servers for client connections.

View Ethernet Address

Option 7 displays the MAC address of your Wind River ICE SX unit.

Save Parameters

Option 8 saves any modifications you may have made to the IP address, routing information, and server parameters in the ICE NVRAM.

Exit Setup Mode

Option 9 exits Ethernet Setup mode. You must reset the Wind River ICE SX after exiting for your changes to take effect.

Port A/B Select

Option 10 lets you change which Ethernet port on the ICE unit is used for Ethernet communications. By default, this option is set to automatically detect which port is being used. You can elect to force the unit to use either the 10BaseT or the 10/100BaseT port at all times.

3.5.3 Programming Wind River ICE SX Step-by-Step

This section provides a step by step list of things to do to configure the Wind River ICE SX for network operation.

Programming the IP Address, Netmask, and Default Gateway

At this point, you should know which of the four methods of assigning an IP address you want to use. The choices are DHCP, manually assigning an address, BOOTP, and RARP, and there is detailed information on all of these protocols in *3.3 Networking Overview*, p.37. Please choose a method, then refer to the appropriate section below.

Using DHCP

DHCP is the easiest method of configuring Wind River ICE SX for network operation, and ICE is set to use this protocol by default. Provided that your network has a DHCP server capable of handing out dynamic IP addresses, work through the following steps to configure ICE for network operation using the Dynamic Host Configuration Protocol.

1. At the **>NET>** prompt in the **Terminal** view, type **ETHSETUP** and press **ENTER**.

2. Select Option 1 and press **ENTER**.

   The options that the ICE unit is currently set to are displayed. The options that are shipped on the ICE unit by default are as follows:

   ```
   System DNS name is: ICE
   System IP address will be determined using DHCP
   DHCP retry delay is LINEAR
   System Netmask will be determined using DHCP
   System will not use a Default Gateway
   ```

3. Select Option 2 and press **ENTER**.

   This allows you to change the default settings for your network:

   ```
   How should the system determine its address?
        1. Enter the IP manually
        2. Use the BOOTP Protocol
        3. Use the RARP Protocol
        4. Use the DHCP Protocol
   Select a method [1]:
   ```

4. To have the ICE unit determine its IP address using DHCP, select Option 4 from the displayed list and press **ENTER**.

5. Choose whether you want the DHCP retry delay to be linear (the default) or exponential by typing **L** or **E**, respectively.

   A linear retry delay means that the ICE unit sends out a packet to the DHCP server in regular intervals, for example every ten seconds. An exponential retry delay means that instead of sending packets at regular intervals, ICE leaves an exponentially longer delay each time it sends a packet. For example, it might leave two seconds between the first and second packets, four seconds between the second and third, sixteen seconds between the third and fourth, and so on. In most cases, leaving a linear delay is acceptable.

6. The **DNS Name** option is not implemented at this time. Press **ENTER** to bypass this menu option.

7. Specify the way that you would like the ICE unit to acquire the netmask.

   If you are using DHCP to determine the IP address, it may be easiest to determine the netmask using DHCP as well. If you prefer, you can use one of the other methods. If you select the **Determine Netmask from IP class** option, the ICE unit calculates the netmask for your network based on the IP address. The **Use ICMP Netmask Request** option is a request that includes the IP address and is sent to a gateway on the network. The gateway responds with the netmask.

8. Specify whether the Wind River ICE SX unit should use a default gateway.

By default, this option is set to **No**. If you enter **Yes**, you must also enter the IP address of the gateway that you want to use.

You are returned to the main **Ethsetup** menu.

9. To save the changes in the ICE unit's NVRAM, select Option 8 and press **ENTER**.
10. To exit the **ETHSETUP** menu, select Option 9 and press **ENTER**.

    You are returned to a **>NET>** prompt in the **Terminal** view.
11. To make your changes take effect, power cycle the Wind River ICE SX.

    The ICE unit runs through the same series of internal tests as on initial startup, making sure that all the hardware and firmware in the unit is functioning correctly. These tests are again displayed in the **Terminal** view in Wind River Workbench. When they conclude, the **> NET >** prompt is again visible.
12. At the **>NET>** prompt, type **ETHSETUP** to view the networking options, select Option 1 from the menu, and press **ENTER**.

    The networking parameters that you programmed in the preceding steps are displayed.

You have now correctly specified the IP address, netmask, and default gateway for your ICE unit using DHCP. For information on configuring routing for your network, see *Setting Up Routing*, p.60.

Manual Configuration

To manually assign an IP address, a netmask, and a default gateway to your Wind River ICE SX unit, follow the steps below. Prior to beginning, you should know the IP address that you want to assign to the ICE unit. You should also know the netmask that is required for your network. If you are unsure of either of these addresses, contact your network administrator to obtain the correct information.

1. At the **>NET>** prompt in the **Terminal** view, type **ETHSETUP** and press **ENTER**.
2. Select Option 1 and press **ENTER**.

   The options that the ICE unit is currently set to are displayed. The options that are shipped on the ICE unit by default are as follows:

```
System DNS name is: ICE
System IP address will be determined using DHCP
DHCP retry delay is LINEAR
System Netmask will be determined using DHCP
```

```
System will not use a Default Gateway
```

3. Select Option 2 and press **ENTER**.

   This allows you to change the default settings for your network:

```
How should the system determine its address?
     1. Enter the IP manually
     2. Use the BOOTP Protocol
     3. Use the RARP Protocol
     4. Use the DHCP Protocol
Select a method [1]:
```

4. To set your IP address manually, select Option 1 and press **ENTER**.
5. Enter the IP address for the ICE unit in dot format.



NOTE: Make sure that you have the correct address for your ICE unit, and that you enter it carefully. The IP address you enter will remain with your unit until you reprogram it.

6. Specify the way you want the Wind River ICE SX unit to acquire the netmask.

   If you are manually programming the IP address, it is most common to program the netmask manually as well. If you choose to enter it manually using Option 1, you are prompted to enter the address in the next step. If you prefer, however, you may elect to use one of the other methods. The **Determine Netmask From IP Class** option sets the ICE unit to calculate the netmask for your network based on the IP address. The **Use ICMP Netmask Request** option is a request that includes the IP address and is sent to a gateway on the network. The gateway responds with the netmask.

7. Specify whether you would like the ICE unit to use a default gateway.

   By default, this option is set to **No**. If you enter **Yes**, you must also enter the IP address of the gateway that you want to use.

   You are returned to the main **ETHSETUP** menu.

8. To save the changes in the ICE unit's NVRAM, select Option 8 and press **ENTER**.
9. To exit the **ETHSETUP** menu, select Option 9 and press **ENTER**.

   You are returned to a **>NET>** prompt in the **Terminal** view.

10. To make your changes take effect, power cycle the Wind River ICE SX.

    The ICE unit runs through the same series of internal tests as on initial startup, making sure that all the hardware and firmware in the unit is functioning

correctly. These tests are again displayed in the **Terminal** view in Wind River Workbench. When they conclude, the **> NET >** prompt is again visible.

11. At the **>NET>** prompt, type **ETHSETUP** to view the networking options, select Option 1 from the menu, and press **ENTER**.

    The networking parameters that you programmed in the preceding steps are displayed.

You have now correctly specified the IP address, netmask, and default gateway for your ICE unit. For information on configuring routing for your network, see *Setting Up Routing*, p.60.

Using BOOTP

Assigning an IP address and a netmask to the ICE unit using the Bootstrap protocol is a fairly simple process. The following steps describe programming ICE for network operation using BOOTP.

1. At the **>NET>** prompt in the **Terminal** view, type **ETHSETUP** and press **ENTER**.
2. Select Option 1 and press **ENTER**.

   The options that the ICE unit is currently set to are displayed. The options that are shipped on the ICE unit by default are as follows:

```
System DNS name is: ICE
System IP address will be determined using DHCP
DHCP retry delay is LINEAR
System Netmask will be determined using DHCP
System will not use a Default Gateway
```

3. Select Option 2 and press **ENTER**.

   This allows you to change the default settings for your network:

```
How should the system determine its address?
     1. Enter the IP manually
     2. Use the BOOTP Protocol
     3. Use the RARP Protocol
     4. Use the DHCP Protocol
Select a method [1]:
```

4. To set your IP address using BOOTP, select Option 2 and press **ENTER**.
5. Choose whether you want the BOOTP retry delay to be linear (the default) or exponential by typing **L** or **E**, respectively.

A linear retry delay means that the ICE unit sends out a packet to the BOOTP server in regular intervals, such as every ten seconds. An exponential retry delay means that instead of sending packets at regular intervals, the Wind River ICE SX leaves an exponentially longer delay each time it sends a packet. For example, it might leave two seconds between the first and second packets, four seconds between the second and third, sixteen seconds between the third and fourth, and so forth. In most cases, leaving a linear delay is acceptable.

6. Specify the way that you would like the ICE unit to acquire the netmask.

   If you are using BOOTP to determine the IP address, it may be easiest to determine the netmask using BOOTP as well. If you prefer, however, you may elect to use one of the other methods. The **Determine Netmask From IP Class option** sets the ICE unit to calculate the netmask for your network based on the IP address. The **Use ICMP Netmask Request** option is a request that includes the IP address and is sent to a gateway on the network. The gateway responds with the netmask.

7. Specify whether you want the ICE unit to use a default gateway.

   By default, this option is set to **No**. If you enter **Yes**, you must also enter the IP of the gateway that you want to use.

   You are returned to the main **ETHSETUP** menu.

8. To save the changes in the ICE unit's NVRAM, select Option 8 and press **ENTER**.

9. To exit the **ETHSETUP** menu, select Option 9 and press **ENTER**.

   You are returned to a **>NET>** prompt in the **Terminal** view.

10. To make your changes take effect, power cycle the Wind River ICE SX.

    The ICE unit runs through the same series of internal tests as on initial startup, making sure that all the hardware and firmware in the unit is functioning correctly. These tests are again displayed in the **Terminal** view in Wind River Workbench. When they conclude, the **> NET >** prompt is again visible.

11. At the **>NET>** prompt, type **ETHSETUP** to view the networking options, select Option 1 from the menu, and press **ENTER**.

    The networking parameters that you programmed in the preceding steps are displayed.

You have now correctly specified the IP address, netmask, and default gateway for your ICE unit using BOOTP. For information on configuring routing for your network, see *Setting Up Routing*, p.60.

Using RARP

Using RARP to assign an IP address to the ICE unit is a simple process. However, unlike the other protocols, RARP is only capable of obtaining the IP address. The netmask (and the default gateway, if one is being used) must still be programmed manually. Work through the following steps to program ICE for network operation using RARP.

1. At the **>NET>** prompt in the **Terminal** view, type **ETHSETUP** and press **ENTER**.
2. Select Option 1 and press **ENTER**.

   The options that the ICE unit is currently set to are displayed. The options that are shipped on the ICE unit by default are as follows:

   ```
   System DNS name is: ICE
   System IP address will be determined using DHCP
   DHCP retry delay is LINEAR
   System Netmask will be determined using DHCP
   System will not use a Default Gateway
   ```

3. Select Option 2 from the **Ethsetup** menu in the **Terminal** view of Wind River Workbench.

   This allows you to change the default settings for your network:

   ```
   How should the system determine its address?
        1. Enter the IP manually
        2. Use the BOOTP Protocol
        3. Use the RARP Protocol
        4. Use the DHCP Protocol
   Select a method [1]:
   ```

4. To set your IP address using RARP, select Option 3 and press **ENTER**.
5. Specify the way that you would like the ICE unit to acquire the netmask.

   If you are using RARP to determine the IP address, it may be easiest to program the netmask manually. If you choose to enter it manually (Option 1), you are prompted to enter the address in the next step. If you prefer, however, you may elect to use one of the other methods. The **Determine Netmask from IP class option** sets the ICE unit to calculate the netmask for your network based on the IP address. The Use **ICMP Netmask Request** option is a request

that includes the IP address and is sent to a gateway on the network. The gateway responds with the netmask.

6. Specify whether or not you would like the ICE unit to use a default gateway.

   By default, this option is set to **No**. If you enter **Yes**, you must also enter the IP of the gateway that you want to use.

   You are returned to the main **ETHSETUP** menu.

7. To save the changes in the ICE unit's NVRAM, select Option 8 and press **ENTER**.

8. To exit the **ETHSETUP** menu, select Option 9 and press **ENTER**.

   You are returned to a **>NET>** prompt in the **Terminal** view.

9. To make your changes take effect, power cycle the Wind River ICE EX.

   The ICE unit runs through the same series of internal tests as on initial startup, making sure that all the hardware and firmware in the unit is functioning correctly. These tests are again displayed in the **Terminal** view in Wind River Workbench. When they conclude, the **> NET >** prompt is again visible.

10. At the **>NET>** prompt, type **ETHSETUP** to view the networking options, select Option 1 from the menu, and press **ENTER**.

    The networking parameters that you programmed in the preceding steps are displayed.

You have now correctly specified the IP address, netmask, and default gateway for your Wind River ICE SX unit using RARP. For information on configuring routing for your network, see *Setting Up Routing*, p.60.

Setting Up Routing

If your network is designed in such a way that routing information is necessary, the Wind River ICE SX needs to be set up to account for that. Before beginning, decide if you want the ICE to determine the routing information dynamically, to program static routing tables into the ICE's memory, or whether you want to disable routing on your unit. The following sections describe how to enable or disable routing for the ICE unit. Refer to the appropriate section for configuring your unit for the network.

Configuring Dynamic Routing

If the network on which the Wind River ICE SX is being run uses the Routing Information Protocol (RIP), configuring routing information on the ICE unit dynamically is the best option, since once the unit is set up, it automatically detects any changes that occur on the network and updates the unit appropriately. Work through the steps shown below to configure the ICE to use dynamic routing.

1. At the **>NET>** prompt in the **Terminal** view, type **ETHSETUP** and press **ENTER**.
2. Select Option 3 and press **ENTER**.

   The routing options that the ICE unit is currently set for are displayed. By default, ICE is shipped with routing disabled.

   ```
   Routing is disabled.
   ```

3. Select Option 4 and press **ENTER**.

   This allows the routing information in ICE to be modified to suit your network.

4. From the list that displays, select Option 3 - **Enable routing using the RIP protocol**.
5. Next, you are asked to enter how many route entries you want stored in the ICE unit at run-time.

   For example, consider the case where you have 25 routes specified. As your network system propagates new routes, these routes are stored in the routing table in the ICE unit until 25 routes are stored. When the table reaches 25 routes, the oldest unused routes are replaced by any new ones that are propagated. If a new route arrives that supersedes a route already stored in the tables, the new route replaces the existing route.

   At this point, you are returned to the main **Ethsetup** menu.

6. To save the changes in the ICE unit's NVRAM, select Option 8 and press **ENTER**.
7. To exit the **ETHSETUP** menu, select Option 9 and press **ENTER**.

   You are returned to a **>NET>** prompt in the **Terminal** view.

8. To make your changes take effect, power cycle the Wind River ICE SX.

   The ICE unit runs through the same series of internal tests as on initial startup, making sure that all the hardware and firmware in the unit is functioning correctly. These tests are again displayed in the **Terminal** view in Wind River Workbench. When they conclude, the **> NET >** prompt is again visible.

9. At the **>NET>** prompt, type **ETHSETUP** to view the networking options, select Option 1 from the menu, and press **ENTER**.

   The networking parameters that you programmed in the preceding steps are displayed.

You have now configured dynamic routing for your ICE unit. For information on saving and testing your configuration, see *Saving Network Setup Information*, p.66.

Configuring Static Routing

If the network on which ICE is being run is not designed on the Routing Information Protocol (RIP), you must configure a static routing table to be stored in the Wind River ICE SX unit. A static routing table is one that is stored in the ICE unit's NVRAM and is added to the run-time routing table when the unit is booted.

Both network routes and host routes can be stored in the static table of the ICE unit. A network route tells ICE that in order to access Network X, the packets should be addressed to Host Y. A host route tells the ICE unit that in order to get to Host A, the packet should be addressed to Host B. In these cases, Host Y and Host B are essentially routers, since they have more than one network connection.



NOTE: Before continuing, make sure that you know what routes you want to program into the Wind River ICE SX unit. Also, exercise caution when entering the data and make sure that each address is correct before moving on to the next step.

To program the ICE with a static routing table, use the following steps.

1. At the **>NET>** prompt in the **Terminal** view, type **ETHSETUP** and press **ENTER**.
2. Select Option 3 and press **ENTER**.

   The routing options that the ICE unit is currently set for are displayed. By default, ICE is shipped with routing disabled.

   ```
   Routing is disabled.
   ```

3. Select Option 4 and press **ENTER**.

   This allows the routing information in ICE to be modified to suit your network.

4. From the list that displays, select Option 2 - **Enable routing using static route table**.
5. Next, you are asked to specify how many route entries should be in the ICE unit at runtime.

A table appears displaying the number of routes you have specified in the previous step, as shown below:

```
How many route entries should be in the run-time route table [25]: 10

Current static route table entries are:
     [01] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
     [02] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
     [03] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
     [04] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
     [05] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
     [06] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
     [07] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
     [08] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
     [09] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
     [10] Dest Net   0.0.0.0         --> 0.0.0.0        Status: Disabled
Enter the number of the route to change (0 to exit):
```

In the above example, ten routes are specified, and as a result the table shows ten routes, numbered 1-10 on the left side of the figure.

6. Next, specify the number of the route you want to change.

   For example, if you wanted to modify the first route in the table, you would type **1** and press **ENTER**.

7. Specify whether you would like to edit or delete the entry specified.

   If you choose to delete the entry, it is replaced with a blank entry—all zeroes.

   If you choose to edit an entry, you are first asked to enter whether you want to program a host route or a network route. Type either **H** (for host route) or **N** (for network route) and press **ENTER**.

8. Next you are asked for the IP address of either the destination host or the destination network, depending on which type of route you are creating. Enter the IP address in dot format and press **ENTER**.

9. You now have to enter the IP address of the next hop gateway to the destination host or network IP address that you specified in the last step.

   This is the address of the router that packets should be addressed to in order to reach a host or network on the other side of that router. Enter the IP address in dot format and press **ENTER**.

10. You are returned to the table, as shown below:

```
Enter the number of the route to change (0 to exit): 1

Do you want to delete or edit this entry (D or E): e

Is this a Host or Network Route (H or N): n
```

```
Enter the IP address of the destination network [0.0.0.0]: 199.2.201.0

Enter the IP address of the next hop gateway to 199.2.201.0 [0.0.0.0]:
199.2.200.1

Current static route table entries are:
     [01] Dest Net   199.2.201.0     --> 199.2.200.1     Status: Enabled
     [02] Dest Net   0.0.0.0         --> 0.0.0.0         Status: Disabled
     [03] Dest Net   0.0.0.0         --> 0.0.0.0         Status: Disabled
     [04] Dest Net   0.0.0.0         --> 0.0.0.0         Status: Disabled
     [05] Dest Net   0.0.0.0         --> 0.0.0.0         Status: Disabled
     [06] Dest Net   0.0.0.0         --> 0.0.0.0         Status: Disabled
     [07] Dest Net   0.0.0.0         --> 0.0.0.0         Status: Disabled
     [08] Dest Net   0.0.0.0         --> 0.0.0.0         Status: Disabled
     [09] Dest Net   0.0.0.0         --> 0.0.0.0         Status: Disabled
     [10] Dest Net   0.0.0.0         --> 0.0.0.0         Status: Disabled
Enter the number of the route to change (0 to exit):
```

The information that you entered is visible in the appropriate route table entry. For example, if you elected to change entry **01** in the table, the IP addresses you entered are visible in line **01** of the table. Notice also that the entry has automatically been enabled. This means that at run-time, the ICE unit includes that entry as one of the possible routes.

11. Repeat steps 4-10 as many times as necessary to fill the entries in your table.

    As each entry is added, its status is changed to **Enabled**. Any entries you choose to leave blank remain disabled, and are not included as one of the possible routes at run-time.

12. When you are satisfied that all of the entries have been filled out correctly, type **0** at the prompt, and press **ENTER** to exit.

    You are returned to the main **Ethsetup** menu.

13. To save the changes in the ICE unit's NVRAM, select Option 8 and press **ENTER**.

14. To exit the **ETHSETUP** menu, select Option 9 and press **ENTER**.

    You are returned to a **>NET>** prompt in the **Terminal** view.

15. To make your changes take effect, power cycle the Wind River ICE SX.

    The ICE unit runs through the same series of internal tests as on initial startup, making sure that all the hardware and firmware in the unit is functioning correctly. These tests are again displayed in the **Terminal** view in Wind River Workbench. When they conclude, the **> NET >** prompt is again visible.

16. At the **>NET>** prompt, type **ETHSETUP** to view the networking options, select Option 1 from the menu, and press **ENTER**.

The networking parameters that you programmed in the preceding steps are displayed.

You have now configured dynamic routing for your ICE unit. For information on saving and testing your configuration, see *Saving Network Setup Information*, p.66.

Disabling Routing

If you do not require that Wind River ICE SX store any routing table information in its NVRAM, either static or dynamically programmed, then you can disable routing.

NOTE: Disabling routing in this case does not mean disabling the default route. You can disable routing using the **Modify Routing Parameters** option and still have a default route programmed.

To disable routing on your ICE unit:

1. At the **>NET>** prompt in the **Terminal** view, type **ETHSETUP** and press **ENTER**.
2. Select Option 3 and press **ENTER**.

   The routing options currently set for the ICE unit appear. By default, the ICE is shipped with routing disabled, and the following line appears when Option 3 is selected:

   ```
   Routing is disabled.
   ```

   If your Wind River ICE SX unit is in the default configuration with routing disabled, proceed to *Saving Network Setup Information*, p.66. If your ICE unit is not in the default configuration, proceed to the next step.
3. Select Option 4 and press **ENTER**.

   This allows the routing information in the ICE to be modified to suit your network.
4. From the list that appears, select Option 1 - **Disable routing**.

   You are returned to the main **Ethsetup** menu.
5. To save the changes in the ICE unit's NVRAM, select Option 8 and press **ENTER**.
6. To exit the **ETHSETUP** menu, select Option 9 and press **ENTER**.

   You are returned to a **>NET>** prompt in the **Terminal** view.

7. To make your changes take effect, power cycle the Wind River ICE SX.

   The ICE unit runs through the same series of internal tests as on initial startup, making sure that all the hardware and firmware in the unit is functioning correctly. These tests are again displayed in the **Terminal** view in Wind River Workbench. When they conclude, the **> NET >** prompt is again visible.

8. At the **>NET>** prompt, type **ETHSETUP** to view the networking options, select Option 1 from the menu, and press **ENTER**.

   The networking parameters that you programmed in the preceding steps are displayed.

You have now configured dynamic routing for your ICE unit. For information on saving and testing your configuration, see *Saving Network Setup Information*, p.66.

Saving Network Setup Information

You have now programmed all the information into the ICE unit that is required to make it visible on your network. Save and exit the **Ethsetup** menu by selecting Option 8 and pressing **ENTER**, and then select Option 9 and pressing **ENTER**. You are returned to a **>NET>** prompt.

Turn off the ICE unit. If you have not yet connected your Wind River ICE SX unit to a network device, refer to *2.6.2 Ethernet Connections*, p.22, and make these connections now.

Turn on the ICE unit. This will reset it and allow all the network configuration options to take effect, and allow you to test the configuration.

As the unit boots, you can watch it perform the standard boot up sequence, which includes attempting to initialize the Ethernet interface. Any problems that are encountered while the ICE unit is booting, for example no RARP server responding, are displayed on the screen during this process. The boot up sequence where the Ethernet interface is initialized using DHCP is shown below.

```
*************************************************************************
Wind River ICE Ethernet Platform
Copyright © Wind River Systems, Inc. 1999-2004.  All rights reserved
*************************************************************************
Firmware Type Wind River ICE BSP  Version 2.0a  Created On: Oct 22 2004
16:07:17

Configuring TCP/IP Network Suite:
   IP Address..... DHCP
                DHCP: Sending DISCOVER  0  -  1  -  +
                DHCP: OFFER received
                DHCP: Sending REQUEST   0  -  1  -  +
```

```
            DHCP: ACK received
    DHCP Server at 255.52.25.255 returned IP address 255.5.2.255
    DHCP IP address 255.52.25.255 lease time - 7 days, 0 hours, 0 min
    Netmask........ DHCP = 0xFFFF0000

   Default Gateway DHCP = 255.0.0.1
   Routing........ Disabled
   MAC Address.... 00:A0:1E:00:32:E7

Supervisory command mode enabled..................... PASSED
Pseudo device initialization......................... PASSED
TFTP device initialized.............................. PASSED
Device inititalized.................................. PASSED
Starting TCP/IP on PORT A 10BaseT.................... PASSED
Starting TCP/IP on PORT B 100BaseT................... PASSED
Initializing FFS Driver.............................. PASSED
FFS disk initialized  26408 Kbytes free.............. PASSED
FFS disk      0 percent fragmented................... PASSED
Disk volume 45.0.0 initialization.................... PASSED
Starting TCP TGTCONS   server TGTCONS [ 1232] ....... PASSED
Setting TGTCONS baud rate to 9600.................... PASSED
Starting WRS shell server............................ PASSED
Wind River ICE System Shell - Type HELP for list of commands

>NET>
```

If the ICE unit encounters errors during the attempt to initialize the Ethernet interface, it will still boot. However, the Ethernet interface will not be enabled.

Testing the Installation

Once the Wind River ICE SX has been connected to the network and reset properly, it is accessible from the network. The **Ping** and **Telnet** diagnostics, available on most TCP/IP hosts, allow this to be verified.

The **Ping** utility is available on all UNIX and Windows hosts. Ping sends a packet to a network address and has that address echoed back within a certain time period. To ping your ICE unit, type the following information at any prompt:

ping *addr*

addr is the IP address of your ICE unit in dot format.

A response such as

```
Reply from 255.52.25.255: bytes=32 time<10ms TTL=255
```

is returned.

A second utility that is widely available on most hosts is **Telnet**. Telnet is a terminal emulation package that lets you log into a network node. The ICE unit contains a

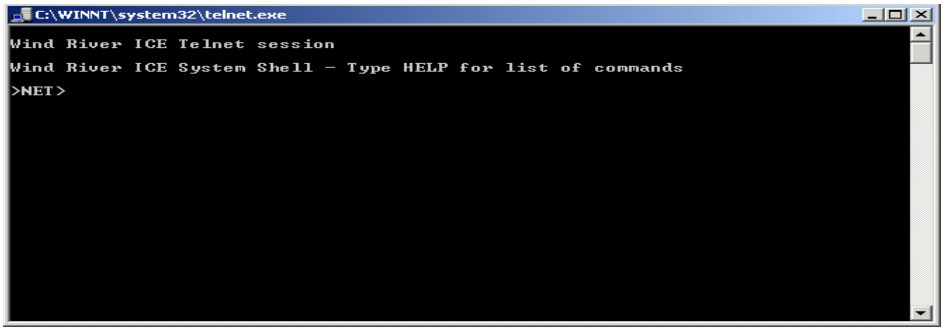
Telnet server, and you can use a UNIX or PC Telnet client to log in to the ICE unit by typing the following at any command prompt.

```
telnet addr
```

addr is the IP address of your ICE unit in dot format.

A Telnet window opens as shown in Figure 3-4.

Figure 3-4 **Telnet Utility**



If these tests execute successfully, it indicates that ICE is visible and active on the network.

The Wind River ICE SX unit includes an implementation of the Ping utility that is available from the **>NET>** prompt. This can be used to test routing if either static or a dynamic routing has been set up on the ICE unit. From the **>NET>** prompt, try to ping hosts on each of the routed segments. This verifies that the ICE is correctly configured to route messages on your network.

3.6 Using the Target Console (TGTCONS) Port

In situations where the ICE is not connected directly to your host computer during configuration, you can open a serial channel to the target using the TGTCONS port on the front of the ICE unit.

Before using the TGTCONS port, you must configure the Wind River ICE SX for network operation as described previously in this chapter.

3.6.1 Connecting to the TGTCONS Port

To make the physical connections between the TGTCONS port on the ICE unit and the target, use the following steps.

1. Connect one end of an RS-232 cable to the TGTCONS port on the front of the ICE unit.
2. Connect the other end of the RS-232 cable into either the 9- or 25-pin female D subminiature adapter.
3. Take a second RS-232 cable (two are included in your shipment) and plug it into the serial port on the target.
4. Connect the other end of the second RS-232 cable (the one connected to the target) to either the 9- or 25-pin male D subminiature adapter. Make sure that you choose the same type of adapter (either 9 or 25 pins) as you used in Step 2.
5. Connect the two 9- or 25-pin D subminiature adapters together to complete the connection between the target and the ICE unit.

The following figures show the pins that are actually used in the TGTCONS port, the 25-pin adapter, and the 9-pin adapter.

Figure 3-5 **TGTCONS Port**

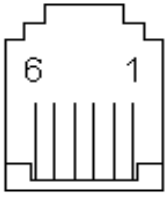


Table 3-4 **TGTCONS Port Pin Scheme**

Pin #	Host (ICE)	Target
Pin 3	Transmit	Receive
Pin 2	Receive	Transmit
Pin 5	Ground	Ground

Figure 3-6 **25-Pin Male Adapter**

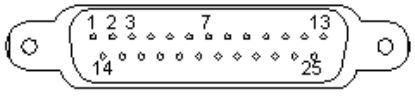


Table 3-5 **25-Pin Male Adapter Pin Scheme**

Pin #	Host (ICE)	Target
Pin 2	Transmit	Receive
Pin 3	Receive	Transmit
Pin 7	Ground	Ground

Figure 3-7 **9-Pin Male Adapter**



Table 3-6 **9-Pin Male Adapter Pin Scheme**

Pin #	Host (ICE)	Target
Pin 3	Transmit	Receive
Pin 2	Receive	Transmit
Pin 5	Ground	Ground

3.6.2 Configuring the Target Console Baud Rate

The Wind River ICE SX is set to use a serial baud rate of 9600 by default. If you want to use a baud rate of 9600, skip this section and go on to *3.6.3 Connecting to the Target*, p.72. If you want to use a different baud rate, use the following steps.

1. At the **>NET>** prompt in the **Terminal** view, type **ETHSETUP** and press **ENTER**.

   The **ETHSETUP** menu appears.

```
                              Ethernet Setup Mode
Select from the operations below
     1. Display Basic IP parameters  2. Modify Basic IP parameters
     3. Display Routing parameters   4. Modify Routing parameters
     5. Display Server parameters    6. Modify Server parameters
     7. View ethernet address        8. Save parameters
     9. Exit setup mode             10. Port A/B select
    11. Advanced Options

Make a selection:
```

2. Enter 5 and press **ENTER**.

   Workbench displays the current settings of the server ports. By default the TGTCONS server uses port 1232 at 9600 baud.

```
Make a selection: 5

The ESTTOOLS  server is assigned Port 1234
The TGTCONS   server is assigned Port 1232 at 9600 Baud
The UDPCNSL   server is disabled
The TCPCNSL   server is assigned Port 1237

Select from the operations below
     1. Display Basic IP parameters  2. Modify Basic IP parameters
     3. Display Routing parameters   4. Modify Routing parameters
     5. Display Server parameters    6. Modify Server parameters
     7. View ethernet address        8. Save parameters
     9. Exit setup mode             10. Port A/B select
    11. Advanced Options

Make a selection:
```

3. Enter 6 and press **ENTER**.

```
Make a selection: 6

   [1]   Server: ESTTOOLS   Port: 1234
    [2]   Server: TGTCONS    Port: 1232
    [3]   Server: UDPCNSL    Disabled
    [4]   Server: TCPCNSL    Port: 1237

Enter the number of the server to modify (0 to exit):
```

4. Enter 2 and press **ENTER**.

   Workbench prompts you for the port number.

```
Enter the Port for the TGTCONS   Server (0 to disable) [1232]:
```

5. Enter 1232 and press **ENTER**.

```
Enter the Port for the TGTCONS   Server (0 to disable) [1232]: 1232

    [1]   1200
    [2]   1800
    [3]   2400
    [4]   4800
    [5]   9600
    [6]   19200
    [7]   38400

Select a baud rate from the previous choices [5 (9600)]:
```

6. Enter the number that corresponds to the baud rate you want. For instance, to use a baud rate of 19200, enter 6.

   You are returned to the server list.

```
  [1]   Server: ESTTOOLS   Port: 1234
    [2]   Server: TGTCONS    Port: 1232
    [3]   Server: UDPCNSL    Disabled
    [4]   Server: TCPCNSL    Port: 1237

Enter the number of the server to modify (0 to exit):
```

7. To exit the list, enter 0 and press **ENTER**.

   You are returned to the **ETHSETUP** menu.

8. To save your changes, enter 8 and press **ENTER**.
9. To exit the **ETHSETUP** menu, enter 9 and press **ENTER**.
10. To make your changes take effect, power cycle the Wind River ICE SX.

3.6.3 Connecting to the Target

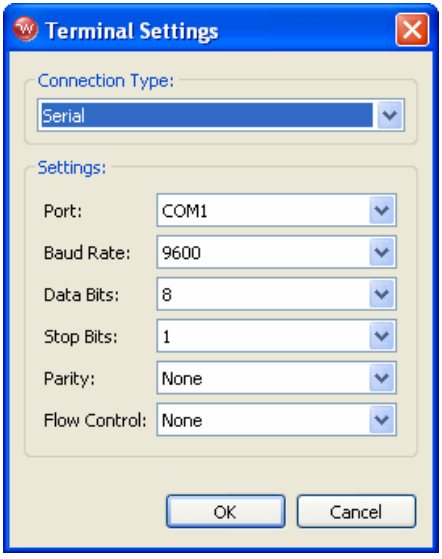
To establish a serial connection to the target, use the following steps:

1. In the **Terminal** view, click the **New Terminal** button.

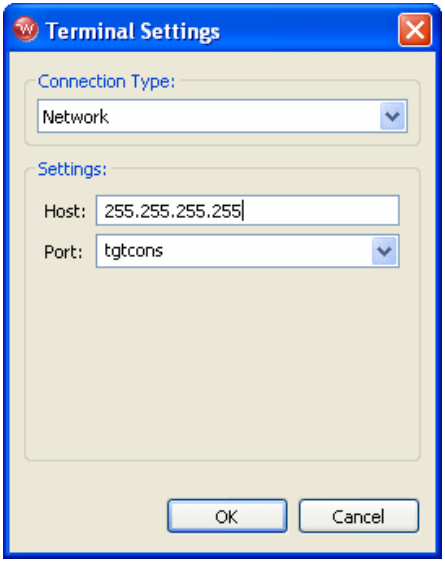
   A second instance of the **Terminal** view opens. The first instance is now labeled **Terminal 0** and this new instance is labeled **Terminal 1**.

2. In **Terminal 1**, click the **Settings** button.

The **Settings** dialog appears.



3. In the **Connection Type** field, select **Network**.



4. In the **Host** field, enter the IP address of your Wind River ICE SX.
5. In the **Port** field, select **tgtcons**.
6. Press **ENTER** to see your target boot prompt in **Terminal 1**.



NOTE: If your Wind River ICE SX is connected and attached to the target -- that is, if there is a **>BKM>** prompt in the **OCD Command Shell** -- then you will not get a target prompt, because the Wind River ICE SX has forced the target into background mode. To get the prompt, you must perform a hard reset of your target. This causes an "Unexpected target reset" error message in Workbench, and an **>ERR>** prompt appears in the **OCD Command Shell**.

To disconnect from the Target Console connection, click the **Disconnect** button in **Terminal 1** and click on the **X** in the **Terminal 1** tab to close it.

3.7 Network Command Reference

The Wind River ICE SX includes several network commands that can be used from the **>NET>** prompt. For a complete Wind River ICE SX command reference, including network commands, see the *Wind River Workbench for On-Chip Debugging Command Reference*.

4 Establishing Communications

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4.8 Moving On 115

4.1 Introduction

After you have installed the Wind River Workbench software, connected the Wind River ICE SX hardware and configured it correctly for network operation, the next step is to establish communications with a target.

The Wind River ICE SX uses the On-Chip Debugging (OCD) services that are embedded in the microprocessor of the target board. You can access these OCD services by using a BDM/JTAG/EJTAG connector on the target. Through the utilization of these OCD services, ICE is able to effectively control and monitor the processor.

Establish communications between Wind River ICE SX and the target using Wind River Workbench.



NOTE: This chapter assumes that you have Wind River Workbench installed and running on the host. For information on Wind River Workbench, see the *Wind River Workbench User's Guide*.

Wind River Workbench allows you to use either a graphical interface or low-level commands to work with the target. Once you have established communications with the target, Wind River recommends that you use the Wind River Workbench Graphical User Interface (GUI) to perform most tasks. For information on using the Wind River Workbench GUI to perform tasks with ICE and the target, see the *Wind River Workbench for On-Chip Debugging User Tutorials*.

If you are more comfortable using low-level commands, you may do so from the **OCD Command Shell** in Wind River Workbench, as explained in this chapter. For a detailed low-level command reference, see the *Wind River Workbench for On-Chip Debugging Command Reference.*

4.2 Connecting to the Wind River ICE SX

Prior to attempting to establish communications with the target using the ICE, please make sure that:

- All hardware is properly connected to the host and the target, and that the connections are tight (see *2. Hardware Setup* for more information).
- You have set the Wind River ICE SX up properly for operation on your network (see *3. Configuring Wind River ICE SX for Network Operation* for more information).
- You have applied power to both the ICE and the target board.

Establishing Communications

To establish communications with the Wind River ICE SX, use the following steps:

1. Launch Wind River Workbench according to the method for your host.

Linux/Solaris Hosts

From your installation directory, issue the following command:

```
$ ./startWorkbench.sh
```

Windows Hosts

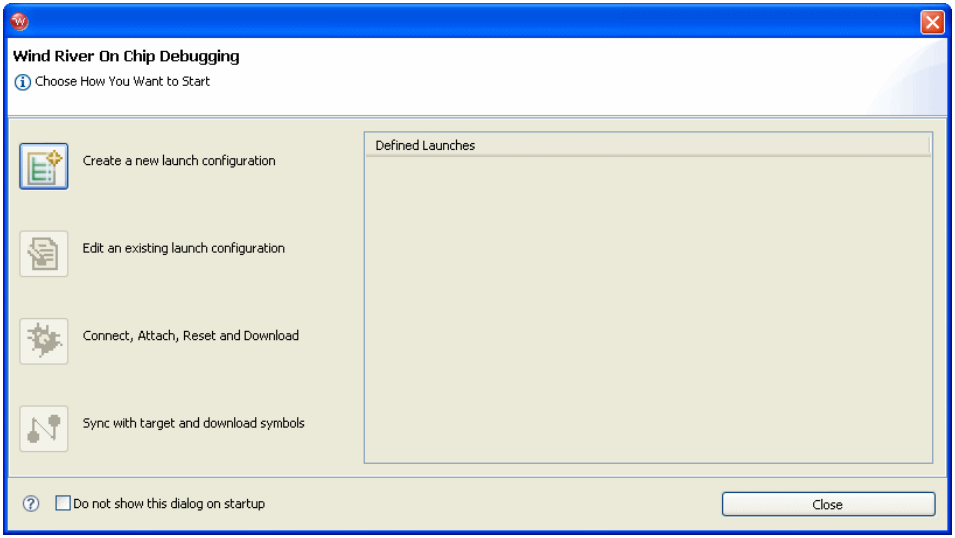
Select **Start > Programs > Wind River > Wind River Workbench 2.6.1 > Wind River Workbench** *version*.

Wind River Workbench opens.

2. Specify a workspace.

   For Windows hosts, Workbench displays a dialog where you can specify a location for your workspace. For Linux hosts, the workspace defaults to *installDir*/**workspace**.

   After you specify your workspace, Workbench opens and the **Quick Target Launch** dialog appears.



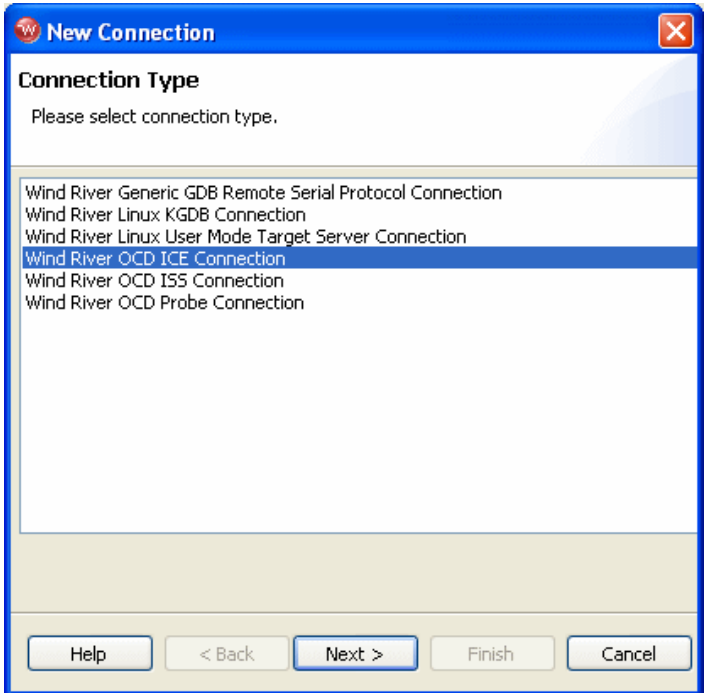
The **Quick Target Launch** dialog allows you to create a launch configuration to initialize your target and download symbols and code. Once created, the launch configuration is persistent, so you can return to it at any time.

If this is the first time you have launched Workbench, the only available option is **Create a new launch configuration**. The next time you open Workbench, the

Quick Target Launch dialog will give you the option of re-launching the same launch configuration or creating a new one.

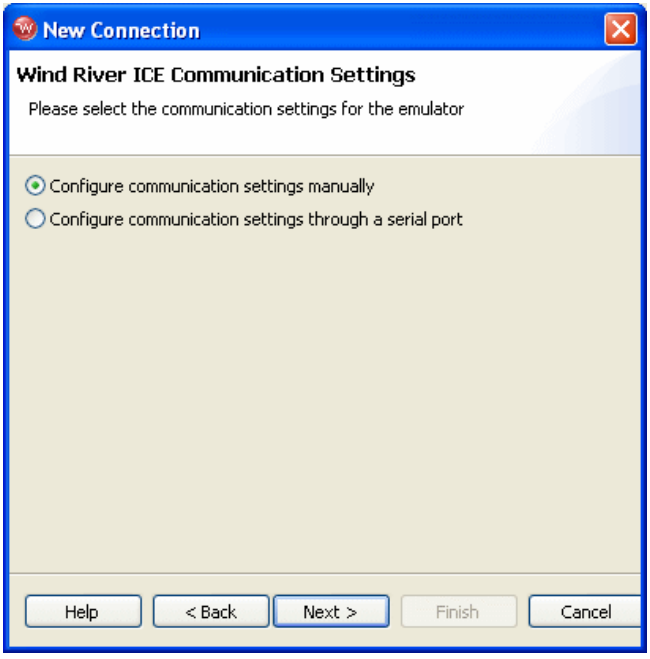
3. Select **Create a new launch configuration**.

   The **New Connection** Wizard appears.



4. Choose **Wind River OCD ICE Connection** from the list of options and click **Next**.

The **Communication Settings** dialog appears.



To configure communication settings manually, see *Configuring Communication Settings Manually*, **p.79.** To configure communication settings through a serial port, see *Configuring Communication Settings Through a Serial Port*, p.81.

Configuring Communication Settings Manually

NOTE: If you choose this option you will need to know either the network name of the emulator or its IP address. For information on assigning these values, see *3. Configuring Wind River ICE SX for Network Operation*.

5. Select the **Configure Communication Settings Manually** box and click **Next.**

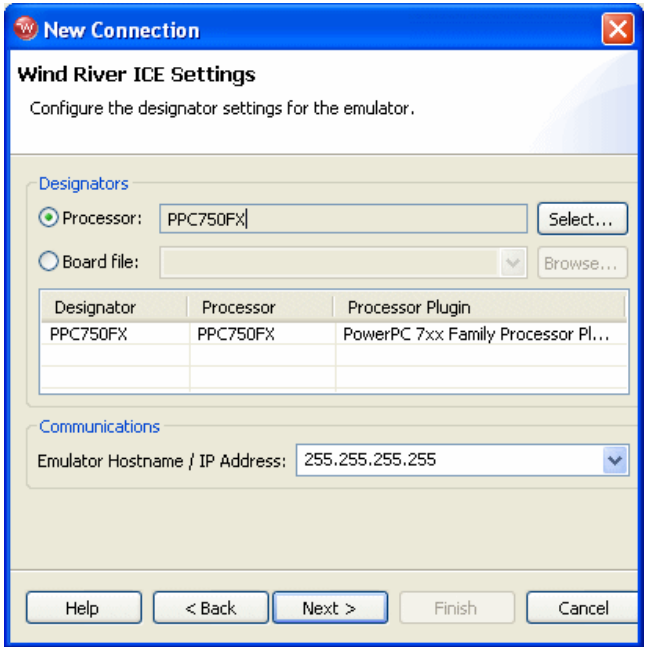
   The **Emulator Settings** dialog appears.

6. In the **Designators** area, enter your target processor type in the **Processor** field, or click **Select** to choose from a list of available processor types.

If you are using multiple processors, or if you have other devices besides your processor on your JTAG scan chain, you must specify a board file in the **Board File** field. Check the **Board File** radio button and click **Browse** to navigate to your board file.

Either choice will populate the field below the **Board File** field with a summary description of your board.

7. In the **Communications** area, fill in the **IP Address** field with the IP address you have assigned to your ICE unit.



8. When you have entered the correct processor or board file and IP address, click **Next**.

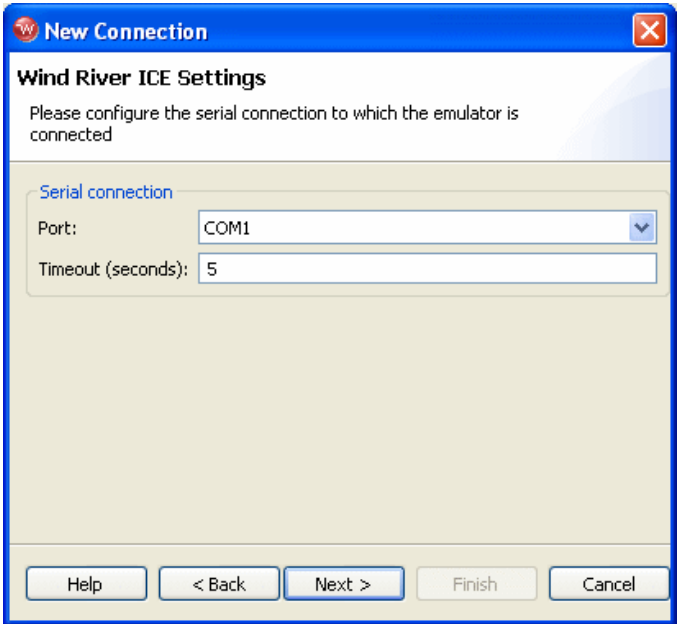
The **Target Operating System Settings** dialog appears. Proceed to Step 12.

Configuring Communication Settings Through a Serial Port

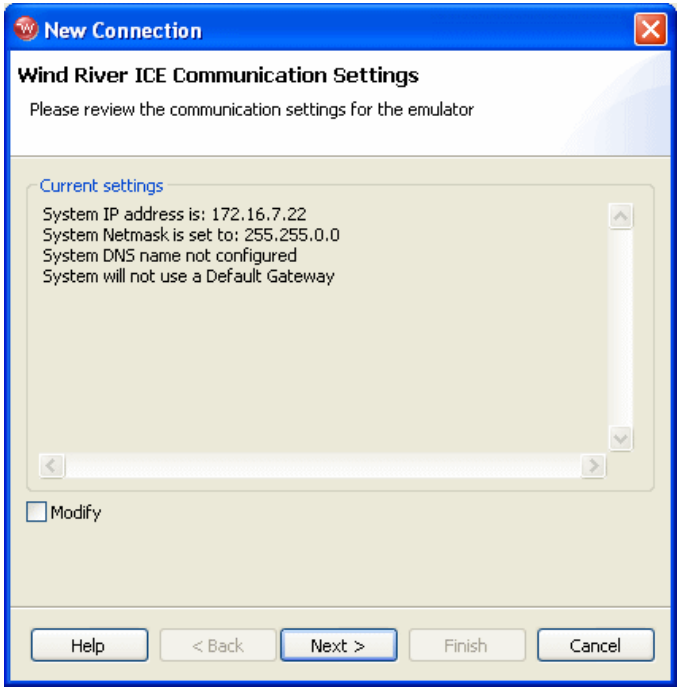
If you choose to make your connection using the serial port, make sure that a serial cable is connected between Wind River ICE SX and your host computer.

NOTE: A direct serial cable is required to create your connection this way. If you do not have a direct serial connection between your host and emulator, you must configure your ICE settings manually.

a. Check the **Configure Communication Settings Through a Serial Port** box and click **Next.** The **Serial Settings** dialog appears.



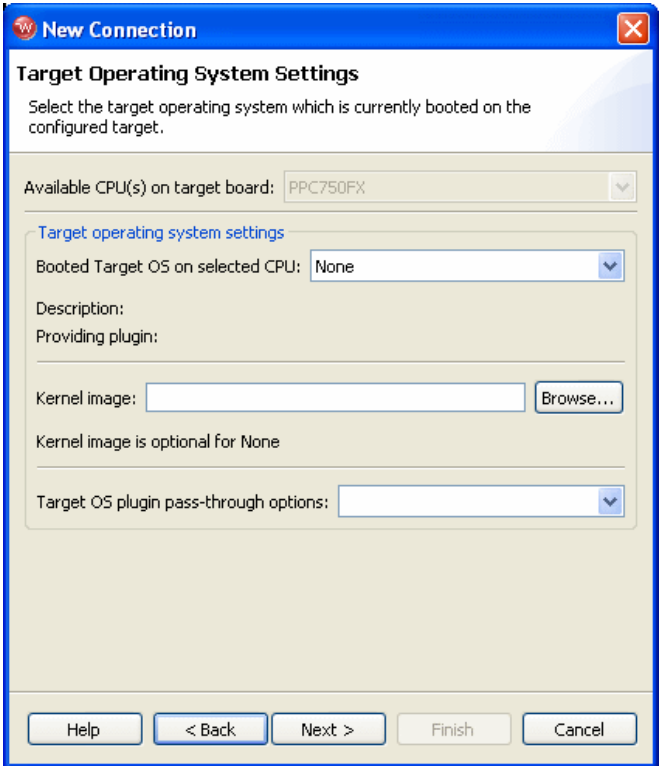
b. Use this dialog to select the serial port you want to connect to, and set a timeout value in seconds. Communication settings, such as the emulator's dynamically assigned IP address and other settings, will be retrieved and displayed automatically, as shown below.



The retrieved settings can also be modified (select the **Modify** checkbox); that is, you can reconfigure the emulator's communication settings using a serial connection.

c. Click **Next**.

The **Target Operating System Settings** dialog appears.



9. In the **Booted Target OS on selected CPU** field, select the operating system that is running on your target processor. The default is **None**.
10. Next to the **Kernel Image** field, click **Browse** to navigate to the kernel image you wish to specify. If you selected **None** in the previous step, you do not need to specify a kernel image.
11. If you are using a Linux plug-in specify the pass-through options in the **Target OS Pass-Through Options** field. If you are not using a Linux plug-in, skip this step.

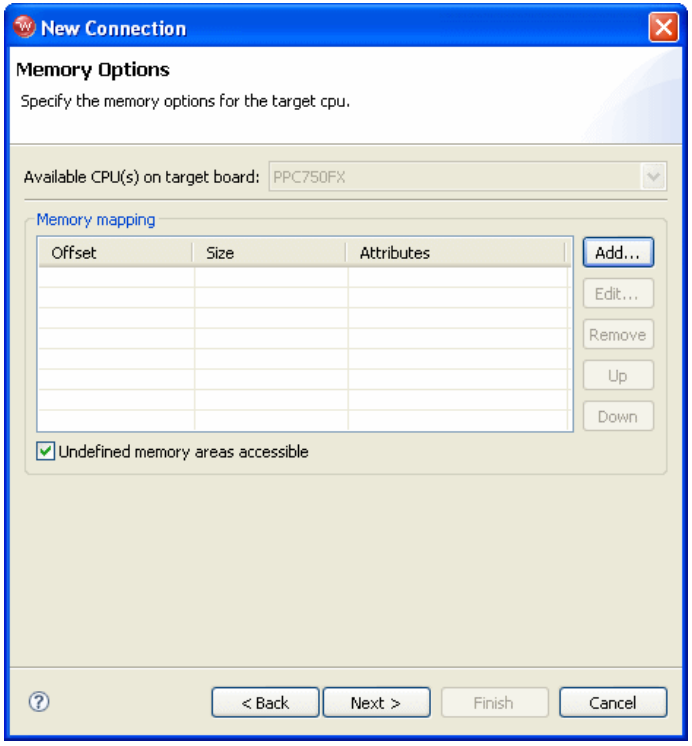
    Options are passed as pairs in the format *name=value*. Separate options with a comma. The following options are available:

    - **notasklist=1** : Never fetch process list.

- **noautomodules=1** : Do not plant internal breakpoints to do automatic kernel module load/unload detection. When this option is specified, you must manually refresh to see an updated module list.
- **noloadcheck=1** : Do not issue gophers until the hardware breakpoint is used to detect kernel load triggers. This option is for “sensitive” boards that don’t accept access until the kernel loads and sets up memory mapping.
- **loaddetectloc=***symbol* **or** *address*: Set the hardware breakpoint used to detect kernel load at *symbol* (for example, **loaddetectloc=start_kernel**) or *address* (for example, **loaddetectloc=0x1000**). If you do not specify a symbol or address, Workbench uses a default. For most architectures the default is **start_kernel**; for PowerPC targets, the default is **0x0**.

12. Click **Next**.

    The **Memory Options** dialog appears.

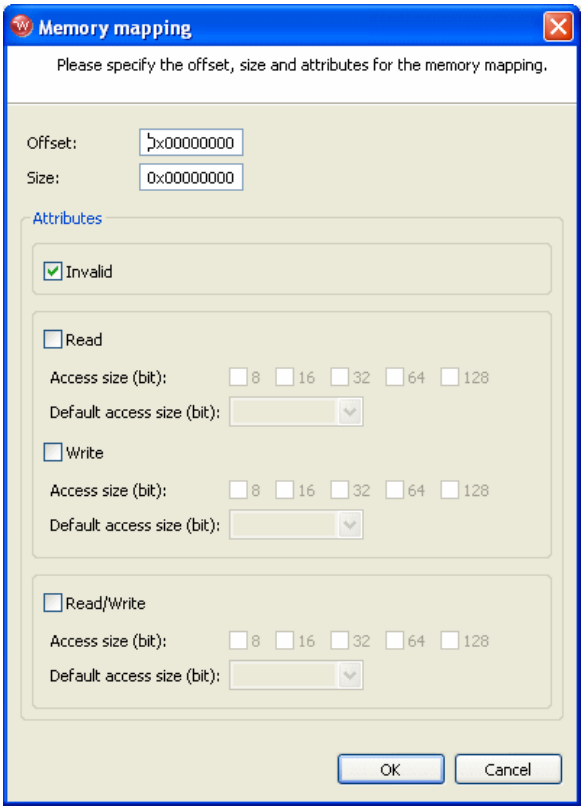


Use the **Memory Options** dialog to specify how memory on the target is partitioned, and what the attributes of the particular memory regions are.

NOTE: The **Memory Options** dialog is only necessary for Linux or other non-VxWorks target operating systems.

To specify an area of memory, click **Add**.

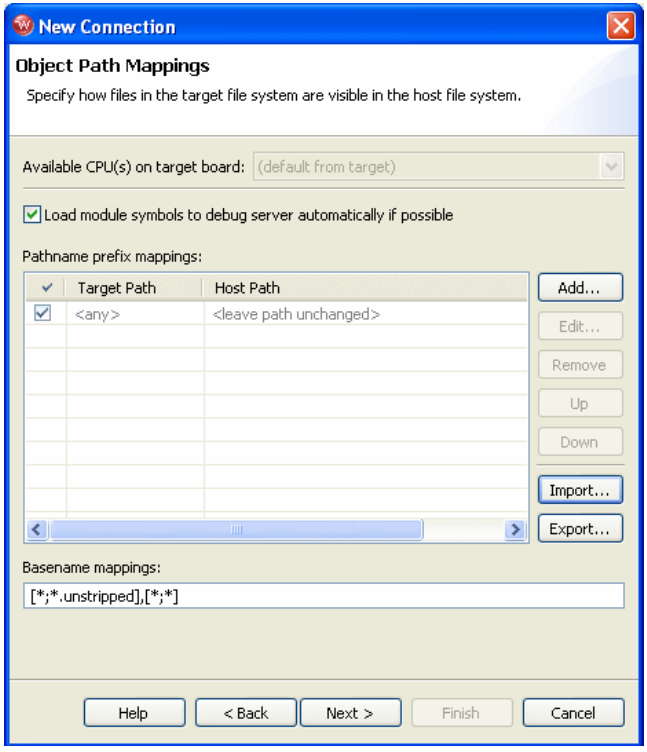
The **Set Memory Map** dialog appears.



Use the **Set Memory Map** dialog to specify which memory areas are read-only, read-write, or write-only, and to specify the access width Workbench should use to read the data from those regions.

13. Click **Next**.

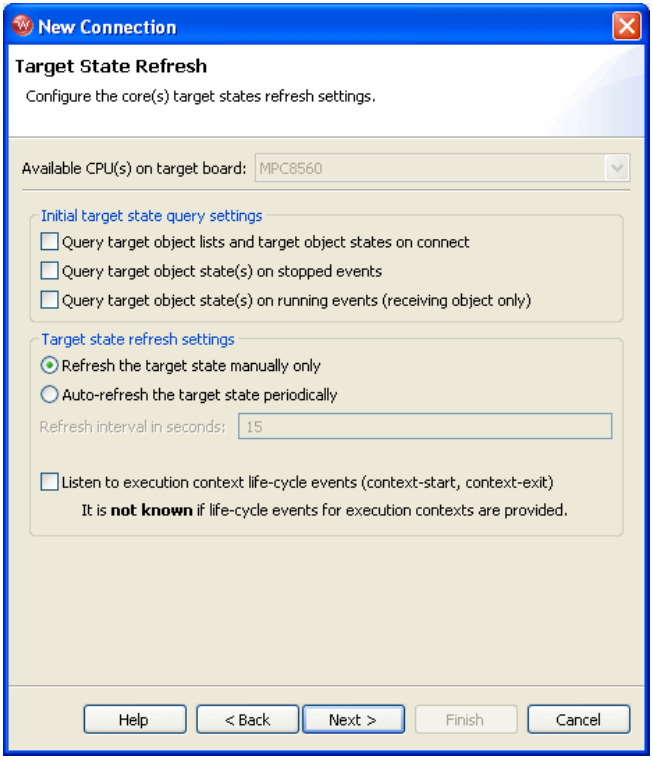
The **Object Path Mappings** dialog appears.



Use the **Object Path Mappings** dialog to specify how files in the target file system are visible in the host file system.

14. To add a host or target path, click **Add...** and type the path in the dialog that appears.
15. Click **Next**.

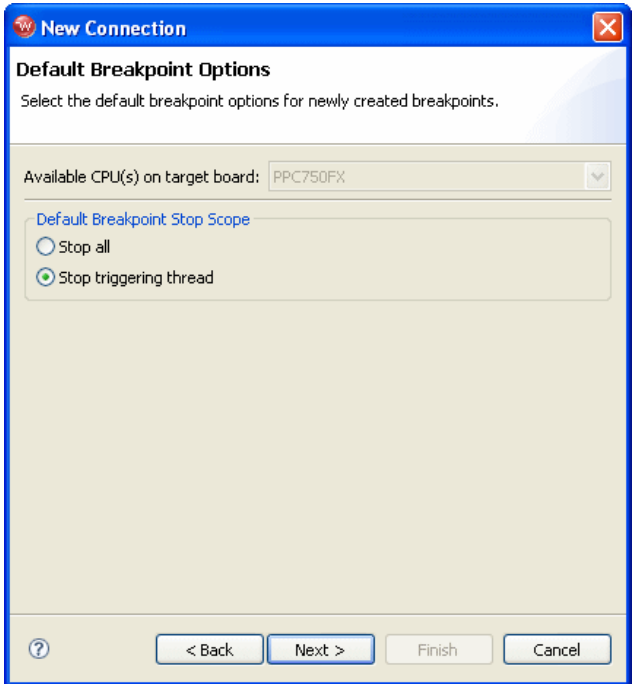
    The **Target State Refresh** dialog appears.



Use the **Target State Refresh** dialog to configure the target state query and target state refresh settings on your target processor.

16. Click **Next**.

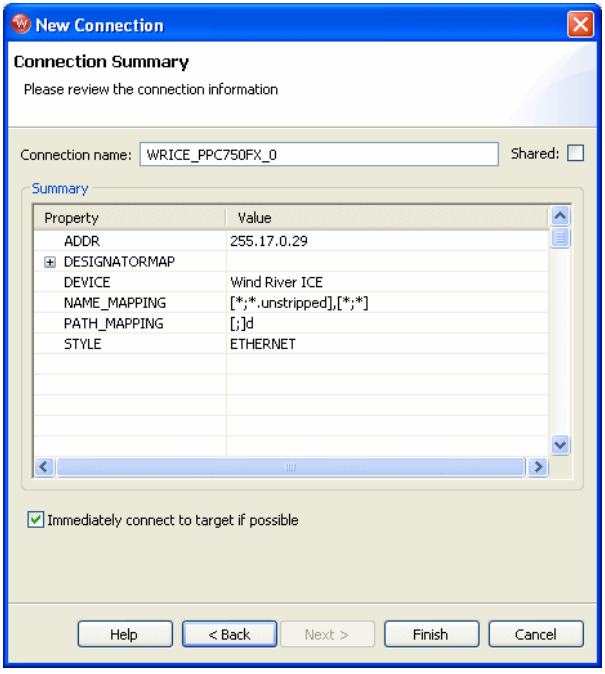
The **Default Breakpoint Options** dialog appears.



Use this dialog to set default breakpoint options for newly created breakpoints.

17. Click **Next**.

The **Connection Summary** dialog appears.



18. Check the displayed values to make sure they are correct.

    If you want to connect to your target now, select **Immediately connect to target if possible**. If you do not wish to connect to your target now, clear the **Immediately connect to target if possible** box. You can connect at any time by clicking **Connect** in the **Launch Configuration** dialog.

19. If you want to share your target connection, select **Shared**.

    This option serves a dual purpose:

- When you define a target connection configuration, this connection is normally only visible for your user-id. If you define it as **Shared**, other users can also see the configuration in your registry, provided that they connect to your registry by adding it as a remote registry on their computer.
- Normally, when you disconnect a target connection, the target server (and simulator) are killed because they are no longer needed. In a connection that is flagged as **Shared**, however, they are left running so that other users can connect to them. In other words, you can flag a connection as shared if you

want to keep the target server (and simulator) running after you disconnect or exit Workbench.

20. Click **Finish**.

Your target name appears in the **Target Manager** view. You can connect at any time by right-clicking on the target name in the **Target Manager** view and selecting **Connect.**

A **>BKM>** prompt appears in the **OCD Command Shell**.



NOTE: If the **OCD Command Shell** is not visible on your desktop, click on **Window** in the toolbar and select **Show View > OCD Command Shell**.

Once the **>BKM>** prompt is visible, you are ready to begin debugging. For information on debugging and other procedures for the Wind River ICE SX, see the *Wind River Workbench for On-Chip Debugging User Tutorials*.

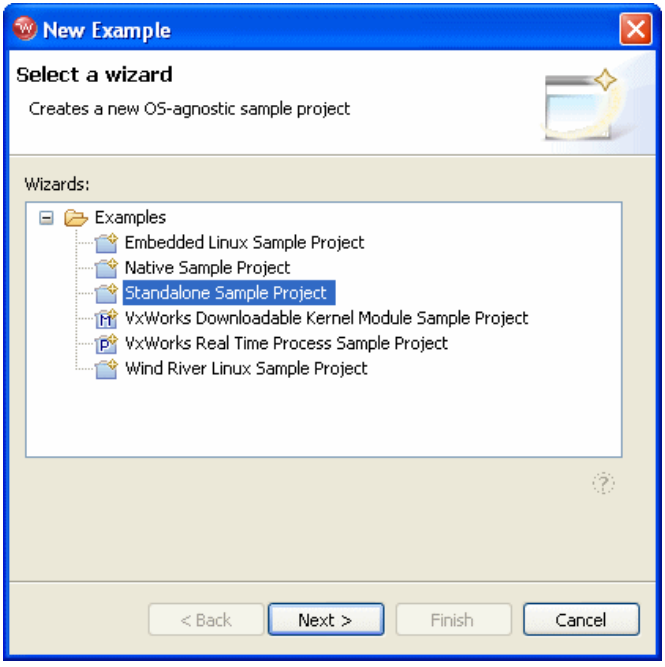
Workbench allows you to run and debug code either in combination with the Workbench project management facility, or without using a project. If you want to use a Workbench project to run and debug code, continue to *4.3 Setting Up a Project*, p.90. If you want to run and debug code without using a Workbench project, skip to *4.4 Downloading Code*, p.93.

4.3 Setting Up a Project

Several example projects are included in Wind River Workbench for demonstration purposes. To open a new demonstration project, use the following steps:

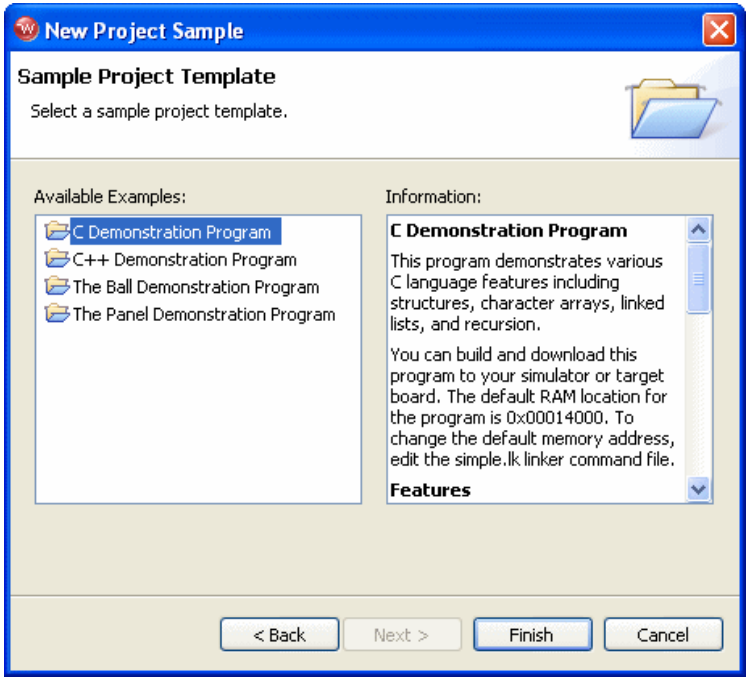
1. Select **File > New > Example**.

   The **New Example** wizard appears.



2. Select **Standalone Sample Project** and click **Next**.

   The **Sample Project** template appears.

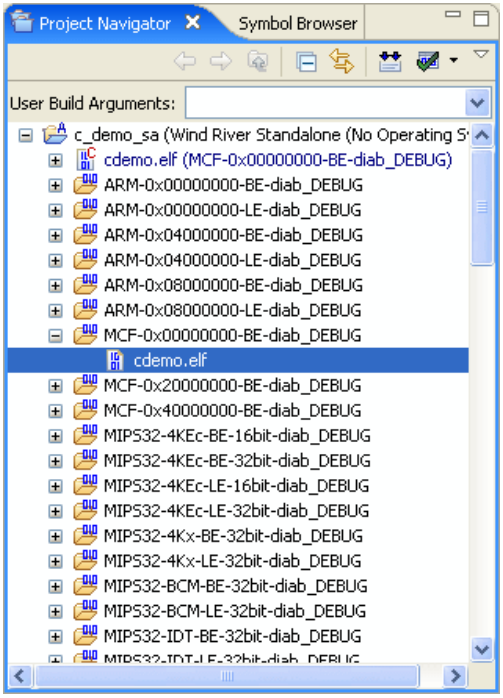


3. Select **C Demonstration Program** and click **Finish**.

   The project name **c_demo_sa** appears in the **Project Navigator** view.

4. Click on the "**+**" next to the project name to expand it.

   A list of available build specs appear.



4.4 Downloading Code

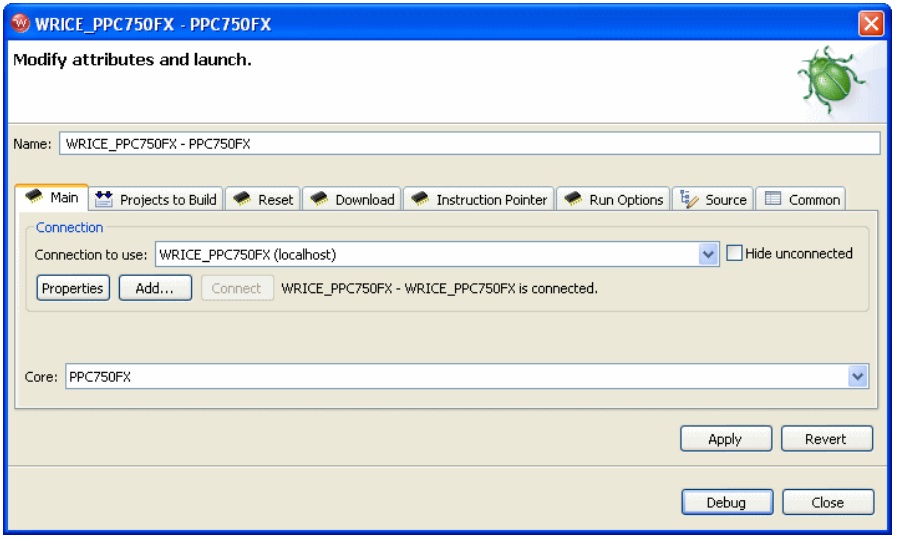
The **Reset and Download** view initializes your target and downloads an executable file.

To perform a reset and download, use the following steps.

1. To open the **Reset and Download** view, highlight your target name in the **Target Manager** view and click the **OCD Reset and Download** button.

   You can also right-click on your selected target name and choose **Reset and Download...** from the context menu.

   The **Reset and Download** view opens, displaying the **Main** tab.



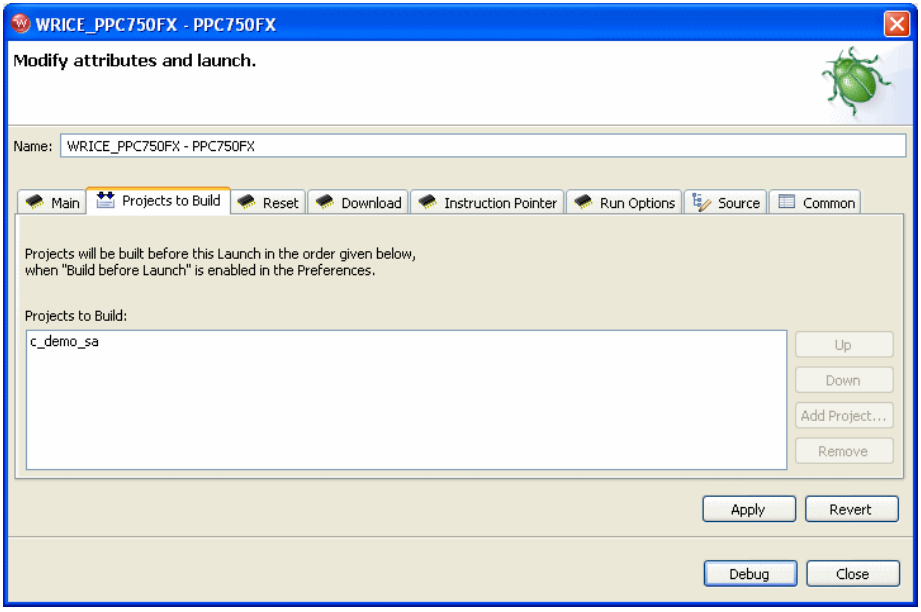
4.4.1 Projects to Build Tab

1. Select the **Projects to Build** tab.

   If you want Workbench to build your project before launching the reset and download operation, specify your project here. In the **Projects to Build** tab, select **Add Project**. From the list of available projects that appears, select the project you want to build and click **OK**.

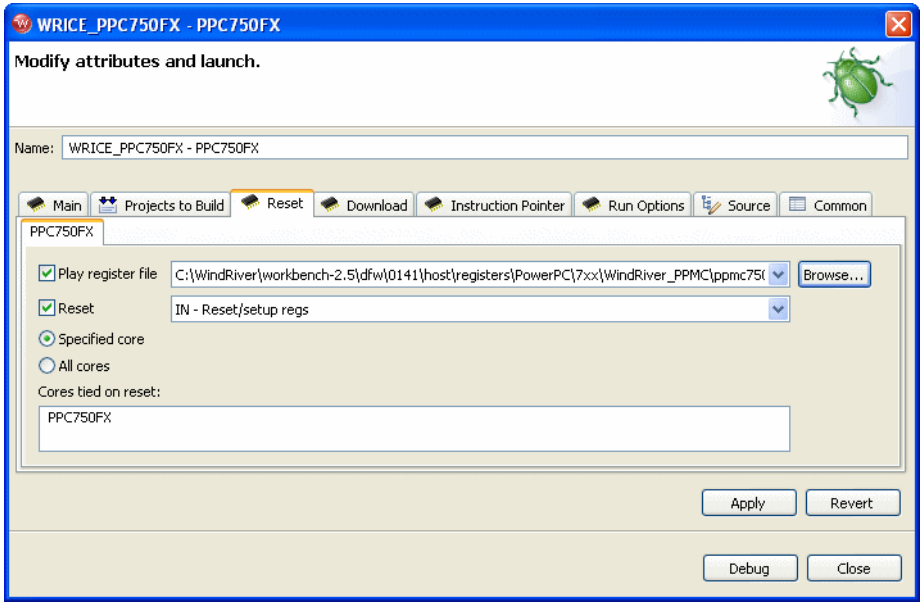
NOTE: To enable this operation, make sure your launching preferences are correctly set. In the Workbench toolbar, select **Window > Preferences > Run/Debug > Launching**. In the **General settings for launching** field, make sure the **Build (if required) before launching** checkbox is selected. This checkbox is selected by default.

This example shows the **Projects to Build** tab set to build the project **c_demo_sa** before launching.



4.4.2 Reset Tab

1. Select the **Reset** tab.



2. If you want to play a register file, select **Play Register File** and browse for the **.reg** file you want to use.

   This example shows a Wind River PPMC750FX target; the Wind River register file for this target is **ppmc750fx.reg**, located in *installDir*/**workbench-2.***x*/**dfw**/*build*/**host/registers**, in the directory **PowerPC/7xx/WindRiver_PPMC**.

   If you do not want to reconfigure your target registers, leave this box unchecked.

3. Choose the type of reset initialization you want to perform.

   You can use the **IN** or **INN** initialization commands. For a full discussion of these two commands, see *4.5.2 Initializing the Target*, p.105.

   You can also choose not to perform an initialization by clearing the **Reset** box.

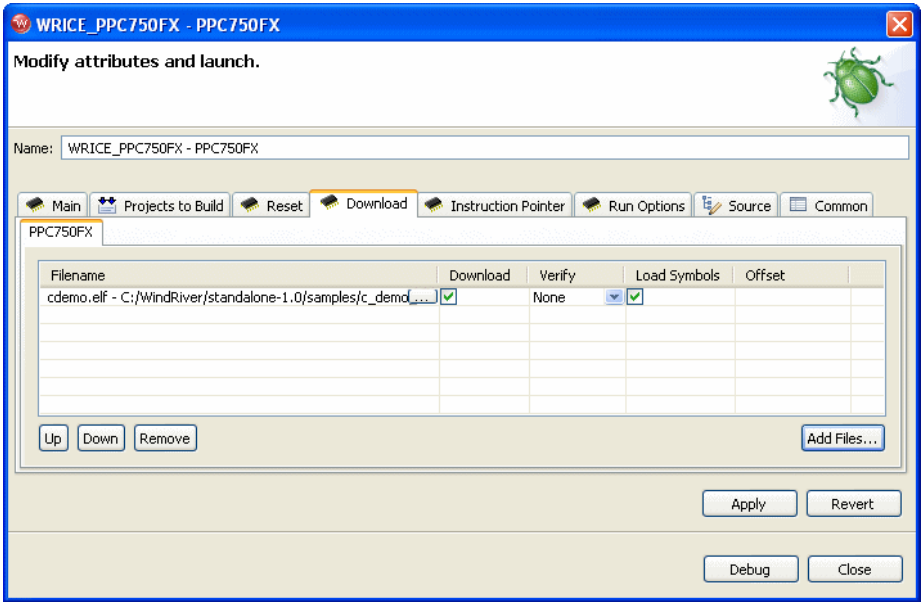
⚠ **CAUTION:** If you are manually changing registers on your target, be aware that issuing an **IN** or **INN** initialization command will overwrite your changes.

4. Choose which core your reset and download will affect.

In the **Cores Tied on Reset** field, you will see a list of all the cores on your JTAG scan chain. If you want your reset and download to affect only one core, click on that core in the **Cores Tied on Reset** field and check **Specified Core**. If you want your reset and download to affect all your target boards, click on **All Cores**.

4.4.3 Download Tab

1. Select the **Download** tab.



2. Click **Add Files**.

   In the browser window that appears, navigate to the executable file you want to run. This example uses the PowerPC version of the executable **cdemo.elf** file from the sample C Demonstration Program.

   The file you select appears in the **Filename** field. Repeat this process as many times as necessary.

   The file at the top of the list will download to the target first, followed by the others from the top down. You can edit the order of the list by clicking on any filename to highlight it and using the **Up**, **Down**, and **Delete** buttons.

3. Use the other fields to configure the download.

Download

The **Download** field is checked by default. If you clear it, the file will remain on the list but will not download data to the target. This is useful if, for example, you only want to download symbol information and not data.

Verify

The **Verify** field configures the extent to which the file you are downloading will be compared to a file that may already be on the target. There are three options: **Full**, **Compare**, and **None**.

When this field is set to **Full**, a write/read verify will occur for every download. Workbench writes to the target and then verifies that the write to the target and the read from the target are identical. This is slower than a normal download, but it is a useful security option.

When the field is set to **Compare**, Workbench will verify that the image has been downloaded correctly (that is, that the image on the host is the same as the image on the target.) This is useful for programming flash.



NOTE: You should only set the **Verify** field to **Compare** if an image already exists on the target. If you set the field to **Compare** when there is no image on the target, Workbench will look for a file to compare and not find one, and the reset and download operation will fail.

When the field is set to **None**, Workbench will perform no verification.

The **Verify** field is set to **None** by default.

Load Symbol

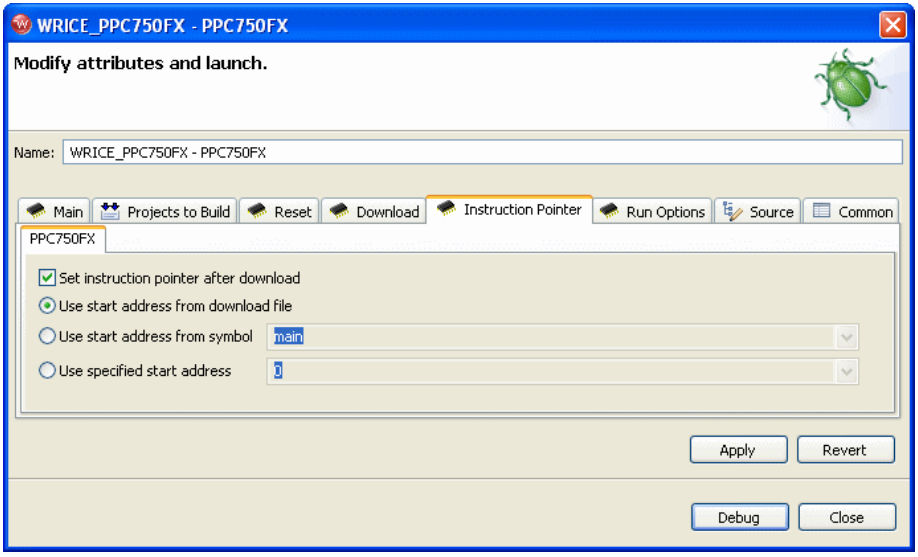
The **Load Symbol** field, which is checked by default, determines whether the file's symbol information is downloaded to the target.

Offset

In the **Offset** field, you can enter a value in hex to set a memory offset bias for your application file. If you do not enter a value, Workbench uses the default value **0x00000000**.

4.4.4 Instruction Pointer Tab

1. Select the **Instruction Pointer** tab.



2. Set the starting point for your file.

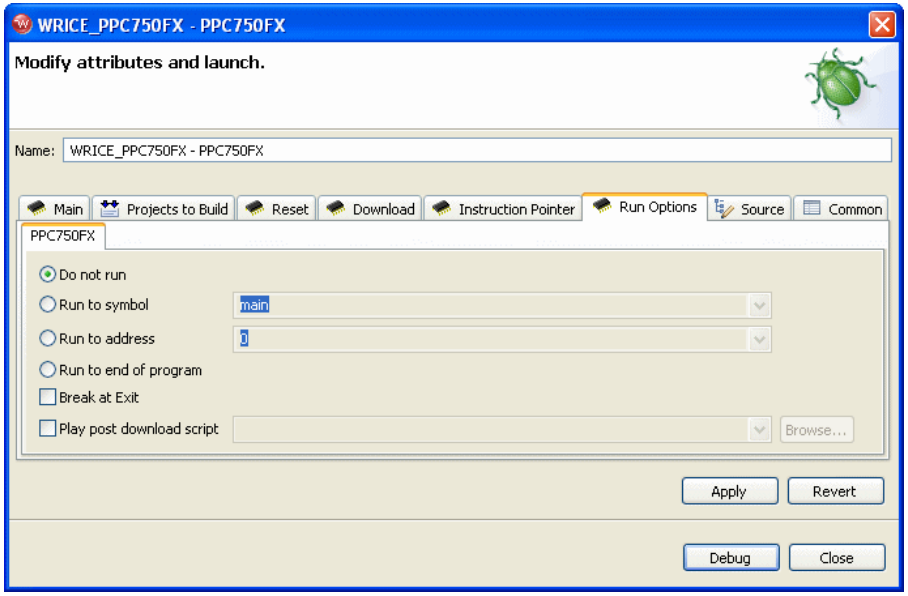
   By default, the instruction pointer is set to use the starting address from the download file.

   You can set the instruction pointer to start the file from the first occurrence of a particular symbol (for example, **main**) or you can just specify a starting address by entering the address value in hex in the **Use Specified Start Address** field.

   If you do not want to set a starting point, clear the **Set Instruction Pointer After Download** box.

4.4.5 Run Options Tab

1. Select the **Run Options** tab.



2. Determine how you want your file to run.

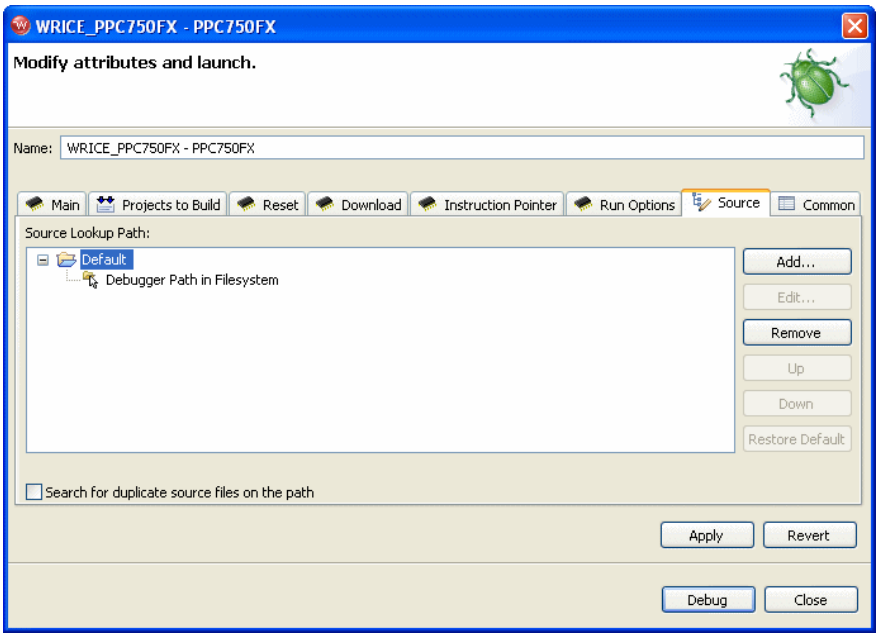
   By default, the **Reset and Download** view is set not to run the file after downloading. If you want the file to run, you have several options to determine where it should break:

   - You can set it to break at the first occurrence of a symbol (for example, **main**) by selecting **Run to Symbol** and entering the symbol in that field.
   - You can set it to break at the end of your program by selecting **Run to end of program**.
   - You can set it to break at a given memory address by selecting the **Run to Address** box and entering the address in hex in that field.
   - You can set it to break at an **_exit** routine by selecting the **Break at Exit** box.

   If you need to perform a post-initialization, you can define it here. Select the **Play post download script** box and click **Browse**. In the browser window that appears, navigate to your initialization file.

4.4.6 Source Tab

1. Select the **Source** tab.



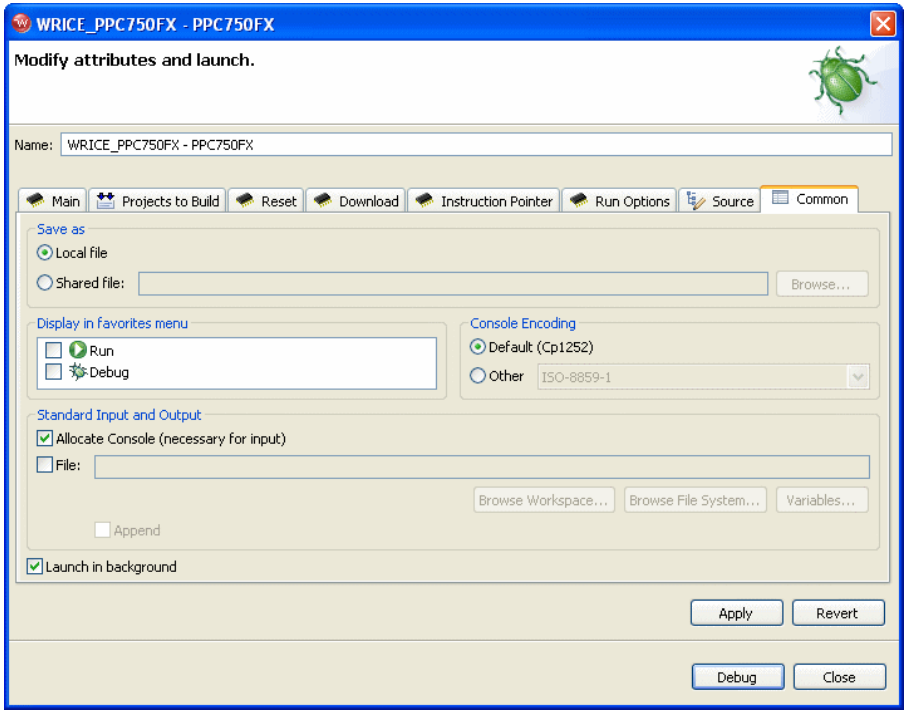
2. Use the **Source** tab to configure the source path of your file.

   Workbench uses the input path of the local file system by default. Unless you need to use a different path, you do not need to do anything in the **Source** tab.

   If you need to use a different path, click **Add...** and use the **Add Source** dialog to configure the appropriate search path for your project.

4.4.7 Common Tab

1. Select the **Common** tab.



2. Specify whether your launch configuration is local or shared.

   The configuration is local by default. To make it shared, click **Shared file:** and browse to the shared directory where you want the configuration to be located.

   You have now fully defined your reset and download operation.

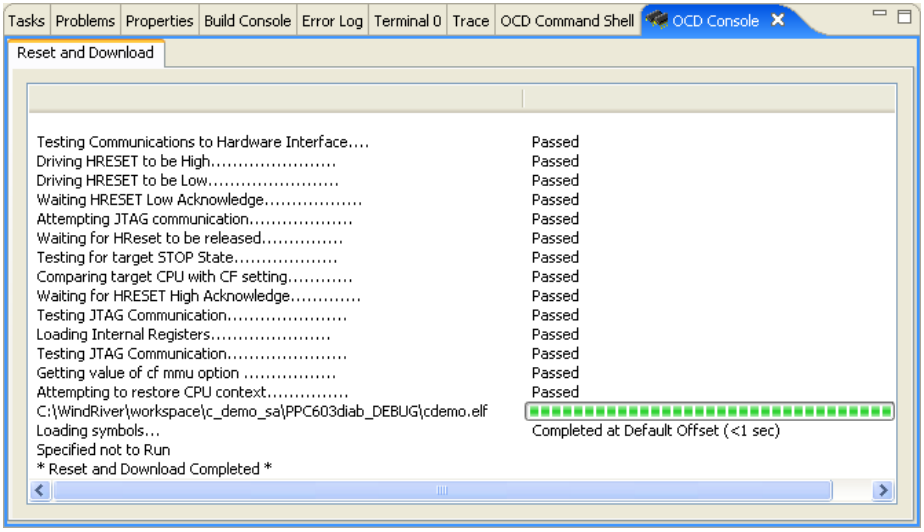
4.4.8 Executing the Reset and Download

1. Click **Debug**.

   This resets the target and downloads the specified file.

   Workbench will first initialize the target board, then download the file, then run the file.

   The **OCD Console** view opens to show the progress of the reset and download operation.



You can now step through instructions and debug code using the **Resume** and **Suspend** buttons in the **Debug** view. For information on debugging, see the *Wind River Workbench User's Guide*.

4.5 Initializing Wind River ICE SX and the Target

If you make changes to the firmware of Wind River ICE SX, you must initialize it for the changes to take effect. Similarly, if you make changes to the target, you may have to initialize the target to have those changes take effect. *4.5.1 Initializing Wind River ICE SX*, p.103, and *4.5.2 Initializing the Target*, p.105, describe methods of initializing both ICE and the target, and provide some examples of situations where an initialization may be required.

4.5.1 Initializing Wind River ICE SX

Any time you make changes to the ICE firmware, you need to initialize the unit so that the changes take effect. For example, after you configure ICE for network

operation, you must initialize it so that the unit recognizes its new configuration. You also need to initialize ICE any time the firmware is updated.

There are two methods of initializing Wind River ICE SX:

- *Power On*, p.104
- *Reset*, p.105

Power On

A power on is a complete power cycle of the ICE, and it occurs when the power switch on the back of the unit is turned from the **OFF** position to the **ON** position. In a power on boot up sequence, ICE searches for its component boards and runs a complete set of diagnostics for each board. Unless you have statically programmed an IP address into your ICE unit, the IP address for the unit is requested from the appropriate server during the cold start boot up sequence. Any other network information that is to be acquired dynamically is also set up during the initialization. The power on boot up sequence, as seen over a serial connection to ICE, resembles the following:

```
*******************************************************************************
Wind River ICE Ethernet Platform
Copyright © Wind River Systems, Inc. 1999-2004.  All rights reserved
*******************************************************************************
Firmware Type Wind River ICE BSP  Version 2.0a Created On: Oct 22 2004
16:07:17

Configuring TCP/IP Network Suite:
   IP Address..... NVRAM = 255.255.255.255
   Netmask........ NVRAM = 0xFFFF0000
   Default Gateway None
   Routing........ Disabled
   MAC Address.... 00:A0:1E:00:3C:71

Supervisory command mode enabled..................... PASSED
Pseudo device initialization......................... PASSED
TFTP device initialized.............................. PASSED
Device inititalized.................................. PASSED
Starting TCP/IP on PORT A 10BaseT.................... PASSED
Starting TCP/IP on PORT B 100BaseT................... PASSED
Initializing FFS Driver.............................. PASSED
FFS disk initialized  26408 Kbytes free.............. PASSED
FFS disk      0 percent fragmented................... PASSED
Disk volume 45.0.0 initialization.................... PASSED
Starting TCP TGTCONS   server TGTCONS [ 1232] ....... PASSED
Setting TGTCONS baud rate to 9600..................... PASSED
Starting WRS shell server............................ PASSED
Wind River ICE System Shell - Type HELP for list of commands

>NET>
```



NOTE: If you do not have an active serial connection to your Wind River ICE SX unit, you will not see this boot up sequence display in the **Terminal** view. The same set of commands and diagnostics are still run, regardless of whether or not you have this connection open.

Reset

A reset occurs when the **RESET** switch on the back of the Wind River ICE SX unit is pressed. In this case, many of the tests that are run during a power on are run. However, ICE only runs a subset of its diagnostics. This means that the boot-up process is faster with a reset than it is with a power on.

4.5.2 Initializing the Target

You need to initialize the target in order to obtain a connection when you first try to establish communications with it. Similarly, if the code you are running on your target causes the connection to be lost, then you also need to initialize the target in order to restore that connection. Initialization is also required if you change the register settings in the emulator and want them to be reflected in the target.

The target is initialized whenever you first establish a connection using Wind River Workbench. If you need to initialize the target when you are debugging, you can do it using either the **IN** or the **INN** command.

The **IN** and **INN** commands are terminal level target initialization commands, and they are the easiest way to initialize the target when you are working in the **OCD Command Shell**. The **IN** or **INN** command can be executed at a **>BKM>** or **>ERR>** prompt. If a **>RUN>** prompt is visible, stop the target running by typing a **Ctrl + C** key combination, a **Ctrl + X** key combination, or by typing **HALT**. The target stops running and a **>BKM>** prompt is visible.

The **IN** and **INN** commands differ in that the **IN** command copies the register information that is stored in Wind River ICE SX's non-volatile memory (NVRAM) to the target board after background mode is entered, whereas the **INN** command places the target in background mode without overwriting the target's registers, leaving them in their default reset state for the processor. More information on register settings is available in the *Wind River Workbench for On-Chip Debugging User Tutorials*. The following two sections further describe the **IN** and the **INN** commands.

INN Command

The **INN** command is a low level command that is used to place the target processor into background mode. In order to get a processor into background mode, the reset line of the processor is asserted and then released. As a consequence of entering background mode, the processor and its peripherals on the target board are forced into their reset state (the same state as if you hit the Reset button on the ICE unit) and all of the internal registers are forced to their manufacturer's reset value.

IN Command

The **IN** command does two different things. First, as with the **INN** command, it places the target board into background mode. Second, it copies all of the register information that is stored in ICE's NVRAM for that target down to the target board.

Wind River ICE SX writes register values to the target for all of the register groups that are enabled at the time of initialization. Even if code is located on the target to properly configure the registers, ICE still overwrites the values when it first establishes communications (is initialized). For that reason, it is important to make sure that the register settings that are stored in the ICE unit's NVRAM match any register configuration code on the target. The **SCT DIFF** command can be used to display the differences between the registers in ICE's NVRAM and the registers on the target. More information on this command is available in the *Wind River Workbench for On-Chip Debugging Command Reference*, and more information on register configuration is available in the *Wind River Workbench for On-Chip Debugging User Tutorials*.

If you do not want ICE to configure the registers during initialization, use the **INN** command instead of the **IN** command.

After initialization is completed, output appears in the **OCD Command Shell:**

```
>BKM>in
************************************************************************
Wind River ICE Initialization Sequence.
Copyright (c) Wind River Systems, Inc. 1999-2005. All Rights Reserved.
************************************************************************
     Support Expires....... FlexLM key in use.
     Target Processor...... MPC8260:U1
Wind River ICE            Group ID#=0
Wind River ICE            Serial #= MIKEFLEX      Firmware= vn2.3a
Type CF For a Menu of Configuration Options
Initializing Background Mode...................Successful
>BKM>
```

The information includes the version number of the hardware, the target processor, and the operation mode.

4.6 Troubleshooting Wind River ICE SX Communication Problems

If you have problems establishing communications with the target using Wind River ICE SX, it is likely that there is either a problem between ICE and the target, or between the ICE unit and the host computer.

A good indication that the communication problem is between ICE and the target is if an **>ERR>** prompt displays in the **OCD Command Shell** after initialization instead of a **>BKM>** prompt.

Problems between the ICE unit and the host computer are usually indicated by an error message.

4.6.1 Problems Between Wind River ICE SX and the Target

Communication errors between ICE and the target are typically indicated by an **>ERR>** prompt in the **OCD Command Shell**. The following sections describe three solutions that you can try to correct this error.

Register Files

If the target board you are using has been shipped with the registers uninitialized, you may have to download a register file (**.reg**) to the target (or specify one in your board file) before you are able to get the processor into background mode and see a **> BKM >** prompt in the **OCD Command Shell**. The *Wind River Workbench for On-Chip Debugging User Tutorials* provides step-by-step instructions for downloading a register file to your target. You can verify how the registers on your target board were shipped by referring to the documentation that came with that board. Often, your board includes a register file for the board that you just need to download.

Set Verbose On Command

The **Set Verbose On** command puts Wind River ICE SX into verbose mode, which can be useful when attempting to diagnose connection problems. Using the **IN** command at an **>ERR>** prompt only shows that the attempt to connect failed. Using verbose mode provides more information about where the communication attempt failed.

To use verbose mode, follow the steps listed below.

1. At the **>ERR>** prompt in the **OCD Command Shell**, type **set verbose on**.
2. Press **ENTER**, which returns you to an **> ERR >** prompt.
3. Type **IN** at the **>ERR>** prompt and press **ENTER**.

This time, the output in the **OCD Command Shell** lists all of the diagnostic tests that it performs while trying to place the target in background mode, and states whether the test passes or fails. The following shows an example of a JTAG target being initialized with verbose mode invoked:

```
>ERR>set verbose on
>ERR>in
*******************************************************************************
Wind River ICE Initialization Sequence.
Copyright (c) Wind River Systems, Inc. 1999-2005.  All rights reserved.
*******************************************************************************
     Support Expires........ FlexLM key in use.
     Target Processor....... MPC8260:U1
Wind River ICE             Group ID#=0
Wind River ICE               Serial#=MIKEFLEX         Firmware= vn2.2a
Type CF For a Menu of Configuration Options.

Testing Communications to Hardware Interface....Passed
Checking Paddle Board...........................Passed
Driving HRESET to be High.......................Passed
Driving HRESET to be Low........................Passed
Waiting HRESET Low Acknowledge..................Passed
Attempting JTAG Communication...................Passed
Waiting for HRESET to be Released...............Passed
Testing for target STOP State...................Passed
Comparing target CPU with CF setting............Passed
Waiting for HRESET High Acknowledge.............Failed
>ERR>
```

Using verbose mode helps you determine why the target cannot be placed in background mode. The entry for **Set Verbose On** in the *Wind River Workbench for On-Chip Debugging Command Reference* describes each of the diagnostic tests that are performed, and provides things that you can check to try to correct the problem.

Hardware

An **>ERR>** prompt in the **OCD Command Shell** can also signify a problem with the hardware connections between the ICE unit and the target. Check the following items to determine if the connection problem is hardware related.

- Make sure that all connections have been made between ICE and the target, as described in *2. Hardware Setup*.
- Make sure that power has successfully been applied to both ICE and the target.
- Make sure that all connections are tight.
- If you are using the OCD extender cable or a right angle connector to connect ICE to the target, try making a direct connection instead if possible. That eliminates any noise that may be interfering with the connection attempt.

4.6.2 Problems Between Wind River ICE SX and the Host

If no prompt is visible in the **OCD Command Shell**, or if an error message is shown, it is likely that the connection error is between the Wind River ICE SX and the host computer. Communication problems of this nature are usually related to the physical connections between the ICE and the host. The following two sections describe some of the common problems and solutions for these types of errors.

Hardware

Error messages of this type can signify a problem with the hardware connections between the ICE unit and the host computer. Check the following items to determine if the connection problem is hardware related.

- Make sure that all connections have been made correctly and are tight, as described in *2. Hardware Setup*. Pay extra attention to the connections between ICE and the host.
- Make sure that power has been applied correctly to the ICE unit.

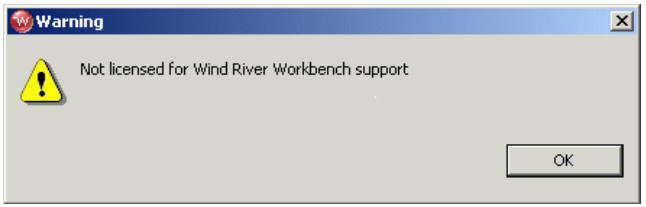
Networking

The problem may also occur because your ICE unit is not being recognized on your network. Make sure that you have set up your ICE unit correctly for network operation, as described in *3. Configuring Wind River ICE SX for Network Operation*. Try pinging your unit, as described in *Testing the Installation*, p.67 of *3. Configuring Wind River ICE SX for Network Operation* to make sure that your ICE is being recognized on the network.

4.6.3 License Key Problems

If the error message shown in Figure 4-1 appears when you try to connect, your emulator's license key is incorrect or expired.

Figure 4-1 **License Key Error Message**



To upgrade your license key, use the following steps:

1. Right-click in the **Target Manager** and select **OCD Utilities > Capture Current Key to File**.

   A browser window appears.

2. In the browser's **Look In** field, select **Desktop**.

3. In the browser's **File Name** field, enter your name and append **.txt.**

   For example, if your name were John Smith, you would name the file **JohnSmith.txt.**

4. Click **Open**.

   Workbench automatically creates the text file and logs your current license key to it.

5. Send an email to **licadmin@windriver.com** and attach the text file you created in the preceding steps.

   This file contains the license key that Wind River needs in order to upgrade your Wind River ICE SX.

When you request a new license key, your email must include the sales order number associated with the upgrade. Within 24 hours you will receive a message with a text file attachment that contains your upgraded license key.

To install your new license key, use the following steps:

1. Open the email message you received from Wind River and save the attached file to your desktop.

2. Connect your Wind River ICE SX to your host PC and open Wind River Workbench.
3. Right-click in the **Target Manager** and select **OCD Utilities > Install License Key From File**.

   A browser window appears.
4. Navigate to the file you saved on your desktop in Step 1 and Click **Open**.

   This will burn your new license key.

4.7 Working with Wind River ICE SX

Once you are in background mode and have a **>BKM>** prompt visible in the **OCD Command Shell**, you are ready to verify that your ICE and target are working together correctly, and you can begin working with your system.

This section provides a brief description of some of the tasks that you can perform with your ICE unit. Detailed instructions and descriptions for performing most of the tasks using the Wind River Workbench GUI are provided in the *Wind River Workbench User's Guide*. In addition, a complete command reference of the low level Wind River ICE SX command language is laid out in the *Wind River Workbench for On-Chip Debugging Command Reference*. Any commands described in that document can be entered at the **>BKM>** prompt in the **OCD Command Shell** with the correct syntax.

Configuration Options

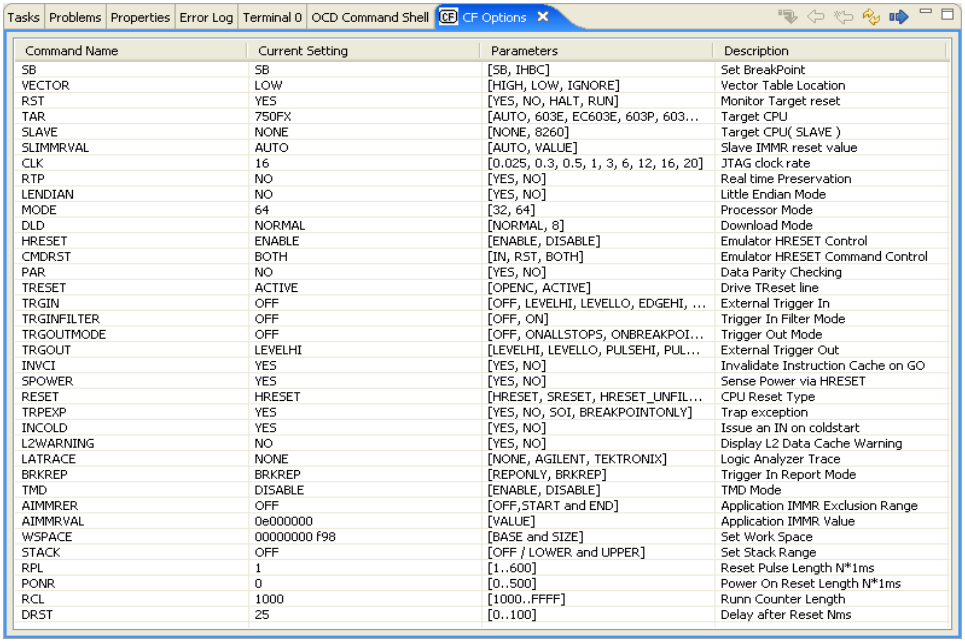
To see the configuration options available for your target, click on **Window** in the toolbar. From the drop-down list that appears,
choose **Show View > CF Options View.**

Alternatively, your target can be configured using the low-level **CF** command, which can be issued at either a **>BKM>** prompt or an **>ERR>** prompt in the **OCD Command Shell**. Although the configuration options for a target vary depending on the target you are using, typing the command **CF** at a prompt provides a list of the options that are available for your target. Please note that these options are subject to change with new revisions of the product.

NOTE: The **CF** command can be entered at either the **>BKM>** prompt or the **>ERR>** prompt, but not at a **>RUN>** prompt.

Figure 4-2 shows an example of the configuration options that are available for a PPC750FX target.

Figure 4-2 **PPC750FX CF Options**



Command Name	Current Setting	Parameters	Description
SB	SB	[SB, IHBC]	Set BreakPoint
VECTOR	LOW	[HIGH, LOW, IGNORE]	Vector Table Location
RST	YES	[YES, NO, HALT, RUN]	Monitor Target reset
TAR	750FX	[AUTO, 603E, EC603E, 603P, 603...	Target CPU
SLAVE	NONE	[NONE, 8260]	Target CPU(SLAVE)
SLIMMRVAL	AUTO	[AUTO, VALUE]	Slave IMMR reset value
CLK	16	[0.025, 0.3, 0.5, 1, 3, 6, 12, 16, 20]	JTAG clock rate
RTP	NO	[YES, NO]	Real time Preservation
LENDIAN	NO	[YES, NO]	Little Endian Mode
MODE	64	[32, 64]	Processor Mode
DLD	NORMAL	[NORMAL, 8]	Download Mode
HRESET	ENABLE	[ENABLE, DISABLE]	Emulator HRESET Control
CMDRST	BOTH	[IN, RST, BOTH]	Emulator HRESET Command Control
PAR	NO	[YES, NO]	Data Parity Checking
TRESET	ACTIVE	[OPENC, ACTIVE]	Drive TReset line
TRGIN	OFF	[OFF, LEVELHI, LEVELLO, EDGEHI, ...	External Trigger In
TRGINFILTER	OFF	[OFF, ON]	Trigger In Filter Mode
TRGOUTMODE	OFF	[OFF, ONALLSTOPS, ONBREAKPOI...	Trigger Out Mode
TRGOUT	LEVELHI	[LEVELHI, LEVELLO, PULSEHI, PUL...	External Trigger Out
INVCI	YES	[YES, NO]	Invalidate Instruction Cache on GO
SPOWER	YES	[YES, NO]	Sense Power via HRESET
RESET	HRESET	[HRESET, SRESET, HRESET_UNFIL...	CPU Reset Type
TRPEXP	YES	[YES, NO, SOI, BREAKPOINTONLY]	Trap exception
INCOLD	YES	[YES, NO]	Issue an IN on coldstart
L2WARNING	NO	[YES, NO]	Display L2 Data Cache Warning
LATRACE	NONE	[NONE, AGILENT, TEKTRONIX]	Logic Analyzer Trace
BRKREP	BRKREP	[REPONLY, BRKREP]	Trigger In Report Mode
TMD	DISABLE	[ENABLE, DISABLE]	TMD Mode
AIMMRER	OFF	[OFF,START and END]	Application IMMR Exclusion Range
AIMMRVAL	0e000000	[VALUE]	Application IMMR Value
WSPACE	00000000 f98	[BASE and SIZE]	Set Work Space
STACK	OFF	[OFF / LOWER and UPPER]	Set Stack Range
RPL	1	[1..600]	Reset Pulse Length N*1ms
PONR	0	[0..500]	Power On Reset Length N*1ms
RCL	1000	[1000..FFFF]	Runn Counter Length
DRST	25	[0..100]	Delay after Reset Nms

NOTE: The **CF** options listed will not be the same for all targets. This is a PPC750FX example only.

To make a change to any of these values, double-click on its entry under the **Current Setting** heading to bring up a list of parameters. Select the parameter you want and click the **Send All CF Options to Target** icon. For most options your changes will not take effect until you issue a reset using the **IN** or **RST** commands.

To change CF options using low-level commands, type **CF** and the CF option to be modified, followed by the specific parameter to be configured (all on the same command line) at the **>BKM>** or **>ERR>** prompt in the **OCD Command Shell**.

For example, to configure the system for an MPC8240 target rather than the PPC750FX displayed above, you would type:

```
>BKM>CF TAR 8240
```

If you type **CF** again and press **ENTER**, **8240** would display next to the **Target CPU** parameter in the list of configuration options.

A full listing of the available configuration options and descriptions is available in the *Wind River Workbench On-Chip Debugging Configuration Options Reference*. Please refer to this document for more information about configuration options.

Boot Register Initialization

Once communications are established with Wind River ICE SX and the target, the registers required for initialization must be programmed and configured, a necessary step prior to downloading code. In order to be able to access a peripheral device using the OCD link on your target, it is necessary for all applicable registers in the interface to be properly configured.



NOTE: If your target has valid running boot initialization code, you may omit the register initialization process and rely on your own boot code to initialize your board. To reset your target, start your boot code, and stop the target, you may use an **INN**; **GO**; **HALT** command sequence in the **OCD Command Shell**.

Detailed information about working with registers is included in the *Wind River Workbench for On-Chip Debugging user Tutorials: Configuring Target Registers*. Please refer to that document for more information about how to program and configure the registers required for initialization.

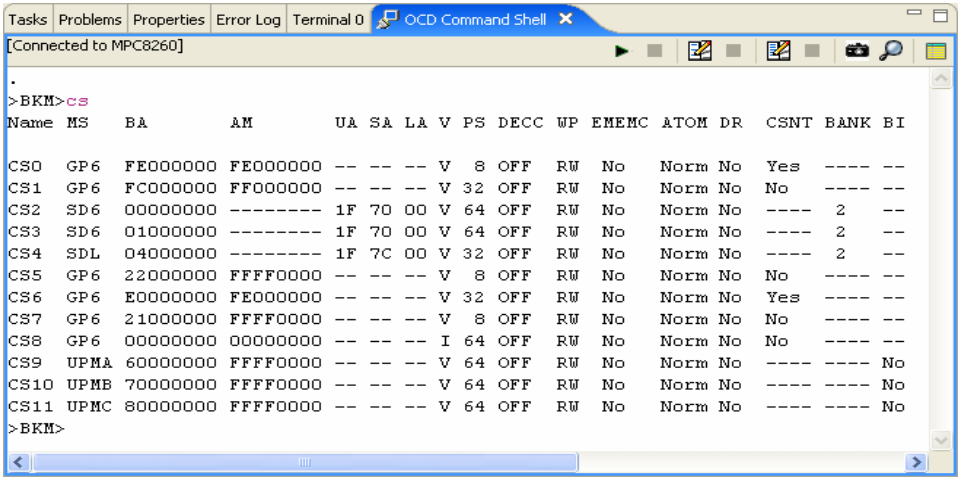
Setting Chip-Selects with the CS Command

The **CS** command provides information about a special set of registers that are used for controlling the chip selects within a target. Not all targets possess programmable chip-selects. Refer to your processor documentation for information about chip-selects on your target.

If your target does include programmable chip-selects, the **CS** command allows you to view a table that lists the available chip-selects with all of their options. Each of the entries in the table can be programmed as described below.

Type **CS** at the **>BKM>** prompt with no parameters to display the chip-select table for your target, as shown in Figure 4-3.

Figure 4-3 **Chip Select Table**



To modify any of the chip-selects, type the **CS** command followed by the name of the chip-select you want to modify. For example, to modify chip-select **cs0**, you would enter

```
>BKM>CS CS0
```

The options and the current settings for that chip-select display one line at a time, allowing you to make individual changes to the settings. To move from one line to the next, press **ENTER**. An example for setting chip-select **cs0** is shown below.

```
>BKM>cs cs0

(0-6) = GP6,GPL SD6,SDL,UPMA,UPMB,UPMC     |      Machine State = GP6        >
0000000 -> FFFF8000                        |     Base Register  = FE000000   >
0000000 -> FFFF8000                        |      Address Mask  = FE000000   >
0 = Not Valid, 1 = Valid                   |       Valid State  = Valid      >
(0-3) = 64, 8, 16, 32 bits                 |         Port Size  =  8 Bits    >
(0-3) = OFF, Normal, RMW, Correct & Check  |          Data ECC  = Disabled   >
0 = Read/Write, 1 = Read Only              |     Write Product  = Normal     >
0 = Disabled, 1 = Enabled                  |  Ext MEMC Enable   = Disabled   >
(0-3) = Normal,RAWA,WARA,Rsvd              | Atomic Operation   = Normal     >
0 = Normal, 1 = Delayed                    |     Delayed Read   = Normal     >
0 = Normal, 1 = Early                      |      CS Negation   = Early      >
(0-3) = Normal, rsvd, 1/4 clk, 1/2 clk     | Address/CS Setup   = Normal     >
0 -> F (Number of Wait States)             |    Wait State(s)   = 5          >
0 = Internal, 1 = External                 | Trans Ack (SETA)   = Internal   >
0 = Normal, 1 = Relaxed                    |   Timing Relaxed   = Relaxed    >
```

```
0 = Normal, 1 = Extended                    |  Extend Hold Time  = Extended  >

>BKM>
```

The chip-select table is stored in the ICE NVRAM, and is automatically downloaded to the appropriate target location after every initialization sequence using the **IN** command. If you want to initialize the system without writing the chip-select table, use the **INN** command, or disable the chip-select group using the **CF GRP** command, as described in the *Wind River Workbench for On-Chip Debugging Command Reference*.

Any time you change the chip-select table, you must issue an **IN** command to download your new table to the target for the changes to take effect.

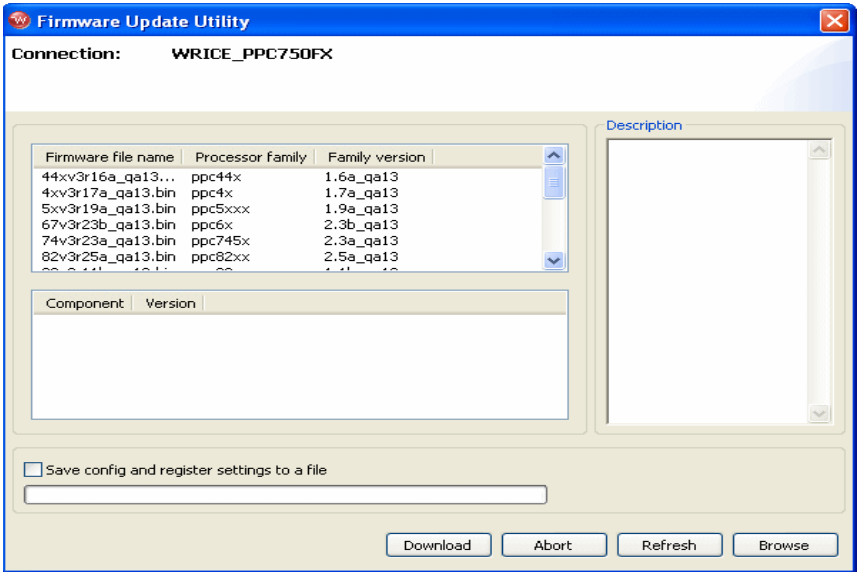
4.8 Moving On

For information on using your Wind River ICE SX to download, run and debug application files in Wind River Workbench, please see the *Wind River Workbench for On-Chip Debugging User Tutorials*.

5 Using the Firmware Update Utility

Use the Firmware Update Utility in Wind River Workbench to update the firmware on your Wind River ICE SX.

Figure 5-1 **Firmware Update Utility**

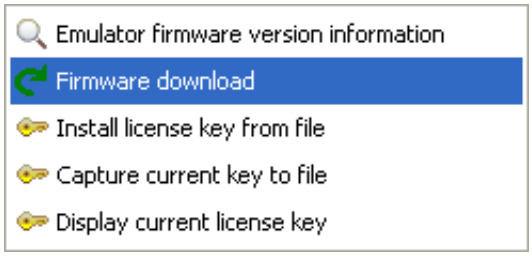


NOTE: You can only update firmware in the Wind River ICE SX when you do not have an active debugging session attached to it.

To use the Firmware Update Utility:

1. Open Wind River Workbench.
2. If you have not already established communications with your Wind River ICE SX, do so now using the procedure described in *4. Establishing Communications*.
3. Right-click on the processor under your target name in the **Target Manager** view and select **OCD Utilities > Firmware Download...**, as shown in Figure 5-2.

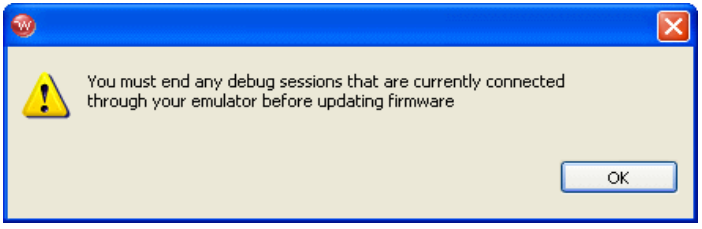
Figure 5-2 **Firmware Download Option**



The Firmware Update Utility appears, as shown in Figure 5-1.

If an error message such as the one shown in Figure 5-3 appears, you must disconnect the Wind River ICE SX from any active debug context.

Figure 5-3 **Firmware Update Warning**



Setting the Firmware File Directory

Wind River Workbench automatically searches for the directory named **firmware**, located in *installDir*/**workbench-2.***x*/**dfw/***version*/**host/firmware**, where *version* is the installed version of the debugger middleware.

To change the default firmware directory:

1. Click **Browse**.
2. In the browser window that appears, navigate to your desired directory and click **OK**.

   This will populate the **Firmware File Name** field with the **.bin** files from your directory.

Click on any **.bin** file to highlight it. Its components appear in the **Component** field below, with their release version numbers appearing under the **Version** field. The file's creation date appears in the **Description** field to the right.

Downloading Firmware to the Wind River ICE SX

Click **Download** to download the highlighted firmware to your Wind River ICE SX.

Downloading new firmware can sometimes reset the emulator's configuration and register settings. To save your settings in order to restore them after the download, check the **Save Config and Register Settings to a File before Download** box.

If you check this box, a browser window will appear when you click **Download**. Use this window to choose a folder to save your settings in. They will be saved as a **.reg** file. After the download, right-click in the **Registers** view and select **Play Register File** to restore the settings.

If an error message appears when you click **Download**, your flash file system may be full. Check to make sure you have flash memory available for the firmware download.

To cancel to firmware update, click **Abort**.

Refreshing the Firmware File List

If you make changes to your firmware directory while the view is open, you can click **Refresh** to refresh the list in the **Firmware File Name** field.

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