CodeWarrior Development Studio for StarCore 3900FP DSP Architectures Targeting Manual

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Contents

Section number	Title	Page

Chapter 1
Introduction

Chapter 2
Working with Projects

Section number	Title	Page

Chapter 3
Build Properties

Section number	Title	Page

Chapter 4 Debug Configurations

Chapter 5
Working with Debugger

Section number	Title	Page

Chapter 6
Target Initialization File

Chapter 7
Memory Configuration File

Chapter 8
CodeWarrior Command-Line Debugging

Section number	Title	Page

Section number	Title	Page

Section number	Title	Page

Chapter 9
Multi-Core Debugging

Chapter 10
Working with Hardware Tools

Section number	Title	Page

Section number	Title	Page

Chapter 11
Exception Configurator

Chapter 12
Memory Management Unit Configurator

Chapter 13
Maple Memory Management Unit Configurator

Chapter 14
StarCore DSP Utilities

Section number	Title	Page

Chapter 1
Introduction

This manual explains how to use CodeWarrior Development Studio tools to develop software for Freescale StarCore 3900FP DSP processors.

This chapter provides an overview of this manual and introduces you to the CodeWarrior development tools and development process.

The topics covered here are as follows:

- Release notes
- Contents of this manual
- Accompanying documentation
- CodeWarrior Development Studio tools
- CodeWarrior IDE

1.1 Release notes

Release notes include information about new features, last-minute changes, bug fixes, incompatible elements, or other sections that may not be included in this manual.

You should read release notes before using the CodeWarrior IDE.

NOTE

The release notes for specific components of the CodeWarrior IDE are located in the `Release_Notes` folder in the CodeWarrior installation directory.

1.2 Contents of this manual

Each chapter of this manual describes a different area of software development.

The table below lists each chapter in the manual.

Table 1-1. Organization of this manual

Chapter	Description
Introduction	This chapter.
Working with Projects	Describes the different types of projects you can create, provides an overview of CodeWarrior project wizards.
Build Properties	Explains build properties for StarCore projects.
Debug Configurations	Describes the different types of launch configurations you can create, provides an overview of the debugger.
Working with Debugger	Explains various aspects of CodeWarrior debugging, such as debugging a project, configuring connections, setting breakpoints and watchpoints, working with registers, viewing memory, viewing cache, and debugging externally built executable files.
Target Initialization File	Explains what a target initialization file is, and lists an example of the initialization file.
Memory Configuration File	Discusses how to use a memory configuration file.
CodeWarrior Command-Line Debugging	Explains the CodeWarrior command-line debugger interface, Debugger Shell.
Multi-Core Debugging	Explains multi-core debugging capabilities of CodeWarrior debugger.
Working with Hardware Tools	Explains CodeWarrior hardware tools used for board bring-up, test, and analysis.
Exception Configurator	Explains the CodeWarrior Exception Configurator tool.
Memory Management Unit Configurator	Explains the CodeWarrior Memory Management Unit (MMU) Configurator tool.
Maple Memory Management Unit Configurator	Explains the Maple Memory Management Unit (MMU) Configurator tool.
StarCore DSP Utilities	Explains the utility programs included in CodeWarrior Development Studio for StarCore 3900FP DSP Architectures.

1.3 Accompanying documentation

The Documentation page describes the documentation included in this version of CodeWarrior Development Studio for StarCore 3900FP DSP Architectures.

You can access the Documentation page by:

- Using a shortcut link that the CodeWarrior installer creates by default on the Desktop.
- Opening the `START_HERE.html` file available in the `<CWInstallDir>\SC\Help` folder.

1.4 CodeWarrior Development Studio tools

This section talks about some important tools of CodeWarrior Development Studio.

Programming for StarCore 3900FP DSP processors is much like programming for any other CodeWarrior platform target. If you have not used CodeWarrior tools before, start by studying the Eclipse IDE, which is used to host the tools.

Note that CodeWarrior Development Studio for StarCore 3900FP DSP Architectures uses the Eclipse IDE, whose user interface is substantially different from the "classic" CodeWarrior IDE. For more details on these interface differences, see *CodeWarrior Development Studio Common Features Guide* available in the `<CWInstallDir>\SC\Help\PDF\` folder.

The following are some important tools of CodeWarrior Development Studio:

- Eclipse IDE
- C Compiler
- Assembler
- Linker
- Debugger
- CodeWarrior Profiling and Analysis tools

1.4.1 Eclipse IDE

The Eclipse Integrated Development Environment (IDE) is an open-source development environment that lets you develop and debug your software. It controls the project manager, the source code editor, the class browser, the compilers and linkers, and the debugger. The Eclipse workspace organizes all files related to your project. This allows you to see your project at a glance and navigate easily through the source code files.

The Eclipse IDE has an extensible architecture that uses plug-in compilers and linkers to target various operating systems and microprocessors. The IDE can be hosted on Microsoft Windows, Linux, and other platforms. There are many development tools available for the IDE, including C, C++, and Java compilers for desktop and embedded processors

For more information about the Eclipse IDE, read the Eclipse documentation at:

http://www.eclipse.org/documentation/

1.4.2 C Compiler

The StarCore C Compiler:

- Conforms to the American National Standards Institute (ANSI) C standards.
- Conforms to version 1 of the StarCore Application Binary Interface (ABI) standards.
- Supports a set of Digital Signal Processor (DSP) extensions.
- Supports International Telecommunications Union (ITU)/European Telecommunications Standards Institute (ETSI) primitives for saturating arithmetic. Additional parameters are available for non-saturating arithmetic and double-precision arithmetic.
- Allows standard C constructs for representing special addressing modes.
- Supports a wide range of runtime libraries and runtime environments.
- Optimizes for size, speed, or a combination of both, depending on options that you select.

The compiler can link all application modules before optimizing. By examining the entire linked application before optimizing, the compiler produces highly optimized code. The compiler performs many optimizations, such as:

- software pipelining
- instruction paralleling and scheduling
- data and address register allocation
- aggressive loop transformations, including automatic unrolling

For more information, see the StarCore C/C++ Compiler User Guide.

1.4.3 Assembler

The CodeWarrior StarCore assembler is a standalone assembler that translates assembly-language source code to machine-language object files or executable programs. Either you can provide the assembly-language source code to the assembler, or the assembler can take the assembly-language source code generated by the compiler.

For each assembly-language module in a build target, the StarCore assembler can generate a file that lists the generated code side-by-side with the assembly-language source code.

For more information, see the StarCore Assembler User Guide.

1.4.4 Linker

CodeWarrior Eclipse IDE for Power Architecture processors supports two types of linkers:

- CodeWarrior linker
- GCC linker

The StarCore Linker combines object files into a single executable file. You specify the link mappings of your program in a Linker Command File (LCF).

For more information, see the StarCore Linker (SC3000) User Guide.

1.4.5 Debugger

The CodeWarrior StarCore debugger controls the execution of your program and allows you to see what is happening internally as the program runs. You can use the debugger to find problems in your program.

The debugger can execute your program one statement at a time and suspend execution when control reaches a specified point. When the debugger stops a program, you can view the chain of function calls, examine and change the values of variables, and inspect the contents of registers.

The debugger allows you to debug your CodeWarrior project using either a simulator or target hardware.

The debugger communicates with the board through a monitor program (such as CodeWarrior TRK) or through a hardware probe (such as CodeWarrior USB TAP).

1.4.6 CodeWarrior Profiling and Analysis tools

CodeWarrior Profiling and Analysis tools provide visibility into an application as it runs on the simulator and hardware. This visibility can help you understand how your application runs, as well as identify operational problems. The tools also provide user friendly data viewing features:

- Simultaneously step through trace data and the corresponding source and assembly code of that trace data
- Export source line information of the performance data generated by the simulator into an Excel file
- Export the trace and function data generated by simulator and target hardware into an Excel file
- Apply multi-level filters to isolate data
- Apply multi-level searches to find specific data
- Display results in an intuitive, user friendly manner in the trace, critical code, and performance views
- Show or hide columns and also reorder the columns
- Copy and paste a cell or a line of the trace, alu-agu and performance data generated by simulator and target hardware
- Control trace collection by using start and stop tracepoints to reduce the amount of unwanted trace events in the trace buffer making the trace data easier to read
- View the value of the DPU counters in form of graphs (pie charts and bar charts) while the application is in debug mode
- Display real time cycle count for simulated targets to allow quick monitoring of evolution of application in time

For more information, see *CodeWarrior Development Studio for StarCore 3900FP DSP Architectures Tracing and Analysis Tools User Guide* available in the `<CWInstallDir>\SC\Help\PDF\` folder.

1.5 CodeWarrior IDE

This section explains the CodeWarrior IDE and tells how to perform basic IDE operations.

While working with the CodeWarrior IDE, you will proceed through the development stages familiar to all programmers, such as writing code, compiling and linking, and debugging. See *CodeWarrior Development Studio Common Features Guide* for:

- Complete information on tasks, such as editing, compiling, and linking
- Basic information on debugging

The difference between the CodeWarrior development environment and traditional command-line environments is how the software, in this case the CodeWarrior IDE, helps you manage your work more effectively.

The following sections explain the CodeWarrior IDE and describe how to perform basic CodeWarrior IDE operations:

- Project files
- Code editing
- Compiling
- Linking
- Debugging

1.5.1 Project files

A CodeWarrior *project* is analogous to a set of make files, because a project can have multiple settings that are applied when building the program. For example, you can have one project that has both a debug version and a release version of your program. You can build one or the other, or both as you wish. The different settings used to launch your program within a single project are called *launch configurations*.

The CodeWarrior IDE uses the **CodeWarrior Projects** view to list all the files in a project. A project includes files, such as source code files and libraries. You can add or remove files easily. You can assign files to one or more different build configurations within the project, so files common to multiple build configurations can be managed simply.

The CodeWarrior IDE itself manages all the interdependencies between files and tracks which files have changed since the last build.

The CodeWarrior IDE also stores the settings for the compiler and linker options for each build configuration. You can modify these settings using the IDE, or with the `#pragma` statements in your code.

1.5.2 Code editing

CodeWarrior IDE has an integral text editor designed for programmers. It handles text files in ASCII, Microsoft® Windows® and UNIX® formats.

To edit a file in a project, double-click the file name in the **CodeWarrior Projects** view. CodeWarrior IDE opens the file in the editor associated with the file type.

The editor view has excellent navigational features that allow you to switch between related files, locate any particular function, mark any location within a file, or go to a specific line of code.

1.5.3 Compiling

To compile a source code file, it must be among the files that are part of the current launch configuration. If the file is in the configuration, select it in the **CodeWarrior Projects** view and select **Project > Build Project** from the CodeWarrior IDE menu bar.

To automatically compile all the files in the current launch configuration after you modify them, select **Project > Build Automatically** from the CodeWarrior IDE menu bar.

1.5.4 Linking

Select **Project > Build Project** from the CodeWarrior IDE menu bar to link object code into a final binary file. The **Build Project** command makes the active project up-to-date and links the resulting object code into a final output file.

You can control the linker through the IDE. There is no need to specify a list of object files. The workspace tracks all the object files automatically.

You can also modify the build configuration settings to specify the name of the final output file.

1.5.5 Debugging

Select **Run > Debug** from the CodeWarrior IDE menu bar to debug your project. This command downloads the current project's executable to the target board and starts a debug session.

NOTE

The CodeWarrior IDE uses the settings in the launch configuration to generate debugging information and initiate communications with the target board.

You can now use the debugger to step through the program code, view and change the value of variables, set breakpoints, and much more. For more information, see *CodeWarrior Development Studio Common Features Guide* and the Working with Debugger chapter of this manual.

Chapter 2
Working with Projects

This chapter explains how to create and build projects for StarCore 3900FP DSP processors using the CodeWarrior tools.

This chapter explains:

- CodeWarrior Bareboard Project Wizard
- Creating projects
- Building projects
- Importing Projects
- Deleting Projects

2.1 CodeWarrior Bareboard Project Wizard

The term bareboard refers to hardware systems that do not need an operating system to operate.

The CodeWarrior Bareboard Project Wizard presents a series of pages that prompt you for the features and settings to be used when making your program.

For example, the devices options lets you select the derivative or board you would like to use. This wizard also helps you specify other settings, such as whether the program executes on a simulator rather than actual hardware, and the characteristics of the connection that communicates with a hardware target.

This section describes the various pages that the **CodeWarrior Bareboard Project Wizard** displays as it assists you in creating a bareboard project.

NOTE

The pages that the wizard presents can differ, based upon the choice of project type or execution target.

The pages of the **CodeWarrior Bareboard Project Wizard** are:

- Create a CodeWarrior Bareboard Project Page
- Processor Page
- Debug Target Settings Page
- Build Settings Page
- SmartDSP OS Page

2.1.1 Create a CodeWarrior Bareboard Project Page

Use this page to specify the project name and the directory where the project files are located.

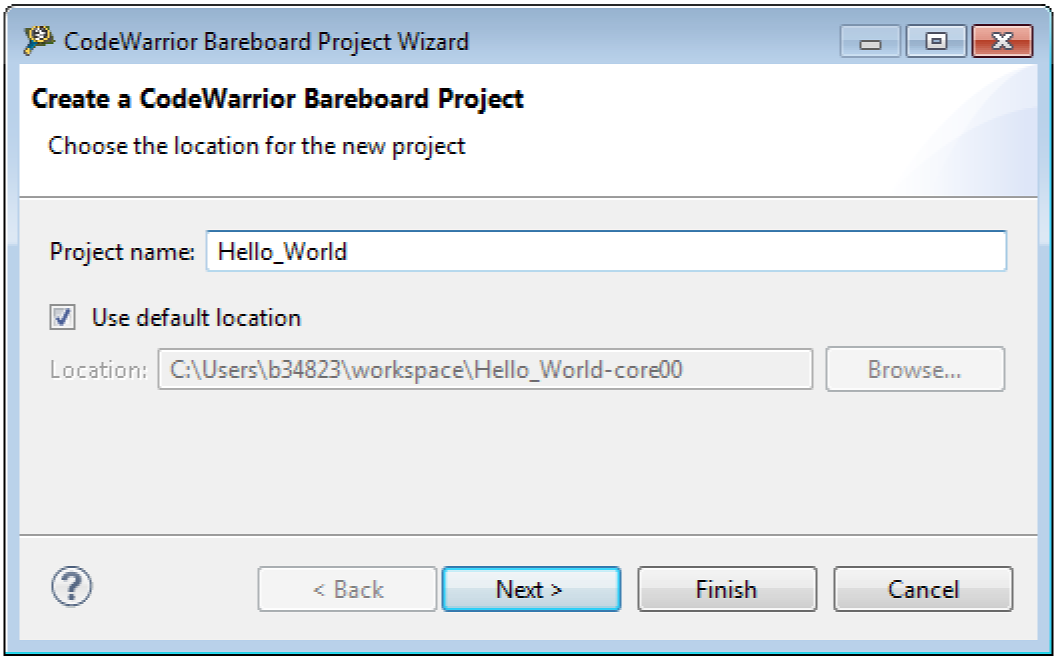


Figure 2-1. Create a CodeWarrior Bareboard Project page

The table below describes the various options available on the **Create a CodeWarrior Bareboard Project** page.

Table 2-1. Create a CodeWarrior Bareboard Project page settings

Option	Description
Project name	Enter the name for the project in this text box.
Use default location	Select to choose the directory to store the files required to build the program. Use the Location option to select the desired directory.
Location	Specifies the directory that contains the project files. Use **Browse** to navigate to the desired directory. This option is only available when **Use default location** is cleared.

2.1.2 Processor Page

This page displays the target devices supported by the current installation.

Use this page to specify the type of processor and the output for the new project.

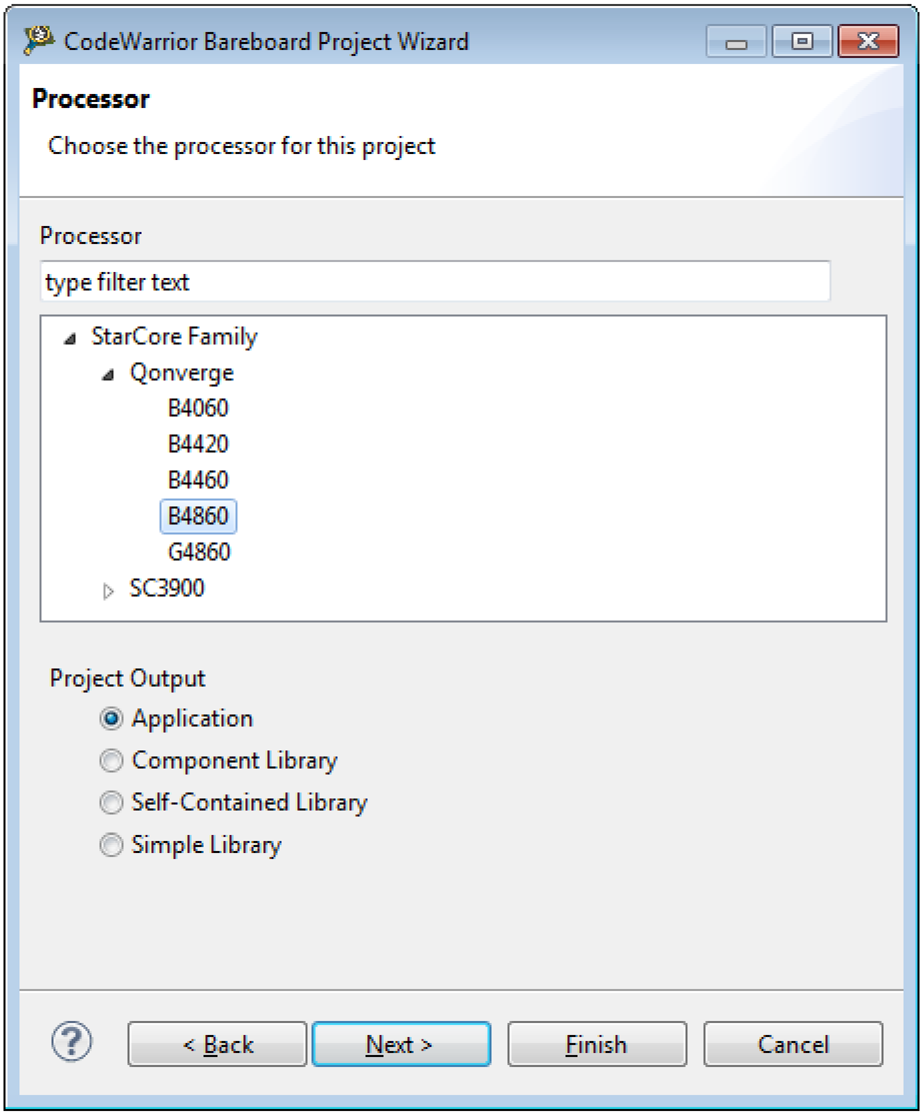


Figure 2-2. CodeWarrior Bareboard Project Wizard - Processor Page

NOTE

CodeWarrior for StarCore v10.6.4 and earlier versions support rev1 targets. Support for rev1 targets is discontinued starting SC10.6.5. Therefore, all rev1 projects need to be migrated to rev2, using 10.6.4 or an earlier version of CodeWarrior software for StarCore. For information on how to migrate projects from rev1 to rev2, see product release notes.

The table below describes the various options available on the **Processor** page.

NOTE

The pages of the wizard change depending on the selected derivative or board.

Table 2-2. Processor Page Settings

Option	Description
Processor	Expand the processor family tree and select a supported target. The toolchain uses this choice to generate code that makes use of processor-specific features, such as multiple cores. The available options are as follows: **Qonverge family** • **B4060**: Select to generate projects for multi-core targets: B4060 QDS. • **B4420**: Select to generate projects for multi-core targets: B4420 QDS and B4420 ISS. • **B4460**: Select to generate projects for multi-core targets: B4460 QDS. • **B4860**: Select to generate projects for multi-core targets: B4860 QDS, B4860 ISS, and B4860 Palladium. • **G4860**: Select to generate projects for multi-core targets: G4860 QDS. **SC3900 family** • **SC3900fp**: Select to generate projects for the single-core targets: SC3900 ISS and SC3900 PACC
Project Output	Select any one of the following supported project output: • **Application**: Select to create a StarCore application, for the specified target device, that runs on a board or simulator. • **Component Library**: Select to create a component library project, where the entry points and visible symbols are defined in an application file. • **Self-Contained Library**: Select to create a self-contained library, where all unresolved references for symbols will be solved by using first the library's own symbol definitions and then symbol definitions from the other object files or libraries. • **Simple Library**: Select to create an archive of object files can be used to build an application. The archive is created using the `sc100-ar.exe` archiver utility.

2.1.3 Debug Target Settings Page

Use this page to select debugger connection type, board type, launch configuration type, and connection type for your project.

This page also lets you configure connection settings for your project.

NOTE

This wizard page will prompt you to either create a new remote system configuration or select an existing one. A remote system is a system configuration that defines connection, initialization, and target parameters. The remote system explorer provides data models and frameworks to configure and manage remote systems, their connections, and their services. For more information, see *CodeWarrior Development Studio Common Features Guide*.

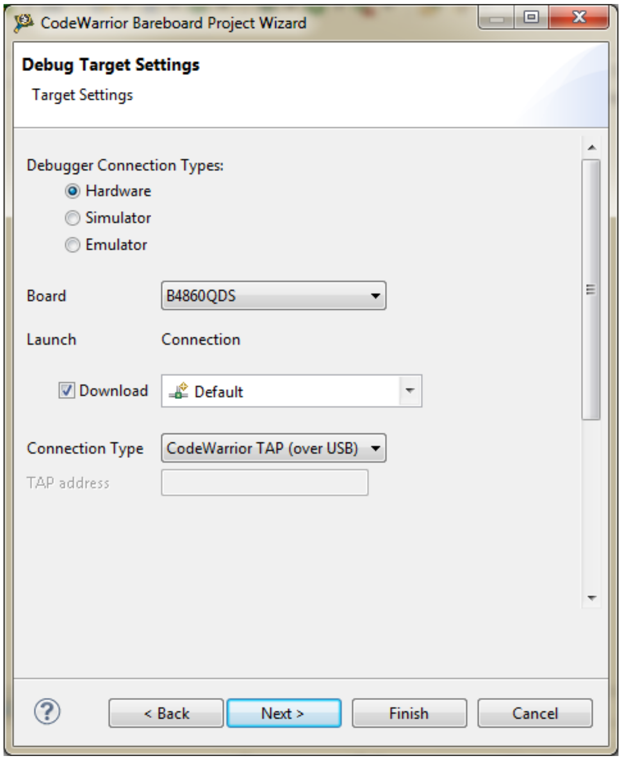


Figure 2-3. CodeWarrior Bareboard Project Wizard - Debug Target Settings Page

The table below describes the various options available on the **Debug Target Settings** page.

Table 2-3. Debug Target Settings page settings

Option	Description
Debugger Connection Types	Specifies the available target types: • **Hardware** - Select to execute the program on the target hardware available. • **Simulator** - Select to execute the program on a software simulator. • **Emulator** - Select to execute the program on a hardware emulator.
Board	Specifies the hardware supported by the selected processor.
Launch	Specifies the launch configurations and corresponding connection, supported by the selected processor.
Connection Type	Specifies the interface to communicate with the hardware. • **CodeWarrior TAP (over USB)** - Select to use the CodeWarrior USB TAP interface to communicate with the hardware device. • **CodeWarrior TAP (over Ethernet)** - Select to use the CodeWarrior Ethernet TAP interface to communicate with the hardware device.

Table continues on the next page...

Table 2-3. Debug Target Settings page settings (continued)

Option	Description
	• **USB TAP** - Select to use the USB interface to communicate with the hardware device. • **Ethernet TAP** - Select to use the Ethernet interface to communicate with the target hardware. For more details on CodeWarrior TAP, see *CodeWarrior TAP User Guide* available in the <*CWInstallDir*>`\SC\Help\PDF\` folder, where `<CWInstallDir>` is the installation directory of your Codewarrior software. • **Gigabit TAP** - Corresponds to a Gigabit TAP that includes an Aurora daughter card, which allows you to collect Nexus trace in a real-time non-intrusive fashion from the high speed serial trace port (the Aurora interface). • **Gigabit TAP + Trace (JTAG over JTAG cable)** - Select to use the Gigabit TAP and Trace probe to send JTAG commands over the JTAG cable. • **Gigabit TAP + Trace (JTAG over Aurora cable)** - Select to use the Gigabit TAP and Trace probe to send JTAG commands over the Aurora cable. For more details on Gigabit TAP, see *Gigabit TAP Users Guide* available in the `<CWInstallDir>\SC\Help\PDF\` folder, where `<CWInstallDir>` is the installation directory of your Codewarrior software.
TAP address	Enter the IP address of the TAP device here. This option is available only if CodeWarrior Ethernet TAP, Ethernet TAP, or Gigabit TAP is selected as the connection type.

2.1.4 Build Settings Page

Use this page to select a programming language, toolchain, and the output project type for your project.

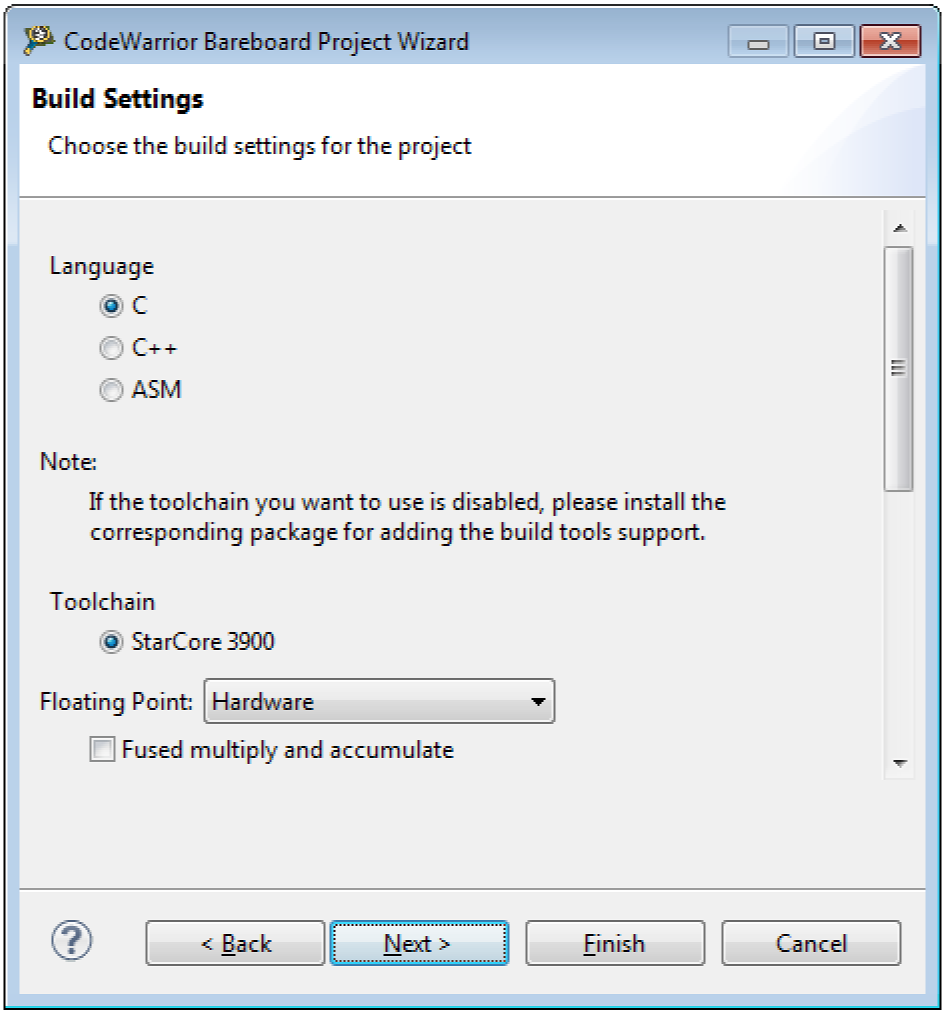


Figure 2-4. CodeWarrior Bareboard Project Wizard - Build Settings Page

The table below describes the various options available on the **Build Settings** page.

Table 2-4. Build Settings Page

Option	Description
Language	Specifies the programming language used by the new project. The current installation supports the following languages: • **C** - Select to generate ANSI C-compliant startup code, and initializes global variables. • **C++** - Select to generate ANSI C++ startup code, and performs global class object initialization. • **ASM** - Select to generate Assembly startup code.
Toolchain	Specifies the toolchains supported by the current installation. Selected toolchain sets up the default compiler, linker, and libraries used to build the new project. Each toolchain generates code targeted for a specific platform.
Floating Point	Select floating point support type for your target: • Hardware - Allows the compiler to perform single precision floating point arithmetic, partially compliant with the IEEE 754. • Software - Allows the compiler to implement both single and double precision floating point arithmetic, partially compliant with IEEE 754.

Table continues on the next page...

Table 2-4. Build Settings Page (continued)

Option	Description
	Both hardware floating point and software floating point are supported on B4420, B4860, SC3900fp, and their derivatives. For more information on hardware and software floating point support, see *StarCore C/C++ Compiler User Guide*.
Fused multiply and accumulate	Enables fused multiply and add generation. Fused multiply and add are generated only if hardware floating point support is enabled on the SC3900fp compiler.

2.1.5 SmartDSP OS Page

Use this page to specify the SmartDSP OS support for your project.

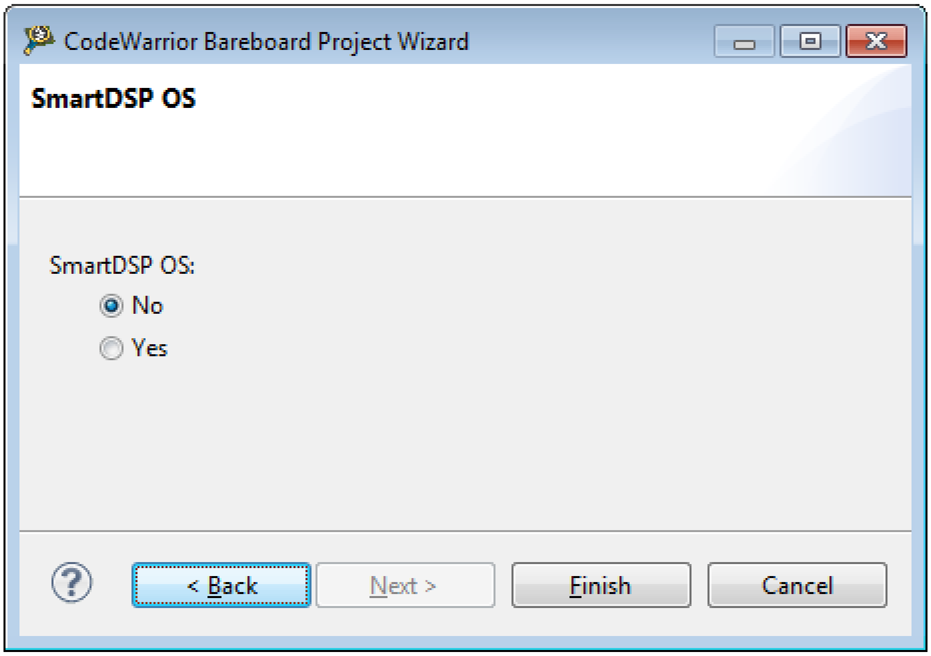


Figure 2-5. CodeWarrior Bareboard Project Wizard - SmartDSP OS Page

Table 2-5. SmartDSP OS Page Settings

Option	Description
SmartDSP OS	Specifies the SmartDSP operating system support for your project. • Yes-Select to create a project that supports SmartDSP OS. • No-Select to create a project without SmartDSP OS support.

2.2 Creating projects

This section explains you how to use the **CodeWarrior Bareboard Project Wizard** to quickly create new projects with default settings (build and launch configurations).

This section explains:

- Creating CodeWarrior Bareboard Project

2.2.1 Creating CodeWarrior Bareboard Project

You can create a CodeWarrior bareboard application project using the **CodeWarrior Bareboard Project Wizard**.

To create a CodeWarrior bareboard application project, perform these steps:

NOTE

For details about the options in the **CodeWarrior Bareboard Project** wizard pages, see the topic CodeWarrior Bareboard Project Wizard.

1. Select **Start > All Programs > Freescale CodeWarrior > CW for StarCore 3900FP v*number* > CodeWarrior IDE**, where *number* is the version number of your product.

   The **Workspace Launcher** dialog box appears, prompting you to select a workspace to use.

   NOTE

   Click **Browse** to change the default location for workspace folder. You can also select the Use this as the default and do not ask again checkbox to set default or selected path as the default location for storing all your projects.

2. Click **OK**.

   The default workspace is accepted. The CodeWarrior IDE launches and the **Welcome** page appears.

NOTE

The **Welcome** page appears only if the CodeWarrior IDE or the selected workspace is started for the first time. Otherwise, the Workbench window appears.

3. Click **Go to Workbench** from the **Welcome** page.

   The workbench window appears.

4. Select **File > New > CodeWarrior Bareboard Project Wizard**, from the CodeWarrior IDE menu bar.

   The **CodeWarrior Bareboard Project Wizard** launches and the **Create a CodeWarrior Bareboard Project** page appears.

5. Specify a name for the new project in the **Project name** text box.

   For example, enter the project name as `Hello_World`.

6. If you do not want to create your project in the default workspace:
   a. Clear the **Use default location** checkbox.
   b. Click **Browse** and select the desired location from the **Browse For Folder** dialog box.
   c. In the **Location** text box, append the location with the name of the directory in which you want to create your project. In the **Location** text box, append the location with the name of the directory in which you want to create your project.

   NOTE

   An existing directory cannot be specified for the project location. If created, the CodeWarrior will prompt an error message.

7. Click **Next**.

   The **Processor** page appears.

8. Select the target processor for the new project, from the **Processor** list.
9. Select **Application** from the **Project Output** group, to create an application with `.elf` extension, that includes information required to debug the project.
10. Click **Next**.

    The **Debug Target Settings** page appears.

11. Select a supported connection type (hardware, simulator, or emulator), from the **Debugger Connection Types** group. Your selection determines the launch configurations that you can include in your project.
12. Select the board you are targeting, from the **Board** drop-down list.

13. Select the launch configurations that you want to include in your project and the corresponding connection, from the **Launch** group.

NOTE

For more information on remote systems, see *CodeWarrior Development Studio Common Features Guide*.

14. Select the interface to communicate with the hardware, from the **Connection Type** drop-down list.
15. Enter the IP address of the TAP device in the **TAP address** text box. This option is available only if **Ethernet TAP**,**CodeWarrior Ethernet TAP**, or **Gigabit TAP** is selected as the connection type.
16. Click **Next**.

    The **Build Settings** page appears.

17. Select the programming language, you want to use, from the **Language** group.

    The language you select determines the libraries that are linked with your program and the contents of the main source file that the wizard generates.

NOTE

If you select C++, you can still add C source files to the project and vice versa.

18. Select a toolchain from the **Toolchain** group.

    Selected toolchain sets up the default compiler, linker, and libraries used to build the new project. Each toolchain generates code targeted for a specific platform.

NOTE

If the toolchain you want to use is disabled, you have to install the corresponding Service Pack for adding the build tools support.

19. Select an option from the **Floating Point** drop-down list, to prompt the compiler to handle the floating-point operations by generating instructions for the selected floating-point unit.
20. Check the Fused multiple and accumulate checkbox to enable fused multiply and add generation.

NOTE

Fused multiply and add are generated only if hardware floating point support is enabled on the SC3900fp compiler.

NOTE

For more information on hardware and software floating point support and fused multiply and accumulate, see the *StarCore C/C++ Compiler User Guide*.

21. Click **Next**.

    The **SmartDSP OS** page appears.

22. Select **Yes** to create a project that supports SmartDSP OS.

    NOTE

    SmartDSP OS support is currently available for the Qonverge targets only.

23. Click **Finish**.

    The wizard creates an application project according to your specifications. You can access the project from the **CodeWarrior Projects** view on the Workbench.

The new project is ready for use. You can now customize the project by adding your own source code files, changing debugger settings and adding libraries.

2.3 Importing Projects

This section explains how to import existing projects, such as SmartDSP in StarCore.

- Importing SmartDSP OS Project

2.3.1 Importing SmartDSP OS Project

CodeWarrior Development Studio for StarCore 3900FP DSPs includes SmartDSP OS, a pre-emptable, real-time, priority-based operating system, specially designed for high-performance DSPs operating with tight memory requirements.

NOTE

SmartDSP OS support must be installed as part of the CodeWarrior installation to be able to import and modify a SmartDSP OS project.

To import an existing sample SmartDSP OS project and customize it, follow these steps:

1. Select **Start > Programs > Freescale CodeWarrior > CW for StarCore 3900FP v*number* > CodeWarrior IDE**, where *number* is the version number of your product.

   The **Workspace Launcher** dialog box appears.

2. Click **OK**.

   The default workspace is accepted. The CodeWarrior IDE launches and the **Welcome** page appears.

   NOTE
   The **Welcome** page appears only if the CodeWarrior IDE or the selected Workspace is opened first time. Otherwise, the Workbench window appears.

3. Click **Go to Workbench,** on the **Welcome** page.

   The Workbench window appears.

4. Select **File > Import**, from the CodeWarrior IDE menu bar.

   The Import wizard appears.

5. Expand the **General** tree item.
6. Select **Existing Projects into Workspace** as shown in Figure 2-6.

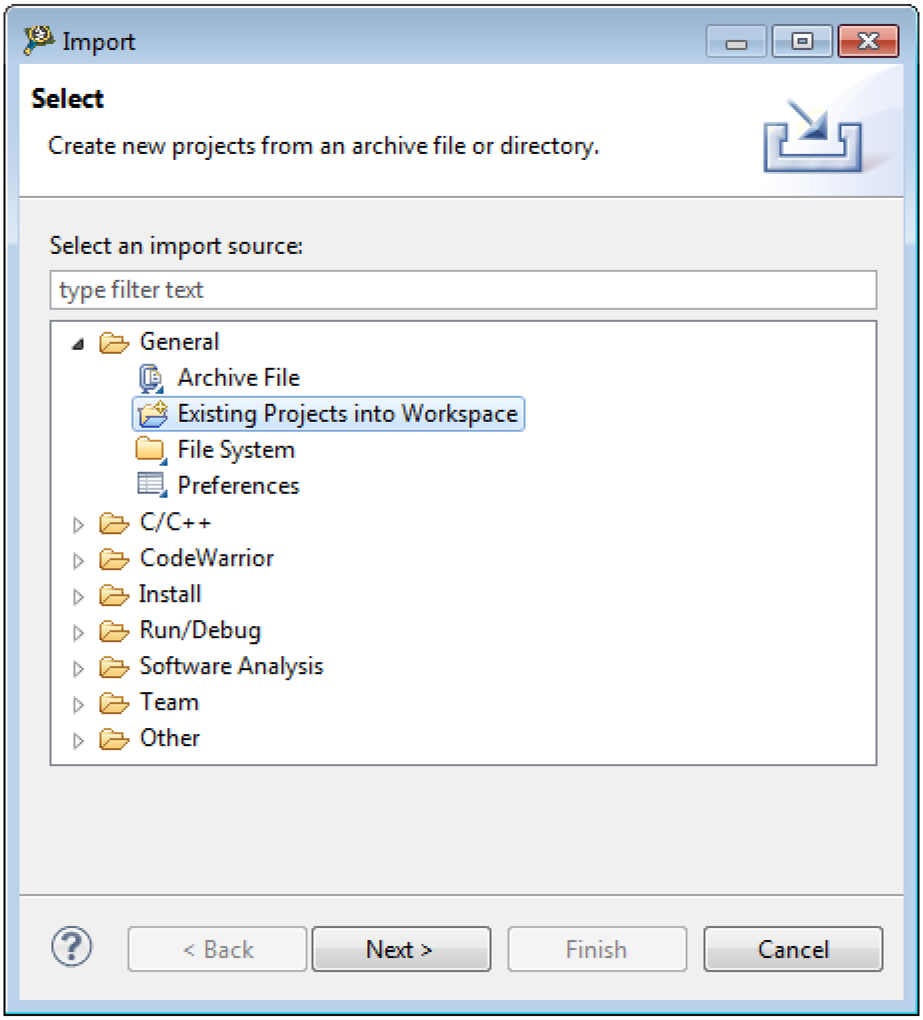


Figure 2-6. Import Wizard - Select Existing Projects into Workspace

7. Click **Next**.

   The **Import Projects** page appears.

8. Select the **Select root directory** option.

   The wizard enables the corresponding **Browse** button.

   NOTE

   The Projects text box displays all the `projects` available under the selected directory.

9. Click **Browse**.

   The **Browse For Folder** dialog box appears.

10. Use the dialog box to navigate to the SmartDSP OS demo project you want to modify. For example, `b4860\basic_demo\project`.

NOTE

The SmartDSP OS demo projects are available in the `<CWInstallDir>\SC\StarCore_Support\SmartDSP\demos\starcore\<platform>` folder, where `<CWInstallDir>` is the path to your CodeWarrior installation.

11. Click **OK**.

    The **Browse For Folder** dialog box closes. The path to the demo project appears in the **Select root directory** text box (Figure 2-7).

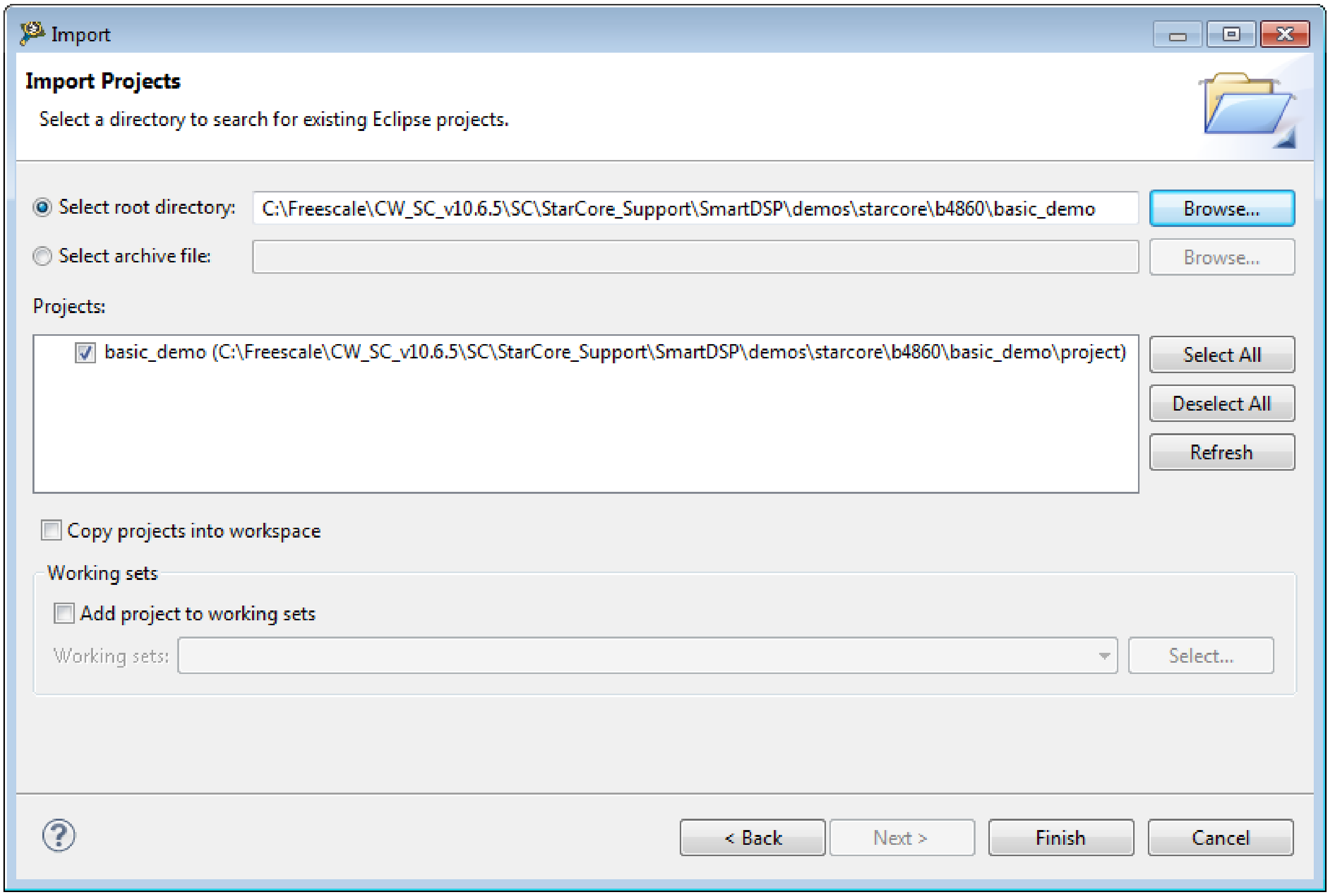


Figure 2-7. Import Wizard - Import Existing Projects

12. Ensure that the project you want to import is selected.
13. Click **Finish**.

    The Import wizard closes and the C/C++ perspective appears.

    The **CodeWarrior Projects** view shows the selected SmartDSP OS project.

NOTE

To make your own project, rename the demo project directory and copy it to the `<CWInstallDir>\SC`

`\StarCore_Support\SmartDSP\demos\starcore\<platform>` folder.
The projects in the renamed directory work because all project access paths are relative.

14. In the **CodeWarrior Projects** view, select the project to configure the build properties.
15. Select **Project >Properties**.

    The **Properties for** <*project*> dialog box appears. The left side of this dialog box has a Properties list. This list shows the properties that apply to the selected project.

16. Expand the **C/C++ Build** property.
17. Select **Settings**.
18. Use the Configuration drop-down list to select the launch configuration for which you want to modify the build properties.
19. Click the **Tool Settings** tab.

    The corresponding page appears.

20. From the list of tools on the **Tool Settings** page, expand the StarCore 3900 C/C++ Linker Application tree item.
21. The library build configuration options panel appears.

    If you want to change these options, see the chapter *Libraries*.

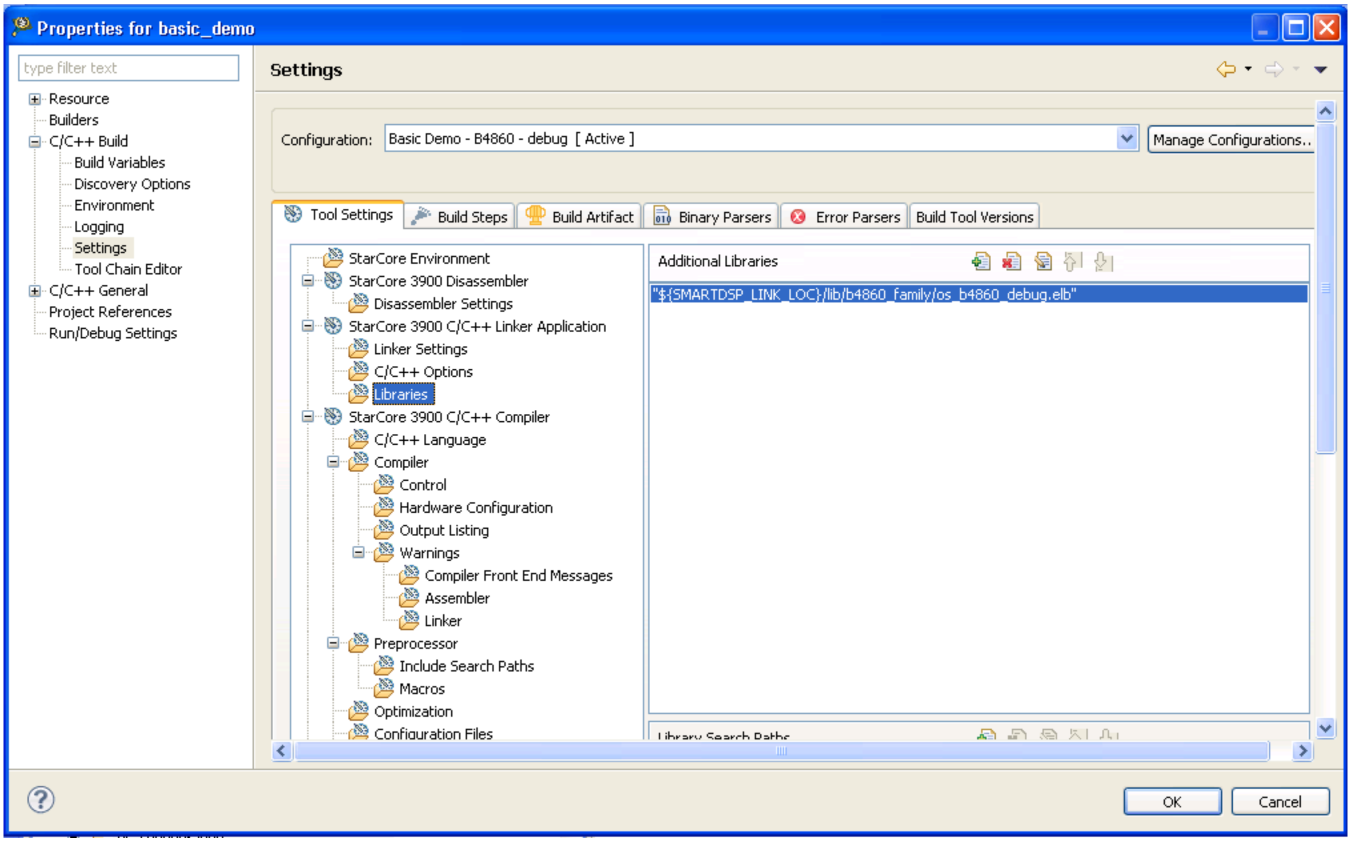


Figure 2-8. CodeWarrior Projects-Demo SmartDSP OS Project

22. Click **Apply**.
23. Click **OK**.

    The **Properties for <***project***>** dialog box closes.

You just finished importing a sample SmartDSP OS project.

2.4 Building projects

CodeWarrior IDE supports two modes of building projects, manual-build mode and auto-build mode.

2.4.1 Manual-Build mode

In large workspaces, building the entire workspace can take a long time if users make changes with a significant impact on dependent projects. Often there are only a few projects that really matter to a user at a given time.

To build only the selected projects, and any prerequisite projects that need to be built to correctly build the selected projects, select **Project > Build Project** from the CodeWarrior IDE menu bar.

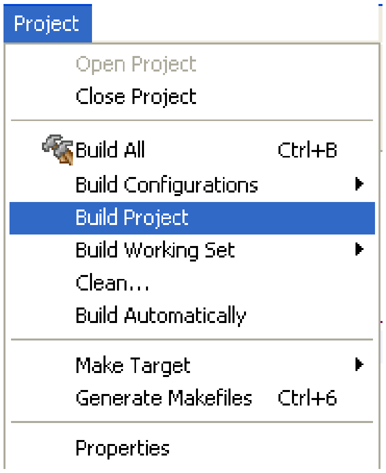


Figure 2-9. Project Menu- Build Project

Alternatively, right-click on the selected project in the **CodeWarrior Projects** view and select **Build Project** from the context menu.

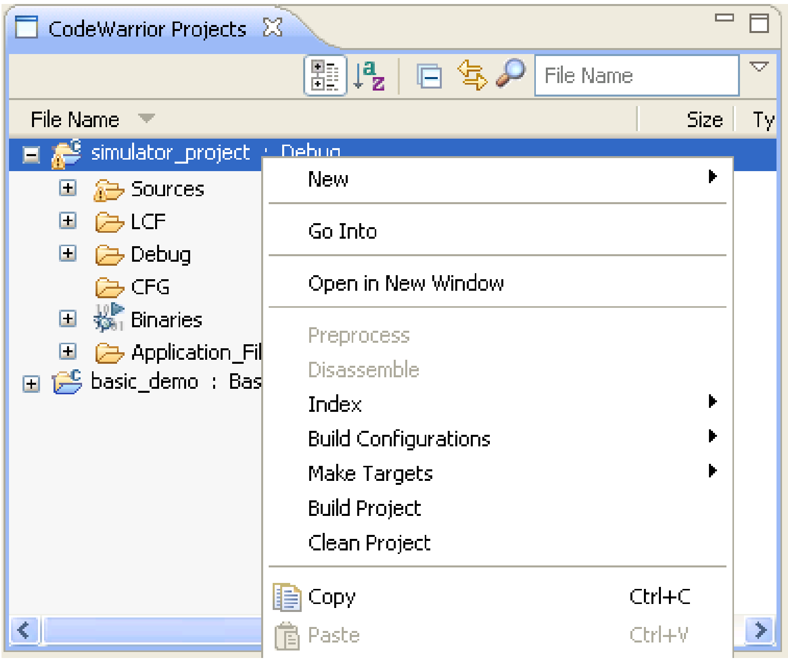


Figure 2-10. Context Menu-Build Project

To build all projects available in the **CodeWarrior Projects** view, select **Project > Build All**.

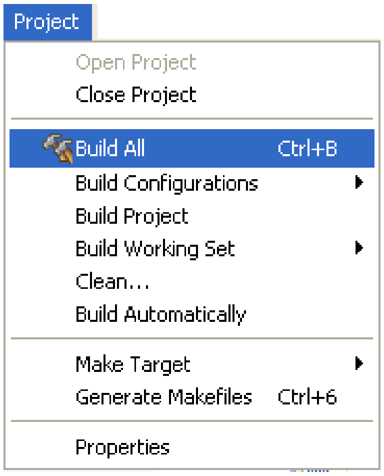


Figure 2-11. Project Menu-Build All

2.4.2 Auto-Build mode

CodeWarrior IDE takes care of compiling source files automatically. When auto-build is enabled, project build occurs automatically in the background every time you change files in the workspace (for example saving an editor).

To automatically build all the projects in a workspace, select **Project > Build Automatically** from the CodeWarrior IDE menu bar.

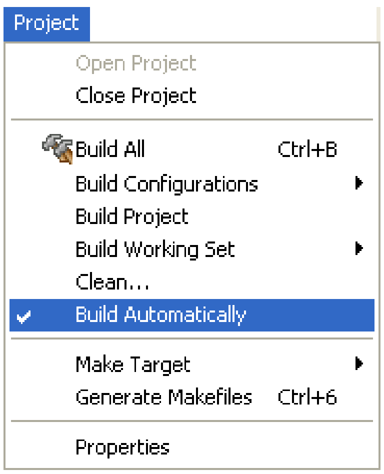


Figure 2-12. Project Menu-Build Automatically

If auto-build is taking too long and is interfering with ongoing development, it can be turned off. Select **Project > Build Automatically** from the CodeWarrior IDE menu bar to disable auto-build mode.

NOTE

It is advised that you do not use the **Build Automatically** option for C/C++ development. Using this option will result in building the entire project whenever you save a change to the makefile or source files. This can take a significant amount of time for very large projects.

2.5 Deleting Projects

Using the options available in CodeWarrior IDE, you can delete a project and optionally the resources linked to the project.

To delete a project, follow these steps:

1. Select the project you want to delete in the **CodeWarrior Projects** view.
2. Select **Edit > Delete**.

   The **Delete Resources** dialog box appears.

   NOTE

   Alternatively, you can also select **Delete** from the context menu that appears when you right-click the project.

3. Select the **Delete project contents on disk (cannot be undone)** option to delete the project contents permanently.

   NOTE

   You will not be able to restore your project using **Undo**, if you select the **Delete project contents on disk (cannot be undone)** option.

4. Click **OK**.

The selected project is deleted and relevant details of the project are removed from the **CodeWarrior Projects** view.

Chapter 3
Build Properties

This chapter explains build properties for StarCore projects. A project can contain multiple build and launch configurations.

A *build configuration* is a named collection of build tools options. The set of options in a given build configuration causes the build tools to generate a final binary with specific characteristics. For example, the binary produced by a **Debug** build configuration might contain symbolic debugging information and have no optimizations, while the binary product by a **Release** build configuration might contain no symbolics and be highly optimized.

NOTE

> The settings of the CodeWarrior IDE's build and launch configuration correspond to an object called a target made by the classic CodeWarrior IDE.

This chapter explains:

- Changing Build Properties
- Restoring Build Properties
- Build Properties for StarCore

3.1 Changing Build Properties

You can modify the build properties of a project to better suit your needs.

Follow these steps to change build properties:

1. Start the CodeWarrior IDE.
2. In the **CodeWarrior Projects** view, select the project for which you want to modify the build properties.

3. Select **Project > Properties**.

   The **Properties for** <*project*> dialog box appears. The left side of this window has a Properties list. This list shows the build properties that apply to the current project.

4. Expand the **C/C++ Build** property node.
5. Select **Settings**.
6. Use the **Configuration** drop-down list to specify the launch configuration for which you want to modify the build properties.
7. Click the **Tool Settings** tab. The corresponding page appears.
8. From the list of tools on the **Tool Settings** page, select the tool for which you want to modify properties.
9. Change the settings as per the requirements.
10. Click **Apply**.

    The CodeWarrior IDE saves your new settings.

You can select other tool pages and modify their settings. When you finish, click **OK** to save your changes and close the **Properties for *<project>*** dialog box.

3.2 Restoring Build Properties

You can modify a build configuration of a project and restore it back in order to have a factory-default configuration, or to revert to a last-known working build configuration.

To undo your modifications to build properties, click the **Restore Defaults** button at the bottom of the **Properties for**<*project*> dialog box.

This changes the values of the options to the absolute default of the toolchain. By default, the toolchain options are blank.

3.3 Build Properties for StarCore

The **Properties for *<project>*** dialog box shows the corresponding build properties for a StarCore project.

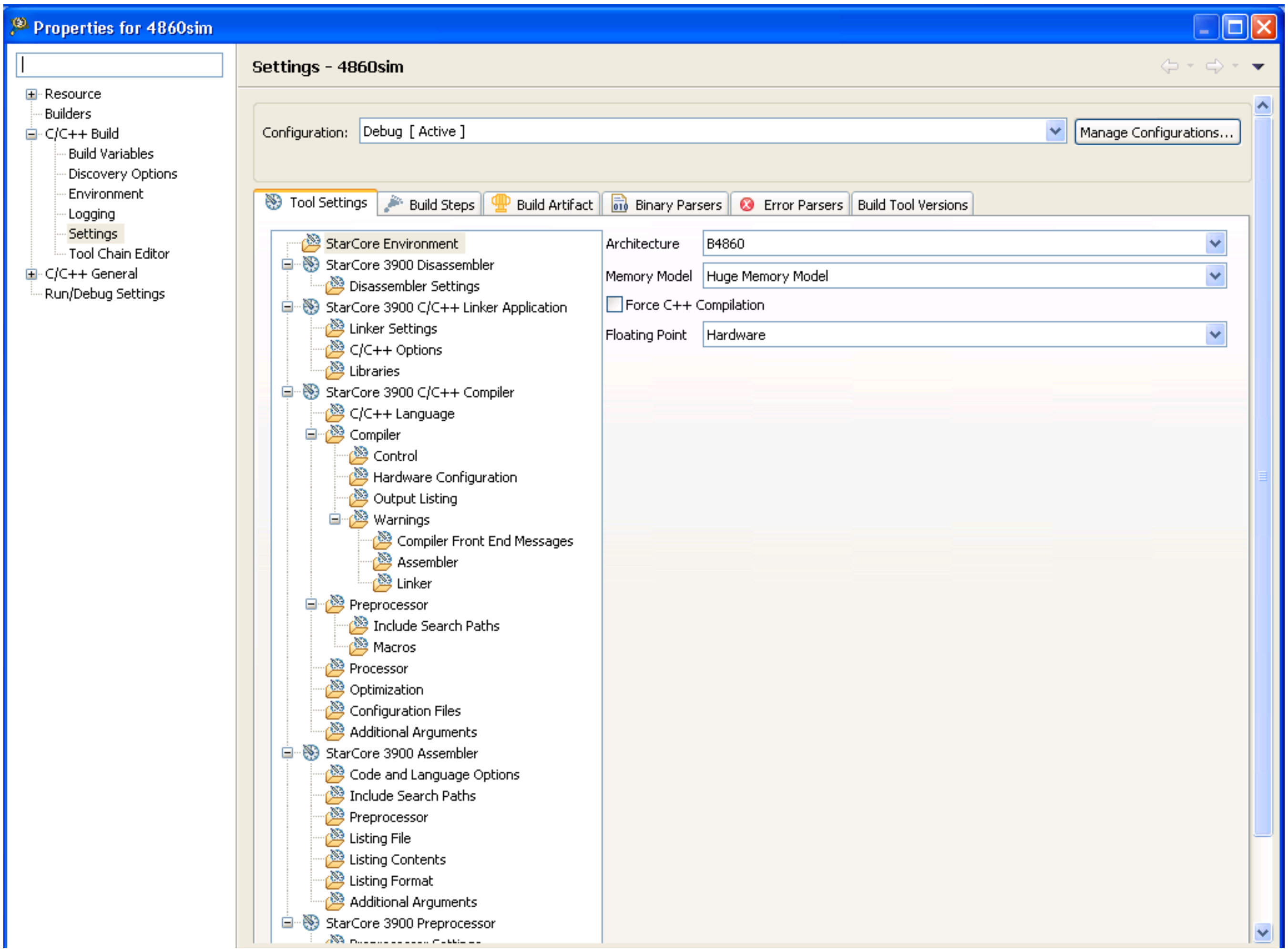


Figure 3-1. Properties for <*Project*> Dialog Box

Table 3-1 lists the build tool settings specific to developing software for StarCore.

Table 3-1. Build Tool Settings for StarCore

Build Tool	Build Properties Panels
StarCore Environment	
StarCore 3900 Disassembler	Disassembler Settings
StarCore 3900 C/C++ Linker Application	Linker Settings
	C/C++ Options
	Libraries
StarCore 3900 C/C++ Compiler	C/C++ Language
	Control
	Hardware Configuration
	Output Listing
	Warnings
	Compiler Front End Messages
	Assembler

Table continues on the next page...

Table 3-1. Build Tool Settings for StarCore (continued)

Build Tool	Build Properties Panels
	Linker
	Include Search Paths
	Macros
	Processor
	Optimization
	Configuration Files
	Additional Arguments
StarCore 3900 Assembler	Code and Language Options
	Include Search Paths
	Preprocessor
	Listing File
	Listing Contents
	Listing Format
	Additional Arguments
StarCore 3900 Preprocessor	Preprocessor Settings

The CodeWarrior build tools listed in Table 3-1 share some properties panels, such as the **Include Search Paths**. The properties that you specify in these panels apply to the selected build tool on the **Tool Settings** page of the **Properties for *<project>*** dialog box.

3.3.1 StarCore Environment

Use this panel to specify the StarCore architecture for the build and the memory model that the architecture uses.

The build tools (compiler, linker, and assembler) use the properties that you specify on this page.

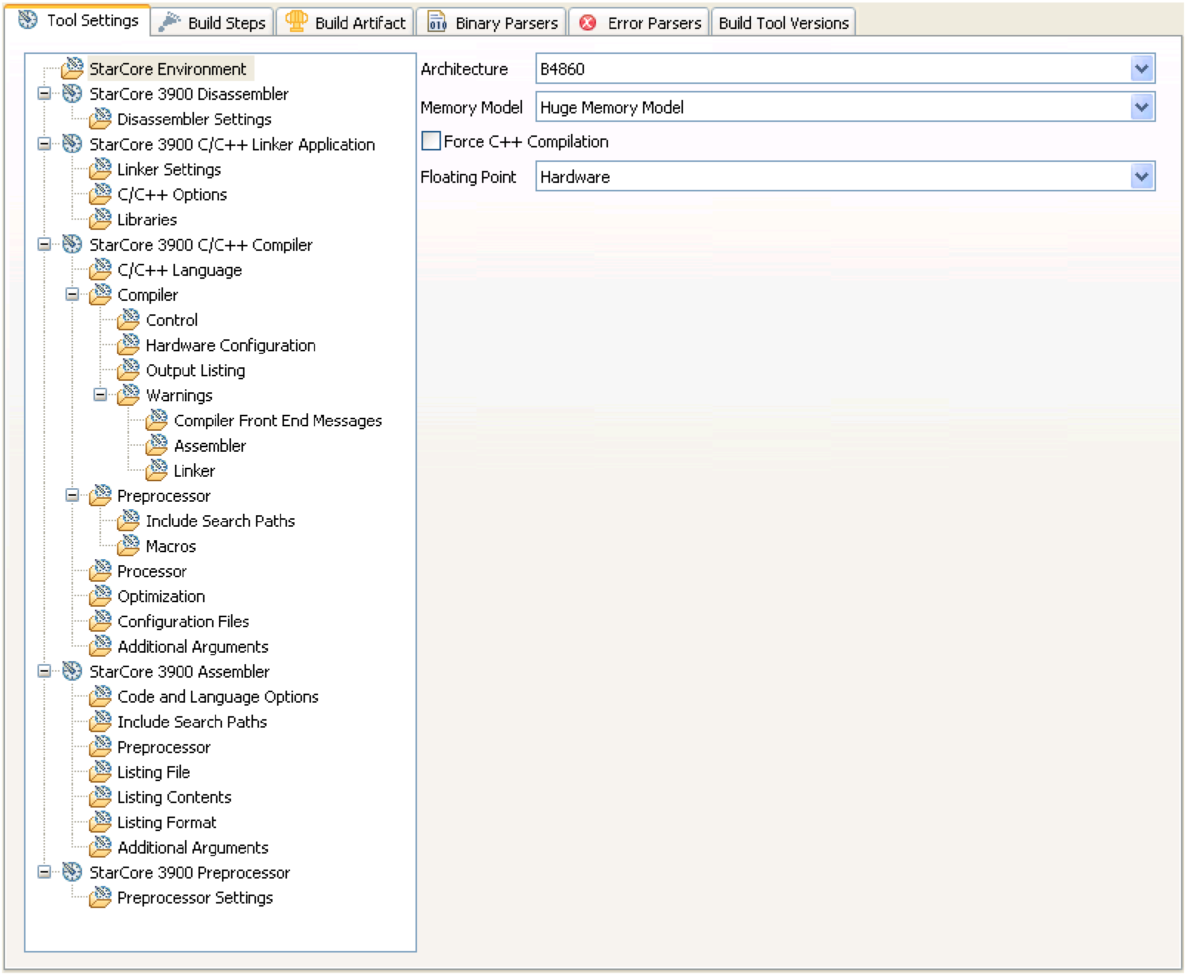


Figure 3-2. Tool Settings - StarCore Environment

Table 3-2 describes the various options available on the **StarCore Environment** panel.

Table 3-2. Tool Settings - StarCore Environment Options

Option	Description
Architecture	Specify the StarCore architecture for which you build your project.
Memory Model	Specify the memory model for the build tools: • Small Memory Model-absolute addresses fit in 64KB • Big Memory Model-absolute addresses do not fit in 64KB, but fit in 1MB • Big Memory Model w/ Far RT Lib Calls-Absolute addresses do not fit in 64KB, but fit in 1MB. The build tools make runtime-library calls in the same manner they do for the huge memory model. • Huge Memory Model-absolute addresses do not fit in 1MB

Table continues on the next page...

Table 3-2. Tool Settings - StarCore Environment Options (continued)

Option	Description
Force C++ Compilation	**Checked** -Enforce C++ compilation for the files that do not have the .cpp extension. This setting is equivalent to specifying the `-force c++` command-line option. **Cleared** - C++ compilation is not enforced for the files that do not have the .cpp extension.
Floating Point	Specify floating point type for the project, Hardware or Software. Both hardware floating point and software floating point are supported on B4420, B4860, SC3900fp, and their derivatives.

3.3.2 StarCore 3900 Disassembler

Use this panel to specify the command, options, and expert settings for the StarCore 3900 disassembler.

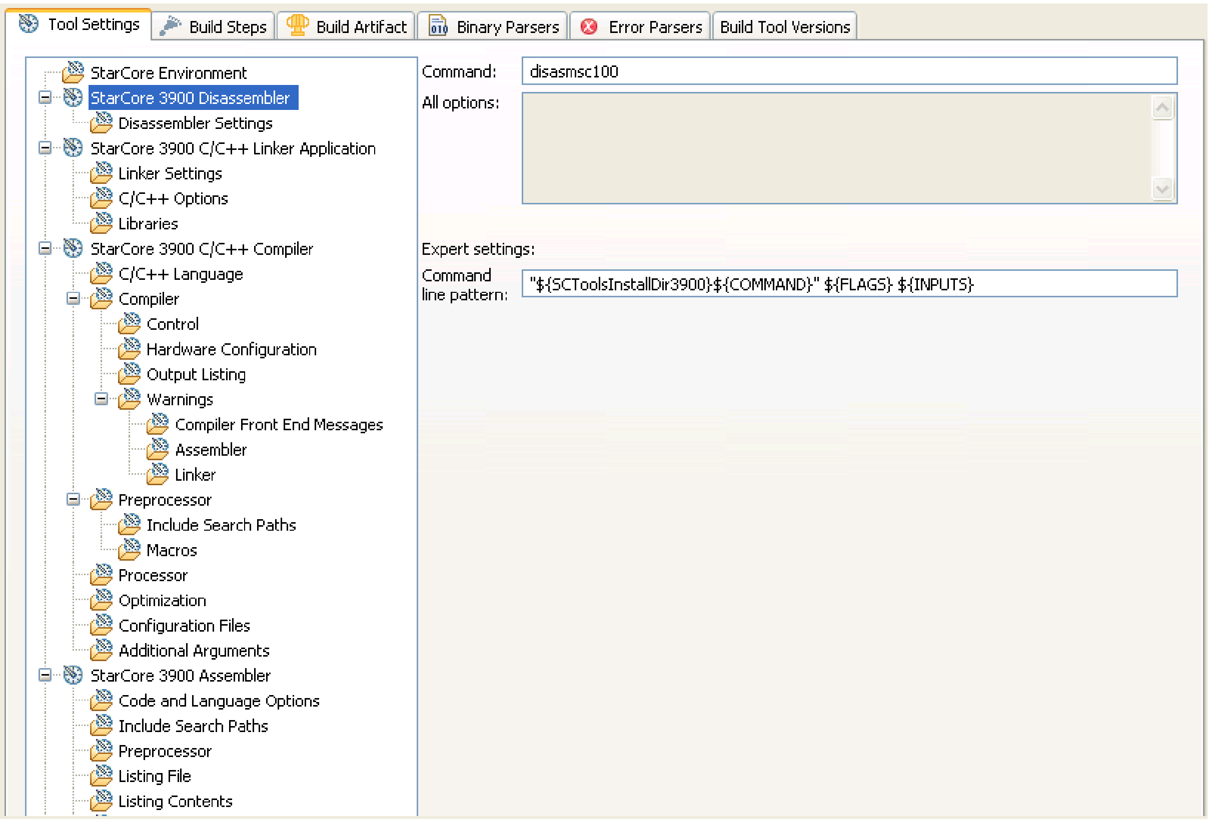


Figure 3-3. Tool Settings - StarCore 3900 Disassembler

Table 3-3 describes the various options available on the **StarCore 3900 Disassembler** panel.

Table 3-3. Tool Settings - StarCore 3900 Disassembler Options

Option	Description
Command	Shows the location of the disassembler executable file.
All options	Shows the actual command line the disassembler will be called with.
Expert Settings: Command line pattern	Shows the expert settings command line parameters; default is `"${SCToolsInstallDir}${COMMAND}" ${FLAGS} ${INPUTS}`.

3.3.2.1 Disassembler Settings

Use this panel to specify the Disassembler behavior.

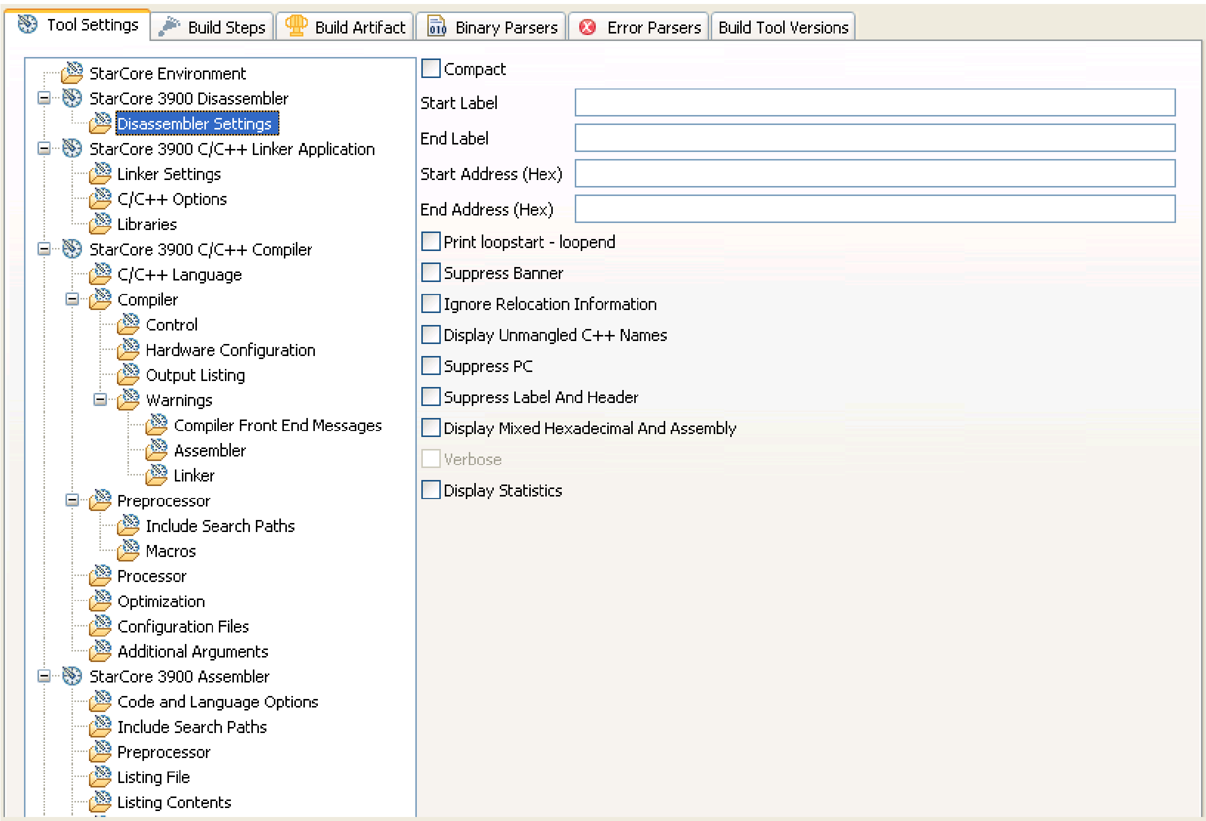


Figure 3-4. Tool Settings - Disassembler Settings

Table 3-4 describes the various options available on the **Disassembler Settings** panel.

Table 3-4. Tool Settings - Disassembler Settings Options

Option	Description
Compact	Specifies compact output mode. **Checked** - The disassembler prints instructions in an execution -set on a single line. **Cleared** - The disassembler does not print instructions in an execution -set on a single line.
Start Label	Specifies the label at which disassembly of the input file starts.
End Label	Specifies the label at which disassembly of the input file ends.
Start Address (Hex)	Specifies the hexadecimal address at which the disassembly starts.
End Address (Hex)	Specifies the hexadecimal address at which the disassembly ends.
Print loopstart - loopend	**Checked** - The disassembler prints `loopstart-loopend` directives. **Cleared** - The disassembler prints `lpmarka/lpmarkb` directives.
Suppress Banner	**Checked** - The disassembler suppresses display of banner information. **Cleared** - The disassembler does not suppress banner display.
Ignore Relocation Information	**Checked** - The disassembler ignores the relocation information relevant to `.eln` and `.elb` files. **Cleared** - Disassembler does not ignore the relocation information.
Display Unmangled C++ Names	**Checked** - The disassembler displays unmangled form of C++ names. **Cleared** - The disassembler does not display unmangled form of C++ names.
Suppress PC	**Checked** - The disassembler suppresses the PC display for VLES. **Cleared** - The disassembler does not supress the PC display for VLES.
Suppress Label and Header	**Checked** - The disassembler suppresses display of labels, headers, and global information (`equs`, `globals`, and `section` information). **Cleared** - The disassembler does not supress display of labels and header information.
Display Mixed Hexadecimal and Assembly	**Checked** - The disassembler displays mixed hexadecimal codification and assembly code. **Cleared** - The disassembler does not display mixed hexadecimal codification and assembly code.
Verbose	**Checked** - Enables verbose mode. **Cleared** - Does not enable verbose mode.

Table continues on the next page...

Table 3-4. Tool Settings - Disassembler Settings Options (continued)

Option	Description
Display Statistics	**Checked** - The disassembler displays statistics after each section, which includes but not limited to: number of VLES with `0 - 4` DALU instructions, number of VLES with `0 - 2` AGU instructions, not-generated instructions. **Cleared** - The disassembler does not display statistics after each section.

3.3.3 StarCore 3900 C/C++ Linker Application

Use this panel to specify the command, options, and expert settings for the build tool linker.

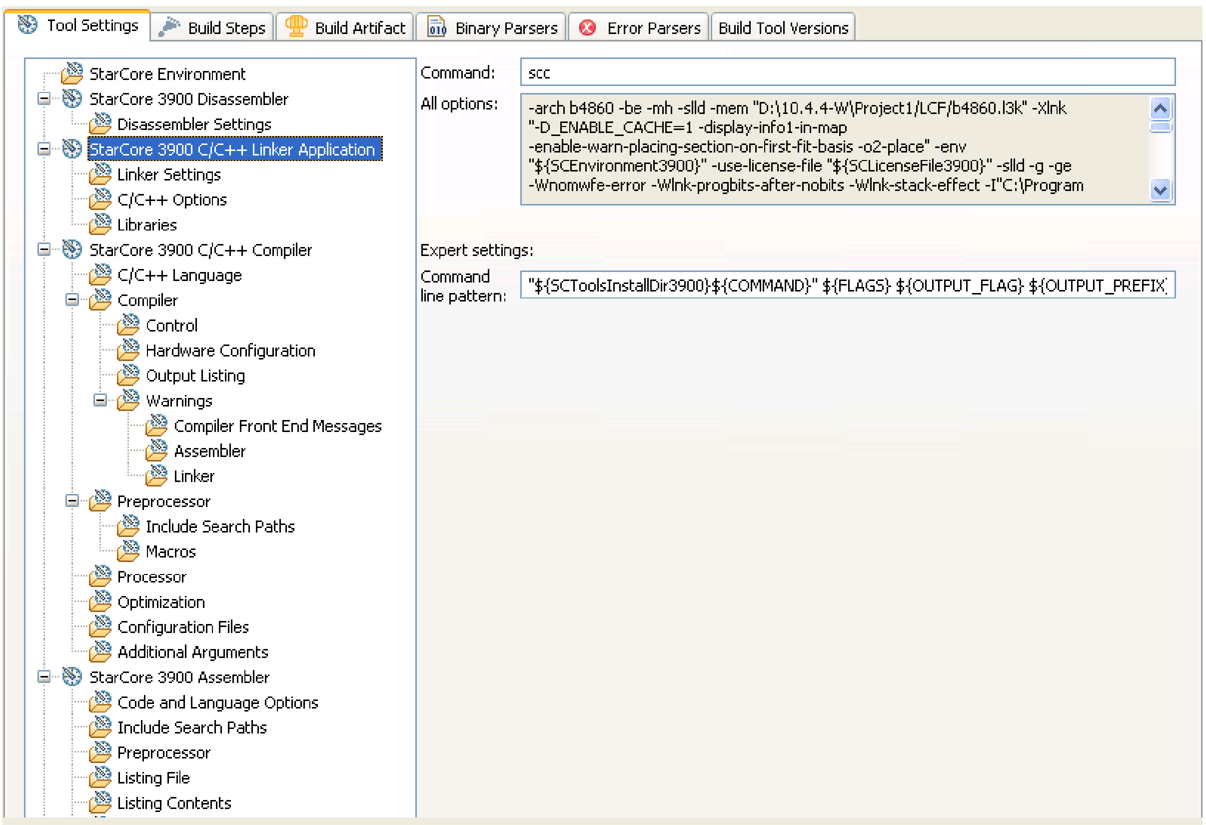


Figure 3-5. Tool Settings - StarCore 3900 C/C++ Linker Application

Table 3-5 describes the various options available on the **StarCore 3900 C/C++ Linker Application** panel.

Table 3-5. Tool Settings - StarCore 3900 C/C++ Linker Application Options

Option	Description
Command	Shows the location of the linker executable file.
All options	Shows the actual command line the linker will be called with.
Expert Settings Command line pattern	Shows the expert settings command line parameters; default is `"${SCToolsInstallDir}${COMMAND}" ${FLAGS} ${OUTPUT_FLAG} ${OUTPUT_PREFIX}${OUTPUT} ${INPUTS}`.

3.3.3.1 Linker Settings

Use this panel to specify the linker behavior.

For C and C++ source files, build tools optimize the output object code. The build tools do not optimize hand-coded assembly language.

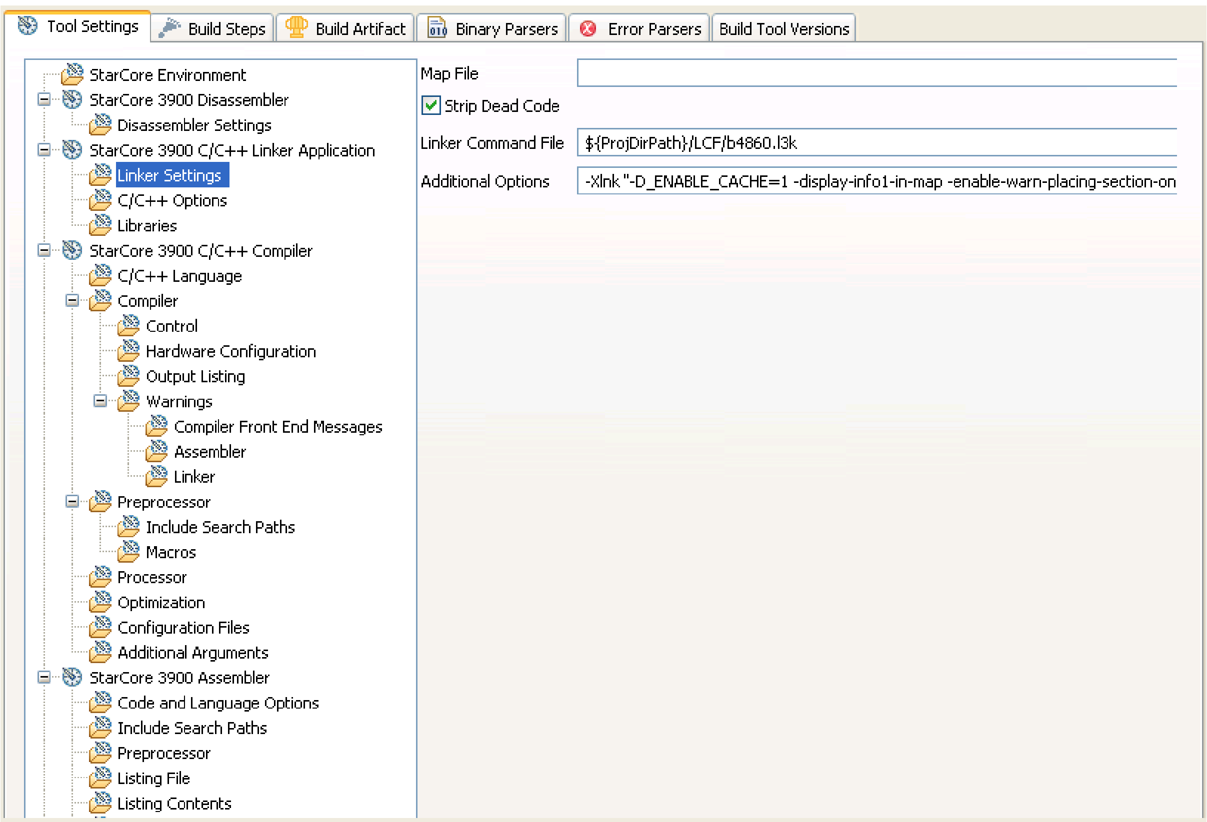


Figure 3-6. Tool Settings - Linker Settings

Table 3-6 describes the various options available on the **Linker Settings** panel.

Table 3-6. Tool Settings - Linker Settings Options

Option	Description
Map File	Enter the path of the file to which the linker writes memory-map information. This filename must have a `.map` extension.
Strip Dead Code	**Checked** - The linker removes both unreferenced source code and unreferenced data from your program. Enabling this option reduces your program's memory footprint. **Cleared** - The linker preserves both unreferenced source code and unreferenced data in your program.
Linker Command File	Enter the path of the linker-command file that the build tools use for processing your project. Alternatively, click the **Browse** button, then use the resulting dialog box to specify the linker command file.
Additional Options	Enter additional linker command-line options. The IDE passes these options to the scc shell during the link phase. Note that the IDE passes command-line options to the scc shell exactly as you enter them in this text box.

3.3.3.2 C/C++ Options

Use this panel to specify linker behavior.

For C and C++ source files, the build tools optimize output object code. The build tools do not optimize hand-coded assembly language.

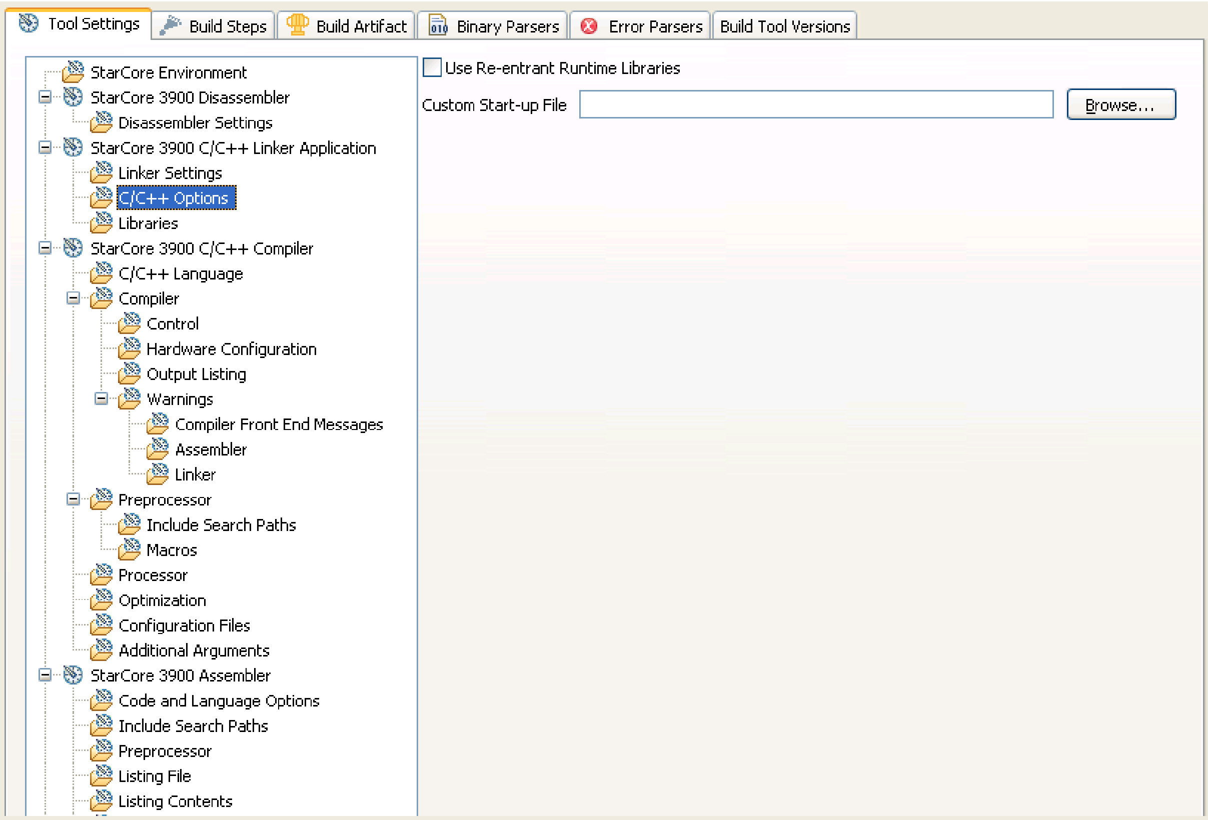


Figure 3-7. Tool Settings - C/C++ Options

Table 3-7 describes the various options available on the **C/C++ Options** panel.

Table 3-7. Tool Settings - C/C++ Options

Option	Description
Use Re-entrant Runtime Libraries	**Checked** - The linker uses the correct thread-safe libraries and start-up code for your target architecture. If checked, the IDE passes `-reentrant` to the `scc` shell. **Cleared** - The linker uses default libraries and startup code.
Custom Start-Up File	Enter the path to a custom start-up file that the linker uses instead of a default start-up file. Alternatively, click the Browse button, then use the resulting dialog box to specify the custom start-up file. Leave this text box blank to have the linker use a default start-up file.

3.3.3.3 Libraries

Use this panel to specify additional libraries that the StarCore C/C++ Linker should use.

You can specify multiple additional libraries and library search paths. Also, you can change the order in which the IDE uses or searches the libraries.

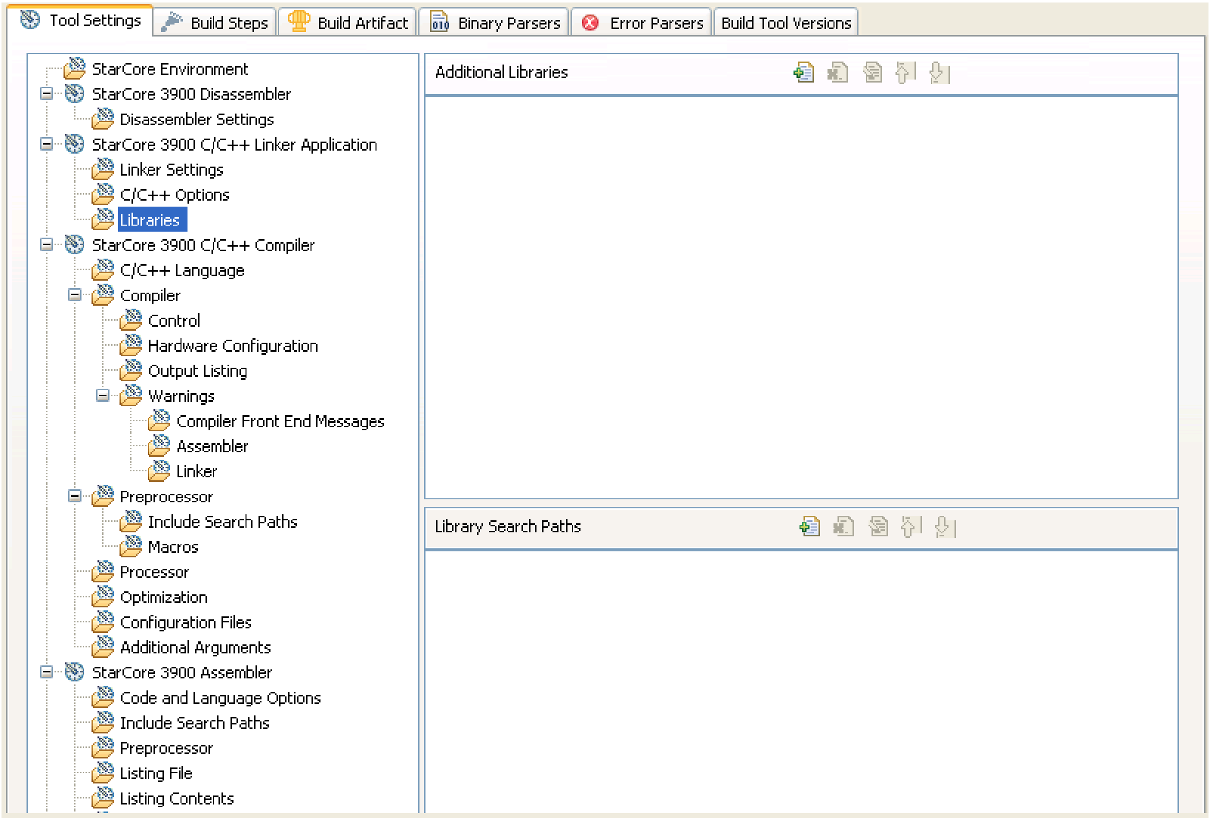


Figure 3-8. Tool Settings - Libraries

Table 3-8 describes the various options available on the **Libraries** panel.

Table 3-8. Tool Settings - Libraries

Option	Description
Additional Libraries	Lists paths to additional libraries that the StarCore C/C++ linker uses. The linker uses the libraries in the order shown in this list.
Library Search Paths	Lists paths that the StarCore C/C++ linker searches for libraries. The linker searches the paths in the order shown in this list.

Table 3-9 lists and describes the toolbar buttons that help work with the libraries.

Table 3-9. Tool Settings - Libraries Toolbar Buttons

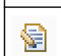
Button	Description
	**Add** - Click to open the **Add file path or the Add directory path** dialog box and create a file or directory path.
	**Delete** - Click to delete the selected file or directory. To confirm deletion, click **Yes** in the **Confirm Delete** dialog box.
	**Edit** - Click to open the **Edit file path or Edit directory path** dialog box and update the selected file or directory.

Table continues on the next page...

Table 3-9. Tool Settings - Libraries Toolbar Buttons (continued)

Button	Description
	**Move up** - Click to move the selected file search path one position higher in the list.
	**Move down** - Click to move the selected file search path one position lower in the list.

3.3.4 StarCore 3900 C/C++ Compiler

Use this panel to specify the command, options, and expert settings for the build tool compiler.

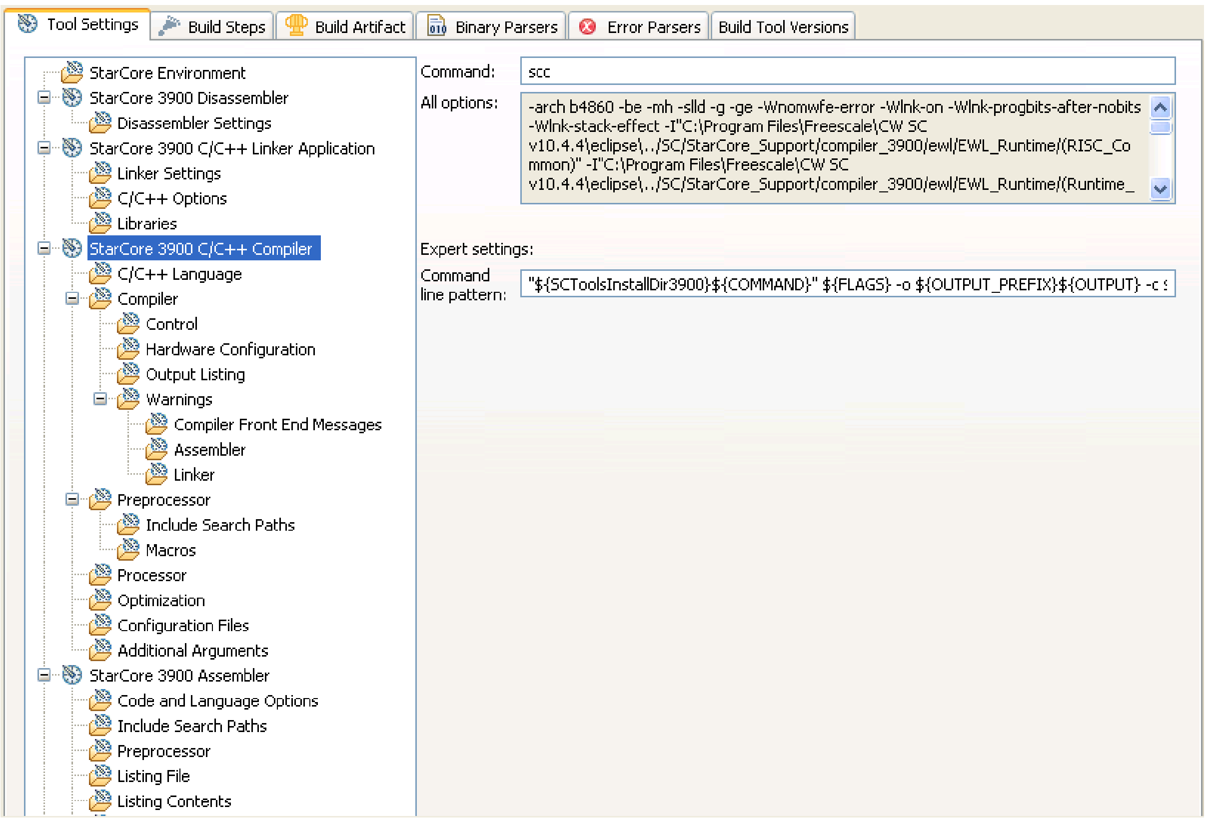


Figure 3-9. Tool Settings - StarCore 3900 C/C++ Compiler

Table 3-10 describes the various options available on the **StarCore 3900 C/C++ Compiler** panel.

Table 3-10. Tool Settings - StarCore 3900 C/C++ Compiler Options

Option	Description
Command	Shows the location of the linker executable file.
All options	Shows the actual command line the compiler will be called with.
Expert Settings Command line pattern	Shows the expert settings command line parameters; default is `"${SCToolsInstallDir}${COMMAND}" ${FLAGS} -o ${OUTPUT_PREFIX}${OUTPUT} -c ${INPUTS}`.

3.3.4.1 C/C++ Language

Use this panel to direct the CodeWarrior C/C++ compiler to apply specific processing modes to your C/C++ language source code. The C/C++ compiler's default state is ANSI/ISO mode with extensions.

The C/C++ compiler treats the settings of this panel as one collection. You can compile source files with just one collection at a time. To compile source files with multiple collections, you must compile the source code sequentially. After each compile iteration, you change the collection of settings that the C/C++ compiler uses.

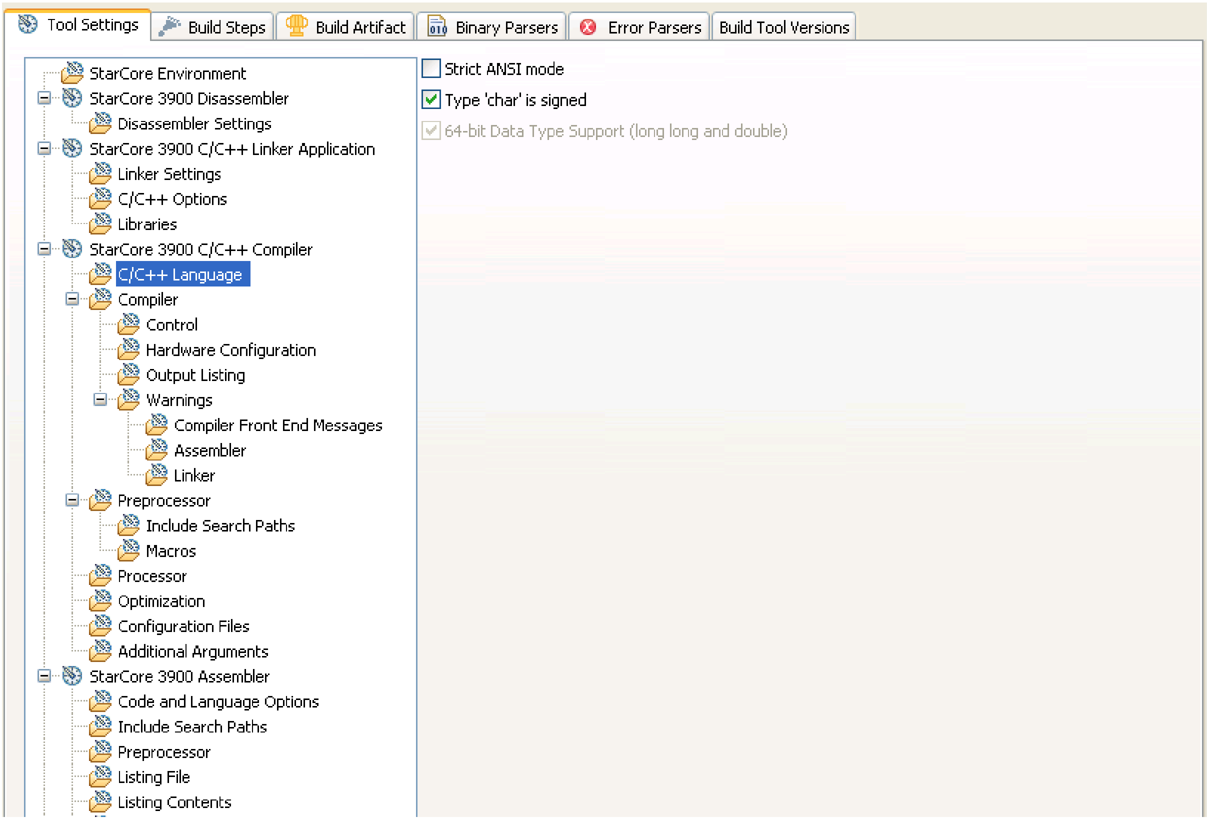


Figure 3-10. Tool Settings - C/C++ Language

Table 3-11 describes the various options available on the C/C++ Language panel.

Table 3-11. Tool Settings - C/C++ Language Options

Option	Description
Strict ANSI mode	**Checked** - The C/C++ compiler operates in strict ANSI mode. In this mode, the compiler strictly applies the rules of the ANSI/ISO specification to all input files. This setting is equivalent to specifying the `- ansi` command-line option. The compiler issues a warning for each ANSI/ISO extension it finds. **Cleared** - The C/C++ compiler does not operate in strict ANSI mode.
Type 'char' is signed	**Checked** - The C/C++ compiler treats all `char` data types as signed. This setting is the default. **Cleared** - The C/C++ compiler treats all `char` data types as unsigned (as if you had declared them `unsigned char`). This setting is equivalent to specifying the `-usc` command line option.
64-Bit Data Type Support	**Checked** - The C/C++ compiler supports 64-bit data types `long long` and `double`. A `long long` is a 64-bit integer. A `double` is a 64-bit double-precision floating-point value. **Cleared** - The C/C++ compiler does not support data types `long long` and `double`.

3.3.4.2 Control

Use this panel to control compiler and shell behavior. You can specify command-line options to pass to the compiler and whether to generate debugging information.

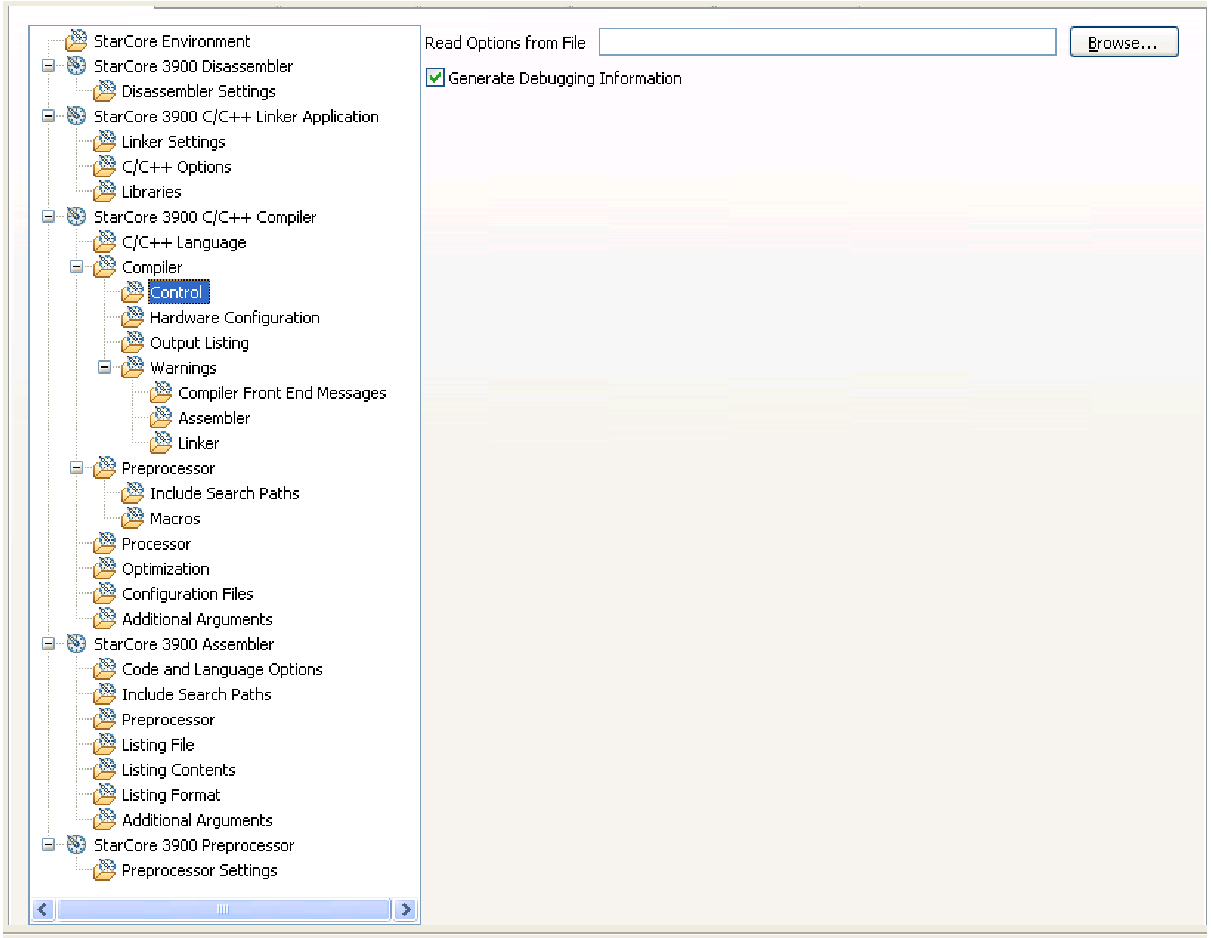


Figure 3-11. Tool Settings - Control

Table 3-12 describes the various options available on the **Control** panel.

Table 3-12. Tool Settings - Control Options

Options	Description
Read Options from File	Enter the path to a file that contains compiler command-line options. Alternatively, click **Browse** and use the resulting dialog box to specify the file. This setting is equivalent to specifying the `-F` file command-line option. The filename must use the `.opt` extension. The shell treats the options in this file as if you had passed them on the command line. Each

Table continues on the next page...

Table 3-12. Tool Settings - Control Options (continued)

Options	Description
	time you invoke the compiler, you can select a file with the set of options that suits your needs. Note that the IDE does not verify the validity of the options in the file.
Generate Debugging Information	**Checked** - The compiler produces symbolic information for debugging the build target. **Cleared** - The compiler does not produce symbolic information.

3.3.4.3 Hardware Configuration

Use this panel to control how the compiler structures generated object code. You can specify whether to initialize variables from read-only memory (ROM).

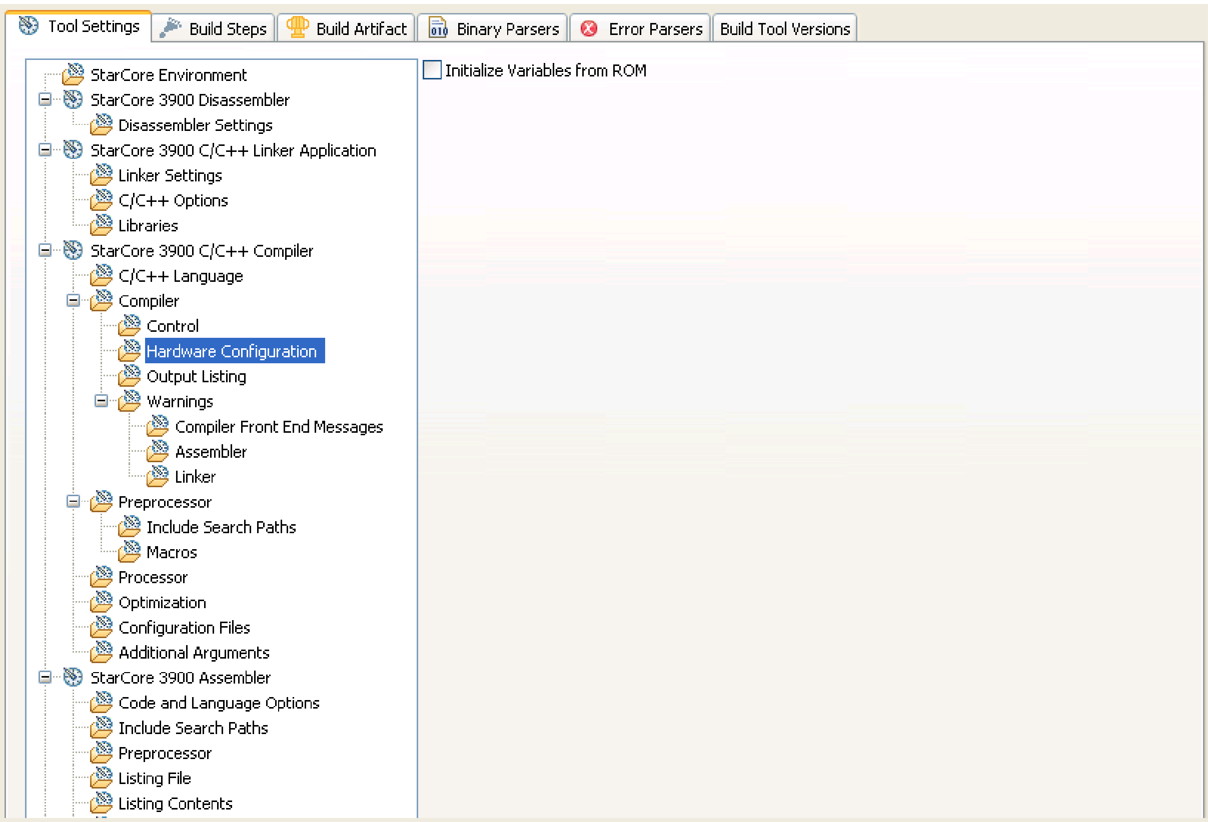


Figure 3-12. Tool Settings - Hardware Configuration

Table 3-13 describes the various options available on the Hardware Configuration panel.

Table 3-13. Tool Settings - Hardware Configuration Options

Option	Description
Initialize Variables from ROM	**Checked** - The compiler places the initialization data for your program's global variables in a separate section. This setting is equivalent to specifying the `-mrom` command-line option. The IDE can manipulate the section at link time and at load time. **Cleared** - The compiler bypasses placing the initialization data for your program's global variables in a separate section. You can clear this checkbox as you develop your source code, because a separate loader program handles initializing your program's global variables. After you finish development, you can check this checkbox, then place into ROM the segment with the initialization data for your global variables.

3.3.4.4 Output Listing

Use this panel to control how the compiler formats the listing file, as well as error and warning messages.

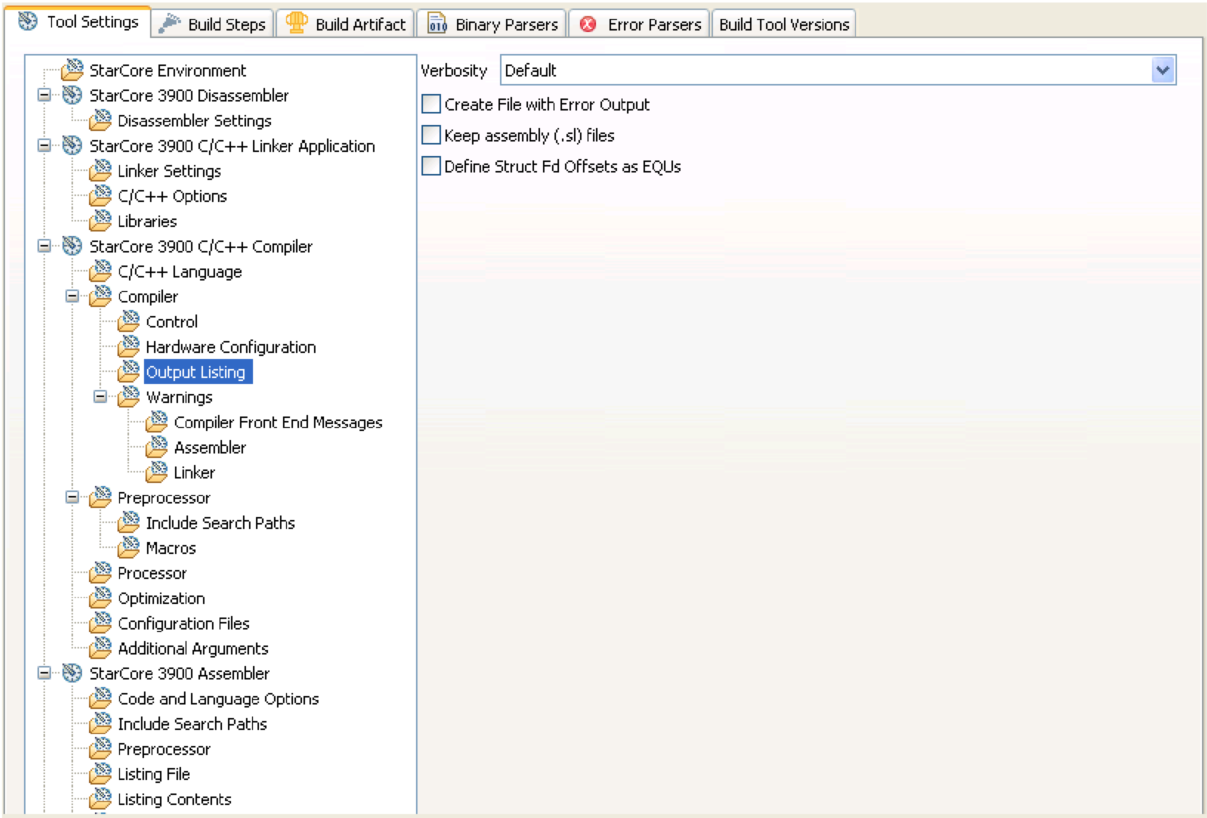


Figure 3-13. Tool Settings - Output Listing

Table 3-14 describes the various options available on the **Output Listing** panel.

Table 3-14. Tool Settings - Output Listing Options

Option	Description
Verbosity	Specify the amount of information that the compiler generates: • **Quiet** - The IDE displays just error messages that the compiler emits. The IDE suppresses warning and informational messages. This setting is equivalent to specifying the `-q` command-line option. • **Default** - The IDE chooses whether to use Quiet or Verbose. • **Verbose** - The IDE shows each command line that it passes to the shell, along with all progress, error, warning, and informational messages that the tools emit. This setting is equivalent to specifying the `-v` command-line option.
Create File with Error Output	**Checked** - The IDE generates a file that contains error messages that the compiler outputs. **Cleared** - The IDE does not generate a file that contains error messages.

Table continues on the next page...

Table 3-14. Tool Settings - Output Listing Options (continued)

Option	Description
Keep assembly (.sl) files	**Checked** - The compiler keeps the intermediate assembly-language source files (`.sl` files) it creates, instead of deleting them. This setting is equivalent to specifying the `-s` command-line option. The compiler generates one `.sl` file for each C source file in the build target. **Cleared** - The compiler discards the intermediate assembly-language source files it creates.
Define Struct Fd Offsets as EQUs	**Checked** - The compiler includes the offsets of C data-structure field definitions in each generated intermediate assembly-language source file. This setting is equivalent to specifying the - `do` command-line option. **Cleared** - The compiler does not include the offsets of C data-structure field definitions in each generated intermediate assembly-language source file.

3.3.4.5 Warnings

Use this panel to control how the compiler reports the error and warning messages.

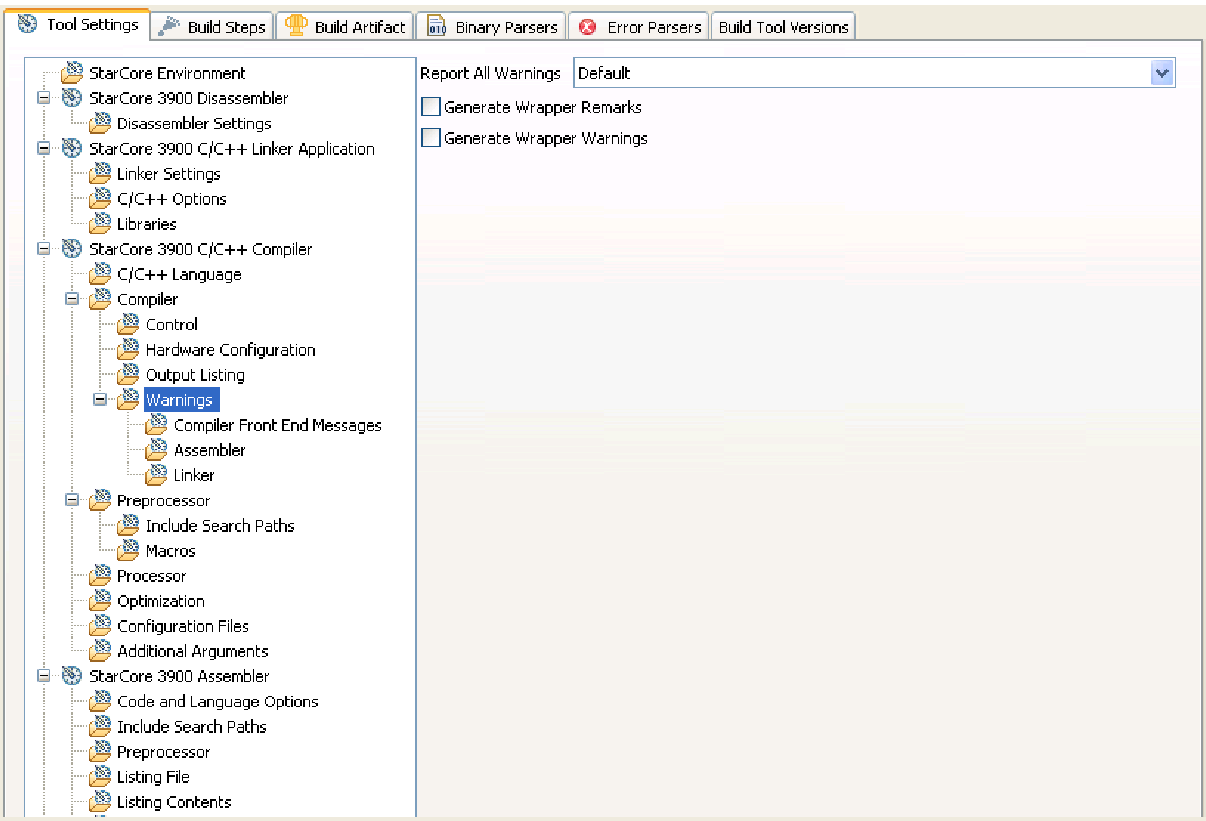


Figure 3-14. Tool Settings - Warnings

Table 3-15 describes the various options available on the **Warning** panel.

Table 3-15. Tool Settings - Warning Options

Option	Description
Report All Warnings	Specifies global remark/warning control. This setting is equivalent to specifying the `-W` command-line option.
Generate Wrapper Remarks	Checked-The IDE generates a file that contains Wrapper remarks that the compiler outputs. Cleared-The IDE does not generate a file that contains Wrapper remarks.
Generate Wrapper Warnings	Checked-The IDE generates a file that contains Wrapper warnings that the compiler outputs. Cleared-The IDE does not generate a file that contains Wrapper remarks.

3.3.4.5.1 Compiler Front End Messages

Use this panel to control how the compiler generates compiler-front-end warnings.

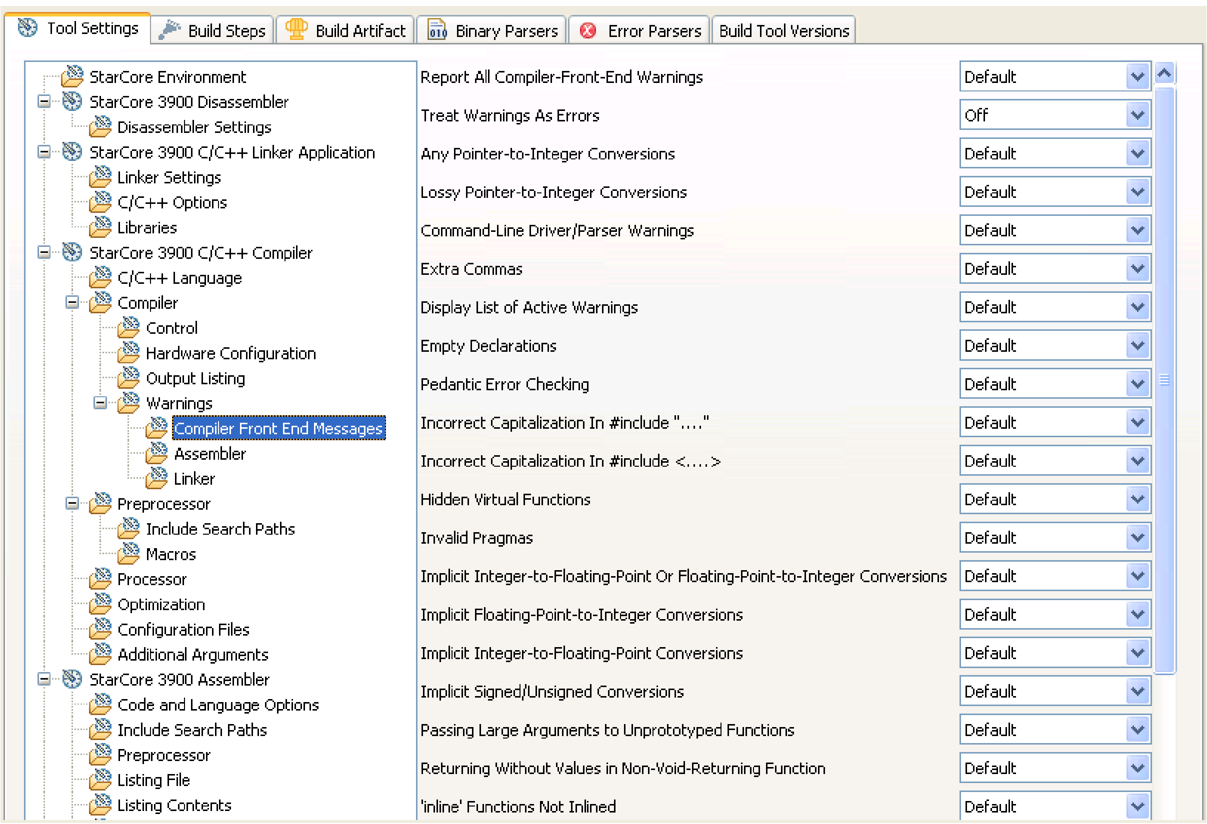


Figure 3-15. Tool Settings - Compiler Front End Messages

Table 3-16 describes the various options available on the **Compiler Front End Messages** panel.

Table 3-16. Tool Settings - Compiler Front End Messages Options

Option	Description
Report All Compiler Front End Warnings	Specifies global Compiler Front End warning control. This setting is equivalent to specifying the `-Wmwfe` or `-Wnomwfe` command-line options.
Treat Warnings As Errors	Activates or deactivates treatment of compiler-front-end warnings as errors.
Any Pointer-to-Integer Conversions	Activates or deactivates generation of warnings about any pointer-to-integer conversions. This setting is equivalent to specifying the `-Wmwfe-anyptrintconv` or `-Wnomwfe-anyptrintconv` command-line options.
Lossy Pointer-to- Integer Conversions	Activates or deactivates generation of warnings about lossy pointer-to-integer conversions.
Command-Line Driver/Parser Warnings	Activates or deactivates generation of command-line driver/ parser warnings. This setting is equivalent to specifying the `-Wmwfe-cmdline` or `-Wnomwfe-cmdline` command-line options.
Extra Commas	Activates or deactivates generation of warnings about extra commas. This setting is equivalent to specifying the `-Wmwfe-comma` or `-Wnomwfe-comma` command-line options.
Display List of Active Warnings	Activates or deactivates display of archive warnings list. This setting is equivalent to specifying the `-Wmwfe-display` or `-Wnomwfe-display` command-line options.
Empty Declarations	Activates or deactivates generation of warnings about empty declarations. This setting is equivalent to specifying the `-Wmwfe-emptydecl` or `-Wnomwfe-emptydecl` command-line options.
Pedantic Error Checking	Activates or deactivates pedantic error checking. This setting is equivalent to specifying the `-Wmwfe-pedantic` or `-Wnomwfe-pedantic` command-line options.
Incorrect Capitalization In #include "...."	Activates or deactivates generation of warnings about incorrect capitalization in #include "...". This setting is equivalent to specifying the `-Wmwfe-filecaps` or `-Wnomwfe-filecaps` command-line options.
Incorrect Capitalization In #include <....>	Activates or deactivates generation of warnings about incorrect capitalization in #include <...>. This setting is equivalent to specifying the `-Wmwfe-sysfilecaps` or `-Wnomwfe-sysfilecaps` command-line options.
Hidden Virtual Functions	Activates or deactivates generation of warnings about hidden virtual functions. This setting is equivalent to specifying the `-Wmwfe-hidenvirtual` or `-Wnomwfe-hidevirtual` command-line options.
Invalid Pragmas	Activates or deactivates generation of warnings about invalid pragmas. This setting is equivalent to specifying the `-Wmwfe-illpragmas` or `-Wnomwfe-illpragmas` command-line options.

Table continues on the next page...

Table 3-16. Tool Settings - Compiler Front End Messages Options (continued)

Option	Description
Implicit Integer-to-Floating-Point or Floating-Point-to-Integer Conversions	Activates or deactivates generation of warnings about implicit integer-to-floating-point or floating-point-to-integer conversions. This setting is equivalent to specifying the `-Wmwfe-implicitconv(or -Wmwfe-implicit)` or `-Wnomwfe-implicitconv(or -Wnomwfe-implicit)` command-line options.
Implicit Floating-Point-to-Integer Conversions	Activates or deactivates generation of warnings about implicit floating-point-to-integer conversions. This setting is equivalent to specifying the `-Wmwfe-float2int` or `-Wnomwfe-float2int` command-line options.
Implicit Integer-to-Floating-Point Conversions	Activates or deactivates generation of warnings about implicit integer-to-floating-point conversions. This setting is equivalent to specifying the `-Wmwfe-int2float` or `-Wnomwfe-int2float` command-line options.
Implicit Signed/Unsigned Conversions	Activates or deactivates generation of warnings about implicit signed/unsigned conversions. This setting is equivalent to specifying the `-Wmwfe-impl_signedunsigned` or `-Wnomwfe-impl_signedunsigned` command-line options.
Passing Large Arguments to Unprototyped Functions	Activates or deactivates generation of warnings about passing large arguments to unprototyped functions. This setting is equivalent to specifying the `-Wmwfe-largeargs` or `-Wnomwfe-largeargs` command-line options.
Returning Without Values in Non-Void-Returning Function	Activates or deactivates generation of warnings about returns without values in non-void-returning functions. This setting is equivalent to specifying the `-Wmwfe-missingreturn` or `-Wnomwfe-missingreturn` command-line options.
\`inline' Functions Not Inlined	Activates or deactivates generation of warnings about \`inline' functions not inlined. This setting is equivalent to specifying the `-Wmwfe-notinlined` or `-Wnomwfe-notinlined` command-line options.
Result of Non-Void-Returning Function Not Being Used	Activates or deactivates generation of warnings about result of non-void-returning function not being used. This setting is equivalent to specifying the `-Wmwfe-notused` or `-Wnomwfe-notused` command-line options.
Padding Added Between Struct Members	Activates or deactivates generation of warnings about padding added between struct members. This setting is equivalent to specifying the `-Wmwfe-padding` or `-Wnomwfe-padding` command-line options.
Possible Unwanted Side Effects	Activates or deactivates generation of warnings about padding added between struct members. This setting is equivalent to specifying the `-Wmwfe-padding` or `-Wnomwfe-padding` command-line options.
Inconsistent Use of Class and Struct	Activates or deactivates generation of warnings about inconsistent use of class and struct. This setting is equivalent to specifying the `-Wmwfe-structclass` or `-Wnomwfe-structclass` command-line options.
Tokens Not Formed By The ## Operator	Activates or deactivates generation of warnings about tokens not formed by the `##` operator. This setting is equivalent to specifying the `-Wmwfe-tokenpasting` or `-Wnomwfe-tokenpasting` command-line options.

Table continues on the next page...

Table 3-16. Tool Settings - Compiler Front End Messages Options (continued)

Option	Description
Undefined Macros In #if/#else Conditionals	Activates or deactivates generation of warnings about undefined macros in `#if/#else` conditionals. This setting is equivalent to specifying the `-Wmwfe--undefmacro (or -Wmwfe-undef)` or `-Wnomwfe-undefmacro (or -Wnomwfe-undef)` command-line options.
Unused Variables	Activates or deactivates generation of warnings about unused variables. This setting is equivalent to specifying the `-Wmwfe-unusedvar` or `-Wnomwfe-unusedvar` command-line options.
Unused Arguments	Activates or deactivates generation of warnings about unused arguments. This setting is equivalent to specifying the `-Wmwfe-unusedarg` or `-Wnomwfe-unusedarg` command-line options.
Using Expressions As Statements Without Side Effects	Activates or deactivates generation of warnings about using expressions as statements without side effects. This setting is equivalent to specifying the `-Wmwfe-unusedexpr` or `-Wnomwfe-unusedexpr` command-line options.
Overriding Function Has No `virtual' Keyword	Activates or deactivates generation of warnings about overriding function that has no `virtual' keyword.
Variables Uninitialized Before Used	Activates or deactivates generation of warnings about variables uninitialized before used. This setting is equivalent to specifying the `-Wmwfe-unused` or `-Wnomwfe-unused` command-line options.
Hidden Local Variables	Activates or deactivates generation of warnings about hidden local variables. This setting is equivalent to specifying the `-Wmwfe-hidden` or `-Wnomwfe-hidden` command-line options.
Missing Enum Case Labels	Activates or deactivates generation of warnings about missing `Enum` case labels.

3.3.4.5.2 Assembler

Use this panel to control how the compiler generates FALIGN, assembler remarks and warnings.

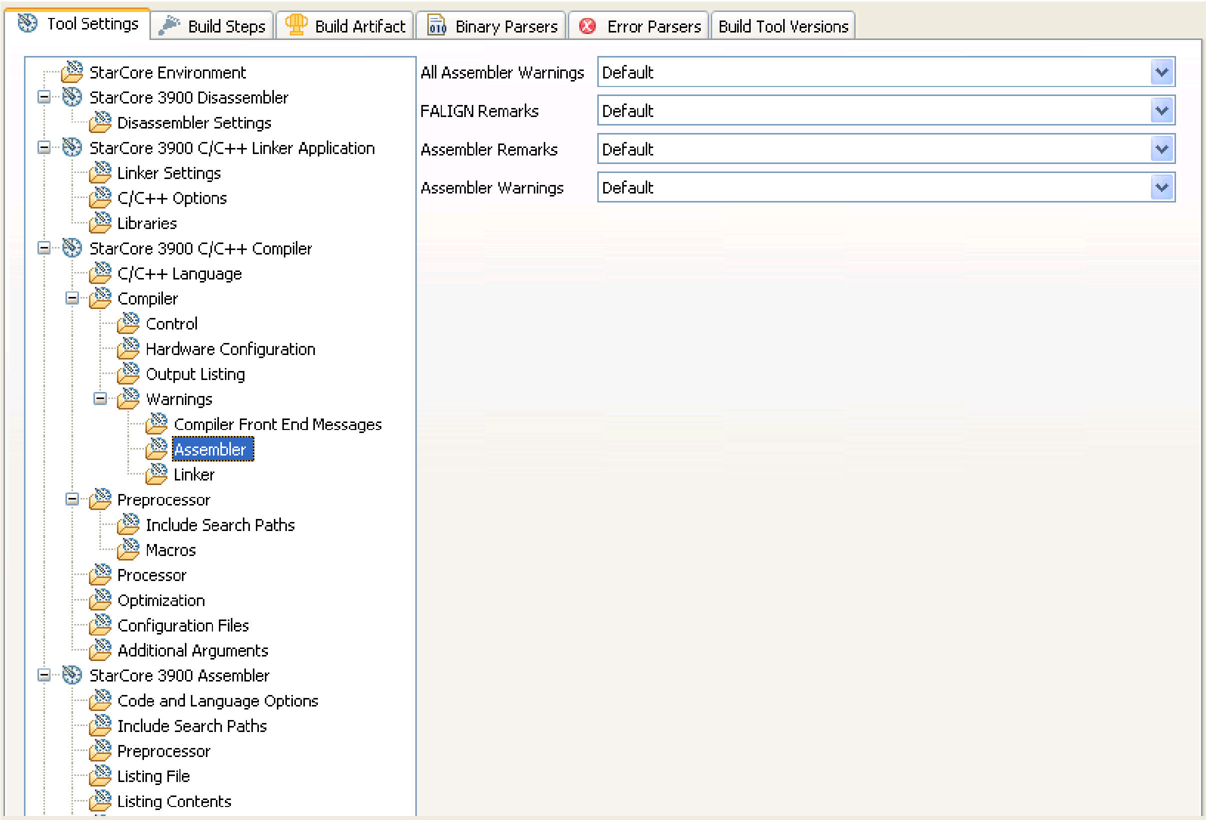


Figure 3-16. Tool Settings - Assembler

Table 3-17 describes the various options available on the **Assembler** panel.

Table 3-17. Tool Settings - Assembler Options

Option	Description
All Assembler warnings	Specifies global Assembler warning control. This setting is equivalent to specifying the `-Wasm` or `-Wnoasm` command-line options.
FALIGN Remarks	Activates or deactivates generation of FALIGN remarks. This setting is equivalent to specifying the `-Wasm-falign` or `-Wnoasm-falign` command-line options.
Assembler Remarks	Activates or deactivates generation of assembler remarks. This setting is equivalent to specifying the `-Wasm-remarks` or `-Wnoasm-remarks` command-line options.
Assembler Warnings	Activates or deactivates generation of assembler warnings. This setting is equivalent to specifying the `-Wasm-warnings` or `-Wnoasm-warnings` command-line options.

3.3.4.5.3 Linker

Use this panel to control how the compiler generates all linker warnings.

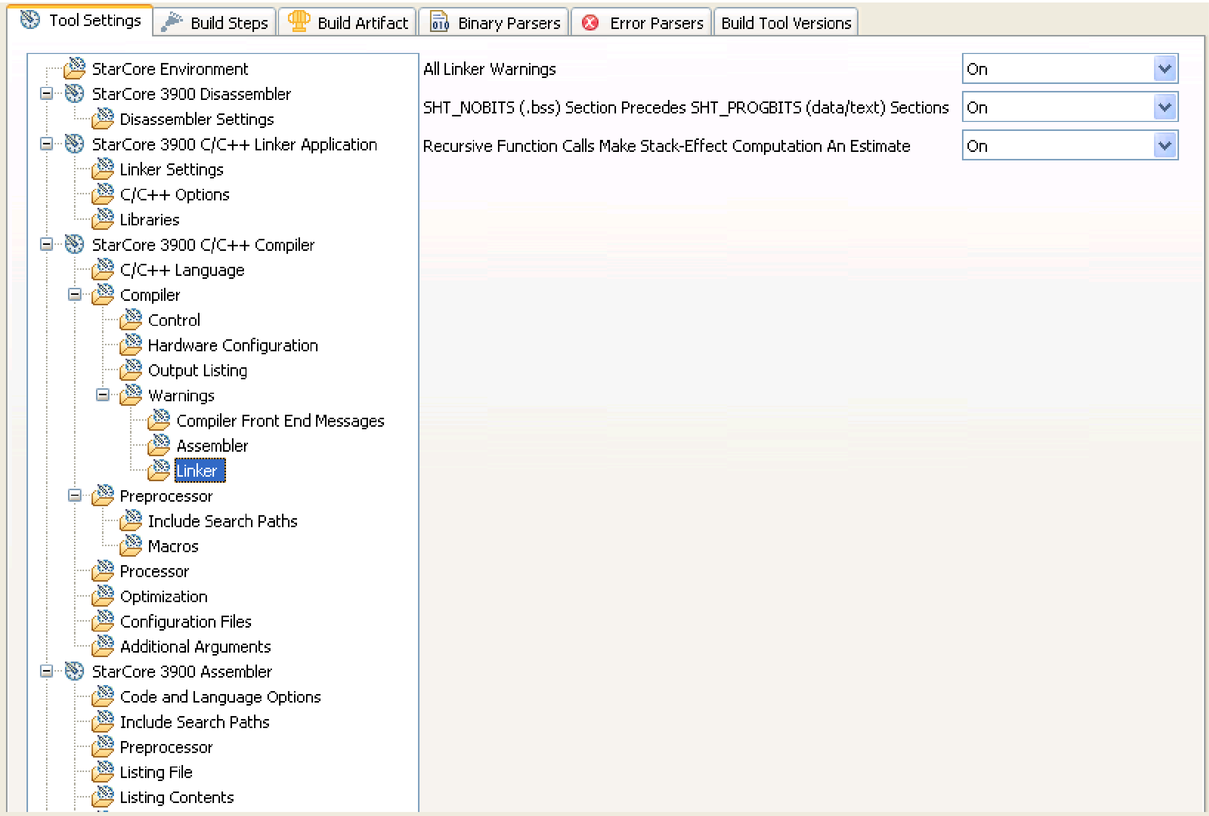


Figure 3-17. Tool Settings - Linker

Table 3-18 describes the various options available on the **Linker** panel.

Table 3-18. Tool Settings - Linker Options

Option	Description
All Linker Warnings	Specifies global Linker warning control. This setting is equivalent to specifying the `-Wlnk` or `-Wnolnk` command-line options.
SHT_NOBITS (.bss) Section Precedes SHT_PROGBITS (data/text) Sections	Activates or deactivates generation of warnings if SHT_NOBITS (.bss) section precedes SHT_PROGBITS (data/text) sections in the segment. By default, this option is turned on. This setting is equivalent to specifying the `-Wlnk-progbits-after-nobits` or `-Wnolnk-progbits-after-nobits` command-line options.
Recursive Function Calls Make Stack-Effect Computation An Estimate	Activates or deactivates generation of warnings about if recursive function calls make stack-effect computation an estimate. By default, this option is turned on. This setting is equivalent to specifying the `-Wlnk-stack-effect` or `-Wnolnk-stack-effect` command-line options.

3.3.4.6 Include Search Paths

Use this panel to specify paths to search for `#include` files. Note that the IDE displays an error message if a header file is in a different directory from the referencing source file. Sometimes, the IDE also displays an error message if a header file is in the same directory as the referencing source file.

For example, if you see the message `Could not open source file myfile.h`, you must add the path for `myfile.h` to this panel.

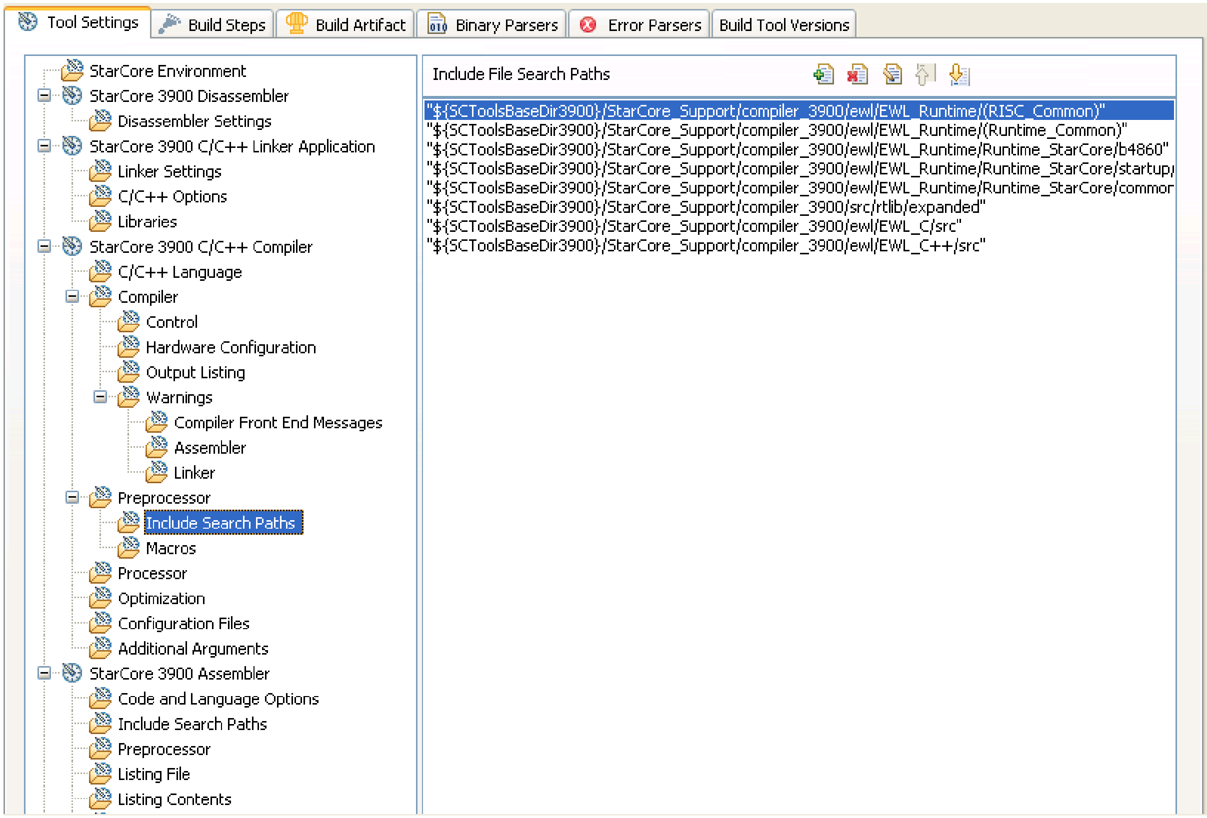
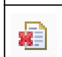
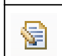
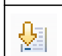


Figure 3-18. Tool Settings - Include Search Paths

Table 3-19 lists and describes the toolbar buttons that help work with the file search paths.

Table 3-19. Tool Settings - Include Search Paths Toolbar Buttons

Button	Description
	Add - Click to open the **Add directory path** dialog box (Figure 3-19) and specify the file search path.
	Delete - Click to delete the selected file search path. To confirm deletion, click **Yes** in the **Confirm Delete** dialog box.
	Edit - Click to open the **Edit directory path** dialog box (Figure 3-20) and update the selected object file search path.
	Move up - Click to move the selected file search path one position higher in the list.
	Move down - Click to move the selected file search path one position lower in the list.

[Figure 3-19](#) shows the Add directory path dialog box.

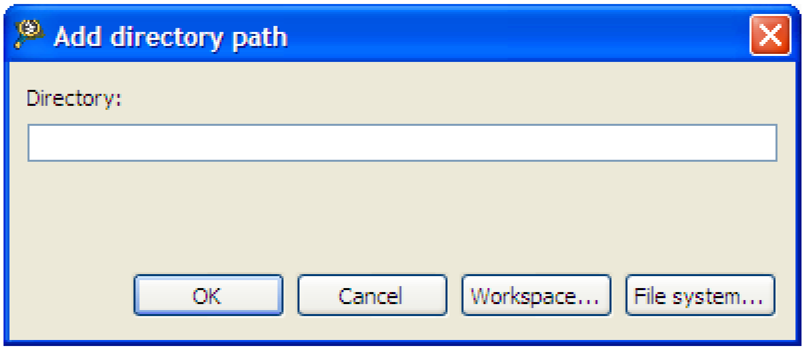


Figure 3-19. Add directory path Dialog Box

[Figure 3-20](#) shows the Edit directory path dialog box.

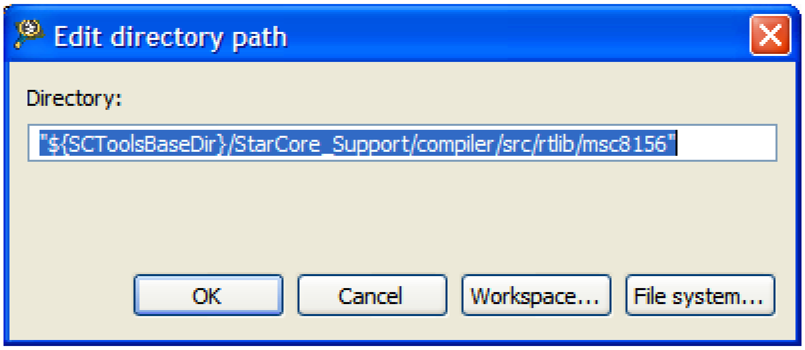


Figure 3-20. Edit directory path Dialog Box

The buttons in the **Add directory path and Edit directory path** dialog boxes help work with the object file search paths.

- **OK-** Click to confirm the action and exit the dialog box.
- **Cancel -** Click to cancel the action and exit the dialog box.
- **Workspace-** Click to display the **Folder Selection** dialog box and specify the object file search path. The resulting path, relative to the workspace, appears in the appropriate list.
- **File system-** Click to display the **Browse for Folder** dialog box and specify the object file search path. The resulting path appears in the appropriate list.

3.3.4.7 Macros

Use this panel to define and undefine preprocessor macros. You can specify multiple macros and change the order in which the IDE uses the macros.

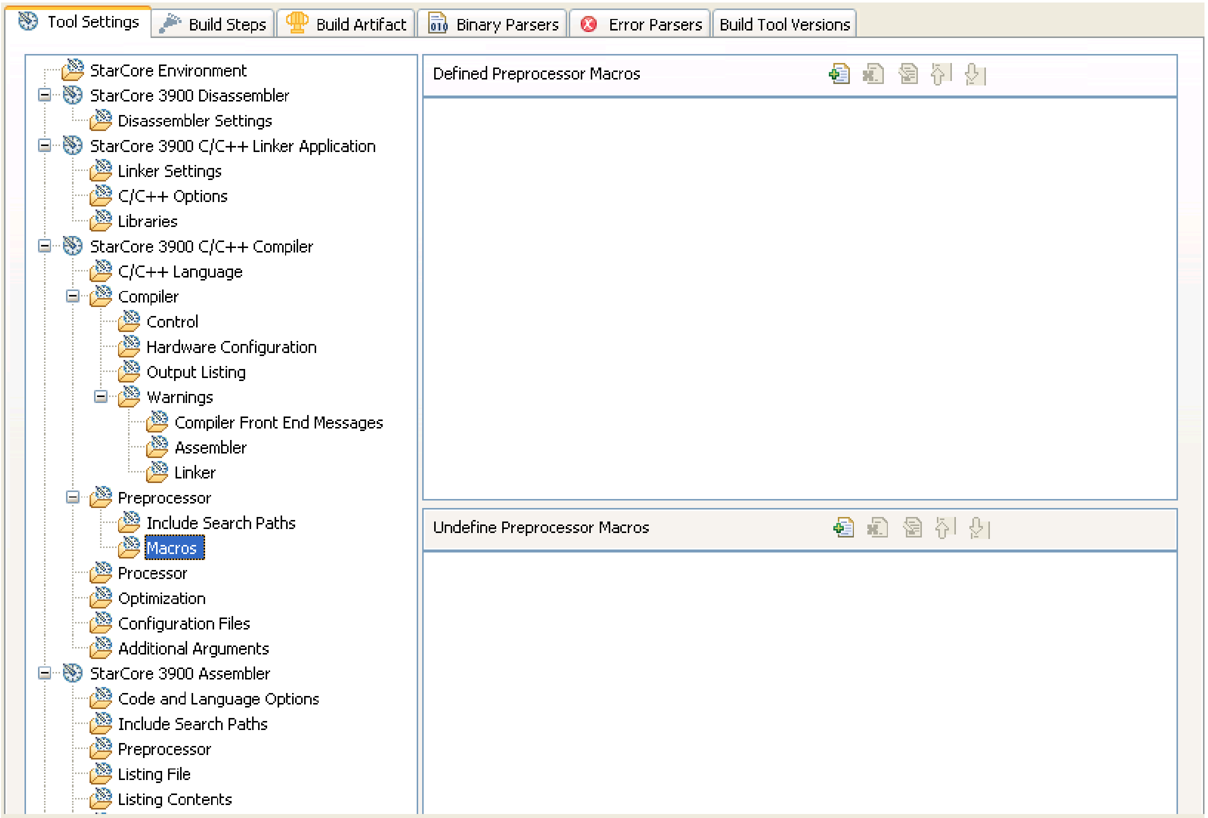


Figure 3-21. Tool Settings - Macros

Table 3-20 describes the various options available on the **Macros** panel.

Table 3-20. Tool Settings - Macros Options

Option	Description
Define Preprocessor Macros	Define preprocessor macros and optionally assign their values. This setting is equivalent to specifying the `-D name[=value]` command-line option. To assign a value, use the equal sign (=) with no white space. For example, this syntax defines a preprocessor value named `EXTENDED_FEATURE` and assigns `ON` as its value: `EXTENDED_FEATURE=ON` Note that if you do not assign a value to the macro, the shell assigns a default value of 1.
Undefine Preprocessor Macros	Undefine preprocessor macros. This setting is equivalent to specifying the `-U name` command-line option. For example, this syntax undefines the `EXTENDED_ FEATURE` macro: `EXTENDED_FEATURE` Note that the shell processes these items after it processes all Defined Preprocessor Macros items.

Table 3-21 lists and describes the toolbar buttons that help work with the macros.

Table 3-21. Tool Settings - Macros Toolbar Buttons

Button	Description
	**Add** - Click to add a defined preprocessor macro.
	**Delete** - Click to delete the selected macro. To confirm deletion, click **Yes** in the **Confirm Delete** dialog box.
	**Edit** - Click to update the selected defined preprocessor macro.
	**Move up** - Click to move the selected macro one position higher in the list.
	**Move down** - Click to move the selected macro one position lower in the list.

3.3.4.8 Processor

Use this panel to enable fused multiply and accumulate operation.

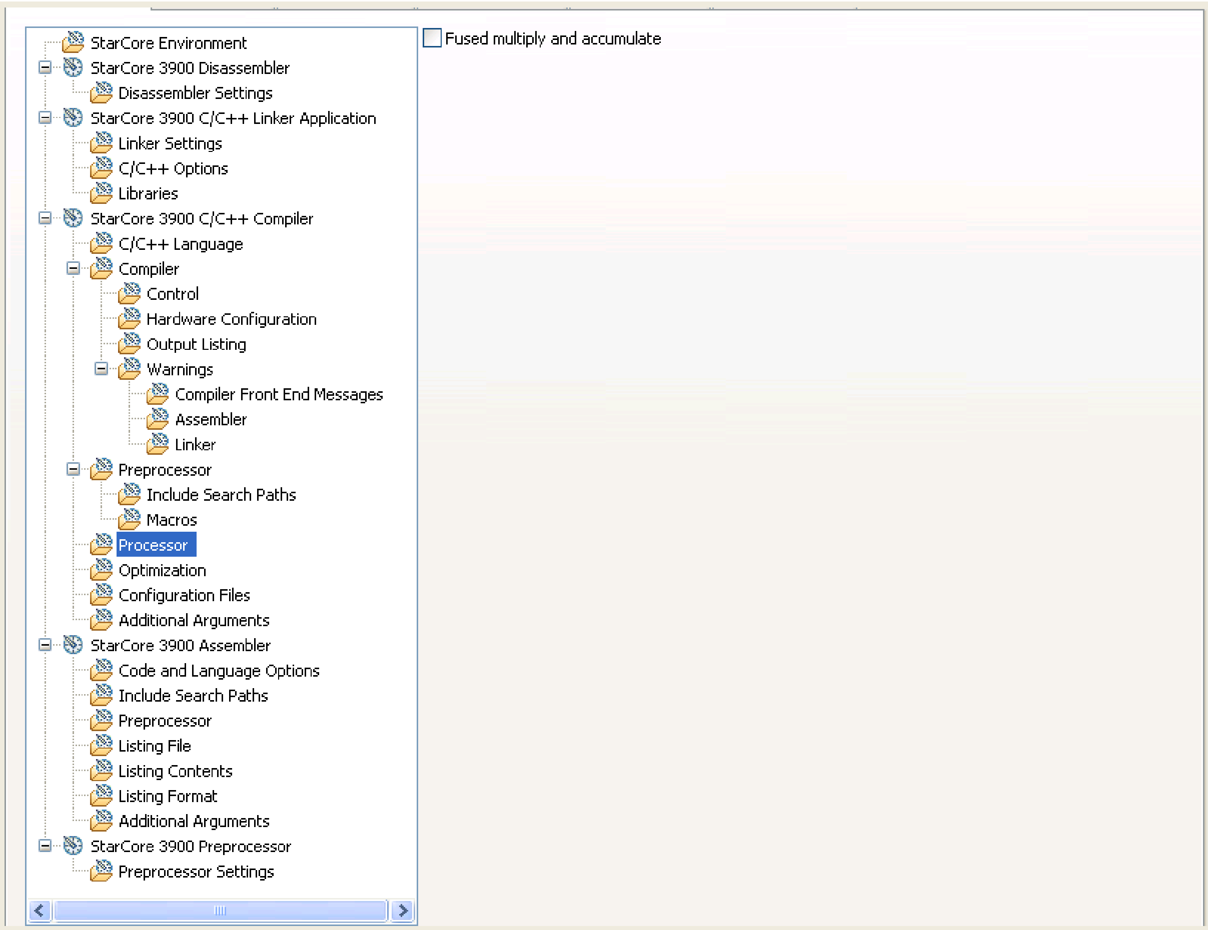


Figure 3-22. Tool Settings - Processor Panel

Table 3-22 explains the options available on the **Processor** panel.

Table 3-22. Tool Settings - Processor

Option	Description
Fused multiply and accumulate	Check to enable the fused multiply and accumulate operation. Fused multiply and add are generated only if hardware floating point support is enabled on the SC3900fp compiler.

3.3.4.9 Optimization

Use this panel to control compiler optimizations. Compiler optimization can be applied in either global or non-global optimization mode. You can apply global optimization at the end of the development cycle, after compiling and optimizing all source files individually or in groups.

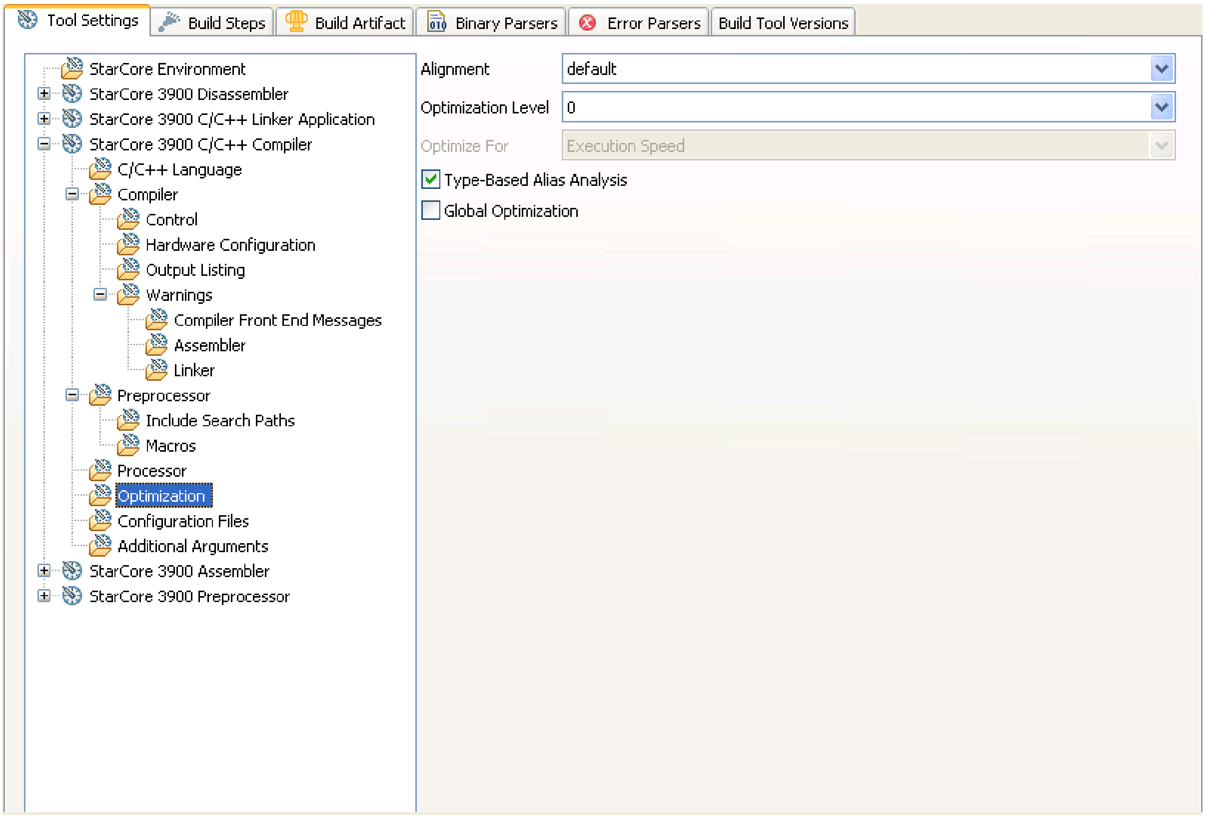


Figure 3-23. Tool Settings - Optimization

Table 3-23 describes the various options available on the **Optimization** panel.

Table 3-23. Tool Settings - Optimization Options

Option	Description
Alignment	Specify the alignment level that the compiler uses. This setting is equivalent to specifying the -align level command-line option. • **default** - level 0 applies to size optimizations, and level 2 applies to speed optimizations • **0** - disable alignment • **1** - align hardware loops • **2** - align hardware and software loops • **3** - align all existing labels • **4** - align all existing labels and subroutine-return points Note that using a higher alignment constraint increases execution speed but also increases object-code size.
Optimization Level	Specify the optimizations that you want the compiler to apply to the generated object code: • **0** - Disable optimizations. This setting is equivalent to specifying the `-O0` command-line option. The compiler generates unoptimized, linear assembly-language code. • **1** - The compiler performs all target-independent (that is, non-parallelized) optimizations, such as function inlining. This setting is equivalent to specifying the `-O1` command-line option.

Table continues on the next page...

Table 3-23. Tool Settings - Optimization Options (continued)

Option	Description
	The compiler omits all target-specific optimizations and generates linear assembly-language code. • **2** - The compiler performs all optimizations (both target-independent and target-specific). This setting is equivalent to specifying the `-O2` command-line option. The compiler outputs optimized, non-linear, parallelized assembly-language code. • **3** - The compiler performs all the level 2 optimizations, then the low-level optimizer performs global-algorithm register allocation. This setting is equivalent to specifying the `-O3` command-line option. At this optimization level, the compiler generates code that is usually faster than the code generated from level 2 optimizations. • **4** - The compiler performs all the level 3 optimizations, then the low-level optimizer performs global-algorithm register allocation. This setting is equivalent to specifying the `-O4` command-line option. At this optimization level, the compiler generates code that is usually faster than the code generated from level 3 optimizations.
Optimize For	To specify this setting, specify an Optimization Level greater than 0. Specify the goal of the optimizations that the compiler performs: • **Faster Execution Speed** - The compiler optimizes object code at the specified Optimization Level such that the resulting binary file has a faster execution speed, as opposed to a smaller executable code size. • **Smaller Code Size** - The compiler optimizes object code at the specified Optimization Level such that the resulting binary file has a smaller executable code size, as opposed to a faster execution speed. This setting is equivalent to specifying the `-Os` command-line option.
Type-Based Alias Analysis	Instructs the compiler to use alias by type rules for alias analysis. As per alias by type rules, a value which is stored in memory should always be accessed using the same access size or through a signed/unsigned char*. For more information, see Chapter 6.5, Paragraph 7 in C99 Standard document.
Global Optimization	To specify this setting, specify an Optimization Level greater than 0. **Checked** - The compiler applies the selected optimizations across all files in the build target. This global optimization is the most effective. This setting is equivalent to specifying the `-cfe` compiler command-line option followed by the `-Og` linkphase command-line option. **Cleared** - The compiler creates intermediate files that have the `.obj` file extension.

3.3.4.10 Configuration Files

Use this panel to specify the application-configuration file view, and the custom application-configuration file.

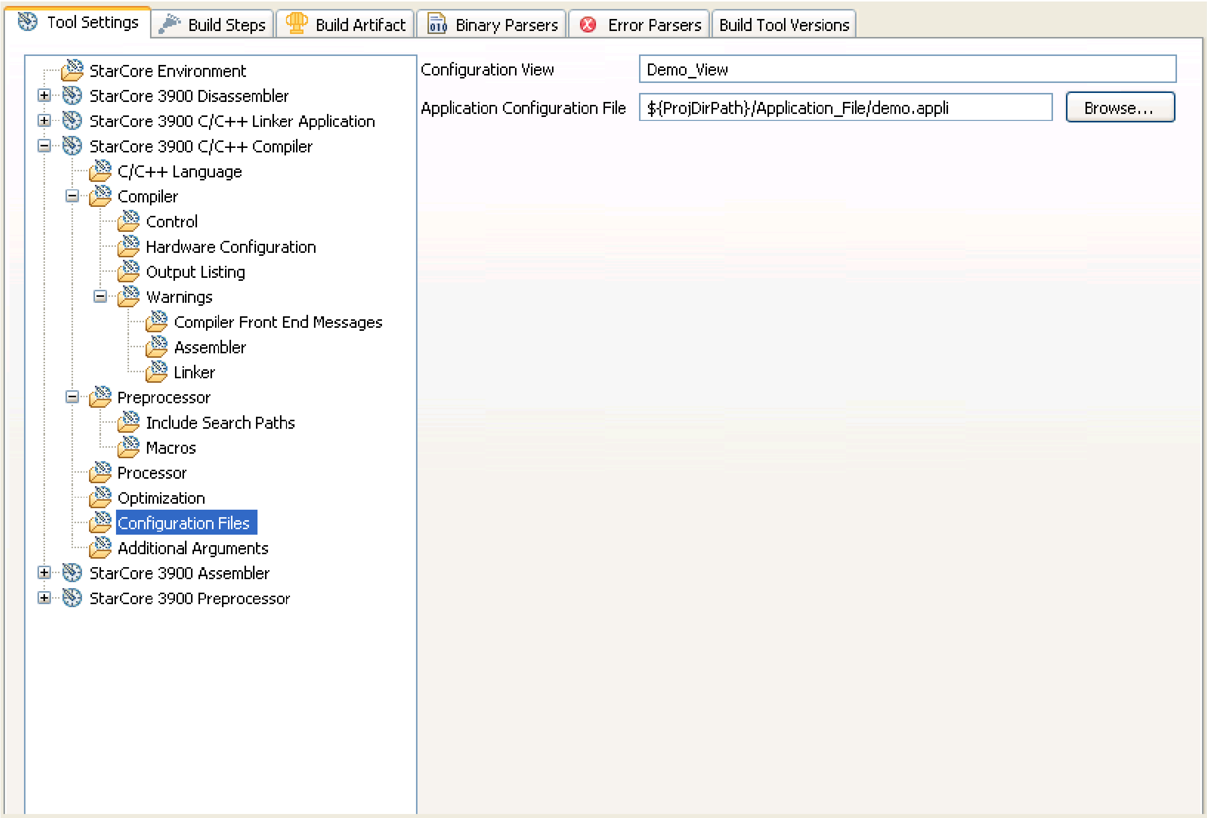


Figure 3-24. Tool Settings - Configuration Files

Table 3-24 describes the various options available on the **Configuration Files** panel.

Table 3-24. Tool Settings - Configuration Files Options

Option	Description
Configuration View	Enter the application-configuration file view that the build target uses. This setting is equivalent to specifying the `-view identifier` command-line option. If you use this text box, you must specify a path in the Application Configuration File text box.
Application Configuration File	Enter the path to a custom application-configuration file. This setting is equivalent to specifying the `-ma filename` command line option. Alternatively, click the Browse button, then use the resulting dialog box to specify the file. Clear this text box to use a default application-configuration file. Use a custom application-configuration file to apply different settings

Table 3-24. Tool Settings - Configuration Files Options

Option	Description
	and optimization levels to various files and functions of the build target. An application-configuration file must have the `.appli` filename extension.

3.3.4.11 Additional Arguments

Use this panel to specify command-line options that the shell program (scc) passes directly to individual build tools (such as the front-end compiler, the various optimizers, and the assembler). Because the IDE shares this panel among multiple tools, just the options that apply to the selected tool appear in each instance of the panel.

NOTE

The IDE applies the command-line options that you specify in this panel to the compilation of the C-language source files in a build target (even the options that you enter in the To Assembler text box). To pass command-line options to the assembler for application to the assembly-language files in a build target, use the Read Options from File text box of the **StarCore 3900 Assembler > Preprocessor** panel.

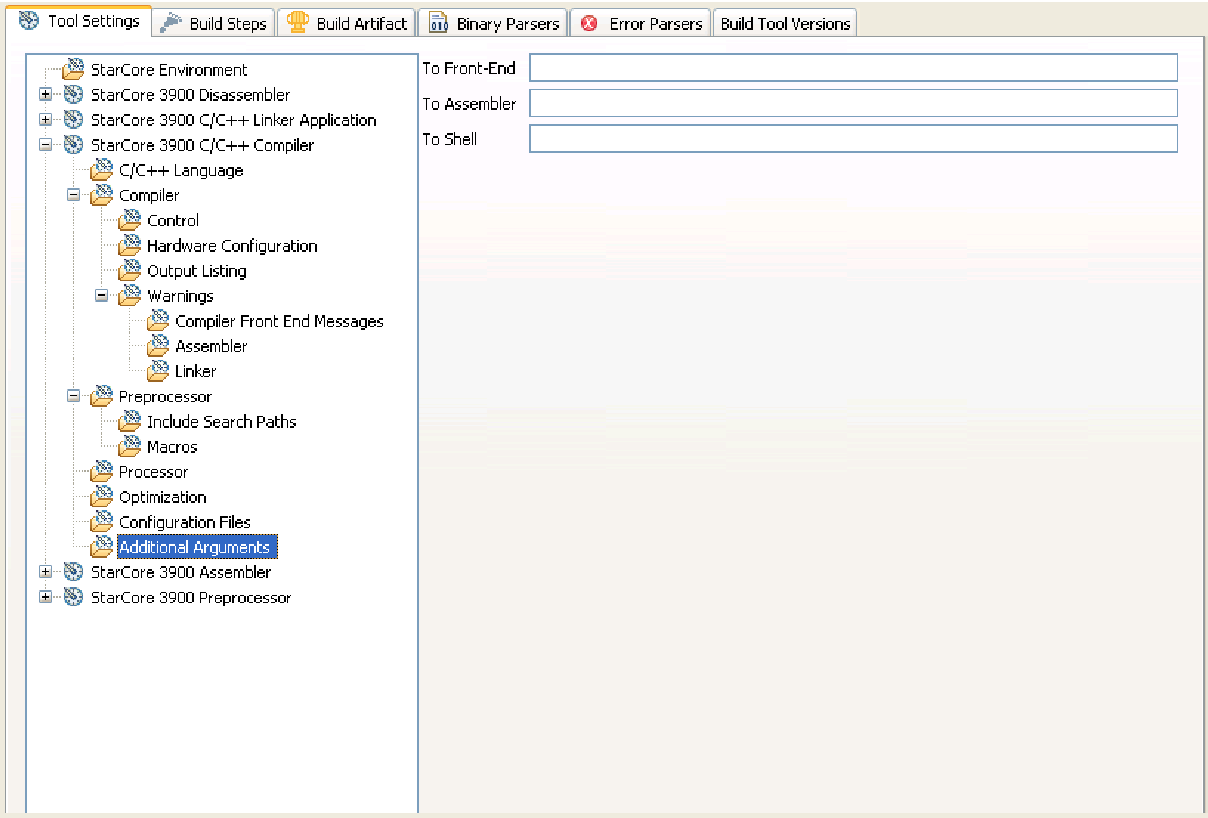


Figure 3-25. Tool Settings - Additional Arguments

Table 3-25 describes the various options available on the **Additional Arguments** panel.

Table 3-25. Tool Settings - Additional Arguments Options

Option	Description
To Front-End	Enter command-line options for the shell program to pass to the front-end compiler. This setting is equivalent to specifying the `-Xcfe` command-line option.
To Assembler	Enter command-line options for the shell program to pass to the assembler. This setting is equivalent to specifying the `-Xasm` command-line option.
To Shell	Enter command-line options for the IDE to pass to the shell program. The IDE passes the options exactly as you type them and does not check for errors.

3.3.5 StarCore 3900 Assembler

Use this panel to specify the command, options, and expert settings for the build tool assembler.

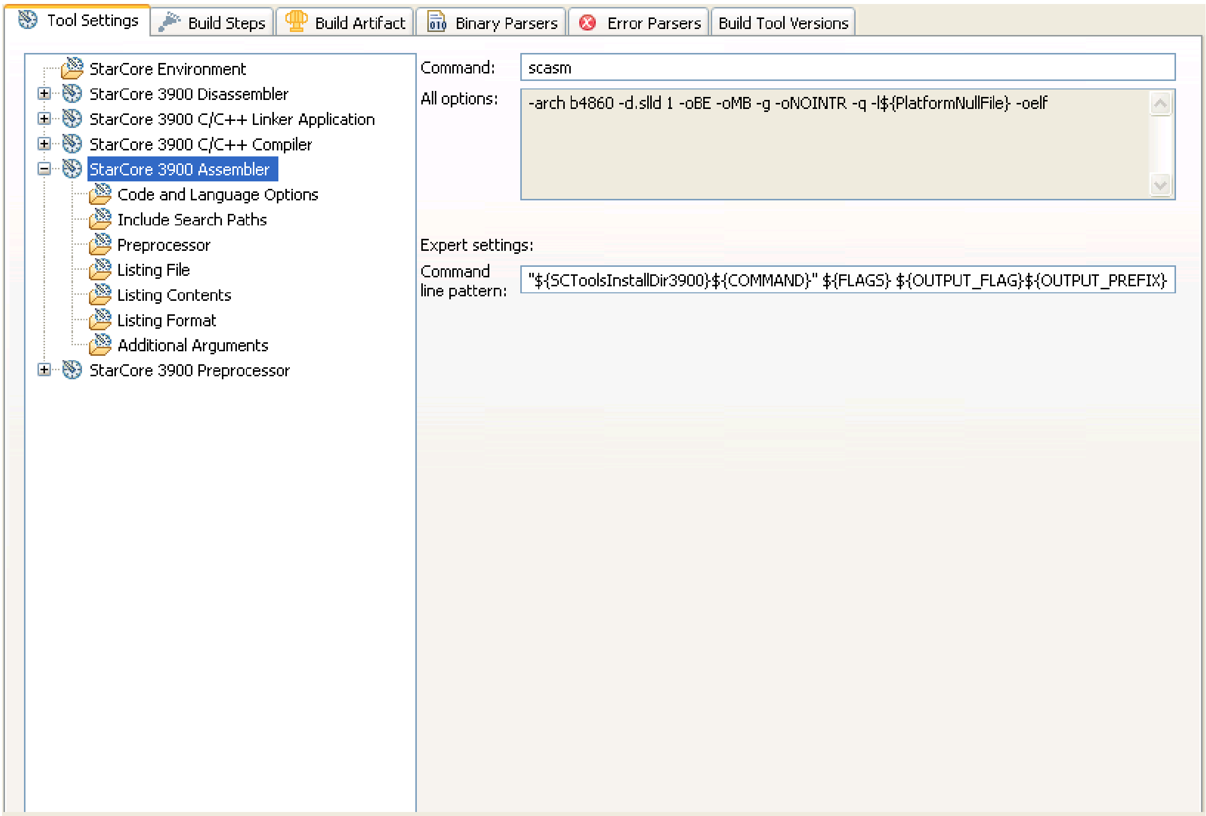


Figure 3-26. Tool Settings - StarCore 3900 Assembler

Table 3-26 describes the various options available on the **StarCore 3900 Assembler** options.

Table 3-26. Tool Settings - StarCore 3900 Assembler Options

Option	Description
Command	Shows the location of the assembler executable file.
All options	Shows the actual command line the assembler will be called with.
Expert Settings Command line pattern	Shows the expert settings command line parameters; default is `"${SCToolsInstallDir}${COMMAND}" ${FLAGS} ${OUTPUT_FLAG}${OUTPUT_PREFIX}${OUTPUT} ${INPUTS}`.

3.3.5.1 Code and Language Options

Use this panel to specify code- and symbol-generation options for the StarCore assembler.

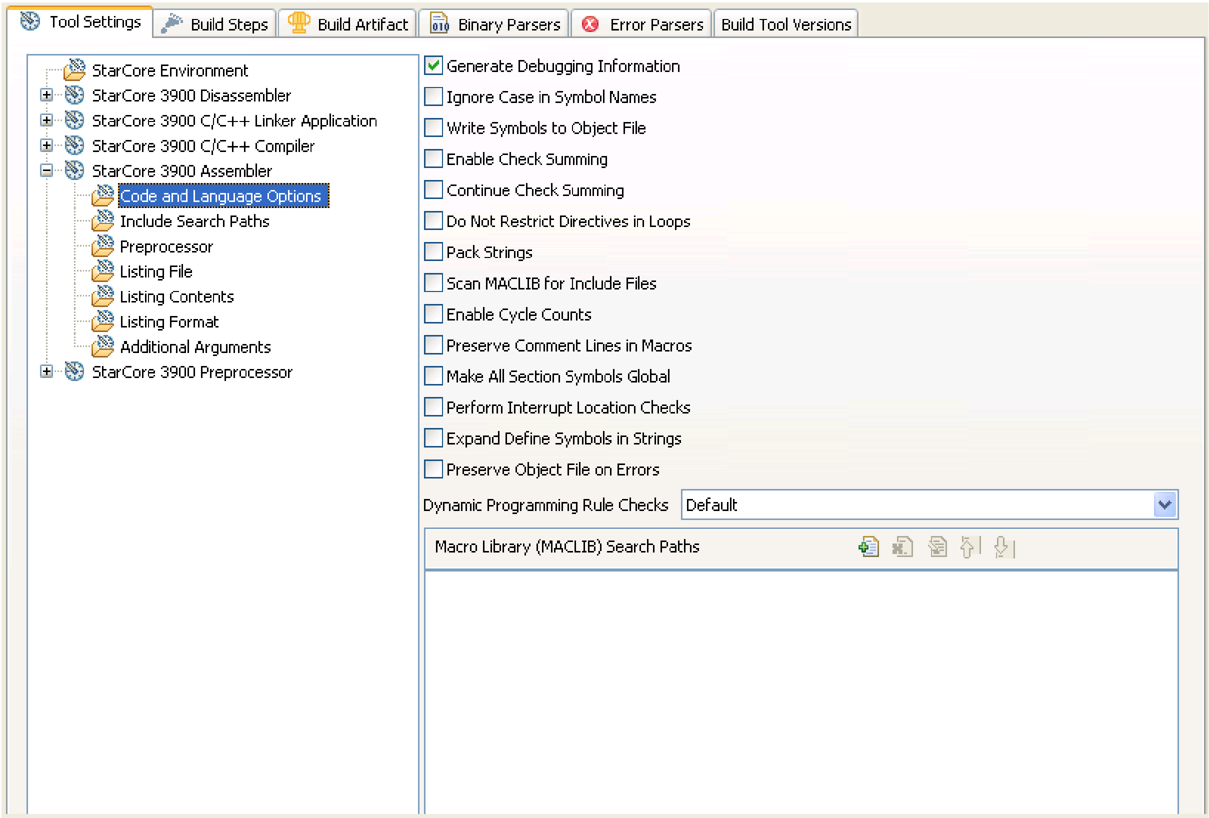


Figure 3-27. Tool Settings - Code and Language Options

Table 3-27 describes the various options available on the **Code and Language Options** panel.

Table 3-27. Tool Settings - Code and Language Options

Option	Description
Generate Debugging Information	**Checked** - The assembler produces symbolic information for debugging the build target. **Cleared** - The assembler does not produce symbolic information.
Ignore Case in Symbol Names	**Checked** - The assembler ignores the case of symbol, section, and macro names. This setting corresponds to the `IC` option of the `OPT` directive and to the `-oic` command-line option. **Cleared** - The assembler considers the case of symbol, section, and macro names.
Write Symbols to Object File	**Checked** - The assembler writes symbol information to the object files that it generates. This setting corresponds to the `SO` option of the `OPT` directive and to the `-oso` command-line option. **Cleared** - The assembler does not write symbol information to assembler-generated object files.

Table continues on the next page...

Table 3-27. Tool Settings - Code and Language Options (continued)

Option	Description
Enable Check Summing	**Checked** - The assembler allows check-summing of instruction and data values and clearing the cumulative checksum. **Cleared** - The assembler does not allow check summing of instruction and data values. You can use the `@CHK()` function to obtain the checksum value. Note that the assembler never preserves a comment line in a macro definition that starts with two consecutive semicolons (;;). This setting corresponds to the `CK` option of the `OPT` directive and to the `-ock` command-line option.
Continue Check Summing	Checked-The assembler re-enables check summing of instructions and data. This setting corresponds to the `CONTCK` option of the `OPT` directive and to the `-ocontck` command-line option. Checking this checkbox does not cause the assembler to clear the cumulative checksum value. Cleared-The assembler does not re-enable check summing of instructions and data.
Do Not Restrict Directives in Loops	**Checked** - The assembler suppresses error messages related to directives that might be invalid in `DO` loops. This setting corresponds to the `DLD` option of the `OPT` directive and to the `-odld` command-line option. **Cleared** - The assembler generates error messages related to directives that might be invalid in `DO` loops.
Pack Strings	**Checked** - The assembler packs strings that appear in the Define Constant (`DC`) directive. This setting corresponds to the `PS` option of the `OPT` directive and to the `-ops` command-line option. The assembler packs individual bytes of strings into consecutive target words for the length of the string. **Cleared** - The assembler does not pack strings that appear in the `DC` directive.
Scan MACLIB for Include Files	**Checked** - The assembler searches for `#include` files in the paths shown in the Macro Library (MACLIB) Search Paths list, as well as the paths shown in the Include Search Paths panel of the StarCore Assembler. This setting corresponds to the `MI` option of the `OPT` directive and to the `-omi` command-line option. **Cleared** - The assembler searches for include files just in the paths shown in the Include Search Paths panel of the StarCore Assembler.
Enable Cycle Counts	**Checked** - The assembler enables the cycle counter and clear-total-cycle-count features. This setting corresponds to the `CC` option of the `OPT` directive and to the `-occ` command-line option. Checking this checkbox causes the listing file to show a cycle count for each instruction entry. **Cleared** - The assembler disables the cycle counter. Note that cycle counts assume a full instruction-fetch pipeline and no wait states.

Table continues on the next page...

Table 3-27. Tool Settings - Code and Language Options (continued)

Option	Description
Preserve Comment Lines in Macros	**Checked** - The assembler preserves comment lines in macros. This setting corresponds to the `CM` option of the `OPT` directive and to the `-ocm` command-line option. **Cleared** - The assembler does not preserve comment lines in macros.
Make All Section Symbols Global	**Checked** - The assembler treats all sections as if you had declared them explicitly as `GLOBAL` sections. This setting corresponds to the `GL` option of the `OPT` directive and to the `-ogl` command-line option. You must check this checkbox before explicitly defining any section in a source file. **Cleared** - The assembler does not treat all sections as if you had declared them explicitly as `GLOBAL` sections.
Perform Interrupt Location Checks	Checked-The assembler checks for DSP instructions that cannot appear in the interrupt-vector locations of program memory. This setting corresponds to the `INTR` option of the `OPT` directive and to the `- ointr` command-line option. Cleared-The assembler does not check for DSP instructions that cannot appear in the interrupt- vector locations of program memory.
Expand Define Symbols in Strings	**Checked** - The assembler expands `DEFINE` symbols in strings. This setting corresponds to the `DEX` option of the `OPT` directive and to the `-odex` command-line option. **Cleared** - The assembler does not expand `DEFINE` symbols in strings.
Preserve Object File on Errors	**Checked** - The assembler preserves object files if assembly errors occur. This setting corresponds to the SVO option of the OPT directive and to the - osvo command-line option. **Cleared** - The assembler discards object files if assembly errors occur.
Dynamic Programming Rule Checks	Specify how the assembler reports violations of programming rules: · **Disable All** - The assembler does not report violations of dynamic StarCore 3900FP DSP programming rules. This setting is the default behavior when you invoke the assembler from the command line. · **Default** - The assembler chooses whether to report violations of dynamic StarCore 3900FP DSP programming rules. **Enable All** - The assembler reports violations of dynamic StarCore 3900FP DSP programming rules. The IDE passes the `-s all` option to the assembler.
Macro Library (MACLIB) Search Paths	Lists paths to search for `#include` files. The assembler searches the paths in the order shown in this list. Use these toolbar buttons to work with the search paths: • **Add** - Click, then use the resulting dialog box to specify the path. • **Delete** - Click to remove the selected path. • **Edit** - Click, then use the resulting dialog box to change the selected path.

Table 3-27. Tool Settings - Code and Language Options

Option	Description
	• **Move up** - Click to move the selected path one position higher in the list. • **Move down** - Click to move the selected path one position lower in the list. Use these buttons in the dialog boxes to help you work with paths: • **Workspace** - Click, then use the resulting dialog box to specify the path. The resulting path, relative to the workspace, appears in the list. • **File system** - Click, then use the resulting dialog box to specify the path. The resulting absolute path appears in the list.

3.3.5.2 Include Search Paths

Use this panel to specify multiple search paths and the order in which to search those paths. The IDE first looks for the specified file in the current directory, or the directory that you specify in the `INCLUDE` directive. If the IDE does not find the file, it continues searching the paths shown in this panel. The IDE keeps searching paths until it finds the file or finishes searching the last path at the bottom of the Include File Search Paths list. The IDE appends to each path the string that you specify in the `INCLUDE` directive.

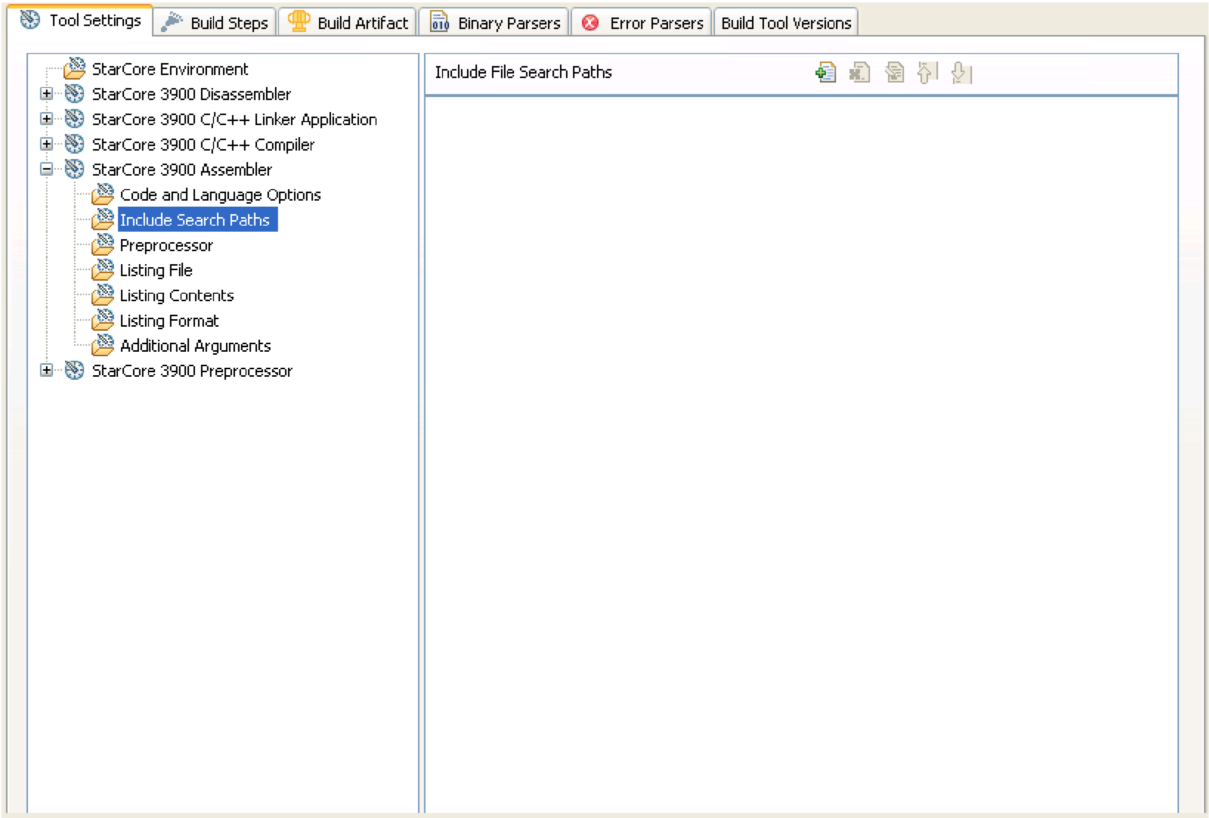


Figure 3-28. Tool Settings - Include Search Paths

Table 3-28 lists and describes the toolbar buttons that help work with the file search paths.

Table 3-28. Tool Settings - Include Search Paths Toolbar Buttons

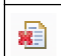
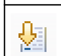
Button	Description
	**Add** - Click to open the **Add directory path** dialog box (Include Search Paths) and specify the file search path.
	**Delete** - Click to delete the selected file search path. To confirm deletion, click **Yes** in the **Confirm Delete** dialog box.
	**Edit** - Click to open the **Edit directory path** dialog box (Include Search Paths) and update the selected object file search path.
	**Move up** - Click to move the selected file search path one position higher in the list.
	**Move down** - Click to move the selected file search path one position lower in the list.

Figure 3-29 shows the Add directory path dialog box.

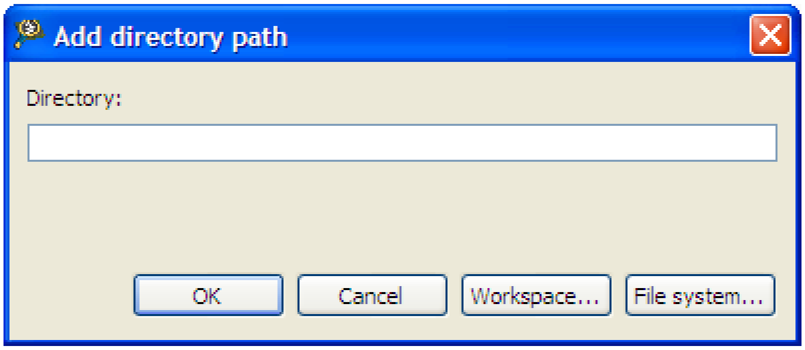


Figure 3-29. Add directory path Dialog Box

Figure 3-30 shows the Edit directory path dialog box.

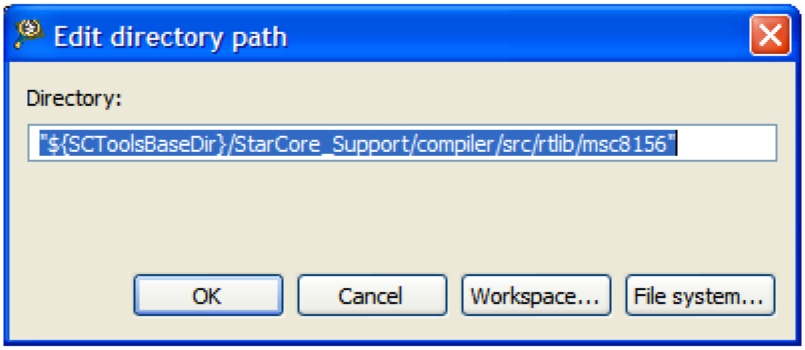


Figure 3-30. Edit directory path Dialog Box

The buttons in the **Add directory path and Edit directory path** dialog boxes help work with the object file search paths.

- **OK-** Click to confirm the action and exit the dialog box.
- **Cancel-** Click to cancel the action and exit the dialog box.
- **Workspace-** Click to display the **Folder Selection** dialog box and specify the object file search path. The resulting path, relative to the workspace, appears in the appropriate list.
- **File system-** Click to display the **Browse for Folder** dialog box and specify the object file search path. The resulting path appears in the appropriate list.

3.3.5.3 Preprocessor

Use this panel to specify preprocessor behavior. You can specify whether to display banner information or verbose progress messages, and you can control error output. Also, you can specify substitution strings for the preprocessor.

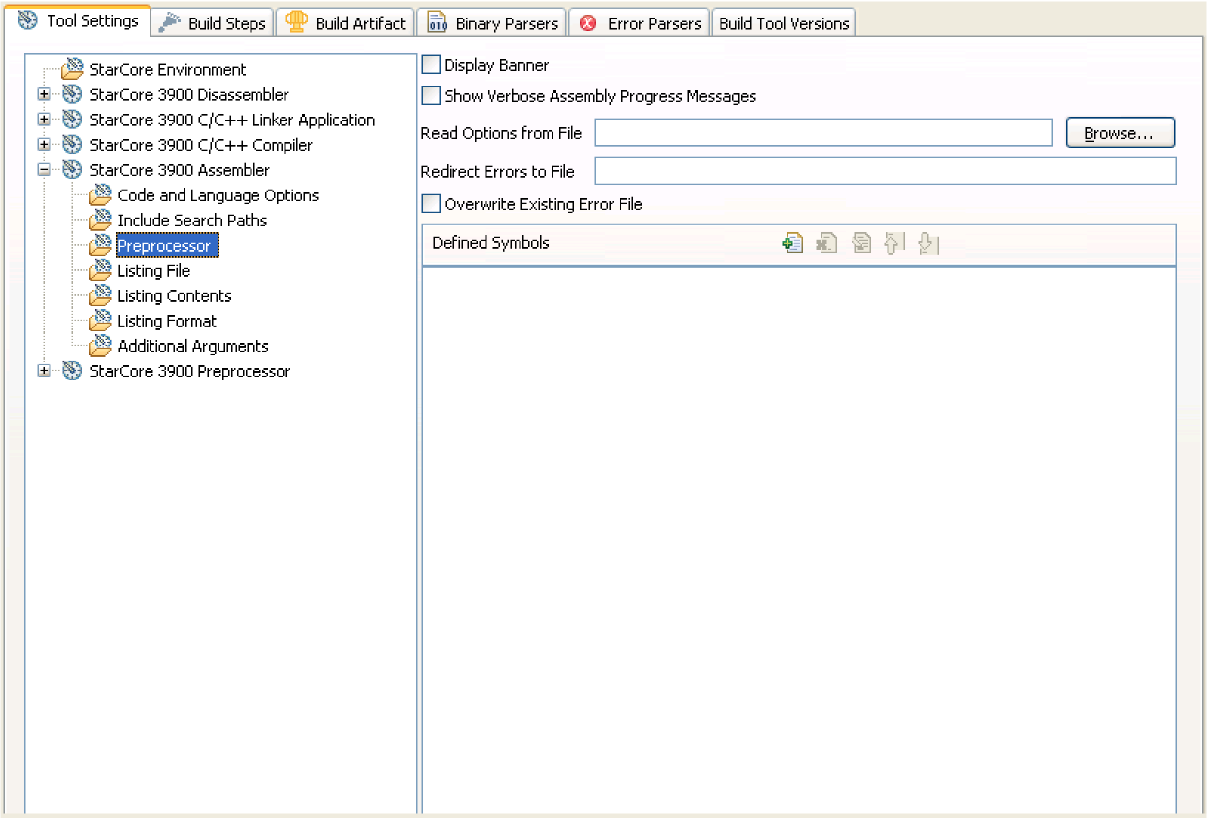


Figure 3-31. Tool Settings - Preprocessor

Table 3-29 describes the various options available on the **Preprocessor** panel.

Table 3-29. Tool Settings - Preprocessor Options

Option	Description
Display Banner	**Checked** - The assembler shows banner information. **Cleared** - The assembler hides banner information. Note that this option has no effect on hosts where the default setting is to hide the banner.
Show Verbose Assembly Progress Messages	**Checked** - The assembler reports the progress of the assembly process to the standard error output stream. For example, the assembler reports the beginning of each pass and the opening and closing of input files. You can use this information to monitor the assembly process and ensure that it proceeds normally. **Cleared** - The assembler does not report assembly progress to the standard error-output stream.
Read Options from File	Enter the path to a file that specifies command-line options for assembler use. Alternatively, click the **Browse** button, then use the resulting dialog box to specify the file.
Redirect Errors to File	Enter the path to a file that the assembler uses in place of the default error file (`errfil`). The **Overwrite Existing Error File** checkbox controls how the assembler writes to the file that you specify in this text box.

Table continues on the next page...

Table 3-29. Tool Settings - Preprocessor Options (continued)

Option	Description
Overwrite Existing Error File	**Checked** - The assembler overwrites the file that you specify in the **Redirect Errors to File** text box. **Cleared** - The assembler appends information to the file that you specify in the **Redirect Errors to File** text box.
Defined Symbols	Specify substitution strings that the assembler applies to all the assembly-language modules in the build target. Enter just the string portion of a substitution string. The IDE prepends the `-d` token to each string that you enter. For example, entering `opt1 x` produces this result on the command line: `-dopt1 x` Note that this option is similar to the DEFINE directive, but applies to all assembly-language modules in a build target. Use these toolbar buttons to work with the substitution strings: • **Add** - Click, then use the resulting dialog box to specify the string. • **Delete** - Click to remove the selected string. • **Edit** - Click, then use the resulting dialog box to change the selected string. • **Move up** - Click to move the selected string one position higher in the list. • **Move down** - Click to move the selected string one position lower in the list.

3.3.5.4 Listing File

Use this panel to specify whether the assembler generates a listing file. When generating a listing file, you can specify whether the assembler also prints a memory-utilization report. Also, you can specify the types of warnings that the assembler includes in the listing file. (Figure 3-32)

NOTE

Use the Additional Arguments panel of the StarCore Assembler to specify options that you want to apply to all assembly-language files in the current build target. Use the `OPT` directive for options that you want to apply to just the assembly-language source file in which the `OPT` directive appears.

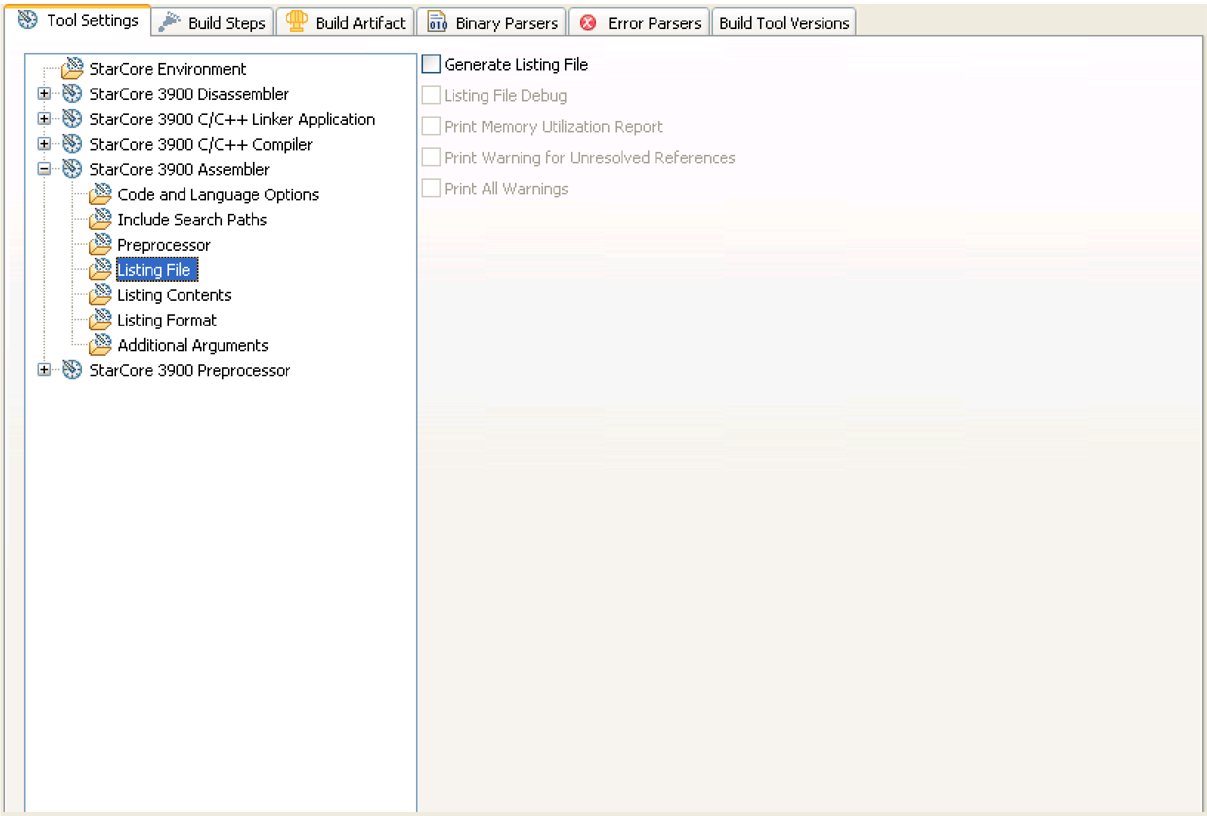


Figure 3-32. Tool Settings - Listing File

Table 3-30 describes the various options available on the **Listing File** panel.

Table 3-30. Tool Settings - Listing File Options

Option	Description
Generate Listing File	**Checked** - The assembler creates a listing file named `lstfil.lst`. **Cleared** - The assembler does not create a list file.
Listing File Debug	To specify this setting, check the **Generate Listing File** checkbox. **Checked** - The assembler uses the source listing, instead of the assembly-language source file, as the debug source file. This setting corresponds to the `LDB` option of the `OPT` directive and to the `-oldb` command-line option. **Cleared** - The assembler uses the assembly language source file, instead of the source listing, as the debug source file.
Print Memory Utilization Report	To specify this setting, check the **Generate Listing File** checkbox. **Checked** - The assembler writes a report of load and runtime memory-use information to the listing file. This setting corresponds to the `MU` option of the `OPT` directive and to the `-omu` command-line option. **Cleared** - The assembler does not write the memory-utilization report to the listing file.

Table continues on the next page...

Table 3-30. Tool Settings - Listing File Options (continued)

Option	Description
Print Warning for Unresolved References	To specify this setting, check the **Generate Listing File** checkbox. **Checked** - The assembler generates a warning at assembly time for each unresolved external reference. This setting, valid just in relocatable mode, corresponds to the `UR` option of the `OPT` directive and to the `-our` command-line option. **Cleared** - The assembler does not generate a warning at assembly time for each unresolved external reference.
Print All Warnings	To specify this setting, check the **Generate Listing File** checkbox. **Checked** - The assembler writes all warning messages to the listing file. This setting corresponds to the `W` option of the `OPT` directive and to the `-ow` command-line option. **Cleared** - The assembler does not write all warning messages to the listing file.

3.3.5.5 Listing Contents

Use this panel to specify the information that the assembler generates in a listing file.

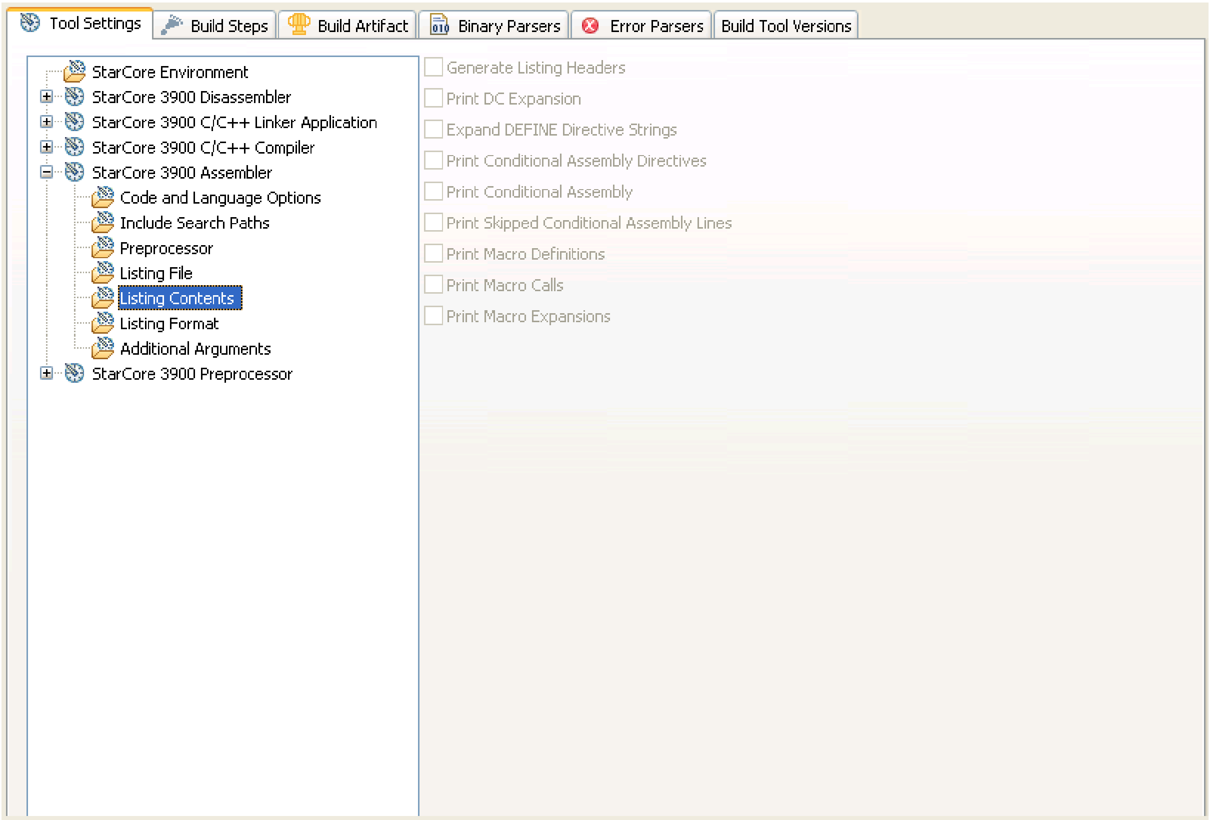


Figure 3-33. Tool Settings - Listing Contents

Table 3-31 describes the various options available on the **Listing Contents** panel.

Table 3-31. Tool Settings - Listing Contents Options

Option	Description
Generate Listing Headers	**Checked** - The assembler writes listing headers, titles, and subtitles to the listing file. This setting corresponds to the `HDR` option of the `OPT` directive and to the `-ohdr` command-line option. **Cleared** - The assembler does not write listing headers, titles, and subtitles to the listing file.
Print DC Expansion	**Checked** - The assembler writes Define Constant (DC) expansions to the listing file. This setting corresponds to the `CEX` option of the `OPT` directive and to the `-ocex` command-line option. **Cleared** - The assembler does not write Define Constant expansions to the listing file.
Expand `DEFINE` Directive Strings	**Checked** - The assembler writes expanded `DEFINE` directives to the listing file. This setting corresponds to the `MD` option of the `OPT` directive and to the `- omd` command-line option. **Cleared** - The assembler does not write expanded `DEFINE` directives to the listing file.

Table continues on the next page...

Table 3-31. Tool Settings - Listing Contents Options (continued)

Option	Description
Print Conditional Assembly Directive	**Checked** - The assembler writes conditional-assembly directives to the listing file. This setting corresponds to the `CL` option of the `OPT` directive and to the `-ocl` command-line option. **Cleared** - The assembler does not write conditional-assembly directives to the listing file.
Print Conditional Assembly	**Checked** - The assembler writes conditional-assembly and section nesting-level information to the listing file. This setting corresponds to the `NL` option of the `OPT` directive and to the `-onl` command-line option. **Cleared** - The assembler does not write conditional-assembly and section nesting-level information to the listing file.
Print Skipped Conditional Assembly Lines	**Checked** - The assembler writes to the listing file assembly-language statements skipped due to conditional assembly. This setting corresponds to the `U` option of the `OPT` directive and to the `-ou` command-line option. **Cleared** - The assembler does not write to the listing file assembly-language statements skipped due to conditional assembly.
Print Macro Definitions	**Checked** - The assembler writes macro definitions to the listing file. This setting corresponds to the `MD` option of the `OPT` directive and to the `-omd` command-line option. **Cleared** - The assembler does not write macro definitions to the listing file.
Print Macro Calls	**Checked** - The assembler writes macro calls to the listing file. This setting corresponds to the `MC` option of the `OPT` directive and to the `-omc` command-line option. **Cleared** - The assembler does not write macro calls to the listing file.
Print Macro Expansions	**Checked** - The assembler writes macro expansions to the listing file. This setting corresponds to the `MEX` option of the `OPT` directive and to the `-omex` command-line option. **Cleared** - The assembler does not write macro expansions to the listing file.

3.3.5.6 Listing Format

Use this panel to specify format of the information that the assembler generates in a listing file.

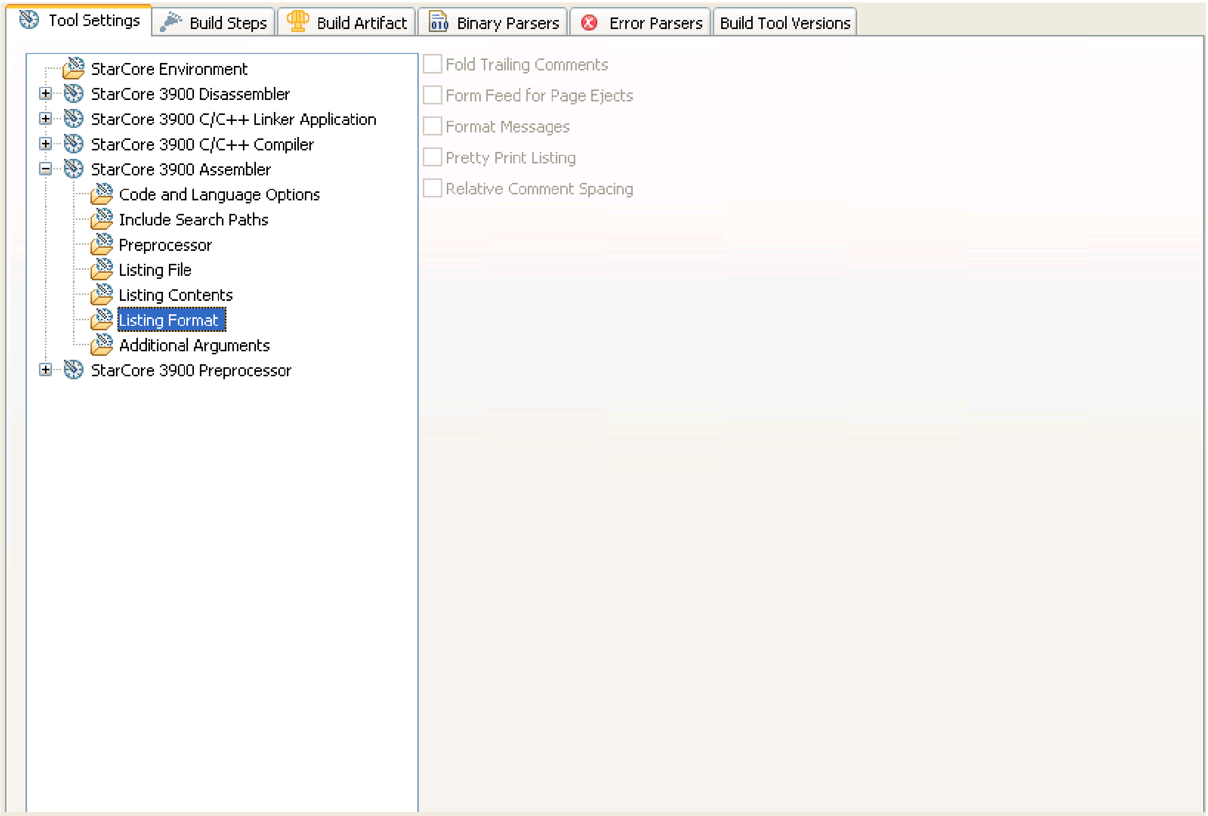


Figure 3-34. Tool Settings - Listing Format

Table 3-32 describes the various options available on the **Listing Format** panel.

Table 3-32. Tool Settings - Listing Format Options

Option	Description
Fold Trailing Comments	**Checked** - For each source-code statement that has a trailing comment, the assembler moves the comment underneath that statement. The assembler aligns the moved comment with the opcode field. This setting corresponds to the `FC` option of the `OPT` directive and to the `-ofc` command-line option. **Cleared** - The assembler does not move trailing comments underneath their corresponding source code statements.
Form Feed for Page Ejects	**Checked** - The assembler inserts form feeds into the listing file. Each form feed causes a printer to eject the currently printing page. This setting corresponds to the `FF` option of the `OPT` directive and to the `-off` command-line option. **Cleared** - The assembler does not insert form feeds into the listing file.
Format Messages	**Checked** - The assembler inserts format messages into the listing file such that the message text aligns and breaks at word boundaries. This setting corresponds to the `FM` option of the `OPT` directive and to the `-ofm` command-line option. **Cleared** - The assembler does not insert format messages into the listing file.

Table continues on the next page...

Table 3-32. Tool Settings - Listing Format Options (continued)

Option	Description
Pretty Print Listing	**Checked** - The assembler aligns listing-file fields at fixed column positions (without regard to the related source file's format). This setting corresponds to the `PP` option of the `OPT` directive and to the `-opp` command-line option. **Cleared** - The assembler does not align listing-file fields at fixed column positions.
Relative Comment Spacing	**Checked** - The assembler uses relative comment spacing in the listing file. Checking this checkbox causes the position of comments in the listing file to float. This setting corresponds to the `RC` option of the `OPT` directive and to the `-orc` command-line option. **Cleared** - The assembler uses fixed comment spacing in the listing file.

3.3.5.7 Additional Arguments

Use this panel to specify StarCore assembler additional arguments.

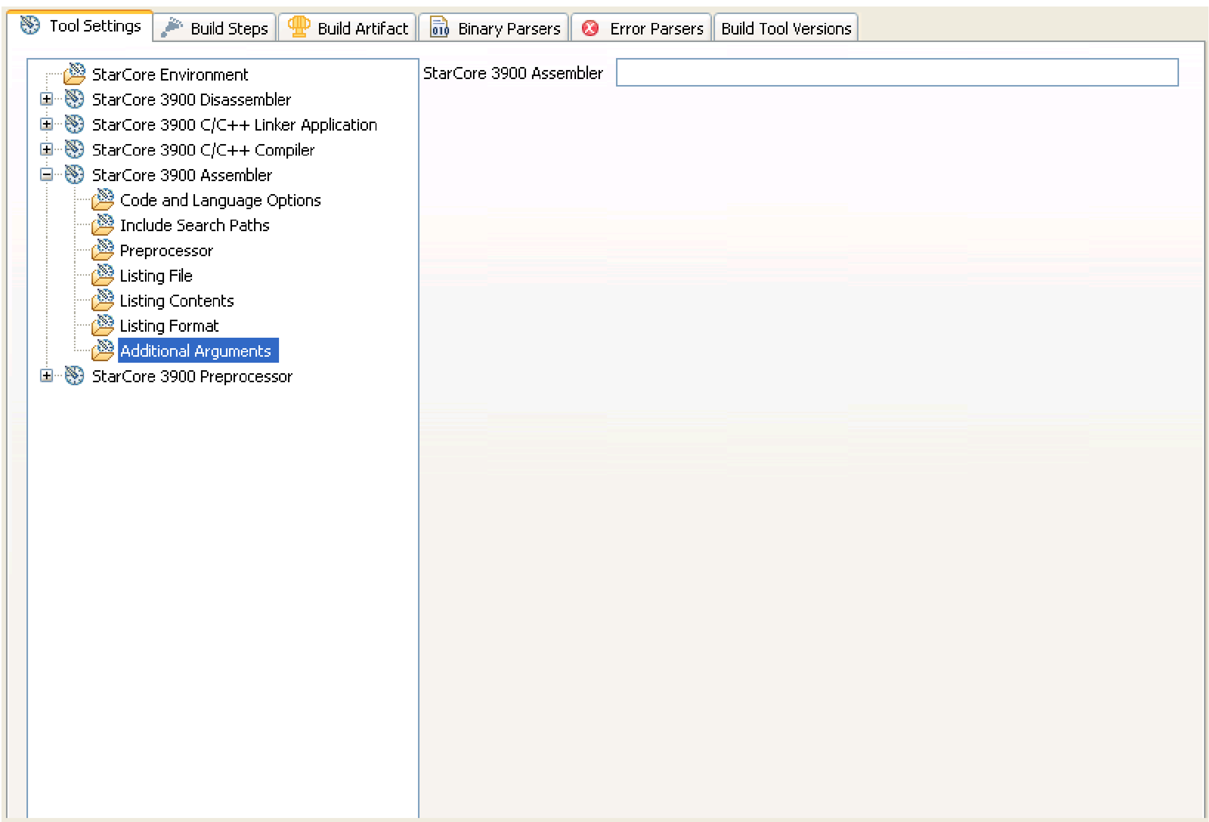


Figure 3-35. Tool Settings - Additional Arguments

Table 3-33 describes the various options available on the **Additional Arguments** panel.

Table 3-33. Tool Settings - Additional Arguments Options

Option	Description
StarCore 3900 Assembler	Specify additional command-line options to the assembler. The arguments specified in this panel apply will to all assembly language files in the current build target.

3.3.6 StarCore 3900 Preprocessor

Use this panel to specify the command, options, and expert settings for the StarCore 3900 preprocessor.

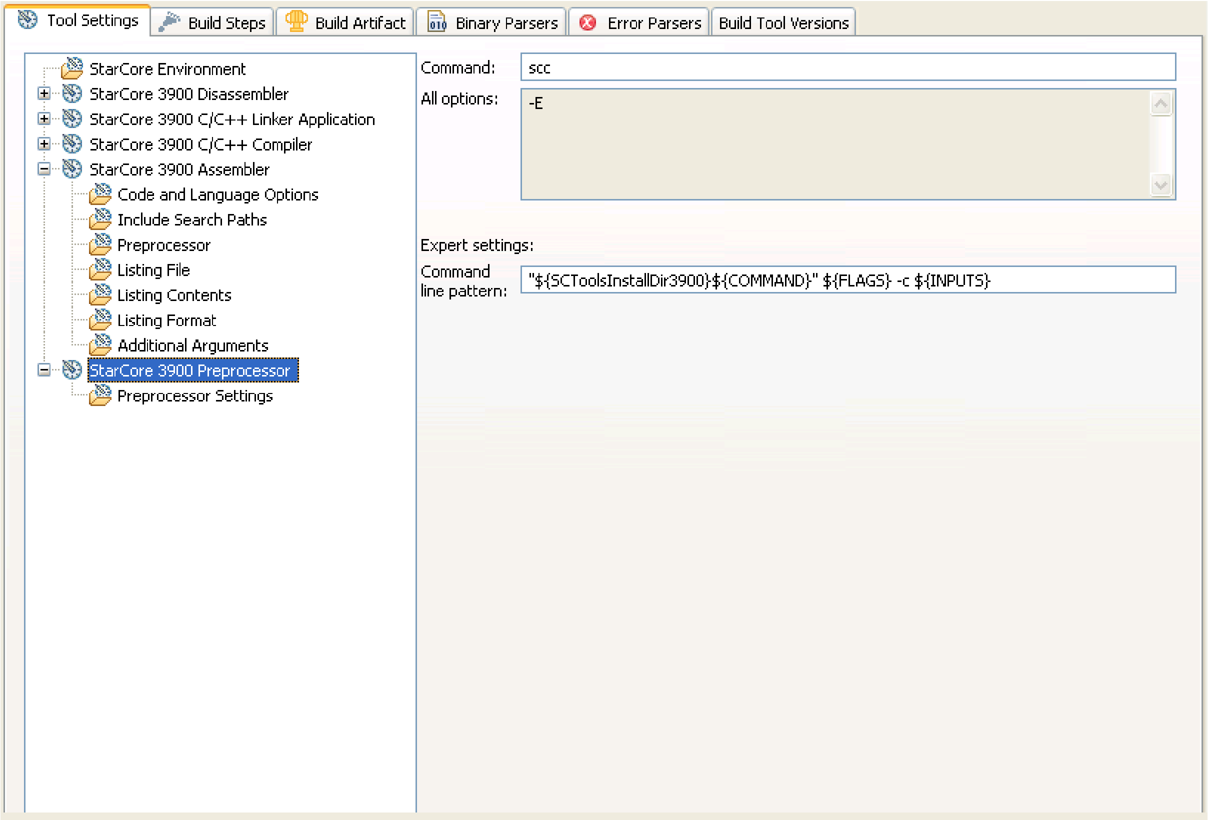


Figure 3-36. Tool Settings - StarCore 3900 Preprocessor

Table 3-34 describes the various options available on the **StarCore 3900 Preprocessor** panel.

Table 3-34. Tool Settings - StarCore 3900 Preprocessor Options

Option	Description
Command	Shows the location of the disassembler executable file.
All options	Shows the actual command line the disassembler will be called with.
Expert Settings: Command line pattern	Shows the expert settings command line parameters; default is `"${SCToolsInstallDir}${COMMAND}" ${FLAGS} ${INPUTS}`.

3.3.6.1 Preprocessor Settings

Use this panel to specify the Preprocessor behavior.

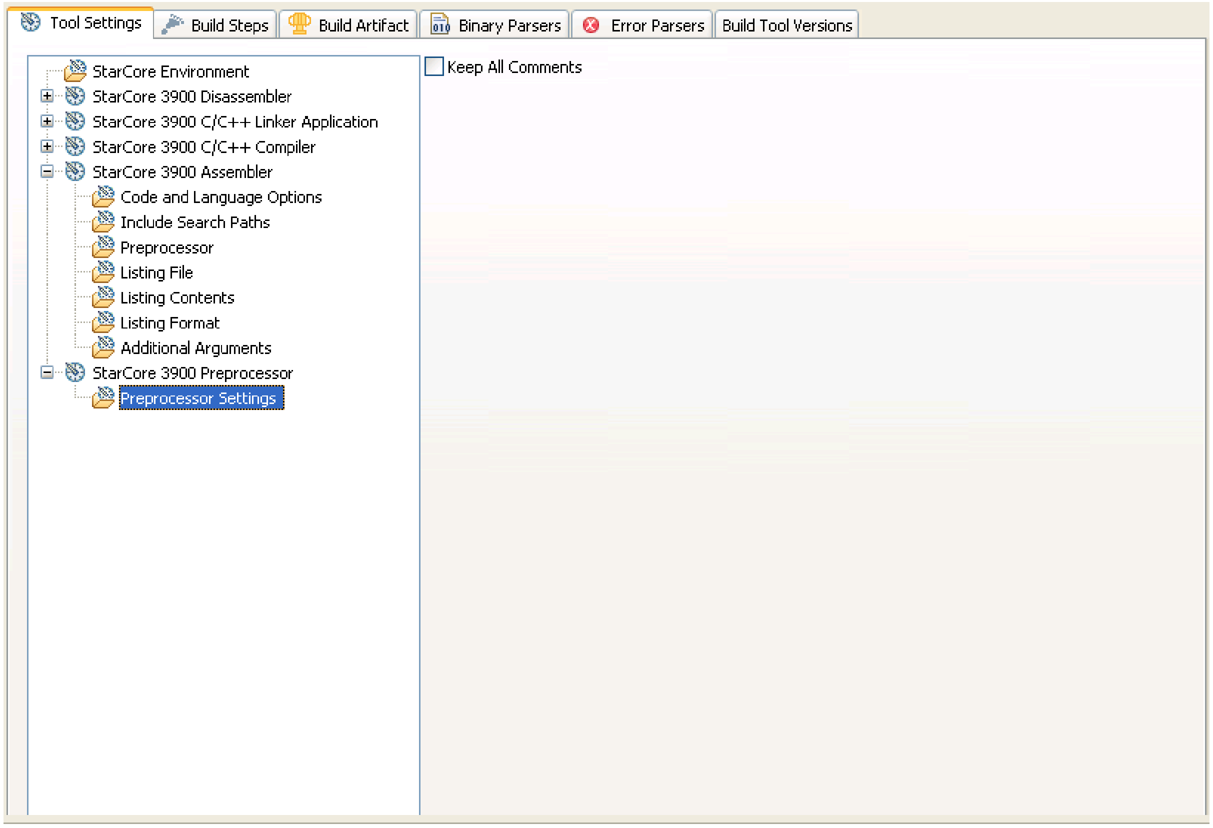


Figure 3-37. Tool Settings - Preprocessor Settings

Table 3-35 describes the various options available on the **Preprocessor Settings** panel.

Table 3-35. Tool Settings - Preprocessor Settings Options

Option	Description
Keep All Comments	**Checked** -The preprocessor preserves all the comments. **Cleared** -The preprocessor does not preserve comments.

Chapter 4
Debug Configurations

A CodeWarrior project can have multiple associated debug configurations.

A debug configuration is a named collection of settings that the CodeWarrior tools use.

The CodeWarrior project wizard generates launch configurations with names that follow the pattern **projectname - configtype - targettype**, where:

- **projectname** represents the name of the project
- **configtype** represents the type of launch configuration
- **targettype** represents the type of target software or hardware on which the launch configuration acts

If you use the CodeWarrior wizard to create a new project, the IDE creates two debugger related launch configurations:

- a **Debug** configuration that produces unoptimized code for development purposes
- a **Release** configuration that produces code intended for production purposes

This chapter explains:

- Using Debug Configurations Dialog Box
- Customizing Debug Configurations
- Reverting Debug Configuration Settings

4.1 Using Debug Configurations Dialog Box

The **Debug Configurations** dialog box allows you to specify debugger-related settings for your CodeWarrior project.

NOTE

As you modify a launch configuration's debugger settings, you create pending, or unsaved, changes to that launch configuration. To save the pending changes, you must click the **Apply** button of the **Debug Configurations** dialog box, or click the **Close** button and then the **Yes** button.

Table 4-1. Debug Configurations Dialog Box Tabs

Main	
Arguments	
Debugger	Debug
	Download
	Other Executables
	Symbolics
	OS Awareness
Source	
Environment	
Common	
Trace and Profile	

4.1.1 Main

Use this tab to specify the project and the application you want to run or debug.

You can also specify a connection configuration on this tab.

The following figure shows the **Main** tab.

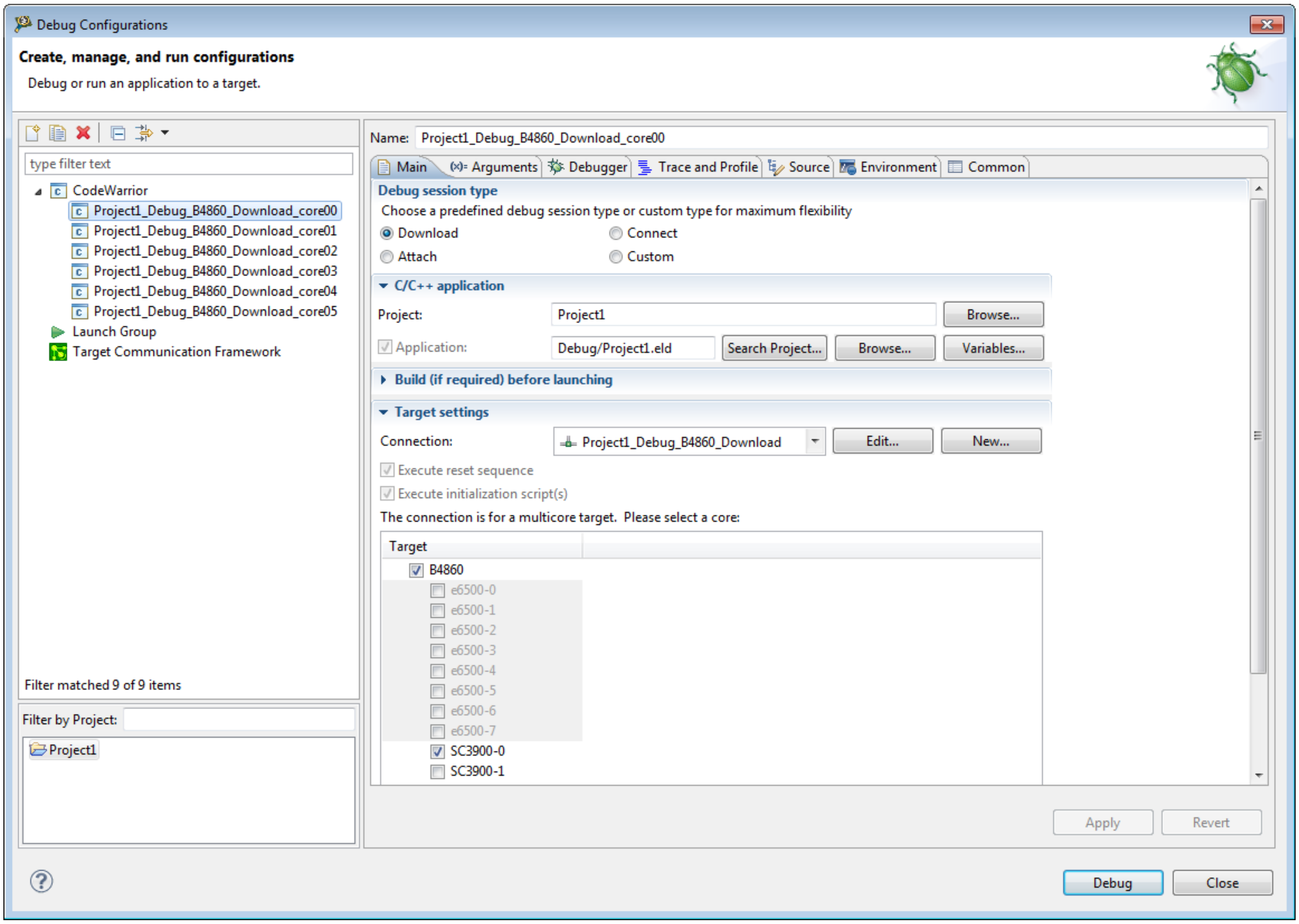


Figure 4-1. Debug Configurations - Main Tab

The table below lists the various sections available on the **Main** tab page.

Table 4-2. Main tab sections

Section
Debug Session Type
C/C++ application
Build (if required) before launching
Target settings

4.1.1.1 Debug Session Type

You can use this section to select one of the pre-defined debug session type or create a custom debug session.

The table listed below describes the options in the **Debug session type** section in the **Main** tab page.

Table 4-3. Main Tab - Debug session type options and use cases

Option	Typical Use Example
Attach	Debug a target system without modifying its state at all initially, but allow use of symbolics during actual debug. Useful for debugging a system that is already up and running. For more details, see Attach .
Connect	Raw debug of a board without any software or symbolics. Useful during hardware bring up, and often combined with scripts for checking various aspects of the hardware. For more details, see Connect .
Download	Develop code that gets downloaded to the system on debugger launch. Useful for bareboard code development without a working bootloader. For more details, see Download .
Custom	Debug a target system using additional debugging features. Useful when a Custom debug configuration may needs to be transformed into an Attach or Connect configuration. For more details, see Custom .

NOTE

The default debugger configuration causes the debugger to cache symbolics between sessions. However, the **Connect** command invalidates this cache. If you must preserve the contents of the symbolics cache, and you plan to use the **Connect** command, clear the **Cache Symbolics Between Sessions** checkbox in the **Symbolics page** of the **Debug Configurations** dialog box just before you issue the **Connect** command.

The table listed below shows the debugging phases supported by the launch configurations at the run-time.

NOTE

The **CodeWarrior Attach** launch configuration does not support restarting a debugging session.

Table 4-4. CodeWarrior Launch Configurations-Run-time behavior

Startup Phase	Download	Attach	Connect	Custom
Load symbolic info for main application	Yes	Yes	Not applicable	Optional
Reset target	Yes	No	Yes	Optional
Initialization	Yes	Optional	Yes	Optional

Table continues on the next page...

Table 4-4. CodeWarrior Launch Configurations-Run-time behavior (continued)

Startup Phase	Download	Attach	Connect	Custom
Download	Optional	No	Not applicable	Optional
OS Awareness	Optional	Optional	Not applicable	Optional
Initialize PC	Optional	No	Not applicable	Optional
Stop at startup	Optional	No	Not applicable	Optional

4.1.1.1.1 Attach

The **Attach** command assumes that code is already running on the board and therefore does not run a target initialization file.

The state of the running program is undisturbed. The debugger loads symbolic debugging information for the current build target's executable. The result is that you have the same source-level debugging facilities you have in a normal debug session (the ability to view source code and variables, and so on). The function does not reset the target, even if the launch configuration specifies this action. Further, the command loads symbolics, does not stop the target, run an initialization script, download an ELF file, or modify the program counter (PC).

NOTE

The debugger assumes that the current build target's generated executable matches the code currently running on the target.

In a debugging session, the **CodeWarrior Attach** launch configuration skips setting up the target hardware, and downloading the program image to that target hardware. The code image might reside on the target hardware already, or you might want to skip setting up the target hardware. Like the **CodeWarrior Connect** launch configuration, the settings in the Arguments and Environment panels do not apply.

Although similar to a debugging session, the goal of attaching the debugger to a process is to get insight into the current state of that process, and to do so with minimal disturbance to its state of execution. Having the debugger attach to a process skips most of the state-altering steps involved in starting a debugging session, such as resetting the target, initializing the target, and downloading code. When the debugger finishes attaching to the process, you have many of the debugging capabilities that you would have in a debugging session (such as source-level debugging, line breakpoints, watchpoints, console input/output, and so on).

NOTE

The debugger does not support restarting debugging sessions that you start by attaching the debugger to a process.

A process is an active program and related resources:

- Executing program code
- An address space
- One or more threads of execution. A thread is a unit of activity that has a program counter and a set of processor registers
- A data section
- A set of resources, such as open files and pending signals

On a bareboard (without an operating system), a given core has one process: one thread of execution executing one program in one address space. With an operating system, there can be several processes on a given core (with one active at any given moment).These processes either run different programs in different address spaces or even execute the same program, sharing an address space, open files, and so on.

4.1.1.1.2 Connect

The **Connect** command runs the target initialization file specified in the **Properties for <Target>** dialog box.

This file is responsible for setting up the board before connecting to it. The **Connect** function does not load any symbolic debugging information for the current build target's executable. You therefore do not have access to source-level debugging and variable display. The **Connect** command resets the target if the launch configuration specifies this action. Further, the command stops the target, (optionally) runs an initialization script, does not load symbolics, download an ELF file, or modify the program counter (PC).

In a debugging session, the **CodeWarrior Connect** launch configuration skips downloading the code image to the target hardware, and loading symbolics into the debugger. Skipping these steps is useful for board initialization and bring-up. The code might reside on the target hardware already, or you might want to skip loading symbolics into the debugger.

Like the CodeWarrior Attach launch configuration, the settings in the **Arguments** and **Environment** panels do not apply. The **Source** tab is available, however, so that you can specify source paths in order to load an image after connecting the debugger to the target.

4.1.1.1.3 Download

The **Debug** command resets the target if the launch configuration specifies the action.

Further, the command stops the target, (optionally) runs an initialization script, downloads the specified ELF file, and modifies the PC.

In a debugging session, the **CodeWarrior Download** launch configuration downloads the code image to the target hardware, and loads symbolics into the debugger. The **Source** tab can be used to specify source paths in order to load an image after connecting the debugger to the target.

4.1.1.1.4 Custom

Custom debug session type provides maximum flexibility to choose between debugging features.

4.1.1.2 C/C++ application

Use this section to control how C/C++ application is configured for the launch configuration.

The following table lists the options in the **C/C++ application** section in the **Main** tab page.

Table 4-5. Main Tab - C/C++ application options

Option	Description
Project	Specifies the project to associate with the selected debug launch configuration. Click **Browse** to select a different project.
Application **NOTE:** This option is disabled when the **Connect** debug session type is selected.	Check, if you want to use an target application. And, specify the name and location of the C or C++ application in the corresponding text box. Clear, if you do not want to use a target application.
	Search Project - Click to open the **Program Selection** dialog box and select from the binary files generated for the selected project.
	Browse - Click to open the **Open** dialog box and select any binary file.
	Variables - Click to open the **Select build variable** dialog box and select the build variables to be associated with the program.

Table 4-5. Main Tab - C/C++ application options

Option	Description

	NOTE: The dialog box displays an aggregation of multiple variable databases and not all these variables are suitable to be used from a build environment. Given below are the variables that should be used:
	• `ProjDirPath` - returns the absolute path of the current project location in the file system
	`${ProjDirPath}/Source/main.c"`
	• `workspace_loc` - returns the absolute path of a workspace resource in the file system, or the location of the workspace if no argument is specified
	`${workspace_loc:/ProjectName/Source main.c"`

4.1.1.3 Build (if required) before launching

Use this section to control how auto build is configured for the launch configuration.

Changing this setting overrides the global workspace setting and can provide some speed improvements.

The following table lists the options in the **Build (if required) before launching** section in the **Main** tab page.

Table 4-6. Main Tab - Build (if required) before launching options

Option	Description
Build Configuration	Specifies the configuration to build before launching the resulting executable.
Select configuration using `C/C++ Application'	Select to build the build configuration that generated the file specified in the Application text box, before launching the application. When the **Select configuration using `C/C++ Application'** checkbox is selected, the **Build Configuration** drop-down list is disabled, and the build configuration that generated the file specified in the **Application** text box is selected to be built before launching the application.
Disable auto build	Disables auto build for the launch configuration which may improve launch performance.
Enable auto build	Enables auto build for the launch configuration which can slow down launch performance.
Use workspace settings (default)	Uses the global auto build settings.
Configure Workspace Settings	Opens the **Launching** preference panel where you can change the workspace settings.

4.1.1.4 Target settings

Use this section to control how the target is configured for the launch configuration.

The following table lists the options in the **Target settings** section in the **Main** tab page.

Table 4-7. Main Tab - Target settings Options

Option	Description
Connection	Specifies the applicable connection configuration.
Edit	Click to edit the selected connection configuration.
New	Click to create a new connection configuration for the selected project and application.
Execute reset sequence	Check to apply reset settings, specified in the target configuration. Alternatively, clear the option to ignore reset settings. **NOTE:** This option is disabled when the **Connect** or **Attach** debug session type is selected.
Execute initialization script(s)	Check to execute the initialization script(s), specified in the target configuration. Alternatively, clear the option to ignore the initialization script(s). **NOTE:** This option is disabled when the **Connect** debug session type is selected.
Target	Select the core to be debugged. The list of cores is displayed in the Target list, if the selected connection configuration is for a multicore target.

4.1.2 Arguments

Use this tab to specify the program arguments that an application uses and the working directory for a run or debug configuration.

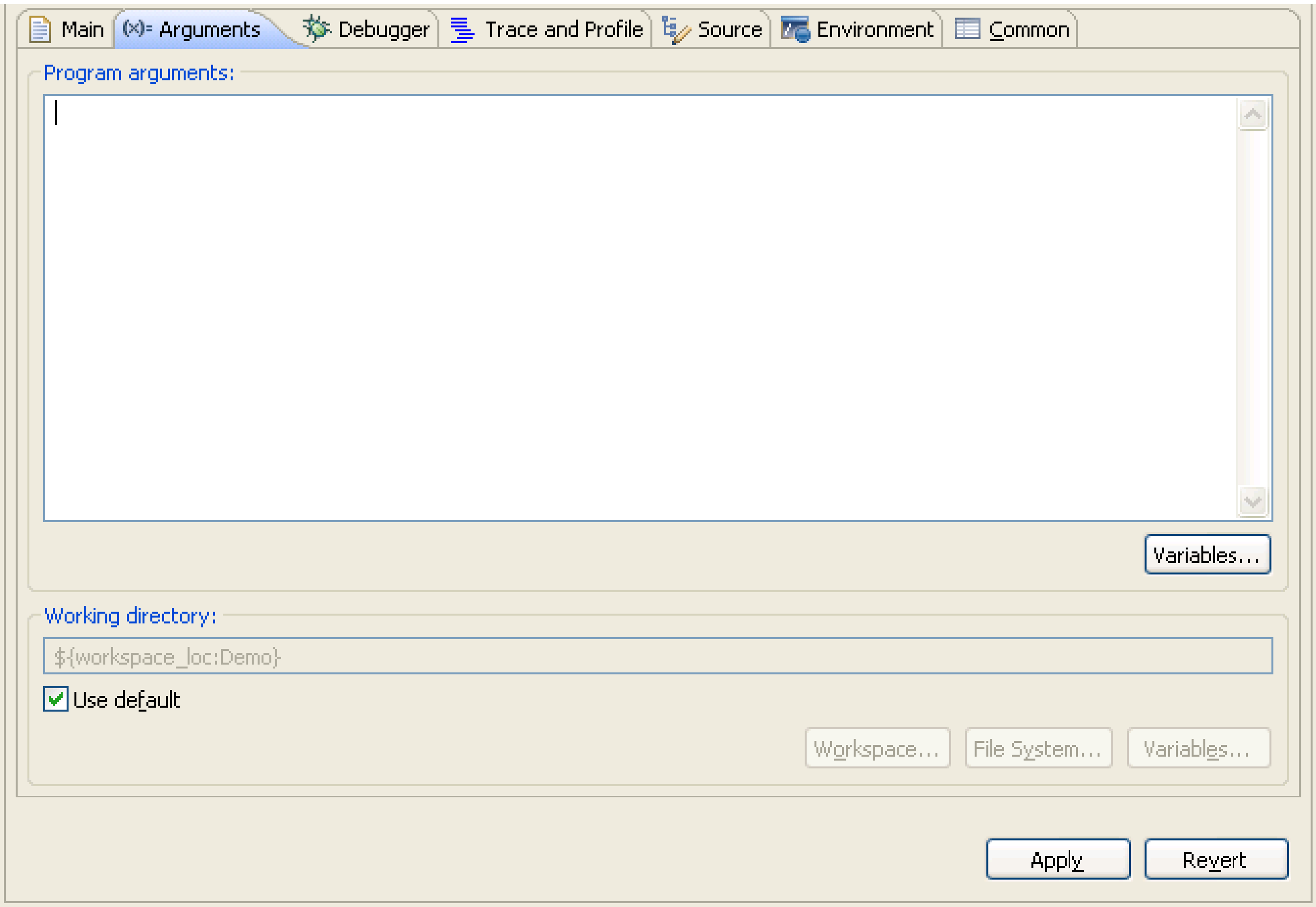


Figure 4-2. Debug Configurations-Arguments tab

The table below lists the various options available on the **Arguments** tab page.

Table 4-8. Arguments Tab options

Option	Description
Program arguments	Specifies the arguments passed on the command line.
Variables	Click to select variables by name to include in the program arguments list.
Working Directory	Specifies the run/debug configuration working directory.
Use default	Check to specify the local directory or clear to specify a different workspace, a file system location, or variable.
Workspace	Click to specify the path of, or browse to, a workspace relative working directory.
File System	Click to specify the path of, or browse to, a file system directory.
Variables	Click to specify variables by name to include in the working directory.

4.1.3 Debugger

Use this tab to configure debugger settings.

The **Debugger** tab presents different pages for specifying different settings.

NOTE

The content in the **Debugger Options** panel changes, depending on the **Debug session type** selected on the **Main** tab page.

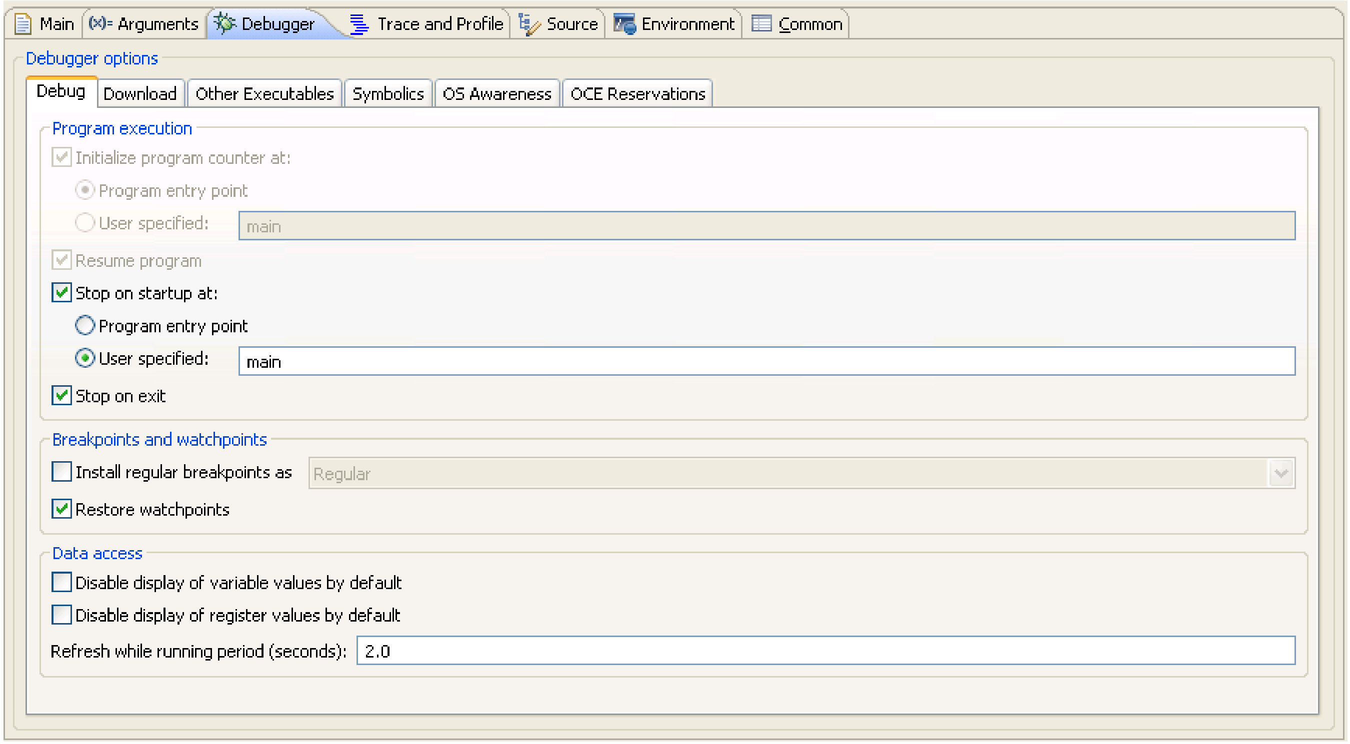


Figure 4-3. Debug Configurations-Debugger tab

The table below lists the various options available on the **Arguments** tab page.

Table 4-9. Debugger tab options

Option	Description
Debugger Options	Displays configuration options specific to the selected debugger type. See the following sections for more details: • Debug • Download • Other Executables • Symbolics • OS Awareness

NOTE

OCE feature is not supported in current release.

4.1.3.1 Debug

Use this page to specify the program execution options, Breakpoint and watchpoint options, and target access behavior.

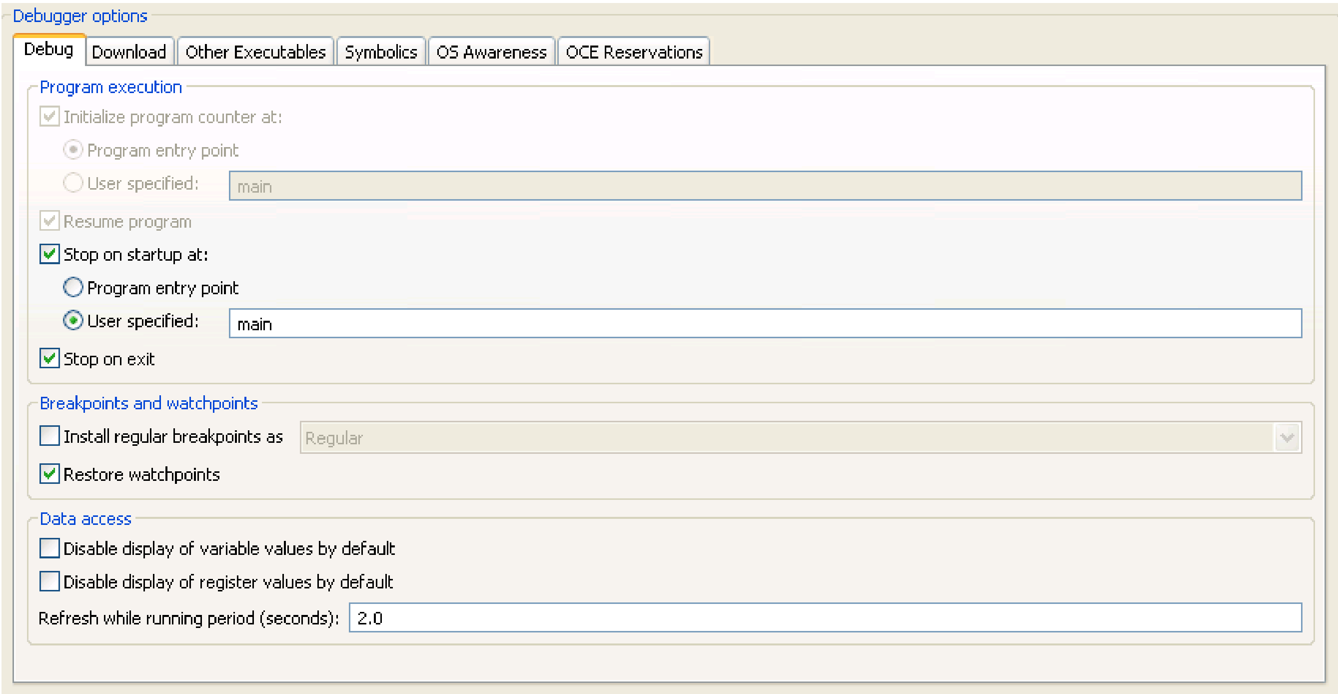


Figure 4-4. Debugger Options-Debug Page

NOTE

The options displayed on the **Debug** tab varies depending on the selected launch configuration.

The table below lists the various options available on the **Debug** page.

Table 4-10. Debugger Options - Debug

Option	Description
Initialize program counter at	Controls the initialization of program counter. • **Program entry point** - Select to initialize the program counter at a specified program entry pont. • **User specified** - Select to initialize the program counter at a user-specified function. The default location is `main`. **NOTE:** Disabling this option will also disable the **Resume program** and **Stop on startup at** options.
Resume program	Select to resume the execution after the program counter is initialized.

Table continues on the next page...

Table 4-10. Debugger Options - Debug (continued)

Option	Description
	NOTE: Disabling this option will also disable the **Stop on startup at** option.
Stop on startup at	Stops program at specified location. When cleared, the program runs until you interrupt it manually, or until it hits a breakpoint. • **Program entry point** - Select to stop the debugger at a specified program entry point. • **User specified** - Select to stop the debugger at a user-specified function. The default location is `main`.
Stop on exit	Check this option to have the debugger set a breakpoint at the code's exit point. For multicore projects, when you set this option for one project on one core, it is set for projects on the other cores. Clear this option to prevent the debugger from setting a breakpoint at the code's exit point.
Install regular breakpoints as	Check this option to install breakpoints as either: • Regular • Hardware • Software Clear this option to install breakpoints as Regular breakpoints.
Restore watchpoints	Check this option to restore previous watchpoints.
Disable display of variable values by default	Check this option to disable the display of variable values. Clear this option to enable the display of variable values
Disable display of register values by default	Check this option to disable the display of register values. Clear this option to enable the display of register values
Refresh while running period (seconds)	Specifies the refresh period used when a view is configured to refresh, while the application is running. By default, the refresh period is set to two seconds.

4.1.3.2 Download

Use this page to specify which executable code sections the debugger downloads to the target, and whether the debugger should read back those sections and verify them.

NOTE

Selecting all options in the **Program Download Options** group significantly increases download time.

Initial Launch options apply to the first debugging session. Successive Runs options apply to subsequent debugging sessions.

The **Download** options control whether the debugger downloads the specified Program Section Data type to the target hardware. The **Verify** options control whether the debugger reads the specified Program Section Data type from the target hardware and compares the read data against the data written to the device.

The Section Data type corresponds to the section defined in the linker command file (.lcf).

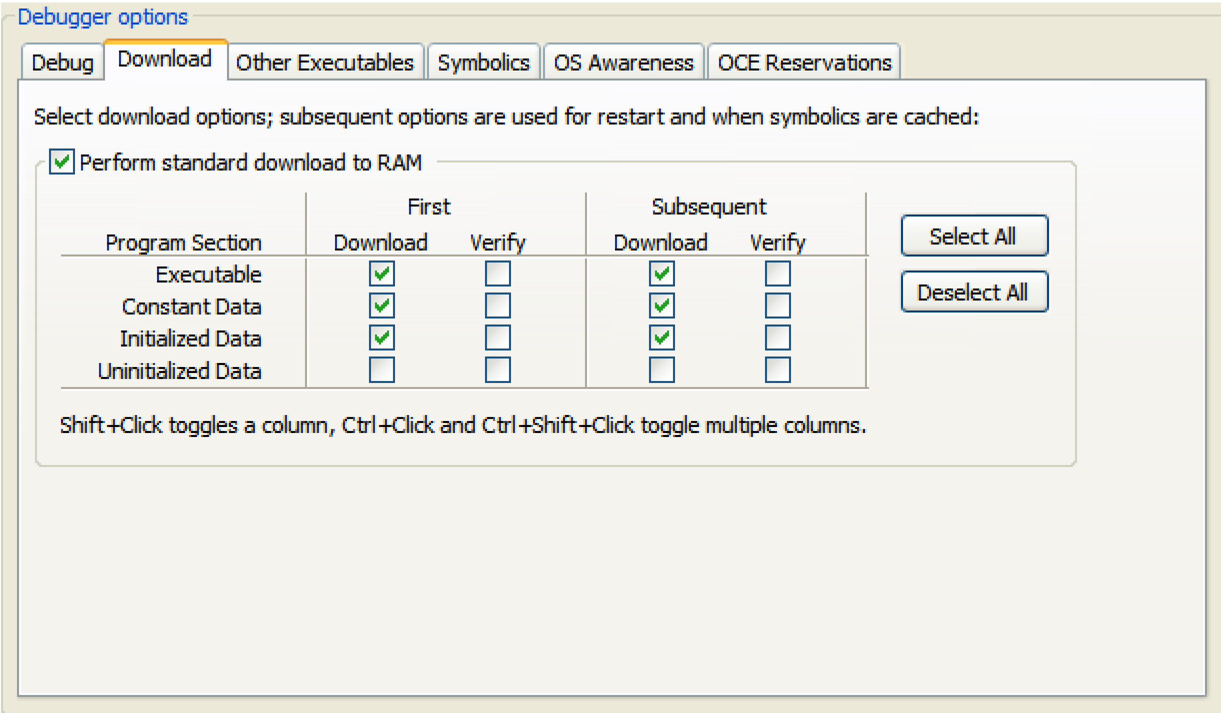


Figure 4-5. Debugger Options-Download Page

The table below lists the various options available on the Download page.

Table 4-11. Debugger Options - Download

Section Data Type	Explanation
Executable	Controls downloading and verification for executable sections. Check appropriate checkboxes to specify downloading and verifications, for initial launch and for successive runs.
Constant Data	Controls downloading and verification for constant-data sections. Check appropriate checkboxes to specify downloading and verifications, for initial launch and for successive runs.
Initialized Data	Controls downloading and verification for initialized-data sections. Check appropriate checkboxes to specify downloading and verifications, for initial launch and for successive runs.
Uninitialized Data	Controls downloading and verification for uninitialized-data sections. Check appropriate checkboxes to specify downloading and verifications, for initial launch and for successive runs.

Table 4-12. Section Data Type Corresponding to Linker Command file

Section Data Type	Linker Command File Section Type	Comments
Executable	Text	Program-code sections that have xflags in the linker-command file.

Table continues on the next page...

Table 4-12. Section Data Type Corresponding to Linker Command file (continued)

Section Data Type	Linker Command File Section Type	Comments
Constant Data	Data	Program-data sections that have neither xnor wflags in the linker command file.
Initialized Data	Data	Program-data sections with initial values. These sections have wflags, but not xflags, in the linker command file.
Uninitialized Data	bss	Program-data sections without initial values. These sections have wflags, but not xflags, in the linker-command file.

4.1.3.3 Other Executables

Use this page to specify additional ELF files to download or debug in addition to the main executable file associated with the launch configuration.

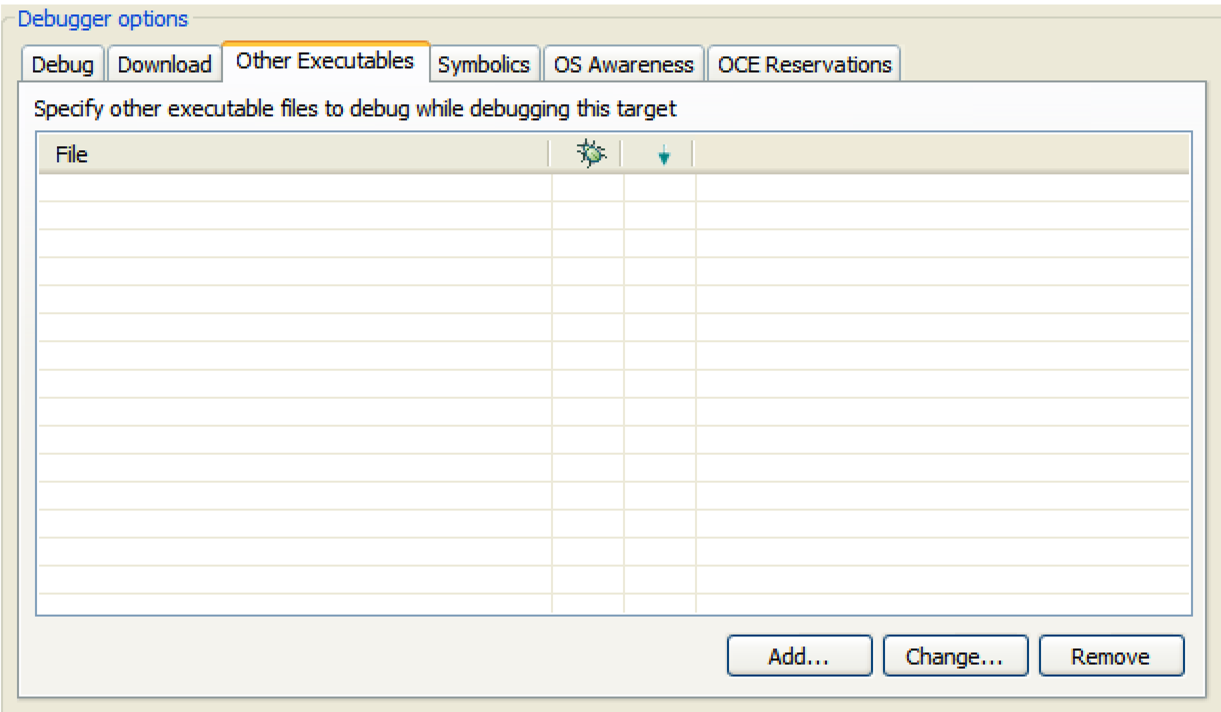


Figure 4-6. Debugger Options-Other Executables Page

The table below lists the various options available on the **Other Executables** page.

Table 4-13. Debugger Options - Other Executables

<table>
<tr><th>Option</th><th colspan="2">Description</th></tr>
<tr><td rowspan="3">File list</td><td colspan="2">Shows files and projects that the debugger uses during each debug session.</td></tr>
<tr><td></td><td>Debug column:
• Checked-The debugger loads symbolics for the file.
• Cleared-The debugger does not load symbolics for the file.</td></tr>
<tr><td></td><td>Download column:
• Checked-The debugger downloads the file to the Target Device.
• Cleared-The debugger does not download the file to the Target Device.</td></tr>
<tr><td>Add</td><td colspan="2">Click to open the Debug Other Executable dialog box, and add other executable file to debug while debugging this target.

Use this dialog box to specify the following settings:

• Specify the location of the additional executable - Enter the path to the executable file that the debugger controls in addition to the current project's executable file. Alternatively, click the Browse button to open a dialog box that you can use to specify the path.
• Load symbols - Check to have the debugger load symbols for the specified file. Clear to prevent the debugger from loading the symbols. The Debug column of the File list corresponds this setting.
• Download to device - Check to have the debugger download the specified file to the target device. If you are debugging a Linux application, you can enter in the Specify the remote download path text box the path on the device to which you want to download the file.

NOTE: The Specify the remote download path option applies just to Linux application debugging; you should leave the text box blank for all other types of debugging sessions.
Clear the Download to device checkbox to prevent the debugger from downloading the file to the device. The Download column of the File list corresponds to the Download to device setting.
• OK - Click to add the information that you specify in the Debug Other Executable dialog box to the File list.</td></tr>
<tr><td>Change</td><td colspan="2">Click to change the settings for the entry currently selected in the File list column. Change this information as needed, then click the OK button to update the entry in the File list.</td></tr>
<tr><td>Remove</td><td colspan="2">Click to remove the entry currently selected in the File list.</td></tr>
</table>

4.1.3.4 Symbolics

Use this page to specify whether the IDE keeps symbolics in memory.

Symbolics represent an application's debugging and symbolic information. Keeping symbolics in memory, known as caching symbolics, is beneficial when you debug a large-size application.

Consider a situation in which the debugger loads symbolics for a large application, but does not download content to a hardware device and the project uses custom makefiles with several build steps to generate this application. In such a situation, caching symbolics helps speed up the debugging process. The debugger uses the readily available cached symbolics during subsequent debugging sessions. Otherwise, the debugger spends significant time creating an in-memory representation of symbolics during subsequent debugging sessions.

NOTE

Caching symbolics provides the most benefit for large applications, where doing so speeds up application-launch time. If you debug a small application, caching symbolics does not significantly improve the launch times.

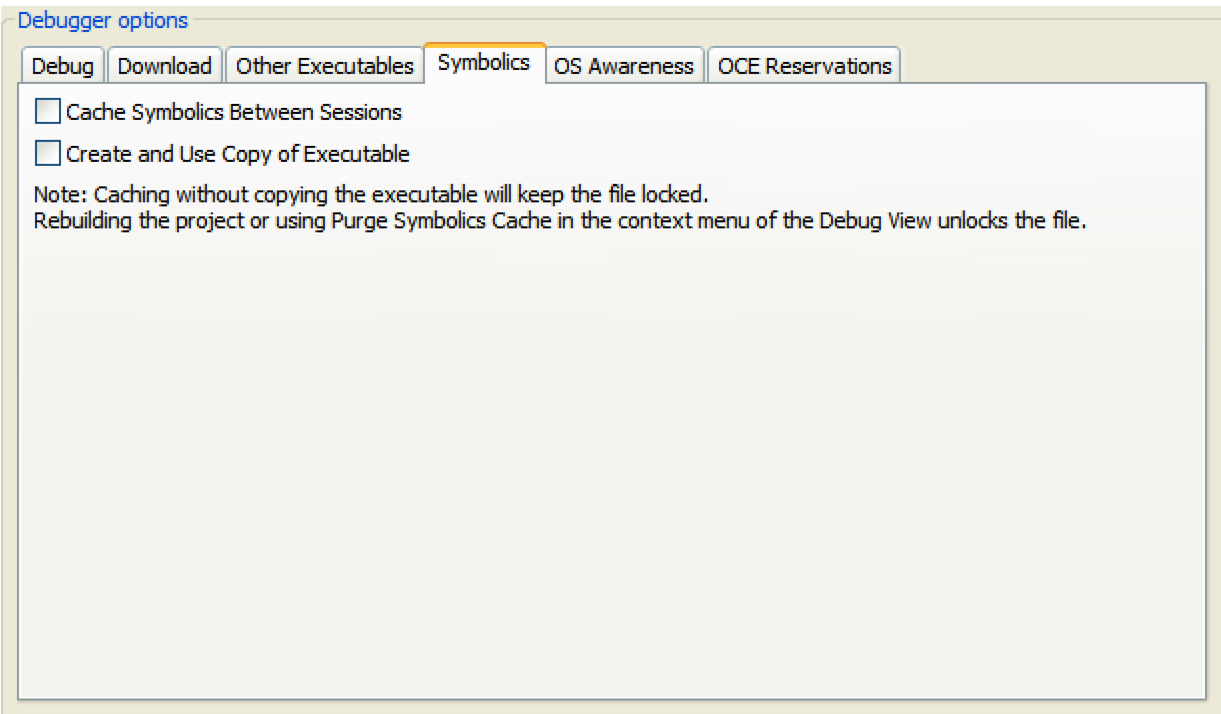


Figure 4-7. Debugger Options-Symbolics Page

The table below lists the various options available on the **Symbolics** page.

Table 4-14. Debugger Options - Symbolics

Option	Description
Cache Symbolics Between Sessions	Check this option to have the debugger cache symbolics between debugging sessions. If you check this checkbox and clear the **Create and Use Copy of Executable** checkbox, the executable file remains locked after the debugging session ends. In the **Debug** view, right-click the locked file and select **Un-target Executables** to have the debugger delete its symbolics cache and release the file lock. The IDE enables this menu command when there are currently unused cached symbolics that it can purge. Clear this option so that the debugger does not cache symbolics between debugging sessions.
Create and Use Copy of Executable	Check this option to have the debugger create and use a copy of the executable file. Using the copy helps avoid file-locking issues with the build system. If you check this checkbox, the IDE can build the executable file in the background during a debugging session. Clear this option so that the debugger does not create and use a copy of the executable file.

4.1.3.5 OS Awareness

Use this page to specify the operating system (OS) that resides on the target device.

Use the **Target OS** list box to specify the OS that runs on the target device, or specify **None** to have the debugger use the bareboard.

For more information, see the *SmartDSP OS Concepts Guide*.

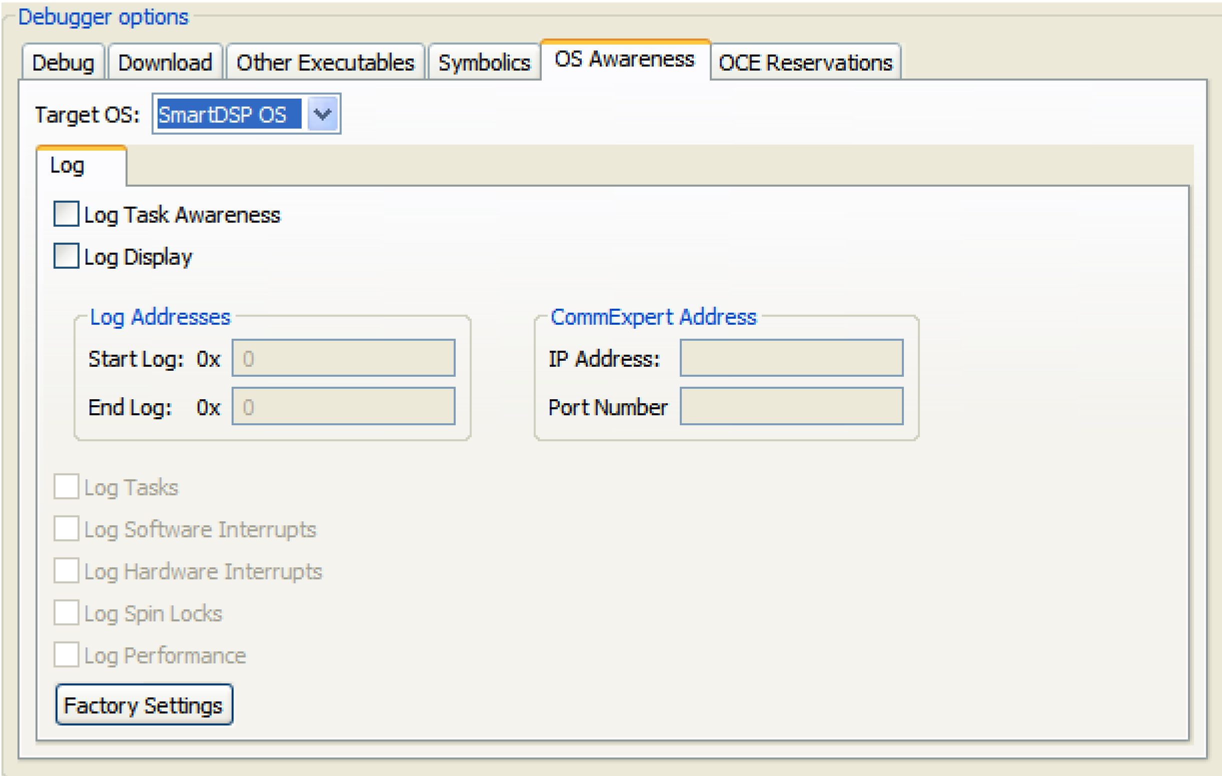


Figure 4-8. Debugger Options-OS Awareness Page

The table below lists the options available on the **OS Awareness** page.

Table 4-15. Debugger Options - OS Awareness

Option	Description
Log Task Awareness	Enables the logging of Task Awareness in the Kernel Awareness Log Viewer
Log Display	Enables graphic Display of the log
Start log	Specify the Kernel Awareness log start address
End log	Specify the Kernel Awareness log end address
IP Address	Specify the CommExpert IP Address
Port Number	Specify the CommExpert IP Address
Log Tasks	Enables the logging of Tasks in the Kernel Awareness Log Viewer
Log Software Interrupts	Enables the logging of Software Interrupts in the Kernel Awareness Log Viewer
Log Hardware Interrupts	Enables the logging of Hardware Interrupts in the Kernel Awareness Log Viewer
Log Spin Locks	Enables the logging of Spin Locks in the Kernel Awareness Log Viewer
Log Performance	Enables the logging of Performance in the Kernel Awareness Log Viewer
Factory Settings	Set the log addresses and events to default values

4.1.4 Source

Use this tab to specify the location of source files used when debugging a C or C++ application.

By default, this information is taken from the build path of your project.

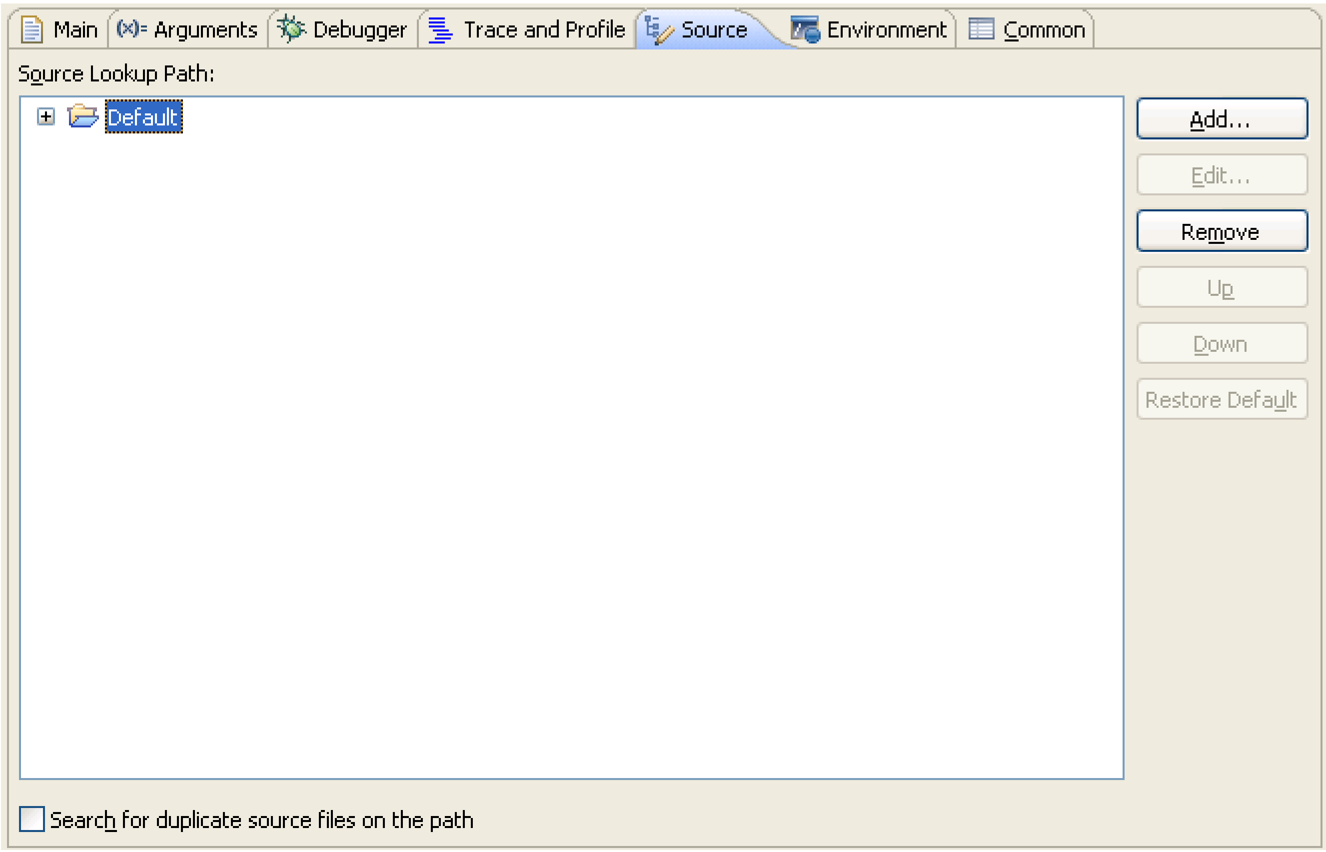


Figure 4-9. Debug Configurations-Source Tab

The table below lists the various options available on the **Source** tab page.

Table 4-16. Source Tab Options

Option	Description
Source Lookup Path	Lists the source paths used to load an image after connecting the debugger to the target.
Add	Click to add new source containers to the Source Lookup Path search list.
Edit	Click to modify the content of the selected source container.
Remove	Click to remove selected items from the **Source Lookup Path** list.
Up	Click to move selected items up the **Source Lookup Path** list.
Down	Click to move selected items down the **Source Lookup Path** list.
Restore Default	Click to restore the default source search list.

Table continues on the next page...

Table 4-16. Source Tab Options (continued)

Option	Description
Search for duplicate source files on the path	Select to search for files with the same name on a selected path.

4.1.5 Environment

Use this tab to specify the environment variables and values to use when an application runs.

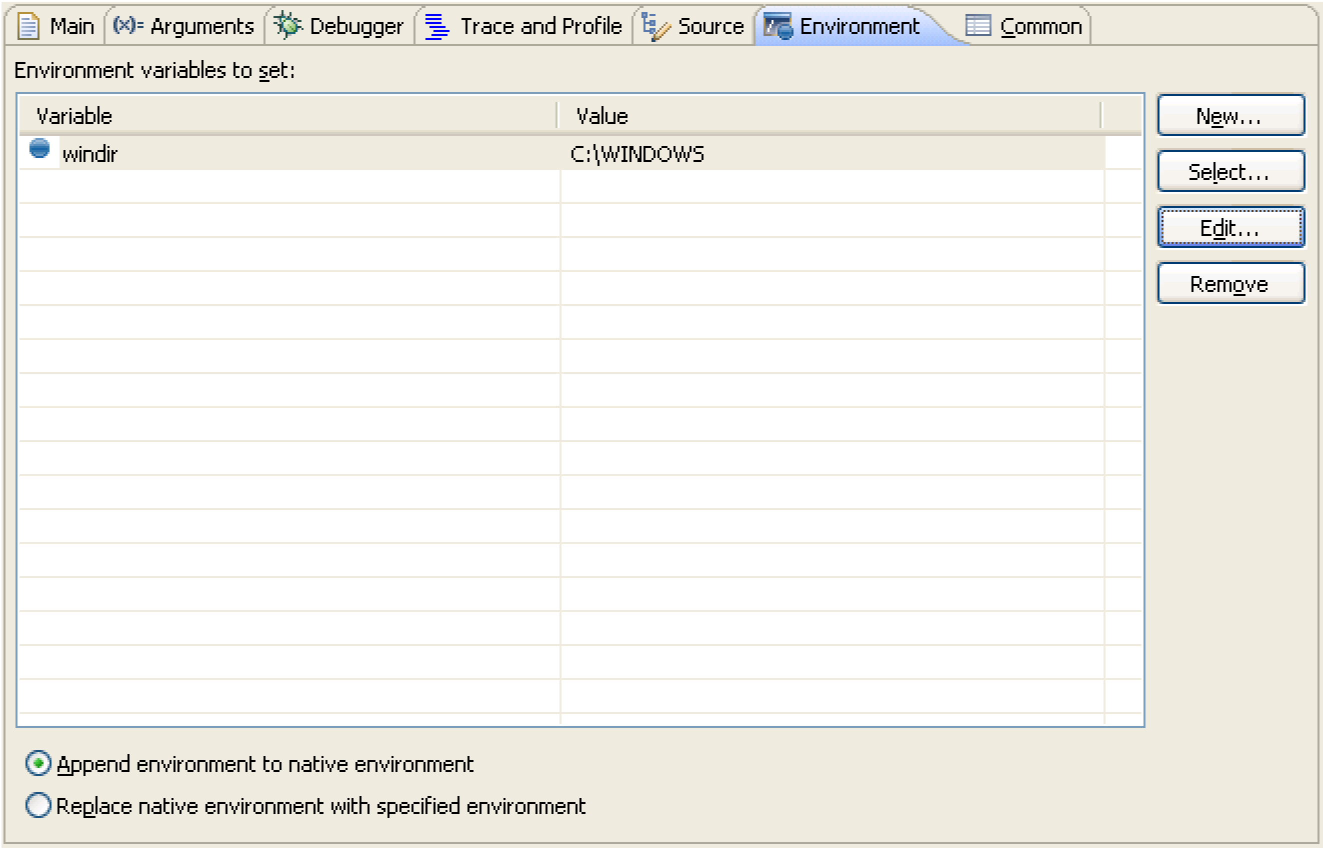


Figure 4-10. Debug Configurations-Environment Tab

The table below lists the various options available on the **Environment** tab page.

Table 4-17. Environment Tab Options

Option	Description
Environment Variables to set	Lists the environment variable name and its value.
New	Click to create a new environment variable.

Table continues on the next page...

Table 4-17. Environment Tab Options (continued)

Option	Description
Select	Click to select an existing environment variable.
Edit	Click to modify the name and value of a selected environment variable.
Remove	Click to remove selected environment variables from the list.
Append environment to native environment	Select to append the listed environment variables to the current native environment.
Replace native environment with specified environment	Select to replace the current native environment with the specified environment set.

4.1.6 Common

Use this tab to specify the location to store your run configuration, standard input and output, and background launch options.

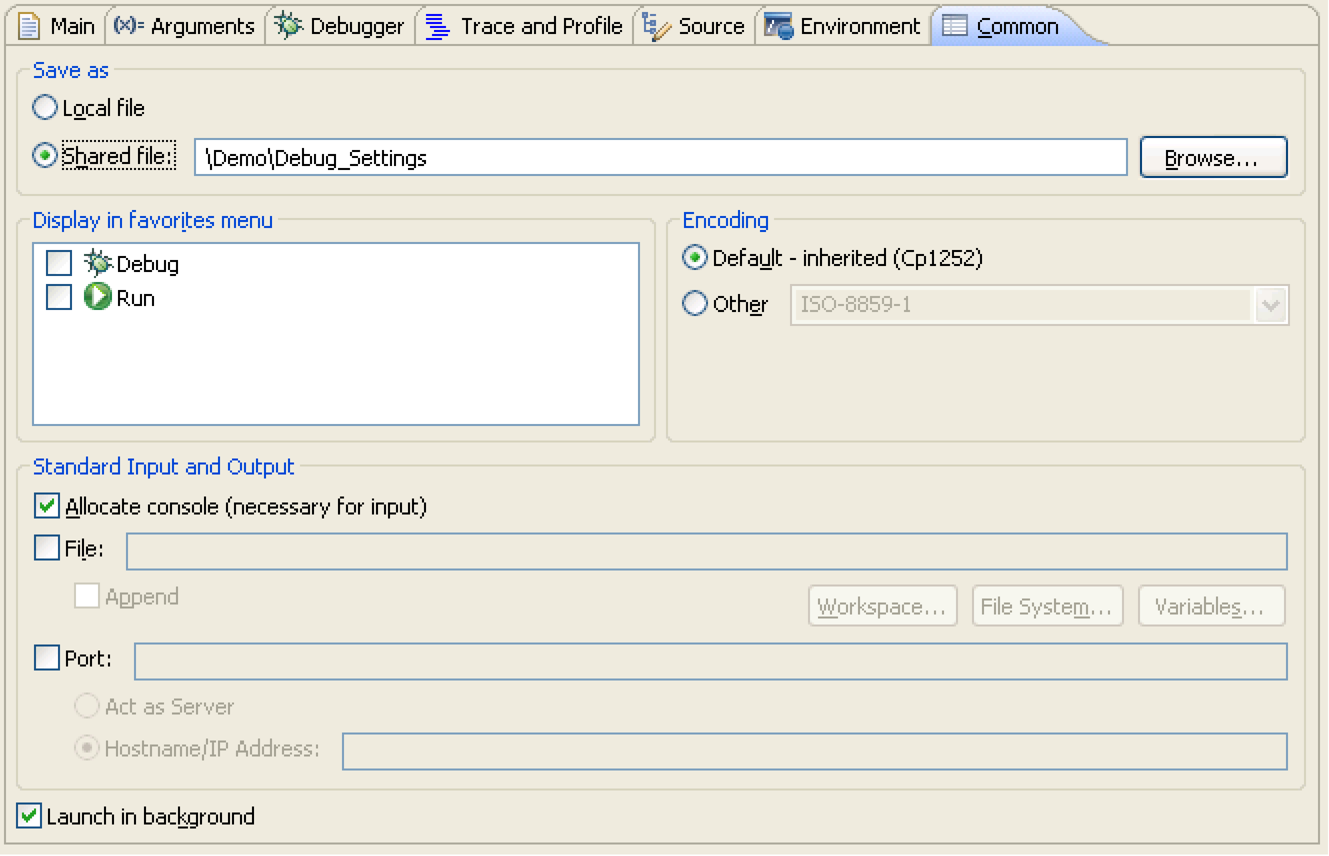


Figure 4-11. Debug Configurations-Common Tab

The table below lists the various options available on the **Common** tab page.

Table 4-18. Common Tab Options

Option	Description
Local file	Select to save the launch configuration locally.
Shared file	Select to specify the path of, or browse to, a workspace to store the launch configuration file, and be able to commit it to a repository.
Display in favorites menu	Select to add the configuration name to Run or Debug menus for easy selection.
Console Encoding	Select an encoding scheme to use for console output.
Allocate Console (necessary for input)	Select to assign a console view to receive the output.
File	Specify the file name to save output. .
Browse Workspace	Specifies the path of, or browse to, a workspace to store the output file.
Browse File System	Specifies the path of, or browse to, a file system directory to store the output file.
Variables	Select variables by name to include in the output file.
Append	Select to append output. Clear to recreate file each time.
Port	Select to redirect standard output (`stdout`, `stderr`) of a process being debugged to a user specified socket. **NOTE:** You can also use the `redirect` command in debugger shell to redirect standard output streams to a socket.
Act as Server	Select to redirect the output from the current process to a local server socket bound to the specified port.
Hostname/IP Address	Select to redirect the output from the current process to a server socket located on the specified host and bound to the specified port. The debugger will connect and write to this server socket via a client socket created on an ephemeral port
Launch in background	Select to launch configuration in background mode.

4.1.7 Trace and Profile

Use this page to configure the selected launch configuration for simulator and hardware profiling.

NOTE

Trace and Profile is available only for PACC and QDS targets.

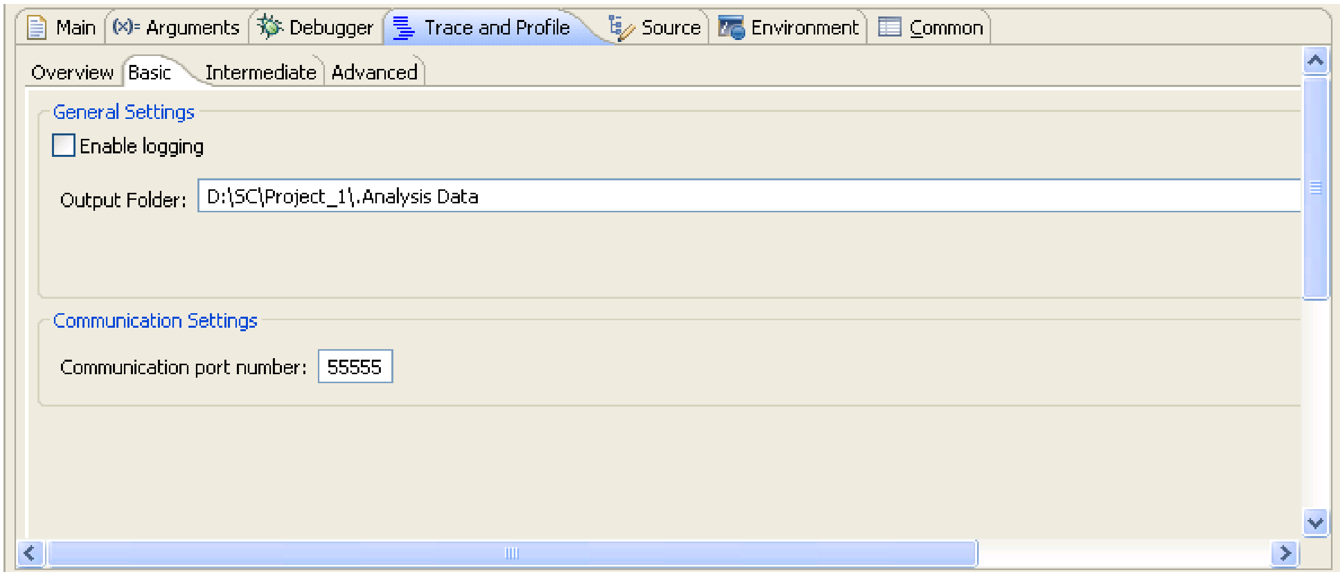


Figure 4-12. Debug Configurations-Trace and Profile Tab (PACC Simulator Target)

The table listed below explains the **Trace and Profile** tab options for PACC simulator targets.

Table 4-19. Trace and Profile Tab Options (PACC Simulator Target)

Option	Description
Basic Tab	
Enable logging	Check **Enable Logging** checkbox if you want that a log file is created. The log file has details of the actions that takes place while collecting the trace data. For example, when the debug session is terminated or when the target execution resumed or stopped.
Output Folder	Specify the location of folder that will store the trace and profile results.
Communication port number	Used in TCP/IP communication between software analysis and CCSSIM2. You should choose the free port no. from interval 0-65535.
Intermediate Tab	
Automatically (when debug session starts)	The trace collection process is started automatically when the debug session is launched.
Manually (using debug toolbar trace buttons)	This is the default behavior. This option is used when you want to manually control the trace collection. The trace collection process will not be started automatically on debug session launch, but the trace configuration options are applied, when you click on Start Trace Collection button.

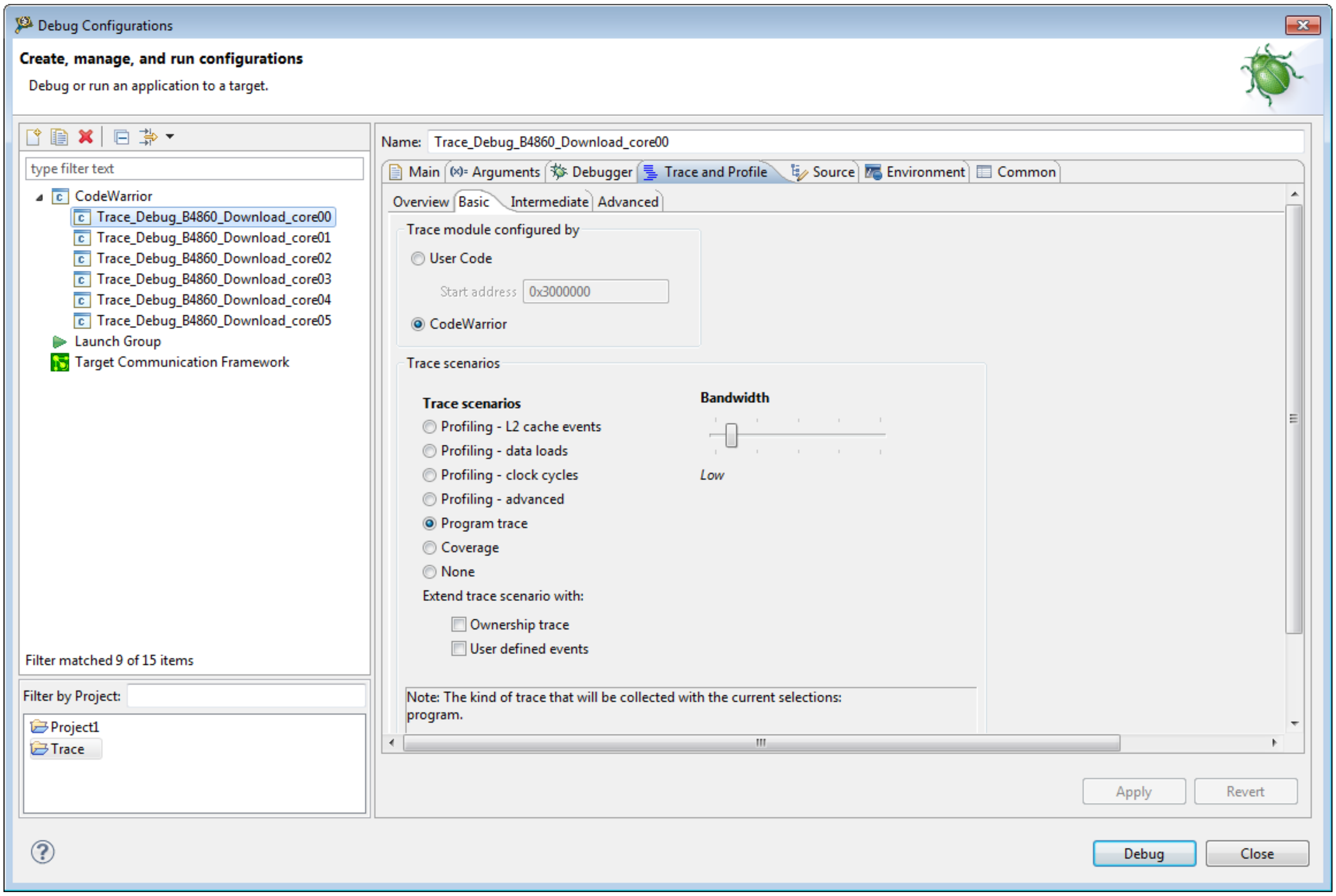


Figure 4-13. Debug Configurations - Trace and Profile Tab (QDS Hardware Target)

The table listed below explains the **Trace and Profile** tab options for the QDS hardware targets.

Table 4-20. Trace and Profile Tab Options (QDS Hardware Target)

Option	Description	
Basic Tab		
Trace module configured by	User Code	Allows to do the trace settings in the code without using the Trace and Profile page of Debug launch.
	CodeWarrior	Allows to do the trace settings using Trace and Profile page of Debug launch
Trace Scenario	Profiling - L2 cache events	Trace values of counters of both triad A and B on subroutine/interrupt call/return instructions
	Profiling - data loads	Trace values of counters of both triad A and B on subroutine/interrupt call/return instructions
	Profiling - clock cycles	Trace values of counters of triad A on subroutine/interrupt call/return instructions

Table continues on the next page...

Table 4-20. Trace and Profile Tab Options (QDS Hardware Target) (continued)

Option	Description	
	Profiling - advanced	Traces each change of flow instructions
	Program trace	Trace values of counters of both triad A and B on subroutine/interrupt call/return instructions
	Coverage	For C source lines, displays the percentage of number of assembly instructions executed from the total number of assembly instructions corresponding to the source line. For assembly source lines, it shows if the instructions were executed or not
	None	Traces only subroutine/interrupt call/ return instructions
Extend Trace Scenario with:	Ownership Trace	Traces information on current task ID. Ownership trace facilitates tracking the active operating system task by providing visibility to the special purpose registers designated for use by the OS for process ID
	User defined events	Traces any write to TMDAT and TMTAG core registers
Bandwidth		Each default trace scenario has a specific bandwidth. The bandwidth indicates how many messages are routed in trace stream, on hardware, depending on used trace scenario to collect trace
Intermediate Tab		
Trace collection	One Buffer	When the buffer is full, tracing stops, but not the target.
	Overwrite	Continue to write trace to buffer by overwriting old records in buffer - circular buffer.
	Continuos	Collects trace continuously till you suspend the target application.
Location	NPC Buffer	Saves trace data in NPC internal buffer.
	Gigabit TAP + Trace	Saves trace data in probe buffer.
	Probe buffer size (bytes)	Specifies the size of the probe buffer.
	DDR buffer	Saves trace data in DDR. Magenta is the bus that transfers trace data from NPC internal buffer to DDR.
	Buffer start address	Specifies the start address of the DDR where trace data is saved.
	Buffer size	Specifies the DDR memory size of the region used as trace buffer.
	Use settings from LCF file	Uses trace buffer start address and size from linker files. File `common.l3k` contains `_TRACE_BUFFER_size` and

Table continues on the next page...

Table 4-20. Trace and Profile Tab Options (QDS Hardware Target) (continued)

Option	Description	
		`_TRACE_BUFFER_start` variables that allow you to change the start address and size. File `mmu_attr.l3k` contains `_ENABLE_TB` variable that allows to enable and disable settings for trace buffer from linker's files.
Trace Control Settings		Allows you to specify trace configuration settings.
	Automatically (when debug session starts)	The trace collection process is started automatically when the debug session is launched.
	Manually (using debug toolbar trace buttons)	This is the default behavior. This option is used when you want to manually control the trace collection. The trace collection process will not be started automatically on debug session launch, but the trace configuration options are applied, when you click on the Start Trace Collection button.
Advanced Tab		
Triad Settings	Triad A	In the **Advanced** tab, you need to configure triad settings if you have selected **Profile trace** checkbox in Customize Trace Scenario. After selecting **Profile trace** checkbox, the default profiling events are mapped on Triad A - L1 Icache Access Sorting and Triad B - Program L1 L2 Cacheable Access Sorting.
	Triad B	

NOTE

For more details about the **Trace and Profile** tab options, see the *CodeWarrior Development Studio for StarCore SC3900FP DSP Architectures Tracing and Analysis Tools User Guide*.

4.2 Customizing Debug Configurations

When you use the CodeWarrior wizard to create a new project, the wizard sets the project's launch configurations to default values.

You can change the default values of your project's launch configurations, according to your program's requirements.

To modify the launch configurations:

1. Start the CodeWarrior IDE.
2. From the main menu bar of the IDE, select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears. The left side of this dialog box has a list of debug configurations that apply to the current application.

3. Expand the **CodeWarrior** configuration.
4. From the expanded list, select the debug configuration that you want to modify.

   The follwoing figure shows the **Debug Configurations** dialog box with the settings for the debug configuration you selected.

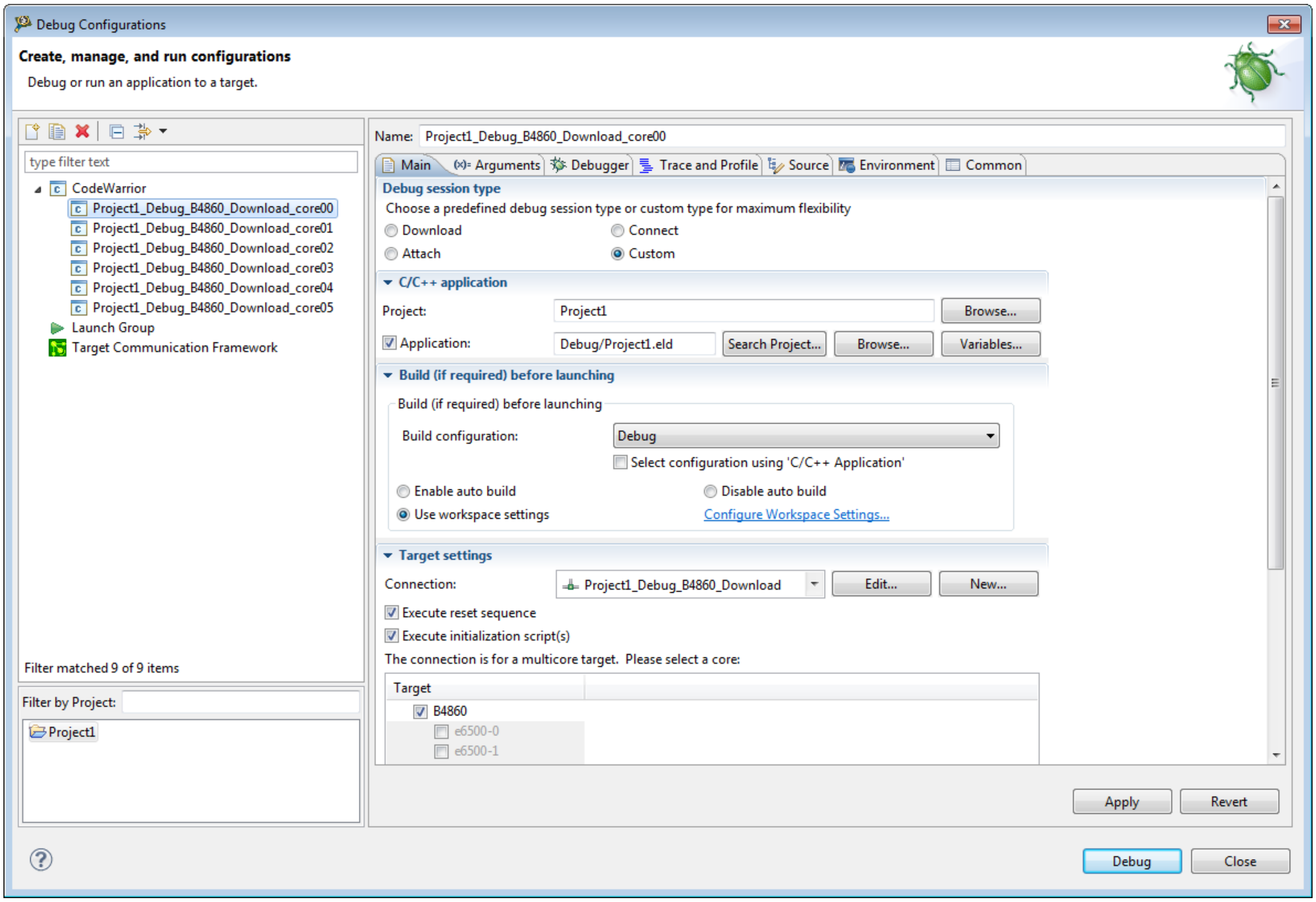


Figure 4-14. Debug Configurations Dialog Box

5. In the group of tabs in the upper-right side of the dialog box, click a tab.
6. Change the settings on the debug configuration page as per your requirements. See Using Debug Configurations Dialog Box for details on the various settings of this page.
7. Click **Apply** to save the new settings.

When you finish, you can click **Debug** to start a new debugging session, or click **Close** to save your changes and close the **Debug Configurations** dialog box.

4.3 Reverting Debug Configuration Settings

After making some modifications in a debug configuration's settings, you can either save the pending (unsaved) changes or revert to last saved settings.

To save the pending changes, click the **Apply** button of the **Debug Configurations** dialog box, or click the **Close** button and then the **Yes** button.

To undo pending changes and restore the last saved settings, click the **Revert** button at the bottom of the **Debug Configurations** dialog box.

The IDE restores the last set of saved settings to all pages of the **Debug Configurations** dialog box. Also, the IDE disables the **Revert** button until you make new pending changes.

Chapter 5
Working with Debugger

This chapter explains various aspects of CodeWarrior debugging, such as debugging a project, configuring connections, setting breakpoints and watchpoints, working with registers, viewing memory, viewing cache, and debugging externally built executable files.

NOTE

This chapter documents debugger features that are specific to CodeWarrior Development Studio for StarCore 3900FP DSP Architectures. For more information on debugger features that are common in all CodeWarrior products, see *CodeWarrior Development Studio Common Features Guide*.

This chapter explains:

- Debugging a CodeWarrior project
- Configuring Connections
- Editing remote system configuration
- Working with Breakpoints
- Working with Watchpoints
- Working with Registers
- Viewing memory
- Viewing Cache
- Changing Program Counter Value
- Hard resetting
- Per Core Reset
- Setting Stack Depth
- Import a CodeWarrior Executable file Wizard
- Debugging Externally Built Executable Files

5.1 Debugging a CodeWarrior project

This section explains how to debug a CodeWarrior project.

This section describes the following two ways of debugging a CodeWarrior project:

- Debugging Project Using Simulator
- Debugging Project using Target Hardware

5.1.1 Debugging Project Using Simulator

This section describes how to debug a project using simulator.

To debug a CodeWarrior project using a simulator, follow these steps:

1. Select the project you want to debug in the **CodeWarrior Projects** view.
2. From the CodeWarrior IDE menu bar, select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears, as shown in the figure below.

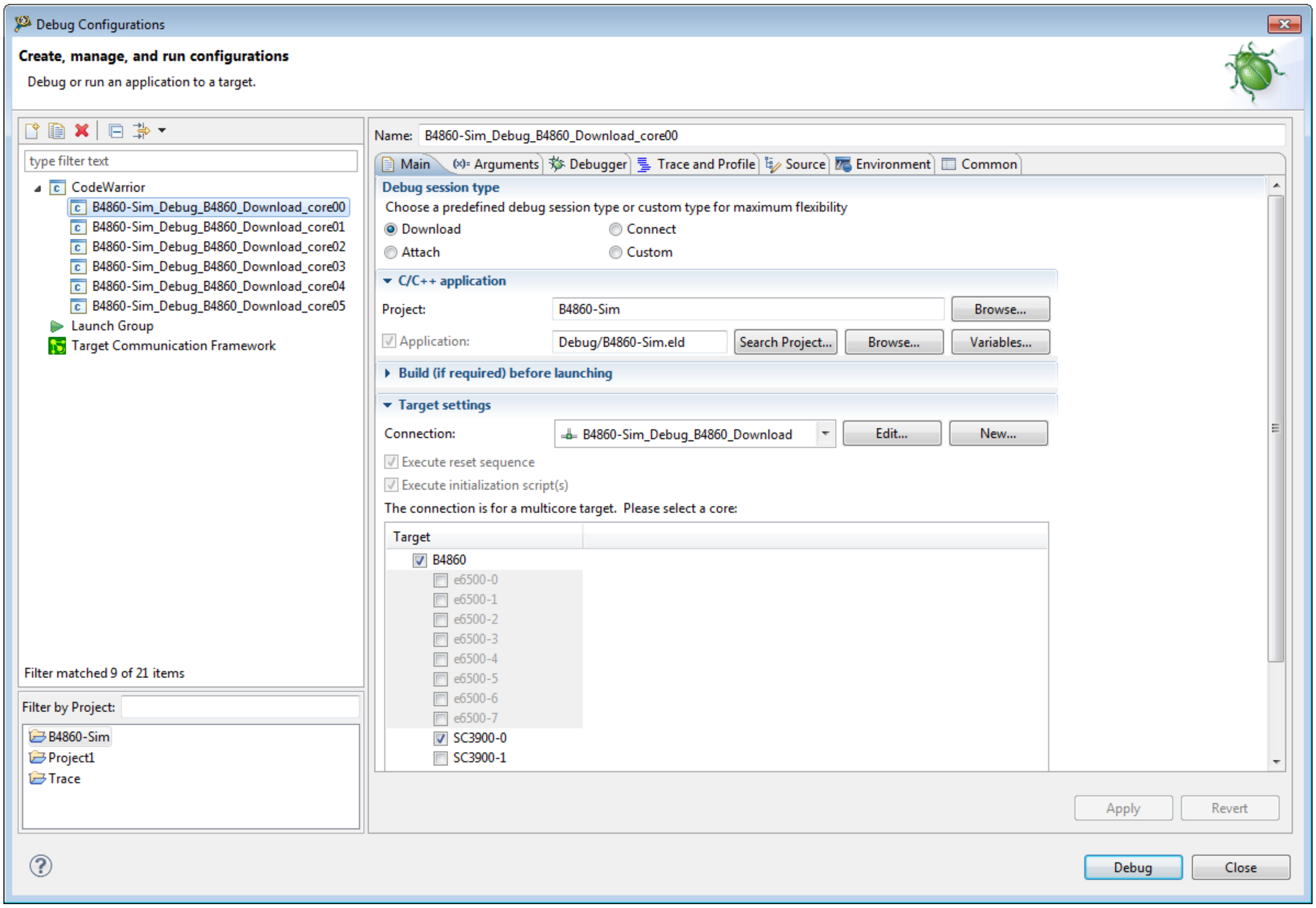


Figure 5-1. Debug Configurations Dialog Box

3. Select the required launch configuration, for example `B4860-Sim_Debug_B4860_Download_core00`.

   You can also debug the B4860 simulator projects using the B4860 instruction set simulator (ISS) supported on Linux 64-bit operating system.

   a. In the **Connection** area, click **Edit**.

      The **Properties for <project>** dialog box appears (shown in the figure below).

   b. Select **CCSSIM2 ISS** from the **Connection type** drop-down list.
   c. In the **Connection** tab, select the **Manual Launch** option.
   d. Specify the IP address of the Linux 64-bit machine, CCSSIM2 is started on, in the **Server hostname/IP** text box.

NOTE

For information about launching simulator on a Linux PC, see "Creating, Building, and Debugging a Project" section in *CodeWarrior for StarCore 3900FP DSPs - Windows Edition Quick Start*.

e. Specify the port number used while launching the CCSSIM2 in the **Server port number** text box.

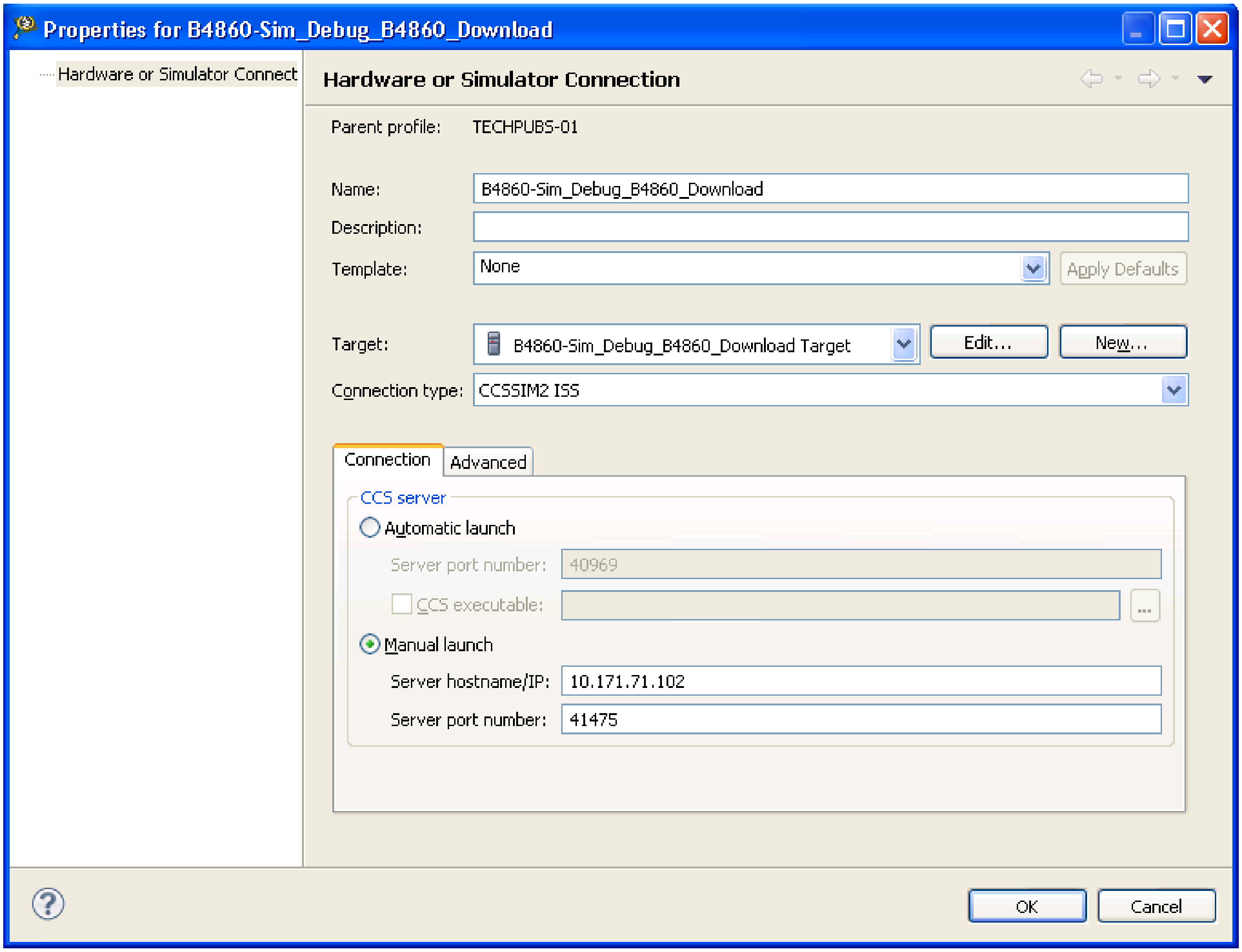


Figure 5-2. Properties for <Project> Dialog Box

f. Click **OK**.

4. Configure the launch configuration settings, using the various tabs available in the **Debug Configurations** dialog box.
5. Click **Debug**.

   The debugger downloads your program to the selected core, switches to the **Debug** perspective, and halts execution at first statement of `main()`.

6. Similarly, download your program to all the other cores.

   The **Debug** view displays all the threads associated with the cores.

7. Click **Multicore Resume** in the **Debug** view (see the figure below) to resume all cores.

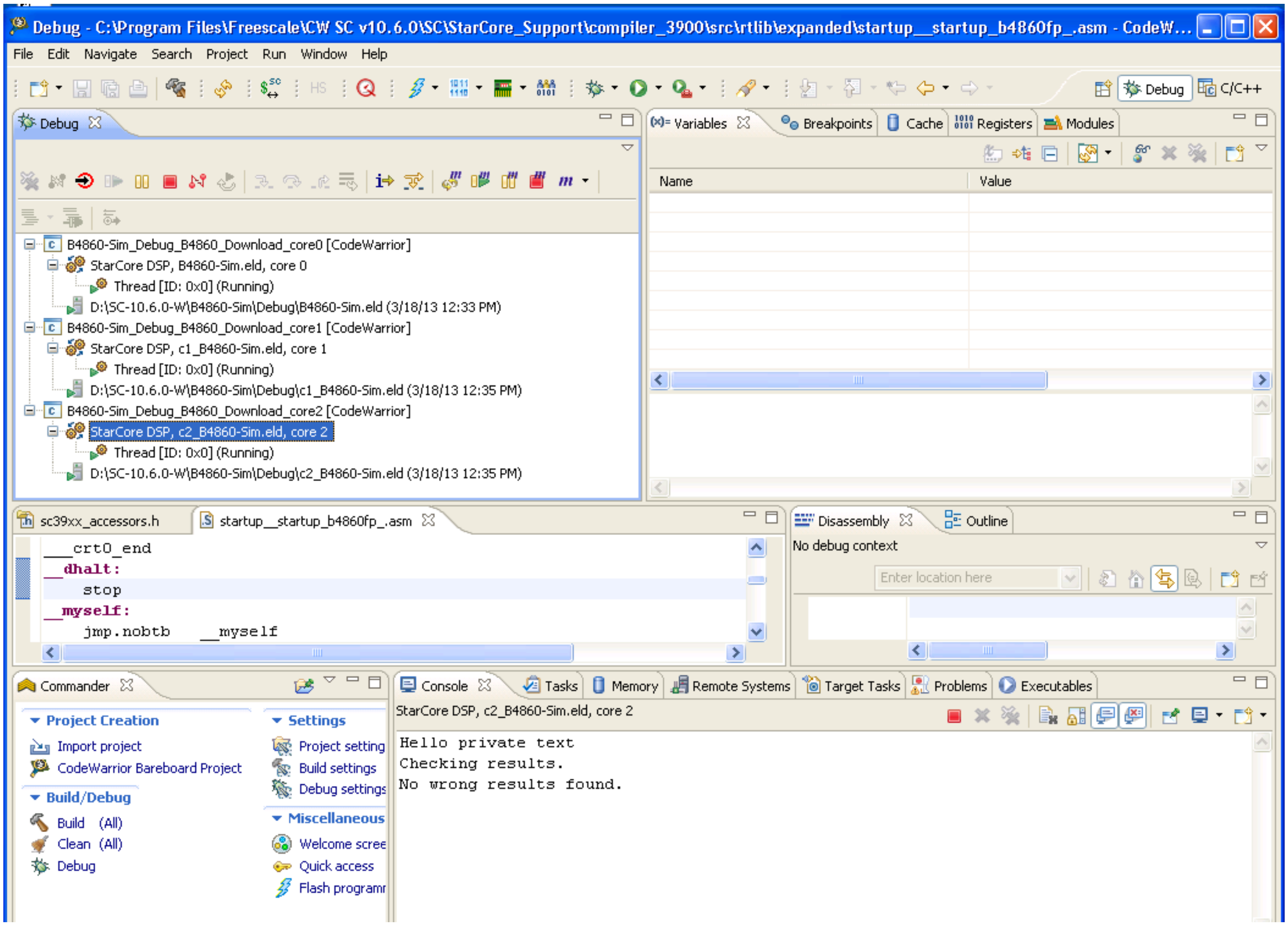


Figure 5-3. Multi-core Debugging - Resume All Cores

8. Select **Run > Multicore Terminate**.

NOTE

For details on multi-core debugging, see the Multi-Core Debugging chapter.

The debugger terminates the active debug session. The threads associated with each core in the **Debug** view disappear.

You just finished debugging a simulator project.

5.1.2 Debugging Project using Target Hardware

This section describes how to debug a project using target hardware.

To debug a CodeWarrior project using target hardware, follow these steps:

1. Select the hardware project you want to debug in the CodeWarrior Projects view.
2. From the CodeWarrior IDE menu bar, select Run > Debug Configurations.

   The **Debug Configurations** dialog box appears, as shown in the figure below.

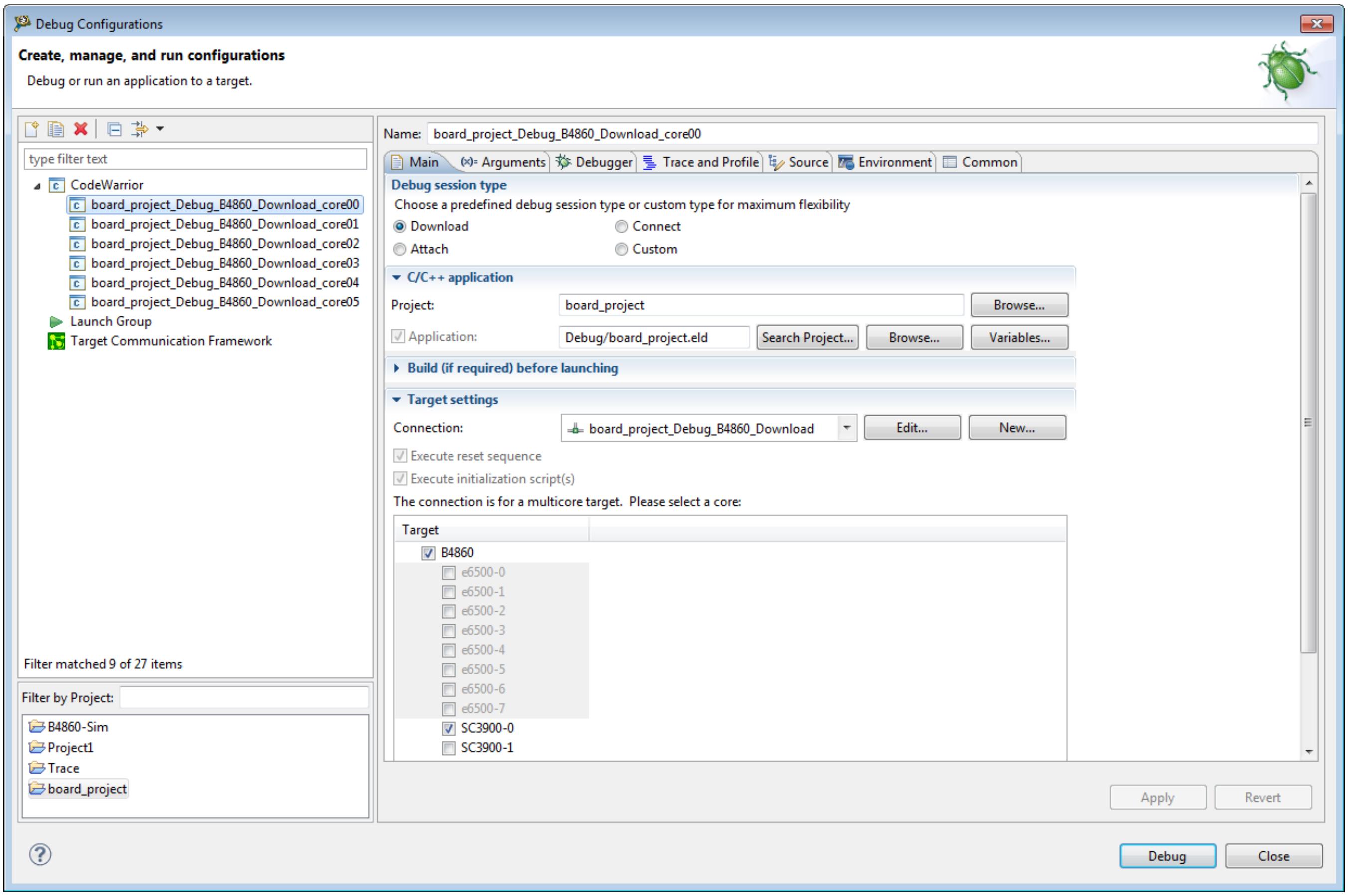


Figure 5-4. Debug Configurations Dialog Box

3. Select the required launch configuration, for example `board_project_Debug_B4860_Download_core00`.
4. Click **Edit** next to the **Connection** drop-down list.

   The **Properties for <connection>** dialog box appears (shown in the figure below).

5. Select required TAP connection from the **Connection type** drop-down list. For example, **Ethernet TAP**.
6. Enter the JTAG clock speed in the **JTAG clock speed** text box.
7. Specify the hostname/IP of the target board in the **Server hostname/IP** text box.
8. Specify the port number in the **Server port number** text box.

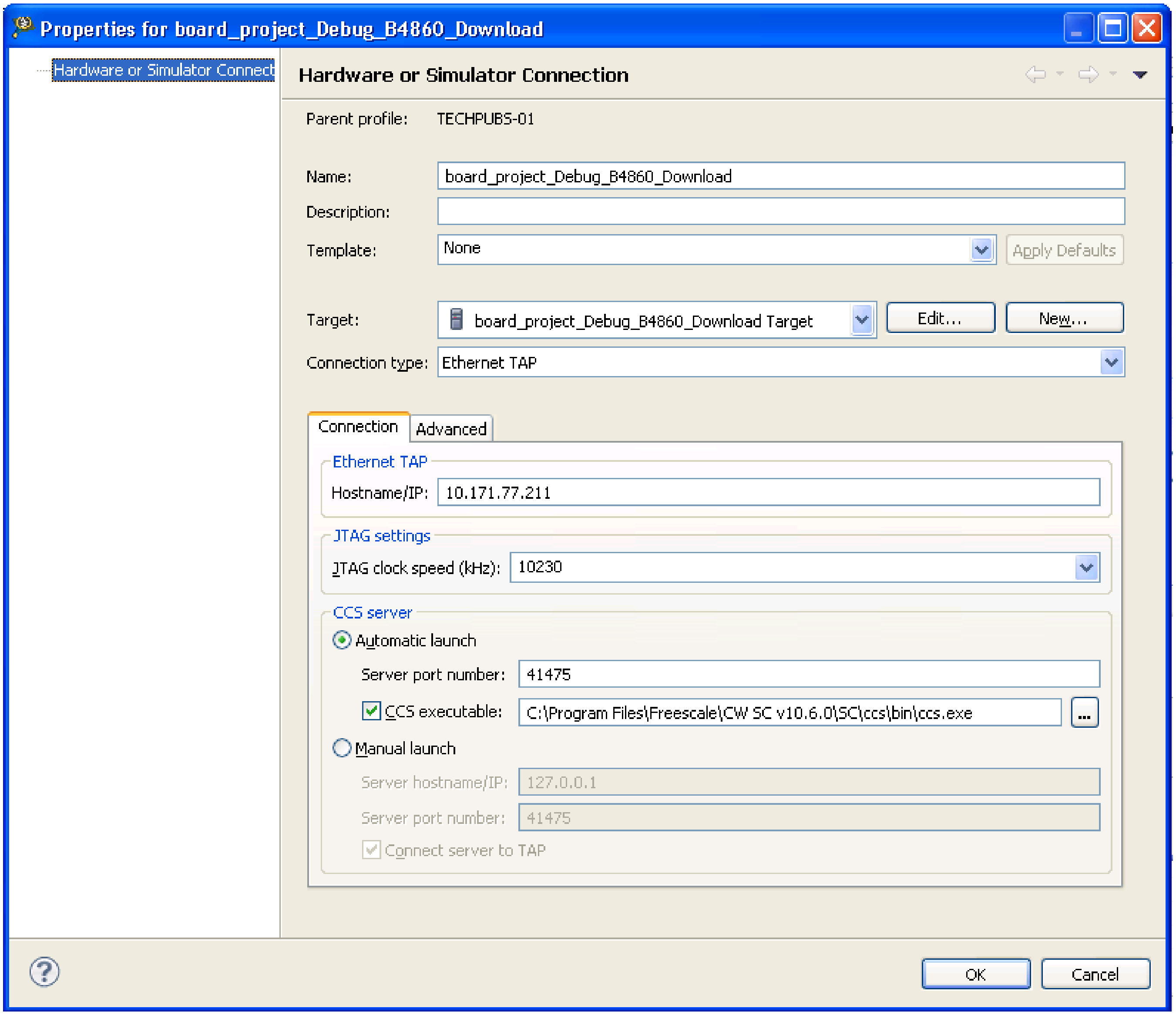


Figure 5-5. Properties for <connection> Dialog Box - Connection Settings

9. Click **OK**.
10. Configure the launch configuration settings, using the various tabs available in the **Debug Configurations** dialog box.
11. Click **Apply**.
12. Click **Debug**.

    The debugger downloads your program to the selected core, switches to the Debug perspective, and halts execution at first statement of `main()`**.**

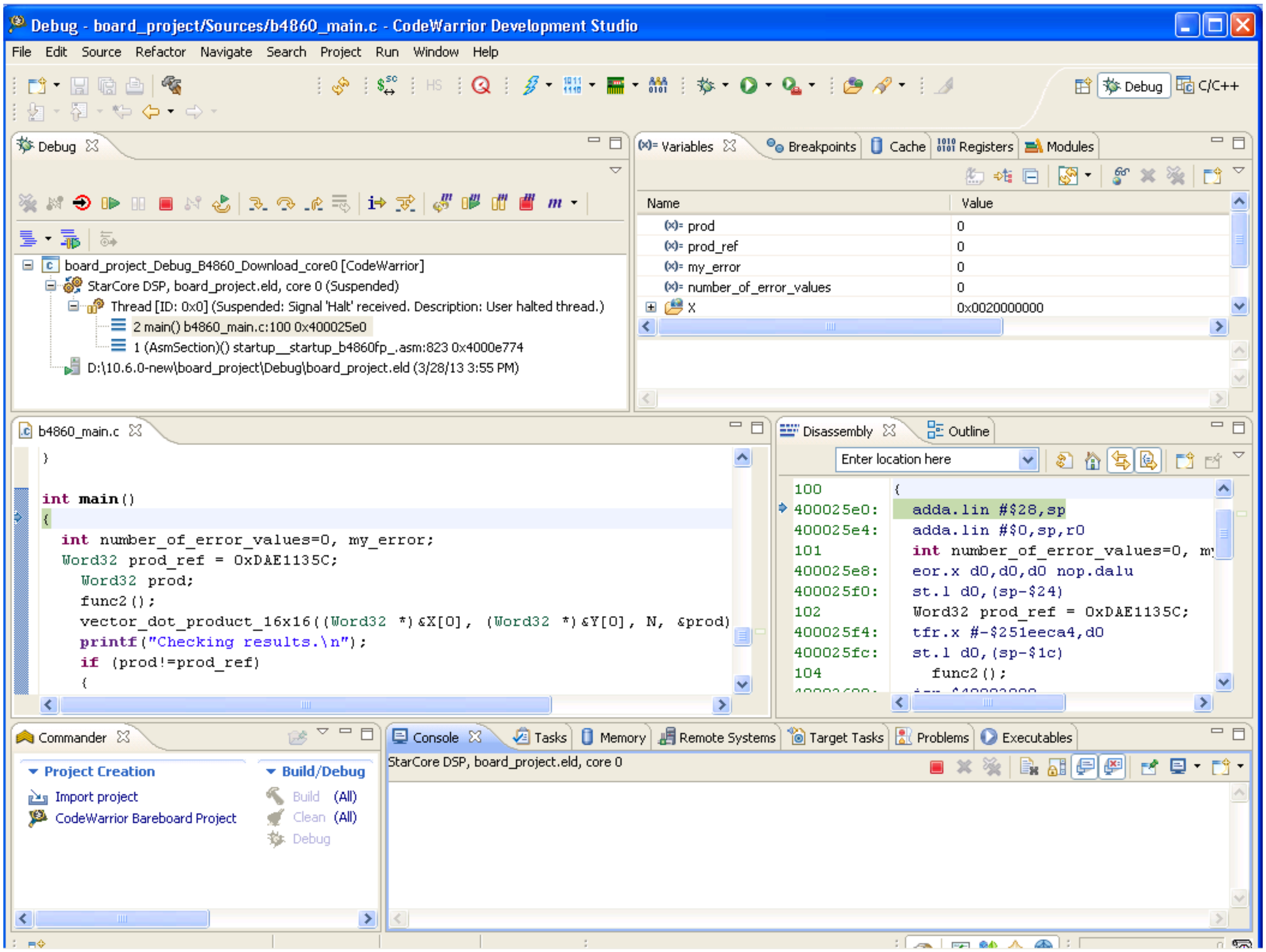


Figure 5-6. Debugging - Target Board Project

13. Select **Run > Terminate**.

    The debugger terminates the active debug session.

NOTE

For details on multi-core debugging, see the Multi-Core Debugging chapter.

You just finished debugging a project using the target board.

5.2 Configuring Connections

This section describes how to configure the debugger connections.

The CodeWarrior debugger can communicate with StarCore devices in several ways. The table below lists each StarCore device along with the protocols the debugger can use to communicate with that device.

Table 5-1. Debugger Communication Protocols for StarCore Devices

Device family	StarCore device	CCS	Simulator	TAP
Qonverge	B4060 QDS	✓		✓
	B4420 QDS	✓		✓
	B4420 ISS		✓	
	B4460 QDS	✓		✓
	B4860 QDS	✓		✓
	B4860 ISS		✓	
	G4860 QDS	✓		✓
SC3900	SC3900fp Platform ISS		✓	
	SC3900fp Platform PACC		✓	

In this section:

- CodeWarrior Connection Server
- Connection types

5.2.1 CodeWarrior Connection Server

The CodeWarrior Connection Server (CCS) provides a TCP/IP connection point for debugger communications.

If you run a CCS instance on your computer, remote instances of the CodeWarrior debugger can access each target board connected to your system. Similarly, each instance of the CodeWarrior debugger can access the target boards connected to each remote computer that runs a CCS instance.

In this section:

- Running CCS

- Displaying CCS Console
- Configuring CCS

5.2.1.1 Running CCS

Each time you debug a project that uses a local CCS connection, the CodeWarrior IDE automatically starts CCS if it is not running already. Also, you can run CCS yourself from this location, where <*CWInstallDir*> is the path to your CodeWarrior installation:

```
<CWInstallDir>\ccs\bin\ccs.exe
```

If CCS is running, the  icon appears in the Windows® taskbar. Right-click this icon to display the CCS context menu. The menu has these commands:

- **Show Console**: Displays the CCS console
- **Hide Console:** Hides the CCS console
- **About CCS:** Displays version information
- **Quit CCS**: Terminates CCS

5.2.1.2 Displaying CCS Console

The **CodeWarrior Connection Server** (CCS) console allows you to view and change server-connection options. You can issue commands by typing them into the command-line window or by selecting options from the console's menus.

To display CCS console, follow these steps:

1. Run `<CWInstallDir>\ccs\bin\ccs.exe`, where `<CWInstallDir>` is the path to your CodeWarrior installation.

   CCS starts and the  icon appears in the Windows® taskbar.

2. Right-click the CCS icon and select **Show console** from the context menu.

   The **CodeWarrior Connection Server** console appears, as shown in the figure below.

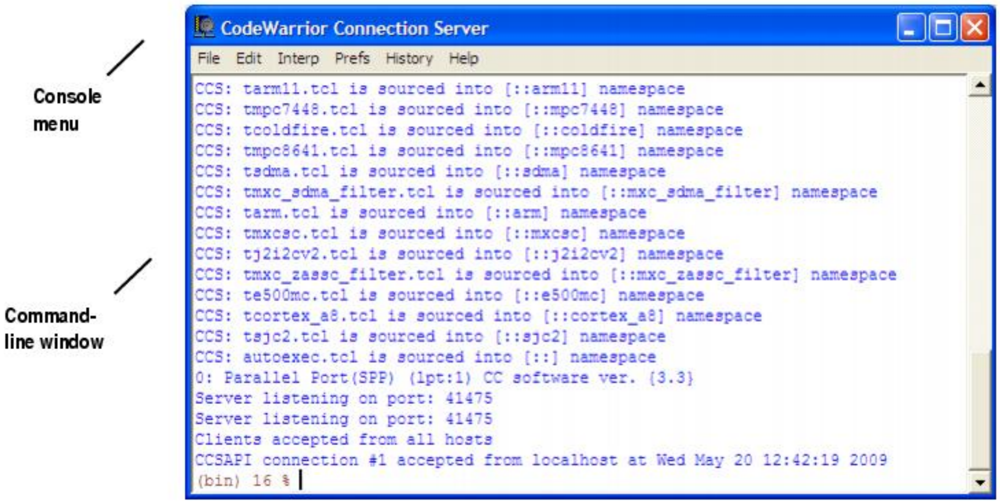


Figure 5-7. CodeWarrior Connection Server Console

5.2.1.3 Configuring CCS

CodeWarrior Connection Server uses parallel port 1 to communicate with a target device and listens for commands on port 41475. The CCS connection configuration can be set up using the `ccs.cfg` file. CCS reads `ccs.cfg` for start up commands to configure the connection. `ccs.cfg` is located in `<CWInstallDir>\ccs\bin\`. To change these default settings, follow these steps:

1. Run `<CWInstallDir>\ccs\bin\ccs.exe`, where `<CWInstallDir>` is the path to your CodeWarrior installation.

   CCS starts and the icon appears in the Windows® taskbar.

2. Right-click the **CCS** icon and select **Show console** from the context menu.

   The **CodeWarrior Connection Server** console appears.

3. At the console command prompt, issue these commands:
   a. `delete all`

      This command deletes the current CCS configuration.

   b. `config` *cc*

      where *cc* can be:

      - `parallel:`<#>
      - `lpt` (same as `parallel`)
      - `epp:`<#>

- `usb`
- `powertap:`*<ipaddr>*
- `wiretap:`*<#>*
- `lspusb`

This command defines the command converter that CCS uses.

c. `config port` *port_num*

where *port_num* is the port on which CCS listens for commands. The default CCS port number is 41475.

4. Right click the CCS icon.

   The CCS context menu appears.

5. Select **Quit CCS** from this menu.

   CodeWarrior Connection Server console exits.

NOTE

Any changes you make to the CCS configuration are permanent. They persist from one CCS session to the next.

You have modified the default CCS settings.

5.2.2 Connection types

This section describes the different connection types provided by CodeWarrior debugger for connecting the target board to a computer.

The connection types supported by CodeWarrior debugger are:

- CCSSIM2 ISS
- CCSSIM2 PACC
- Ethernet TAP
- Gigabit TAP + Trace
- Gigabit TAP
- USB TAP
- CodeWarrior TAP

5.2.2.1 CCSSIM2 ISS

Select this connection type to connect to simulators based on the CCSSIM2 ISS interface.

To configure the settings of the CCSSIM2 ISS connection type, perform the following steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears.

2. In the **Connection** group, click **Edit** next to the **Connection** drop-down list.

   The **Properties for <*connection launch configuration*>** window appears.

3. Select **CCSSIM2 ISS** from the **Connection type** drop-down list.

   The **Connection** and **Advanced** tabs display options with respect to the settings of the selected connection type.

The table below describes various options available on the **Connection** tab page.

Table 5-2. CCSSIM2 ISS - Connection Tab Options

Option		Description
CCS server	Automatic launch	Select to automatically launch the specified CCS server on the specified port.
	Server port number	Specifies the port number to launch the CCS server on.
	CCS executable	Select to specify the path of, or browse to, the executable file of the CCS server.
	Manual launch	Select to manually launch the specified CCS server on the specified port.
	Server hostname/IP	Specifies hostname or the IP address of the CCS server.
	Server port number	Specifies the port number to launch the CCS server on.

The table below describes the various options available on the **Advanced** tab page.

Table 5-3. CCSSIM2 ISS - Advanced Tab Options

Option		Description
Target connection lost settings	Try to reconnect	If this option is selected, the lost CCS connection between the target and host is reset. Select the **Timeout** checkbox to specify the time interval (in seconds) after which the connection will be lost.

Table continues on the next page...

Table 5-3. CCSSIM2 ISS - Advanced Tab Options (continued)

Option		Description
	Terminate the debug session	If this option is selected, the debug session is terminated and the lost connection between JTAG and CCS server is not reset.
	Ask me	This is the default setting. If the CCS connection is lost between the target and host, the user is asked if the connection needs to be reset or terminated.
Advanced CCS settings	CCS timeout	Specifies the CCS timeout period. If the target does not respond in the provided time-interval, you receive a CCS timeout error.
	Enable logging	Select to display protocol logging in console.

5.2.2.2 CCSSIM2 PACC

Select this connection type to connect to simulators based on the CCSSIM2 PACC interface.

NOTE

CCSSIM2 PACC connection is available only for the SC3900fp target.

To configure the settings of the **CCSSIM2 PACC** connection type, perform the following steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** window appears.

2. In the **Connection** group, click the **Edit** button next to the **Connection** drop-down list.

   The **Properties for *<connection launch configuration>*** window appears.

3. Select **CCSSIM2 PACC** from the **Connection type** drop-down list.

   The **Connection** and **Advanced** tabs display options with respect to the settings of the selected connection type.

The table below describes various options available on the **Connection** tab page.

Table 5-4. CCSSIM2 PACC - Connection Tab Options

Option		Description
CCS Server	Automatic launch	Select to automatically launch the specified CCS server on the specified port.
	Server port number	Specifies the port number to launch the CCS server on.
	CCS executable	Select to specify the path of, or browse to, the executable file of the CCS server.
	Manual launch	Select to manually launch the specified CCS server on the specified port.
	Server hostname/IP	Specifies hostname or the IP address of the CCS server.
	Server port number	Specifies the port number to launch the CCS server on.

The table below describes the various options available on the **Advanced** tab page.

Table 5-5. CCSSIM2 PACC - Advanced Tab Options

Option		Description
Target connection lost settings	Try to reconnect	If this option is selected, the lost CCS connection between the target and host is reset. Select the **Timeout** checkbox to specify the time interval (in seconds) after which the connection will be lost.
	Terminate the debug session	If this option is selected, the debug session is terminated and the lost connection between JTAG and CCS server is not reset.
	Ask me	This is the default setting. If the CCS connection is lost between the target and host, the user is asked if the connection needs to be reset or terminated.
Advanced CCS settings	CCS timeout	Specifies the CCS timeout period. If the target does not respond in the provided time-interval, you receive a CCS timeout error.
	Enable logging	Select to display protocol logging in console.

5.2.2.3 Ethernet TAP

The CodeWarrior and Ethernet TAP and USB TAP hardware use emulation technology to control and provide visibility into your target system. They let you control and debug software running in-target, with minimal intrusion into target operation. You use the OnCE connector on your target hardware to interface with the TAP hardware.

Select this connection type when Ethernet network is used as interface to communicate with the hardware device.

To configure the settings of an **Ethernet TAP** connection type, perform the following steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears.

2. In the **Connection** group, click **Edit** next to the **Connection** drop-down list.

   The **Properties for <*connection launch configuration*>** window appears.

3. Select the **Ethernet TAP** from the **Connection type** drop-down list.

   The **Connection** and **Advanced** tabs display options with respect to the settings of the selected connection type.

The table below describes various options available on the **Connection** tab page.

Table 5-6. Ethernet TAP - Connection Tab Options

Option		Description
Ethernet TAP	Hostname/IP	Specifies hostname or the IP address of the TAP.
JTAG settings	JTAG clock speed (kHz)	Specifies the JTAG clock speed.
CCS server	Automatic launch	Select to automatically launch the specified CCS server on the specified port.
	Server port number	Specifies the port number to launch the CCS server on.
	CCS executable	Click to specify the path of, or browse to, the executable file of the CCS server.
	Manual launch	Select to manually launch the specified CCS server on the specified port.
	Server hostname/IP	Specifies hostname or the IP address of the CCS server.
	Server port number	Specifies the port number to launch the CCS server on.
	Connect server to TAP	Select to enable the CCS server to connect to the TAP.

The table below describes the various options available on the **Advanced** tab page.

Table 5-7. Ethernet TAP - Advanced Tab Options

Option		Description
Target connection lost settings	Try to reconnect	If this option is selected, the lost CCS connection between the target and host is reset. Select the

Table continues on the next page...

Table 5-7. Ethernet TAP - Advanced Tab Options (continued)

Option		Description
		Timeout checkbox to specify the time interval (in seconds) after which the connection will be lost.
	Terminate the debug session	If this option is selected, the debug session is terminated and the lost connection between JTAG and CCS server is not reset.
	Ask me	This is the default setting. If the CCS connection is lost between the target and host, the user is asked if the connection needs to be reset or terminated.
Advanced CCS settings	CCS timeout	Specifies the CCS timeout period. If the target does not respond in the provided time-interval, you receive a CCS timeout error.
	Enable logging	Select to display protocol logging in console.
JTAG config file		This panel displays the JTAG configuration file being used. This panel is populated only if you have selected a JTAG configuration file for your project. If a JTAG configuration file is not selected, this panel displays a None value. For more details on JTAG configuration files, see Creating a JTAG Initialization File and Setting Launch Configurations.
Advanced TAP settings	Force shell download	Select to force a reload of the TAP shell software.

5.2.2.4 Gigabit TAP + Trace

Select this connection type when Gigabit TAP and Trace is used as interface to communicate with the hardware device.

To configure the settings of a **Gigabit TAP + Trace** connection type, perform the following steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears.

2. In the **Connection** group, click **Edit** next to the **Connection** drop-down list.

   The **Properties for <*connection launch configuration*>** window appears.

3. Select the **Gigabit TAP + Trace** from the **Connection type** drop-down list.

   The **Connection** and **Advanced** tabs display the options with respect to the settings of the selected connection type.

The table below describes various options available on the **Connection** tab page.

Table 5-8. Gigabit TAP + Trace - Connection Tab Options

Option		Description
Gigabit TAP + Trace	Hostname/IP	Specifies hostname or the IP address of the TAP.
	Debug connection	Specifies the type of debug connection to use. The options available are JTAG over JTAG cable connection, JTAG over Aurora cable connection, and Aurora connection.
JTAG settings	JTAG clock speed (kHz)	Specifies the JTAG clock speed.
Aurora settings	Aurora data rate	Specifies the Aurora data rate, which refers to the frequency with which the raw data bits are transferred on the wire. The Aurora connection is used only for trace analysis.
	Receive lanes	Select to specify the Aurora receive lane settings.
	Transmit lanes	Select to specify the Aurora transmit lane settings.
CCS server	Automatic launch	Select to automatically launch the specified CCS server on the specified port.
	Server port number	Specifies the port number to launch the CCS server on.
	CCS executable	Select to specify the path of, or browse to, the executable file of the CCS server.
	Manual launch	Select to manually launch the specified CCS server on the specified port.
	Server hostname/IP	Specifies hostname or the IP address of the CCS server.
	Server port number	Specifies the port number to launch the CCS server on.
	Connect server to TAP	Select to enable the CCS server to connect to the TAP.

The table below describes the various options available on the **Advanced** tab page.

Table 5-9. Gigabit TAP + Trace - Advanced Tab Options

Option		Description
Target connection lost settings	Try to reconnect	If this option is selected, the lost CCS connection between the target and host is reset. Select the **Timeout** checkbox to specify the time interval (in seconds) after which the connection will be lost.
	Terminate the debug session	If this option is selected, the debug session is terminated and the lost connection between JTAG and CCS server is not reset.
	Ask me	This is the default setting. If the CCS connection is lost between the target and host, the user is asked if the connection needs to be reset or terminated.

Table continues on the next page...

Table 5-9. Gigabit TAP + Trace - Advanced Tab Options (continued)

Option		Description
Advanced CCS settings	CCS timeout	Specifies the CCS timeout period. If the target does not respond in the provided time-interval, you receive a CCS timeout error.
	Enable logging	Select to display protocol logging in console.
JTAG config file		This panel displays the JTAG configuration file being used. This panel is populated only if you have selected a JTAG configuration file for your project. If a JTAG configuration file is not selected, this panel displays a None value. For more details on JTAG configuration files, see Creating a JTAG Initialization File and Setting Launch Configurations.
Advanced TAP settings	Force shell download	Select to force a reload of the TAP shell software.

5.2.2.5 Gigabit TAP

Select this connection type when Gigabit TAP is used as interface to communicate with the hardware device.

To configure the settings of a **Gigabit TAP** connection type, perform the following steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears.

2. In the **Connection** group, click **Edit** next to the **Connection** drop-down list.

   The **Properties for *<connection launch configuration>*** window appears.

3. Select the **Gigabit TAP** from the **Connection type** drop-down list.

   The **Connection** and **Advanced** tabs display options with respect to the settings of the selected connection type.

The table below describes various options available on the **Connection** tab page.

Table 5-10. Gigabit TAP - Connection Tab Options

Option		Description
Gigabit TAP	Hostname/IP	Specifies hostname or the IP address of the TAP.
JTAG settings	JTAG clock speed (kHz)	Specifies the JTAG clock speed.

Table continues on the next page...

Table 5-10. Gigabit TAP - Connection Tab Options (continued)

Option		Description
CCS server	Automatic launch	Select to automatically launch the specified CCS server on the specified port.
	Server port number	Specifies the port number to launch the CCS server on.
	CCS executable	Click to specify the path of, or browse to, the executable file of the CCS server.
	Manual launch	Select to manually launch the specified CCS server on the specified port.
	Server hostname/IP	Specifies hostname or the IP address of the CCS server.
	Server port number	Specifies the port number to launch the CCS server on.
	Connect server to TAP	Select to enable the CCS server to connect to the TAP.

The table below describes the various options available on the **Advanced** tab page.

Table 5-11. Gigabit TAP - Advanced Tab Options

Option		Description
Target connection lost settings	Try to reconnect	If this option is selected, the lost CCS connection between the target and host is reset. Select the **Timeout** checkbox to specify the time interval (in seconds) after which the connection will be lost.
	Terminate the debug session	If this option is selected, the debug session is terminated and the lost connection between JTAG and CCS server is not reset.
	Ask me	This is the default setting. If the CCS connection is lost between the target and host, the user is asked if the connection needs to be reset or terminated.
Advanced CCS settings	CCS timeout	Specifies the CCS timeout period. If the target does not respond in the provided time-interval, you receive a CCS timeout error.
	Enable logging	Select to display protocol logging in console.
JTAG config file		This panel displays the JTAG configuration file being used. This panel is populated only if you have selected a JTAG configuration file for your project. If a JTAG configuration file is not selected, this panel displays a None value. For more details on JTAG configuration files, see Creating a JTAG Initialization File and Setting Launch Configurations.
Advanced TAP settings	Force shell download	Select to force a reload of the TAP shell software.

5.2.2.6 USB TAP

Select this connection type when USB TAP is used as interface to communicate with the hardware device.

To configure the settings of a **USB TAP** connection type, perform the following steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears.
2. In the **Connection** group, click **Edit** next to the **Connection** drop-down list.

   The **Properties for *<connection launch configuration>*** window appears.
3. Select **USB TAP** from the **Connection type** drop-down list.

   The **Connection** and **Advanced** tabs display the options with respect to the settings of the selected connection type.
4. n

The table below describes various options available on the **Connection** tab page.

Table 5-12. USB TAP - Connection Tab Options

Option		Description
USB TAP	USB serial number	Select and specify the USB serial number of the USB TAP, required only if using multiple USB TAPs.
JTAG settings	JTAG clock speed (kHz)	Specifies the JTAG clock speed.
CCS server	Automatic launch	Select to automatically launch the specified CCS server on the specified port.
	Server port number	Specifies the port number to launch the CCS server on.
	CCS executable	Click to specify the path of, or browse to, the executable file of the CCS server.
	Manual launch	Select to manually launch the specified CCS server on the specified port.
	Server hostname/IP	Specifies hostname or the IP address of the CCS server.
	Server port number	Specifies the port number to launch the CCS server on.
	Connect server to TAP	Select to enable the CCS server to connect to the TAP.

The table below describes the various options available on the **Advanced** tab page.

Table 5-13. USB TAP - Advanced Tab Options

Option		Description
Target connection lost settings	Try to reconnect	If this option is selected, the lost CCS connection between the target and host is reset. Select the **Timeout** checkbox to specify the time interval (in seconds) after which the connection will be lost.
	Terminate the debug session	If this option is selected, the debug session is terminated and the lost connection between JTAG and CCS server is not reset.
	Ask me	This is the default setting. If the CCS connection is lost between the target and host, the user is asked if the connection needs to be reset or terminated.
Advanced CCS settings	CCS timeout	Specifies the CCS timeout period. If the target does not respond in the provided time-interval, you receive a CCS timeout error.
	Enable logging	Select to display protocol logging in console.
JTAG config file		This panel displays the JTAG configuration file being used. This panel is populated only if you have select a JTAG configuration file for your project. If a JTAG configuration file is not selected, this panel displays a None value. For more details on JTAG configuration files, see Creating a JTAG Initialization File and Setting Launch Configurations.
Advanced TAP settings	Force shell download	Select to force a reload of the TAP shell software.

5.2.2.7 CodeWarrior TAP

Select this connection type when either the CodeWarrior TAP is used as interface to communicate with the hardware device.

To configure the settings of a **CodeWarrior TAP** connection type, perform the following steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears.

2. In the **Connection** group, click **Edit** next to the **Connection** drop-down list.

   The **Properties for <connection launch configuration>** window appears.

3. Select **CodeWarrior TAP** from the **Connection type** drop-down list.

The **Connection** and **Advanced** tabs display the options with respect to the settings of the selected connection type.

The table below describes various options available on the **Connection** tab page.

Table 5-14. CodeWarrior TAP - Connection Tab Options

Option		Description
CodeWarrior TAP	Hardware Connection	Specifies CodeWarrior TAP interface to communicate with the hardware device. CodeWarrior TAP supports both USB and Ethernet network interfaces.
	Hostname/IP	Specifies hostname or the IP address of the TAP. **NOTE:** Enabled only if **Hardware Connection** is set to **Ethernet**.
	Serial Number	Select and specify the USB serial number of the USB TAP; required only if using multiple CodeWarror TAPs (over USB). **NOTE:** Enabled only if **Hardware Connection** is set to **USB**.
JTAG settings	JTAG clock speed (kHz)	Specifies the JTAG clock speed.
CCS server	Automatic launch	Select to automatically launch the specified CCS server on the specified port.
	Server port number	Specifies the port number to launch the CCS server on.
	CCS executable	Click to specify the path of, or browse to, the executable file of the CCS server.
	Manual launch	Select to manually launch the specified CCS server on the specified port.
	Server hostname/IP	Specifies hostname or the IP address of the CCS server.
	Server port number	Specifies the port number to launch the CCS server on.
	Connect server to TAP	Select to enable the CCS server to connect to the CodeWarrior TAP.

The table below describes the various options available on the **Advanced** tab page.

Table 5-15. CodeWarrior TAP - Advanced Tab Options

Option		Description
Target connection lost settings	Try to reconnect	If this option is selected, the lost CCS connection between the target and host is reset. Select the **Timeout** checkbox to specify the time interval (in seconds) after which the connection will be lost.
	Terminate the debug session	If this option is selected, the debug session is terminated and the lost connection between JTAG and CCS server is not reset.

Table continues on the next page...

Table 5-15. CodeWarrior TAP - Advanced Tab Options (continued)

Option		Description
	Ask me	This is the default setting. If the CCS connection is lost between the target and host, the user is asked if the connection needs to be reset or terminated.
Advanced CCS settings	CCS timeout	Specifies the CCS timeout period. If the target does not respond in the provided time-interval, you receive a CCS timeout error.
	Enable logging	Select to display protocol logging in console.
JTAG config file		This panel displays the JTAG configuration file being used. This panel is populated only if you have select a JTAG configuration file for your project. If a JTAG configuration file is not selected, this panel displays a None value. For more details on JTAG configuration files, see Creating a JTAG Initialization File and Setting Launch Configurations.
Advanced TAP settings	Force shell download	Select to force a reload of the TAP shell software.

You can connect to the **CodeWarrior TAP** connection using two options:

- CodeWarrior TAP - JTAG Connection through USB
- CodeWarrior TAP - JTAG Connection through Ethernet

5.2.2.7.1 CodeWarrior TAP - JTAG Connection through USB

This section describes how to connect to a board using the CodeWarrior TAP – JTAG physical connection through USB.

To connect perform the following steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears.

2. In the **Connection** group, click **Edit** next to the **Connection** drop-down list.

   The **Properties for <connection launch configuration>** dialog box appears.

3. Select **CodeWarrior TAP** from the **Connection type** drop-down list.
4. Select **USB** from the **Hardware connection** drop-down list.
5. If you have more than one target connected to your machine through USB, then you have specify the serial number of the device for the connection, for this check the corresponding checkbox and specify the correct serial number in the text box (Figure 5-8).

NOTE

The CodeWarrior TAP USB serial number is its MAC address.

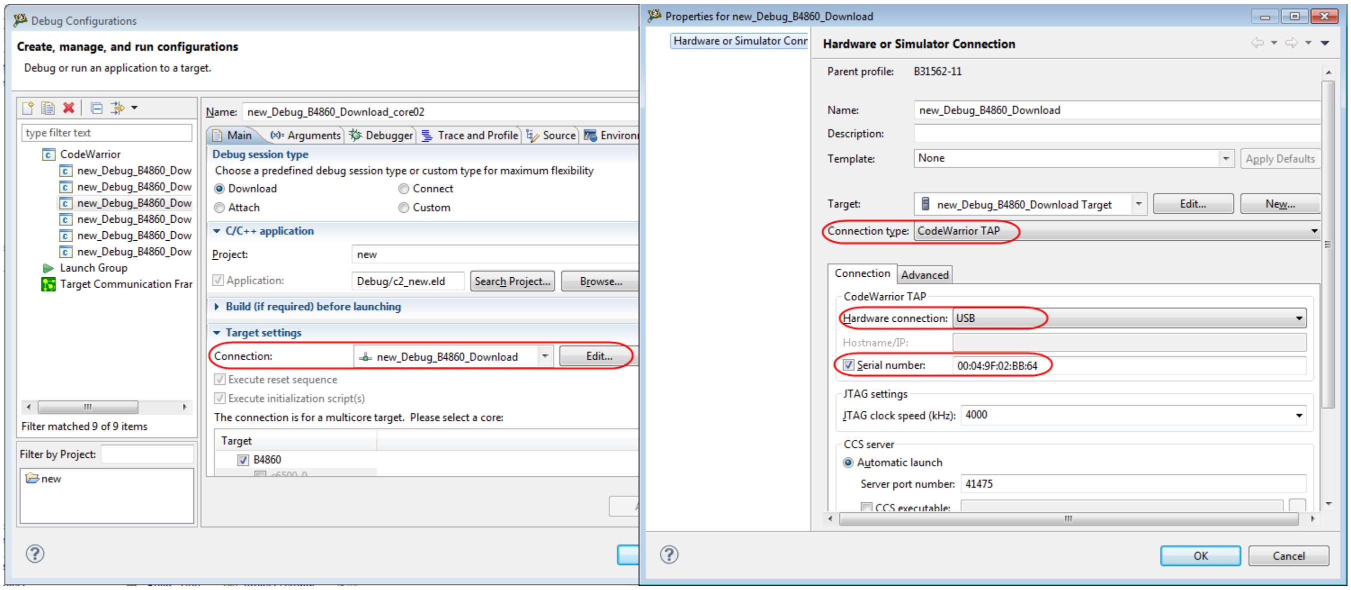


Figure 5-8. CodeWarrior TAP - USB Connection

6. Configures the JTAG speed and the advanced CCS settings as per the requirement.
7. Validate the settings.
8. Selects the new connection in the launch configuration and starts the debug session.

NOTE

The connection through JTAG interface through USB has the same settings as the *CodeWarrior USB TAP* connection.

5.2.2.7.2 CodeWarrior TAP - JTAG Connection through Ethernet

This section describes how to connect to a board using the CodeWarrior TAP – JTAG physical connection through Ethernet.

To connect the board, perform the following steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears.

2. In the **Connection** group, click **Edit** next to the **Connection** drop-down list.

   The **Properties for <connection launch configuration>** dialog box appears.

3. Select **CodeWarrior TAP** from the **Connection type** drop-down list.
4. Select **Ethernet** from the **Hardware connection** drop-down list.

5. Specify the correct IP address of the device in the **Hostname/IP** text box (Figure 5-9).

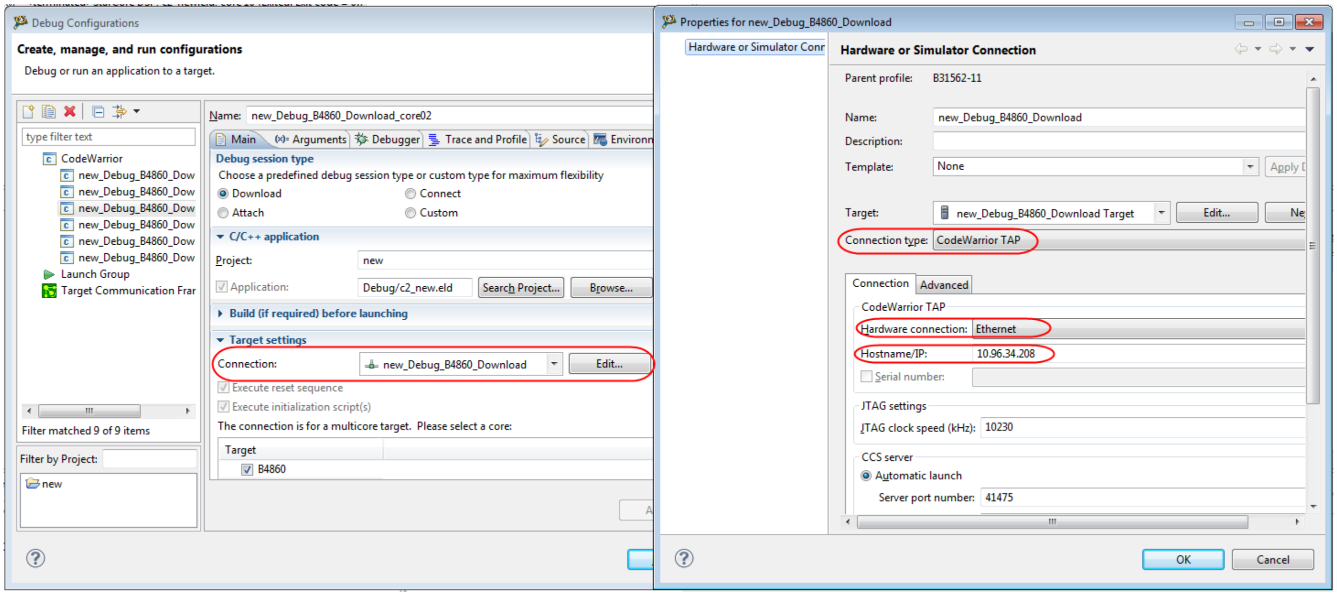


Figure 5-9. CodeWarrior TAP - Ethernet Connection

6. Configures the JTAG speed and the advanced CCS settings as per the requirement.
7. Validate the settings.
8. Selects the new connection in the launch configuration and starts the debug session.

NOTE

The connection through JTAG interface through Ethernet has the same settings as the *CodeWarrior Ethernet TAP* connection.

5.3 Editing remote system configuration

The remote system configuration model defines the connection and system configurations where you can define a single system configuration that can be referred to by multiple connection configurations.

To edit the system configuration, perform these steps:

1. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears.

2. In the **Connection** panel, click **Edit** next to the **Connection** drop-down list.

   The **Properties for <*connection launch configuration*>** window appears.

3. Click **Edit** next to the **Target** drop-down list.

   The **Properties for <*system launch configuration*>** window appears.

4. Select the appropriate system type from the **Target type** drop-down list.
5. Make the respective settings in Initialization tab, Memory tab, I/O Model Tab and Advanced tab.
6. Click **OK** to save the settings.
7. Click **OK** to close the **Properties** window.

In this section:

- Initialization tab
- Memory tab
- I/O Model Tab
- Advanced tab

5.3.1 Initialization tab

Use the Initialization tab to specify target initialization file for various cores.

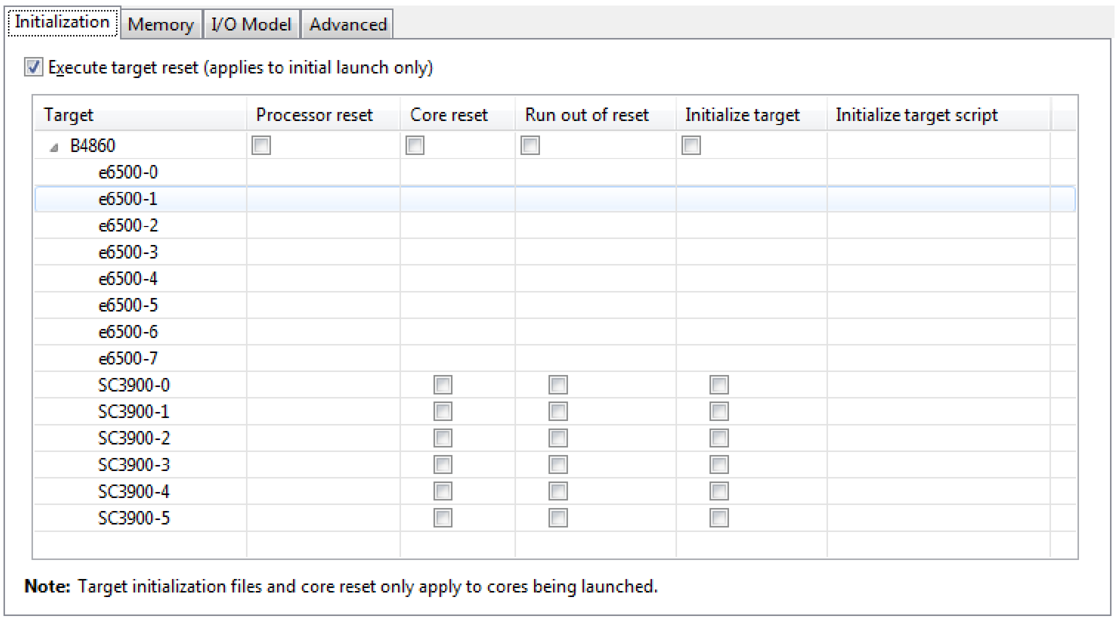


Figure 5-10. Initialization tab

The table below lists the various options available on the **Initialization** tab page.

Table 5-16. Initialization tab options

Option	Description
Target	Select to execute target system reset. **NOTE:** If the current core is the first core debugged from the JTAG chain, then debugger will reset all cores from the chain (from all processors of the current JATG chain, including the non-StarCore cores). If you have other debug sessions started for the cores from the current chain, then 'target reset' will be ignored.
Processor reset	Select to execute processor reset. **NOTE:** If the current core is the first debugged core from the current processor, then the debugger will reset all StarCore cores of that processor, but the non-StarCore cores of the processor will not be affected. If you have other debug session started for the cores of the current processor, then 'processor reset' will be ignored, also, if for the current debug session a 'target reset' was executed, then also 'processor reset' will be ignored.
Core reset	Select to include the respective core for core reset operation. **NOTE:** **Core reset** option resets only the current core. If for the current debug session a 'target reset' or a 'processor reset' was executed, then 'core reset' will be ignored.
Run out of reset	Select to include the respective core for run out of reset operation. Debugger runs this command right after reset (independent of the reset type) and will trigger a core resume.
Initialize target	Click to specify a target initialization file for the respective core. Debugger executes this command at launch/debug, if the current core has the corresponding control checked.
Initialize target script	Lists the path to a Debugger Shell Tcl script that runs when launching a debug session for the respective core. To edit, select a cell, then click the ellipsis (...) button to open the **Target InitializationFile** dialog box. The settings for a group of cores can be changed all at once by editing the cell of a common ancestor node in the Target hierarchy.

5.3.2 Memory tab

Use the Memory tab to specify memory configuration file for various cores.

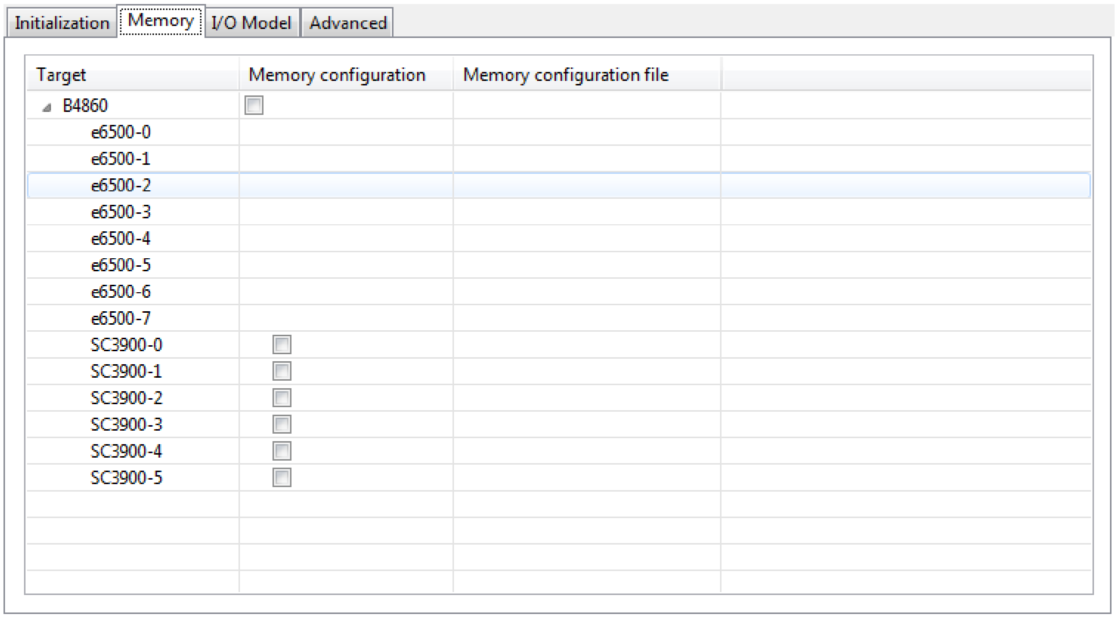


Figure 5-11. Memory tab

The table below lists the various options available on the **Memory** tab page.

Table 5-17. Memory tab options

Option	Description
Target	Lists the targets and the supported cores.
Memory configuration	Select to specify a memory configuration file for the respective core.
Memory configuration file	Lists the path to the memory configuration file for the respective core. To edit, select a cell, then click the ellipsis button to open the **Memory Configuration File** dialog box. The settings for a group of cores can be changed all at once by editing the cell of a common ancestor node in the Target hierarchy.

5.3.3 I/O Model Tab

Use the I/O Model tab to specify the I/O support option for the selected target (shown in the figure below).

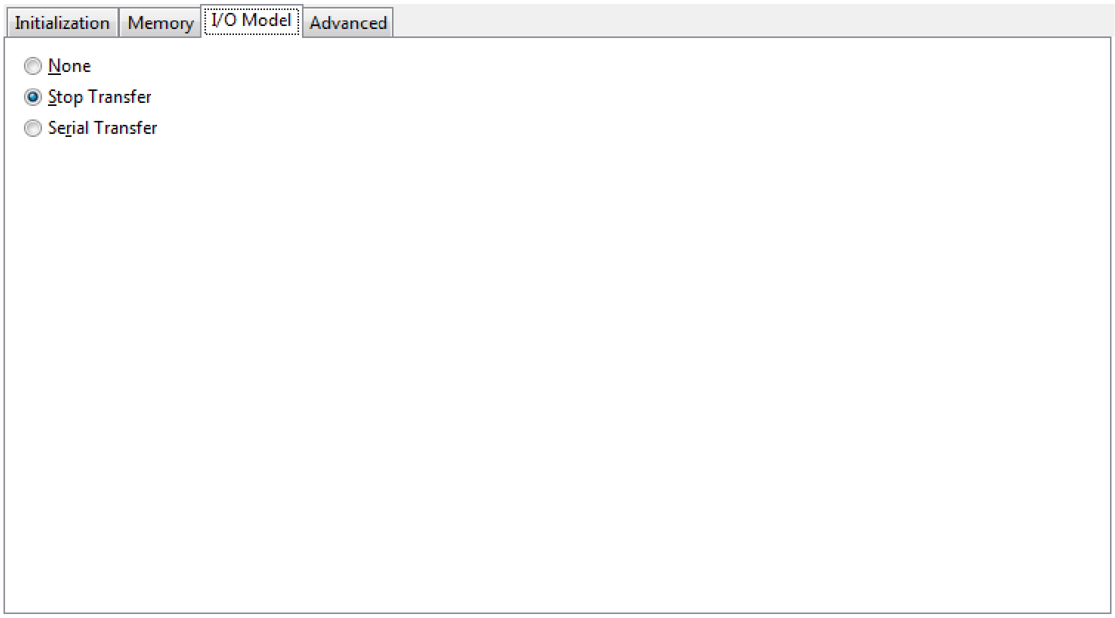


Figure 5-12. I/O Model Tab

5.3.4 Advanced tab

Use the **Advanced** tab to specify that Palladium is used to emulate the target.

Figure 5-13. Advanced tab

5.4 Working with Breakpoints

A breakpoint is set on an executable line of a program; if the breakpoint is enabled when you debug, the execution suspends before that line of code executes.

The different breakpoint types that you can set are listed below:

- Software breakpoints: The debugger sets a software breakpoint into target memory. When program execution reaches the breakpoint, the processor stops and activates the debugger. The breakpoint remains in the target memory until the user removes it.

  The breakpoint can only be set in writable memory, such as SRAM or DDR. You cannot use this type of breakpoints in ROM.
- Hardware breakpoints: Selecting the Hardware menu option causes the debugger to use the internal processor breakpoints. These breakpoints are usually very few and can be used with all types of memories (ROM/RAM) because they are implemented by using processor registers.

Tip

You can also set breakpoint types by issuing the `bp` command in the **Debugger Shell** view.

In this section:

- Setting Breakpoints
- Setting Hardware Breakpoints
- Removing Breakpoints
- Removing Hardware Breakpoints

5.4.1 Setting Breakpoints

This section explains how to set breakpoints within a program in CodeWarrior IDE.

To set a breakpoint, perform the following steps:

1. Switch to the **Debug** perspective in CodeWarrior IDE.
2. Open the **Debug** view if it is not already open by selecting **Window > Show View > Debug**.

   The **Debug** view appears, shown in the figure below.

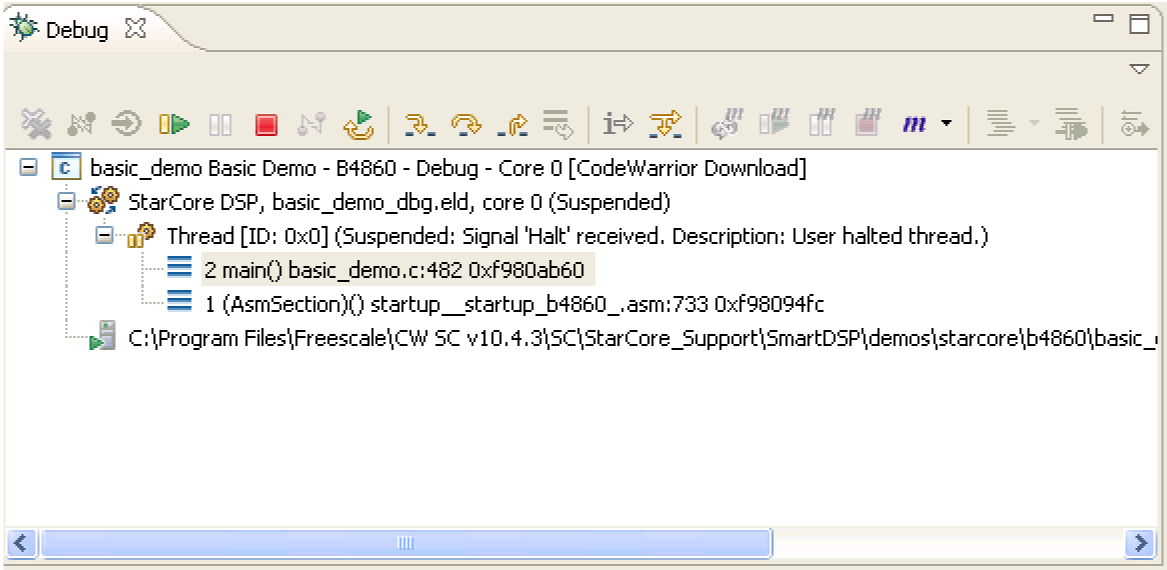


Figure 5-14. Debug View

3. Expand the **Thread** group.
4. Under the **Thread** group, select the thread that has the `main()` function.

   The source code appears in the Editor view (shown in the figure below). The small blue arrow to the left of the source code indicates which code statement the processor's program counter is set to execute next.

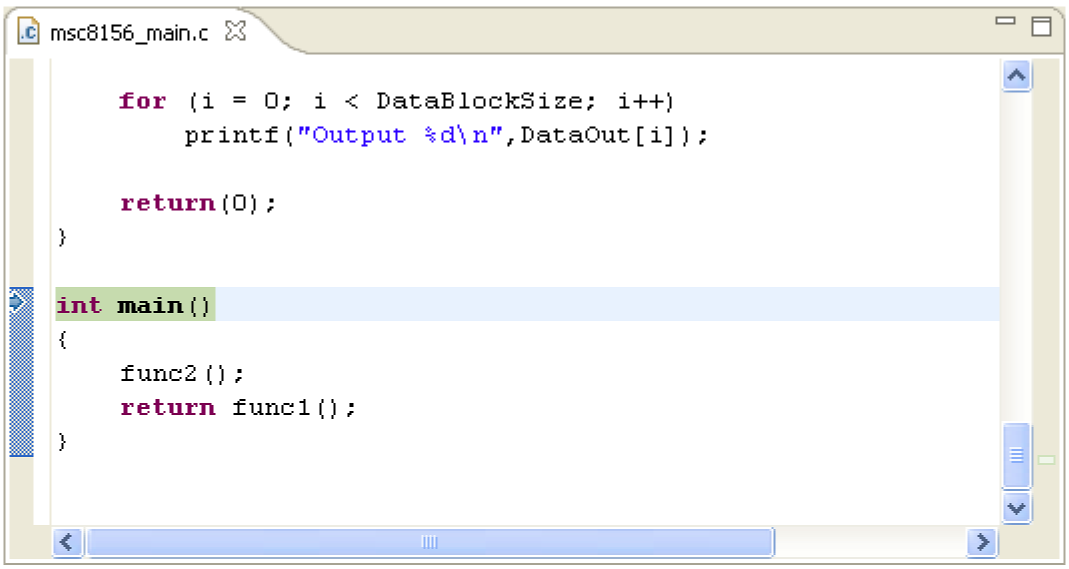


Figure 5-15. Editor View

5. In the Editor view, place the cursor on the line that has this statement: `printf("Output %d\n",DataOut[i]);`
6. Select **Run > Toggle Line Breakpoint**.

A blue dot appears in the marker bar to the left of the line (shown in the figure below). This dot indicates an enabled breakpoint. After the debugger installs the breakpoint, a blue checkmark appears beside the dot. The debugger installs a breakpoint by loading into the Java™ virtual machine the code in which you set that breakpoint.

Tip

An alternate way to set a breakpoint is to double-click the marker bar to the left of any source-code line. If you set the breakpoint on a line that does not have an executable statement, the debugger moves the breakpoint to the closest subsequent line that has an executable statement. The marker bar shows the installed breakpoint location. If you want to set a hardware breakpoint instead of a software breakpoint, use the `bp` command in the Debugger Shell view. You can also right-click on the marker bar to the left of any source-code line, and select Set Special Breakpoint from the context menu that appears.

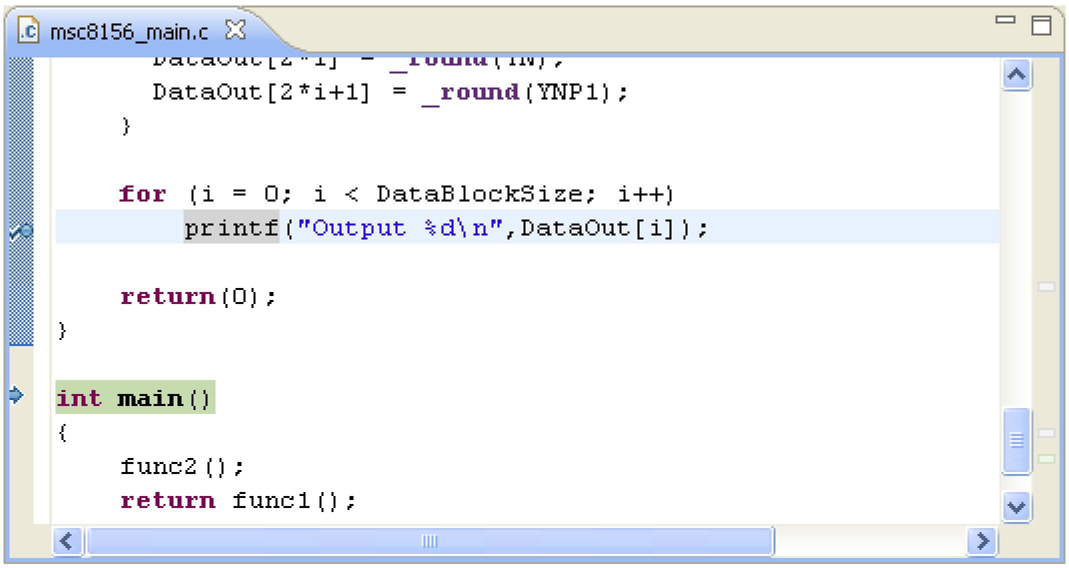


Figure 5-16. Editor View - After Setting Breakpoints

7. From the menu bar, select **Run > Resume**.

   The debugger executes all lines up to, but not including, the line at which you set the breakpoint. The editor view highlights the line at which the debugger suspended execution.

5.4.2 Setting Hardware Breakpoints

This section explains how to set hardware breakpoints within a program in CodeWarrior IDE.

There are two ways to set hardware breakpoints:

- Using IDE to Set Hardware Breakpoints
- Using Debugger Shell to Set Hardware Breakpoints

5.4.2.1 Using IDE to Set Hardware Breakpoints

To set a hardware breakpoint using the IDE, follow these steps:

1. In the CodeWarrior IDE, select **Run > Breakpoint Types > C/C++ Hardware Breakpoints**.
2. In the Editor view, click in the source line where you want to place the breakpoint.
3. Select **Run > Toggle Breakpoint**.

   A hardware breakpoint appears in the marker bar on the left side of the source line.

5.4.2.2 Using Debugger Shell to Set Hardware Breakpoints

You can use the **Debugger Shell** view to set hardware breakpoints. Follow these steps to set a hardware breakpoint using the **Debugger Shell** view:

1. Open the **Debugger Shell** view.
2. Begin the command line with the text:

   ```
   bp -hw
   ```
3. Complete the command line by specifying the function, address, or file at which you want to set the hardware breakpoint.

   For example, to set a breakpoint for line 6 in your program, type:

   ```
   bp -hw 6
   ```
4. Press the Enter key.

   The debugger shell executes the command and sets the hardware breakpoint.

Tip

Enter help `bp` at the command-line prompt to see examples of the `bp` command syntax and usage.

5.4.3 Removing Breakpoints

This section explains how to remove breakpoints from a program in CodeWarrior IDE.

To remove a breakpoint from your program, you have two options:

- Remove Breakpoints using Marker Bar
- Remove Breakpoints using Breakpoints View

5.4.3.1 Remove Breakpoints using Marker Bar

To remove an existing breakpoint using the marker bar, follow these steps:

1. Right-click the breakpoint in the marker bar.
2. Select **Toggle Breakpoint** from the menu that appears.

5.4.3.2 Remove Breakpoints using Breakpoints View

To remove an existing breakpoint using the **Breakpoints** view, follow these steps:

1. Open the **Breakpoints** view if it is not already open by selecting **Window > Show View > Breakpoints**.

   The **Breakpoints** view appears, displaying a list of breakpoints.

2. Right-click on the breakpoint you wish to remove and select **Remove** from the menu that appears (shown in the figure below).

   The selected breakpoint is removed, and it disappears from the both the marker bar and the list in the view.

NOTE

To remove all of the breakpoints from the program at once, select **Remove All** from the menu.

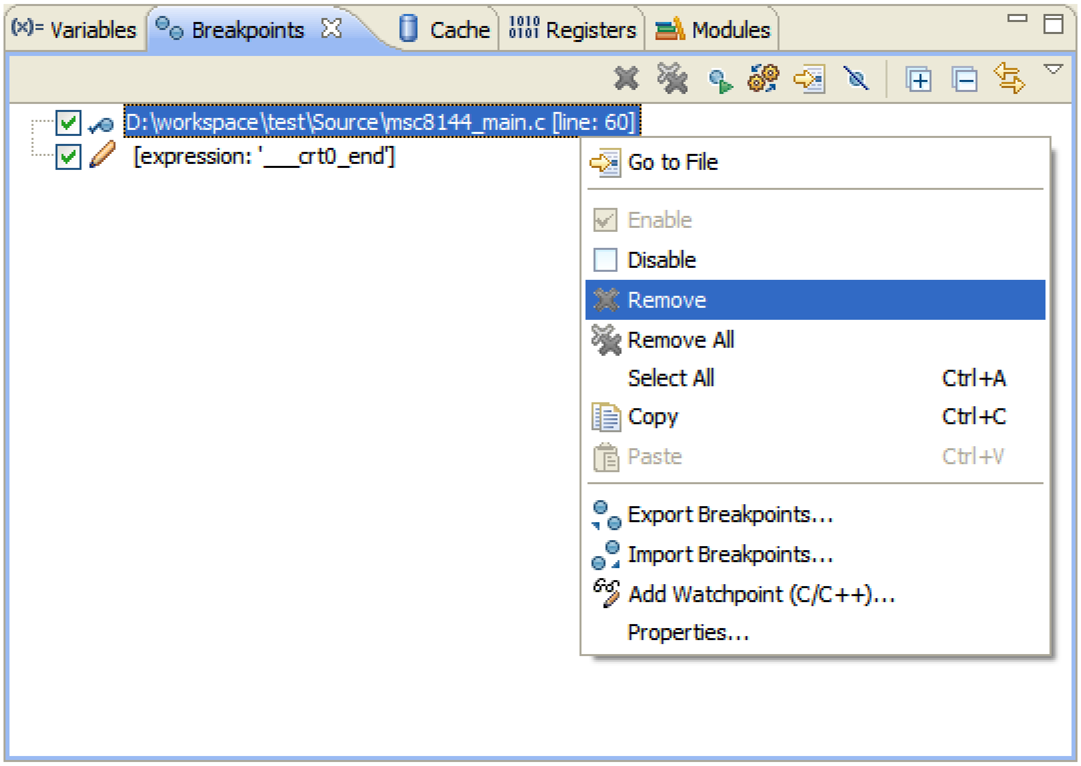


Figure 5-17. Removing Breakpoint

5.4.4 Removing Hardware Breakpoints

This section explains how to remove hardware breakpoints from a program in CodeWarrior IDE.

There are two ways to remove existing hardware breakpoints:

- Remove Hardware Breakpoints using the IDE
- Remove Hardware Breakpoints using Debugger Shell

5.4.4.1 Remove Hardware Breakpoints using the IDE

To remove a hardware breakpoint, follow these steps:

1. Right-click on the existing breakpoint in the marker bar.
2. Select **Toggle Breakpoint** from the menu that appears.

Alternatively, you can remove the breakpoint from the **Breakpoints** view, using the following steps:

1. Open the **Breakpoints** view if it is not already open by choosing **Window > Show View > Breakpoints**.

   The **Breakpoints** view appears, displaying a list of breakpoints.

2. Right-click on the hardware breakpoint you wish to remove and select **Remove** from the menu that appears.

   The selected breakpoint is removed, and it disappears from the both the marker bar and the list in the view.

5.4.4.2 Remove Hardware Breakpoints using Debugger Shell

To remove a hardware breakpoint using the **Debugger Shell** view, follow these steps:

1. Open the debugger shell.
2. Begin the command line with the text:

   ```
   bp -hw
   ```
3. Complete the command line by specifying the function, address, or file at which you want to remove the hardware breakpoint.

   For example, to remove a breakpoint at line 6 in your program, type:

   ```
   bp -hw 6 off
   ```
4. Press the **Enter** key.

   The debugger shell executes the command and removes the hardware breakpoint.

5.5 Working with Watchpoints

A watchpoint is another name for a data breakpoint that you can set on an address or a range of addresses in the memory.

The debugger halts execution each time the watchpoint location is read, written, or accessed (read or written). You can set a watchpoint using the **Add Watchpoint** dialog box. To open the **Add Watchpoint** dialog box, use one of the following views:

- **Breakpoints** view
- **Memory** view
- **Variables** view

The debugger handles both watchpoints and breakpoints in similar manners. You can use the **Breakpoints** view to manage both watchpoints and breakpoints. It means, you can use the **Breakpoints** view to add, remove, enable, and disable both watchpoints and breakpoints. The debugger attempts to set the watchpoint if a session is in progress based on the active debugging context (the active context is the selected project in the **Debug** view).

If the debugger sets the watchpoint when no debugging session is in progress, or when re-starting a debugging session, the debugger attempts to set the watchpoint at startup as it does for breakpoints. The **Problems** view displays error messages when the debugger fails to set a watchpoint. For example, if you set watchpoints on overlapping memory ranges, or if a watchpoint falls out of execution scope, an error message appears in the Problems view. You can use this view to see additional information about the error.

The following sections explain how to set or remove watchpoints:

- Setting Watchpoints
- Removing Watchpoints

5.5.1 Setting Watchpoints

Use the **Add Watchpoint** dialog box to create a watchpoint for a memory range. You can specify these parameters for a watchpoint:

- An address (including memory space)
- An expression that evaluates to an address
- A memory range
- An access type on which to trigger

To open the **Add Watchpoint** dialog box, follow these steps:

1. Open the **Debug** perspective.
2. Click one of these tabs:
    - **Breakpoints**
    - **Memory**
    - **Variables**

    The corresponding view appears.

3. Right-click the appropriate content inside the view as mentioned in the table below.

Table 5-18. Opening the Add Watchpoint dialog box

In the View...	Right-Click...
Breakpoints	An empty area inside the view.
Memory	The cell or range of cells on which you want to set the watchpoint.
Variables	A global variable.

NOTE

The debugger does not support setting a watchpoint on a stack variable or a register variable. Setting a watchpoint on a local variable may result in halt of execution at unexpected locations.

4. Select **Add Watchpoint (C/C++)** from the context menu that appears.

   The **Add Watchpoint** dialog box appears (shown in the figure below). The debugger sets the watchpoint according to the settings that you specify in the **Add Watchpoint** dialog box. The **Breakpoints** view shows information about the newly set watchpoint. The **Problems** view shows error messages when the debugger fails to set the watchpoint.

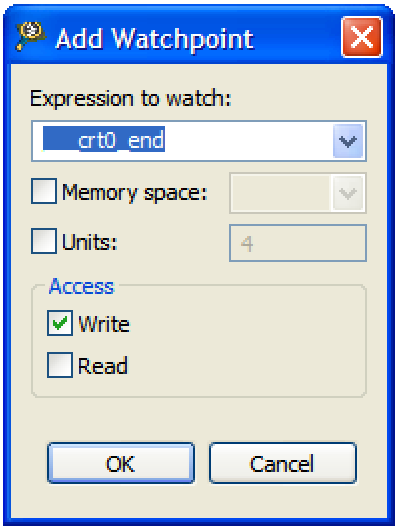


Figure 5-18. Add Watchpoint Dialog Box

The table below describes the options available in the **Add Watchpoint** dialog box.

Table 5-19. Add Watchpoint dialog box options

Option	Description
Expression to watch	Enter an expression that evaluates to an address on the target device. When the specified expression evaluates to an invalid address, the debugger halts execution and displays an error message. You can enter these types of expressions: • An r-value, such as `&variable` • A register-based expression. Use the $ character to denote register names. For example, enter `$SP-12` to have the debugger set a watchpoint on the stack pointer address minus 12 bytes. The **Add Watchpoint** dialog box does not support entering expressions that evaluate to registers.
Memory space	Select this option to specify an address, including memory space, at which to set the watchpoint. Use the text box to specify the address or address range on which to set the watchpoint. If a debugging session is not active, the text/list box is empty, but you can still type an address or address range.
Units	Enter the number of addressable units that the watchpoint monitors.
Write	Select this option to enable the watchpoint to monitor write activity on the specified memory space and address range. Clear this option if you do not want the watchpoint to monitor write activity.
Read	Select this option to enable the watchpoint to monitor read activity on the specified memory space and address range. Clear this option if you do not want the watchpoint to monitor read activity.

5.5.2 Removing Watchpoints

To remove a watchpoint, perform these steps:

1. Open the **Breakpoints** view if it is not already open by selecting **Window > Show View > Breakpoints**.

   The **Breakpoints** view appears, displaying a list of watchpoints.

2. Right-click on the watchpoint you wish to remove and select **Remove** from the menu that appears.

   The selected watchpoint is removed, and it disappears from the list in the **Breakpoints** view.

5.6 Working with Registers

Use the **Registers** view to display and modify the contents of the registers of the processor on your target board.

To display the **Registers** view, select **Window > Show View > Other > Debug > Registers**. The **Registers** view appears (shown in the figure below). The default state of the **Registers** view provides details on the processor's registers.

The **Registers** view displays categories of registers in a tree format. To display the contents of a particular category of registers, expand the tree element of the register category of interest.

Tip

You can also view and update registers by issuing the `reg`, `change`, and `display` commands in the **Debugger Shell** view.

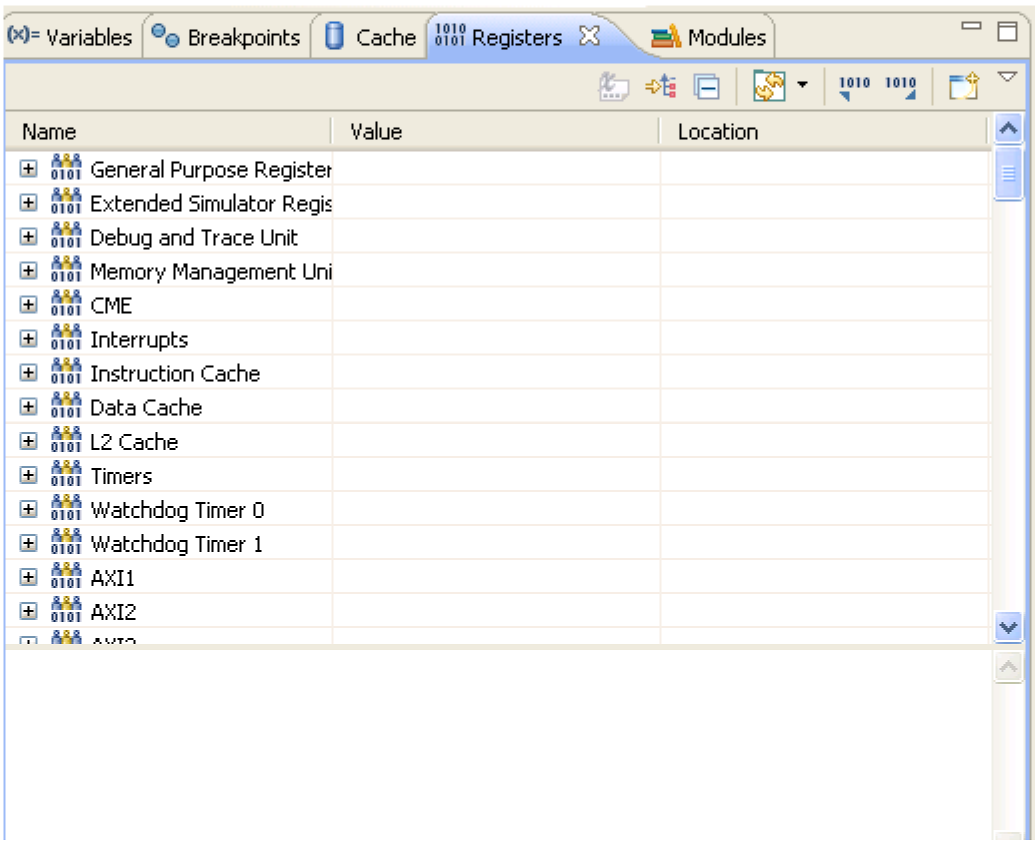


Figure 5-19. Registers View

In this section:

- Viewing Register Details
- Registers View Context Menu
- Working with Register Groups

5.6.1 Viewing Register Details

This section explains how to use the **Registers** view to show the details of a register.

To open the **Registers** view, you must first start a debugging session.

To see the registers and their descriptions, follow these steps:

1. In the **Debug** perspective, click the **Registers** view tab.

   The **Registers** view appears, as shown in the figure below.

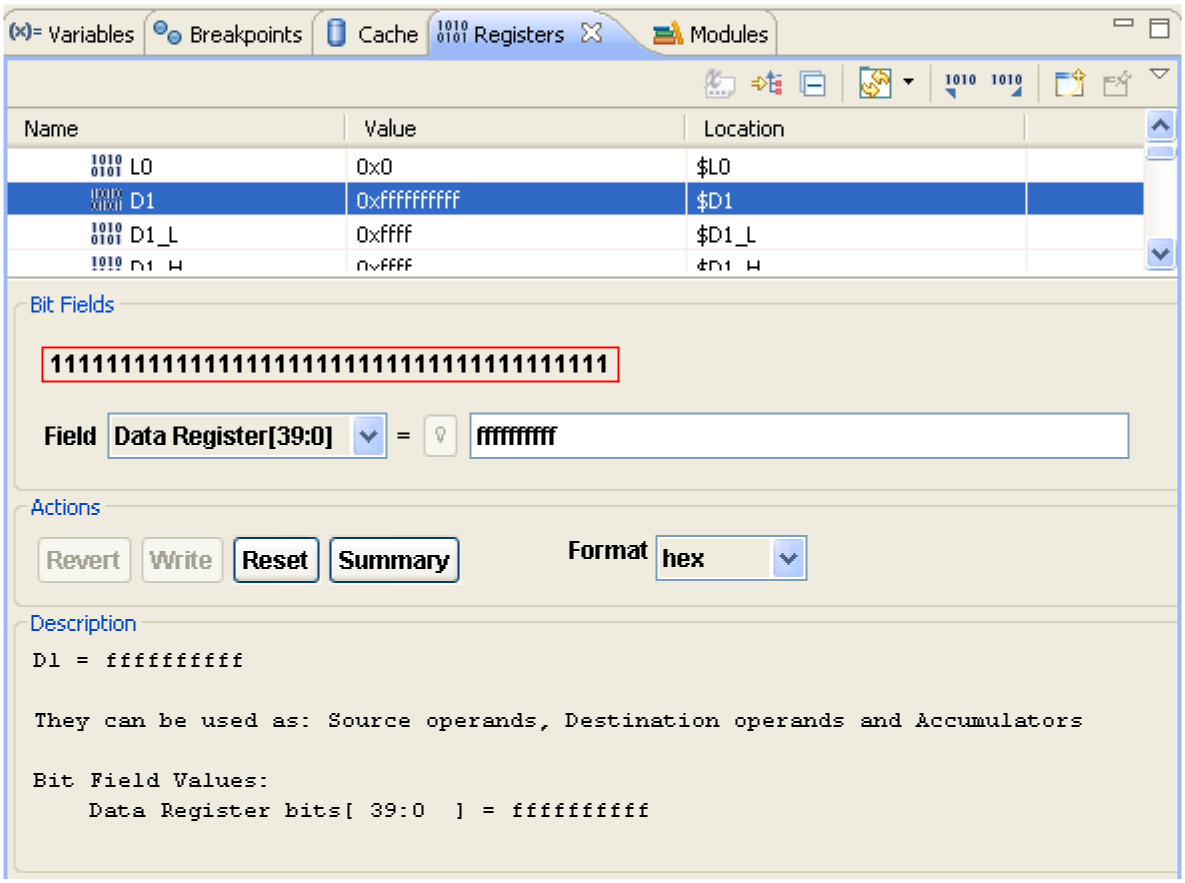


Figure 5-20. Registers View - Register Details

2. Click the **View Menu** button (the inverted triangle) on the **Registers** view toolbar.
3. Select **Layout > Vertical** or **Layout > Horizontal** to show register details.

NOTE

Selecting **Layout > Registers View Only** hides the register details.

4. Expand a register group to see individual registers.

5. Select a specific register by clicking it.

   The details of the selected register get displayed.

   NOTE

   Use the **Format** list box to change the format of data displayed for the selected register.

6. Examine register details. For example,
   - Use the **Bit Fields** group to see a graphical representation of the selected register's bit fields. You can use this graphical representation to select specific bits or bit fields.
   - Use the **Actions** group to perform operations, such as update bit field values and format the displayed register data.
   - Use the **Description** group to see an explanation of the selected register, bit field, or bit value.

   Tip

   To enlarge the **Registers** view, click **Maximize** on the view's toolbar. After you finish looking at the register details, click **Restore** on the view's toolbar to return the view to its previous size. Alternatively, right-click the **Registers** tab and select **Detached**. The **Registers** view becomes a floating window that you can resize. After you finish looking at the register details, right-click the **Registers** tab of the floating window and select **Detached** again. You can rearrange the re-attached view by dragging its tab to a different collection of view tabs.

In this section:

- Bit Fields
- Changing Bit Fields
- Actions
- Description

5.6.1.1 Bit Fields

The **Bit Fields** group of the **Registers** view (see the figure below) shows a graphical representation of the selected register's bit values. This graphical representation shows how the register organizes bits. You can use this representation to select and change the register's bit values. Hover the cursor over each part of the graphical representation to see additional information.

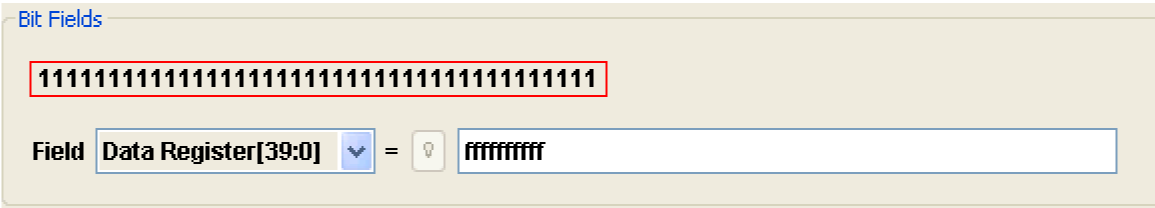


Figure 5-21. Register Details - Bit Fields Group

Tip

You can also view register details by issuing the `reg` command in the **Debugger Shell** view.

A bit field is either a single bit or a collection of bits within a register. Each bit field has a mnemonic name that identifies it. You can use the **Field** list box to view and select a particular bit field of the selected register. The list box shows the mnemonic name and bit-value range of each bit field. In the Bit Fields graphical representation, a box surrounds each bit field. A red box surrounds the bit field shown in the **Field** list box.

After you use the **Field** list box to select a particular bit field, you see its current value in the **=** text box. If you change the value shown in the text box, the **Registers** view shows the new bit field value.

The minimum resolution of bit field descriptions is 2 bits. Consequently, register details are not available for single-bit overflow registers.

The maximum resolution of bit field descriptions is 32 bits.

5.6.1.2 Changing Bit Fields

To change a bit field in a register, you must first start a debugging session, and then open the **Registers** view.

To change a bit field, perform these steps:

1. In the **Registers** view, view register details.
2. Expand the register group that contains the bit field you want to change.

   Register details appear in the **Registers** view.

3. From the expanded register group above the register details, select the name of the register that contains the bit field that you want to change.

   The **Bit Fields** group displays a graphical representation of the selected bit field. The **Description** group displays explanatory information about the selected bit field and parent register.

4. In the **Bit Fields** group, click the bit field that you want to change. Alternatively, use the **Field** list box to specify the bit field that you want to change.
5. In the **=** text box, type the new value that you want to assign to the bit field.
6. In the **Action** group, click **Write**.

   The debugger updates the bit field value. The bit values in the **Value** column and the **Bit Fields** group change to reflect your modification.

NOTE

Click **Revert** to discard your changes and restore the original bit field value.

5.6.1.3 Actions

Use the **Actions** group of the Registers view (see the figure below) to perform various operations on the selected register's bit field values.

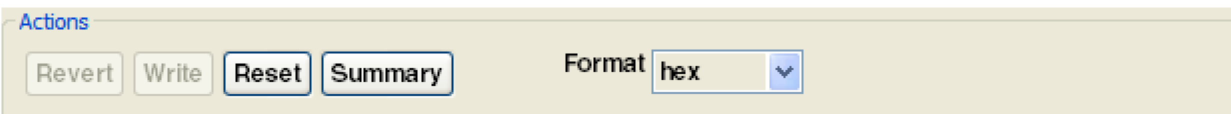


Figure 5-22. Register View - Actions Group

The table below lists each item in the **Actions** group and explains the purpose of each.

Table 5-20. Actions Group Items

Item	Description
Revert	Discard your changes to the current bit field value and restore the original value. The debugger disables this button if you have not made any changes to the bit field value.
Write	Save your changes to the current bit field value and write those changes into the register's bit field. The debugger disables this button after writing the new bit field value, or if you have not made any changes to that value.
Reset	Change each bit of the bit field value to its register-reset value. The register takes on this value after a target-device reset occurs. To confirm the bit field change, click Write. To cancel the change, click **Revert**.

Table continues on the next page...

Table 5-20. Actions Group Items (continued)

Item	Description
Summary	Display **Description** group content in a pop-up window. Press the Esc key to close the pop-up window.
Format	Specify the data format of the displayed bit field values.

5.6.1.4 Description

The **Description** group of the **Registers** view (see the figure below) shows explanatory information for the selected register.

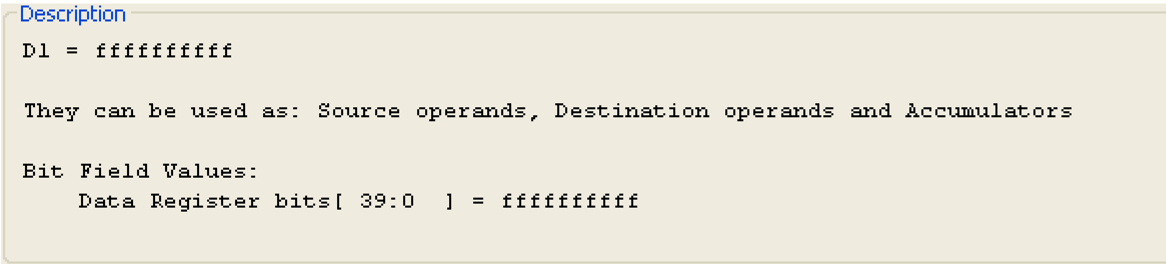


Figure 5-23. Register View - Description Group

The register information covers:

- Current value
- Description
- Bit field explanations and values

Some registers have multiple modes (meaning that the register's bits can have multiple meanings, depending on the current mode). If the register you examine has multiple modes, you must select the appropriate mode.

5.6.2 Registers View Context Menu

The Registers view context menu provides you various options for working with registers.

To display the Registers view context menu, right-click a register in the **Registers** view.

The table below lists the options of the Registers view context menu.

Table 5-21. Registers View Context Menu Options

Option	Description
Select All	Selects the entire contents of the current register.
Copy Registers	Copies to the system clipboard the contents of the selected register.
Enable	Allows the debugger to access the selected register.
Disable	Prevents the debugger from accessing the selected register.
View Memory	Displays the corresponding memory for the selected register.
Format	Use to specify the displayed data format for the selected register: • Natural: Default data format • Decimal: Decimal data format • Hexadecimal: Hexadecimal data format • Binary: Binary data format • Fractional: Fractional data formats, Q0-Q39
Cast to Type	Opens a dialog box that you can use to cast the selected register value to a different data type.
Restore Original Type	Reverts the selected register value to its default data type.
Find	Opens a dialog box that you can use to select a particular register.
Change Value	Opens a dialog box that you can use to change the current register value.
Show Details As	Allows you to specify how the debugger displays the register's contents. The options are: • **Default Viewer**: The register's contents are displayed as a hexadecimal value. • **Register Details Panel**: The register's values are display in a bit format, along with a description of their purpose.
Add Register Group	Opens a dialog box that you can use to create a new collection of registers to display in the **Registers** view.
Restore Default Register Groups	Resets the custom groups of registers created using the **Add Register Group** option, and restores the default groups provided by the debugger as they were when CodeWarrior was installed. Note that if you select this option, all custom groupings of registers done by you are lost.
Add Watchpoint (C/C++)	Opens the **Add Watchpoint** dialog box, proposing to set a watchpoint on an expression representing the register. The debugger sets the watchpoint according to the settings that you specify in the **Add Watchpoint** dialog box. The **Breakpoints** view shows information about the newly set watchpoint. The **Problems** view shows error messages when the debugger fails to set the watchpoint.
Watch	Adds a new watch-expression entry to the **Expressions** view.

5.6.3 Working with Register Groups

This section describes different operations that can be performed on register groups.

You can perform the following operations on the register groups:

- Adding a Register Group
- Editing a Register Group
- Removing a Register Group

5.6.3.1 Adding a Register Group

The default display of the **Registers** view groups related registers into a tree structure.

You can add a custom group of registers to the default register tree structure.

To add a new register group, perform these steps:

1. Right-click in the **Registers** view.

   A context menu appears.

2. Select **Add Register Group** from the context menu.

   The **Register Group** dialog box appears, as shown in the figure below.

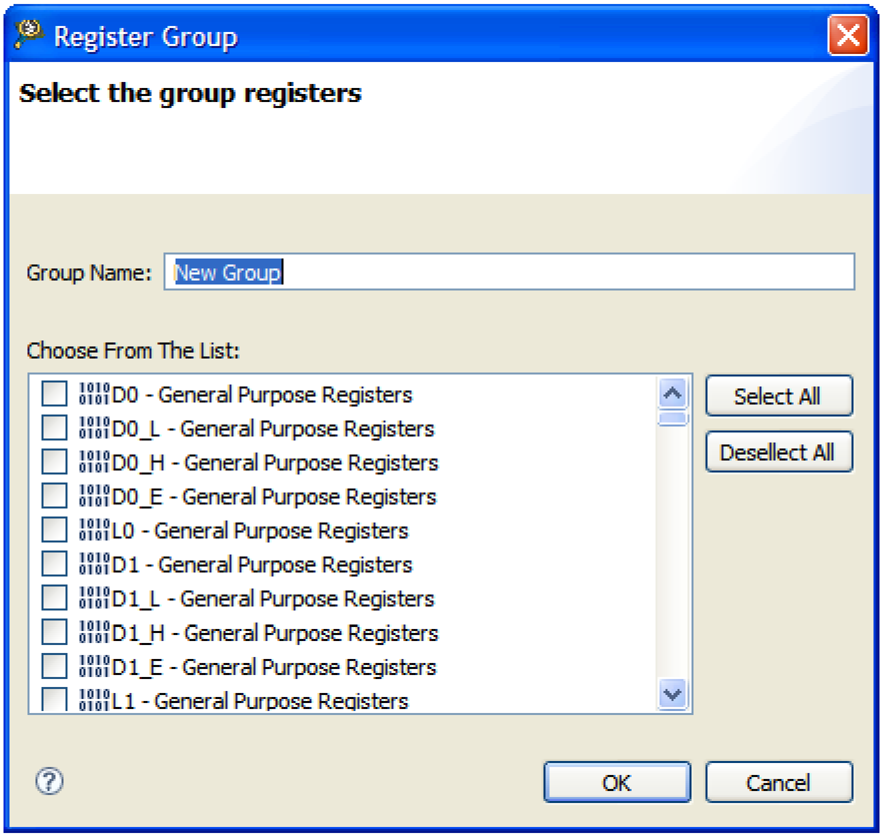


Figure 5-24. Register Group Dialog Box

3. Enter in the **Group Name** text box a descriptive name for the new group.
4. Select the checkbox next to each register you want to appear in the new group.

Tip

Click **Select All** to check all of the checkboxes. Click **Deselect All** to clear all of the checkboxes.

5. Click **OK**.

   The **Register Group** dialog box closes. The new group name appears in the **Registers** view.

5.6.3.2 Editing a Register Group

In the **Registers** view, you can edit both the default register groups and the groups that you add.

To do so, use the following steps:

1. In the **Registers** view, right-click the name of the register group you want to edit.

   A context menu appears.

2. Select **Edit Register Group** from the context menu.

   The **Register Group** dialog box appears.

3. If you wish, enter in the **Group Name** text box a new name for the group.
4. Check the checkbox next to each register you want to appear in the group.

Tip

Click **Select All** to check all of the checkboxes. Click **Deselect All** to clear all of the checkboxes.

5. Click **OK**.

   The **Register Group** dialog box closes. The new group name appears in the **Registers** view.

5.6.3.3 Removing a Register Group

In the **Registers** view, you can remove register groups.

To remove a register group, follow these steps:

1. In the **Registers** view, right-click the name of register group that you wish to remove.

   A context menu appears.

2. Select **Remove Register Group** from the context menu.

   The selected register group disappears from the **Registers** view.

5.7 Viewing memory

This section explains how to view memory of a target processor.

Use the **Memory** view to examine the active memory rendering of a specified expression or address. To display the **Memory** view, select **Window > Show View > Other > Debug > Memory (shown in the figure below)**.

The **Memory** view supports the display of multiple memory spaces. The figure below shows the **Memory** view with the *Expression:baseaddr <name> tree* active memory rendering tab.

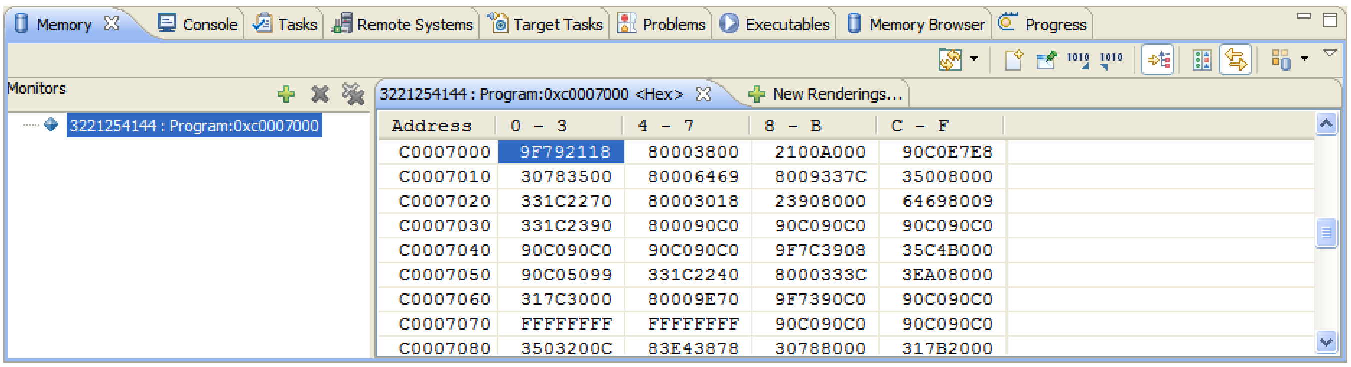


Figure 5-25. Memory View

In this section:

- Adding Memory Monitor
- Adding Memory Rendering
- Removing Memory Rendering
- Resetting to Base Address
- Go to Address

5.7.1 Adding Memory Monitor

This section describes how to add memory monitor in the Memory view.

To display the supported memory spaces for a target in the **Memory** view, perform the following steps:

You can add multiple memory monitors to the **Memory** view. To add a new memory monitor, follow these steps:

1. Start a debugging session.
2. Open the **Memory** view.
3. Click the plus sign (+) icon on the **Monitors** pane toolbar. Alternatively, right-click in the **Monitors** pane and select **Add Memory Monitor** from the context menu.

   The **Monitor Memory** dialog box appears, as shown in the figure below.

   NOTE

   The **Memory space** option appears only when the debugger associated with the active debugging context supports memory spaces, and the currently debugged process has multiple memory spaces.

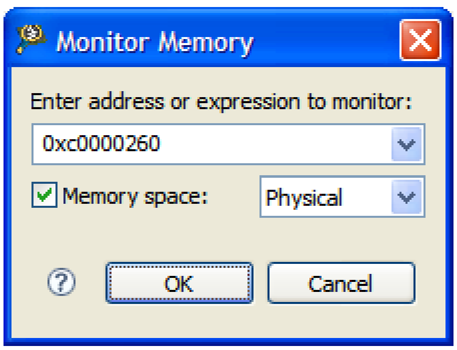


Figure 5-26. Monitor Memory Dialog Box

4. Specify information about the memory monitor:
   - To enter a memory space and literal address, simply enter an address.
   - To enter an expression, type in the expression. If you enter a literal address as the expression, use the prefix 0x to indicate hexadecimal notation, or use no prefix to indicate decimal notation. You can use the drop-down list to select a previously specified expression.

   NOTE

   If you do not select a memory space and the expression does not contain a memory space then the memory space is set to default data memory space that is specific for each architecture

5. Select the **Memory space** checkbox to translate the memory address or the expression to another memory space.

   The **Memory space** drop-down list is enabled.

6. Select one of the following values from the **Memory space** drop-down list:

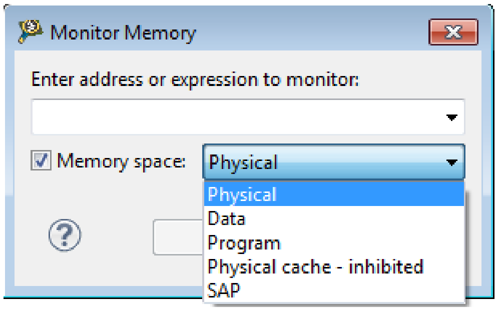


Figure 5-27. Monitor Memory Dialog Box - Memory space Options

- Physical: Indicates that the specified address or expression refers to physical memory space.
- Data: Indicates that the specified address or expression refers to data memory space.
- Program: Indicates that the specified address or expression refers to program memory space.
- Physical cache - inhibited: Similar with the **Physical** memory space, but no cached information will be used when the data is displayed.
- SAP: The memory is accessible while the system is running. The target must not be running for the above listed memory spaces. While using this memory space, other memory spaces will not be available.

NOTE

This memory space is available only for hardware targets.

7. Click **OK**.

   After evaluating the expression, an address and a memory space are generated. The debugger is responsible for converting the address and the memory space into a new address and other memory space that user selected.

   The debugger uses the following rules to perform the address and memory space conversion:

- If memory space is `NA` or it is not compatible with selected memory space, then the new expression address has the same value as evaluated address. For example, `Data:0x100` should be converted to `Program:0x100`, because the `Data` and `Program` memory spaces are not compatible.
- If memory space is compatible with selected memory space, than the new expression address is computed based on the MMU information. For example, `Data:0x100` should be converted to `Physical:0x2100` based on MMU configuration (`data:0x0 --> physical:0x2000`).

NOTE

In both scenarios, the new address and new memory space for expression will be displayed in memory rendering label and title along with the original expression.

The memory monitor is added to the **Monitors** panel and the default rendering is displayed in the **Renderings** panel.

5.7.2 Adding Memory Rendering

You can use the **Renderings** tab page of the **Memory** view to examine the memory content, starting at any valid address. The information displayed in this page is read-only and cannot be used to modify the memory content.

To add a new memory rendering, follow these steps:

1. Start a debugging session.
2. Open the **Memory** view.
3. In the **Monitors** pane, select the memory monitor for which you want to add a memory rendering.

   NOTE

   To create a memory monitor, right-click a blank area in the **Monitors** pane and select **Add Memory Monitor**. Alternatively, click the plus sign (+) icon in the **Monitors** pane toolbar.

4. Click the **New Renderings** tab in the **Memory** view.

   The **New Renderings** tab page appears, as shown in the figure below.

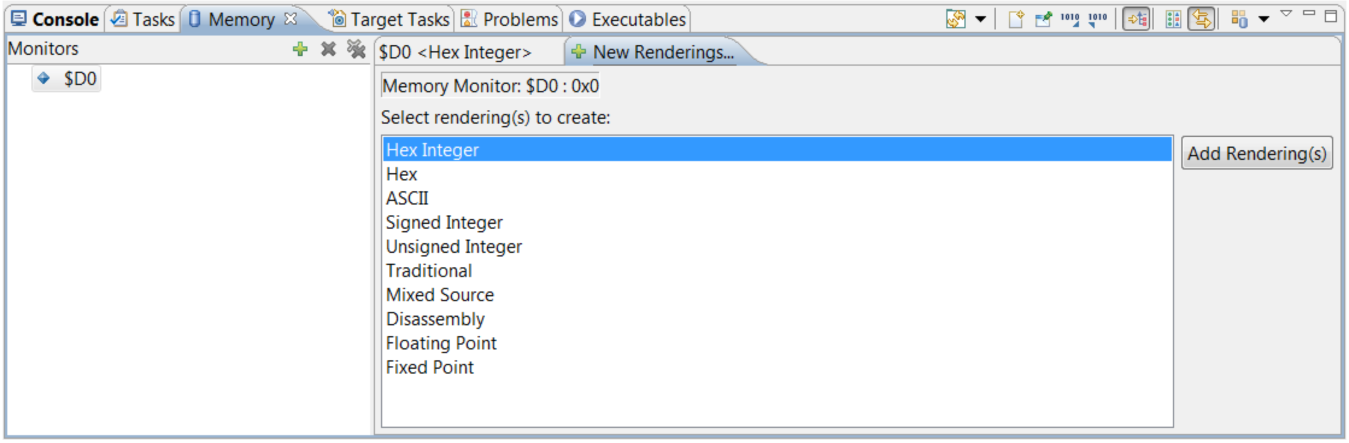


Figure 5-28. New Renderings Tab Page

5. Select a rendering type from the **Select rendering(s) to create** list.
6. Click **Add Rendering(s)**.

   The selected memory rendering type appears in the **Memory** view.

5.7.3 Removing Memory Rendering

To remove a memory rendering from the **Memory** view, follow these steps:

1. Open the **Memory** view.
2. In the **Renderings** tab page, select the tab that corresponds to the memory rendering that you want to remove.
3. Select **Remove Rendering** from the context menu.

   The memory rendering is removed from the **Memory** view.

5.7.4 Resetting to Base Address

To reset the memory rendering and display the base address of the rendering, follow these steps:

1. Open the **Memory** view.
2. In the **Renderings** tab page, select the tab that corresponds to the disassembly rendering that you want to reset to the base address.
3. Select **Reset to Base** from the context menu.

The disassembly rendering scrolls to the line that contains the base address of the displayed rendering.

5.7.5 Go to Address

The memory view provides graphical controls to display memory at a specific address. To go to a specific address, follow these steps:

1. Open the **Memory** view.
2. In the **Renderings** tab page, select the tab that corresponds to the disassembly rendering for which you want to display a specific address.
3. Select **Go to Address** from the context menu.

   A group of controls appears on the **Renderings** tab page, as shown in the figure below.

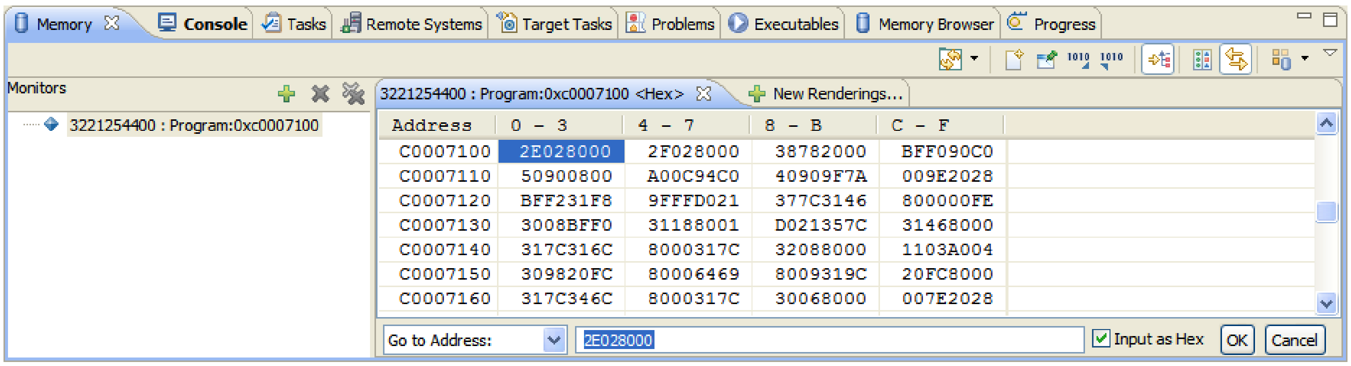


Figure 5-29. Disassembly Rendering - Go to Address

4. In the blank text box, enter the address that you want to display.

NOTE

Select the **Input as Hex** checkbox only if you enter the address in hexadecimal notation.

5. Click **OK** to have the Disassembly rendering scroll to the specified address. Alternatively, click **Cancel** to abort the operation and hide the group of controls.

5.8 Viewing Cache

This section provides detailed information on working with caches.

The CodeWarrior debugger allows you to view and modify the instruction cache and data cache of the target system during a debug session. The CodeWarrior for StarCore current release supports the cache viewer for L1 instruction, L1 data, L2 and L3 both instruction and data cache.

NOTE

Projects created for ISS targets do not support cache.

In this section:

- Cache View
- Cache View Toolbar Menu

5.8.1 Cache View

This section describes how to use Cache view.

Use the **Cache** view to examine L1 cache (such as instruction cache or data cache). Also, you can use the viewer to display L2 and L3 cache for targets that support it.

Use the **Cache** view to examine L1 cache (such as instruction cache or data cache). You can also use the viewer to display L2 and L3 cache for the supported targets. To open the **Cache** view, use the following steps:

1. Start a debugging session.
2. From the CodeWarrior IDE menu bar, select **Window > Show View > Other**.

   The **Show View** dialog box appears.

3. Expand the **Debug** group.
4. Select **Cache**.
5. Click **OK**.

   The **Cache** view appears, as shown in the figure below.

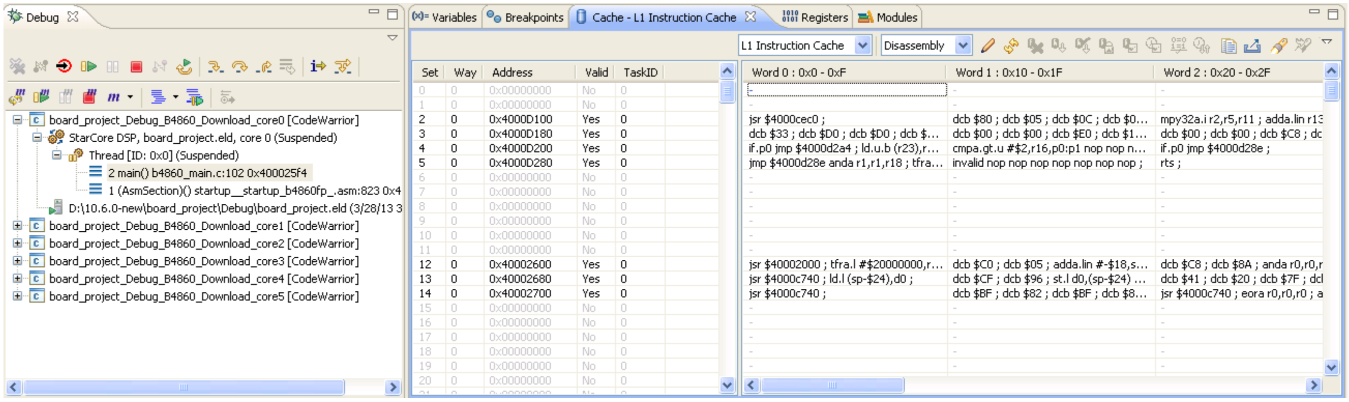


Figure 5-30. Cache View

6. Use the **Choose a Cache** drop-down list to specify the cache that you want to examine.

NOTE

For each target, you can view the content of all caches if they are enabled. If the **Choose a Cache** list box is grayed out, the current target does not support viewing the cache.

The table below explains the column headers displayed in the **Cache** view.

Table 5-22. Cache View Column Headers

Cache	Column Header	Description
L1 Cache L2 Cache L3 Cache	Set	Specifies the line in current way.
	Way	Specifies the way in current cache.
	Address	Displays the storage address of the current cache line.
	Valid	Specifies if the current line is valid. For targets supporting L1 cache viewer, the information is at the line level.
	Task ID	Displays the task ID of the task holding the current cache line. Currently supported only for L1 cache.
	Word	Specifies groups of bytes that are read at once and are aligned in cache memory at a given range offset.
L2 Cache L3 Cache	Dirty	Specifies if the cache line is dirty or not.
	Lock	Locks the cache and prevent the debugger from fetching new lines or discarding current valid lines.
	LRU	Displays the Least Recently Used (LRU) attribute for each cache line.
L2 Cache	CoreID	Lists the core that caused the reload of the address into the L2 cache.

Table continues on the next page...

Table 5-22. Cache View Column Headers (continued)

Cache	Column Header	Description
	CoreValid	core_id[0:3] indicates which of the dL1s have a copy of the line (core_valid[0]=1 - core0 dL1 has a copy, core_valid[1]=1 - core1 dL1 has a copy). The bits are not mutually exclusive, because a SC cluster has only 2 cores core_valid[2] & core_valid[3] are not used.

5.8.2 Cache View Toolbar Menu

Use the **Cache** view toolbar menu is to configure the cache information.

To display this menu, click the **Menu** button (inverted triangle) in the **Cache** view toolbar.

Tip

The **Cache** view toolbar buttons are alternative ways to implement the control actions defined in the toolbar menu.

NOTE

Depending upon the selected target, the options available in the **Cache** view toolbar may vary.

The table below describes the **Cache** view toolbar menu options.

Table 5-23. Cache View Toolbar Menu Options

Option	Description
Write	Commits content changes from the **Cache** view to the cache registers on the target hardware (if the target hardware supports doing so).
Refresh	Reads data from the target hardware and updates the **Cache** view display.
Invalidate	Discards the cache.
Flush	Flushes the entire contents of the cache. This option commits uncommitted data to the next level of the memory hierarchy, then invalidates the data within the cache.
Lock	Locks the cache and prevent the debugger from fetching new lines or discarding current valid lines.
Enable/Disable	Turns on/off the cache.
Disable LRU	Removes the Least Recently Used (LRU) attribute from the existing display for each cache line.

Table continues on the next page...

Table 5-23. Cache View Toolbar Menu Options (continued)

Option	Description
Enable/Disable Parity	Turns on/off the line data parity checksum calculation.
Inverse LRU	Displays the inverse of the Least Recently Used attribute for each cache line.
Copy Cache	Copies the cache contents to the system clipboard.
Export Cache	Exports the cache contents to a file.
Search	Finds an occurrence of a string in the cache lines.
Search Again	Finds the next occurrence of a string in the cache lines.
Preserve Sorting	Preserves sorting of the cache when the cache data is updated and the cache is refreshing. This option is disabled by default. If enabled, every operation that triggers cache refresh (such as step, run to breakpoint) will have to wait for cache data loading and sorting.
View Memory	Allows you to view the corresponding memory for the selected cache lines.
Lock Line	Locks the selected cache lines.
Invalidate Line	Invalidates the selected cache lines.
Flush Line	Flushes the entire contents of the selected cache lines.
Synchronize Line	Synchronizes selected cache data with memory data.
Lock Way	Locks the cache ways specified with the **Lock Ways** menu option. Locking a cache way means that the data contained in that way must not change. If the cache needs to discard a line, it will not discard locked lines (such as lines explicitly locked, or lines belonging to locked ways).
Unlock Way	Unlocks the cache ways specified with the **Lock Ways** menu option.
Lock Ways	Specifies the cache ways on which the **Lock Way** and **Unlock Way** menu options operate.

5.9 Changing Program Counter Value

This section explains how to change the program counter value in the CodeWarrior IDE to make the debugger execute a specific line of code.

To change the program counter value, follow these steps:

1. Start a debugging session.
2. In the Editor view, place the cursor on the line that you want the debugger to execute next.
3. Right-click in the Editor view.

   A context menu appears.

4. From the context menu, select **Move To Line**.

The CodeWarrior IDE modifies the program counter according to the specified location. The Editor view shows the new location.

5.10 Hard resetting

Use the reset hard command in the **Debugger Shell** view to send a hard reset signal to the target processor.

NOTE

The **Hard Reset** command is enabled only if the debug hardware you are using supports it.

Tip

You can also perform a hard reset by clicking **Reset** () on the **Debug** perspective toolbar.

5.11 Per Core Reset

This section describes how to enable per core reset.

To enable, follow the steps listed below:

1. Select **Run > Debug Configurations** from the IDE menu bar.

   The **Debug Configurations** dialog box appears.

2. Expand the **CodeWarrior** tree control, and select the desired target core.
3. In the right panel, click **Edit** from the **Target settings** group.

   The **Properties for <target>** dialog box appears.

4. Click **Edit**.

   The **Properties for <target> Target** dialog box with **Hardware or Simulator Target** page in the right panel appears, as the Figure 5-31 shows.

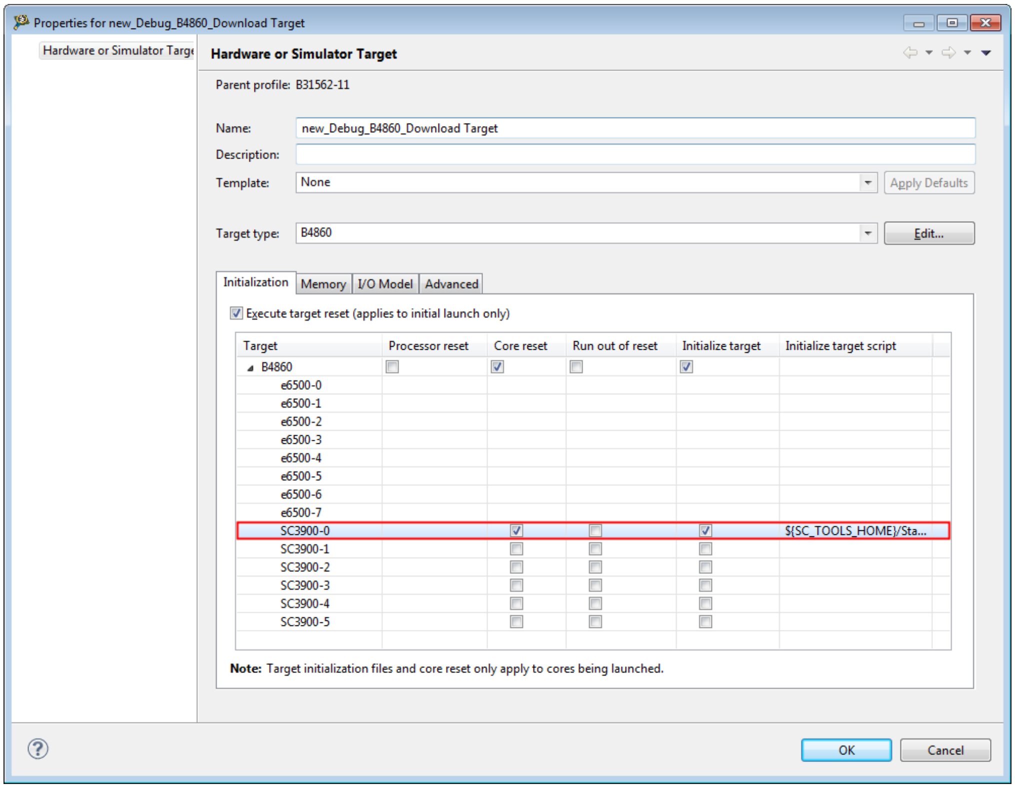


Figure 5-31. Properties for <target> Target Dialog Box

5. Select the checkbox in the Core reset column, corresponding to the desired target in the **Target** column (Figure 5-31).
6. Click **OK**.

   The **Properties for <target> Target** dialog box closes and the core reset is enabled for the selected target.

NOTE

Per-core reset affects only the debugged core if the corresponding **Core reset** option is selected.

NOTE

Core reset will be ignored when the current core is the first debugged core from the processor and **Execute target reset** or the **Processor reset** checkboxes are checked.

5.12 Setting Stack Depth

This section describes how to control the depth of the call stack displayed by the debugger.

Select **Window > Preferences > C/C++ > Debug > Maximum stack crawl depth** option to set the depth of the stack to read and display. Showing all levels of calls when you are examining function calls several levels deep can sometimes make stepping through code more time consuming. Therefore, you can use this menu option to reduce the depth of calls that the debugger displays.

5.13 Import a CodeWarrior Executable file Wizard

The **Import a CodeWarrior Executable file** wizard helps you to import a CodeWarrior executable file and create a new project.

To use the **Import a CodeWarrior Executable file** wizard, perform these steps:

1. From the CodeWarrior IDE menu bar, select **File > Import**.

   The **Import** wizard launches and the **Select** page appears, as shown in the figure below.

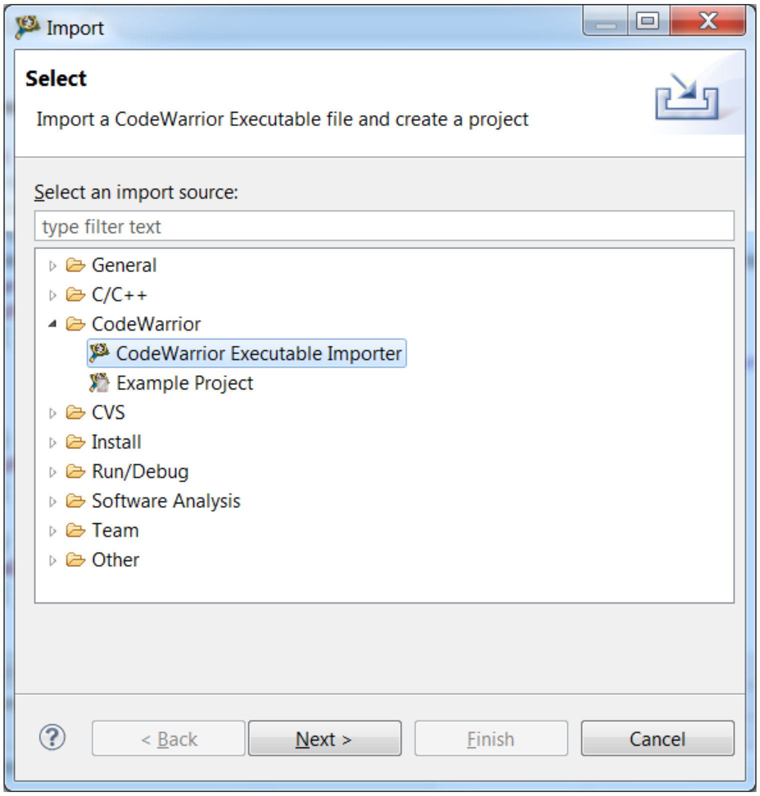


Figure 5-32. Import Wizard - Selecting CodeWarrior Executable Importer

2. Expand the **CodeWarrior** group.
3. Select the **CodeWarrior Executable Importer** to import a StarCore `.eld` file.
4. Click **Next**.

The wizard name changes to **Import a CodeWarrior Executable file** and the **Import a CodeWarrior Executable file** page appears.

The following sections describe the various pages that the wizard displays as it assists you in importing an executable (.eld) file:

- Import a CodeWarrior Executable file Page
- Import C/C++/Assembler Executable Files Page
- Processor Page
- Debug Target Settings Page

5.13.1 Import a CodeWarrior Executable file Page

Use the **Import a CodeWarrior Executable file** page to specify the name and location for your project.

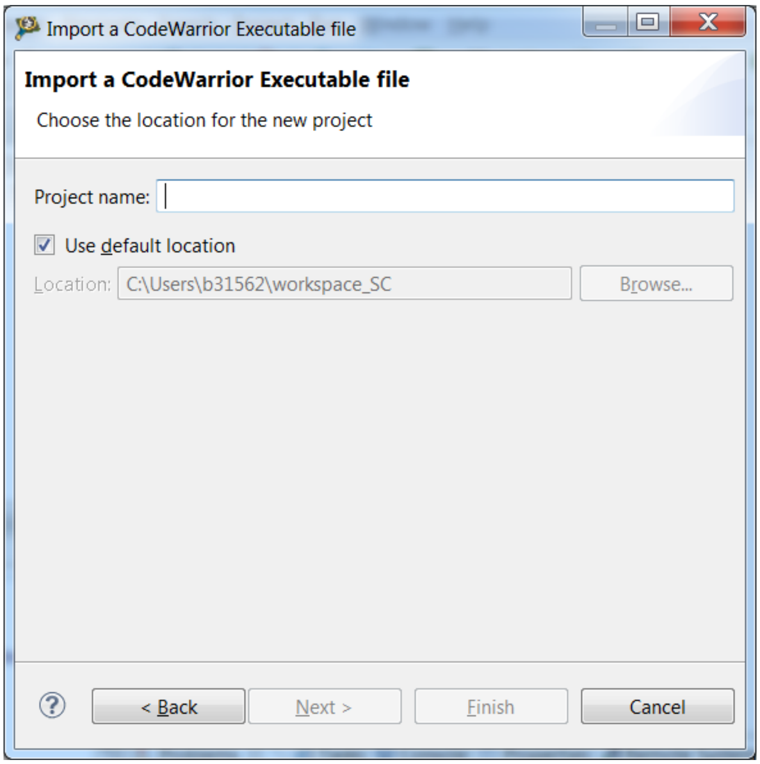


Figure 5-33. StarCore Executable - Import a CodeWarrior Executable File Page

The table below describes the options available on this page.

Table 5-24. Import a CodeWarrior Executable file page settings

Option	Description
Project name	Specify the name of the project. The specified name identifies the project created for debugging (but not building) the executable file.
Use default location	If you select this option, the project files required to build the program are stored in the current workspace directory of the workbench. If you clear this option, the project files are stored in the directory that you specify in the **Location** option.
Location	Specifies the directory that contains the project files. Use the Browse button to navigate to the desired directory. This option is only available when the **Use default location** option is cleared.

5.13.2 Import C/C++/Assembler Executable Files Page

Use the **Import C/C++/Assembler Executable Files** page to select an executable file or a folder to search for C/C++/assembler executable files.

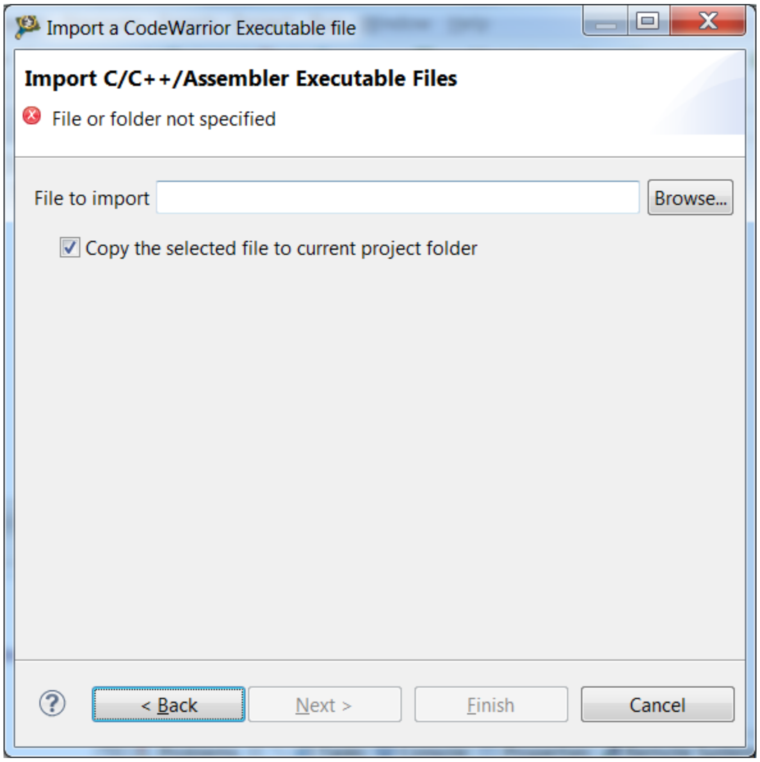


Figure 5-34. StarCore Executable - Import C/C++/Assembler Executable Files Page

The table below explains the options available on the page.

Table 5-25. Import C/C++/Assembler Executable Files page settings

Option	Description
File to import	Specifies the C/C++/assembler executable file. Click **Browse** to choose an executable file.
Copy the selected file to current project folder	Select this option to copy the executable file in the project folder.

5.13.3 Processor Page

Use the **Processor** page to specify the processor family for the imported executable file.

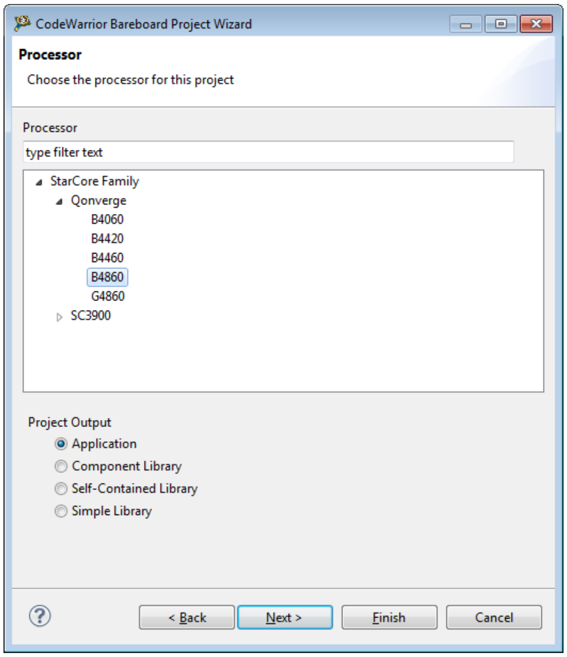


Figure 5-35. StarCore Executable - Processor Page

The table below describes the options available on the page.

Table 5-26. Processor page settings

Option	Description
Processor	Expand the processor family and select the appropriate target processor for the execution of the specified executable file. **Tip:** You can also type the processor name in the text box.

5.13.4 Debug Target Settings Page

Use the **Debug Target Settings** page to specify debugger connection type, board type, launch configuration type, and connection type for your project.

This page also allows you to configure connection settings for your project.

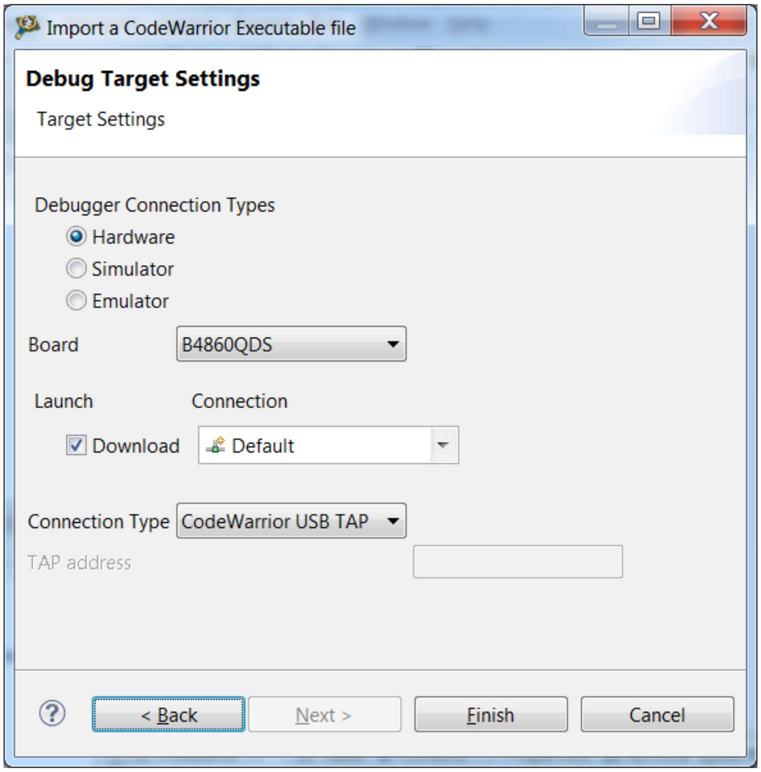


Figure 5-36. StarCore Executable - Debug Target Settings Page

The table below describes the options available on the page.

Table 5-27. Debug Target Settings page settings

Option	Description
Debugger Connection Types	Specifies what target the program executes on. • **Hardware**: Select to execute the program on the hardware available for the product. • **Simulator:** Select to execute the program on a software simulator. • **Emulator**: Select to execute the program on a hardware emulator.
Board	Specifies the hardware (board) supported by the selected processor.
Launch	Specifies the launch configurations and corresponding connection configurations, supported by the selected processor.
Connection	Specifies the connection configuration used by the project. • **Default**: Select to create a new connection with default configuration. • **Create New**: Select to create a new connection configuration manually. • **Edit Remote Systems**: Select to edit existing remote systems.

Table continues on the next page...

Table 5-27. Debug Target Settings page settings (continued)

Option	Description
Connection Type	Specifies the interface to communicate with the hardware.
TAP address	Enter the IP address of the selected TAP device.

5.14 Debugging Externally Built Executable Files

You can use the **Import a CodeWarrior Executable file** wizard to debug an externally built executable file, that is, an executable (`.eld`) file that has no associated CodeWarrior project.

For example, you can debug a `.eld` file that was generated using a different IDE. The process of debugging an externally built executable file can be divided into the following tasks:

- Import an Executable File
- Edit the Launch Configuration
- Specify the Source Lookup Path
- Debug Executable File

5.14.1 Import an Executable File

First of all, you need to import the executable file that you want the CodeWarrior IDE to debug.

The IDE imports the executable file into a new project.

To import an externally built executable file, follow these steps:

1. From the CodeWarrior IDE menu bar, select **File > Import**.

   The **Import** wizard appears.

2. Expand the **CodeWarrior** group.
3. Select **CodeWarrior Executable Importer** to import a StarCore `.eld` file.
4. Click **Next**.

   The wizard name changes to **Import a CodeWarrior Executable file** and the **Import a CodeWarrior Executable file** page appears.

5. In the **Project name** text box, enter the name of the project. This name identifies the project that the IDE creates for debugging (but not building) the executable file.
6. Clear the **Use default location** checkbox and click **Browse** to specify a different location for the new project. By default, the **Use default location** checkbox is selected.
7. Click **Next**.

   The **Import C/C++/Assembler Executable Files** page appears.

8. Click **Browse**.

   The **Select file** dialog box appears. Use the dialog box to navigate to the executable file that you want to debug.

9. Select the required file and click **Open**.

   The **Select file** dialog box closes. The path to the executable file appears in the **File to import** text box.

10. Check the **Copy the selected file to current project folder** checkbox to copy the executable file in the current workspace.
11. Click **Next**.

    The **Processor** page appears.

12. Select the appropriate target processor from the **StarCore Family** list.
13. Click **Next**.

    The **Debug Target Settings** page appears.

14. Select a debugger connection type for the execution of the specified executable file:
    - **Simulator:** If you select this option, the program executes on a software simulator.
    - **Hardware:** If you select this option, the program executes on the hardware available for the product.
15. Select the connection type you want to use, from the **Debugger Connection Types** group.
16. Select the board, you plan to use, from the **Board** drop-down list.
17. Select the launch configurations, that you want to include in your project and the corresponding connection configuration.

    NOTE

    For more information on remote systems, see *CodeWarrior Development Studio Common Features Guide*.

18. Click **Finish**.

The **CodeWarrior Executable Importer** wizard creates a new project according to your specifications. You can access the project from the **CodeWarrior Projects** view in the IDE.

5.14.2 Edit the Launch Configuration

Using the tabs of the **Debug Configurations** dialog box, you can change the launch configuration settings that you specified while importing the `.eld` file.

To edit the launch configuration for your executable file, follow these steps:

1. Click the **Debugger** tab of the **Debug Configurations** dialog box.

   The corresponding page appears.

2. Configure the debugger options as appropriate for your executable file.

   For example, specify the appropriate target processor, any initialization files, and connection protocol.

5.14.3 Specify the Source Lookup Path

Source lookup path is specified in terms of the compilation path and the local file system path.

The CodeWarrior debugger uses both these paths to debug the executable file.

The compilation path is the path to the original project that built the executable file. If the original project is from an IDE on a different computer, you need to specify the compilation path in terms of the file system on that computer.

The local file system path is the path to the project that the CodeWarrior IDE creates to debug the executable file.

The CodeWarrior IDE supports automatic as well as manual path mapping.

In this section:

- Automatic Path Mapping
- Manual Path Mapping

5.14.3.1 Automatic Path Mapping

This section describes how to set automatic path mapping for your project.

The Automatic Path Mapping feature focuses on reducing as much as possible the manual steps required by the user to set up the path mapping settings to support source level debugging.

For automatic path mapping, use these steps:

1. In the **CodeWarrior Projects** view, expand **Binaries** folder.
2. Right-click the `*.eld` file and select **Properties** from the context menu that appears.

   The **Properties for *<project>*.eld** dialog box appears.

3. Select **Path Mappings** from the list.

   The **Path Mappings** page appears. The **Path Mapping Configuration** page displays every path mapping settings for the launch configurations associated with a project. You can edit either a single set of settings for all launch configurations associated with a project or the settings for a given launch configuration by selecting the appropriate value from the launch configuration combo box.

   Under each path mapping, the table displays a list of source files that exist in the binary executable that share the same source mapping prefix. In the **Local Path** column, a green (✔) is displayed if the file exists after being mapped by the destination path or a red (✖) if it does not. Also, the local path itself is displayed in red if it does not exist on the local file system.

   A default folder named **Files Not Mapped** is created if the user explicitly removes existing mappings. All unmapped files that are not found on the file system are automatically shown under this folder.

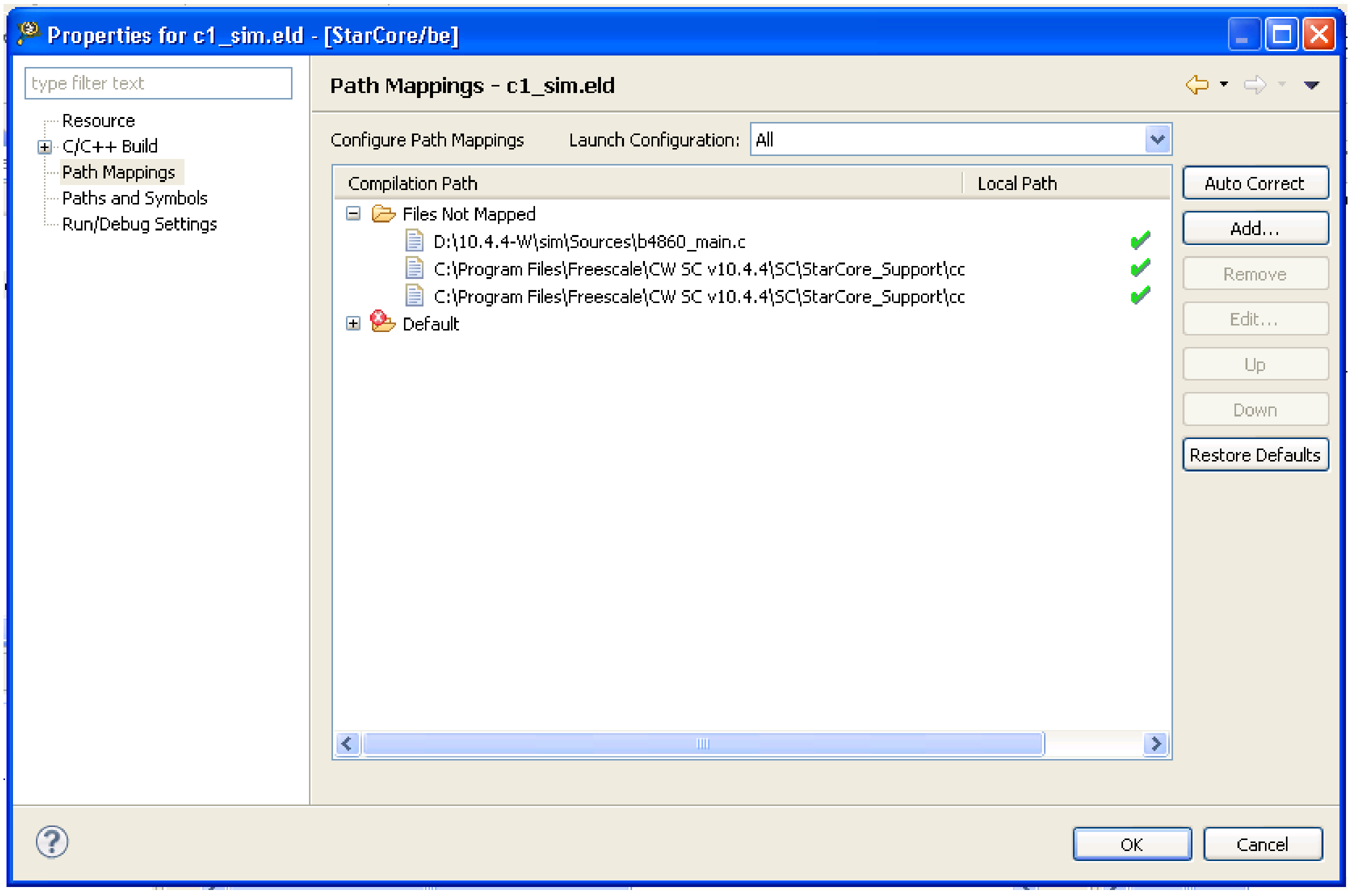


Figure 5-37. Automatic Path Mapping

The table below describes various options available in the **Path Mappings** page.

Table 5-28. Automatic Path Mappings Options

Options	Description
Auto Correct	The **Auto Correct** button automatically iterate through all the files not found on the file system and attempt to group them with their common prefix. This action often generates satisfactory results from the source files listed in the binaries so that the manual steps required by the user are kept at a minimum.
Add	The **Add button** allows you to create a new **Path Mapping** entry. If any paths are selected, the dialog will be pre-initialized with their common prefix.
Remove	The **Remove** button allows you to remove any path mapping or default entry.
Edit	The Edit button allows you to change the values of the selected path mapping entry. Editing non-path mapping entry is not supported.
Up	The **Up** button allows the user to reorder the entries by moving the selected entry up in the list. Note that path mappings need always to be grouped together, and as such moving up the top most path mapping will always move its siblings above the preceding entry as well.
Down	The **Down** button allows the user to reorder the entries by moving the selected entry down in the list. Note that path mappings need always to be

Table continues on the next page...

Table 5-28. Automatic Path Mappings Options (continued)

Options	Description
	grouped together, and as such moving down the bottom most path mapping will always move its siblings below the following entry as well.
Restore Defaults	The **Restore Defaults** button resets the launch configuration path mappings settings to their previous values, including the library path mapping automatically generated by the APM plug-in.

NOTE

If you create a new path mappings manually from the source lookup path, the source files are automatically resorted to their most likely path mapping parent.

4. Click **OK**.

The **Path Mappings** dialog box closes.

5.14.3.2 Manual Path Mapping

This section describes how to set path mapping manually in your project.

To manually specify the source lookup path for the newly imported executable file, use these steps:

1. Click the **Source** tab of the **Debug Configurations** dialog box.

   The corresponding page appears, as shown in the figure below.

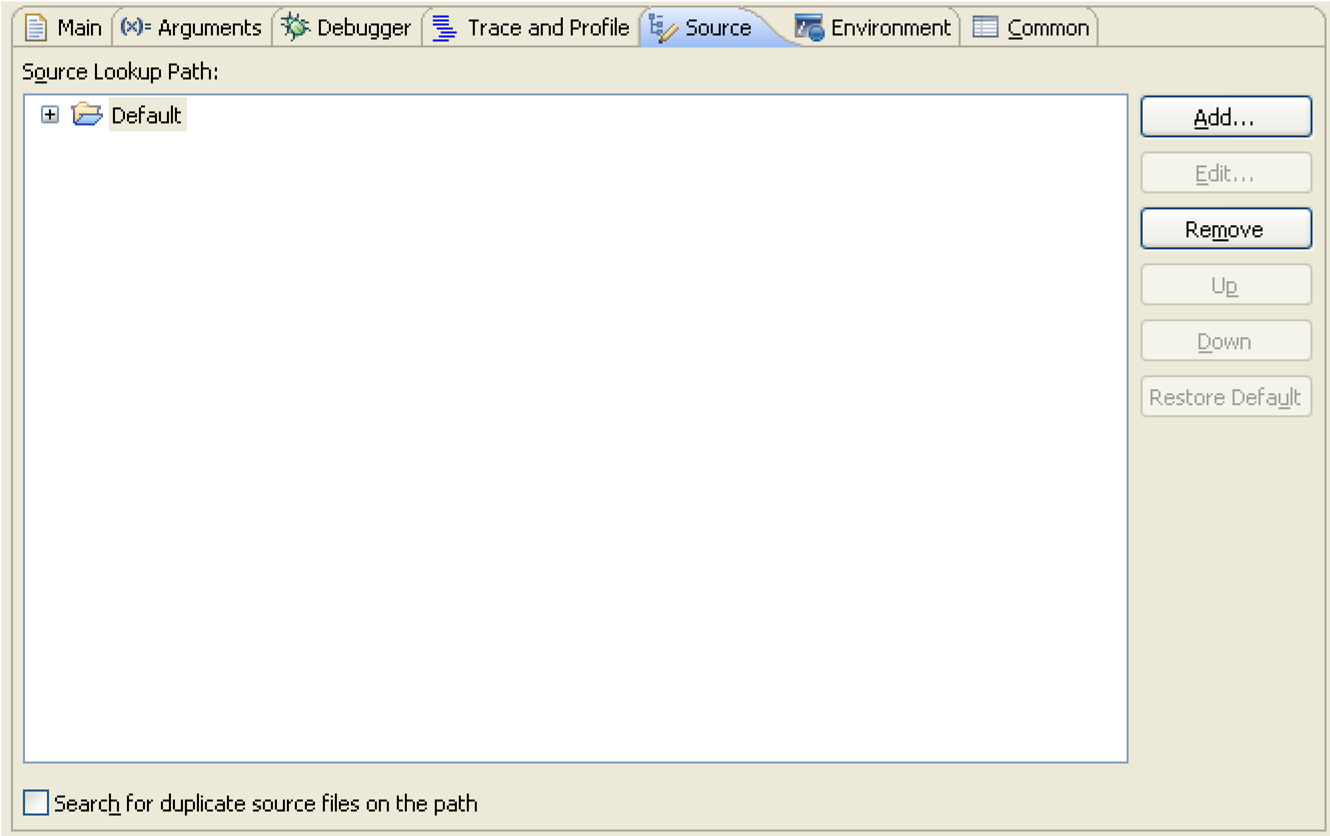


Figure 5-38. Debug Configurations - Source Page

Like **Source** tab, you can also use **Edit Source Lookup Path** dialog box to manually specify the source lookup path. To open the **Edit Source Lookup Path** dialog box, right-click in the **Debug** view and select **Edit Source Lookup**.

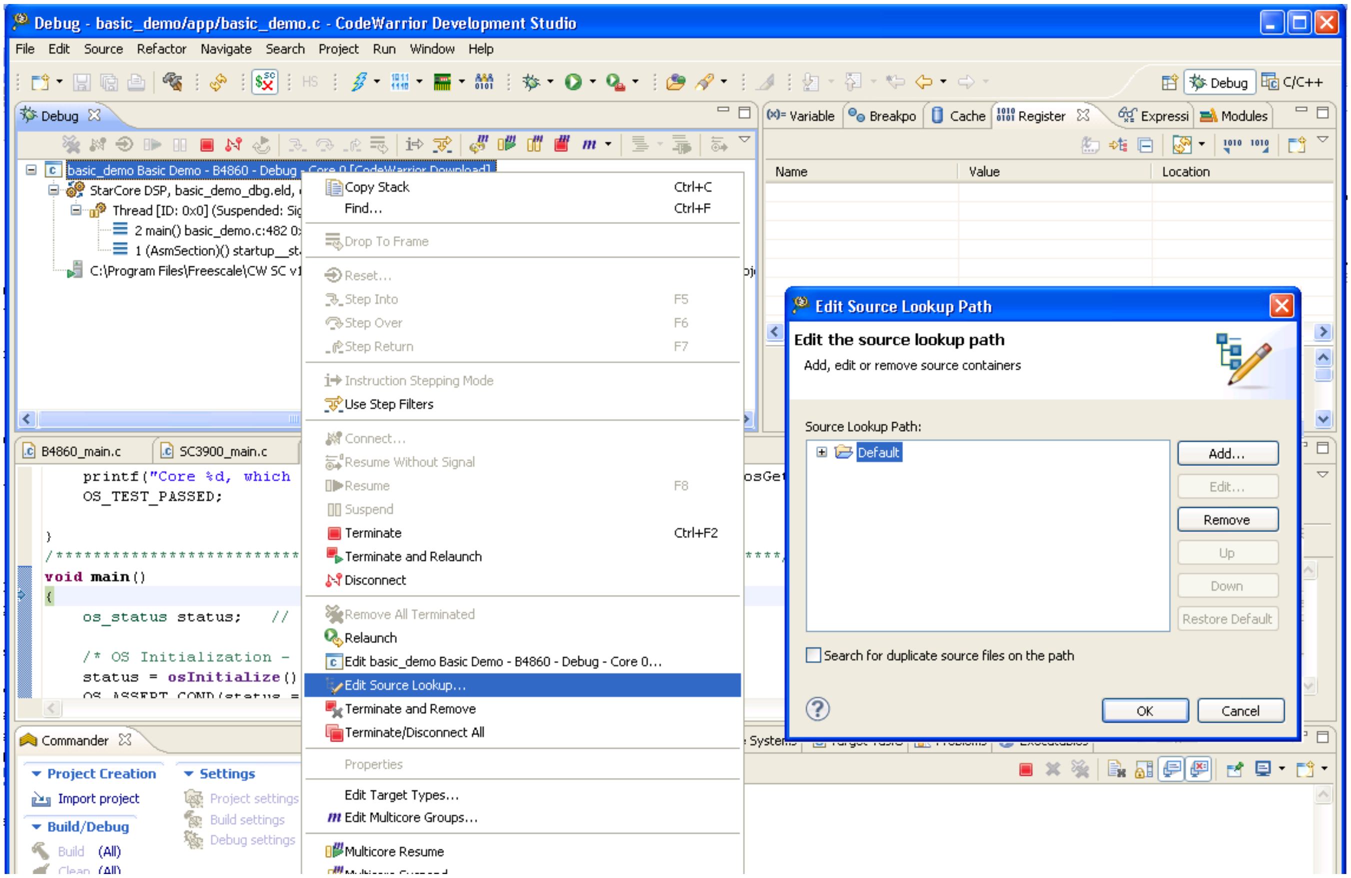


Figure 5-39. Edit Source Lookup Path Dialog Box

2. Click **Add**.

   The **Add Source** dialog box appears.

3. Select **Path Mapping** (see the figure below).

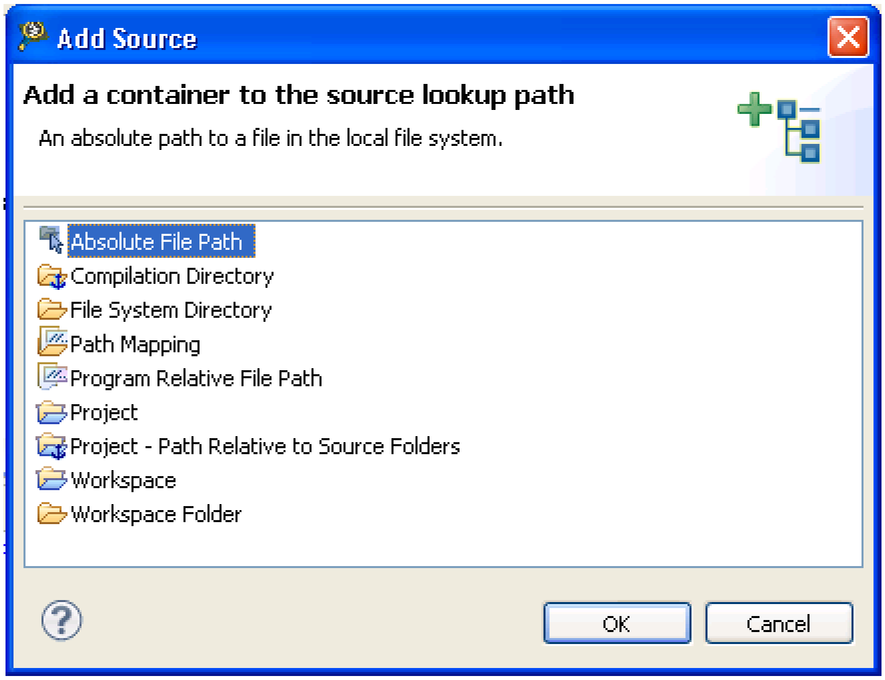


Figure 5-40. Add Source Dialog Box

4. Click **OK**.

   The **Path Mappings** dialog box appears (shown in the figure below).

5. In the **Name** text box, enter the name of the new path mapping.

   The name you enter also appears in the **Source Lookup Path** list of the **Source** page.

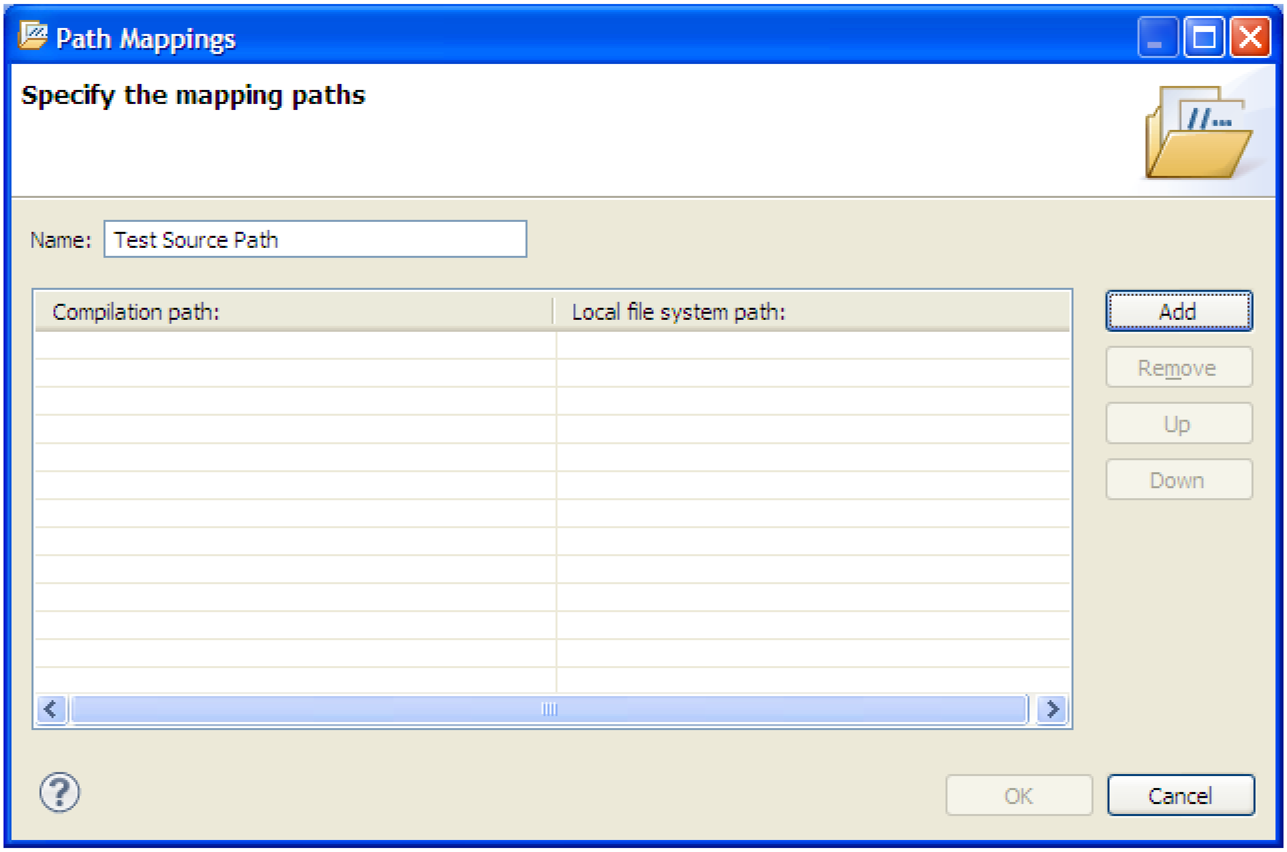


Figure 5-41. Path Mappings Dialog Box

6. Click **Add**.
7. In the **Compilation path** text box, enter the path to the parent project of the executable file, relative to the computer that generated the file.

   For example, the computer on which you debug the executable file is not the same computer that generated that executable file. On the computer that generated the executable file, the path to the parent project is `D:\workspace\originalproject`. Enter this path in the **Compilation path** text box.

Tip

You can use the IDE to discover the path to the parent project of the executable file, relative to the computer that generated the file. In the **C/C++ Projects** view of the **C/C++** perspective, expand the project that contains the executable file that you want to debug. Next, expand the group that has the name of the executable file itself. A list of paths appears, relative to the computer that generated the file. Search this list for the names of source files used to build the executable file. The path to the parent project of one of these source files is the path you should enter in the **Compilation path** text box.

8. In the **Local file system path** text box, enter the path to the parent project of the executable file, relative to your computer. Alternatively, click the **Browse** button to specify the parent project.

   Suppose the computer on which you debug the executable file is not the same computer that generated that executable file. On your current computer, the path to the parent project of the executable file is `C:\projects\thisproject`. Enter this path in the **Local file system path** text box.

9. Click **OK**.

   The **Path Mappings** dialog box closes. The mapping information now appears under the path mapping shown in the **Source Lookup Path** list of the **Source** page.

10. If needed, change the order in which the IDE searches the paths.

    The IDE searches the paths in the order shown in the **Source Lookup Path** list, stopping at the first match. To change this order, select a path, then click the **Up** or **Down** button to change its position in the list.

11. Click **Apply**.

    The IDE saves your changes.

5.14.4 Debug Executable File

You can use the CodeWarrior debugger to debug the externally built executable file.

To debug the executable file:

1. Select the project in the **CodeWarrior Projects** view.
2. Click the **Debug** button from the IDE toolbar.

The IDE switches to Debug perspective listing the debugging output.

Chapter 6
Target Initialization File

This chapter explains the target initialization file and lists an example.

The initialization file is a text file that contains commands that tell the debugger how to initialize your hardware after reset but before downloading code. Use the initialization file commands to write values to various registers, core registers, and memory locations.

To use an initialization file, you must check the Use Initialization File box and specify the name of your initialization file in the Debugger settings panel.

The target initialization files for the StarCore 3900FP DSP targets are available at:

Windows

```
<CWInstallDir>\SC\StarCore_Support\Initialization_Files\RegisterConfigFiles\
```

For example, `B4860_QDS_Init.tcl`.

NOTE

You can customize the contents of `B4860_QDS_Init.tcl` if needed.

For details about commands, see Debugger Shell Command List .

Chapter 7
Memory Configuration File

This chapter explains the memory configuration file, and lists an example.

The memory configuration file is a text file that contains commands that tell the compiler how to initialize the hardware memory after reset, but before downloading code. Use the memory configuration files to write values to various memory locations.

The memory configuration files are available at the following location:

`<CWinstallDir>\SC\StarCore_Support\Initialization_Files\MemoryConfigFiles`

The syntax for memory configuration is defined in each of memory configuration files available with the CodeWarrior layout. For example, you can refer to the `B4860_Memory_Example.mem` file at the mentioned location.

To specify memory configuration file for a target:

1. Open the **Debug Configurations** dialog box.
2. Click the **Edit** button in the **Target settings** area.

   The **Properties for <connection>** dialog box appears.

3. Click the **Edit** button next to the **Target** field.

   The **Properties for <project> Target** dialog box appears.

4. Select the target for which you want to specify the memory file from the **Target type** drop-down list.
5. Click the **Memory** tab.
6. Check the **Memory configuration** checkbox for the target or core(s) for which you want to specify the memory file.
7. Click the corresponding **Memory configuration file** column.
8. Locate and specify a valid memory configuration file using the **Memory Configuration File** dialog box that appears on clicking the **Ellipse** button in the **Memory configuration file** column.

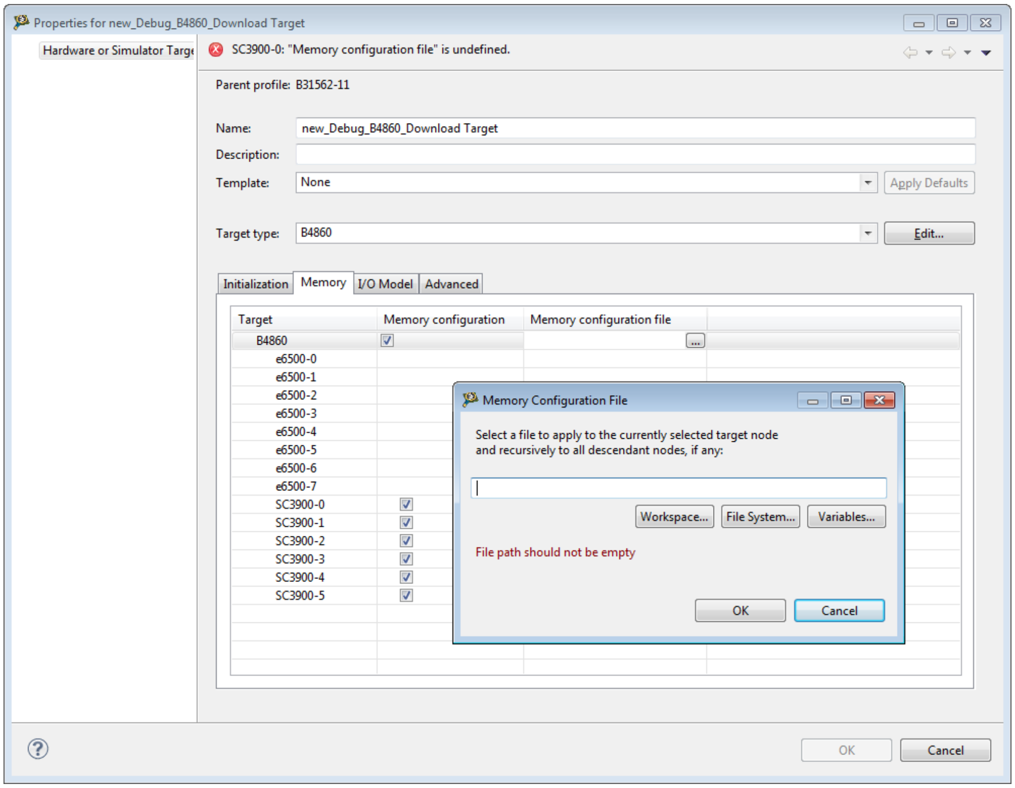


Figure 7-1. Specify Memory Configuration File

9. Click **OK**.

   The specified memory configuration file appears in the **Memory configuration file** column.

Chapter 8
CodeWarrior Command-Line Debugging

CodeWarrior supports a command-line interface to some of its features including the debugger.

You can use the command-line interface together with various scripting engines, such as the Microsoft® Visual Basic® script engine, the Java™ script engine, TCL, Python, and Perl. You can even issue a command that saves the command-line activity to a log file.

This chapter explains:

- Working with Debugger Shell
- Tcl Support
- Command-Line Debugging Tasks
- Debugger Shell Command List

8.1 Working with Debugger Shell

You use the **Debugger Shell** view to issue command lines to the IDE.

For example, you enter the command `debug` in this window to start a debugging session. The window lists the standard output and standard error streams of command-line activity.

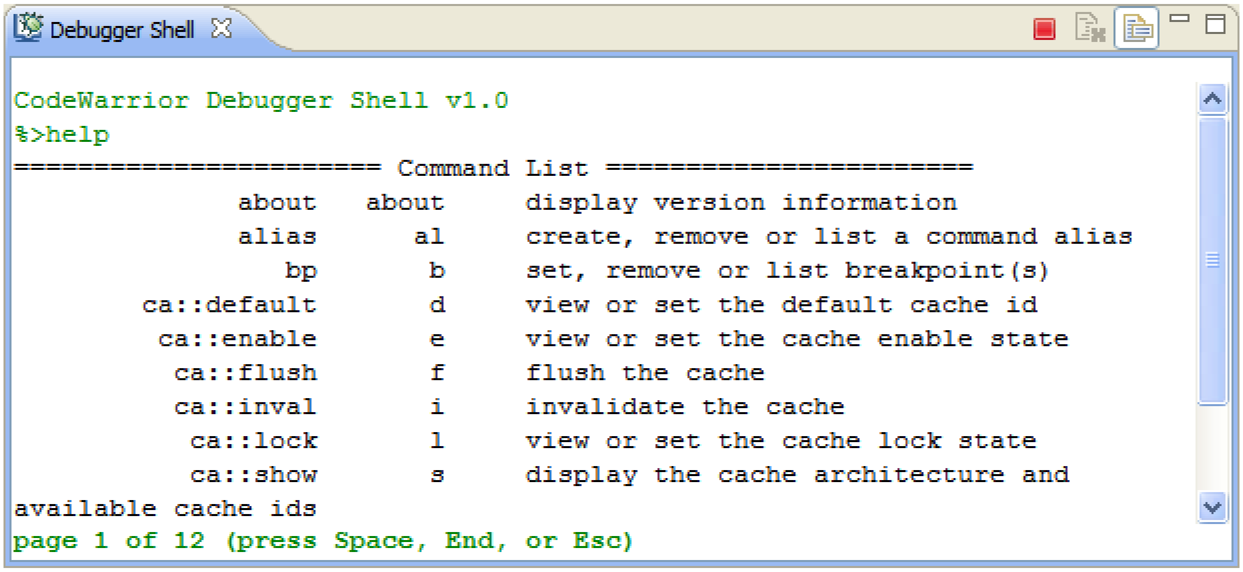


Figure 8-1. Debugger Shell View

To open the **Debugger Shell** view, perform these steps:

1. Switch the IDE to the **Debug** perspective and start a debugging session.
2. Select **Window > Show View > Debugger Shell**.

   The **Debugger Shell** view appears.

NOTE

Alternatively, select **Window > Show View > Other**. Expand the **Debug** tree control in the **Show View** dialog box, select **Debugger Shell**, and click **OK**.

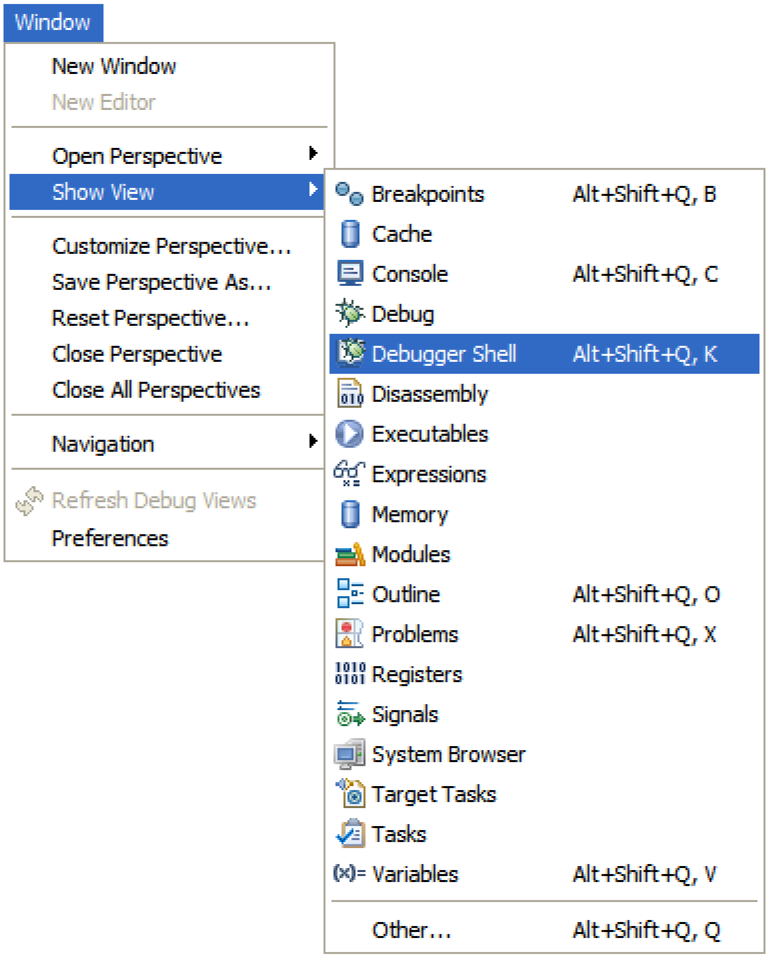


Figure 8-2. Show View - Debugger Shell

To issue a command-line command, type the desired command at the command prompt (`%>`) in the **Debugger Shell** view, then press *Enter* or *Return*. The command-line debugger executes the specified command.

If you work with hardware as part of your project, you can use the command-line debugger to issue commands to the debugger while the hardware is running.

NOTE

To list the commands the command-line debugger supports, type `help` at the command prompt and press *Enter*. The `help` command lists each supported command along with a brief description of each command.

Tip

To view page-wise listing of the debugger shell commands, right-click in the **Debugger Shell** view and select **Paging** from the context menu. Alternatively, click the **Enable Paging**  icon.

8.2 Tcl Support

This section provides the following details on using the command-line debugger with Tcl script engine.

- Resolution of Conflicting Command Names
- Execution of Script Files
- Tcl Startup Script

8.2.1 Resolution of Conflicting Command Names

The names of several command-line debugger commands conflict with the Tcl commands.

The following table explains how the command-line debugger resolves such conflicts (if the mode is set to auto).

Table 8-1. Resolving Conflicting Commands

Command	Resolution
`bp`	If you pass the command-line debugger a bp command from within a script and the command has arguments, the debugger invokes the Tcl break command. Otherwise, the debugger interprets a break command as a command to control breakpoints.

8.2.2 Execution of Script Files

Tcl usually executes a script file as one large block, returning only after execution of the entire file.

For the run command, however, the command-line debugger executes script files line-by-line. If a particular line is not a complete Tcl command, the debugger appends the next line. The debugger continues appending lines until it gets a complete Tcl script block.

The following listing lists code that includes a script. For the Tcl source command, the debugger executes this script as one block. But for the run debug command, the debugger executes this script as two blocks: the set statement and the while loop.

Listing: Example Tcl Script

```
set x 0;
while {$x < 5}

{

puts "x is $x";

set x [expr $x + 1]

}
```

NOTE

The run debug command synchronizes debug events between blocks in a script file. For example, after a go, next, or step command, run polls the debug thread state and does not execute the next line or block until the debug thread terminates. However, the Tcl source command does not consider the debug thread state. Consequently, use the run debug command to execute script files that contain these debug commands: debug, go, next, stop, and kill.

8.2.3 Tcl Startup Script

The command-line debugger can automatically run a Tcl script each time you open the command-line debugger window.

This script is called a startup script.

You can use both Tcl and command-line debugger commands in the startup script. For example, you might include commands that set an alias or a define color configuration in a startup script.

To create a command-line debugger startup script, follow these steps:

1. Put the desired Tcl and command-line debugger commands in a text file.
2. Name this file `tcld.tcl`.
3. Place `tcld.tcl` in one of the directories listed below.
    - On a Windows® PC, put `tcld.tcl` in the system directory.

For example, put `tcld.tcl` in the `WINDOWS` directory.

- On a Solaris Workstation, put `tcld.tcl` in your home directory.

NOTE

There is no synchronization of debug events in the startup script. Consequently, put the c debug command to the startup script and place these debug commands in another script so they will execute properly: `debug`, `go`, `stop`, `kill`, `next`, and `step`.

8.3 Command-Line Debugging Tasks

This section provides instructions for common command-line debugging tasks.

See the following table for details.

Table 8-2. Common Command-Line Debugging Tasks

Task	Instruction	Comments
Open the Debugger Shell	Select **Windows > Show View > Others > Debugger Shell**.	The **Debugger Shell** view appears.
Use the help command	1. On the Debugger shell command prompt (%>), type `help`. 2. Press Enter.	The Command List for the CodeWarrior tool appears.
Enter a command	1. On the Debugger shell, type a command followed by a space. 2. Type any valid command-line options, separating each with a space. 3. Press Enter.	You can use shortcuts instead of complete command names, such as `k` for `kill`.
View debug command hints	Type alias followed by a space	The syntax for the rest of the command appears.
Review previous commands	Press Up Arrow and Down Arrow keys	
Clear command from the command line	Press the Esc key	
Stop an executing script	Press the Esc key	
Toggle between insert/overwrite mode	Press the Insert key	
Scroll up/ down a page	Press Page Up or Page Down key	
Scroll left/right one column	Press Ctrl-Left Arrow or Ctrl-Right Arrow keys	
Scroll to beginning or end of buffer	Press Ctrl-Home or Ctrl-End keys	

8.4 Debugger Shell Command List

This section lists commands that are unique to the CodeWarrior tool.

The list of the commands that can be used in the CodeWarrior Debugger Shell view is as follows:

NOTE

For information on the Tcl built-in commands, visit http://sourceforge.net/projects/tcl.

Table 8-3. Debugger Shell Command List

about	alias	bp
cd	change	cls
config	copy	debug
dir	disassemble	display
evaluate	finish	fl::blankcheck
fl::checksum	fl::device	fl::diagnose
fl::disconnect	fl::dump	fl::erase
fl::image	fl::protect	fl::secure
fl::target	fl::verify	fl::write
funcs	getIDEpref	getpid
go	help	history
jtagclock	kill	launch
loadsym	log	mc::config
mc::go	mc::group	mc::kill
mc::reset	mc::restart	mc::stop
mc::type	mem	next
nexti	oneframe	protocol
pwd	quitIDE	radix
redirect	refresh	reg
reset	restart	restore
run	save	sc::setMaxAccessLength
sc::setReset	sc::getPhysicalAddress	setpc
setpicloadaddr	stack	status
step	stepi	stop
switchtarget	system	var
wait	watchpoint	

8.4.1 about

Lists the version information.

Syntax

```
about
```

8.4.2 alias

Creates an alias for a debug command, removes such an alias, or lists all current aliases.

Syntax

```
alias [<alias> [<command>]]
```

Parameters

`alias`

Lists current aliases.

Examples

Table 8-4 lists and defines examples of the alias command.

Table 8-4. alias Command-Line Debugger Command - Examples

Command	Description
`alias`	Lists current aliases.
`alias ls dir`	Issue the dir command when ls is typed.
`alias ls`	Remove the alias ls.

8.4.3 bp

Sets a breakpoint, removes a breakpoint, or lists the current breakpoints.

Syntax

```
bp [-{hw|sw|auto}] {<func>|[<ms>:]<addr>|<file> <line> [<column>]}
```

```
bp all|#<id>|<func>|<addr> off|enable|disable
```

Examples

Table 8-5 lists and defines examples of the bp command.

Table 8-5. bp Command-Line Debugger Command - Examples

Command	Description
`bp`	Lists all breakpoints.
`bp -hw fn`	Set hardware breakpoint at function fn().
`bp -autofile.cpp 101 1`	Set an auto breakpoint on file file.cpp at line 101, column 1.
`bp fn off`	Remove the breakpoint at function fn().
`bp 10343`	Set a breakpoint at memory address 10343.
`bp #4 off`	Remove the breakpoint number 4.
`bp #4 disable`	Disable the breakpoint number 4.
`bp #4 cond x == 3`	Set the condition for breakpoint number 4 to fire only if x == 3.
`bp #4 cond Hit Count % 3 == 0`	Break every third time. Hit Count corresponds to the breakpoint property of the same name.

8.4.4 cd

Changes to a different directory or lists the current directory.

Pressing the Tab key completes the directory name automatically.

Syntax

```
cd [<path>]
```

Parameter

```
path
```

Directory pathname; accepts asterisks and wildcards.

Examples

Table 8-6 lists and defines examples of the cd command.

Table 8-6. cd Command-Line Debugger Command-Examples

Command	Description
`cd`	Lists current directory.
`cd c:`	Changes to the C: drive root directory.
`cd d:/mw/0622/ test`	Changes to the specified D: drive directory
`cd c:p*s`	Changes to any C: drive directory whose name starts with p and ends with s.

8.4.5 change

Changes the contents of register, memory location, block of registers, or memory locations.

Syntax

```
change <addr-spec> [<range>] [-s|-ns] [%<conv>] <value>

change <addr-spec>{..<addr>|#<n>} [<range>] [-s|-ns] [%<conv>] <value>

change <reg-spec> [<n>] [-s|-ns] [%<conv>] <value>

change <reg-spec>{..<reg>|#<n>} [-s|-ns] [%<conv>] <value>

change <var-spec> [-s|-ns] [%<conv>] <value>

change v <var> [-s|-ns] [%<conv>] <value>
```

Parameter

```
<addr-spec> [<ms>:]<addr>
```

On architectures supporting multiple memory spaces, specifies the memory space in which <addr> is to be found.

See the help for the option `-ms` of display or mem for more information on memory spaces. If unspecified, the setting config MemIdentifier is used.

```
<addr>
```

Target address in hex format.

```
<count>
```

Number of memory cells.

```
x<cell-size>
```

Memory is displayed in units called cells, where each cell consists of <cell-size> bytes. If unspecified, the setting config MemWidth is used.

```
h<access-size>
```

Memory is accessed with a hardware access size of <access-size> bytes.

If unspecified, the setting config MemWidth is used.

```
%<conv>
```

Specifies the type of the data. Possible values for <conv> are given below. The default conversion is set by the radix command for memory and registers and by the config var command for variables.

- %x Hexadecimal
- %d Signed decimal
- %u Unsigned decimal
- %f Floating point

NOTE

You can not access array elements in Tcl except through `array` and `set` commands. Therefore, to use the `change` or `var` command on an array element, enclose it in curly braces `{}`.

Examples

The examples assume the following settings:

- `radix x`
- `config MemIdentifier 0`
- `config MemWidth 32`
- `config MemAccess 32`
- `config MemSwap off`

Table 8-7 lists and defines Memory examples of the change command.

Table 8-7. change Command-Line Debugger Command-Memory Examples

Command	Description
`change 10000 10`	Change memory range `0x10000-3` to `0x10` (because radix is hex).
`change 1:10000 20`	Change memory range `0x10000-3`, memory space `1`, to `0x20`.
`change 10000 16 20`	Change each of 16 cells in the memory range `0x10000-3f` to `0x20`.
`change 10000 16x1h8 31`	Change each of 16, 1-byte cells to `0x31`, using a hardware access size of 8-bytes per write.
`change 10000 -s %d 200`	Change memory range `0x10000-3` to `c8000000`.
`change {x[1]} 10`	Change the second element in the array `x` to the value `10`.
`change {t1.x} 2`	Change the value of the variable `x` in the structure `t1` to `2`.

Table 8-8 lists and defines Register examples of the change command.

Table 8-8. change Command-Line Debugger Command-Register Examples

Command	Description
`change R1 123`	Change register R1 to 0x123.
`change R1..R5 5432`	Change registers R1 through R5 to 0x5432.
`change "General Purpose Registers/R1" 100`	Change register R1 in the General Purpose Register group to 0x100.

Table 8-9 lists and defines Variable examples of the change command.

Table 8-9. change Command-Line Debugger Command-Variable Examples

Command	Description
`change myVar 10`	Change the value of variable myVar to 16 (0x10)

8.4.6 cls

Clears the command line debugger window.

Syntax

```
cls
```

8.4.7 config

Lists current configuration information.

Provides the name of the default project or build target, or configures:

- command-line debugger window colors.
- command-line debugger window scrolling size.
- command-line debugger window mode.
- Default build target
- Hexadecimal prefix
- Memory identifier
- Processor name
- Subprocessor name

Syntax

```
conf[ig] [ c[olor] [r | m | c | s | e | n]

text_color [background_color] |

m[ode] [ dsp | tcl | auto] |

s[croll] number_of_lines |

h[exprefix] hexadecimal_prefix |

mem[identifier] memory_identifier |

p[rocessor] processor_name [subprocessor_name] ]
```

Parameter

```
color text indicators -
```

r (registers), m (memory), c (commands), s (script), e (errors), or n (normal)

```
text_color
```

Text color values for red, green, and blue, each from 0 through 255.

```
background_color
```

Background color values for red, green, and blue, each from 0 through 255.

mode

Command-name conflict resolution mode:

- dsp: use command-line debug commands
- tcl: use tcl commands
- auto: resolve automatically

```
number_of_lines
```

Number of lines to scroll.

```
hexadecimal_prefix
```

Prefix for display of hexadecimal values.

```
memory_identifier
```

Memory identifier.

```
processor_name
```

Name or identifier of target processor.

```
subprocessor_name
```

Name or identifier of target subprocessor.

```
target_name
```

Name of build target.

Examples

Table 8-10 lists and defines examples of the config command.

Table 8-10. config Command-Line Debugger Command-Examples

Command	Description
`config`	Lists current configuration information.
`config c e $ff $0 $0`	Sets error text to red.
`config c r $0 $0 $0 $ff $ff $ff`	Sets register display to black, on a white background.
`config m dsp`	Sets clash resolution to dsp mode.
`config hexprefix 0x`	Specifies 0x prefix for hexadecimal values.
`config memidentifier m`	Sets memory identifier to m.
`config processor 8101`	Sets processor to 8101.
`config project`	Lists default-project name.
`config target`	Lists default build-target name.
`config target debug release x86`	Changes default build-target name to debug release x86.

8.4.8 copy

Copies contents of a memory address or address block to another memory location.

Syntax

```
copy [<ms>:]<addr>[..<addr>|#<bytes>] [<ms>:]<addr>
```

Parameter

```
<addr>
```

One of these memory-address specifications:

- A single address
- First address of the destination memory block.

Examples

Table 8-11 lists and defines examples of the copy command.

Table 8-11. copy Command-Line Debugger Command-Examples

Command	Description
`copy 00..1f 30`	Copy memory addresses 00 through 1f to address 30.

Table continues on the next page...

Table 8-11. copy Command-Line Debugger Command-Examples (continued)

Command	Description
`copy 20#10 50`	Copy 10 memory locations beginning at memory location 20 to memory beginning at location 50.

8.4.9 debug

Launches a debug session.

Syntax

```
debug [<index> | <debug-config-name>]
```

Examples

Table 8-12 lists and defines examples of the debug command.

Table 8-12. debug Command-Line Debugger Command-Examples

Command	Description
`debug`	Start debugging using the default launch configuration, which is the last debugged configuration if one exists and index 0 otherwise.
`debug 3`	Start debugging using the launch configuration at index 3. Type launch for the current set of launch configurations.
`debug {My Launch Config}`	Start debugging using the launch configuration named My Launch Config. Type launch for the current set of launch configurations.

8.4.10 dir

Lists directory contents.

Syntax

```
dir [path|files]
```

Examples

Table 8-13 lists and defines examples of the dir command.

Table 8-13. dir Command-Line Debugger Command-Examples

Command	Description
`dir`	Lists all files of the current directory.
`di *.txt`	Lists all current-directory files that have the .txt file name extension.
`dir c:/tmp`	Lists all files in the tmp directory on the C: drive.
`dir /ad`	Lists only the subdirectories of the current directory.

8.4.11 disassemble

Disassembles the instructions of the specified memory block.

Syntax

```
disassemble
```

```
disassemble pc|[<ms>:]<addr> [<count>]
```

```
disassemble reset
```

```
disassemble [<ms>:]<a1>{..<a2>|#<n>}
```

Parameter

`[none]`

With no options, the next block of instructions is listed. After a target stop event, the next block starts at the PC.

`[<ms>:]<addr>`

Target address in hex. On targets with multiple memory spaces, a memory space id can be specified.

`pc`

The current program counter.

`<count>`

Number of instructions to be listed.

`reset`

Reset the next block to the PC and the instruction count to one screen.

```
<a1>{..<a2>|#<n>}
```

Specifies a range of memory either by two endpoints, <a1> and <a2>, or by a startpoint and a count, <a1> and <n>.

Examples

Table 8-14 lists and defines examples of the disassemble command.

Table 8-14. disassemble Command-Line Debugger Command-Examples

Command	Description
`disassemble`	Lists the next block of instructions.
`disassemble reset`	Reset the next block to the PC and the instruction count to one screenful.
`disassemble pc`	Lists instructions starting at the PC.
`disassemble pc 4`	Lists 4 instructions starting at the PC. Sets the instruction count to 4.
`disassemble 1000`	Lists instructions starting at address 0x1000.
`disassemble p:1000 4`	Lists 4 instructions from memory space p, address 1000. Sets the instruction count to 4.

8.4.12 display

Lists the contents of a register or memory location.

This command lists all register sets of a target, adds register sets, registers, or memory locations, or removes register sets, registers, or memory locations.

Syntax

```
display <addr-spec> [<range>] [-s|-ns] [%<conv>] [-np]

display -ms

display <addr-spec>{..<addr>|#<n>} [<range>] [-s|-ns] [%<conv>] [-np]

display <reg-spec> [<n>] [-{d|nr|nv|np} ...] [-s|-ns] [%<conv>]

display <reg-spec>{..<reg>|#<n>} [-{d|nr|nv|np} ...] [-s|-ns] [%<conv>]

display all|r:|nr: [-{d|nr|nv|np} ...] [-s|-ns] [%<conv>]

display [-]regset

display <var-spec> [-np] [-s|-ns] [%<conv>]

display v: [-np] [-s|-ns] [%<conv>]
```

Parameter

<ms>

On architectures supporting multiple memory spaces, specifies the memory space in which `<addr>` is to be found.

<addr>

Target address in hex.

<range>

`[<count>][x<cell-size>][h<access-size>] | [<count>] [{8,16,32,64}bit].`

<count>

Number of memory cells.

x<cell-size>

Memory is displayed in units called cells, where each cell consists of <cell-size> bytes. If unspecified, the setting config MemWidth is used.

{8,16,32,64}bit

Sets both `<cell-size>` and `<access-size>`.

Examples

The examples assume the following settings:

- `radix x`
- `config MemIdentifier 0`
- `config MemWidth 32`
- `config MemAccess 32`
- `config MemSwap off`

Table 8-15 lists and defines examples of the display command.

Table 8-15. display Command-Line Debugger Command-Examples

Command	Description
`display 10000`	Display memory range 0x10000-3 as one cell.
`display 1:10000`	Display memory range 0x10000-3, memory space 1, as one cell.
`display 10000 16`	Display memory range 0x10000-3f as 16 cells.
`display 10000 16x1h8`	Display 16, 1-byte cells, with a hardware access size of 8-bytes per read.
`display 10000 8bit`	Display one byte, with a hardware access size of one byte.
`display 10000 -np`	Return one cell, but don't print it to the Command Window.
`display 10000 -s`	Display one cell with the data endian-swapped.
`display 10000 %d`	Display one cell in decimal format.

Table continues on the next page...

Table 8-15. display Command-Line Debugger Command-Examples (continued)

Command	Description
`display -ms`	Display the available memory spaces, if any.
`display -regset`	List all the available register sets on the target chip.
`display R1`	Display the value of register R1.
`display "General Purpose Registers/R1"`	Display the value of register R1 in the General Purpose Register group.
`display R1 -d`	Display detailed "data book" contents of R1, including bitfields and definitions.
`display "nr:General Purpose Registers/R1" 25`	Beginning with register R1, display the next 25 registers. Register groups are not recursively searched.

8.4.13 evaluate

Lists variable or expression.

Syntax

```
evaluate [#<format>] [-l] [<var|expr>]
```

Parameter

```
<format>
```

Output format and possible values:

```
#-, #Default

#d, #Signed

#u, #Unsigned

#h, #x, #Hex

#c, #Char

#s, #CString

#p, #PascalString

#f, #Float

#e, #Enum

#i, #Fixed

#o, #w, #Unicode

#b, #Binary

<none>, #Fract
```

```
<none>, #Boolean

<none>, #SignedFixed
```

Examples

Table 8-16 lists and defines examples of the evaluate command.

Table 8-16. evaluate Command-Line Debugger Command-Examples

Command	Description
`evaluate`	List the types for all the variables in current and global stack.
`evaluate i`	Return the value of variable 'i'
`evaluate #b i`	Return the value of variable 'i' formatted in binary
`evaluate -l 10`	Return the address for line 10 in the current file
`evaluate -l myfile.c,10`	Return the address for line 10 in file myfile.c
`evaluate -l +10`	Return the address to an offset of 10 lines starting from the current line

8.4.14 finish

Executes until the current function returns.

Syntax

```
finish
```

8.4.15 fl::blankcheck

Tests that the flash device is in the blank state.

Syntax

```
fl::blankcheck
```

8.4.16 fl::checksum

Calculates a checksum.

Syntax

```
fl::checksum
```

8.4.17 fl::device

Defines the flash device.

Syntax

```
fl::device
```

8.4.18 fl::diagnose

Dumps flash information like ID, sector map, sector factory, protect status.

Syntax

```
fl::diagnose [full]
```

Parameter

```
full
```

Dumps sector status (programmed/erased). This could take a few minutes for large flashes

Remarks

Use `fl::device` command prior to this command in order to set the flash device.

8.4.19 fl::disconnect

Closes the connection to the target.

Syntax

```
fl::disconnect
```

8.4.20 fl::dump

Dumps the content of entire flash.

Syntax

```
fl::dump [all | -range start_addr end_addr] -o <file>
```

Parameter

```
-all
```

Dumps content of entire flash.

```
-range <start_addr> <end_addr>
```

Sets the range of flash region to be dumped.

```
-t <type>
```

Sets the type of flash region ("Motorola S-Record Format" or "Binary/Raw Format") to be dumped .

```
-o <file>
```

Dumps the flash to the specified file.

8.4.21 fl::erase

Erases the flash device.

Syntax

```
fl::erase
```

8.4.22 fl::image

Defines the flash image settings.

Syntax

```
fl::image
```

8.4.23 fl::protect

Protects the sectors.

Syntax

```
fl::protect [on | off]
```

Parameter

```
on | off
```

Enable or disable protection of sectors.

8.4.24 fl::secure

Secures the device

Syntax

```
fl::secure [on | off] [password <pass>]
```

Parameter

```
on | off
```

Secure or unsecure device.

```
password <pass>
```

Password used to secure the device.

8.4.25 fl::target

Defines the target configuration settings.

Syntax

```
fl::target
```

8.4.26 fl::verify

Verifies the flash device.

Syntax

```
fl::verify
```

8.4.27 fl::write

Writes the flash device.

Syntax

```
fl::write
```

8.4.28 funcs

Displays information about functions.

Syntax

```
funcs [-all] <file> <line>
```

Parameter

```
[-all]
```

Displays information about the functions using all debug contexts.

```
<file>
```

Specifies the file name.

```
<line>
```

Specifies the line number.

Examples

Table 8-17 lists and defines examples of the funcs command.

Table 8-17. funcs Command-Line Debugger Command-Examples

Command	Description
`funcs main.c 100`	Display information about the functions containing line `100` in file `main.c`, using the active debug context
`funcs -all main.c 100`	Display information about the functions containing line `100` in file `main.c`, using all debug contexts.

8.4.29 getIDEpref

The command displays the value of the launch configuration attribute associated with the user-provided key; `<attribute_key>` and `<attribute_type>` are mandatory parameters.

Syntax

```
getIDEpref <attribute_key> <attribute_type>
```

Parameter

```
<attribute_type> = [bool | int | str | strlist]
```

8.4.30 getpid

List the ID of the process being debugged.

Syntax

```
getpid
```

8.4.31 go

Starts to debug your program from the current instruction.

Syntax

```
go [nowait | <timeout_s>]
```

Parameter

```
<none>
```

Run the default thread. The command may wait for a thread break event before returning, depending on the settings config runControlSync and config autoThreadSwitch.

```
nowait
```

Return immediately without waiting for a thread break event.

```
<timeout_s>
```

Maximum number of seconds to wait for a thread break event. Can be set to nowait.

Examples

Table 8-18 lists and defines examples of the go command.

Table 8-18. go Command-Line Debugger Command-Examples

Command	Description
`go`	Run the default thread.
`go nowait`	Run the default thread without waiting for a thread break event.
`go 5`	Run the default thread. If config runControlSync is enabled, then the command will wait for a thread break event for a maximum of 5 seconds.

8.4.32 help

Lists debug command help in the command-line debugger window.

Syntax

```
help [-sort | -tree | <cmd>]
```

Parameter

```
command
```

Name or short-cut name of a command.

Examples

Table 8-19 lists and defines examples of the help command.

Table 8-19. help Command-Line Debugger Command-Examples

Command	Description
`help`	Lists all debug commands.
`help b`	Lists help information for the break command.

8.4.33 history

Lists the history of the commands entered during the current debug session.

Syntax

```
history
```

8.4.34 jtagclock

Reads or updates the current JTAG clock speed.

Syntax

```
jtagclock <chain-position> [<speed-in-kHz>]
```

Parameter

```
<chain-position>
```

Specifies the chain position.

```
<speed-in-kHz>
```

Specifies the speed in kilo hertz.

Examples

Table 8-20 lists and defines examples of the help command.

Table 8-20. jtagclock Command-Line Debugger Command-Examples

Command	Description
`jtagclock 3`	Read the current jtag clock speed for chain position 3.
`jtagclock 3 1000`	update the current jtag clock speed to 1000 kHz for chain position 3.

8.4.35 kill

Stops one or all current debug sessions.

Syntax

```
kill [<index> ...]
```

Parameter

```
all
```

Specifier for all debug sessions.

Examples

Table 8-21 lists and defines examples of the help command.

Table 8-21. kill Command-Line Debugger Command-Examples

Command	Description
`kill`	Kills the debug session for the current process.
`kill 0 1`	Kills debug sessions 0 and 1.

8.4.36 launch

Lists the launch configurations.

Syntax

```
launch
```

8.4.37 loadsym

Load a symbolic file.

Syntax

```
loadsym
```

8.4.38 log

Logs the commands or lists entries of a debug session.

If issued with no parameters, the command lists all open log files.

Syntax

```
log c|s <filename>
```

```
log off [c|s] [all]
```

```
log
```

Parameter

```
c
```

Command specifier.

```
s
```

Lists entry specifier.

```
<filename>
```

Name of a log file.

Examples

Table 8-22 lists and defines examples of the log command.

Table 8-22. log Command-Line Debugger Command-Examples

Command	Description
`log`	Lists currently opened log files.
`log s session.log`	Log all display entries to file session.log.
`log off c`	Close current command log file.
`log off`	Close current command and log file.
`log off all`	Close all log files.

8.4.39 mc::config

List or edit multicore group options.

Syntax

```
mc::config
```

8.4.40 mc::go

Resumes multiple cores.

Syntax

```
mc::go
```

Examples

Table 8-23 lists and defines examples of the mc::go command.

Table 8-23. mc::go Command-Line Debugger Command-Examples

Command	Description
`debug {SBL1_FWK_core0_ADS}debug {SBL1_FWK_core1_ADS}debug {SBL1_FWK_core2_ADS}debug {SBL1_FWK_core3_ADS}debug {SBL1_FWK_core4_ADS}debug {SBL1_FWK_core5_ADS}mc::go`	Sample usage of `mc::go` command.

8.4.41 mc::group

List or edit multicore groups.

Syntax

```
mc::group
```

8.4.42 mc::kill

Terminates multiple cores.

Syntax

```
mc::kill
```

8.4.43 mc::reset

Resets multiple cores.

Syntax

```
mc::reset
```

8.4.44 mc::restart

Restarts multiple cores.

Syntax

```
mc::restart
```

8.4.45 mc::stop

Suspend multiple cores.

Syntax

```
mc::stop
```

8.4.46 mc::type

List or edit system types.

Syntax

```
mc::type
```

8.4.47 mem

Read and write one or more adjacent "cells" of memory, where a cell is defined as a contiguous block of bytes.

The cell size is determined by the <cell-size> parameter or by the using `MemWidth` attribute of the `config` command.

Syntax

```
Read memory

mem <addr-spec> [<range>] [-s|-ns] [%<conv>] [-np]

Write memory

mem <addr-spec> [<range>] [-s|-ns] [%<conv>] =<value>
```

Parameter

```
[none]
```

With no options, the next block of memory is read.

```
<addr-spec> [<ms>:]<addr>
```

```
<ms>
```

On architectures supporting multiple memory spaces, specifies the memory space in which <addr> is to be found. See the help for the option -ms of display or mem for more information on memory spaces. If unspecified, the setting " `config MemIdentifier`" is used.

```
<addr>
```

Target address in hex.

```
<range>  [<count>][x<cell-size>][h<access-size>] | [<count>]
[{8,16,32,64}bit]
```

```
<count>
```

Number of memory cells.

```
x<cell-size>
```

Memory is displayed in units called cells, where each cell consists of <cell-size> bytes. If unspecified, the setting " `config MemWidth`" is used.

```
h<access-size>
```

Memory is accessed with a hardware access size of <access-size> bytes. If unspecified, the setting " `config MemAccess`" is used.

```
{8,16,32,64}bit
```

Sets both `<cell-size>` and `<access-size>`.

```
-np
```

Don't print anything to the display, only return the data.

```
-ms
```

On architectures supporting multiple memory spaces, displays the list of available memory spaces including a mnemonic and/or an integer index which may be used when specifying a target address.

```
-s|-ns
```

Specifies whether each value is to be swapped. For memory, specifies whether each cell is to be swapped. With a setting of `-ns`, target memory is written in order from lowest to highest byte address. Otherwise, each cell is endian swapped. If unspecified, the setting `config MemSwap` is used.

```
%<conv>
```

Specifies the type of the data. Possible values for `<conv>` are given below. The default conversion is set by the radix command for memory and registers and by the config var command for variables.

```
%x      Hexadecimal.

%d      Signed decimal.

%u      Unsigned decimal.

%f      Floating point.

%[E<n>]F          Fixed or Fractional.  The range of a fixed
point value depends on  the (fixed) location
of the decimal point.  The default location  is
set by the config command option
"MemFixedIntBits".

%s      Ascii.
```

Examples

Table 8-24 lists and defines examples of the mem command.

Table 8-24. mem Command-Line Debugger Command-Examples

Command	Description
`mem x:1000 4`	Read program memory starting from address 1000 for four 32-bit cells.
`mem m:1000 16bit 4`	Read data memory starting from address 1000 for four 16-bit cells.
`mem m:1000 16bit 4 %d =48`	Starting at address 1000, write the decimal value 48 into data memory for four 16-bit cells

8.4.48 next

Runs to next source line or assembly instruction in current frame.

Syntax

```
next
```

Remarks

If you execute the next command interactively, the command returns immediately, and target-program execution starts. Then you can wait for execution to stop (for example, due to a breakpoint) or type the stop command.

If you execute the next command in a script, the command-line debugger polls until the debugger stops (for example, due to a breakpoint). Then the command line debugger executes the next command in the script. If this polling continues indefinitely because debugging does not stop, press the ESC key to stop the script.

8.4.49 nexti

Executes over function calls, if any, to the next assembly instruction.

Syntax

```
nexti
```

8.4.50 oneframe

Query or set the one-frame stack crawl mode for the current thread.

Syntax

```
oneframe
```

8.4.51 protocol

Executes a protocol plugin command (internal).

Syntax

```
protocol
```

8.4.52 pwd

Lists current working directory.

Syntax

```
pwd
```

8.4.53 quitIDE

Quits the IDE.

Syntax

```
quitIDE
```

8.4.54 radix

Lists or changes the default input radix (number base) for command entries, registers and memory locations.

Entering this command without any parameter values lists the current default radix.

Syntax

```
radix [x|d|u|b|f|h]
```

Parameter

`x`

Hexadecimal

`d`

Decimal

`u`

Unsigned decimal

`b`

Binary

`f`

Fractional

`h`

Hexadecimal

Examples

Table 8-25 lists and defines examples of the radix command.

Table 8-25. radix Command-Line Debugger Command-Examples

Command	Description
`radix`	Lists the current setting.
`radix d`	Change the setting to decimal.
`radix x`	Change the setting to hexadecimal.

8.4.55 redirect

Redirects I/O streams of the current target process.

Syntax

```
redirect
```

8.4.56 refresh

Discard all cached target data and refresh views.

Syntax

```
refresh
```

8.4.57 reg

Read and write registers.

Syntax

```
reg
```

8.4.58 reset

Reset the target hardware.

Syntax

```
reset
```

8.4.59 restart

Restarts the current debug session.

Syntax

```
restart
```

8.4.60 restore

Write file contents to memory.

Syntax

```
restore
```

8.4.61 run

Launch a process.

Syntax

```
run
```

8.4.62 save

Saves the contents of memory locations to a binary file or a text file containing hexadecimal values.

Syntax

```
save -h|-b [<ms>:]<addr>... <filename> [-a|-o] [8bit|16bit|32bit|64bit]
```

Parameter

```
-h|-b
```

Sets the output file format to hex or binary. For hex format, the address is also saved so that the contents can easily be restored with the "restore" command.

```
[<ms>:]<addr>
```

Address to read from. For architectures with multiple memory spaces, a memory space id may be specified.

```
-a
```

Append specifier. Instructs the command-line debugger to append the saved memory contents to the current contents of the specified file.

```
-o
```

Overwrite specifier: tells the debugger to overwrite any existing contents of the specified file.

Examples

Table 8-26 lists and defines examples of the save command.

Table 8-26. save Command-Line Debugger Command-Examples

Command	Description
`set addressBlock1 "p:10..`31"set addressBlock2 "p:10000#20"save -h $addressBlock1 $addressBlock2hexfile -a`	Dumps contents of two memory blocks to the text file hexfile.lod (in append mode).
`set addressBlock1 "p:10..`31"set addressBlock2 "p:10000#20"save -b $addressBlock1 $addressBlock2binfile -o`	Dumps contents of two memory blocks to the binary file binfile.lod (in overwrite mode).

8.4.63 sc::setMaxAccessLength

Sets the maximum amount of data accessible in one target operation.

Syntax

```
sc::setMaxAccessLength
```

Example

The following command sets a maximum of 1000 elements that can be read or written:

```
sc::setMaxAccessLength 1000
```

8.4.64 sc::setReset

Sets the reset mode.

Syntax

```
sc::setReset <mode>
```

Parameter

```
<mode>
```

Can be `ToUser` or `ToDebug`. `ToUser` sets the reset to run out of reset. For debug mode after reset, use `ToDebug` parameter.

8.4.65 sc::getPhysicalAddress

Returns the physical address that corresponds to the specified virtual address.

Use `mem -ms` command, to view the list of supported memory spaces. For more information, refer to the mem command.

Syntax

```
sc::getPhysicalAddress <mem_space>:<virtual_address>
```

8.4.66 setpc

Set the value of the program counter register.

Syntax

```
setpc
```

8.4.67 setpicloadaddr

Indicate where a PIC executable is loaded.

Syntax

```
setpicloadaddr
```

8.4.68 stack

Print the call stack.

Syntax

```
stack
```

8.4.69 status

Lists the debug status of all existing active targets.

Syntax

```
status
```

8.4.70 step

Steps through a program, automatically executing the `display` command.

Syntax

```
step [asm|src] [into|over|out]
```

```
step [nve|nxt|fwd|end|aft]
```

Parameter

```
asm|src
```

Controls whether the step is performed at the assembly instruction level or the source code level.

```
into|over|out
```

Controls the type of step operation. If unspecified, into is used.

```
nve
```

Step non optimized action.

```
nxt
```

Step next action.

```
fwd
```

Step forward action.

```
end
```

Step end of statement action.

```
aft
```

Step end all previous action.

Examples

Table 8-27 lists and defines examples of the step command.

Table 8-27. step Command-Line Debugger Command-Examples

Command	Description
`step`	Step into the current source or assembly line.
`step over`	Step over the current source or assembly line.
`step out`	Step out of a function.
`step asm`	Step over a single assembly instruction.

8.4.71 stepi

Execute to the next assembly instruction.

Syntax

```
stepi
```

8.4.72 stop

Stops a running program (started by a go, step, or next command).

Syntax

```
stop
```

Examples

Table 8-28 lists and defines examples of the stop command.

Table 8-28. stop Command-Line Debugger Command-Examples

Command	Description
`stop`	Using it after command go/step out/next, this will stop the target program.

8.4.73 switchtarget

Chooses a thread for subsequent commands.

Syntax

```
switchtarget [<index> | -cur | -ResetIndex]
```

Parameter

```
index
```

Session Index number.

Examples

Table 8-29 lists and defines examples of the switchtarget command.

Table 8-29. switchtarget Command-Line Debugger Command-Examples

Command	Description
`switchtarget`	list currently available debug sessions.
`switchtarget 0`	choose the thread with index 0
`switchtarget -cur`	list the index of the current thread.
`switchtarget -ResetIndex`	reset the index counter to 0, not valid while debugging.

8.4.74 system

execute system command.

Syntax

```
system [command]
```

Parameter

`command`

Any system command that does not use a full screen display.

Examples

Table 8-30 lists and defines examples of the system command.

Table 8-30. system Command-Line Debugger Command-Examples

Command	Description
`system del *.tmp`	Delete from the current directory all files that have the .tmp filename extension.

8.4.75 var

Read and write variables or C-expressions.

Syntax

```
Display variable

var

var <var-spec> [-np] [-s|-ns] [%<conv>]

var v: [-np] [-s|-ns] [%<conv>]

Modify variable

var <var-spec> [-s|-ns] [%<conv>] =<value>
```

Parameter

`[none]`

With no options, this is equivalent to using `var v:`.

`<var-spec> [v:]<var>`

`v:`

If this option appears with no `<var>` following it, then all variables pertinent to the current scope are printed.

`<var>`

Symbolic name of the variable to print. Can be a C expression as well.

`-np`

Don't print anything to the display, only return the data.

```
-s|-ns
```

Specifies whether each value is to be swapped. For memory, specifies whether each cell is to be swapped. With a setting of `-ns`, target memory is written in order from lowest to highest byte address. Otherwise, each cell is endian swapped. If unspecified, the setting `config MemSwap` is used.

```
%<conv>
```

Specifies the type of the data. Possible values for `<conv>` are given below. The default conversion is set by the radix command for memory and registers and by the config var command for variables.

```
%x      Hexadecimal.

%d      Signed decimal.

%u      Unsigned decimal.

%f      Floating point.

%[E<n>]F  Fixed or Fractional.  The range of a fixed
point value depends on  the (fixed) location
of the decimal point.  The default location  is
set by the config command option
"MemFixedIntBits".

%s      Ascii.
```

Examples

Table 8-31 lists and defines examples of the var command.

Table 8-31. var Command-Line Debugger Command-Examples

Command	Description
`var flag =0`	Set the value of the variable flag to 0.
`var {x[2]} =11`	Set the value of the third element in the array x to 11.
`var {t1.y} =3`	Set the value of the variable y in the structure t1 to 3.

8.4.76 wait

Tells the debugger to wait for a specified amount of time, or until you press the space bar.

Syntax

```
wait <time-ms>
```

Parameter

```
time-ms
```

Number of milliseconds to wait.

Examples

Table 8-32 lists and defines examples of the wait command.

Table 8-32. wait Command-Line Debugger Command-Examples

Command	Description
`wait`	Debugger waits until you press the space bar.
`wait 2000`	Wait for 2 seconds.

8.4.77 watchpoint

Sets, removes, disables, enables or list watchpoints. You can also set condition on watchpoint.

Syntax

```
watchpoint

watchpoint [-{r|w|rw}] {<var>|[<ms>:]<addr> <length>}

watchpoint all|#<id>|<var>|[<ms>:]<addr>  off|enable|disable

watchpoint #<id> cond <c-expr>
```

Examples

Table 8-33 lists and defines examples of the watchpoint command.

Table 8-33. watchpoint Command-Line Debugger Command-Examples

Command	Description
`watchpoint`	Display all watchpoints.
`watchpoint gData`	Set read-write (the default) watchpoint on variable gData.
`watchpoint -r gData`	Set read-only watchpoint on variable gData.
`watchpoint all off`	Remove all watchpoints.
`watchpoint #4 disable`	Disable watchpoint number 4.
`watchpoint 10343 4`	Set a watchpoint at memory address 10343 of length 4.

Chapter 9
Multi-Core Debugging

This chapter explains how to use the multi-core debugging capability of the CodeWarrior debugger.

In this chapter:

9.1 Creating a JTAG Initialization File

This section explains how to create a JTAG initialization file that specifies the type and chain order of the cores you want to debug.

The listing below shows the JTAG initialization file for a StarCore processor and a generic device, connected to a JTAG chain.

Listing 9-1. JTAG Initialization File for Generic Device Connected to JTAG Chain

```
# JTAG Initialization File
#
# Standards for this file
#    1. Comments begin with the character '#'.
#    2. A StarCore device is specified with:
#                    B4860
#    3. A non-StarCore device is specified with:
#                    Generic <Value_1> <Value_2> <Value_3>
#       Value_1 is the length in bits of the JTAG instruction register.
#       Value_2 is the length in bits of the JTAG bypass register.
```

```
#       Value_3 is the hex value of the JTAG bypass instruction.
#             Hex values are prefixed with 0x.
#    4. Each device is specified on a new line.
#    5. Device specification is case sensitive, and a Generic device
#       cannot be specified without all three values.
#
#An example configuration is shown below:
B4860
Generic 4 1 Oxf
```

You can also include entries for other StarCore, non-StarCore devices connected to the JTAG chain by adding the following lines of code to your JTAG initialization file:

```
Generic
instruct_reg_len
data_reg_bypass_len
JTAG_bypass_instruct
```

The table below shows the variable definitions that you must specify for a generic device.

Table 9-1. Syntax Variables to Specify Generic Device on JTAG Chain

Variable	Description
`instruct_reg_len`	Length (in bits) of the JTAG instruction register.
`data_reg_bypass_len`	Length (in bits) of the JTAG bypass register.
`JTAG_bypass_instruct`	Value of the JTAG bypass instruction (in hexadecimal).

9.2 Debugging Multi-Core Projects

This section explains how to set launch configurations and how to debug multiple cores in a multi-core project.

The CodeWarrior debugger provides the facility to debug multiple StarCore processors using a single debug environment. The run control operations can be operated independently or synchronously. A common debug kernel facilitates multi-core, run control debug operations for examining and debugging the interaction of the software running on the different cores on the system.

NOTE

This procedure assumes that you have already created a multi-core project, named `board_project`.

To debug multiple cores connected to a JTAG chain, perform the steps given in the following sections:

- Setting Launch Configurations
- Debugging Multiple Cores

9.2.1 Setting Launch Configurations

Setting a launch configuration allows you to specify all core-specific initializations.

To set up the launch configurations, follow these steps:

1. Connect to your JTAG chain.

   NOTE

   The JTAG chain includes multiple boards or multiple processors on the same or multiple boards.

2. Create a JTAG initialization file that describes the items on the JTAG chain. For more information on how to create a JTAG initialization file, see Creating a JTAG Initialization File.
3. Open the CodeWarrior project you want to debug.
4. Switch to the **Debug** perspective.
5. Select **Run > Debug Configurations**.

   The **Debug Configurations** dialog box appears (shown in the figure below) with a list of debug configurations that apply to the current application.

6. Expand the **CodeWarrior** tree control.
7. From the expanded list, select the debug configuration for which you want to modify the debugger settings. For example, `board_project_Debug_B4860_Download_Core00`.

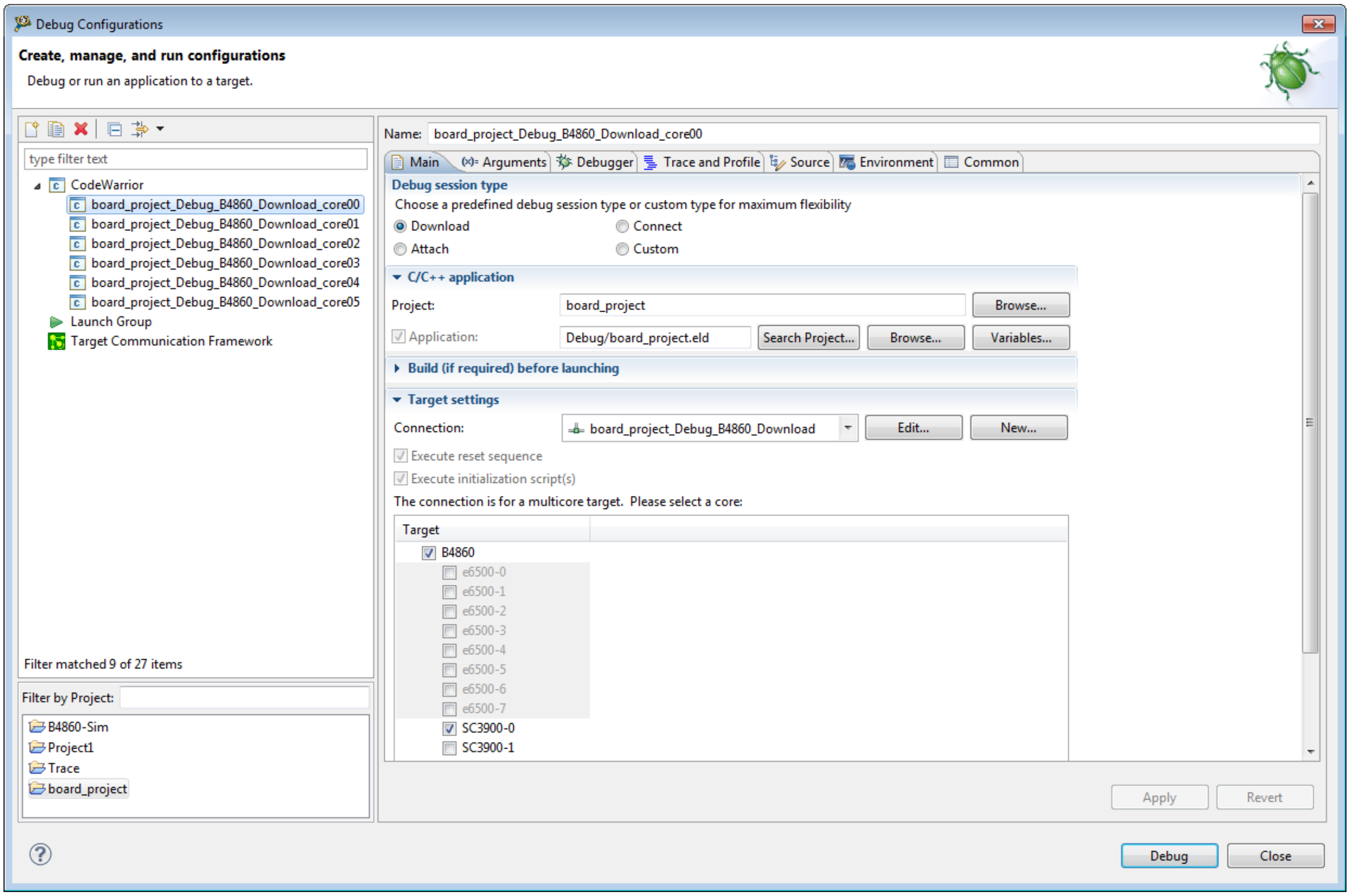


Figure 9-1. Debug Configurations Dialog Box

8. On the **Main** tab, select a connection from the **Connection** drop-down list.
9. Select a core from the **Target** list.
10. Click **Edit** next to the **Connection** drop-down list.

    The **Properties for <connection>** dialog box appears.

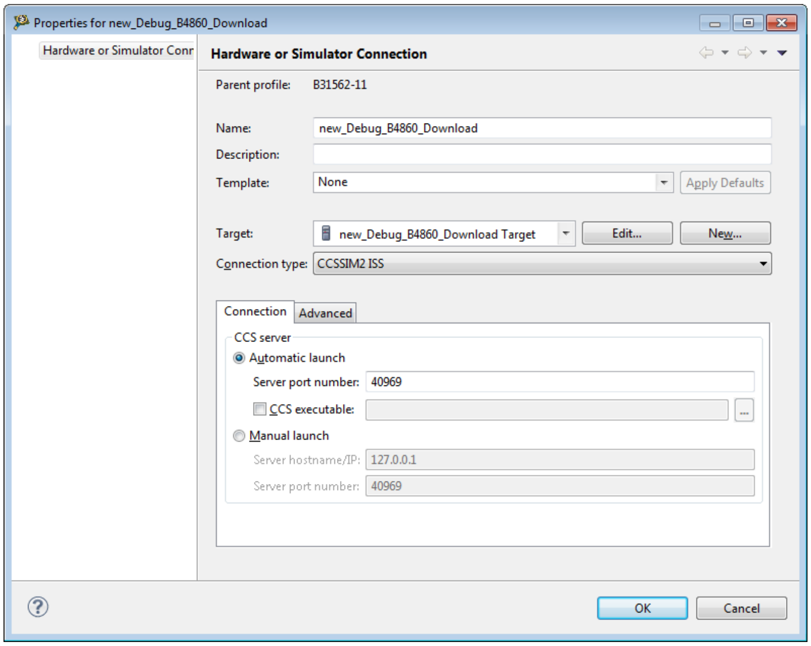


Figure 9-2. Properties for <connection> Dialog Box

11. Select a target from the **Target** drop-down list.
12. Select the required TAP connection from the **Connection type** drop-down list. For example, **Ethernet TAP**.
13. On the **Connection** tab, specify the hostname/IP of the target board in the **Hostname/IP** text box.
14. Enter the JTAG clock speed in the **JTAG clock speed** text box.
15. Specify the port number of the CCS server in the **Server port number** text box.

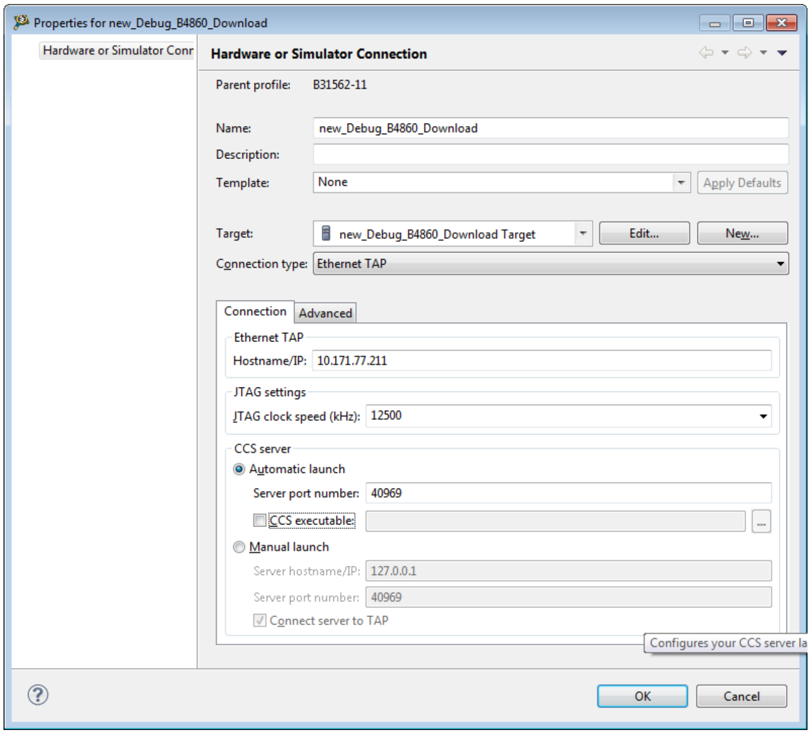


Figure 9-3. Properties for <connection> Dialog Box - Connection Settings

16. Click **Edit**.

    The **Properties for <project> Target** dialog box appears.

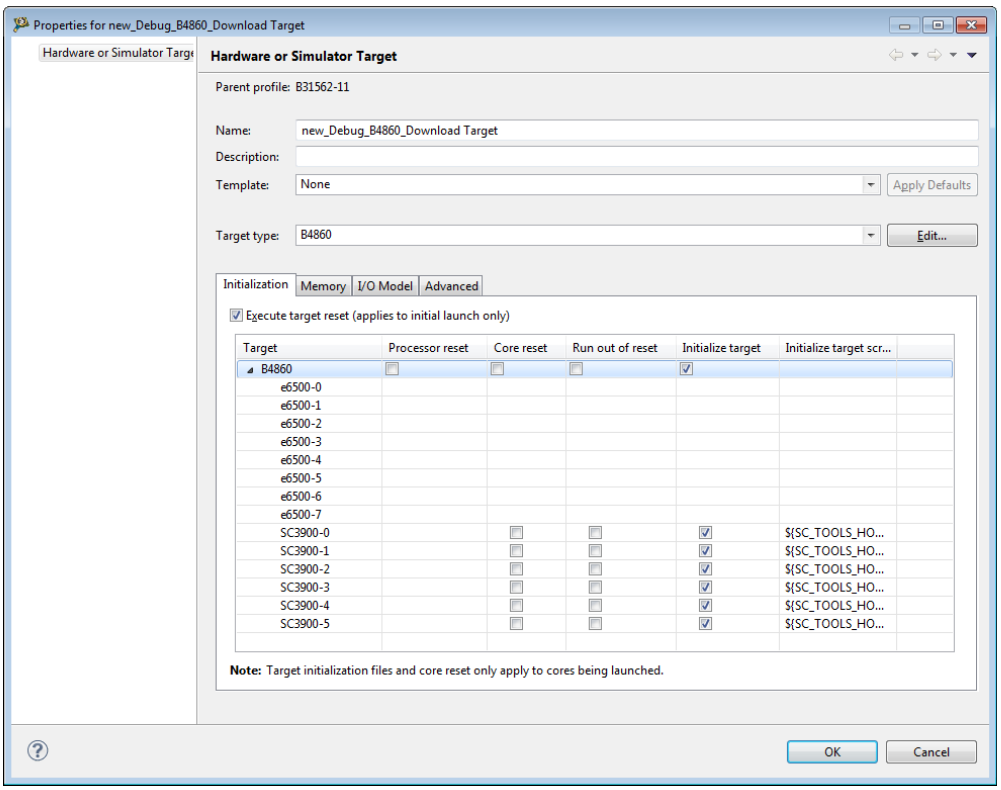


Figure 9-4. Debug Configurations - Properties for <target> Dialog Box

17. Select a target from the **Target type** drop-down list.
18. Click **Edit**.

    The **Target Types** dialog box appears.

19. Click **Import**.

    The **Import Target Type** dialog box appears.

20. Select the JTAG initialization file that describes the items on the JTAG chain.
21. Click **Open**.

    The items on the JTAG chain described in the file appear in the **Target Types** dialog box.

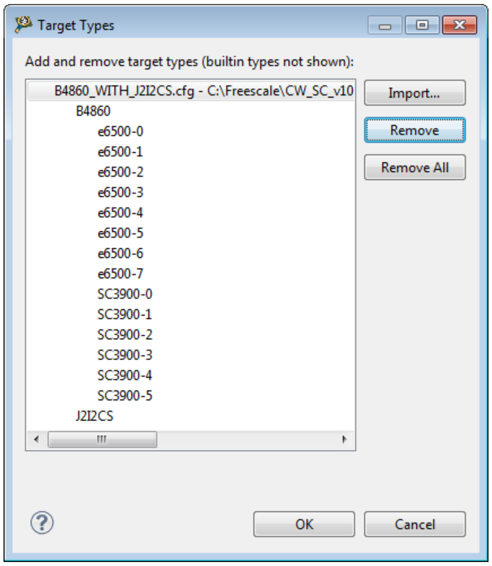


Figure 9-5. Target Types Dialog Box

22. Click **OK**.

    The selected JTAG configuration file appears on the **Initialization** tab.

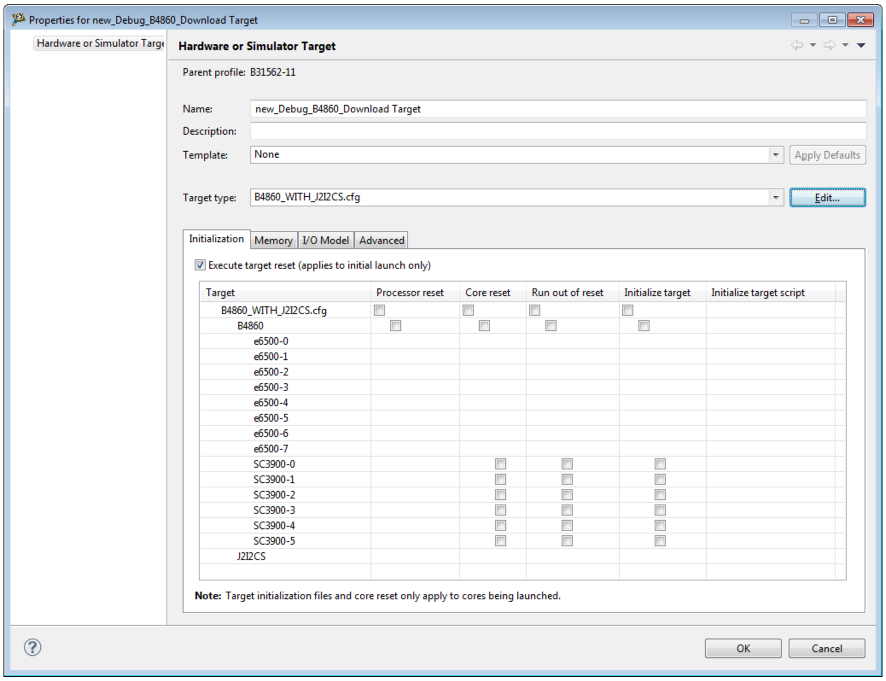


Figure 9-6. Initialization Tab - JTAG Configuration

23. Click **OK**.
24. Click **OK**.
25. Click the **Debugger** tab in the **Debug Configurations** dialog box.

    The **Debugger** tab page appears.

26. Ensure that the **Stop on startup at** checkbox is selected and `main` is specified in the **User specified** text box.
27. Click **Apply** to save the changes.

    You have successfully configured a debug configuration.

28. Similarly, configure remaining debug configurations.

NOTE

To successfully debug multiple cores, the connection settings must be identical for all debug configurations.

9.2.2 Debugging Multiple Cores

The CodeWarrior debugger enables system developers to simultaneously develop and debug applications on a system with multiple processors, within the same debug environment.

NOTE

Ensure that you have attached a debug probe to the target board and to the computer hosting the CodeWarrior IDE before performing the steps listed in this section.

To debug multiple cores, follow these steps:

1. Select a multi-core project in the **CodeWarrior Projects** view.
2. Select **Run > Debug**.

   The debugger downloads core 0 and switches to the **Debug** perspective. The debugger halts execution at the first statement of `main()`. The **Debug** view displays all the threads associated with the core.

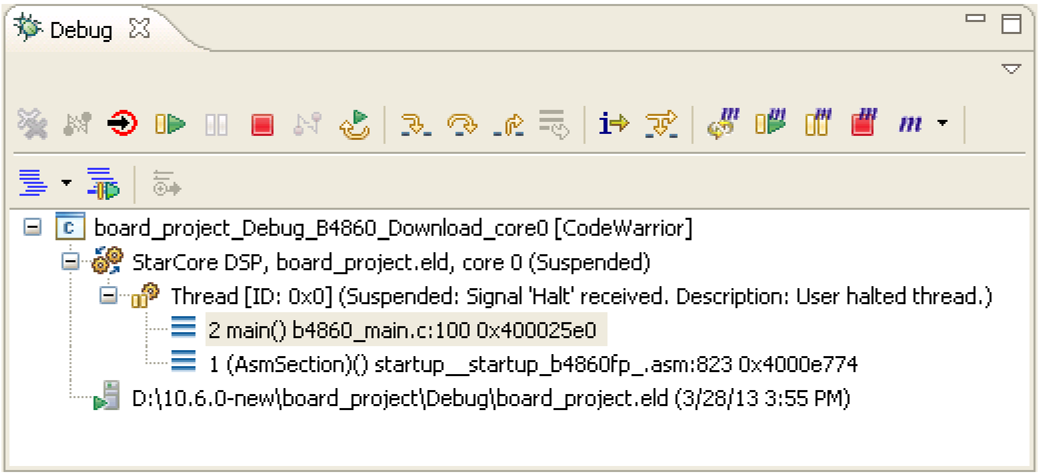


Figure 9-7. Multi-Core Debugging - Debug Core 0

3. Download all other cores associated with the project.
4. Select a thread from core 0 in the **Debug** view.

   All the views in the **Debug** perspective will be updated to display the debug session for the selected core. The figure below displays the debug session for a selected thread in core 0.

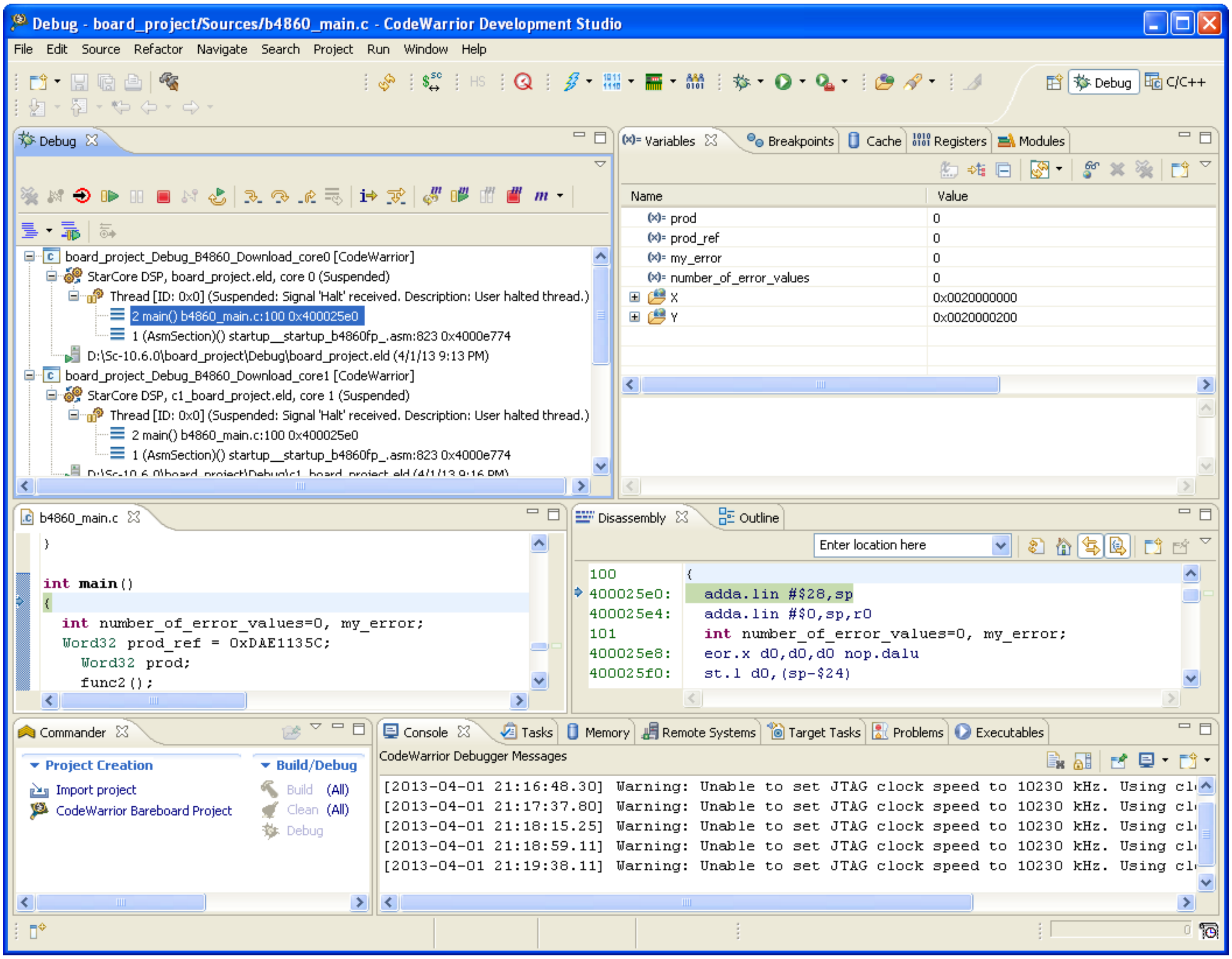


Figure 9-8. Viewing Debug Information for Core 0

5. Select and expand the **General Purpose Registers** group.
6. Select **Run > Step Over**.

   The following actions occur:

   - Debugger executes the current statement and halts at the next statement.
   - The program counter (PC) indicator moves to the next executable source line in the Source view.
   - In the **Debug** view, the status of the program changes to (`Suspended`).
   - Modified register values are highlighted in yellow.
7. Select **Window > New Window**.

   Another instance of the **Debug** perspective opens in a new window. The figure below displays multiple instances of an active debug session.

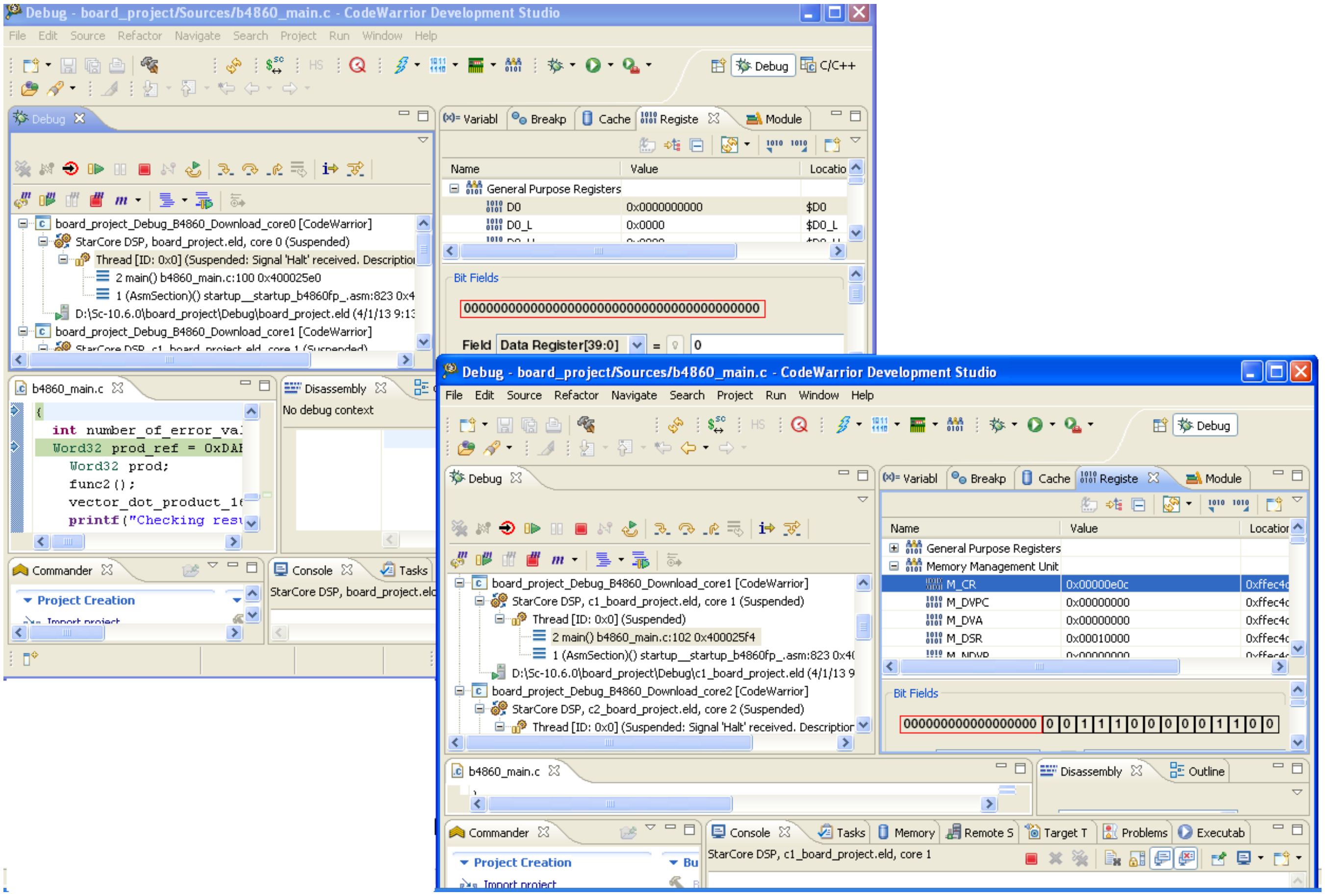


Figure 9-9. Viewing Multiple Instances of Active Debug Session

8. Select a thread from core 1 in the **Debug** view of the newly opened **Debug - <*project*>** window.

   All the views in the **Debug** perspective will be updated to display the debug session for the selected core.

9. Select and expand the **Extended Simulator Registers** group.
10. Select **Run > Step Over**.

    The following actions occur:

    - Debugger executes the current statement and halts at the next statement.
    - The program counter (PC) indicator moves to the next executable source line in the Source view.
11. Issue several more **Step Over** commands and watch the register values change.
12. Select `main()` thread from core 0 again.

    Notice that the register values remain unchanged. This is because the CodeWarrior debugger controls each core's execution individually.

13. With core 0 still selected, click the **Step Over** button several times until you reach the `printf()` statement.

    Debugger executes the current statement, the following statements, and halts at the `printf()` statement.

14. Switch to the other debug window.
15. Select the `main()` thread for core 1 by clicking it. Notice that the program counter icon in the Source view did not move. The debugger controls the execution of each core individually.
16. In the **Debug** view, click the **Resume** button.

    Core 1 enters an infinite loop. The status of the program changes to (`Running`).

17. In the **Debug** view, click the `main()` thread for core 0 and click the **Resume** button.

    Core 0 enters an infinite loop and core 1 continues to execute in its loop.

18. Select `main()` thread from core 1 and click the **Suspend** button.

    The debugger halts core 1 at the current statement and the status of the program changes to (`Halted`). Core 0 continues to execute.

19. Select **Run > Multicore Terminate**.

    The debugger terminates the active debug session. The threads associated with each core in the **Debug** view disappear.

9.3 Multi-Core Debugging Commands

This section describes the multi-core commands available in the **Run** menu of CodeWarrior IDE and in the Debugger Shell.

If you are debugging a multi-core project, you can use single and multi-core debugging commands to debug parts of each core project.

- Multi-Core Commands in CodeWarrior IDE
- Multi-Core Commands in Debugger Shell

9.3.1 Multi-Core Commands in CodeWarrior IDE

This section describes the multi-core commands in the CodeWarrior IDE.

When you start a multi-core debug session, multi-core commands are enabled on the CodeWarrior IDE **Run** menu. These commands, when issued, affect all cores simultaneously. The table below describes each menu choice. For detailed information on these commands, see *CodeWarrior Development Studio Common Features Guide*.

Table 9-2. Multi-Core Debugging Commands

Command	Icon	Description
Multicore Resume		Starts all cores of a multi-core system running simultaneously.
Multicore Suspend		Stops execution of all cores of a multi-core system simultaneously.
Multicore Restart		Restarts all the debug sessions for all cores of a multi-core system simultaneously.
Multicore Terminate		Kills all the debug sessions for all cores of a multi-core system simultaneously.
Multicore Groups		**Use All Cores:** If the selected debug context is a multi-core system, then all cores are used for multi-core operations. **Disable Halt Groups:** Disables breakpoint halt groups. For more information on halt groups, see "Multicore Breakpoint Halt Groups" in *CodeWarrior Development Studio Common Features Guide*. **Limit new breakpoints to current group:** If selected, all new breakpoints set during a debug session are reproduced only on cores belonging to the group of the core on which the breakpoint is set. **Edit Target Types:** Opens T**arget Types** dialog box that lets you add and remove system types. **Edit Multicore Groups:** Opens the **Multicore Groups** dialog box to create multi-core groups. You can also use this option to modify the existing multi-core groups.

NOTE

For more information about creating/modifying multi-core groups, or editing target type, see "Multicore Groups" in *CodeWarrior Development Studio Common Features Guide*.

To use the multi-core commands from the **Debug** perspective, follow these steps:

1. Start a debugging session by selecting the appropriately configured launch configuration.
2. If necessary, expand the desired core's list of active threads by clicking on the tree control in the **Debug** view.
3. Click the thread you want to use with multi-core operations.

4. From the **Run** menu, specify the multi-core operation to perform on the thread.

NOTE

The keyboard shortcut for the **Multicore Resume** operation is Alt+Shift+F8.

9.3.2 Multi-Core Commands in Debugger Shell

This section describes the multi-core commands in debugger shell.

In addition to the multicore-specific toolbar buttons and menu commands available in the **Debug** view, the **Debugger Shell** has multi-core specific commands that can control the operation of one or more processor cores at the same time. Like the menu commands, the multi-core debugger shell commands allow you to select, start, and stop a specific core. You can also restart or kill sessions executing on a particular core. The table below lists and defines the affect of each multi-core debugging command.

Table 9-3. Multi-Core Debugging Commands

Command	Shortcut	Description
mc::config	mc::c	List or edit multicore group options. **Syntax** `mc::config`
mc::go	mc::g	Resume multiple cores **Syntax** `mc::go` **Examples** `mc::go` Resumes the selected cores associated with the current thread context.

mc::group	mc::gr	Display or edit multicore groups
		Syntax
		`group group new <type-name> [<name>] group rename <name>|<group-index> <new-name>group remove <name>|<group-index> ... group removeall group enable|disable <index> ...|all`
		Examples
		`mc::group`
		Shows the defined groups, including indices for use in the `mc::group rename|enable|remove` set of commands.
		`mc::group new 8572`

Table continues on the next page...

Table 9-3. Multi-Core Debugging Commands (continued)

Command	Shortcut	Description

		Creates a new group for system type `8572`. The group name will be based on the system name and will be unique. The enablement of the group elements will be all non-cores enabled, all cores disabled.
		`mc::group rename 0 "My Group Name"`
		Renames the group at index 0 to "My Group Name".
		`mc::group enable 0 0.0`
		Enables the group at index 0 and the element at index 0.0 of the `mc::group` command.
		`mc::group remove "My Group Name"`
		Removes the group named "My Group Name".
		`mc::group removeall`
		Removes all groups.

mc::kill	mc::kill	Terminates the debug session for selected cores associated with the current thread context. **Syntax** `mc::kill` **Examples** `mc::kill` Terminates multiple cores.
mc::reset	mc::reset	Resets multiple cores. **Syntax** `mc::reset`
mc::restart	mc::restart	Restarts the debug session for selected cores associated with the current thread context. **Syntax** `mc::restart` **Examples** `mc::restart` Restarts multiple cores.
mc::stop	mc::stop	Stops the selected cores associated with the current thread context. **Syntax** `mc::stop` **Examples** `mc::stop` Suspends multiple cores.
mc::type	mc::t	Shows the system types available for multicore debugging as well as type indices for use by the `mc::type remove` and `mc::group new` commands. **Syntax**

Table 9-3. Multi-Core Debugging Commands

Command	Shortcut	Description

		`type type import <filename> type remove <filename>|<type-index> ... type removeall`
		Examples
		`mc::type`
		Display or edit system types.
		`mc::type import 8572_jtag.txt`
		Creates a new type from the JTAG configuration file.
		`mc::type remove 8572_jtag.txt`
		Removes the type imported from the specified file.
		`mc::type removeall`
		Removes all imported types.

Chapter 10
Working with Hardware Tools

This chapter explains how to use the CodeWarrior hardware tools. Use these tools for board bring-up, test, and analysis.

In this chapter:

- Flash programmer
- Flash File to Target
- Hardware diagnostics
- Import/Export/Fill memory

10.1 Flash programmer

Flash programmer is a CodeWarrior plug-in that lets you program the flash memory of the supported target boards from within the IDE.

The flash programmer can program the flash memory of the target board with code from a CodeWarrior IDE project or a file. You can perform the following actions on a flash device using the flash programmer:

- Erase/Blank check actions
- Program/Verify actions
- Checksum actions
- Diagnostics actions
- Dump Flash actions
- Protect/Unprotect actions

The flash programmer runs as a target task in the Eclipse IDE. To program the flash memory on a target board, you need to perform the following tasks:

- Create a flash programmer target task

- Configure flash programmer target task
- Execute flash programmer target task

NOTE

Click the **Save** button or press **Ctrl+S** to save task settings.

10.1.1 Create a flash programmer target task

You can create a flash programmer task using the **Create New Target Task** wizard.

1. Choose **Window > Show View > Other** from the CodeWarrior IDE menu bar.

   The **Show View** dialog appears.

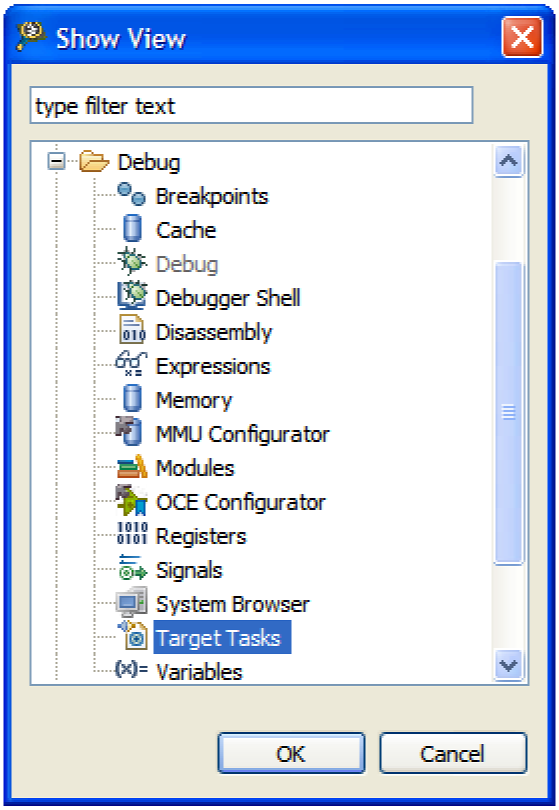


Figure 10-1. Show View dialog

2. Expand the **Debug** group and select **Target Tasks**.
3. Click **OK**.

   The **Target Tasks** view appears.

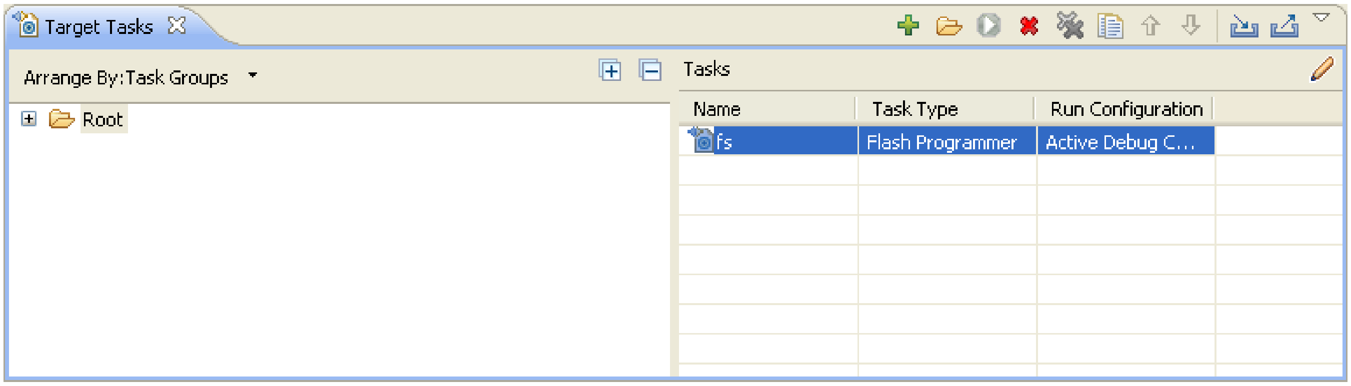


Figure 10-2. Target Tasks view

4. Click the **Create a new Target Task** button in the **Target Tasks** view toolbar.

   The **Create New Target Task** wizard appears.

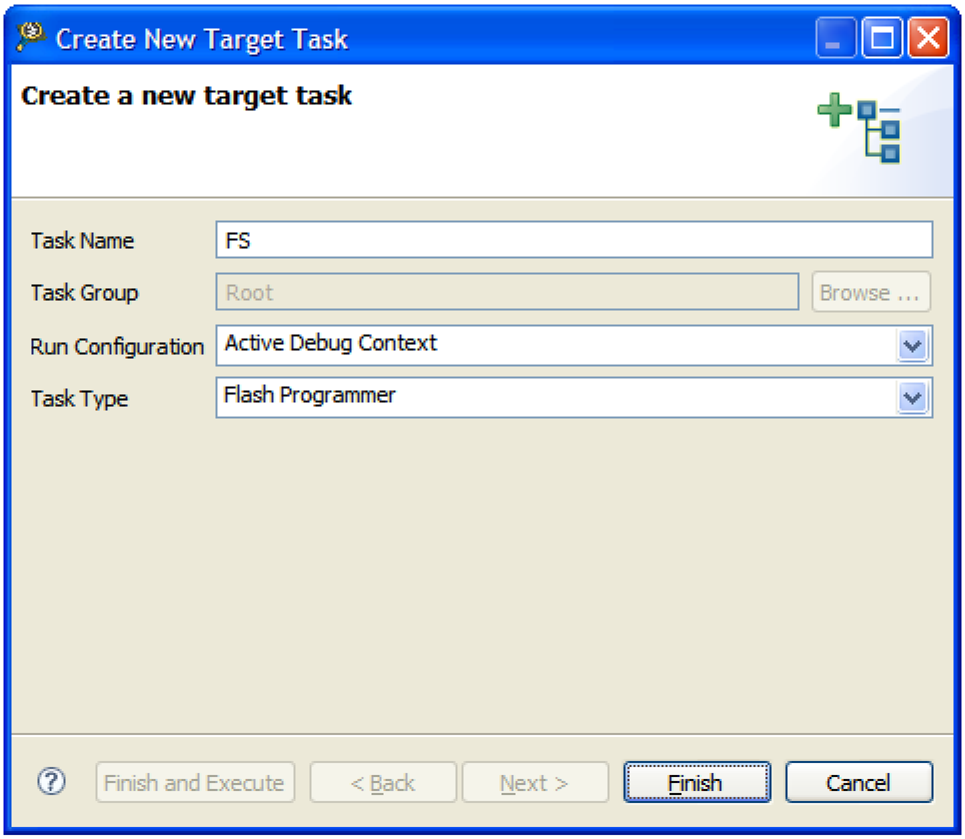


Figure 10-3. Create New Target Task window

5. In the **Task Name** textbox, enter a name for the new flash programming target task.
6. Choose a launch configuration from the **Run Configuration** pop-up menu.
   - Choose **Active Debug Context** when flash programmer is used over an active debug session.
   - Choose a project-specific debug context when flash programmer is used without an active debug session.
7. Choose **Flash Programmer** from the **Task Type** pop-up menu.

8. Click **Finish**.

   The target task is created and the **Flash Programmer Task** editor window appears. You use this window to configure the flash programmer target task.

   - Flash Devices - Lists the devices added in the current task.
   - Target RAM - Lets you specify the settings for Target RAM.
   - Flash Program Actions - Displays the programmer actions to be performed on the flash devices.

10.1.2 Configure flash programmer target task

You can add flash devices, specify Target RAM settings, and add flash program actions to a flash programmer task to configure it.

This topic contains the following sub-topics:

- Add flash device
- Specify target RAM settings
- Add flash programmer actions

10.1.2.1 Add flash device

To add a flash device to the **Flash Devices** table:

1. Click the **Add Device** button.

   The **Add Device** dialog appears.

2. Select a flash device from the device list.
3. Click the **Add Device** button.

   The flash device is added to the **Flash Devices** table in the **Flash Programmer Task** editor window.

   NOTE

   You can select multiple flash devices to add to the **Flash Devices** table. To select multiple devices, hold down the Control key while selecting the devices.

4. Click **Done**.

The **Add Device** dialog closes and the flash device appears in the **Flash Devices** table in the **Flash Programmer Task** editor window.

NOTE

For NOR flashes, the base address indicates the location where the flash is mapped in the memory. For SPI and NAND flashes, the base address is usually `0x0`.

10.1.2.2 Specify target RAM settings

The Target RAM is used by Flash Programmer to download its algorithms.

NOTE

The Target RAM memory area is not restored by flash programmer. If you are using flash programmer with Active Debug Context, it will impact your debug session.

The **Target RAM**(Add flash device) group contains fields to specify settings for the Target RAM.

- **Address** textbox: Use it to specify the address from the target memory. The **Address** textbox should contain the first address from target memory used by the flash algorithm running on a target board.
- **Size** textbox: Use it to specify the size of the target memory. The flash programmer does not modify any memory location other than the target memory buffer and the flash memory.
- **Verify Target Memory Writes** checkbox: Select this checkbox to verify all write operations to the hardware RAM during flash programming.

10.1.2.3 Add flash programmer actions

In the **Flash Programmer Actions** group in the Flash Programmer Task editor window (Create a flash programmer target task), you can add following actions on the flash device.

- Erase/Blank check actions
- Program/Verify actions
- Checksum actions
- Diagnostics actions

- Dump Flash actions
- Protect/Unprotect actions

The **Flash Programmer Actions** group contains the following UI controls to work with flash programmer actions:

- **Add Action** pop-up menu
    - **Erase/Blank Check Action**: Allows you to add erase or blank check actions for a flash device.
    - **Program/Verify Action**: Allows you to add program or verify flash actions for a flash device.
    - **Checksum Action**: Allows you to add checksum actions for a flash device.
    - **Diagnostics Action**: Lets you add a diagnostics action.
    - **Dump Flash Action**: Lets you add a dump flash action.
    - **Protect/Unprotect Action**: Lets you add protect or unprotect action.
    - **Secure/Unsecure Action**: Lets you add secure or unsecure action.
- **Duplicate Action** button: Allows you to duplicate a flash program action in the **Flash Programmer Actions** table.
- **Remove Action** button: Allows you to remove a flash program action from the **Flash Programmer Actions** table.
- **Move Up**button: Allows you to move up the selected flash action in the **Flash Programmer Actions** table.
- **Move Down** button: Allows you to move down the selected flash action in the **Flash Programmer Actions** table.

NOTE

Actions can also be enabled or disabled using the **Enabled** column. The **Description** column contains the default description for the flash programmer actions. You can also edit the default description.

10.1.2.3.1 Erase/Blank check actions

The Erase action erases sectors from the flash device.

You can also use the erase action to erase the entire flash memory without selecting sectors. The blank check action verifies if the specified areas have been erased from the flash device.

NOTE

Flash Programmer will not erase a bad sector in the NAND flash. After the erase action a list of bad sectors is reported (if any).

To add an erase/blank check action:

1. Choose **Erase/Blank Check Action** from the **Add Action** pop-up menu.

   The **Add Erase/Blank Check Action** dialog appears.

2. Select a sector from the **Sectors** table and click the **Add Erase Action** button to add an erase operation on the selected sector.

   NOTE

   Press the Control or the Shift key for selecting multiple sectors from the **Sectors** table.

3. Click the **Add Blank Check** button to add a blank check operation on the selected sector.
4. Select the **Erase All Sectors Using Chip Erase Command** checkbox to erase the entire flash memory.

   NOTE

   After selecting the **Erase All Sectors Using Chip Erase Command** checkbox, you need to add either erase or blank check action to erase all sectors.

5. Click **Done**.

   The **Add Erase/Blank Check Action** dialog closes and the added erase/blank check actions appear in the **Flash Programmer Actions** table in the **Flash Programmer Task** editor window.

10.1.2.3.2 Program/Verify actions

The Program action allows you to program the flash device and the verify action verifies the programmed flash device.

NOTE

The program action will abort and fail if it is performed in a bad block for NAND flashes.

To add a program/verify action:

1. Choose **Program/Verify Action** from the **Add Action** pop-up menu.

   The **Add Program/Verify Action** dialog appears.

2. Select the file to be written to the flash device.

3. Select the **Use File from Launch Configuration** checkbox to use the file from the launch (run) configuration associated with the task.
4. Specify the file name in the **File** textbox. You can use **Workspace**, **File System**, or **Variables** buttons to select the desired file.
5. Choose a file type from the **File Type** pop-up menu. You can select any one of the following file types:
   - Auto - Detects the file type automatically.
   - Elf - Specifies executable in ELF format.
   - Srec - Specifies files in Motorola S-record format.
   - Binary - Specifies binary files.
6. Select the **Erase sectors before program** checkbox to erase sectors before program.
7. [Optional] Select the **Verify after program** checkbox to verify after the program.

NOTE

The **Verify after program** checkbox is available only with the processors supporting it.

8. Select the **Restricted To Address in this Range** checkbox to specify a memory range. The write action is permitted only in the specified address range. In the **Start** textbox, specify the start address of the memory range sector and in the **End** textbox, specify the end address of the memory range.
9. Select the **Apply Address Offset** checkbox and set the memory address in the **Address** textbox. Value is added to the start address of the file to be programmed or verified.
10. Click the **Add Program Action** button to add a program action on the flash device.
11. Click the **Add Verify Action** button to add a verify action on the flash device.
12. Click **Done**.

    The **Add Program/Verify Action** dialog closes and the added program/verify actions appear in the **Flash Programmer Actions** table in the **Flash Programmer Task** editor window.

10.1.2.3.3 Checksum actions

The checksum can be computed over host file, target file, memory range or entire flash memory.

To add a checksum action:

1. Choose **Checksum Action** from the **Add Action** pop-up menu.

   The **Add Checksum Action** dialog appears.

2. Select the file for checksum action.
3. Select the **Use File from Launch Configuration** checkbox to use the file from the launch (run) configuration associated with the task.
4. Specify the filename in the **File** textbox. You can use the **Workspace**, **File System**, or **Variables** buttons to select the desired file.
5. Choose the file type from the **File Type** pop-up menu.
6. Select an option from the **Compute Checksum Over** options. The checksum can be computed over the host file, the target file, the memory range, or the entire flash memory.
7. Specify the memory range in the **Restricted To Addresses in this Range** group. The checksum action is permitted only in the specified address range. In the **Start** textbox, specify the start address of the memory range sector and in the **End** textbox, specify the end address of the memory range.
8. Select the **Apply Address Offset** checkbox and set the memory address in the **Address** textbox. Value is added to the start address of the file to be programmed or verified.
9. Click the **Add Checksum Action** button.
10. Click **Done**.

    The **Add Checksum Action** dialog closes and the added checksum actions appear in the **Flash Programmer Actions** table in the **Flash Programmer Task** editor window.

10.1.2.3.4 Diagnostics actions

The diagnostics action generates the diagnostic information for a selected flash device.

NOTE

Flash Programmer will report bad blocks, if they are present in the NAND flash.

To add a diagnostics action:

1. Choose **Diagnostics** from the **Add Action** pop-up menu.

   The **Add Diagnostics Action** dialog appears.

2. Select a device to perform the diagnostics action.
3. Click the **Add Diagnostics Action** button to add diagnostic action on the selected flash device.

NOTE
Select the **Perform Full Diagnostics** checkbox to perform full diagnostics on a flash device.

4. Click **Done**.

   The **Add Diagnostics Action** dialog closes and the added diagnostics action appears in the **Flash Programmer Actions** table in the **Flash Programmer Task** editor window.

10.1.2.3.5 Dump Flash actions

The dump flash action allows you to dump selected sectors of a flash device or the entire flash device.

To add a dump flash action:

1. Choose **Dump Flash Action** from the **Add Action** pop-up menu.

   The **Add Dump Flash Action** dialog appears.

2. Specify the file name in the **File** textbox. The flash is dumped in this selected file.
3. Choose the file type from the **File Type** pop-up menu. You can choose any one of the following file types:
   - Srec: Saves files in Motorola S-record format.
   - Binary: Saves files in binary file format.
4. Specify the memory range for which you want to add dump flash action.
   - Enter the start address of the range in the **Start** textbox.
   - Enter the end address of the range in the **End** textbox.
5. Click the **Add Dump Flash Action** button to add a dump flash action.
6. Click **Done**.

   The **Add Dump Flash Action** dialog closes and the added dump flash action appear in the **Flash Programmer Actions** table in the **Flash Programmer Task** editor window.

10.1.2.3.6 Protect/Unprotect actions

The protect/unprotect actions allow you to change the protection of a sector in the flash device.

To add a protect/unprotect action:

1. Choose the **Protect/Unprotect Action** from the **Add Action** pop-up menu.

   The **Add Protect/Unprotect Action** dialog appears.

2. Select a sector from the **Sectors** table and click the **Add Protect Action** button to add a protect operation on the selected sector.

   NOTE

   Press the Control or Shift key for selecting multiple sectors from the **Sectors** table.

3. Click the **Add Unprotect Action** button to add an unprotect action on the selected sector.
4. Select the **All Device** checkbox to add action on full device.
5. Click **Done**.

   The **Add Protect/Unprotect Action** dialog closes and the added protect or unprotect actions appear in the **Flash Programmer Actions** table in the **Flash Programmer Task** editor window.

10.1.2.3.7 Duplicate action

You can duplicate a flash programmer action from the **Flash Programmer Actions** table.

1. Select the action in the **Flash Programmer Actions** table.
2. Click the **Duplicate Action** button.

   The selected action is copied in the **Flash Programmer Action** table.

10.1.2.3.8 Remove action

You can remove a flash programmer action from the **Flash Programmer Actions** table.

1. Select the action in the **Flash Programmer Actions** table.
2. Click the **Remove Action** button.

   The selected action is removed from the **Flash Programmer Action** table.

10.1.3 Execute flash programmer target task

You can execute the flash programmer tasks using the **Target Tasks** view.

To execute the configured flash programmer target task, select a target task and click the **Execute** button in the **Target Tasks** view toolbar. Alternatively, right-click on a target task and choose **Execute** from the shortcut menu.

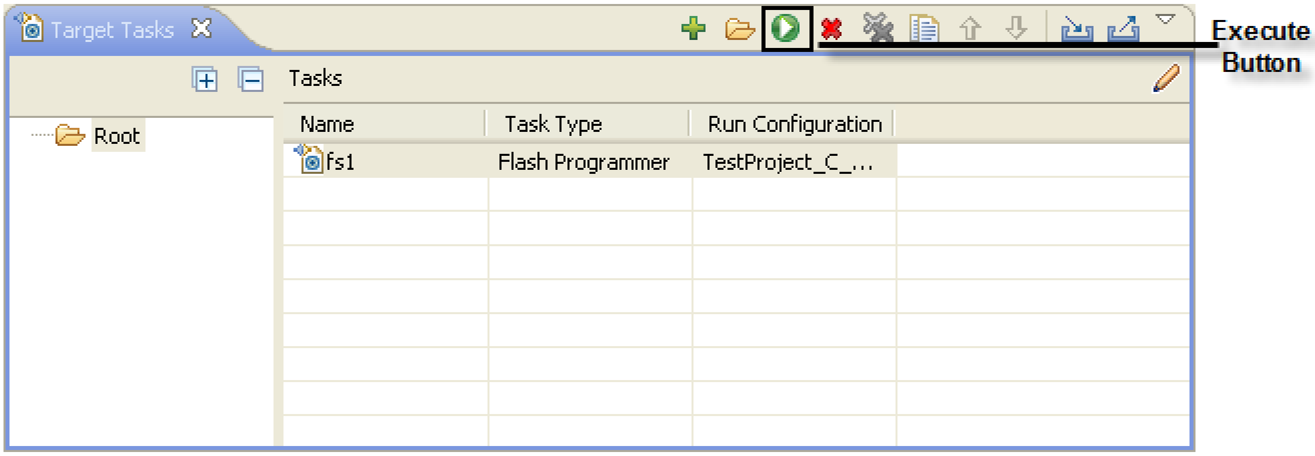


Figure 10-4. Execute target task

NOTE

You can use predefined target tasks for supported boards. To load a predefined target task, right-click in the **Target Tasks** view and choose **Import Target Task** from the shortcut menu. To save your custom tasks, right-click in the **Target Tasks** view and then choose **Export Target Task** from the shortcut menu.

You can check the results of flash batch actions in the **Console** view. The green color indicates the success and the red color indicates the failure of the task.

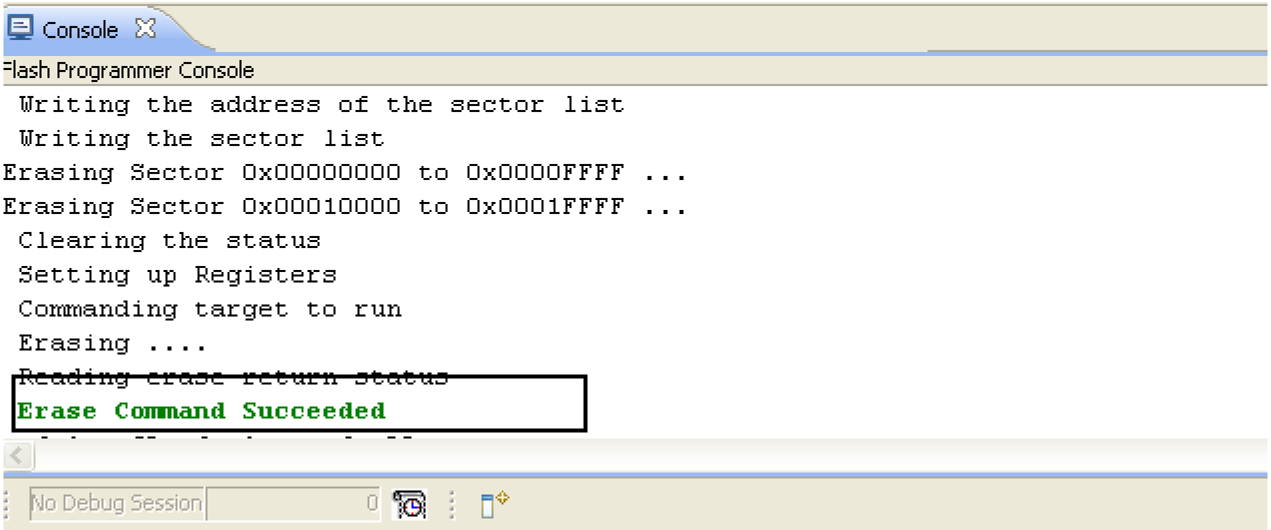


Figure 10-5. Console view

10.1.4 Flash Programmer Use Case

This topic lists the following use case:

- Using Flash Programmer to Write uboot Image to Target

10.1.4.1 Using Flash Programmer to Write uboot Image to Target

You need to perform the following actions to write uboot images using CodeWarrior for StarCore 3900FP DSP flash programmer:

NOTE

You need `B4860QDS_NOR_FLASH.xml` for RCW writing at step 5, and the offset at step 7 is `0xE8000000`.

1. Edit the launch configuration.

   NOTE

   CodeWarrior for StarCore 3900FP DSP flash programmer supports both SRAM and DDR `init` files. For this tutorial, you must change the default `init` file with the `SRAM init` for core 0.

   To edit the launch config, perform these steps:

a. Select **Run > Debug Configurations** to open the **Debug configurations** dialog box.
b. Select *Core 0* launch config
c. From the **Target settings** group, click **Edit**.

   The **Properties for <*connection*>** dialog box appears.

d. From the **Target** option, click **Edit**.

   The **Properties for <connection> Target** dialog box appears.

e. Check the Target Initialize checkbox for core 0, then click in the **Initialize target script** column.
f. Click the browse button (...) to open the **Target Initialization File** dialog box.
g. Click **File System** and select **B4860_QDS_SRAM_Init.tcl** file from **SC\StarCore_Support\Initialization_Files\RegisterConfigFiles\B4860_QDS** folder.

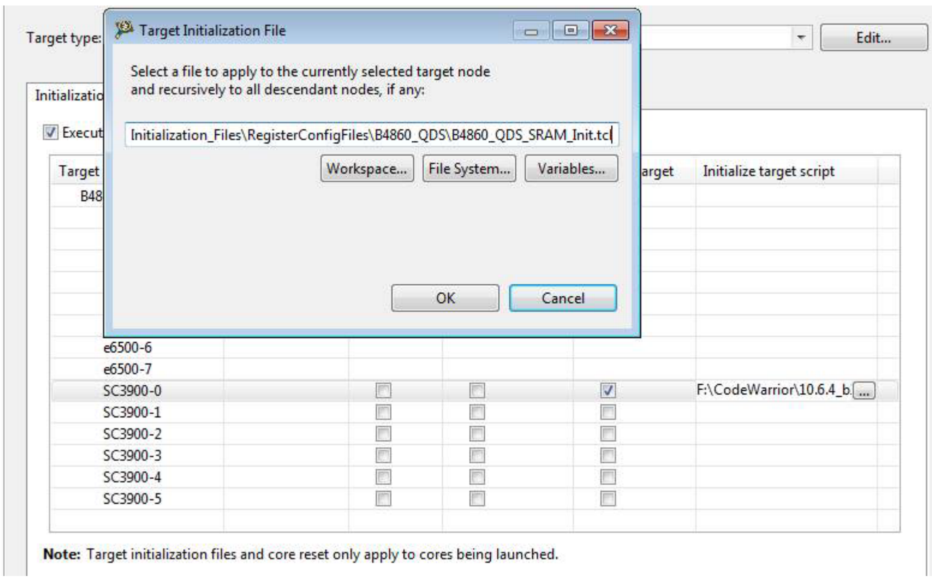


Figure 10-6. Target Initialization File Dialog Box

2. Start a debugging session. Wait until the control stops at address 0x00000000.
3. Press *Ctrl + 3* and write `Commander` to open the **Commander** view.
4. From **Commander** view, click **Flash programmer**.
5. From the **Flash Configuration File** group click **Browse** and select `B4860QDS_NOR_FLASH.xml` to write u-boot in NOR memory, otherwise use the NAND file.
6. Click **Browse** to specify for your u-boot image file in the **File** textbox.
7. Write your u-boot offset in **Offset** textbox. You may use `0xeff80000`.
8. You can save the file by selecting **Save as Target Task** option, otherwise, clear the checkbox.
9. Click **Erase and Program**.

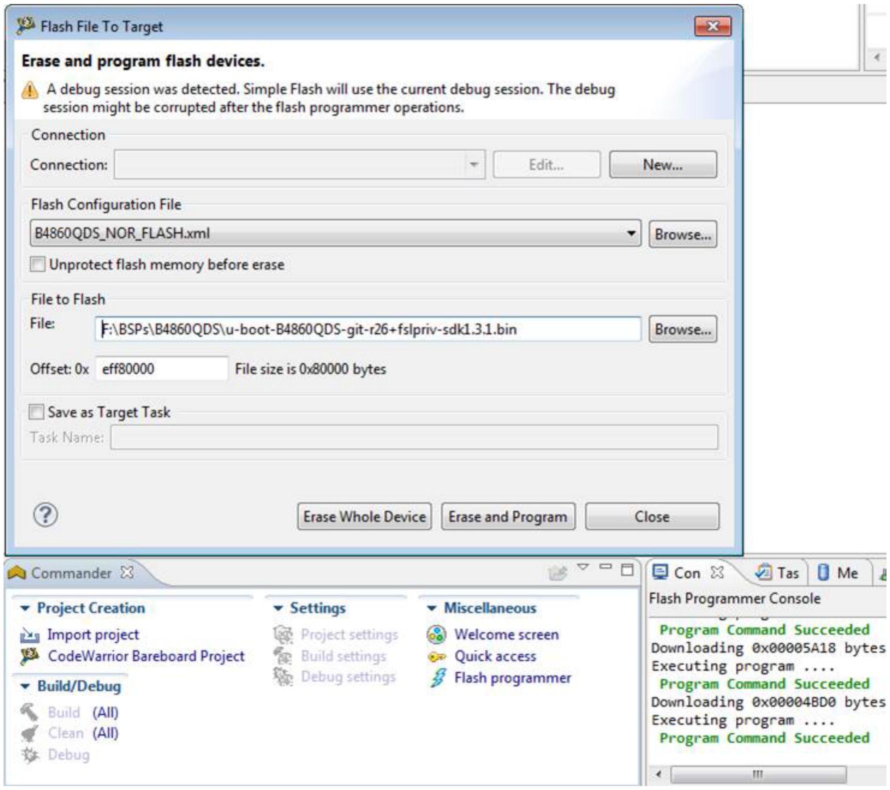


Figure 10-7. Flash File To Target Dialog Box

The flash programmer writes the uboot image file to the target.

NOTE

If you cannot connect to the board anymore, you can write the new RCW by following these steps:

1. Note and save the current configuration of SW2 and SW3.
2. Modify the switches to boot from hard-coded RCW:
   a. SW3 -> 0100_0011
   b. SW2 -> 0111_0100
   c. SW2: SRC8 (b1) set to 0 and RES_REQ(b5) set to 0.
3. Connect to the board and write the new RCW using the instructions listed above.
4. Set the switches back to the saved configuration.

10.2 Flash File to Target

You can use the **Flash File to Target** feature to perform flash operations such as erasing a flash device or programming a file.

You do not need any project for using **Flash File to Target** feature, only a valid **Remote System** is required.

To open the **Flash File to Target** dialog, click the **Flash Programmer** button on the IDE toolbar.

- **Connection** pop-up menu- Lists all run configurations defined in Eclipse. If a connection to the target has already been made the control becomes inactive and contains the text Active Debug Configuration.
- **Flash Configuration File** pop-up menu - Lists predefined target tasks for the processor selected in the Launch Configuration and tasks added by user with the **Browse** button. The items in this pop-up menu are updated based on the processor selected in the launch configuration. For more information on launch configurations, see product's *Targeting Manual*.
  - **Unprotect flash memory before erase** checkbox - Select to unprotect flash memory before erasing the flash device. This feature allows you to unprotect the flash memory from **Flash File To Target** dialog.
- **File to Flash** group - Allows selecting the file to be programmed on the flash device and the location.
  - **File** textbox - Used for specifying the filename. You can use the **Workspace**, **File System**, or **Variables** buttons to select the desired file.
  - **Offset:0x** textbox - Used for specifying offset location for a file. If no offset is specified the default value of zero is used. The offset is always added to the start address of the file. If the file does not contain address information then zero is considered as start address.
- **Save as Target Task** - Select to enable **Task Name** textbox.
  - **Task Name** textbox - Lets you to save the specified settings as a Flash target task. Use the testbox to specify the name of the target task.
- **Erase Whole Device** button - Erases the flash device. In case you have multiple flash blocks on the device, all blocks are erased. If you want to selectively erase or program blocks, use the Flash programmer feature.
- **Erase and Program** button - Erases the sectors that are occupied with data and then programs the file. If the flash device can not be accessed at sector level then the flash device is completely erased.

This feature helps you perform these basic flash operations:

- Erasing flash device
- Programming a file

10.2.1 Erasing flash device

To erase a flash device, follow these steps:

1. Click the **Flash Programmer** button on the IDE toolbar.

   The **Flash File to Target** dialog appears.

2. Choose a connection from the **Connection** pop-up menu.

   NOTE

   If a connection is already established with the target, this control is disabled.

   The **Flash Configuration File** pop-up menu is updated with the supported configurations for the processor from the launch configuration.

3. Choose a flash configuration from the **Flash Configuration File** pop-up menu.
4. Select the **Unprotect flash memory before erase** checkbox to unprotect flash memory before erasing the flash device.
5. Click the **Erase Whole Device** button.

10.2.2 Programming a file

1. Click the **Flash Programmer** button on the IDE toolbar.

   The **Flash File to Target** dialog appears.

2. Choose a connection from the **Connection** pop-up menu.

   NOTE

   If a connection is already established with the target, this control is disabled.

   The **Flash Configuration File** pop-up menu is updated with the supported configurations for the processor from the launch configuration.

3. Choose a flash configuration from the **Flash Configuration File** pop-up menu.
4. Select the **Unprotect flash memory before erase** checkbox to unprotect flash memory before erasing the flash device.
5. Type the file name in the **File** textbox. You can use the **Workspace**, **File System**, or **Variables** buttons to select the desired file.
6. Type the offset location in the **Offset** textbox.
7. Click the **Erase and Program** button.

10.3 Hardware diagnostics

The **Hardware Diagnostics** utility lets you run a series of diagnostic tests that determine if the basic hardware is functional.

These tests include:

- Memory read/write: This test only makes a read or write access to the memory to read or write a byte, word (2 bytes) and long word (4 bytes) to or from the memory. For this task, the user needs to set the options in the **Memory Access** group.
- Scope loop: This test makes read and write accesses to memory in a loop at the target address. The time between accesses is given by the loop speed settings. The loop can only be stopped by the user, which cancels the test. For this type of test, the user needs to set the memory access settings and the loop speed.
- Memory tests: This test requires the user to set the access size and target address from the access settings group and the settings present in the **Memory Tests** group.

This topic contains the following sub-topics:

- Creating hardware diagnostics task
- Working with Hardware Diagnostic Action editor
- Memory test use cases

10.3.1 Creating hardware diagnostics task

You can create a hardware diagnostic task using the **Create New Target Task** wizard.

To create a task for hardware diagnostics:

1. Choose **Window > Show View > Other** from the IDE menu bar.

   The **Show View** dialog appears.

2. Expand the **Debug** group and select **Target Tasks**.
3. Click **OK**.
4. Click the **Create a new Target Task** button on the **Target Tasks** view toolbar. Alternatively, right-click in the **Target Tasks** view and choose **New Task** from the shortcut menu.

   The **Create a New Target Task** wizard appears.

5. Type name for the new task in the **Task Name** textbox.
6. Choose a launch configuration from the **Run Configuration** pop-up menu.

NOTE

If the task does not successfully launch the configuration that you specify, the **Execute** button on the **Target Tasks** view toolbar stays unavailable.

7. Choose **Hardware Diagnostic** from the **Task Type** pop-up menu.
8. Click **Finish**.

A new hardware diagnostic task is created in the **Target Tasks** view.

NOTE

You can perform various actions on a hardware diagnostic task, such as renaming, deleting, or executing the task, using the shortcut menu that appears on right-clicking the task in the **Target tasks** view.

10.3.2 Working with Hardware Diagnostic Action editor

The **Hardware Diagnostic Action** editor is used to configure a hardware diagnostic task.

To open the **Hardware Diagnostic Action** editor for a particular task, double-click the task in the **Target Tasks** view.

The following figure shows the **Hardware Diagnostics Action** editor.

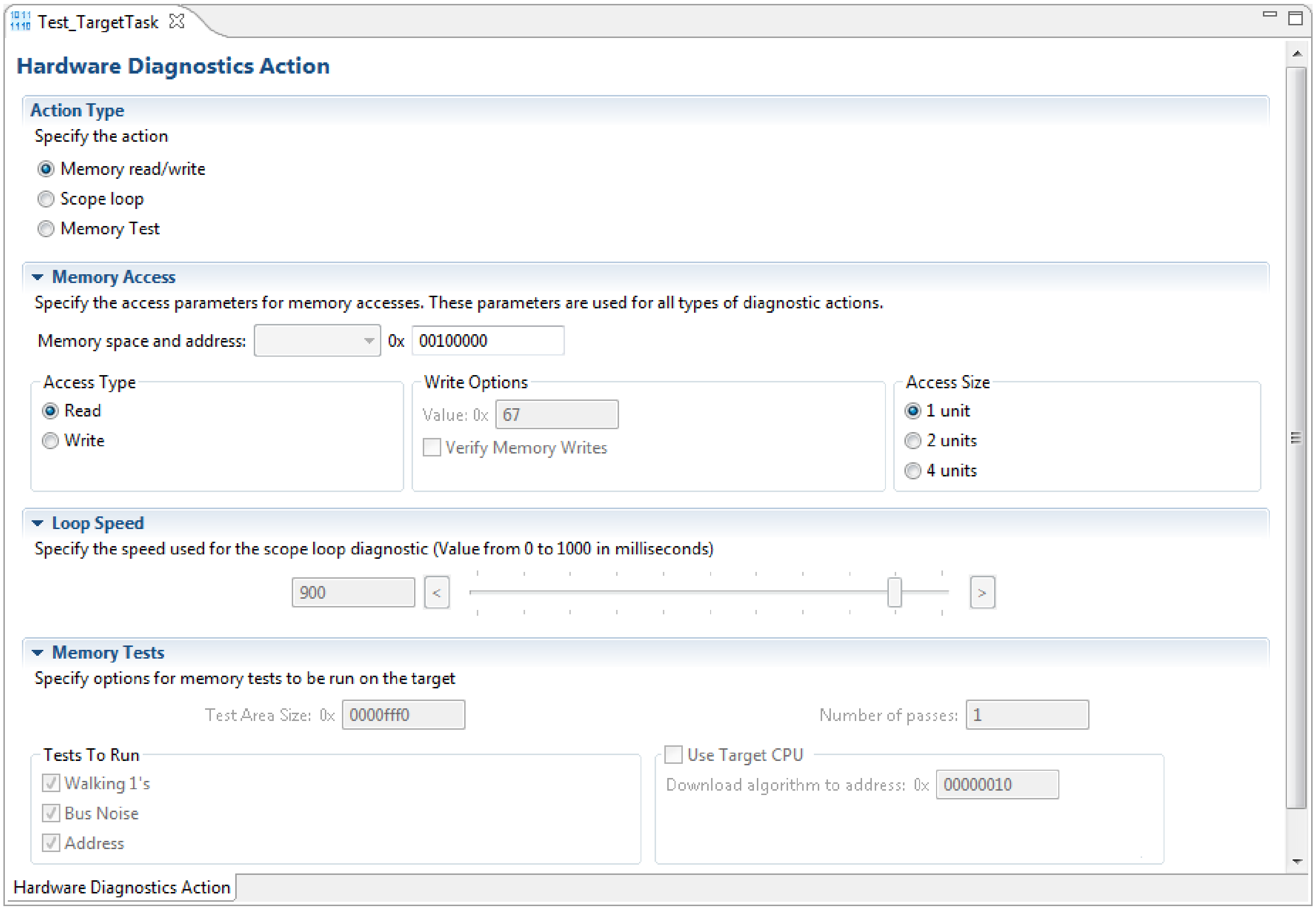


Figure 10-8. Hardware Diagnostics Action editor

The **Hardware Diagnostics Action** editor window includes the following groups:

- Action Type
- Memory Access
- Loop Speed
- Memory Tests

10.3.2.1 Action Type

The **Action Type** group in the **Hardware Diagnostics Action** editor window is used for selecting the action type.

You can choose any one of the following actions:

- Memory read/write - Enables the options in the **Memory Access** group.

- Scope loop - Enables the options in the **Memory Access** and the **Loop Speed** groups.
- Memory test - Enables the access size and target address from the access settings group and the settings present in the **Memory Tests** group.

10.3.2.2 Memory Access

The **Memory Access** pane configures diagnostic tests for performing memory reads and writes over the remote connection interface.

The table below lists and describes the items in the pane.

Table 10-1. Memory Access Pane Items

Item	Description
Read	Select to have the hardware diagnostic tools perform read tests.
Write	Select to have the hardware diagnostic tools perform write tests.
1 unit	Select to have the hardware diagnostic tools perform one memory unit access size operations.
2 units	Select to have the hardware diagnostic tools perform two memory units access size operations.
4 units	Select to have the hardware diagnostic tools perform four memory units access size operations.
Target Address	Specify the address of an area in RAM that the hardware diagnostic tools should analyze. The tools must be able to access this starting address through the remote connection (after the hardware initializes).
Value	Specify the value that the hardware diagnostic tools write during testing. Select the **Write** option to enable this textbox.
Verify Memory Writes	Select the checkbox to verify success of each data write to the memory.

10.3.2.3 Loop Speed

The **Loop Speed** pane configures diagnostic tests for performing repeated memory reads and writes over the remote connection interface.

The tests repeat until you stop them. By performing repeated read and write operations, you can use a scope analyzer or logic analyzer to debug the hardware device. After the first 1000 operations, the **Status** shows the estimated time between operations.

NOTE

For all values of **Speed**, the time between operations depends heavily on the processing speed of the host computer.

For **Read** operations, the Scope Loop test has an additional feature. During the first read operation, the hardware diagnostic tools store the value read from the hardware. For all successive read operations, the hardware diagnostic tools compare the read value to the stored value from the first read operation. If the Scope Loop test determines that the value read from the hardware is not stable, the diagnostic tools report the number of times that the read value differs from the first read value. Following table lists and describes the items in Loop Speed pane.

Table 10-2. Loop Speed Pane Items

Item	Description
Set Loop Speed	Enter a numeric value between 0 to 1000 in the textbox to adjust the speed. You can also move the slider to adjust the speed at which the hardware diagnostic tools repeat successive read and write operations. Lower speeds increase the delay between successive operations. Higher speeds decrease the delay between successive operations.

10.3.2.4 Memory Tests

The **Memory Tests** pane lets you perform three hardware tests, Walking Ones, Bus Noise, and Address.

You can specify any combination of tests and number of passes to perform. For each pass, the hardware diagnostic tools performs the tests in turn, until all passes are complete. The tools compare memory test failures and display them in a log window after all passes are complete. Errors resulting from memory test failures do not stop the testing process; however, fatal errors immediately stop the testing process.

The following table explains the items in the **Memory Tests** pane.

Table 10-3. Memory Tests pane items

Item	Explanation
Walking 1's	Select the checkbox to have the hardware diagnostic tools perform the Walking Ones test. Deselect to have the diagnostic tools skip the Walking Ones test.
Address	Select to have the hardware diagnostic tools perform the Address test. Deselect to have the diagnostic tools skip the Address test.
Bus Noise	Select to have the hardware diagnostic tools perform the Bus noise test. Deselect to have the diagnostic tools skip the Bus noise test.
Test Area Size	Specify the size of memory to be tested. This setting along with Target Address defines the memory range being tested.
Number of Passes	Enter the number of times that you want to repeat the specified tests.

Table continues on the next page...

Table 10-3. Memory Tests pane items (continued)

Item	Explanation
Use Target CPU	Select to have the hardware diagnostic tools download the test code to the hardware device. Deselect to have the hardware diagnostic tools execute the test code through the remote connection interface. Execution performance improves greatly if you execute the test code on the hardware CPU, but requires that the hardware has enough stability and robustness to execute the test code. **NOTE:** The option is not applicable for CodeWarrior StarCore devices.
Download Algorithm to Address	Specify the address where the test driver is downloaded in case the Use target CPU is selected. **NOTE:** The option is not applicable for CodeWarrior StarCore devices.

10.3.2.4.1 Walking Ones

This test detects these memory faults:

- Address Line: The board or chip address lines are shorting or stuck at 0 or 1. Either condition could result in errors when the hardware reads and writes to the memory location. Because this error occurs on an address line, the data may end up in the wrong location on a write operation, or the hardware may access the wrong data on a read operation.
- Data Line: The board or chip data lines are shorting or stuck at 0 or 1. Either condition could result in corrupted values as the hardware transfers data to or from memory.
- Retention: The contents of a memory location change over time. The effect is that the memory fails to retain its contents over time.

The Walking Ones test includes four sub-tests:

- Walking Ones: This subtest first initializes memory to all zeros. Then the subtest writes, reads, and verifies bits, with each bit successively set from the least significant bit (LSB) to the most significant bit (MSB). The subtest configures bits such that by the time it sets the MSB, all bits are set to a value of 1. This pattern repeats for each location within the memory range that you specify. For example, the values for a byte-based Walking Ones subtest occur in this order:

  ```
  0x01, 0x03, 0x07, 0x0F, 0x1F, 0x3F, 0x7F, 0xFF
  ```
- Ones Retention: This subtest immediately follows the Walking Ones subtest. The Walking Ones subtest should leave each memory location with all bits set to 1. The Ones Retention subtest verifies that each location has all bits set to 1.
- Walking Zeros: This subtest first initializes memory to all ones. Then the subtest writes, reads, and verifies bits, with each bit successively set from the LSB to the

MSB. The subtest configures bits such that by the time it sets the MSB, all bits are set to a value of 0. This pattern repeats for each location within the memory range that you specify. For example, the values for a byte-based Walking Zeros subtest occur in this order:

```
0xFE, 0xFC, 0xF8, 0xF0, 0xE0, 0xC0, 0x80, 0x00
```

- Zeros Retention: This subtest immediately follows the Walking Zeros subtest. The Walking Zeros subtest should leave each memory location with all bits set to 0. The Zeros Retention subtest verifies that each location has all bits set to 0.

10.3.2.4.2 Address

This test detects memory aliasing. *Memory aliasing* exists when a physical memory block repeats one or more times in a logical memory space. Without knowing about this condition, you might conclude that there is much more physical memory than what actually exists.

The address test uses a simplistic technique to detect memory aliasing. The test writes sequentially increasing data values (starting at one and increasing by one) to each successive memory location. The maximum data value is a prime number and its specific value depends on the addressing mode so as to not overflow the memory location.

The test uses a prime number of elements to avoid coinciding with binary math boundaries:

- For byte mode, the maximum prime number is 28-5 or 251.
- For word mode, the maximum prime number is 216-15 or 65521.
- For long word mode, the maximum prime number is 232-5 or 4294967291.

If the test reaches the maximum value, the value rolls over to 1 and starts incrementing again. This sequential pattern repeats throughout the memory under test. Then the test reads back the resulting memory and verifies it against the written patterns. Any deviation from the written order could indicate a memory aliasing condition.

10.3.2.4.3 Bus noise

This test stresses the memory system by causing many bits to flip from one memory access to the next (both addresses and data values). *Bus noise* occurs when many bits change consecutively from one memory access to another. This condition can occur on both address and data lines.

10.3.2.4.4 Address lines

To force bit flips in address lines, the test uses three approaches:

- Sequential- This approach works sequentially through all of the memory under test, from lowest address to highest address. This sequential approach results in an average number of bit flips from one access to the next.
- Full Range Converging- This approach works from the fringes of the memory range toward the middle of the memory range. Memory access proceeds in this pattern, where + *number* and - *number* indicate the next item location (the specific increment or decrement depends on byte, word, or long word address mode):
  - the lowest address
  - the highest address
  - (the lowest address) + 1
  - (the highest address) - 1
  - (the lowest address) + 2
  - (the highest address) - 2
- Maximum Invert Convergence- This approach uses calculated end point addresses to maximize the number of bits flipping from one access to the next. This approach involves identifying address end points such that the values have the maximum inverted bits relative to one another. Specifically, the test identifies the lowest address with all `0x5` values in the least significant nibbles and the highest address with all `0xA` values in the least significant nibbles. After the test identifies these end points, memory access alternates between low address and high address, working towards the center of the memory under test. Accessing memory in this manner, the test achieves the maximum number of bits flips from one access to the next.

10.3.2.4.5 Data lines

To force bit flips in data lines, the test uses two sets of static data, a pseudo-random set and a fixed-pattern set. Each set contains 31 elements-a prime number. The test uses a prime number of elements to avoid coinciding with binary math boundaries. The sets are unique to each addressing mode so as to occupy the full range of bits.

- The test uses the pseudo-random data set to stress the data lines in a repeatable but pattern-less fashion.
- The test uses the fixed-pattern set to force significant numbers of data bits to flip from one access to the next.

The sub-tests execute similarly in that each subtest iterates through static data, writing values to memory. The test combines the three address line approaches with the two data sets to produce six unique sub-tests:

- Sequential with Random Data
- Sequential with Fixed Pattern Data
- Full Range Converging with Random Data
- Full Range Converging with Fixed Pattern Data
- Maximum Invert Convergence with Random Data
- Maximum Invert Convergence with Fixed Pattern Data

10.3.3 Memory test use cases

The memory read /write and scope loop tests are host based tests. The host machine issues read and write action to the memory through the connection protocol. For example **CCS**.

Memory tests are the complex tests that can be executed in two modes: Host based and Target based

depending upon the selection made for the **Use Target CPU** checkbox.

- **Selected**: Target Based
- **Deselected**: Host Based

The **Host Based** tests are slower than the **Target Based** tests.

10.3.3.1 Use Case 1: Execute host-based Scope Loop on target

You need to perform the following action to execute the host based scope loop on the target:

1. Select **Scope loop** in the **Action Type**.
2. Set **Memory Access** settings from the **Memory Access** section.
3. Set the speed used for the scope loop diagnostic from the **Loop Speed** section.
4. Save the settings.
5. Press **Execute** to execute the action.

10.3.3.2 Use Case 2: Execute target-based Memory Tests on target

You need to perform the following action to execute the target based memory test on the target:

1. Select **Memory Test** in the **Action Type**.
2. Specify **Target Address** and **Access Size** settings from the **Memory Access** section.
3. Specify the following settings for **Memory Tests** section:
   - **Test Area Size**: The tested memory region is computed from **Target Address** until **Target Address + Test Area Size**.
   - **Tests to Run**: Select tests to run on the target.
   - **Number of passes**: Specify number of times a test will be executed.
   - **Use Target CPU**: set the Address to which the test driver (algorithm) is to be downloaded.
4. Save the settings.
5. Press **Execute** to execute the action.

10.4 Import/Export/Fill memory

The **Import/Export/Fill Memory** utility lets you export memory contents to a file and import data from a file into memory.

The utility also supports filling memory with a user provided data pattern.

10.4.1 Creating task for import/export/fill memory

You can use the **Import/Export/Fill Memory** utility to perform various tasks on memory.

The utility can be accessed from the **Target Tasks** view.

To open the **Target Tasks** view:

1. Choose **Window** > **Show View** > **Other** from the **IDE** menu bar.

   The **Show View** dialog appears.

2. Expand the **Debug** group.
3. Select **Target Tasks**.

4. Click **OK**.

The first time it opens, the **Target Tasks** view contains no tasks. You must create a task to use the **Import/Export/Fill Memory** utility.

To create a task:

1. Click the **Create a new Target Task** button on the toolbar of the **Target Tasks** view. Alternatively, right-click the left-hand list of tasks and choose **New Task** from the shortcut menu that appears.

   The **Create a New Target Task** page appears.

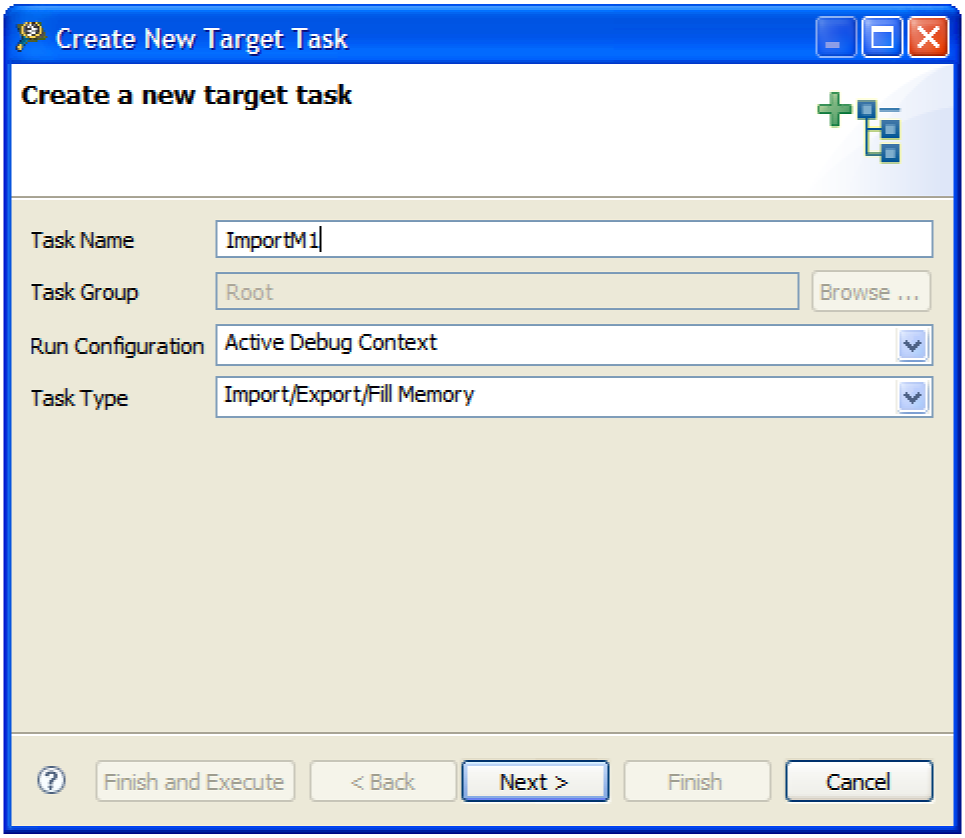


Figure 10-9. Create New Target Task Window

2. In the **Task Name** textbox, enter a name for the new task.
3. Use the **Run Configuration** pop-up menu to specify the configuration that the task launches and uses to connect to the target.

NOTE

If the task does not successfully launch the configuration that you specify, the **Execute** button of the **Target Tasks** view toolbar stays unavailable.

4. Use the **Task Type** pop-up menu to specify **Import/Export/Fill Memory**.
5. Click **Finish**.

The **Import/Export/Fill Memory** target task is created and it appears in the **Import/Export/Fill Memory Action** editor.

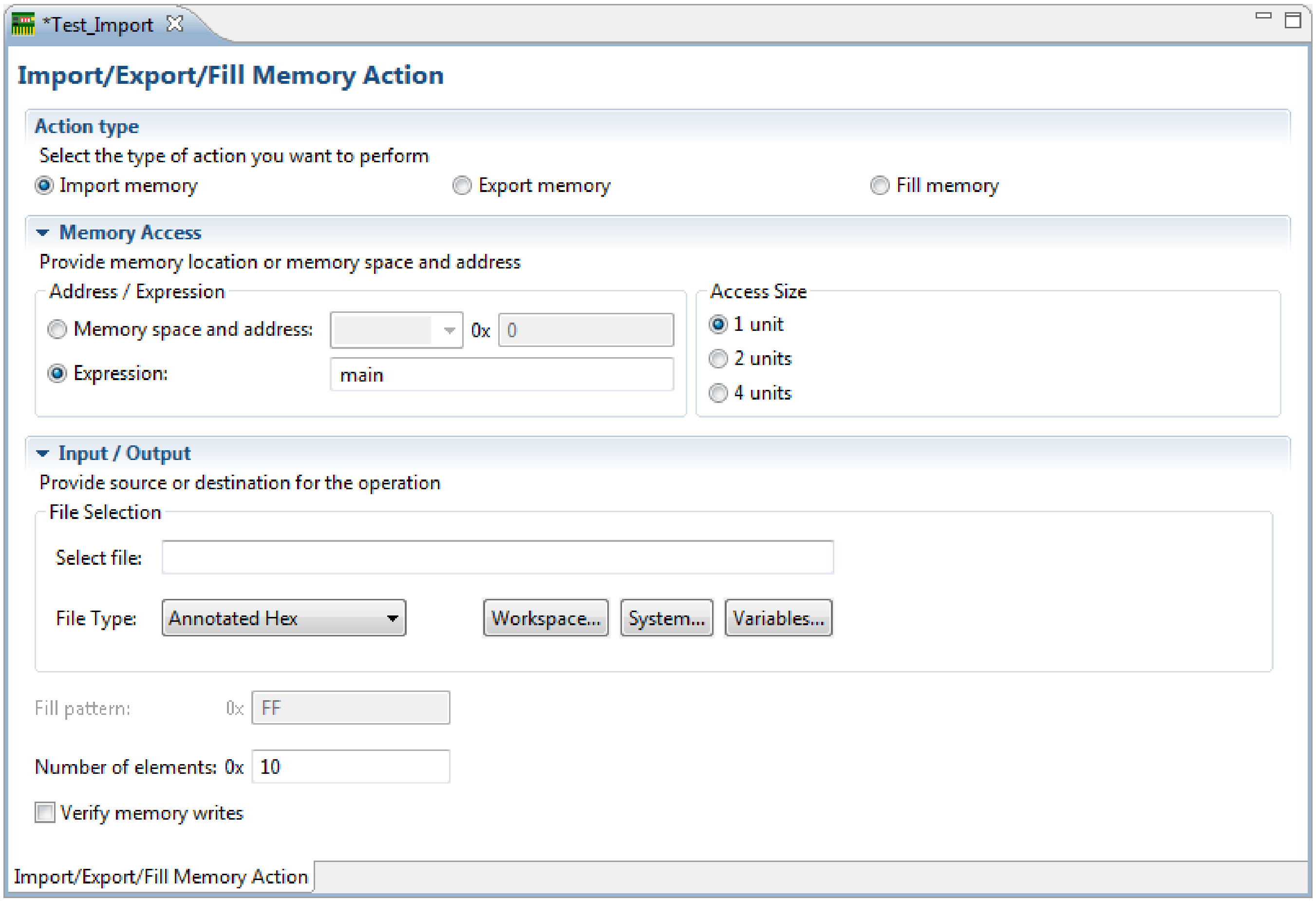


Figure 10-10. Import/Export Memory Action editor

10.4.2 Importing data into memory

You can import the encoded data from a user specified file, decode it, and copy it into a user specified memory range.

Select the **Import memory** option from the **Import/Export/Fill Memory Action** editor to import data into memory.

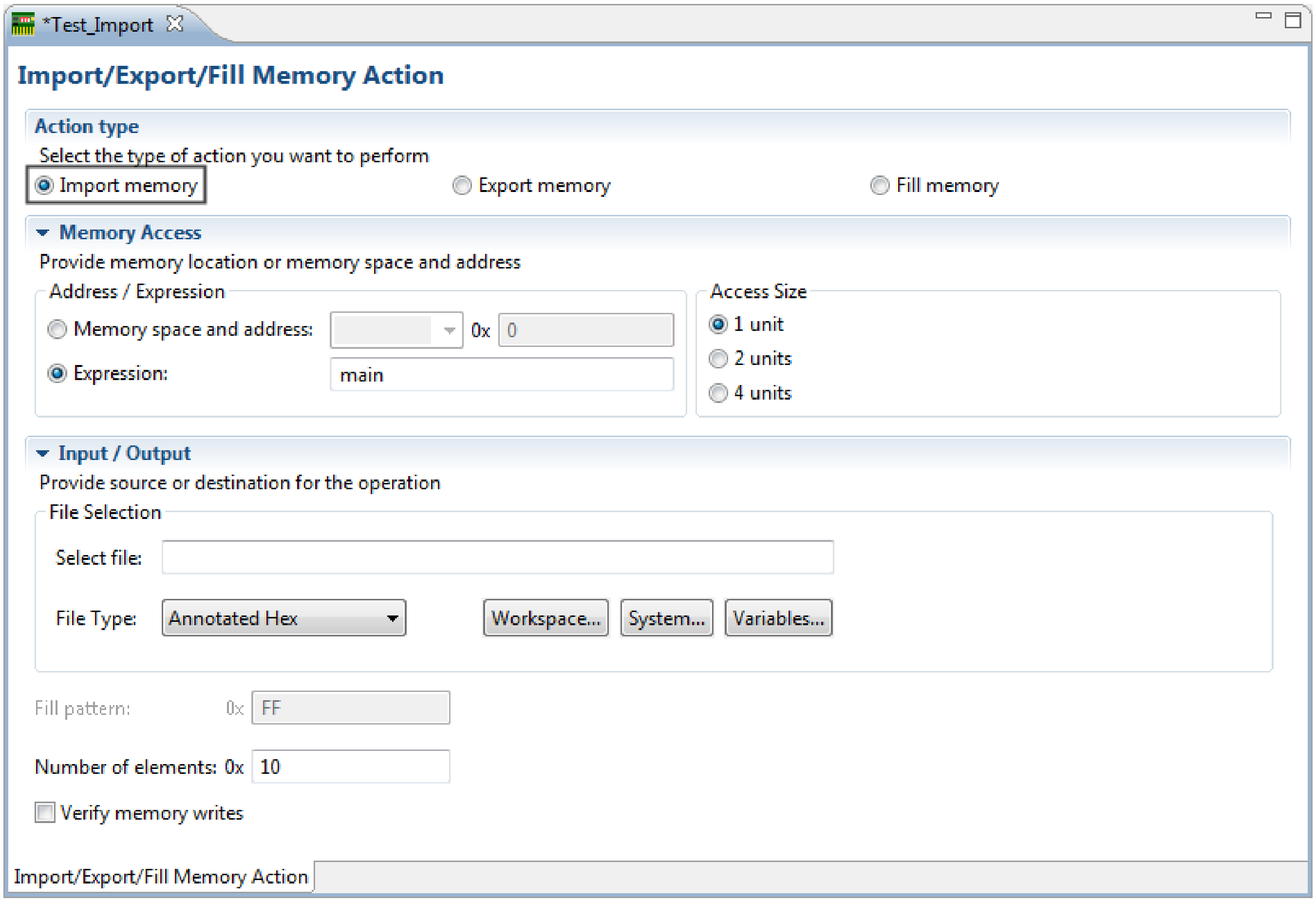


Figure 10-11. Import/Export Memory Action editor - Importing data into memory

The following table explains the import memory options.

Table 10-4. Controls used for importing data into memory

Item	Explanation
Memory space and address	Enter the literal address and memory space on which the data transfer is performed. The Literal address field allows only decimal and hexadecimal values.
Expression	Enter the memory address or expression at which the data transfer starts.
Access Size	Denotes the number of addressable units of memory that the debugger accesses in transferring one data element. The default values shown are 1, 2, and 4 units. When target information is available, this list shall be filtered to display the access sizes that are supported by the target.
Select file	Enter the path to the file that contains the data to be imported. Click the **Workspace** button to select a file from the current project workspace. Click the **System** button to select a file from the file system the standard File Open dialog. Click the **Variables** button to select a build variable.
File Type	Defines the format in which the imported data is encoded. By default, the following file types are supported: • Signed decimal Text • Unsigned decimal Text • Motorola S-Record format • Hex Text

Table continues on the next page...

Table 10-4. Controls used for importing data into memory (continued)

Item	Explanation
	• Annotated Hex Text • Raw Binary
Number of Elements	Enter the total number of elements to be transferred.
Verify Memory Writes	Select the checkbox to verify success of each data write to the memory.

10.4.3 Exporting memory to file

You can read data from a user specified memory range, encode it in a user specified format, and store this encoded data in a user specified output file.

Select the **Export memory** option from the **Import/Export/Fill Memory Action** editor to export memory to a file.

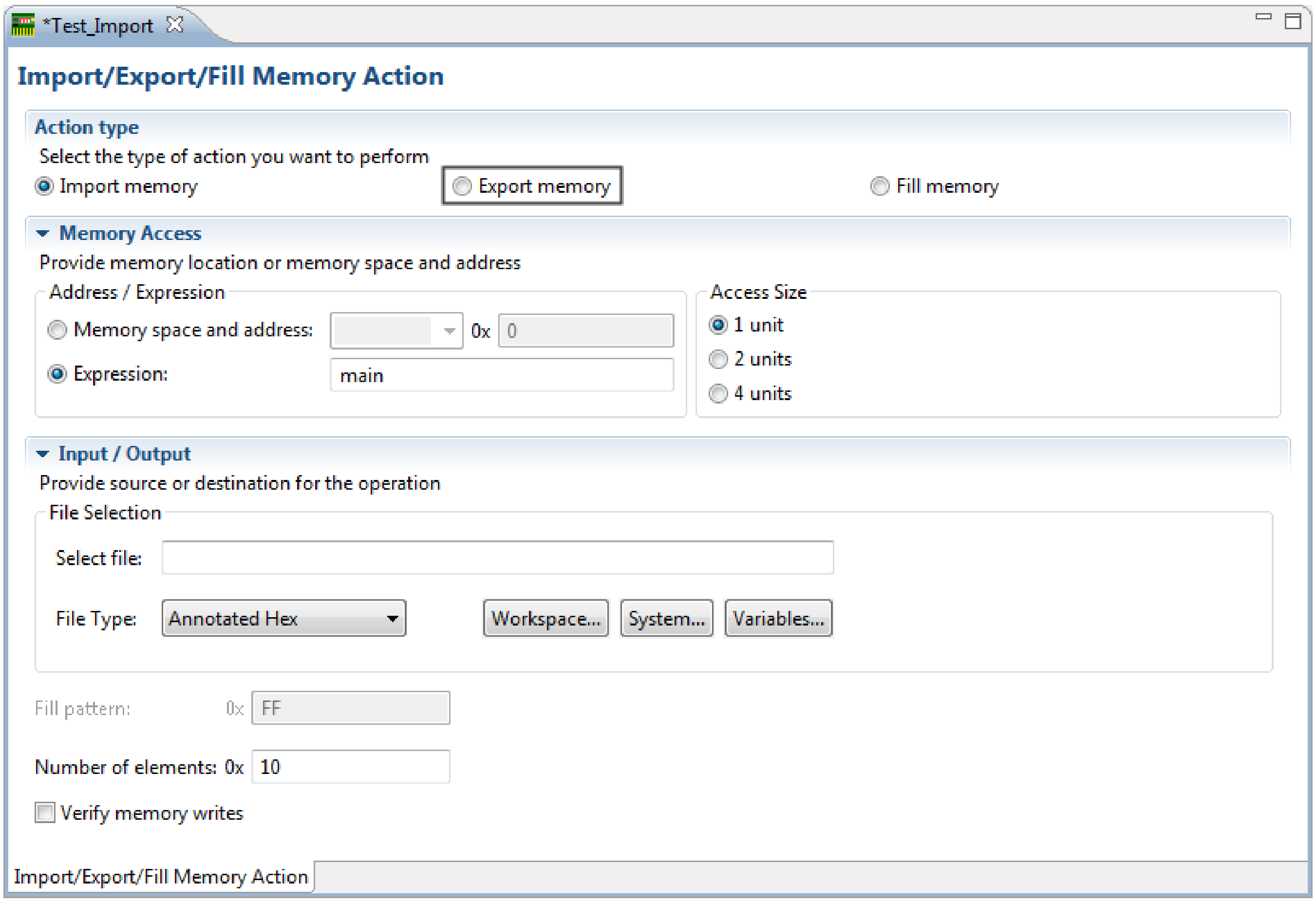


Figure 10-12. Exporting memory

The following table explains the export memory options.

Table 10-5. Controls used for exporting data from memory into file

Item	Explanation
Memory space and address	Enter the literal address and memory space on which the data transfer is performed. The Literal address field allows only decimal and hexadecimal values.
Expression	Enter the memory address or expression at which the data transfer starts.
Access Size	Denotes the number of addressable units of memory that the debugger accesses in transferring one data element. The default values shown are 1, 2, and 4 units. When target information is available, this list shall be filtered to display the access sizes that are supported by the target.
Select file	Enter the path of the file to write data. Click the **Workspace** button to select a file from the current project workspace. Click the **System** button to select a file from the file system the standard **File Open** dialog. Click the **Variables** button to select a build variable.
File Type	Defines the format in which encoded data is exported. By default, the following file types are supported: • Signed decimal Text • Unsigned decimal Text • Motorola S-Record format • Hex Text • Annotated Hex Text • Raw Binary
Number of Elements	Enter the total number of elements to be transferred.

10.4.4 Fill memory

You can fill a user specified memory range with a user specified data pattern.

Select the **Fill memory** option from the **Import/Export/Fill Memory Action** editor window to fill memory.

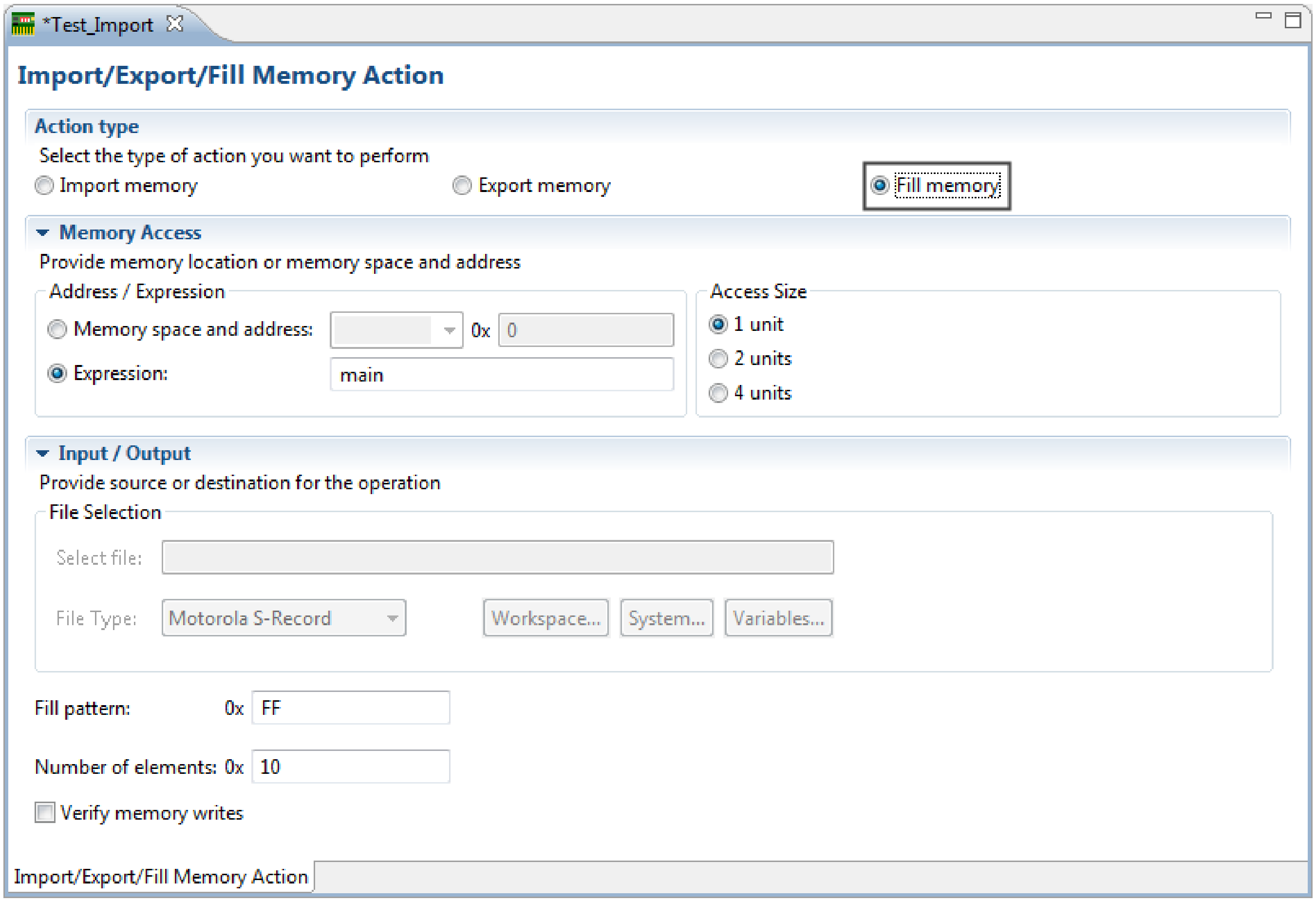


Figure 10-13. Fill memory

The following table explains the fill memory options.

Table 10-6. Controls used for filling memory with data pattern

Item	Explanation
Memory space and address	Enter the literal address and memory space on which the fill operation is performed. The Literal address field allows only decimal and hexadecimal values.
Expression	Enter the memory address or expression at which the fill operation starts.
Access Size	Denotes the number of addressable units of memory that the debugger accesses in modifying one data element. The default values shown are 1, 2, and 4 units. When target information is available, this list shall be filtered to display the access sizes that are supported by the target.
Fill Pattern	Denotes the sequence of bytes, ordered from low to high memory mirrored in the target. The field accept only hexadecimal values. If the width of the pattern exceeds the access size, an error message.
Number of Elements	Enter the total number of elements to be modified.
Verify Memory Writes	Select the checkbox to verify success of each data write to the memory.

Chapter 11
Exception Configurator

This chapter explains how to use the CodeWarrior Exception Configurator tool.

Use the Exceptions Configurator view to quickly determine the cause of an exception while executing an application.

To view the details of an exception using the **Exceptions Configurator** view, follow these steps:

1. Switch the IDE to the **Debug** perspective and start a debugging session.
2. Select **Window > Show View > Other**.

   The **Show View** dialog box appears (Figure 11-1).

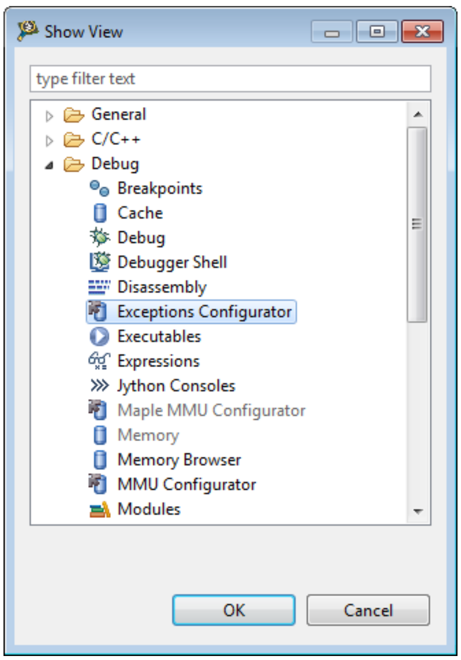


Figure 11-1. Show View Dialog Box

3. Expand the **Debug** group.
4. Select **Exceptions Configurator**.
5. Click **OK**.

The **Exception Configurator** view appears (Figure 11-2).

NOTE

A blank window appears if no process is selected from the debug window.

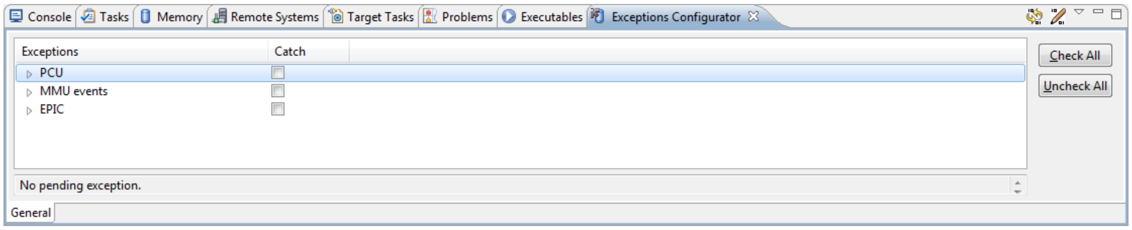


Figure 11-2. Exceptions Configurator View

6. Check the **Catch** checkbox to select the exception.

   Checking a parent node will automatically check all the children nodes. Clearing a parent node checkbox clears all the children nodes.

7. If you wish to change the current value of the VBA register, enter a hexadecimal value, a symbol name or a register name in the **Vector Base Address** text box.

   NOTE

   The debugger will try to evaluate the expression provided in the Vector **Base Address** text box. If the evaluation fails, specified text will be highlighted in red.

8. Click the *Apply Changes* button () to save the changes.

   The exceptions configurator is configured to capture the selected exceptions.

9. Retry the steps that caused the exception.

   The debugger displays a complete stack crawl. The exceptions captured by the **Exceptions Configurator** view are highlighted in red (Figure 11-3).

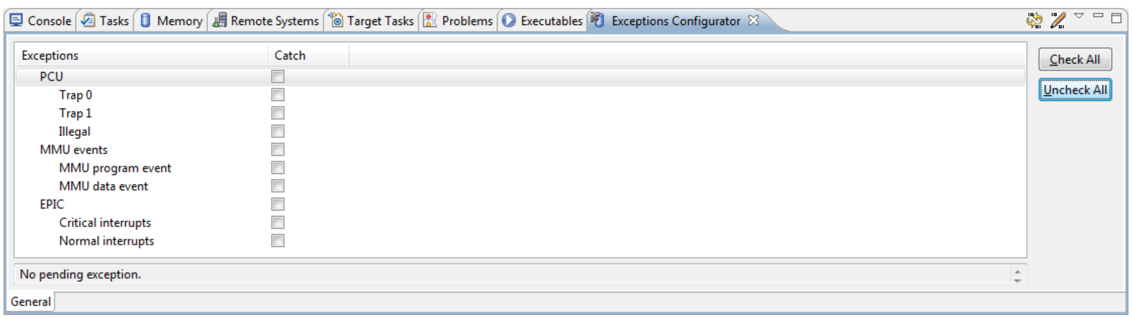


Figure 11-3. Exceptions

NOTE

Exception settings defined for each debug configuration may not be identical. The state of the captured exceptions is persistent after restart.

Chapter 12
Memory Management Unit Configurator

This chapter explains how to use the CodeWarrior Memory Management Unit (MMU) Configurator. The MMU allows different user tasks or programs (usually in the context of an RTOS) to use the same areas of memory. To use the MMU:

- You set up a mapping for data and instruction addresses
- Enable address translation

The mapping links the virtual addresses to the physical addresses. Translation occurs before software acts on the addresses.

The MMU Configurator simplifies peripheral-register initialization of the MMU registers. You can use the tool to generate code that you can insert into a program. The inserted code initializes an MMU configuration or writes to the registers on-the-fly. Also, you can use the MMU Configurator to examine the status of the current MMU configuration.

Use the MMU Configurator to:

- Configure MMU general control registers
- Configure MMU program memory-address-translation properties
- Configure MMU data memory-address-translation properties
- Display the current contents of each register
- Write the displayed contents from the MMU Configurator to the MMU registers
- Save to a file (in a format that you specify) the displayed contents of the MMU Configurator

This chapter has these sections:

- Saving MMU Configuration
- MMU Configurator View

12.1 Creating MMU Configuration

In order to use the MMU Configurator, you need to create an MMU configuration.

Follow these steps to create the configuration:

1. From the CodeWarrior IDE menu bar, select **File > New > Other**.

   The **New** wizard starts, displaying its **Select a wizard** page.

2. Expand the **Peripheral Configurators** tree control and select **MMU Configuration File** (Figure 12-1).

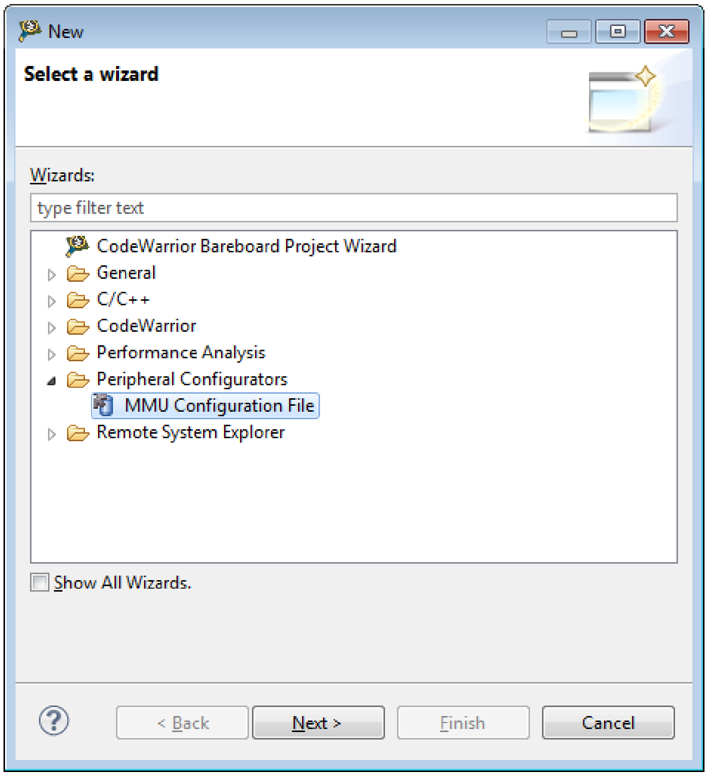


Figure 12-1. Select a wizard Page of New Wizard

3. Click **Next**.

   The **New** wizard closes and the **MMU Configurator Wizard** starts, displaying its **MMU Configurator File** page.

4. In the **Container** text box, type the path of the directory where you want to store the MMU configuration, or click **Browse** to find and select the new file container.

5. In the **File name** text box, type the name of the MMU configuration, or leave the default name intact.

NOTE

If you enter a new name, ensure to preserve the `.mmu` file extension.

6. Expand a tree control in the **Device Number** group.
7. From the expanded list, select the target hardware for which you want to create the MMU configuration. For example, `B4860` (Figure 12-2).

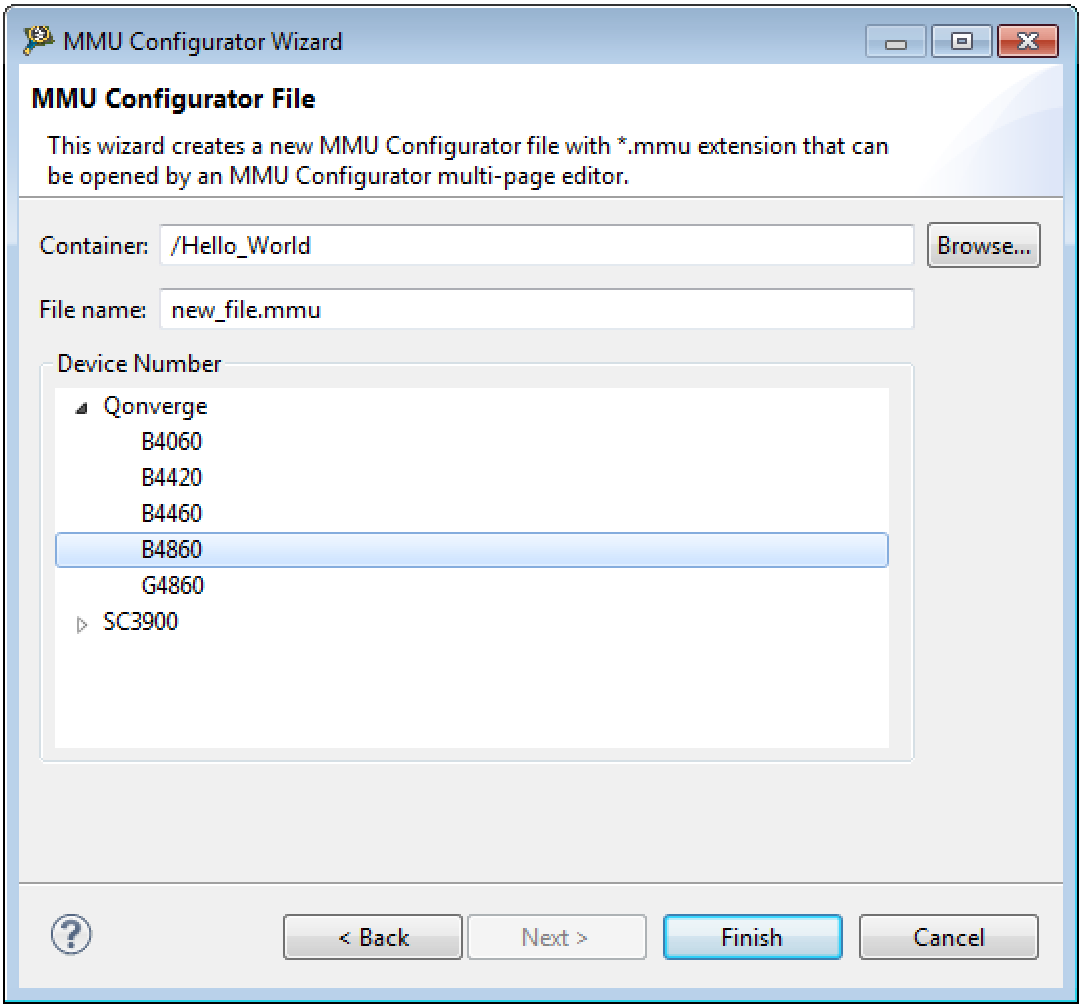


Figure 12-2. MMU Configurator File Page of MMU Configurator Wizard

NOTE

When started in the offline mode, the MMU Configurator fills in the required defaults for all fields.

8. Click **Finish**.

The **MMU Configurator Wizard** closes. CodeWarrior IDE generates the MMU configuration file in the specified container directory and opens the MMU Configuration File Editor.

12.2 MMU Configuration File Editor Pages

This section explains each page of the MMU Configuration File Editor.

You use these pages to configure MMU mapping and translation properties. The tabbed interface of the MMU Configuration File Editor displays pages for configuration options and for the generated code.

NOTE

When you specify settings in the MMU Configuration File Editor, configure the tabbed pages in left-to-right order. For example, configure the General page before configuring the Translations page. In addition, within a page, configure settings from the top-left position to the bottom-right position.

Table 12-1 lists the MMU Configuration File Editor pages.

Table 12-1. MMU Configuration File Editor Pages

Page	Description
General	This page helps you configure the overall MMU configurations (as opposed to specific properties for each virtual-to-physical map entry).
Translations	This page helps you configure the program and data translations (virtual-to-physical address mappings) for the StarCore 3900FP DSP.
new_file.mmu	This page displays the generated MMU state file. MMU Configurator generates the state file each time you change the MMU configuration.

12.2.1 General

Use this page to configure the overall MMU configurations (as opposed to specific properties for each virtual-to-physical map entry).

Figure 12-3 shows the General page of the MMU Configuration File Editor.

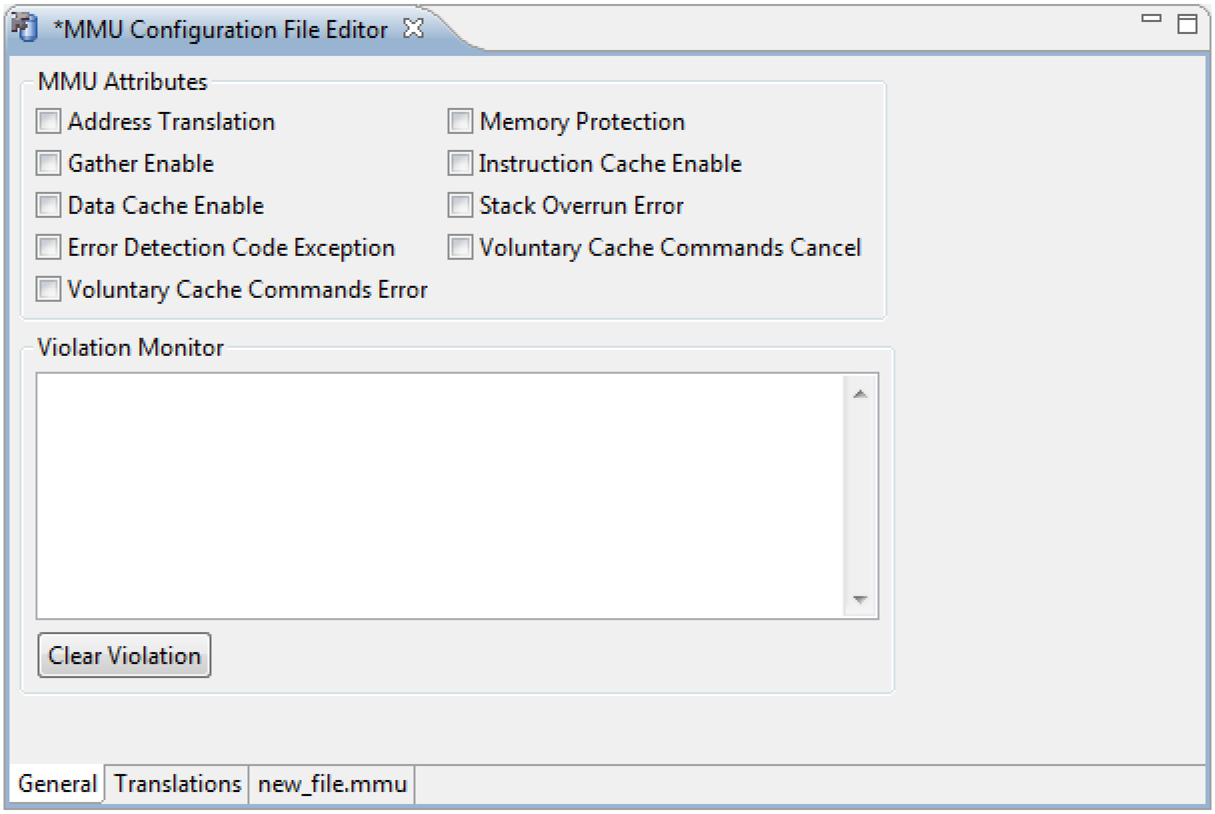


Figure 12-3. MMU Configuration File Editor - General Page

NOTE

If you check the **Voluntary Cache Commands Cancel** checkbox, the MMU cancels the cache command for program and data except for DFLUSH and DSYNC. Similarly, if you check the **Voluntary Cache Commands Error** checkbox, the MMU indicates the core for DFETCH/DFL2C*/DMALLOC/PFETCH/PFL2C* address errors.

Table 12-2 explains the options available on the General page of the MMU Configuration File Editor.

Table 12-2. MMU Configuration File Editor - General Page Settings

Option	Description
Address Translation	Checked - Enables address translation. For example, translation occurs from a virtual address to a physical address. Cleared - Disables address translation. For example, translation does not occur from a virtual address to a physical address. This option corresponds to the Address Translation Enable (ATE) bit of the MMU Control Register (M_CR).
Memory Protection	Checked - Enables memory protection checking for all enabled segment descriptors. With this option checked, the system consumes more power.

Table continues on the next page...

Table 12-2. MMU Configuration File Editor - General Page Settings (continued)

Option	Description
	Cleared - Disables memory protection checking for all enabled segment descriptors. This option corresponds to the Memory Protection Enable (MPE) bit of the MMU Control Register (M_CR).
Gather Enable	Checked - Enables the gather option. Cleared - Disables the gather option.
Instruction Cache Enable	Checked - Enables the cache in instruction mode. Cleared - Disables the cache instruction mode.
Data Cache Enable	Checked - Enables the data cache mode. Cleared - Disables the data cache mode.
Stack Overrun Error	Checked - Throws error for stack overrun. Cleared - Does not throw error for stack overrun.
Error Detection Code Exception	Checked - Enables the error detection mode for code exceptions. Cleared - Disables the error detection mode for code exceptions.
Voluntary Cache Commands Cancel	Checked - Cancels the voluntary cache commands. Cleared - Does not cancel the voluntary cache commands.
Voluntary Cache Commands Error	Checked - Enables the voluntary cache commands error mode. Cleared - Disables the voluntary cache commands error.

12.2.2 Translations

Use the **Translations** page to define and display program and data translations (virtual-to-physical address mappings) for the StarCore 3900FP DSPs.

The MMU Configuration File Editor generates the appropriate descriptors for the program and data Memory-Address Translation Table (MATT).

On the Translations page, details of program and/or data translations are shown in the MATT table on the left side and settings of the entry, currently selected in the MATT table, are summarized on the right side. By clicking the header of a column in the MATT table, you can sort the table data based on that column. Modified translations in the MATT table display in blue color. Similarly, erroneous translations display in red color.

To modify a translation, follow these steps:

1. Select an option from the **Select Translations** drop-down list within the **Type** group. Based on the option selected in the **Select Translations** drop-down list, the MATT table displays details of program and/or data translations.

2. Select a translation from the MATT table. The options displayed in the **Properties** group vary depending on the type of translation selected in the MATT table.
3. Change the **Address**, **Size**, and **Properties** group settings.

Figure 12-4 shows the Translations page of the MMU Configuration File Editor when a program translation is selected in the MATT table.

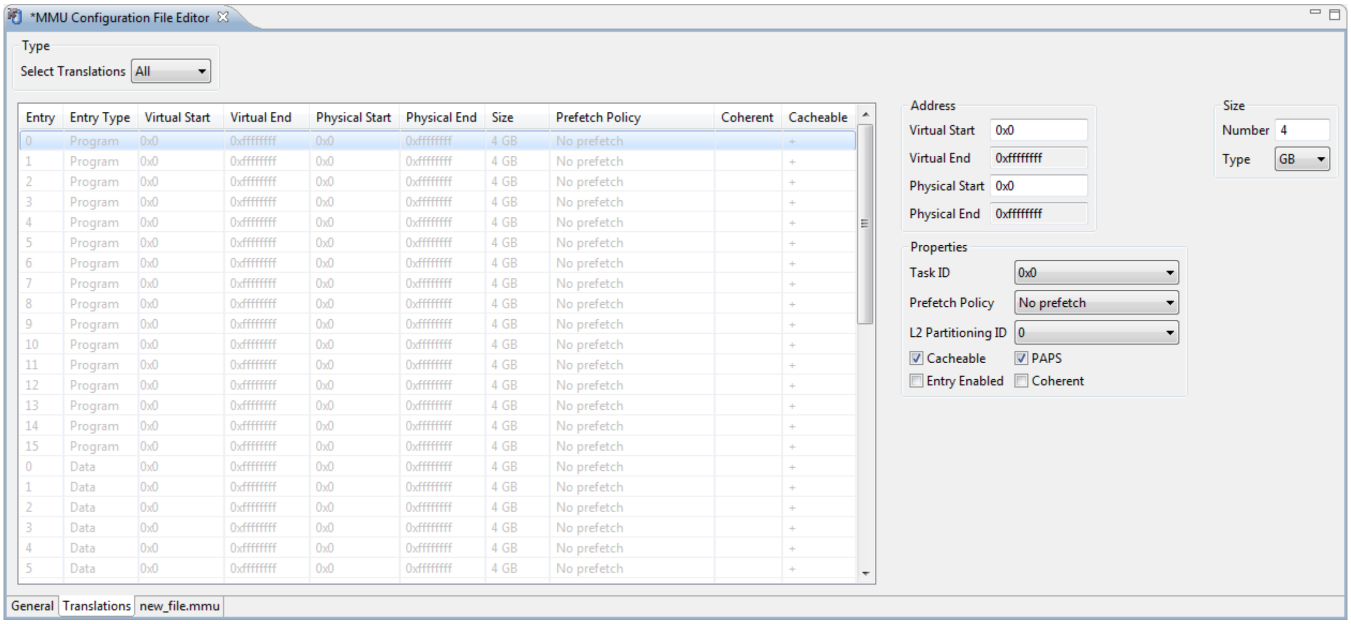


Figure 12-4. MMU Configuration File Editor - Translations Page for a Program Translation

Figure 12-5 shows the Translations page of the MMU Configuration File Editor when a data translation is selected in the MATT table.

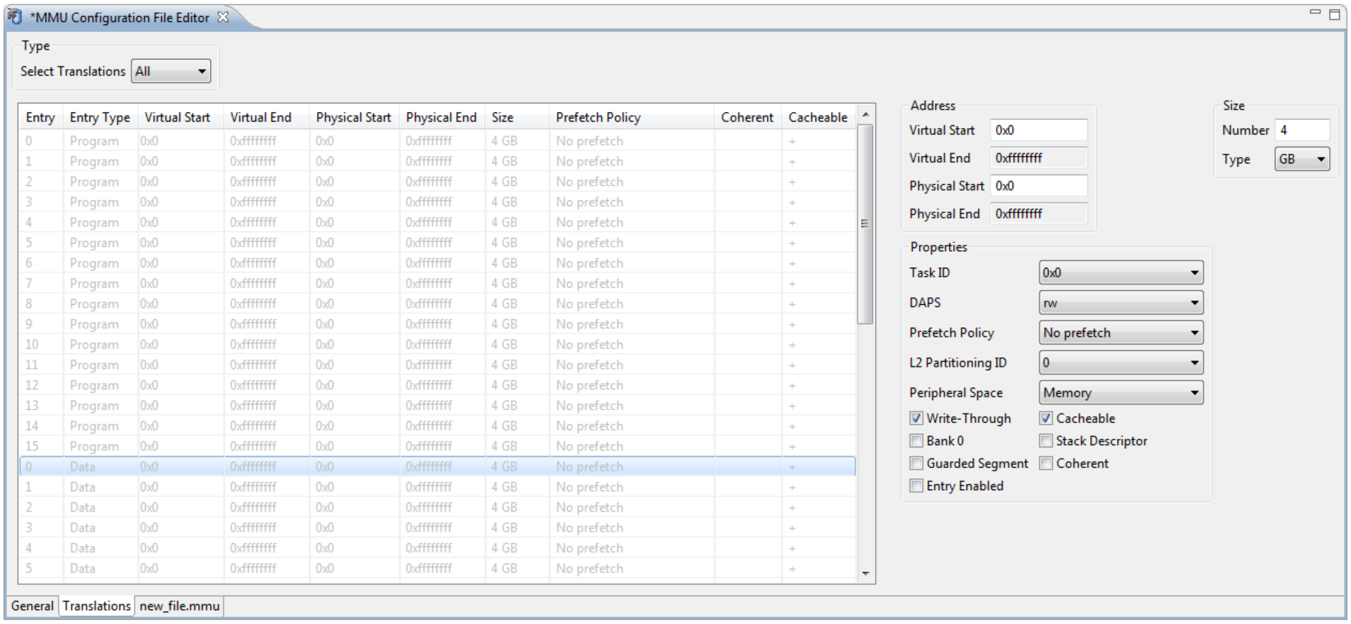


Figure 12-5. MMU Configuration File Editor - Translations Page for a Data Translation

Table 12-3 explains the options available on the Translations page of the MMU Configuration File Editor.

Table 12-3. MMU Configuration File Editor - Translations Page Settings

Option	Explanation
Show Translations	Select an option from the drop-down list to specify which translations to display. • Enabled - Selecting this option displays all enabled translations in the MATT table. This is the default selection for the configurator mode. • All - Selecting this option displays all translations in the MATT table. This is the default selection for the editor mode. • Program - Selecting this option displays all program translations in the MATT table. • Data - Selecting this option displays all data translations in the MATT table.
Virtual Start	Specifies the virtual base address of the program or data segment, selected in the MATT table.
Virtual End	Specifies the virtual end base address of the program or data segment.
Physical Start	Specifies the most-significant part of the physical address to be used for translation.
Physical End	Specifies the end part of the physical address to be used for translation.
Number	Specifies the size (without unit) of the program or data segment.
Type	Specifies the unit of the size of the program or data segment. • B - Bytes • KB - Kilo Bytes • MB - Mega Bytes • GB - Giga Bytes
Task ID	Specifies the task ID for the program or data segment.
DAPS (for data translations only)	Specifies whether to allow supervisor-level read (r-), write (-w), both (rw), or neither (--) types of data access. This option corresponds to the Data Access Permission in Supervisor Level (DAPS) bits of the Data Segment Descriptor Registers A (M_DSDAx).

Table continues on the next page...

Table 12-3. MMU Configuration File Editor - Translations Page Settings (continued)

Option	Explanation
Prefetch Policy	Specifies the prefetch policy for the program or data segment: • No Prefetch • Prefetch on miss access • Prefetch on any access • Reserved
L2 Partitioning ID	Specifies the L2 partitioning ID for the program or data segment.
Peripheral Space (for data translations only)	Specifies the peripheral space for the data segment: • Memory • Peripheral
Write-Through (for data translations only)	Checked - MMU enables the write through option. Cleared - MMU disables the write through option.
Cacheable	Checked - Enables caching of the segment in the instruction cache. Cleared - Disables caching of the segment in the instruction cache.
PAPS (for program translations only)	Checked - Segment has supervisor-level fetch permission for program accesses. If you check the PAPU option, you disable program-protection checks for this segment. Cleared - Segment does not have supervisor-level fetch permission for program accesses. This option corresponds to the Program Access Permission in Supervisor Level (PAPS) bit of the Program Segment Descriptor Registers A (M_PSDAx).
Bank 0 (for data translations only)	Checked - MMU enables the bank 0 option. Cleared - MMU disables the bank 0 option.
Stack Descriptor (for data translations only)	Checked - MMU enables the stack descriptor. Cleared - MMU disables the stack descriptor.
Guarded Segment (for data translations only)	Checked - MMU enables the guarded segment option. Cleared - MMU disables the guarded segment option.
Entry Enabled	Checked - MMU enables this translation entry. Cleared - MMU disables this translation entry.
Coherent	Checked - MMU enables the coherent entry. Cleared - MMU disables the coherent entry.

12.2.3 new_file.mmu

The **new_file.mmu** page contains the generated MMU state file.

The MMU Configuration File Editor generates the state file each time you change the MMU configuration. The state file contains target-specific register-state information, as well as Family and Target Device Number state data that you specified in the wizard you used to create the configuration.

The **MMU Configurator** uses the state file to re initialize the settings on each page. You can maintain a collection of state files and load the file that initializes settings for a particular set of translations.

Figure 12-6 shows the **new_file.mmu** page of the MMU Configuration File Editor.

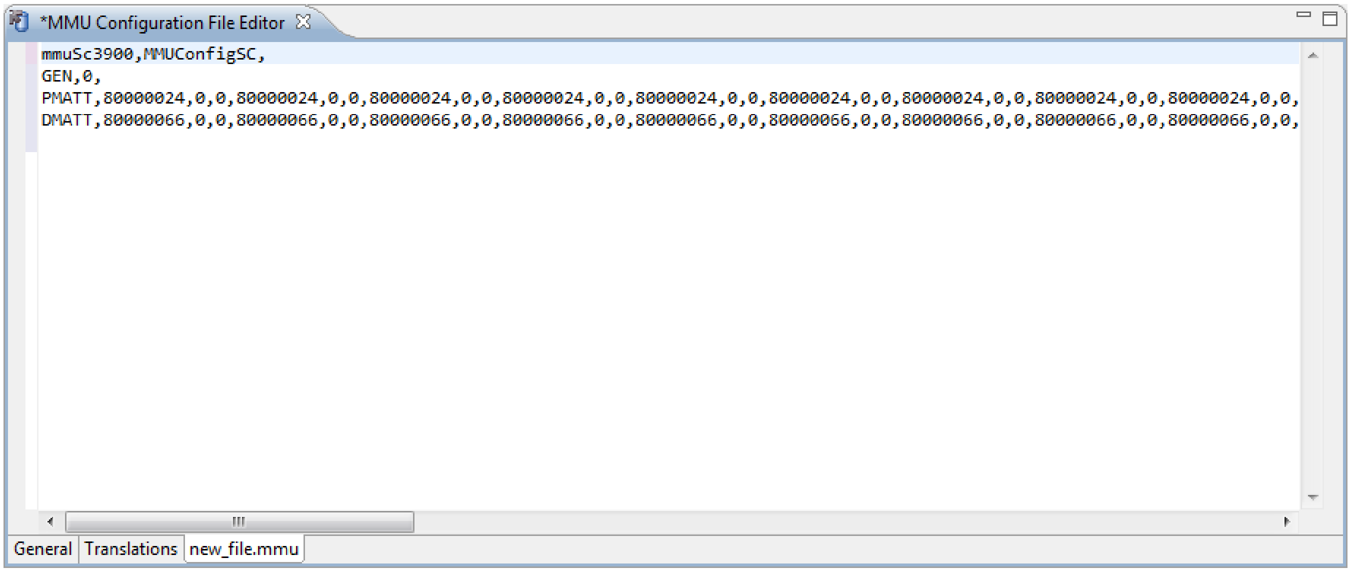


Figure 12-6. MMU Configuration File Editor - < *filename*>.mmu Page

NOTE

The MMU Configuration File Editor regenerates the **new_file.mmu** page when you change settings in the MMU Configuration File Editor pages.

12.3 MMU Editor Menu

The MMU Configuration File Editor has an associated menu, **MMU Editor**, that displays in the CodeWarrior IDE menu bar, when MMU Configuration File Editor is active in the Editor view.

Table 12-4 explains each menu item in the MMU Editor menu.

Table 12-4. MMU Editor Menu Items

Menu Item	Icon	Description
Save C		Saves the generated C code to a new `.c` file.
Save ASM		Saves the generated assembly code to a new `.asm` file.

Table continues on the next page...

Table 12-4. MMU Editor Menu Items (continued)

Menu Item	Icon	Description
Save TCL		Saves the generated TCL script to a new `.tcl` file.
Read Target Registers		Updates the content of the MMU Configuration File Editor pages to reflect the current values of the target hardware registers.
Write Target Registers		Writes the modified content of the MMU Configuration File Editor pages to the target hardware registers.

12.4 MMU Editor Toolbar

The MMU Configuration File Editor has an associated toolbar that displays in the CodeWarrior IDE toolbar, when MMU Configuration File Editor is active in the Editor view.

Table 12-5 explains each toolbar button.

Table 12-5. MMU Editor Toolbar Buttons

Toolbar Button	Icon	Description
Save C Source		Saves the generated C code to a new `.c` file.
Save ASM Source		Saves the generated assembly code to a new `.asm` file.
Save TCL Source		Saves the generated TCL script to a new `.tcl` file.
Load MMU Configurator state from active thread		Updates the content of the MMU Configuration File Editor pages to reflect the current values of the target hardware registers.
Write active thread registers from MMU Configurator state		Writes the modified content of the MMU Configuration File Editor pages to the target hardware registers.

12.5 Saving MMU Configuration

This section explains how to save the changes you made in the MMU Configurator.

Each time you change the settings in the MMU Configurator File Editor, you create a pending or unsaved change. In order to commit those pending changes, you need to save the MMU Configurator settings to a file. If an asterisk (*) appears before the title of the MMU Configuration File Editor, it implies that the editor still has unsaved changes.

- Saving MMU Configuration File Editor Settings
- Saving Generated C Code
- Saving Generated Assembly Code
- Saving Generated TCL Script

12.5.1 Saving MMU Configuration File Editor Settings

Follow these steps to save the current settings of the MMU Configuration File Editor:

1. Select the MMU Configuration File Editor.
2. From the CodeWarrior IDE menu bar, select **File > Save**.

   The IDE saves the current settings of the MMU Configuration File Editor to the `.mmu` file.

12.5.2 Saving Generated C Code

The generated C code is unique for each target. Follow these steps to save the C code generated by the MMU Configuration File Editor:

1. From the CodeWarrior IDE menu bar, select **MMU Editor > Save C** to save the generated C code. Alternatively, click the **Save C Source** button in the MMU editor toolbar.

   A standard **Save** dialog box appears.

2. Specify the file name in the **File name** text box and click **Save** to save the generated code as a new file.

NOTE

The MMU Configuration File Editor regenerates the C code when you change settings in the MMU Configuration File Editor pages.

12.5.3 Saving Generated Assembly Code

The generated assembly (ASM) code is unique for each target. Follow these steps to save the ASM code generated by the MMU Configuration File Editor:

1. From the CodeWarrior IDE menu bar, select **MMU Editor > Save ASM** to save the generated assembly code. Alternatively, click the **Save ASM Source** button in the MMU editor toolbar.

   A standard **Save** dialog box appears.
2. Specify the file name in the **File name** text box and click **Save** to save the generated code as a new file.

NOTE

The MMU Configuration File Editor regenerates the assembly code when you change settings in the MMU Configuration File Editor pages.

12.5.4 Saving Generated TCL Script

The generated TCL script can be executed within the Debugger Shell view, or the Debugger Shell can execute the generated TCL script as an initialization script for the target hardware. The generated TCL script is unique for each target.

Follow these steps to save the TCL script generated by the MMU Configuration File Editor:

1. From the CodeWarrior IDE menu bar, select **MMU Editor > Save TCL** to save the generated TCL script. Alternatively, click the **Save TCL Source** button in the MMU editor toolbar.

   A standard **Save** dialog box appears.
2. Specify the file name in the **File name** text box and click **Save** to save the generated code as a new file.

NOTE

The MMU Configuration File Editor regenerates the TCL script when you change settings in the MMU Configuration File Editor pages.

12.6 MMU Configurator View

Use the MMU Configurator view to examine the current state of a thread's MMU configuration during the debug session.

You can also detach the MMU Configurator view into its own floating window and reposition the window within the collection of views.

To open the **MMU Configurator** view, follow these steps:

1. Start a debugging session.
2. In the **Debug** view of the **Debug** perspective, select the process for which you want to work with MMU.
3. Select **Window > Show View > Other**.

   The **Show View** dialog box appears.

4. Expand the **Debug** tree control.
5. Select **MMU Configurator** (Figure 12-7).

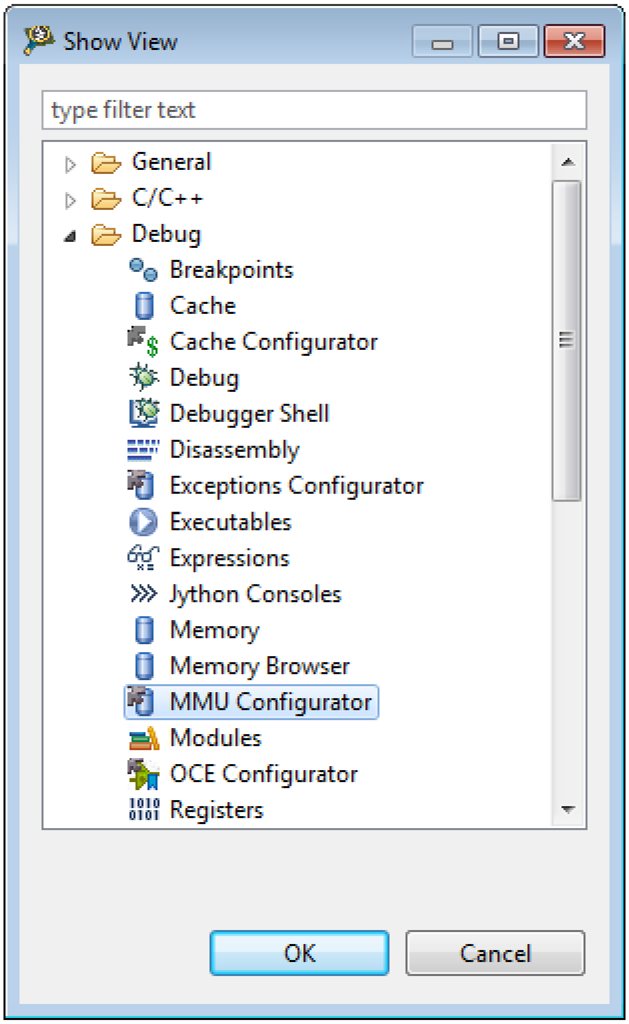


Figure 12-7. Show View Dialog Box - MMU Configurator

6. Click **OK**.

   The **Show View** dialog box closes. The **MMU Configurator** view appears, attached to an existing collection of views in the current perspective.

Chapter 13
Maple Memory Management Unit Configurator

This chapter explains how to use the Maple Memory Management Unit (MMU) Configurator. To use the Maple MMU:

- You set up a mapping for data addresses
- Enable address translation

The mapping links the virtual addresses to the physical addresses. Translation occurs before software acts on the addresses.

The Maple MMU Configurator simplifies peripheral-register initialization of the Maple MMU registers. You can use the Maple MMU Configurator to examine the status of the current Maple MMU configuration.

Use the Maple MMU Configurator to:

- Configure Maple MMU general control registers
- Configure Maple MMU memory-address-translation properties
- Display the current contents of each register
- Write the displayed contents from the Maple MMU Configurator to the Maple MMU registers

This chapter has these sections:

- Maple MMU Configurator View
- Maple MMU Configurator View Pages
- Maple MMU Configurator View Menu

13.1 Maple MMU Configurator View

Use the **Maple MMU Configurator** view to examine the current state of a thread's Maple MMU configuration during the debug session.

You can also detach the **Maple MMU Configurator** view into its own floating window and reposition the window within the collection of views.

To open the **Maple MMU Configurator** view, follow these steps:

1. Start a debugging session.
2. In the **Debug** view of the **Debug** perspective, select the process for which you want to work with Maple MMU.
3. Select **Window > Show View > Other**.

   The **Show View** dialog box appears.

4. Expand the **Debug** tree control.
5. Select **Maple MMU Configurator** (as the following figure shows).

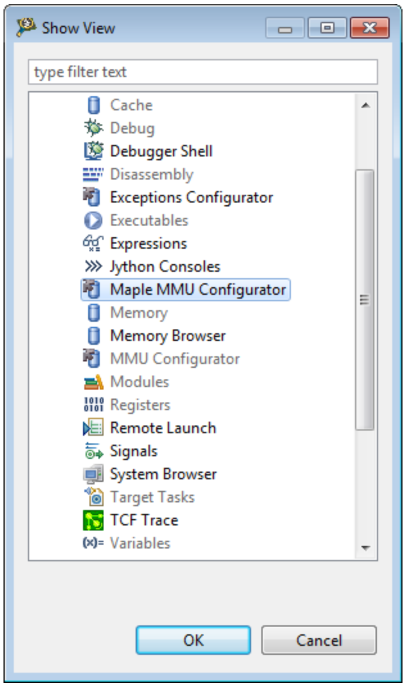


Figure 13-1. Show View Dialog Box - Maple MMU Configurator

6. Click **OK**.

   The **Show View** dialog box closes. The **Maple MMU Configurator** view appears, attached to an existing collection of views in the current perspective.

13.2 Maple MMU Configurator View Pages

This section explains each page of the Maple MMU Configurator view.

You use these pages to configure Maple MMU mapping and translation properties. The tabbed interface of the **Maple MMU Configurator** view displays pages for the configuration options.

NOTE

When you specify settings in the **Maple MMU Configurator** view, configure the tabbed pages in left-to-right order. For example, configure the **General** page before configuring the **Translations** page. In addition, within a page, configure settings from the top-left position to the bottom-right position.

The following table lists the Maple MMU Configurator pages.

Table 13-1. Maple MMU Configurator Pages

Page	Description
General	This page helps you configure the overall Maple MMU configurations (as opposed to specific properties for each virtual-to-physical map entry).
Translations	This page helps you configure the data translations (virtual-to-physical address mappings) for maple instances.

13.2.1 General

Use this page to configure the overall Maple MMU configurations (as opposed to specific properties for each virtual-to-physical map entry).

The following figure shows the **General** page of the Maple MMU Configurator.

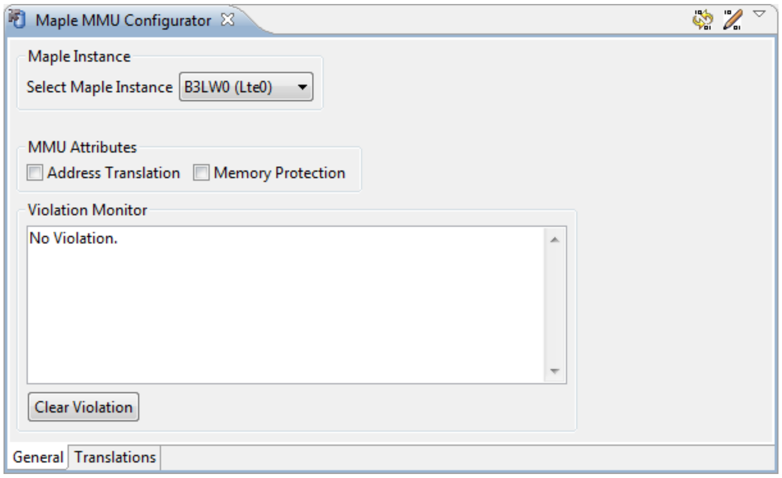


Figure 13-2. Maple MMU Configurator - General Page

The following table describes the options available on the **General** page of the Maple MMU Configurator.

Table 13-2. Maple MMU Configurator - General Page Settings

Option	Description
Select Maple Instance	Use this option to select Lte0, Lte1 and wcdma maple instances. **NOTE:** The availability of the options depends on the target selected. • LTE1 is not supported for b4420. • LTE0, LTE1 and WCDMA are supported for B4060, B4460 and B4860. • Maple instances are not supported for G4860 and SC3900 targets.
Address Translation	Checked - Enables address translation. For example, translation occurs from a virtual address to a physical address. Cleared - Disables address translation. For example, translation does not occur from a virtual address to a physical address. This option corresponds to the Address Translation Enable (ATE) bit of the register from the list below, depending on the Maple instance you selected: • MAPLE_B3LW0_M_CR • MAPLE_B3LW1_M_CR • MAPLE_B3W_M_CR
Memory Protection	Checked - Enables memory protection checking for all enabled segment descriptors. With this option checked, the system consumes more power. Cleared - Disables memory protection checking for all enabled segment descriptors. This option corresponds to the Memory Protection Enable (MPE) bit of the register from the list below, depending on the Maple instance you selected: • MAPLE_B3LW0_M_CR • MAPLE_B3LW1_M_CR • MAPLE_B3W_M_CR
Violation Monitor	Displays current violation status.
Clear Violation	Use this button to clear the violation data.

13.2.2 Translations

Use the **Translations** page to define and display data translations (virtual-to-physical address mappings) for the maple instances.

The Maple MMU Configurator generates the appropriate descriptors for the data Memory-Address Translation Table (MATT).

On the **Translations** page, details of the data translations are shown in the MATT table on the left side and settings of the entry, currently selected in the MATT table, are summarized on the right side. By clicking the header of a column in the MATT table, you can sort the table data based on that column. Modified translations in the MATT table display in blue color. Similarly, erroneous translations display in red color.

To modify a translation, follow these steps:

1. Select an option from the **Select Translations** drop-down list within the **Type** group. Based on the option selected in the **Select Translations** drop-down list, the MATT table displays details of data translations.
2. Select a translation from the MATT table.
3. Change the **Address**, **Size**, and **Properties** group settings.

The following figure shows the **Translations** page of the Maple MMU Configurator.

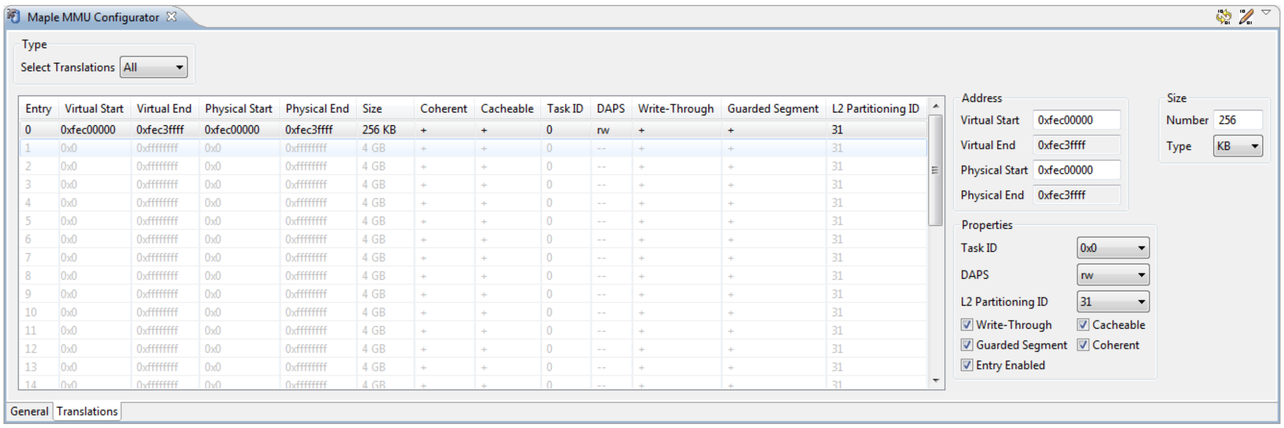


Figure 13-3. Maple MMU Configurator - Translations Page

The following table describes the options available on the Translations page of the Maple MMU Configurator.

Table 13-3. MMU Configuration File Editor - Translations Page Settings

Option	Explanation
Select Translations	Select an option from the drop-down list to specify which translations to display. • Enabled - Selecting this option displays all enabled translations in the MATT table. This is the default selection for the configurator mode. • All - Selecting this option displays all translations in the MATT table.
Virtual Start	Specifies the virtual base address of the data segment, selected in the MATT table.
Virtual End	Specifies the virtual end base address of the data segment.
Physical Start	Specifies the most-significant part of the physical address to be used for translation.
Physical End	Specifies the end part of the physical address to be used for translation.

Table continues on the next page...

Table 13-3. MMU Configuration File Editor - Translations Page Settings (continued)

Option	Explanation
Number	Specifies the size (without unit) of the data segment.
Type	Specifies the unit of the size of the data segment. • B - Bytes • KB - Kilo Bytes • MB - Mega Bytes • GB - Giga Bytes
Task ID	Specifies the task ID for the data segment.
DAPS	Specifies whether to allow supervisor-level read (r-), write (-w), both (rw), or neither (--) types of data access. This option corresponds to the Data Access Permission in Supervisor Level (DAPS) bits of the register from the list below, depending on the Maple instance selected by you: • MAPLE_B3LW0_M_DSDAx • MAPLE_B3LW1_M_DSDAx • MAPLE_B3W_M_DSDAx
L2 Partitioning ID	Specifies the L2 partitioning ID for the data segment.
Write-Through	Checked - MMU enables the write-through policy attribute for the segment. Cleared - MMU disables the write-through policy attribute for the segment.
Guarded Segment	Checked - MMU enables the guarded attribute for the segment. Cleared - MMU disables the guarded attribute for the segment.
Entry Enabled	Checked - MMU enables this translation entry. Cleared - MMU disables this translation entry.
Cacheable	Checked - The segment is cacheable in DCache and L2 Cache. Cleared - The segment is not cacheable in DCache and L2 Cache.
Coherent	Checked - MMU enables the memory coherent attribute. Cleared - MMU disables the memory coherent attribute.

13.3 Maple MMU Configurator View Menu

This section decsribes the Maple MMU Configurator view menu.

The following table describes toolbar menu item:

Table 13-4. Maple MMU Configurator View Menu Items

Menu Item	Icon	Description
Read Target Registers		Loads Maple MMU Configurator state from the currently selected maple instance.
Write Target Registers		Writes the active thread registers from Maple MMU Configurator state.

Chapter 14
StarCore DSP Utilities

This chapter explains how to use the utility programs included in the *CodeWarrior Development Studio for StarCore 3900FP DSP Architectures* product.

This chapter explains:

- Archiver Utility
- Disassembler Utility
- ELF File Dump Utility
- ELF2XX Utility
- Name Utility
- Size Utility

14.1 Archiver Utility

Use the Archiver utility groups to separate object files into a single file for linking or archival storage.

You can add, extract, delete, and replace files in an existing archive.

To invoke the Archiver utility from the command prompt, type:

```
sc100-ar [Options] archive <file...>
```

NOTE

The `sc100-ar` utility is in this directory:

```
<CWinstallDir>\StarCore_Support\compiler\bin
```

Archiver utility command-line options are case-sensitive.

Parameters

option

Table 14-1 defines the purpose and effect of each command-line option.

archive

Name of the archive file.

file

Name of the file or files to add, extract, replace, or delete from the specified archive file. Separate multiple filenames with spaces. The archiver processes files in the order listed on the command line.

argument file

Name of a file that contains archiver command-line options. The syntax rules for an argument file are listed below.

- Begin a comment line with the # character.
- Each line must end with a backslash (\) character.

Table 14-1. Archiver Utility-Command-Line Options

Option	Description
`-c`	Suppresses the default diagnostic message written to standard error when the archive is created. This option is valid only with the `-r` option.
`-d`	Deletes the listed files from the specified archive.
`-e`	Recreates the whole archive. This option is valid only with the -r option.
`-f`	Forces adding an unknown file format to the library. This option is valid only with the `-r` option.
`-p`	Writes the contents of the listed files from the specified archive to the standard output. If the command does not include any filenames, the archiver writes the contents of all files, in their order in the archive.
`-r`	Replaces the files, appends new files to the specified archive, or creates a new archive that contains the listed files.
`-s`	Forces the extraction of `.elf` files from the specified archive, addition or replacement the `.elf` files instead of the whole archive. This option is valid with just the `-r` option.

Table continues on the next page...

Table 14-1. Archiver Utility-Command-Line Options (continued)

Option	Description
`-t`	Writes the archive table of contents, including the specified files, to the standard output. If no files are specified, all files in the archive are included in the list in the order that they appear in the archive.
`-u`	Updates archive files that have been changed since the last update. This option is valid only with the -r option.
`-v`	Produces verbose output: • `-d`, `-r` or `-x` : Produces a file-by-file description of archive creation and maintenance • `-p` : Writes the name of a file to the standard output before writing the file contents to the standard output • `-t`: Includes a long listing of file information within the archive
`-V`	Displays the current archiver version and exits.
`-x`	Extracts the listed files from the specified archive. If the command does not include any file names, the archiver extracts all files of the archive. This option does not change archive contents.

14.2 Disassembler Utility

Use the Disassembler utility to convert the ELF object files to SC3900fp assembly code.

The object files can be linked (`.eld`) or non-linked (`.eln` and `.elb`).

In the interactive mode, you provide hexadecimal encoding, which the disassembler converts to assembly code. The disassembler can dump labels, equ directives, and section information such as type and alignment.

Additional features include:

- Interpretation of relocation information
- Data disassembling
- Label (symbol) address output
- Padding awareness (alignment)
- Statistics display

To invoke the `disasmsc100` utility from the command prompt, type:

```
disasmsc100 [option ...] <srcfile>
```

Parameters

`option`

Table 14-2 defines the purpose and effect of each command-line option. All the options are case-sensitive.

`srcfile`

Any ELF object file.

NOTE

The disasmsc100 utility is in directory:

```
<CWinstallDir>\StarCore_Support\compiler\bin
```

A simple example command line is:

```
disasmsc100 -f -m -q -r bin/coder.eld
```

Which starts disassembly of file `bin/coder.eld` printing `loopstart-loopend` instead of `lpmarkka/lpmarkb` (`-f`), displaying intermixed C-source and disassembled code (`-m`), suppressing the banner (`-q`), and rearranging packet instructions (`-r`).

Table 14-2. disasmsc100 Disassembler-Command-Line Options

Option	Description
`-arch<tgt>`	Specifies the architecture for interactive mode. Valid `tgt` values are `sc3900fp` and `b4860`. Ignored during disassembly of an ELF object file, which includes the hard coded architecture version.
`-b<label>`	Specifies the disassembly starting point, the VLES input file at the specified label.
`-c`	Specifies compact output mode, prints instructions in an execution-set on a single line.
`-e<label>`	Ends disassembly at the input file at the specified label.
`-f`	Prints `loopstart-loopend` directives instead of `lpmarka/lpmarkb` directives.
`-h<addr>`	Stops disassembly when it reaches the specified hexadecimal address.
`-i{l|b}`	Specifies interactive mode with little endianness (l) or big endianness (b). Default target is `sc3900fp`; to specify a different target, use the `-arch` option.
`-l<addr>`	Starts disassembly at the specified hexadecimal address.
`-m`	Specifies mixed view: C source-code lines mixed with disassembled code lines.
`-n`	Displays unmangled form of C++ names.
`-p`	Suppresses the PC display for VLESes.
`-q`	Suppresses banner display.

Table continues on the next page...

Table 14-2. disasmsc100 Disassembler-Command-Line Options (continued)

Option	Description
`-r{i}`	Rearranges instructions in packets in the order `IFT`, `IFF`, and `IFA`.Without the optional `i` value, places `DALU` instructions before `AGU` instructions. *With* the optional `i` value, does not rearrange `AGU` instructions, permitting reassembly of the disassembled dump file.
`-s`	Suppresses display of labels, headers, and global information (equs, globals, and section information).
`-u`	Ignores relocation information (relevant for `.eln` and `.elb` files).
`-v`	Specifies verbose mode.
`-x`	Displays mixed hexadecimal codification and assembly code.
`-z`	Displays statistics after each section: number of VLESes with 0 - 4 `DALU` instructions, number of VLESes with 0 - 2 `AGU` instructions, not-generated instructions, and so forth.

In the usual disassembler output, the PC address precedes each execution set; the execution set is in a comment. Another comment at the beginning of each execution set, specifies the grouping prefix type. The following listing shows a simple output example.

Listing: Simple Disassembler Output Example

```
;00001f10:
DW58

                 [ ;one word low registerprefix

                   ifa

                     iadd d2,d1

                   ift

                     move.l (r3),r1

]
```

NOTE

The `-p` option suppresses the PC value in such output.

Another option that affects the output is `-z`, which specifies statistics. The following listing shows an example.

Listing: disasmsc100 Disassembler-Output Produced by -z Option

```
;Global EQUs
X        equ      $fffd

zl       equ      $fffffffe

;Local EQUs

lab1     equ      $fffffffd
```

```
lab3     equ     $fffffffd
                 section .text2
                 sectype progbits
                 secflags alloc
                 secflags execinstr
;00000000:
_f3      type    func
F__MemAllocArea_18_00000000
F__MemAllocArea_18
                 nop
;00000002:
F__MemAllocArea_18_00000002
                 nop
;00000004:
F_f3_end
F__MemAllocArea_18_end
                 endsec
-------------------------------------------------------
  General Statistics:
    No of instruction:                      2
    No of packets:                          2
    No of 1-word-low-prefixes:              0
    No of 1-word-high-prefixes:             0
    No of 2-word-prefixes:                  0
    No of DALU instructions:                0    0%
    No of AGU instructions:                 0    0%
    No of prefixes and NOP instructions:    2  100%
-------------------------------------------------------
  DALU Statistics:
    No of VLESs with 0 DALU:                2  100%
    No of VLESs with 1 DALU:                0    0%
    No of VLESs with 2 DALU:                0    0%
    No of VLESs with 3 DALU:                0    0%
    No of VLESs with 4 DALU:                0    0%
    DALU parallelism:                      0.00
```

```
-------------------------------------------------------
  AGU Statistics:
    No of VLESs with 0 AGU:                    2 100%
    No of VLESs with 1 AGU:                    0   0%
    No of VLESs with 2 AGU:                    0   0%
    AGU parallelism:                        0.00
-------------------------------------------------------
  DALU/AGU Usage Details:
          0 DALU | 1 DALU | 2 DALU | 3 DALU | 4 DALU
  0 AGU     100%       0%       0%       0%       0%
  1 AGU       0%       0%       0%       0%       0%
  2 AGU       0%       0%       0%       0%       0%
-------------------------------------------------------
  Used Instructions:
    nop                                        2
-------------------------------------------------------
```

Ensure that you read these additional considerations while using the Disassembler utility:

1. If there is data in the text sections, for example, you wrote assembling code and used `dcb`statements, the disassembler tries to match data with instructions.
2. Disassembly happens incrementally. If no instruction matches the current bytes from the data stream, the disassembler dumps two bytes as data (`dcb` directives) and then tries to match an instruction starting with the next bytes. Code alignment due to the `ALIGN` assembler directive can lead to this situation.
3. The disassembler does not consider `.bss`-like sections (`SHT_NOBITS`); it also ignores all symbols defined inside such sections.
4. The disassembler follows this algorithm to generate `loopstart-loopend` pseudo-instructions:
    a. Traverse source file VLES by VLES, incrementing PC at each step
    b. Disassemble input file
    c. Memorize label of each `dosetup` instruction found
    d. For each `lpmarkx` instruction found, use information gathered from `doen`/ `dosetup` instructions to compute `loopstart`/ `loopend` index and location

    However, as this algorithm is not flow sensitive, it fails in cases like the one discussed in the following listing.

    Listing: Algorithm Failure Example

```
        [...]
        dosetup3 ls3

        bt l1

        doen3 #5

        bt l2

l1:

        doen3 #7

l2:

        loopstart3

        [...]

        loopend3

        [...]
```

NOTE

The disassembler does not know which `doen` corresponds to `loopstart3`, so ends up with an unmatched `doen` instruction and prompts fatal error message. Disassembly is still possible if you omit the `-f` command-line option.

14.3 ELF File Dump Utility

Use the Executable and Linking Format (ELF) file Dump Utility to output the headers of absolute and linkable object files in a human-readable format.

The information produced by the utility depends on the selected ELF object file type:

- Absolute (executable) -- Default output is ELF header, all program headers, and all sections headers.
- Linkable (relocatable) -- Default output is ELF header and all section headers.

To invoke the ELF dump utility from the command-line prompt, type:

```
sc100-elfdump [option ...] <elf-file>
```

NOTE

The ELF dump utility is in this directory:

```
<CWinstallDir>\SC\StarCore_Support\compiler\bin
```

Parameters

option

Table 14-3 defines the purpose and effect of each command-line option. Without options, the utility returns the contents of the ELF Ehdr, Phdr, and Shdr structures and the symbol table. If you specify command-line options, the utility returns only the information that you specify on the command line.

NOTE

sc100-elfdump utility command-line options are case-sensitive.

elf-file

one or more filenames, including optional pathnames. The input file should be either Absolute- or Relocatable ELF object file.

Table 14-3. ELF File Dump Utility-Command-Line Options

Option	Description
`-A`	Writes the contents of all program segments
-a	Writes the contents of all sections
-b	Writes the contents of all `SHT_PROGBITS` sections
`-D`	Writes the contents of all `PT_DYNAMIC` segments, does not apply to the `SC3900fp DSP` core
-d	Writes the contents of all `SHT_DYNAMIC` sections, does not apply to the `SC3900fp DSP` core
`-E`	Writes `ELF` header information
-e *file*	Writes error messages to the specified file instead of `stderr`
-g	Writes the contents of all debug sections in hex format
-h	Writes the contents of all `SHT_HASH` sections, does not apply to the `SC3900fp DSP` core
`-I`	Writes the contents of all `PT_INTERP` segments, does not apply to the `SC3900fp DSP` core
-i	Interprets the section contents
`-L`	Writes the contents of all `PT_LOAD` segments
`-N`	Writes the contents of all `PT_NOTE` segments, does not apply to the `SC3900fp DSP` core
-n	Writes the contents of all `SHT_NOTE` sections
-o	Writes the contents of overlay table sections
`-P`	Writes the contents of all `PT_PHDR` segments
-q	Specifies quiet mode, limits header information to the specified sections and segments
`-R` *file*	Writes the output to the specified file, instead of to the standard output
-r	Writes the contents of all `SHT_REL` and `SHT_RELA` sections
`-S`	Writes the contents of all `PT_SHLIB` segments, does not apply to the `SC3900fp DSP` core

Table continues on the next page...

Table 14-3. ELF File Dump Utility-Command-Line Options (continued)

Option	Description
-s	Writes the contents of all `SHT_SHLIB` sections, does not apply to the `SC3900fp DSP` core
-t	Writes the contents of all `SHT_STRTAB` sections
`-U`	Writes the contents of all unknown-type segments as hex dumps
-u	Writes the contents of all unknown-type sections as hex dumps
`-V`	Displays the version of the ELF file dump utility
`-X`	Dumps all program-segment contents as hex
-x	Dumps contents of all sections as hex
-y	Writes the contents of all `SHT_SYMTAB` sections
`-z`	Writes the contents of all `SHT_DYNSYM` sections, does not apply to the `SC3900fp DSP` core

The following listing shows the output of the ELF file dump utility.

NOTE

The file name is `hello.eld`.

The ELF header extends from line `e_ident` through line `e_shstrndx`.

The program headers comprise lines `Segment 0`, `Segment 1` and their subordinate lines.

The section headers comprise the remaining lines.

Listing: ELF File Dump Utility-Output

```
hello.eld:
   e_ident     : 7f 45 4c 46 02 02 01 00 00 00 00 00 00 00 00 00

                 (ELF 64-bit LSB Version 1

   e_type      : 2 (Executable file)

   e_machine   : 58 (StarCore 100)

   e_version   : 1

   e_entry     : 0x4000c778

   e_phoff     : 0

   e_shoff     : 0x40

   e_flags     : 0x200 (SC3900fp (unknown revision))

   e_ehsize    : 64

   e_phentsize : 56
```

```
e_phnum     : 6
e_shentsize : 64
e_shnum     : 24
e_shstrndx  : 23
Segment 0:
    p_type   : PT_LOAD
    p_offset : 0x190
    p_vaddr  : 0x40000000
    p_paddr  : 0x40000000
    p_filesz : 12
    p_memsz  : 12
    p_flags  : 0x6 PF_R PF_W
    p_align  : 4
Segment 1:
    p_type   : PT_LOAD
    p_offset : 0x1a0
    p_vaddr  : 0x40001000
    p_paddr  : 0x40001000
    p_filesz : 200
    p_memsz  : 200
    p_flags  : 0x4 PF_R
    p_align  : 8
Section 0:
    sh_name      :
    sh_type      : SHT_NULL
    sh_flags     : 0
    sh_addr      : 0
    sh_offset    : 0
    sh_size      : 0
    sh_link      : 0
    sh_info      : 0
    sh_addralign : 0
    sh_entsize   : 0
Section 1:
    sh_name      : ddr_shared_data_nc_wt
```

```
sh_type      : SHT_STARCORE_OVERLAY

sh_flags     : 0x3 SHF_WRITE SHF_ALLOC

sh_addr      : 0x40000000

sh_offset    : 0x190

sh_size      : 12

sh_link      : 0

sh_info      : 0

sh_addralign : 4

sh_entsize   : 0

          .

          .

          .
```

14.4 ELF2XX Utility

Use the ELF2XX utility to write the information within the executable ELF file in user specific format such as srec, lod, or bin.

To invoke the ELF2XX utility from the command prompt, type:

`sc100-elf2xx [`*option* `...] <`*input-file*`>`

NOTE

The ELF to S-Record utility is in this directory:

```
<CWinstallDir>\SC\StarCore_Support\compiler\bin
```

Parameters

option

Table 14-4 defines the purpose and effect of each command-line option.

input-file

The filename of the ELF object file.

Listing: LOD File-Format

```
_START Module_ID Version Rev# Device# Asm_Version Comment
_END Entry_point_address

_DATA Memory_space Address Code_or_Data
```

```
_BLOCKDATA Memory_space Address Count Value

_SYMBOL Memory_space Symbol_Address ...

_COMMENT Comment
```

Listing: BIN File-Format

```
ENDIANNESS_BYTE (1Byte)

<ADDRESS - 8Bytes><SIZE_IN_BYTES - 8Bytes><data_payload>

<ADDRESS - 8Bytes><SIZE_IN_BYTES - 8Bytes><data_payload>

....

<ADDRESS -8Bytes><SIZE_IN_BYTES - 8Bytes><data_payload>
<ADDRESS = 0x00000000C007B010><SIZE = 8><value_of_entrypoint>
```

NOTE

`ENDIANNESS_BYTE` has the value 2 for `MSB` and 1 for `LSB`. This feature can be used to dump the executable `.elf` file into a fast download format. The file can be parsed and loaded into target's memory.

Table 14-4. elf2xx Utility-Command-Line Options

Option	Description	Type
`-t <output-type>`	Sets the output type format `<output-type>` is one of: `srec`, `lod` , `eld`, , or `bin`	Mandatory
`-DumpUninitializedData= Off`	Inhibits to dump the information about the Uninitialized Data <BSS sections>	Optional
`-DumpUninitializedData= On`	Enables to dump the information about the Uninitialized Data <BSS sections>	
`-DumpNewLine=Off`	Inhibits dumping new line for the `srec` format	Optional
`-DumpNewLine=On`	Enables dumping new line for the `srec` format.	
`-entry_address HEX_VALUE`	Enables the user to change the default value of the address, where the entry point is written, to the specified `HEX_VALUE`. The `HEX_VALUE` must be written as "0xNUMBER" (for example: 0xC007B010) **NOTE:** This option is valid only for the bin format.	
`-m <arch> -#<value> <list_eld> { #<value> <list_eld> ...}`	Enables us to merge one or more applications. The result of merger can be specified by the output-type argument from `-t` option. `<arch>` is one of `b4420`, `b4860` `<value>` is the index of core. For example, `-#0` means core	

Table continues on the next page...

Table 14-4. elf2xx Utility-Command-Line Options (continued)

Option	Description	Type
	zero. `<list_eld>` is the list of executable ELF file that are delimited by space.	
`-merge-with-symbol-information=On`	Enables dumping in merged `.eld` file symbol information.	
`-merge-with-symbol-information=Off`	Disables dumping in merged `.eld` file symbol information. This is default behaviour.	
`-split <arch>`	Enables us to split an executable ELD file into multiple core specific ELD files. `<arch>` is one of: b4420, b4860	
`-o <output-file>`	Redirects the output to the specified file; standard output is used in case the file/ output is missing	Optional
`-removeAllBss`	Generates a `srec` file that does not contain records for the `bss` sections. The tool will read the bss table from the input `.eld` file.	
`-V`	Displays the current version of the `sc100-elf2xx` utility.	
`-ccsr_address HEX_VAL`	Defines the CCSR start address of the first StarCore core. This information will be used by the tool to generate the .bin files entries that will be used by the loader to program the MMU descriptors. For B4860 the value is 0xffec40000.	Valid only for bin format.

When using the output file, after loading the information into memory, the host has to write `0xa5a5a5a5` to `0xC007B000` in order to finalize the download process.

NOTE

Even if the user program uses only one core, private data for the other cores must also be included in the output file for proper boot operation.

For example, the user program generates the following output files for each of the cores:

- Core 0, project.eld
- Core 1, c1_project.eld
- Core 2, c2_project.eld
- Core 3, c3_project.eld

To create an S-record output called `led_output.s` from the combined object files, the `sc100-elf2xx` utility is called, as the code in the following listing shows. The `-t srec` selects an S-record output format. The `-o led_output.s` specifies the name of the output file. The `-m b4860` selects the device. Finally, all four input `.eld` files specify the object code to combine.

Listing: Running ELF2XX Utility for Multiple Input Files

```
installDir\SC\StarCore_Support\compiler\bin >sc100-elf2xx -t srec -o
led_output.s -m b4860 -#0 project.eld -#1 c1_project.eld
-#2 c2_project.eld -#3 c3_project.eld
```

To create an S-record output without any `.bss` section records, the `sc100-elf2xx` utility is called as shown in the following listing.

Listing: Running ELF2XX Utility for Multiple Input Files

```
installDir\SC\StarCore_Support\compiler\bin >sc100-elf2xx -t srec
-DumpUninitializedData=Off -removeAllBss bss_table_file.txt -m b4860 -
#0 project.eld -#1 c1_project.eld -#2 c2_project.eld -#3
c3_project.eld
```

-removeAllBss bss_table_file.txt option ensures that all the bss sections are eliminated, no mater where they are placed, based on the information in the `bss_table_file.txt` file.

This section contains the following topic:

- L1 Defense Support
- Extract core specific images from multicore image

14.4.1 L1 Defense Support

This section describes the L1 defense support in the elf2xx utility for StarCore 3900FP DSPs.

When reloading a core's image, the loader must know what it should load without interfering with the running state of the other cores. In order to be able to do this, the loader (debugger or boot loader) must know which parts of the image are private and which are shared. It loads only the private parts or, in case multiple cores are restarted, also the image parts shared between the restarted and reloaded cores.

Based on the information in the segment header, the `sc100-elf2xx` tool generates multiple images for each core: one containing the private code, and some other – one for each sharing space (cluster, multiple clusters, whole platform). Based on the output name, you will know to which cores each file corresponds.

You can use the following command:

```
sc100-elf2xx -t bin -o binary_image.bin -SeparateBinFiles=On -DumpUninitializedData=Off -m
b4860 -entry_address 0xFFFFFFFFFFFFFFFF -ccsr_address 0xffec40000 -#0 test.eld -#1
c1_test.eld -#2 test.eld -#3 test.eld -#4 c4_test.eld -#5 c5_test.eld
```

The generated files name appears as:

```
<visible_cores>_binary_image.bin
```

Where visible_cores represents the cores that the image is visible on. Syntax is:

```
<visible_cores> =
    -cX_ if the segment is private
    -cX_c(X+1) if the segment is shared on one cluster
```

Example,

If one segment is private on core c0, the image will be emitted in file:

```
c0_binrary_image.bin
```

if one segment is shared on cluster 0, the image name will be:

```
c0_c1_binary_image.bin
```

if the segment is shared on the whole platform, the image name will be:

```
c0_c1_c2_c3_c4_c5_binary_image.bin
```

if the segment is shared among cluster 0 and 2, the image name will be:

```
c0_c1_c4_c5_binary_image.bin
```

This behavior is available only for the `.bin` output format.

Each image will contain the necessary information for the loader to program the MMU descriptors.

14.4.2 Extract core specific images from multicore image

This feature allows you to extract the core specific ELD images from a multicore ELD image which must be generated by using sc100-elf2xx. The listing below shows how to create multicore image from the core specific images.

Listing: Creating multicore image from core specific images

```
installDir\SC\StarCore_Support\compiler\bin >sc100-elf2xx -t eld -m b4860
-#0 project.eld -#1 c1_project.eld -#2 c2_project.eld -#3 c3_project.eld
-#4 c4_project.eld -#5 c5_project.eld -merge-with-symbol-information=On -o project.elf
```

The core specific images are extracted from the multicore image by using sc100-elf2xx, as shown by the listing below.

Listing: Extract core specific images

```
installDir\SC\StarCore_Support\compiler\bin >sc100-elf2xx -t eld -split b4860 project.elf -o
project.eld
```

An ELD image is created for each core that has private segments in the multicore ELD image.

The image corresponding to core 0 will have the same name as the one provided to the `-o` option (`project.eld`). The same name is used for the images corresponding the other cores but prefixed by the core identifier (`c1_project.eld` for core 1 and so on).

In order for the extracted core specific images to have the same contents (including debug information) as the original images used to create the multicore image, the multicore image should include symbol information. This behaviour is enabled by using the `-merge-with-symbol-information=On` command line option. Not specifying this option or setting it to *off* results in a multicore image that does not include symbol information and consequently, the core specific images obtained from splitting it will not include symbol information.

14.5 Name Utility

Use the name utility to display the symbolic information in each object file and library passed on the command line.

If a file contains no symbolics, the utility reports this fact.

To invoke the name utility from the command prompt, type:

```
sc100-nm [-option ...] file ...
```

NOTE

The sc100-nm utility is in this directory:

```
<CWinstallDir>\StarCore_Support\compiler\bin
```

Parameters

option

Table 14-5 defines the purpose and effect of each command-line option.

NOTE

Name utility command-line options are case-sensitive.

file

Name of the file to process.

Table 14-5. Name Utility-Command-Line Options

Option	Effect
`-A`	Writes the full pathname or library name of an object on each line.
`-g`	Writes only external (global) symbol information; do not use this option with the `-u` option.
`-P`	Writes the information in the `POSIX.2` portable output format.
`-s`	Prints the symbol index for archives.
`-t {d | o | x}`	Writes each numeric value in the specified format: `d`-decimal `o`-octal `x`-hexadecimal (the default)
`-l`	Displays the original name of static symbols.
-m	Displays unmangled names for C++ symbols that have the format mangle_name{unmangle_name}.
`-u`	Writes only undefined symbols; do not use this option with the `-g` option.
`-V`	Displays the version of the name utility.
`-v`	Sorts output by value, instead of by name.

Figure 14-1 the output generated by the name utility.

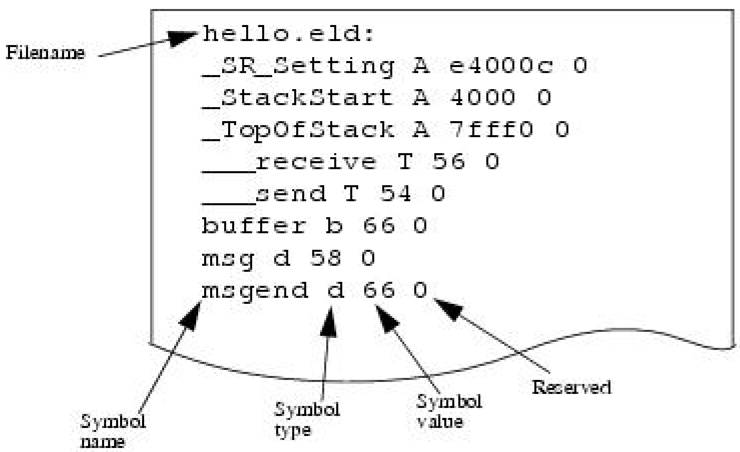


Figure 14-1. Name Utility-Output

Table 14-6 provides a key to the name utility's output.

NOTE

The uppercase letters indicate `global` symbols, while the lowercase letters indicate `local` symbols.

Table 14-6. Name Utility-Output Key

Character	Symbol Type
`U`	Undefined reference
`A` or `a`	Absolute symbol
`B` or `b`	BSS symbol
`T or t`	Text (code) symbol
`D or d`	Data symbol
`R or r`	Read-only data symbol
`N`	Debug symbol
`?`	Unknown symbol type or binding

14.6 Size Utility

Use the Size utility to output the size (in bytes) of each section of each ELF object file passed on the command line.

The default output lists totals for all `.text`, `.rodata`, `.data`, and `.bss` sections.

To invoke Size utility from the command prompt, type:

```
sc100-size [-option ...] file ...
```

NOTE

The sc100-size utility is in this directory:

```
<CWinstallDir>\StarCore_Support\compiler\bin
```

Parameters

option

Table 14-7 defines the purpose and effect of each command-line option.

NOTE

Size utility command-line options are case-sensitive.

file

Name of an ELF file.

Table 14-7. Size Utility-Command-Line Options

Option	Description
-l	Specifies long listing mode: outputs names and sizes of individual sections.
-n	Outputs the sizes of individual sections that do not get loaded.
-p	Outputs the size of all loadable segments (program view).
-V	Displays the version of the size utility.

Figure 14-2 shows two examples of size utility output.

- The default output, at the upper left, lists the totals of all text, rodata, data, and bss sections of the object file. It shows 148 text bytes, 72 data bytes, and 24 bss bytes.
- The lower right output example shows the long-listing format for the same object file. It shows that the 72 data bytes are in two files of 48 and 24 bytes.

```
text  rodata  data  bss  total
 148       0    72   24    244  corr.eln
 148       0    72   24    244  Total
```

Default Output

```
corr.eln:
            0   .default
           48   .data_input1
           24   .data_input2
           24   .data_output
          148   .text
          244   Total
```

Long-Listing Output

Figure 14-2. Size Utility-Output

Index

E

F

G

H

I

J

K

L

T

U

V

W

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