# Configuring CodeWarrior for StarCore DSPs for MSC815x/MSC825x Variants When Used with the MSC8156ADS

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Freescale offers a family of StarCore DSPs whose capabilities target different markets. These specialized parts either have fewer DSP cores or lack a data coprocessor in order to hit a specific cost or power consumption point for a design. These parts, the MSC815x and the MSC825x family, are based on Freescale's flagship part, the MSC8156 DSP.

For any new hardware project, often the required processors are scarce. To keep the software development on schedule, the code is tested on prototype devices built with substitute processors. Since the StarCore DSP variants are nearly identical to the StarCore MSC8156, this latter part can act as a substitute until the variants become available.

The danger to using the MSC8156 to fill in for a less-featured variant is that the software might accidentally make full use of its feature set. However, CodeWarrior's StarCore Project wizard can properly configure the DSP application template to use only the same resources as the variant parts, and therefore minimize this problem. This paper shows how to use the wizard for this purpose.

**Contents**

# 1 Variants Overview

The StarCore MSC815x and MSC825x family DSPs are based on the MSC8156. To understand the capabilities of these variant parts, it becomes necessary to first describe the MSC8156's feature set.

The MSC8156 is a multicore processor, and certain of these cores perform different and specialized functions. The cores are:

- Six StarCore SC3850 DSP cores that perform signal processing functions
- One Multi-Accelerator Platform Engine for Baseband (MAPLE-B) coprocessor that performs decoding operations and Fourier transform processing
- One RISC-based coprocessor that manages data transport over packet networks
- Two memory controllers
- A high speed-interface subsystem

The variants use a subset of these cores. Specifically, the MSC815x variants have fewer than six SC3850 DSP cores. The MSC825x variants lack the MAPLE-B coprocessor and have six or fewer DSP cores. The differences among the various parts are summarized in Table 1.

**Table 1. A Comparison of the Feature Set of MSC8156 and Its Variants.**

| StarCore Part | Number of SC3850 Cores | MAPLE-B Coprocessor Present |
|---|---|---|
| **MSC815x Family** | | |
| MSC8156 | 6 | Yes |
| MSC8154 | 4 | Yes |
| MSC8152 | 2 | Yes |
| MSC8151 | 1 | Yes |
| **MSC825x Family** | | |
| MSC8256 | 6 | No |
| MSC8254 | 4 | No |
| MSC8252 | 2 | No |
| MSC8251 | 1 | No |

The CodeWarrior StarCore Project wizard, based upon the processor choice, generates a DSP application template whose code is tailored to the part's specific set of features. Because the variant processors use the same SC3850 DSP core and same memory map for peripherals as the MSC8156, a DSP application configured to use only the variant's subset of features can still execute on a board built around a fully-featured MSC8156. The steps to configure the application this way are described in the sections that follow.

**NOTE**

While it is possible to use the wizard to configure a DSP application for a variant part than can execute on the MSC8156, the reverse is not true. That is, an application configured for the fully-featured MSC8156 cannot execute on a board with a variant processor.

# 2   Configure the DSP Application with the Wizard

To use the CodeWarrior for StarCore DSPs project wizard to configure an application for the MSC8154 or MSC825x family variants, follow these steps:

1.   Launch CodeWarrior for StarCore DSPs and choose **New > StarCore Project**.

The New StarCore Project wizard appears, and displays the **Create a StarCore Project** page.

2.   Type in a descriptive name for the project in the **New Project Name** text box, for example `MSC8254_board_test` (Figure 1). If you require the folder to be in a location other than the default workspace folder, uncheck the **Use default location** option, click **Browse**, and navigate to the desired folder. Click **Next**.
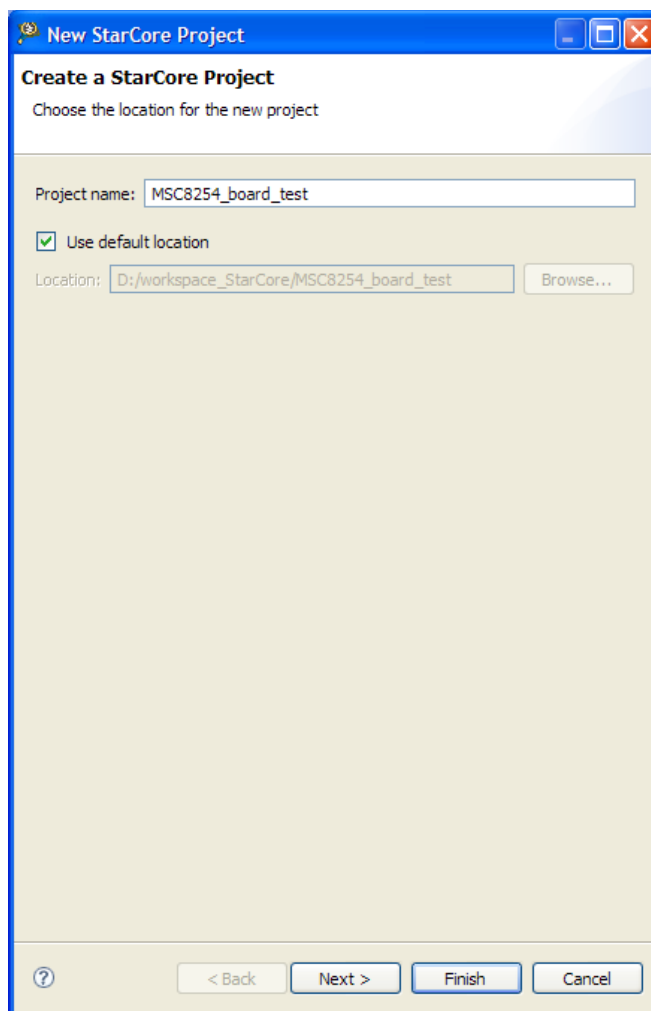


**Figure 1. The Wizard's Create A Project Page.**

The **Devices** page appears.

3.  Open the tree control for the desired StarCore variant part, say, the `MSC825x Family`. Click on the item (`MSC8254`) in the list to select the processor (Figure 2). Leave the **Project Type** option set for `Application`. Click **Next**.
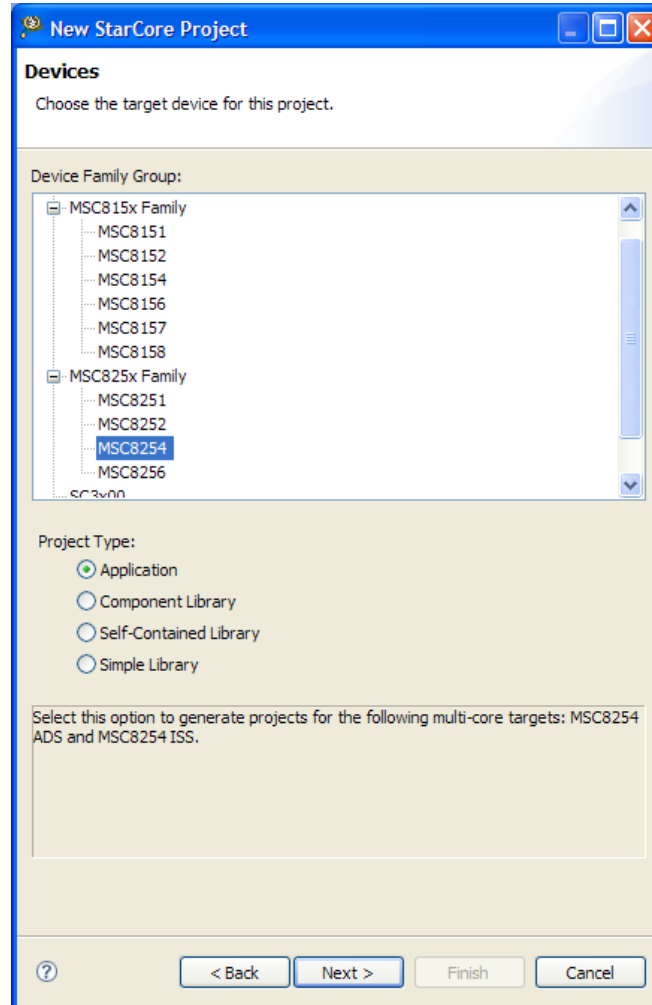


**Figure 2. The Wizard's Devices Page.**

The **Build** page appears next.

4. Choose the memory model that the application uses, and the programming language used to write the application (Figure 3). Click **Next**.
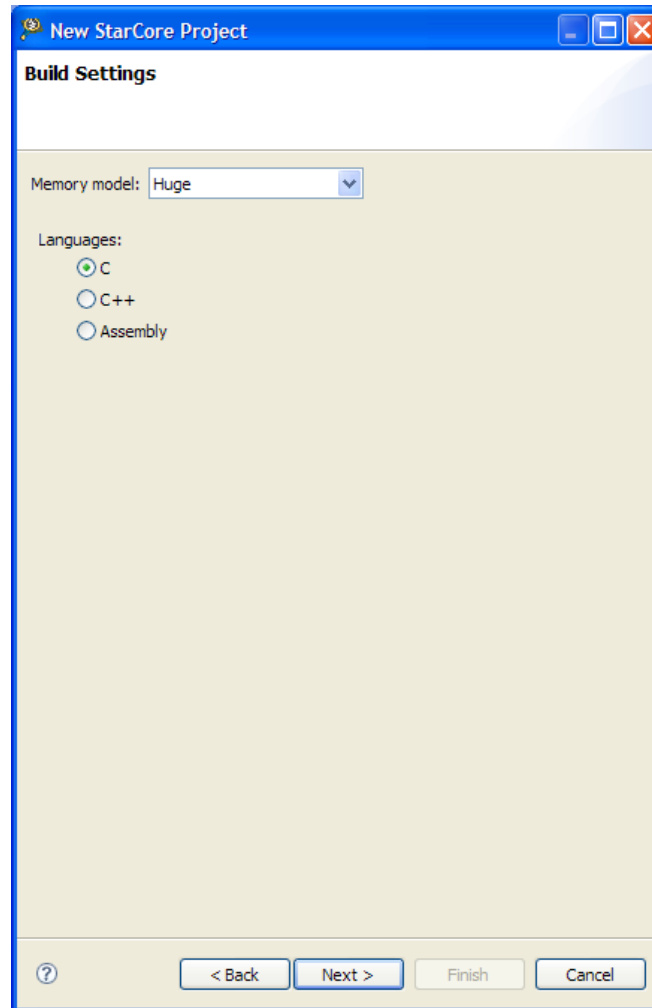


**Figure 3. The Wizard's Build Settings Page.**

The **SmartDSP OS** page appears.

5. This page allows the choice of integrating Freescale's SmartDSP OS, a real-time operating system, with the application template (Figure 4). Choose whether to add the OS or not and then click **Next**.
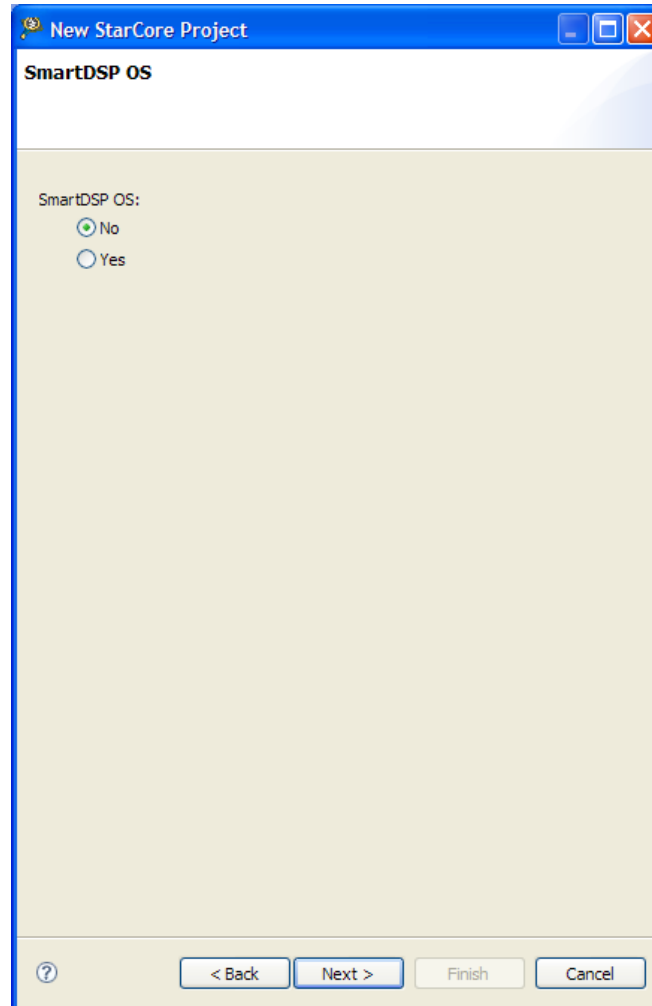


**Figure 4. The Wizard's SmartDSP OS Page.**

The **Launch Configurations** page appears.

6. This page specifies the execution target (such as hardware or simulator) and other launch configuration options. Make any changes to the default options (), and then click **Next**.
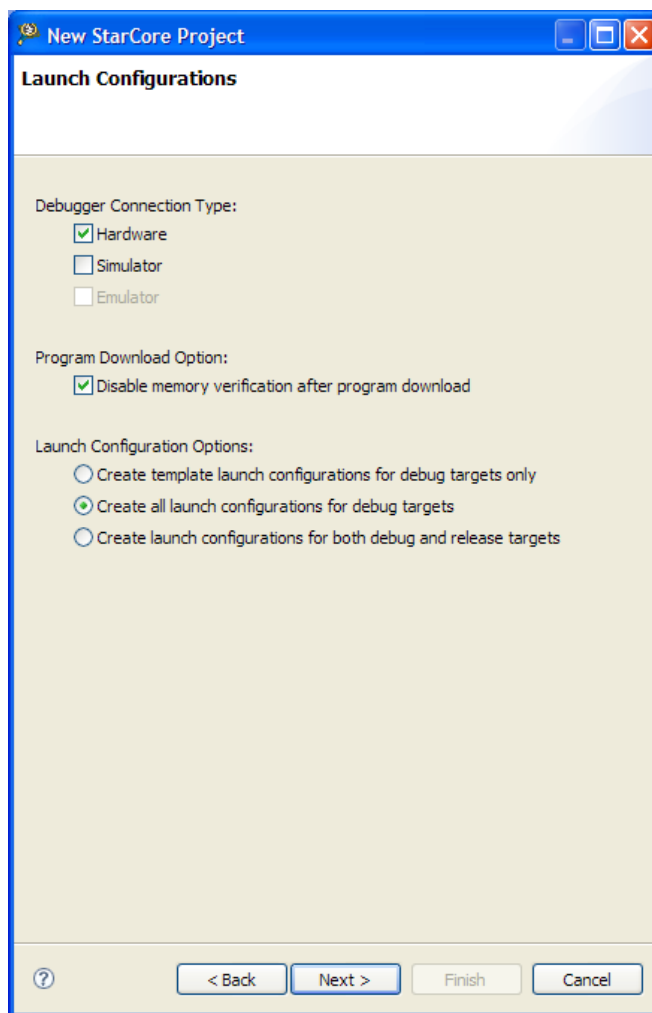


**Figure 5. The Launch Configurations Page of the Wizard.**

The **Hardware** page appears.

7. The default board for the given processor choice is the MSC8156ADS, and the `Default` settings for this board are set in the **Remote System Configuration** option. Note that all of the other board choices are disabled. Make any changes to the **Connection Type** option (Figure 6) and click **Next**.
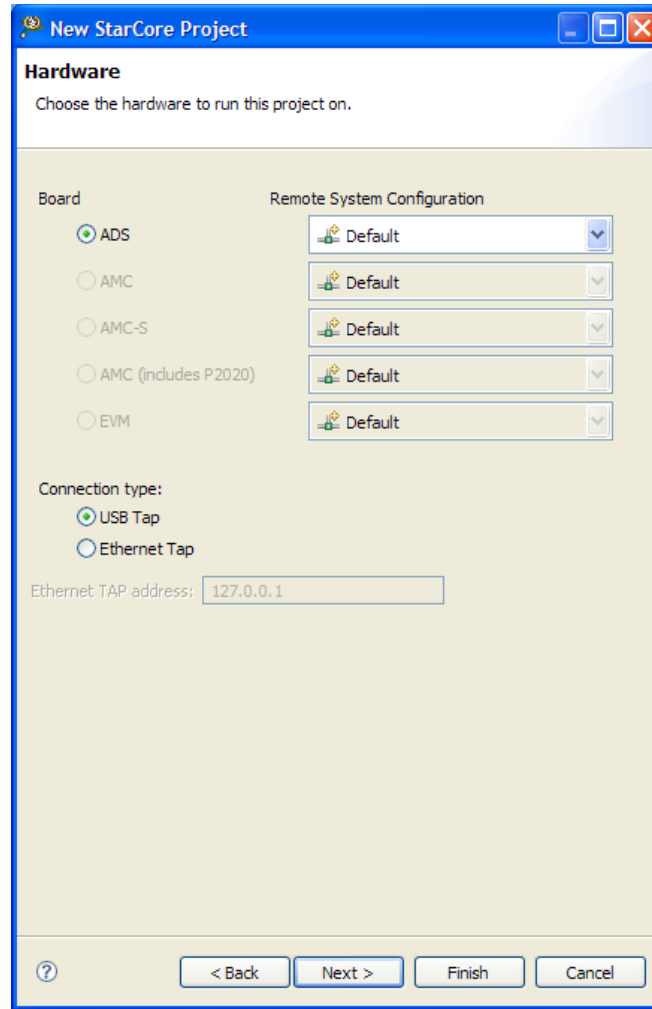


**Figure 6. The Wizard's Hardware Page.**

The **Software Trace and Analysis** page appears.

8. Check the **Enable trace and profile** if performance statistics are required. Otherwise, leave this option unchecked (Figure 7). Click **Finish**.
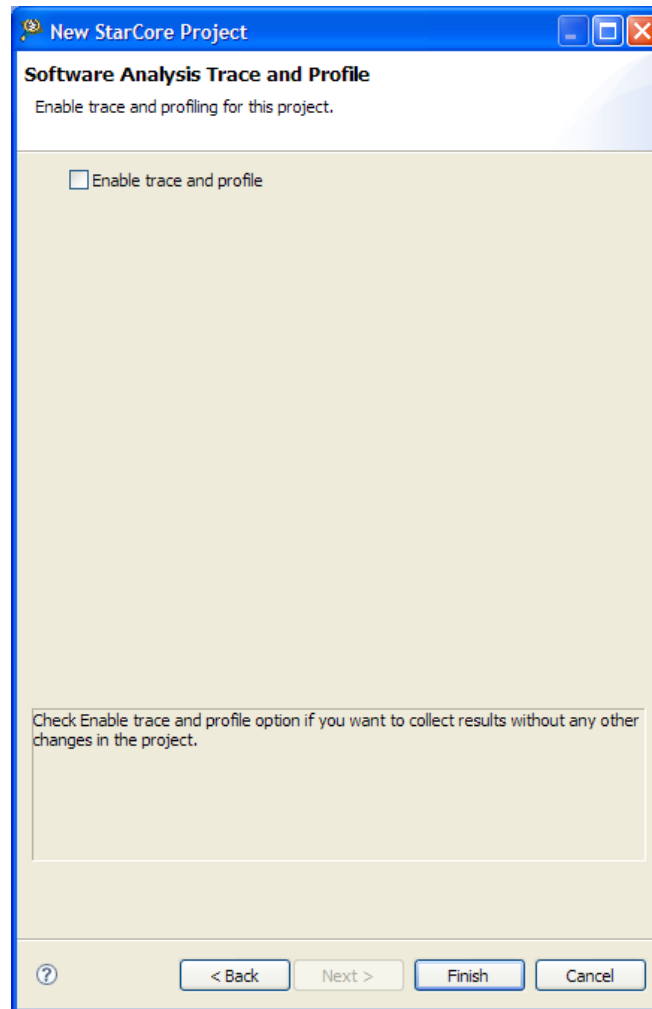


**Figure 7. The Trace and Profiling Page of the Wizard.**

The CodeWarrior StarCore Project wizard generates an application template in the specified folder and the project appears in the **CodeWarrior Projects** view (Figure 8).
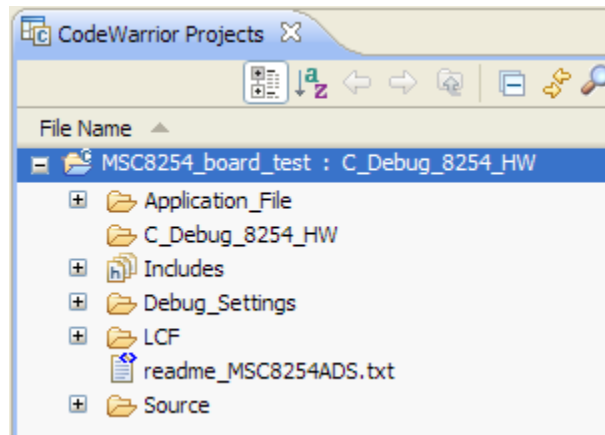


**Figure 8. The MSC8254 Project Generated by the CodeWarrior Wizard.**

# 3    Examine the Variant Project

This section describes how to examine and confirm that the DSP application is configured properly for the chosen variant. To do this, first display the various debug configurations by choosing **Run > Debug Configurations**. The **Debug Configurations** dialog appears (Figure 9).
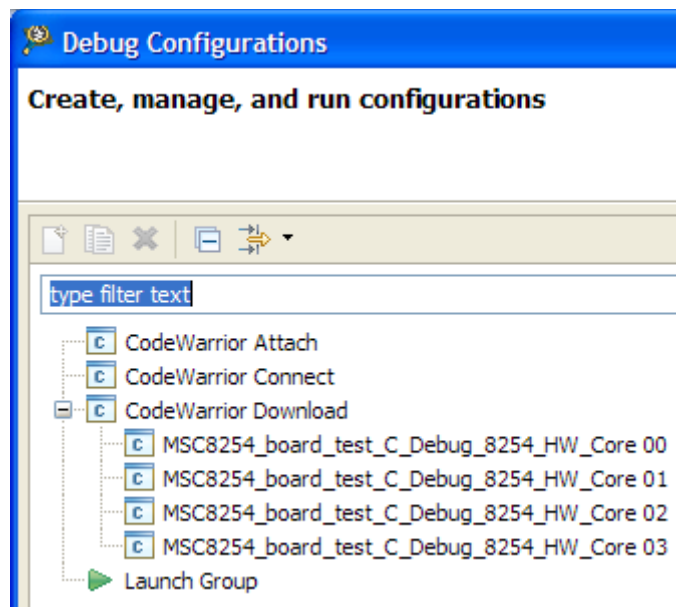


**Figure 9. The Launch Configurations Generated by the Wizard.**

Note that the CodeWarrior wizard has generated four debug configurations, one for each of the four cores in the MSC8254. Since code is assigned to a core via a debug configuration, *if the core does not have a debug configuration, no code can execute on it*. This prevents the DSP application from accidentally using any DSP cores on the MSC8156ADS beyond those defined by the wizard.

A launch group is required to start the DSP application properly. To make one, in the **Debug Configurations** window click on the **Launch Group** icon at the bottom of the launch configurations list. Next, click on the **New launch configuration** icon. A **New Configuration** window appears at the right. Name the configuration MSC8254_Launch_Group. Click **Add**. In the **Add Launch Configuration** dialog that appears, expand the **CodeWarrior Download** choice and select all four of the launch configuration that the wizard just made. Click **OK**. The four items appear under the **Launches** tab. Click **Apply** to save the launch group. For further information on how to set up a launch group, consult the *Freescale Eclipse Extensions Guide*.

A click on the launch group name, MSC8254_Launch_Group, displays the debug configurations associated with the group (Figure 10).This launch group has preset all actions to affect all four debug configurations. For example, clicking on **Debug** when this launch group is selected has the debugger load and start code execution on all four DSP cores simultaneously.
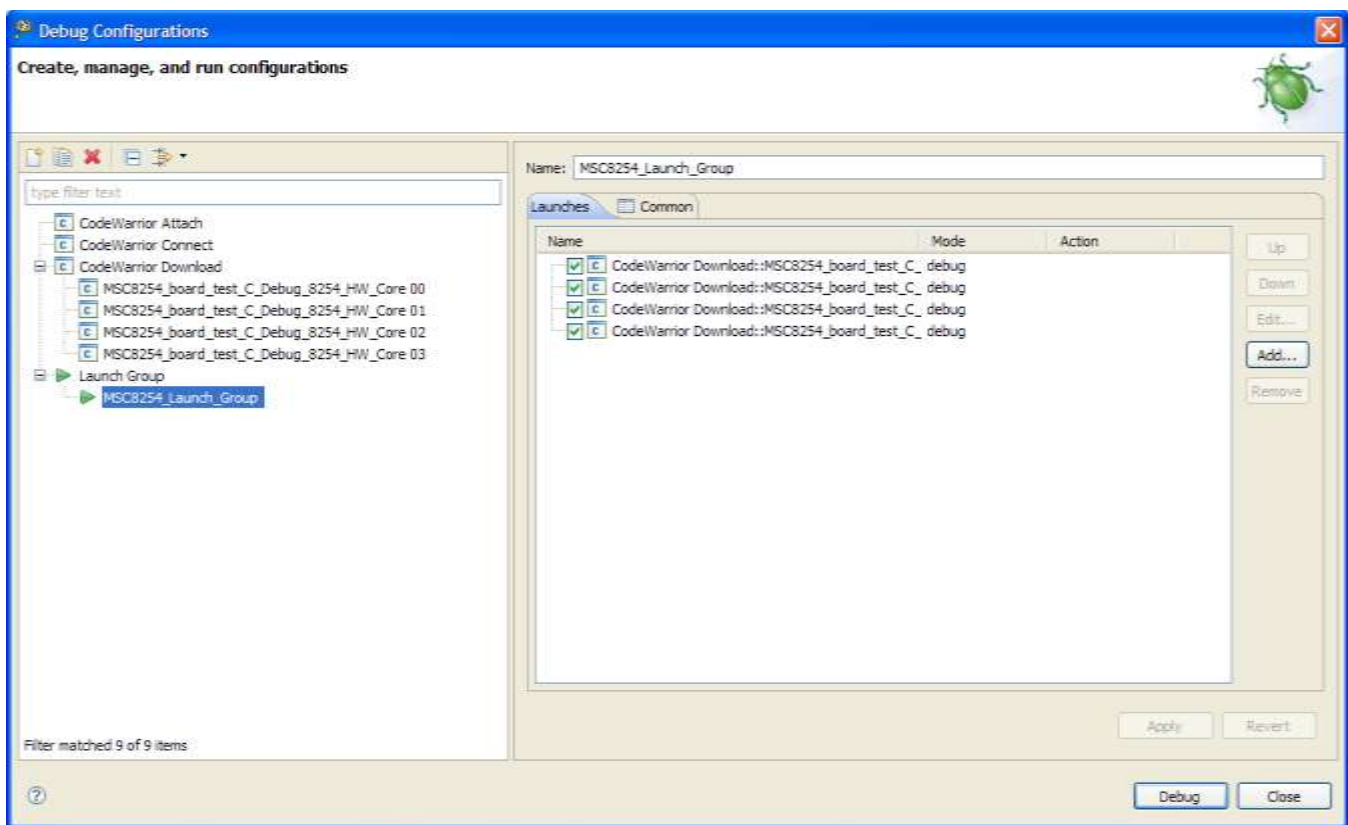


**Figure 10. The MSC8254 Launch Group and the Launch Configurations It Controls.**

# 4    Building and Running the Variant Project

To build the variant application, click on the project name in the **CodeWarrior Project** view and then choose **Project > Build Project**, or click on **Debug** in the **Debug Configurations** dialog to build and launch the application's components in the CodeWarrior debugger. During the download process for debugging, a warning message appears in the **Console** view, stating that there is a mismatch between the project's processor type and that of the processor on the target board. See Figure 11.



**Figure 11. The Error Message Warning of a Hardware Mismatch.**

This warning is normal when an application configured for anything other than an MSC8156 processor runs on a MSC8156ADS board. The application, however, executes properly on the board under debugger control.

## NOTE

If an attempt to debug a DSP application configured for a more-capable variant is made on a variant with fewer features, the debugger displays an error message. For this situation, the DSP application cannot be debugged.

Table 2 summarizes the combination of DSP application features and variant hardware that determine whether an application can be debugged. Combinations marked in gray are not allowed, and an error message is displayed.

**Table 2. Permitted Variations Between CodeWarrior Processor Choice and the Target Hardware.**

| Actual device on board | User's selection of processor in CodeWarrior StarCore wizard | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | MSC8156 | MSC8256 | MSC8154 | MSC8254 | MSC8152 | MSC8252 | MSC8151 | MSC8251 |
| MSC8156 | Allowed | Allowed | Allowed | Allowed | Allowed | Allowed | Allowed | Allowed |
| MSC8256 | | Allowed | | Allowed | | Allowed | | Allowed |
| MSC8154 | | | Allowed | Allowed | Allowed | Allowed | Allowed | Allowed |
| MSC8254 | | | | Allowed | | Allowed | | Allowed |
| MSC8152 | | | | | Allowed | allowed | Allowed | Allowed |
| MSC8252 | | | | | | Allowed | | Allowed |
| MSC8151 | | | | | | | Allowed | Allowed |
| MSC8251 | | | | | | | | Allowed |

These same steps can be used to build DSP applications configured for the MSC8154, MSC8256, MSC8152, MSC8252, MSC8151, and the MSC8251. The applications generated by the CodeWarrior StarCore Project wizard for these variants can also be tested on the MSC8156ADS board.

# 5    Revision History

Table 3 provides a revision history for this application note.

**Table 3. Revision History**

| Rev. Number | Date | Substantive Change |
|:---:|:---:|---|
| A | 4/09/10 | Initial creation. |
| 1 | 2/02/11 | Revised to reflect new features of CodeWarrior for StarCore DSPs v10.1.8. |

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