Getting Started with the Microcontroller Student Learning Kit (MCUSLK)

Using the MC9S12C32 MCU Development Module (CSM-12C32)

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Overview

This document will guide you through all the steps necessary to begin development on an HCS12 Family microcontroller unit (MCU) using your MCUSLK. The hardware setup section will walk you through configuring the MCU project board for use with the MC9S12C32 MCU development module (Axiom's CSM-12C32). The software setup section will assist you install the Metrowerks' CodeWarrior software and show you how to create, build, and debug your application. Refer to the MCU project board user guide, MC9S12C32 MCU development module user guide and Metrowerks' CodeWarrior documentation for details. A list of all related reference material is listed in the Hardware References and Software References sections.

freescale™
semiconductor

Hardware References

For *Freescale's Microcontroller Student Learning Kit: Prototyping Environment for Education* product preview, refer to:

MCU Student Learning Kit Product Preview

For the *MCU Project Board: Prototyping Board with Microcontroller Interface* user guide, refer to:

MCU Project Board User Guide

For the *MC9S12C32 Development Module Board* (CSM-12C32) user guide, refer to:

MC9S12C32 Development Module Board User Guide

For more information on *Freescale Semiconductor's MC9S12C32 (16-bit) microcontroller*, refer to:

MC9S12C32 Product Page

MC9S12C32 Device User Guide

Software References

For more information on Metrowerks' CodeWarrior for HC(S)12 development tools, refer to:

CodeWarrior for HC(S)12 Product Page (Metrowerks Website)

CodeWarrior for HC(S)12 Product Page (Freescale Website)

CodeWarrior for HC(S)12 Download Site (Dev Tools + Special Edition License)

For instructional material about how to use Metrowerks' CodeWarrior development tools, refer to:

CodeWarrior for HC(S)12 Documentation plus Newsgroup

CodeWarrior Development Tools Technical FAQs

AN2616: Getting Started with HCS08 and CodeWarrior Using C

AN2596: Using the HCS08 Family On-Chip Real-Time ICE with Metrowerks CodeWarrior Development Tools

Hardware Setup

Unpack
1. Open the shipping carton and remove the contents. Verify that all packing list items have been received.
2. Inspect both the MCU project board and the MCU development module for any damage, which may have occurred during shipping. If damage is found, contact the manufacturer at support@axman.com for assistance.

Configuring the MCU Project Board
1. To begin, place the MCU project board on a flat sturdy surface. Ensure sufficient space is available around the project board to safely construct and test prototyped circuits.
2. Configure the PWR_SEL and option header, JP1. Install a jumper as shown below.
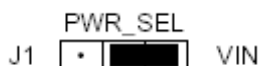
NOTE
The settings described in this document are for configuring the MCU project board in stand-alone mode. These settings are not appropriate for using the project board in conjunction with the NI-ELVIS system.
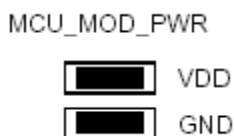
3. Configure the VDD_SEL option header, JP2. Install a jumper as shown below.
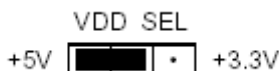
CAUTION
This option jumper selects the operating voltage level for the MCU development module. Select the proper operation voltage for the attached MCU development module.

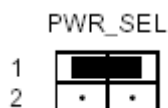4. Configure the MCU_MOD_PWR option header, JP3. Install jumpers as shown below.

CAUTION
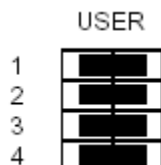*Install jumpers only as shown; otherwise, damage to the on-board voltage regulators will result.*

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5. Configure the MCU development module PWR_SEL option header. Install jumpers as shown.

PWR_SEL

6. Configure the MCU development module USER option header. Install jumpers as shown below.

USER

7. Install the MCU development module in the MCU_PORT connector on the project board. Align pin 1 of the MCU development module with pin 1 of the MCU_PORT connector on the project board.

8. Connect the serial cable to an available COM port on the host PC. Connect the other end of the serial cable to the COM port on the MCU project board.

9. Connect the 6-pin ribbon cable from the BDM_OUT connector on the MCU project board to the BDM_PORT connector on the MCU development module. Make sure to align pin 1 on both BDM connectors with the red stripe on the 6-pin ribbon cable.

10. For the BDM pod interface to program, erase, and debug the microcontroller on the MCU development module, configure the MCU project board COM_SEL option header, JP7 to the BDM position. Install jumpers as shown below.

RS-232	MON08	BDM
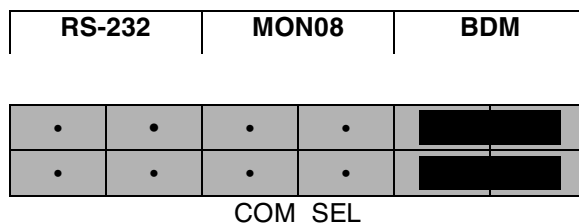
COM_SEL

CAUTION

Install jumpers in horizontal position as shown; otherwise, communication to the MCU development module will not work. If applying MON08 or RS-232 (not BDM) communication through the MCU project board, adjust COM_SEL option header appropriately.

11. The remaining option-selection jumper settings should stay in default position.

12. Plug the transformer into a standard 120-Vac wall outlet. Connect the transformer power cable to the VIN jack on the MCU project board.

CAUTION

Do not connect power to the MCU development module while the module is connected to the MCU project board.

13. Verify that the +3.3V LED and +5V LED on the MCU project board are lit.

14. Verify that the PWR LED on the MCU development module is lit.

15. If the LEDs in steps 13 and 14 are not lit, make sure the jumper options are set as described in steps 2 through 6. Also, see the troubleshooting tips section in the MCU project board user guide.

16. The MCU project board and MCU development module is now ready for use.

Software Setup

To install and register CodeWarrior development tools for HC(S)12 MCUs onto a host PC, follow the instructions outlined in sections A and B of the quick start pamphlet found inside the *CodeWarrior Development Studio for Motorola HC(S)12 Microcontrollers: Special Edition* CD case. Make sure to request the special edition license when registering.[1] The special edition version of CodeWarrior is necessary for developing applications for the MC9S12C32 MCU development module.

> **NOTE**
> *Periodically check the corresponding development tool product page for patches and updates. For questions on CodeWarrior development tools, contact support@metrowerks.com*

Creating and Building a Project in CodeWarrior Environment

After properly installing and registering the CodeWarrior development tools as described in the Software Setup section, you can now begin to develop your application for a target microcontroller. This section will create and build a project under the CodeWarrior for HC(S)12 development tool platform.

> **NOTE**
> *The instructions below are slightly different from the steps described in the quick start pamphlet included in the CodeWarrior for HC(S)12 development tools CD case. The instructions below are adjusted for the MCUSLK and MC9S12C32 development module.*

1. **Launch the CodeWarrior IDE**

   a. Select: Start > Programs > Metrowerks CodeWarrior > CW12 V3.1; a menu will appear

   b. Select: CodeWarrior IDE; IDE will start and a CodeWarrior window will appear

2. **Create a new project**

   a. From IDE main menu bar, select: File> New; a new window will appear (see Figure 1)

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1. Registering will email you instructions for how to acquire the special edition license. After you acquire the special edition license, place it in the root CodeWarrior directory. If you encounter problems with registration, you can acquire your special edition license online at http://www.metrowerks.com/MW/Develop/Embedded/HC12/Downloads.
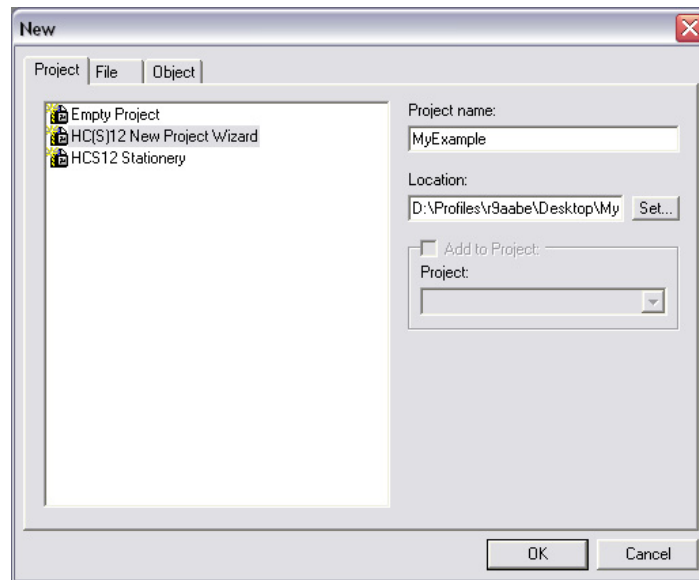
Figure 1. New Window

b.   Select: "HC(S)12 New Project Wizard"

c.   In the "Project name" text box, type the name you want to give the project (IDE automatically adds .mcp extension when it creates project)

d.   In the "Location" text box, set location where you want the project to be created

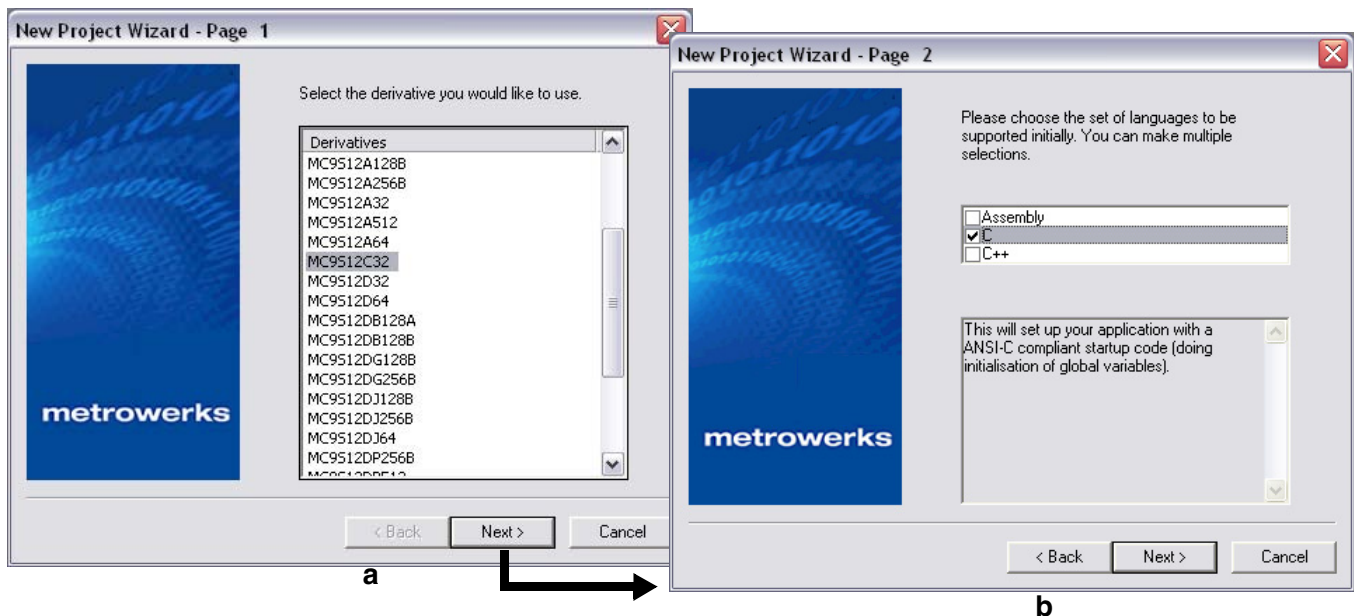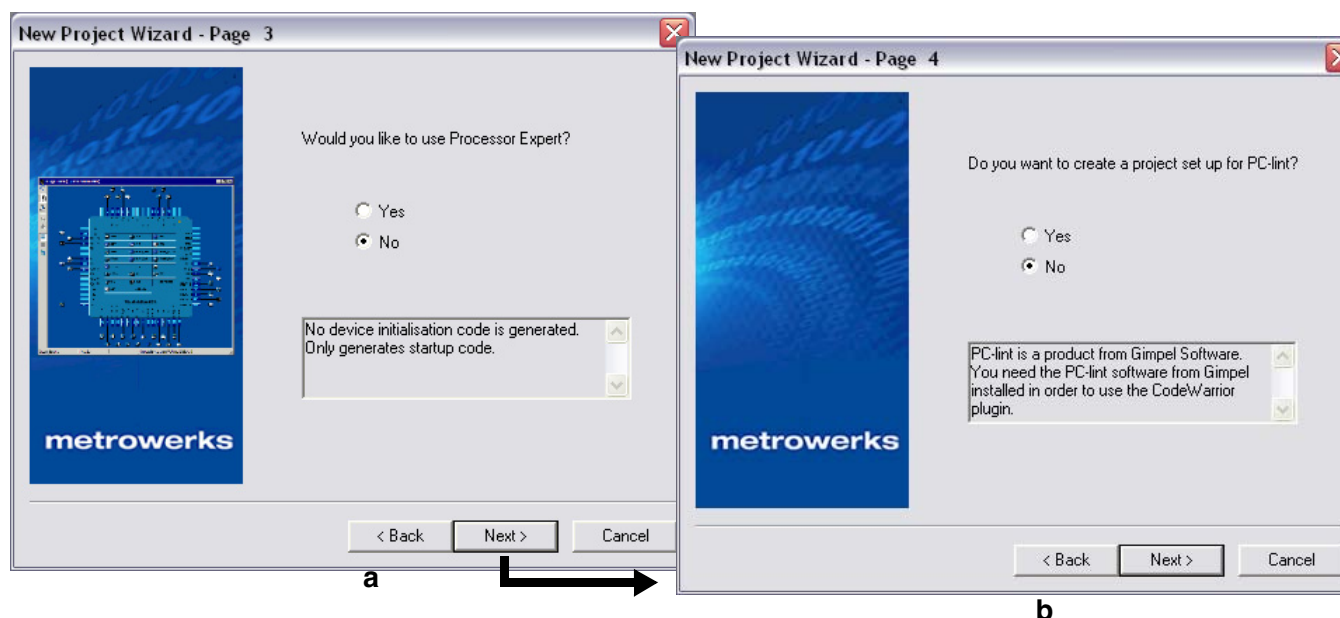e.   Click "OK" — the first page of the new project wizard will appear (see Figure 2a)

Figure 2. New Project Wizard — Page 1 and Page 2

f.   Select "MC9S12C32"

g.   Click "Next" — Page 2 of the new project wizard will appear (see Figure 2b)

h.   Make sure "C" checkbox is marked (if using assembly or C++, mark the respective selection)

i.   Click "Next" — Page 3 of the new project wizard will appear (see Figure 3a)

Figure 3. New Project Wizard — Page 3 and Page 4

j.   Select "No", you do not want your project configured with Processor Expert

k.   Click "Next" — Page 4 of the new project wizard will appear (see Figure 3b)

l.   Select "No", you do not want your project configured to work with PC-lint

m.   Click "Next" — Page 5 of the new project wizard will appear (see Figure 4a)
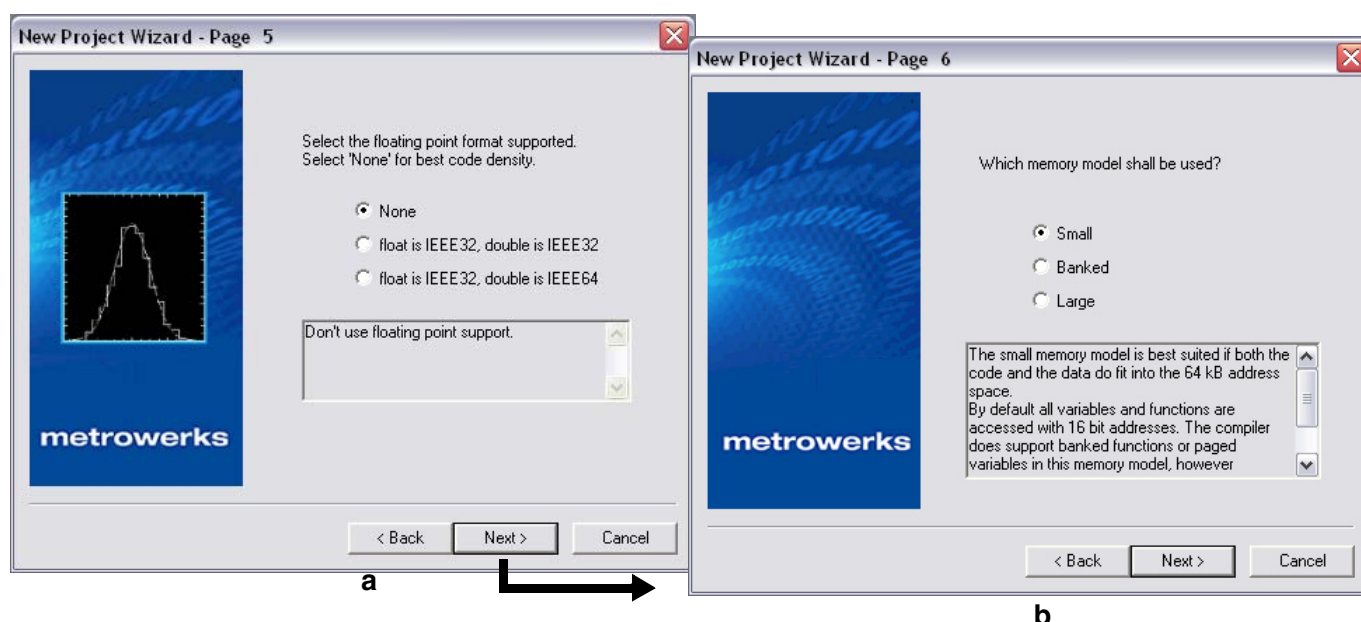
Figure 4. **New Project Wizard — Page 5 and Page 6**

n.   Select "None", you do not want to specify a floating point format

o.   Click "Next" — Page 6 of the new project wizard will appear (see Figure 4b)

p.   Select "Small" memory model

q.   Click "Next" — Page 7 of the new project wizard will appear (see Figure 5)

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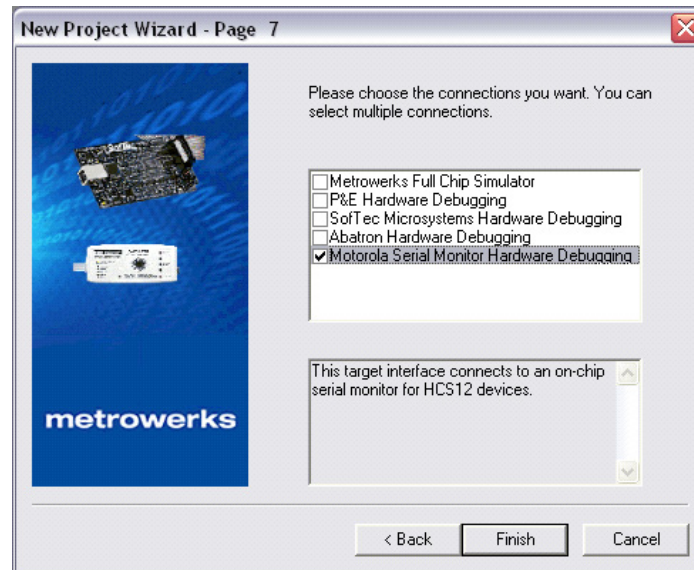
Figure 5. New Project Wizard — Page 7

r.   Page 7 allows you to specify connections that the project should be configured to support. Select "Motorola Serial Monitor Hardware Debugging"

s.   Click "Finish" — the wizard creates a new project based on information you specified. A project window will appear, docked at left side of main window (see Figure 6)
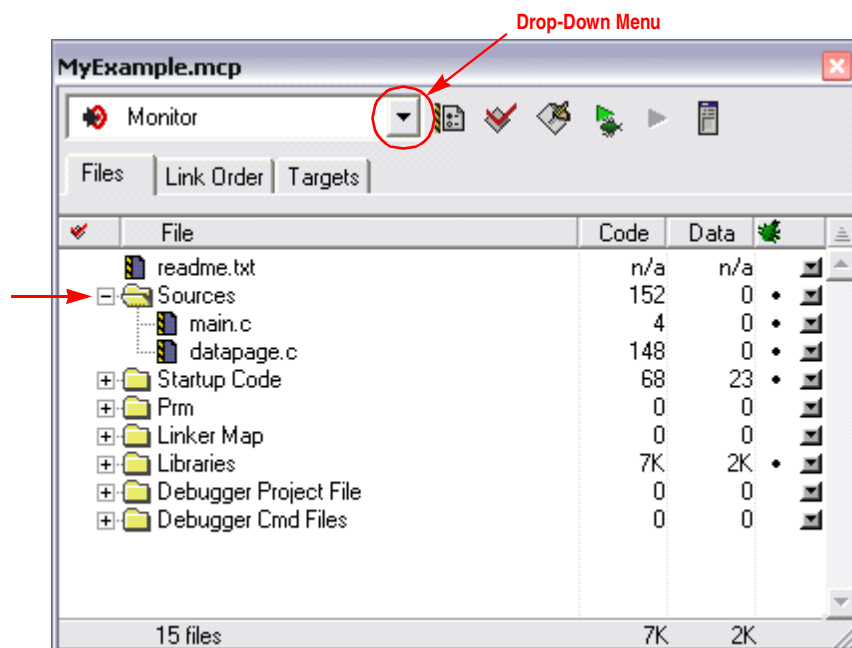
Figure 6. **Project Window**

NOTE

To undock the project window, double-click the docking handle (double gray lines at top of the project window). To re-dock window, right click in title bar of project window, and select "docked".

3. **Select build target**

   Your project can contain multiple build targets. For this example, we use the monitor build target, which uses the BDM pod on the MCU project board. This BDM pod provides bidirectional communication between the microcontroller and the debugger. See step 9 of the Configuring the MCU Project Board section for how to connect the MCU and debugger.

   a. Click the drop-down menu of the project window (see Figure 6)
   b. Select "Monitor"

4. **Edit source code**

   a. Click the "+" sign next to the "sources" folder to reveal files (see Figure 6)
   b. Double-click the main.c file; an editor window will open and display the contents of main.c
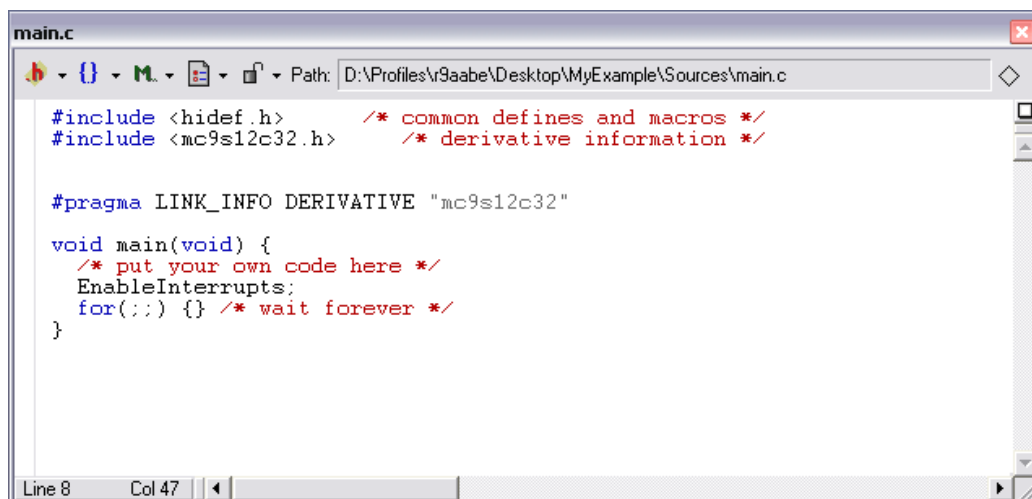
Figure 7. **main.c in Editor Window**

   c. Make changes to the contents of main.c file, if desired
   d. If you make changes to main.c, from IDE main menu bar, select File> Save

5. **Add files (if appropriate)**

   a. Highlight the "sources" folder
   b. From the IDE main menu bar, select "project"; a menu will appear
   c. Select "add files"; a dialog box will appear
   d. Navigate to that directory that contains the file you want to add
   e. Highlight the filename of the file you want to add to your project
   f. Click "open"; the "add files" dialog box will appear
   g. Check the checkbox for each build target to which the file applies
   h. Click "OK"; the "add files" dialog box closes. In the "project" window, the filename of added file will appear under the "sources" folder

6. **Build project**

   a. From IDE main menu bar, select "project"
   b. Select "make"; IDE builds (assembles, compiles, and links) project; error and warnings window will open and show error messages and warning messages, if appropriate

Debugging your Application

The following steps explain how to establish communication and upload your application software to the MC9S12C32 MCU development module (CSM-12C32). This will allow you to debug your application through Metrowerks' True-Time Simulator & Real-Time Debugger using the BDM pod interface on the MCU project board. The Hardware Setup and Software Setup sections must be completed before executing the steps in this section.

1. Reset the BDM pod connection by pressing the BDM RESET pushbutton (PB9) in the BDM pod area on the MCU project board

2. Start debugger

   a. From the main menu bar in CodeWarrior IDE, select "project"

   b. Select "debug"; Debugger window will open in monitor target

NOTE

If prompted by debugger with a monitor setup window, select the appropriate host PC COM port being used by the BDM pod and click "OK".
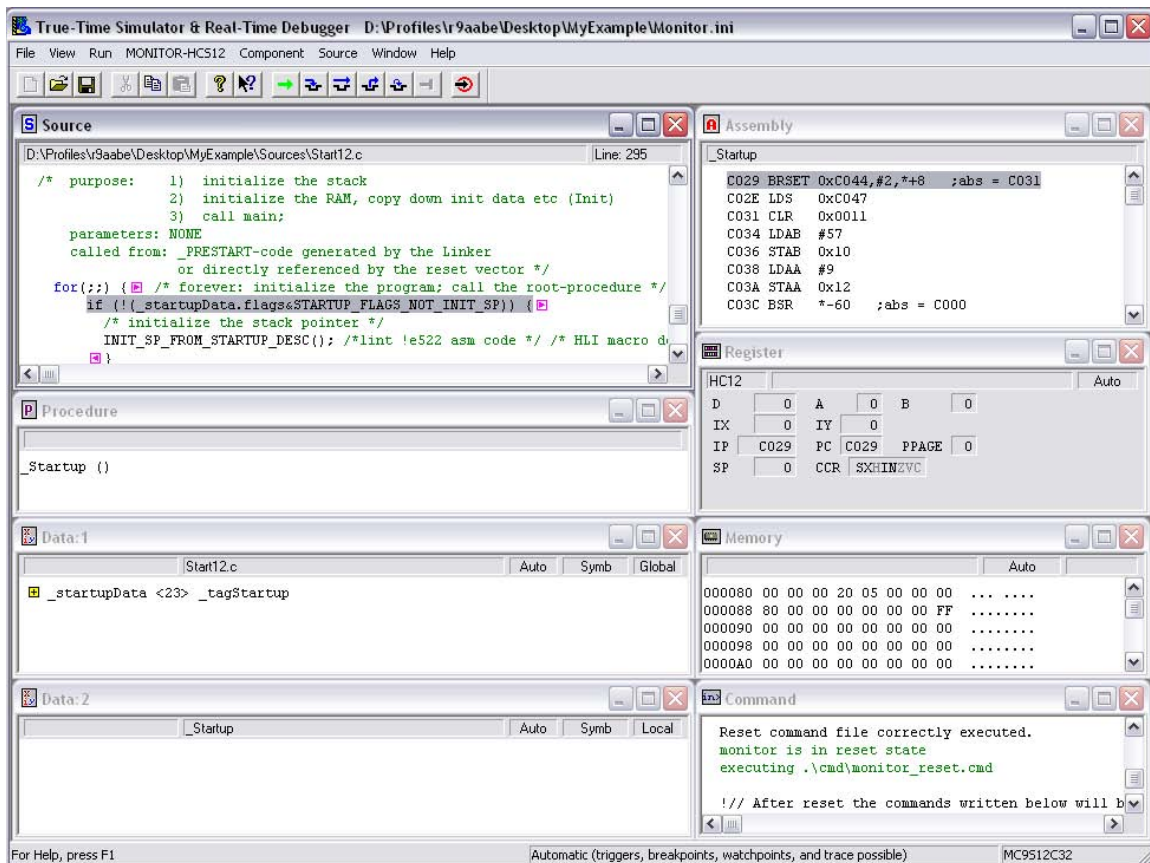
Figure 8. **Debugger Window**[1]

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1. For a description of debugger windows, see Table 1

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Table 1. Debugger Windows

Window Name	Description
Source and Assembly	Display programmed application software in C and assembly programming languages, respectively
Register	Displays the MCU internal registers
Memory	Displays the active value at each memory address in the MCU internal memory map
Procedure	Displays the active procedure being evaluated
Data 1 and Data 2	Display any global or local variables in your application software and their active value
Command	Allows user control and logs commands executed

3. Reset the target by clicking on the reset target icon, [icon] .

4. Right-click on "source" window and select "open source file"; "Source files" menu will appear. To view between source files in your application software, select the appropriate file in the menu, then click "OK"

5. Right-click on executable line of source code in "source" window to set breakpoints or triggers in program code

6. Run application

   a. From debugger main menu, select "run"; "Run" menu will appear

   b. Select "Start/continue"; program will execute until encountering first breakpoint (if breakpoint is present); Command pane displays program status

NOTE
Alternatively, you can click on start/continue icon [icon] in the debugger taskbar

7. Click start/continue icon, [icon], to resume program code execution (if breakpoint occurred) or click halt icon, [icon], to stop program execution

NOTE
The debugger taskbar includes other icons for debugging which allow single step [icon], step over [icon], step out [icon], assembly step [icon], and reset target [icon] functions.

8. In the debugger window tool bar, select: File> Exit (to exit debugger)

9. In the IDE main window tool bar, select: File> Exit (to exit CodeWarrior IDE)

Congratulations! You have successfully developed a project using Metrowerks CodeWarrior development tools and your MCUSLK!

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