Using CodeWarrior for Assembler and C Programming

These instructions are for the MC9S12DP256B derivative of the HCS12 Microcontroller

These instructions will guide through the steps to create:

1. Assembler programs in Code warrior **or**
2. C programs in Code Warrior **or**
3. Assembler and C programs in Code warrior

Follow these instructions carefully

Part 1: Creating a Project in Code Warrior

1. Start CodeWarrior. Select **Create new project**. Select the correct derivative of the HCS Microcontroller by clicking on **HCS12**, click on **HCS12D Family** and then click on the **MC9S12DP256B**. For **Connections** be sure that **Full Chip Simulation** is highlighted. Click on Next.

In **Project Parameters** select one of the choices below:

- **Absolute Assembler** – for an Assembler program project
- **C** - for a C program project
- **C and Relocatable Assembler** - for a project with Assembler and C programs

2. Under **Location** specify a folder and a **Project Name** to save your files. Click on Next.
3. On the **Add Additional Files** page, unclick **Copy files to project**. Click on Next.
4. On the **Processor Expert** page, select **None**. Click on Next.
5. If you are creating a C file, then on the **C/C++ Options** page menu, select **ANSI startup** code, **Small memory model** and **None** for the floating point format. Click on Next. If you are creating an Assembly only program this page will be skipped.
6. Select **None** for **PC_Lint**. Click on **Finish**. CodeWarrior will now create your project. If you are creating an Assembly only program this page will be skipped.

Part 2: Configuring Code Warrior

Absolute Assembly Code only projects

1. On the CodeWarrior main menu, select **Edit** - **Standard Settings**. Click on **Burner for HC12**, then click on **Options**. Select and open the **Configure S-Records** option and unclick the **No S9-record** option. Click on OK. Click on OK to exit **Standard Settings**.

C and C & Relative Assembly Code projects

1. On the CodeWarrior main menu, select **Edit** - **Standard Settings**. Click on **Burner for HC12**, then click on **Options**. Select and open the **Configure S-Records** option and unclick the **No S9-record** option. Click on OK. Click on OK again to exit **Standard Settings**.

   Editing Project.prm file

2. CodeWarrior uses a linker file called Project.prm that tells the compiler where to put the program and data. In the window which lists the project files, select **Project Settings** - **Linker Files** -**Project.prm**. Click on this file to open it.

Find the following line in this file

```
RAM = READ_WRITE 0x1000 TO 0x3FFF ;
```

change it to

```
RAM = READ_WRITE 0x1000 TO 0x1FFF ;
PROG = READ _ONLY 0x2000 TO 0x3C00 ;
```

Next, find the line

```
INTO ROM_C000/* , ROM_4000 */ ;
```

change it to

```
INTO PROG/* , ROM_ 4000 */ ;
```

Now find the line

```
VECTOR 0 _Startup        /* reset vector: this is the default entry point for a C/C++ application. */
```

comment out this line using //.

Close and Save **the Project.prm** file.

To save time in the future, when you create a new C project use Windows Explorer to copy a correctly edited version of the **Project.prm** file to any new project you create. Delete the unedited version of the **Project.prm** file (highlight the file, right click with your mouse and select Remove) and then copy the edited version of the file using Windows Explorer to the **Linker Files** folder in the new project in CodeWarrior.

Part 3 - Creating Listing Files

In CodeWarrior the creation of a listing file is not mandatory when trying to Compile/Assemble the project but are helpful when trying to troubleshoot or better understand program code.

The source code files, found in the Sources folder, are called main.asm and main.c. These names work in Absolute Assembly Code only and C projects but can cause difficulty in C and Relative Assembly Code projects.

Absolute Assembly Code only projects

1. On the CodeWarrior main menu, select **Edit** - **Standard Settings**, select **Target** - **Assembler for HC12**, then click on **Options**. Click on the **Output** tab, and select the **Generate Listing File** option. Click on OK.

2. You should also select "Do not print included files in listing file".

3. The listing file is called main.lst and is found in the **bin** subdirectory of the CodeWarrior project.

C Projects

1. On the CodeWarrior main menu, select **Edit** - **Standard Settings**. Select **Target** - **Compiler for HC12**, then click on **Options**. Click on the **Output** tab, and select the **Generate Listing File** option. Click on OK.

2. The listing file is called main.lst and is found in the **bin** subdirectory of the CodeWarrior project.

C and Relative Assembly Code projects

As mentioned above the source code files are called main.asm and main.c. As CodeWarrior will attempt to create listing files main.lst for both files the results will be unpredictable. It is essential then that the assembly source file is renamed. To rename main.asm double click quickly on the filename until you see the file name contained in a box. Using the CodeWarrior main menu, click on **File** and then **Save As** and give the file a meaningful name. You can now configure CodeWarrior to generate listing files as described above.

Part 4: Writing your Programs

Depending on whether you are writing an Assembler program, a C program or a C and Assembler program do the following as required:

1. Click on **main.c** to open it, highlight and delete the contents of the file and then copy your C code for your program into this file while keeping the required parts of the file as appropriate (included files for example). See your instructor for details.

2. Click on **main.asm** to open it, highlight and delete the contents of the file and then copy your Assembler code for your program into this file while keeping the required parts of the file as appropriate. If you are using **Absolute Assembler** then use an org statement in your code. If you are using **Relocatable Assembler** do not use an org statement in your code. See your instructor for details.

3. You can edit your source file outside of CodeWarrior using Notepad for example. Once you have edited the source file (main.asm or main.c) when you open the project again in CodeWarrior all edits to the source code will be seen.

Part 5: Compiling/Assembling your files in Code warrior

1. On the CodeWarrior main menu, select **Project** - **Make**. The code will be assembled/compiled and any syntax errors will be displayed. Correct them and compile again if needed.

2. For C and C and Assembler files, CodeWarrior generates a file **Project.map** in the Project files window. The file **Project.map** shows the addresses of the C functions and of any global variables. The **Project.map** file also shows the program entry point in the **STARTUP SECTION**. You can determine the program entry point address for your code. This is required to be able to execute your code – see Part 5.

3. The listing file will be called main.lst and is found in the **bin** subdirectory of the CodeWarrior project. The listing file includes the C statements as well as the assembly language which was generated.

Part 6: Downloading and Executing your files in AsmIDE

4. Once your program source files have been successfully compiled/assembled using the Make command and an .s19 file has been generated, open AsmIDE and download the .s19 file and run your program as you have previously done in previous courses. The .s19 file is found in the .bin directory of your project directory and is called **project.abs .s19**. This .s19 file has the same name for all projects.

5. The source code files (main.asm or main.c) are found in the Sources subdirectory.

   For Assembler only files, execute the program by typing g 2000 assuming that you used an org $2000 in your code.

   For C and C and Assembler files type g <entry point address> - where the entry point address is found in Part 2 above

Part 7: Downloading CodeWarrior

You can find a link on the course web site to download CodeWarrior. Or you can go directly to:

http://www.freescale.com/webapp/sps/site/overview.jsp?code=CW_SPECIALEDITIONS&tid=CWH
Choose the fifth link offered Special Edition: CodeWarrior for HCS12(X) Microcontrollers (Classic) ver 5.1

If you are installing CodeWarrior with Windows 7, you will need to make the following change. Right click on the shortcut icon for CodeWarrior. Click on **Properties** and select the **Compatibility tab**. Click on **Disable desktop composition** and then click on Ok.

Part 8: Additional Comments

Searching for Register and Port Addresses in CodeWarrior

In CodeWarrior project click on the mc9s12dp256.h file. Click on the **Search** menu item and then **Find**. Search for the addresses of Registers or Ports needed.

Coding of Numbers

Example: The number 255 is coded as:

Format	Assembler program	C program
Decimal	255	255
Hex	$FF	0xFF
Binary	%11111111	n.a.

Port Labelling

For the various ports, the bits are labelled from 0 to 7 but the pins are labelled from 1 to 8.

Application Note
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