



68HC12 FAMILY

EMBEDDED C USING CODEWARRIOR

Getting Started Manual

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WHY AM I READING THIS MANUAL?

If you have purchased an HC12 module, with a docking module, from Technological Arts and are wondering what to do next, you are at the right place! Or, if you have been accustomed to programming in assembly for most of your career and you want to get your feet wet in embedded C, using CodeWarrior 3.0, then this manual should give you a good start.

Before you dive in and start creating robots or an alarm system to alert you about visiting in-laws, you will need an overview of the CodeWarrior 3.0 environment to get you started.

This graphic oriented step-by-step guide will show you how to:

- Create a project
- Write a simple source code, using embedded C
- Make file
- Download the code to your HC12 module
- Pat yourself on the back when you have completed this task and then gloat to your friends about how you spent \$130 to press buttons and see lights turn on.

You can program the HC12 to do a lot more once you have become familiarized with programming some of the many features of the HC12 including:

- Timer functions to measure frequencies or generate pulses to vary motor speed among other things
- Analog to Digital Conversion for extracting data from the outside world
- The SCI and SPI for communicating with asynchronous and synchronous peripherals respectively (keyboards, mice, monitors etc.)
- Parallel ports to interface to a variety of devices including LCD and seven segment displays
- Combining some or all of these features together to create some incredible projects

NOTE: Programming of the HC12's features is beyond the scope of this manual. These topics will appear in future manuals from Technological Arts.

Getting started is as simple as it sounds.

SO LETS GET STARTED!

GETTING STARTED

We have assumed that you have already installed Metrowerks CodeWarrior 3.0 on your PC. If not, there is a guide included in your HC12 kit that shows you how to install CodeWarrior and how to obtain a license.

STEP 1 – CREATING YOUR FIRST PROJECT

- a. If code Warrior is not already open, you can start the application by selecting:
Start>Programs>Metrowerks CodeWarrior>CW12 3.0> CodeWarrior IDE

- b. **Figure 1**-The Metrowerks CodeWarrior window will pop up:

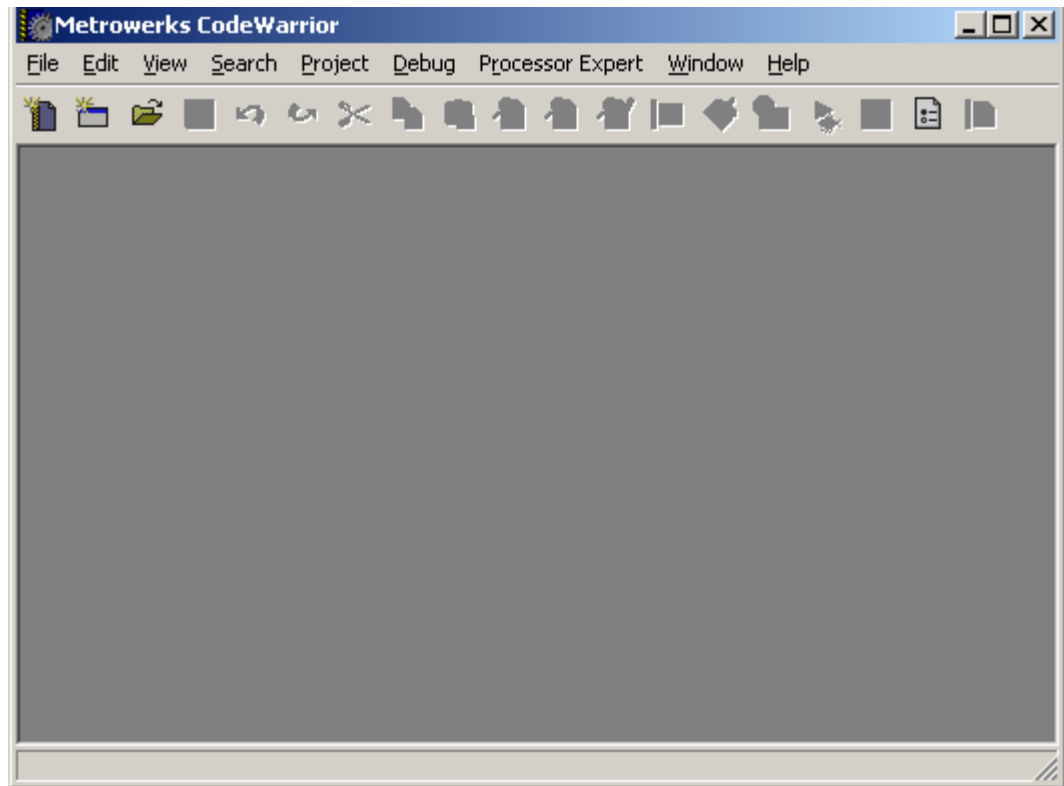


Figure 1

- c. From the Menu bar, select **File > New**

- d. **Figure 2** - The New dialog box will popup. Under the Project tab:
- Select **HC(S)12 New Project Wizard**
 - Type “example” in the Project name textbox (However, the Project Name can be any name you want)
 - Specify the location where you want to save the project
 - Click **OK**

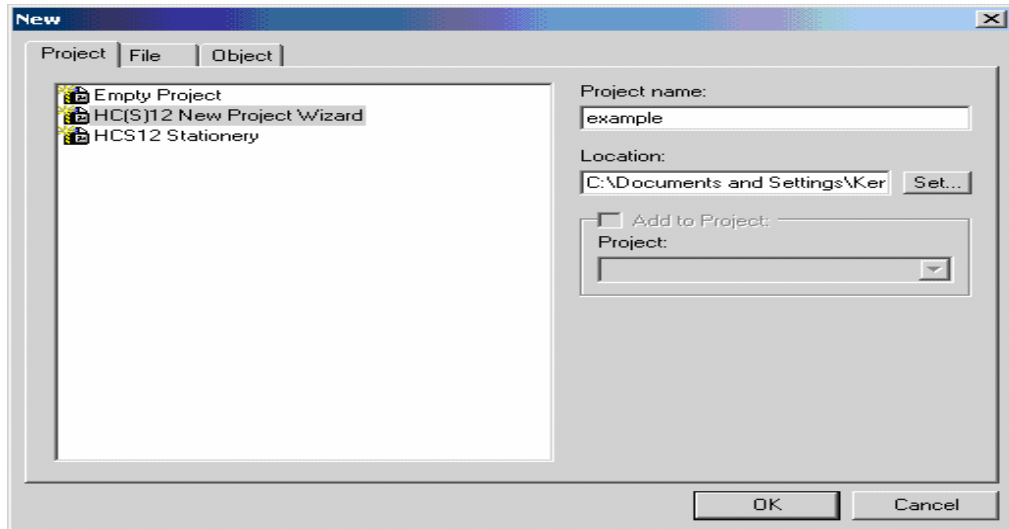


Figure 2

- e. **Figure 3**- Select the HC12 derivative that you will be programming. In this case we have selected the MC9S12C32.
WARNING: Selecting the wrong derivative will cause problems when you program your board!
 Click **Next**

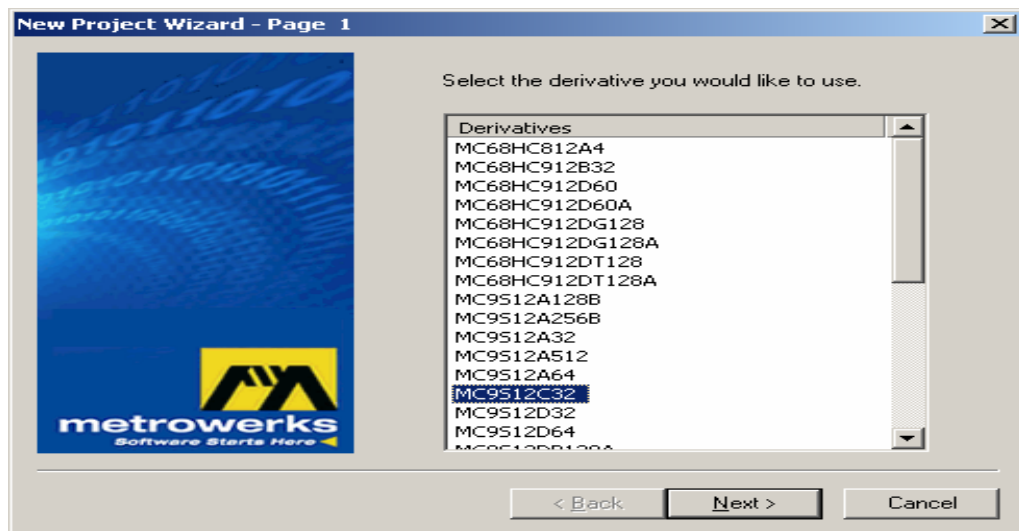


Figure 3

f. **Figure 4**-Check off C and click **Next**

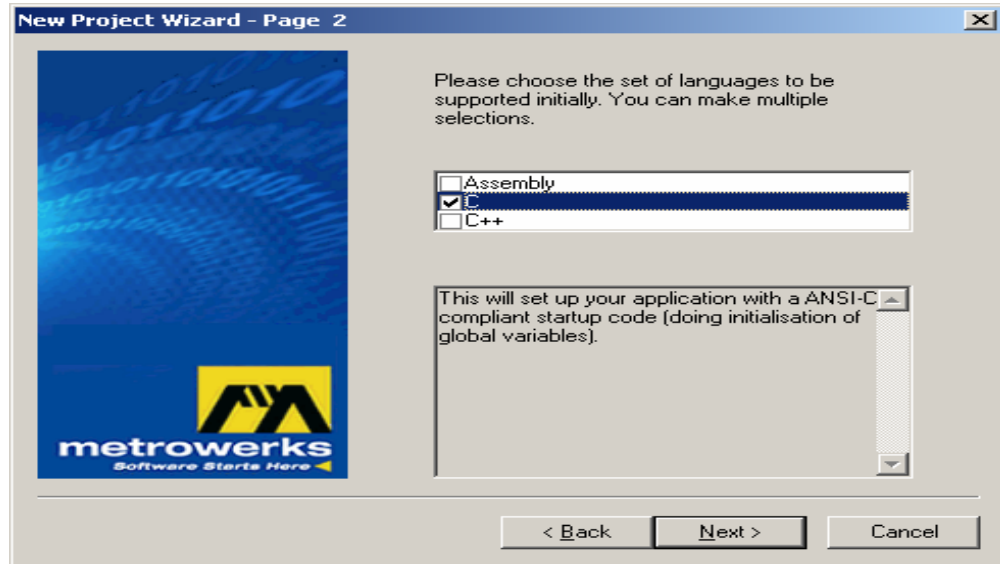


Figure 4

g. **Figure 5**- Select **No** for processor expert

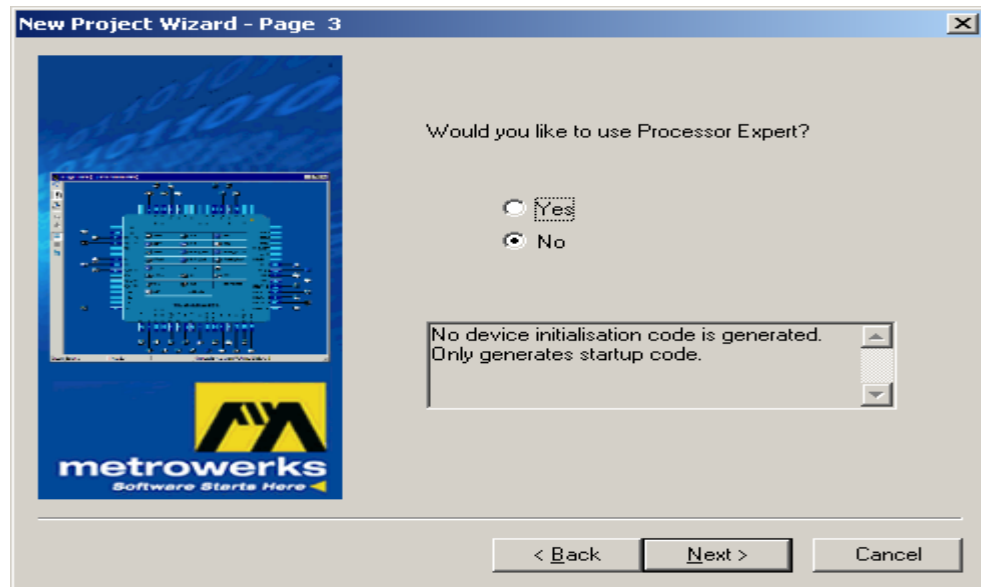


Figure 5

h. Figure 6-Select No for PC-lint

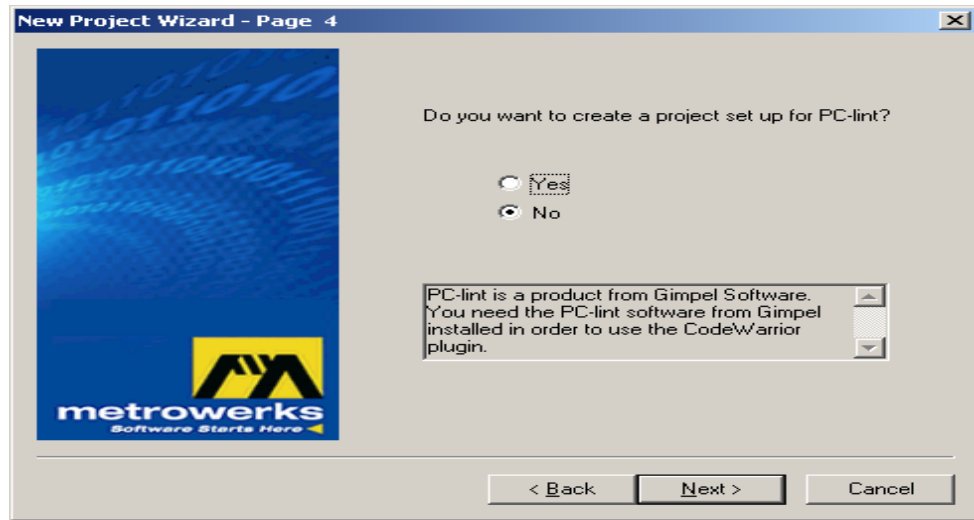


Figure 6

i. Figure 7- Select None for float point format

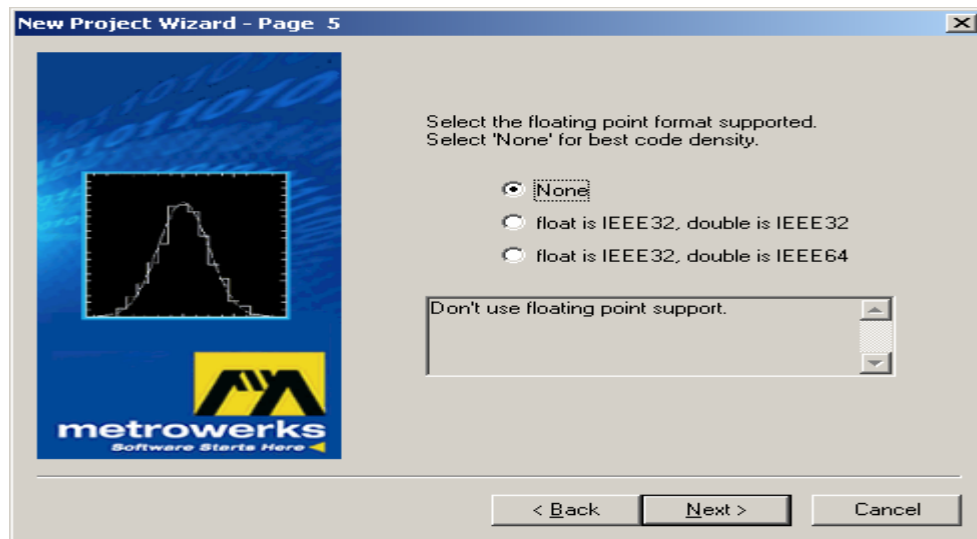


Figure 7

Almost there!!!!

k. **Figure 8-** Select **Small** for memory model

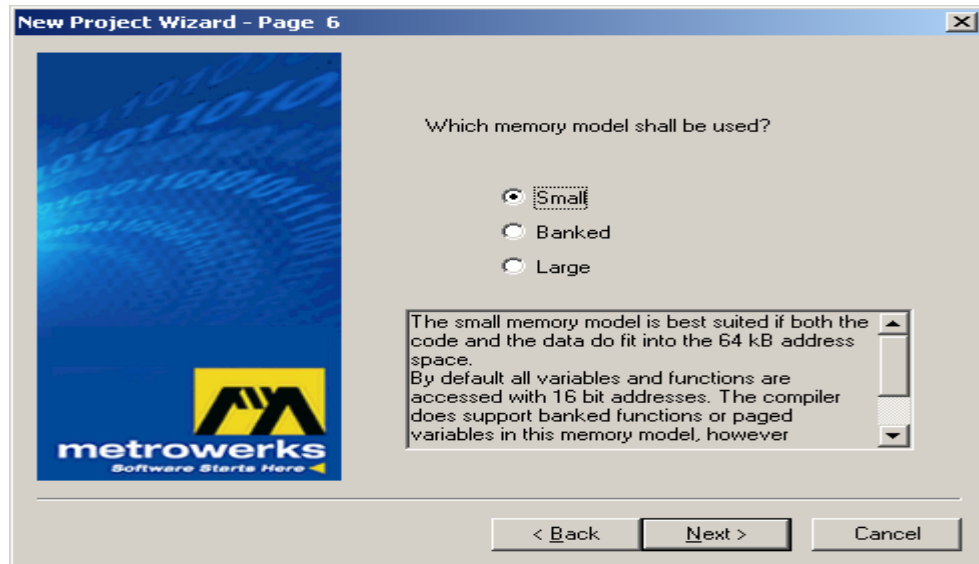


Figure 8

l. **Figure 9-**

- Uncheck Metrowerks Full Chip Simulator
- Check Motorola Serial Monitor Hardware Debugging
- Click Finish
- **Get ready to code!**

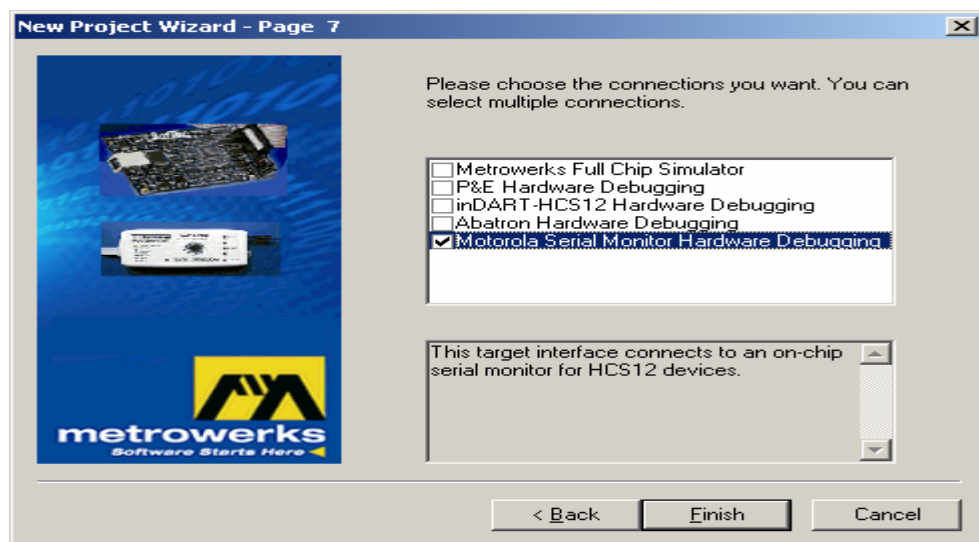


Figure 9

STEP 2 - LETS WRITE SOME SOURCE CODE

- **Figure 10**-This is your new project window. Expand the **Sources** folder by clicking on the [+] and double click on **main.c**

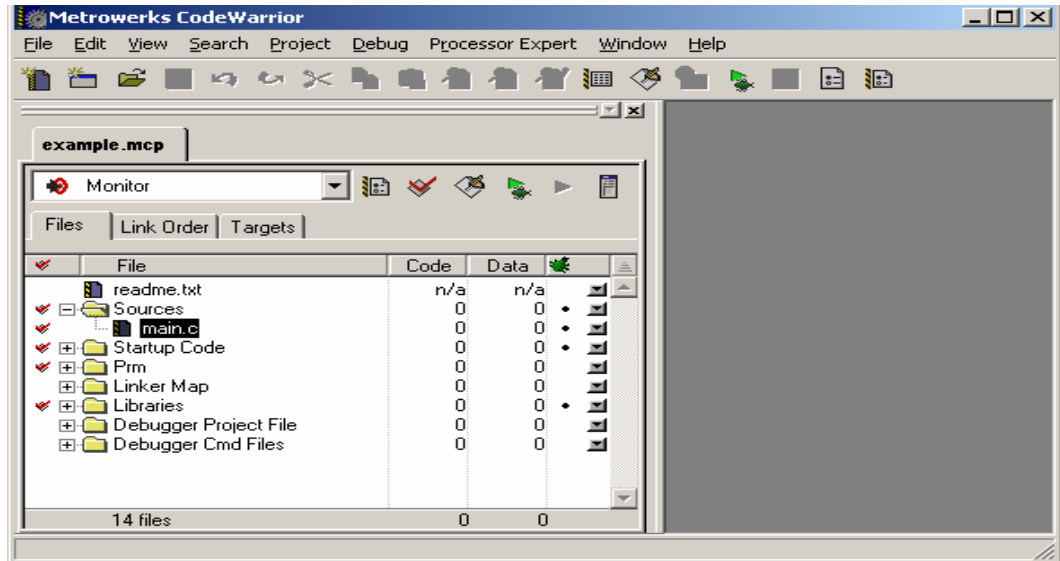


Figure 10

- **Figure 11**-The source code window called main.c should popup. This is where you write the source code (the embedded C code) for your project

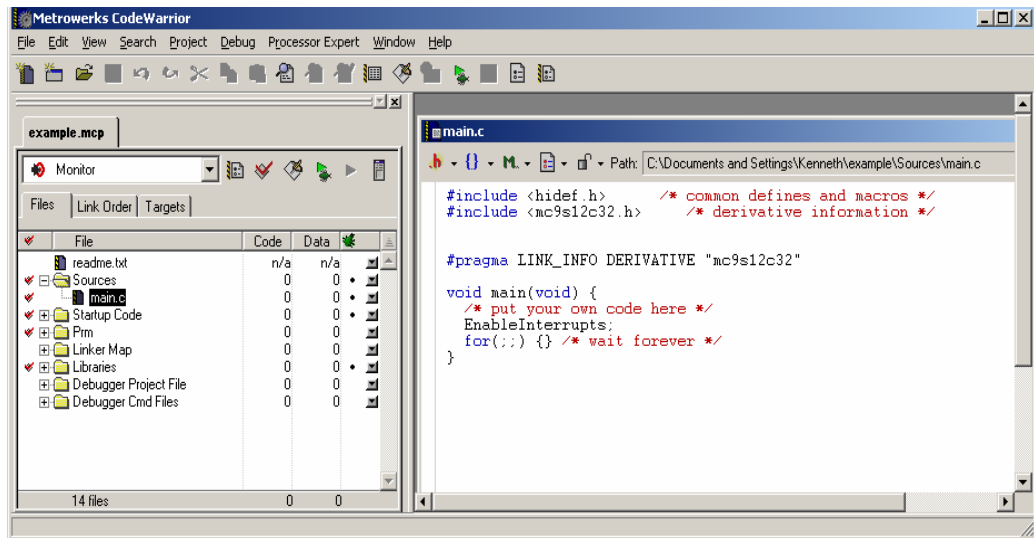


Figure 11

- **Table 1**-Delete the contents of the main.c window and copy and paste the following code into the source code window (main.c). Select **File>save**.

```

#include <hidef.h> /* common defines and macros */
#include <mc9s12c32.h> /* derivative information */
#pragma CODE_SEG DEFAULT

void main(void)
{
    DDRT = 0x03;
    ATDCTL23 = 0x0;
    ATDCTL45 = 0x0;
    ATDDIEN = 0xFF;

    while(1)
    {
        PTT = ~(PTAD/64);
    }
}

```

Table 1

STEP 3 - COMPILING YOUR CODE

- From the menu bar select: **File > Project > Make**
Optionally you could just press function F7 on your keyboard
- **Figure 12**-This step will compile your code and display any errors in or warnings in the Errors & Warnings window as shown. For now **ignore the warnings**. If you have any errors, double check the code to make sure you have copied and pasted everything correctly

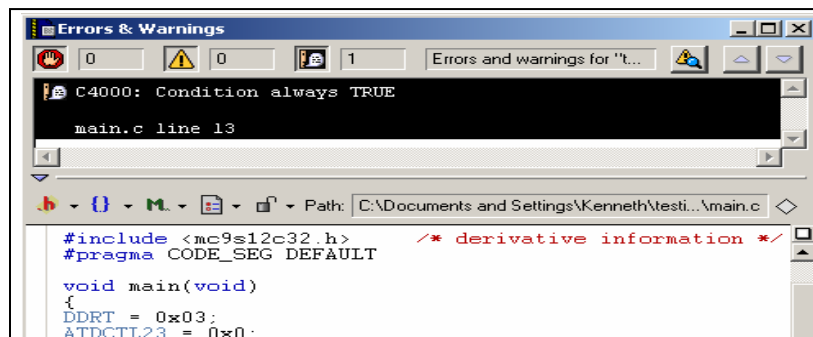


Figure 12

STEP 4 - PROGRAMMING THE HC12 BOARD

Congratulations on making it this far! We are now on the last few stages.

PART 4a - Connecting your HC12 module

- With your HC12 module out of the box connect the 9V power supply which is included with your kit.
- Connect the serial cable, included with your kit, between the serial port of your PC and the female serial connector of the HC12 module
- Make sure that switch SW1 on the module is in BOOT mode
- Plug in the power supply

PART 4b - Downloading your Assembled program

- **Figure 12-**On the new.mcp tab click on the debug button

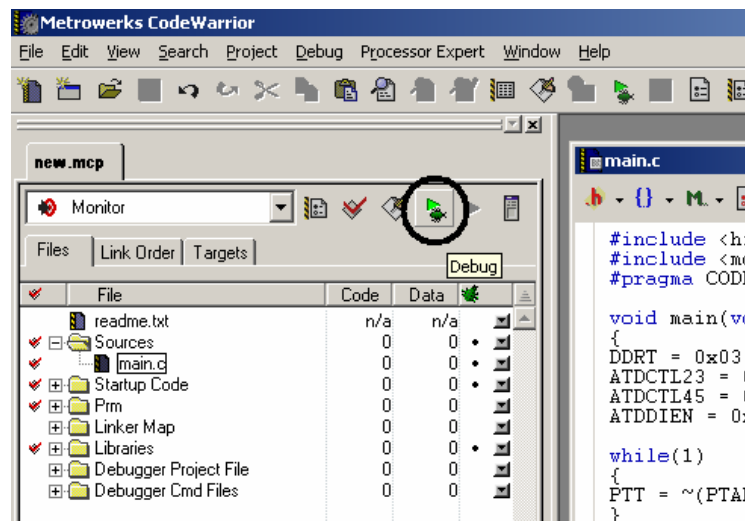


Figure 13

- **Figure 14** - The Monitor Setup dialog box will pop up. Select the COM port that your HC12 module is connected to (eg. COM1, COM2, etc). Click OK

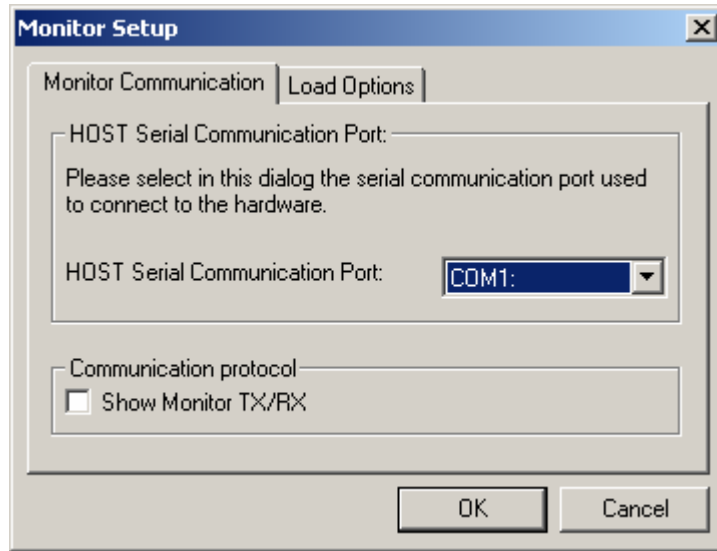


Figure 14

- **Figure 15-** The True Time Simulator and Real-Time Debugger window will appear

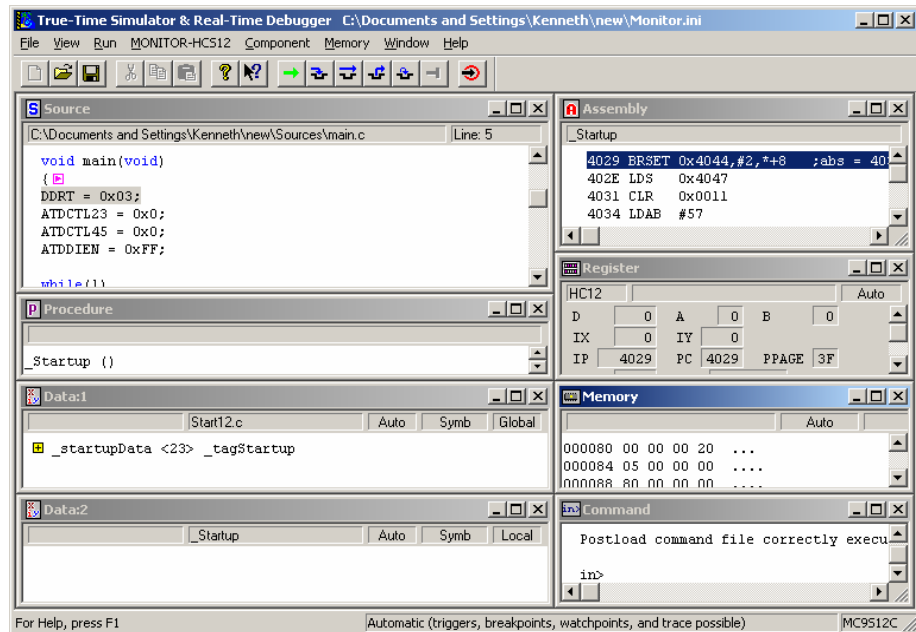
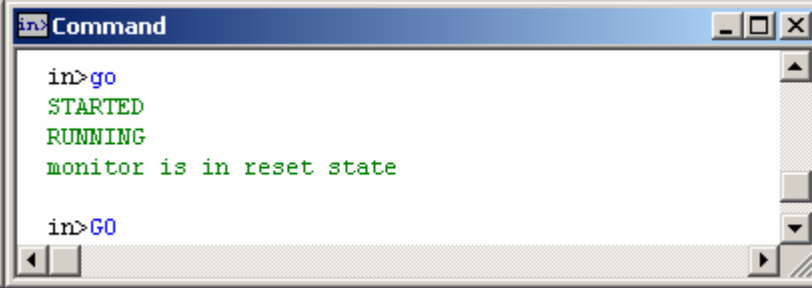


Figure 15

- **Figure 16** - In the Command Window at the bottom right of the True Time Simulator and Real-Time Debugger, figure 16, type GO as shown and hit enter.



```

Command
in>go
STARTED
RUNNING
monitor is in reset state

in>GO

```

Figure 16

- Switch SW1 on the HC12 module into RUN mode and press reset. This should start the program
- The program should now be running. Pressing the user buttons SW2 and SW3, on the docking module, should turn on LEDs D2 and D3 respectively.
- CONGRATULATIONS you have now completed your first embedded C program using CodeWarrior

CONCLUSION

You have now learned how to create project, where to write the source code, how to compile the source code and, finally, download the project to your HC12 module. This just a tip of the iceberg. The next step is to understand the concepts behind some of the various registers and functions that the HC12 offers, and how to program these devices and other peripherals commonly attached to the HC12.

Of course, knowledge of the C language is important for embedded C programming. If you are looking for a good crash course on ANSI C programming we highly recommend the book:

***The C Programming Language Second Edition.* Brian W. Kernighan, Dennis M. Ritchie. Prentice Hall Software Series.**

Also keep checking back on the [Technological Arts](http://www.technologicalarts.com) website @ www.technologicalarts.com as we will be posting how to guides on how to interface with the commonly used features of the HC12.