Using the Keil uVision Debugger with the DS5250

This application note describes how to use the Keil uVision2 suite of tools to debug an application for the DS5250 High-Speed Secure microcontroller. This process involves loading a debug monitor application into the DS5250 which communicates with Keil uVision2 over a selected serial port.

Overview

This application note describes how to use the Keil µVision2 suite of tools to debug an application for the DS5250 High-Speed Secure microcontroller. The process involves loading a debug monitor application into the DS5250 which communicates with Keil µVision2 over a selected serial port.

All development for this application note was done using the DS5250 and the DS52x0 Evaluation Kit Board (Rev A). The C application was created and compiled using Keil's µVision2 version 2.40 and the Keil C51 Compiler version 7.10. The debugging monitor was loaded into the DS52x0 Evaluation Kit Board RAM using the Microcontroller Tool Kit (MTK) version 2.2.0.

Installing the Keil Debugging Monitor

There are three different variations of the Keil debugging monitor available for the DS5250, depending on which serial port will be used to communicate with Keil µVision2 on the host PC. This serial port will be unavailable for use by the application under debug.

Serial Port Used	Timer Used	Crystal Speed	Monitor File Name
Serial Port 0	Timer 1	11.0592 MHz	mon5250s0x11.hex
Serial Port 0	Timer 1	22.1184 MHz	mon5250s0x22.hex
Serial Port 1	Timer 1	11.0592 MHz	mon5250s1x11.hex
Serial Port 1	Timer 1	22.1184 MHz	mon5250s1x22.hex
External Serial Port 2	None	Any	mon5250s2.hex

To obtain these files, please contact the microcontroller technical support group at micro.support@dalsemi.com.

Before loading the selected debugging monitor on the DS52x0 Evaluation Kit board, set the board up as follows:

- A 6-9 volt DC power supply (center post positive) should be connected to power plug J1.
- A straight-through, DB9 serial cable should be connected from J3 (SERIAL 0) to COM1 on the host PC.
- A 11.0592 MHz or 22.1184 MHz crystal should be inserted. (A different crystal speed may be used, but this will result in a different baud rate when communicating with the loader.)
- All DIP switches should be OFF except for A1-A4, B1, and B2 which should be ON.

Next, install the Microcontroller Tool Kit (MTK) software package, which is available at http://www.maxim-ic.com/products/microcontrollers/software/index.cfm To load the debugging monitor:

1. Open MTK. In the microcontroller type dialog, select **DS5240/50**.
2. Turn power on to the DS52x0 Evaluation Kit Board.
3. Select **Options -> Configure Serial Port**. Set the serial port options to **COM1** and **9600 baud**.
4. Select **Target -> Open COM1 at 9600 baud**.
5. Select **Target -> Connect to Loader**.
6. A loader prompt should appear (DS5250 SECURE LOADER...)
7. At the loader prompt, type "W MSIZE 12" and hit ENTER.
8. At the loader prompt, type "W MCEN E0" and hit ENTER.
9. At the loader prompt, type "W MCON 81" and hit ENTER.
10. Select **File -> Load** from the menu. Select the debug monitor file that you wish to use.
11. Once loading completes, select **Target -> Close COM1**.
12. Turn the power to the DS52x0 Evaluation Kit Board off. Set the DIP switch B1 to the OFF position.

See Figure 1 below for the output that should appear in MTK when following this procedure.

Figure 1. Loading the Debug Monitor using MTK

Creating and Compiling the C Application

This section describes the process to create and compile a sample C application for the DS5250 using Keil's µVision2 integrated development environment.

Creating a New Project

In Keil mVision2, select **Project -> Create New Project** from the menu. Enter the name of your new project.

The Select Device for Target dialog will appear as shown below in Figure 2. Under Database, select **Dallas Semiconductor** and **DS5250**. Check the boxes for **Use Extended Linker** and **Use Extended Assembler**, and then hit **OK** to continue.
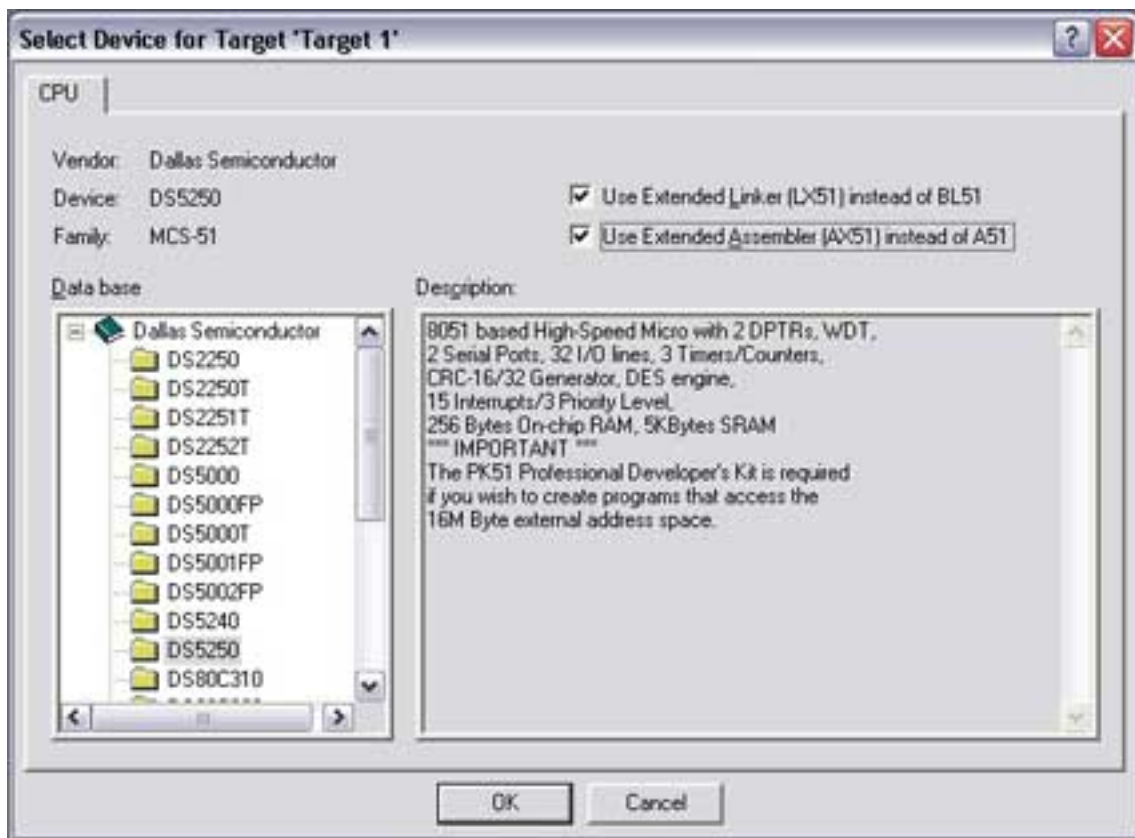
Figure 2. Selecting the DS5250 for a new Keil µVision2 Project

A new dialog box will ask, "Copy Dallas 80C390 Startup Code to Project Folder and Add File to Project?" Select **YES**.

Setting Project Options
When the project window opens on the left, open up Target 1. Right click on Target 1, and select **Options for Target 'Target 1'**. An Option dialog box will appear.

Select the **Target** tab. Change the settings in this tab as follows (as shown below in Figure 3):

- **Memory Model** - Set to **Large: Variables in XDATA**.
- **Code ROM Size** - Set to **Contiguous Mode: 16 MB program**.
- Set the checkbox for **Use multiple DPTR registers**.
- In the Off-chip Code Memory section of the dialog, set the top two fields to **Ram Start: 0x8000** and **Ram Size: 0x10000**.
- In the Off-chip Xdata Memory section of the dialog, set the top two fields to **Ram Start: 0x8000** and **Ram Size: 0x10000**.
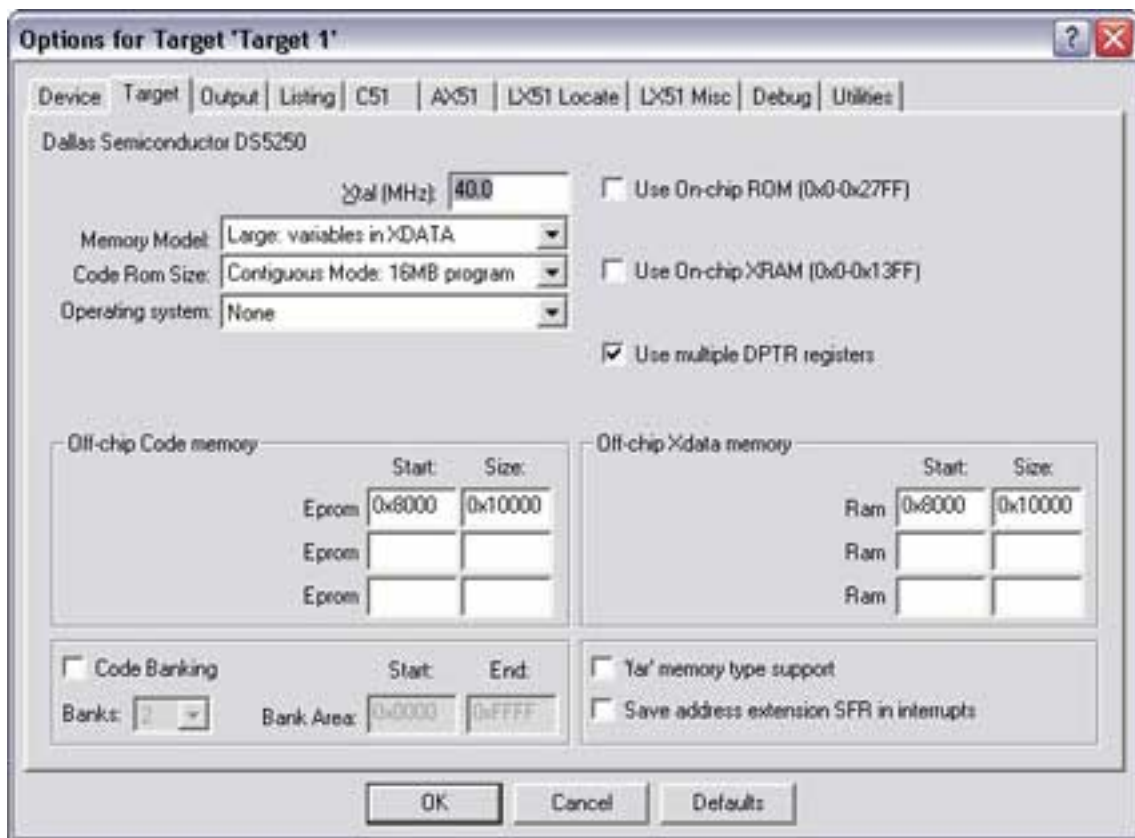
Figure 3. Target Option Settings for the DS5250

Next, select the **Debug** tab, and set the options as follows (as shown in Figure 4 below):

- Select **Use** and select **MON390 - Dallas Contiguous Mode**.
- Click the **Settings** button and select **COM1** and **9600 baud**.
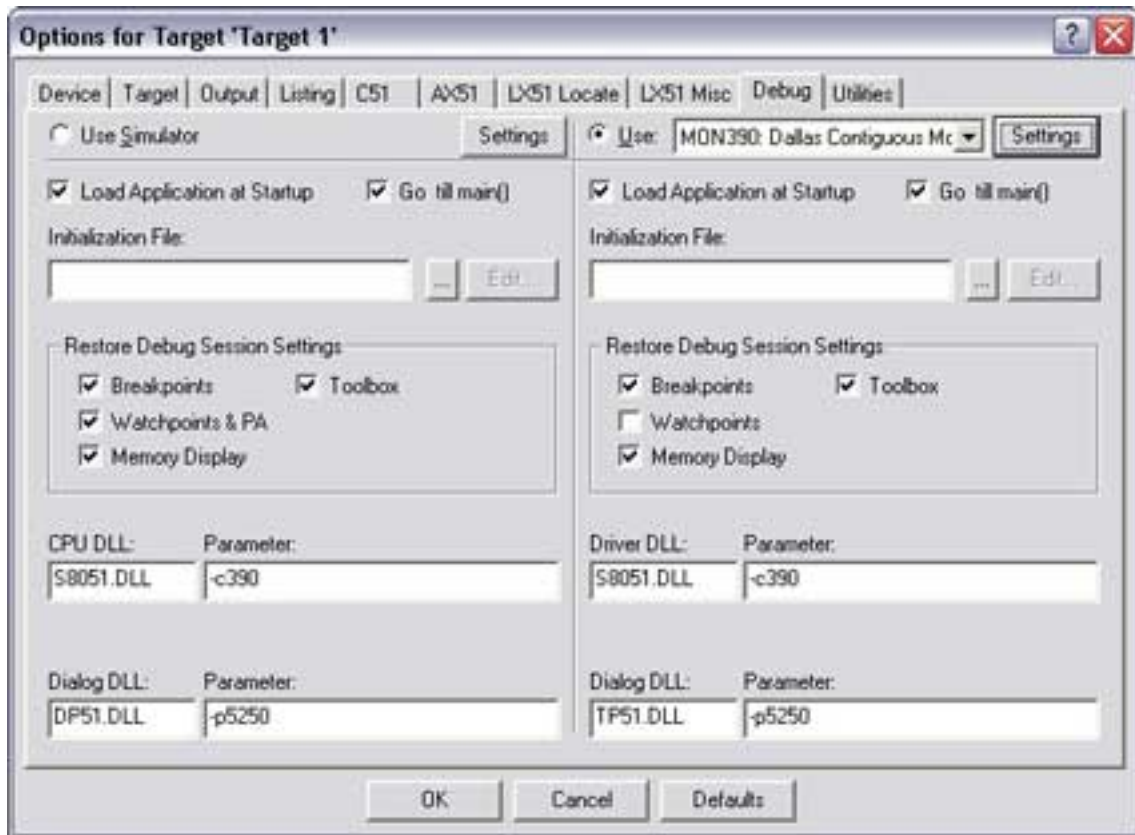- Set the checkboxes for **Load Application at Startup** and **Go till main()**.

Figure 4. Target Debug Settings for the DS5250

Adding the Project Code

Open a new file and enter the following C code:

```c
#include
#include

void main()
{
    while (1) {
        P0 = 0x80;
        P0 = 0x40;
        P0 = 0x20;
        P0 = 0x10;
        P0 = 0x08;
        P0 = 0x04;
        P0 = 0x02;
        P0 = 0x01;
    }
}
```

Save this file as **main.c**. The file will not be automatically added to the project. To add the file, right-click on Source Group 1 and select **Add Files to Group 'Source Group 1'**. Select **main.c**

and click **Add**, then click **Close**.

Next, open the file START390.A51 and comment out the following lines (after the STARTUP1 label):

```
;                    MOV      TA,#0xAA          ; Enable access to P4CNT
;                    MOV      TA,#0x55
;P4CNT_VAL EQU (SBCAN SHL 6) OR (PCES SHL 3) OR (P4PF)
;                    MOV      P4CNT,#P4CNT_VAL
;
;                    MOV      TA,#0xAA          ; Enable access to P5CNT
;                    MOV      TA,#0x55
;P5CNT_VAL EQU (SP1EC SHL 5) OR (CX_IO SHL 3) OR (P5PF)
;                    MOV      P5CNT,#P5CNT_VAL
```

Compiling the Project
To compile the project, press **F7**, or select **Project -> Build Target** from the menu. If no errors occur, messages should appear indicating that compilation completed successfully, as shown in Figure 5.
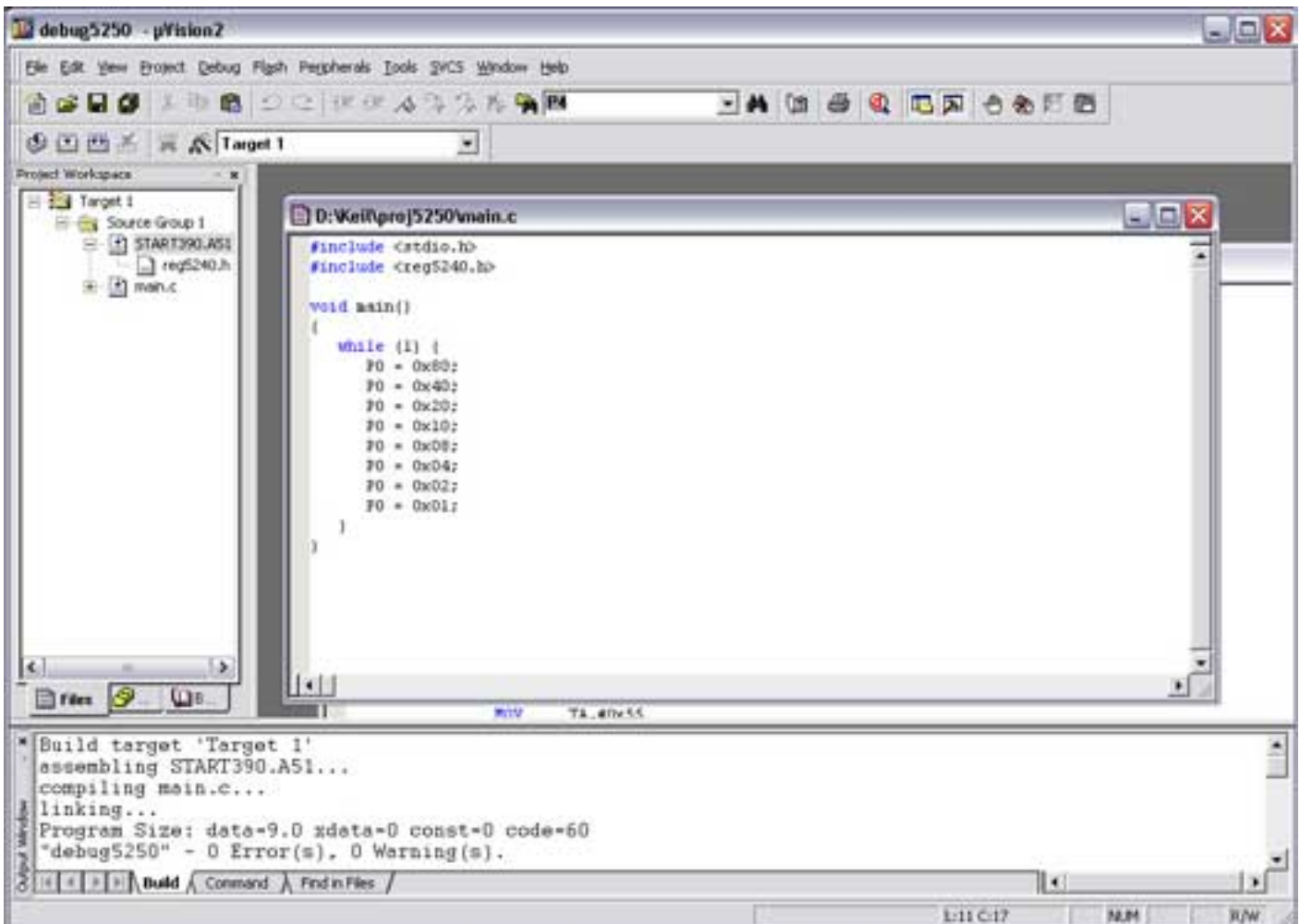
Figure 5. Compilation Output from Keil µVision

Debugging the Project
Before starting the debugging session in Keil µVision2, power on the DS52x0 Evaluation Kit board and verify that the serial cable is connected as follows:

- If you are using the Serial 0 version of the debugging monitor, the serial cable should be connected from COM1 to the J3 / SERIAL 0 connector on the kit board.
- If you are using the Serial 1 version of the debugging monitor, the serial cable should be connected from COM1 to the J2 / SERIAL 1 connector on the kit board.
- If you are using the Serial 2 (external serial) version of the debugging monitor, the serial cable should be connected from COM1 to the J6 / SERIAL 2 connector on the kit board using a DB9-to-2x5 adapter cable.

Select **Debug -> Start/Stop Debug Session** from the menu in Keil µVision2. If everything is connected correctly, the compiled project file will be loaded and Keil µVision2 will enter debugging mode as shown in Figure 6 below. From this point, you can view register and variable values, perform step-by-step and breakpointing, and other operations. Refer to the Keil µVision documentation for more details.

The debugging monitors for the DS5250 have the following limitations.

- You cannot enable the extended stack when using the monitor. The monitor uses this area for data storage.
- Applications must start at 0x8000.
- Applications must not write into Vector RAM.
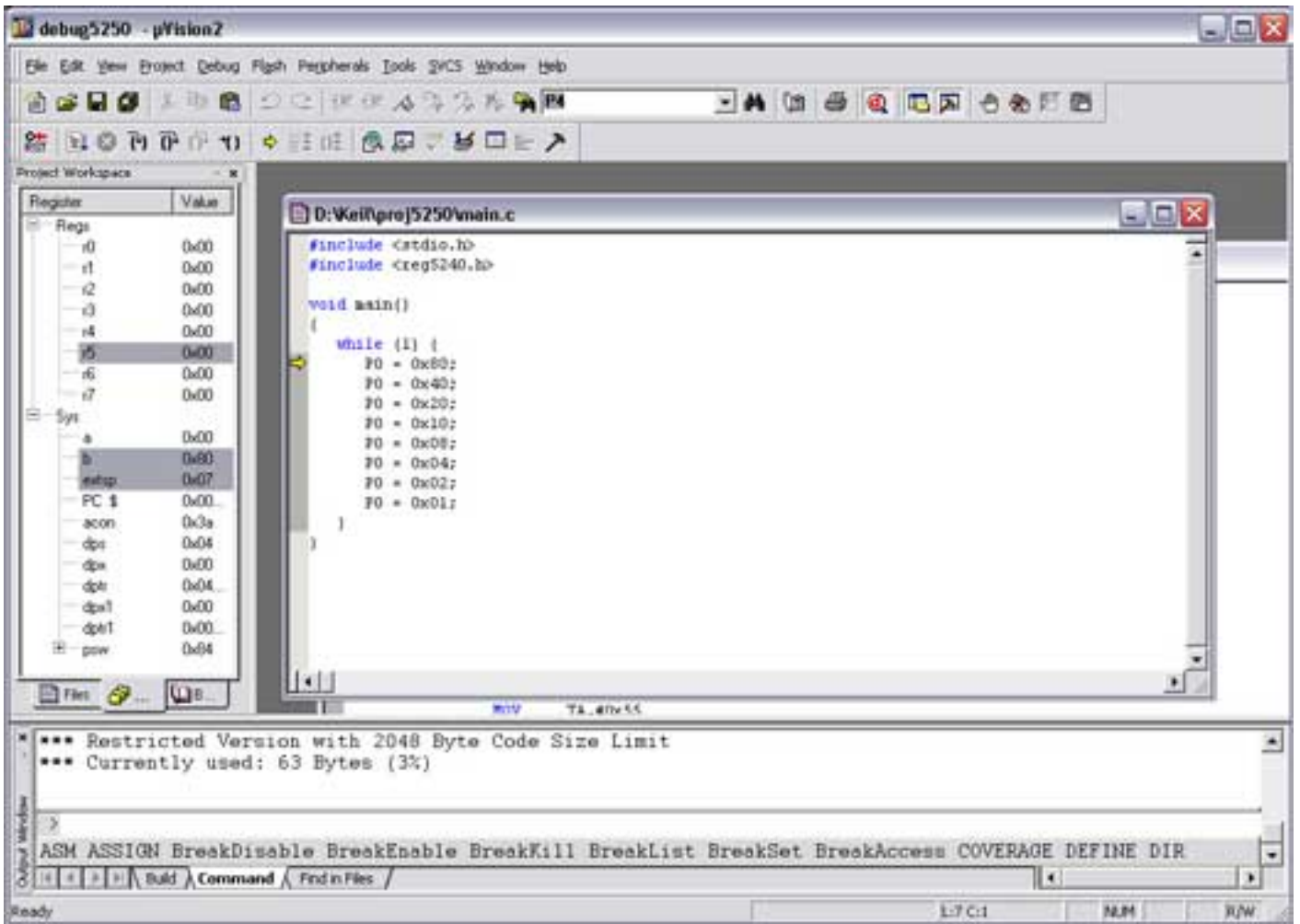- When using the external serial monitor, serial break mode is not supported.

Figure 6. Debugging Output from Keil µVision

More Information

DS5240: QuickView -- Full (PDF) Data Sheet

DS5250: QuickView -- Full (PDF) Data Sheet