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## GETTING STARTED WITH RAISONANCE IDE FOR THE ST6 MICROCONTROLLER

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by Microcontroller Division Applications

### INTRODUCTION

Ride is the development toolchain for ST62 developed by Raisonance. This fully Integrated Development Environment supports all the ST62 microcontroller family and features a powerful macro-assembler, a linker, a C compiler and a state-of-the-art simulator and debugger. It can drive the ST6-HDS2, CEIBO EB-ST62 and SOFTEC DS6225A & DS6265A emulators. You can install the evaluation version from either the "MCU ON CD" CD-ROM or directly from the Raisonance website: <http://www.raisonance.com>.

This tutorial has been extracted from the User Manual of the ST6 Evaluation Board, ST6-Eval, available on either the "MCU ON CD" CD-ROM or on the ST MCU website <http://mcu.st.com>.

For more information about Raisonance IDE, please contact Raisonance at <http://www.raisonance.com> and to get other program examples, please refer to the ST6 Evaluation Board Manual.

**Note:** The corresponding source files are provided in a downloadable .ZIP file along with this note on the ST MCU website <http://mcu.st.com>

The goal of this application note is to help you get started with the Raisonance IDE environment using an example program **tutorial.st6** located in the directory **.\Exercises\Tutorial**. The exercise will make you familiar with the project management, the assembler syntax and debugging using the Raisonance IDE.

The aim of the **tutorial.st6** program is to make two LEDs blink at a frequency of 1Hz, simply using the I/O Ports. It assumes that the LEDs are connected to port **PA0** and **PA1** of the ST6265C device and are active low.

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## Table of Contents

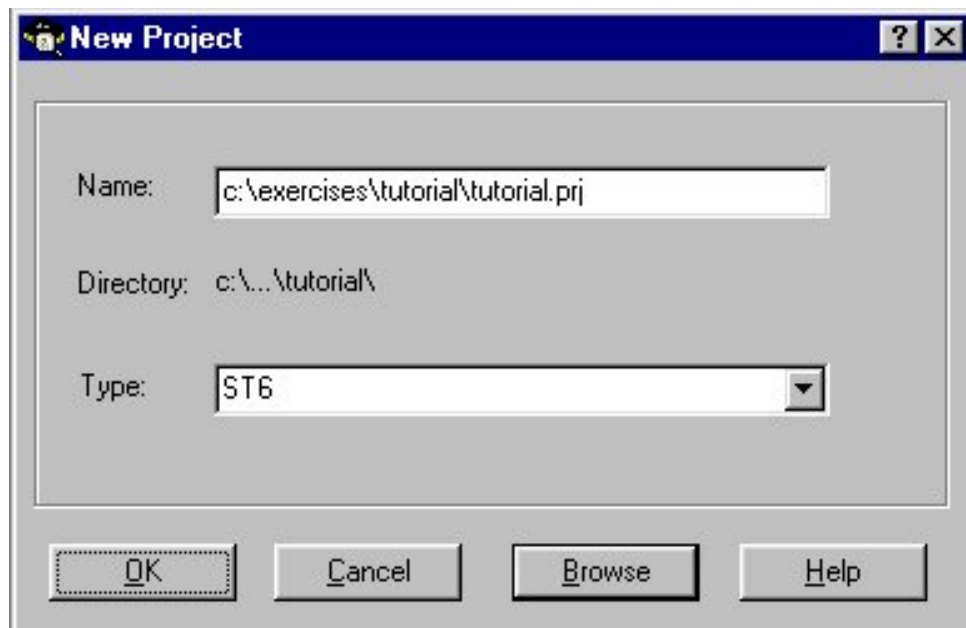
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|                                                               |           |
|---------------------------------------------------------------|-----------|
| <b>1 PROJECT SETUP .....</b>                                  | <b>3</b>  |
| <b>2 EDITING THE CODE .....</b>                               | <b>5</b>  |
| <b>3 COMPILING THE CODE .....</b>                             | <b>6</b>  |
| <b>4 STARTING A DEBUG SESSION .....</b>                       | <b>7</b>  |
| <b>4.1 STEPPING THROUGH THE CODE .....</b>                    | <b>9</b>  |
| <b>4.2 RUNNING THE CODE .....</b>                             | <b>9</b>  |
| <b>4.3 SETTING A BREAKPOINT .....</b>                         | <b>10</b> |
| <b>4.4 WATCHING A VARIABLE .....</b>                          | <b>10</b> |
| <b>4.5 VIEWING THE PERIPHERALS OR THE ST6 REGISTERS .....</b> | <b>12</b> |
| <b>4.6 TIME FEATURE .....</b>                                 | <b>13</b> |
| <b>4.7 ADVANCED FEATURES .....</b>                            | <b>14</b> |
| 4.7.1 Trace window .....                                      | 14        |
| 4.7.2 Refresh feature .....                                   | 16        |
| 4.7.3 Animate Mode .....                                      | 18        |
| 4.7.4 Disassembly code window .....                           | 19        |
| 4.7.5 External interrupt window .....                         | 20        |
| <b>5 ENABLING AST6/LST6 RIDE COMPATIBILITY .....</b>          | <b>21</b> |

### 1 PROJECT SETUP

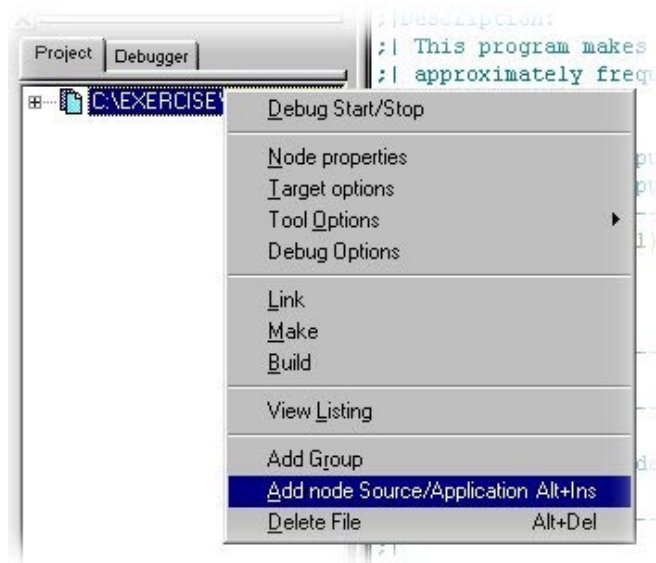
1. Start the Raisonance IDE: from the Windows Start menu, select **Start > Programs > Raisonance Kit 6.1> Ride IDE**.
2. Now you need to create a new project environment. The project file stores all the parameters of the project: settings, options, and all the files that have to be included to the project. To create a new project, go to the Project menu and click on **New**. The dialog box shown in Figure 1 will appear.

**Figure 1. New project dialog box**



3. Click on **Browse** to find the path where you want to create your project and name it (e.g. tutorial.prj). Click on the OK button to validate the creation of the project.
4. Now you have a new window (**Project >Debugger**) with the name of your new project. Click on it with the right mouse button. A menu shown in Figure 2 will be displayed.

Figure 2. New Project Menu



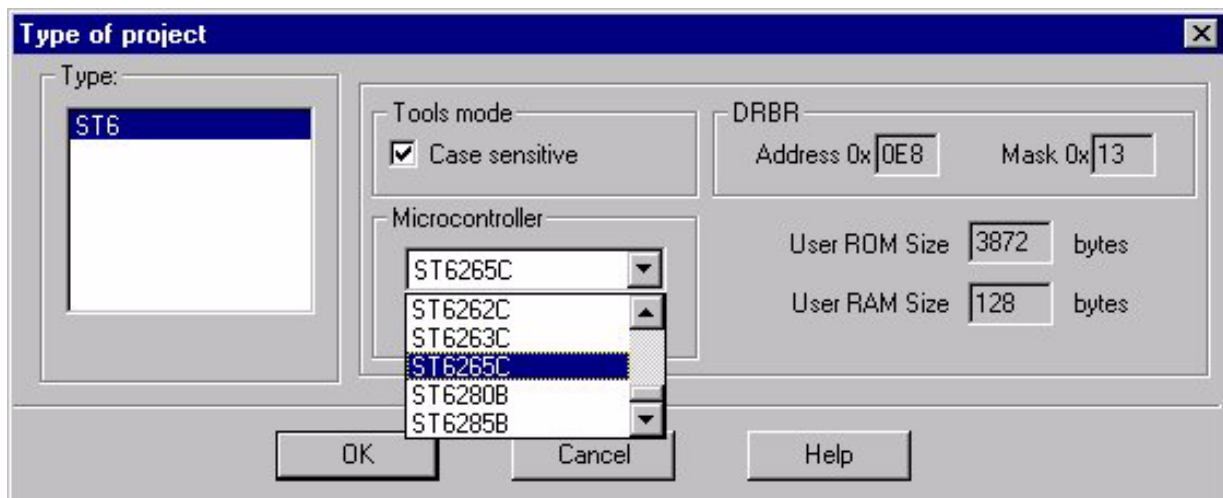
5. Click on **Add node Source/Application** (or find it in the **Project** menu) to add the file you want to work on. Choose the **tutorial.st6** assembly file located in the **.\Exercises\Tutorial**. When you select this file, it will display the file code and you will also be able to see it in the project window as shown below.

Figure 3. Project tree



6. You **HAVE TO** specify the target option before compiling any program. This defines the microcontroller used to run the program. Click on the **Options > Target** menu and choose the microcontroller you are working with (the ST6265C in this case). Click OK to validate the selection.

Figure 4. Type of project dialog box



Now the project environment is set up and you can start playing with the code.

## 2 EDITING THE CODE

You can now start correcting the file! You will have to fill in the blanks next to the question marks.

Before you start work, here is a brief explanation of the toolbar.

Figure 5. Editing toolbar



This is a list of the actions invoked by each toolbar icon from left to right:

- **Open** a file in the editor

**Note:** Be aware that this only opens a file. It doesn't open a project (to do that you have to select **Project > Open**) and it doesn't add the file to the project automatically (to do that you have to select **Project > Add node Source/application**).

- **Save** the changes you made to your file
- **Tile** the windows vertically
- Enter **Debug** mode
- Compile (**Translate**) the single file that is activated or the one that is selected in the Project View window.
- Compile (**Make all**) all the files of the project (recommended)

- **Undo** command
- **Cut** command
- **Copy** command
- **Paste** command
- **Find** an expression in the file
- Find the **Next** same expression

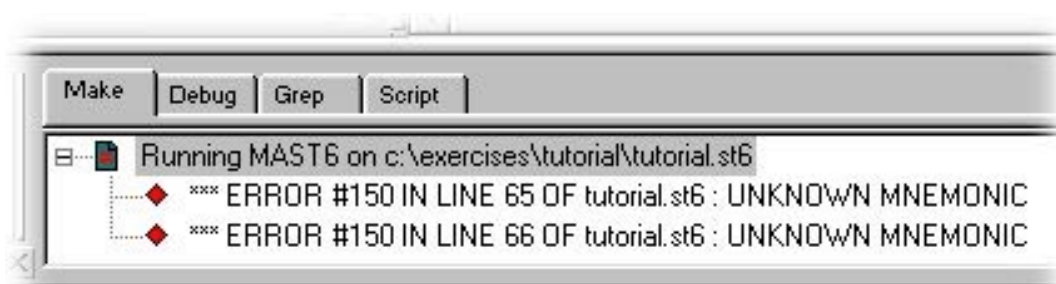
### 3 COMPILING THE CODE

A good way to get familiar with RIDE is to start compiling your program before making any corrections and, then, to correct the errors little by little.

1. Click on the **Make all** icon to compile the assembly file.

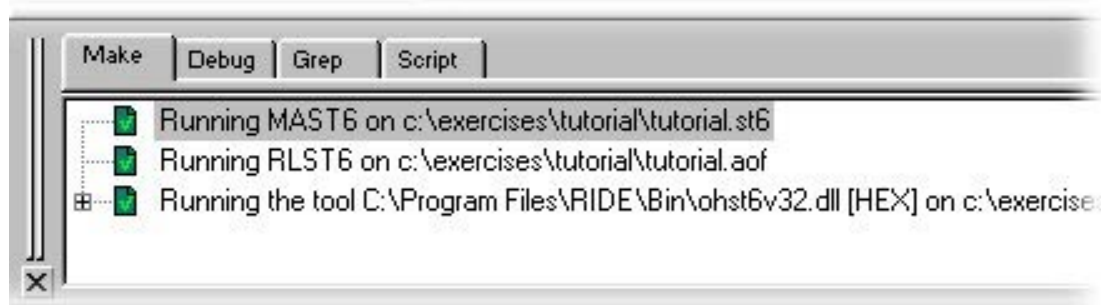
A new window will now appear like that shown in Figure 6. This window shows you the errors and the warnings the compiler generated and displays the results of the compilation.

**Figure 6. Errors and warnings in the Make window**



2. Double-click on the warning or error messages to see the line of the program related to the message. The corresponding line in the program window will be highlighted.
3. Start correcting the errors. Once you have finished, you can save your changes by clicking on the **Save** icon or on the menu **File > Save**. Compile the file again until you made the right corrections, that is to say when no error messages appear anymore. Figure 7 shows the window you will get at this point.

**Figure 7. Successful Make window**



## 4 STARTING A DEBUG SESSION

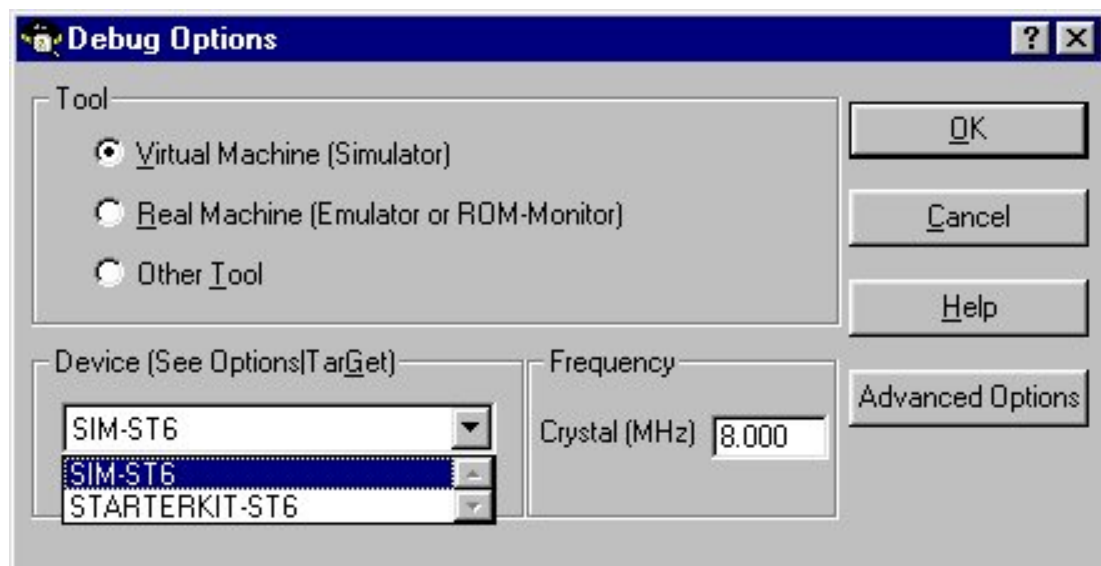
In the last section the only thing we did was to compile, i.e. to make sure the program had the right syntax and the right structure.

We now have to check if it really does what we want it to do. This is the debug phase. This will be done by using the Raisonance simulator to simulate the behaviour of the microcontroller.

1. Click on the **Debug** icon to enter debug mode.

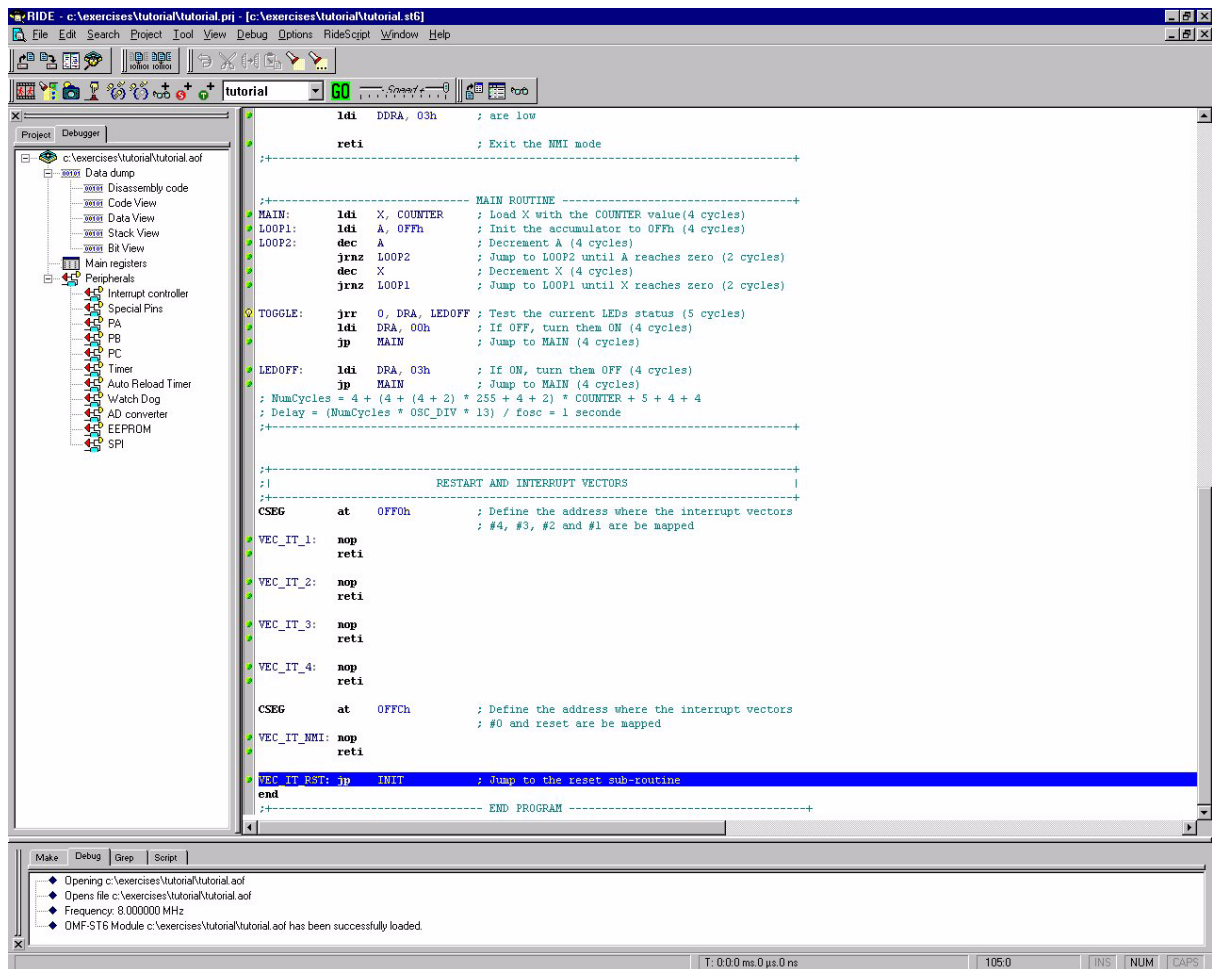
The following dialog box will appear:

**Figure 8. Debug options dialog box**



When you click on **Options > Debug** you can select the type of debug you want to do. Select **Virtual Machine (Simulator)** then **SIM-ST6** and click on the OK button.

**Figure 9. Simulator Environment**



In this environment you have several tools to help you to simulate and view what the program does.

Let's have a look at the **Debug** toolbar:

**Figure 10. Debug Toolbar**



Here is a list of the actions invoked by the toolbar icons from left to right:

- Enable **Animated Mode**
- **Display** executed lines. Each line containing an instruction in the program is indicated with a green dot. If you press this icon, the green dot next to the executed line becomes blue.
- **Refresh** command.

- **Reset** command. This button corresponds exactly to a hardware RESET.
- Execute each line and each function routine step by step (**step into**).
- Execute each line step by step (**step over**).
- Add the **watch window**.
- Add a **toggle breakpoint** at the selected line of the program. Click again to disable the breakpoint.
- Add a **toggle trace** at the selected line of the program. Click again to disable the toggle trace.
- **Select** the file you want to debug.
- **Run** the application. If Animated Mode is selected, it runs the application at a set speed that can be selected with the next icon. Otherwise it runs the application in real-time.
- Set the **execution speed** of the application in Animated Mode.

### 4.1 STEPPING THROUGH THE CODE

Execute the program step by step using the **step over** icon. Each time you click on this icon you will see the current line changing to the next program instruction. At each step you are then able to look at the state of the microcontroller, as explained later on.

**Note:** The **step into** icon allows you to enter the function subroutines. It is not likely that you will need this feature at the beginning. Furthermore this is a rather tedious way of following the execution of the program, because you really step through all the functions.

### 4.2 RUNNING THE CODE

You can also run the program directly using the **Run** icon.

Click once on the icon: it will run the application and the icon will change to



Click on the icon again and the application is stopped.

Note at the bottom of the Debug window the period of time spent running the application.

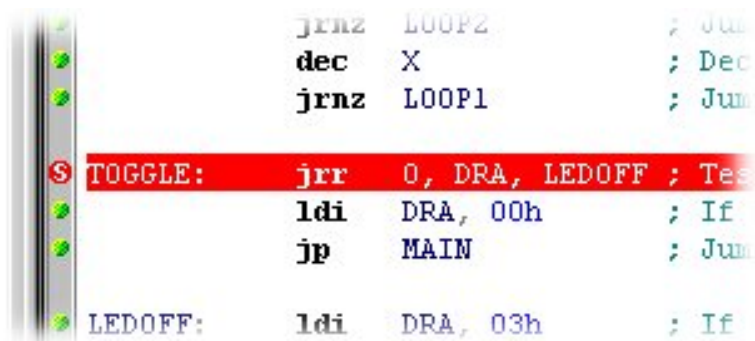
T: 0:0:200 ms.731  $\mu$ s.375 ns

### 4.3 SETTING A BREAKPOINT

Restart the program by selecting the **Debug >Restart** menu.

Click on the vertical bar on the left side of the program window in front of the line where you want to place the breakpoint. The line will be highlighted in red and the next time you run the application, the program counter (PC) will stop at the breakpoint.

**Figure 11. Set breakpoint**

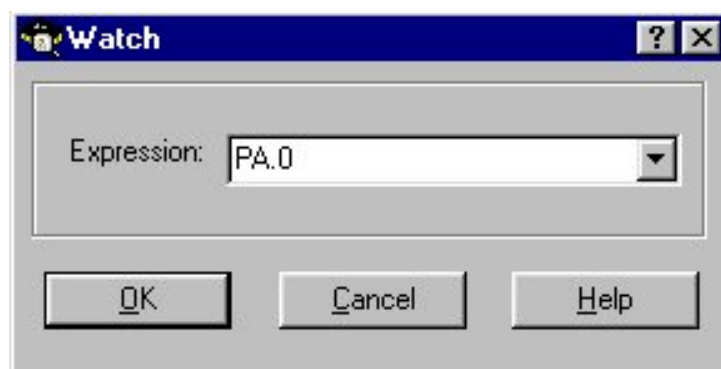


To delete the breakpoint simply click on the red S sign again.

### 4.4 WATCHING A VARIABLE

Click on **Debug >Add Watch**. A dialog box will appear: it allows you to select the registers, labels or variables you want to watch from a list of expressions. Type **PA.0** and click on the OK button.

**Figure 12. Add watch dialog box**



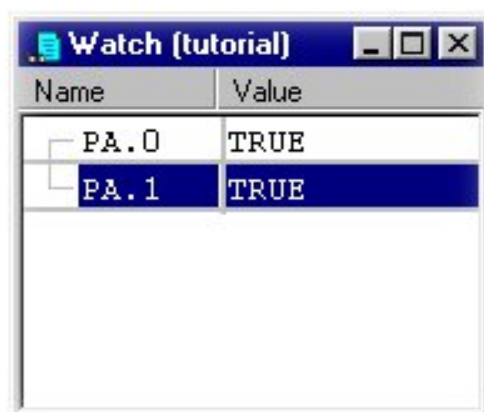
Then the following window will appear. It stores all the expressions you need.

**Figure 13. Watch window**



Now click with the right button of your mouse on the Watch Window and select **Add**. This opens the Add Watch Dialog Box again. Type **PA.1** and click on the OK button.

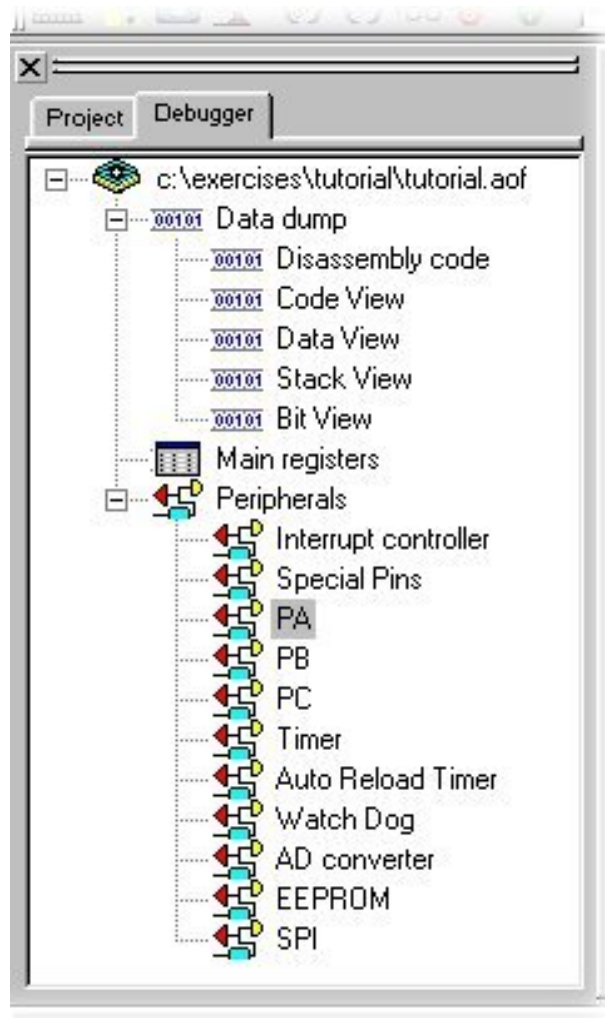
**Figure 14. Watch window**



### 4.5 VIEWING THE PERIPHERALS OR THE ST6 REGISTERS

In the Debugger window you can see all the microcontroller's registers and peripherals.

**Figure 15. Debugger window**



Double-click on any of the items and you will be able to view their state at any time during debugging. Figure 16 shows the window that will be displayed when you double-click on the **PA** icon.

Figure 16. Port A window

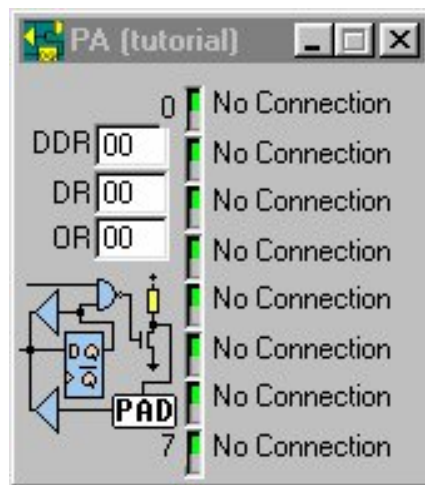
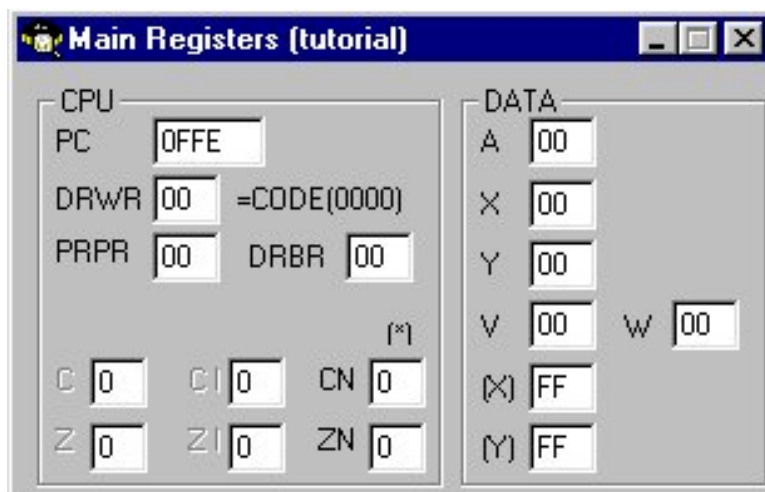


Figure 17 shows the window that will be displayed when you double-click on the **Main Registers** icon.

Figure 17. Main registers window



To watch the values of certain registers only, the address of the labels or the value of the possible variables, you have to open the Watch Window.

#### 4.6 TIME FEATURE

If you want to determine the time spent for one or several instructions of your program, set breakpoints at the first and last instruction. Run your program with the **Run** icon. It will stop at the first breakpoint. Then select the **Debug > Reset Time** menu (you can also use the macro **Ctrl + T**). The displayed time is reset. If you click on the **Run** icon again, it will display the time spent executing the instructions.

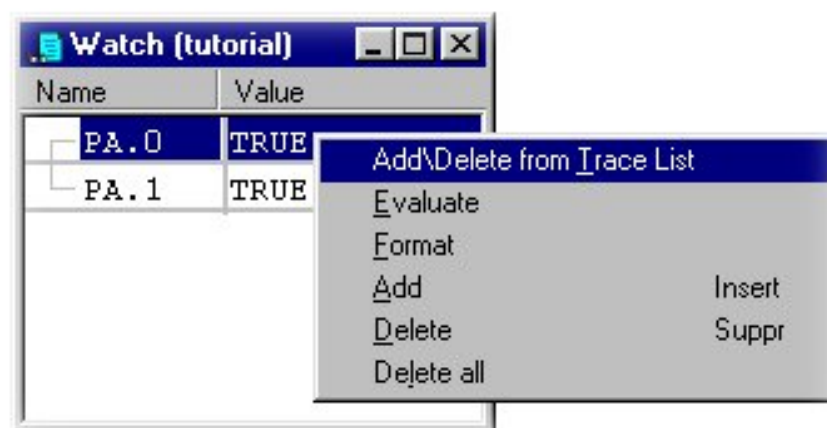
## 4.7 ADVANCED FEATURES

### 4.7.1 Trace window

An easy way to see how the program is executed is to trace the state of the PA0 and PA1 ports. You should be able to see the value toggling from 1 to 0 and 0 to 1 every 0.5s.

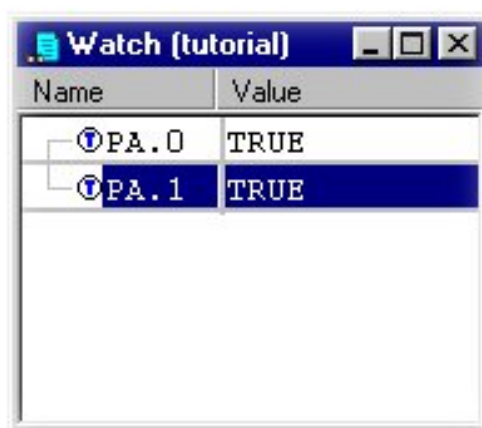
Keep the Watch Window open, select PA.0 and click on the right mouse button. The following menu will appear:

**Figure 18. Add/Delete from Trace List**



Select the **Add/Delete from Trace List** item and a blue "T" will be displayed in front of PA.0. This will allow you to watch the trace of the PA0 pin (you can do the same for PA1) in the Trace Window.

**Figure 19. PA0 and PA1 Toggle Trace**



Then select the **View > Trace > Options** menu to set the **Trace Options** dialog box. Then click on the **On Changes** radio button. The trace will be updated each time the value of the selected item is changed.

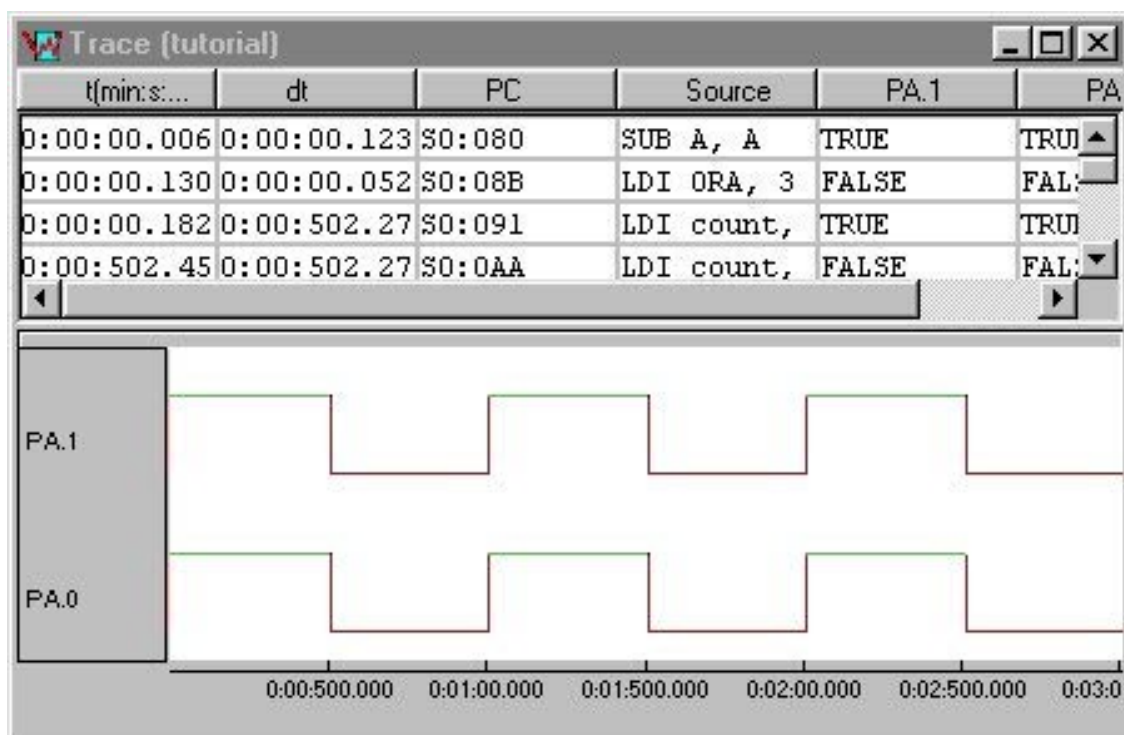
You can also change the maximum number of records that can be displayed in the Trace window. Validate the choice with the OK button.

**Figure 20. Trace Options dialog box**



Click now on the **View >Trace >View** menu to open the trace window.

Figure 21. Trace window

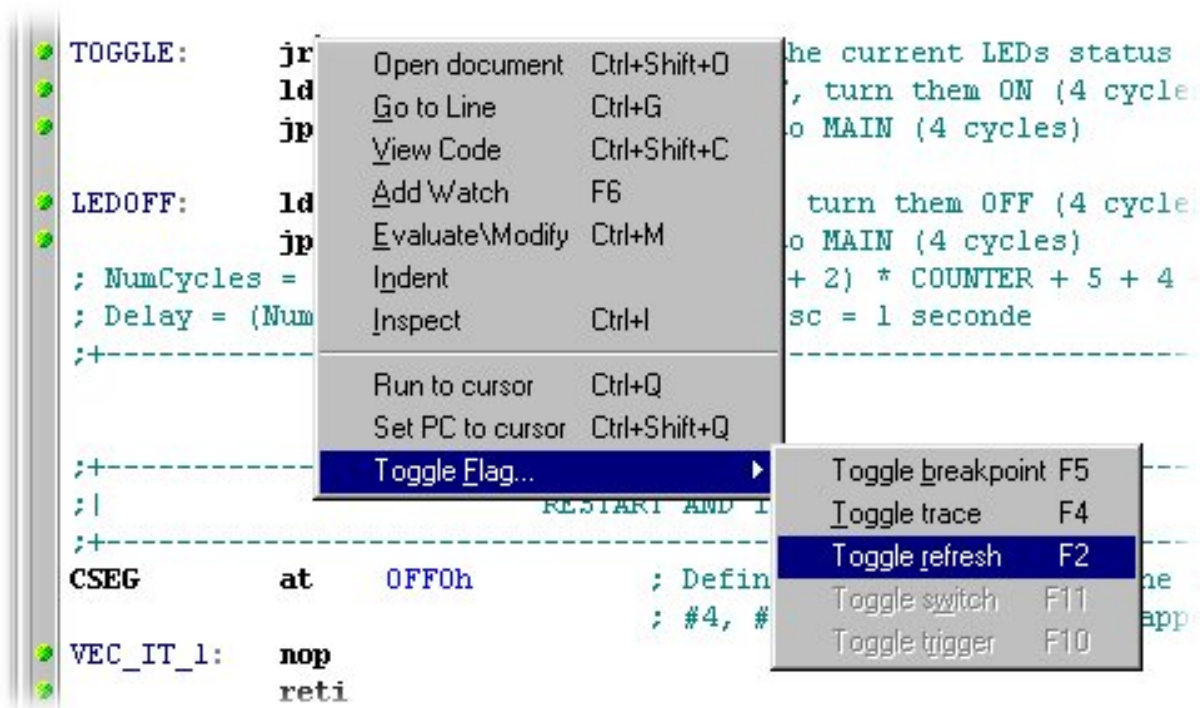


#### 4.7.2 Refresh feature

Now insert a refresh tag so the window will be refreshed each time the instruction, where it is placed, is processed. Place it at the program line where the "TOGGLE" label is located so that the trace will be regenerated at each commutation of the pin.

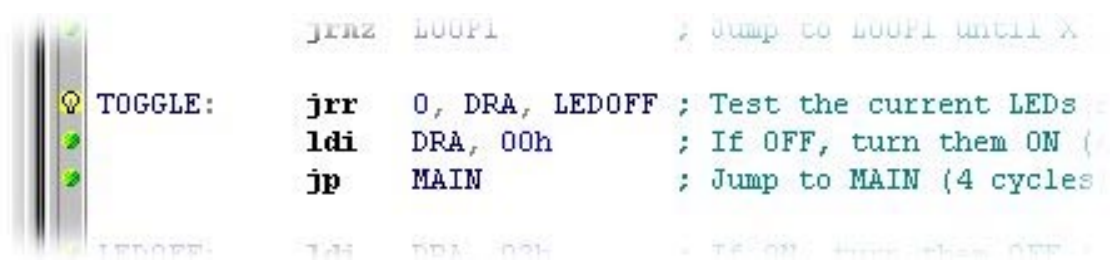
To do this, click on the source code line containing the "TOGGLE" label (so that the cursor blinks), and click on the left margin with the right mouse button. The following menu on the next page appears.

Figure 22. Left margin menu



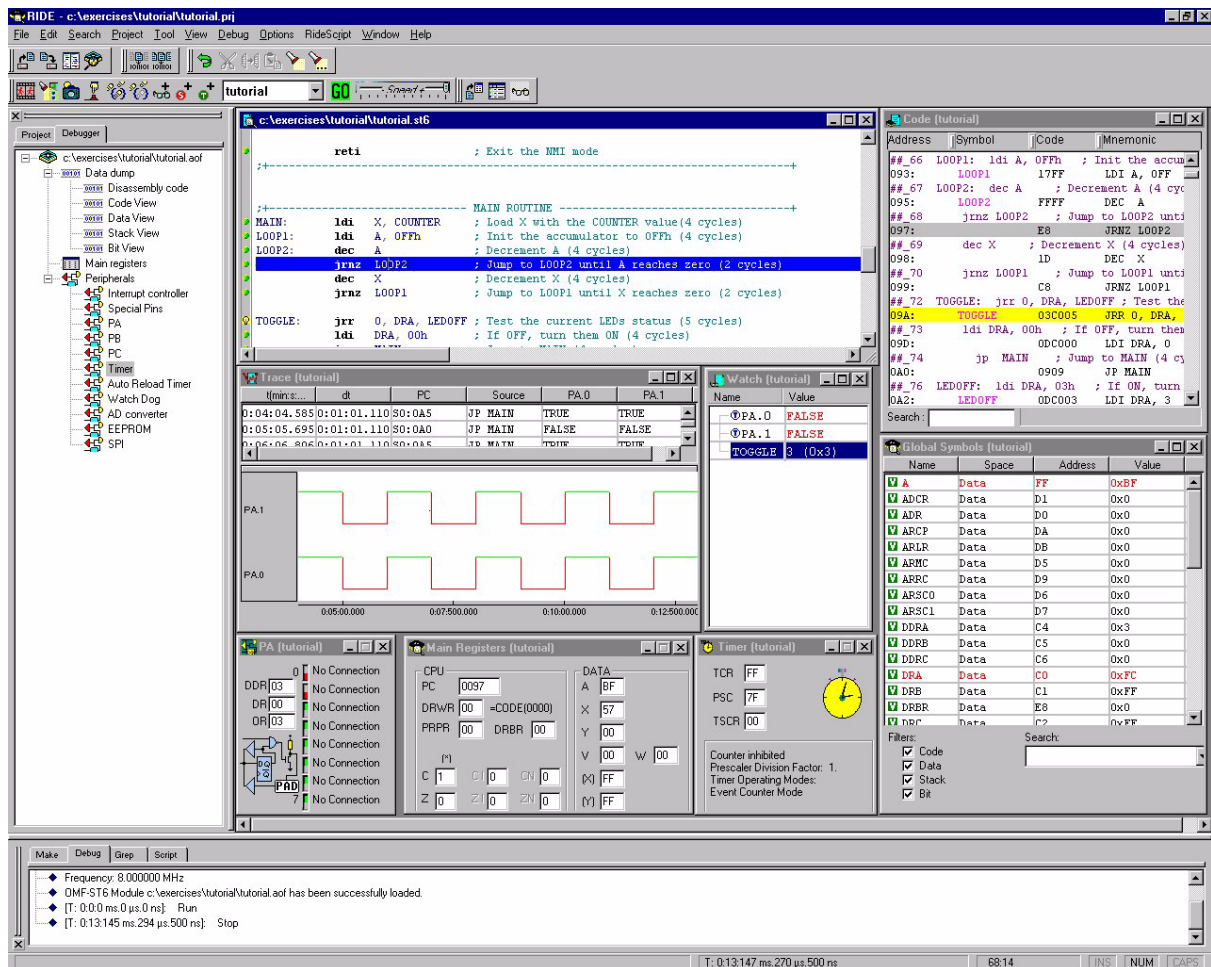
Select **Toggle Flag >Toggle refresh** and a small light bulb icon will appear in front of the line as follows:

Figure 23. Toggle refresh mark



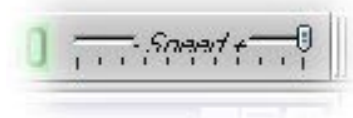
At this point, you may want to resize the windows in the screen to have a clear view of what happens when you run the application. You can use the Tile Vertical icon for example. Now, click on the Run icon and watch the program working! Figure 24 on the next page shows an example of the debug screen you can have.

Figure 24. Debug overview



## 4.7.3 Animate Mode

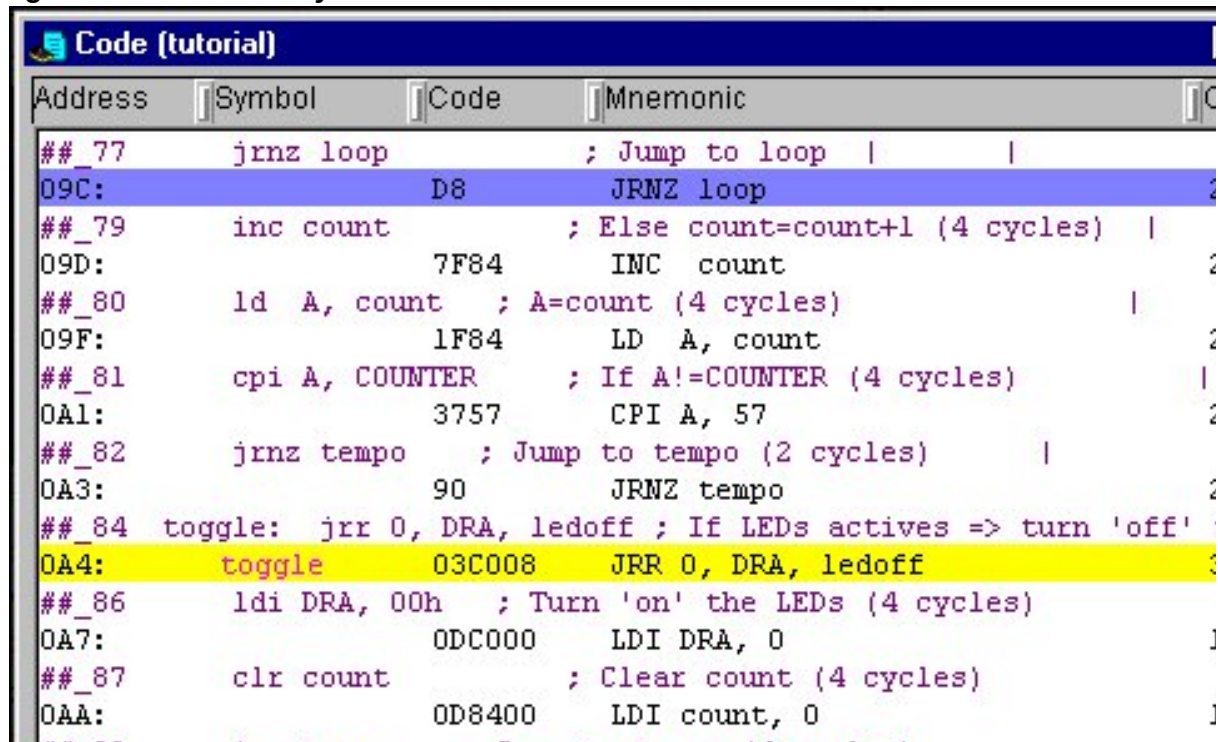
Finally, you can run the program using **Animated Mode**. This mode allows you to see the program execute at a desired speed. To do this, click on the **Animated Mode** icon and then click on the **Run** icon. You should be able to see the PC running through the program. To set the speed faster or slower, use the speed slider, and drag the index to the desired position on the scale.



#### 4.7.4 Disassembly code window

You can open the **Disassembly code** window by selecting the corresponding icon in the **Project > Debugger** window.

Figure 25. Disassembly code window



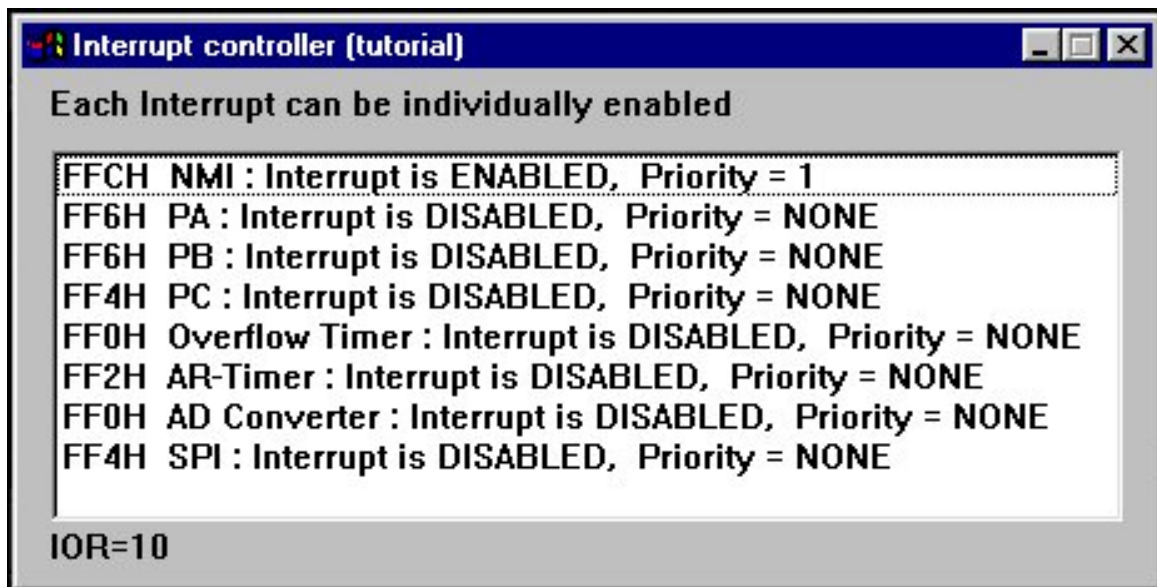
| Address | Symbol                     | Code   | Mnemonic                        |
|---------|----------------------------|--------|---------------------------------|
| ##_77   | jrnz loop                  |        | ; Jump to loop                  |
| 09C:    |                            | D8     | JRNZ loop                       |
| ##_79   | inc count                  |        | ; Else count=count+1 (4 cycles) |
| 09D:    |                            | 7F84   | INC count                       |
| ##_80   | ld A, count                |        | ; A=count (4 cycles)            |
| 09F:    |                            | 1F84   | LD A, count                     |
| ##_81   | cpi A, COUNTER             |        | ; If A!=COUNTER (4 cycles)      |
| 0A1:    |                            | 3757   | CPI A, 57                       |
| ##_82   | jrnz tempo                 |        | ; Jump to tempo (2 cycles)      |
| 0A3:    |                            | 90     | JRNZ tempo                      |
| ##_84   | toggle: jrr 0, DRA, ledoff |        | ; If LEDs actives => turn 'off' |
| 0A4:    | toggle                     | 03C008 | JRR 0, DRA, ledoff              |
| ##_86   | ldi DRA, 00h               |        | ; Turn 'on' the LEDs (4 cycles) |
| 0A7:    |                            | 0DC000 | LDI DRA, 0                      |
| ##_87   | clr count                  |        | ; Clear count (4 cycles)        |
| 0AA:    |                            | 0D8400 | LDI count, 0                    |

You can then check the code at each address of the program memory area. Each line of the program is displayed with its address, the label if applicable (**Symbol**), the op-code actually executed (**Mnemonic**), and the number of times the PC executed the line.

### 4.7.5 External interrupt window

You get the **Interrupt Controller** window after selecting the corresponding icon in the **Project - Debugger** window.

**Figure 26. Interrupt controller window**



This window enables you to check whether each interrupt is enabled or not.

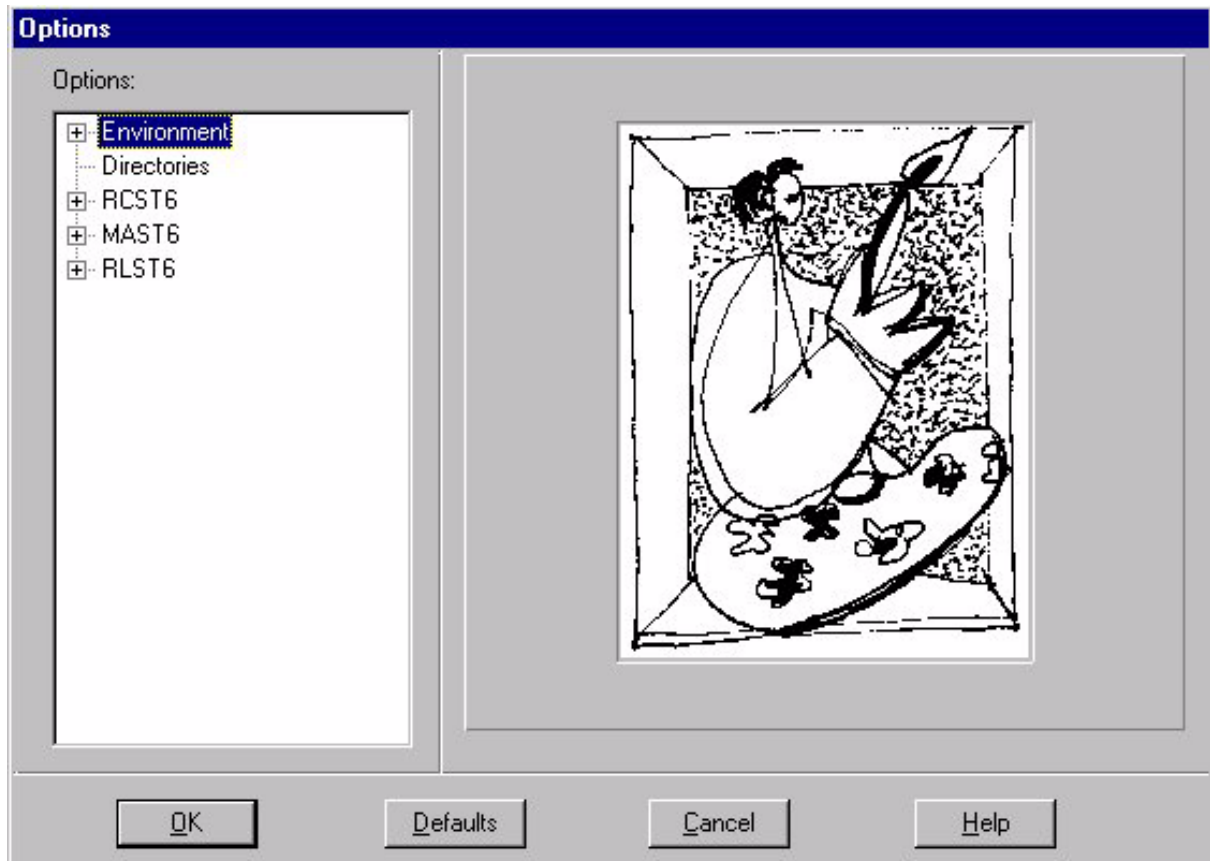
Now it's up to you if you want to make changes to the program (e.g. change the value of COUNTER to modify the delay) or to test the different features of RIDE.

To exit debug mode and return to edit mode, select the **Debug >Terminate** menu.

## 5 ENABLING AST6/LST6 RIDE COMPATIBILITY

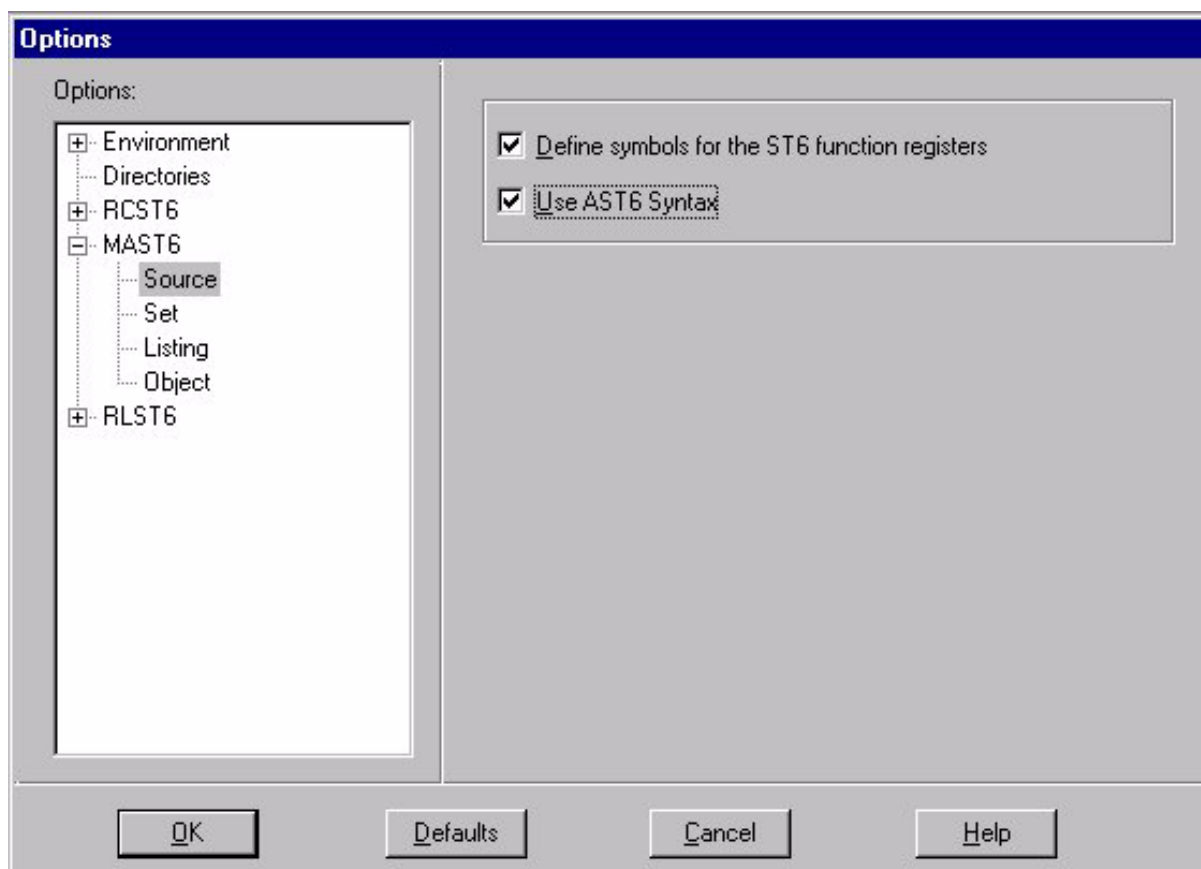
RIDE is able to process AST6/LST6 files. If you want to use them, select **Options >Project** and the following dialog box will appear.

**Figure 27. Project options dialog box**



Then, double-click on **MAST6 > source** and check the **Use AST6 syntax** check box: as shown on the next page.

**Figure 28. Project options dialog box**



This option allows you to assemble files written for the STMicroelectronics AST6 assembler and LST6 linker. A preprocessor will automatically be called to translate the AST6-like directives in MA-ST6-like directives.

## GETTING STARTED WITH RAISONANCE IDE FOR THE ST6 MICROCONTROLLER

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