AN104

INTEGRATING KEIL 8051 TOOLS INTO THE SILICON LABS IDE

1. Introduction

This application note describes how to integrate the Keil 8051 Tools into the Silicon Laboratories IDE (Integrated Development Environment). Integration provides an efficient development environment with compose, edit, build, download and debug operations integrated in the same program.

2. Key Points

- The Intel OMF-51 absolute object file generated by the Keil 8051 tools enables source-level debug from the Silicon Labs IDE.
- Once Keil Tools are integrated into the IDE they are called by simply clicking the 'Assemble/Compile Current File' button or the 'Build/Make Project' button.
- See the "..\Silabs\MCU\Examples" directory for examples created for use with the Keil tools.
- Information in this application note applies to Version 1.90 and later of the Silicon Labs IDE and Evaluation versions of the Keil 8051 tools included with Silicon Labs Kits.
- Evaluation versions of the Keil 8051 toolset included with some Silicon Labs kits are initially limited to a code size of 2 kB and programs start at code address 0x0800. To upgrade the toolset limitations to a code size of 4 kB, see Section 8. "Registering your copy of the evaluation Keil Toolset," on page 4.

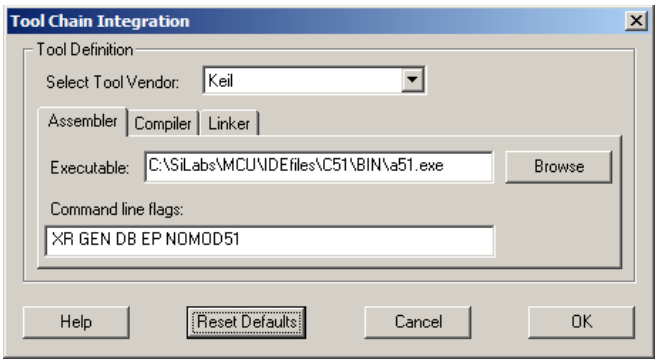
3. Create a Project in the Silicon Labs IDE

A project is necessary in order to link assembly files created by the compiler and build an absolute 'OMF-51' output file. Follow these steps to create a project:

1. Under the 'Project' menu, select 'Add Files to Project...'. Select the 'C' source files that you want to add and click 'Open'. Continue adding files until all project files have been added.
2. To add files to the build process, right-click on the file name in the 'Project Window' and select 'Add *filename* to build'.
3. Under the 'Project' menu, select 'Save Project As...'. Enter a project workspace name and click 'Save'.

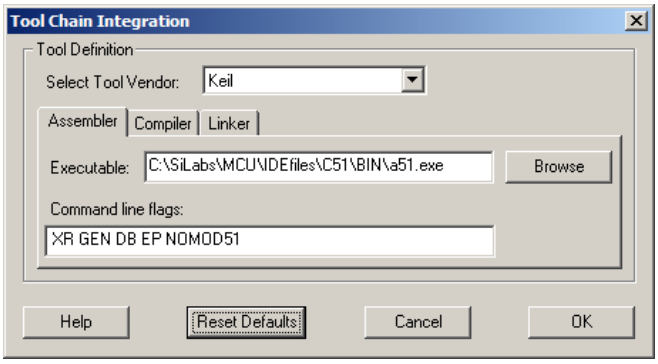
4. Configure the Tool Chain Integration Dialog

Under the 'Project' menu select 'Tool Chain Integration' to bring up the dialog box shown below. First, select 'Keil' from the 'Select Tool Vendor' drop down list. Next, define the Keil assembler, compiler, and linker as shown in the following sections. The executable paths listed are the default locations for the evaluation version of the Keil tools included with Silicon Labs development kits.



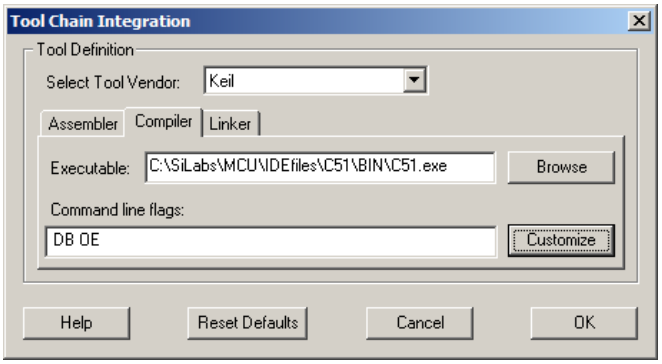
4.1. Assembler Definition

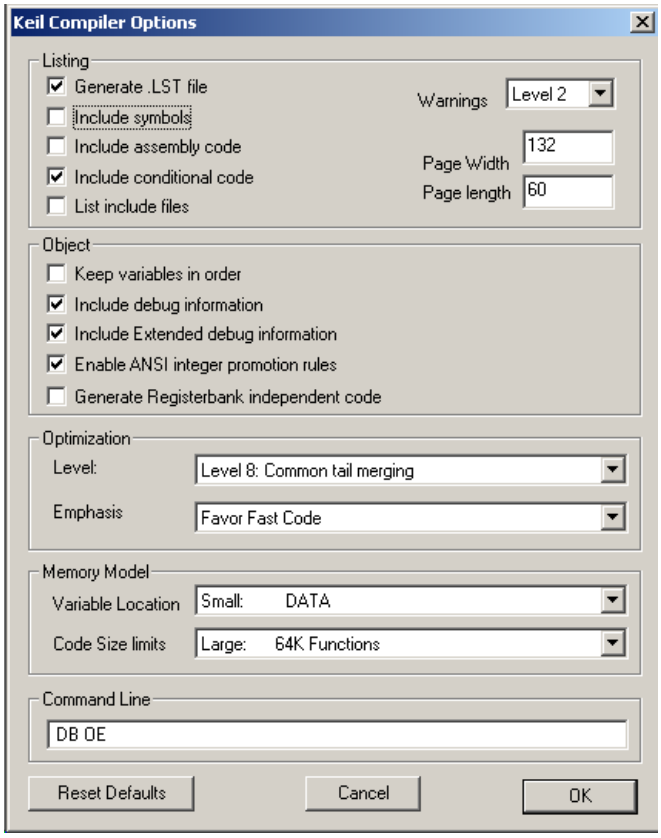
1. Under the 'Assembler' tab click the browse button next to the 'Executable:' text box, and locate the assembler executable. The default location for the Keil assembler is "C:\SiLabs\MCU\IDEfiles\C51\BIN\A51.exe".
2. Enter any additional command line flags directly in the 'Command Line Flags' box.
3. See the following figure for the 'Assembler' tab with the default Keil settings.



4.2. Compiler Definition

1. Under the ‘Compiler’ tab, if the compiler executable is not already defined, click the browse button next to the ‘Executable:’ text box, and locate the compiler executable. The default location for the Keil compiler is “C:\SiLabs\MCU\IDEfiles\C51\BIN\C51.exe”.
2. Enter any additional command line flags directly in the ‘Command Line Flags’ box, or click on the ‘Customize’ button to display the dialog box shown below. To enable source-level debugging ‘Include debug information’ and ‘Include Extended debug information should be selected.

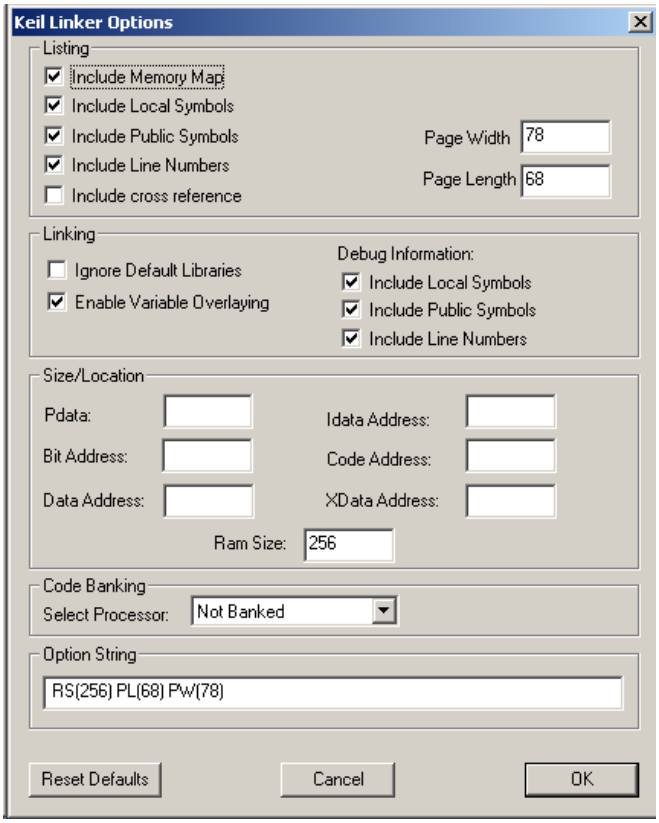




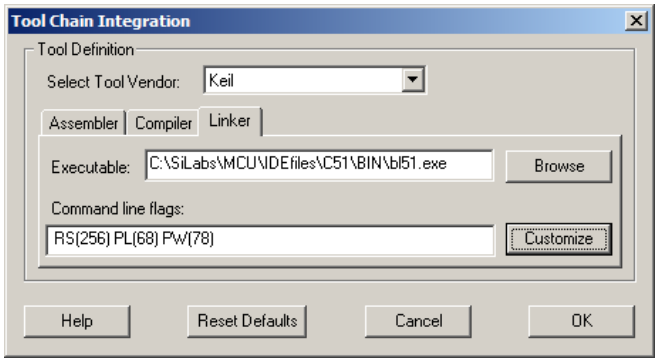
3. See the following figure for the ‘Compiler’ tab with the default Keil settings.

4.3. Linker Definition

1. Under the ‘Linker’ tab, if the linker executable is not already defined, click the browse button next to the ‘Executable:’ text box, and locate the linker executable. The default location for the Keil linker is “C:\SiLabs\MCU\IDEfiles\C51\BIN\BL51.exe.
2. Enter any additional command line flags directly in the ‘Command line flags’ box or click on the ‘Customize’ button to display the dialog box shown below.

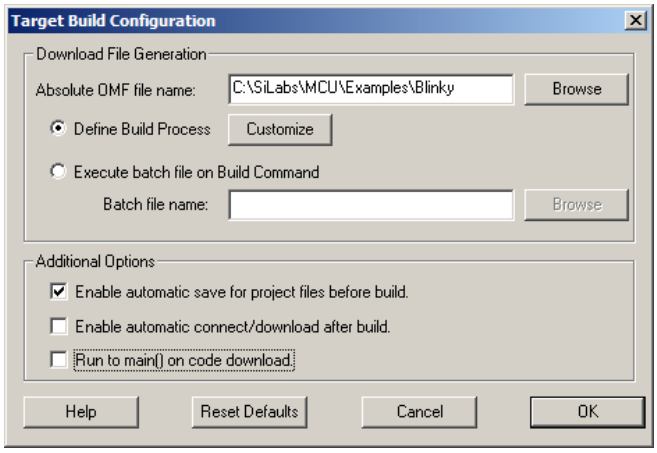


3. See the following figure for the ‘Linker’ tab with the default Keil settings.



5. Target Build Configuration

Under the ‘Project’ menu select ‘Target Build Configuration’ to bring up the dialog box shown below.

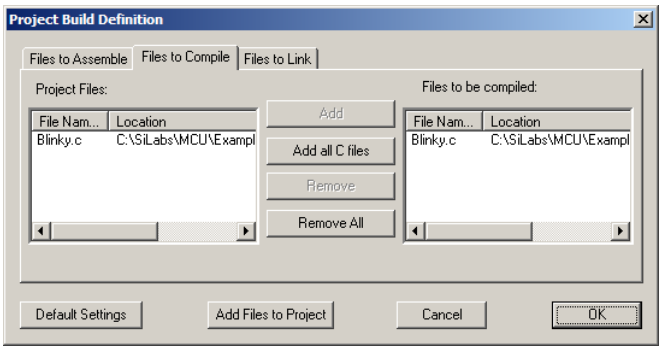


5.1. Output Filename

To customize a default filename or to create a new filename, click the browse button next to the ‘Absolute OMF file name:’ edit box. Select a path and enter an output filename with no extension (ex. blinky).

5.2. Project Build Definition

Click the ‘Customize’ button to bring up the ‘Project Build Definition’ window shown below. This window allows selection of the files to be included in the build process. Although, default assemble and compile selections will be made, ensure that all files have been correctly included in the build process. Under each tab, add Files to assemble or compile by selecting the desired file and clicking the ‘Add’ button. Files are removed in the same manner.



5.3. Additional Options

1. If the ‘Enable automatic save for project files before build.’ box is checked, then all files included in the project will be automatically saved when the ‘Build/ Make project’ button is pressed.
2. If the ‘Enable automatic connect/download after build.’ box is checked, then the project will be automatically downloaded to the target board when the ‘Build/Make project’ button is pressed.
3. If the “Run to main() on code download.” box is checked, the target board will halt at the first line in main() when the “Download code” button is pressed.

6. Building the Project

1. After saving all files that have been edited, the previous revisions will be saved in backup files. Backups are saved as the name of the file with the extension #1, #2, #3, and so on up to the number of backups (N) created and available. '#1' being the most recent and 'N' being the least recent.
2. Click the 'Assemble/Compile current file' button to compile just the current file.
3. Click the 'Build/Make project' button to compile and link all the files in the project.
4. Review the errors and warnings generated during the build process located in the 'Build' tab of the Output window (typically found at the bottom of the screen). Double-clicking on an error that is associated with a line number will automatically move the cursor to the proper line number in the source file that generated the error.

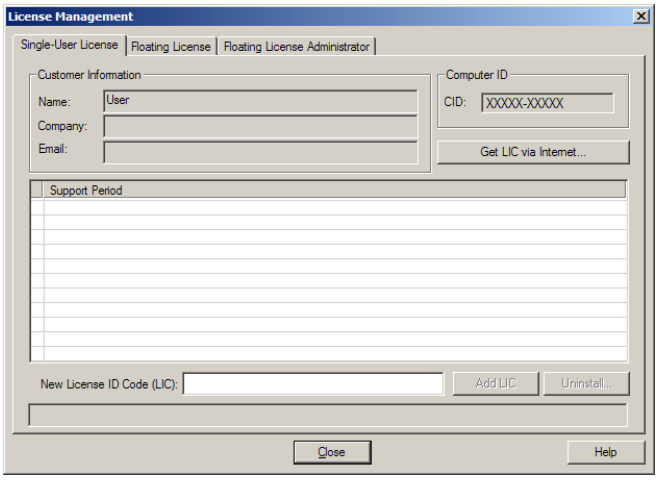
7. Source/Include File Examples

Example source files and include files for each of the Silicon Labs devices have been created for use with the Keil toolset. The default location for these examples is "C:\Silabs\MCU\Examples". In addition, examples can be found in many Silicon Labs Application Notes.

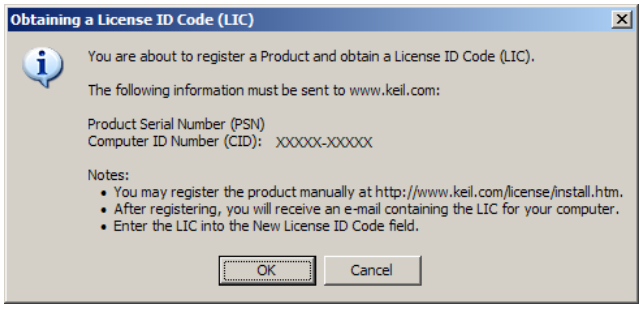
8. Registering your copy of the evaluation Keil Toolset

The Silicon Labs Development Kit CD version 3.00 and later have been upgraded to contain the latest versions of the evaluation Keil 8051 toolset. These versions are initially limited to a code size of 2 kB and programs start at code address 0x0800. If you have purchased a kit that contains this CD or downloaded the evaluation version from the Silicon Labs website, follow the steps below to register your copy of the toolset. After registration, the code size limit is increased to 4 kB and programs will start at code address 0x0000. A complete list of further limitations can be found at www.keil.com/demo/limits.asp.

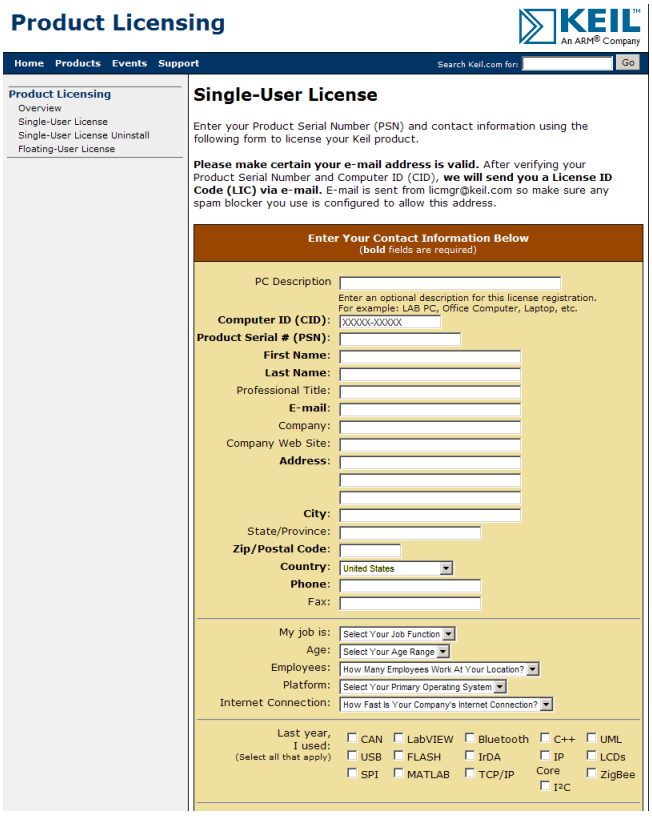
1. Install the Silicon Labs distribution of the Evaluation Keil toolset.
2. From the Programs Start menu select **Silicon Laboratories→Keil Eval→Keil uVision3** to open Keil's uVision3 IDE.
3. In the uVision3 menu, select **File→License Management** to open the "License Management" window shown below.



4. Click on the "Get LIC via Internet..." button to open the "Obtaining a License IDE Code (LIC)" window shown below.



5. Click the "OK" button. (If you are not connected to the internet, you will need to manually go to www.keil.com/license/install.htm to register the tools. You will need the Computer ID Number (CID) to complete the registration process.)



6. An Internet window will open to the Keil licensing website. Any known information will be automatically entered into the form fields.
7. Enter the Silicon Labs Product Serial Number printed on your kit CD or on your ToolStick kit box in the field provided. See the following figures for location of the SN.

8. Once this form is filled out click the "Submit" button.
9. Shortly, an email will be sent to the provided email address. Copy the License ID Code (LIC) contained in this email. An example is shown below.

Thank you for licensing your Keil product. Your License ID Code (LIC) is printed below. Print a copy of this e-mail to save with your installation CD.

DK51 Developer's Kit
For Silicon Labs Devices Only
Support Ends 31 Mar 2008

Computer ID (CID): XXXXX-XXXXX

License ID Code (LIC): XXXXX-XXXXX-XXXXX-XXXXX-XXXXX-XXXXX

To activate your Keil product, copy the License ID Code (LIC) and paste it into the New License ID Code input field on the Single-User License Tab in the uVision3 License Manager Dialog (available from the File menu).

Thank You,
Technical Support

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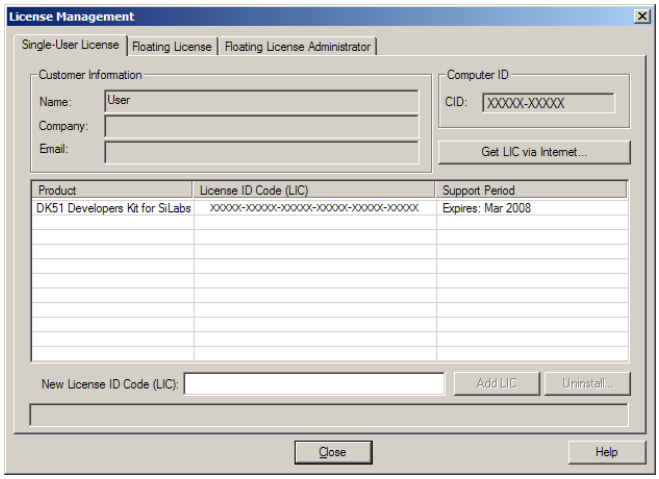
1501 10th Street, Suite 110
Plano, Texas 75074 USA
Phone: +1 972-312-1107
FAX: +1 972-312-1159
http://www.keil.com/

10. In µVision3, open the "License Management" window if not already open.
11. Paste the LIC into the text box labeled "New License ID Code (LIC):" at the bottom of the window.

12. Click the "Add LIC" button.



13. The "License Management" window should now list the "DK51 Developers Kit for Silabs" as a licensed Product.
14. Click the "Close" button.

DOCUMENT CHANGE LIST

Revision 2.4 to Revision 2.5

- Introduction updated.
- Example path updated from C:\Cygnal\Examples to C:\Silabs\MCU\Examples.
- Target Build Configuration and Project Build Definition windows screenshots updated to reflect the new examples path.
- Key Points updated to include Silicon Labs and Keil tools version information.

Revision 2.5 to Revision 2.6

- Section 8. “Registering your copy of the evaluation Keil Toolset” added.
- Bullet added to Section 2. “Key Points” referring to new Section.

Revision 2.6 to Revision 2.7

- Instructions added to retrieve Keil Serial Number from ToolStick kit boxes.
- Instructions updated due to Keil evaluation tools no longer being included with the installation of the Silicon Labs IDE.

Revision 2.7 to Revision 2.8

- Corrected link to Keil website in Section 8. "Registering your copy of the evaluation Keil Toolset," on page 4.

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