Integrating Keil 8051 Tools into the Cygnal IDE

1. Introduction

This application note describes how to integrate the Keil 8051 Tools into the Cygnal IDE (Integrated Development Environment). It applies to Version 1.4 of the Cygnal IDE. Integrating Keil 8051 Tools into the Cygnal IDE provides the most efficient development environment since compose, edit, and build operations are integrated in the same program as download and debug operations.

2. Key Points

- The Intel OMF-51 absolute object file generated by the Keil 8051 tools enables source-level debug from the Cygnal IDE.
- Once Keil Tools are integrated into the IDE they are called by simply pressing the 'Assemble/Compile Current File' button or the 'Build/Make Project' button.
- The generation of debug information and object extensions must be enabled in the Keil 8051 tools to support source-level debug using the Cygnal IDE.

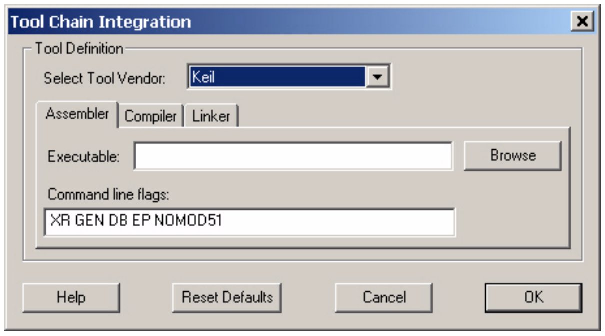
3. Create a Project in the Cygnal IDE

A project is necessary in order to link object files created by your assembler/compiler and build an absolute 'OMF-51' output file. To create a project:

1. Open all assembly and/or 'C' source files which should be part of the project.
2. Under the 'Project' menu select 'Save Project As...'.
3. Enter a project workspace name, and click the 'Save' button.

4. Configure the Tool Chain Integration Dialog

Under the 'Project' menu select 'Tool Chain Integration' to bring up the dialog box shown below.


Tool Chain Integration
Tool Definition
Select Tool Vendor: Keil
Assembler | Compiler | Linker
Executable:
Command line flags: XR GEN DB EP NOMOD51

4.1. Tool Definition

You may define the Keil assembler, compiler, or both, but you must always define the linker to create an absolute object file.

1. Select Keil from the 'Select Tool Vendor' drop down list. Once Keil is selected, the default Command line flags for each tool are automatically filled in.

4.1.1 Assembler Tool Definition

1. Under the 'Assembler' tab, if the assembler executable is not already defined, click the browse button next to the 'Exe-

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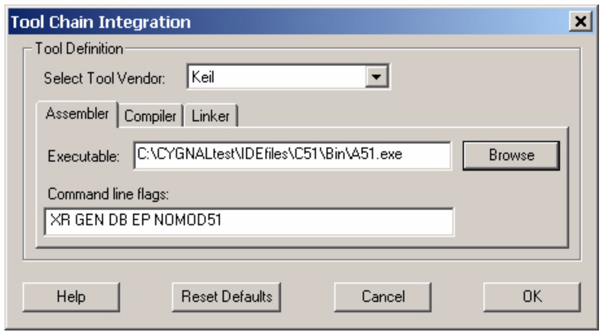
cutable' edit box, and locate the assembler executable. The default for Keil A51 is located at "\C51\BIN\A51.exe".

2. Enter any additional command line flags directly in the 'Command Line Flags' box.
3. The 'Assembler' tab with the default Keil settings should now look like this:



Tool Chain Integration

Tool Definition

Select Tool Vendor: Keil

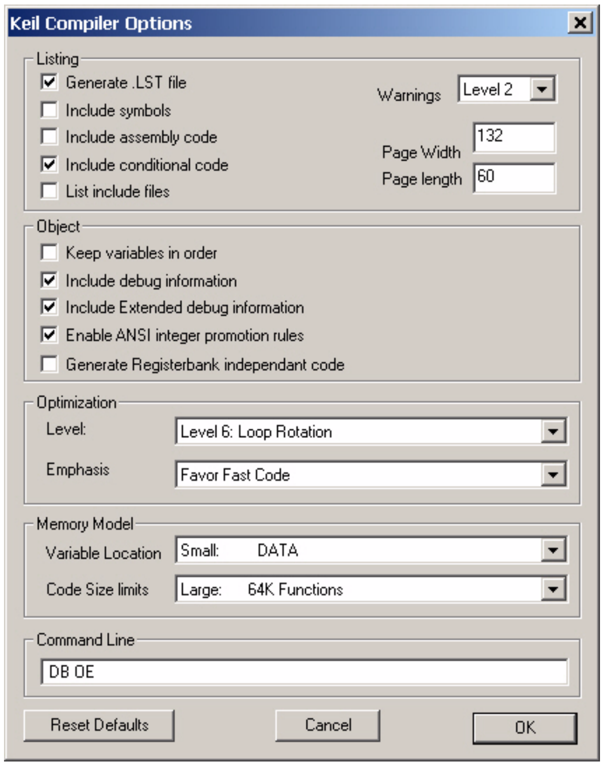
Assembler | Compiler | Linker

Executable: C:\CYGNALtest\IDEfiles\C51\Bin\A51.exe

Command line flags: XR GEN DB EP NOMOD51

4.1.2 Compiler Tool Definition

1. Under the 'Compiler' tab, if the compiler executable is not already defined, click the browse button next to the 'Executable' edit box, and locate the compiler executable. The default for Keil C51 is located at "\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 ensure 'Include symbols', 'Include debug information', and 'Include Extended debug information' are selected.



Keil Compiler Options

Listing
- [✓] Generate .LST file
- [ ] Include symbols
- [ ] Include assembly code
- [✓] Include conditional code
- [ ] List include files

Warnings: Level 2

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Object
- [ ] Keep variables in order
- [✓] Include debug information
- [✓] Include Extended debug information
- [✓] Enable ANSI integer promotion rules
- [ ] Generate Registerbank independant code

Optimization

Level: Level 6: Loop Rotation

Emphasis: Favor Fast Code

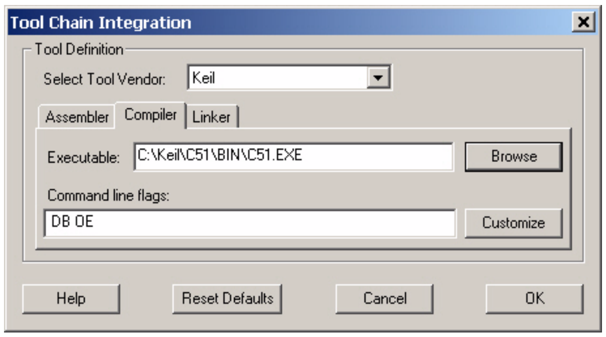
Memory Model

Variable Location: Small: DATA

Code Size limits: Large: 64K Functions

Command Line: DB OE

3. The 'Compiler' tab with the default Keil settings should now look like this:



Tool Chain Integration

Tool Definition

Select Tool Vendor: Keil

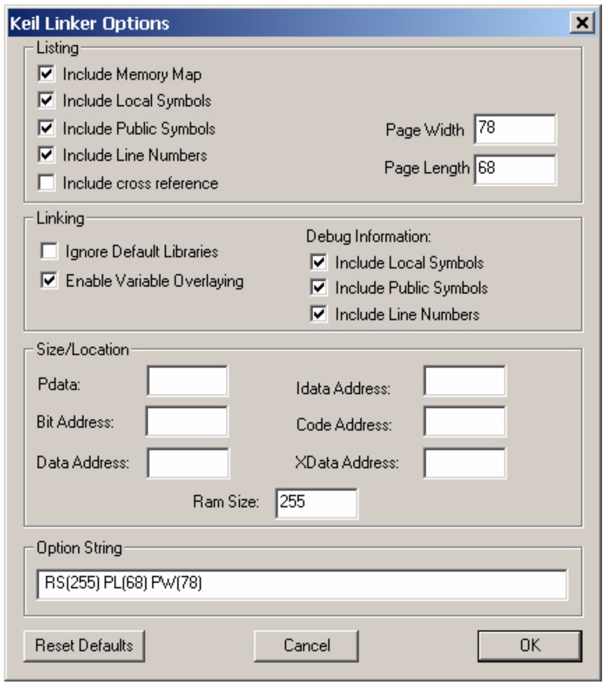
Assembler | Compiler | Linker

Executable: C:\Keil\C51\BIN\C51.EXE

Command line flags: DB OE

4.1.3 Linker Tool Definition

1. Under the 'Linker' tab, if the compiler executable is not already defined, click the browse button next to the 'Executable' edit box, and locate the linker executable. The default for Keil BL51 is located at "\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.


Keil Linker Options

Listing
- ☑ Include Memory Map
- ☑ Include Local Symbols
- ☑ Include Public Symbols
- ☑ Include Line Numbers
- ☐ Include cross reference

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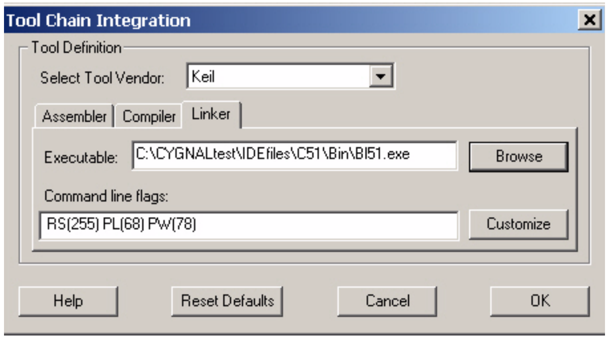
Linking
- ☐ Ignore Default Libraries
- ☑ Enable Variable Overlaying

Debug Information:
- ☑ Include Local Symbols
- ☑ Include Public Symbols
- ☑ Include Line Numbers

Size/Location
Pdata:
Idata Address:
Bit Address:
Code Address:
Data Address:
XData Address:
Ram Size: 255

Option String: RS(255) PL(68) PW(78)

3. The 'Linker' tab with the default Keil settings should now look like this:

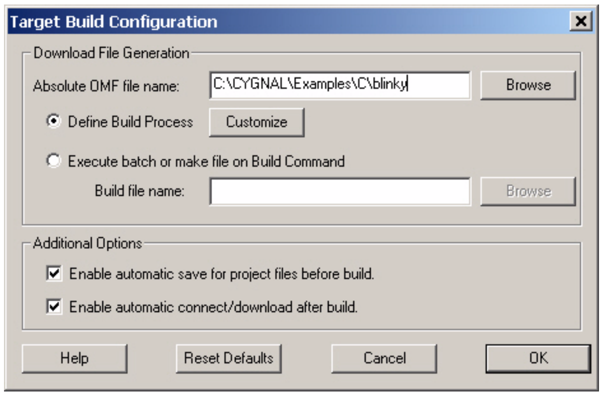

Tool Chain Integration

Tool Definition
Select Tool Vendor: Keil

Executable: C:\CYGNALtest\IDEfiles\C51\Bin\Bl51.exe
Command line flags: RS(255) PL(68) PW(78)

5. Target Build Configuration

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


Target Build Configuration

Download File Generation
Absolute OMF file name: C:\CYGNAL\Examples\C\blinky
[✓ Define Build Process] Execute batch or make file on Build Command
Build file name:

Additional Options
- ☑ Enable automatic save for project files before build.
- ☑ Enable automatic connect/download after build.

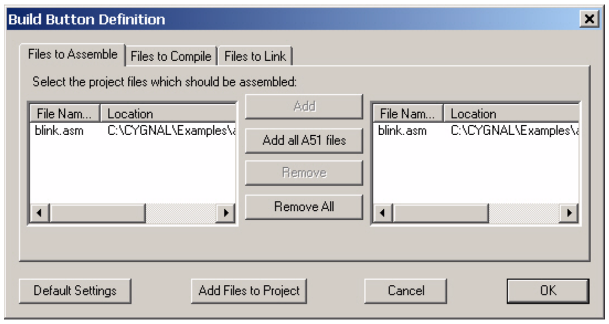
5.1. Download File Generation

First you must specify an output/download file. Define an output file, for the Keil linker to generate, in the following fashion:

1. Click the browse button next to the 'Download file name' edit box. Select a path and enter an output filename, "Blinky", for example.
2. Make sure the 'Define Build Process' button is selected.
3. Click the Customize button to bring up the 'Build Button Definition' dialog box. Default assemble, compile, and link selections will be made automatically, but make sure that all files have been correctly included in the build process.

5.1.1 Build Button Definition

The Build Button Definition Dialog allows you to select which files are to be included in the build process. Under each tab, you may add Files to assemble, compile, or link by selecting the desired file and clicking the 'Add' button. Files are removed in the same manner.



5.2. 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 saved automatically when the 'Build/Make project' button is pressed. The previous revision of your file(s) will be saved in a backup file. Backups are saved as the name of the file with the extensions #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. If the 'Enable automatic connect/download after build' box is checked, then the project will be downloaded to the target board automatically when the 'Build/Make project' button is pressed.

6. Building the Project

To compile and link all the files in the project, click the 'Build/Make project' button.

To assemble or compile just the current file, click the 'Assemble/Compile current file' button.

Errors and warnings generated during the build process can be viewed 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.