

# BSP Project Quick Start

For NuMicro 8051 Series

Jan, 2026

Joy of innovation  
**NUVOTON**

# Agenda

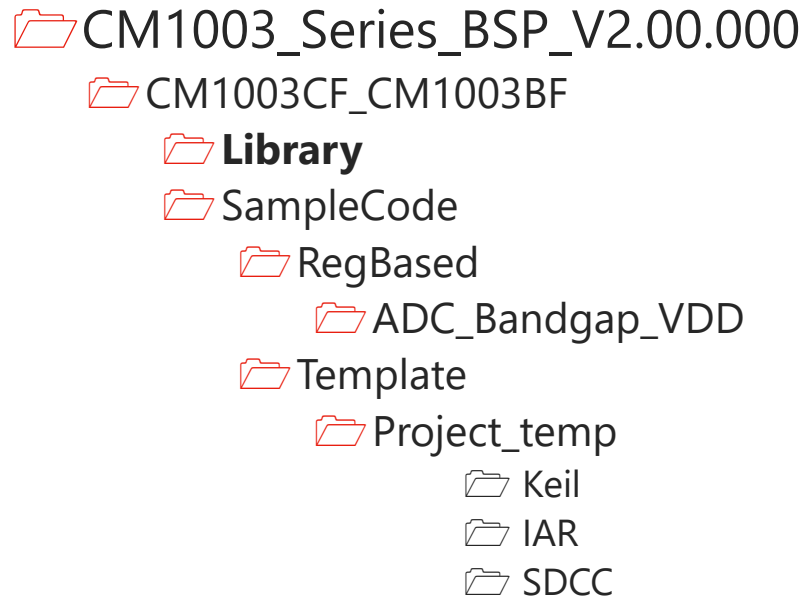
- **The Structure Of BSP**
- **Build Your Project Utilizing BSP - KEIL**
- **Build Your Project Utilizing BSP - IAR**
- **Build Your Project Utilizing BSP - NuEclipse**

# The BSP Structure

KEIL / IAR / SDCC NuEclipse



# | Folder structure



CM1003_Series_BSP_V2.00.000 >			
名称	修改日期	类型	大小
CM1003CF_CM1003BF	2026/1/21 17:16	文件夹	
CM1003DL_CM1003DJ_CM1003CJ	2026/1/21 17:16	文件夹	
Document	2026/1/21 17:16	文件夹	
LICENSE.txt	2022/1/20 17:27	文本文档	12 KB
NOTICE.txt	2024/6/4 15:17	文本文档	1 KB
Readme.pdf	2025/6/17 17:19	PDF 文件	295 KB

- It is recommended to create a new project folder at the same level as the subfolder within either the "Template" or "RegBased" directory.
- The "Library" folder and all subfolders should always be remained.

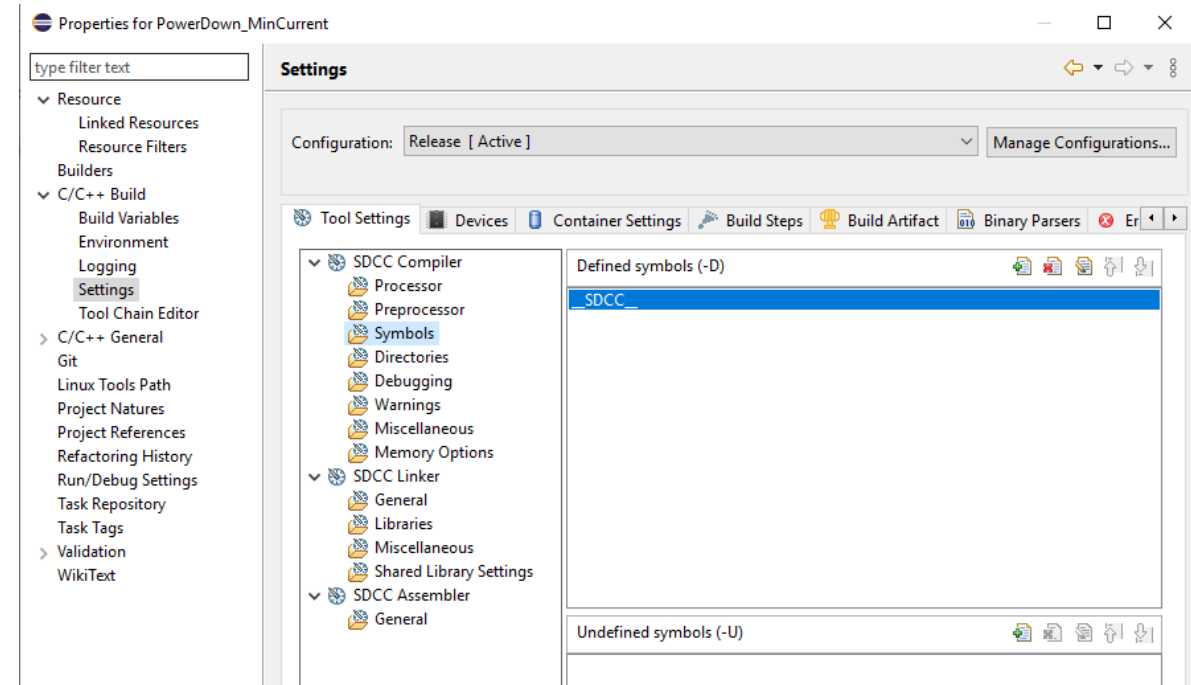


# The .c File Define For Different Compiler

- Different Coding Rule  
    **\_\_C51\_\_** is for KEIL PK51  
    **\_\_ICC8051\_\_** is for IAR 8051 workbench  
    **\_\_SDCC\_\_** is for NuEclipse

```
11 #if defined __C51__
12     uint8_t data TA_REG_TMP, BYTE_TMP, SFRS_TMP;
13
14 #elif defined __ICC8051__
15     uint8_t __data TA_REG_TMP, BYTE_TMP, SFRS_TMP;
16
17 #elif defined __SDCC__
18     __data uint8_t TA_REG_TMP, BYTE_TMP, SFRS_TMP;
19 #endif
```

- Simplify code  
When you decide to use a certain compiler, you can remove the definitions of other compilers whole group.



NuEclipse defined symbols window

# **Build Your Project Utilizing BSP - KEIL**

**Copying from the existing project  
is often more advantageous  
than creating a new one**



# For KEIL

- Copy A Folder From Template “Project\_temp”

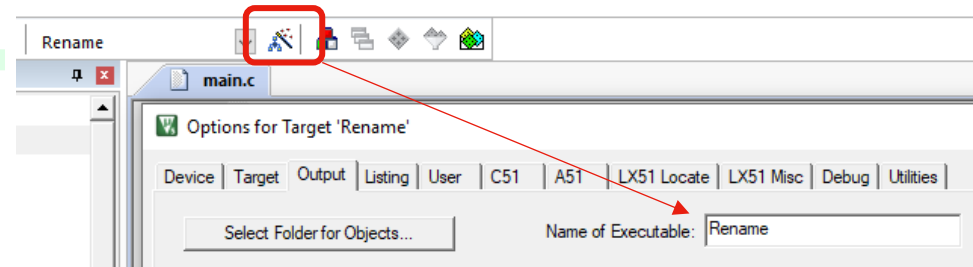
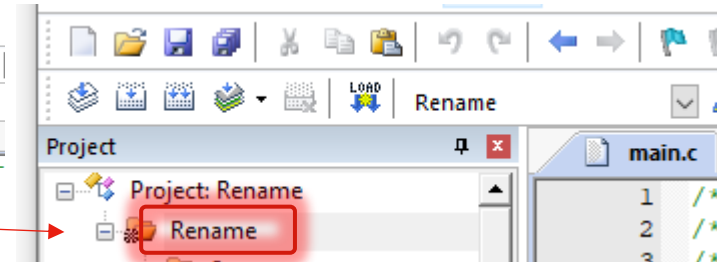
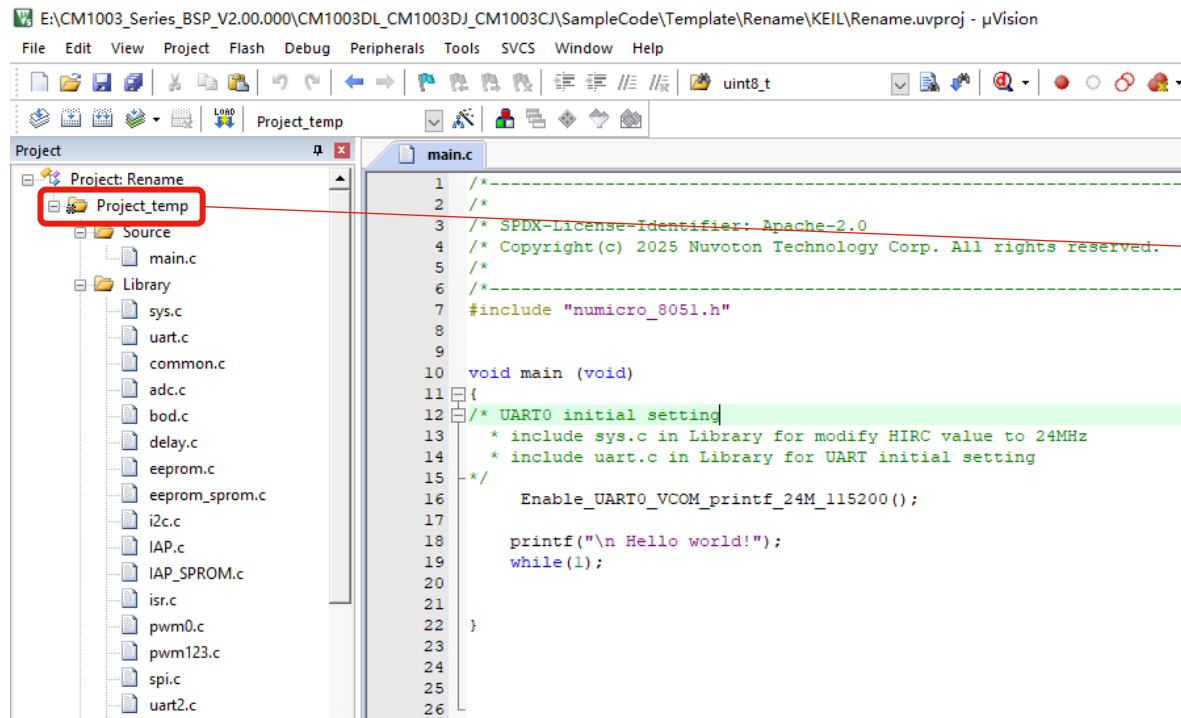
CM1003_Series_BSP_V2.00.000 > CM1003CF_CM1003BF > SampleCode > Template >				
名称	修改日期	类型	大小	
Project_temp	2026/1/21 17:16	文件夹		
Project_temp - copy	2026/1/22 14:22	文件夹		

- Rename the “project\_temp.uvproj” to “Rename.uvproj”

> CM1003_Series_BSP_V2.00.000 > CM1003DL_CM1003DJ_CM1003CJ > SampleCode > Template > <b>Rename</b> > KEIL				
名称	修改日期	类型	大小	
Nu_Link_8051_Driver.ini	2022/11/14 14:26	INI 文件	1 KB	
<b>Rename.uvopt</b>	2023/12/1 14:19	UVOPT 文件	15 KB	
<b>Rename.uvproj</b>	2025/6/17 17:14	µVision4 Project	19 KB	

# | For KEIL

- Modify the Project name in KEIL.





# | For KEIL

- Compile with the new application .c file. Find the output hex and bin file.

```
1  /*
2  /*
3  /* SPDX-License-Identifier: Apache-2.0
4  /* Copyright(c) 2025 Nuvoton Technology Corp. All rights reserved.
5  /*
6  /*
7  #include "numicro_8051.h"
8
9
10 void main (void)
11 {
12     /* UART0 initial setting
13     * include sys.c in Library for modify HIRC value to 24MHz
14     * include uart.c in Library for UART initial setting
15     */
16     Enable_UART0_VCOM_printf_24M_115200();
17
18     printf("\n Hello world!");
19     while(1);
20
21
22 }
```

Build Output

```
compiling wdt.c...
assembling STARTUP.A51...
linking...
Program Size: data=41.4 xdata=844 const=15 code=2069
creating hex file from ".\\Output\\Rename"...
User command #1: C:\\PK51\\Keil_v5\\C51\\NULink\\Hex2Bin.exe .\\output\\Rename.hex
>>> Rename.bin Checksum = 0x1C92 <<<
>>> Rename.bin CRC-8 Checksum = 0xC9 <<<
".\\Output\\Rename" - 0 Error(s), 0 Warning(s).
Build Time Elapsed: 00:00:08
```

名称	修改日期	类型	大小
adc.obj	2026/1/23 11:12	3D Object	543 KB
bod.obj	2026/1/23 11:12	3D Object	540 KB
common.obj	2026/1/23 11:12	3D Object	543 KB
delay.obj	2026/1/23 11:12	3D Object	548 KB
eeprom.obj	2026/1/23 11:12	3D Object	552 KB
eeprom_sprom.obj	2026/1/23 11:12	3D Object	546 KB
gpio.obj	2026/1/23 11:12	3D Object	549 KB
i2c.obj	2026/1/23 11:12	3D Object	544 KB
IAP.obj	2026/1/23 11:12	3D Object	566 KB
IAP_SPROM.obj	2026/1/23 11:12	3D Object	545 KB
isr.obj	2026/1/23 11:12	3D Object	551 KB
main.obj	2026/1/23 11:12	3D Object	539 KB
pwm0.obj	2026/1/23 11:12	3D Object	548 KB
pwm123.obj	2026/1/23 11:12	3D Object	552 KB
Rename	2026/1/23 11:13	文件	12,481 KB
Rename.bin	2026/1/23 11:13	BIN 文件	3 KB
Rename.build_log.htm	2026/1/23 11:13	Microsoft Edge ...	2 KB
Rename.hex	2026/1/23 11:13	HEX 文件	6 KB
Rename.lnp	2026/1/23 11:13	LNP 文件	1 KB
Rename.SBR	2026/1/23 11:13	SBR 文件	12,240 KB
spi.obj	2026/1/23 11:12	3D Object	540 KB
STARTUP.obj	2026/1/23 11:13	3D Object	1 KB
sys.obj	2026/1/23 11:12	3D Object	550 KB
timer.obj	2026/1/23 11:12	3D Object	547 KB
uart.obj	2026/1/23 11:12	3D Object	545 KB
uart2.obj	2026/1/23 11:12	3D Object	543 KB
uart3.obj	2026/1/23 11:12	3D Object	543 KB
uart4.obj	2026/1/23 11:12	3D Object	543 KB

# Options of KEIL PK51

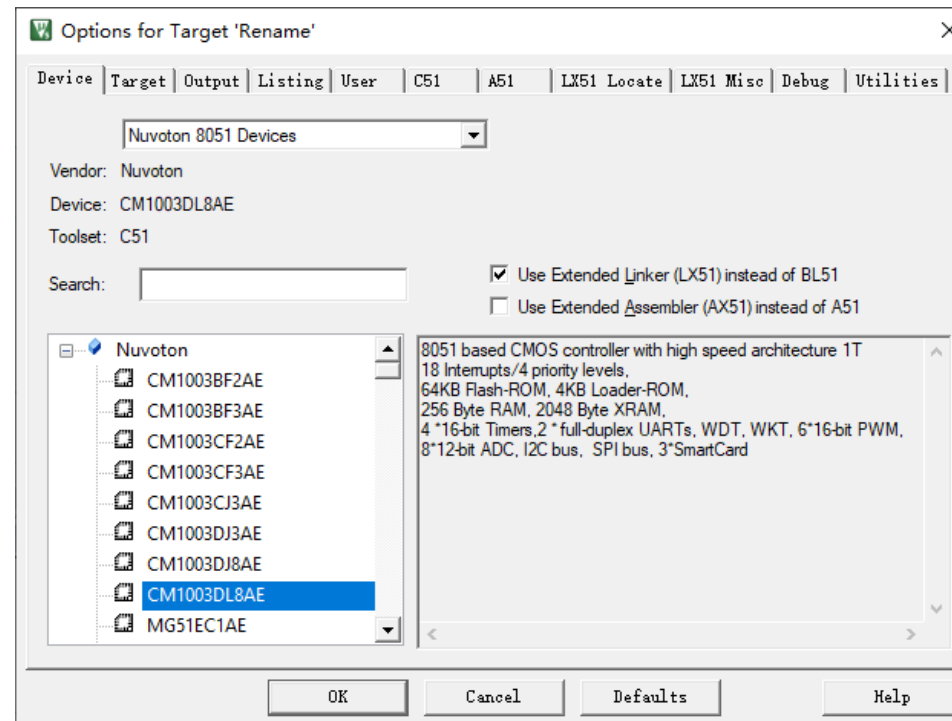
- The following introduction focuses on the special definition of Nuvoton 8051 series.
- For a comprehensive description of all options, please consult the official Keil documentation.

[https://www.keil.com/support/man/docs/uv4cl/uv4cl\\_dg\\_options.htm](https://www.keil.com/support/man/docs/uv4cl/uv4cl_dg_options.htm)



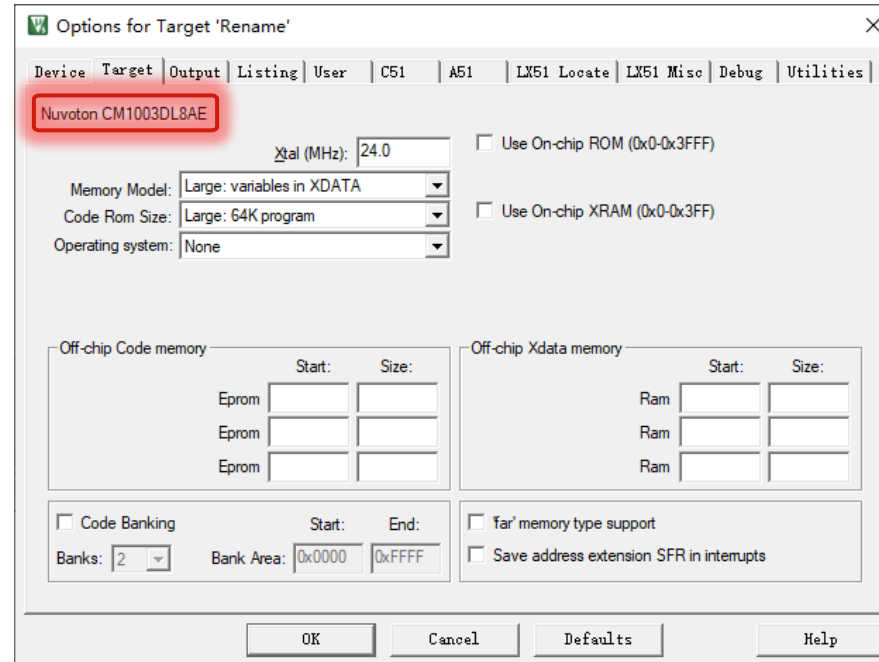
# | For KEIL - Device

- Confirm "Nuvoton 8051 Device" is selectable.
- If this option is unavailable, please install the Nuvoton Keil driver package.



# | For KEIL - Target

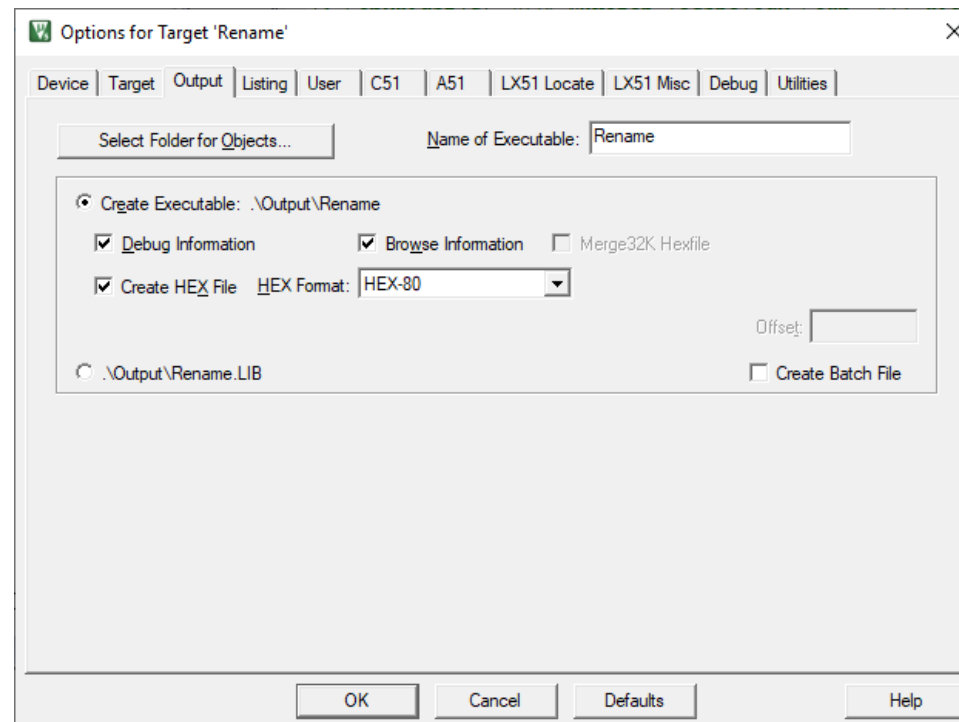
- Check with the device. If not match, select the correct device in “Device” page.
- Memory Model: Large for variable default using XDATA





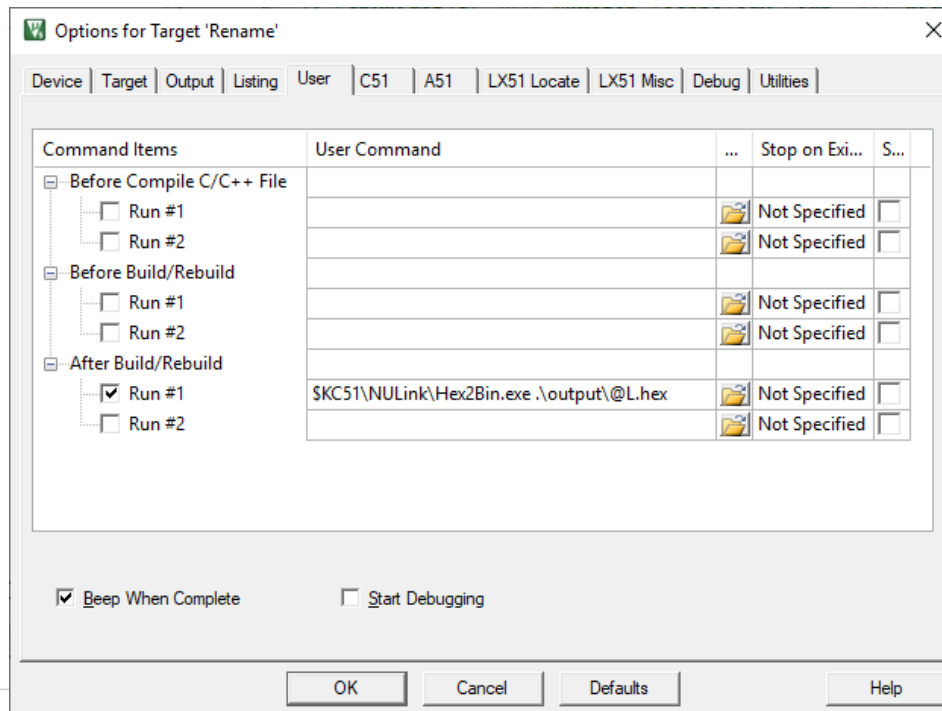
# | For KEIL - Output

- “Name of Executable” define the output .hex file name
- Keil exclusively generates HEX format files, while BIN files are produced using the Nuvoton command line. The command line we introduce in next page.



# | For KEIL - User

- This file is located within the Keil setup folder. For example: C:\Keil\_v5\C51\NULink
  - By default, unused locations will be filled with 0xFF.
  - Users can also include the parameter -P 0x00 means unused locations are filled with zeros.
  - Parameter <start address> <data length>



```
C:\Keil_v5\C51\NULink>hex2bin.exe

=====
Nuvoton HexToBin for 8051 Series v1.07
=====

Command Format:
Hex2Bin [File] [Arg0] [Arg1] [Arg2] [Arg3] [Arg4] [Arg5]

C:\>Hex2Bin C:\File.hex
C:\>Hex2Bin C:\File.hex -P 0xFF
C:\>Hex2Bin C:\File.hex -P 0xFF 0x00 0x1000
C:\>Hex2Bin C:\File.hex 0x00 0x1000
C:\>Hex2Bin C:\File.hex -P 0xFF 0x00 0x1000 0x2000 0x800
C:\>Hex2Bin C:\File.hex 0x00 0x1000 0x2000 0x800
C:\>Hex2Bin C:\File.hex -S 0xFF 0x1000 0x800
```

# | For KEIL – C51

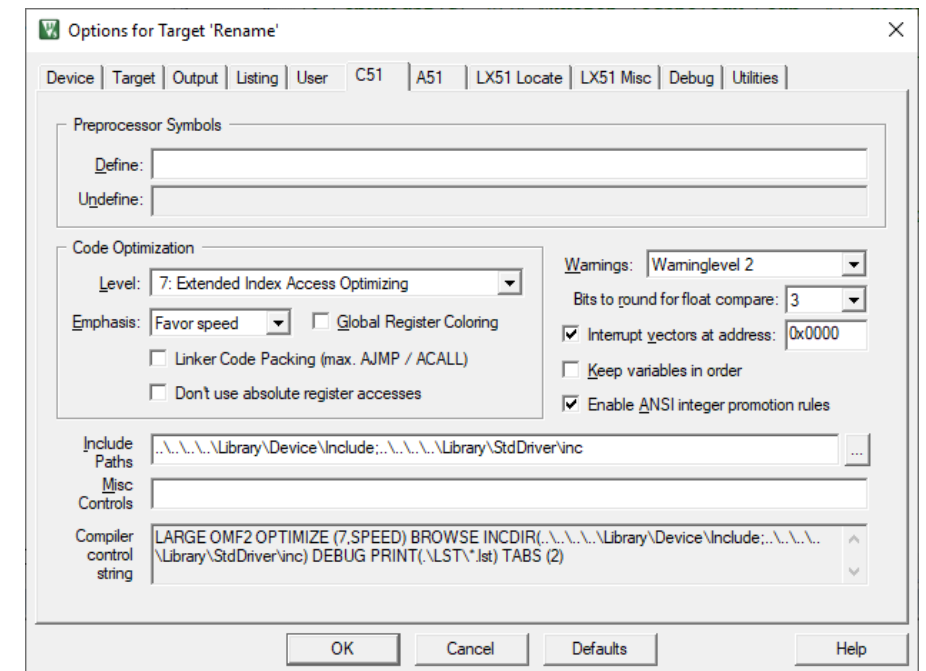
- Code Optimization

Levels 7 and 4 are recommended especially when considering code size.

- Include Paths

Defined the header file path of device and library.

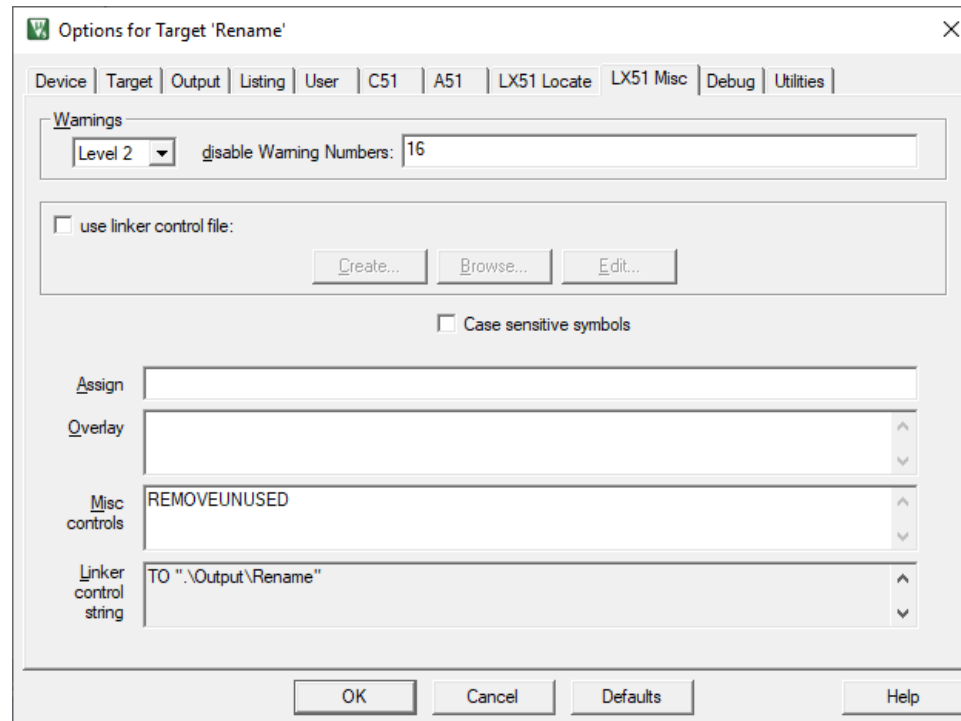
- Following shows the most popular define



# | For KEIL – LX51 Misc

- The Parameter for code size.

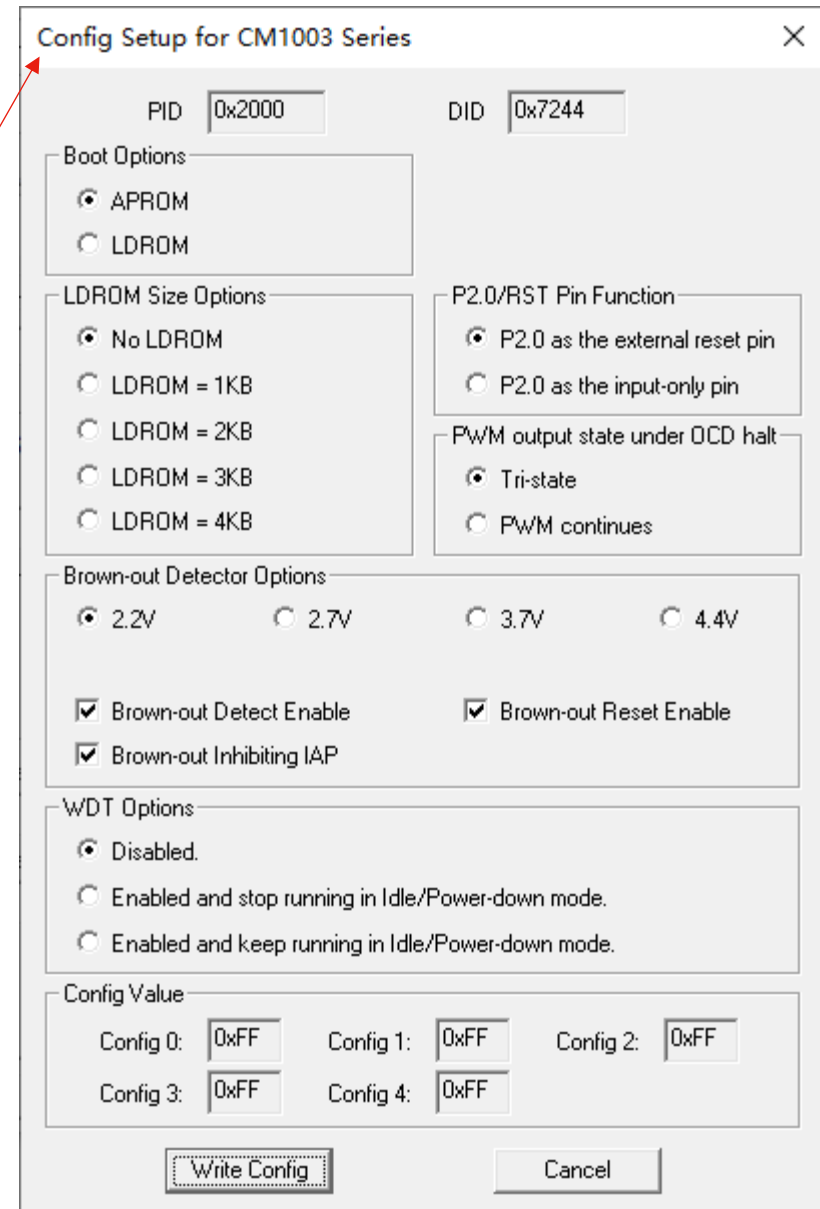
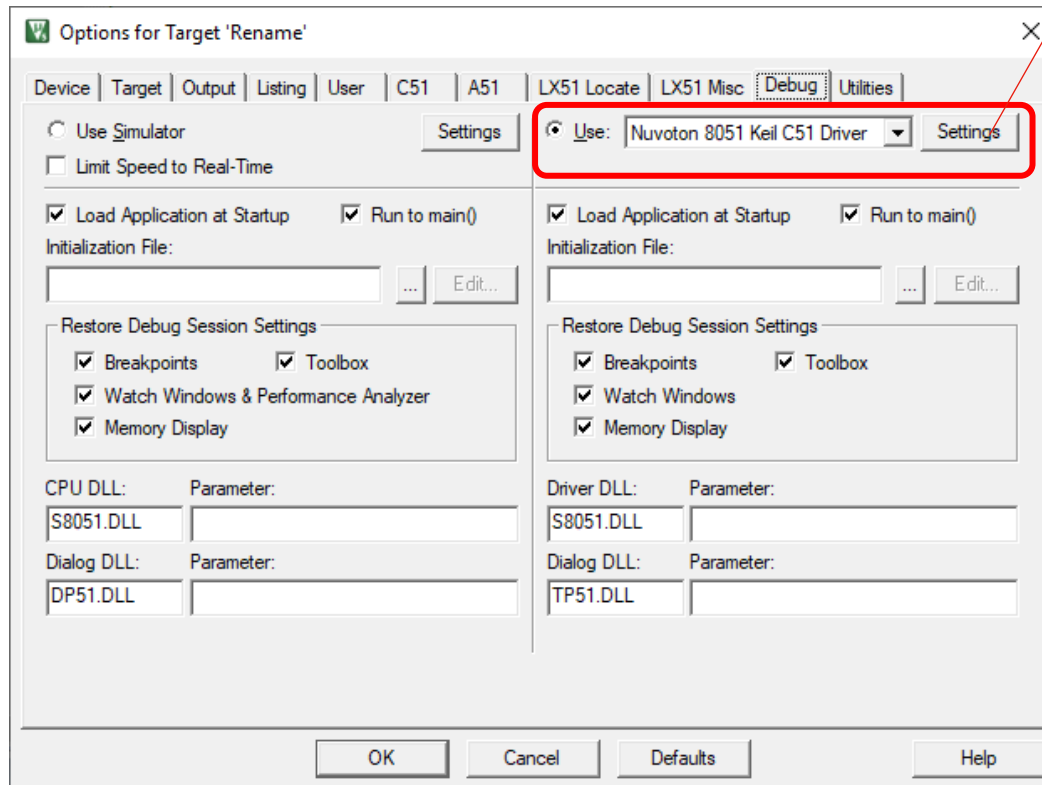
“REMOVEUNUSED” to uncalled subroutine not linked into the project to compile. This can reduce the bin file code size.





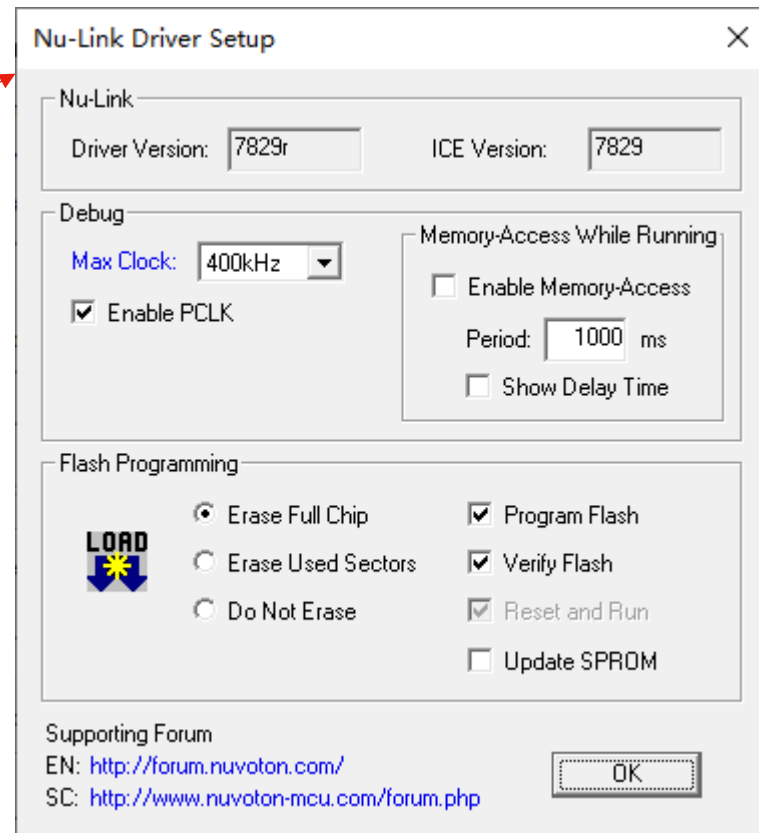
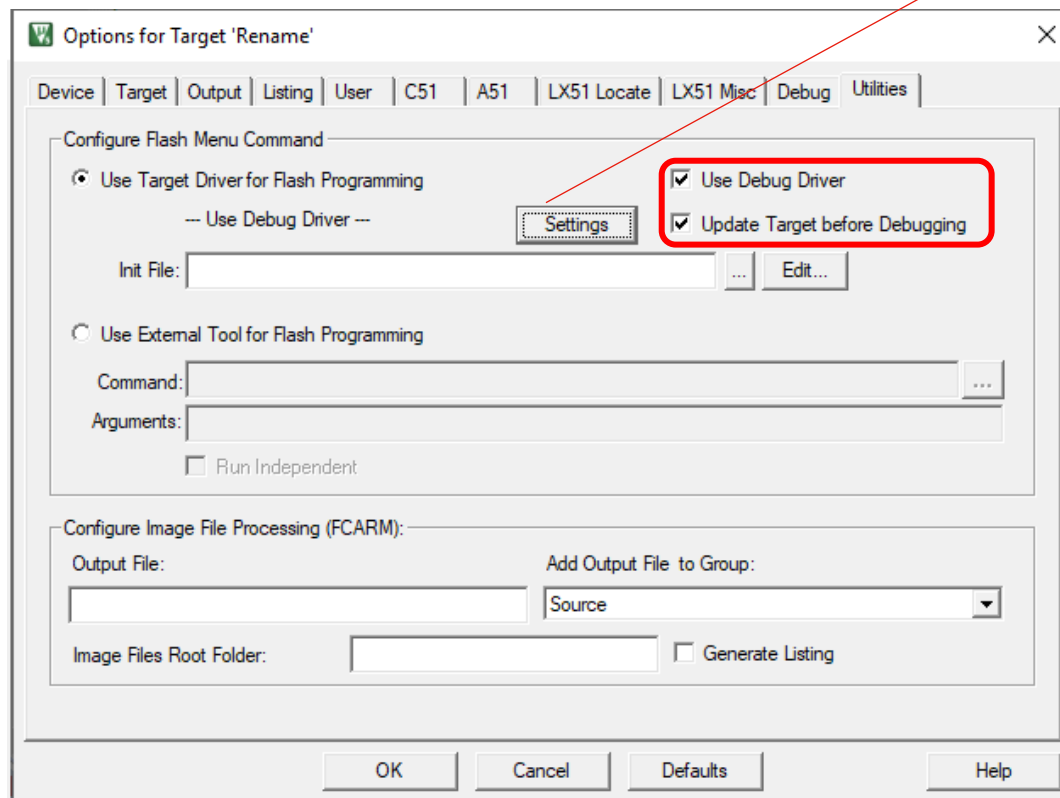
# For KEIL – Debug

## CONFIG setup page



# For KEIL – Utilities

Nu-Link setup



# Build Your Project Utilizing BSP - IAR

**Copying from the existing project  
is often more advantageous  
than creating a new one**

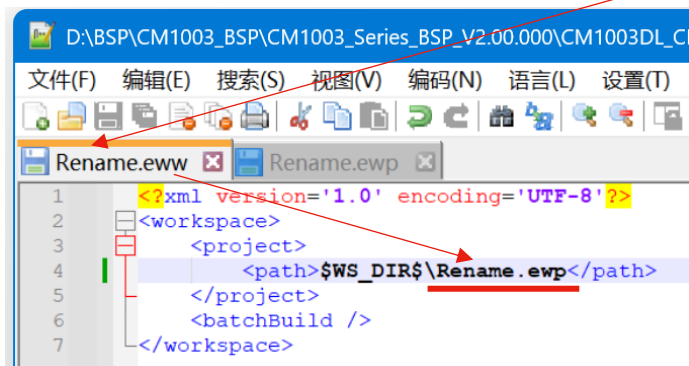


# For IAR

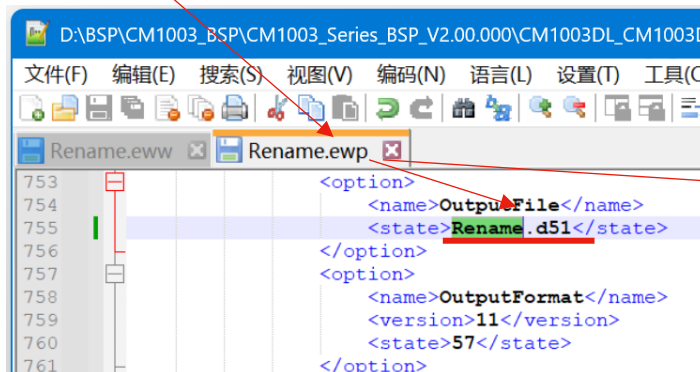
- Duplicate a folder from the template "Project\_temp"
- then rename the ".ewd," ".ewp," and ".eww" file names accordingly.
- Open the ".eww" file and modify the project <path>to reflect the new name, "Rename.ewp."

> CM1003\_Series\_BSP\_V2.00.000 > CM1003DL\_CM1003DJ\_CM1003CJ > SampleCode > Template > Rename > IAR

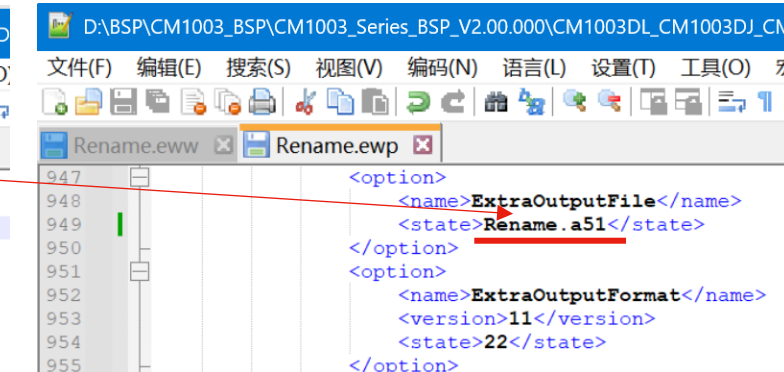
名称	修改日期	类型	大小
Nu-Link_IAR_51.ini	2025/6/17 14:46	INI 文件	1 KB
Rename.ewd	2025/6/17 14:41	EWD 文件	49 KB
Rename.ewp	2026/1/23 17:40	EWP 文件	79 KB
Rename.eww	2026/1/23 17:40	IAR IDE Workspa...	1 KB



1 <?xml version='1.0' encoding='UTF-8'?>  
2 <workspace>  
3 <project>  
4 <path>\$WS\_DIR\$\Rename.ewp</path>  
5 </project>  
6 <batchBuild />  
7 </workspace>



753 <option>  
754 <name>OutputFile</name>  
755 <state>Rename.d51</state>  
756 </option>  
757 <option>  
758 <name>OutputFormat</name>  
759 <version>11</version>  
760 <state>57</state>  
761 </option>

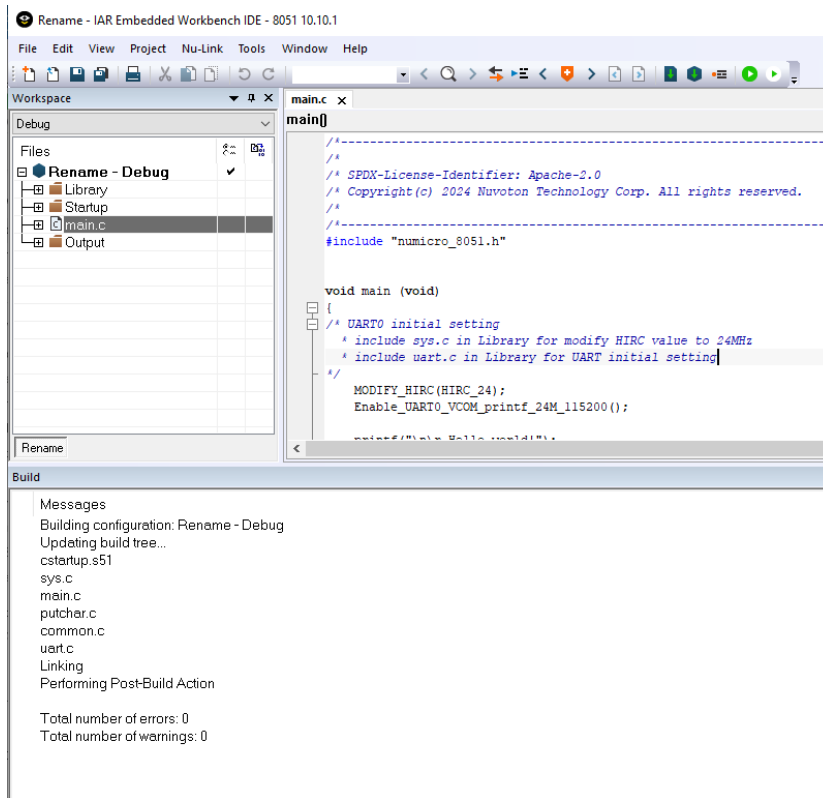





947 <option>  
948 <name>ExtraOutputFile</name>  
949 <state>Rename.a51</state>  
950 </option>  
951 <option>  
952 <name>ExtraOutputFormat</name>  
953 <version>11</version>  
954 <state>22</state>  
955 </option>



# | For IAR

- Compile with the new application .c file. Find the output hex and bin file.

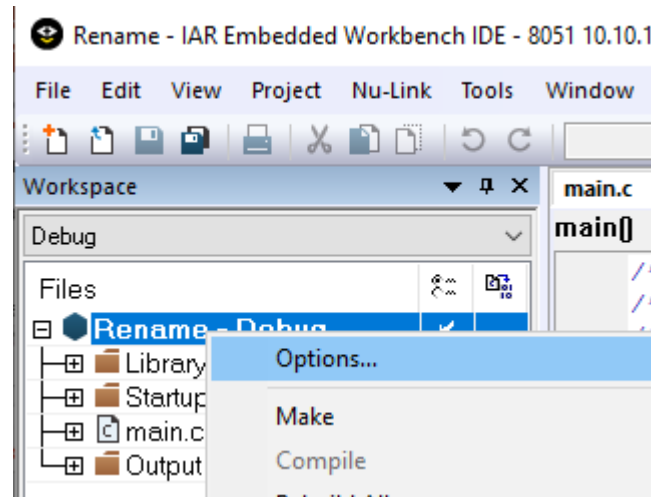


<< SampleCode > Template > Rename > IAR > Debug > Exe	
Name	Date modified
 Rename.a51	12/8/2023 2:54 PM
 Rename.bin	12/8/2023 2:54 PM
 Rename.d51	12/8/2023 2:54 PM

# Options of IAR workbench

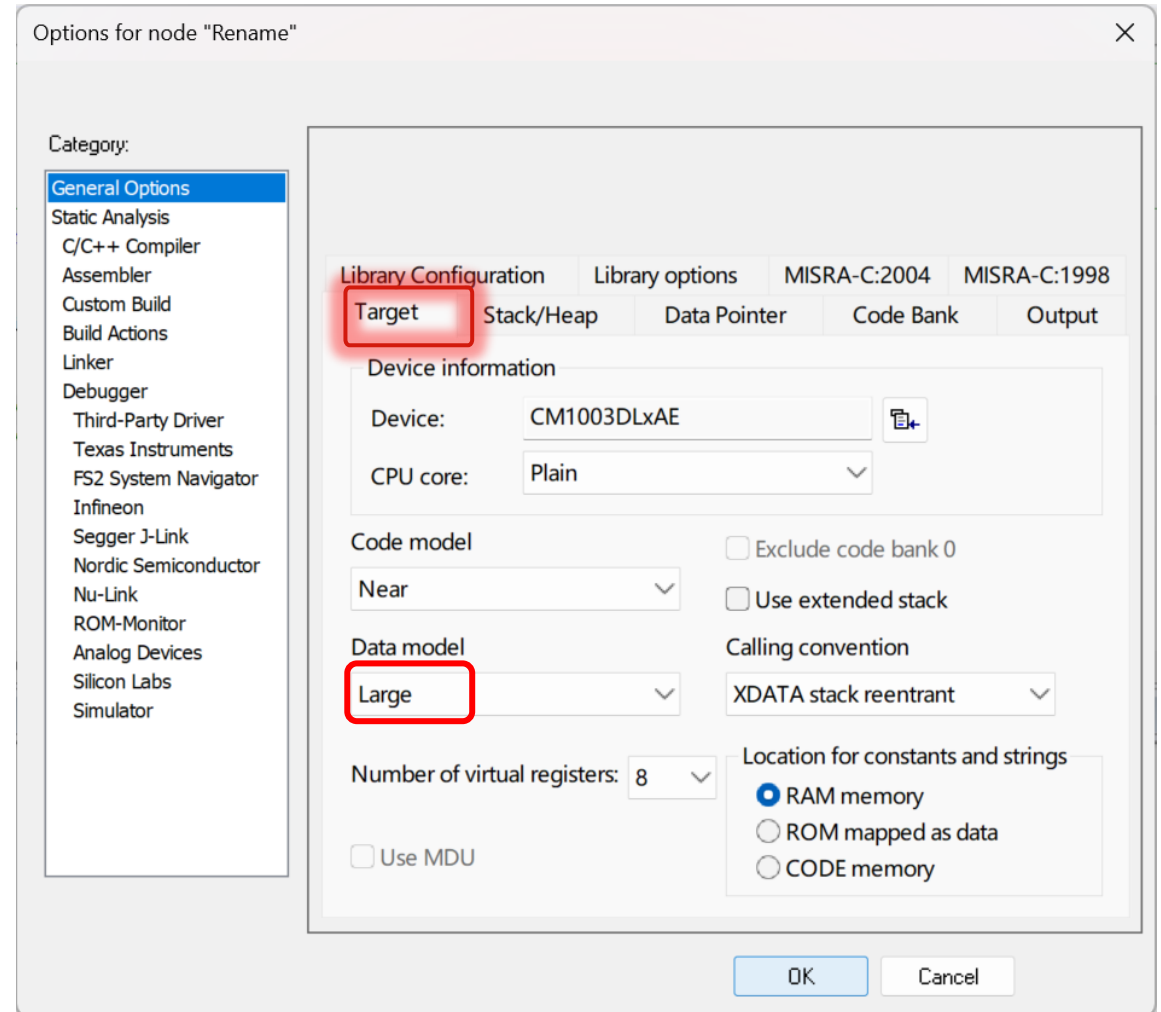
- The following introduction focuses on the special definition of nuvoton 8051 series.
- For a comprehensive description of all options, please consult the official IAR documentation.

[https://wwwfiles.iar.com/8051/webic/doc/EW8051\\_MigrationGuide\\_v7.pdf](https://wwwfiles.iar.com/8051/webic/doc/EW8051_MigrationGuide_v7.pdf)



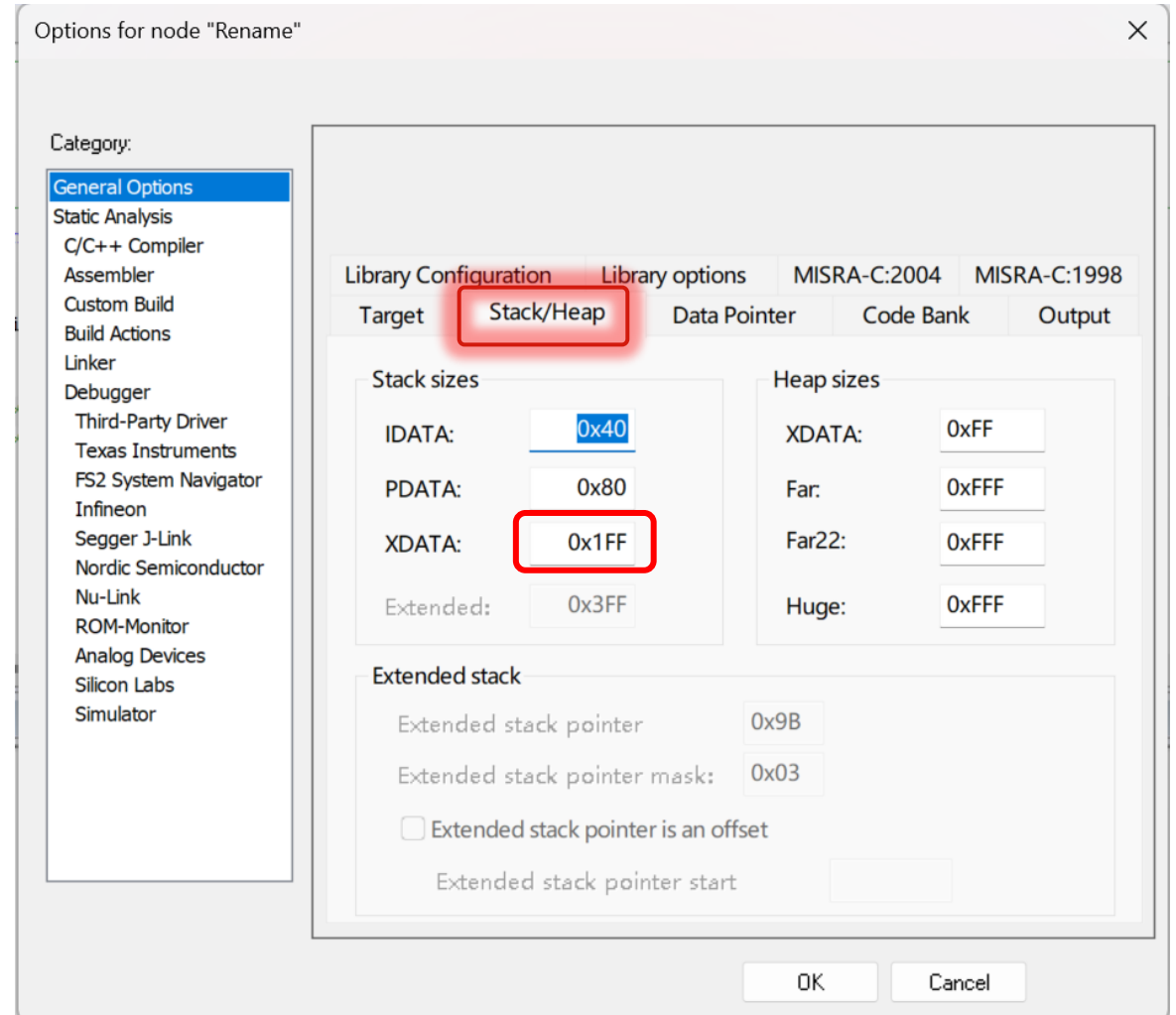
# | For IAR – General Options

- Check with the device.
- Data Model: Large for variable default using XDATA



# | For IAR – General Options

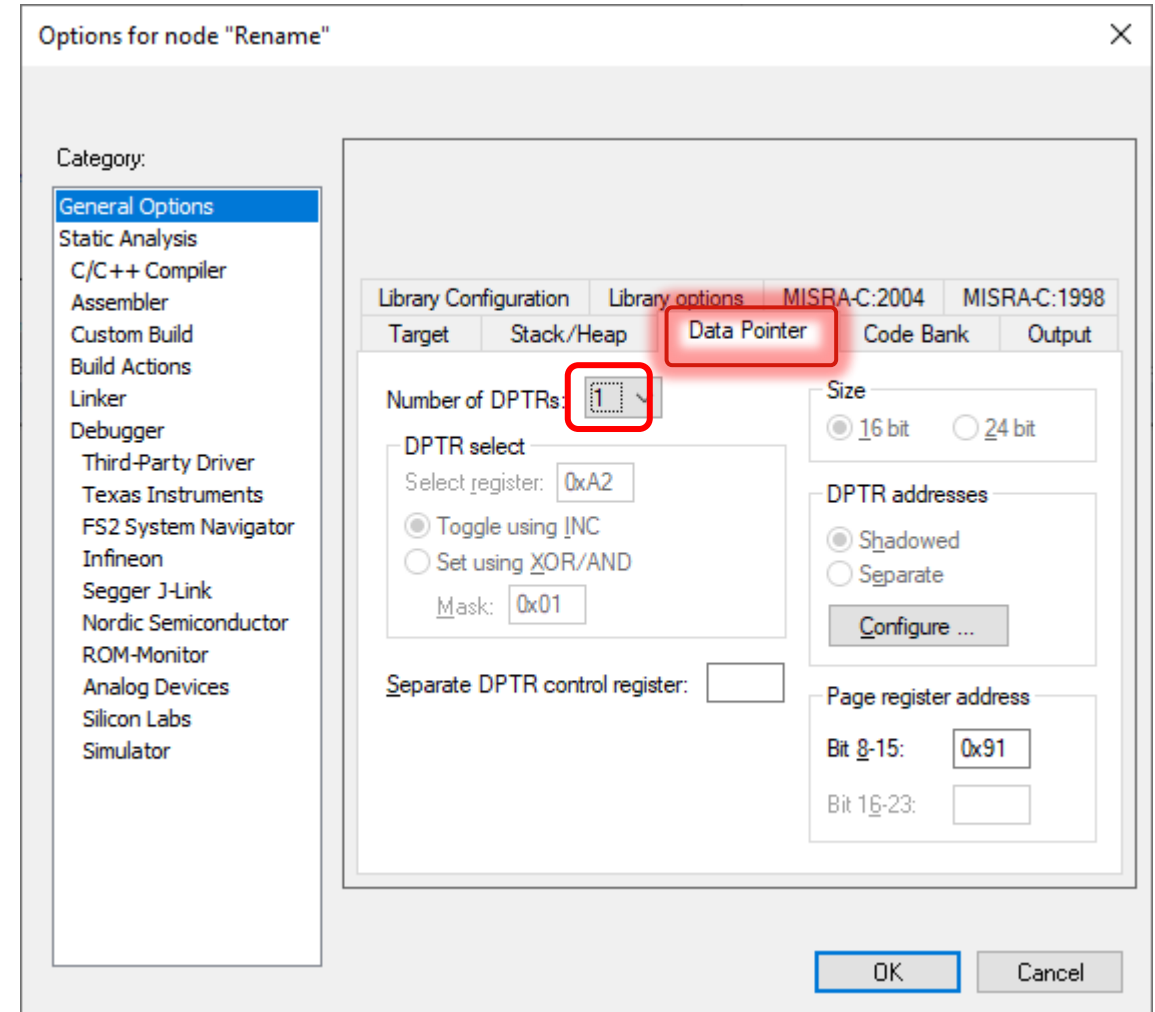
- Stack / Heap
  - XDATA value is important to printf





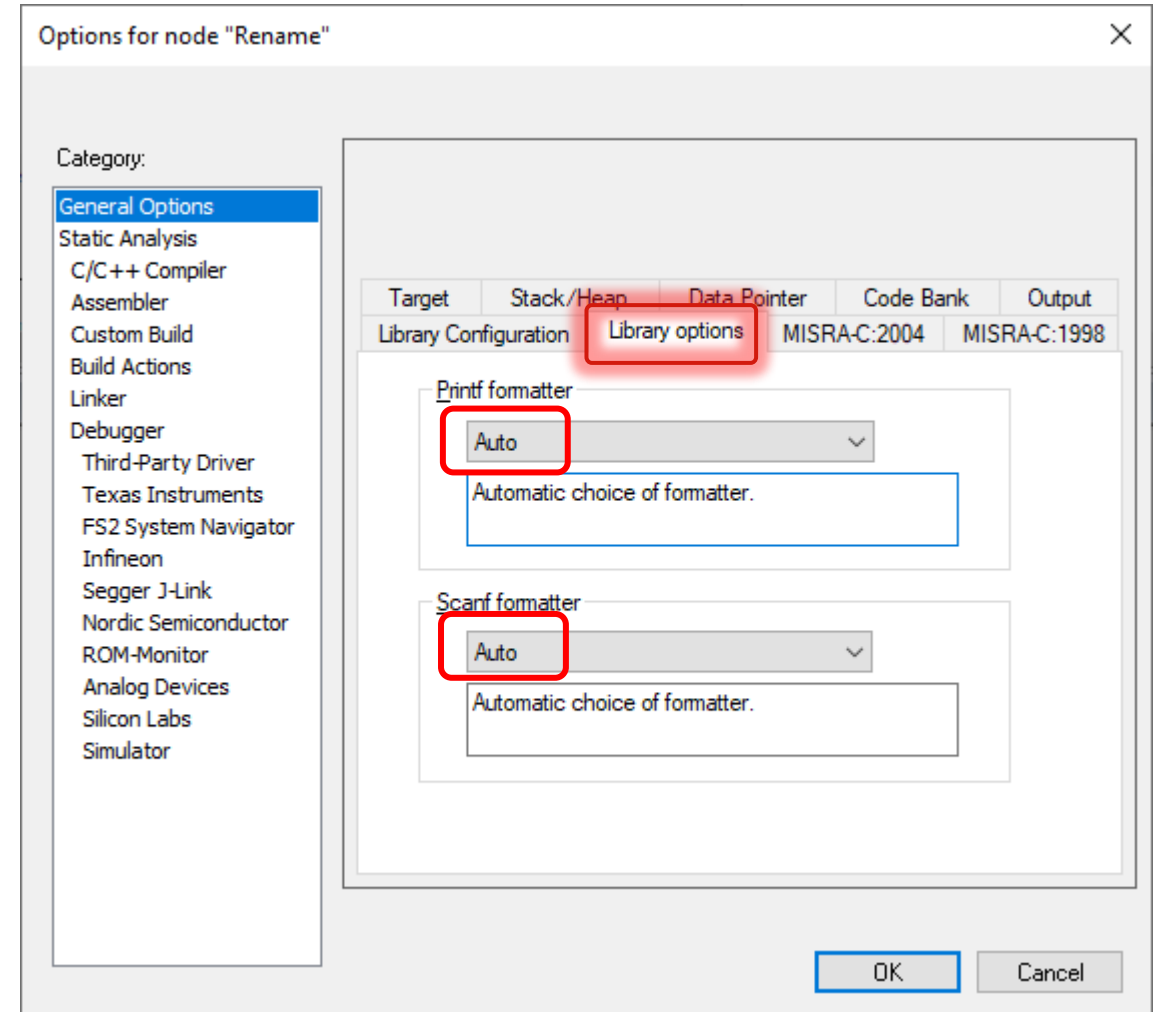
# | For IAR – General Options

- DPTRs
  - Always use 1 DPTR.



# | For IAR – General Options

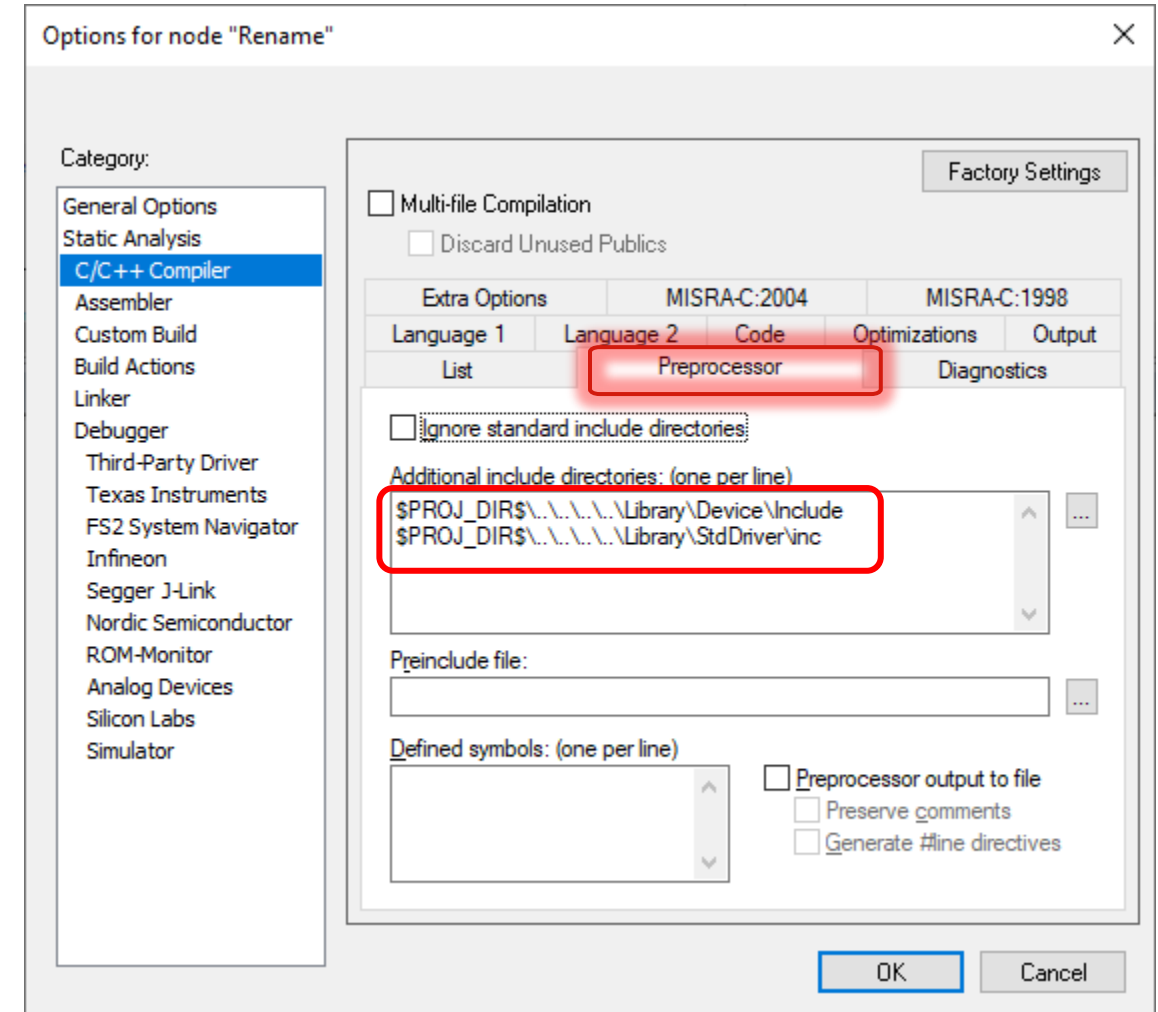
- Auto for Printf formatter



# | For IAR – C/C++ Compiler

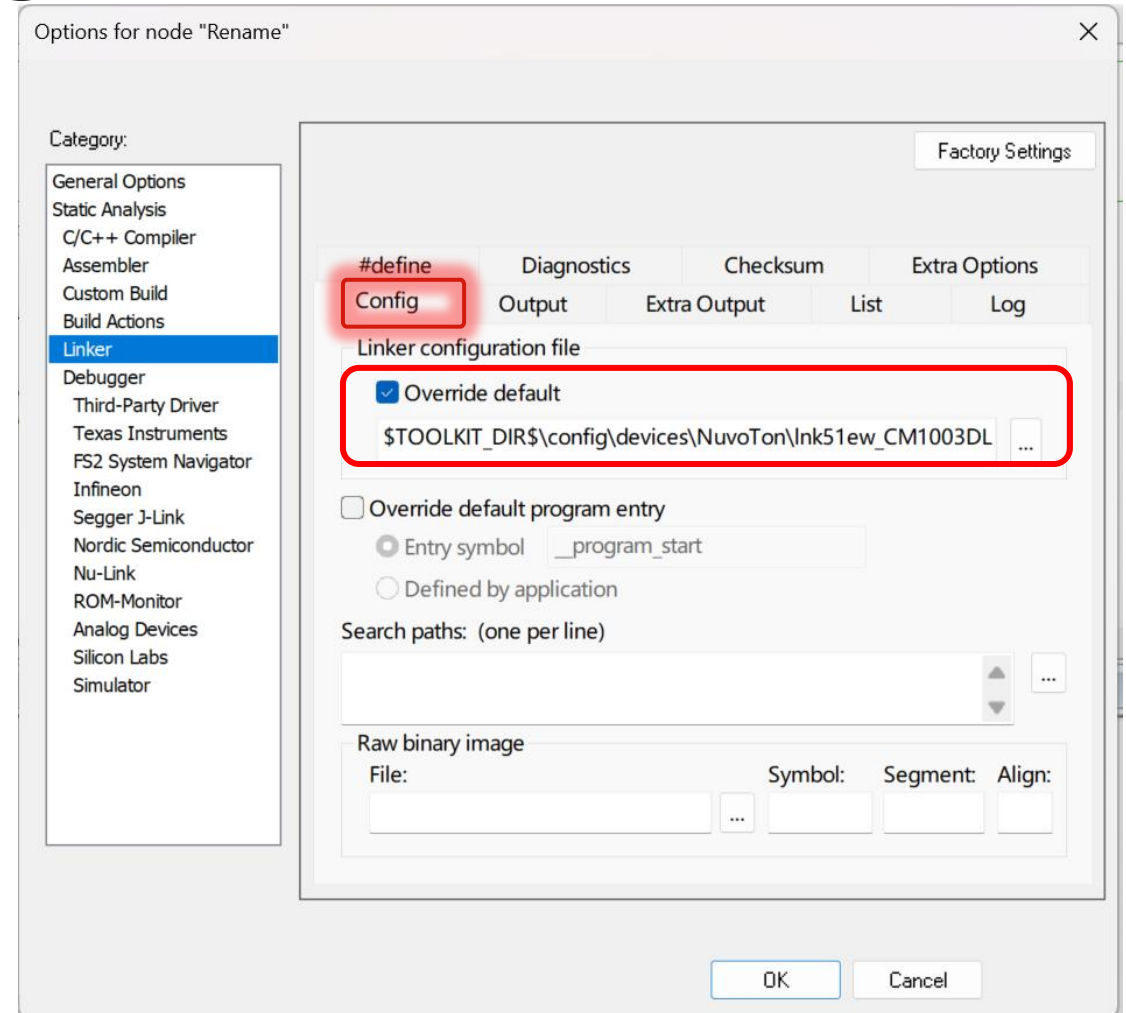
- Include Paths

Defined the header file path of device and library.



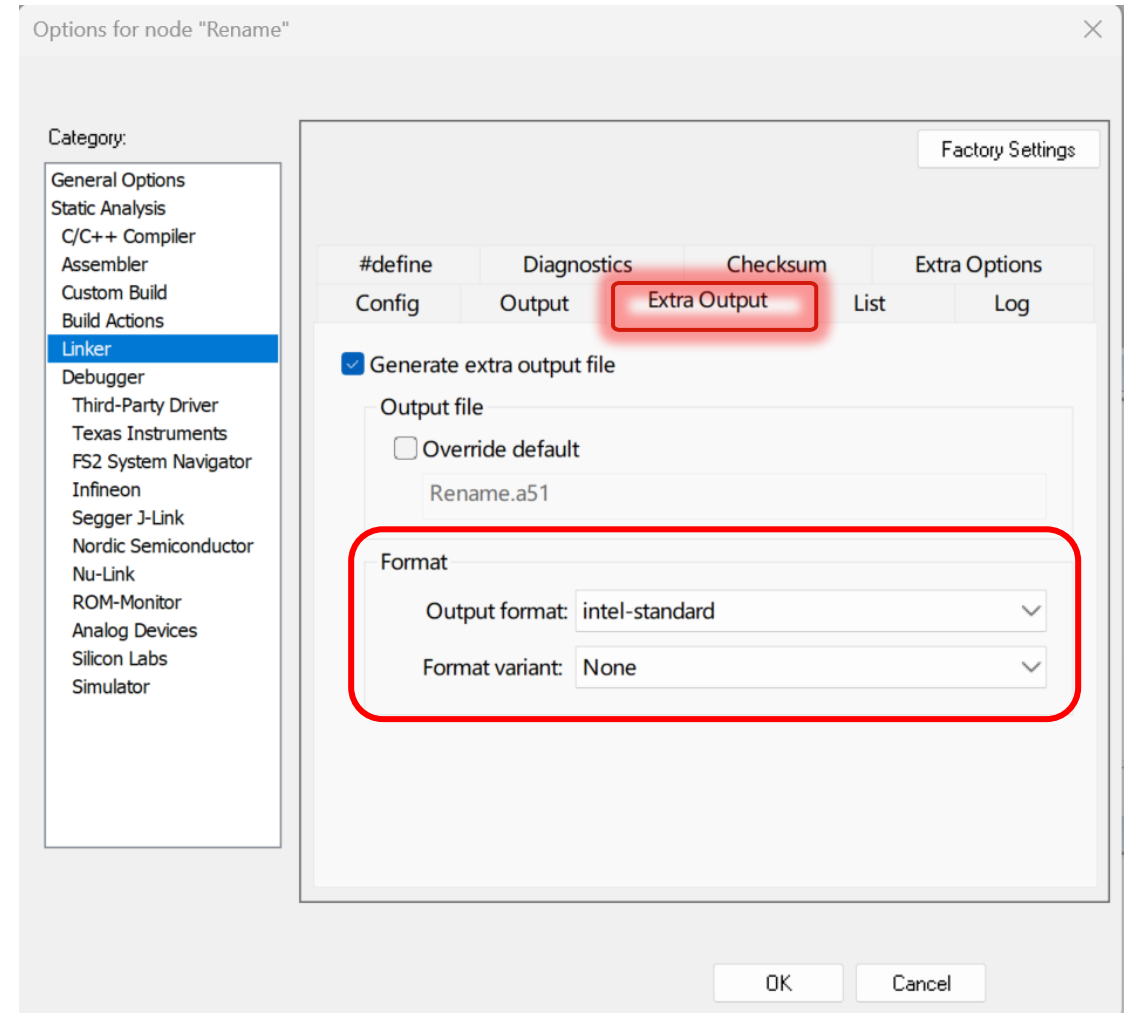
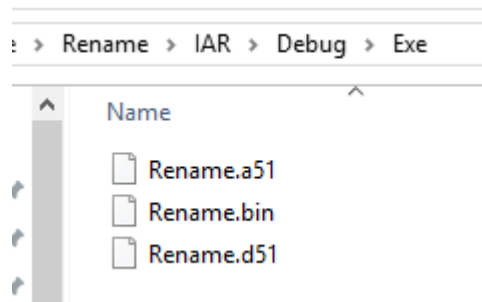
# | For IAR – Build Actions

- Linker configuration file
  - Derived from the device definition manually adjusted by Nuvoton (rather than automatically selected by the IAR tool).
  - **Do not modify the value in this area under any circumstances.**



# | For IAR – Build Actions

- Build with hex format output
- Bin format use nuvoton command line. Introduce in next page.
- After compiler with following
  - .a51 hex format
  - .bin bin format
  - .d51 debug file for IAR



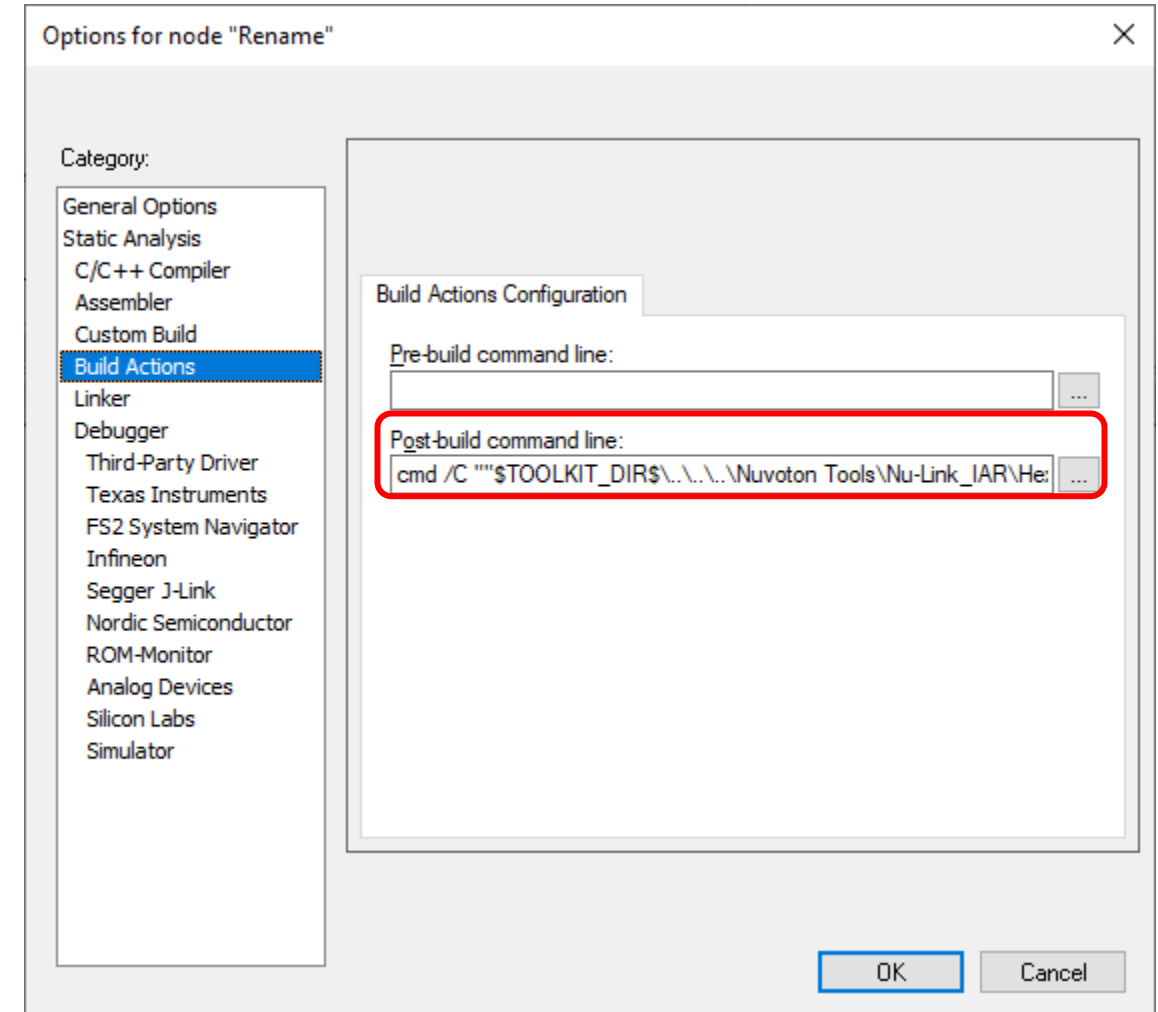
# | For IAR – C/C++ Compiler

- Hex2bin

This file is located within the Nuvoton IAR driver folder.

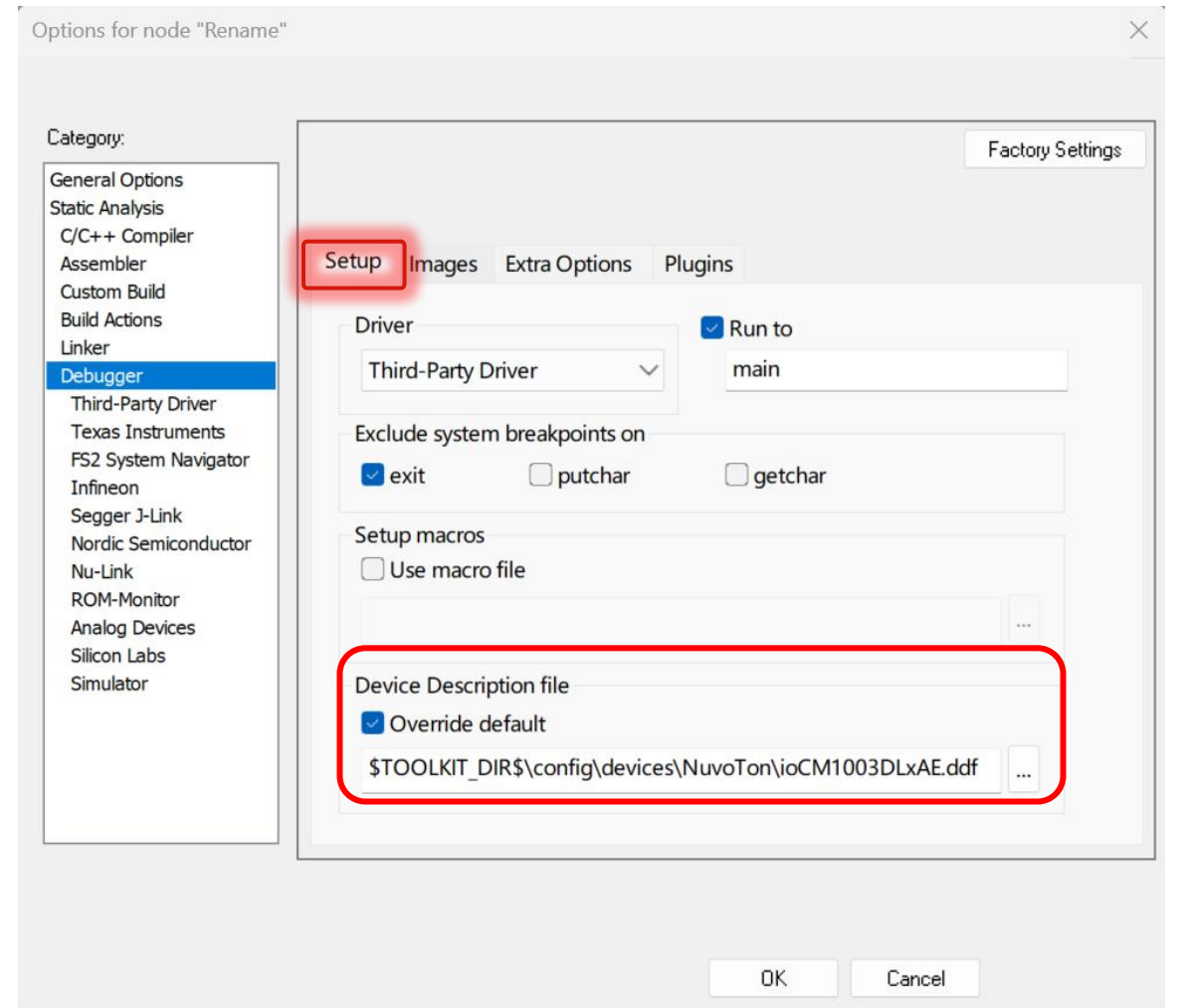
. \Nuvoton Tools\Nu-Link\_IAR\Hex2Bin.exe

- By default, unused locations will be filled with 0xFF.
- Users can also include the parameter -P 0x00 means unused locations are filled with zeros.
- Parameter <start address> <data length>



# | For IAR – Debugger

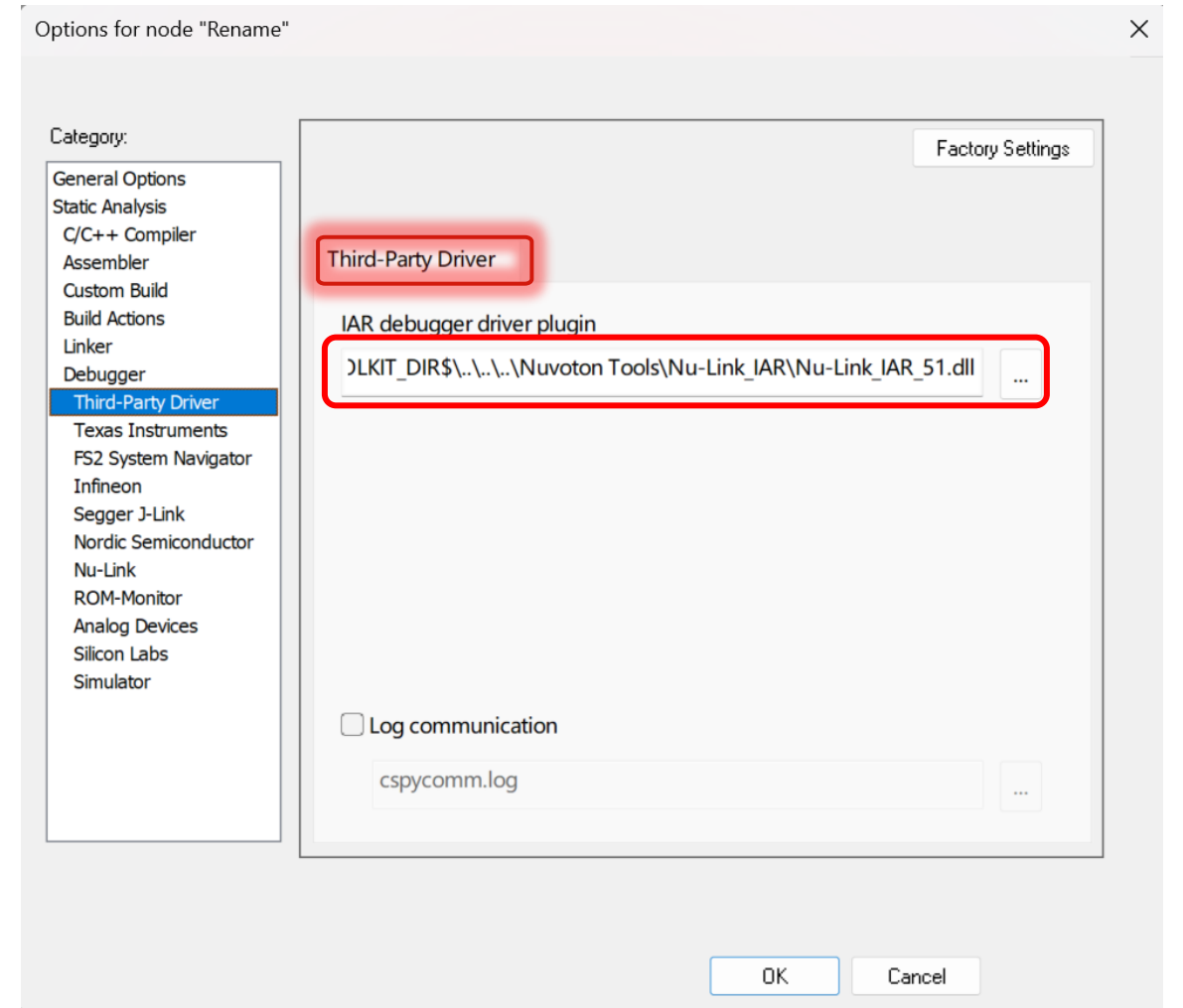
- Third-Party Driver
  - Manually adjusted by Nuvoton (rather than automatically selected by the IAR tool).
  - **Do not modify the value in this area under any circumstances.**





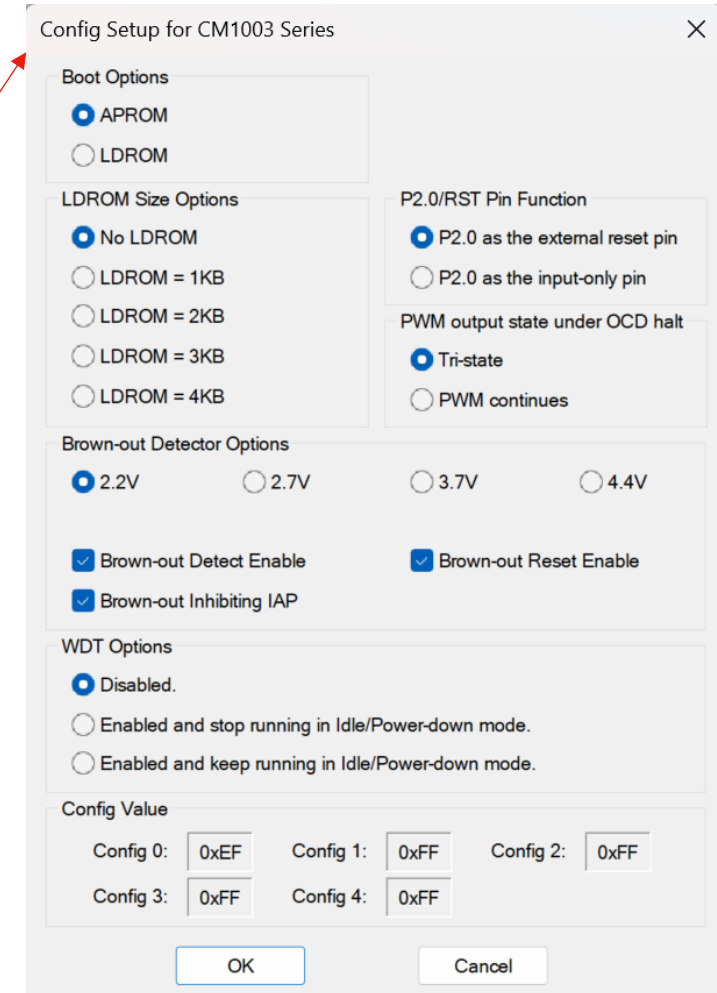
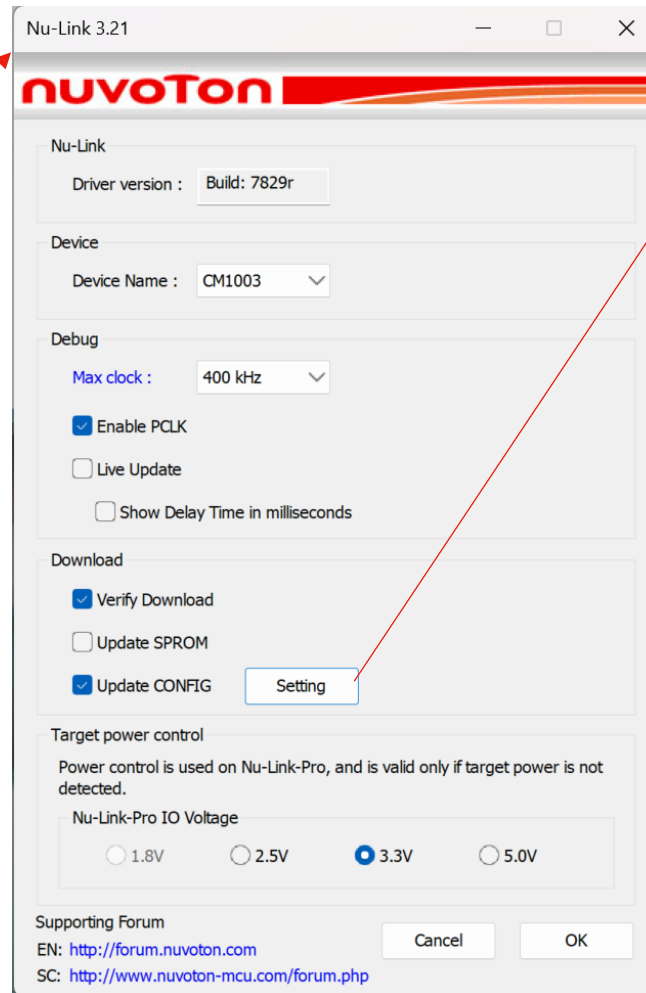
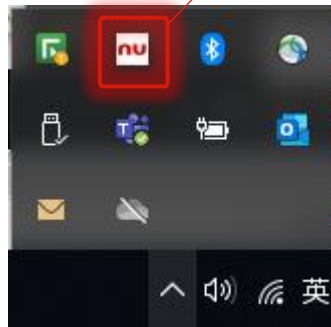
# | For IAR – Third Party Driver

- Third-Party Driver
  - Manually adjusted by Nuvoton (rather than automatically selected by the IAR tool).
  - **Do not modify the value in this area under any circumstances.**



# | For IAR – Nu-Link Setup & CONFIG define

- Third-Party Driver



# **Build Your Project Utilizing BSP - KEIL**

**Copying from the existing project  
is often more advantageous  
than creating a new one**



# | For NuEclipse SDCC

- Refer to the "Nu Eclipse SDCC Quick Start\_EN.pdf" for guidance.

- 1.2 1.2 Create a new Project from an existing BSP project .....9
  - 1.2.1 Copy the existing SDCC project folder to the new Project folder ..... 9
  - 1.2.2 1.2.2 Import this project in Workspace ..... 9
  - 1.2.3 Rename Project ..... 9

Joy of innovation  
**nuvoTon**

Thank You

Danke

Merci

ありがとう

Gracias

Kiitos

감사합니다

धन्यवाद

كل ارکش

הודות