

# Keil uVision 5.x Support

*Power Application Controller<sup>®</sup>*



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## 1 OVERVIEW

This document will discuss how to install and configure Keil uVision for use with PAC5xxx.

### 1.1 Supported Versions

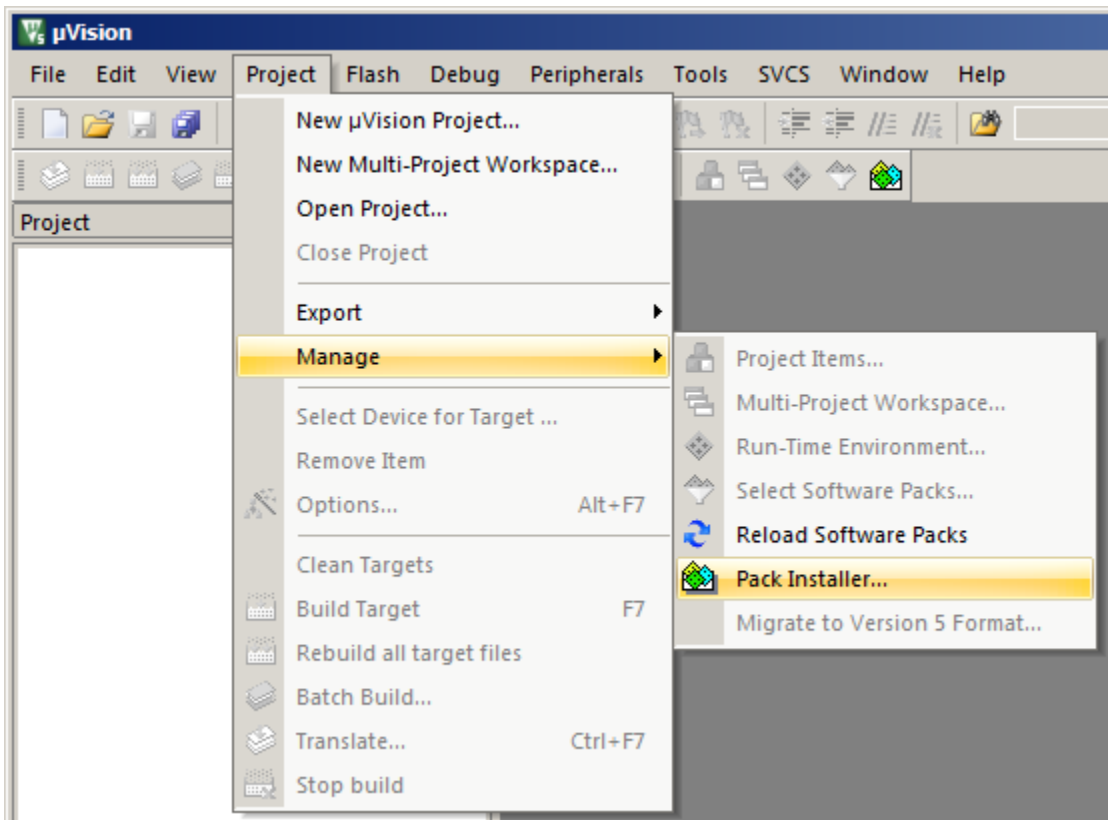
For all versions of Keil uVision v5.14 and newer, follow the instructions in this document.

## 2 DOWNLOAD uVISION

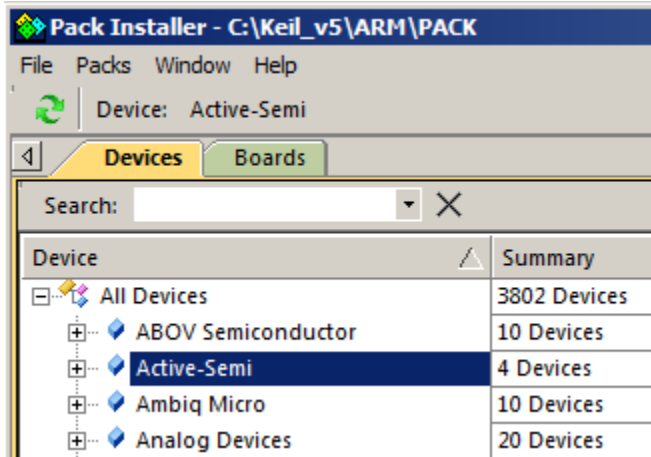
If not already installed, download uVision from <https://www.keil.com/demo/eval/arm.htm> and install it using the default options.

## 3 CONFIGURE uVISION PACKS

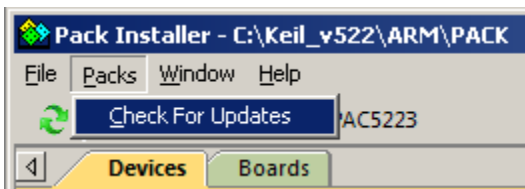
Run the uVision Pack Installer by selecting “Project->Manage->Pack Installer” in the menu.



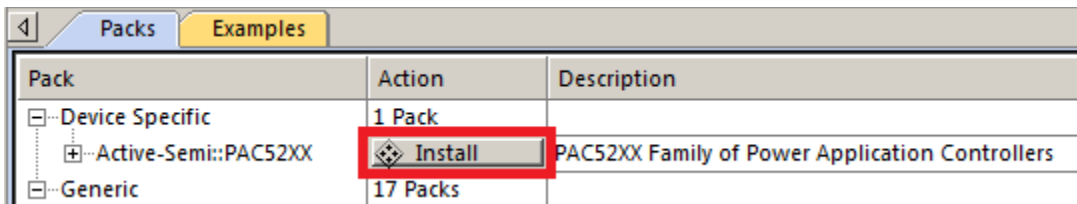
Check to see if “Active-Semi” is present in the Devices tab on the left.



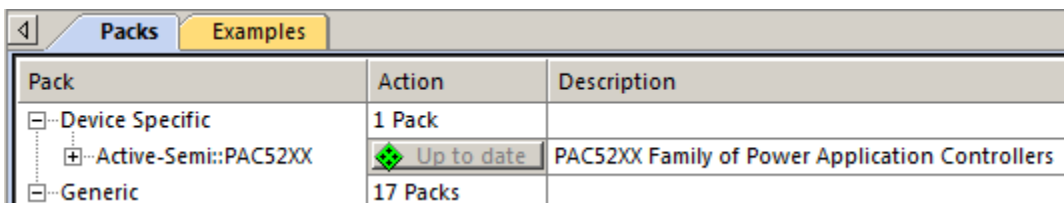
If “Active-Semi” is not present in the Devices tab, update the Pack Installer database by selecting “Packs->Check For Update” in the menu.



When “Active-Semi” is present in the Devices tab, select it and then click the “Install” button next to “Active-Semi::PAC52XX” in the Packs tab on the right.



After installing the Active-Semi pack, when “Active-Semi” is selected in the Devices tab, it should now say “Up to date” next to “Active-Semi::PAC52XX” in the Packs tab on the right.



### 3.1 PAC52XX .pack v1.0.9 to v2.x.x migration

Starting with versions v2.0.0 of the PAC52XX .pack, the PAC52XX SDK is no longer included and must be added in separately. If Keil projects were previously using .PAC52XX pack v1.0.9, then there are some extra considerations discussed in the document named [PAC52XX Keil IDE Upgrade v1.0.9 pack to v2.0.0 pack](#) that can be found on the Software Tab of any PAC52XX product page. For example, the Software tab on the PAC5223 product page, which is located at: <https://active-semi.com/products/intelligent-motor-control/pac5223> as shown below.

## PAC5223

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## 4 CREATING A NEW PROJECT

This section will discuss how to create a new PAC52xx project, create a new source file, and add the PAC52xx SDK.

The latest version of the PAC52xx SDK can be downloaded from the Software Tab of any PAC52XX product page. For example, the PAC5223 product page is located at:

<https://active-semi.com/products/intelligent-motor-control/pac5223>

## PAC5223

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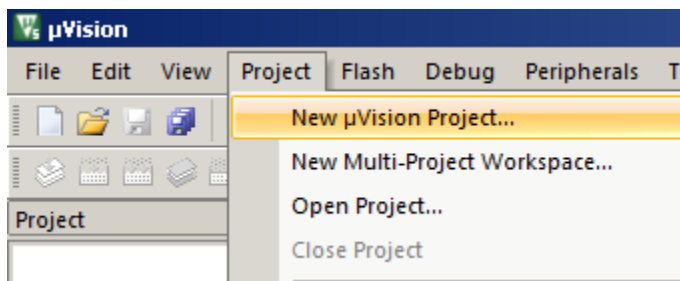
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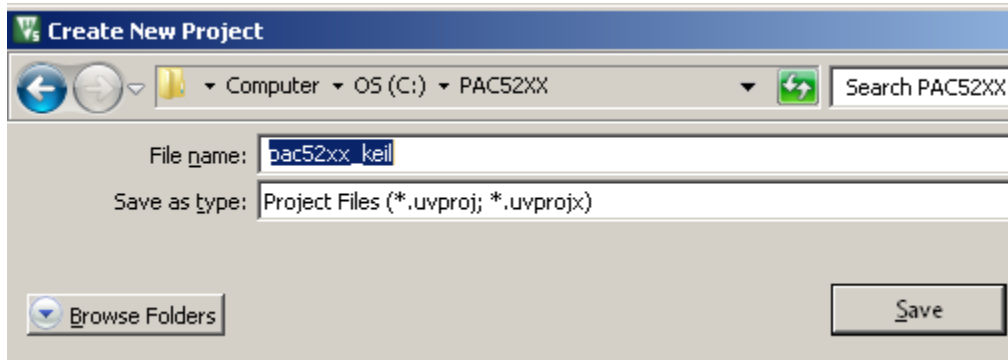


### 4.1 Create a New Pac52xx Project

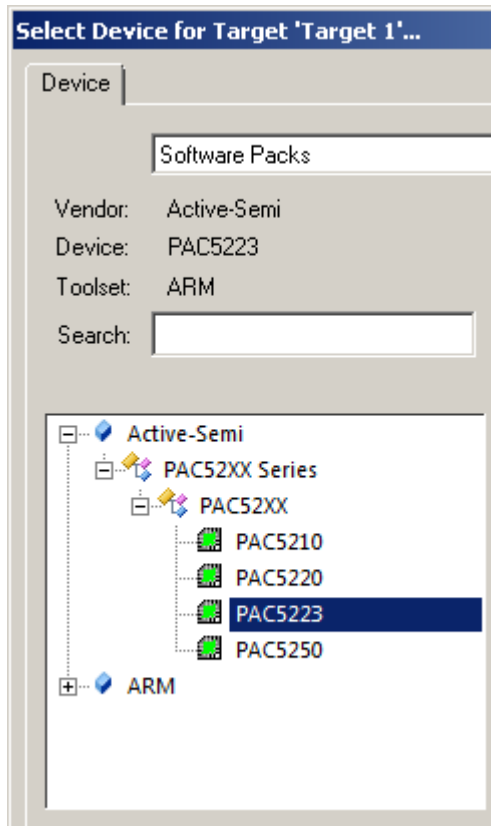
Create a new project by selecting “Project->New uVision Project...” in the menu.



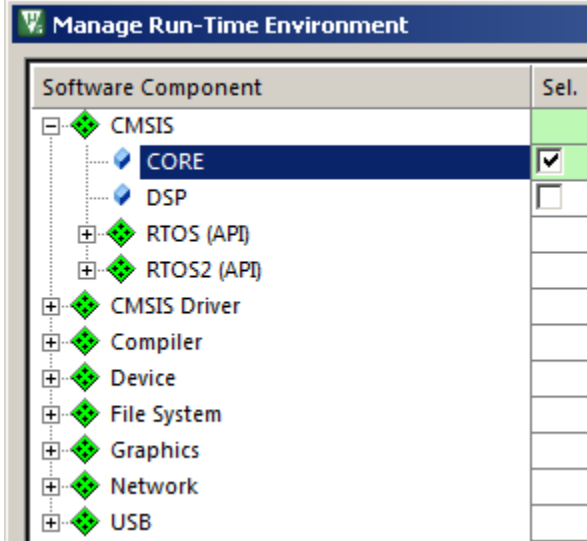
Choose a name and directory to save the new project. The example below uses the project name “pac52xx\_keil” and project directory “C:\PAC52XX”



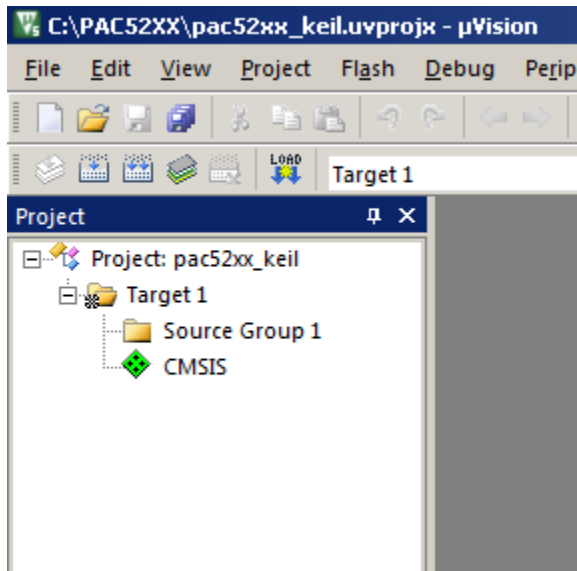
Select a PAC52xx device, such as PAC5223.



Select the CMSIS CORE component which is required for ARM Cortex-M0 devices.

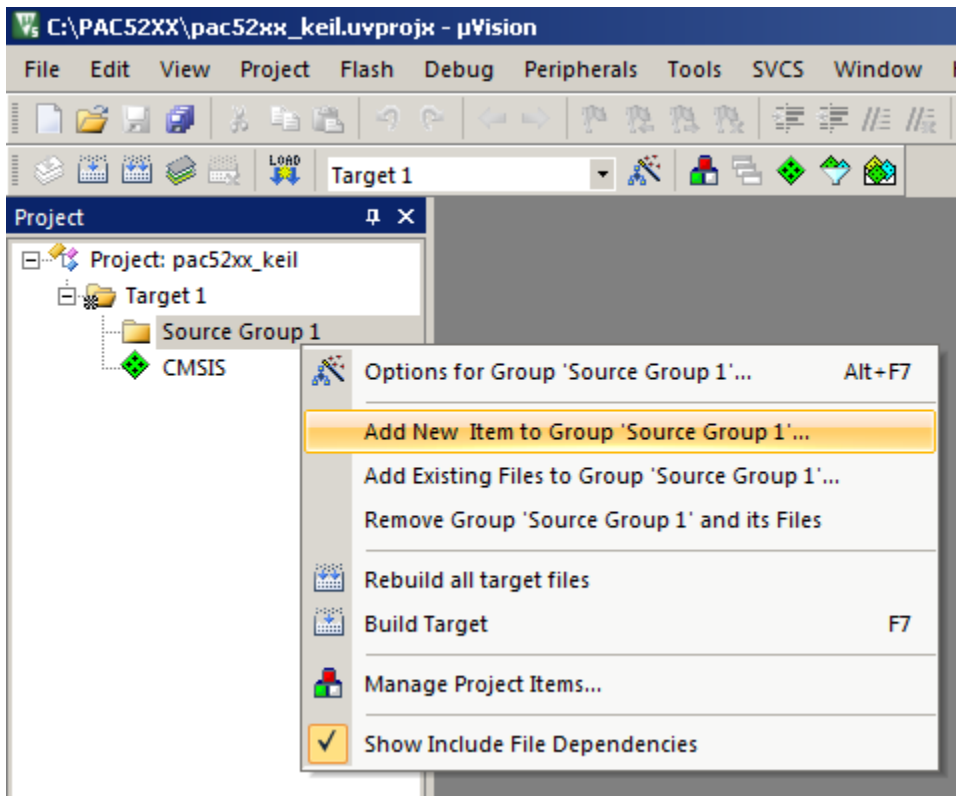


A blank PAC52xx project should now be created.



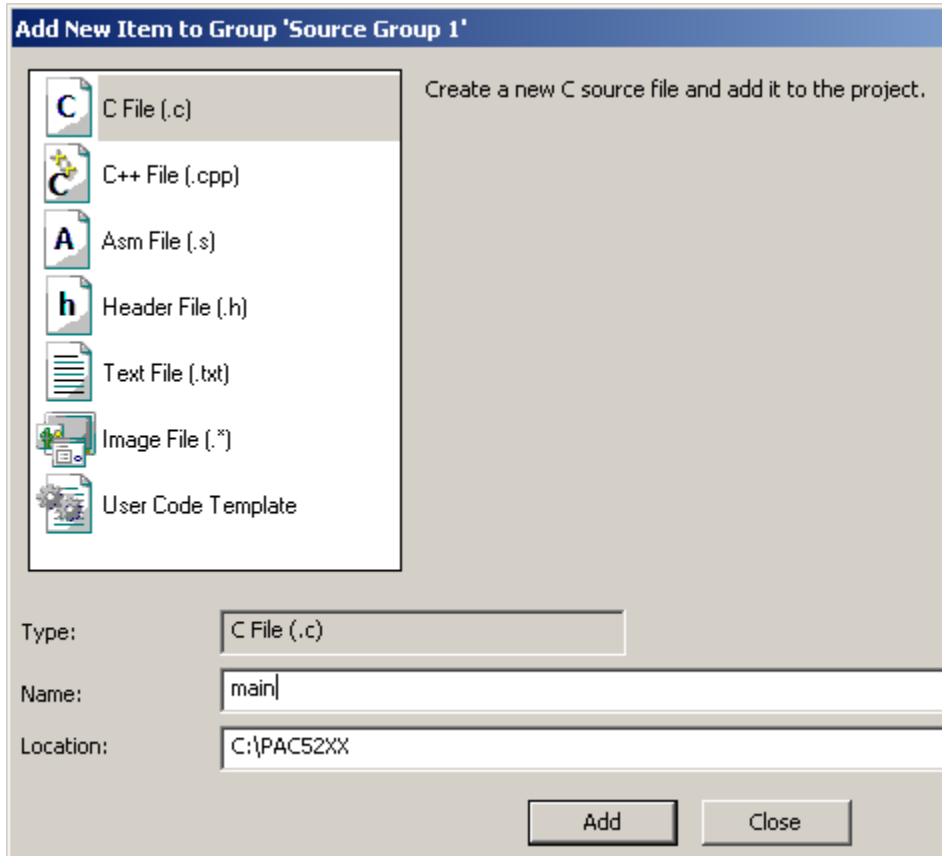
## 4.2 Create a New Source File

Add a new source file to the blank project by right-clicking on “Source Group 1” and selecting “Add New Item to Group...”

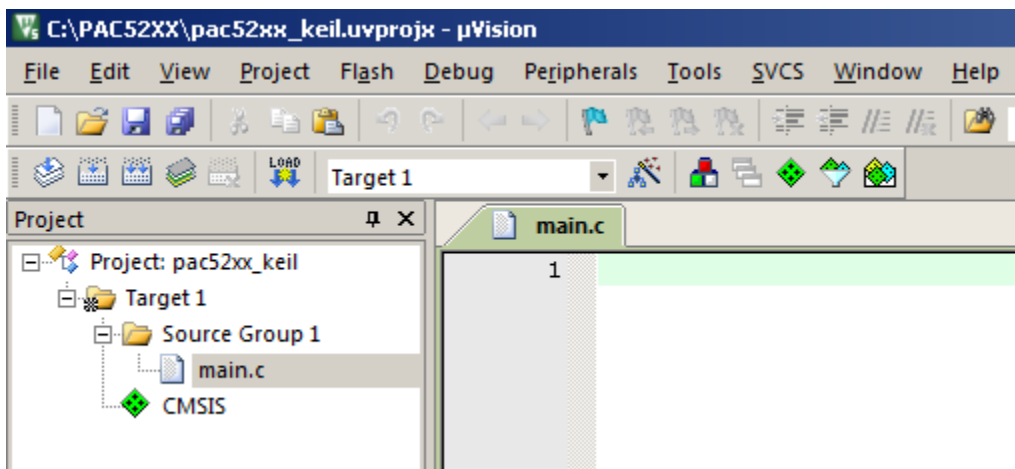




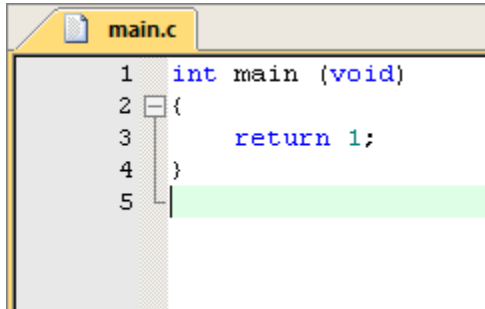
Select the “C File” type and use the filename “main”



A blank “main.c file” should now be in the project under “Source Group 1”



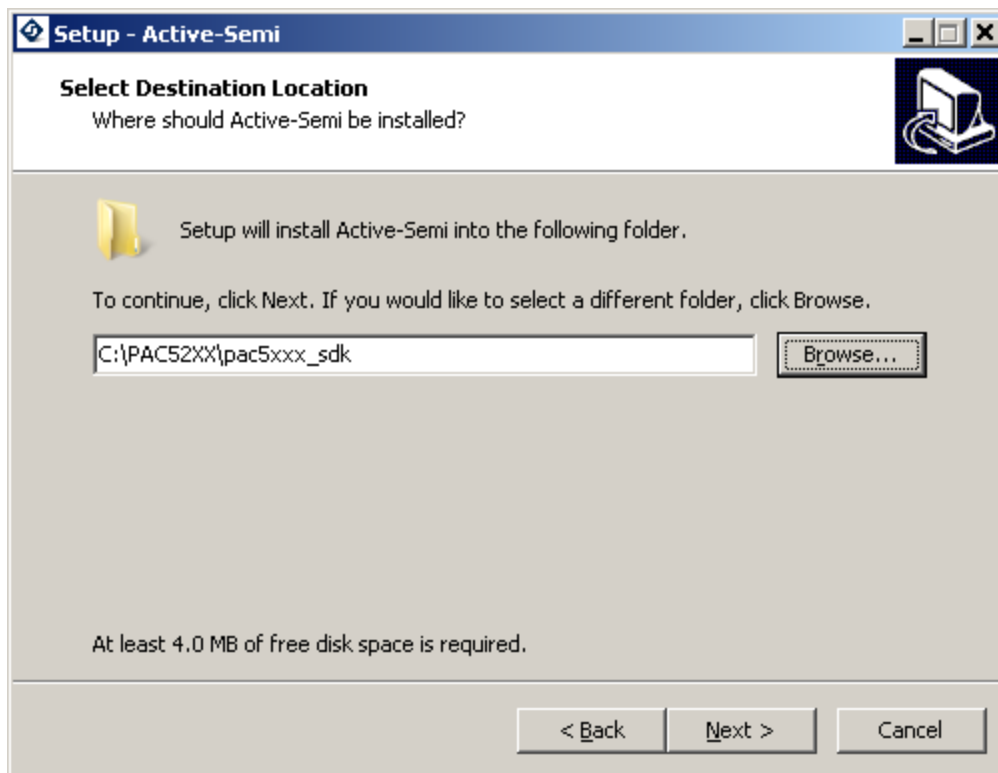
Edit “main.c” as shown below.



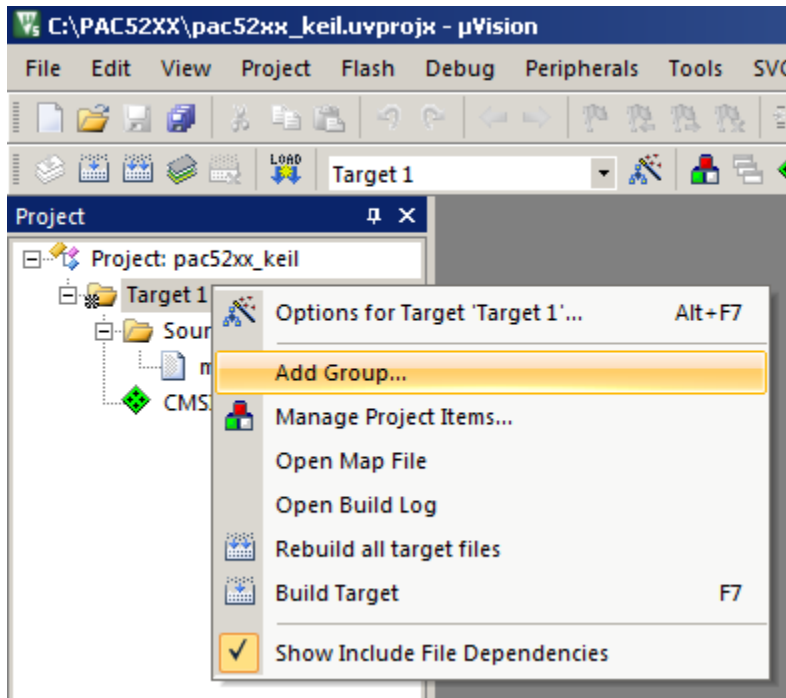
```
1 int main (void)
2 {
3     return 1;
4 }
5
```

### 4.3 Add the PAC52xx SDK

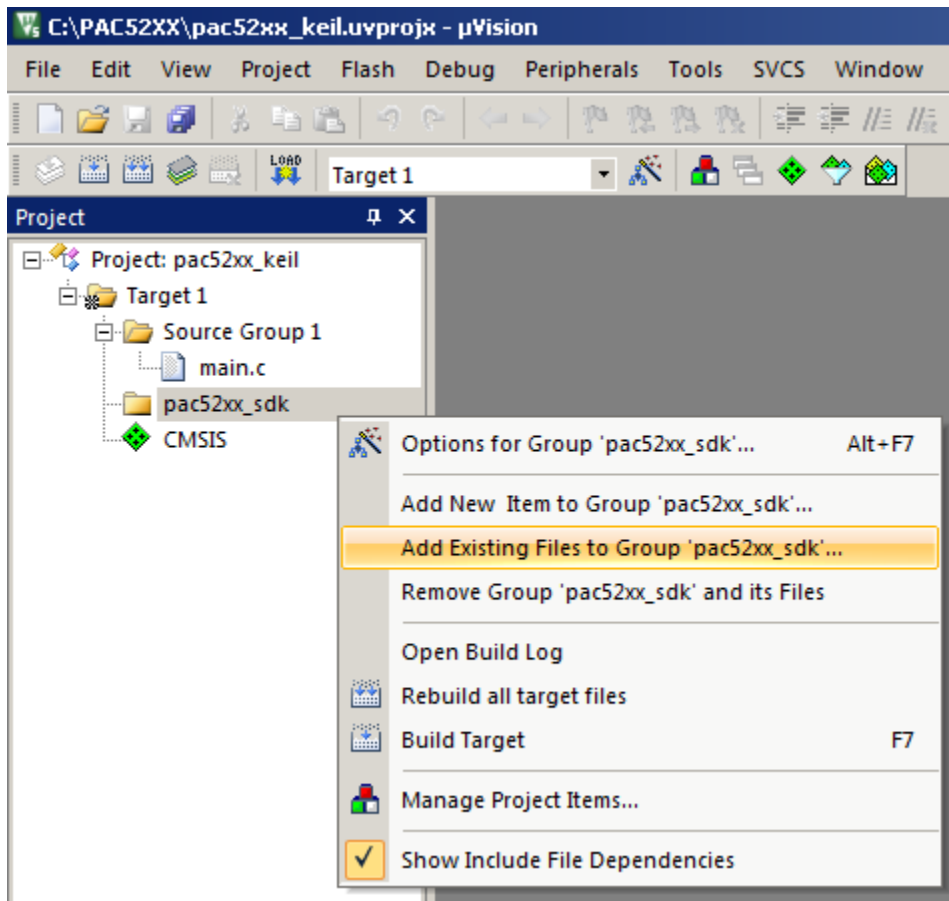
Install the PAC52xx SDK into your project directory, being sure to read and accept the License Agreement. The example below uses the project directory “C:\PAC52XX\” and installs the PAC52xx SDK into the directory “C:\PAC52XX\pac5xxx\_sdk”



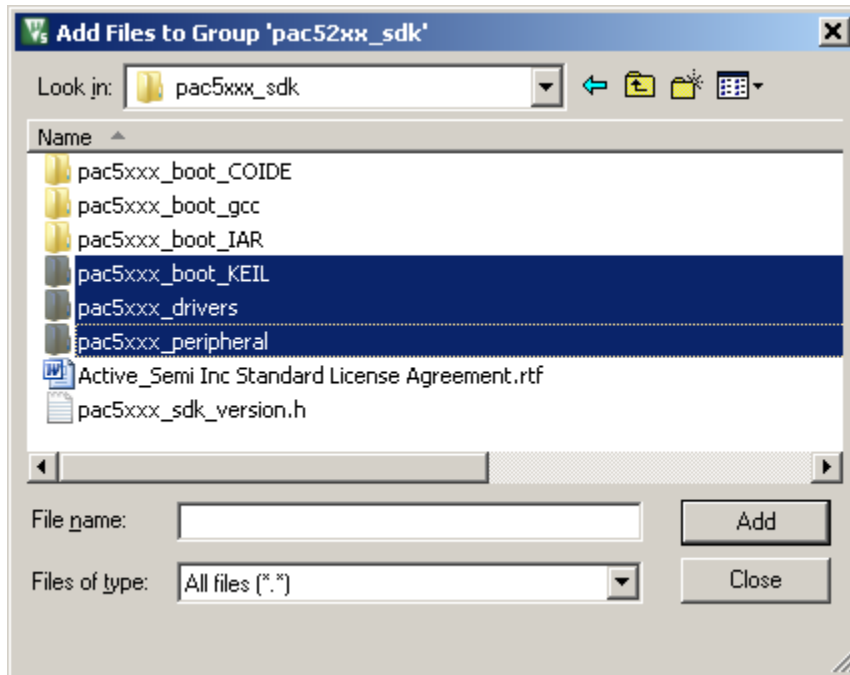
Add a Group to the project by right-clicking on “Target 1” and selecting “Add Group...”



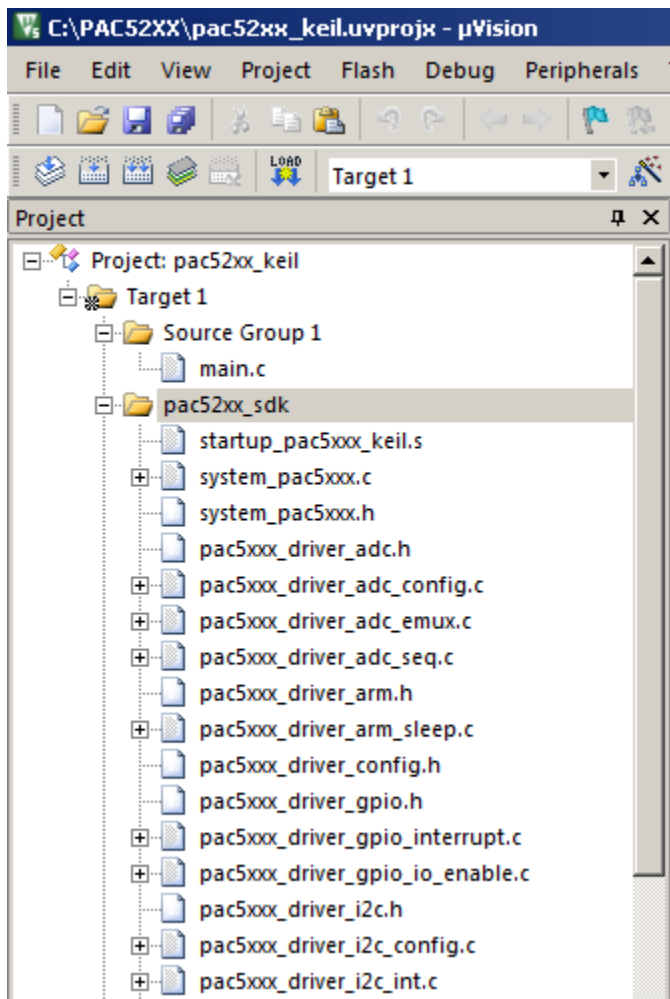
Rename the group to “pac52xx\_sdk” and then add the PAC52xx SDK files to it by right-clicking on it and selecting “Add Existing Files to Group...”



Change the “Files of type:” option to “All Files (\*.\*)” and add all files in the folders highlighted below. These folders are located inside the “pac5xxx\_sdk” folder where the PAC52xx SDK was installed.

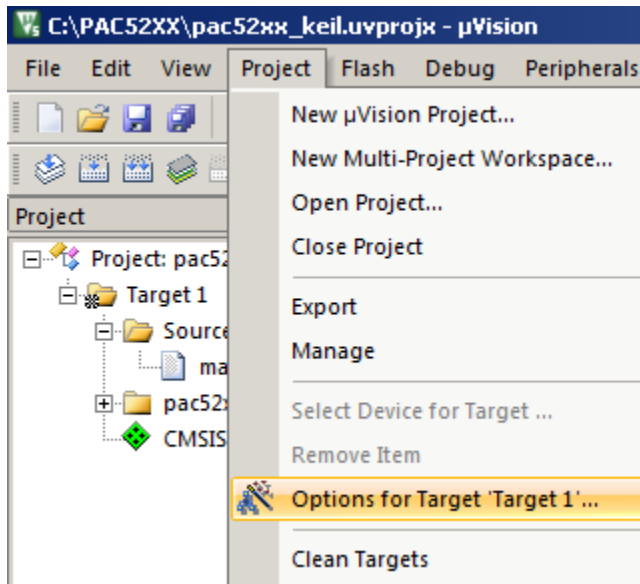


The files from the PAC52xx SDK should now be listed under the “pac5xxx\_sdk” group.

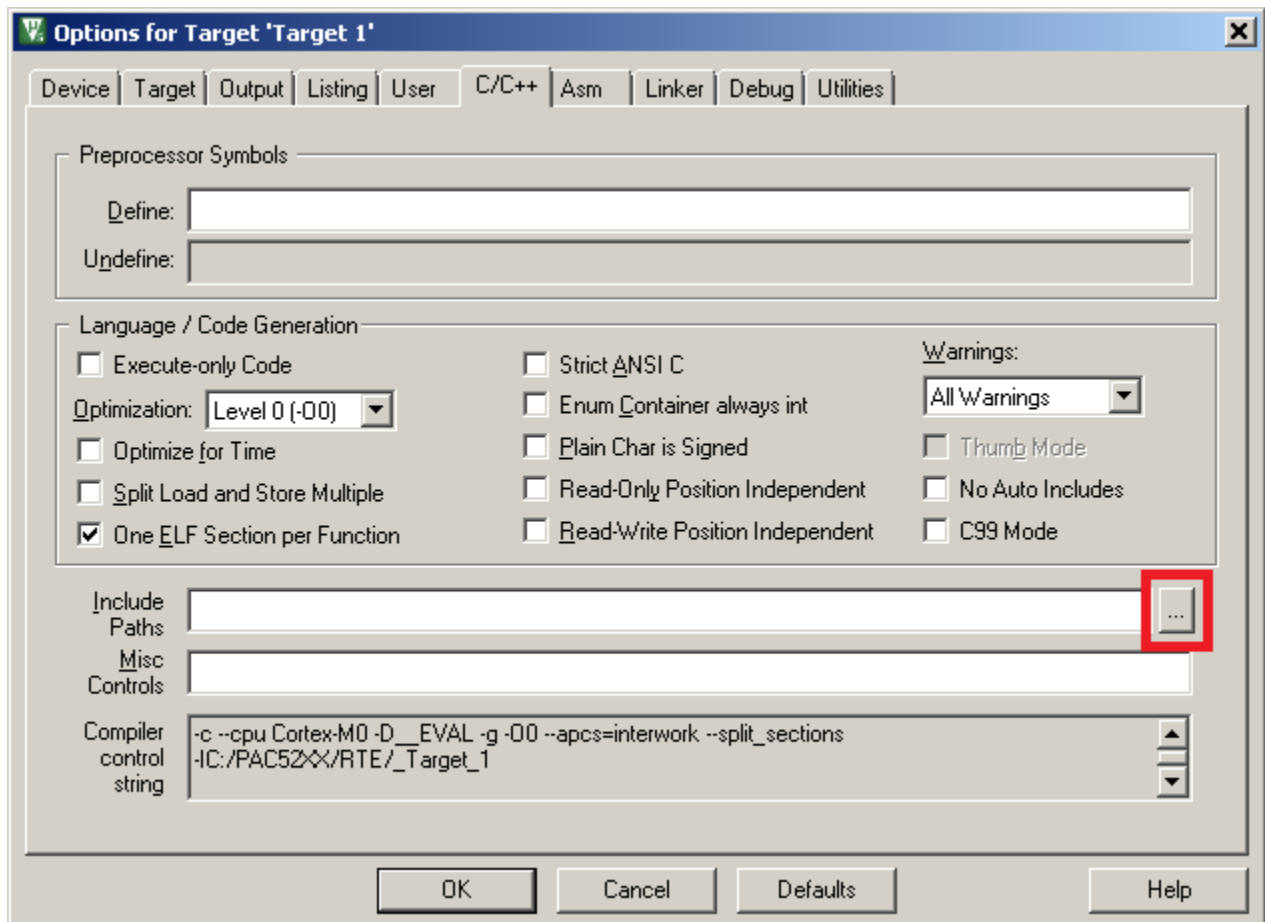


#### 4.4 Add PAC52xx SDK folders to Include Paths

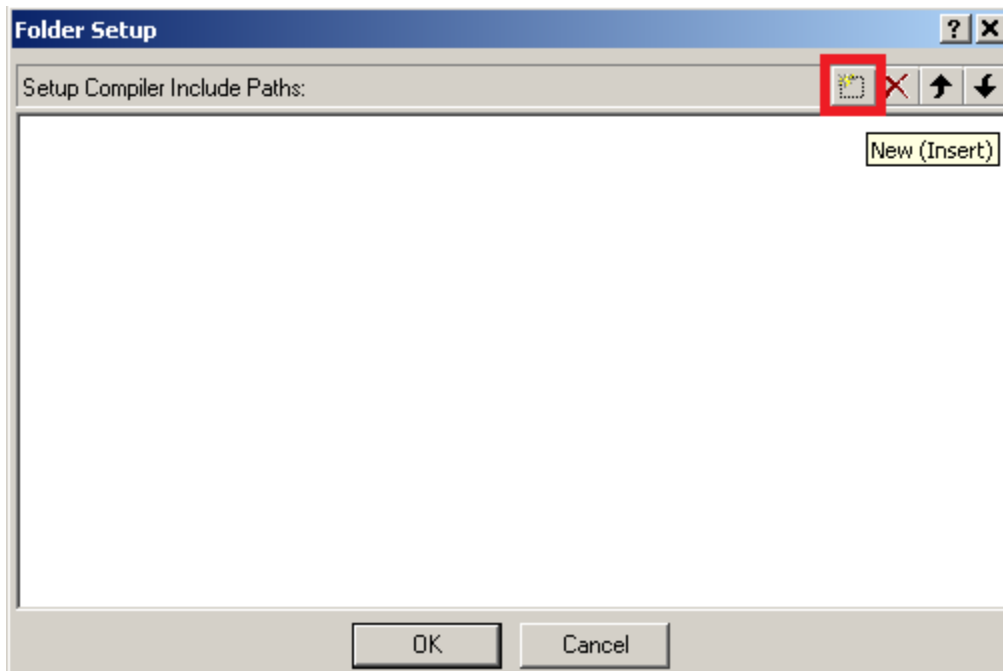
Select “Project->Options for Target...” in the menu.



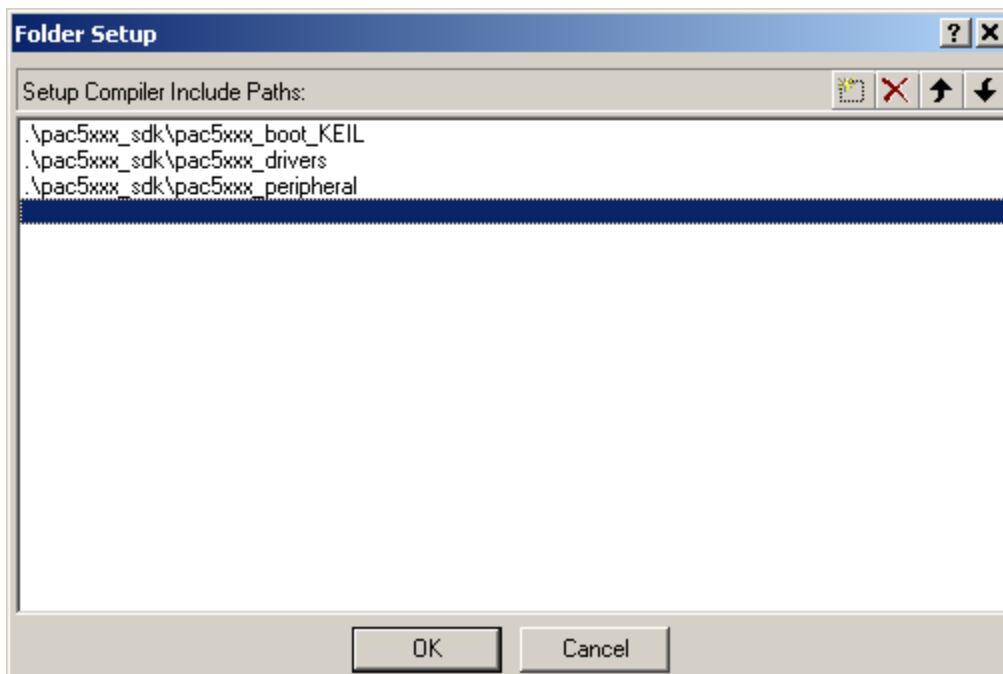
Select the “C/C++” tab. Click on the “...” box next to the “Include Paths” box.



Click on the “New” icon to add a new include path.

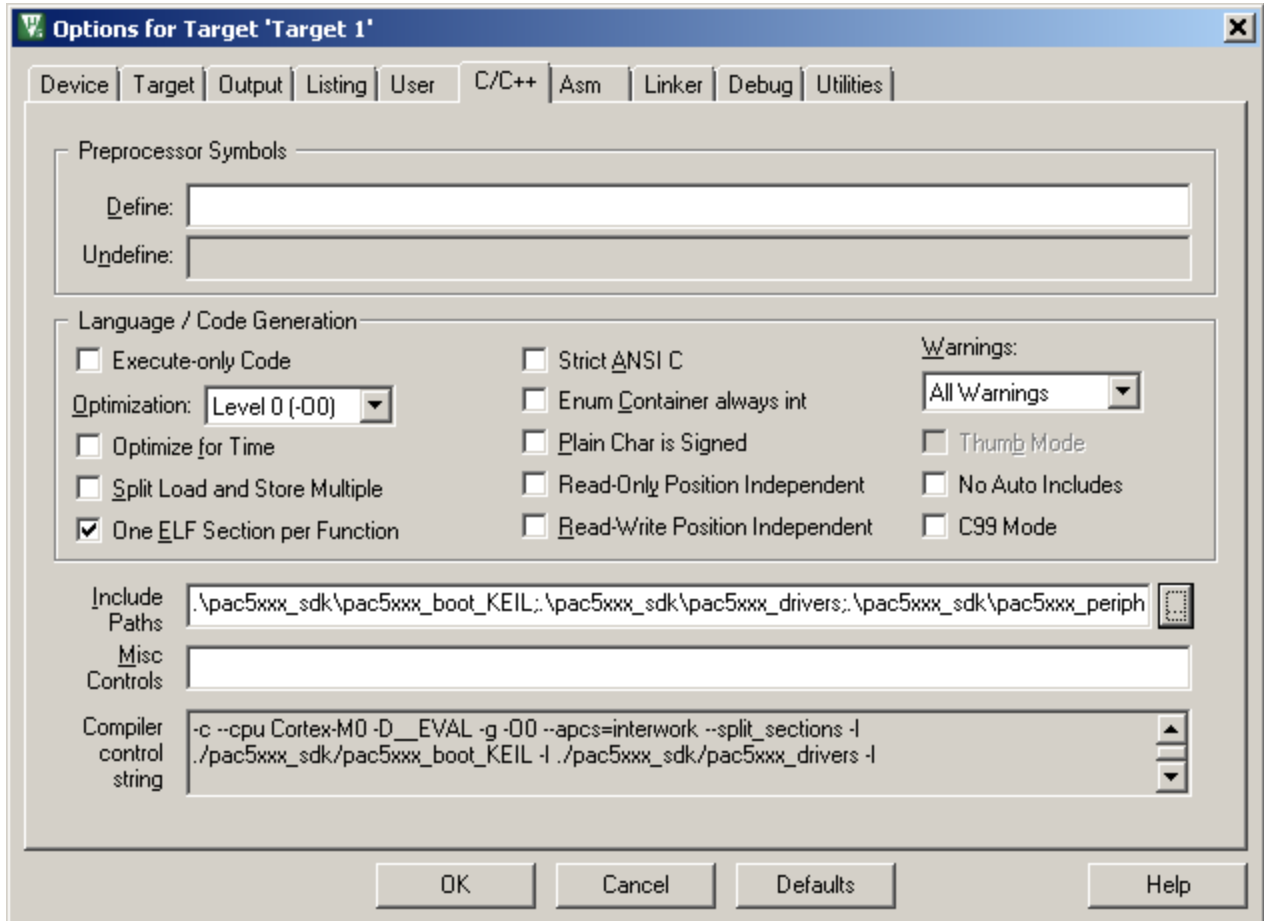


Add the PAC52xx SDK directories shown below.



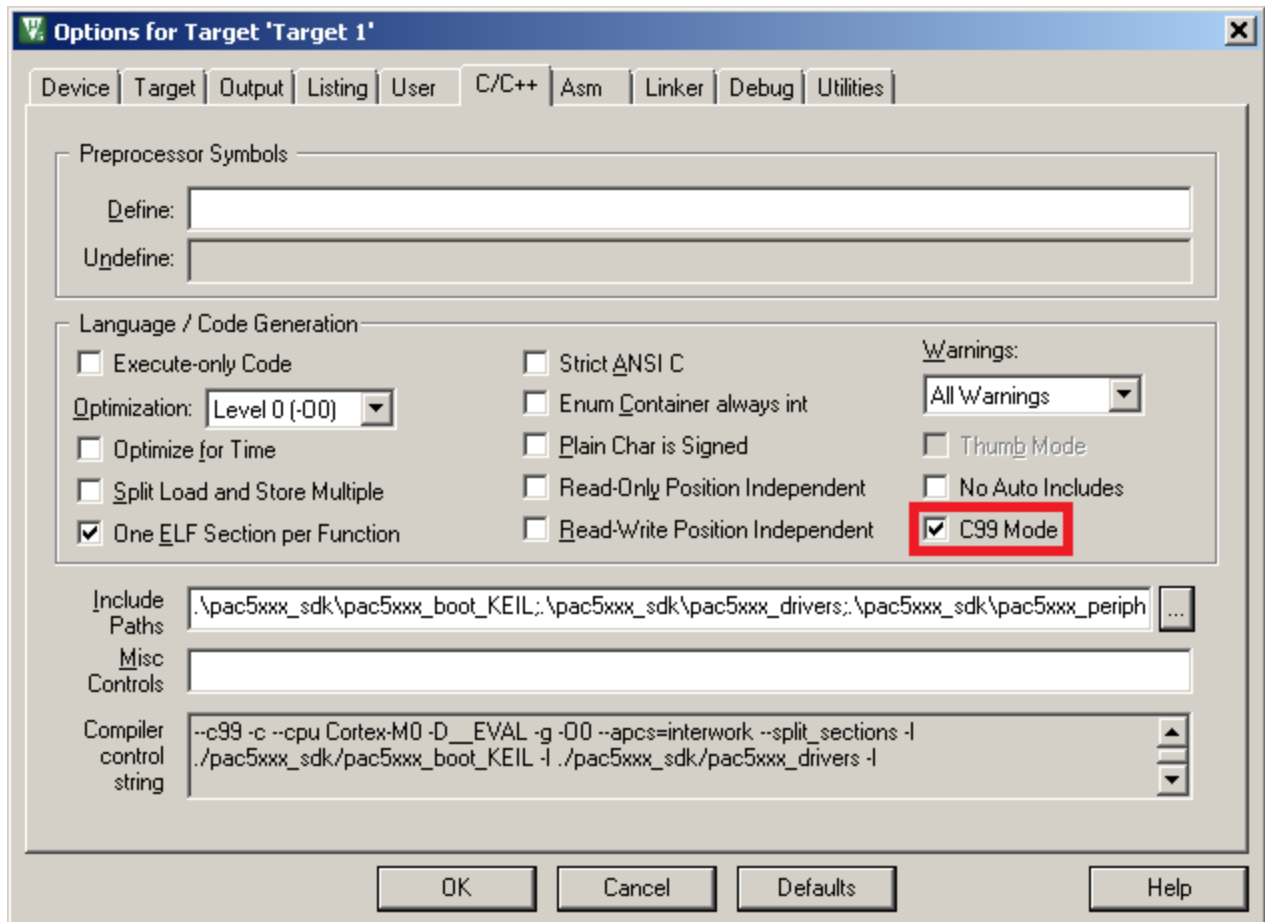


The “C/C++” tab should now show the PAC52xx SDK directories in the “Include Paths” box.



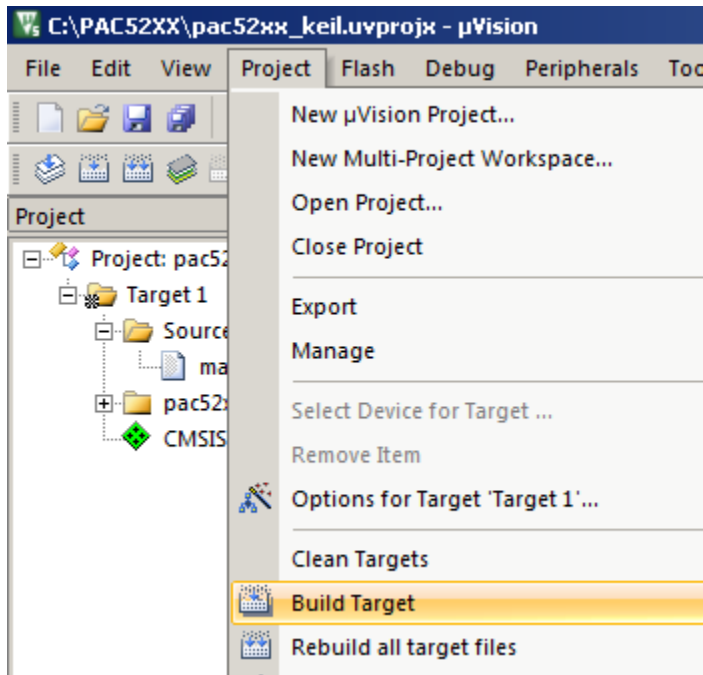
## 4.5 Set C99 Mode

Check the “C99 Mode” box on the “C/C++” tab.



## 4.6 Build the Project

To build the project, select “Project->Build Target” in the menu.



If the build is successful, the “Build Output” window will show 0 Errors.

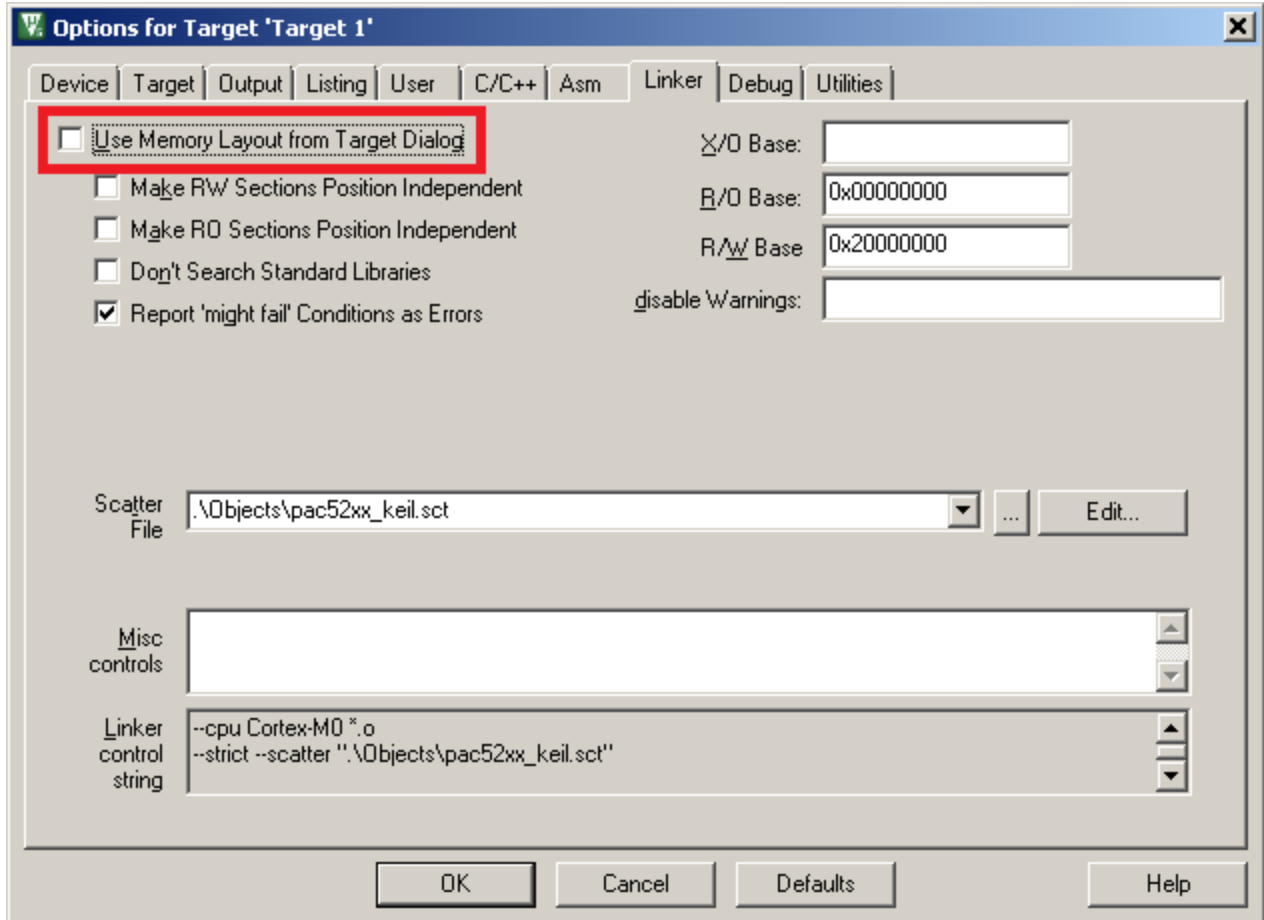
```
Build Output
compiling pac5xxx_driver_watchdog_config_clock.c...
compiling pac5xxx_driver_watchdog_reset.c...
linking...
Program Size: Code=356 RO-data=412 RW-data=4 ZI-data=356
".\Objects\pac52xx_keil.axf" - 0 Error(s), 0 Warning(s).
Build Time Elapsed: 00:00:06
```

## 5 LINKING FUNCTIONS INTO RAM

This section will discuss how to create functions that are placed into RAM, instead of FLASH, for quicker execution.

### 5.1 Create a Custom Scatter File

Select “Project->Options for Target...” in the menu. Select the “Linker” tab. Uncheck the “Use Memory Layout from Target Dialog” box.



Click on the “Edit...” box next to the “Scatter File” box. This should open the “pac52xx\_keil.sct” scatter file in the project workspace.

```

pac52xx_keil.sct
1 ; *****
2 ; *** Scatter-Loading Description File generated by uVision ***
3 ; *****
4
5 LR_IROM1 0x00000000 0x00008000 { ; load region size_region
6 ER_IROM1 0x00000000 0x00008000 { ; load address = execution
7 *.o (RESET, +First)
8 *(InRoot$$Sections)
9 .ANY (+RO)
10 }
11 RW_IRAM1 0x20000000 0x00002000 { ; RW data
12 .ANY (+RW +ZI)
13 }
14 }
15
16

```

Click the “OK” button to close the “Options” window.

Modify “pac52xx\_keil.sct” as shown below.

```

pac52xx_keil.sct
1 ; *****
2 ; *** Scatter-Loading Description File generated by uVision ***
3 ; *****
4
5 LR_IROM1 0x00000000 0x00008000 { ; load region size_region
6 ER_IROM1 0x00000000 0x00008000 { ; load address = execution
7 *.o (RESET, +First)
8 *(InRoot$$Sections)
9 .ANY (+RO)
10 }
11 RW_IRAM1 0x20000000 0x00002000 { ; RW data
12 *(ramfunc)|
13 .ANY (+RW +ZI)
14 }
15 }
16
17

```

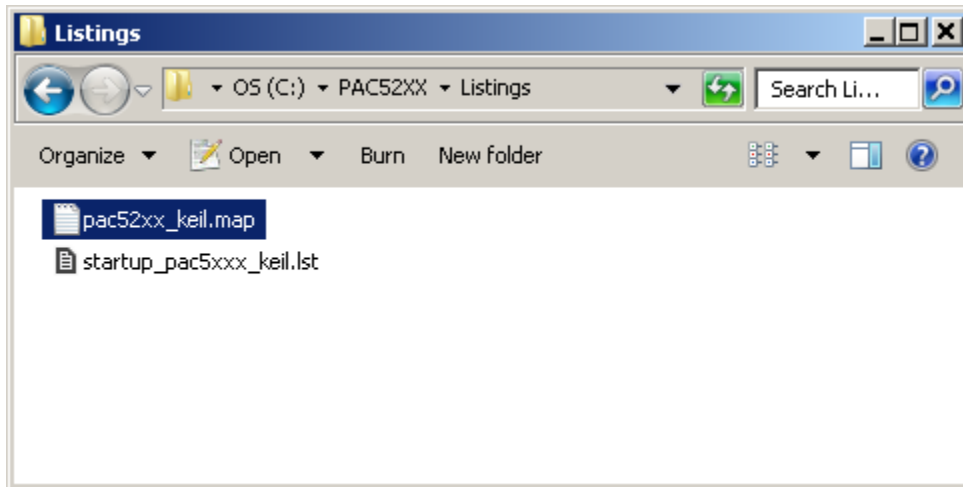
## 5.2 Create a RAM Function

Modify "main.c" as shown below.

```
main.c
1  #include "pac52XX.h"
2
3  void gpio_init(void)
4  {
5      PAC5XXX_GPIOE->OUTEN.PO = 1;
6  }
7
8  PAC5XXX_RAMFUNC void gpio_toggle(void)
9  {
10     PAC5XXX_GPIOE->OUT.PO ^= 1;
11 }
12
13 int main (void)
14 {
15     int i;
16
17     gpio_init();
18
19     while (1)
20     {
21         for (i=0; i<5000; i++);
22
23         gpio_toggle();
24     }
25 }
26
```

In this example, the gpio\_init function will be placed into FLASH but the gpio\_toggle function will be placed into RAM instead because of the PAC5XXX\_RAMFUNC attribute. This can be verified by checking the map file.

The “pac52xx\_keil.map” file is located in the “Listings” folder where the project is saved. The example below uses the project directory “C:\PAC52XX”



Address	Symbol	Value	Type	Offset	Module
3657	__semihosting_library_function	0x000001db	Thumb Code	0	indicate_semi.o(.text)
3658	Long Thumb to Thumb Veneer to gpio_toggle	0x000001dd	Thumb Code	12	anon\$\$obj.o(Veneer\$\$Code)
3659	SystemInit	0x000001e9	Thumb Code	8	system_pac5xxx.o(i.SystemInit)
3660	gpio_init	0x000001f9	Thumb Code	16	main.o(i.gpio_init)
3661	main	0x0000020d	Thumb Code	24	main.o(i.main)
3662	Region\$\$Table\$\$Base	0x00000228	Number	0	anon\$\$obj.o(Region\$\$Table)
3663	Region\$\$Table\$\$Limit	0x00000258	Number	0	anon\$\$obj.o(Region\$\$Table)
3664	gpio_toggle	0x20000001	Thumb Code	26	main.o(ramfunc)
3665	SystemCoreClock	0x20000020	Data	4	system_pac5xxx.o(.data)
3666	__libspace_start	0x20000024	Data	96	libspace.o(.bss)
3667	__temporary_stack_top\$libspace	0x20000084	Data	0	libspace.o(.bss)
3668					

## 6 CONCLUSION

Keil uVision should now be installed and properly configured for use with PAC5xxx.

## ABOUT ACTIVE-SEMI<sup>®</sup>

Active-Semi, Inc., headquartered in Dallas, TX, is a leading innovative semiconductor company with proven power management, analog, and mixed-signal products for end-applications that require power conversion (AC/DC, DC/DC, DC/AC, PFC, etc.), motor drivers and control, and LED drivers and control along with ARM<sup>®</sup> microcontrollers for system development.

Active-Semi's latest family of Power Application Controller<sup>®</sup> (PAC<sup>®</sup>) ICs offer high-level of integration with 32-bit ARM<sup>®</sup> Cortex<sup>®</sup>-M0, along with configurable power management peripherals, a Configurable Analog Front End<sup>™</sup> with high-precision high-speed data converters, single-ended and differential PGAs, and integrated low-voltage and high-voltage gate drives. PAC<sup>®</sup> ICs offer unprecedented flexibility and ease in the systems design of various end-applications such as Wireless Power Transmitters, Motor drives, UPS, Solar Inverters, and LED lighting that require a microcontroller, power conversion, analog sensing, high-voltage gate drives, open-drain outputs, analog and digital general purpose IO, as well as support for wired and wireless communication. More information and samples can be obtained from <http://www.active-semi.com> or by emailing [marketing@active-semi.com](mailto:marketing@active-semi.com)

Active-Semi<sup>®</sup> shipped its 1 Billionth IC in 2012, and has over 120 in patents awarded and pending approval.

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