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### MPLAB X + CCS C Compiler Tutorial

### How to install the CCS C Compiler inside MPLAB X

Before the CCS C Compiler can be used inside MPLAB X, the CCS C MPLAB X Plug-in must be installed. This process can be done inside MPLAB X.

- 1. Launch MPLAB X.
- 2. From the MPLAB X menu, select Tools -> Plugins
- 3. Verify that MPLAB X is searching Microchip's Third Party plug-in repository. This can be done by selecting the **Settings** Tab in the Plugins window and verifying that **Microchip Third Part Plugins** is available and checked.

🗶 Plugins	
Updates Available Plugins (15) Downloaded Installed (23 Settings) Configuration of Update Centers:	
Active Name	Microchip Plugins Edit Remove Last Check: 11/5/12 4:36 PM URL: http://ww1.microchip.com/downloads/mplab/X/plugins/updates.xml
Automatically Check for Updates	bbA
Check Interval: Every Week	Proxy Settings
Advanced	
Force install into shared directories	
	Close Help



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4. Goto the **Available Plugins** tab. Check the box next to **CCS C Compiler**. Once checked, press the **Install** button.

-	d Catalog			Search:					
install	Name	Category ₹	Source	CCS C Compiler					
	dsPIC Filter Designer	MPLAB Plugin	<b>6</b>						
	DMCI	MPLAB Plugin	\$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	🙀 Community Contributed Plugin					
	PCLint	MPLAB Plugin	<u>-</u>	ww					
	Power Monitor	MPLAB Plugin	\$ \$ \$ \$	Version: 1.56					
	MPLABX KeeLoq Plugin	MPLAB Plugin	<u>-</u>	Author: CCS, Inc.					
	ECAN Bit Rate Calculator	MPLAB Plugin	66	Date: 1/28/14					
	MPLAB® Code Configurator	MPLAB Plugin	<u></u>	Source: Microchip Third Party Plugins					
	Proteus VSM Viewer	MPLAB Plugin	88 88 88	Homepage: http://www.ccsinfo.com/					
	Graphics Display Designer X	/ Designer X MPLAB Plugin	<b>~~</b>						
	MemoryStarterkit	MPLAB Plugin	44 44 44 44 44 44 44 44 44 44 44 44 44	Plugin Description					
	dsPICWorks	MPLAB Plugin	<b>~~</b>						
	RTOS Viewer (FreeRTOS)	MPLAB Plugin	କ୍ରିକ	CCS provides a complete integrated tool suite for developing and debugging embedded					
	PBP Tool Chain	Tools	<b>~~</b>	applications running on Microchip PIC MCUs and dsPIC DSCs. The intelligent code optimizing CCS C compiler frees developers to concentrate on design functionality instead					
	PicBasic Language Syntax	Tools	<u> </u>	of having to become an MCU architecture expert. Benefits include maximized code reuse					
V	CCS C Compiler	Tools	ซิซิ	easily porting from one MCU to another, minimize lines of new code by using provided					
	SDCC Toolchain	Tools	ŵŵ	peripheral drivers, built-in functions and standard C operators. Our built-in functions are					
				specific to PIC MCU registers, allowing access to hardware features directly from C and w					
				include ready to run examples and tested peripheral drivers allow developers to quickly					
				start their project.					

If you do not see CCS C Compiler in the Available Plugins tab, it is possible the plugin is already installed in your MPLABX. Skip to step 6 to verify that it is installed.

5. After you press the Install button, a few new dialog windows will ask to verify that you want to install the plug-in and that you accept the license.

If you get a dialog window saying the plugin is signed but not trusted, ignore it and continue the installation of the plugin.

After the plugin is installed, MPLABX will ask you to restart the software. The plugin will not install without MPLABX being restarted.



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The CCS C Compiler plugin should be installed now. Before attempting to use the plugin, verify that it is installed. To do this open the Plugins window by selecting Tools -> Plugins from the MPLABX menu. Select the Installed tab. Look for CCS C Compiler, it should have the Active column checked to signify that the plugin is installed and running.

					Search:
Select	Name	Category ₹	Active		CCS C Compiler
	Local History	Base IDE			ccs c compiler
	Mercurial	Base IDE	Ø		Version: 1.57
	Database	Base IDE	Ø		Source: org-ccs-MPLABXplug.nbm
	Subversion	Base IDE	Ø		
	Spellchecker	Base IDE	Ø		
	IDE Platform	Base IDE	Ø		Plugin Description
	Spellchecker English Dictionaries	Base IDE			CCS provides a complete integrated tool suite for developing and debugging embedded
	Hudson	Base IDE			applications running on Microchip PIC MCUs and dsPIC DSCs. The intelligent code
	Team	Base IDE	0	Ξ	optimizing CCS C compiler frees developers to concentrate on design functionality instead
	CVS	Base IDE			of having to become an MCU architecture expert. Benefits include maximized code reuse
	CCS C Compiler	CCS, Inc.	0		by easily porting from one MCU to another, minimize lines of new code by using provided
	Power Data Processing	MPI AB DBCore	V		peripheral drivers, built-in functions and standard C operators. Our built-in functions are specific to PIC MCU registers, allowing access to hardware features directly from C and we
	PeripheralAndSFRs	MPLAB DBCore	0		include ready to run examples and tested peripheral drivers allow developers to quickly
	toolchainCommon	MPLAB IDE			start their project.
	toolchainMPASMWIN	MPLAB IDE			
	toolchainXC8	MPLAB IDE	$\bigcirc$		
	toolchainASM30	MPLAB IDE	Ø		
	toolchainHI-TECH	MPLAB IDE	$\bigcirc$		
	toolchainXC16	MPLAB IDE			
	toolchainC30	MPLAB IDE	0		
	toolchainC32	MPLAB IDE		-	

If **CCS C Compiler** is missing from this window, go back to step 1 to install the plugin.

This window can also be used to inspect the version of the plugin. (This is the version of the plugin, not the compiler). By highlighting/selecting **CCS C Compiler**, the text description on the right will change and display the version number.



### How to create an MPLAB X project that uses the CCS C Compiler

Before attempting to use the CCS C Compiler in MPLAB X for the first time, verify that the CCS C Compiler plug-in is installed in MPLAB X. This can be done via step 6 of the section labeled **How to install the CCS C Compiler inside MPLABX.** 

- 1. Launch MPLAB X.
- 2. Ensure that no other projects are open by selecting File -> Close All Projects from the menu.
- 3. Start a new project by selecting File -> New Project





4. MPLAB X's New Project dialog will start. It will first ask you what kind of project you want to create. Select 'Standalone Project' and press the 'Next' button.

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	2.		052110,2					hip Emb	edded				ne Project						2
						<b>.</b>	Sample					📄 Existing i	MPLAB IDE					34	
													Hex, Loada	able Image	) Project				^
												🔲 Library P	roject						
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																		ur	
																		F.	
						Descrip	tion:											ŕ	
						Create	es a new	standal	one app	lication pro	ject.	It uses an IDE	-generated	l makefile I	to build y	our project			
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5. A dialog will ask you what PIC you want to use. Select the PIC you want to use for your project from the pull-down selector and then press the 'Next' button.

MPLAB X IDE v1.10 File Edit View Navigate Source Refactor	Run Debug Team Tools Window Help	₽ ×
New Project		× Q+
Star          Steps         1.       Choose Project         2.       Select Device         3.       Select Tool         5.       Select Compiler         6.       Select Project Name and Folder	Select Device Mid-Range 8-bit MCUs (PIC12/16/MCP)   Device:  TC16F887	
	< Back Next > Finish Cancel Help	]



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6. The dialog will ask you what Programmer/Debugger tool you want to use. If you are not using such a tool, then select 'Simulator'. After you have made your selection press the 'Next' button.

Жм	PLAB X IDE v1.10		_ @ 🗙
File	Edit View Navigate Source Refacto	or Run Debug Team Tools Window Help	
12	💢 New Project		2-
Star	Steps	Select Tool	)_
	<ol> <li>Choose Project</li> <li>Select Device</li> <li>Select Header</li> <li>Select Tool</li> <li>Select Compiler</li> <li>Select Project Name and Folder</li> </ol>	<ul> <li>Hardware Tools</li> <li>ICD 3</li> <li>PICkit2</li> <li>PICkit3</li> <li>Real ICE</li> <li>Indiscon</li> <li>Microchip Starter Kits</li> <li>MCHV</li> <li>MICROSTICK</li> <li>SKDE 33 AUDIO</li> <li>SKDE Memory</li> <li>SKDE PIC18FJ</li> <li>SKDE PIC24F 1</li> <li>SKDE PIC32</li> <li>Starter Kits (PKOB)</li> </ul>	it ur 4
<		<pre>&lt; Back Next &gt; Finish Cancel Help</pre>	
<u>1</u>			



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7. The dialog will now ask which compiler you want to use. You should see a section labeled 'CCS C Compiler', and under this section you may have a few CCS C Compilers to choose from. You would have several choices to choose from if you have installed multiple versions of the compiler on your computer at once. If you only have one installed CCS C Compiler then you will only have one choice. Select the 'CCS C Compiler' version you want to use and press the 'Next' button.

MPLAB X IDE v1.10 File Edit View Navigate Source Refacto	or Run Debug Team Tools Window Help	- 8 X
Star Star Steps 1. Choose Project 2. Select Device 3. Select Header 4. Select Tool 5. Select Project Name and Folder	Select Compiler Compiler Toolchains CCS C Compiler CS C Compiler CS C Compiler [C:\Program Files\PICC] CCS C Compiler [C:\Program Files\PICC] HI-TECH PICC (None found) mpasm M mpasm (v5.43) [C:\Program Files\Microchip\MPLABX\mpasmx] PICBASIC PRO™ (None found) SDCC Toolchain (None found)	
	< Back Next > Finish Cancel Help	

## Not getting an option for CCS C Compiler here?

First, verify that the CCS C Compiler plug-in has been installed by following the first section of this tuturial titled **"How to install the CCS C Compiler inside MPLAB X".** 

If the plug-in is installed but there still isn't an option to select the CCS C Compiler here, it's probably because MPLAB X doesn't know where the compiler is located. To resolve this, find the section of this tutorial labeled **"How do I add CCS C Compilers to MPLABX's list of compiler toolchains?"** 



8. The dialog will now ask you what to call the project and where to save the project. The project directory is where MPLAB X will store configuration files for the project and where output files generated after a compile will be stored. The source code does not necessarily have to be placed into the project directory.

After choosing project name and project directory, press the 'Next' button.

🔀 MPLAB X IDE v1.10			<b>_ ~</b> ×
File Edit View Navigate Source	Refactor Run Debug Te	aam Tools Window Help	
📕 New Project			
Steps	Select Project Name ar	nd Folder	^
Choose Project     Select Device     Select Header	Project Name:	first_project	
4. Select Tool 5. Select Compiler	Project Location:	C:\MyProjects	Browse
6. Select Project Name and Folder	Project Folder:	C:\MyProjects\first_project.X	
	Overwrite existing p Also delete sources.	5,	
	Encoding: ISO-8859		
MB/ BEX			>
		<pre>cancel</pre>	Help

- 9. The New Project dialog is now finished and the project is created, but the project is empty and there is no source code attached to the project. We now need to add source to the project. Source can be added to the project in one of two ways: creating a new file or adding an existing file.
- Creating a new file: Right click on 'Source Files' and select 'New -> C Main File' or 'New -> C Source File'. A dialog will ask you what to name the file and where to save it.
- Adding an existing file: Right click on 'Source Files' and select 'Add Existing Item'. A dialog will allow you to browse your computer to chose the file to add the project. A file chosen this way will be left in the directory it was found, it will NOT be copied to the project directory.



For this tutorial, ex\_sqw.c from the CCS C Compiler's examples directory (if the compiler is installed to the default directory, will be found atC:\program files\picc\examples\ex\_sqw.c) was copied to the project directory and then inserted using 'Add Existing Item'

If you only insert one source C file into your project, MPLAB X will call the CCS C Compiler to compile and link in one step. No intermediate .o files used for multiple compilation units are generated.

If you insert more than one source C file into your project, MPLAB X will call the CCS C Compiler multiple times to compile each C file seperately. After each C file is compiled seperately, the .o output files are then linked in the final step to create the .HEX and .COF file. This process of multiple compilation units is only supported by licensed users of the PCW IDE. Command-line only customers do not have this feature.





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10. Compile (build) the project by selecting 'Run -> Build Project' from the menu. 'Clean and Build Project' can also be used, which will erase all output files and intermediate .o files before building.





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11. During the build process, MPLAB X will invoke the CCS C Compiler. You should see the CCS C Compiler window pop-up during this process (depending on the size of your file this may disappear quickly).





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12. Compile status and compiler output messages will be displayed in MPLAB X's output window. The output window will also display where MPLAB X saved the result .HEX and .COF file output of the compiler.

×	MPL	AB X IDE v1.10 - first_project : default
File	Ed	it View Navigate Source Refactor Run Debug Team Tools Window Help
. P	6	🔁 🖴 🎭 🦃 🦿 default 💽 🚏 * 🎲 * 🔽 * 🐴 🖓 PC: 0x0 🛛 z dc c : W:0x0 : bank 0
ses	Ou	tput - first_project (Build, Load) 🛛 🕫 🖉
Classes		make -f nbproject/Makefile-default.mk SUBPROJECTS= .build-conf
ĕ	D	make[1]: Entering directory `C:/MyProjects/first_project.X'
	~~	make -f nbproject/Makefile-default.mk dist/default/production/first_project.X.production.hex
Files		<pre>make[2]: Entering directory `C:/MyProjects/first_project.X' </pre>
ň		gnumkdir -p build/default/production gnumkdir -p dist/default/production
_		"C:\Program Files\PICC\CCSC.exe" out="dist/default/production" "EX_SQW.C" +FM +DF +Y=9 +EA +DF +LN +T
Projects		gnumkdir -p dist/default/production
roje		make[2]: Leaving directory `C:/MyProjects/first_project.X'
Ē.		<pre>make[1]: Leaving directory `C:/MyProjects/first_project.X'</pre>
_		BUILD SUCCESSFUL (total time: 18s)
first_project - Dashboard		Loading C:/MyProjects/first project.X/dist/default/production/first project.X.production.hex
đ		Loading C:/MyProjects/first_project.X/dist/default/production/first_project.X.production.cof
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### How do I change project properties, like the include path?

This can be done in MPLAB X by selecting 'File -> Project Properties' from the menu.



This will open the project properties dialog. CCS C Compiler specific options can be found in the section labeled 'Compiler Options':

X Project Properties - first_project					×
egories: - ● General - ● Conf: [default] - Simulator	Options for CCS C C Option categories:	iompiler General	v	Reset	>
Orbitality     Orbitality     Orbitality     Orbitality     Orbitality     Orbitality     Orbitality	Optimization Level Errors and Warning: Preprocessor Macro Include Directories Extra Output Flags Additional options: Option Description	5	9 Show All Errors, All Warnings		
Manage Configurations	<u>.</u>	III			~
			OK Cancel Apply		



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# How do I add CCS C Compilers to MPLABX's list of compiler toolchains?

# Why isn't MPLAB X finding my CCS C Compiler even though I have the plugin installed?

**Option 1 – Add ccsc.exe to Window's PATH.** When MPLAB X starts, it searches the computer's execution path for any compatible compiler toolchains. In CCS C Compiler's case, it searches for CCSC.EXE and CCSCON.EXE.

In Windows, to changing the execution path requires changing the PATH environment variable. The process of finding this dialog is different for each Windows, but typing Environment Variable in the Control Panel's search bar should find the proper tool.

Once PATH has been updated with the location of the CCS C Compiler's installed directory, exit and start MPLABX and it will automatically find the compiler.

Variable	Value						
MOZ_PLUGIN_P	C:\PROGRAM FILES (X86)\FOXIT SOFT	Ξ					
PATH	"C:\Program Files (x86)\Microchip\xc16\						
SMARTRFSTUDI TEMP	C: \Program Files (x86) \Texas Instrume %USERPROFILE% \AppData \Local \Temp						
ustem variables	New <u>E</u> dit <u>D</u> elete						
Variable	Value						
Variable PROCESSOR_LE	Value 16	•					
vstem variables Variable PROCESSOR_LE PROCESSOR_R PSModulePath	Value 16 0602						
Variable PROCESSOR_LE PROCESSOR_R	Value 16	*					

#### **Option 2 – Add ccsc.exe to MPLABX's Build Tools.**

To manually add a compiler to MPLAB X that isn't in the computer's execution path can be done from MPLAB X's Option screen. From the MPLAB X menu, select **Tools->Options**. On the **Options** screen, select the **Embedded** screen and then the **Buld Tools** tab:

📕 Options									
O C C C C C C C C C C C C C C C C C C C			G W A S	۲	,		16		
General	Editor	Fonts & Co	lors Keymaj	• c/c+-	+	Embedded	Miscellaneous		
Build Tools	Project Option	s Generic Set	tings Suppres	sible Messages	Other				
	mpiler [C:\PR		уре:	CCS C Compiler					
	mpiler [C:\PROG 5.47) [C:\Progra		ase Directory:	C:\PROGRA~1	\PICC41	.36			
<		<b>&gt;</b>	Compiler:	C:\PROGRA~1	\PICC41	.36\CCSC.exe			
	Add	M	lake Command:	C:\Program File	es\Microo	chip\MPLABX\;	gnuBins\GnuWin3	2\bin\make.exe	
Remo	ove D	efault							
								Scan for Bu	ild Tools
Export	] Import	)					ОК	Cancel	Help



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## In my project, why do I get many red underlines because MPLAB X thinks there are a lot of syntax errors in the code?

MPLAB X treats any file with an upper case .C extension as a C++ file. Since the CCS C Compiler is not a C++ compiler MPLAB X will trigger many valid lines as a syntax error.

Bad file:



Good file:



There are 2 possible resolutions. First, rename the file to have a .c extension instead of a .C extension. Second, change the MPLAB X settings so a .C file is a C file and not C++. Performing either of these steps may require you to delete your MPLAB X project and create a new one.

To change the MPLAB X properties to make a .C file a C file, from the MPLAB X menu, select **Tools->Options**. On the **Options** screen, select the **Embedded** screen and then the **Other** tab:

X Options	×
🖗 🗗 🔇 🖛 🤷	
General Editor Fonts & Colors Keymap C/C++ Embedded Miscellaneous	
Build Tools Project Options Generic Settings Suppressible Messages Diagnostics Other	
C/C++ Header File Extensions: H, SUNWCCh, h, hpp, hxx, tcc	
C++ File Extensions: C, c++, cc, cpp, cxx, mm	
C File Extensions: c, i, m	
Fortran File Extensions: F, F03, F90, F95, f, f03, f90, f95, for, mod Edit	
Assembler File Extensions: AS, ASM, S, as, asm, s	
	=
	-
Export     Import       OK     Cancel	Help



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### I have several versions of CCS C Compilers installed on my computer, how do I tell MPLAB X which to use?

This setting is saved to each individual project. To change which compiler to use, the project settings need to be changed. From the MPLAB X menu, select **File -> Project Properties**.

X Project Properties - ex_sqw	
Categories:	Configuration
····· ◇ General i→··· ◇ Conf: [default] ····· ◇ Simulator	Family: Device:
···· <ul> <li>Loading</li> <li>Libraries</li> </ul>	Supported Debug Header: Supported Plugin Board:
Building     CCS C Compiler     O CCS C Compiler	None None V
	Hardware Tool:       Compiler Toolchain:         Hardware Tools       Compiler Toolchains         Image: Simulator       CCS C Compiler [C:\PROGR/         Image: Simulator       CCS C Compiler [C:\PROGR/         Image: Simulator       Image: Simulator         Ima
Manage Configurations	OK Cancel Apply Help

From the Project Properties window, select the **Conf** category on the left side of the window. On the right side of the window you will see all the available compilers under the **Compile Toolchain** section. The full path to the compiler executable is shown with each available compiler toolchain. Select the compiler you want to use, and press the **Ok** button.

MPLAB X is able to scan your computer to find compatible compilers. But MPLAB X may not show your compiler if it fails to find it or if you have too many different compiler versions installed. In this condition you will have to manually add a compiler to MPLAB X's compiler list. To do this, select **Tools -> Options** from the MPLAB X menu. Once the Options window is open, select **Embedded** and then the **Bulid Tools** tab.



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#### I have several versions of CCS C Compilers installed on my computer, how do I tell MPLAB X which to use? (Continued)

Under **Toolchain**, MPLABX will list all the CCS C Compilers that it has found. You can use this dialog window to add or modify MPLAB X's list of available compilers.

🔀 Options	;							
O S B				۲		100		
General	Editor	Fonts & Color:	s Keymap	C/C++	Embedded	Miscellaneous		
Build Tools	Project Options	Generic Settin	gs Suppressible	e Messages Ot	her			
	mpiler [C:\PRO		e; CC	5 C Compiler				
	mpiler [C:\PROGR 5.47) [C:\Program	n Files\Mic Base		PROGRA~1\PIC				
<		> CG	ompiler: C:	PROGRA~1\PIC	C4136\CCSC.exe	•		
	Add	Mak	e Command: C:1	(Program Files\M	licrochip\MPLABX\	gnuBins\GnuWin32	\bin\make.exe	
Remo	ove De	fault						
Scan for Build Tools								
Export	Import					ОК	Cancel	Help



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