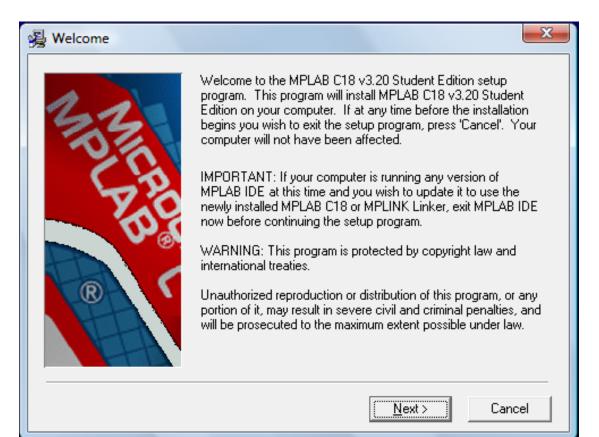
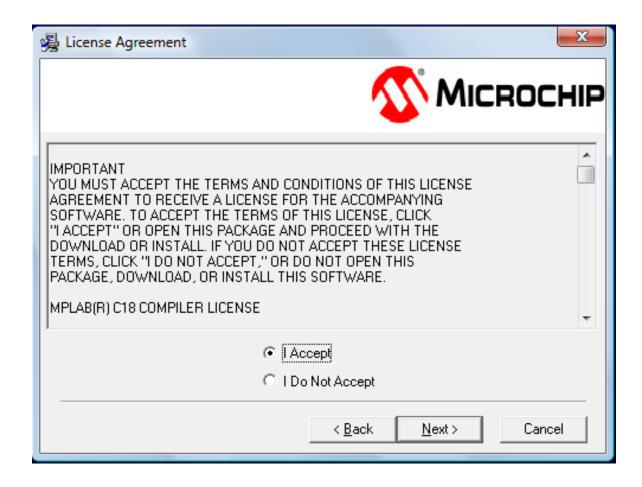
- The layout of this document:
 - Installing MPLAB C18:
 - A step-by-step guide through the installation process of MPLAB C18 Compiler.
 - Configuring MPLAB IDE:
 - MPLAB IDE setup for use with MPLAB C18.
 - Basics of MPLAB IDE configuration to run your Program.
 - Verifying Installation, building and testing programs.
 - Debugging using MPLAB SIM simulator.
 - Configuration Bits.

- Before Installing MPLAB C18 C Compiler
 - MPLAB IDE should be installed on the PC prior to installing MPLAB C18.
 - You can download the MPLAB IDE v8.x from the microchip website: http://www.microchip.com
 - Run the program and follow the series of dialogs

Welcome Screen



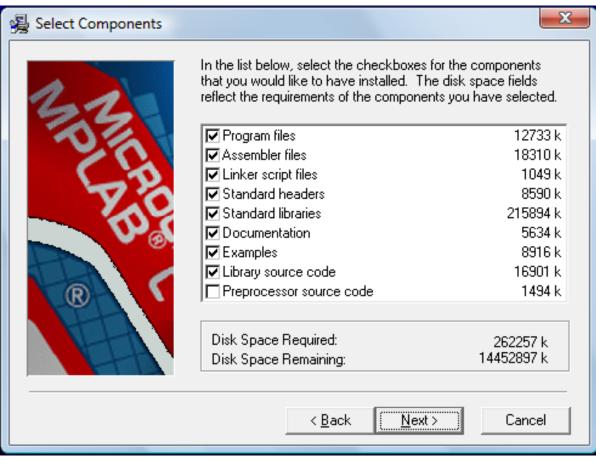
• The license agreement, select I Accept



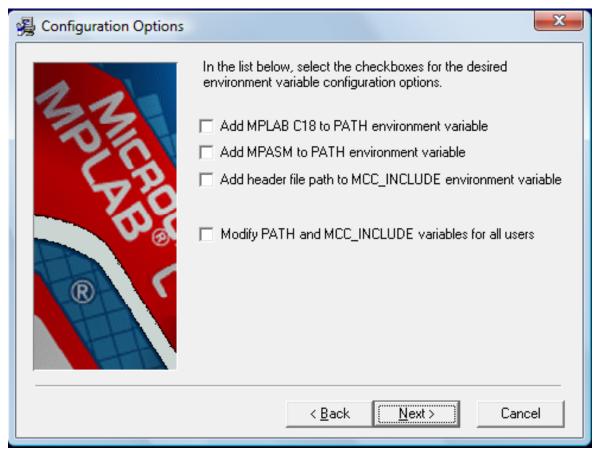
 Select Installation Directory, the default installation directory is c:\mcc18 as shown below

😼 Select Installation Direc	tory
M Minne	MPLAB C18 v3.20 Student Edition will be installed in the following folder. WARNING: Any file in this directory or one of its subdirectories might be overwritten or removed by the setup program. If you wish to keep any of these files, press 'Cancel' now and save these files to another directory. To choose a different installation directory, press 'Browse'. You cannot install the demo over a previous non-demo installation of MPLAB C18.
R	Installation Directory C:\MCC18 Browse
	< <u>B</u> ack <u>Next</u> > Cancel

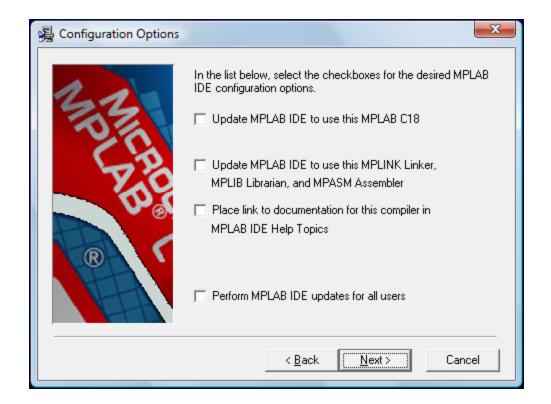
• Choose the components to be installed by checking the appropriate boxes.



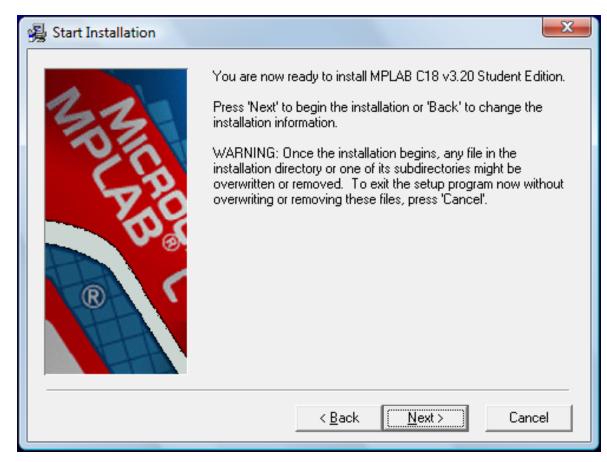
• Environment variable configuration Options: select the desired options to configure MPLAB C18 C compiler.



• MPLAB IDE configuration Options: select the desired options to configure MPLAB C18 C compiler.



 Start Installation, You are ready to install MPLAB C18 C compiler. At the Installation Complete screen, click Finish. MPLAB C18 has been successfully installed.



MPLAB IDE Configuration

- Topics covered:
 - Project Overview
 - Creating a File
 - Creating projects to work with MPLAB C18 C compiler.
 - Using the Project Window
 - Verify Installation and Build Options
 - Building and Testing.

Project Overview

- Projects are groups of files associated with language tools.
- A project consists of source files, header files, object files, library files and a linker script.
- At least one header file is required to identify the register names of the target microcontroller.
- The project's output files consist of executable code to be loaded into the target microcontroller.

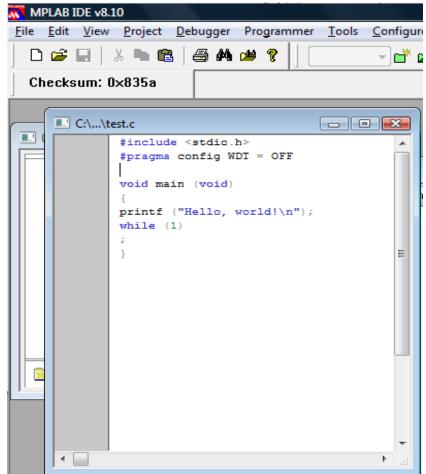
CREATING A FILE

 Start MPLAB IDE and select *File ->New* to bring up a new empty source file.

📉 M	IPLAB I	DE v8.1	0 - Untitle	ed Workspac	e
File	Edit	View	Project	Debugger	Progra
	New			Ctrl	+N
	Add N	lew File	to Projec	t	ł
	Open.			Ctrl	+0
	Close				
	Save			Ctr	I+S
	Save A	As			- 1
	Save A	AII			
	Open	Worksp	ace		
	Save \	Norkspa	ace		
	Save \	Norkspa	ace As		
	Close	Worksp	ace		
	Impor	t			
	Export	t			
	Print			Ctrl	+P
	Recen	t Files			- +
	Recen	t Works	spaces		
	Exit				

CREATING A FILE

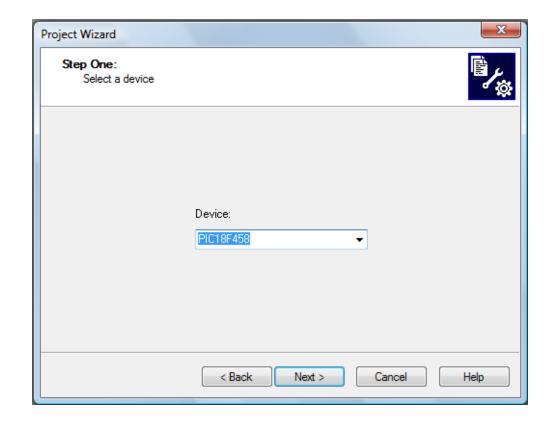
- Type the source text into this new file.
- File ->Save As to save this file. Browse to or create a new folder location to store projects.
- Click Save.



Select *Project -> Project Wizard* to create a new project

File Edit View Project Debugger Programmer Tools Configur Project Project Wizard Project Project <td< th=""><th>MPLAB IDE v8.1</th><th>0</th><th></th><th></th><th></th><th></th></td<>	MPLAB IDE v8.1	0				
Checksum: 0: New Open Close Set Active Project Image: Clean Quickbuild (no .asm file) Clean Build Configuration Image: Clean Build Options Image: Clean Save Project Save Project As Add Files to Project Add New File to Project Add New File to Project Select Language Toolsuite Set Language Tool Locations Set Language Tool Locations	<u>F</u> ile <u>E</u> dit <u>V</u> iew	<u>P</u> roject	<u>D</u> ebugger	Programmer	<u>T</u> ools	Configur
Circle Sum Open Close Image: Set Active Project Quickbuild (no .asm file) Clean Build Configuration Image: Build Options Build Options Image: Build Options Save Project Save Project As Add Files to Project Add New File to Project Add New File to Project Select Language Toolsuite Set Language Tool Locations Image: Build Continue	🗋 🖻 🖬 🛛	Pro	oject Wizard	•		- d 🖌
	Checksum: 0	Op Clo Set Qu Clo Bu Bu Sav Sav Ad Ad Rec Set Set	en ose Active Proje ickbuild (no can ild Configura ild Options ve Project ve Project As d Files to Pro d New File to move File Fro ect Language T	.asm file) ition ject project pm Project e Toolsuite ool Locations	 	
	•					

• Select a device, use the pull-down menu to select the device.



 Select the language toolsuite. If you use the MPLAB C 18 Compiler, then select "Microchip C18 Toolsuite" as the "Active Toolsuite". See the figure below.

Step Two: Select a language	e toolsuite	Ē
Active Toolsuite:	Microchip MPASM Toolsuite	•
 Toolsuite Contents MPASM Assem MPLINK Object MPLIB Librariar 	IAR Systems Midrange	
Location	Microchip C18 Toolsuite Microchip MPASM Toolsuite	
C:\Program Files\M	licrochip\MPASM Suite\MPASMWIN.exe Bro	wse
Help! My Suit	e Isn't Listed! 📃 Show all installed	toolsuites
	< Back Next > Cancel	Help

 Click on each language tool in the toolsuite (under "Toolsuite Contents") and check or set up its associated executable location.

Project Wizard	×
Step Two: Select a language toolsuite	ı B
Active Toolsuite: Microchip C18 Toolsuite	•
MPASM Assembler (mpasmwin.exe) MPLINK Object Linker (mplink.exe) MPLAB C18 C Compiler (mcc18.exe) MPLIB Librarian (mplin eve)	•
Location C:\MCC18\bin\mcc18.exe	Browse
Help! My Suite Isn't Listed!	Show all installed toolsuites
< <u>B</u> ack <u>N</u> ext >	Cancel Help

 MPASM Assembler should point to the assembler executable, MPASMWIN.exe, under "Location". If it does not, enter or browse to the executable location, which is by default:

C:\mcc18\mpasm\MPASMWIN.exe. See figure below

	Project Wizard		
	Step Two: Select a language toolsuite		
	Active Toolsuite: Microchip C18 Toolsuite Toolsuite Contents MPASM Assembler (mpasmwin.exe) MPLINK Object Linker (mplink.exe) MPLAB C18 C Compiler (mcc18.exe) MPLIB Librarian (mnlib eve) Location		
	C:\MCC18\mpasm\MPASM\WIN.exe Browse Browse		
Verify location	Help! My Suite Isn't Listed!		
	< <u>B</u> ack <u>N</u> ext > Cancel Help		

 MPLINK Object Linker (MPLink.exe) should point to the linker executable, MPLink.exe, under "Location". If it does not, enter or browse to the executable location, which is by default:

C:\mcc18\bin\MPLink.exe

ſ	Project Wizard
	Step Two: Select a language toolsuite
	Active Toolsuite: Microchip C18 Toolsuite
	MPASM Assembler (mpasmwin.exe) MPLINK Object Linker (mplink.exe) MPLAB C18 C Compiler (mcc18.exe) MPLIB Librarian (mplin eve)
	Location
	C:\MCC18\bin\mplink.exe Browse
Verify location	Help! My Suite Isn't Listed! Show all installed toolsuites
	< <u>Back</u> <u>N</u> ext > Cancel Help

 MPLAB C18 C Compiler (mcc18.exe) should point to the compiler executable, mcc18.exe, under "Location". If it does not, enter or browse to the executable location, which is by default:

C:\mcc18\bin\mcc18.exe

(Project Wizard
	Step Two: Select a language toolsuite
	Active Toolsuite: Microchip C18 Toolsuite Toolsuite Contents MPASM Assembler (mpasmwin.exe) MPLINK Object Linker (mplink.exe) MPLAB C18 C Compiler (mcc18.exe) MPL IB Librarian (mplih eve) Location C:\MCC18\bin\mcc18.exe Browse
Verify location	Help! My Suite Isn't Listed! Show all installed toolsuites
	< <u>B</u> ack <u>N</u> ext > Cancel Help

 MPLIB Librarian (MPLib.exe) should point to the library executable, MPLib.exe, under "Location". If it does not, enter or browse to the executable location, which is by default: C:\mcc18\bin\MPLib.exe

ĺ	Project Wizard
	Step Two: Select a language toolsuite
	Active Toolsuite: Microchip C18 Toolsuite
	Toolsuite Contents MPLINK Object Linker (mplink.exe) MPLAB C18 C Compiler (mcc18.exe) MPLIB Librarian (mplib.exe)
	Location C:\MCC18\bin\mplib.exe Browse
Verify location	Help! My Suite Isn't Listed! Show all installed toolsuites
	< <u>B</u> ack <u>N</u> ext > Cancel Help

• Enter the name of the project and use **Browse** to select the folder where the project will be saved. Then click **Next** to continue

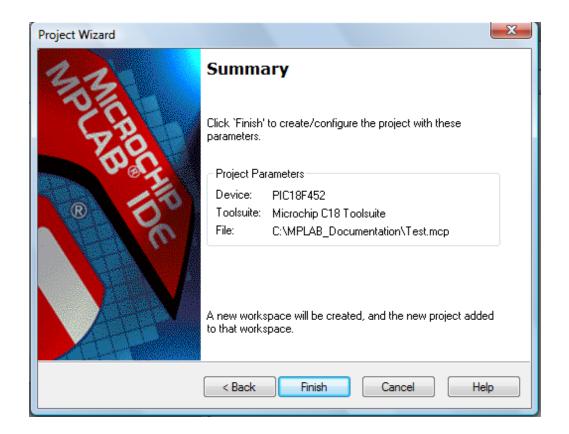
Project Wizard	×
Step Three: Create a new project, or reconfigure the active project?	۱ ش
Oreate New Project File	
C:\MPLAB_Documentation\Test Browse.	
Reconfigure Active Project	
Make changes without saving	
Save changes to existing project file	
Save changes to another project file	
Browse.	
< <u>B</u> ack <u>N</u> ext > Cancel	Help

• Select the source file created earlier (See figure below). If source files have not yet been created, they can be added later. **Click Add** to add it to the list of files to be used for this project (on the right).

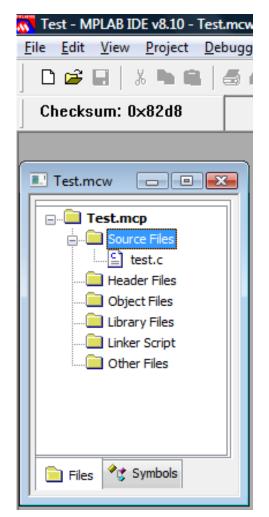
Add test.c file to the project

Project Wizard X
Step Four: Add existing files to your project
Add >> Add >> Add >> Add >> Add >> Add >> Add >> Add >> Add >> Add >> Remove Add >> Remove
< Back Next > Cancel Help

• A summary appears, click 'Finish

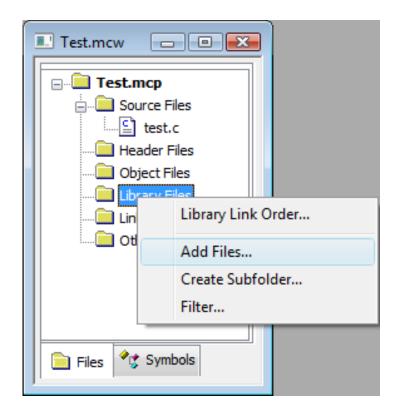


- After clicking 'Finish', the figure on the right window appears.
- A library files and Linker scripts must be added.



Adding Library Files to the Project

- To add Library Files to the project, Right click on the Library Files in the tree.
- Click Add files.



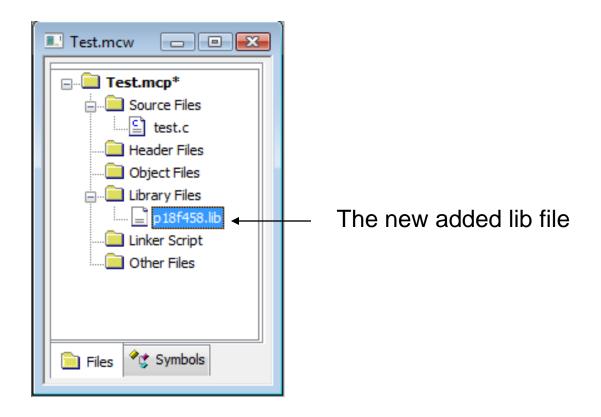
Adding Library Files to the Project

• Browse to the location c:\mcc18\lib\. Then select "p18f458.lib" and click open.

II Test.mcw	Add Files to Project	×
E	Look in: 🌗 lib 👻 😳 🤣 💷 🔻	
Source Files test.c Header Files Object Files Library Files Linker Script	Name Date modified Type Size Image: plage plag	Open
Files Symbols	Files of type: Library Files (*.lib) Jump to: Project Directory Remember this setting Auto: Let MPLAB IDE guess User: File(s) were created especially for this project, use relative path System: File(s) are external to project, use absolute path	 Cancel ▼

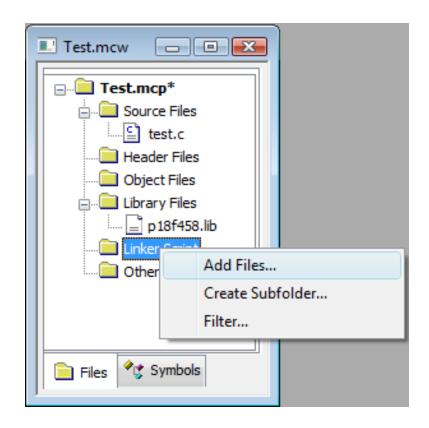
Adding Library Files to the Project

• You will get the figure bellow.



Adding Linker Script to the Project

- To add linker script to the project, Right click on the Linker Script in the tree.
- Click Add files.



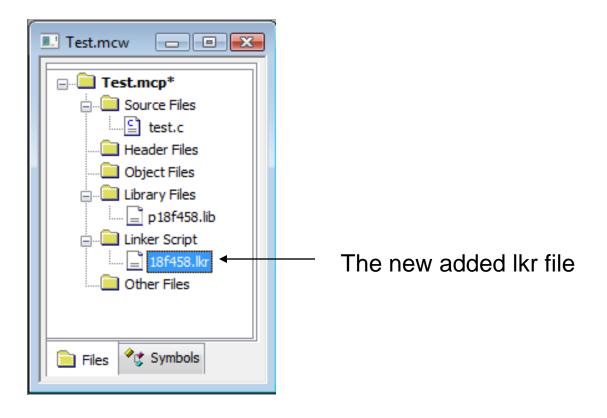
Adding Linker Script to the Project

 Browse to the location c:\mcc18\lkr\ Then select "18f458.lkr" and click open.

I Test.mcw	Add Files to Project	×
□	Look in: 🌗 Ikr 🗸 🎯 🏂 🛄 🕇	
E Source Files	Name Date modified Type Size	^
Header Files	18f442.lkr 18f442i.lkr 18f448i.lkr	
Library Files	18f452.lkr 18f458.lkr	
Linker Script	18f1220.lkr	
	18f1230_e.lkr	-
Files * Symbols	Files of type: Linker Scripts (*.lkr)	Open Cancel
Files Symbols	Jump to: Project Directory	
	Remember this setting	
	 Auto: Let MPLAB IDE guess User: File(s) were created especially for this project, use relative path 	
	System: File(s) are external to project, use absolute path	

Adding Linker Script to the Project

• You will get the figure bellow.



• Select the Project ->Build Options ->Project.

📉 Test - MPLAB IDE	v8.10 - Test.mcw		
<u>File Edit View</u>	roject <u>D</u> ebugger Programmer <u>T</u> ools <u>C</u> or	nfigure	<u>W</u> indow <u>H</u> elp
🗋 🗅 😅 🖬 📔	Project Wizard	÷	E 🚯 🐧 🕸
Checksum: 0:	New		
	Open	- h	
	Close	- -	
Test.mcw	Set Active Project	- ×	
⊡ <mark>⊡</mark> Test.mc	Quickbuild (no .asm file)		
i Sourc	Clean	- 1	
Head	Export Makefile	- 8	
Objec	Build All Ctrl+F	10	
in the second se	Make F1	10	
📑 p	Build Configuration	- •	
	Build Options	•	test.c
Other	Save Project		Project
	Save Project As		
Files 🔧 S	Add Files to Project	- 1	
	Add New File to Project		
	Remove File From Project	-	
	Select Language Toolsuite	- 1	
	Set Language Tool Locations		
	Version Control		

 Under Directories, select the dropdown box and locate Include Search Path and Library Search Path.

Bu	ild Options For I	Project "Test.m	ncp"			? ×
	MPASM Ass	embler	Ν	IPLINK Linker		MPLAB C18
	Directories	Custom Bui	id	Trace	Μ	IPASM/C17/C18 Suite
	Directories and	I Search Paths-				
	Show directori	ies for: Out	put Dir	ectory		-
	4	lew Inte Incl Libr	ude Se ary Sea	ectory ry Directory arch Path arch Path ipt Search Path		
						Suite Defaults
				lirectory, link in c sject directory	outpu	t directory
		ОК		Cancel		Apply Help

If the Include Search
 Path is not set as shown
 in the next Figure, use the
 New button to locate this
 folder in the MPLAB C18
 installation folder

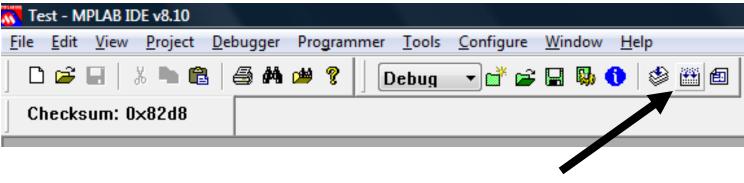
Build Options For Project	"Test.mcp"		? ×
MPASM Assembler		MPLINK Linker	MPLAB C18
Directories Cu:	stom Build	Trace	MPASM/C17/C18 Suite
Directories and Search	Paths		
Show directories for:	Include Se	earch Path	
New	Delete	e Dow	n Up
C:\MCC18\h			
			Suite Defaults
Build Directory Policy-			
Assemble/Compile	in source-file (tirectory link in o	utout directory
Assemble/Compile		-	
		-1	
	ОК	Cancel	Apply Help

 If the Library Search Path is not set as shown in the next Figure, use the New button to locate the folder in the MPLAB C18 installation folder

uild Options For P	Project "Test.mo	p"	? ×
MPASM Ass	embler	MPLINK Linker	MPLAB C18
Directories	Custom Build	Trace	MPASM/C17/C18 Suite
Directories and	Search Paths		
Show directorie	es for: Libra	y Search Path	
N	lew C	lelete Do	wn Up
C:\MCC18\lib			
			Suite Defaults
D 1101			
Build Directory I		Claudian stars. Each in	autout d'archain
	•	-file directory, link in ne project directory	output directory
Assemble/0	Joinplie/Link in tr	le project directory	
	ОК	Cancel	Apply Help

BUILDING AND TESTING

- Building project:
 - project can be built using the menu selection
 Project>Build All or Project>Make.



Build All and make icons

BUILDING AND TESTING

Output Window after successful Build

```
Output
                                                                 - C X
 Build
       Version Control | Find in Files
and will not perform all opermisations.
copy of MPLAB C18, please contact your local distributor or
visit buy.microchip.com
C:\MPLAB_Documentation\test.c:6:Warning [2066] type qualifier mis
Executing: "C:\MCC18\bin\mplink.exe" /I"C:\MCC18\lib" "..\MCC18\lkr\18f458.lkr" "test.o" "I
MPLINK 4.20, Linker
Copyright (c) 2008 Microchip Technology Inc.
Errors
              0
MP2HEX 4.20, COFF to HEX File Converter
Copyright (c) 2008 Microchip Technology Inc.
Errors
            1.1
              - 0
Loaded C:\MPLAB_Documentation\Test.cof.
Debug build of project `C:\MPLAB_Documentation\Test.mcp' succeeded.
Preprocessor symbol `__DEBUG' is defined.
Sun Aug 03 23:09:33 2008
BUILD SUCCEEDED
 .€
                111
```

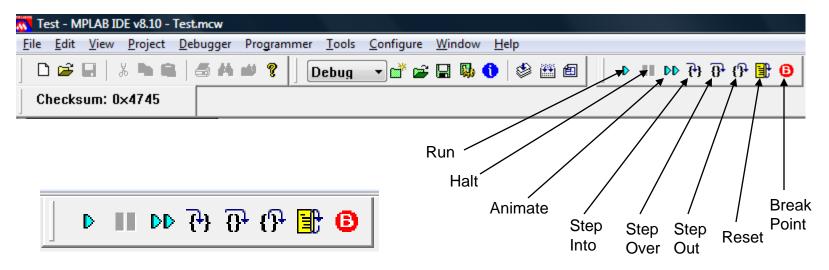
DEBUGGING WITH MPLAB SIM

- To test your programs in MPLAB IDE, use the built-in simulator, MPLAB SIM
- To enable the simulator, select *Debugger, Select Tool,* then select *MPLAB SIM.*

📉 Test - MPLAB IDE v8.10 -	Test.mcw				
<u>File Edit View Project</u>	Debugger Programmer	I	ools	<u>C</u> onfigure <u>W</u> indow	<u>H</u> elp
🗅 🛩 🖬 🐰 🖿 🖷	Select Tool	۲	✓	None	
Checksum: 0×4745	Clear Memory	F		1 MPLAB ICD 2	
				2 MPLAB ICE 4000	
				3 MPLAB SIM	
				4 MPLAB ICE 2000	
				5 REAL ICE	
				6 PICkit 2	
				7 PIC32 Starter Kit	

DEBUGGING WITH MPLAB SIM

• After the simulator is selected, the **Debug Toolbar** appears under the MPLAB menus.



DEBUGGING WITH MPLAB SIM

- Run: Run program
- Halt: Halt program execution
- Animate: Continually step into instructions.
- Step Into: Step into the next instruction.
- Step Over: Step over the next instruction.
- **Step Out**: Step out of the subroutine.
- **Reset**: Perform a MCLR Reset.
- Break Point: Insert a break point.

- The configuration bits are useful to make your chip working properly, e.g., turn OFF the WatchDogTimer, select an external Oscillator, etc.
- The configuration bits can be set directly in your code or using the configuration bit menu.

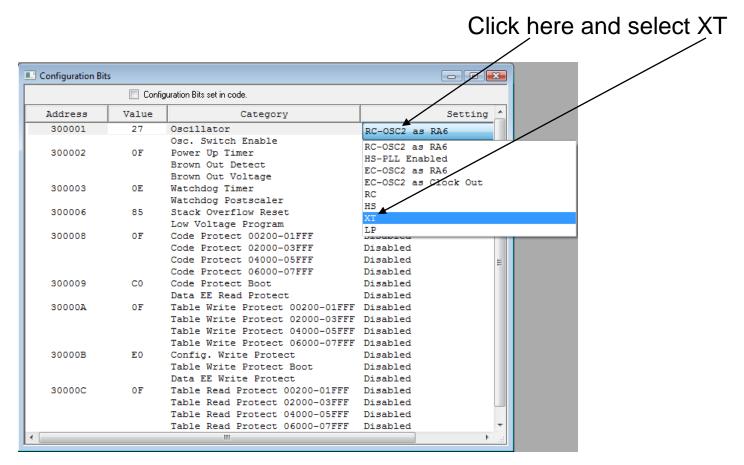
To set the Configuration Bits using the menu.
 Select Configure ~> Configuration Bits

Test - MPLAB IDE v8.10	
<u>F</u> ile <u>E</u> dit <u>V</u> iew <u>P</u> roject <u>D</u> ebugger Programmer <u>T</u> ools	Configure Window Help
🗌 🗅 🚅 🖬 🖌 🐂 📾 🛛 🍜 👫 🗯 🎖 🚺 Debug	Select Device
Checksum: 0×4745	Configuration Bits
	External Memory
	ID Memory
	Settings

• To enable setting the Configuration Bits, uncheck "Configuration Bits set in Code".

	🔶 🔽 Confi	guration Bits set in code.	
Address	Value	Category	Setting
300001	27	Oscillator	RC-OSC2 as RA6
		Osc. Switch Enable	Disabled
300002	OF	Power Up Timer	Disabled
		Brown Out Detect	Enabled
		Brown Out Voltage	2.0V
300003	0E	Watchdog Timer	Disabled-Controlled H
		Watchdog Postscaler	1:128
300006	85	Stack Overflow Reset	Enabled
		Low Voltage Program	Enabled
300008	OF	Code Protect 00200-01FFF	Disabled
		Code Protect 02000-03FFF	Disabled
		Code Protect 04000-05FFF	Disabled
		Code Protect 06000-07FFF	Disabled
300009	CO	Code Protect Boot	Disabled
		Data EE Read Protect	Disabled
30000A	OF	Table Write Protect 00200-01FFF	Disabled
		Table Write Protect 02000-03FFF	Disabled
		Table Write Protect 04000-05FFF	Disabled
		Table Write Protect 06000-07FFF	Disabled
30000B	EO	Config. Write Protect	Disabled
		Table Write Protect Boot	Disabled
		Data EE Write Protect	Disabled
30000C	OF	Table Read Protect 00200-01FFF	Disabled
		Table Read Protect 02000-03FFF	Disabled
		Table Read Protect 04000-05FFF	Disabled

• To enable the external Oscillator.



• To turn the Watchdog Timer OFF.

	📃 Confi	guration Bits set in code.		
Address	Value	Category	Setting 🔺	Disabled-controlle
300001	27	Oscillator	RC-OSC2 as RA6	
		Osc. Switch Enable	Disabled	by SWDTEN bit
300002	OF	Power Up Timer	Disabled	
		Brown Out Detect	Enabled	
		Brown Out Voltage	2.07	
300003	OF	Watchdog Timer	Enabled	
		Watchdog Postscaler	Enabled	
300006	85	Stack Overflow Reset		DTEN bit
		Low Voltage Program	Euapred Concreticited by Swit	JILA DIC
300008	OF	Code Protect 00200-01FFF	Disabled	
		Code Protect 02000-03FFF	Disabled	
		Code Protect 04000-05FFF	Disabled =	
		Code Protect 06000-07FFF	Disabled	
300009	CO	Code Protect Boot	Disabled	
		Data EE Read Protect	Disabled	
30000A	OF	Table Write Protect 00200-01FFF	Disabled	
		Table Write Protect 02000-03FFF	Disabled	
		Table Write Protect 04000-05FFF	Disabled	
		Table Write Protect 06000-07FFF	Disabled	
30000B	EO	Config. Write Protect	Disabled	
		Table Write Protect Boot	Disabled	
		Data EE Write Protect	Disabled	
30000C	OF	Table Read Protect 00200-01FFF	Disabled	
		Table Read Protect 02000-03FFF	Disabled	
		Table Read Protect 04000-05FFF	Disabled	
		Table Read Protect 06000-07FFF	Disabled 🔹	