EtherCAT Evaluation Kit Workshop – Installation Guide



Version 1.3 Date: 2020-05-28



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DOCUMENT HISTORY

Version	Comment
0.1	First version
0.2	Compiler Suite selection added
1.0	MPLAB X related information added
1.1	Add Excel and Wireshark requirement
1.2	Remove old tool instructions
1.3	Email address and mention of board hardware revision updated

CONTENTS

1	Introductior	1	3
2	EL9800 Ha	Irdware Revision	4
3	Installation	– Slave Stack Code	5
	3.1	Vendor ID	5
	3.2	.NET Framework	5
	3.3	SSC Source Files + Tool	5
4	MPLAB X		7
	4.1	Compiler Installation	7
	4.2	IDE Installation	7
	4.3	USB driver and test of the communication	8
	4.4	Create a new Project	10
5	Installation	- TwinCAT	14
	5.1	TwinCAT development environment + runtime	14
	5.2	Real-Time Ethernet Driver	16
	5.3	Test of the communication	18
6	Installation	- Additional Tools	21

1 Introduction

In order to properly operate with the Beckhoff EL9820 Evaluation Kit, the installation of three following software packages is needed:

- **Slave Stack Code (SSC)**: source code (written in C programming language) implementing all general-purpose functionalities of an EtherCAT Slave as well as some application examples.
- MPLAB IDE for Microchip PIC (+ MPLAB XC 16 Compiler for PIC24): development environment for the programming and debugging of the Microchip PIC24 microcontroller integrated on board the EL9800 Evaluation Kit
- **TwinCAT Real-Time Control Suite**: PC-based control platform and development environment which enables to use a standard Windows PC as EtherCAT Master test platform, and therefore to control the EL9820 Evaluation Kit.

This Installation Guide is intended to allow customers to perform in advance all the preliminary steps which are required to successfully attend the EtherCAT Evaluation Kit Workshop.

In case any of the steps described in this Installation Guide fails, please contact the ETG support team at email address <u>Techinfo@ethercat.org</u> as soon as possible, in order find a solution before the workshop begins.

2 EL9800 Hardware Revision

The EtherCAT Evaluation Kit Workshop is based on the board hardware revision **EL9800_6A**. The hardware revision can be checked on the board next to the Beckhoff and EtherCAT® logos.



BECKHOFF EtherCAT EL9800_6A

<u>NOTE</u>: Older board revisions (e.g. EL6800_4A) are not suitable to successfully attend the workshop, as they require programming software versions which are not available anymore.

3 Installation – Slave Stack Code

The Slave Stack Code is a source code written in C programming language, provided and supported free-of-charge by Beckhoff Automation GmbH & Co. KG.

3.1 Vendor ID

Both for download and installation of the Slave Stack Code, an own EtherCAT Vendor ID is required. This information is reported in the answer to the Vendor ID Assignment Request applied by the company. A list of all registered Vendor IDs can be found in the ETG website (http://www.ethercat.org/en/vendor_id_list.html):

	Ethe	therCAT. Technology Group				
EN DE CN JP	HOME	NEWS	EVENTS			
Search →	EtherCA	T Vendor IF	list			
EtherCAT	List of assign This page w	ned and valid Ethe as last updated or	erCAT Vendor IDs January 9, 2015.			
► http://www.ethercat.org EN DE CN JP Search → EtherCAT Organisation FAQs Membership Vendor ID Vendor ID List						
FAQs						
Membership						
Vendor ID						

3.2 .NET Framework

The SSC Tool requires .NET Framework 4.0 or later. The Framework can be downloaded at the following link:

http://www.microsoft.com/germany/net/downloadFile.aspx?file=netframework.

3.3 SSC Source Files + Tool

The Slave Stack Code can be downloaded at the following link (Vendor ID required): http://www.ethercat.org/memberarea/stack_code.aspx The SSC source files and SSC tool are installed by launching the *.exe file provided within the *.zip package:

Name		Date modified	Туре	Size
🔁 EtherCAT Slave Design Quick Guide.pdf		30/10/2014 09:45	Adobe Acrobat D	132 KB
EtherCAT Slave Stack Code Tool.exe	_	15/01/2015 00-01	Application	16 080 KR
T EtherCAT SSC License V1.1.pdf		Open		
ReleaseNotes.pdf	۲	Run as administrat	tor	
SlaveFiles.zip		Troubleshoot com Edit with Notepad	ipatibility + +	
	\$	Sposta in Dropbox		
		Scan with OfficeSc	an Client	

4 MPLAB X

4.1 Compiler Installation

The **XC16 C Compiler** needs to be separately installed. The component to be installed is the same both in case of MPLAB X and of MPLAB 8 IDEs. The installation file can be found at the directory: http://www.microchip.com/mplab/compilers.

Select "Downloads" at the bottom of the web page, then select the last available build of MPLAB XC16 Compiler for Windows platform (MPLAB XC16 Compiler vx.yz):

Additional Information Downloads \Downloads Archive \Documentation	Compiler FAQ	5	
Compilers			
Title	Date Published	Size	D/L
Windows (x86/x64)			
MPLAB® XC8 Compiler v1.38	7/13/16	78.8 MB	ŧ.
MPLAB® XC16 Compiler v1.26	3/4/16	62.6 MB	ŧ.
MPLAB® XC32 Compiler v1.42	6/14/16	58.9 MB	<u>(</u>]

4.2 IDE Installation

The Development Environment for PIC microcontrollers is provided free-of-charge by Microchip.

NOTE: Do not keep MPLAB X and MPLAB 8 installed on your PC at the same time, as this could lead to driver conflicts. In case you need to change MPLAB version, uninstall the previous version and restart your PC first.

Download : http://www.microchip.com/pagehandler/en-us/family/mplabx/.

Select "Download" at the bottom of the web page, and then the latest available build of MPLAB X (MPLAB® X IDE vx.yz):



Features Downloads Documentation Download Archive Webinars

Title	Date Published	Size	D/L
Windows (x86/x64)			
MPLAB® X IDE v3.35	6/23/2016	554.5 MB	(<u>)</u>
MPLAB [®] X IDE Release Notes / User Guide v3.35	6/23/2016	6.0 KB	<u>1</u>

Run the *.exe setup file:

UMPLABX-v3.35-windows-installer.exe

Confirm all the default installation settings proposed by the installation wizard.

4.3 USB driver and test of the communication

With the board powered-off, connect the USB cable from a USB port of the PC to connector **CON600** of the Evaluation Kit, and set switch **SW600** to ON in order to enable the on-board debugger interface.



Power the Evaluation Kit on with a standard 24V power supply.



A new USB device will be detected. The corresponding USB driver should be automatically installed: in case the Operating System shows the dialog window, confirm the automatic installation.

4.4 Create a new Project

Open MPLAB IDE and create a new Project:

X N	IPLAB X IDE	= v2.10 - El	_PIC24 :	default					
File	Edit View	Navigate	Source	Refactor	Run	Debu			
2	New Proje	ct		Ctrl+Shif	t+N				
엄	New File	3		Ctrl+N					
E	Open Proj	ect		Ctrl+Shif	t+0				
	Open Rece	ent Project				•			
	Import					•			
🗙 New Project									×
Steps	Choose Proj	ect		5					
 Choose Project 	Categories: Micro Dothe Dothe Samp	uchip Embedded ir Embedded oles		Projects: Stanc Existi User Librar	dalone Pr ng MPLA uilt (Hex, Makefile ry Projec	roject B IDE v8 , Loadabl Project .t	Project e Image) F	Project	
	Description: Creates a new project.	w standalone ap	plication pro	ject. It uses ar	n IDE-ge	nerated r	nakefile to) build your	
			< Back	Next >	F	inish	Canc	el	Help

Select the Device "PIC24HJ128GP306"

🗙 New Project					×
Steps	Select Device				
 Choose Project Select Device Select Header Select Tool Select Plugin Board Select Compiler Select Project Name and Folder 	Family: Device:	16-bit MCUs (PIC24)	•		
MPLAB X IDE					
		< Back	Next > Fir	nish Cancel	Help

Select the "EL9800PICkit OnBoard Programmer". If this option is not listed, check the USB connection and the correct driver installation.

🔀 New Project		x
Steps 1. Choose Project 2. Select Device 3	Select Tool Image: Construction of the second sec	
	< Back Next > Finish Cancel Hel	lp 🛛

Select the XC 16 compiler

🗴 New Project		x
Steps 1. Choose Project 2. Select Device 3. Select Header 4. Select Tool 5. Select Plugin Board 6. Select Compiler 7. Select Project Name and Folder	Select Compiler Compiler Toolchains ASM30 (None found) C24 (None found) C30 (None found) HI-TECH DSPICC (None found) XC16 XC16 XC16 (v1.26) [C:\Program Files (x86)\Microchip\xc16\v1.26\bin]	
MPLAB X IDE		
	< Back Next > Finish Cancel H	elp

Create the Project in a temporary location (directory and project name are not relevant):

X New Project		1.00	X
Steps	Select Project Name	and Folder	
Choose Project Select Device Select Header Select Plugin Board	Project Name: Project Location:	TestProject C:\Work\ETG\4.Tests\Test 1	Browse
 Select Compiler Select Project Name and Folder 	Project Folder:	C:\Work\ETG\4.Tests\Test 1\TestProject.X	
	Overwrite existing Also delete source	g project. es. ct	
MPLAB X IDE	Encoding:	O-8859-1 ▼	
		< Back Next > Finish	Cancel Help

Refresh the debug tool status, and wait until the output interface reports correct connection (a new firmware version will be automatically installed if needed during the process).



This confirms a correct communication between MPLAB X IDE and the Evaluation Kit.

5 Installation - TwinCAT

The TwinCAT software can be installed free-of-charge for a 7-day trial period. The trial can be extended for an arbitrary number of times - always in 7-day steps - without re-installing the entire software (only a displayed 5-digit code shall be copied in order to restart the trial license).

5.1 TwinCAT development environment + runtime

The installation file for TwinCAT can be downloaded by the website <u>www.beckhoff.com</u>. Select "Download" at the top of the page:



Select the **TE1xxx | Engineering** version:

TwinCAT 3 Download

Software	
TE1xxx Engineering	ring
TC1xxx Runtime	

NOTE : Take care not to install the "Runtime" version: this installation version will not provide the TwinCAT development environment, which is instead needed to test the EtherCAT communication.

NOTE : This Installation Guide refers to TwinCAT 3.1, which is compatible both with 32-bit and with 64-bit Windows Operating Systems. For those who already installed TwinCAT 2 runtime on their 32-bit PC, the installation of TwinCAT 3.1 will not be necessary. Please be sure in this case to have installed the latest build of TwinCAT 2.11 R3. Do not install the TwinCAT 2.11 x64 Engineering version on a 64-bit PC, as this version contains only the development environment for TwinCAT 2 and not the runtime (in case of Windows 64-bit, only TwinCAT 3.1 can be used).

Select the installation file for TwinCAT 3.1:

TwinCAT 3 Download – Engineering

Product	Version	Description
TwinCAT 3.1 – eXtended Automation Engineering (XAE)	3.1.4016.12	TwinCAT Engineering contains the engineering environment of the TwinCAT 3 control software: – integration into Visual Studio® 2010/2012/2013 (if available)

The download can be performed as Guest (the personal/company data provided are intended for information purposes only):

Dowr	load as Guest. Without registration of a
new u	user account
>> D(ownload as Guest
Creat	e a new user account .
By log	gging in with a password you can choose
the T	winCAT 3 downloads more comfortably
and d	lownload them faster.
>> CI	reate new account

<u>NOTE</u> : if you are working with Windows 7 Operating System or later, always perform the installation by selecting **Run as Administrator**:

Name		Date modified	Туре	Size
TC31-Full-Setup.3.1.4016.12.exe		0pen	Ameliantina	E10 650 VD
	0	Run as administrator		
		Troubleshoot compatib Edit with Notepad++	illity	
		Sposta in Dropbox		

5.2 Real-Time Ethernet Driver

In order to use the standard PC network card of a PC as EtherCAT Master, an additional Real-Time Ethernet Driver shall be installed.

The driver can be installed directly from the TwinCAT development environment. Open (the most recent version of) Visual Studio from the TwinCAT icon located on the Windows task bar:



Select the menu "TwinCAT" \rightarrow "Show Realtime Ethernet Compatible Devices...". All the network cards of the PC where the Real-Time Ethernet Driver was not yet installed will be listed either under "Compatible devices" or under "Incompatible devices".



Select the network card that will be used as EtherCAT Master for testing purposes, and click on "Install".

Installation of TwinCAT RT-Ethernet Adapters					
Ethernet Adapters	Update List				
Installed and ready to use devices(realtime capable) Local Area Connection - TwinCAT-Intel PCI Ethernet Adapter (Gigabit)	Install				
Installed and ready to use devices(for demo use only) Compatible devices	Update				
Incompatible devices Mobile Broadband Connection - Dell Wireless 5560 HSPA+ Mini-Card Network Ac Wireless Network Connection - Intel(R) Centrino(R) Advanced N 6205	Bind				
	Unbind				
In Internet State	Enable				
	Disable				
	Show Bindings				

NOTE : If a network card is listed under "Incompatible devices", this does not mean that the card cannot be used as EtherCAT Master for testing purposes. It only means that this card will provide only weak real-time capabilities. For testing purposes this is more than enough, therefore you can proceed with the installation.

If the installation was successfully completed, the network card should have been moved under the "Installed and ready to use devices" list:

- Compatible devices \rightarrow Installed and ready to use devices (realtime capable)
- Incompatible devices \rightarrow Installed and ready to use devices (for demo use only)

5.3 Test of the communication

Connect the Evaluation Kit to the PC network card where the Real-Time Ethernet Driver was installed with a standard Ethernet cable (straight or cross), and power-on the Evaluation Kit.

Create a new TwinCAT project by selecting the corresponding template in Visual Studio (project name and directory are arbitrary):



Right mouse-click on "I/O" \rightarrow "Devices" and select "Scan".



Confirm the message, which is always shown by TwinCAT when automatically scanning the hardware:



Check that the network card where the Real-Time Ethernet Driver was installed is marked as "Device n (EtherCAT)", then select "OK" (if other Devices are shown, deselect them).



Request scan of Slave devices:



In case the following pop-up appears, just confirm it:

TwinCAT XAE						
	New device type found (MyDevice - 'MyDevice'). Vendorld 0x59 ProductCode 0x12345678 RevisionNo 0x0					
	Use available online description instead (YES) or try to load appropriate descriptions from the web					
	Apply to all	Yes No Online B	SI Update (Web access required)			

Check that one Slave device was detected and automatically added to the tree configuration under the EtherCAT Master:



<u>NOTE</u> : The particular icon and name of the detected device are not relevant, as they depend on the previous status of the Evaluation Kit. The important thing is that a slave "Box m (xxxx)" is detected.

This confirms a correct communication between TwinCAT and the Evaluation Kit.

6 Installation - Additional Tools

- Microsoft Excel® 2013 or later is required
- Wireshark should be installed (https://www.wireshark.org/download.html).