EVB-LAN9252-4PORT
Quick Start Guide

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Object of Declaration: EVB-LAN9252-4PORT

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
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USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

Derek Carlson
VP Development Tools

12-Sep-14
Date

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using and configuring the EVB-LAN9252-4PORT. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to configure the EVB-LAN9252-4PORT, such as the DIGIO and SPI, as well as various setup options, scanning, and programming. The manual layout is as follows:

- **Chapter 1. "Overview"** – Shows a brief description of the EVB-LAN9252-4PORT board quick setup.
- **Chapter 2. "EVB-LAN9252-4PORT"** – Provides instructions in configuring GPIO.
- **Appendix A. "Setting Up Master in Windows®"** – This appendix shows how to set up Master in Windows.
- **Appendix B. "EEPROM Programming"** – This appendix shows how to program EEPROM.
- **Appendix C. "Scanning EtherCAT Slaves"** – This appendix shows how to scan EtherCAT Slaves.
- **Appendix D. "Generating SSC Files"** – This appendix shows how to change Vendor ID and Object configuration.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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- **Compilers** – The latest information on Microchip C compilers, assemblers, linkers and other language tools. These include all MPLAB C compilers; all MPLAB assemblers (including MPASM assembler); all MPLAB linkers (including MPLINK object linker); and all MPLAB librarians (including MPLIB object librarian).
- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB REAL ICE and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit 3 debug express.
- **MPLAB IDE** – The latest information on Microchip MPLAB IDE, the Windows Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART Plus and PIC-kit 2 and 3.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at:
http://www.microchip.com/support

DOCUMENT REVISION HISTORY

Revisions	Section/Figure/Entry	Correction
50002441A (02-03-16)	Initial release of document	

Chapter 1. Overview

1.1 INTRODUCTION

This document describes how to use the EVB-LAN9252-4PORT Software development kit as a development tool for the Microchip EVB-LAN9252 EtherCAT® Slave Controller.

Note: All the figures in the document are captured from TwinCAT 3.1.

1.1.1 Abbreviations

IDE - Integrated Development Environment

ESC - EtherCAT Slave Controller

EVB - Evaluation Board

HAL - Hardware Abstraction Layer

HBI - Host Bus Interface

SPI - Serial Protocol Interface

SSC - Slave Stack Code

NOTES:

Chapter 2. EVB-LAN9252-4PORT

2.1 MASTER CONFIGURATION

The following steps describe how to configure EtherCAT Master and Slave:

1. Configure the EtherCAT Master with the TwinCAT® driver.

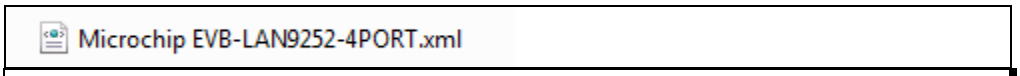
> **Note:** Refer to **Appendix A. "Setting Up Master in Windows®"** for Windows® configuration.

2. Download and extract `EVB-LAN9252-4PORT_PIC32_SDK_Vx.x.zip` from the Microchip website (http://www.microchip.com/LAN9252-041715a).

> **Note:** x.xx denotes the version number of the SDK.

3. In SDK, the `\ESI Files` directory contains the ESI files which can be loaded to EVB-LAN9252-4PORT EEPROM using TwinCAT, as displayed in Figure 2-1.

FIGURE 2-1: ESI FILES DIRECTORY



> **Note:** Refer to **Appendix D. "Generating SSC Files"** to change the Vendor ID and slave information in ESI files.

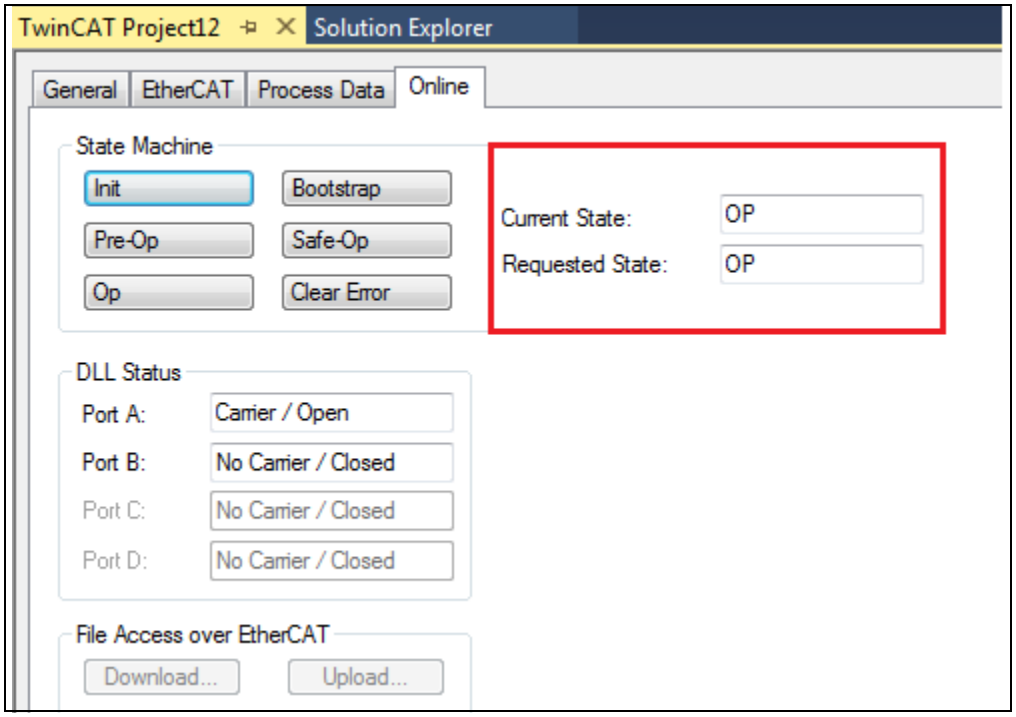
4. Copy `Microchip EVB-LAN9252-4PORT.xml` to the directory path `C:\Twin-CAT\3.1\Config\Io\EtherCAT` for TwinCAT 3.1.
5. Configure the EVB as mentioned in "Configuration Section 2.4" of *EVB-LAN9252-4PORT EtherCAT® ESC PHY Connection Mode User's Guide* from the Microchip website (http://www.microchip.com/DevelopmentTools/ProductDetails.aspx?PartNO=evb-lan9252-4port).
6. By default, corresponding ESI file of PIC32 firmware is flashed to the delivered EVB-LAN9252-4PORT (Board1 and Board2). To change the firmware in PIC32 SoC for Board1 and Board2, refer to **Appendix D. "Generating SSC Files"** and **Appendix E. "Compiling and Programming SoC Firmware"**.

> **Note 1:** The pre-built binaries are available in the "Binaries" directory. This step can be skipped if pre-built binary is used for programming.
>
> **2:** SoC firmware must be changed for both Board1 and Board2 in case of firmware re-programming.

7. Launch TwinCAT and scan EtherCAT slaves from TwinCAT. Refer to **Appendix C. "Scanning EtherCAT Slaves"** to scan the slaves.
8. Program EEPROM using `Microchip EVB-LAN9252-4PORT.xml`. Refer to **Appendix B. "EEPROM Programming"** for EEPROM programming instructions. If the EEPROM is programmed successfully, the device state will enter into 'OP' as displayed in Figure 2-2.

> **Note:** EEPROM ESI file must be programmed for both Board1 and Board2.

FIGURE 2-2: OP MODE

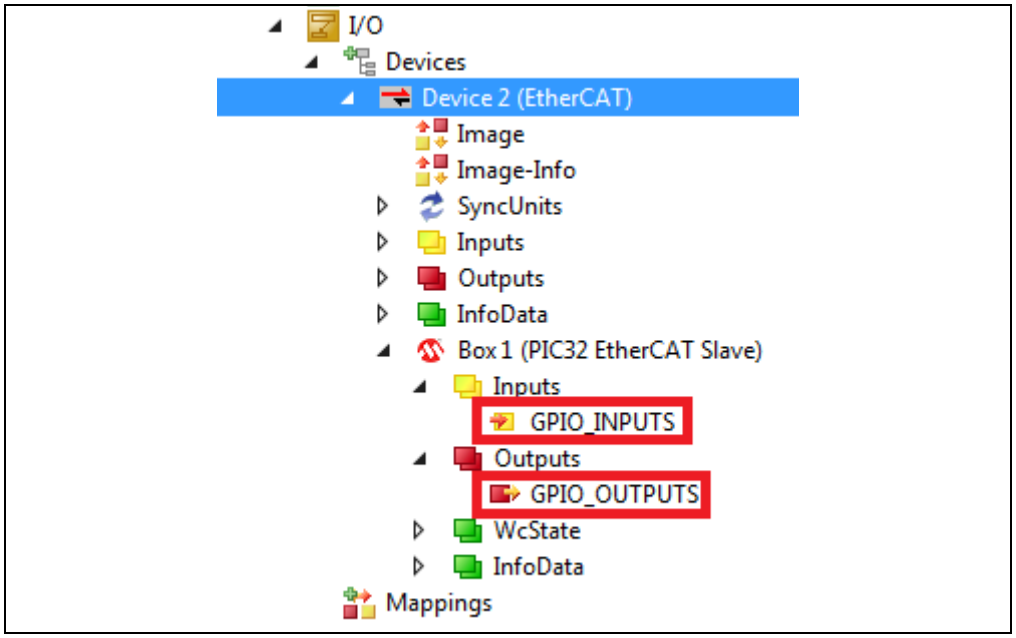


2.2 DEMO

The following describes a demo of the EVB-LAN9252-4PORT:

1. Follow the steps as mentioned in **Section 2.1 "Master Configuration"**. Two demo objects can be seen on the Solution Explorer of TwinCAT, as displayed in Figure 2-3.

FIGURE 2-3: GPIO INPUTS AND OUTPUTS



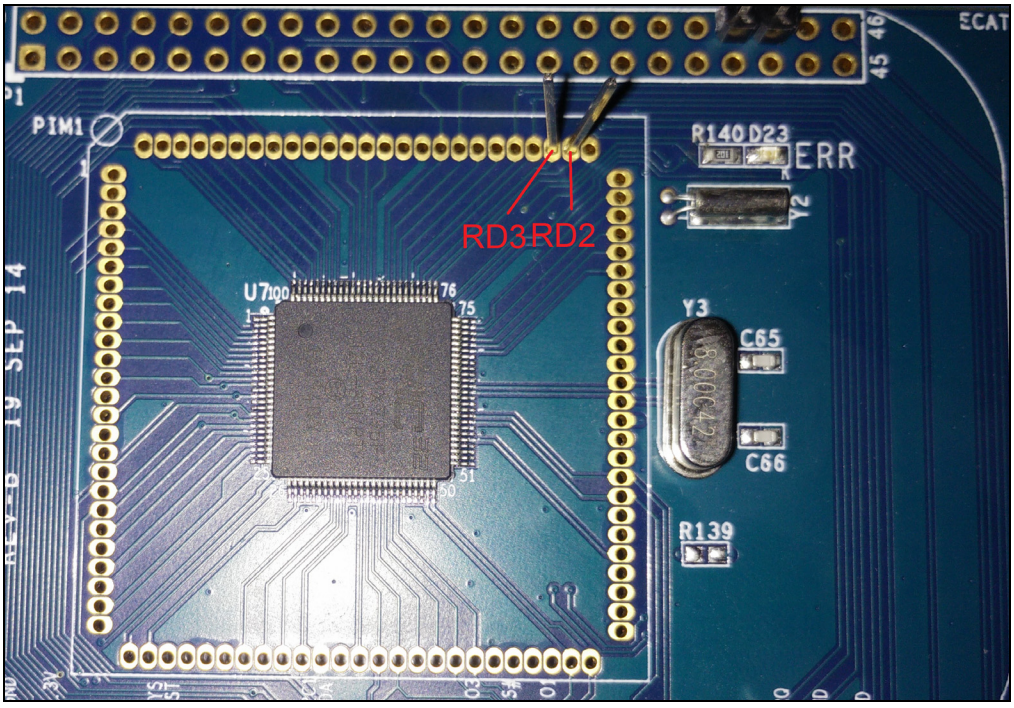
2. As part of this demo, two object variables GPIO_INPUTS and GPIO_OUTPUTS are mapped to PIC32 GPIOs as mentioned below.

GPIO_OUTPUTS - PIC32 RD2

GPIO_INPUTS - PIC32 RD3

3. Interconnect RD2 and RD3 hardware pins for demo purpose, as in Figure 2-5.

FIGURE 2-4: RD2 AND RD3

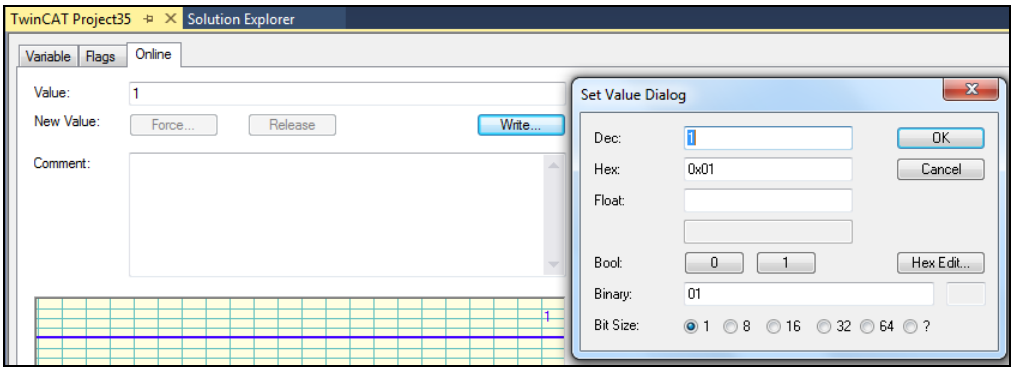


4. To change GPIO_OUTPUTS, double-click the GPIO_OUTPUTS option under Outputs in the Solution Explorer, as displayed in Figure 2-3.

   The TwinCAT project window displays.

5. Click the **Online** tab in TwinCAT project window and select the Write option to change GPIO outputs, as displayed in Figure 2-5.

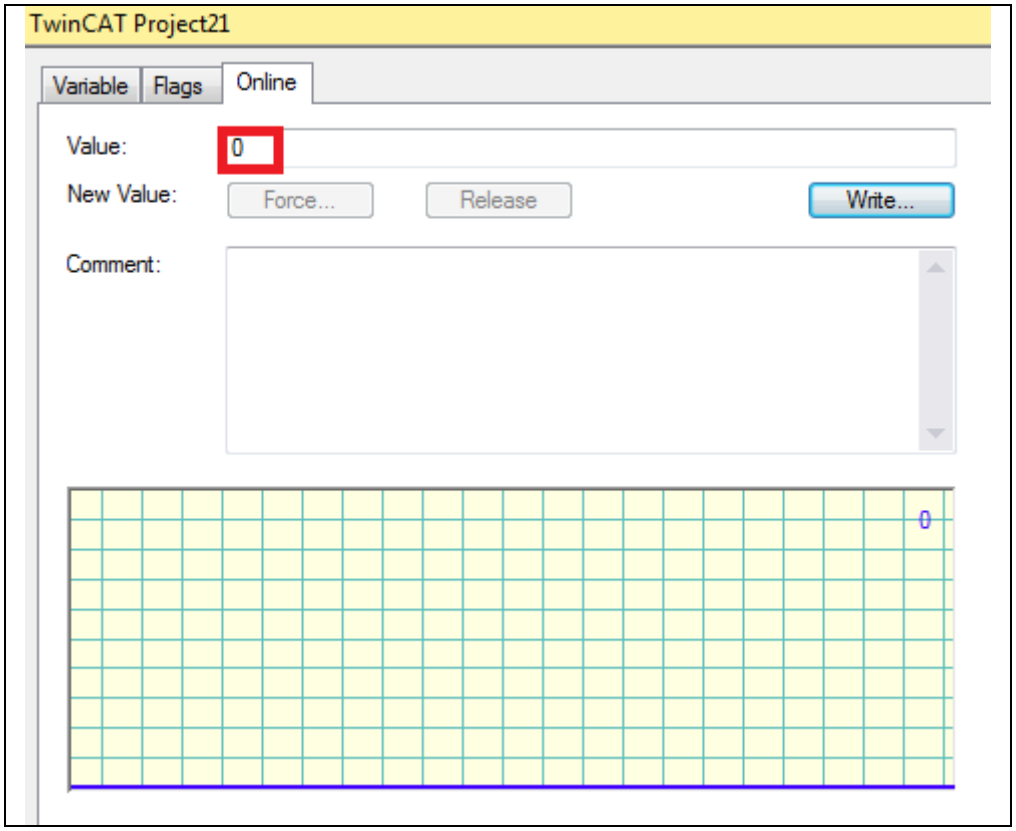
FIGURE 2-5: GPIO OUTPUTS



6. To view GPIO_INPUTS, double-click GPIO_INPUTS under Inputs in the Solution Explorer, as displayed in Figure 2-3

7. Click the **Online** tab in the TwinCAT explorer window as displayed Figure 2-6.

FIGURE 2-6: GPIO INPUTS



Appendix A. Setting Up Master in Windows®

A.1 INTRODUCTION

This appendix shows how to set up Master in Windows®.

Download and install TwinCAT on Windows from http://beckhoff.com.

A.1.1 TwinCAT Ethernet Driver - Installation

To install the TwinCAT Ethernet Driver, do the following:

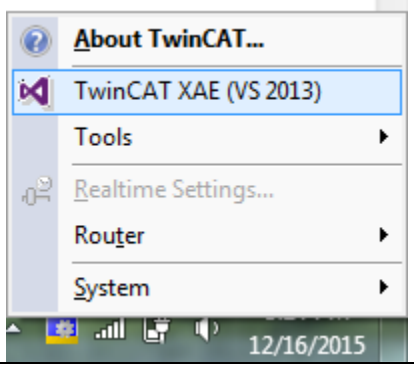
1. If TwinCAT installed successfully, a TwinCAT icon will display in the bottom-right corner of the desktop. Click the TwinCAT icon.

   A pop-up menu displays.

2. Select TWINCAT XAE (VS XXXX), as displayed in Figure A-1.

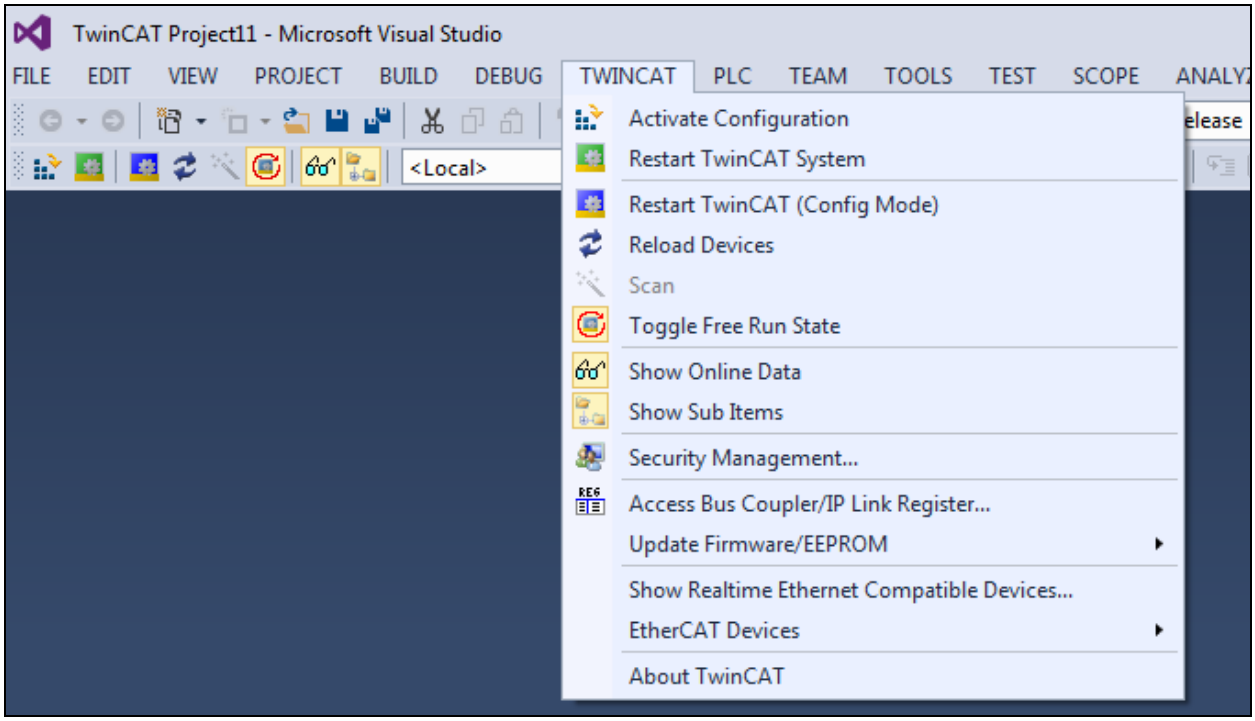
Note:	VS XXXX refers to the version of Visual Studio installed on the computer.

FIGURE A-1: SYSTEM MANAGER



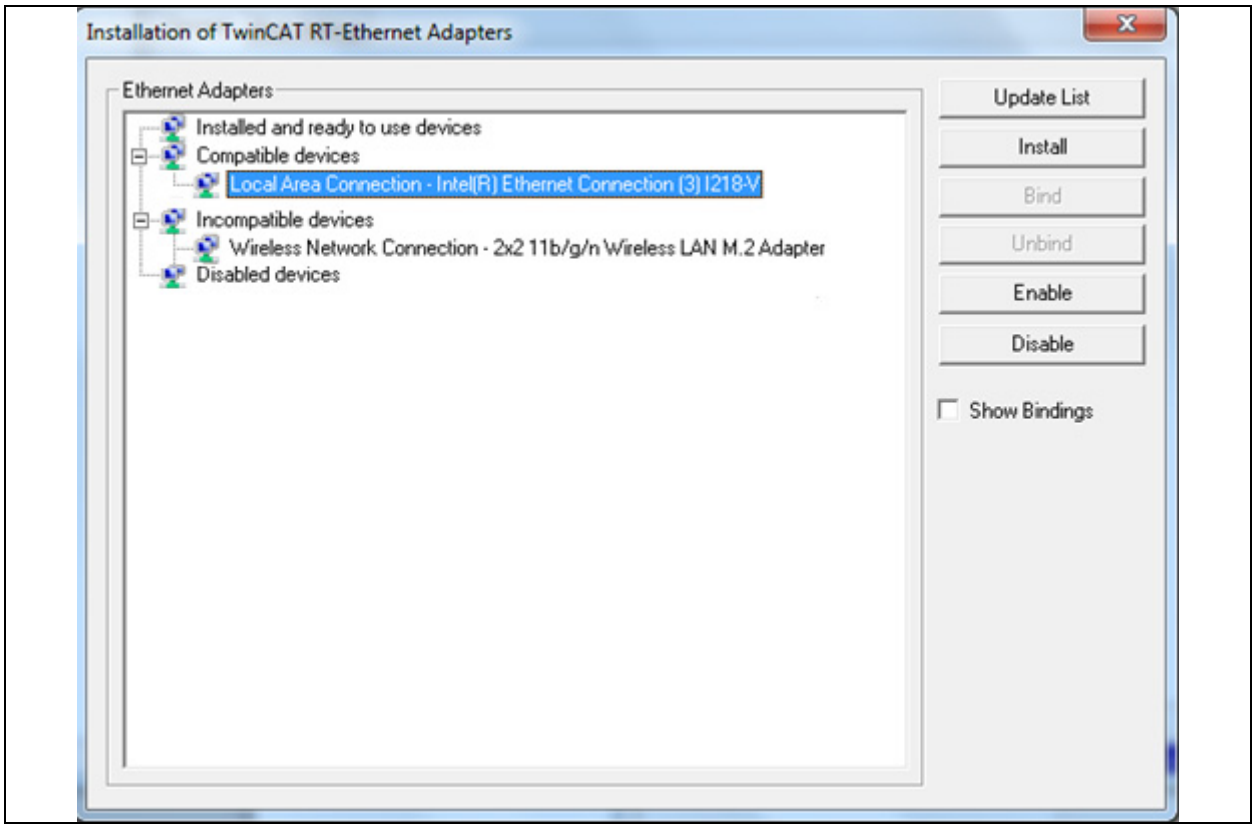
3. Go to *TWINCAT>Show Real Time Ethernet Compatible Devices…* as in Figure A-2.

FIGURE A-2: SHOW REAL TIME ETHERNET COMPATIBLE DEVICES



4. Select the Network adapter and install the TwinCAT driver as in Figure A-3.

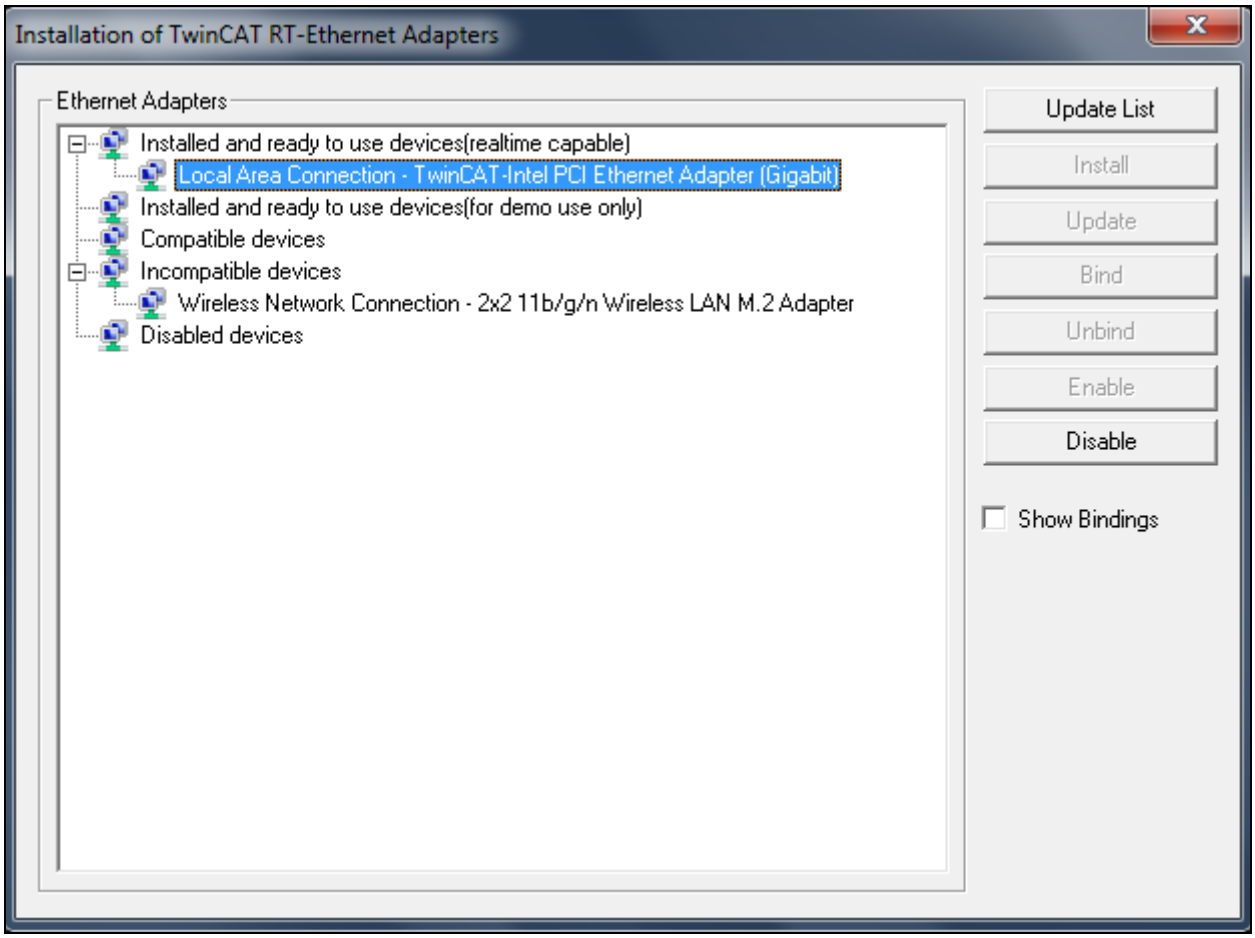
FIGURE A-3: ETHERNET ADAPTERS DIALOG



5. Once the TwinCAT driver is installed successfully, the driver is compatible with the TwinCAT master. The network adapter will then be moved to “Installed and ready to use devices” as displayed in

Figure A-4.

FIGURE A-4: INSTALLED AND READY TO USE DEVICES



6. Go to the corresponding network adapter properties and then select TwinCAT drivers as displayed in Figure A-5 and Figure A-6.

FIGURE A-5: NETWORK ADAPTER PROPERTIES MENU

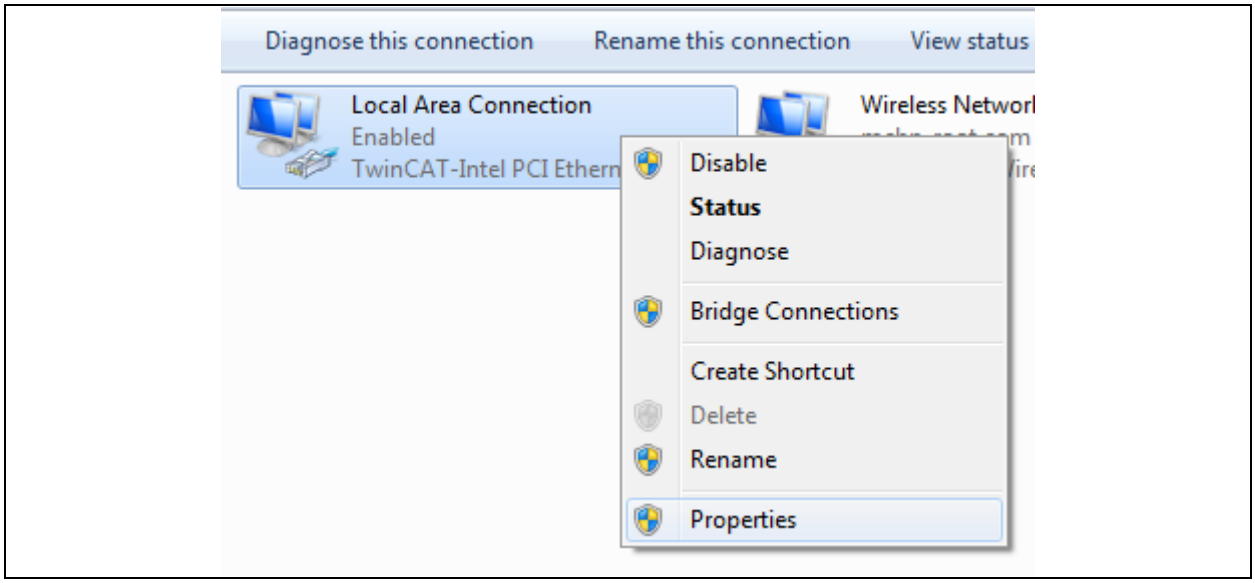
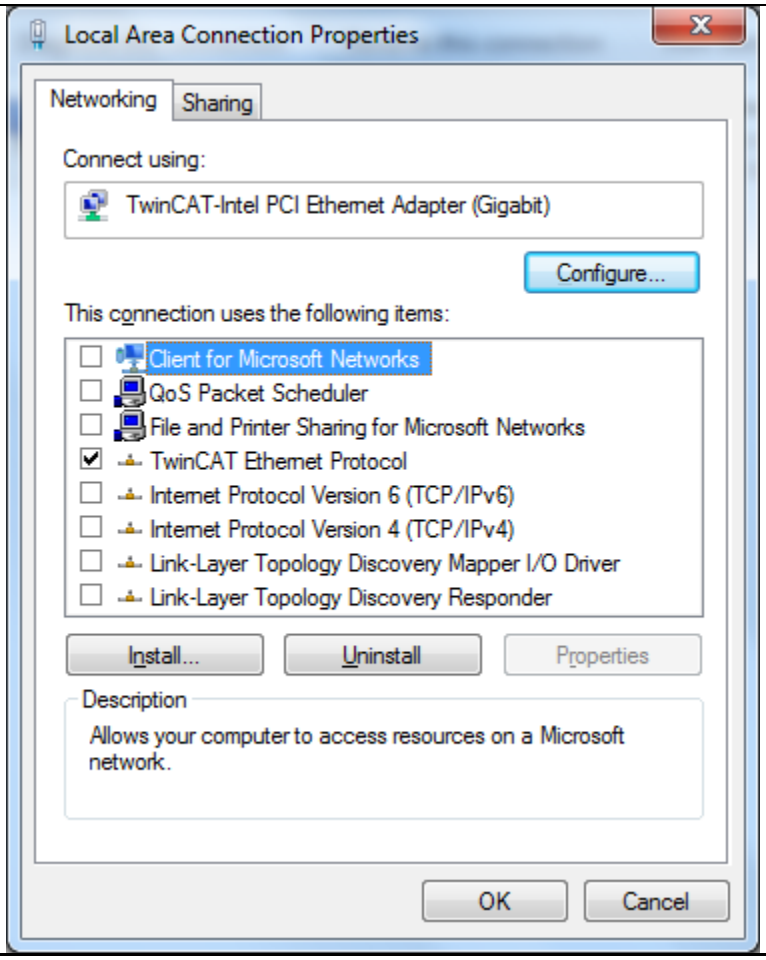


FIGURE A-6: LOCAL AREA CONNECTION PROPERTIES



Note 1: Only select TwinCAT drivers.

2: If TwinCAT cannot find the EtherCAT slaves after following the steps in **Appendix C. "Scanning EtherCAT Slaves"**, restart the computer and attempt to scan again.

Appendix B. EEPROM Programming

B.1 INTRODUCTION

This appendix shows how to program EEPROM.

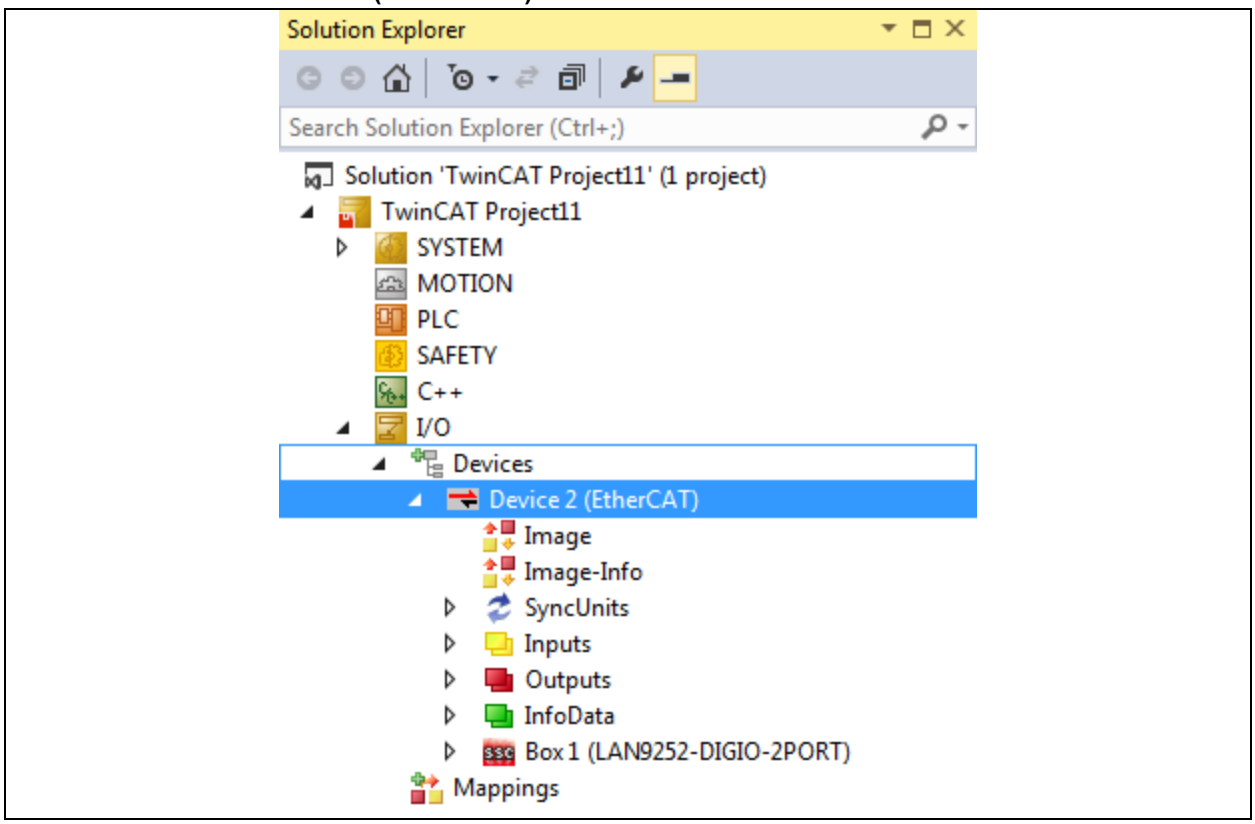
B.1.1 EEPROM Programming

To program EEPROM:

1. After a successful scan, click the “Device 2 (EtherCAT)” drop-down bar from the Solution Explorer of the TwinCAT tool, as displayed in Figure B-1.

   The TwinCAT Explorer window displays.

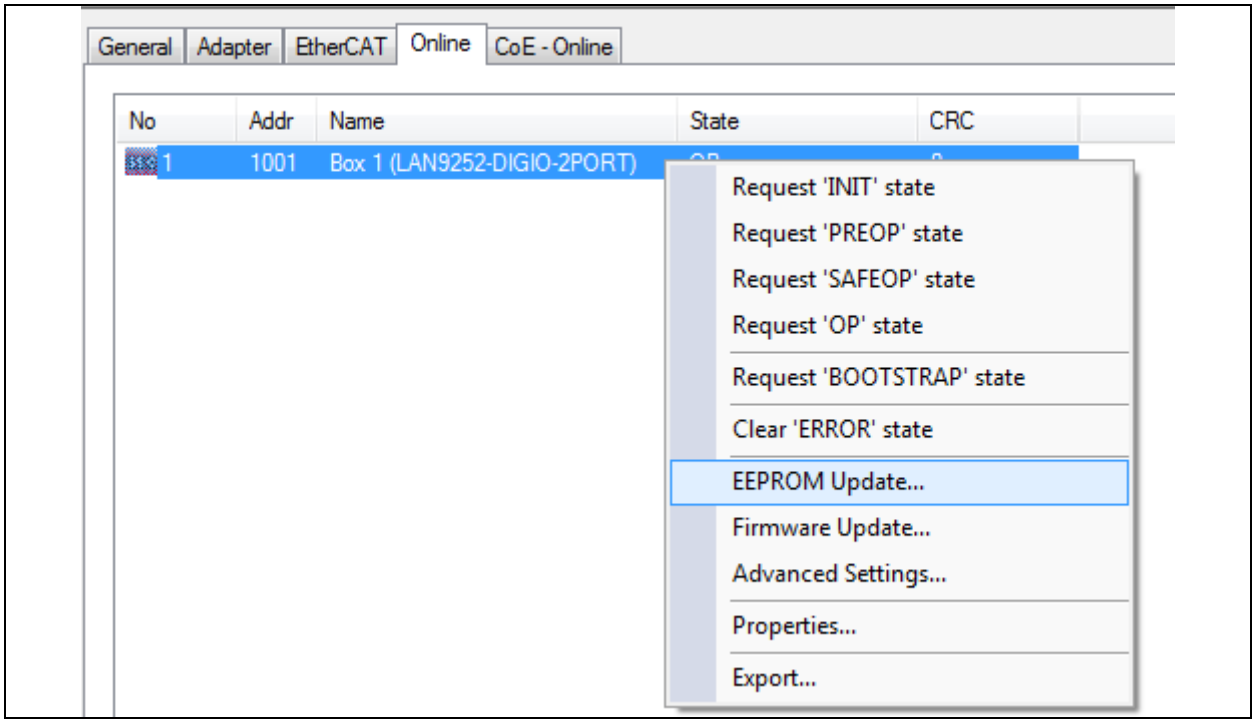
FIGURE B-1: DEVICE 2 (ETHERCAT)



2. Click the **Online** tab in the TwinCAT project window.
3. Right-click the LAN9252 listing and select “EEPROM Update” from the contextual menu, as displayed in Figure B-2.

   The Write EEPROM window displays.

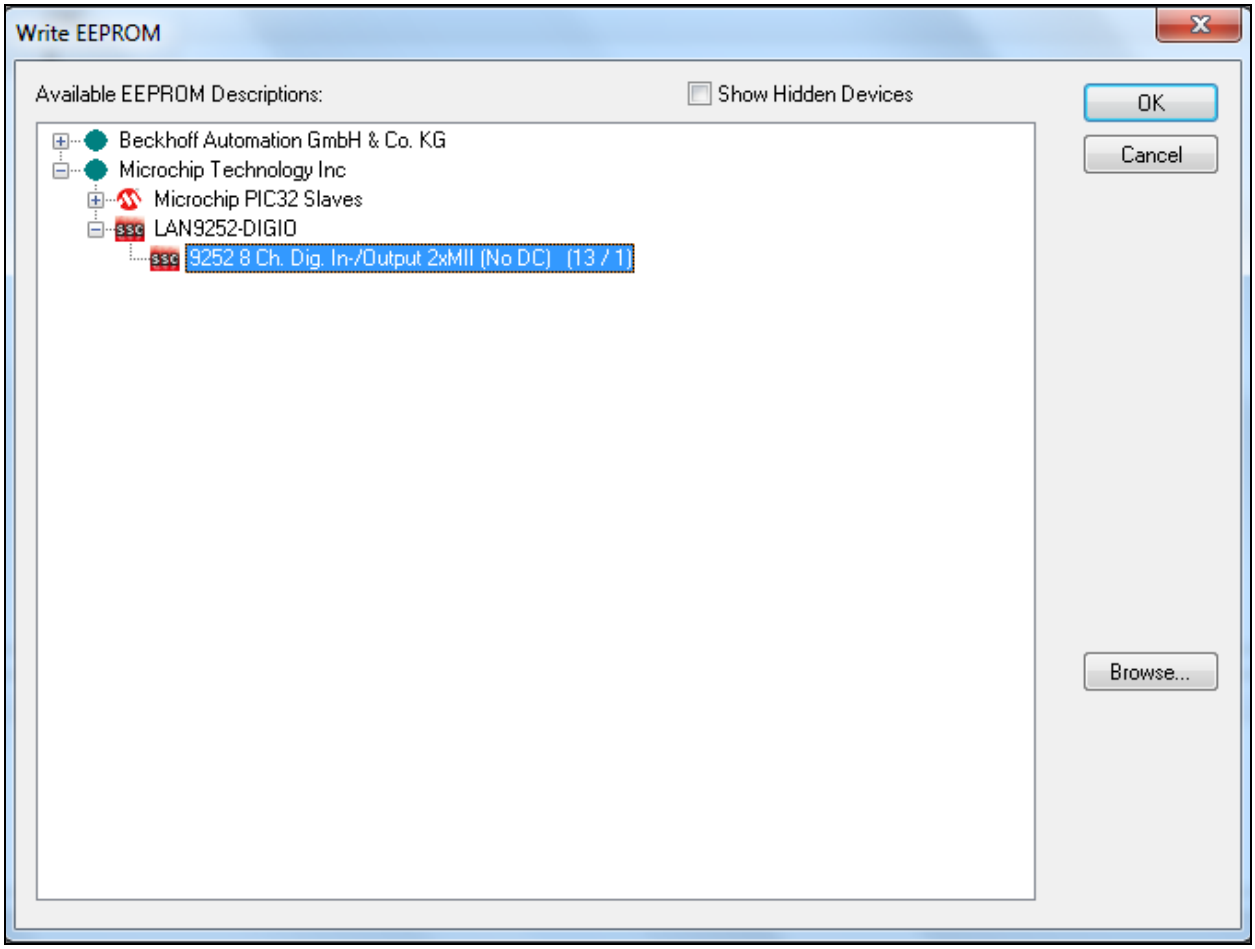
FIGURE B-2: ONLINE TAB



4. Select the corresponding EEPROM configuration and then click **OK** to initiate EEPROM programming.

   For example, Figure B-3 shows LAN9252 one of DIGIO configuration is selected for EEPROM programming in the TwinCAT.

FIGURE B-3: WRITE EEPROM DIALOG



NOTES:

Appendix C. Scanning EtherCAT Slaves

C.1 INTRODUCTION

This appendix shows how to scan EtherCAT Slaves.

C.1.1 Scanning EtherCAT Slaves

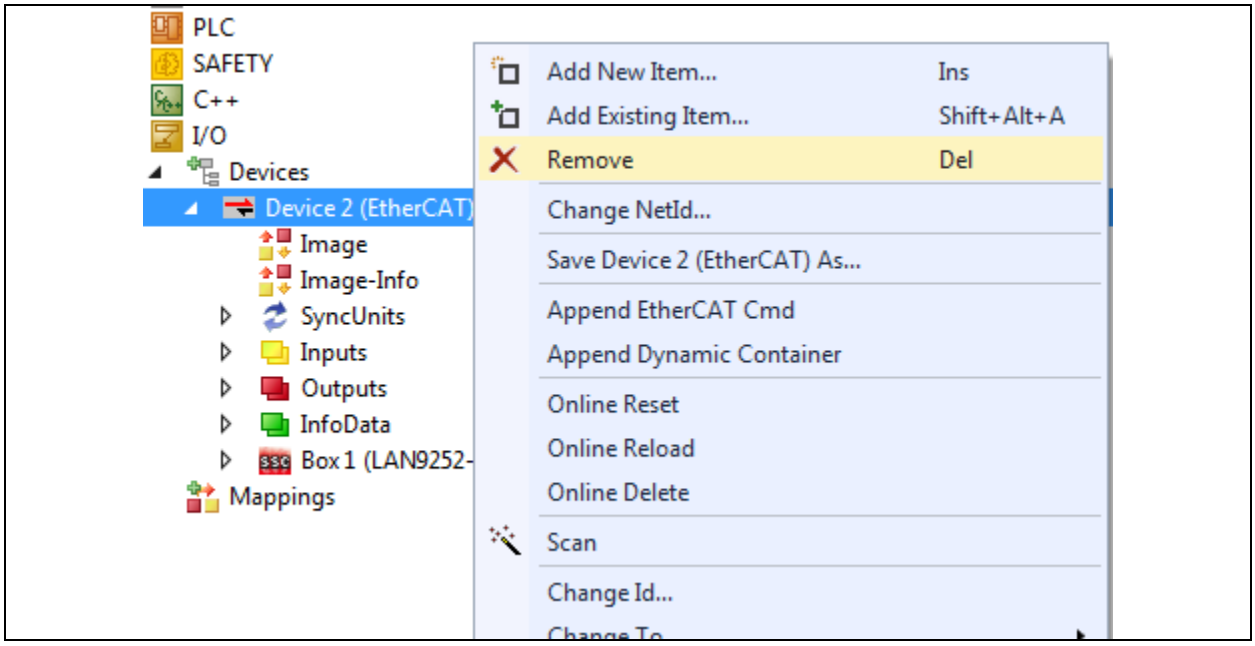
To scan EtherCAT slaves:

1. Connect Port 0 of the device to master using RJ45 Ethernet cable, and then power up the board.

   The Link/Act LED should be ON at Port 0 when the cable is present. If the Link/Act LED is not ON, it indicates there is an issue with the connection or cable.

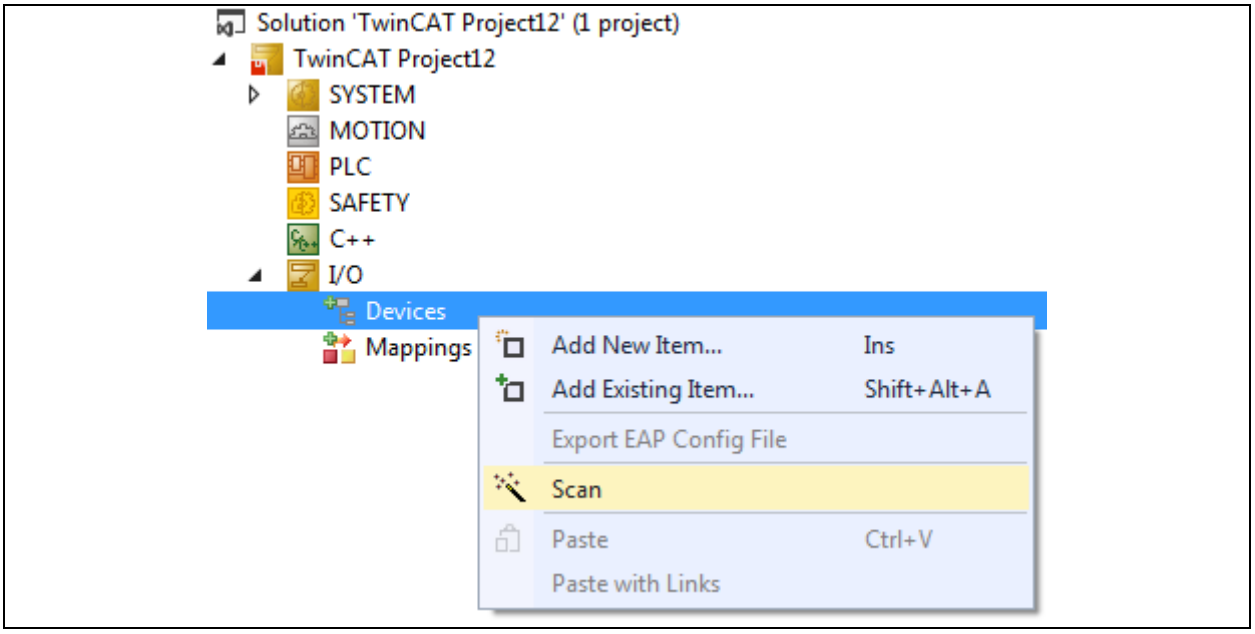
2. If any devices are present, delete them accordingly by clicking the device and selecting Delete Device, as displayed in Figure C-1.

FIGURE C-1: DELETE DEVICE



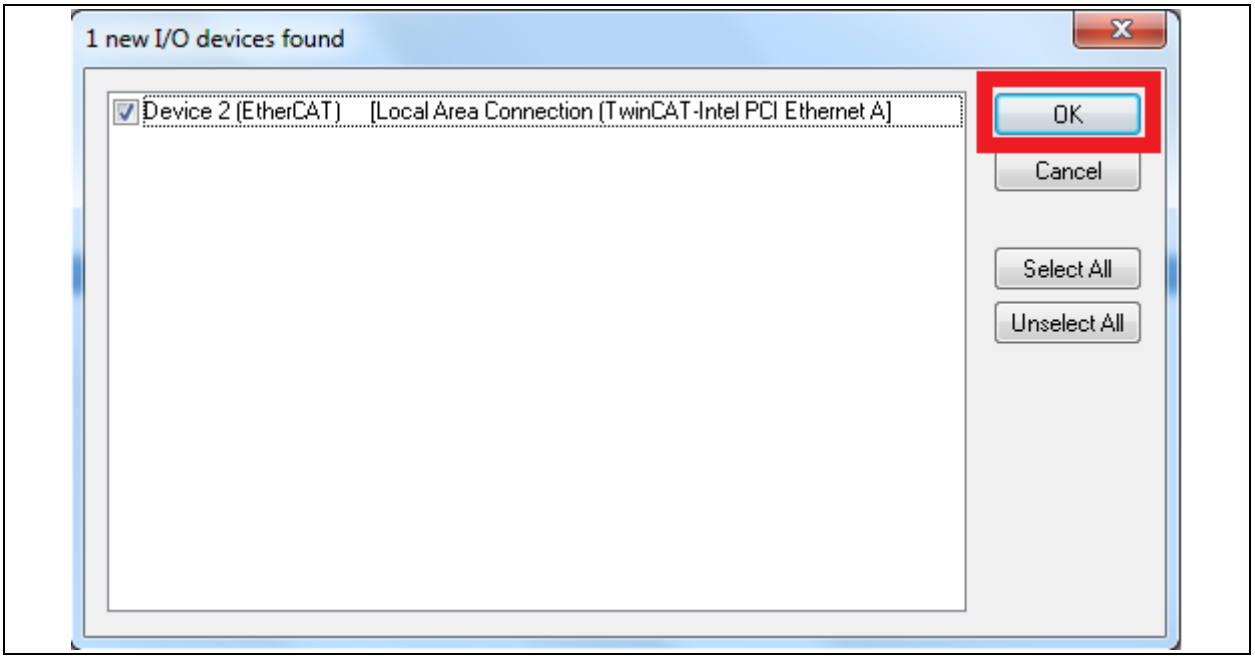
3. Right-click “I/O devices” and then select Scan as displayed in Figure C-2.

FIGURE C-2: SCAN DEVICES MENU



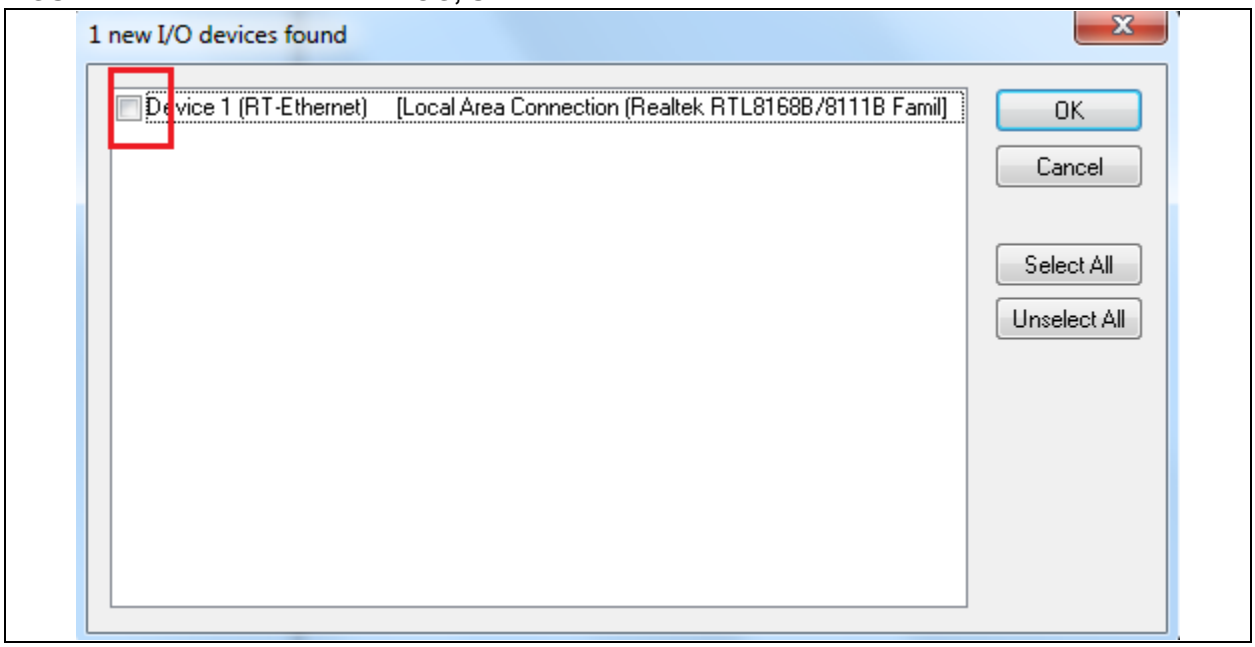
4. Click **OK** to continue scanning as in Figure C-3.

FIGURE C-3: DEVICE DIALOG



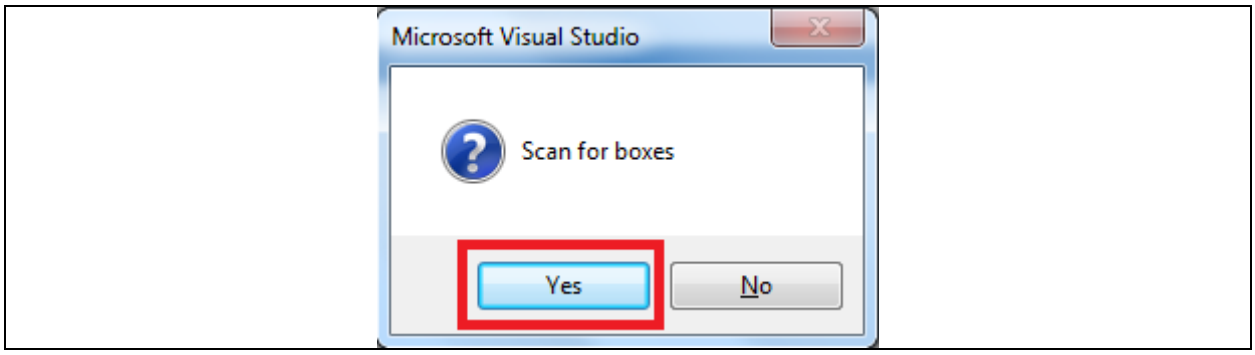
If the check box is not checked as displayed in Figure C-4, then either the device is not functional or driver is not installed properly.

FIGURE C-4: DEVICE DIALOG, UNCHECKED



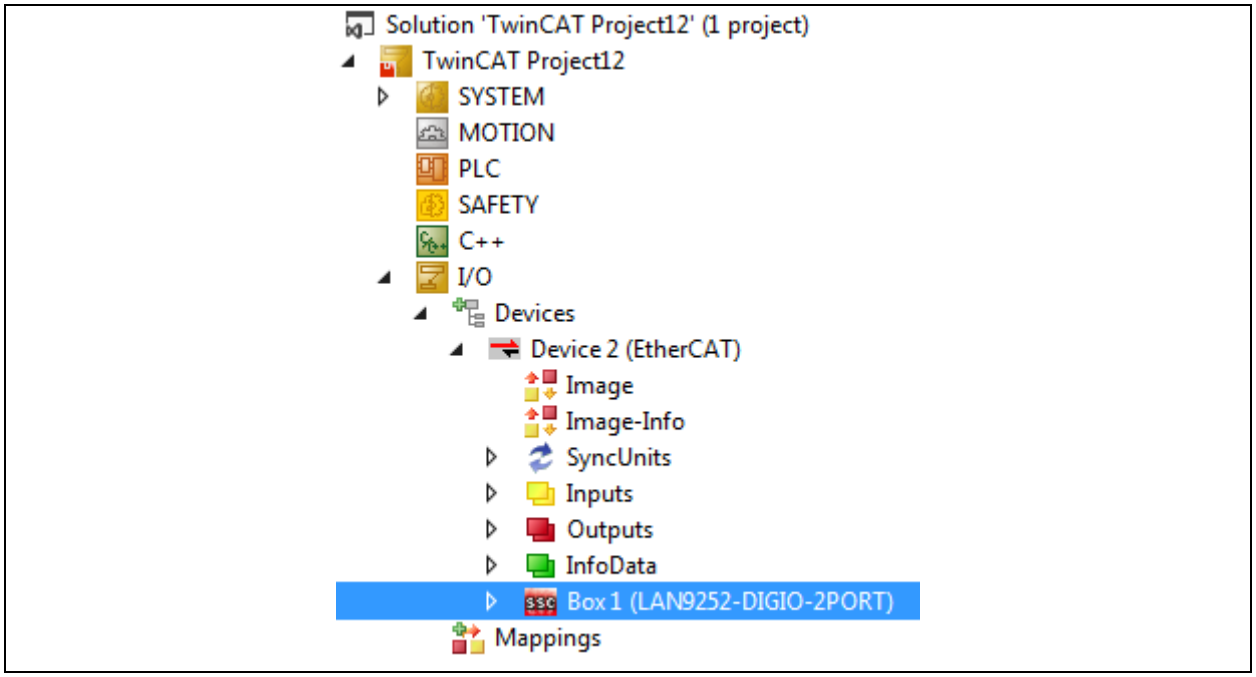
5. Click **Yes** as displayed in Figure C-5 to scan for boxes.

FIGURE C-5: CONFIRMATION DIALOG



The device list displays as displayed in Figure C-6.

FIGURE C-6: DEVICE LIST



After a successful scan, there will be an activity on Link/Act LED at Port 0.

Appendix D. Generating SSC Files

D.1 INTRODUCTION

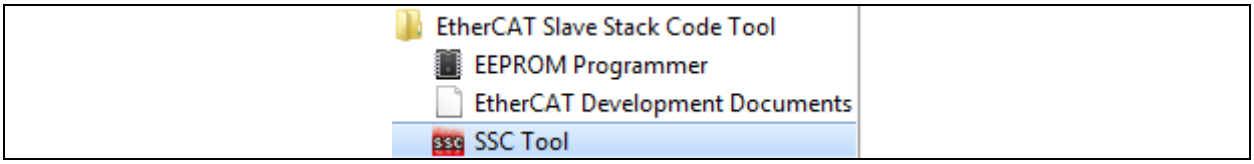
This appendix shows how to generate SSC files.

D.1.1 Generating SSC Files

To generate SSC files:

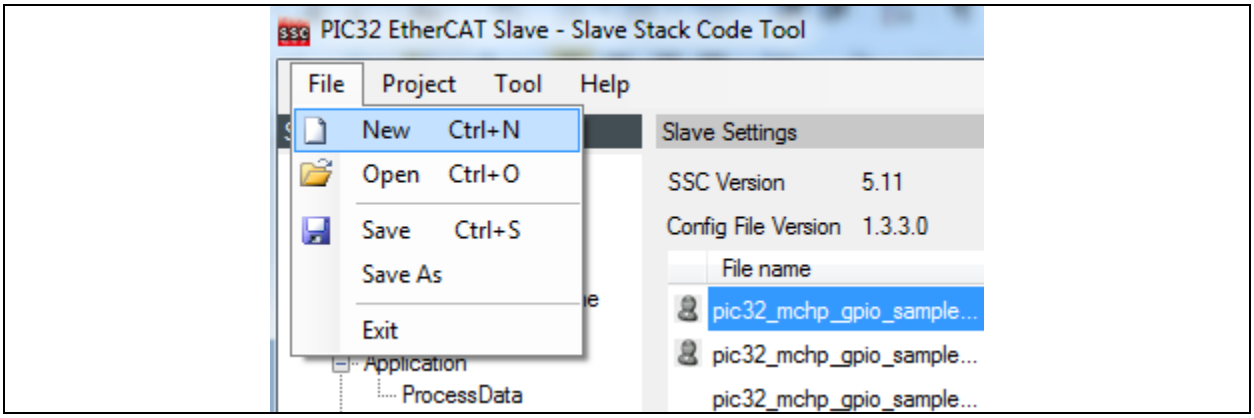
1. Start the SSC Tool from the start menu, as displayed in Figure D-1.

FIGURE D-1: SSC TOOL



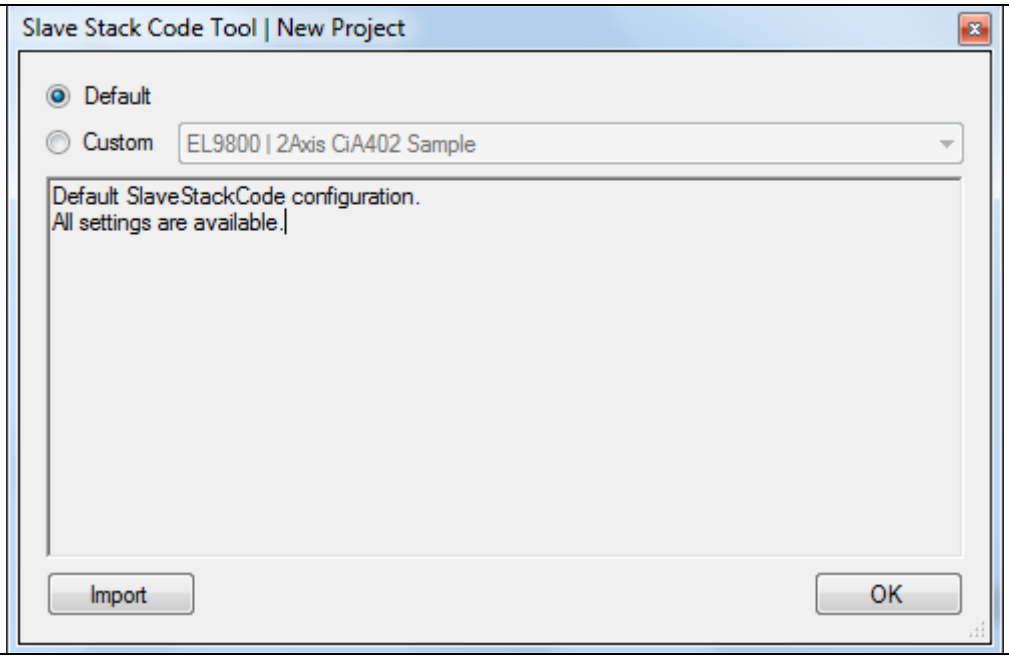
2. From the menu bar, click *File>New* as displayed in Figure D-2.

FIGURE D-2: NEW ETHERCAT SLAVE



3. Click **Import** to import the SSC Tool configuration file `Microchip EVB-LAN9252-4PORT-SSC-CONFIG.xml` from the directory `{SDK_INSTALL_PATH}/EEVB-LAN9252_SDK_VX.X\EVB-LAN9252-4PORT_PIC32_SDK_VX.X/` as displayed in Figure D-3.

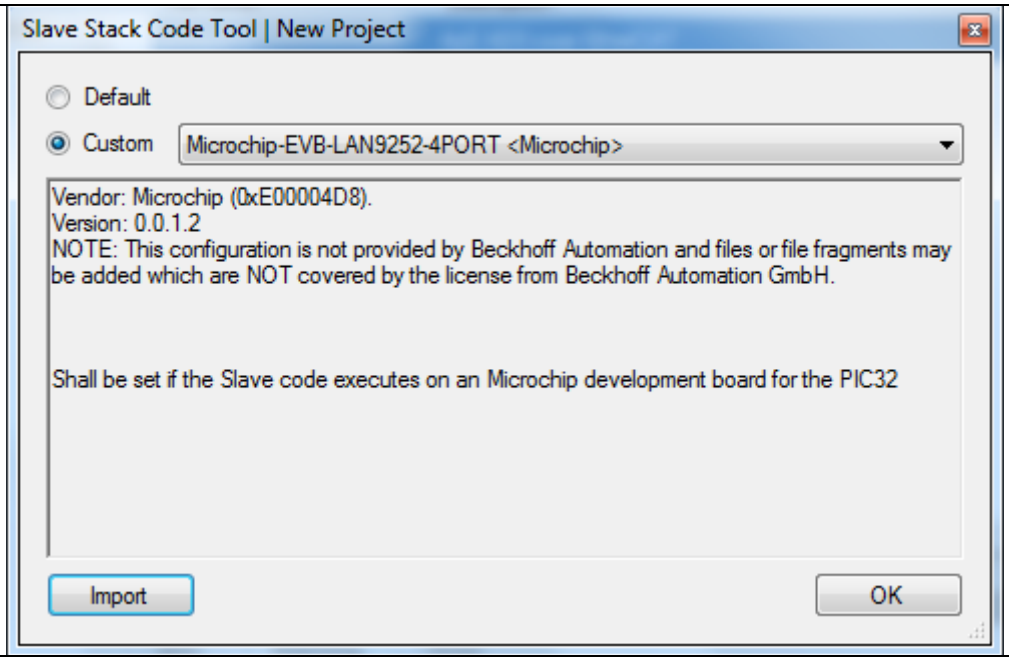
FIGURE D-3: IMPORT PROJECT



After selecting the file, click **Open** to import the SSC Tool configuration file.

4. Once imported, check the “Custom” drop-down box, select “Microchip-EVB-LAN9252-4PORT” configuration, and then click **OK**, as displayed in Figure D-4.

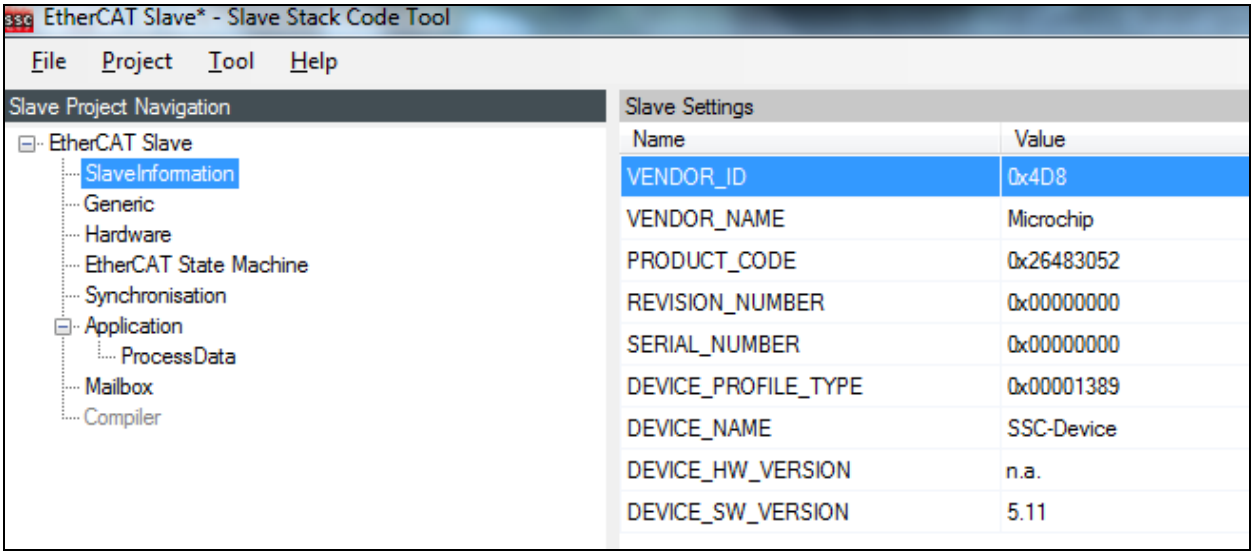
FIGURE D-4: CUSTOM SSC FILE SELECTED



5. All listed parameters under the **Slave Information** tab can be changed, as displayed in Figure D-5.

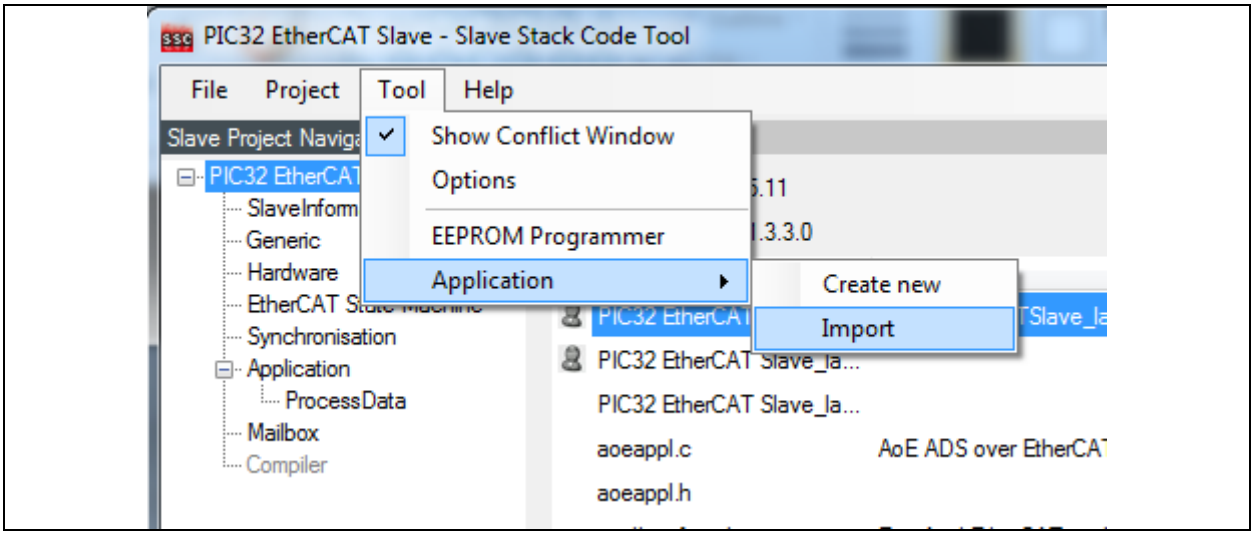
Note: By default, SDK ESI files have an object configuration with Microchip Vendor ID.

FIGURE D-5: SLAVE SETTINGS



6. Click *Tool>Application>Import* from the menu bar, as displayed in Figure D-6.

FIGURE D-6: IMPORT MENU

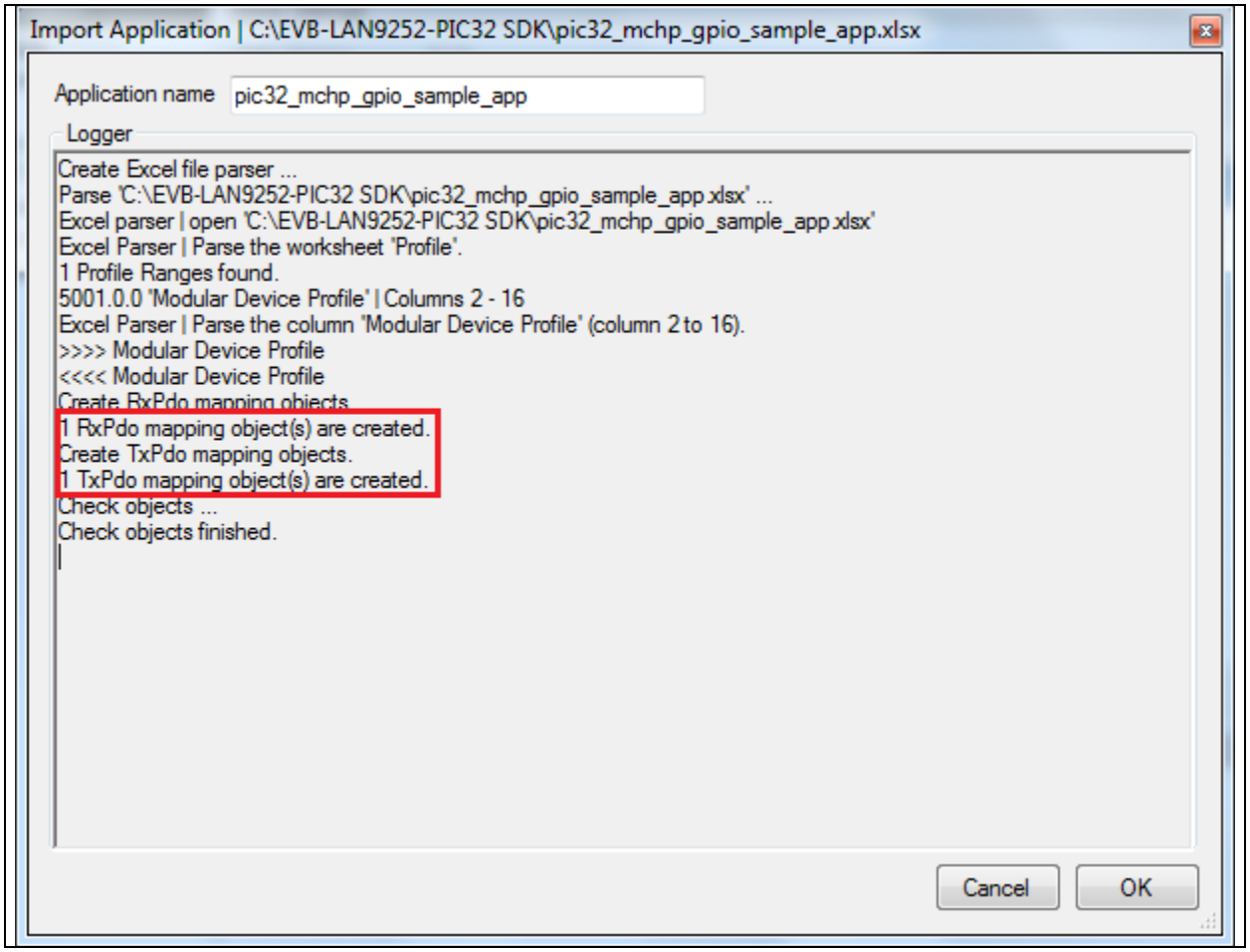


7. Select the file `pic32_mchp_gpio_sample_app.xlsx` which can be found in the directory `{SDK_INSTALL_PATH}/EVB- LAN9252_SDK_VX.X\EVB-LAN9252-4PORT_PIC32_SDK_VX.X/`.

   `pic32_mchp_gpio_sample_app.xlsx` is an object file which contains the information about application objects information.

   A status message displays as in Figure D-7.

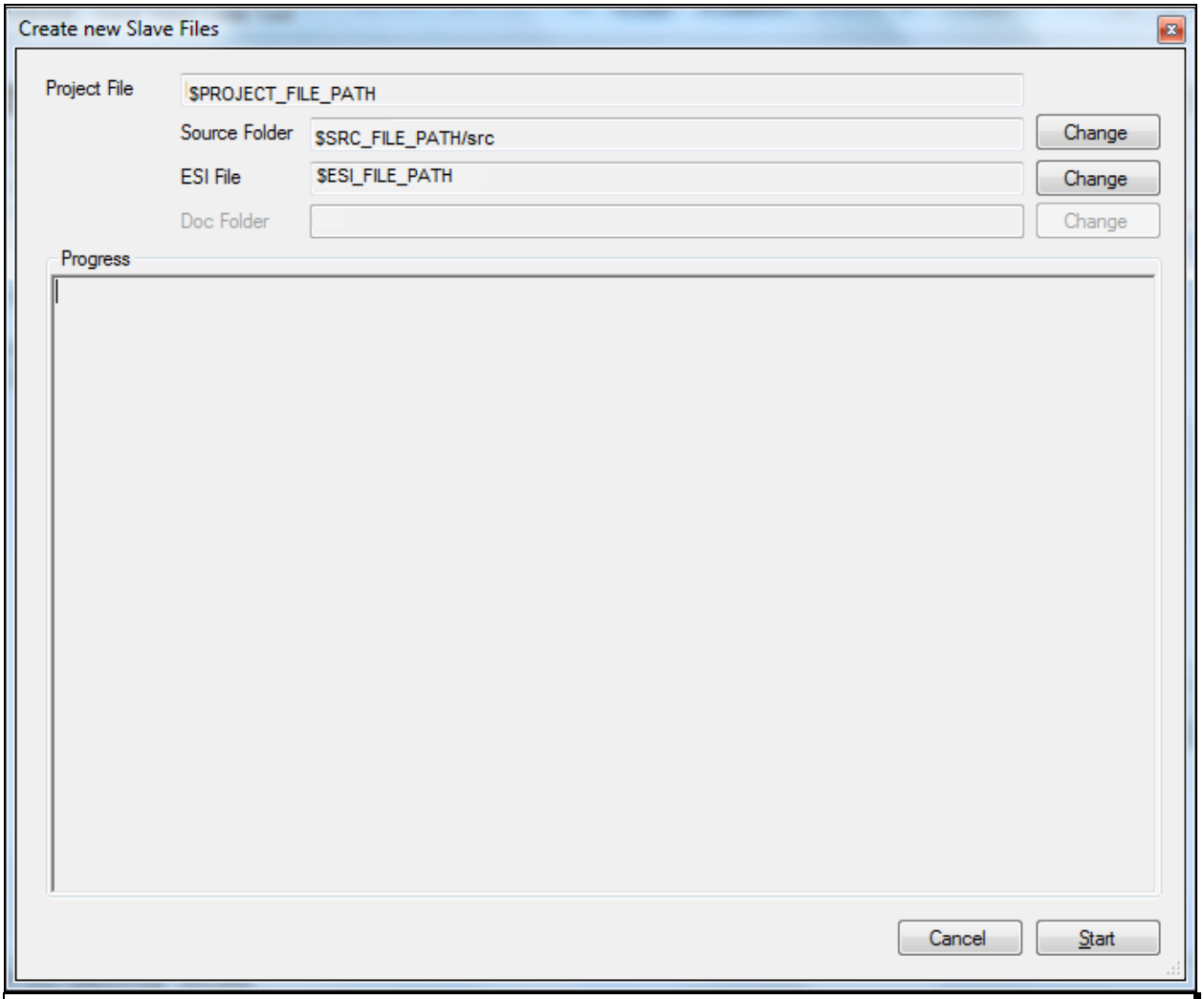
FIGURE D-7: STATUS MESSAGE



8. Click **OK** to continue.
9. Click the “Project” drop-down menu in the tool bar and then select Create New Slave Files.

   The Create new Slave Files window displays, as in Figure D-8.

FIGURE D-8: CREATE NEW SLAVE FILES



Note: The above values signify the following:

- `$PROJECT_FILE_PATH` - The location where the SSC project file is saved.
- `$SRC_FILE_PATH` - Default path is `$PROJECT_FILE_PATH`. It can be changed by clicking its corresponding **Change** button.
- `$ESI_FILE_PATH` - Default path is `$PROJECT_FILE_PATH`. It can be changed by clicking its corresponding **Change** button.

10. Click the **Start** button to create a new project file, Src folder, and ESI file (Slave Information file) in the desired directory path.

    A pop-up window will indicate that the files have been successfully created.

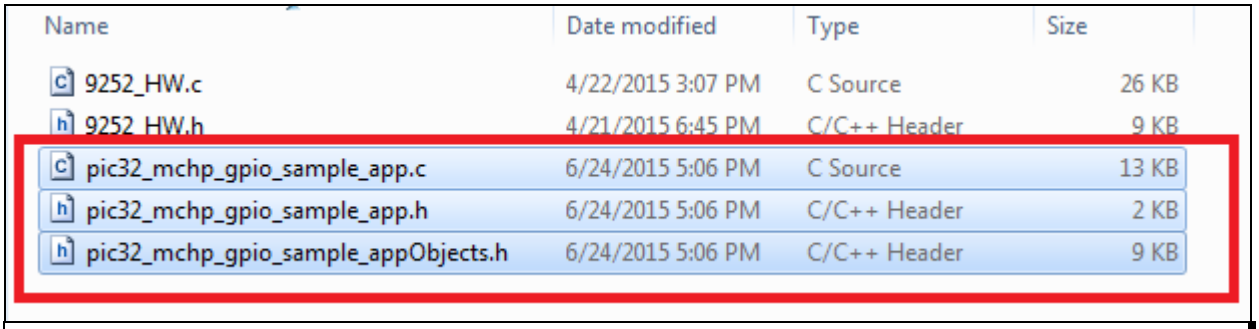
11. Click **OK** to continue.

    Along with generated new slave files, ESI file (.xml file) also will be generated. This ESI file will have information about new Vendor ID and object configuration. Program this ESI file into EEPROM as mentioned in **Appendix B. "EEPROM Programming"**.

12. Replace generated application files with SDK application files as displayed in Figure D-9.

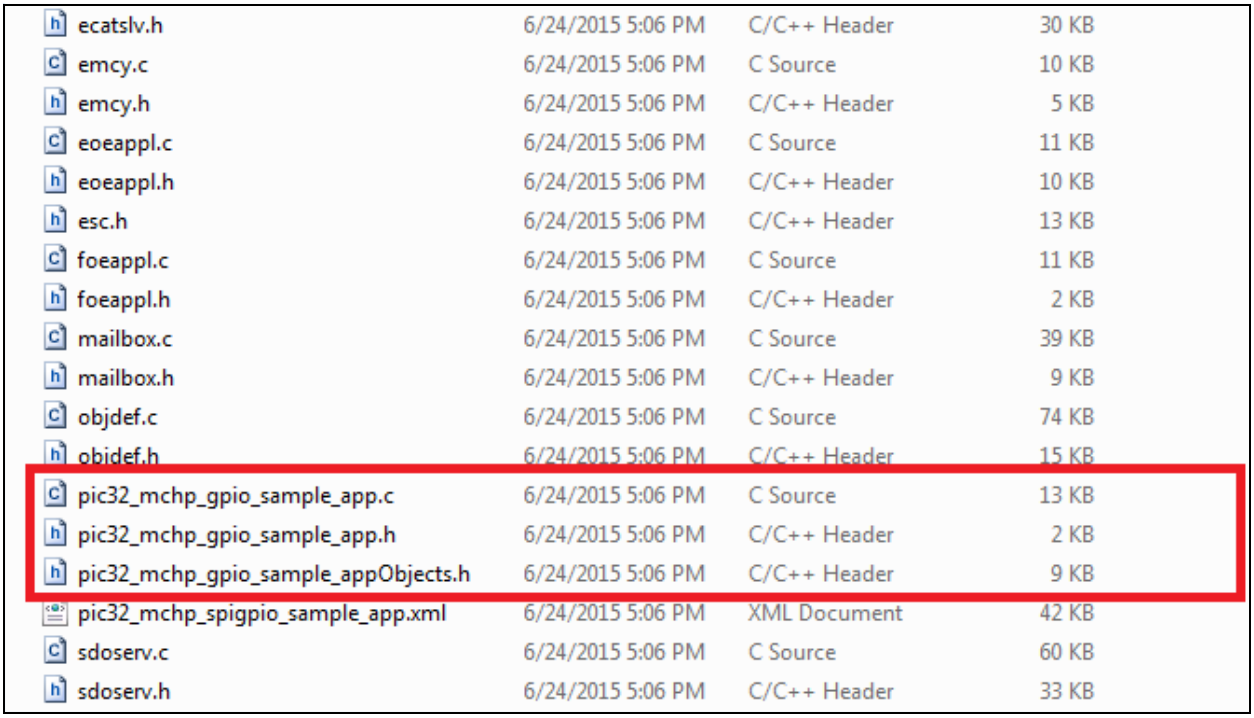
    SDK Application files can be found under `./Common` directory.

FIGURE D-9: SDK APPLICATION FILES



Note: Application files would be named as `pic32_mchp_gpio_sample_app` as in Figure D-10. This is because in this demo, input object file is given as `pic32_mchp_gpio_sample_app.xlsx` as provided in step 2.

FIGURE D-10: APPLICATION FILES



13. Browse to the directory where the new files were created, as shown in the example:
    - `Src (Folder)`: This folder contains the Beckhoff Slave Stack code.
    - `Microchip PIC32 Slaves (ESP)`: This is the SSC Tool project file.
    - `Microchip PIC32 Slaves (XML)`: This is the EtherCAT slave information file that must be used as an input to the EtherCAT master tool to configure EtherCAT slave controllers.
14. Copy all the files inside the Src folder to the following directory:
    `{SDK_INSTALL_PATH}/EVB-LAN9252-4PORT_PIC32_SDK_VX.X/SSC/Common`

D.1.1.1 WHY REPLACE IS REQUIRED

Generated application files will not have the code for accessing the GPIO lines. GPIO support is provided in delivered SDK application files. Hence, the replace is required to get the demo application.

Appendix E. Compiling and Programming SoC Firmware

E.1 INTRODUCTION

This appendix shows how to compile and program SoC firmware.

E.1.1 Compiling and Programming SoC Firmware

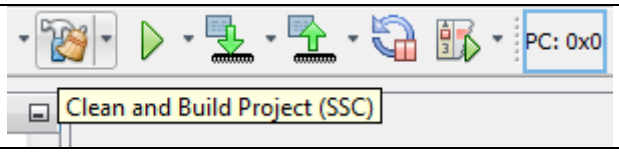
To compile and program SoC firmware:

1. Open the MPLAB IDE and import the SSC project.

   The MPLAB project file is located under `{SDK_INSTALL_PATH}/EVB-LAN9252-4PORT_PIC32_SDK_VX.X/SSC/`.

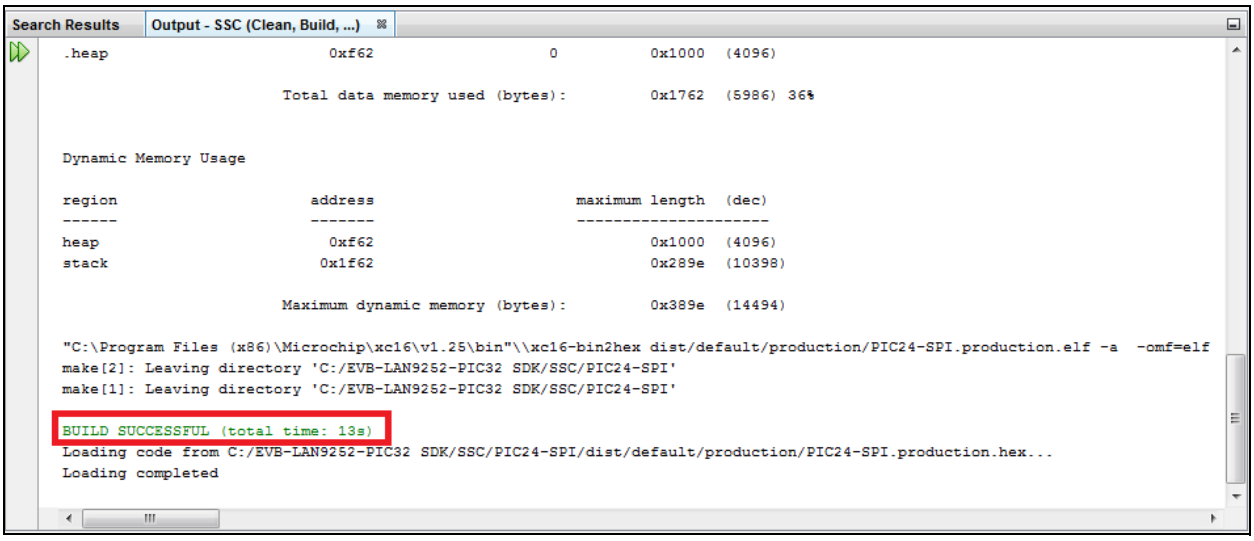
2. Compile the source code as displayed in Figure E-1.

FIGURE E-1: SOURCE CODE



If the compilation is successful, the output window will display “BUILD SUCCESSFUL” as in Figure E-2.

FIGURE E-2: BUILD SUCCESSFUL

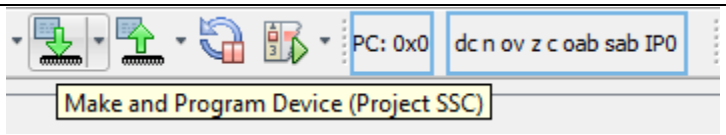


3. Before initiating the firmware download, ensure the debugger/programmer is connected to the EVB’s JTAG pins.

Note: This demo project is debugged with the PICkit-3 In-Circuit debugger/programmer.

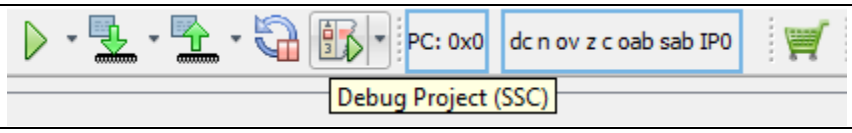
4. To program the PIC32 SoC, click the **Make and Program Device Main Project** button, as displayed in Figure E-3.

FIGURE E-3: MAKE AND PROGRAM DEVICE MAIN PROJECT BUTTON



5. To debug the PIC32 SoC, click the **Debug Main Project** button, as displayed in Figure E-4.

FIGURE E-4: DEBUG MAIN PROJECT



Appendix F. Programming PIC32 Firmware Using Pre-Built Binaries

F.1 INTRODUCTION

This appendix shows how to program PIC32 firmware.

F.1.1 Programming PIC32 Firmware Using Pre-Built Binaries

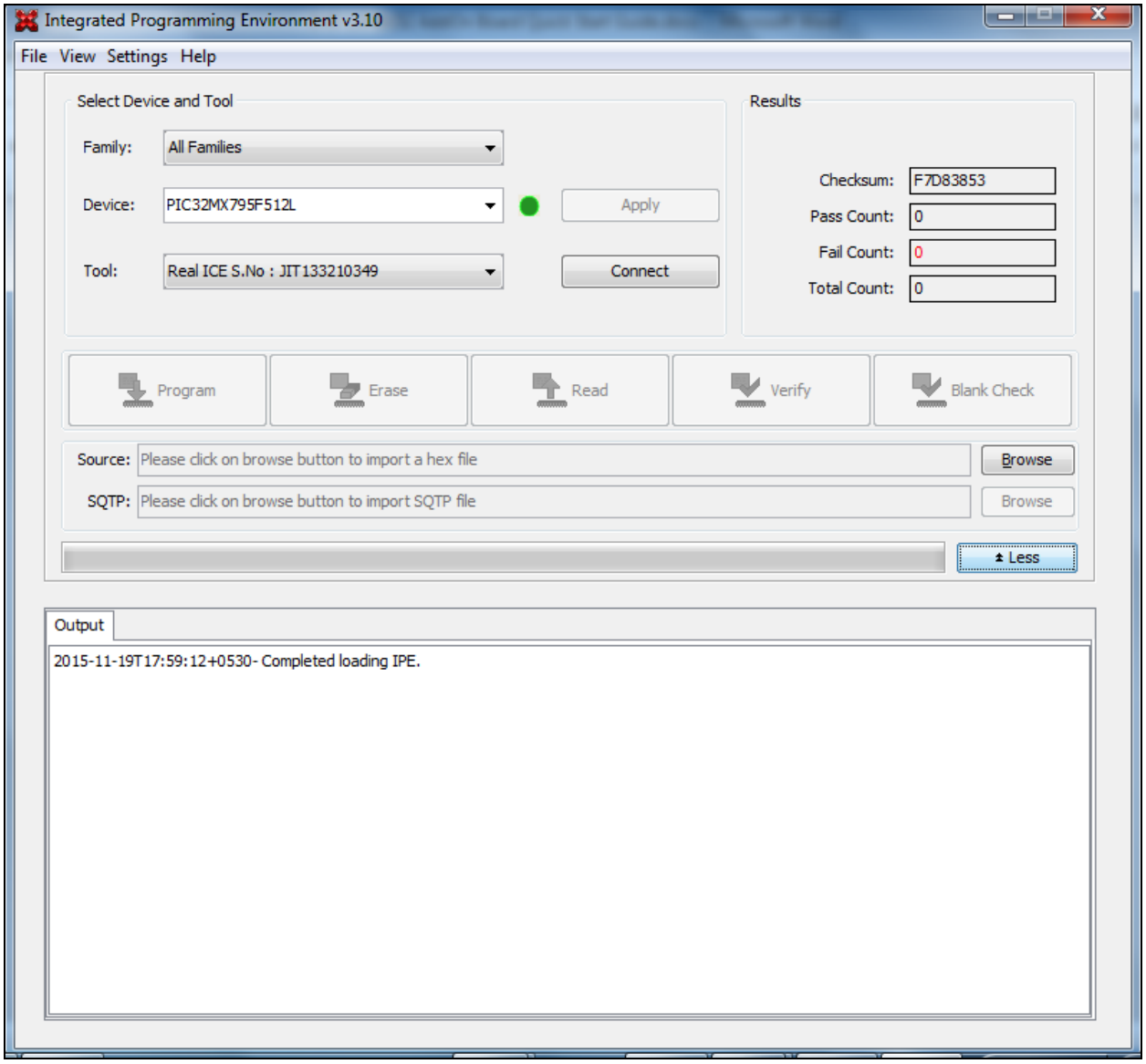
Follow these steps to program the PIC32 firmware using pre-built binaries:

1. Download and install `MPLAB IPE V X.X` from the following link:
   http://microchip.wikidot.com/ipe:installation

Note:	x.xx denotes the version number of the MPLAB IPE.

2. Before initiating the firmware download, ensure the debugger/programmer is connected to the EVB's JTAG pins.
3. Open the MPLAB IPE.
   The window displays as in Figure F-1.

FIGURE F-1: MPLAB IPE



4. Select the corresponding device from the “Device” drop-down box and then click **Apply**.
5. Select the debugger/programmer from the “Tool” drop-down box and then click **Connect**.
6. From “Source,” click the **Browse** button and select the hex files which can be found in the “Binaries” directory of `EVB-LAN9252-4PORT_PIC32_SDK _V X.X`.
7. Once the hex files are loaded, click **Program**.

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