



AD5780 - Microcontroller No-OS Driver

Supported Devices

- [AD5760](#)
- [AD5780](#)
- [AD5781](#)
- [AD5790](#)
- [AD5791](#)

Evaluation Boards

- [EVAL-AD5760SDZ](#)
- [EVAL-AD5780SDZ](#)
- [EVAL-AD5781SDZ](#)
- [EVAL-AD5790SDZ](#)
- [EVAL-AD5791SDZ](#)

Reference Circuits

- [CN0177](#)
- [CN0191](#)
- [CN0200](#)
- [CN0257](#)
- [CN0318](#)

Overview

The [AD5760](#) is a true 16-bit, unbuffered voltage out DAC that operates from a bipolar supply up to 33V. The AD5760 accepts a positive reference input in the range of 5V to VDD - 2.5V and a negative reference input in the range of VSS + 2.5V to 0V. The AD5760 offers relative accuracy of +/-0.5 LSB max and operation is guaranteed monotonic with a ± 0.5 LSB DNL max range specification.

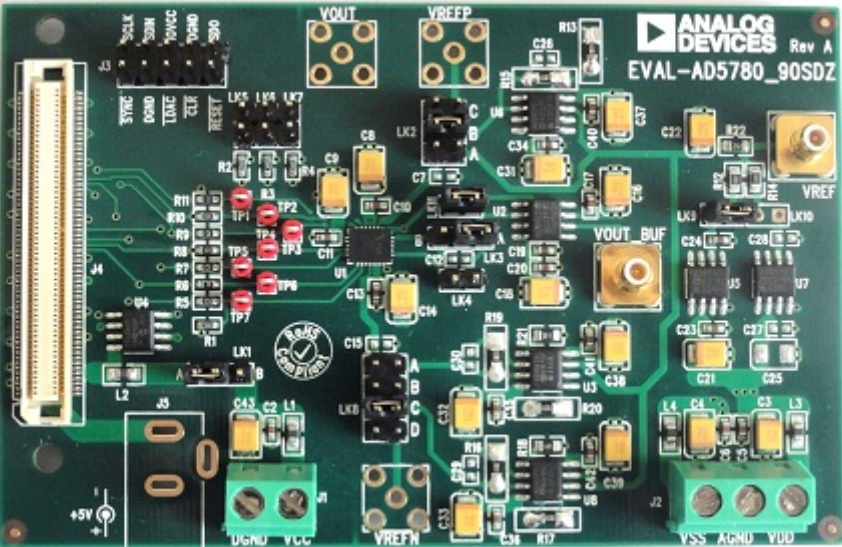
The [AD5780](#) is a true 18-bit, unbuffered voltage out Dac that operates from a bipolar supply up to 33V.

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The **AD5790** is a single 20-bit, voltage out Dac that operates from a bipolar supply up to 33V. Reference buffers are also provided on-chip The AD5790 accepts a positive reference input in the

The [AD5791](#) is a single 20-bit, unbuffered voltage-output DAC that operates from a bipolar supply of up to 33 V. The AD5791 accepts a positive reference input in the range 5 V to $V_{DD} - 2.5$ V and a

These parts use a versatile 3-wire serial interface that operates at clock rates of up to 35 MHz and that is compatible with standard SPI, QSPI™, MICROWIRE™, and DSP interface standards. The parts



Rev 06 Feb 2014 10:29 | Page 2

as a base for any microcontroller platform and also specific drivers for Renesas platforms.

HW Platform(s):

- [Renesas Demo Kit for RL78G13 \(Renesas\)](#)

Driver Description

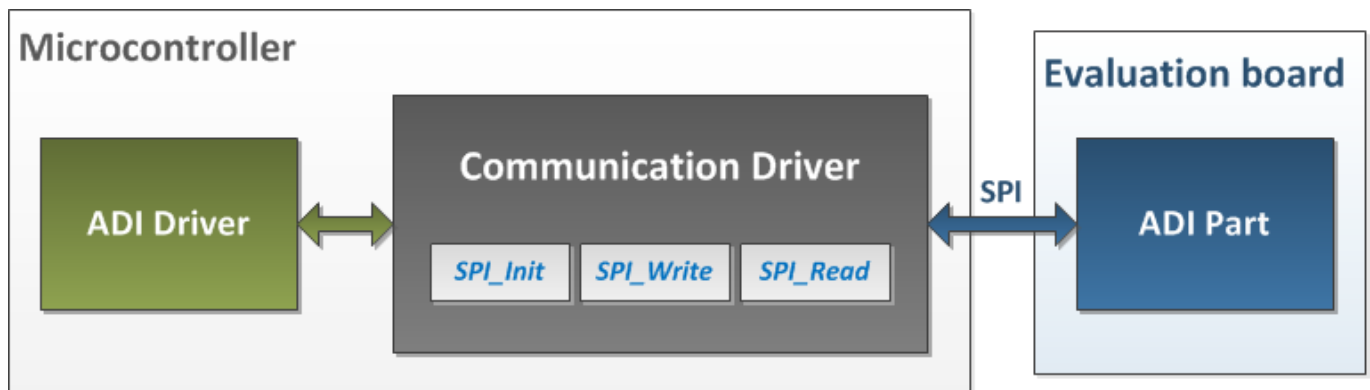
The driver contains two parts:

- The driver for the AD5780 part, which may be used, without modifications, with any microcontroller.
- The Communication Driver, where the specific communication functions for the desired type of processor and communication protocol have to be implemented. This driver implements the communication with the device and hides the actual details of the communication protocol to the ADI driver.

The Communication Driver has a standard interface, so the AD5780 driver can be used exactly as it is provided.

There are three functions which are called by the AD5780 driver:

- SPI_Init() - initializes the communication peripheral.
- SPI_Write() - writes data to the device.
- SPI_Read() - reads data from the device.



SPI driver architecture

The following functions are implemented in this version of AD5780 driver:

Function	Description
unsigned char AD57XX_Init(char deviceVersion)	Initializes the communication with the device.
void AD57XX_SetRegisterValue(unsigned char registerAddress, unsigned long registerValue)	Writes data into a register.

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Function	Description
unsigned long AD57XX_GetRegisterValue(unsigned char registerAddress)	Reads the value of a register.
void AD57XX_EnableOutput(unsigned char state)	The part is placed in normal mode or its output is clamped to the ground.
void AD57XX_SetDacValue(unsigned long value)	Writes to the DAC register.
void AD57XX_SetClearCode(unsigned long clrCode)	Sets the clear code.
void AD57XX_SoftInstruction(unsigned char instructionBit)	Asserts RESET, CLR and LDAC in a software manner.
void AD57XX_Setup(unsigned long setupWord)	Writes to Control Register.

Downloads



- [AD57XX Generic Driver](#)
- [AD5780 RL78G13 Driver](#)
- [AD5780 RX62N Driver](#)

Renesas RL78G13 Quick Start Guide

This section contains a description of the steps required to run the AD5780 demonstration project on a Renesas RL78G13 platform.

Required Hardware

- [Renesas Demo Kit for RL78G13 \(Renesas\)](#)
- [EVAL-AD5780SDZ\(ADI\)](#)

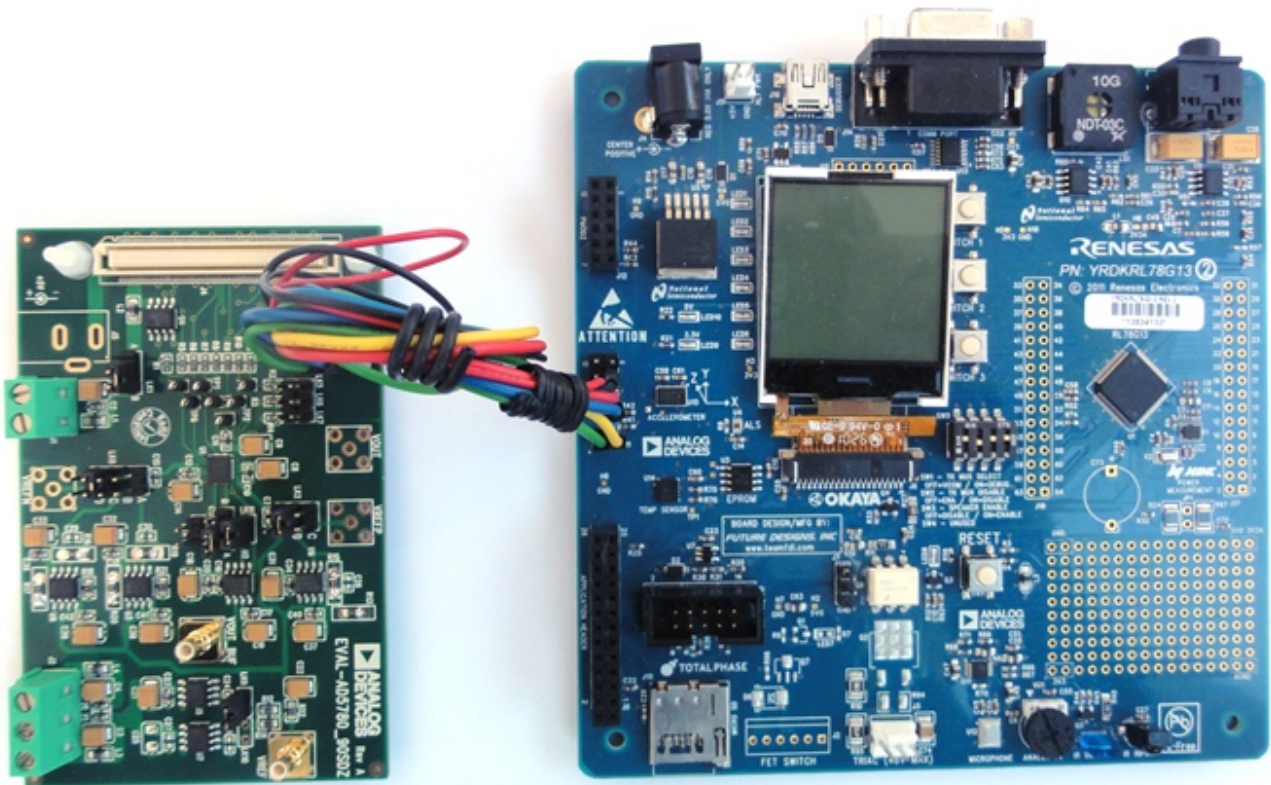
Required Software

- [IAR Embedded Workbench for Renesas RL78 Kickstart](#)

Hardware Setup

An EVAL-AD5780SDZ has to be interfaced with the Renesas Demonstration Kit (RDK) for RL78G13:

EVAL-AD5780SDZ	J3	connector	Pin SYNC	→ YRDKRL78G13	J11	connector	Pin 1
EVAL-AD5780SDZ	J3	connector	Pin SDIN	→ YRDKRL78G13	J11	connector	Pin 2
EVAL-AD5780SDZ	J3	connector	Pin SDO	→ YRDKRL78G13	J11	connector	Pin 3
EVAL-AD5780SDZ	J3	connector	Pin SCLK	→ YRDKRL78G13	J11	connector	Pin 4
EVAL-AD5780SDZ	J3	connector	Pin DGND	→ YRDKRL78G13	J11	connector	Pin 5
EVAL-AD5780SDZ	J3	connector	Pin RESET	→ YRDKRL78G13	J18	connector	Pin 7
EVAL-AD5780SDZ	J3	connector	Pin LDAC	→ YRDKRL78G13	J11	connector	Pin 9
EVAL-AD5780SDZ	J3	connector	Pin CLR	→ YRDKRL78G13	J11	connector	Pin 10



Reference Project Overview

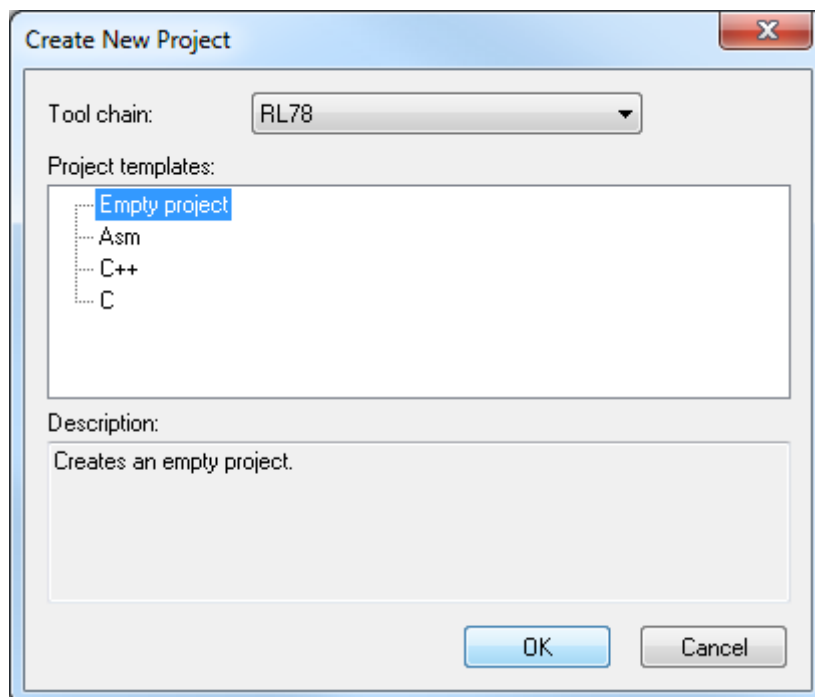
The reference project initializes the device, reads the parts internal registers displays them and then generates a triangle signal.



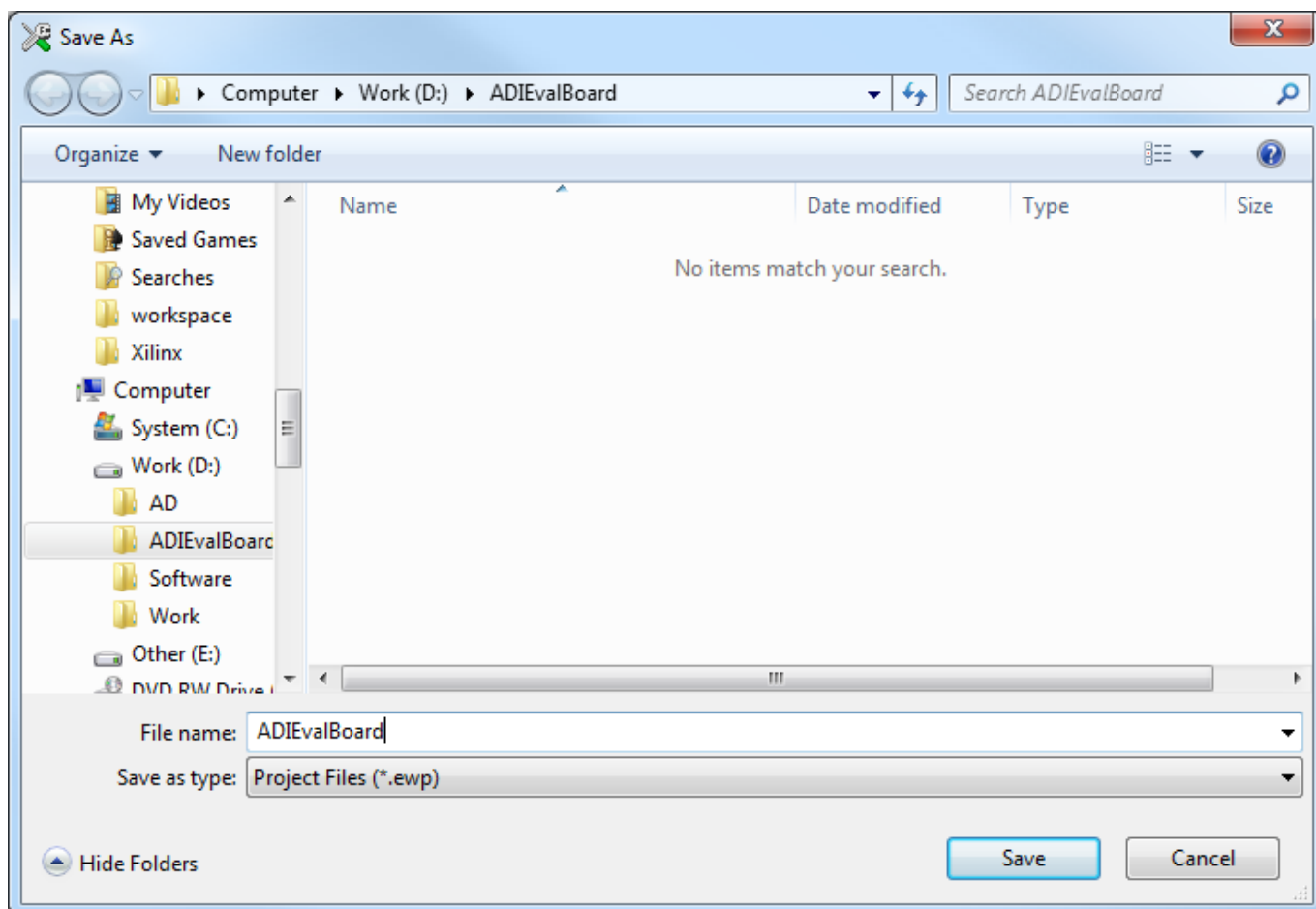
Software Project Setup

This section presents the steps for developing a software application that will run on the **Renesas Demo Kit for RL78G13** for controlling and monitoring the operation of the **ADI** part.

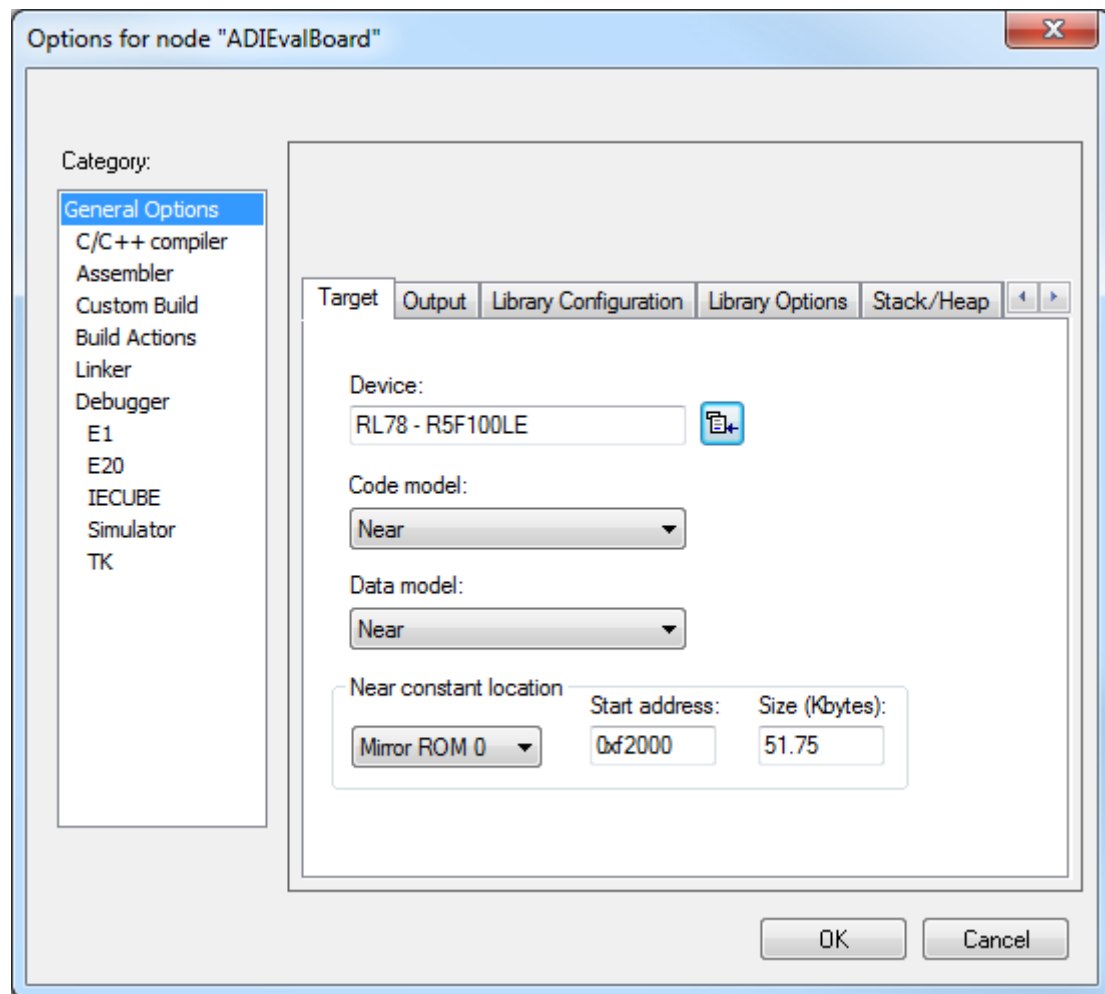
- Run the **IAR Embedded Workbench for Renesas RL78** integrated development environment.
- Choose to create a new project (**Project - Create New Project**).
- Select the **RL78** tool chain, **the Empty project** template and click **OK**.



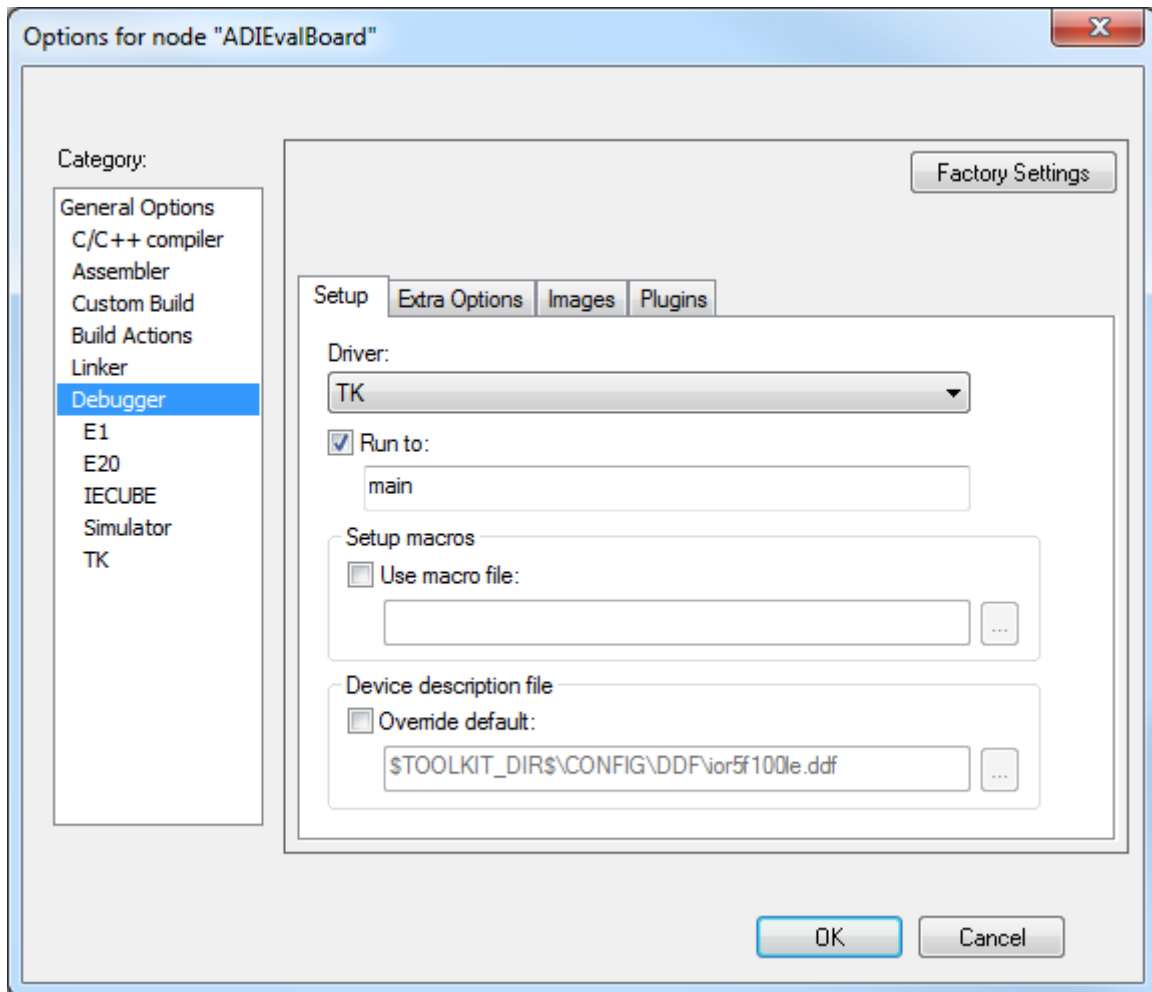
- Select a location and a name for the project (**ADIEvalBoard** for example) and click **Save**.



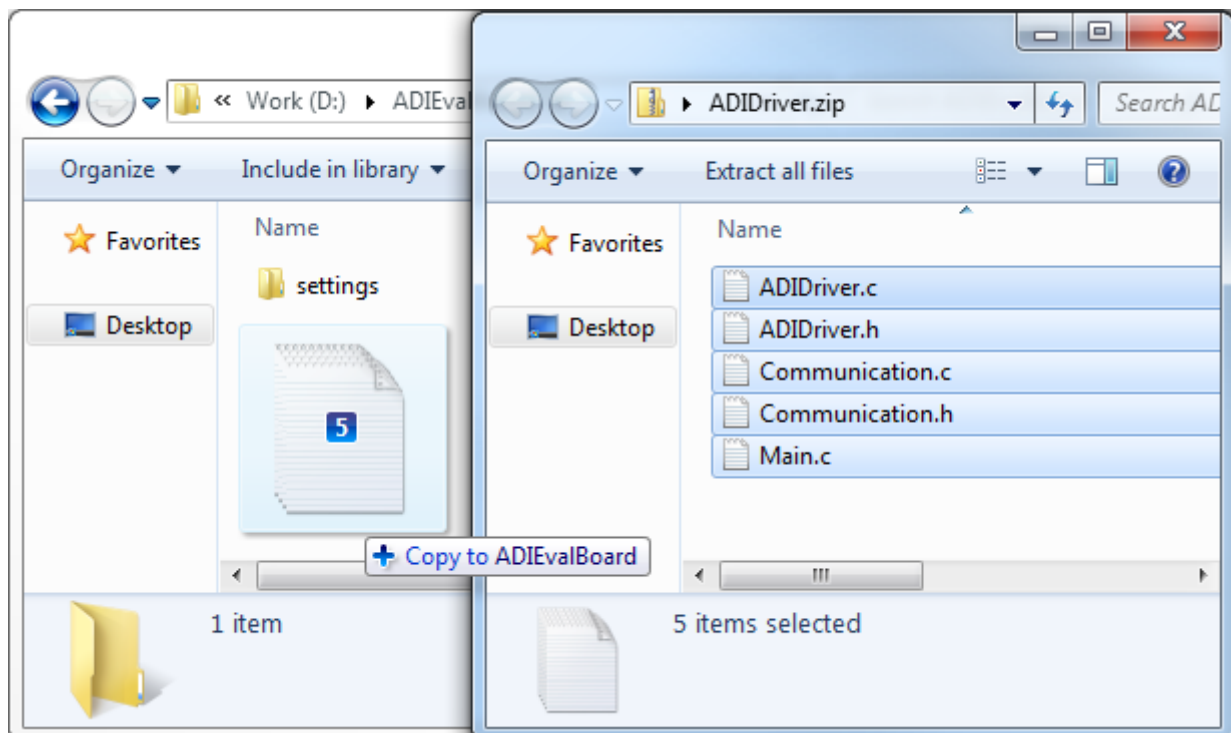
- Open the project's options window (**Project - Options**).
- From the **Target tab** of the **General Options** category select the **RL78 - R5F100LE** device.



- From the **Setup** tab of the **Debugger** category select the **TK** driver and click **OK**.



- Extract the files from the lab .zip archive and copy them into the project's folder.



- The new source files have to be included into the project. Open the **Add Files...** window (**Project -**

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TK Hardware Setup (R5F100LE)

ID Code: ☐ Erase flash before next ID check

Time unit:

OK Cancel

Main clock: ☐ Clock board ☒ External ☐ System MHz

Sub clock: ☐ Clock board ☒ External ☐ System kHz

Default

Fail-safe break: ☐ View setup

Flash programming: ☒ Permit ☐ Not Permit

Target power off: ☐ Permit ☒ Not Permit

Low-voltage: ☐ On ☒ Off

Power supply:

Pin mask: ☐ WAIT ☐ TARGET RESET ☐ NMI ☐ INTERNAL RESET

Peripheral break: ☐ A (timer) ☐ B (serial etc.)

Target: ☐ Connect ☐ Not Connect

Target connect:

Memory map

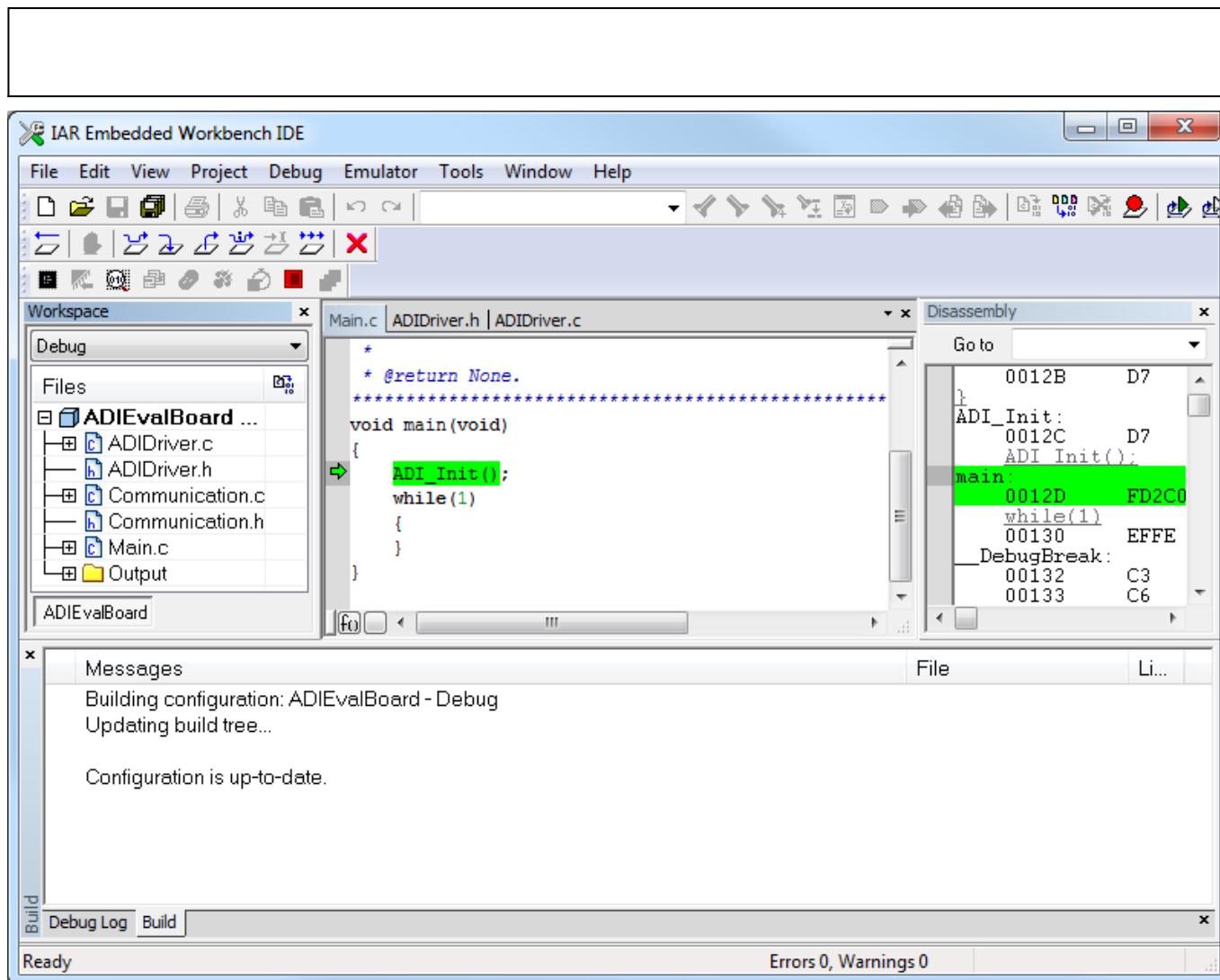
Start address: Length: Type:

Add

0x00000 - 0x0FFFF Internal ROM 64 Kbytes
0xFE000 - 0xFEFFF Internal RAM 4096 bytes

Remove Remove All

- To run the project press F5.



03 Sep 2012 12:02 · [Dragos Bogdan](#)

Renesas RX62N Quick Start Guide

This section contains a description of the steps required to run the AD5780 demonstration project on a Renesas RX62N platform.

Required Hardware

- [Renesas Demo Kit for RX62N \(Renesas\)](#)
- [EVAL-AD5780EBZ \(ADI\)](#)

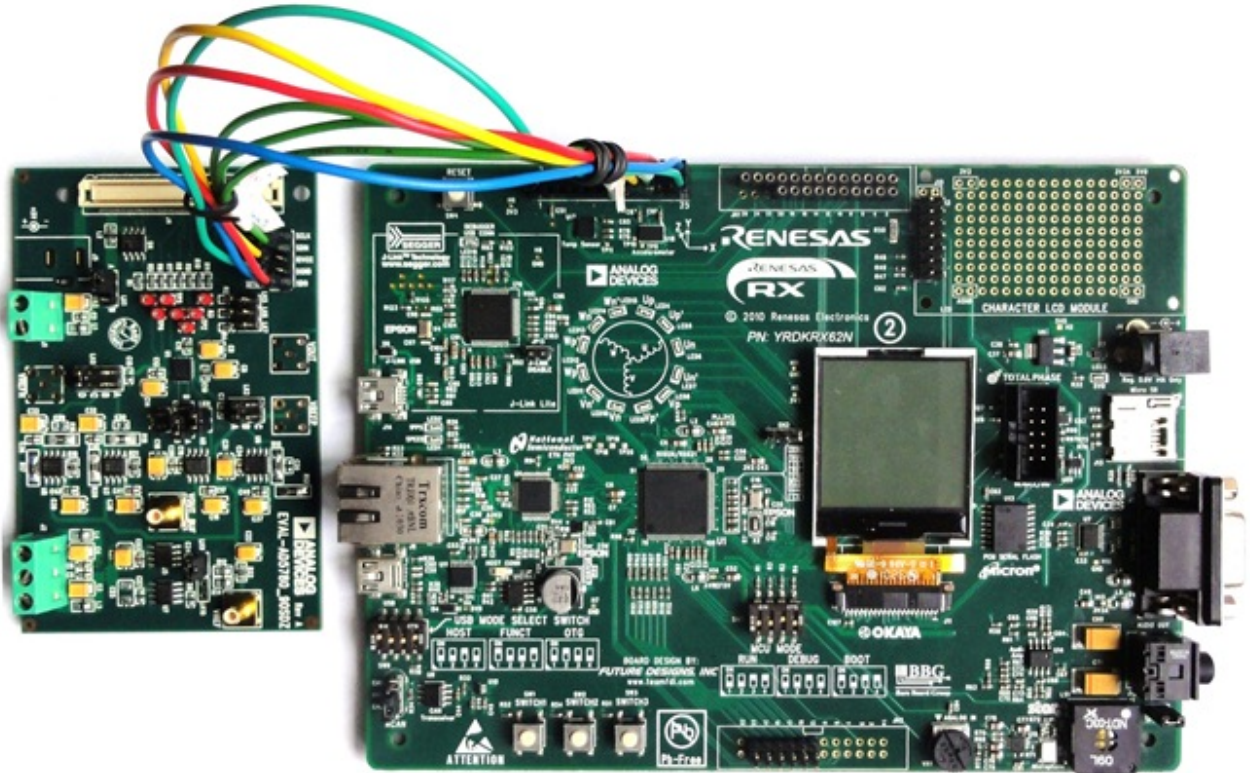
Required Software

- [High-performance Embedded Workshop for RX62N family](#)

Hardware Setup

An EVAL-AD5780EBZ board has to be interfaced with the Renesas Demonstration Kit (RDK) for RX62N:

EVAL-AD5780SDZ J3 connector Pin 15	SYNC (CS)	→	YRDKRX62N J8 connector
EVAL-AD5780SDZ J3 connector Pin 19	SDIN (MOSI)	→	YRDKRX62N J8 connector
EVAL-AD5780SDZ J3 connector Pin 22	SDO (MISO)	→	YRDKRX62N J8 connector
EVAL-AD5780SDZ J3 connector Pin 20	SCLK (SCLK)	→	YRDKRX62N J8 connector
EVAL-AD5780SDZ J3 connector Pin 4	DGND (DGND)	→	YRDKRX62N J8 connector
EVAL-AD5780SDZ J3 connector Pin 17	LDAC (LDAC)	→	YRDKRX62N J8 connector
EVAL-AD5780SDZ J3 connector Pin 25	CLR (CLR)	→	YRDKRX62N J8 connector
EVAL-AD5780SDZ J3 connector Pin 26	RESET (Reset)	→	YRDKRX62N J8 connector



Reference Project Overview

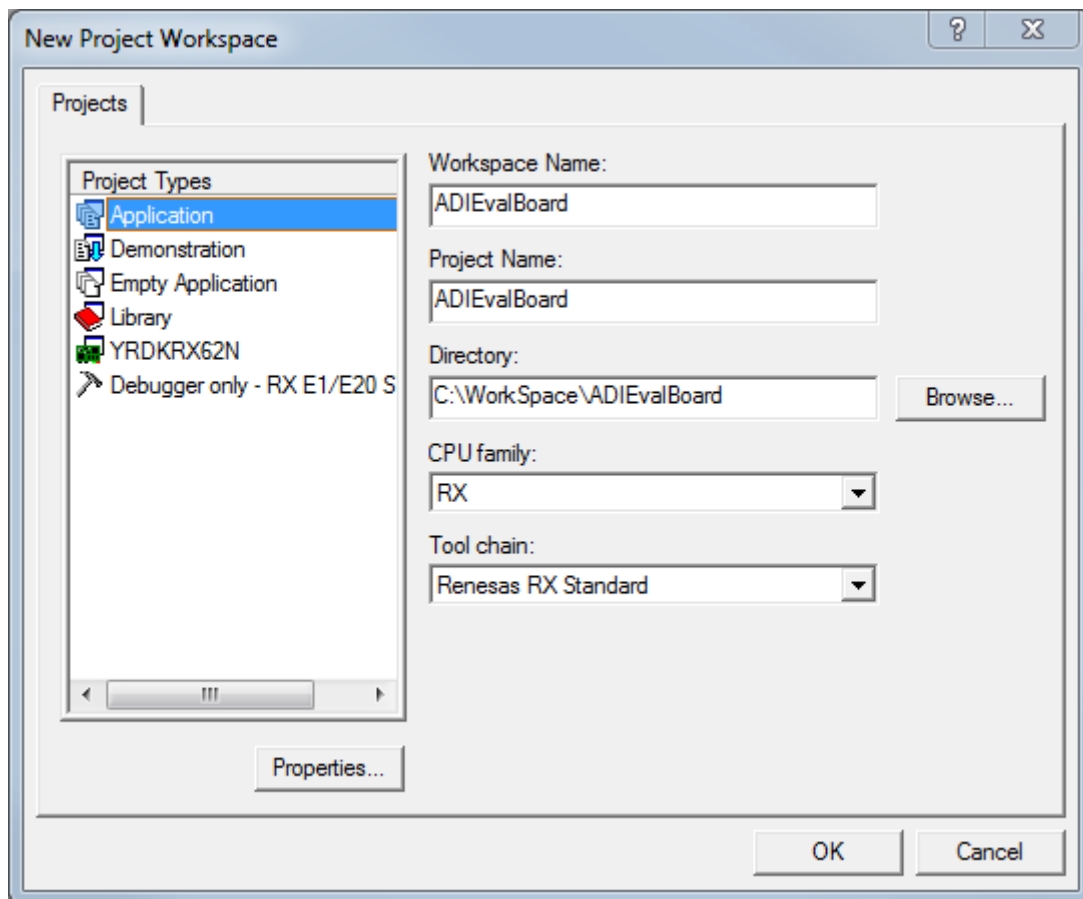
The reference project: The reference project initializes the device, reads the parts internal registers displays them and then generates a triangle signal.



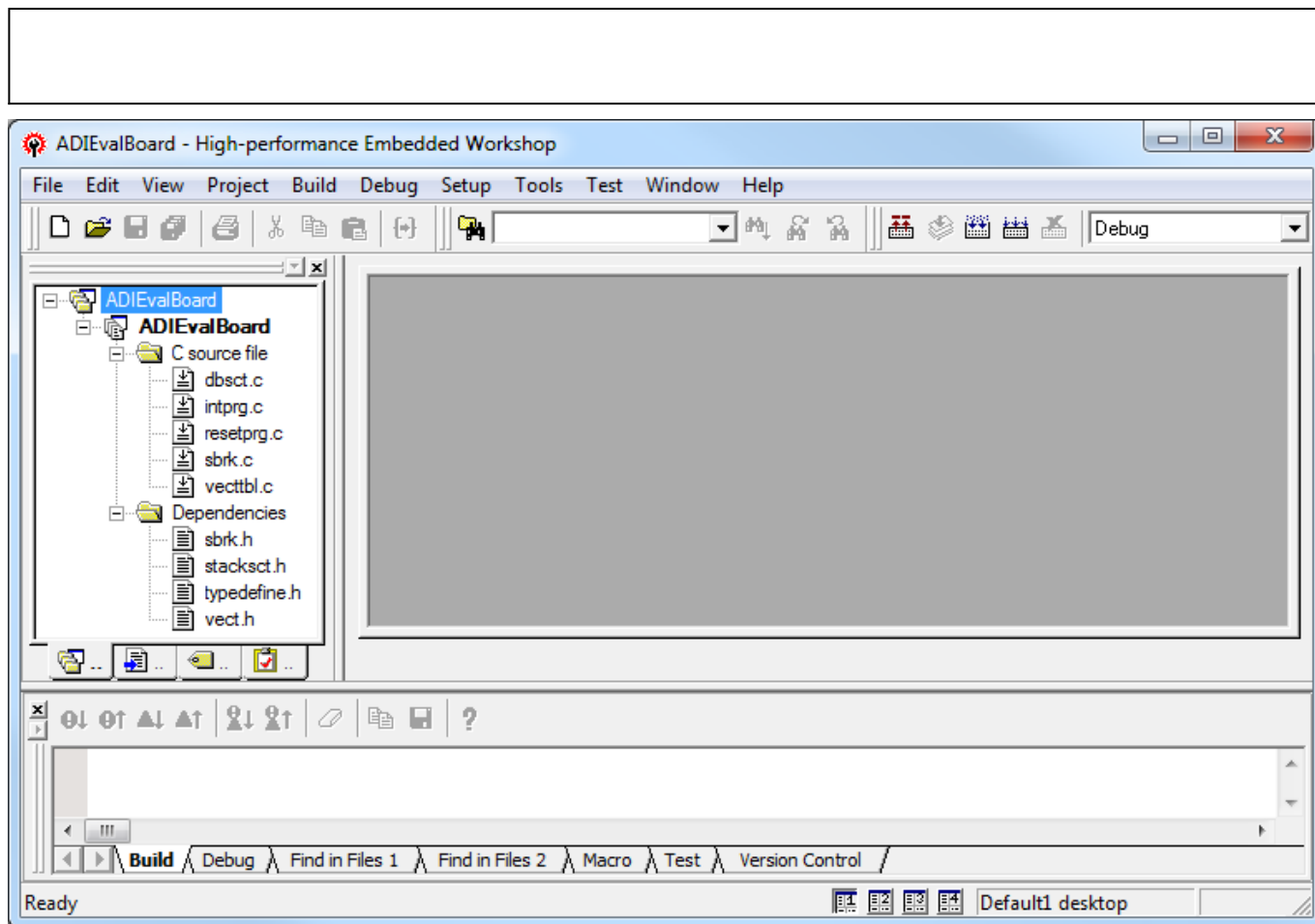
Software Project Setup

This section presents the steps for developing a software application that will run on the **Renesas Demo Kit for RX62N** for controlling and monitoring the operation of the ADI part.

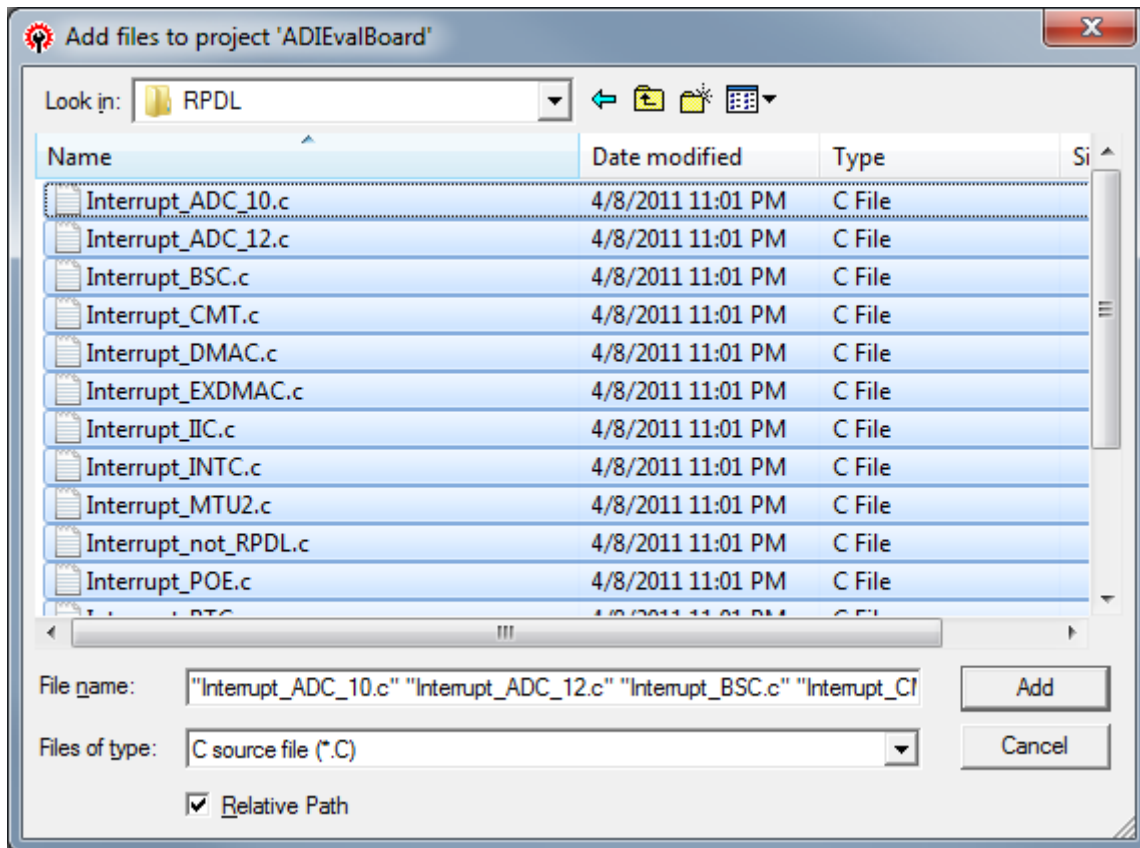
- Run the **High-performance Embedded Workshop** integrated development environment.
- A window will appear asking to create or open project workspace. Choose "Create a new project workspace" option and press OK.
- From "Project Types" option select "Application", name the Workspace and the Project "ADIEvalBoard", select the "RX" CPU family and "Renesas RX Standard" tool chain. Press OK.



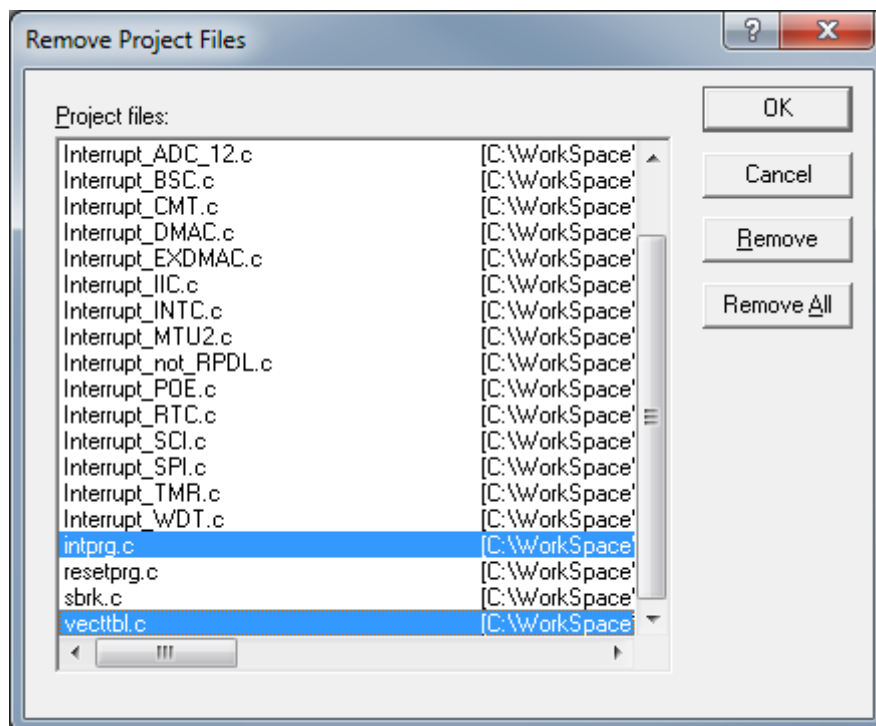
- A few windows will appear asking to configure the project:
 - In the “*Select Target CPU*” window, select “RX600” CPU series, “RX62N” CPU Type and press *Next*.
 - In the “*Option Setting*” windows keep default settings and press *Next*.
 - In the “*Setting the Content of Files to be generated*” window select “None” for the “*Generate main() Function*” option and press *Next*.
 - In the “*Setting the Standard Library*” window press “Disable all” and then *Next*.
 - In the “*Setting the Stack Area*” window check the “*Use User Stack*” option and press *Next*.
 - In the “*Setting the Vector*” window keep default settings and press *Next*.
 - In the “*Setting the Target System for Debugging*” window choose “RX600 Segger J-Link” target and press *Next*.
 - In the “*Setting the Debugger Options*” and “*Changing the Files Name to be created*” windows keep default settings, press *Next* and *Finish*.
- The workspace is created.



- The RPD (Renesas Peripheral Driver Library) has to be integrated in the project. Unzip the RPD files (double-click on the file "*RPD_RX62N.exe*"). Navigate to where the RPD files were unpacked and double-click on the "*Copy_RPD_RX62N.bat*" to start the copy process. Choose the LQFP package, type the full path where the project was created and after the files were copied, press any key to close the window.
- The new source files have to be included in the project. Use the key sequence *Alt, P, A* to open the "*Add files to project 'ADIEvalBoard'*" window. Double click on the RPD folder. From the "*Files of type*" drop-down list, select "*C source file (*.C)*". Select all of the files and press *Add*.

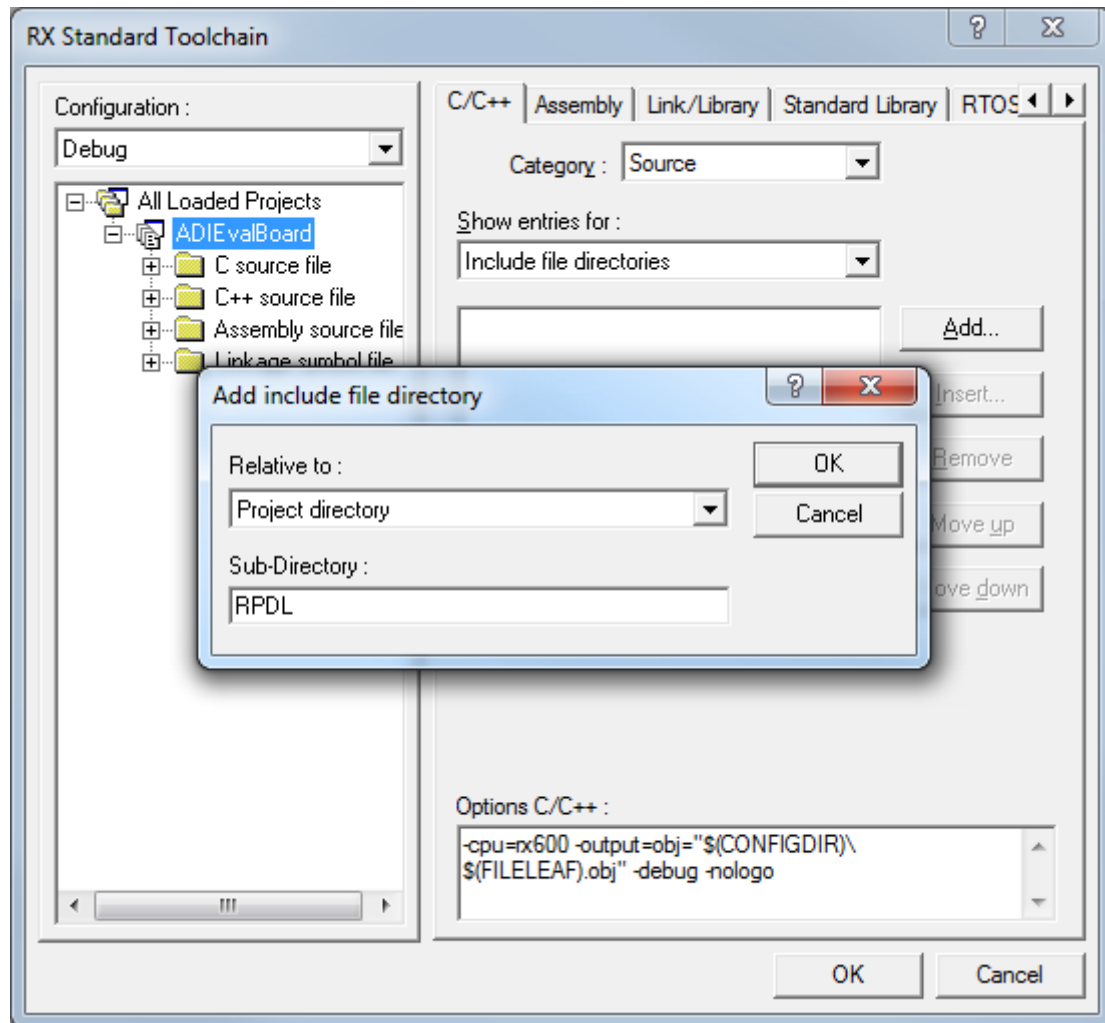


- To avoid conflicts with standard project files remove the files *“intprg.c”* and *“vecttbl.c”* which are included in the project. Use the key sequence *Alt, P, R* to open the *“Remove Project Files”* window. Select the files, click on Remove and press OK.

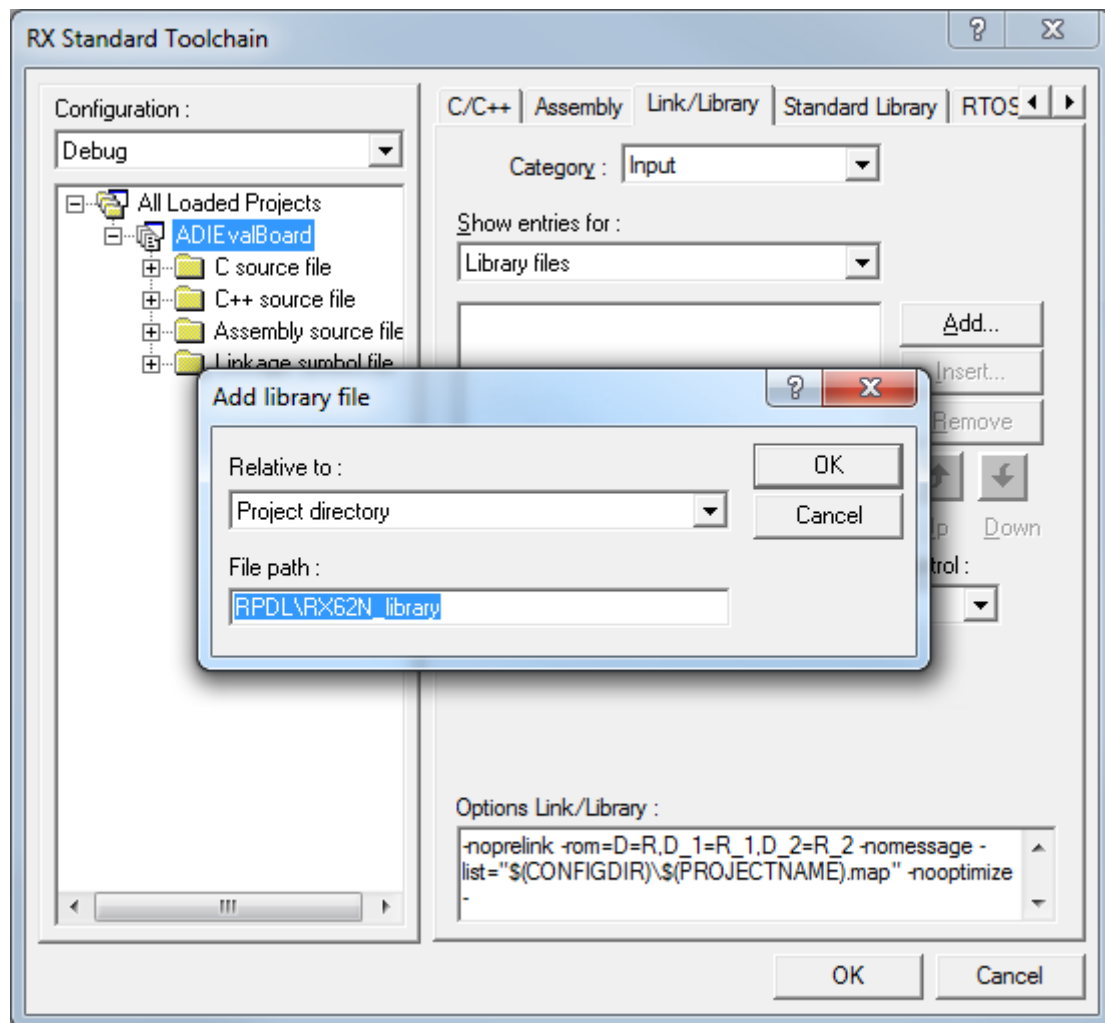


- Next the new directory has to be included in the project. Use the key sequence *Alt, B, R* to open the *“RX Standard Toolchain”* window. Select the C/C++ tab, select *“Show entries for: Include file directories”* and press Add. Select *“Relative to: Project directory”*, type *“RPDL”* as sub-directory and

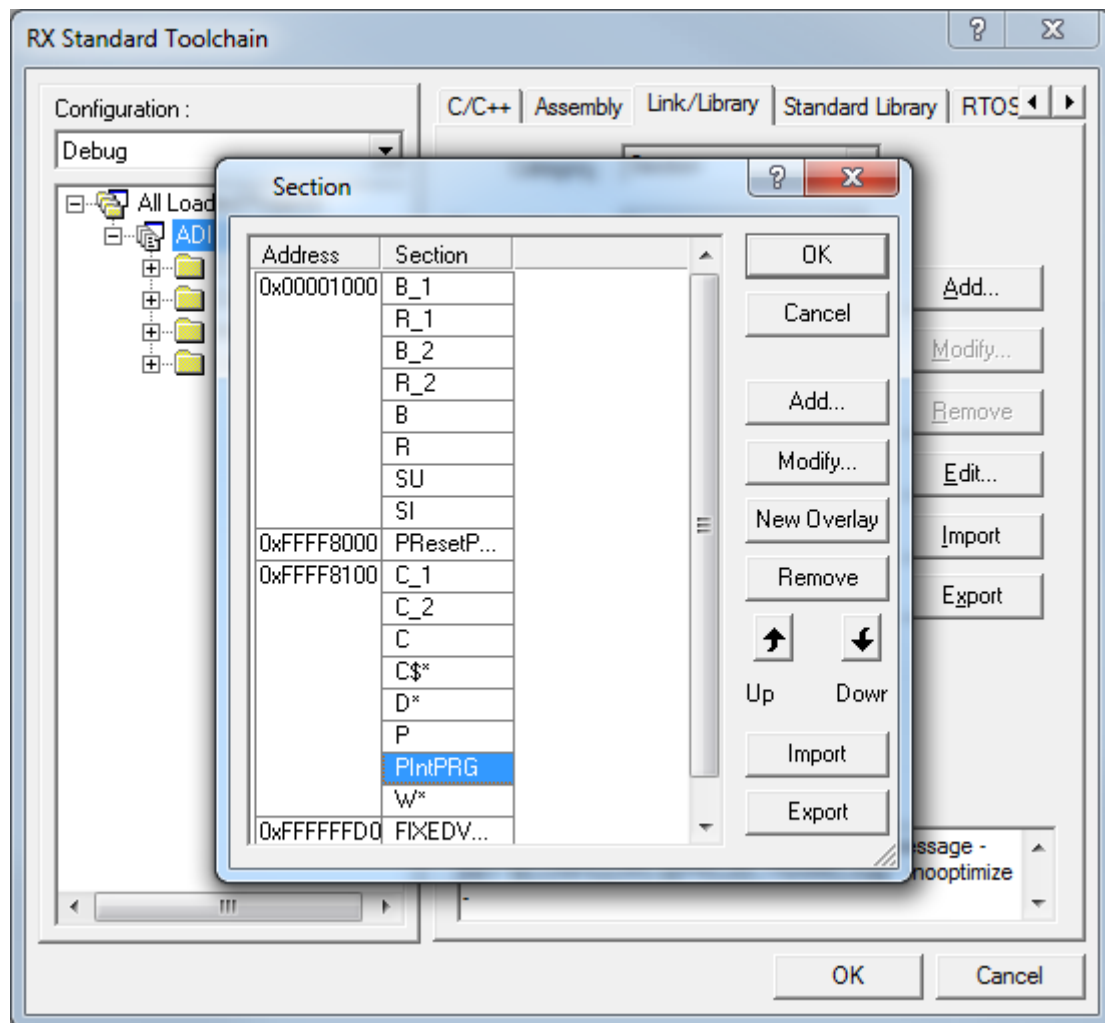
press OK.



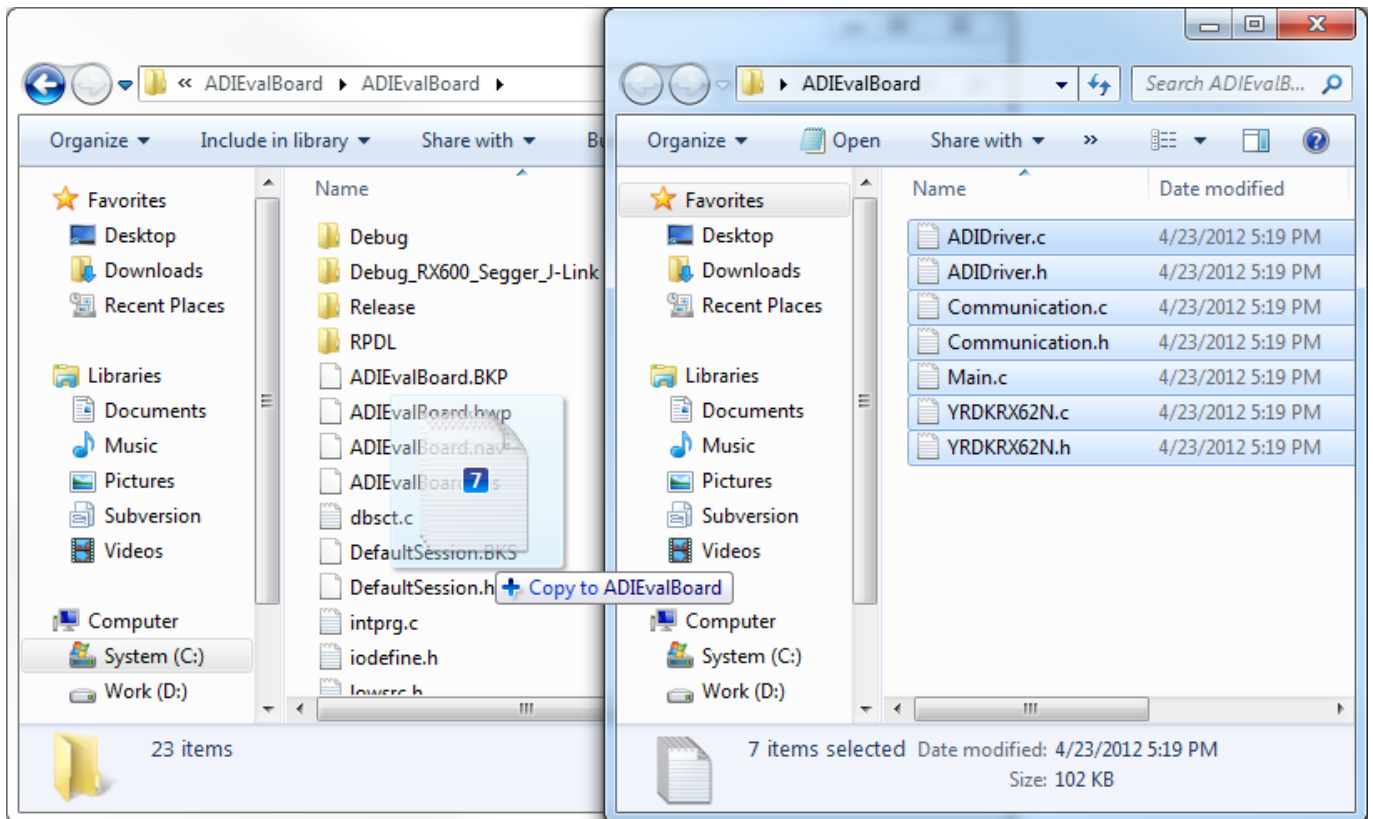
- The library file path has to be added in the project. Select the Link/Library tab, select “Show entries for: Library files” and press Add. Select “Relative to: Project directory”, type “RPDL\RX62N_library” as file path and press OK.



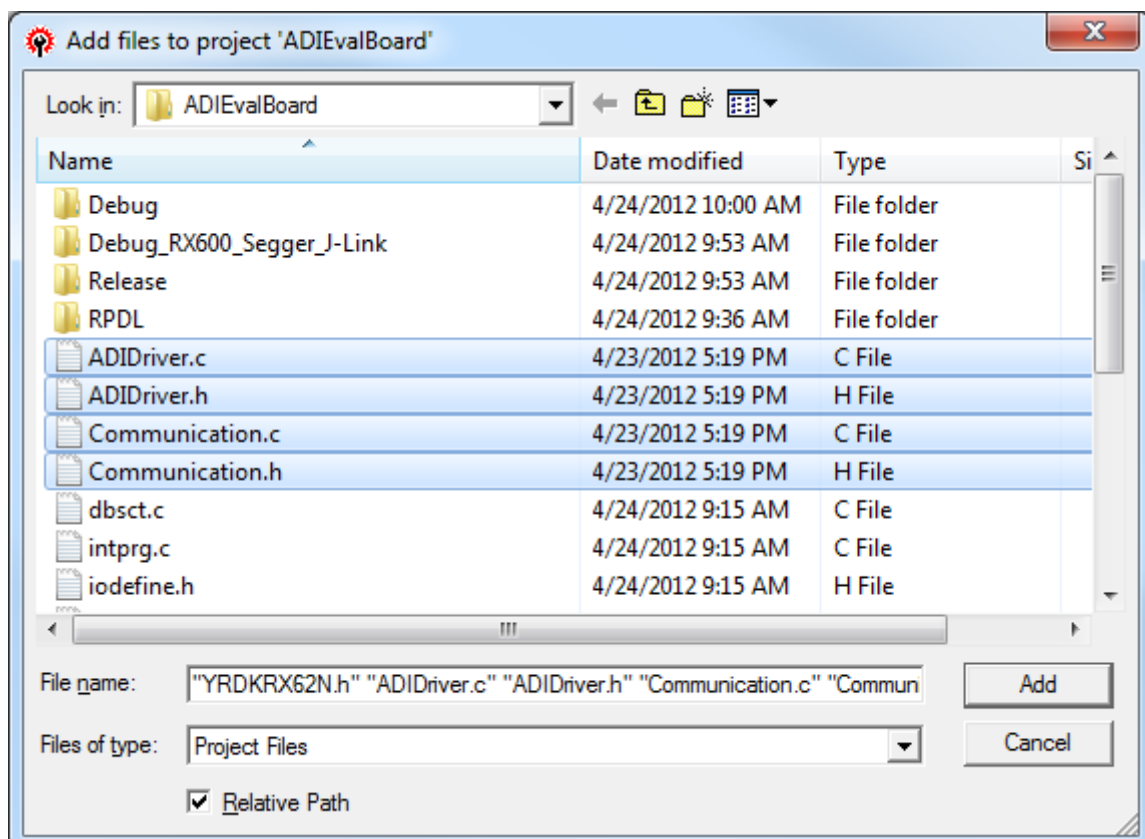
- Because the *"intprg.c"* file was removed the *"PIntPrg"* specified in option *"start"* has to be removed. Change *"Category"* to *"Section"*. Press *"Edit"*, select *"PIntPRG"* and press *"Remove"*. From this window the address of each section can be also modified. After all the changes are made press *OK* two times.



- At this point the files extracted from the zip file located in the “*Software Tools*” section have to be added into the project. Copy all the files from the archive into the project folder.



- Now, the files have to be included in the project. Use the key sequence **Alt, P, A** to open the “Add files to project ‘ADIEvalBoard’” window. Navigate into ADI folder. From the “Files of type” drop-down list, select “Project Files”. Select all the copied files and press **Add**.



- Now, the project is ready to be built. Press **F7**. The message after the Build Process is finished has to

be “0 Errors, 0 Warnings”. To run the program on the board, you have to download the firmware into the microprocessor’s memory.

03 Feb 2012 14:32 · [Dragos Bogdan](#)

More information

- [ask questions about the Microcontroller no-OS Drivers](#)
- Example questions:
 - [Generate initialization script in SPI form for AD9361](#) by RobertM
 - [AD9653 No OS Driver](#) by Emrah
 - [AD9361 Gain Mode Data Port Timing Issues](#) by andrew.dickson
 - [BBBW vs Fcutoff](#) by rgetz
 - [AD9361 Rx Analog Group Delay](#) by jsammy

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