

AP16174

XE164

UConnect-CAN XE164 "Cookery Book" for a
hello world application

Using DAvE (Code Generator)

Using the KEIL tool chain μ Vision 4 (IDE,
Compiler, Utility Tools)

Microcontrollers



Never stop thinking

Edition 2010-04-22

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AP08048

Revision History: 2010-04 V2.0

Previous Version: none

Page	Subjects (major changes since last revision)

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Your feedback will help us to continuously improve the quality of this document.
Please send your proposal (including a reference to this document) to:

mcdocu.comments@infineon.com



Note: Table of Contents [see page 9](#).

Introduction:

This “Appnote” is a Hands-On-Training / Cookery Book / step-by-step book.
It will help inexperienced users to get an UConnect-CAN XE164 up and running.

With this step-by-step book you should be able to get your first useful program in less than 2 hours.

The purpose of this document is to gain know-how of the microcontroller and the tool-chain.
Additionally, the "hello-world-example" can easily be expanded to suit your needs.
You can connect either a part of - or your entire application to the UConnect-CAN XE164.
You are also able to benchmark any of your algorithms to find out if the selected microcontroller fulfils all the required functions within the time frame needed.

Note:

The style used in this document focuses on working through this material as fast and easily as possible. That means there are full screenshots instead of dialog-window-screenshots; extensive use of colours and page breaks; and listed source-code is not formatted to ease copy & paste.

Have fun and enjoy the UConnect-CAN XE164!

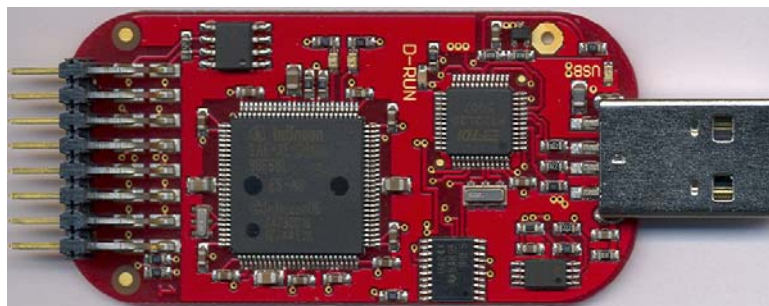
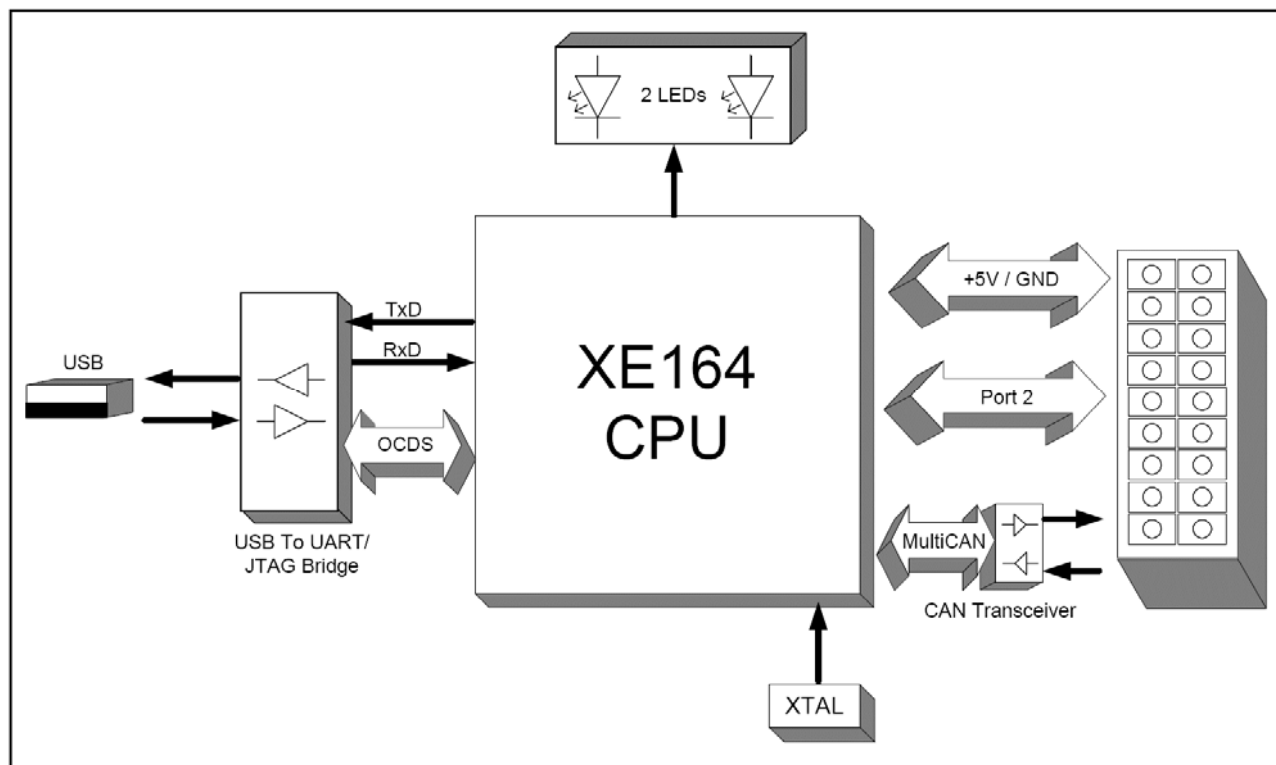


Programming Example

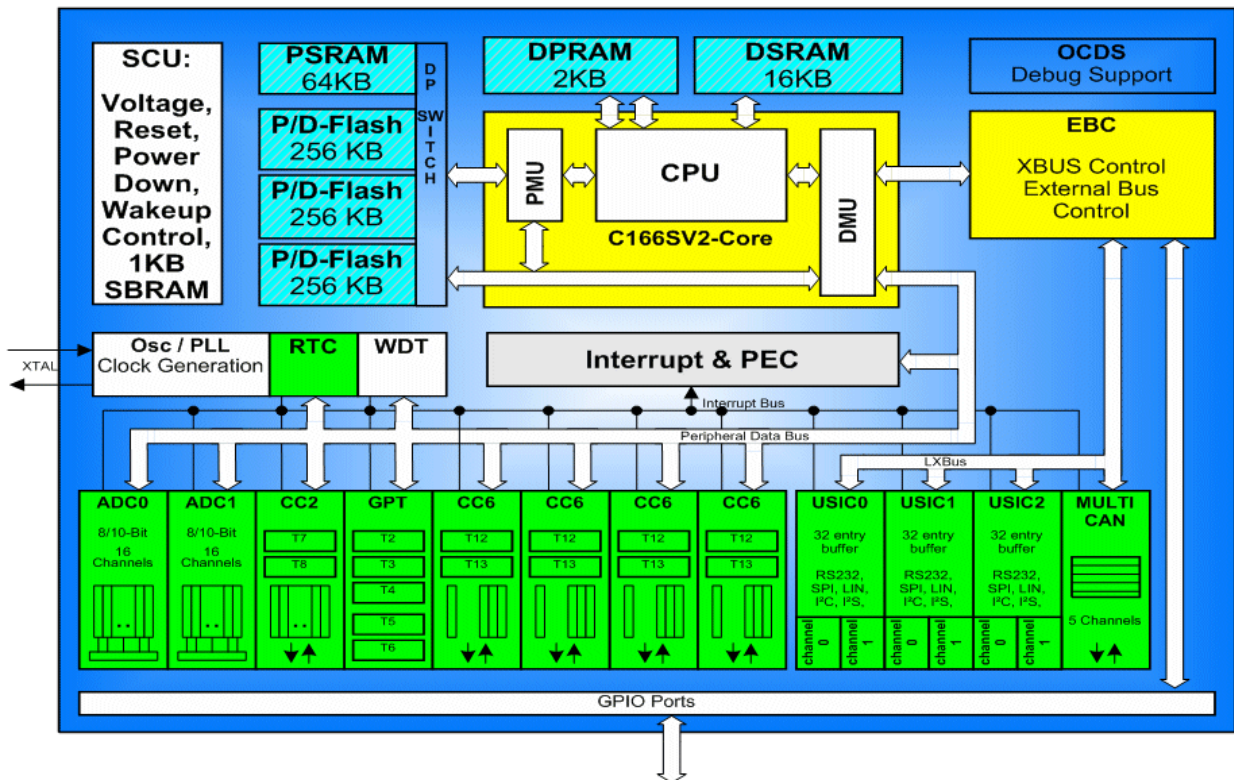
UConnect-CAN XE164



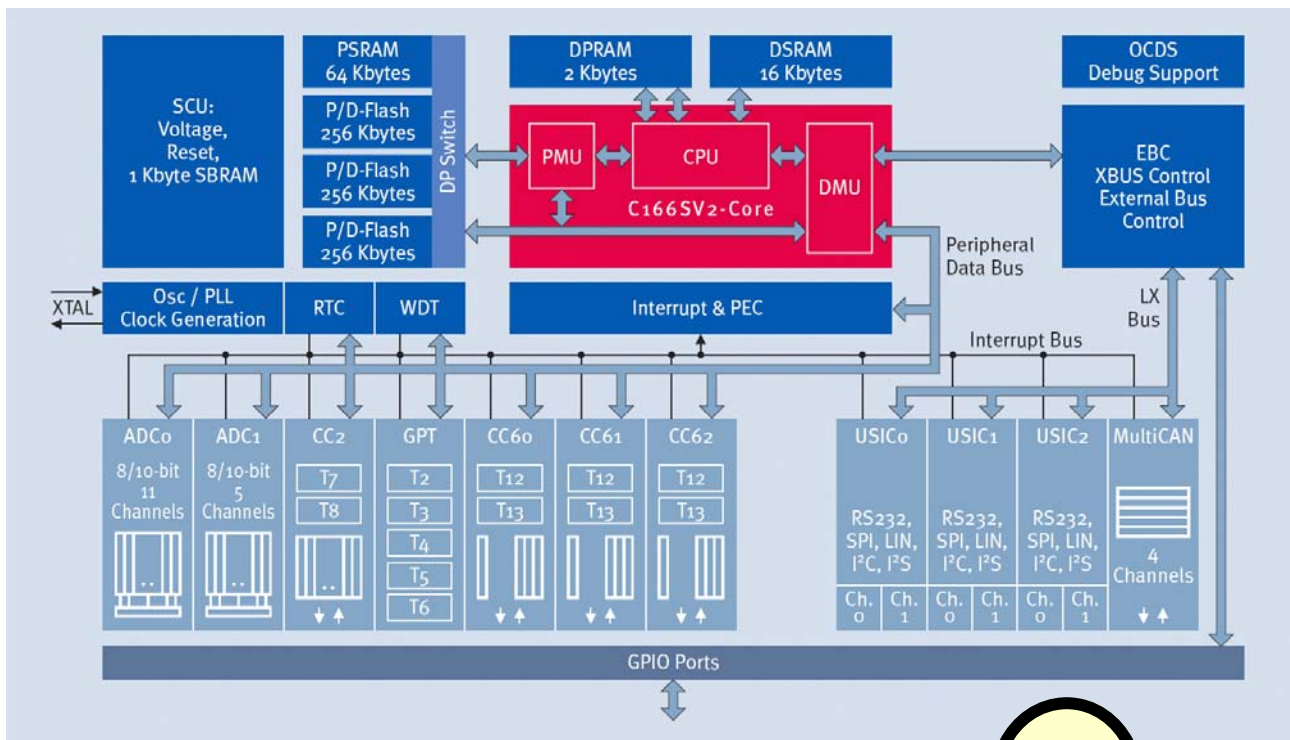
Block Diagram (Source: XE164 UConnect Manual)



SAF-XE167F-96F66L Block Diagram (Source: Product Marketing)



SAF-XE164F-96F66L Block Diagram (Source: Product Brief)

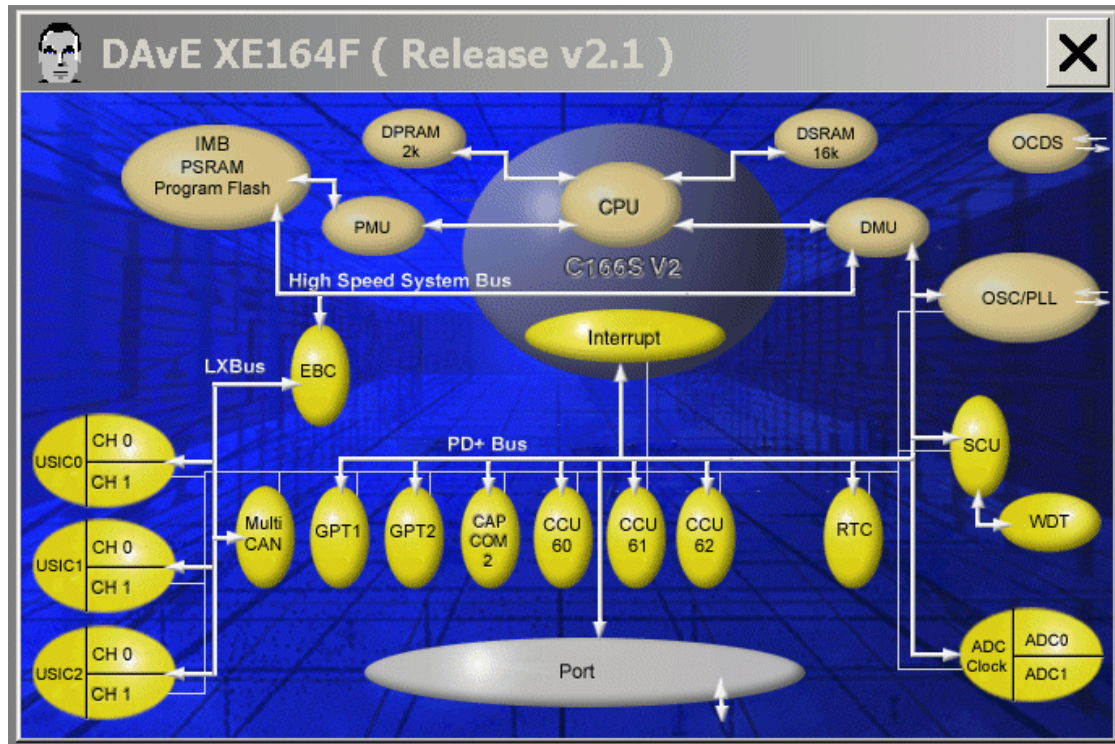


Note:

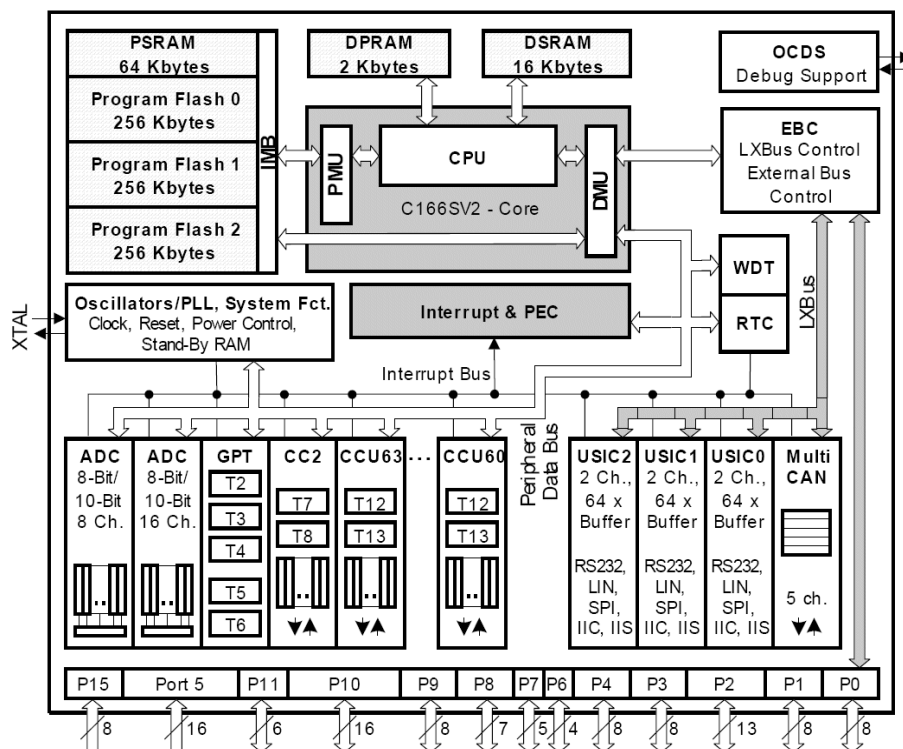
The XE164 microcontroller is a derivative of the XE167 microcontroller!



SAF-XE164F-96F66L Block Diagram (Source: DAVe)



XE16x Block Diagram (Source: User's Manual)



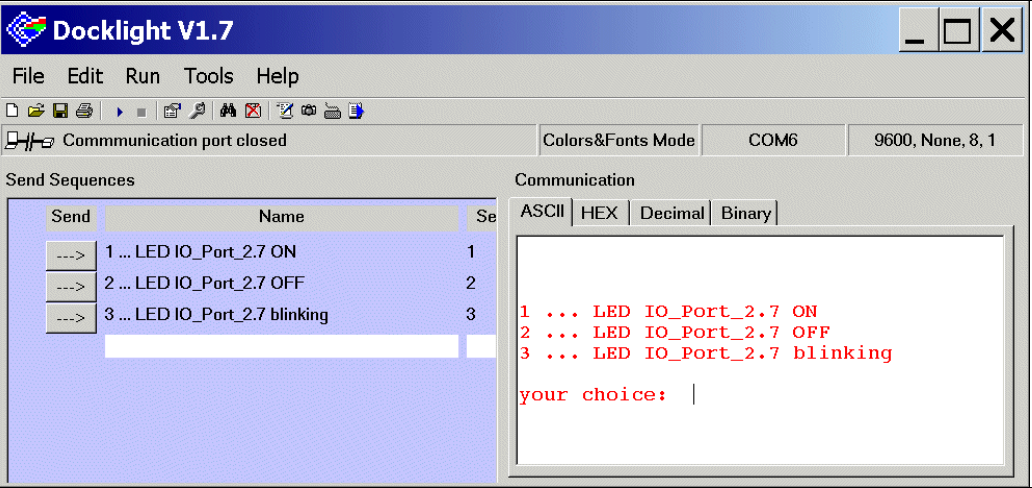
Note:

Just by comparing the different sources of block diagrams, you should be able to get a complete picture of the microcontroller and to answer some of your initial questions.



“Cookery book“

For your first programming example for the UConnect-CAN XE164:

Your program:	
Chapter/ Step	*** Recipes ***
1.)	<u>DAS Installation + Connecting the UConnect-CAN XE164</u>
2.)	<u>DAvE (program generator)</u> <u>DAvE Installation (mothersystem) + DAvE Update Installation (XE16xx Series.dip) for XE164</u>
3.)	<u>Using DAvE</u> <u>Microcontroller initialization for your programming example</u>
4.)	<u>Using the KEIL Development Tools (µVision4; C166 Version 7.00)</u> <u>Programming of your application (hello world) with the KEIL tool chain (µVision4)</u>
5.)	<u>Running your first programming example</u>

Feedback

6.)	<u>Feedback</u>
-----	---------------------------------

1.) DAS Installation + Connecting the UConnect-CAN XE164:



Screenshot of the UConnect-CAN XE164 Homepage:

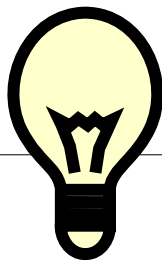
<http://www.infineon.com/cms/en/product/channel.html?channel=db3a3043183a955501183c3446e1006f>



Note:

For further information, please refer to the [XE164 UConnect Manual, V.1.0](#).
For further information, please refer to the [XE164 UConnect Manual, V.1.1](#).





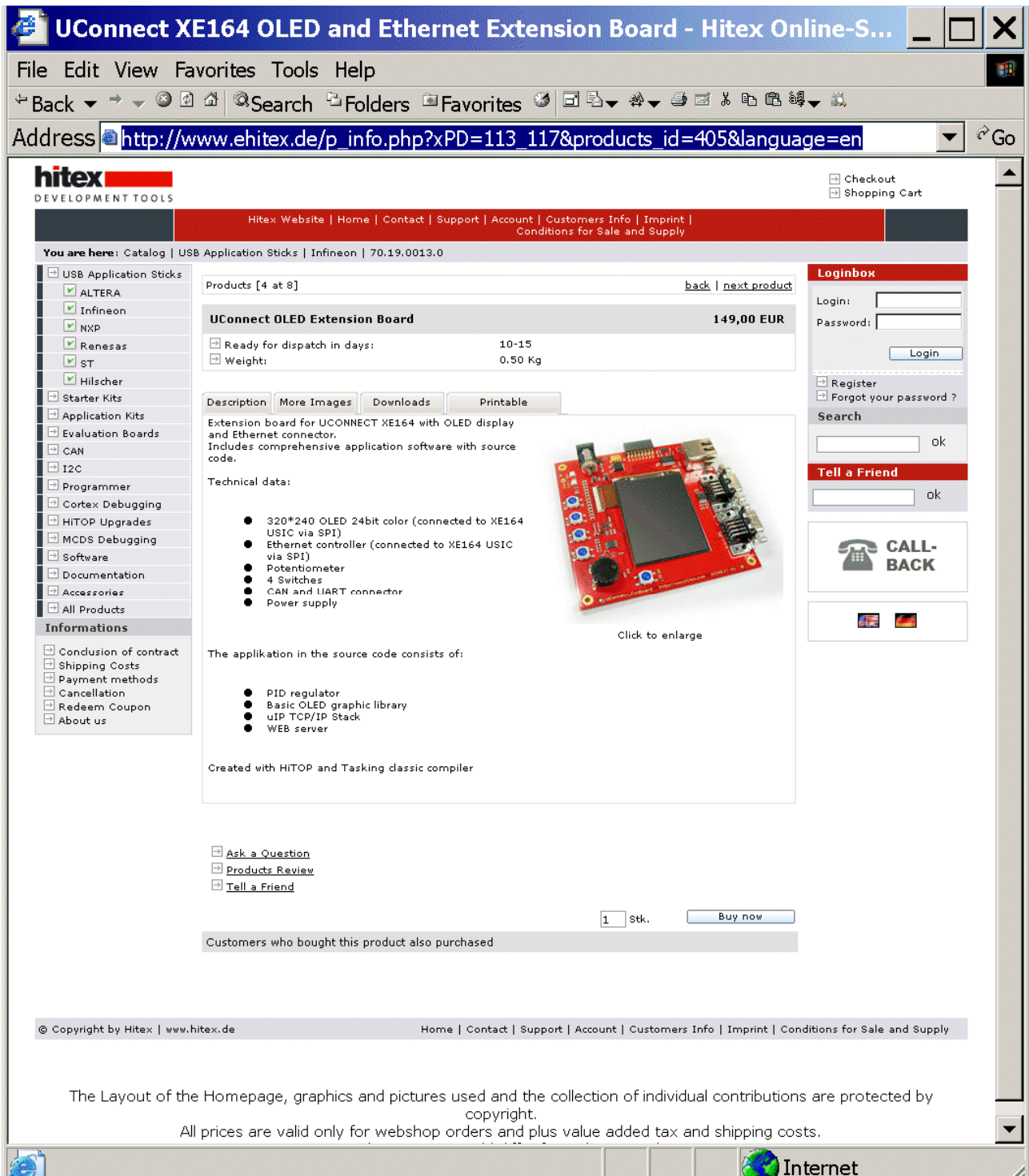
Note:

For the **UConnect-CAN XE164** there is an additional extension board **UConnect OLED Extension** with

320*240 Organic Light Emitting Diode (OLED) 24bit color (Basic OLED graphic library),
and Ethernet controller (uIP TCP/IP Stack and WEB server) available at

http://www.ehitex.de/p_info.php?products_id=405

http://www.ehitex.de/p_info.php?xPD=113_117&products_id=405&language=en.



The screenshot shows a web browser window displaying the Hitex Online-Shop. The browser's address bar shows the URL: http://www.ehitex.de/p_info.php?xPD=113_117&products_id=405&language=en. The website header includes the Hitex logo and navigation links. The main content area displays the product "UConnect OLED Extension Board" for 149,00 EUR. It includes a description, technical data, and a list of features. A sidebar on the left contains a navigation menu. The right sidebar includes a login box, a search bar, and a "Call-Back" button. The footer contains copyright information and a disclaimer.

UConnect XE164 OLED and Ethernet Extension Board - Hitex Online-S...

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Address http://www.ehitex.de/p_info.php?xPD=113_117&products_id=405&language=en Go

hitex
DEVELOPMENT TOOLS

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You are here: Catalog | USB Application Sticks | Infineon | 70.19.0013.0

USB Application Sticks

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- ☒ NXP
- ☒ Renesas
- ☒ ST
- ☒ Hilscher

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Products [4 at 8] back | next product

UConnect OLED Extension Board 149,00 EUR

☐ Ready for dispatch in days: 10-15

☐ Weight: 0.50 Kg

Description More Images Downloads Printable

Extension board for UCONNECT XE164 with OLED display and Ethernet connector. Includes comprehensive application software with source code.

Technical data:

- 320*240 OLED 24bit color (connected to XE164 USIC via SPI)
- Ethernet controller (connected to XE164 USIC via SPI)
- Potentiometer
- 4 Switches
- CAN and UART connector
- Power supply

The application in the source code consists of:

- PID regulator
- Basic OLED graphic library
- uIP TCP/IP Stack
- WEB server

Created with HITOP and Tasking classic compiler

Click to enlarge

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Internet

Install the Infineon **DAS** (D e v i c e A c c e s s S e r v e r) Server:

Go to www.infineon.com/DAS:



Note:

The DAS Server must be installed on your host computer!

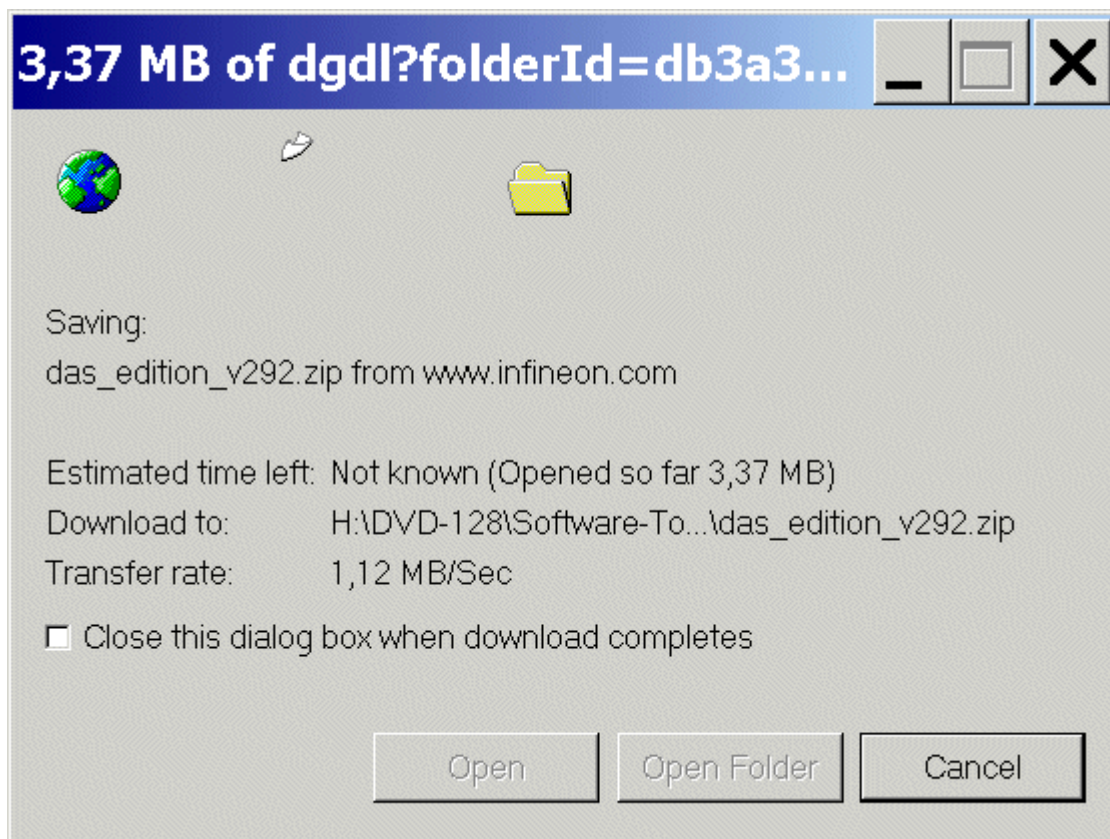
The goal of the DAS software is to provide one single interface for all types of tools (e.g. Programmers/Flash Tools, Emulators/Debugger Development Systems).

The USB Device driver communicates with the UConnect-CAN XE164 when connected to the host computer.

The USB Device driver for the UConnect-CAN XE164 USB interface is included in the DAS software.

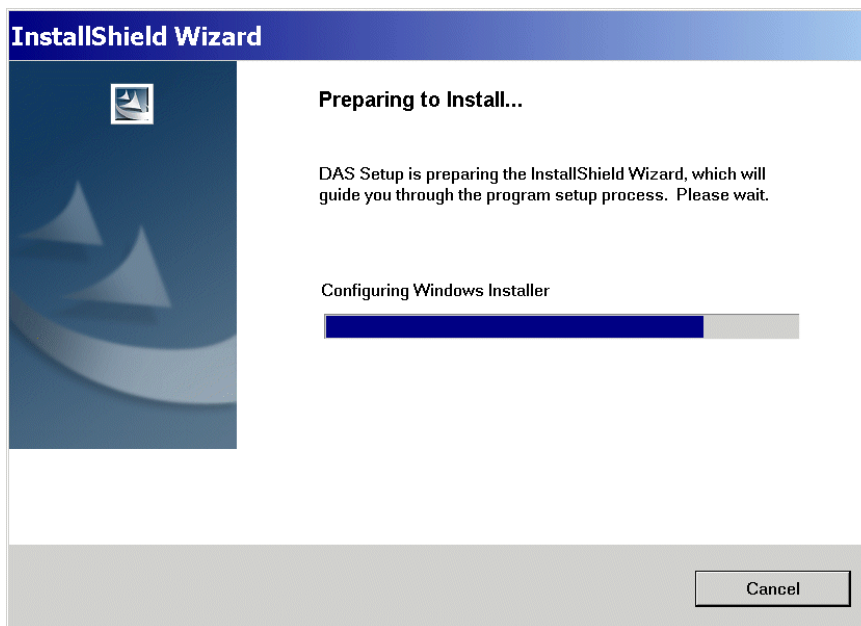
A virtual COM port driver is also included.

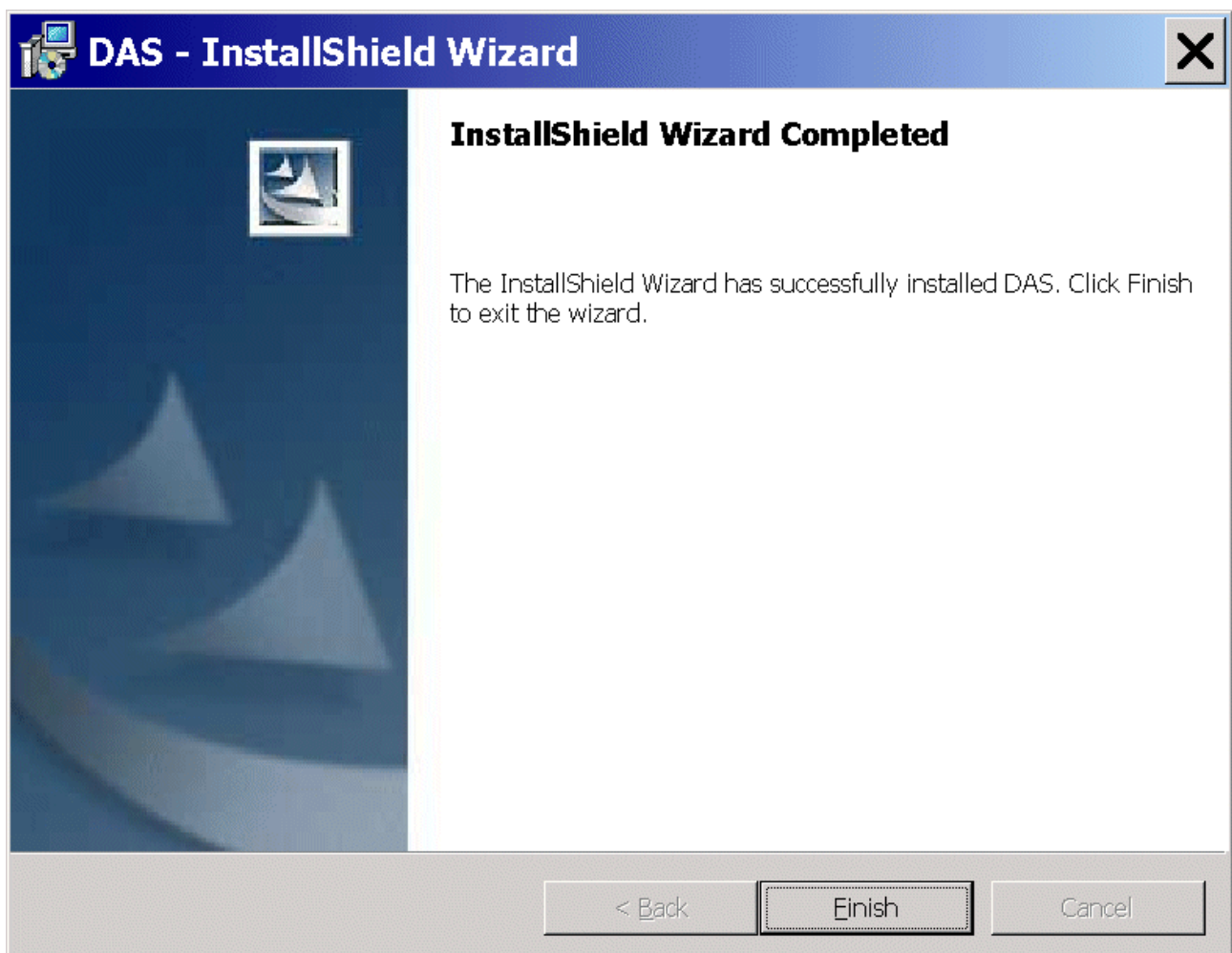
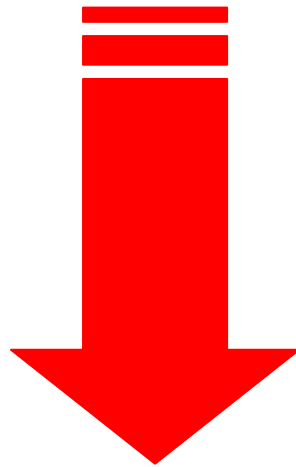
Download "The latest release version for download: DAS Edition v2.9.2"
(- or any higher version !!!):



Unzip [das_edition_v292.zip](#) and

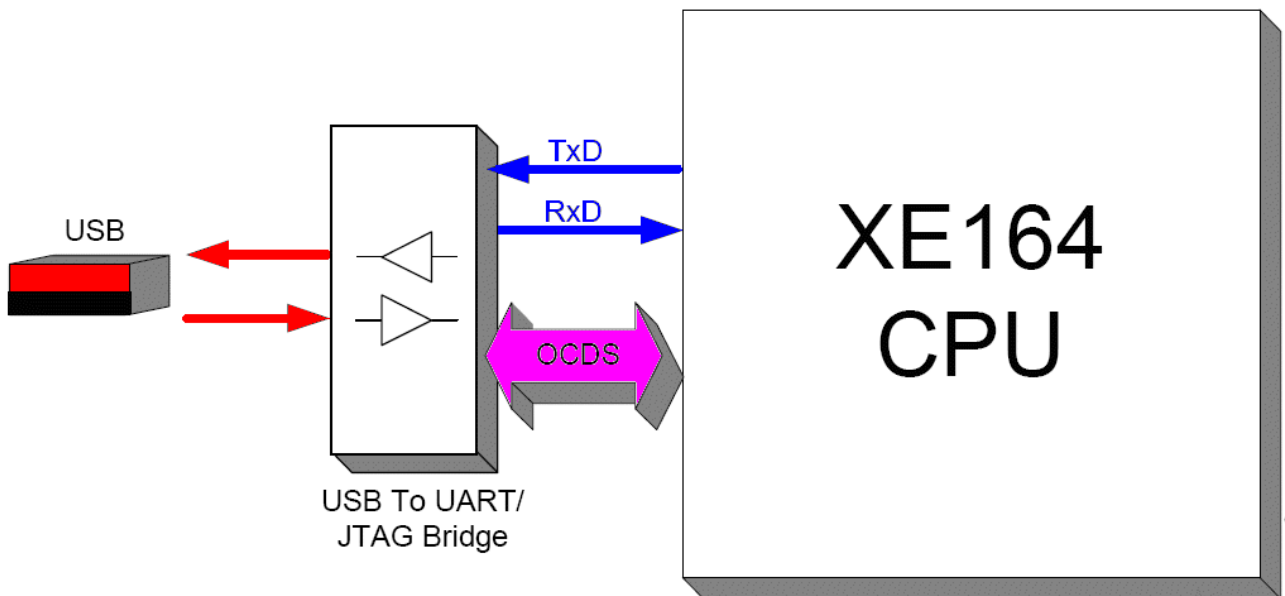
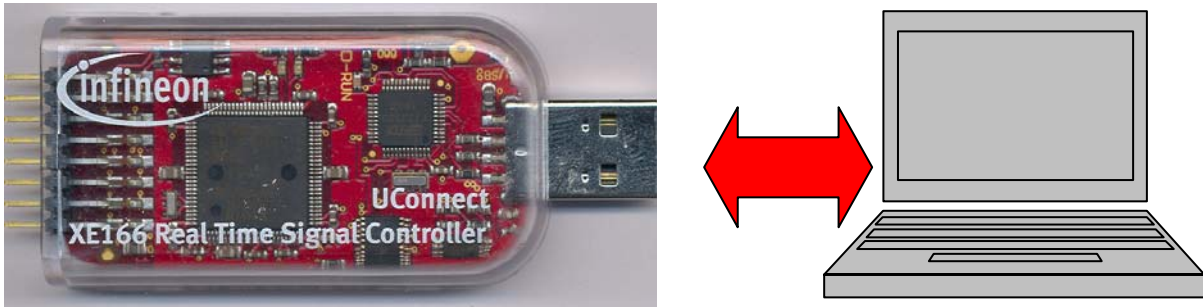
execute “DAS_v292_setup.exe” to install the DAS Server.





Click Finish

Connect the UConnect-CAN XE164 to the host computer:



USB Connection:

.) used for: **UART communication** (the USIC0_CH0/UART/RS232/serial interface is available via USB as a virtual COM port of the second USB channel of the FTDI FT2232 Dual USB to UART/JTAG interface).

.) used for: **On-Chip-Flash-Programming and Debugging** (first USB channel of the FTDI FT2232 Dual USB to UART/JTAG interface).

.) the USB connection works also as the power supply.

Found New Hardware



DAS JTAG over USB UConnect



Note:

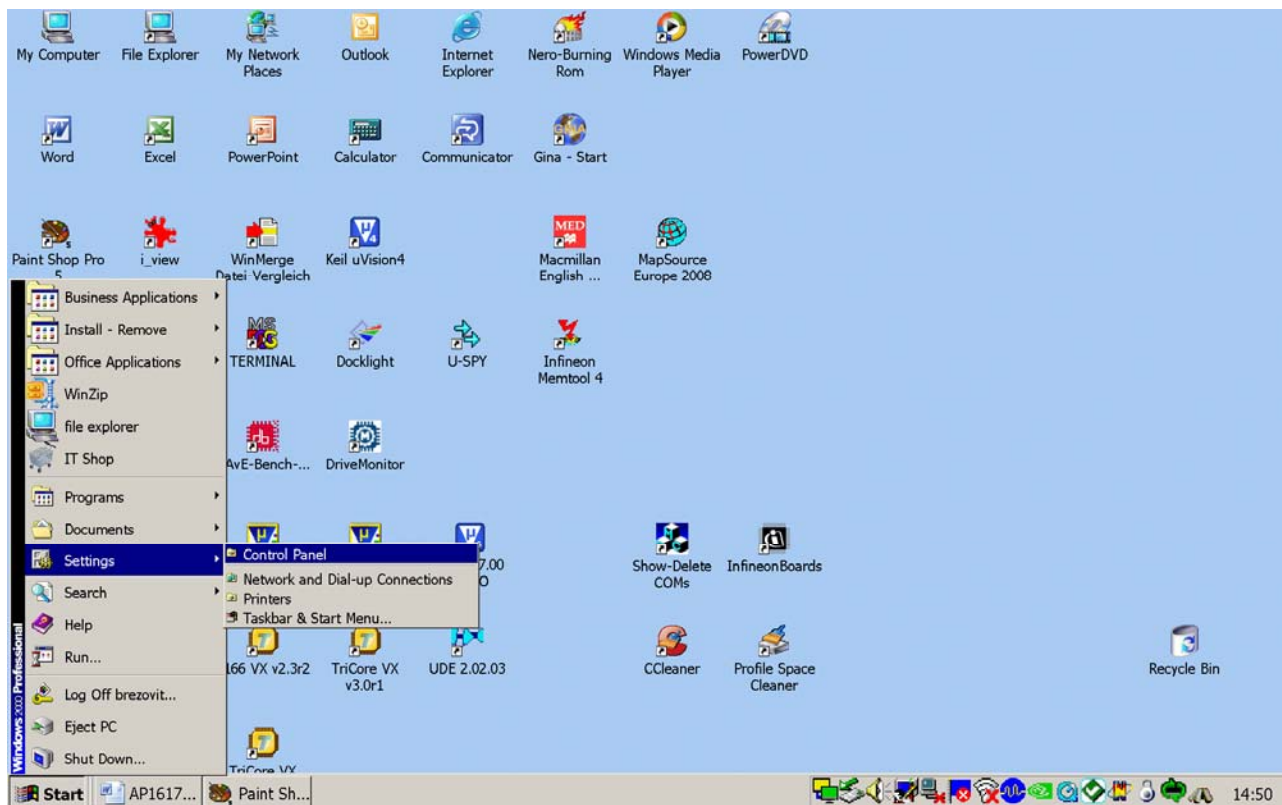
A USB driver is installed the first time while connecting the UConnect-CAN XE164 via USB to your host computer.

Note:

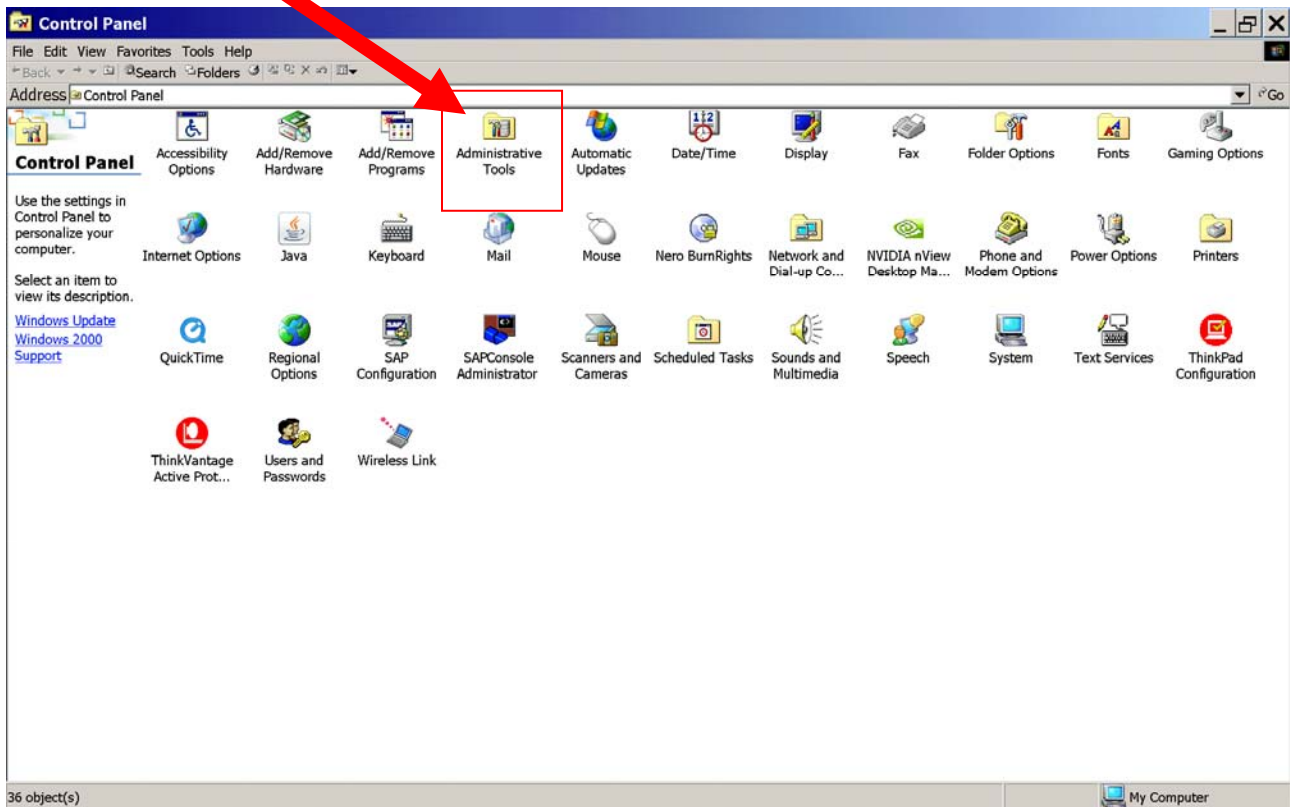
A default virtual COM Port is generated.

Using a Windows 2000 operating system, we are now going to search for the virtual COM Port which was generated after connecting our UConnect-CAN XE164:

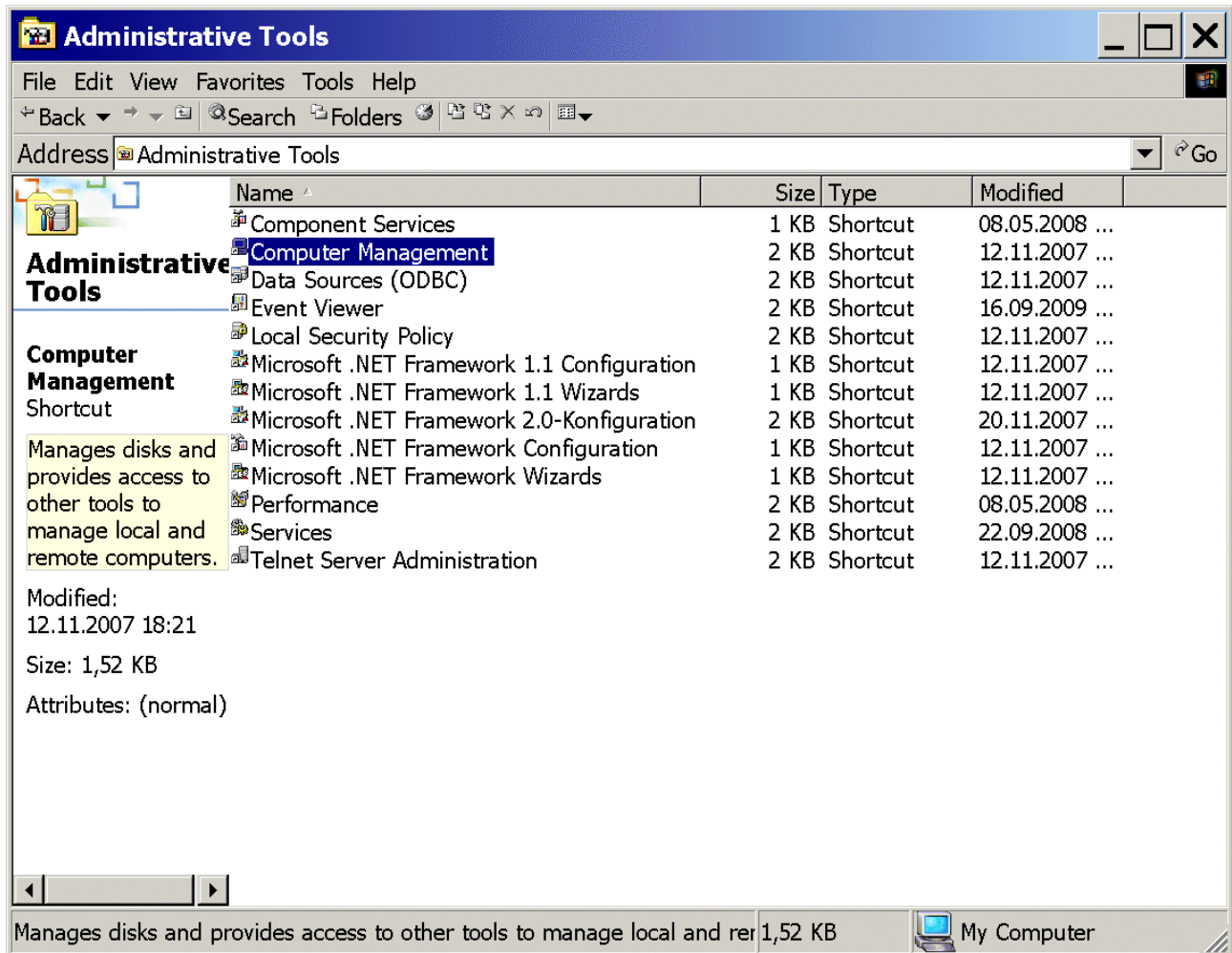
Start – Settings – Control Panel



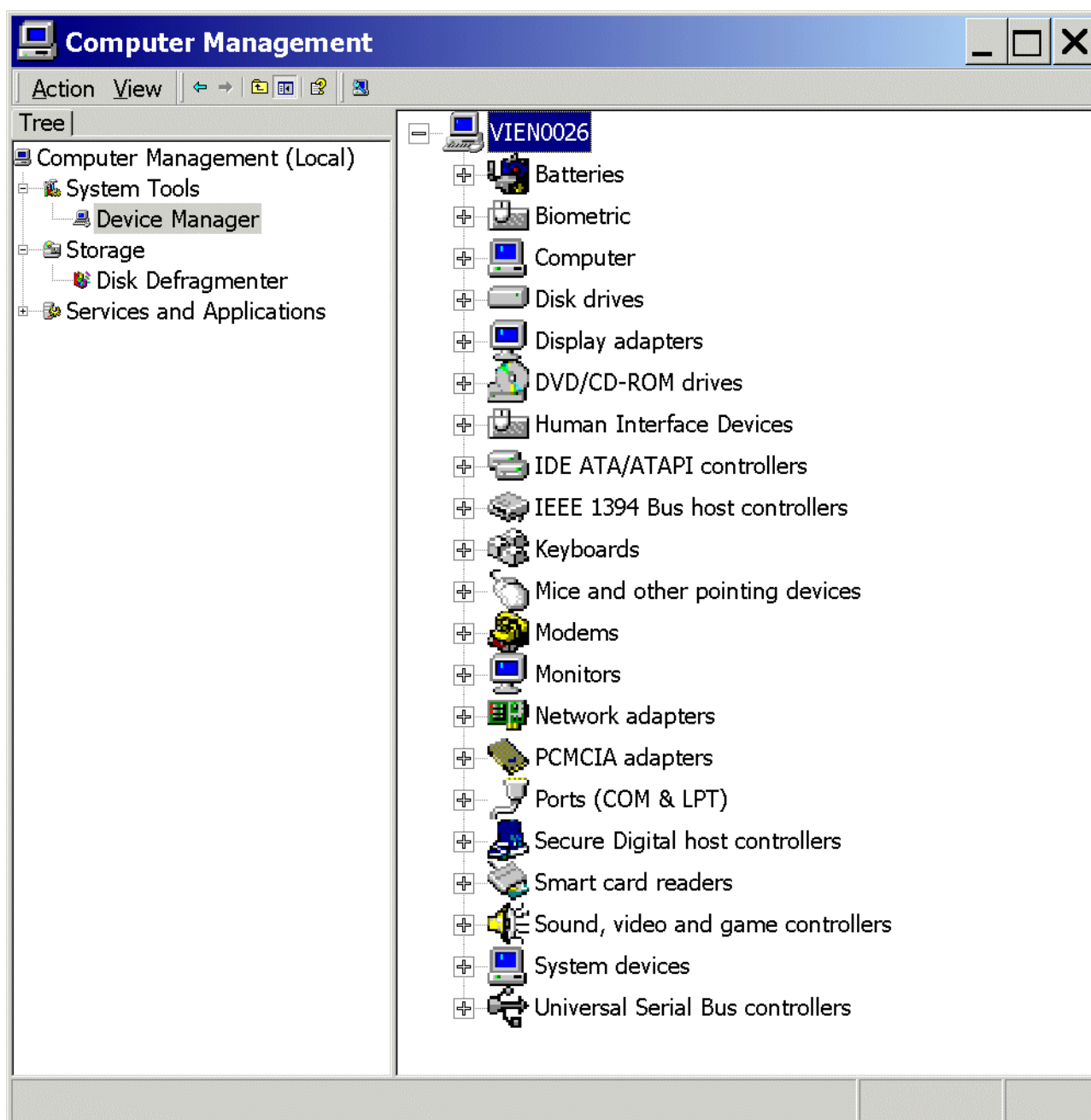
Double click: Administrative Tools



Double click: Computer Management



Click: Device Manager

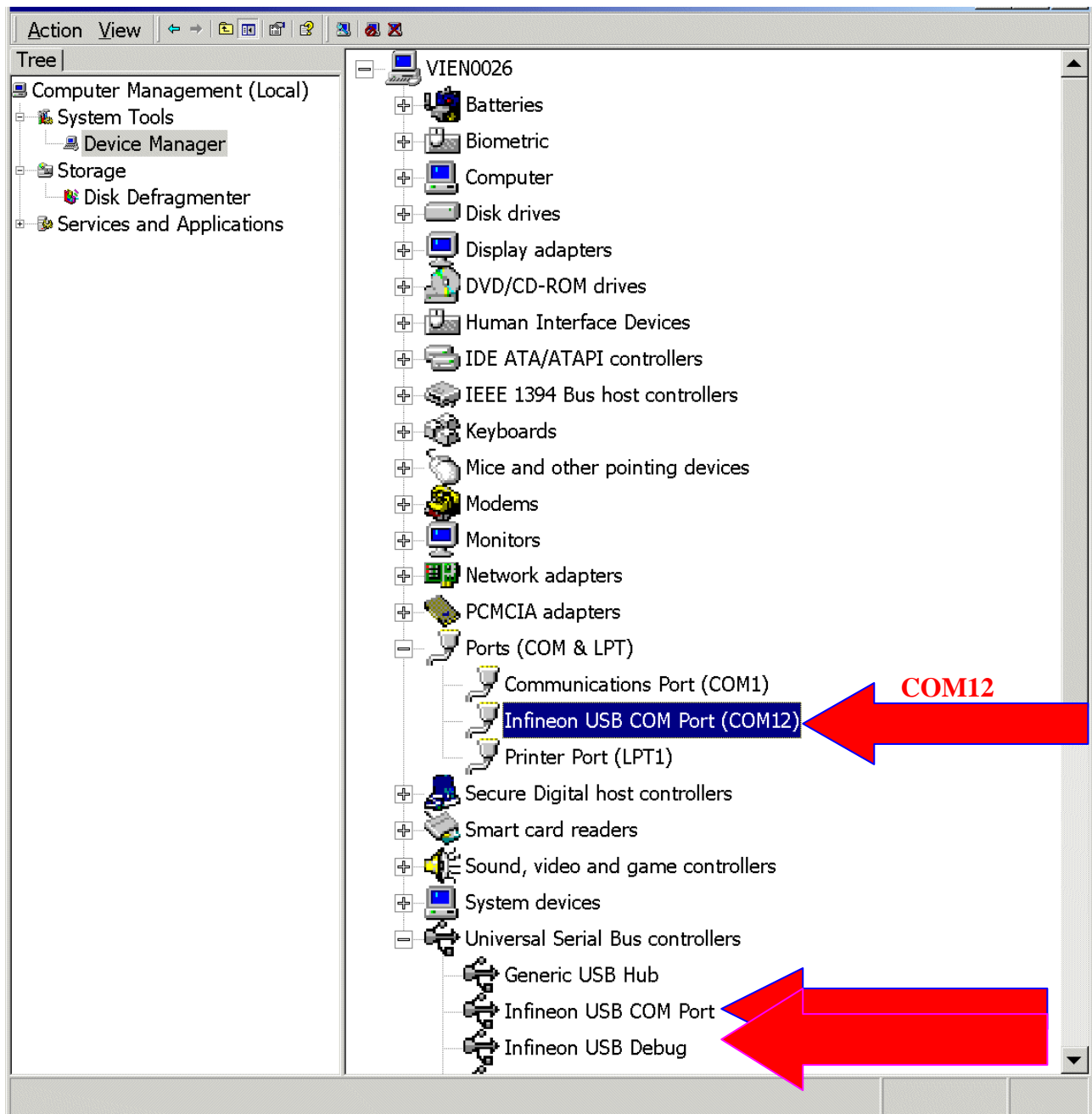


Expand: Ports (COM & LPT):

Expand: Universal Serial Bus controllers:

Note:

As we can see:
our virtual COM Port for
UART/RS232 communication with the
UConnect-CAN XE164 via USB is
COM12!

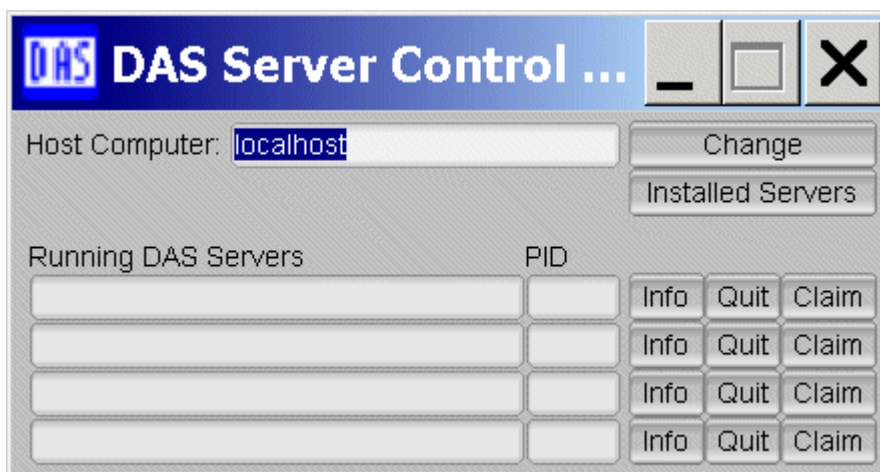
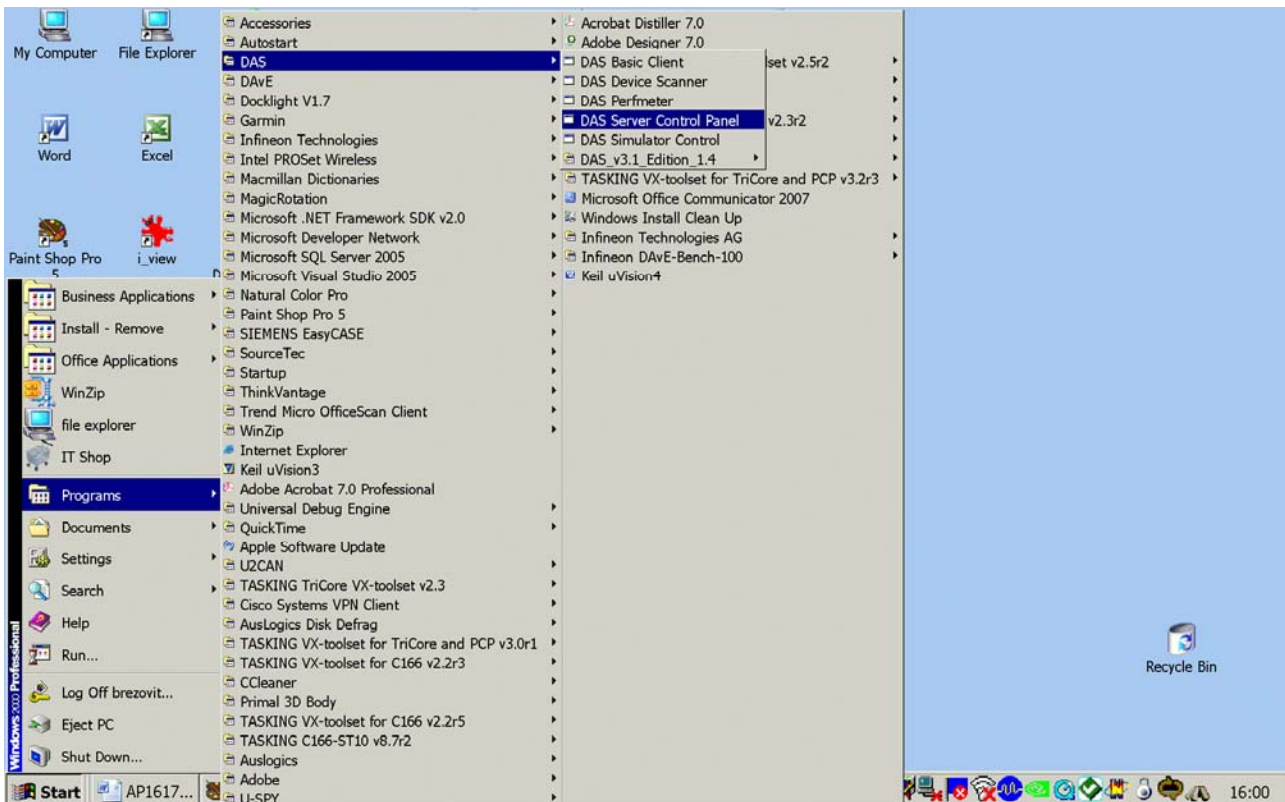




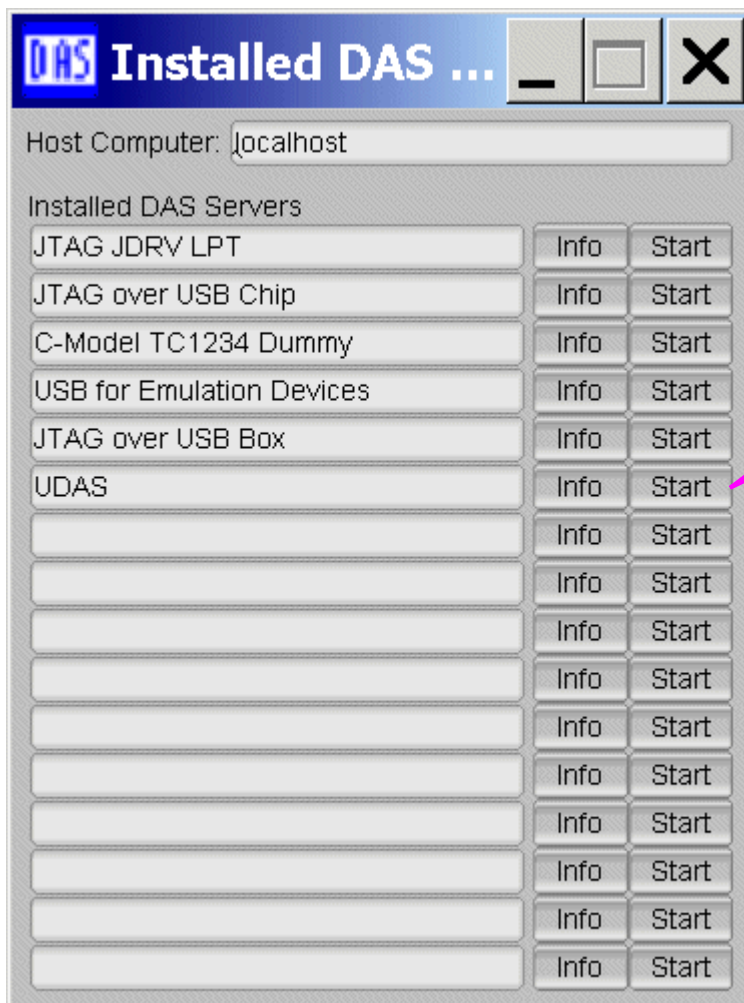
(U)DAS (Universal Device Access Server) Server **hint 1**:

If (U)DAS is not running – even though the board is connected – you may start UDAS with the following dialog:

Start – Programs – DAS – DAS Server Control Panel



Click Installed DAS Servers:



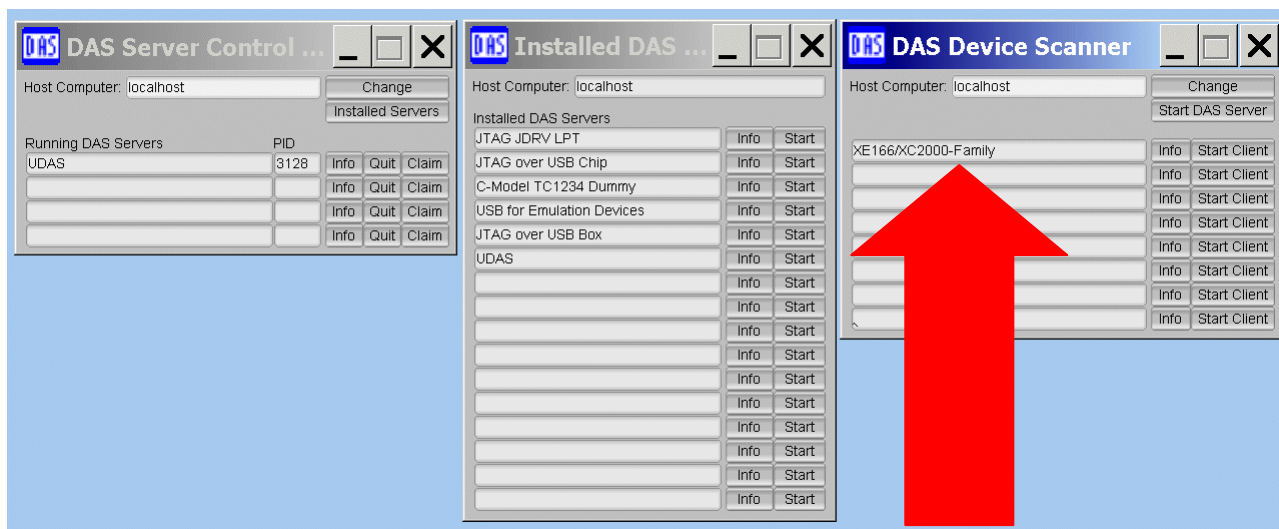
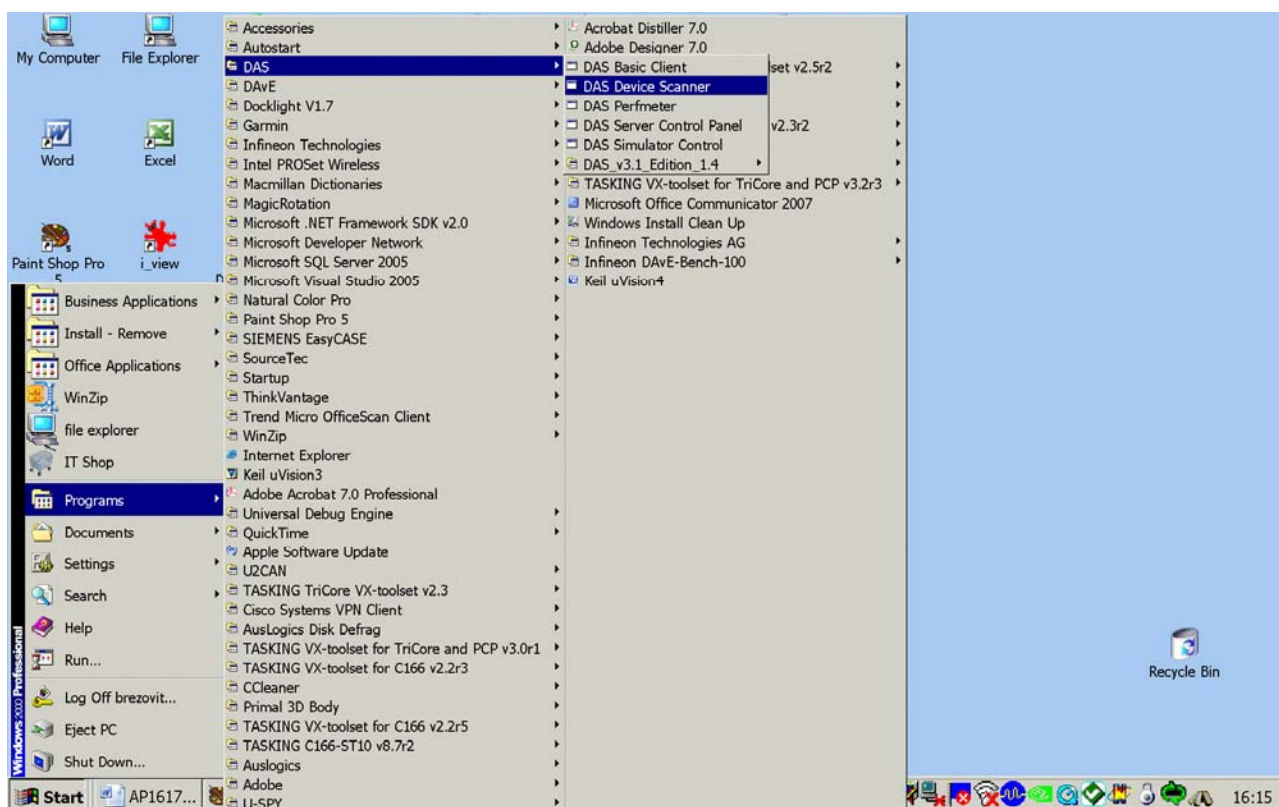
You can
click UDAS Start here



(U)DAS (Universal Device Access Server) Server hint 2:

With the DAS Device Scanner, you can see if the board has been recognized – to do this - you can use the following dialog:

Start – Programs – DAS – DAS Device Scanner



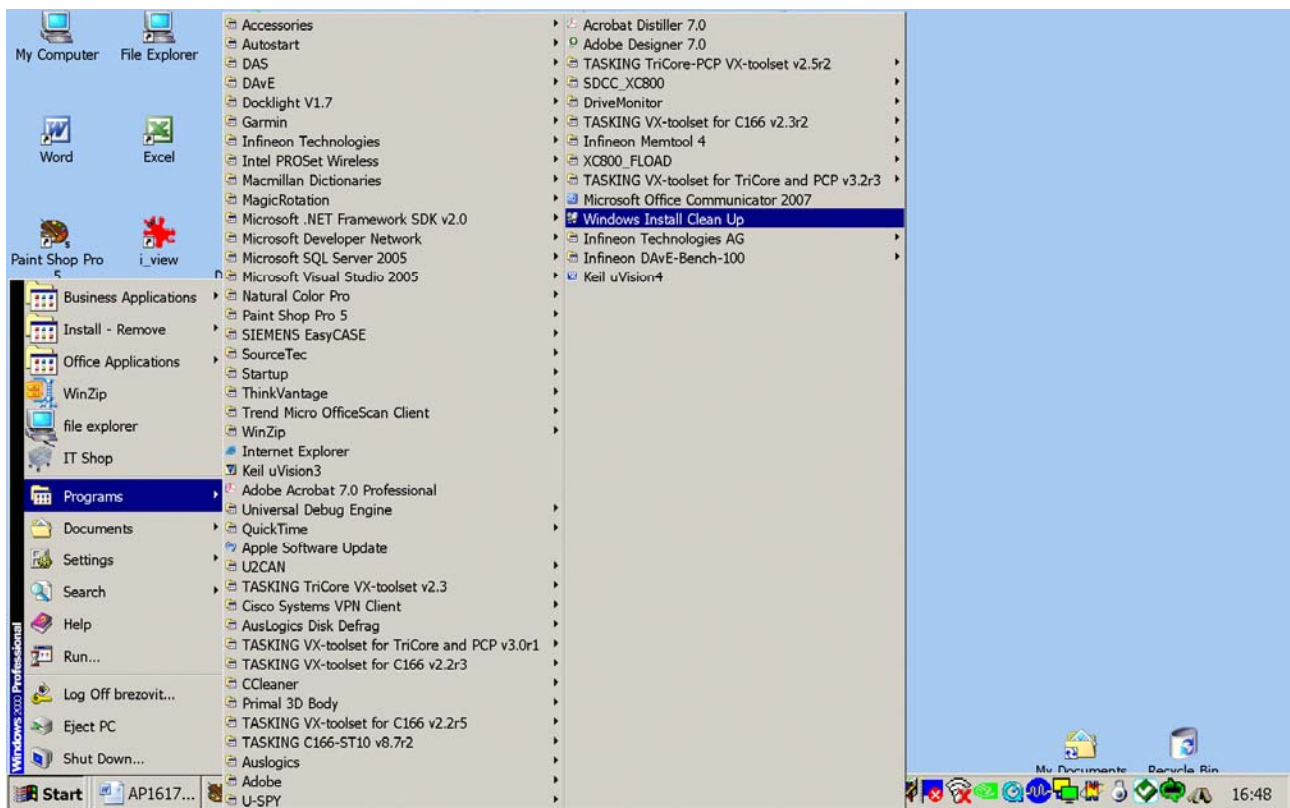


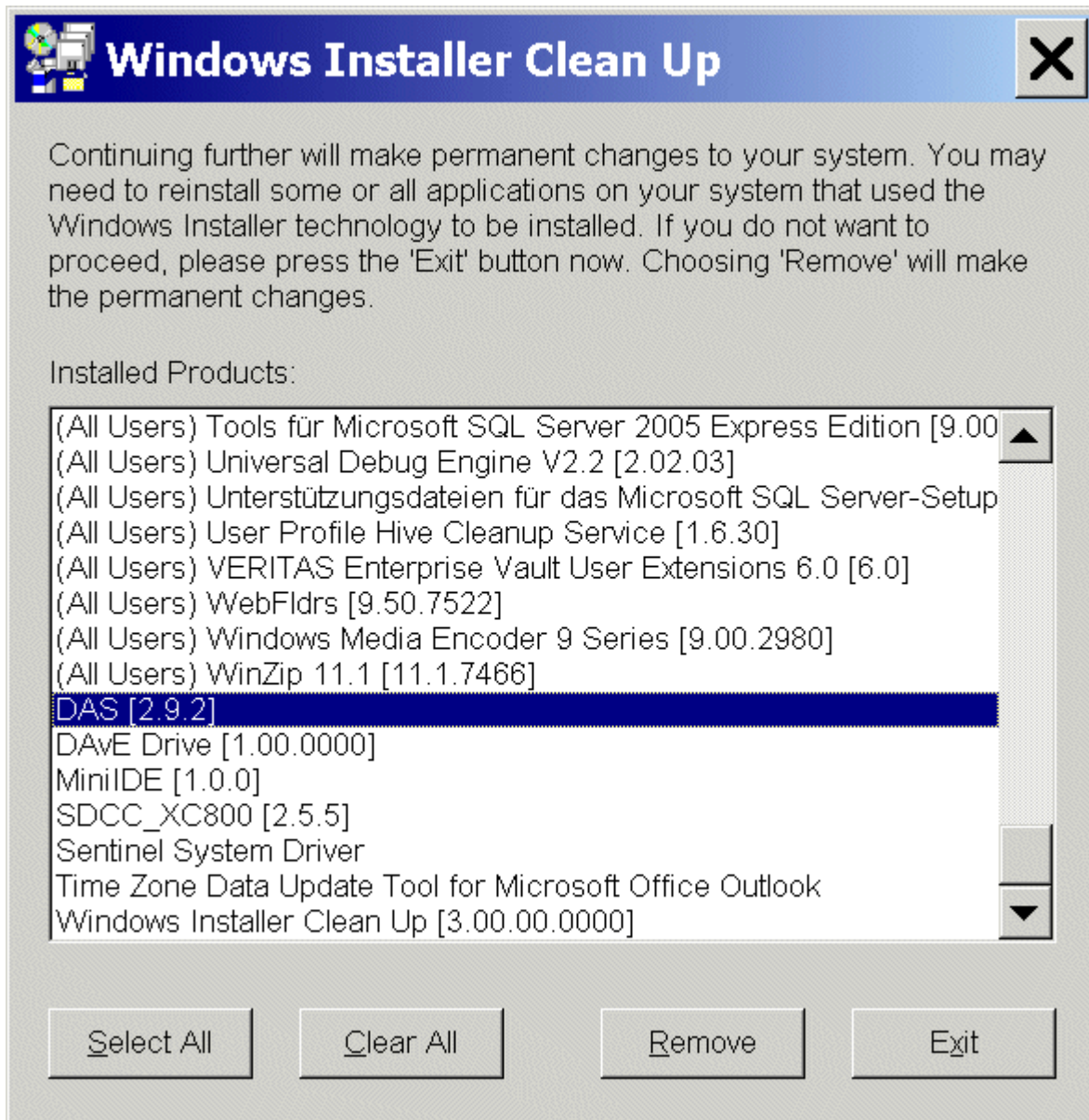
(U)DAS (Universal Device Access Server) Server **hint 3**:

If you want to remove DAS you can use the following dialog:


Execute **msicuu2.exe** (to install Windows Install Clean Up)

Start – Programs – Windows Install Clean Up





Select DAS[]

Click 

Note:

Be careful with this tool!

With only 2 mouse clicks you can remove all software on your computer!





2.) DAvE – Installation for XE16x microcontrollers:



Install DAvE (mothersystem):

Download the DAvE-mothersystem **setup.exe** @ <http://www.infineon.com/DAvE>

Title	Date	Version	Size
Tool Package ^			
 DAvE - Mothersystem (DAvE_Mothersystem_v2_2r1 .zip)	14 Dec 2009	V2.2	8.8 MB
 DAvE - Mothersystem (setup.exe)	14 Dec 2009	V2.2	8.9 MB

and execute **setup.exe** to install DAvE .

Note:

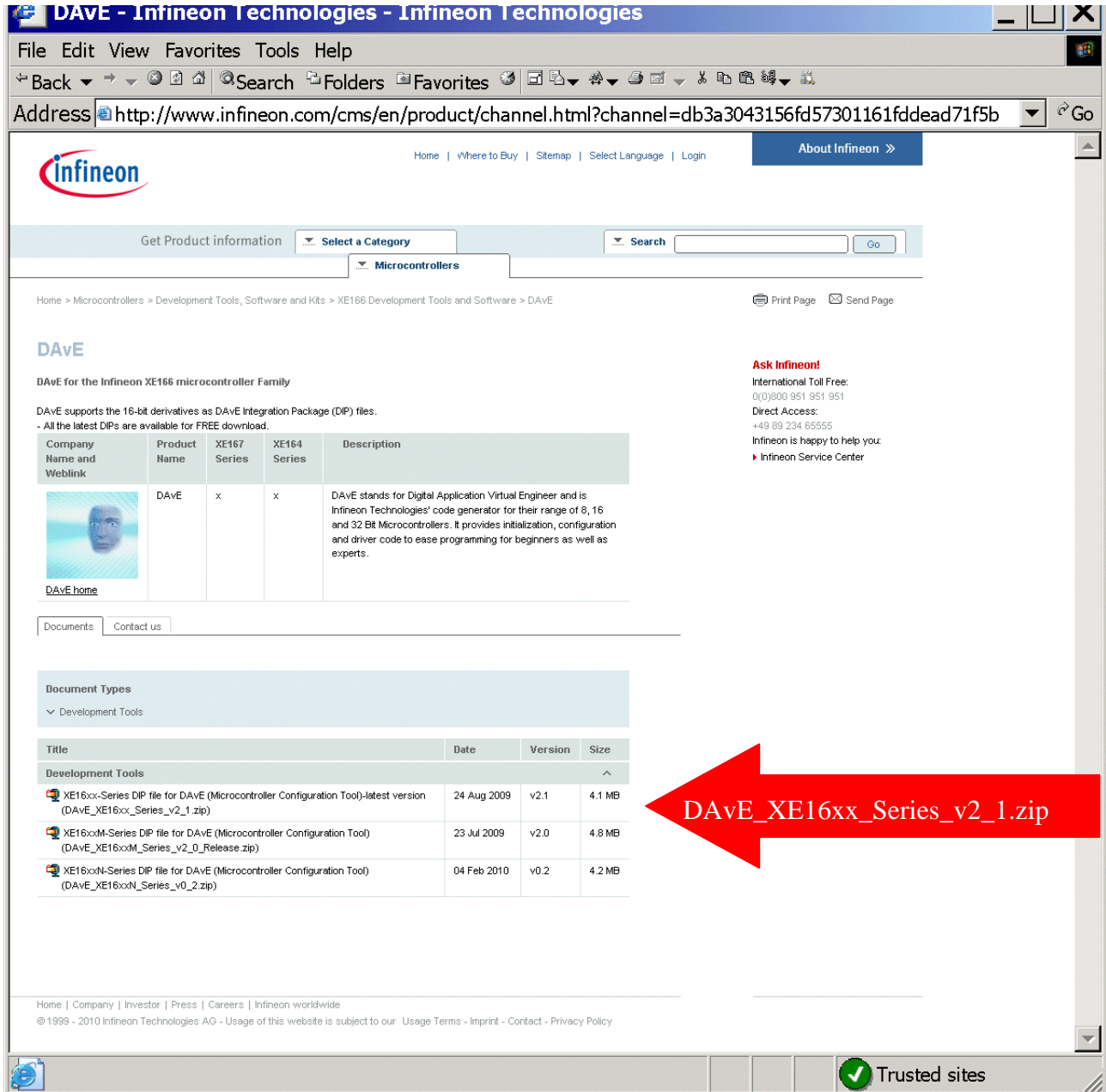
Abort the installation of Acrobat Reader.



Install the XE164 microcontroller support/update (XE16xx_Series.dip):

1.)

Download the DAVe-update-file (.DIP) for the required microcontroller
@ <http://www.infineon.com/DAvE>



DAvE - Infineon Technologies - Infineon Technologies

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DAvE

DAvE for the Infineon XE166 microcontroller Family




DAvE supports the 16-bit derivatives as DAVe Integration Package (DIP) files.
- All the latest DIPs are available for FREE download.

Company Name and Weblink	Product Name	XE167 Series	XE164 Series	Description
 DAvE home	DAvE	x	x	DAvE stands for Digital Application Virtual Engineer and is Infineon Technologies' code generator for their range of 8, 16 and 32 Bit Microcontrollers. It provides initialization, configuration and driver code to ease programming for beginners as well as experts.

Documents Contact us

Document Types

Development Tools


Title	Date	Version	Size
 XE16xx-Series DIP file for DAVe (Microcontroller Configuration Tool)-latest version (DAvE_XE16xx_Series_v2_1.zip)	24 Aug 2009	v2.1	4.1 MB
 XE16xxM-Series DIP file for DAVe (Microcontroller Configuration Tool) (DAvE_XE16xxM_Series_v2_0_Release.zip)	23 Jul 2009	v2.0	4.8 MB
 XE16xxN-Series DIP file for DAVe (Microcontroller Configuration Tool) (DAvE_XE16xxN_Series_v0_2.zip)	04 Feb 2010	v0.2	4.2 MB

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Trusted sites

Unzip the zip-file “DAvE_XE16xx_Series_v2_1.zip” and save “XE16xx_Series_v2.1.dip”
@ e.g. C:\DAvE\ XE16xx_Series_v2.1.dip.

2.)

Start DAVe - ( click DAVe)

3.)

View

Setup Wizard

Default: • Installation

Forward>

Select: • I want to install products from the DAVe's web site

Forward>

Select: C:\DAVe

Forward>

Select: Available Products

click ✓ XE16xx_Series

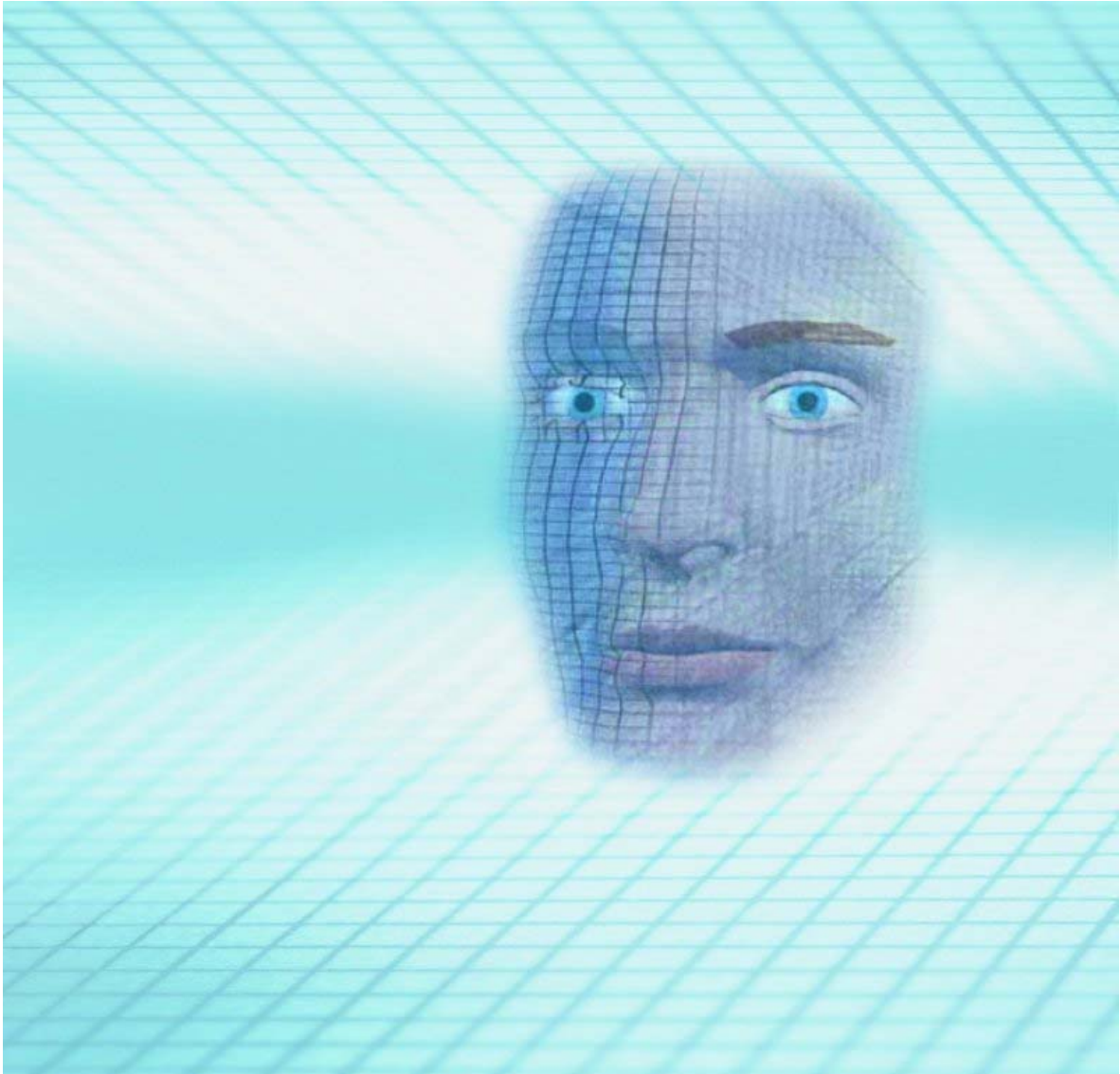
Forward>

Install

End

4.) DAVe is now ready to generate code for the XE16x microcontrollers.

3.) DAvE - Microcontroller Initialization after Power-On:





Start the program generator DAVE and select the XE164 microcontroller:

View - Project Window (Closes the Project Window)

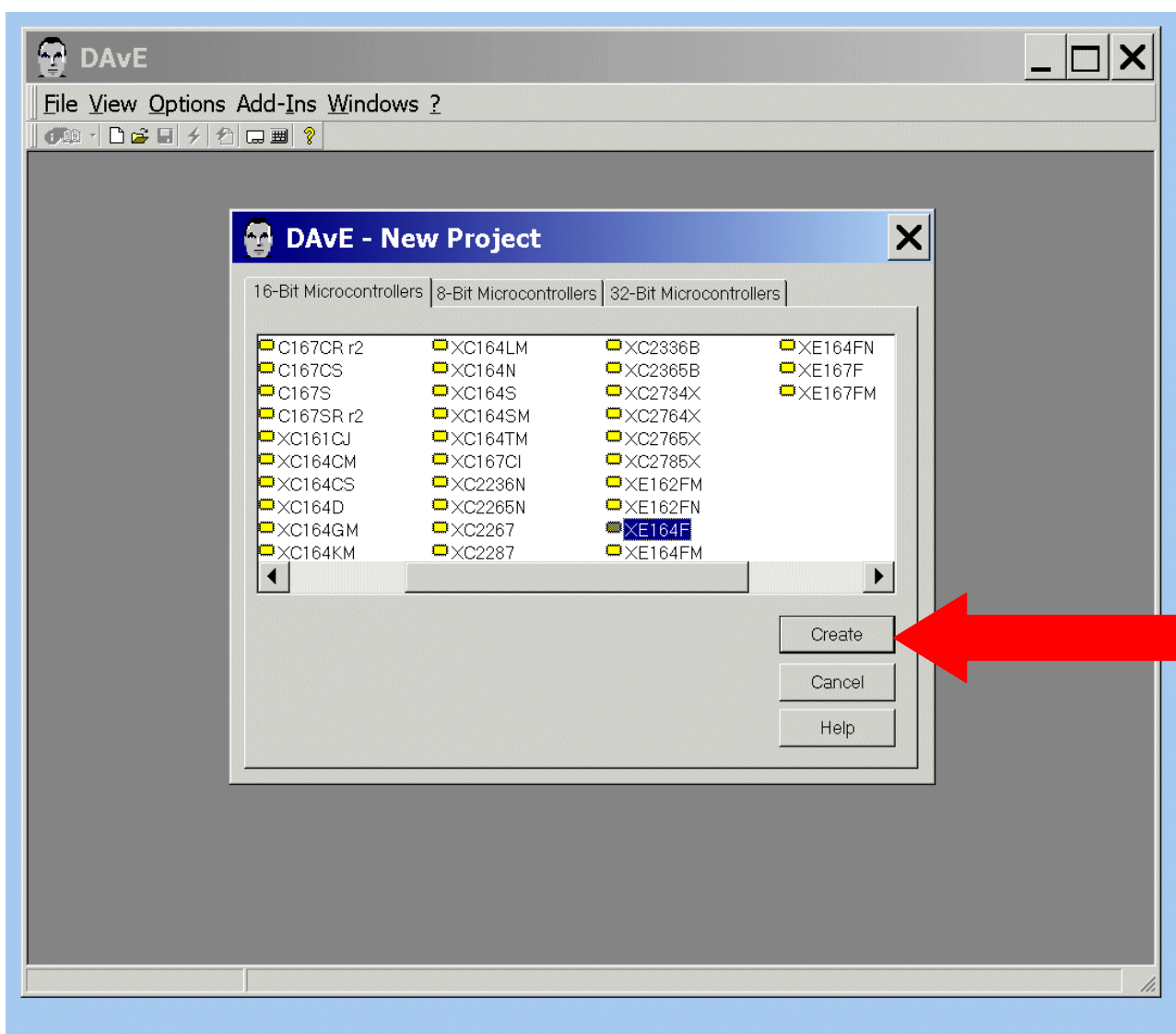
View - Command Window (Closes the Command Window)

File - New

DAvE – New Project: click 16-Bit Microcontrollers

Select XE164F

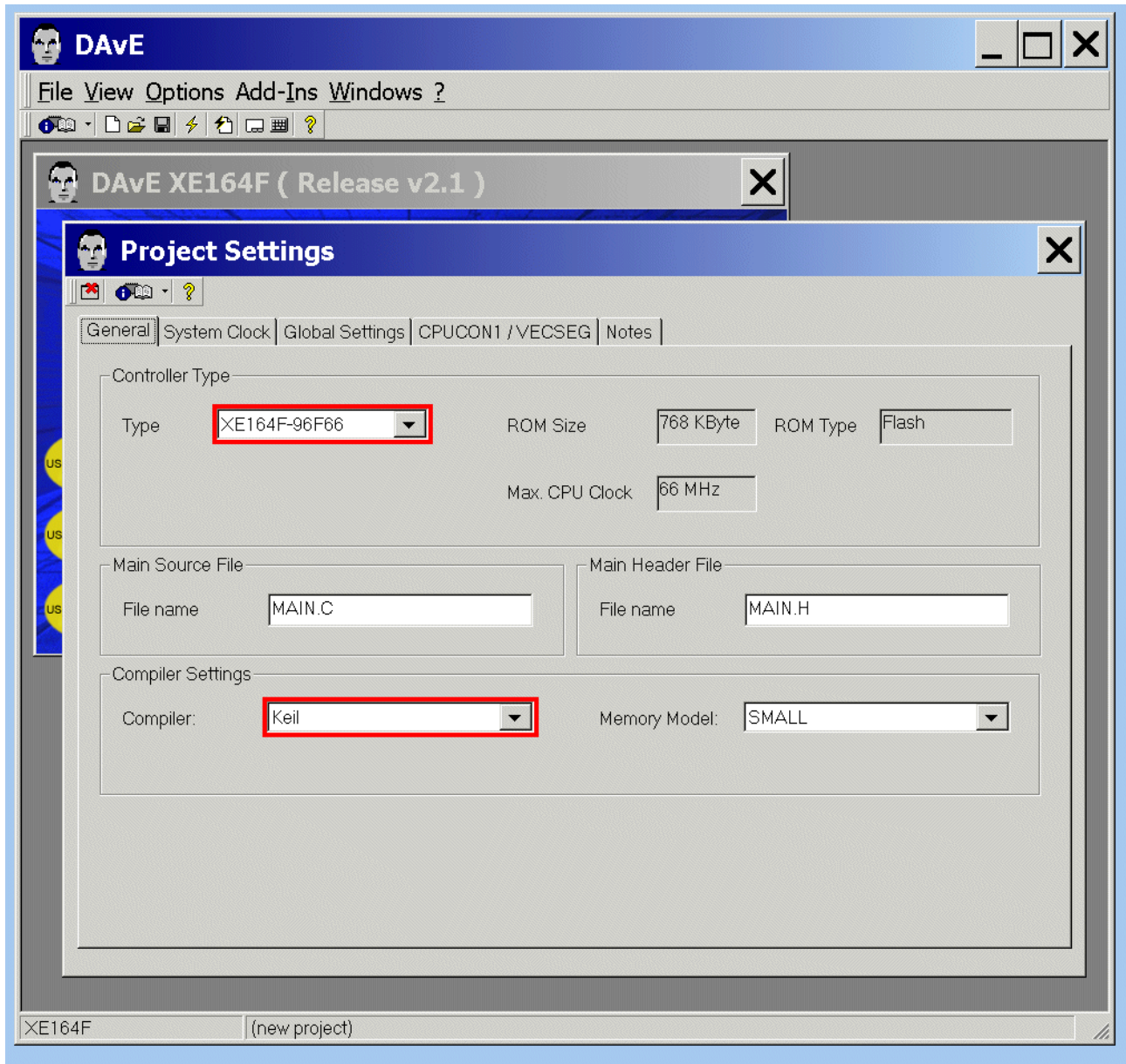
Create



Choose the Project Settings as you can see in the following screenshots:

Project Settings: **General:** **Controller Type:** Type: check/select XE164F-96F66

Project Settings: **General:** **Compiler Settings:** **Compiler:** check/choose Keil



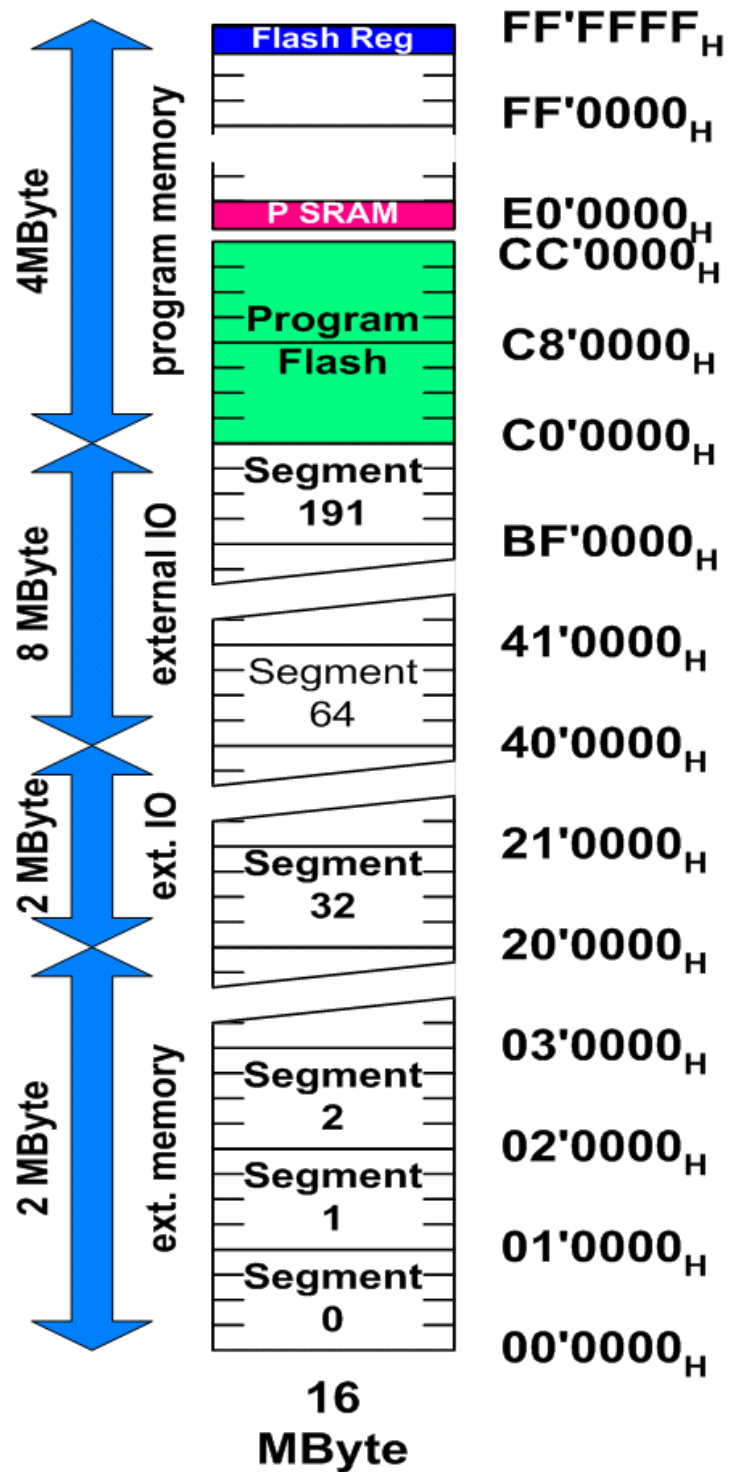
Note:

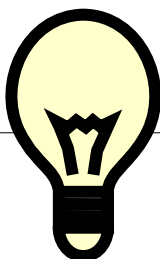
You can change file names (e.g. MAIN.C, MAIN.H) anytime.





Additional information: **Address Space** and Memory Model:





Additional information: Address Space and **Memory Model**:

Memory models:

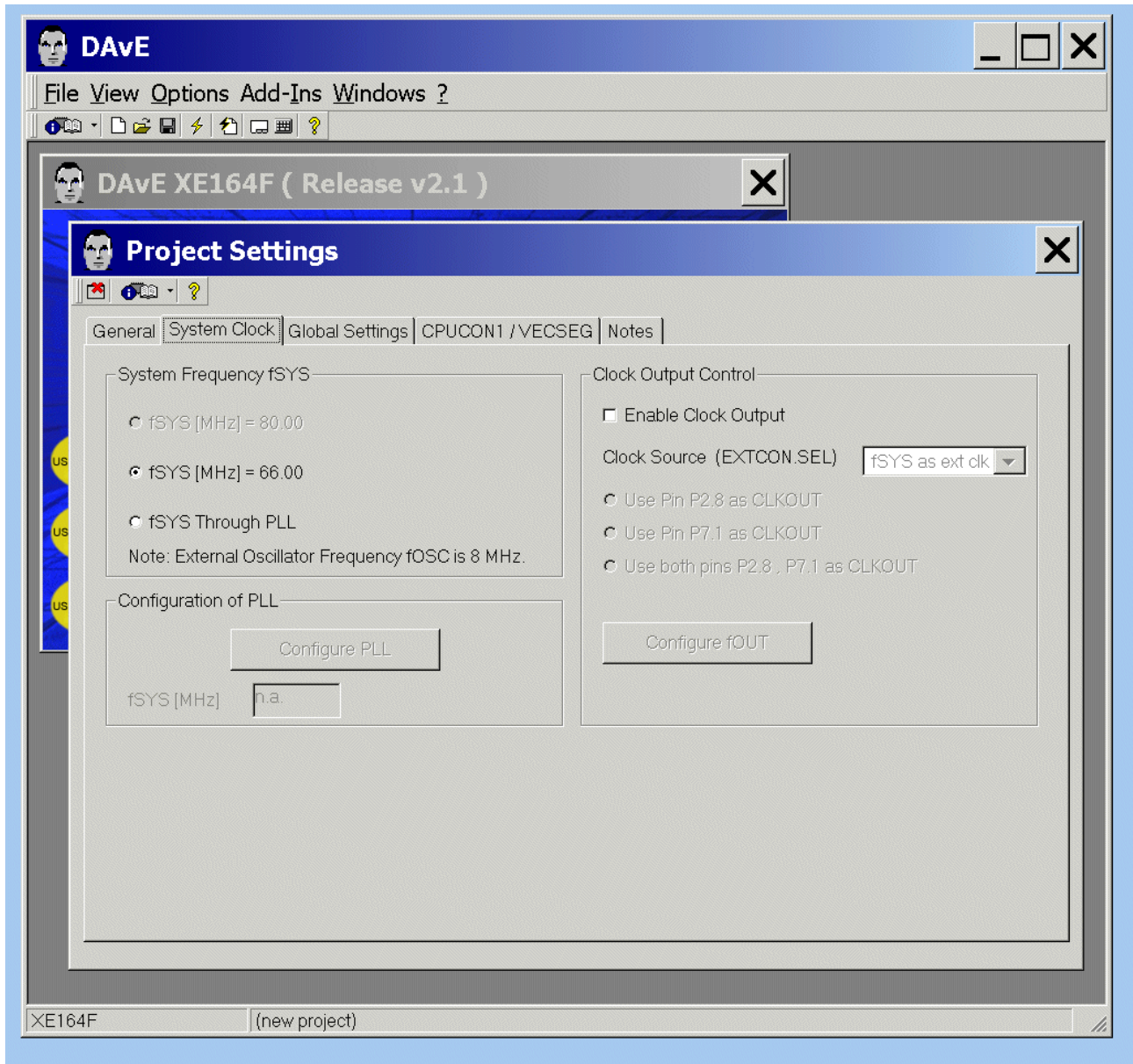
TASKING memory model				Default function memory qualifier ¹			
TINY				_near			
SMALL				_huge			
MEDIUM				_near			
LARGE				_huge			
HUGE				_huge			

Keil	Data space	Data object	Code space		TASKING	Data space	Data object	Code space
TINY	<64K	<16K	<64K	⇒	TINY	<64K	<64K	<64K
SMALL ²	<64K	<16K	<64K	⇒	SMALL ² I,II or III	<64K	<64K	<16M
MEDIUM ²	<64K	<16K	<16M	⇒	SMALL ² I,II or III	<64K	<64K	<16M
COMPACT	<16M	<16K	<64K	⇒	MEDIUM	<16M	<16K	<64K
LARGE	<16M	<16K	<16M	⇒	LARGE ³	<16M	<16K	<16M
HCOMPACT	<16M	<64K	<64K	⇒	MEDIUM	<16M	<16K	<64K
HLARGE	<16M	<64K	<16M	⇒	LARGE ³	<16M	<16K	<16M
XLARGE	<16M	<16M	<16M	⇒	HUGE	<16M	<16M	<16M

Memory qualifiers for variables:

Keil	TASKING ¹	Description
bdata	_bita	bit-addressable RAM
ebdata	_bita	extended bit-addressable memory
idata	_iram	internal RAM
sdata	_system	system page
near	_near	Keil: always restricted to 16K TASKING: 16K or 64K, depends on memory
far	_far	one object is limited to 16K
huge	_shuge	one object is limited to 64K
xhuge	_huge	objects are limited to available memory space

Project Settings: **System Clock**: (do nothing)

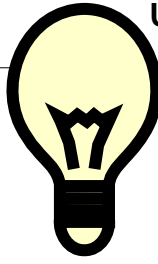


Note (Source: DAVE):

Configuration of the System Clock:

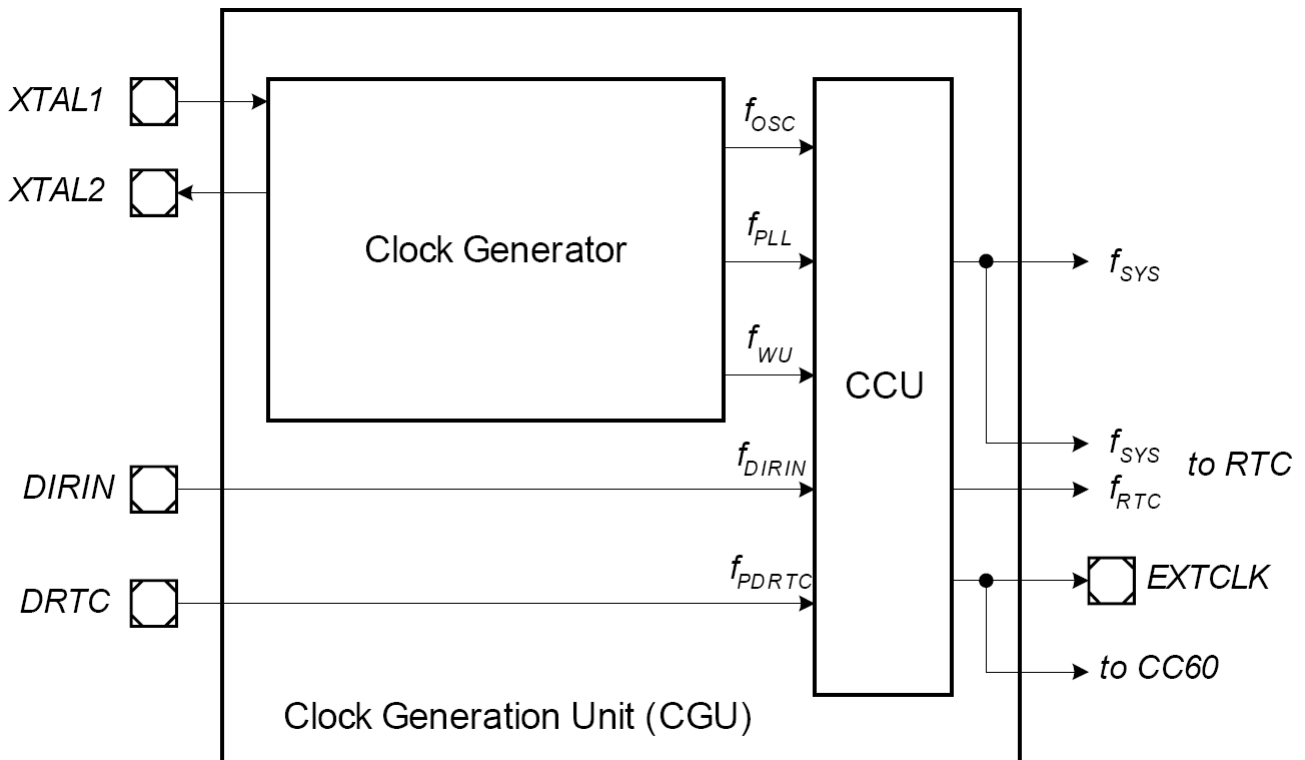
- VCO clock used, input clock is connected
- input frequency is 8,00 MHz (XTAL1)
- configured system frequency is 66,00 MHz
- system clock is 66.00 MHz





Additional information: **Clock System** (Source: User's Manual):

Clock Generation Unit (CGU) Block Diagram:



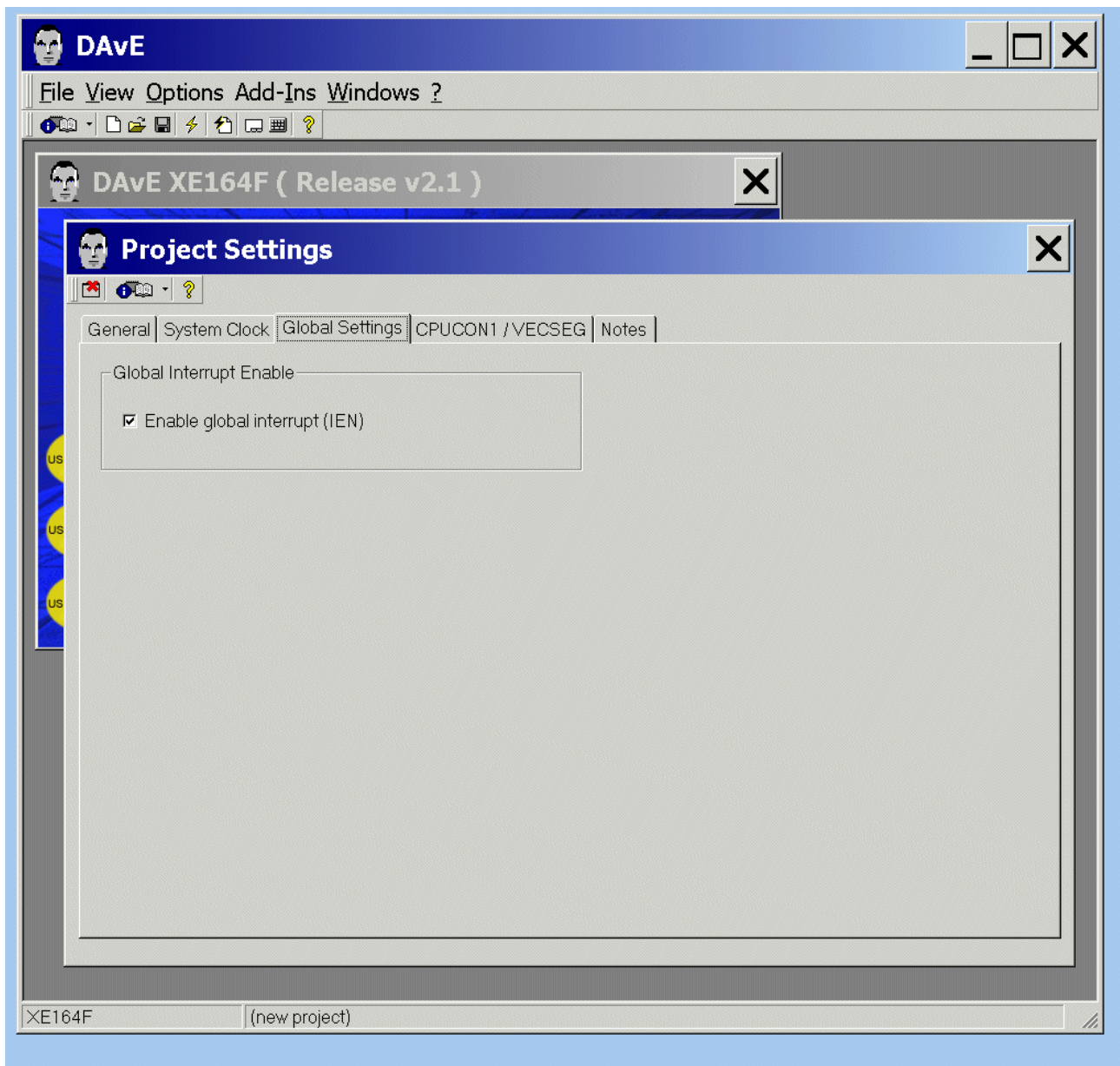
Note:

The CGU can convert a low-frequency external clock to a high-speed internal clock, or can create a high-speed internal clock without external input.

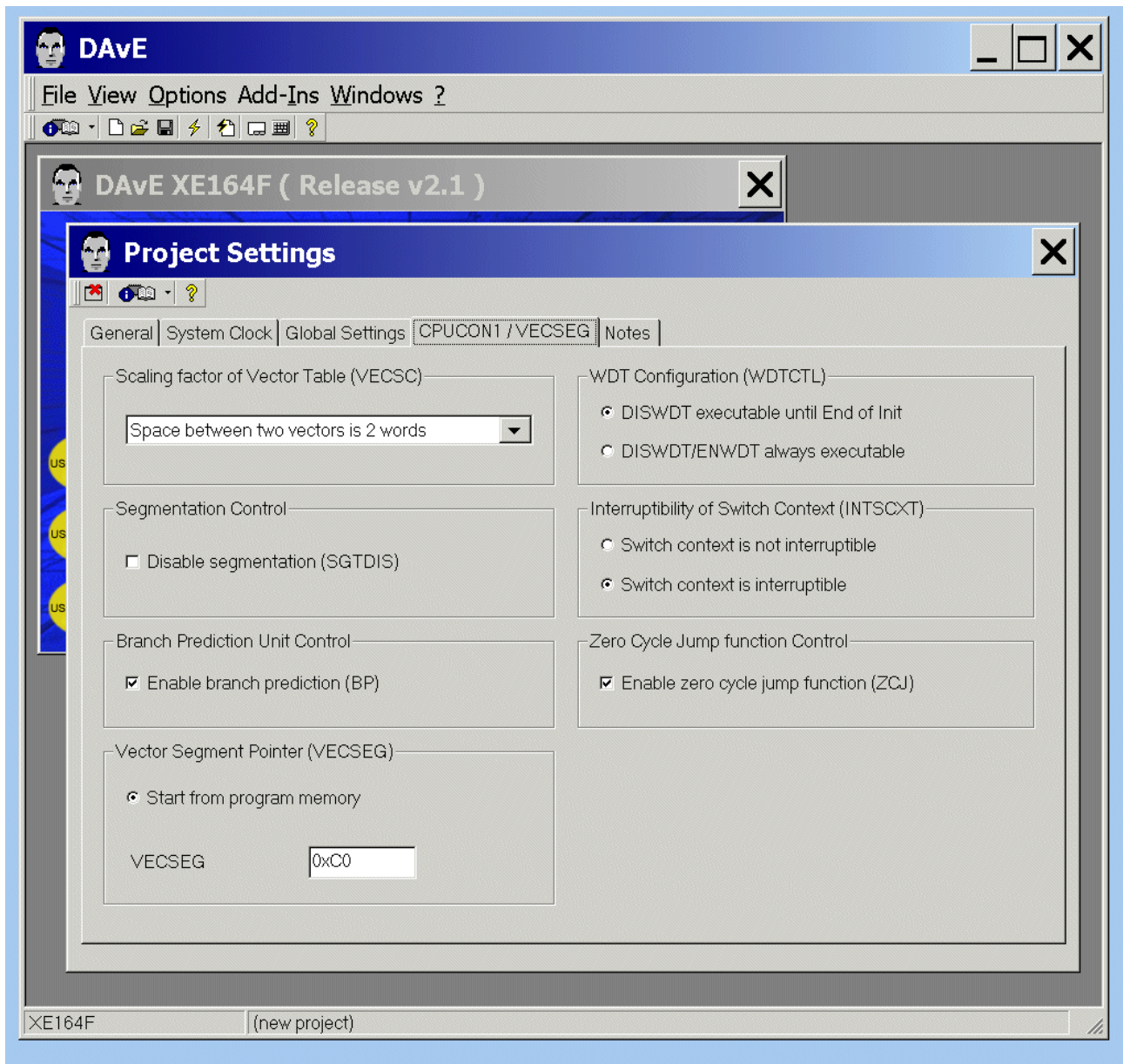
The system clock f_{SYS} is generated out of four selectable clocks:

- PLL clock f_{PLL}
- Wake-Up clock f_{WU}
- The Direct Clock f_{OSC} , from pin XTAL1
- Input DIRIN as Direct Clock Input f_{DIR}

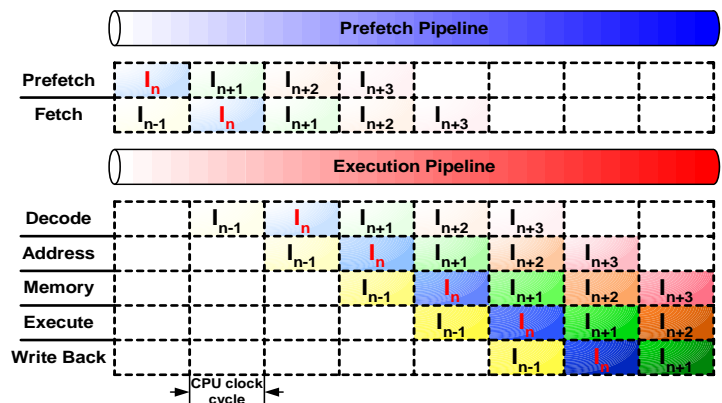
Project Settings: **Global Settings:** (do nothing. Do not change configuration)



Project Settings: CPUCON1/VECSEG: (do nothing)



Note:
We should not change the pipeline behaviour.




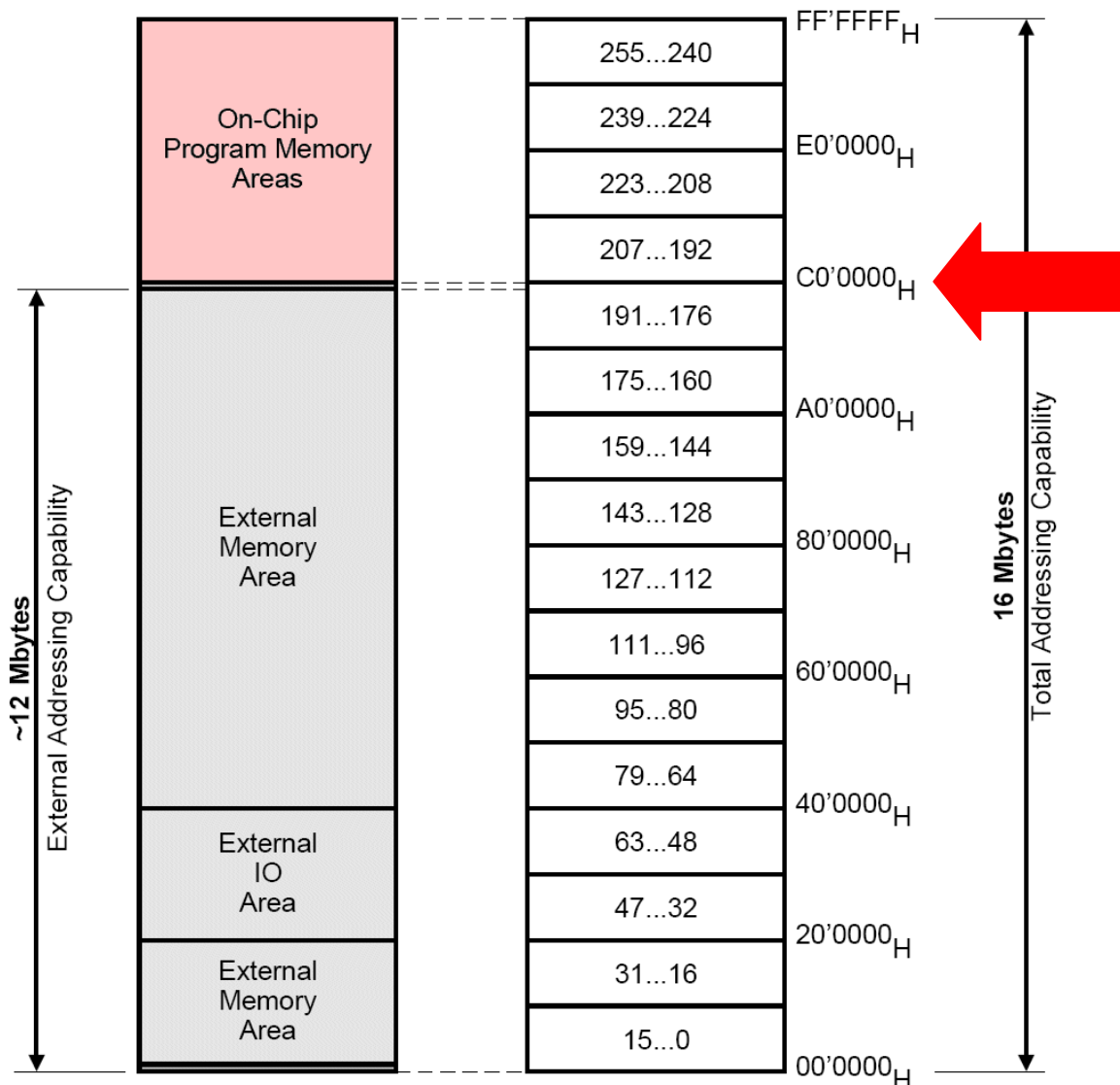


Additional information: **Start from program memory** (Source: User's Manual):

Vector Segment Pointer (VECSEG)

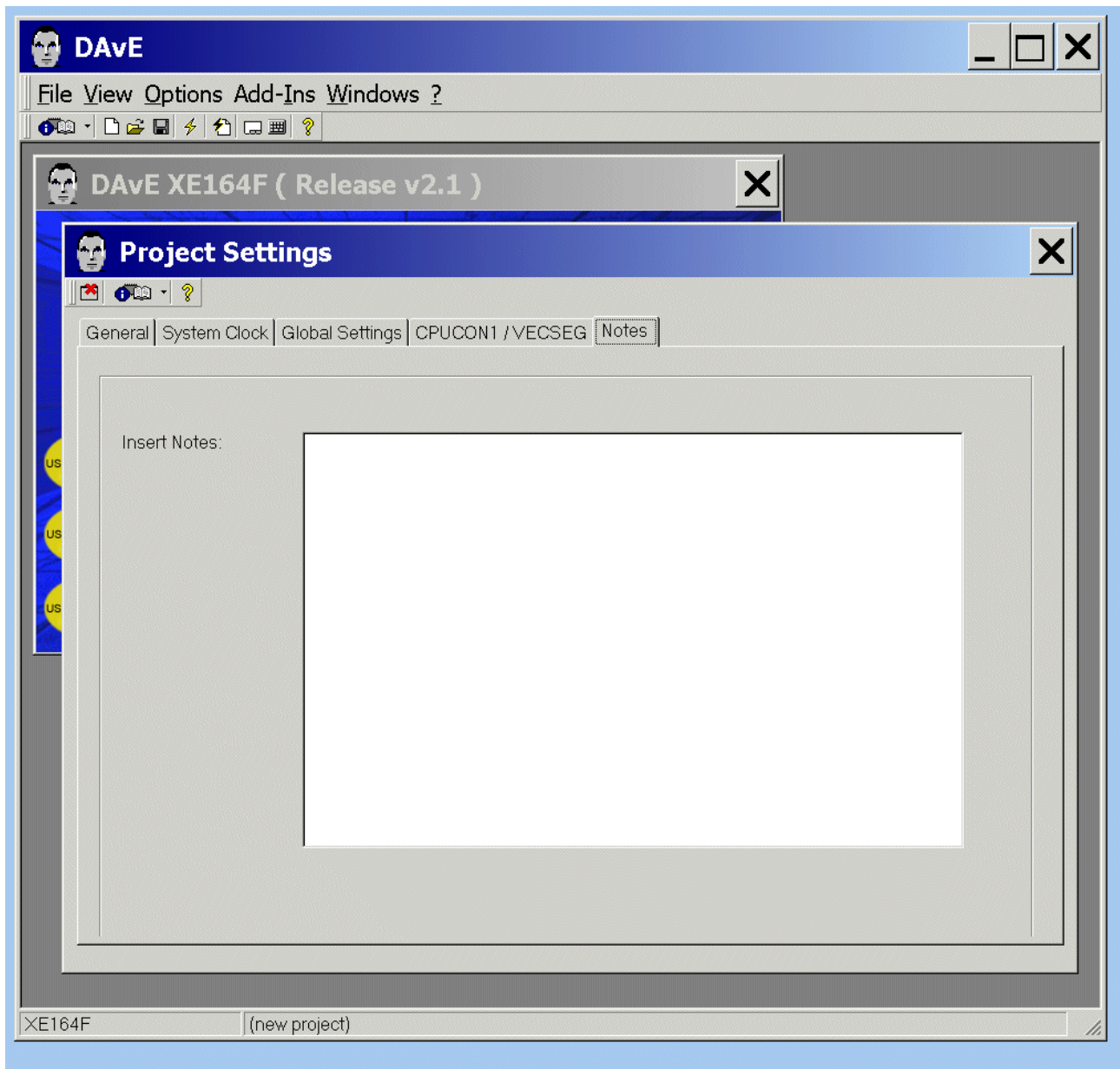
☒ Start from program memory


VECSEG 

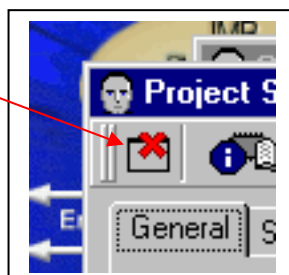


Total Address Space
16 Mbytes, Segments 255...0

Project Settings: Notes: Insert Notes: If you wish, you can insert your comments here.

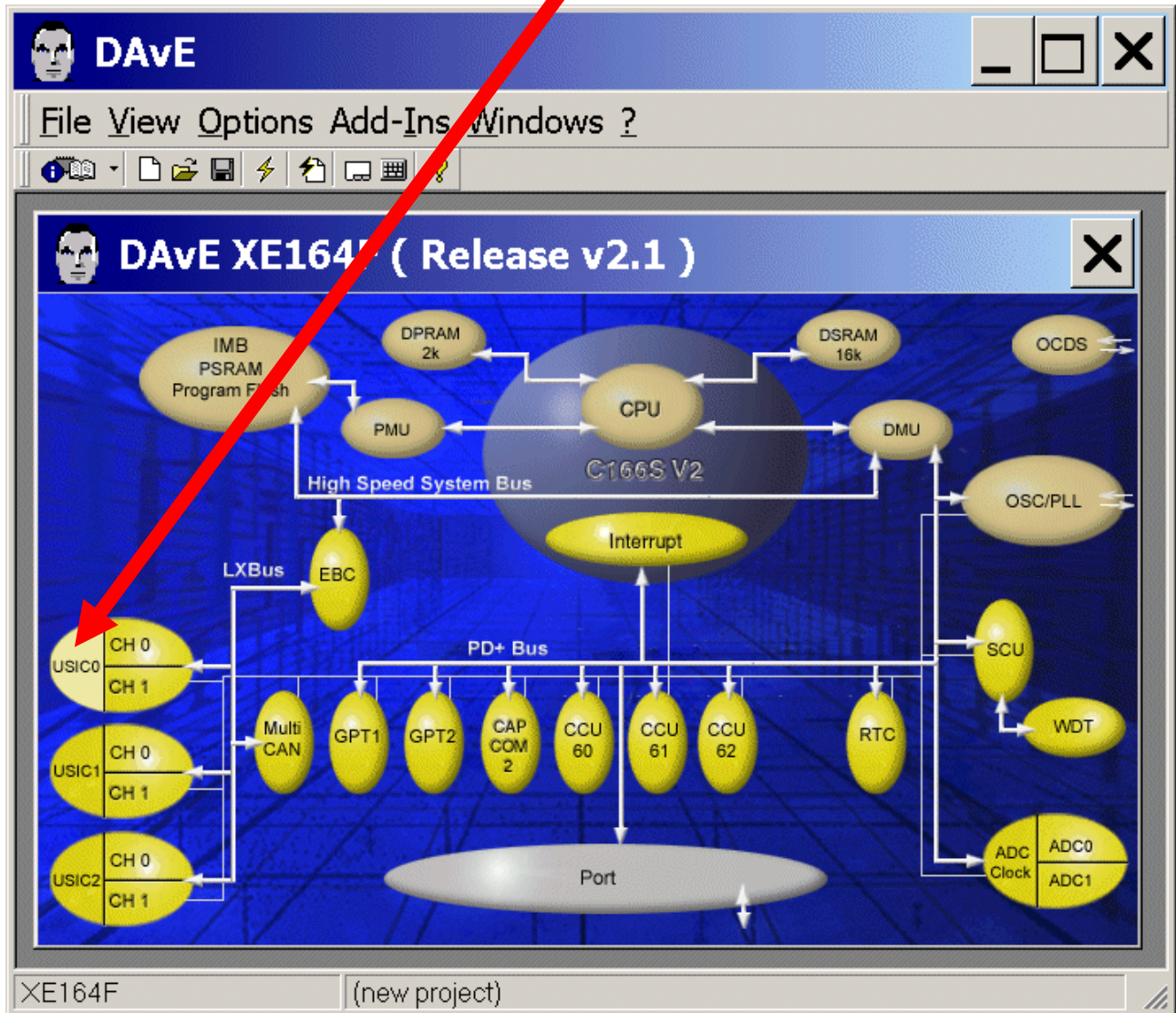


Exit and Save this dialog now by clicking  the close button:



Configuration of the serial interface (Universal Serial Interface Channel module)
"ASC0" / UART / USIC0_CH0 / U0C0:

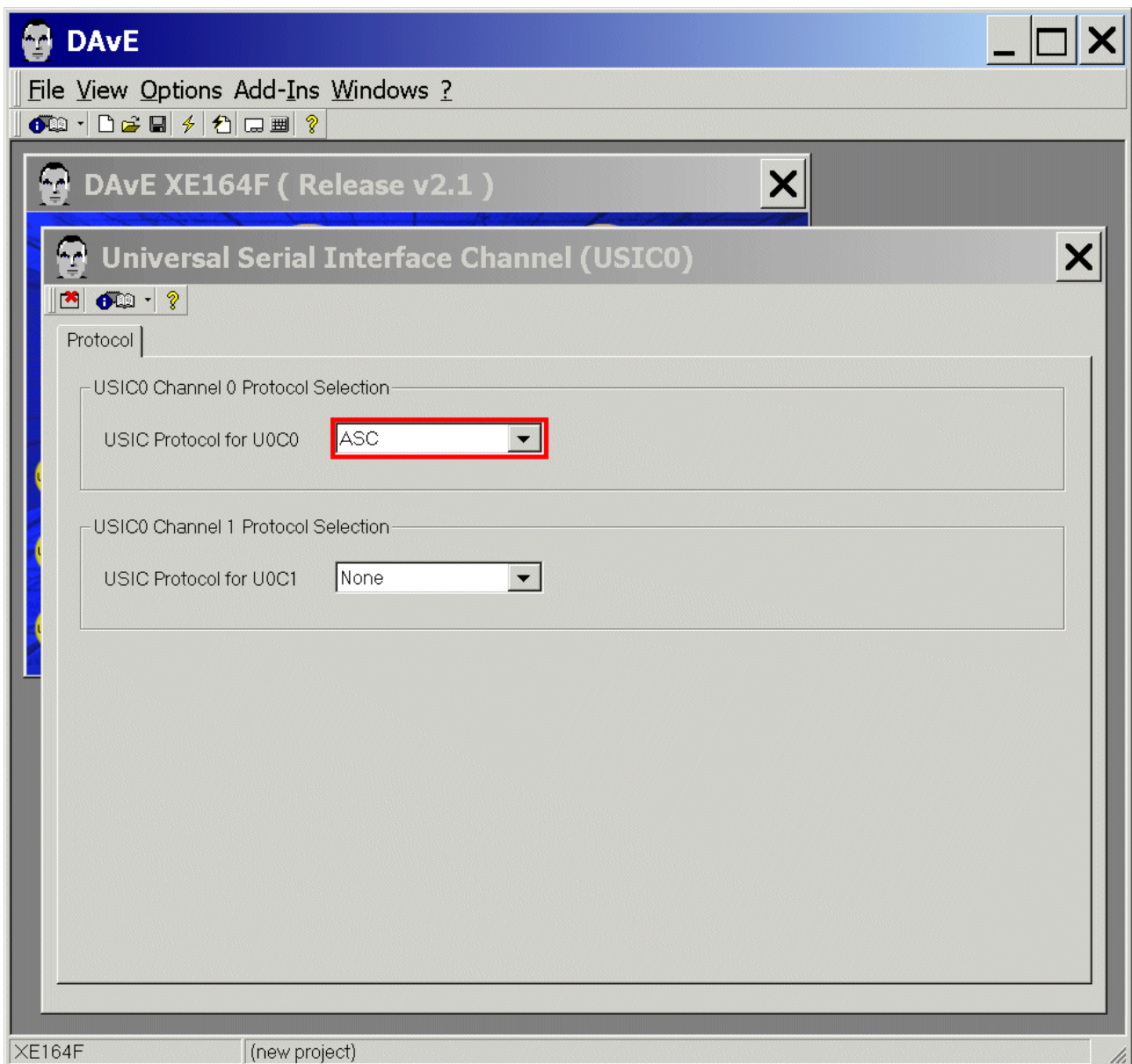
The configuration window/dialog can be opened by clicking the specific block/module (USIC0).




Note:

For serial communication with a terminal program running on your host computer U0C0 is used.

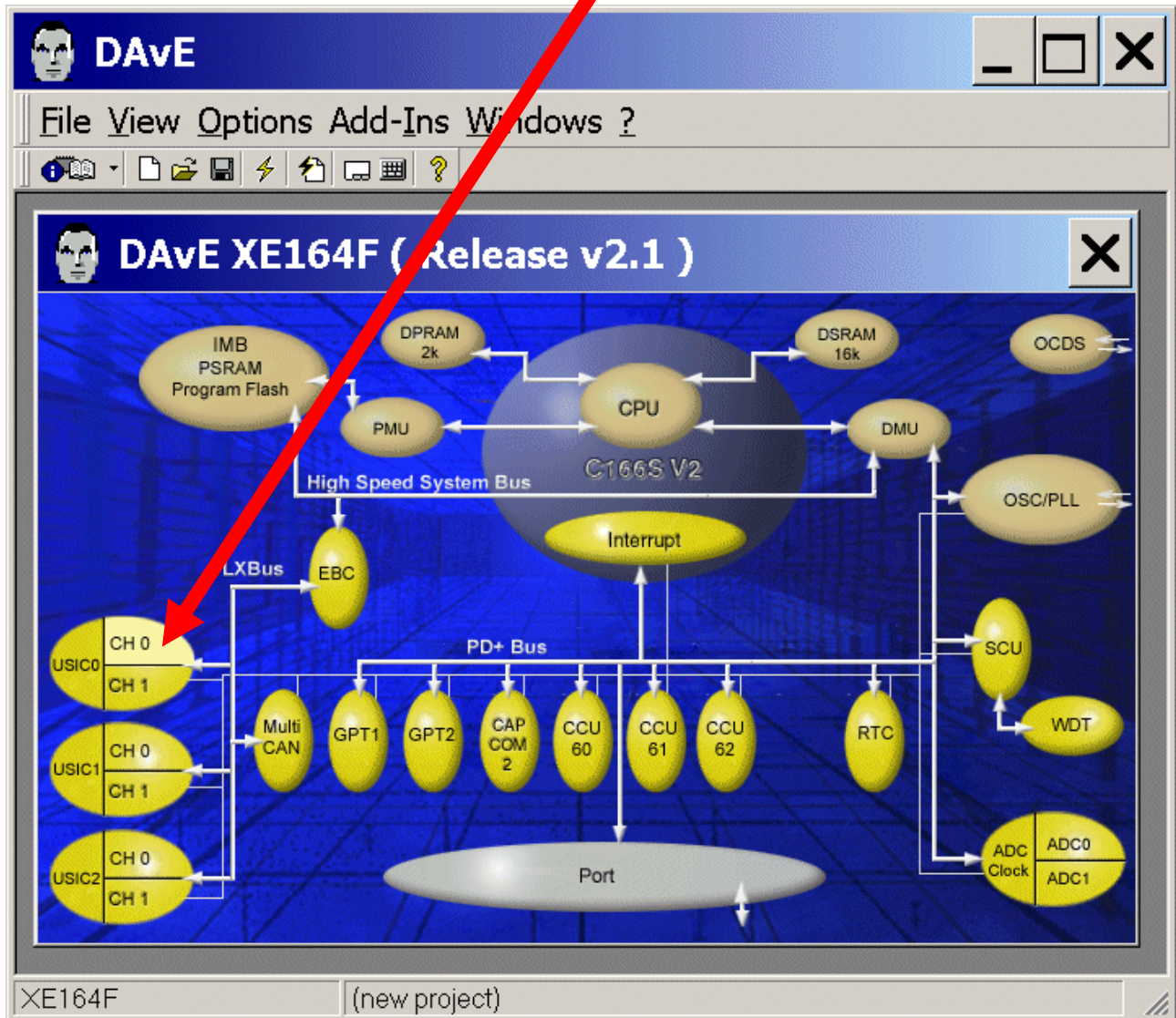
Protocol: USIC0 Channel 0 Protocol Selection: USIC Protocol for U0C0: select ASC



Exit and Save this dialog now by clicking  the close button.

Configuration of the serial interface **USIC0 CH0** / U0C0
(**U**niversal **S**erial **I**nterface **C**hannel module **0**, **C**hannel **0**):

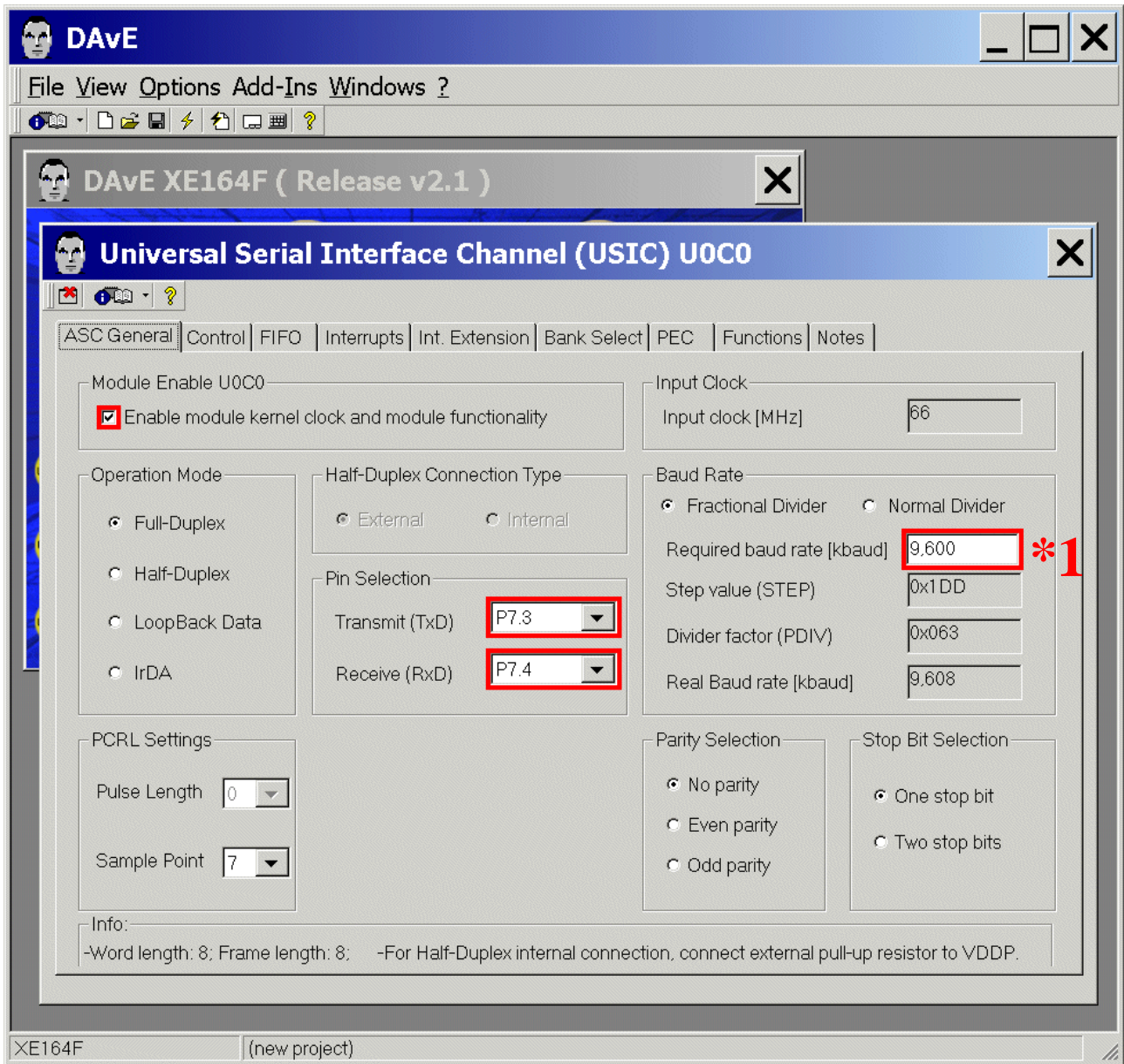
The configuration window/dialog can be opened by clicking the specific block/module (CH 0).



Note:

For serial communication with a terminal program running on your host computer U0C0 is used.

ASC General: Module Enable U0C0: tick ☒ Enable module kernel clock and module functionality
 ASC General: Pin Selection: Transmit (TxD): select P7.3
 ASC General: Pin Selection: Receive (RxD): select P7.4
 ASC General: Baud Rate: Required baud rate [kbaud]: insert 9,600 <ENTER>



Note (*1):
Validate each alphanumeric entry by pressing <ENTER>.

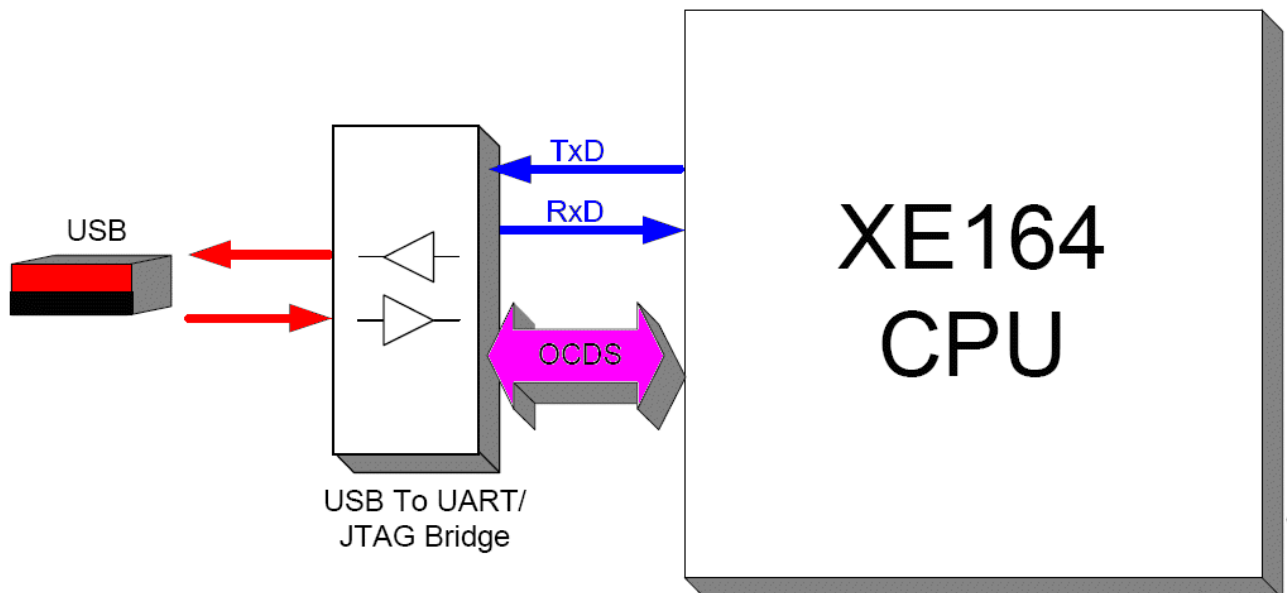




Additional information: **RS232 serial interface:**

Note:

The RS232 serial interface (USIC_0_Channel_0 pins P7.3 and P7.4) is available via the **USB port** which converts the TTL-UART-signals to USB-signals (using a virtual COM port of the second USB channel of the FTDI FT2232 Dual USB to UART/JTAG interface).





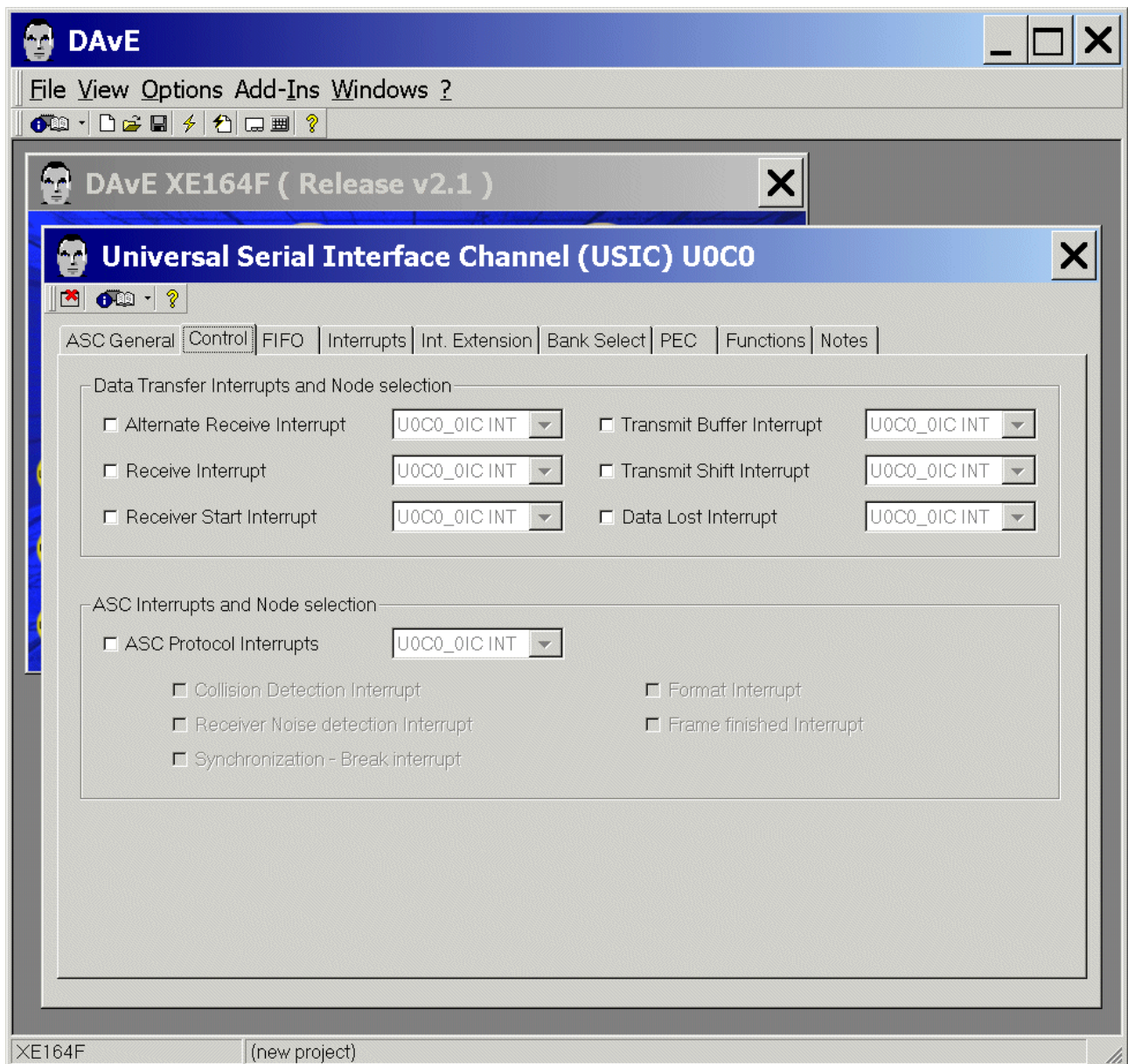
Additional information: **Standard UART / USIC_0_Channel_0 Pins** (Source: User's Manual):

Table 10-10 Configuration Data for Bootstrap Loader Modes

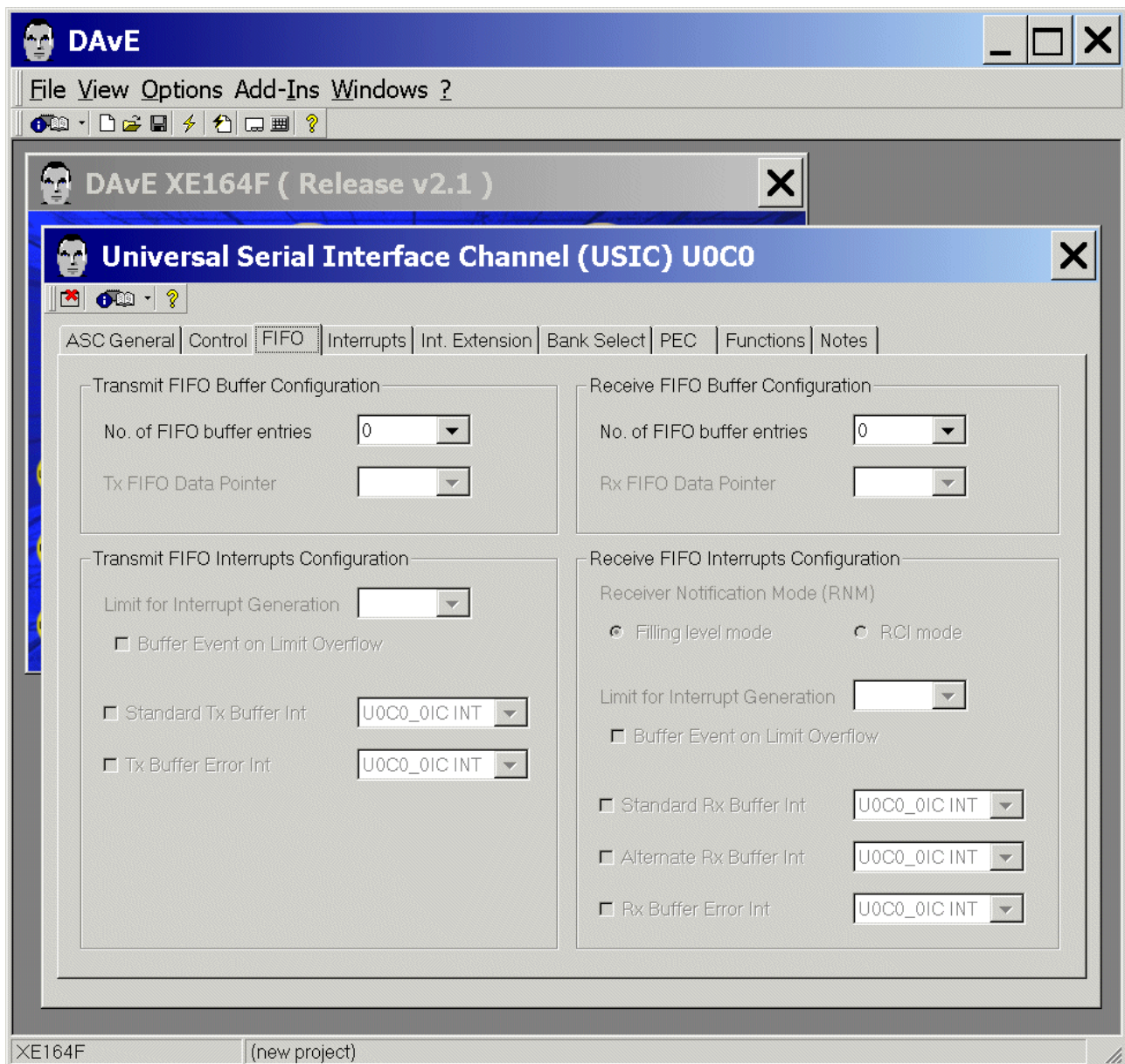
Bootstrap Loader Mode	Configuration on P10.3-0 ¹⁾	Receive Line from Host	Transmit Line to Host	Transferred Data
Standard UART	x110 _B	RxD = P7.4	TxD = P7.3	32 Bytes
Sync. Serial	1001 _B	MRST = P2.4	MTSR = P2.3 SCLK = P2.5 SLS = P2.6	n Bytes; 1 ... 65,280
MultiCAN	x101 _B	RxDC0 = P2.6	TxDC0 = P2.5	8 × n Bytes

1) x means that the level on the corresponding pin is irrelevant.

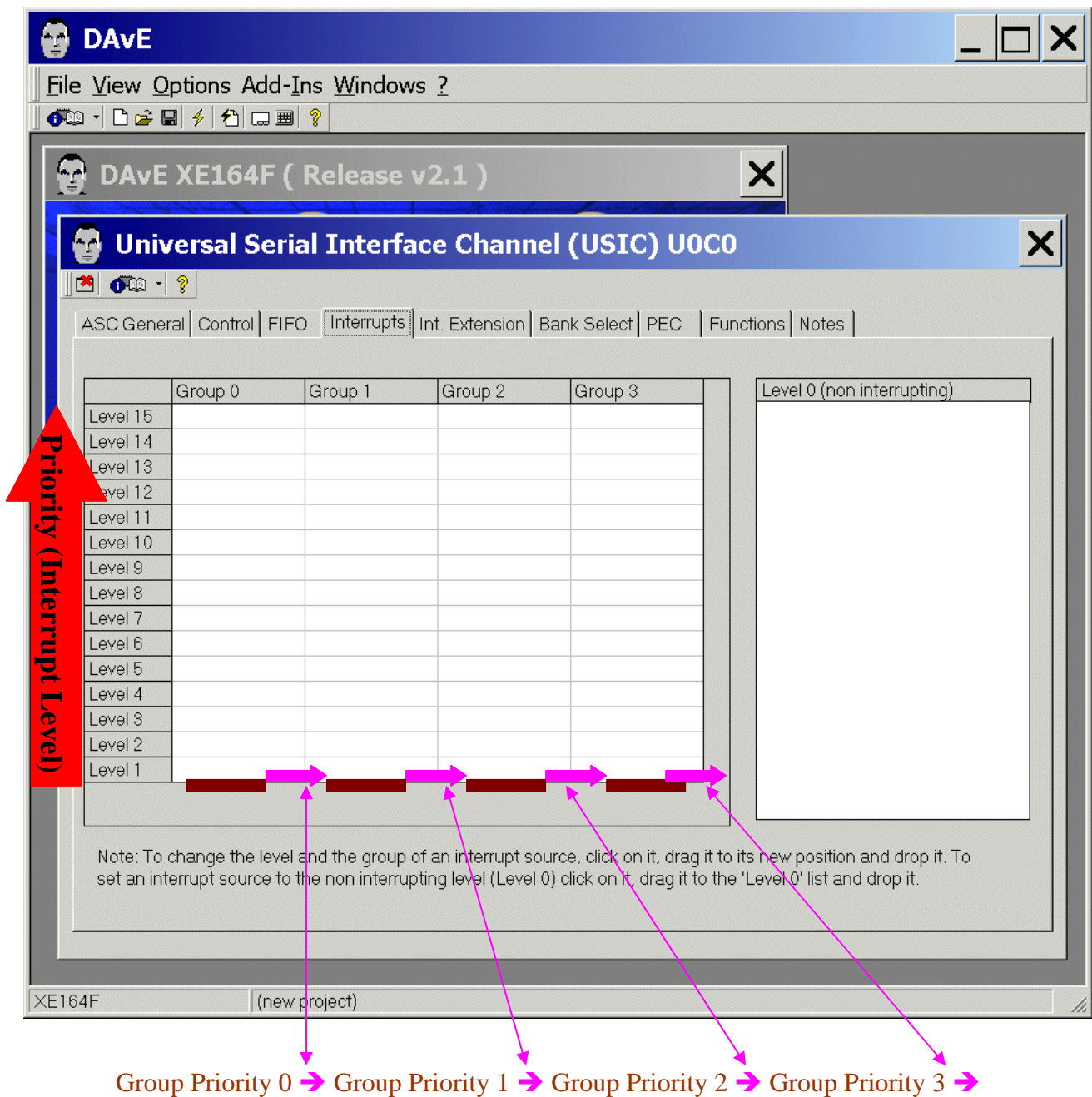
Control: (do nothing)



FIFO: (do nothing)



Interrupts: (do nothing)



Priority (Interrupt Level)

	Group 0	Group 1	Group 2	Group 3
Level 15				
Level 14				
Level 13				
Level 12				
Level 11				
Level 10				
Level 9				
Level 8				
Level 7				
Level 6				
Level 5				
Level 4				
Level 3				
Level 2				
Level 1				

Note: To change the level and the group of an interrupt source, click on it, drag it to its new position and drop it. To set an interrupt source to the non interrupting level (Level 0) click on it, drag it to the 'Level 0' list and drop it.

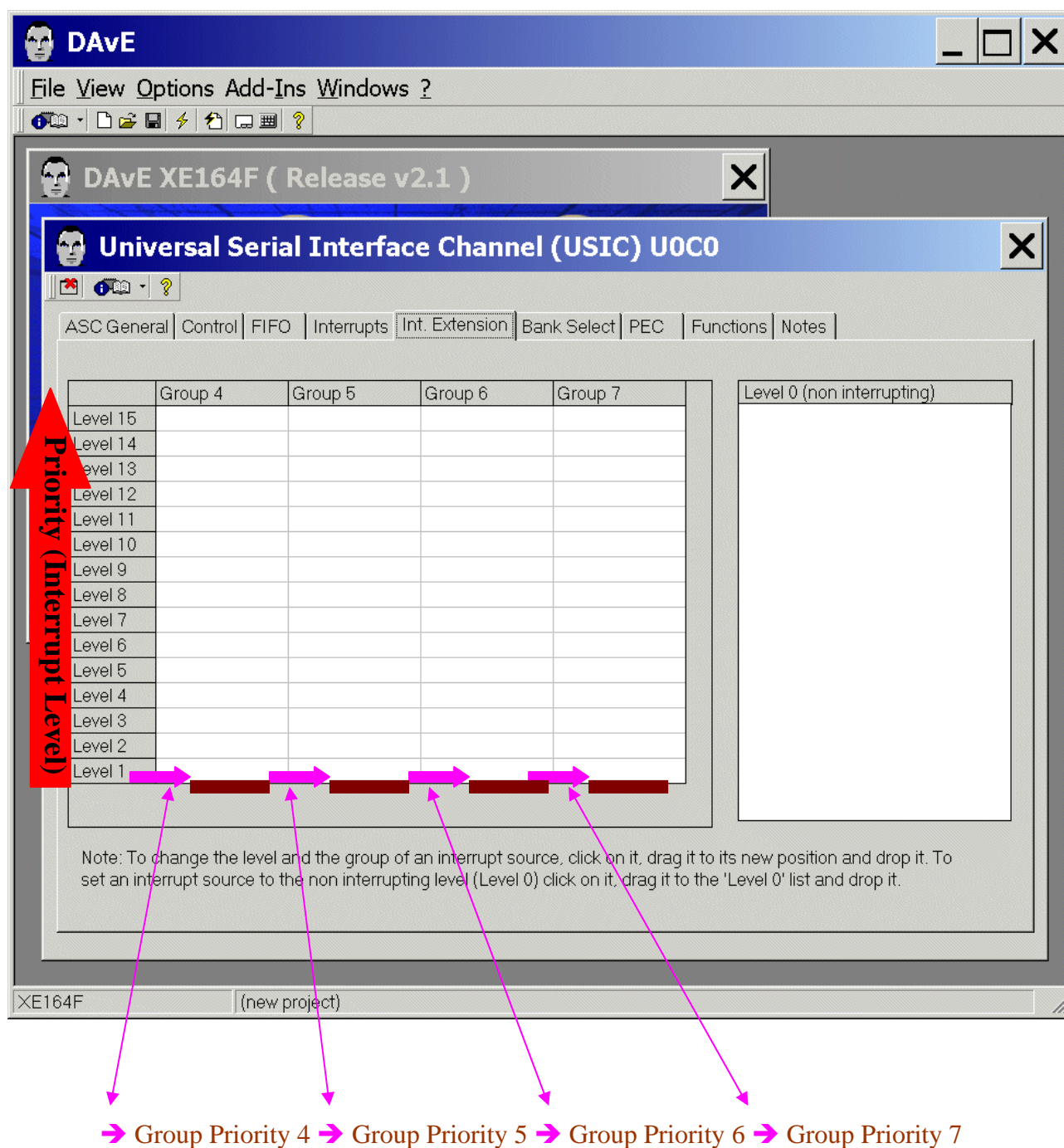
Group Priority 0 → Group Priority 1 → Group Priority 2 → Group Priority 3 →



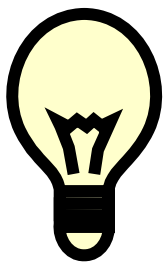
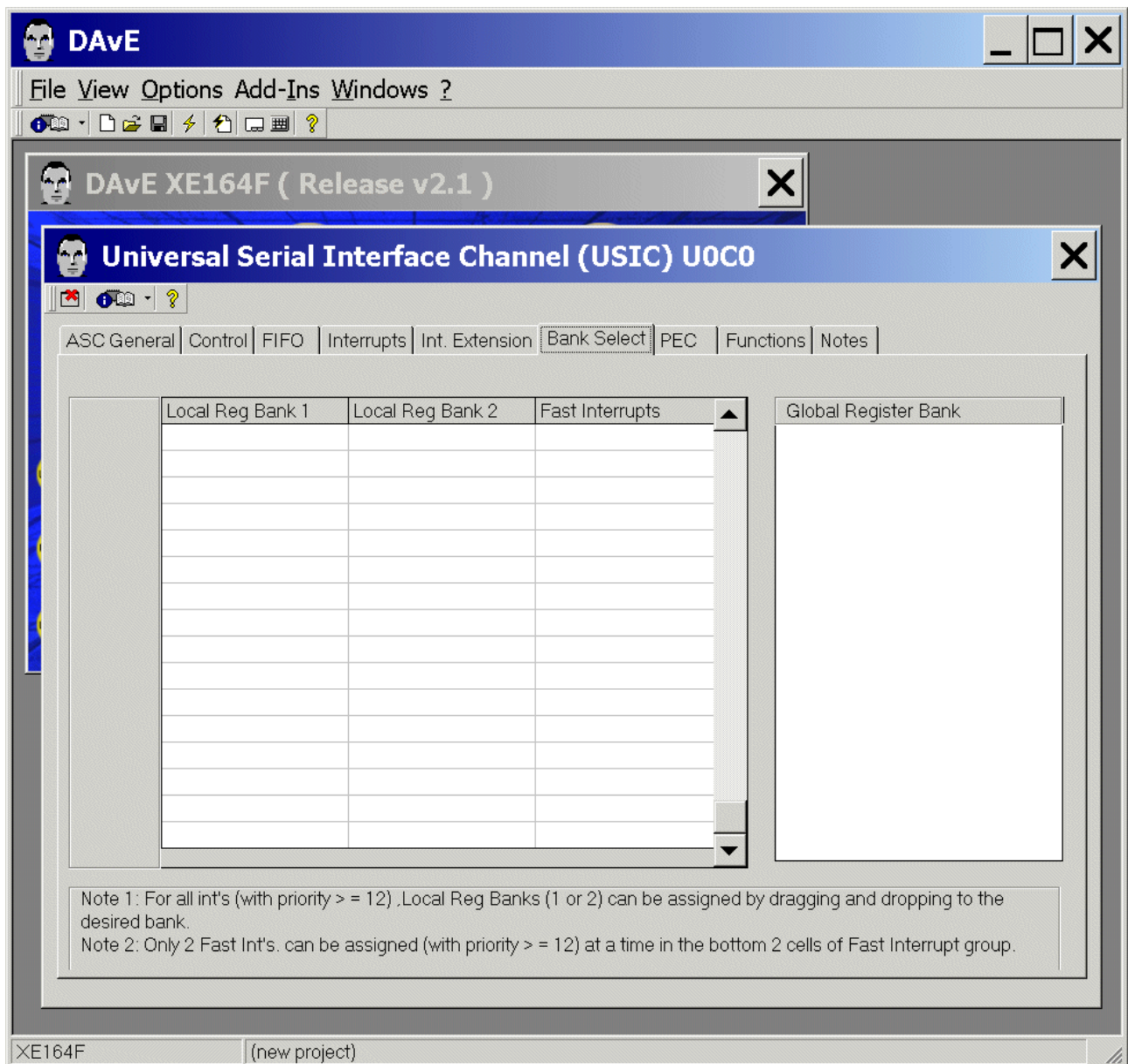
Note:

For the serial communication with a terminal program (e.g. Docklight, www.docklight.de) running on your host computer the myprintf function is used. The myprintf function uses Software-Polling-Mode therefore we do not need to configure any interrupts.

Int. Extension: (do nothing)

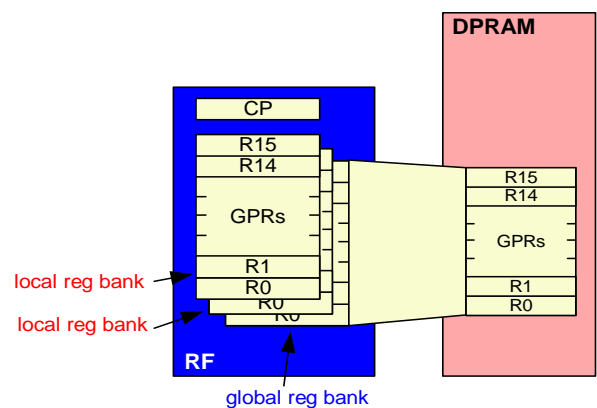


Bank Select: (do nothing)



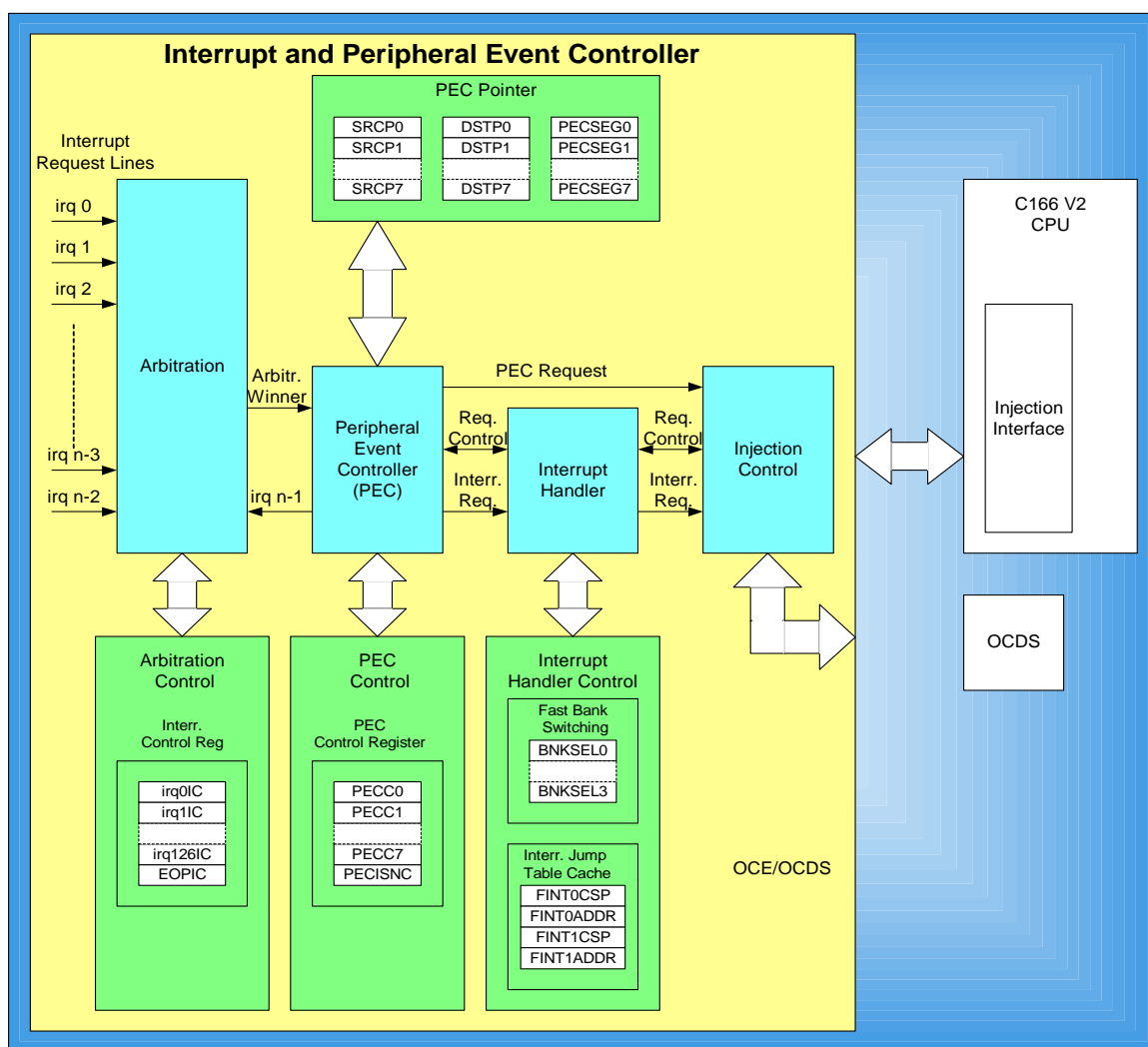
Note:

For our hello world program the 2 local register banks are not needed.





Additional information: **local register banks** and **fast interrupts** (page 1/2):





Additional information: **local register banks** and **fast interrupts** (page 1/2):

```
void CC1_viCC1 (void) interrupt CC1_CC1INT { }

void CC1_viCC1 (void) interrupt CC1_CC1INT using REGBANK4711 { }

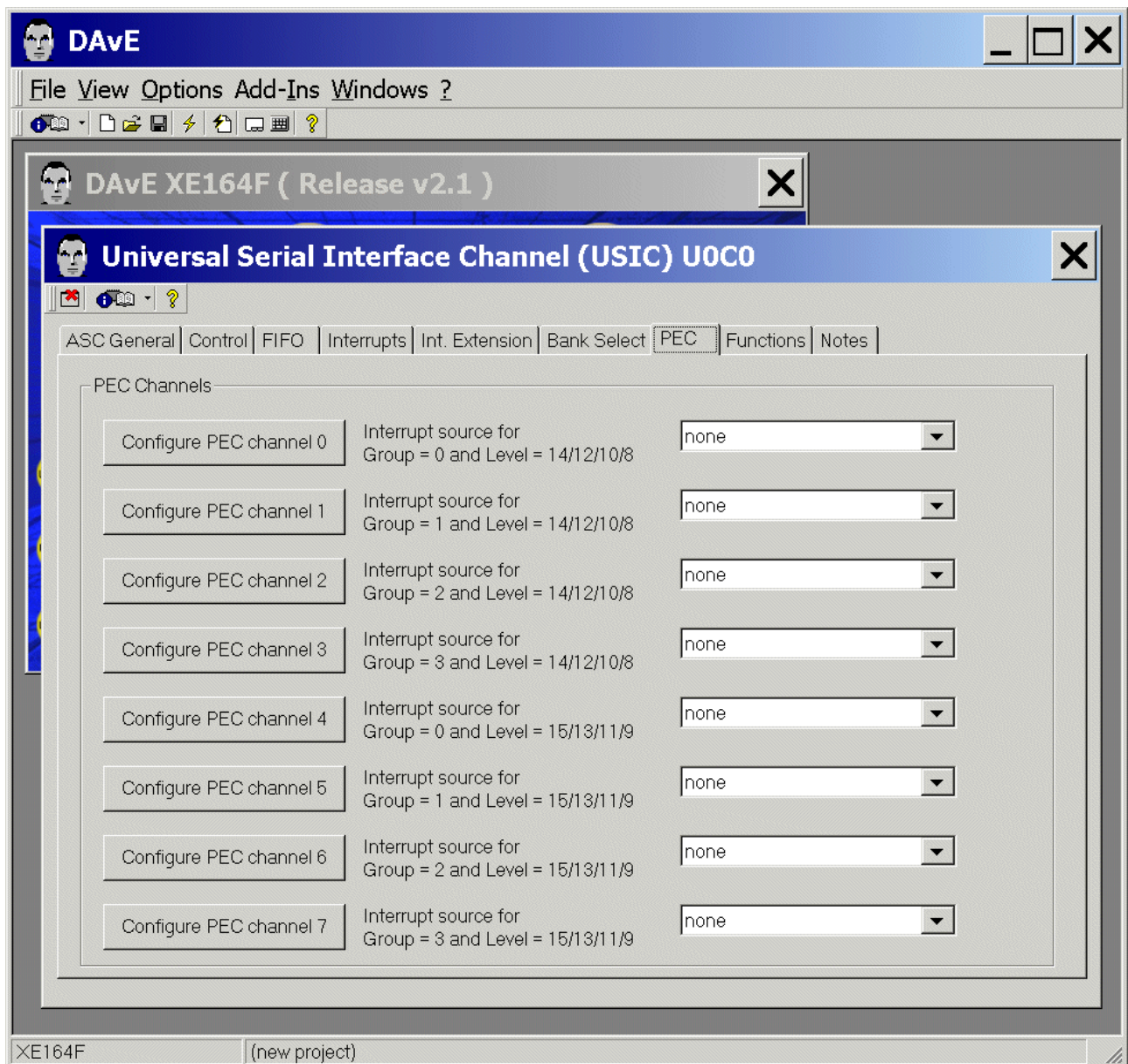
void CC1_viCC1 (void) interrupt CC1_CC1INT using _FAST_ABANK1_ { }

void CC1_viCC1 (void) interrupt MickeyMouse=CACHED { }

void CC1_viCC1 (void) interrupt MickeyMouse=CACHED using REGBANK4711 { }

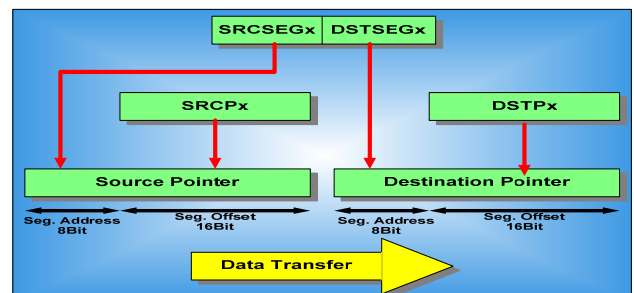
void CC1_viCC1 (void) interrupt MickeyMouse=CACHED using _FAST_ABANK1_ { }
```

PEC: (do nothing)

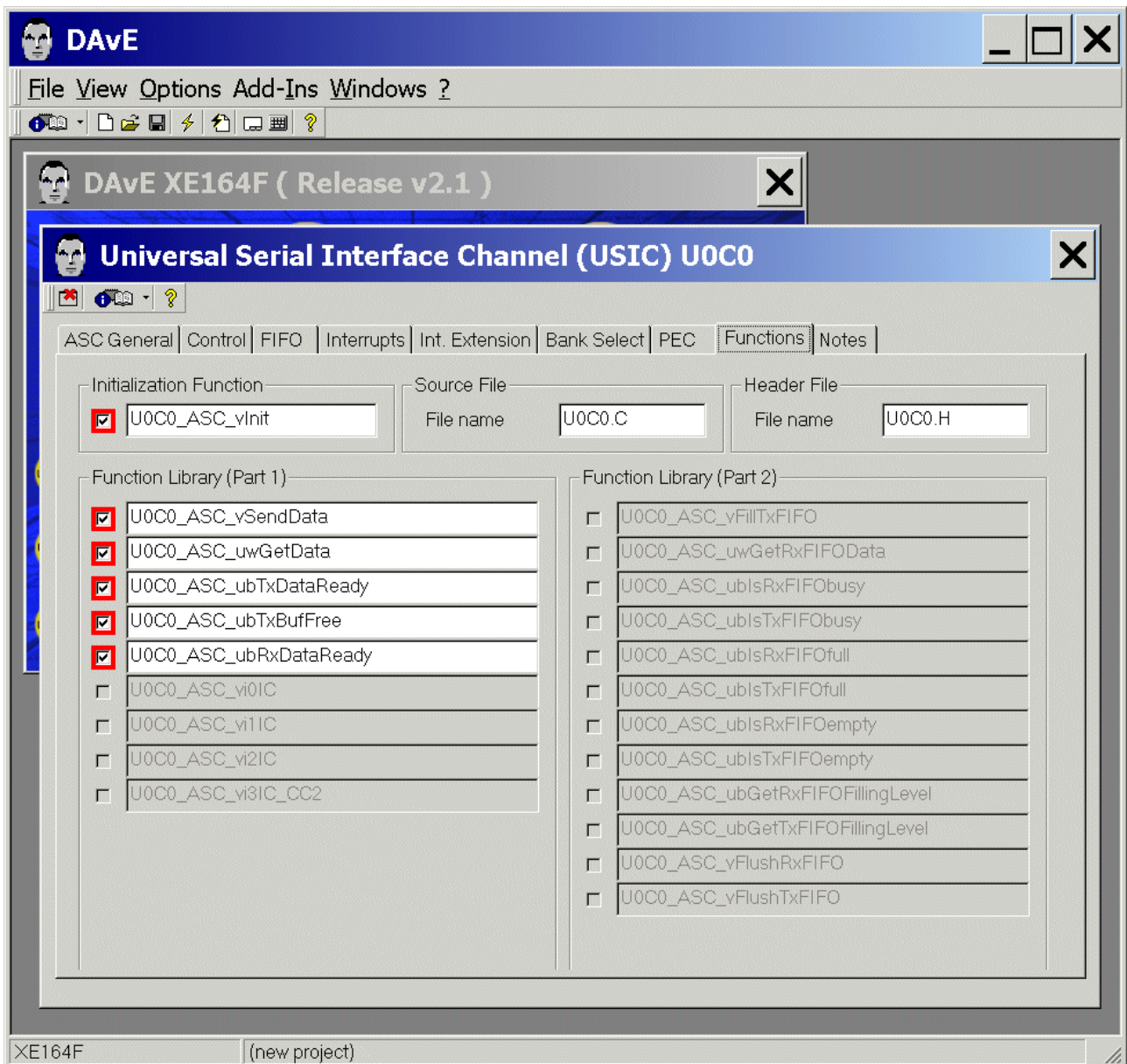


Note:

For our hello world program the 8 PEC Channels are not needed.



Functions: Initialization Function: **tick/check** ☒ U0C0_ASC_vInit
Functions: Function Library (Part 1): **tick** ☒ U0C0_ASC_vSendData
Functions: Function Library (Part 1): **tick** ☒ U0C0_ASC_uwGetData
Functions: Function Library (Part 1): **tick** ☒ U0C0_ASC_ubTxDataReady
Functions: Function Library (Part 1): **tick** ☒ U0C0_ASC_ubTxBufFree
Functions: Function Library (Part 1): **tick** ☒ U0C0_ASC_ubRxDataReady

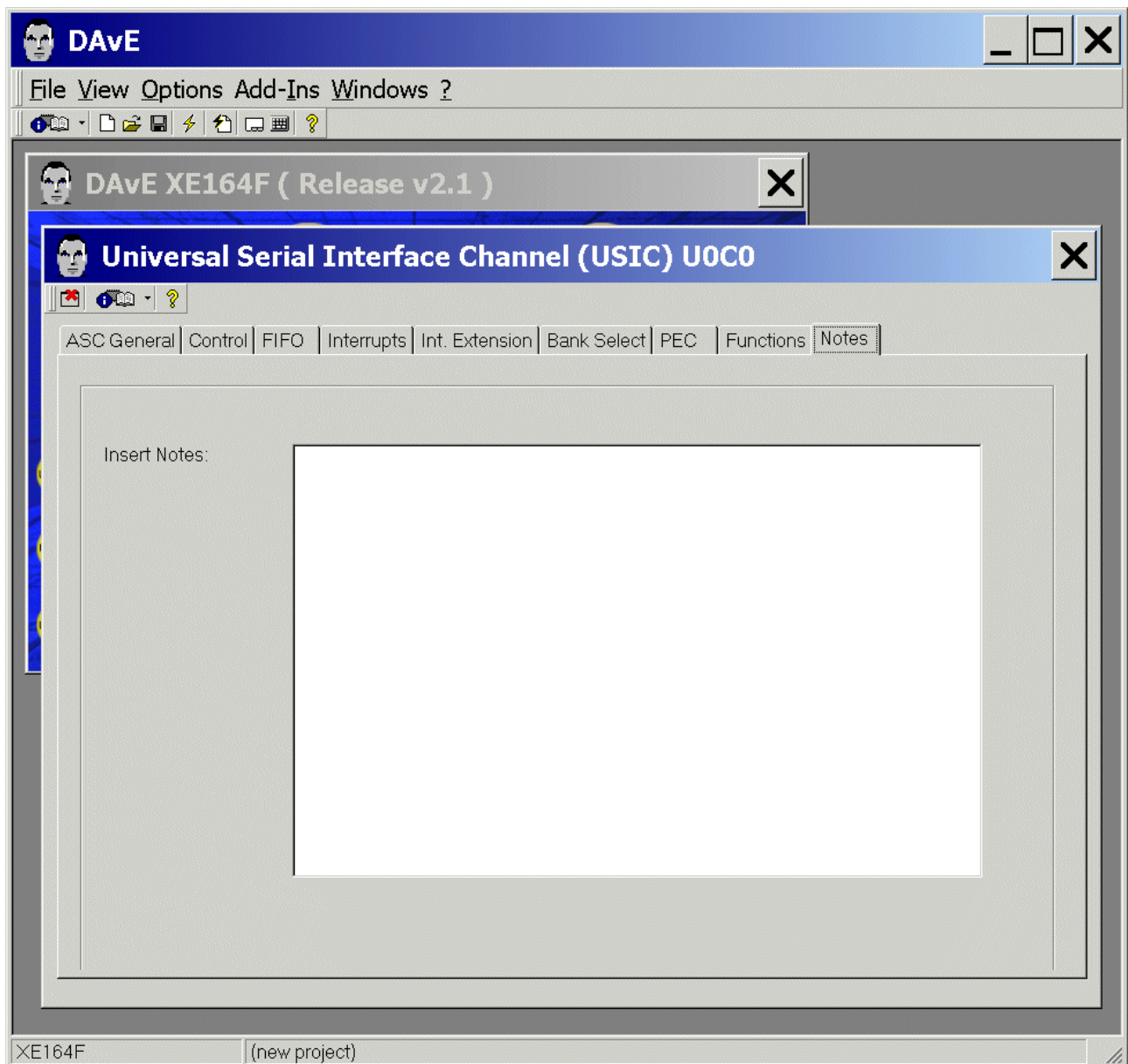


Note:

You can change function names (e.g. U0C0_ASC_vInit) and file names (e.g. U0C0.C, U0C0.H) anytime.




Notes: (do nothing)



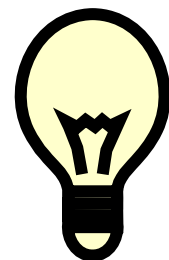
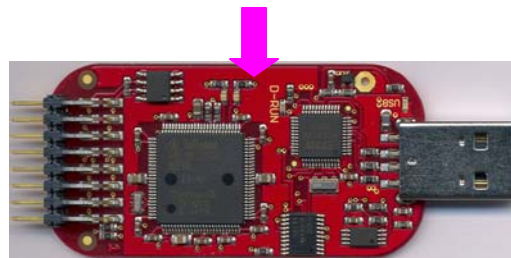
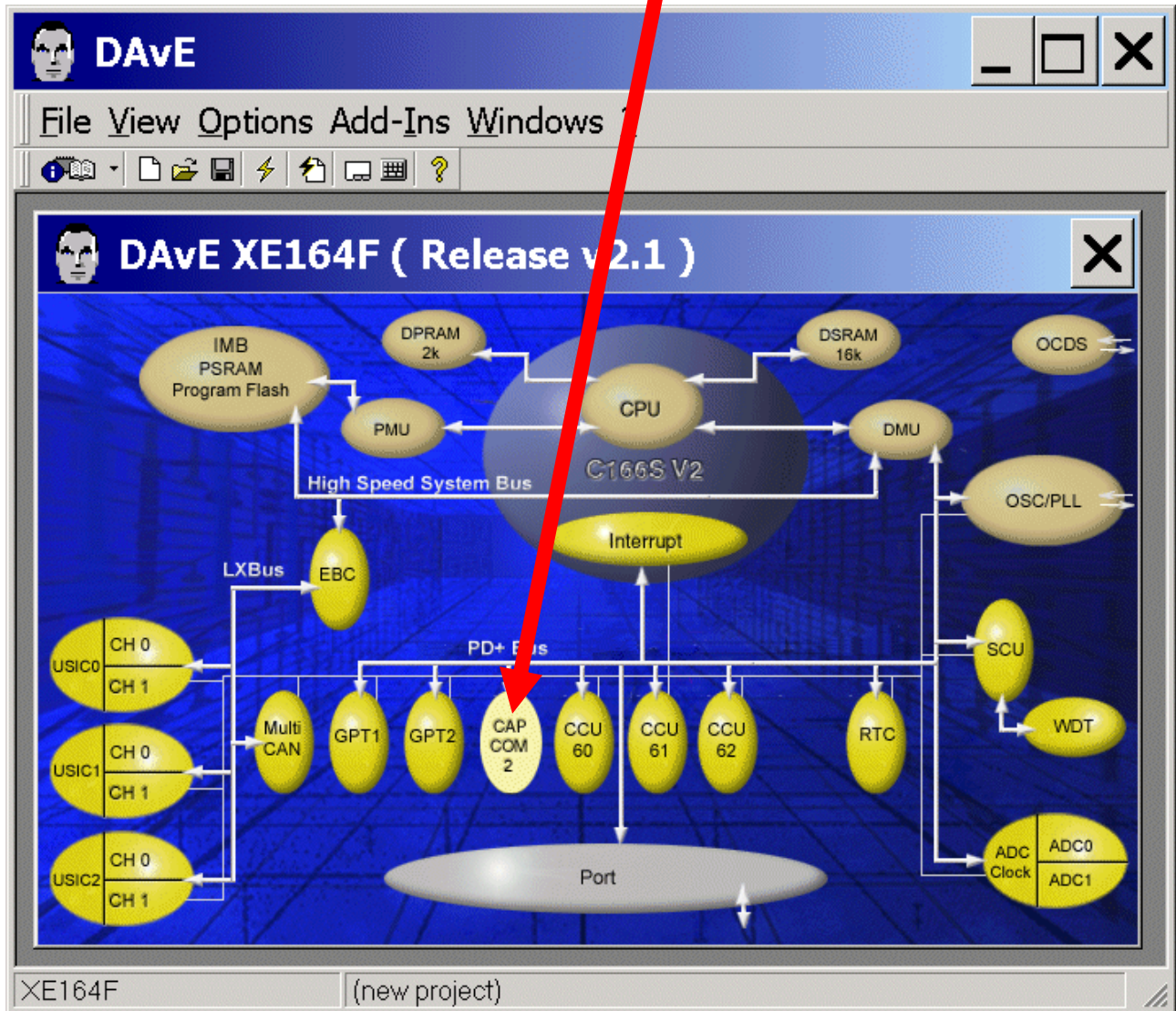
Note:

Notes: Insert Notes: If you wish, you can insert your comments here.

Exit and Save this dialog now by clicking  the close button.

Configure Timer T7 in the CAPCOM 2 module:

The configuration window/dialog can be opened by clicking the specific block/module (CAPCOM2).



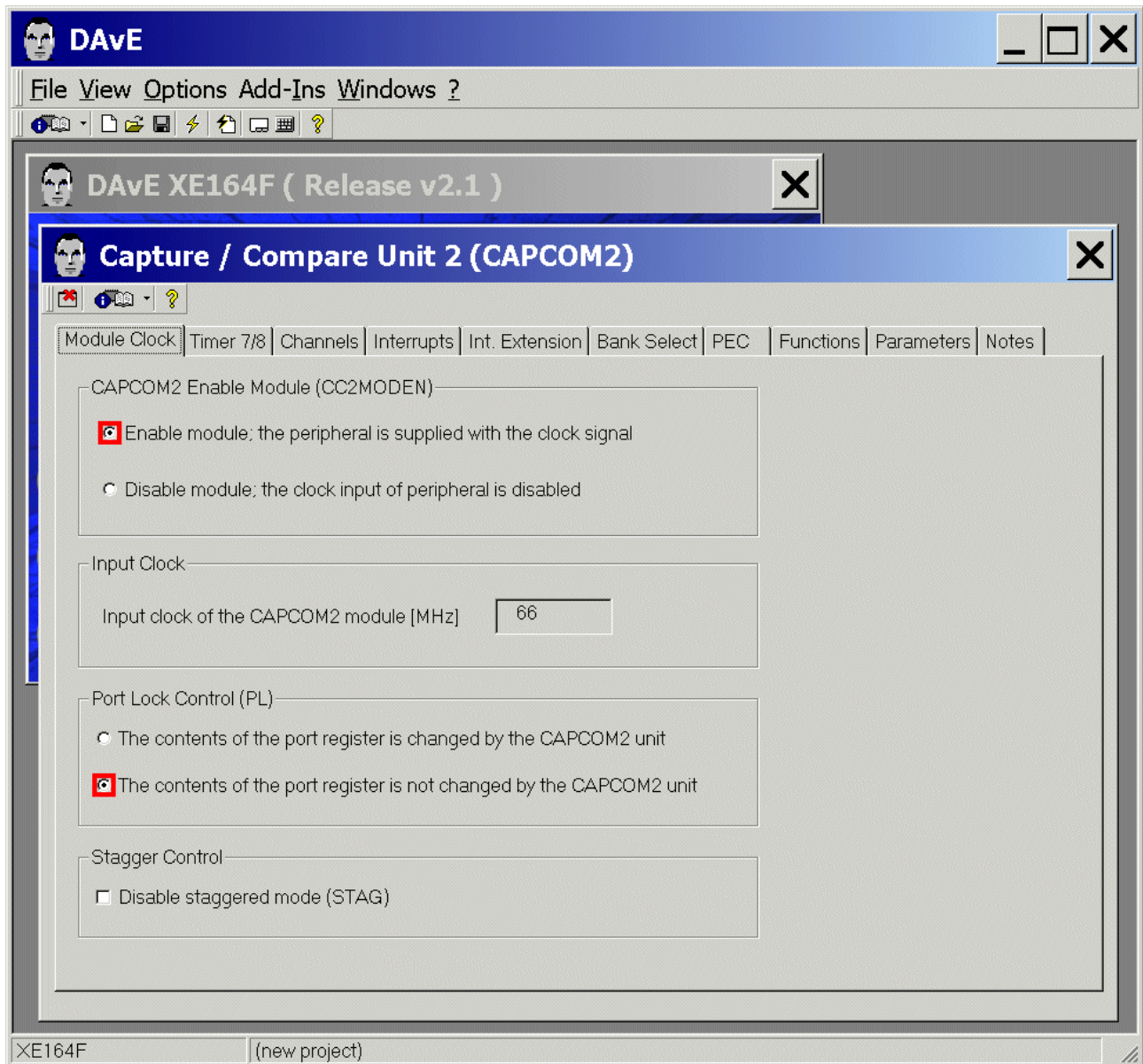
Note:

The **LED on IO_Port_2.7** will be blinking (after Power-On or if selected in the main menu) with a frequency of about 1 second (done in the Timer_7-Interrupt-Service-Routine). Therefore we have to configure Timer_7.

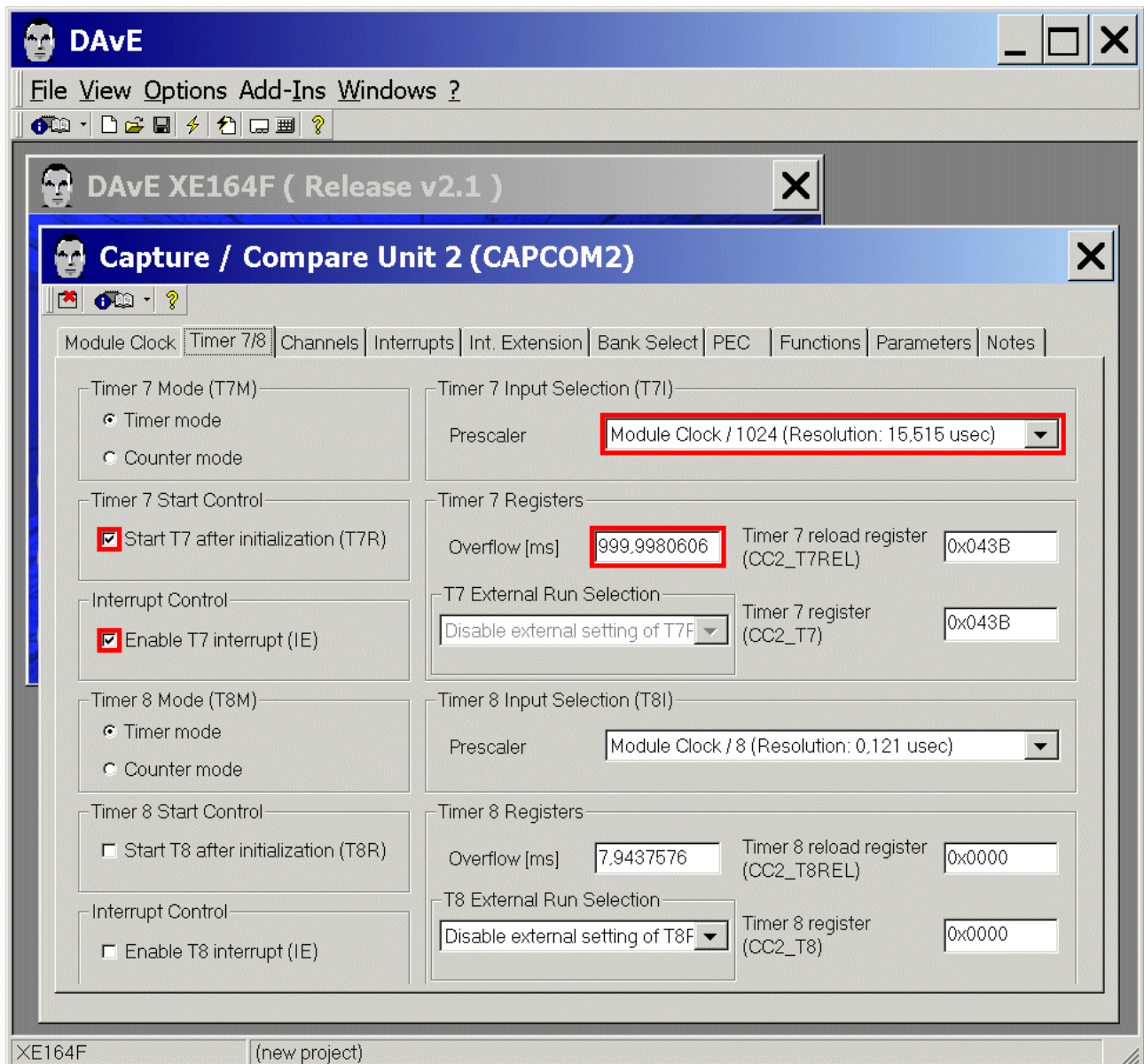
Module Clock: CAPCOM2 Enable Module: **click** ☒ Enable module

Module Clock: Port Lock Control:

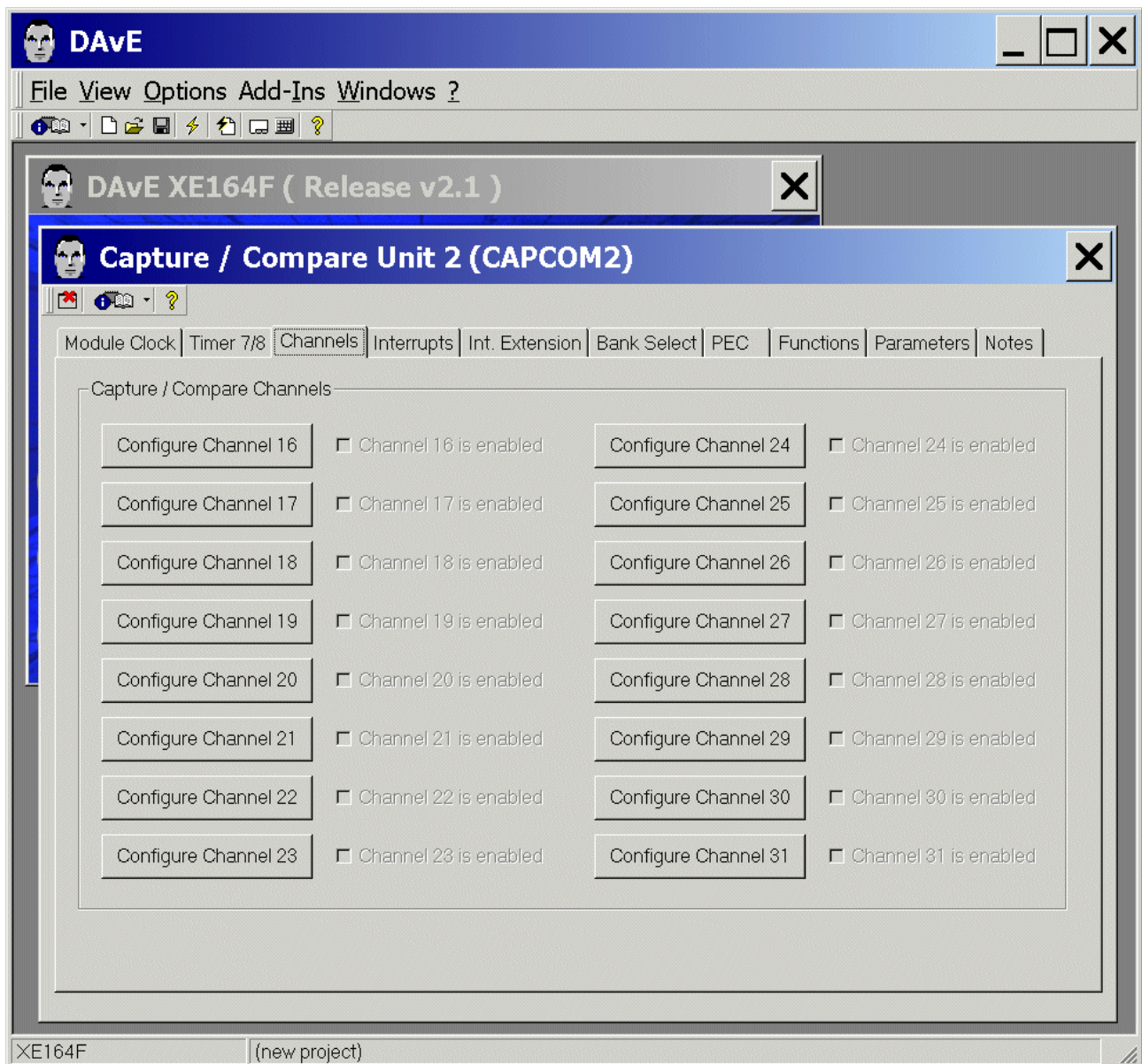
click ☒ The contents of the port register is not changed by the CAPCOM2 unit



Timer 7/8: Timer 7 Start Control: **tick** ✓ Start T7 after initialization (T7R)
 Timer 7/8: Interrupt Control: **tick** ✓ Enable T7 interrupt (IE)
 Timer 7/8: Timer 7 Input Selection (T7I): **Prescaler**: **choose** Module Clock/1024
 Timer 7/8: Timer 7 Registers: **Overflow** [s]: **insert** 1 <ENTER>



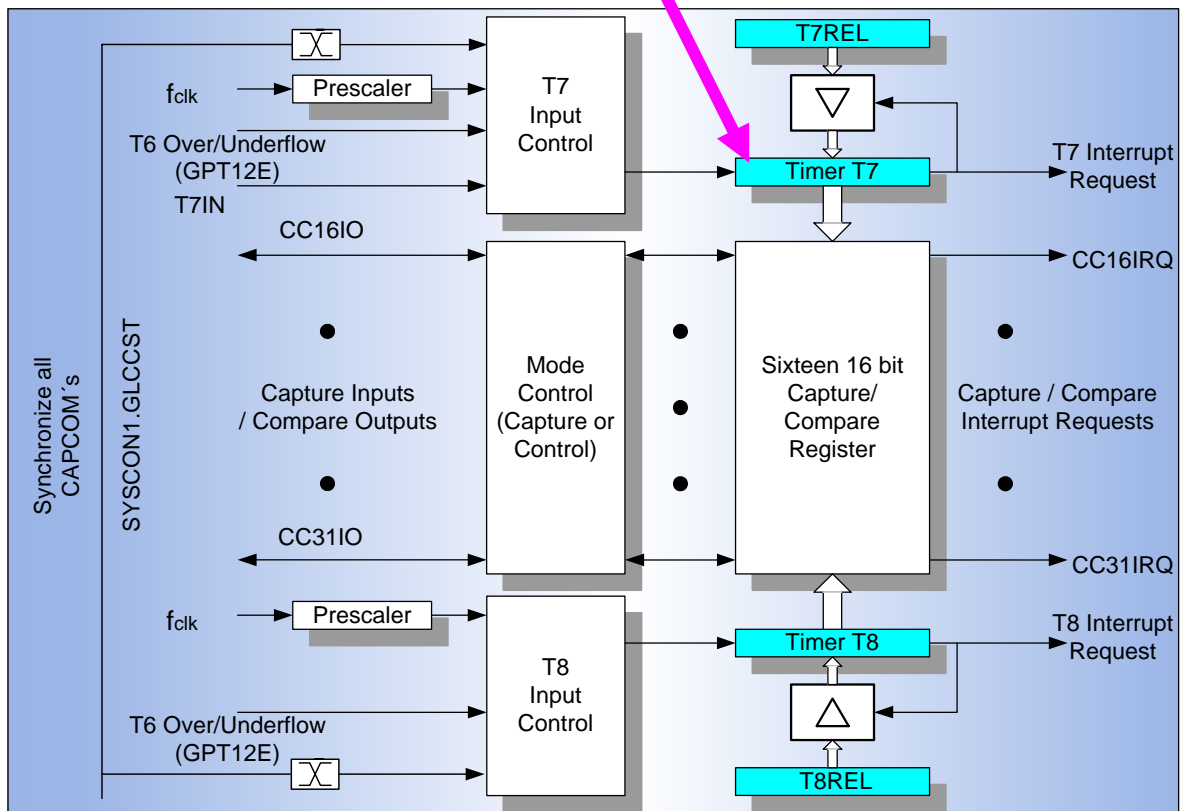
Channels: (do nothing)



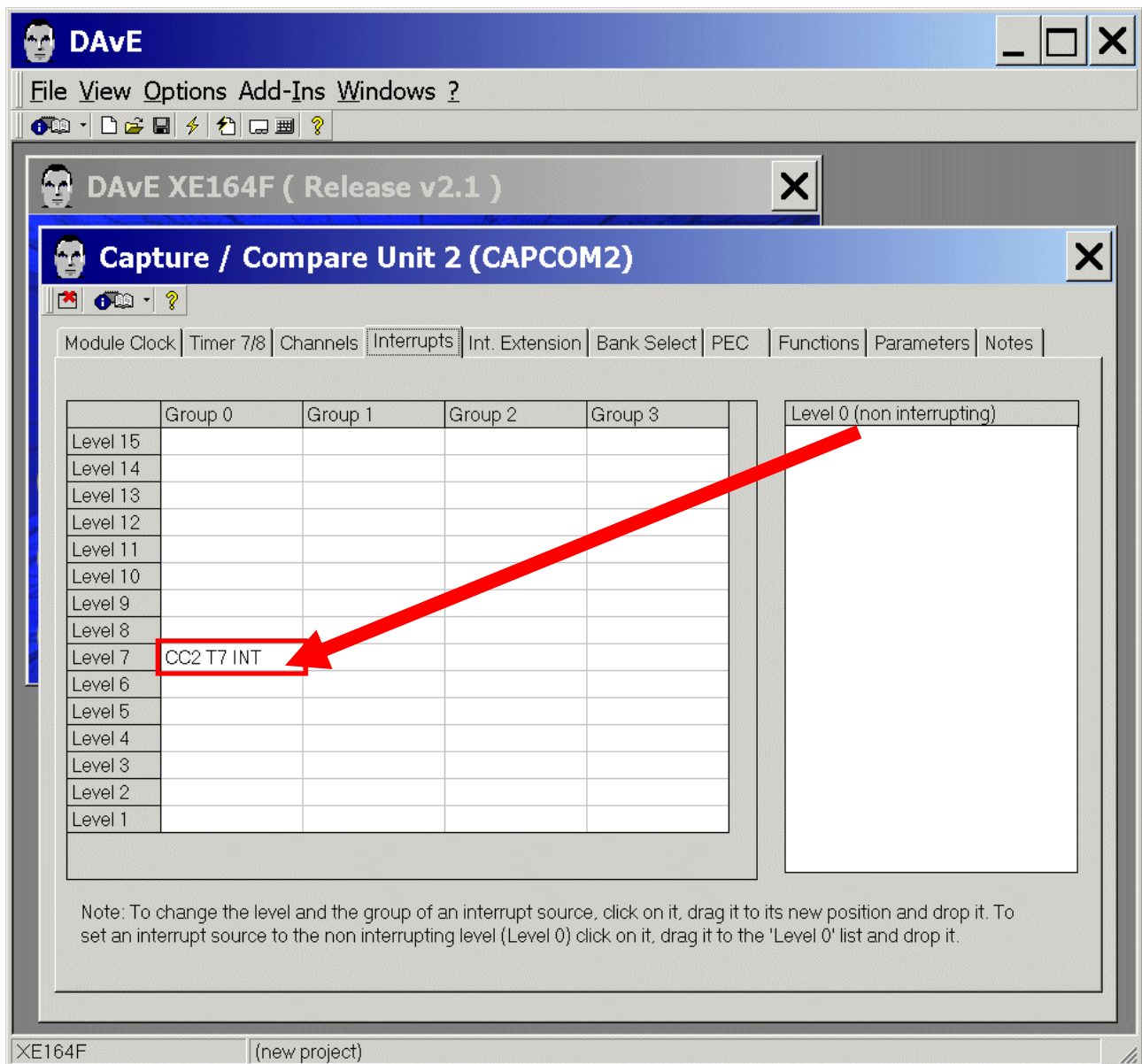


Note:

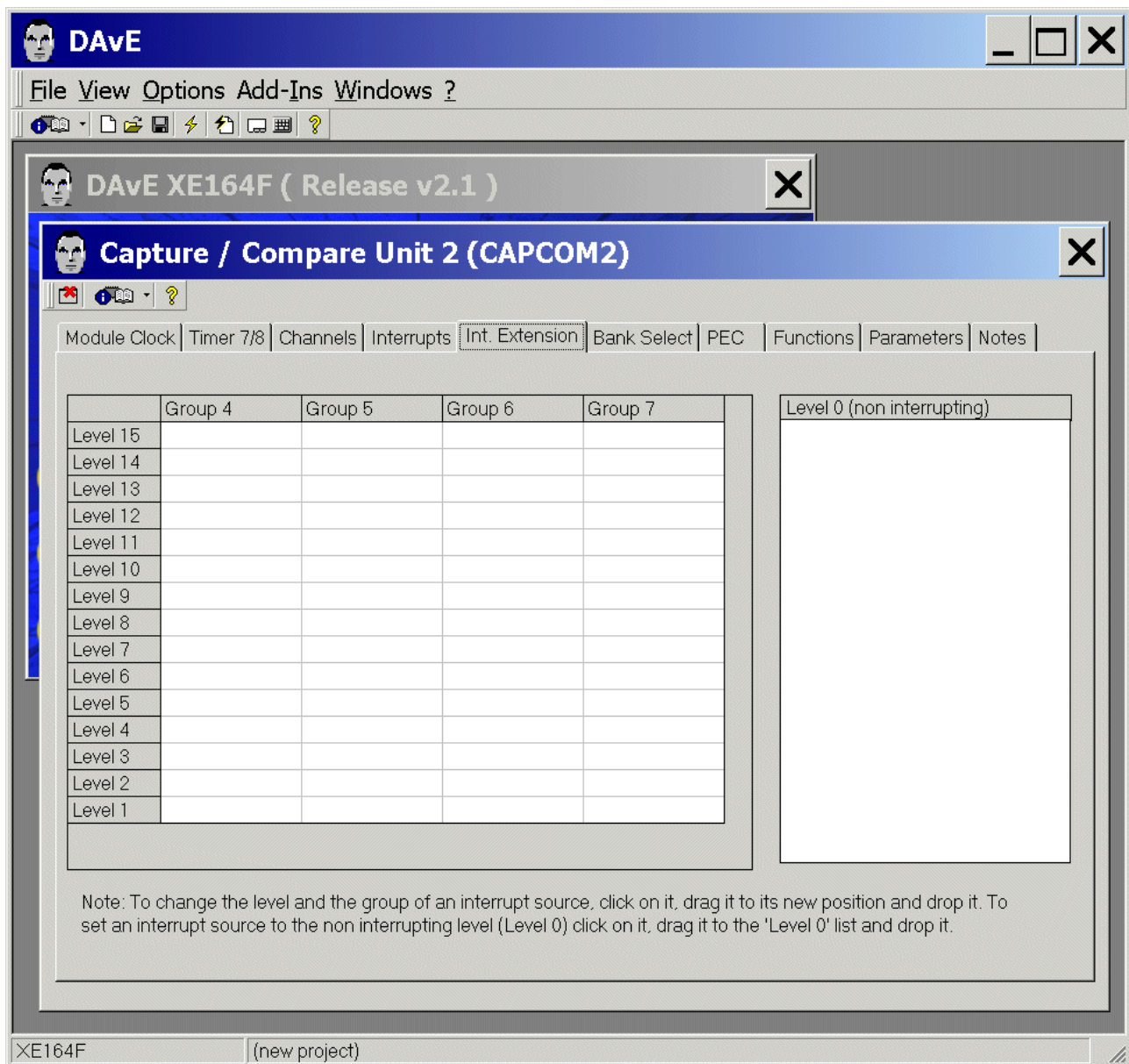
For our hello world program only **Timer 7** in the CAPCOM 2 module is used.



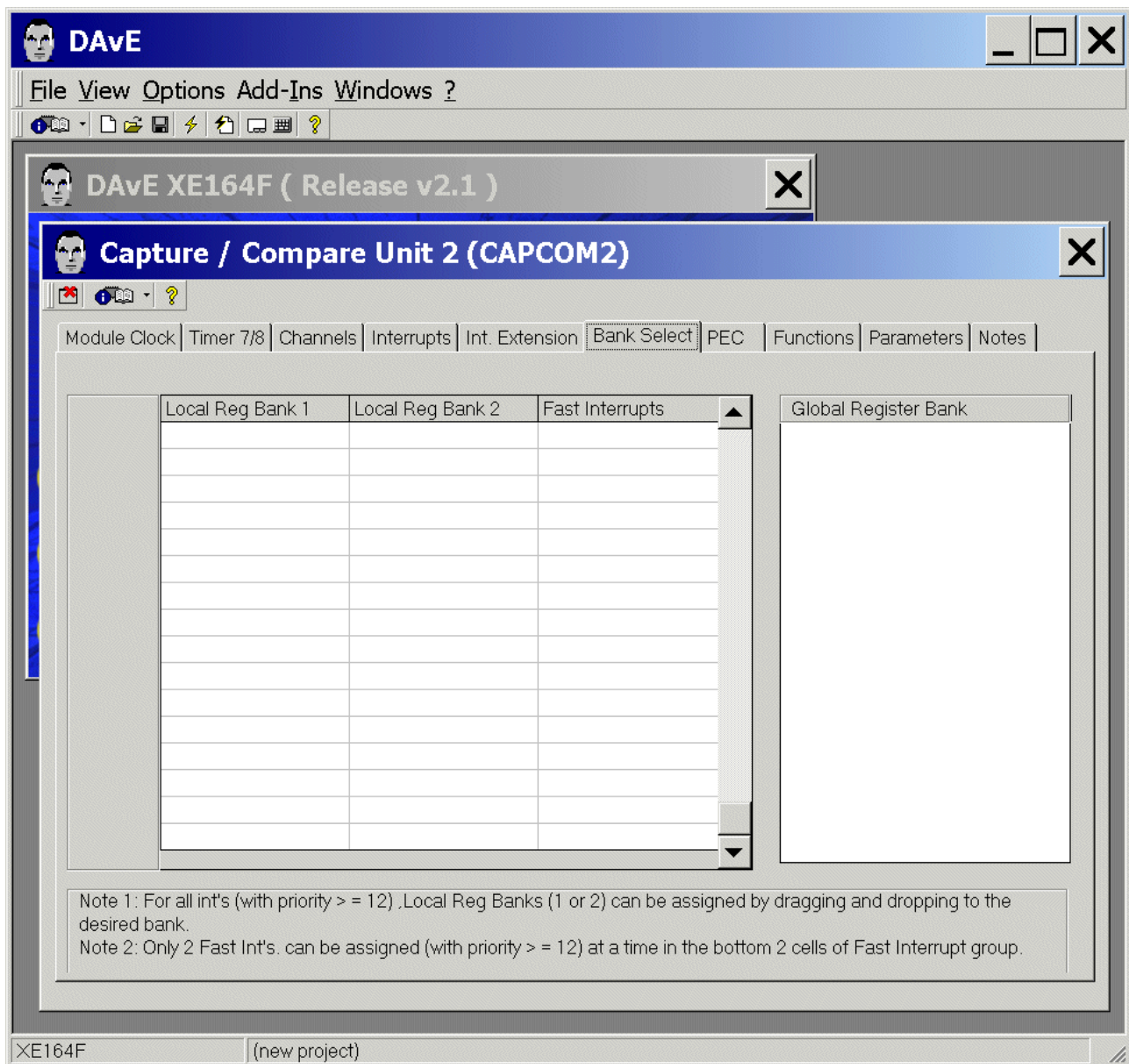
Interrupts: drag and drop the CC2 T7 INT to Interrupt Level 7, Group 0



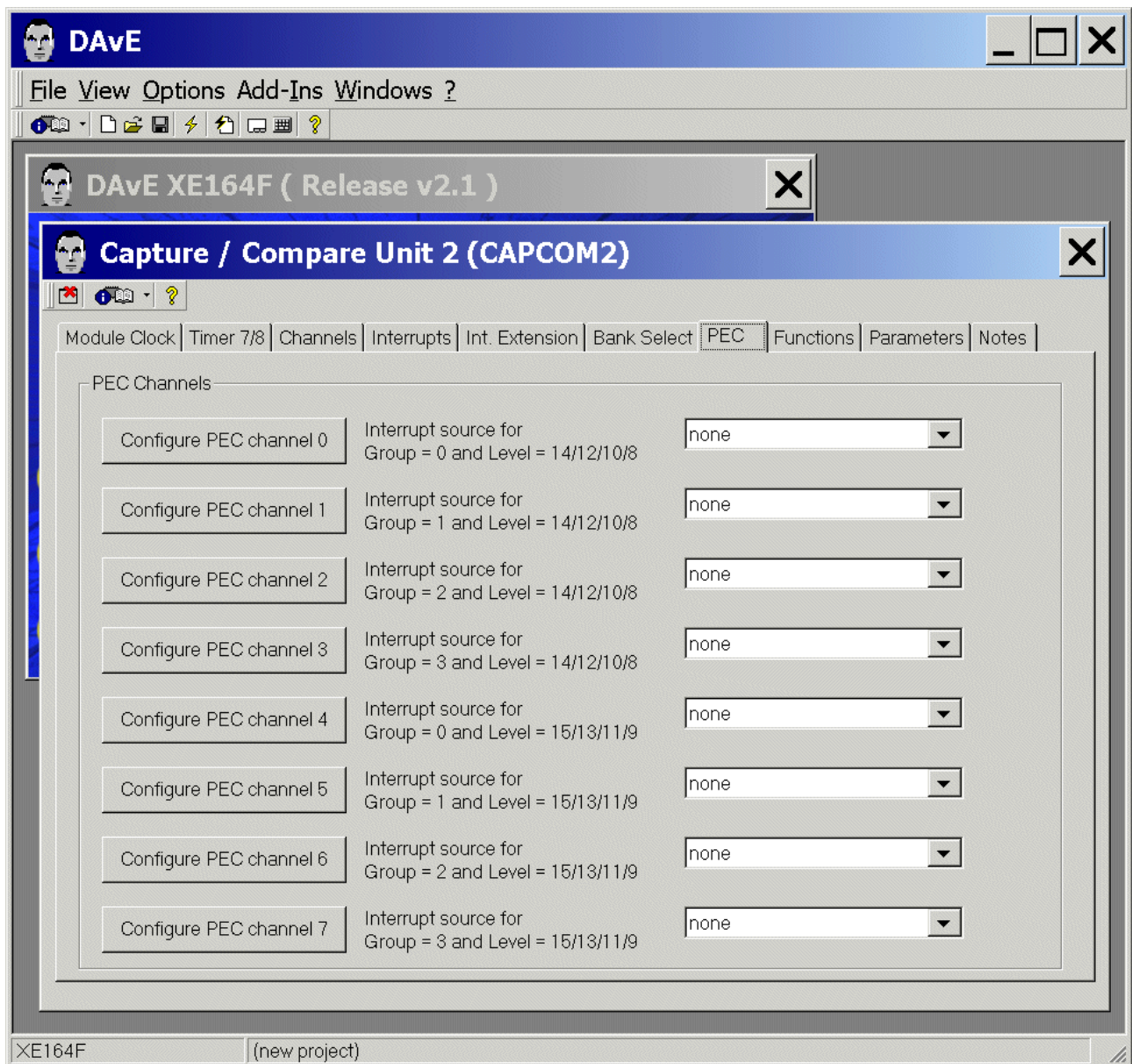
Int. Extension: (do nothing)



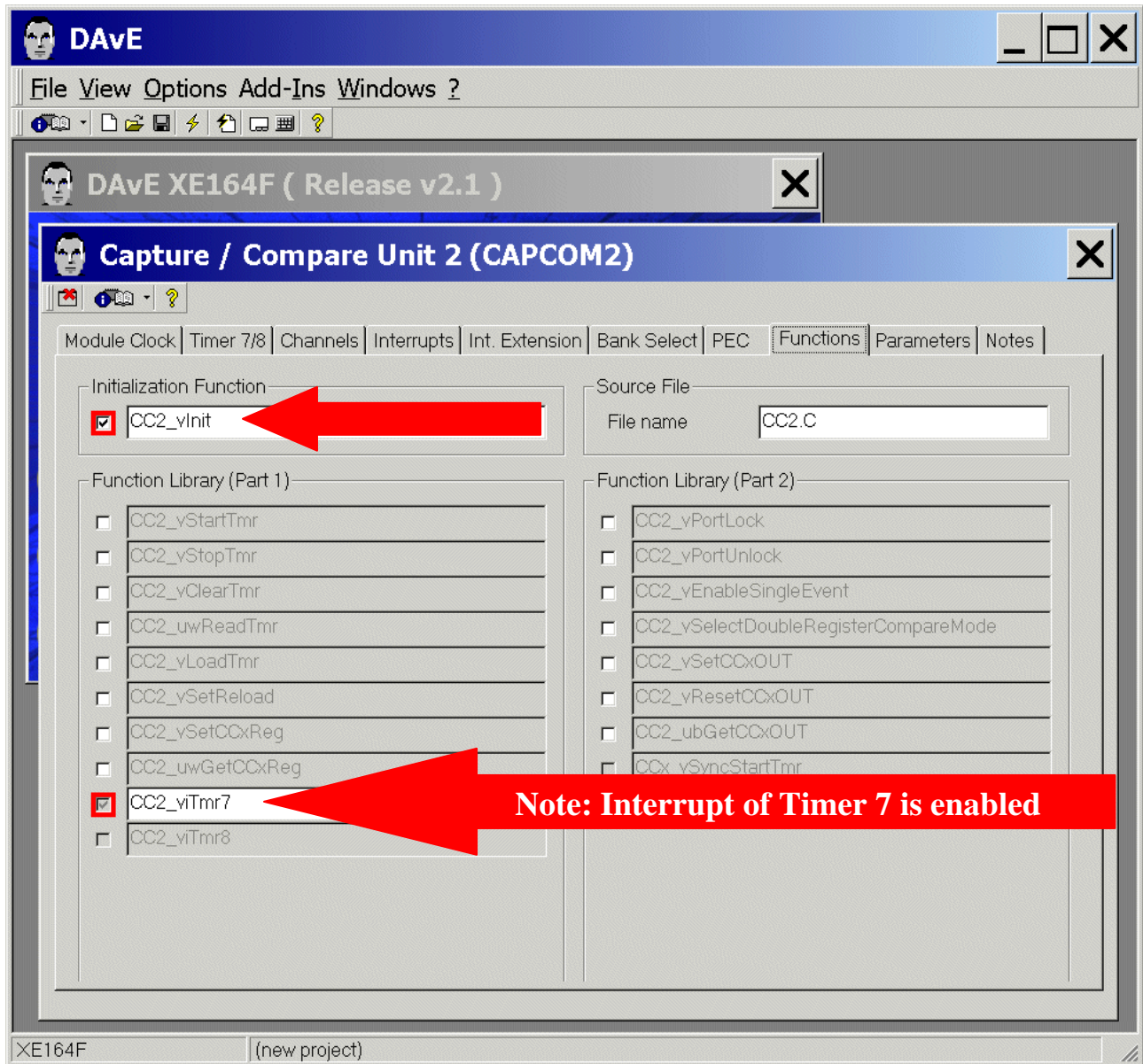
Bank Select: (do nothing)



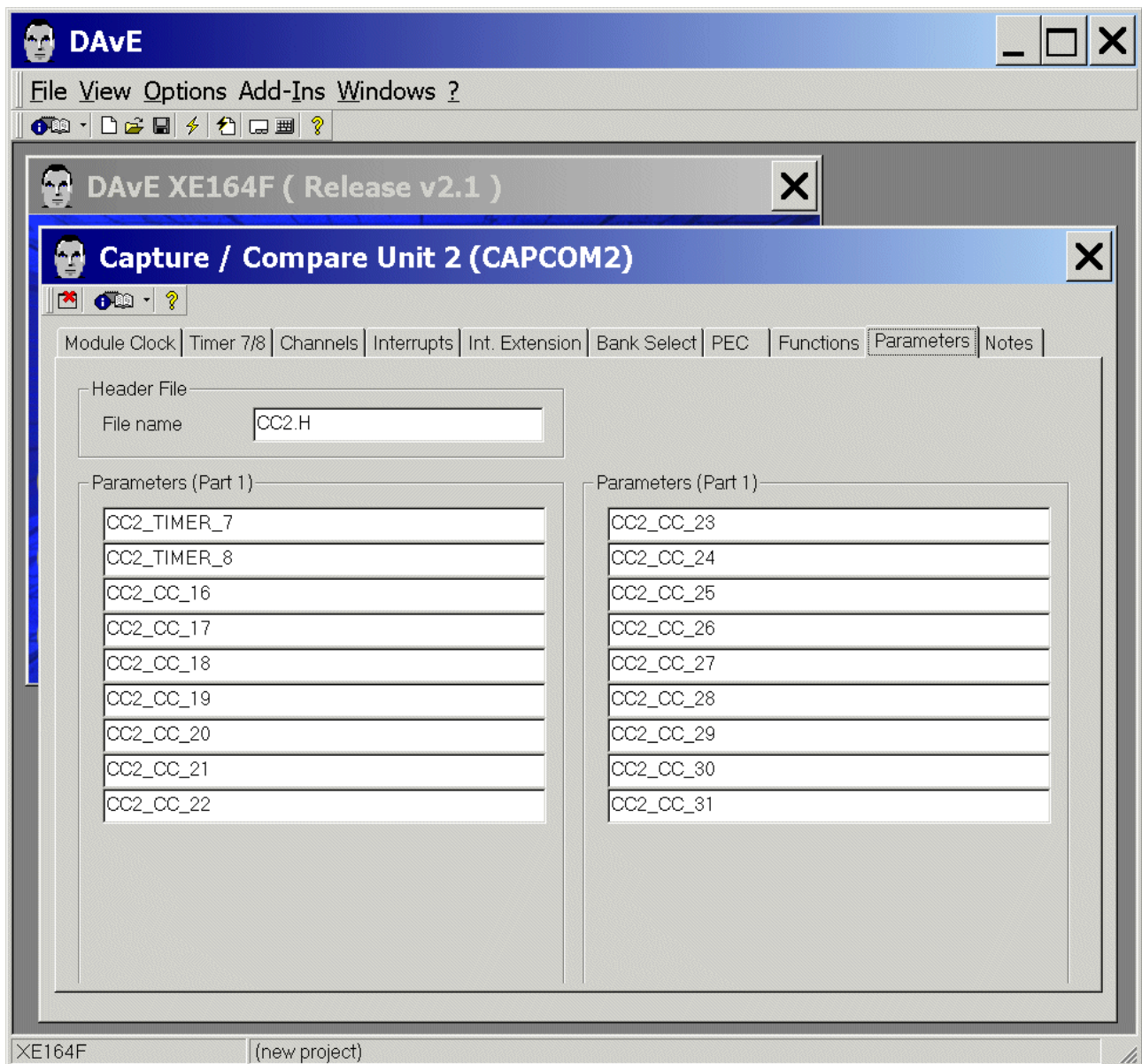
PEC: (do nothing)



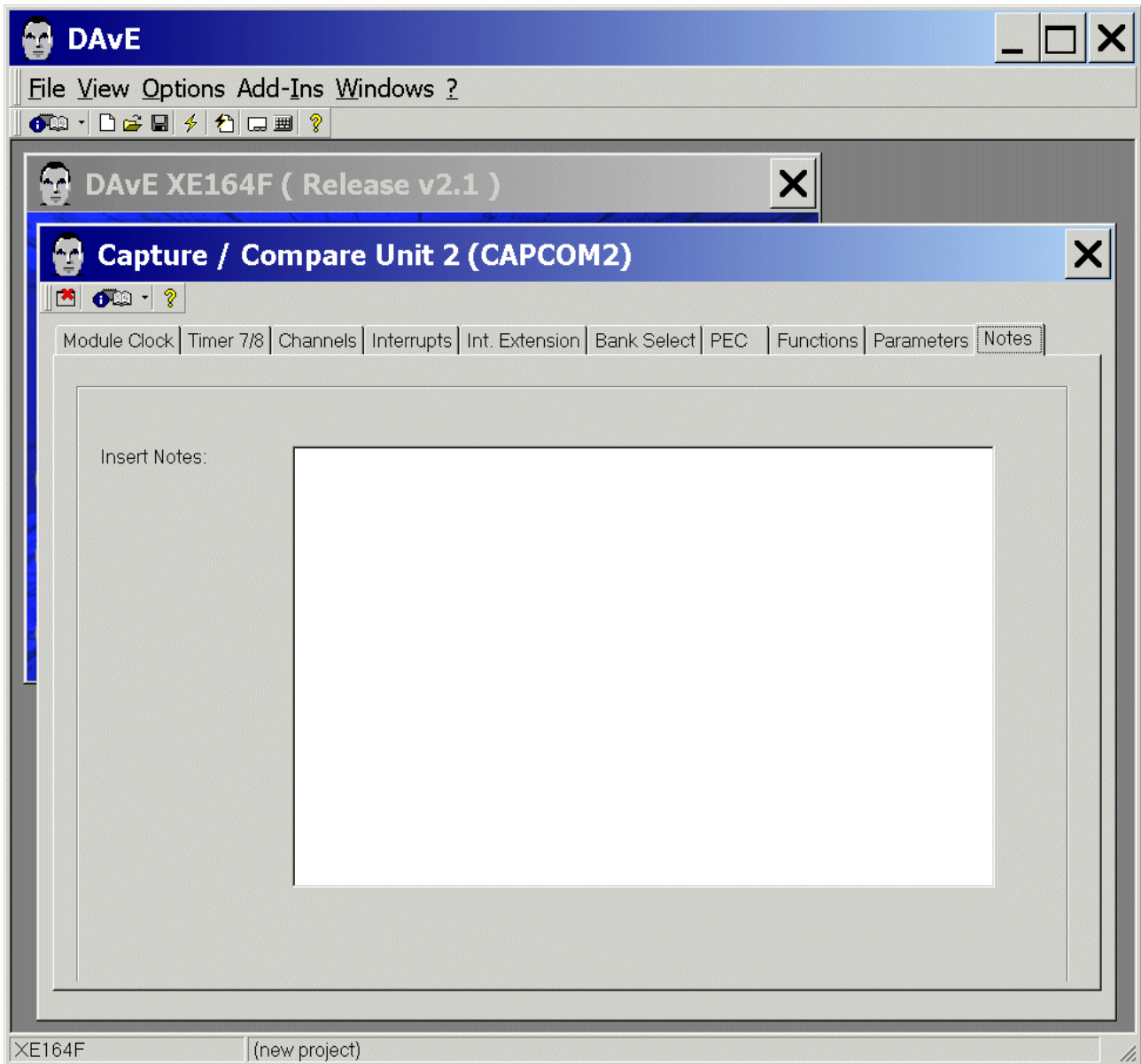
Functions: Initialization Function: tick/check ☒ CC2_vInit




Parameters: (do nothing)



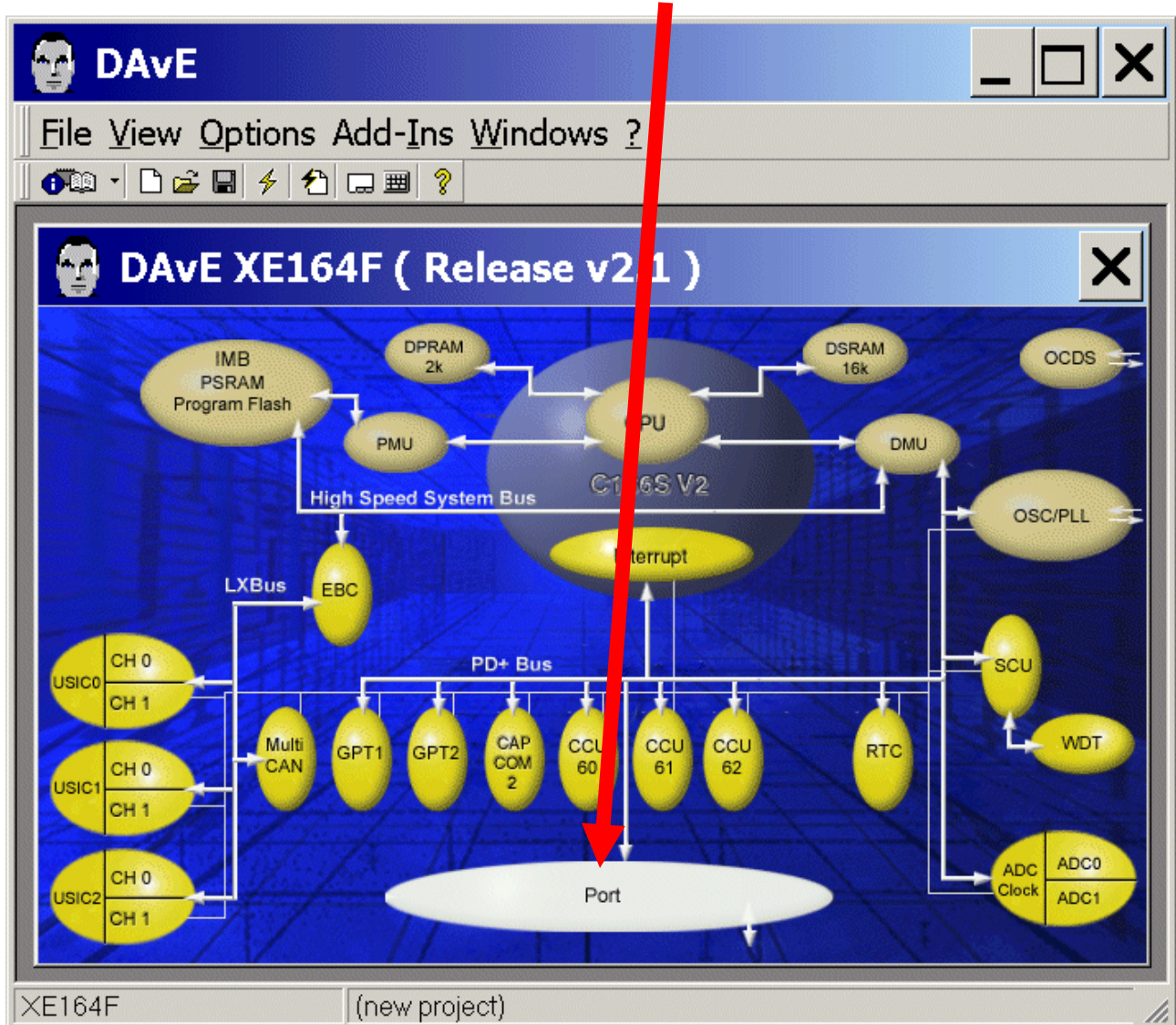
Notes: Insert Notes: If you wish, you can insert your comments here.



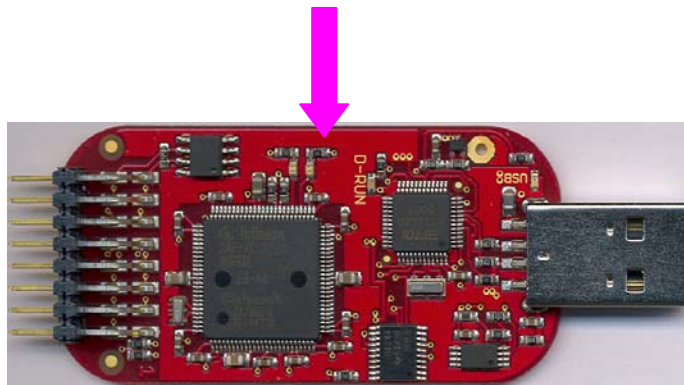
Exit and **Save** this dialog now by clicking  the close button.

Configure Port 2 Pin 7 to Output :

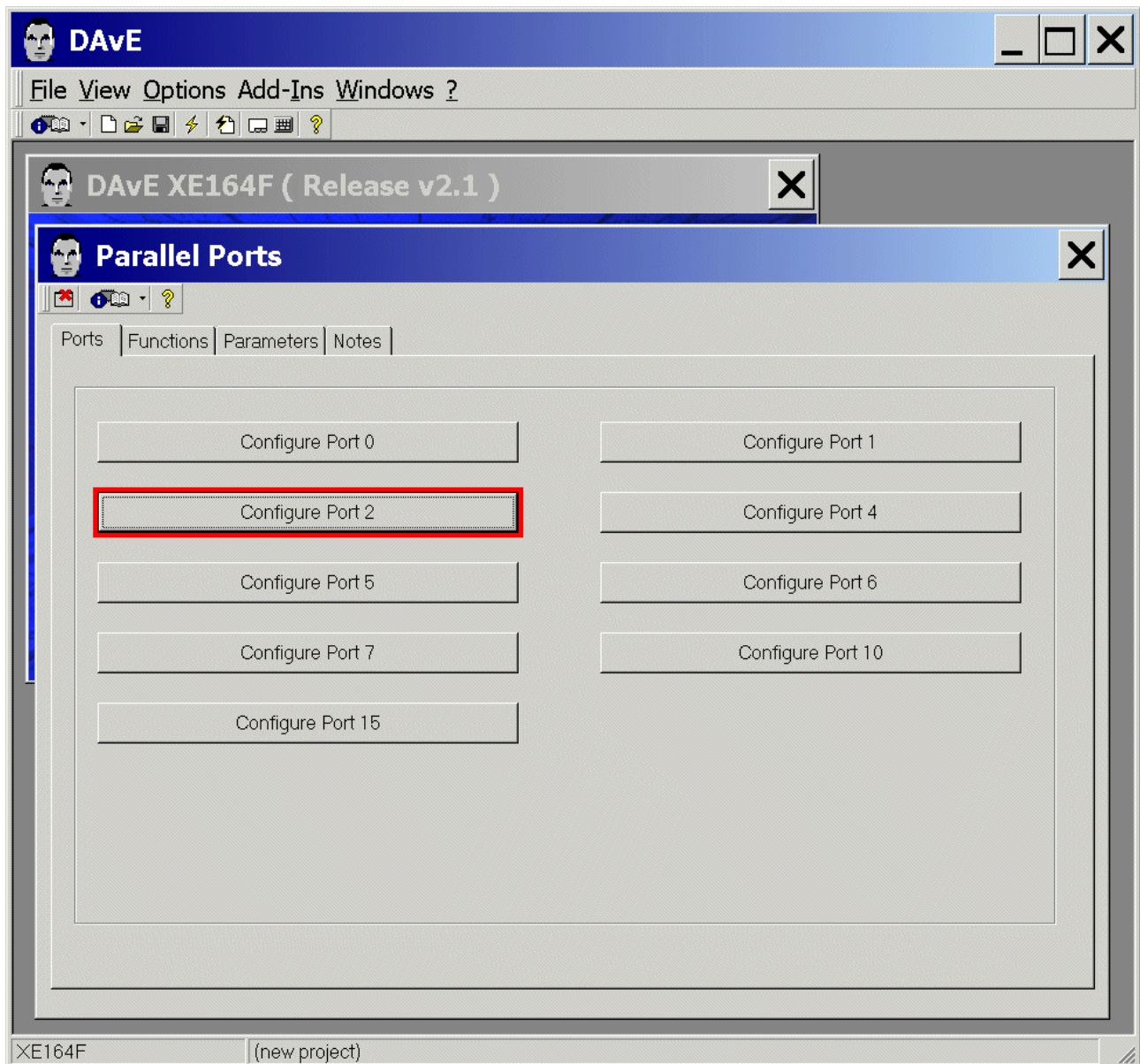
The configuration window/dialog can be opened by clicking the specific block/module (Port).



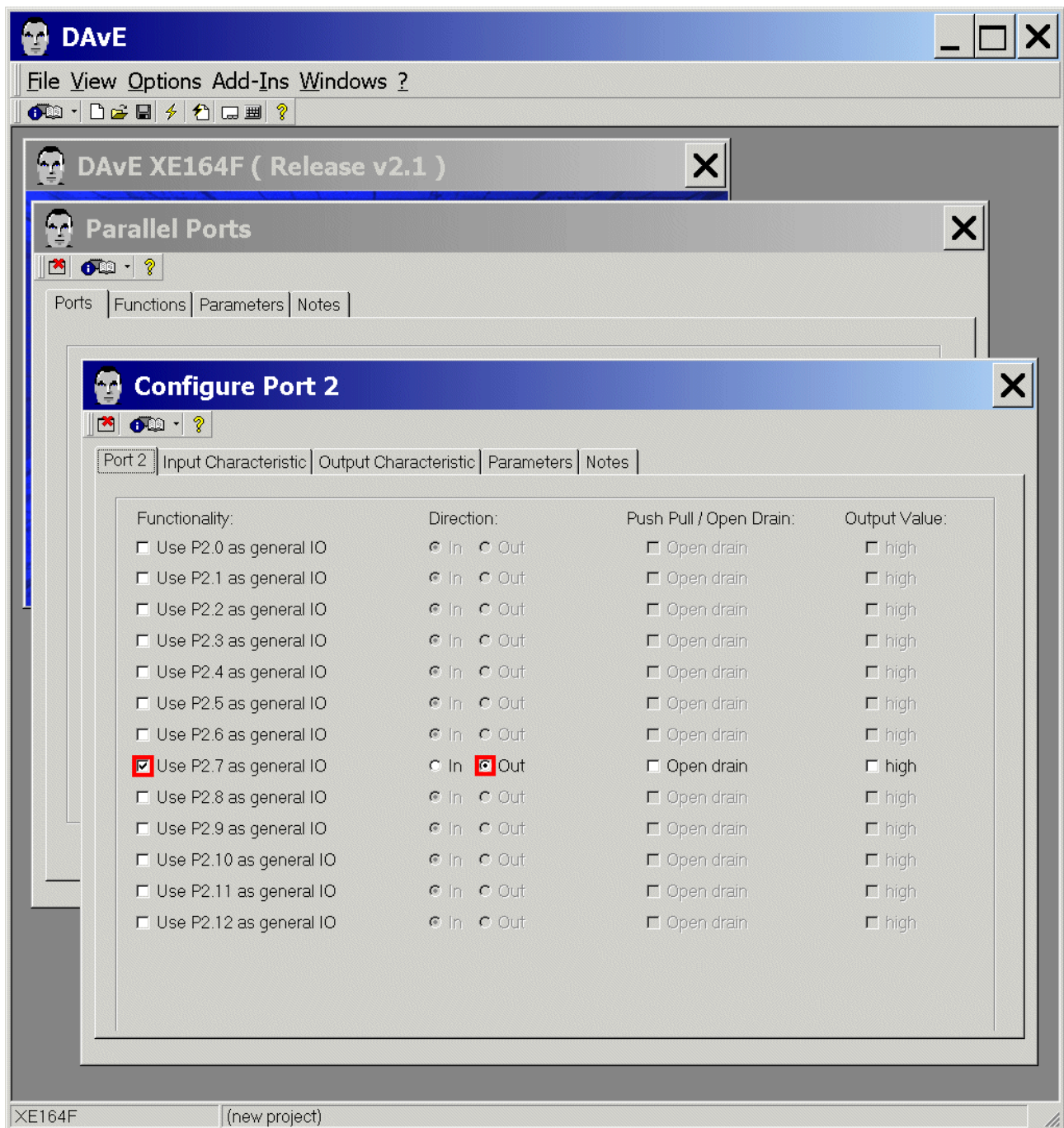
Note:
The LED is connected to **IO_Port_2.7**



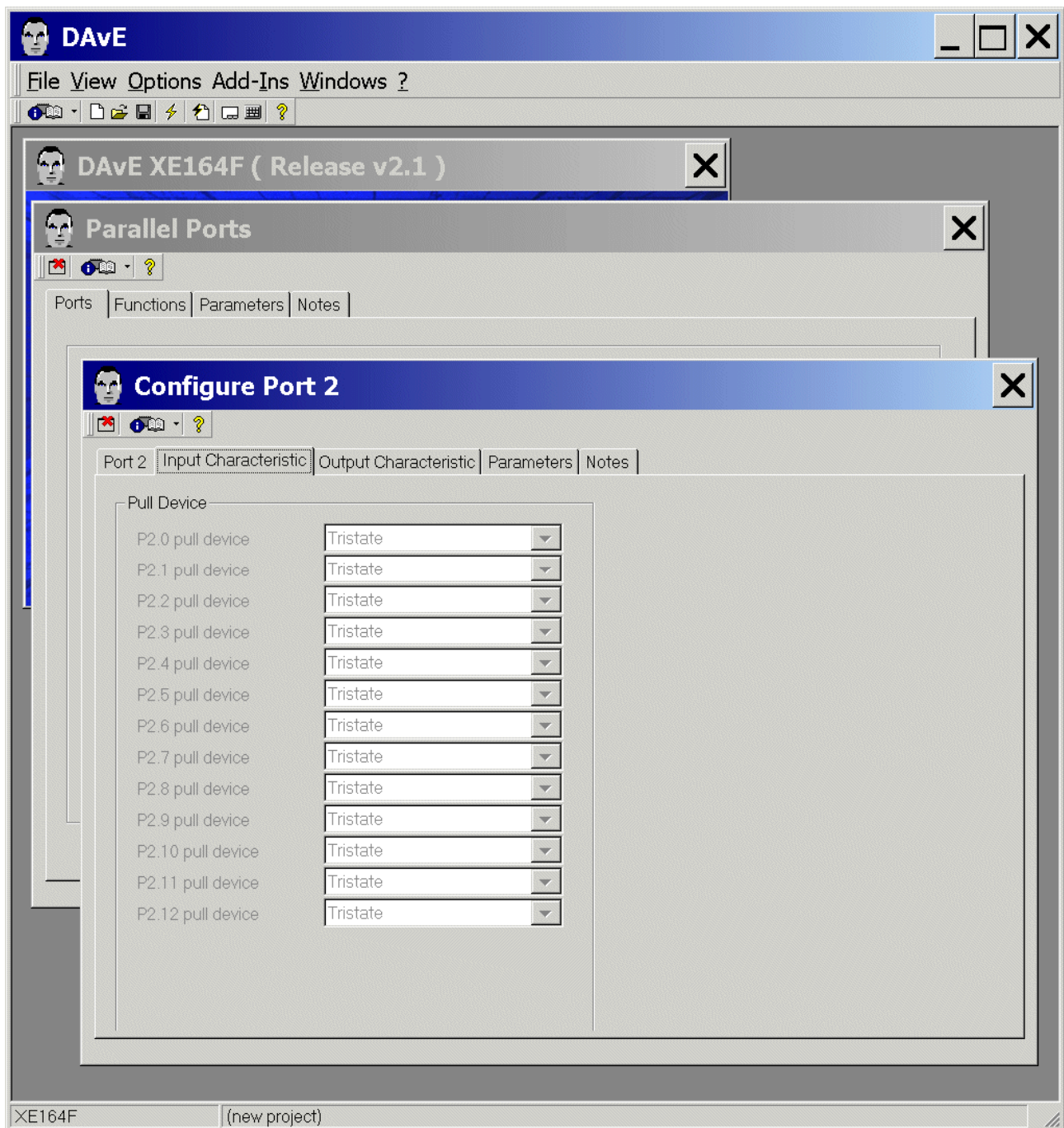
Ports: click "Configure Port 2"



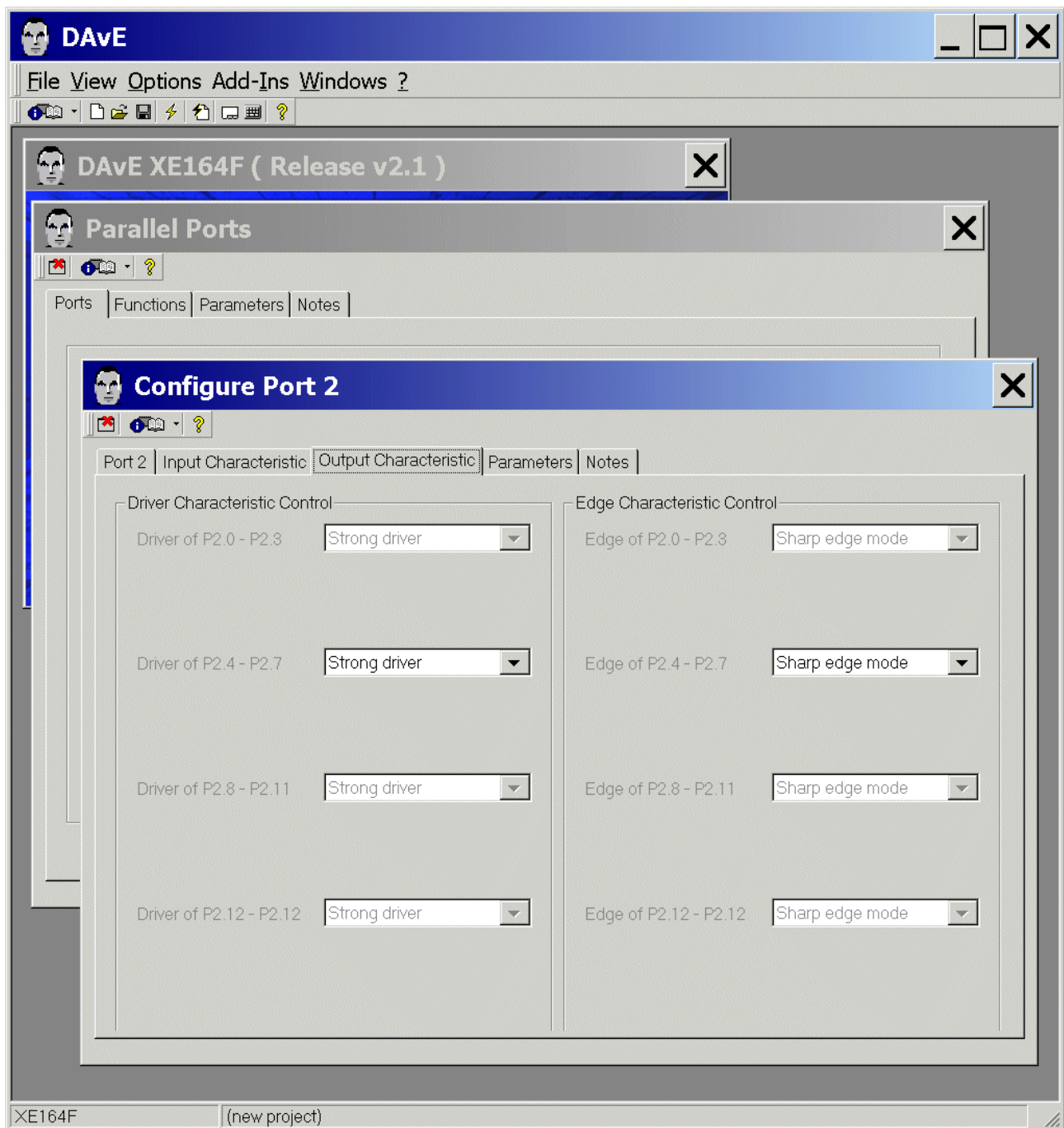
Port 2: Functionality: tick ☒ Use P2.7 as general IO - **Direction:** click ☒ Out



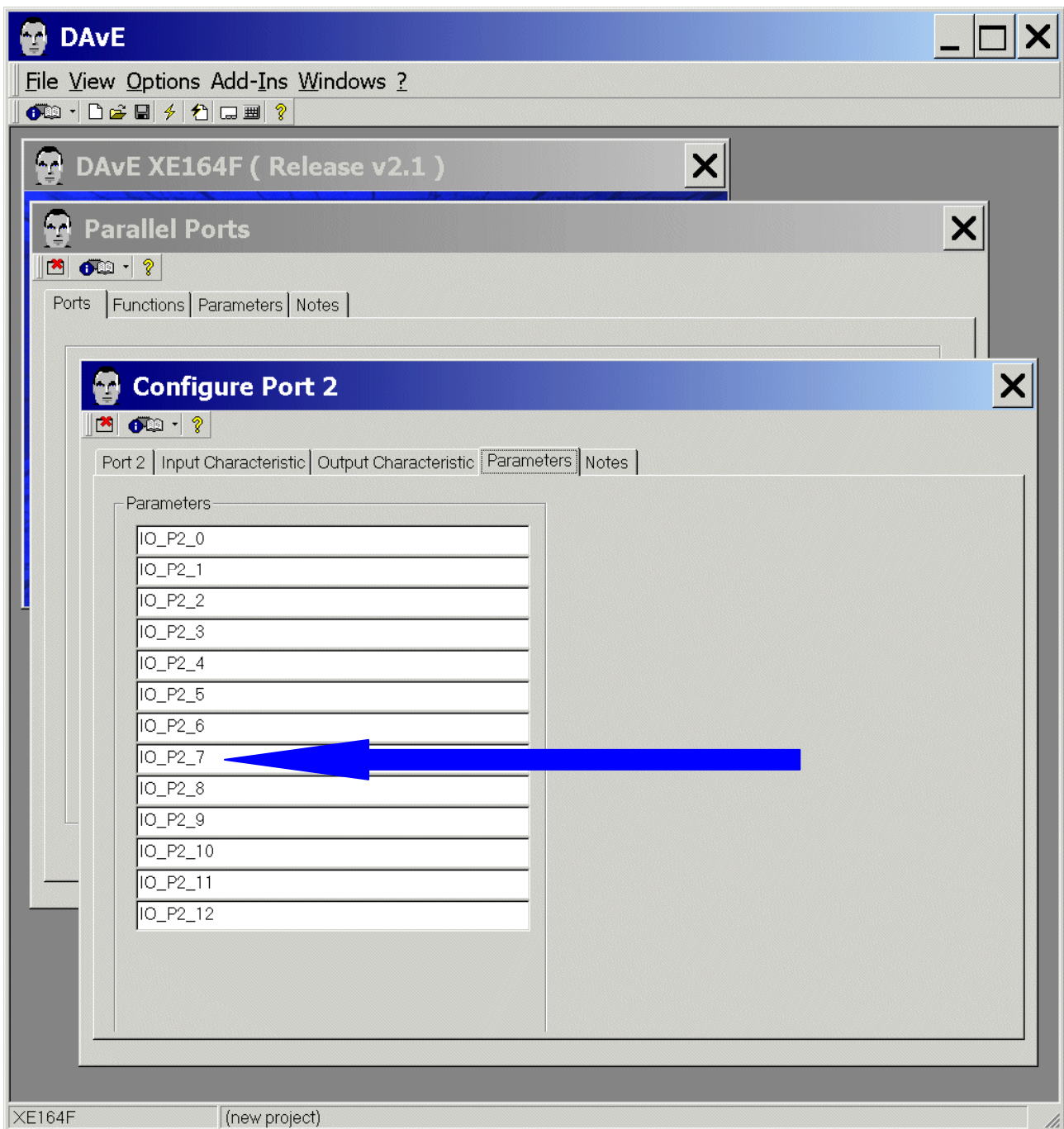
Input Characteristic: (do nothing)



Output Characteristic: (do nothing)



Parameters: (do nothing)

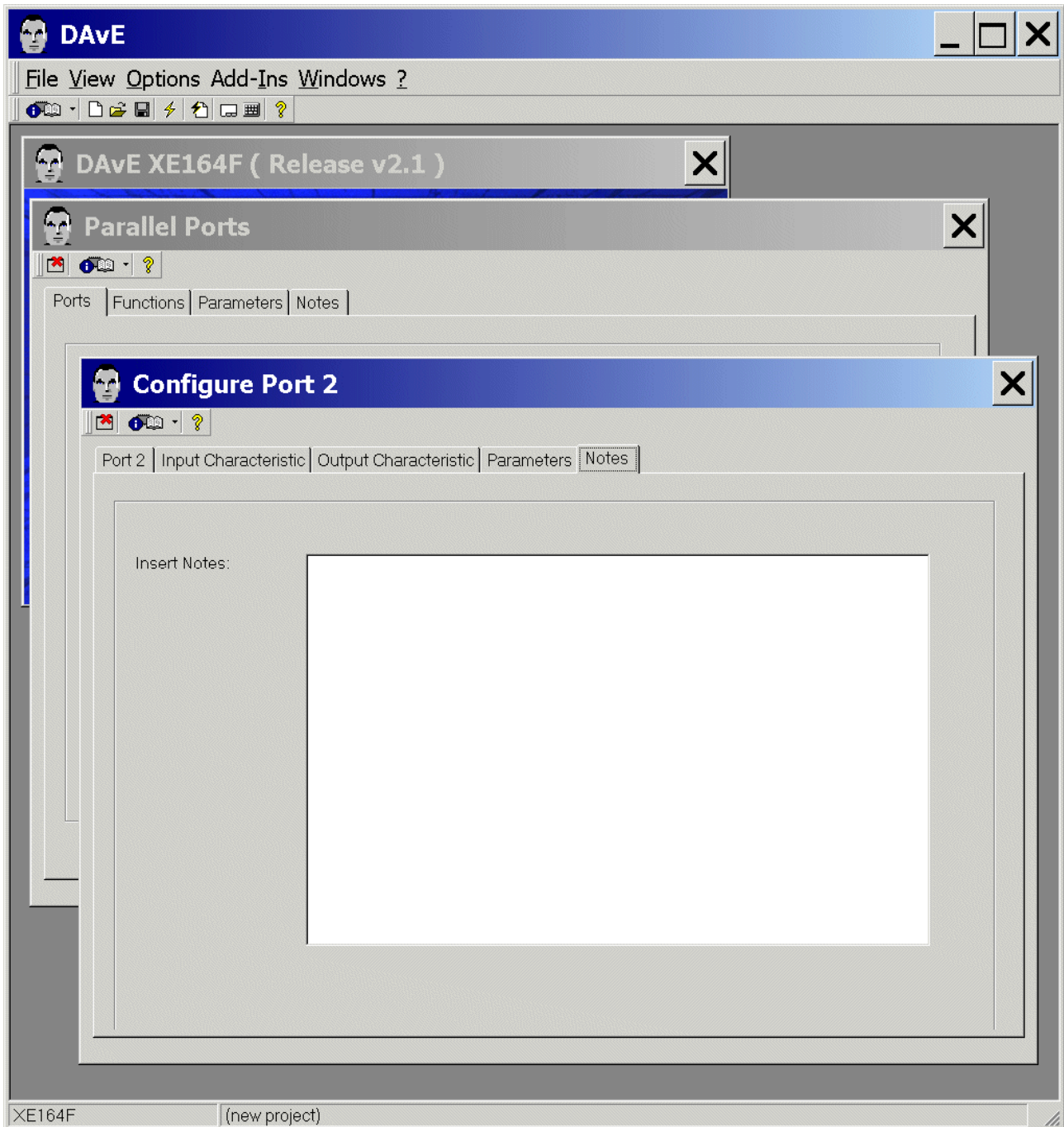



Note:

We will use the name **IO_P2_7** in application programming.

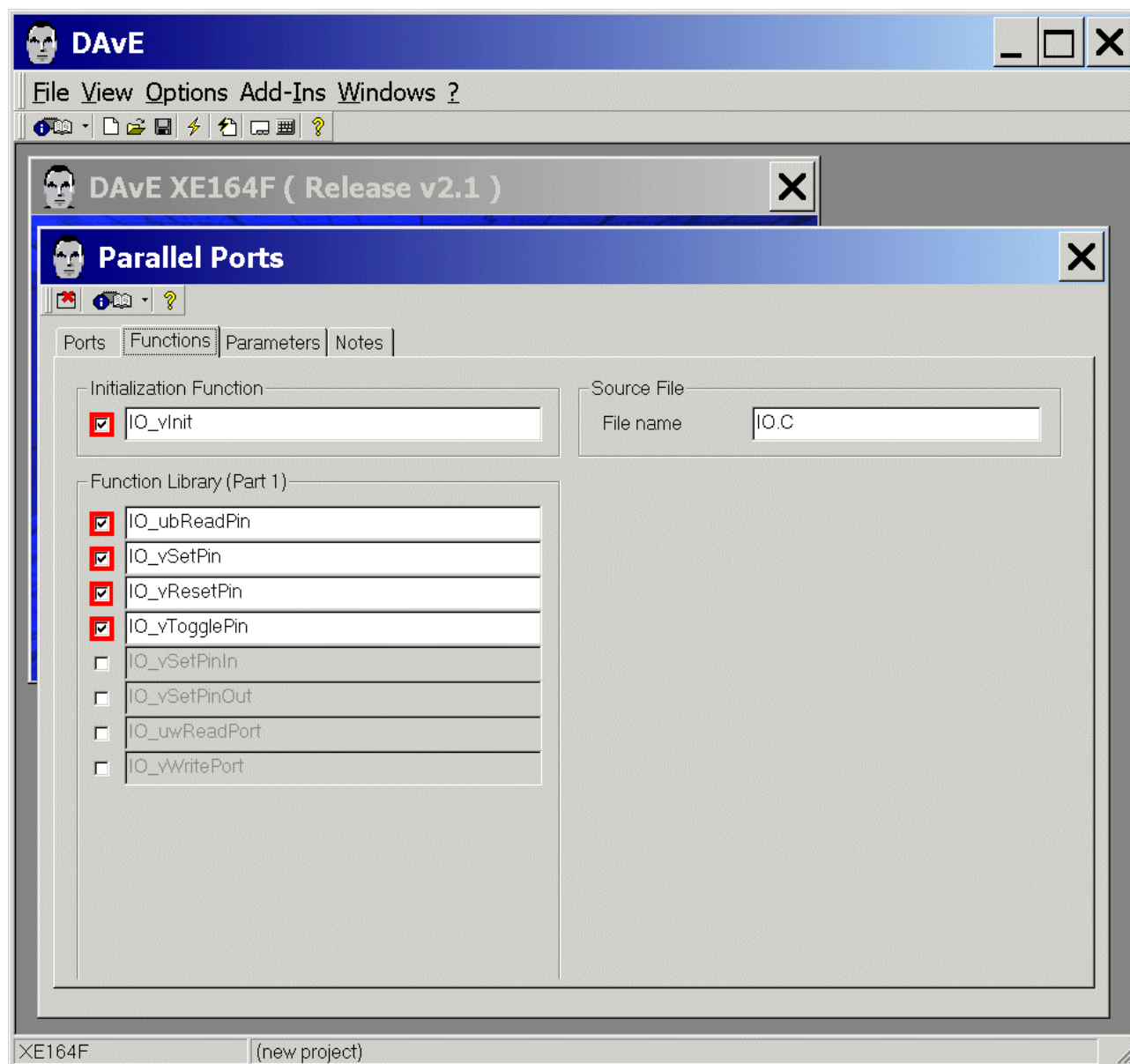


Notes: Insert Notes: If you wish, you can insert your comments here.

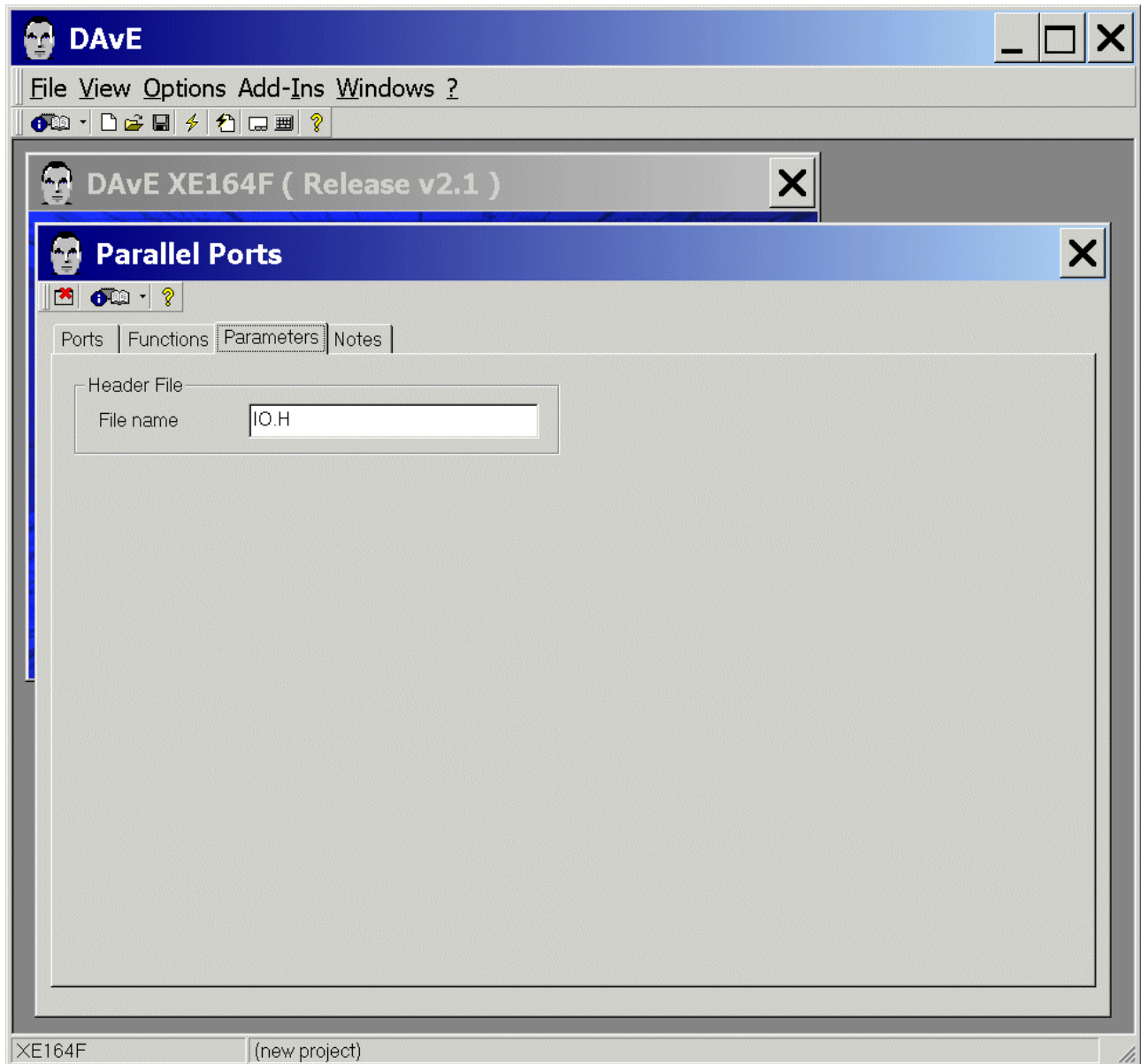


Exit and **Save** this dialog now by clicking  the close button:

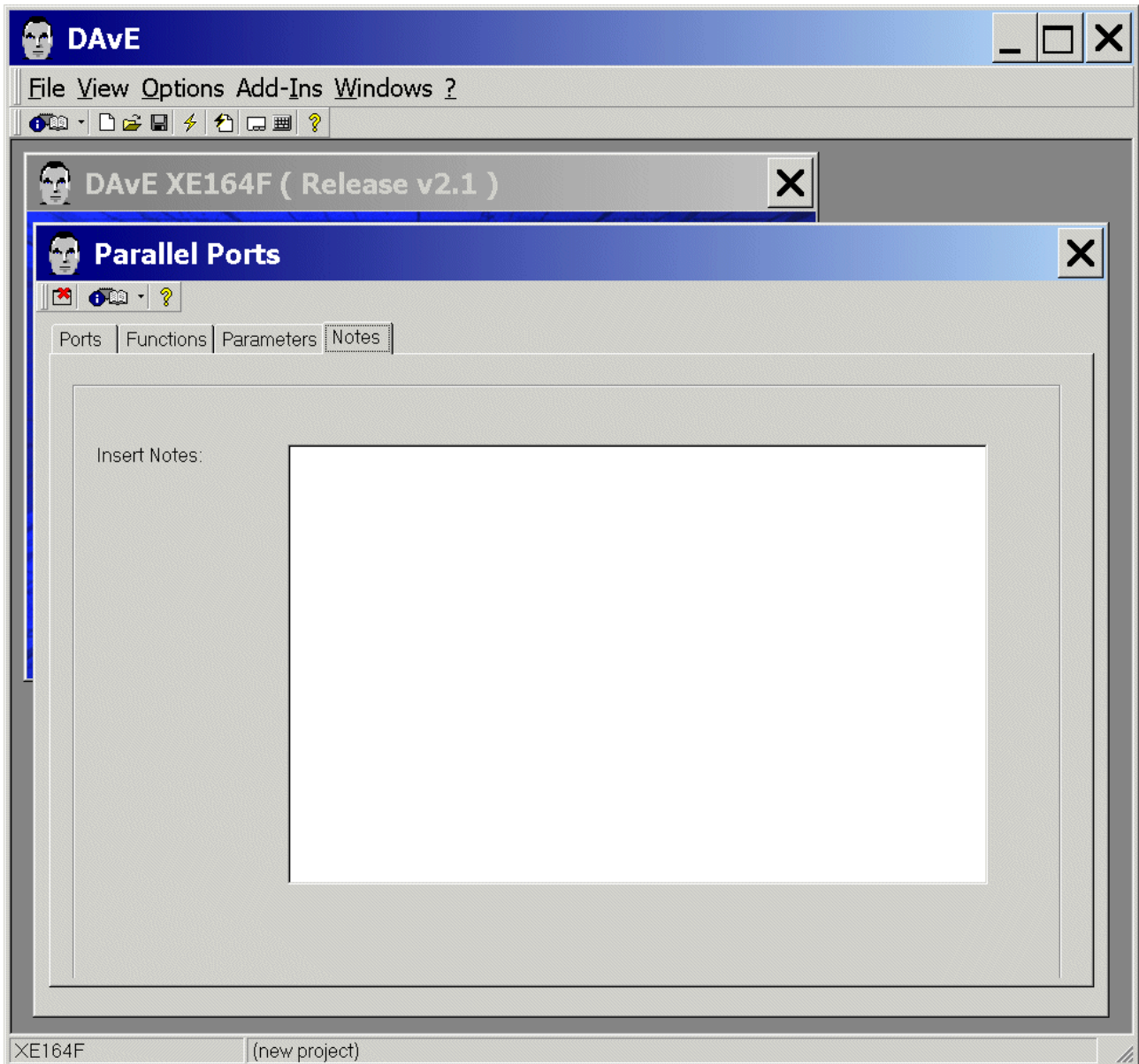
Functions: Initialization Functions: tick/check ☒ IO_vInit
 Functions: Function Library (Part 1): tick ☒ IO_ubReadPin
 Functions: Function Library (Part 1): tick ☒ IO_vSetPin
 Functions: Function Library (Part 1): tick ☒ IO_vResetPin
 Functions: Function Library (Part 1): tick ☒ IO_vTogglePin




Parameters: (do nothing)



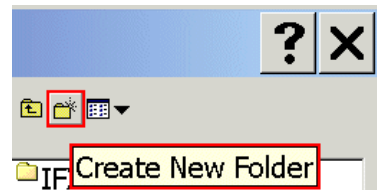
Notes: Insert Notes: If you wish, you can insert your comments here.



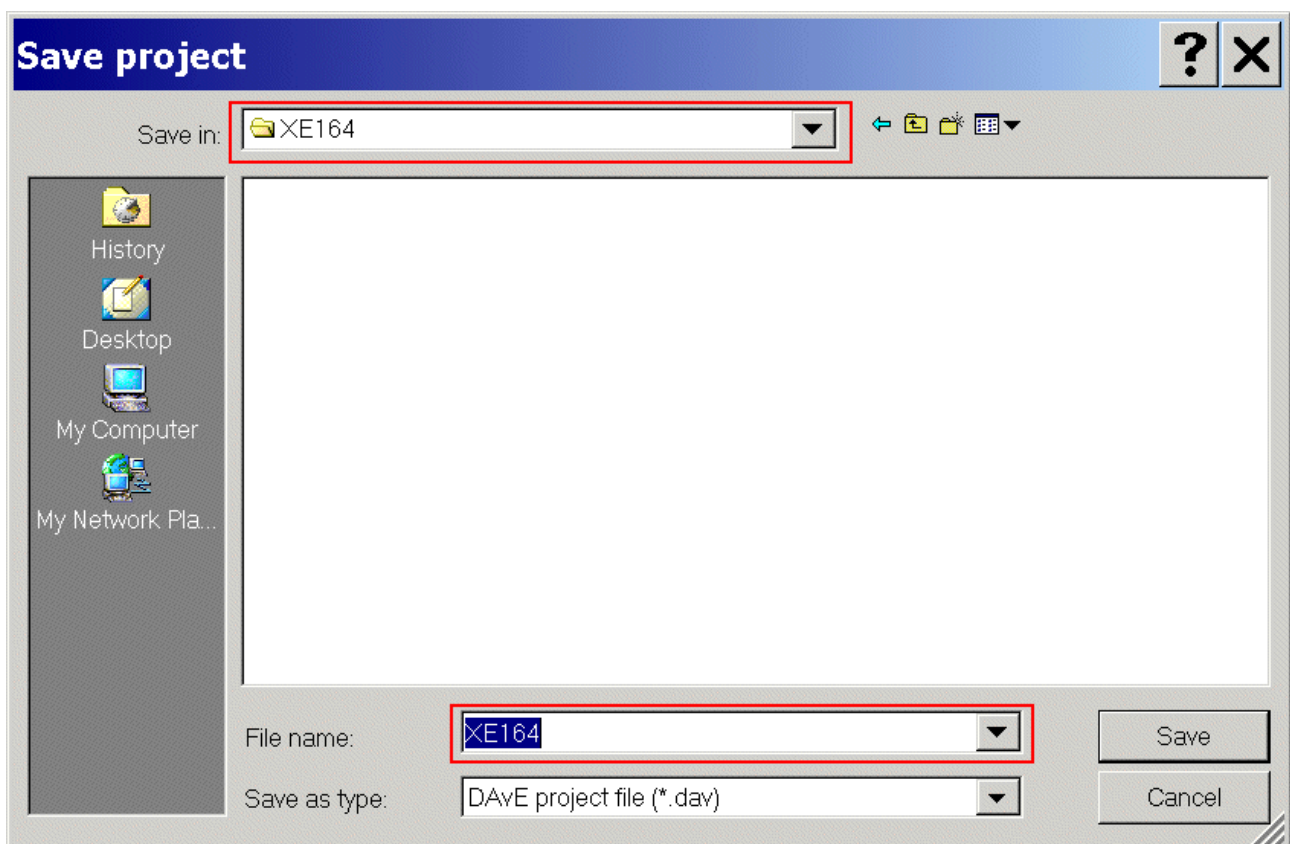
Exit and **Save** this dialog now by clicking  the close button.

Save the project:

File
Save




Save project: Save in C:\XE164 (create new directory IF **Create New Folder** !!!)
File name: XE164



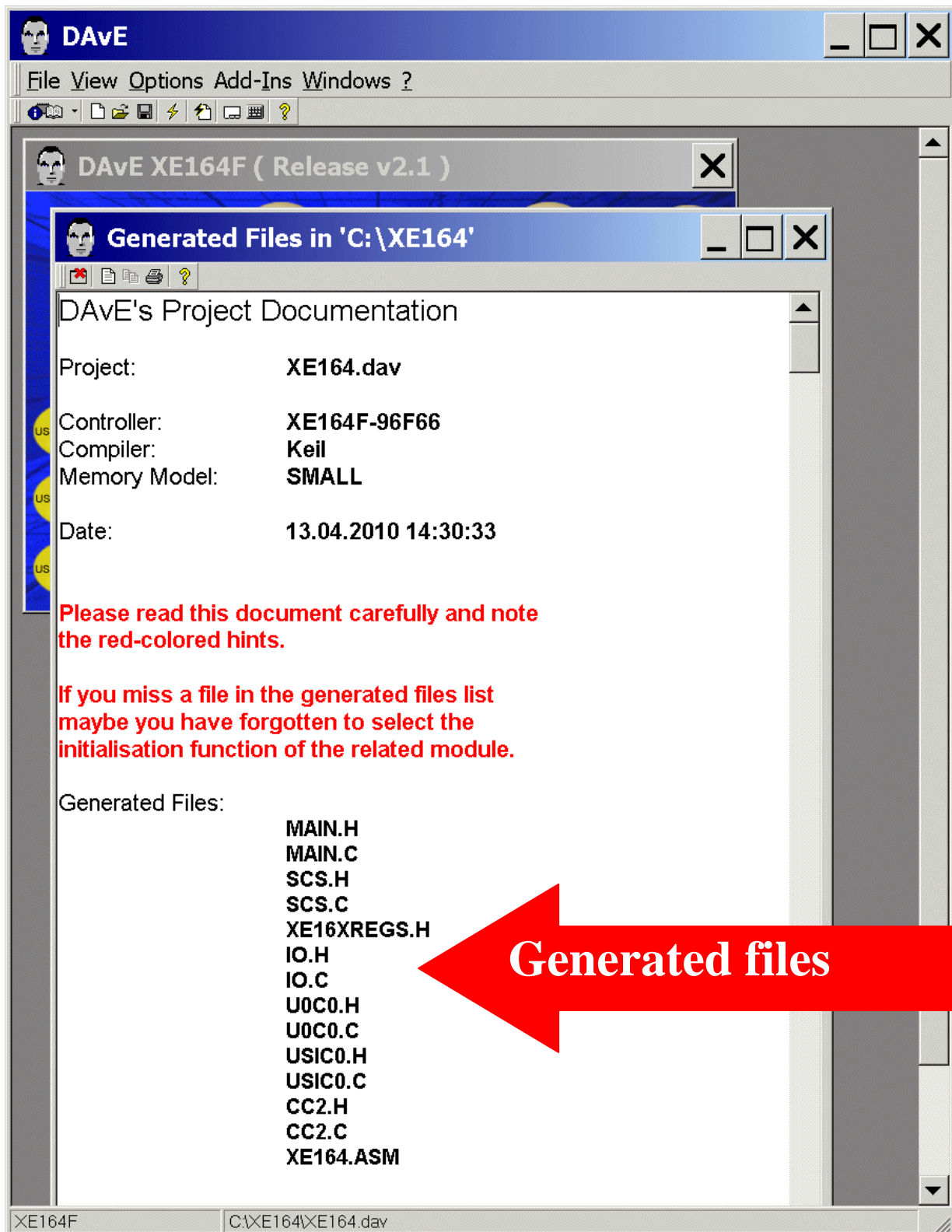
Save

Generate Code:

File - Generate Code	or	click 
----------------------	----	--



DAvE will show you all the files he has generated
(File Viewer opens automatically):

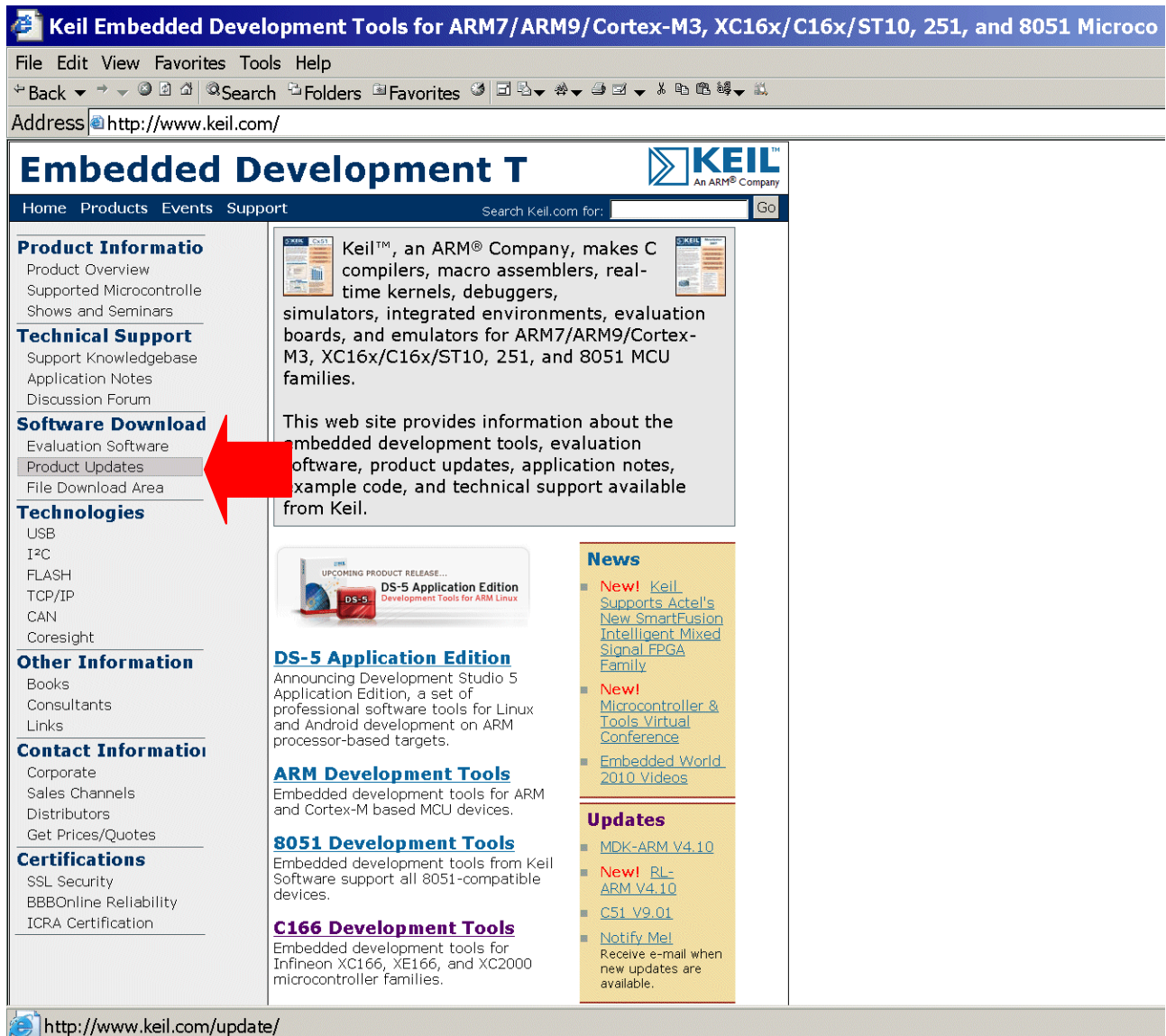


File - Exit
Save changes?

Click: **Yes**

4.) Using the KEIL - μ Vision 4 Development Tools:

Download the tool chain: You can download the Keil Development Tools @ <http://www.keil.com> :



Keil Embedded Development Tools for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 Microcontrollers

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Keil™, an ARM® Company, makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7/ARM9/Cortex-M3, XC16x/C16x/ST10, 251, and 8051 MCU families.

This web site provides information about the embedded development tools, evaluation software, product updates, application notes, example code, and technical support available from Keil.

DS-5 Application Edition
Announcing Development Studio 5 Application Edition, a set of professional software tools for Linux and Android development on ARM processor-based targets.

ARM Development Tools
Embedded development tools for ARM and Cortex-M based MCU devices.

8051 Development Tools
Embedded development tools from Keil Software support all 8051-compatible devices.

C166 Development Tools
Embedded development tools for Infineon XC166, XE166, and XC2000 microcontroller families.

News

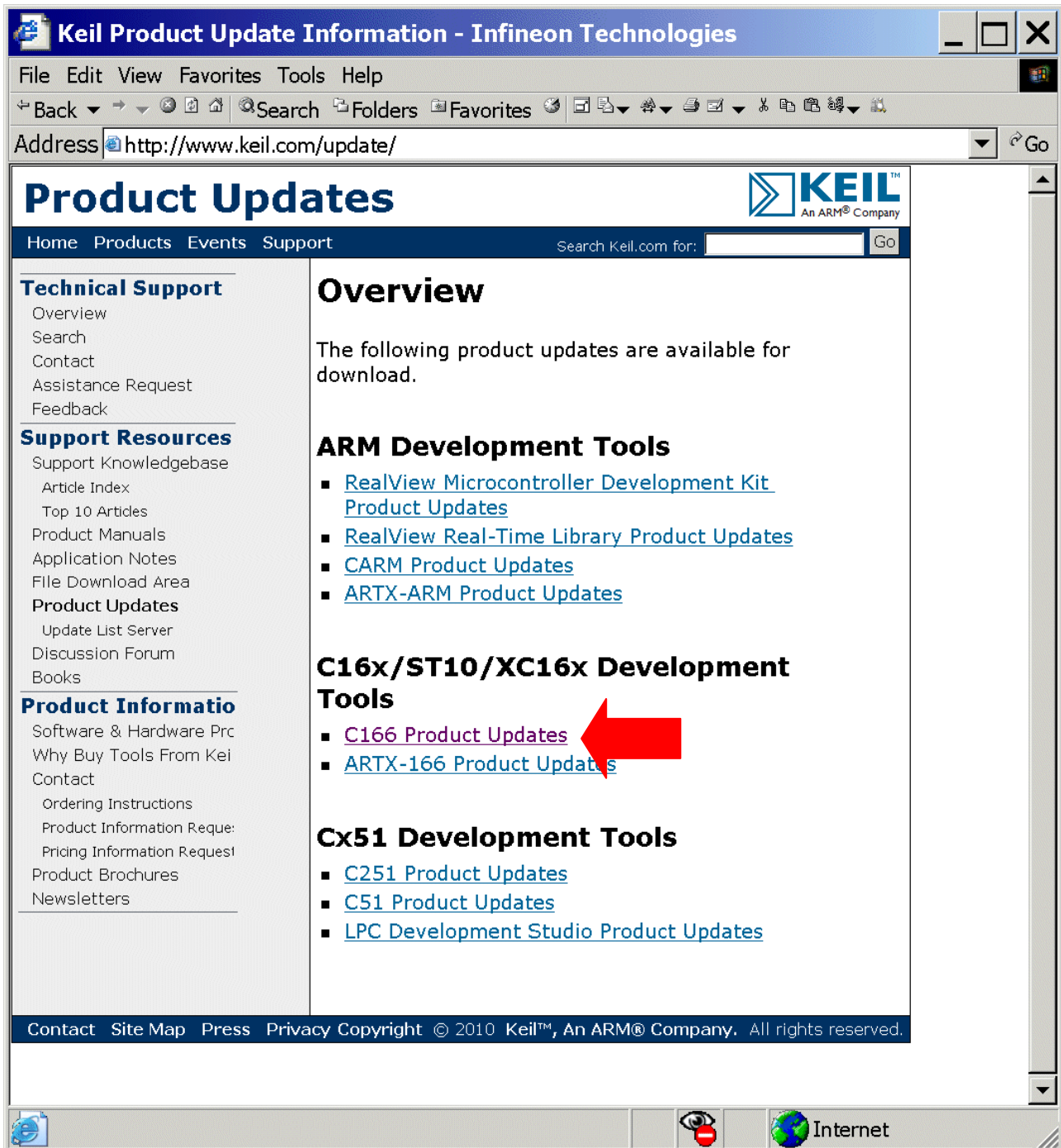
- New! Keil Supports Actel's New SmartFusion Intelligent Mixed Signal FPGA Family
- New! Microcontroller & Tools Virtual Conference
- Embedded World 2010 Videos

Updates

- MDK-ARM V4.10
- New! RL-ARM V4.10
- C51 V9.01
- Notify Me! Receive e-mail when new updates are available.

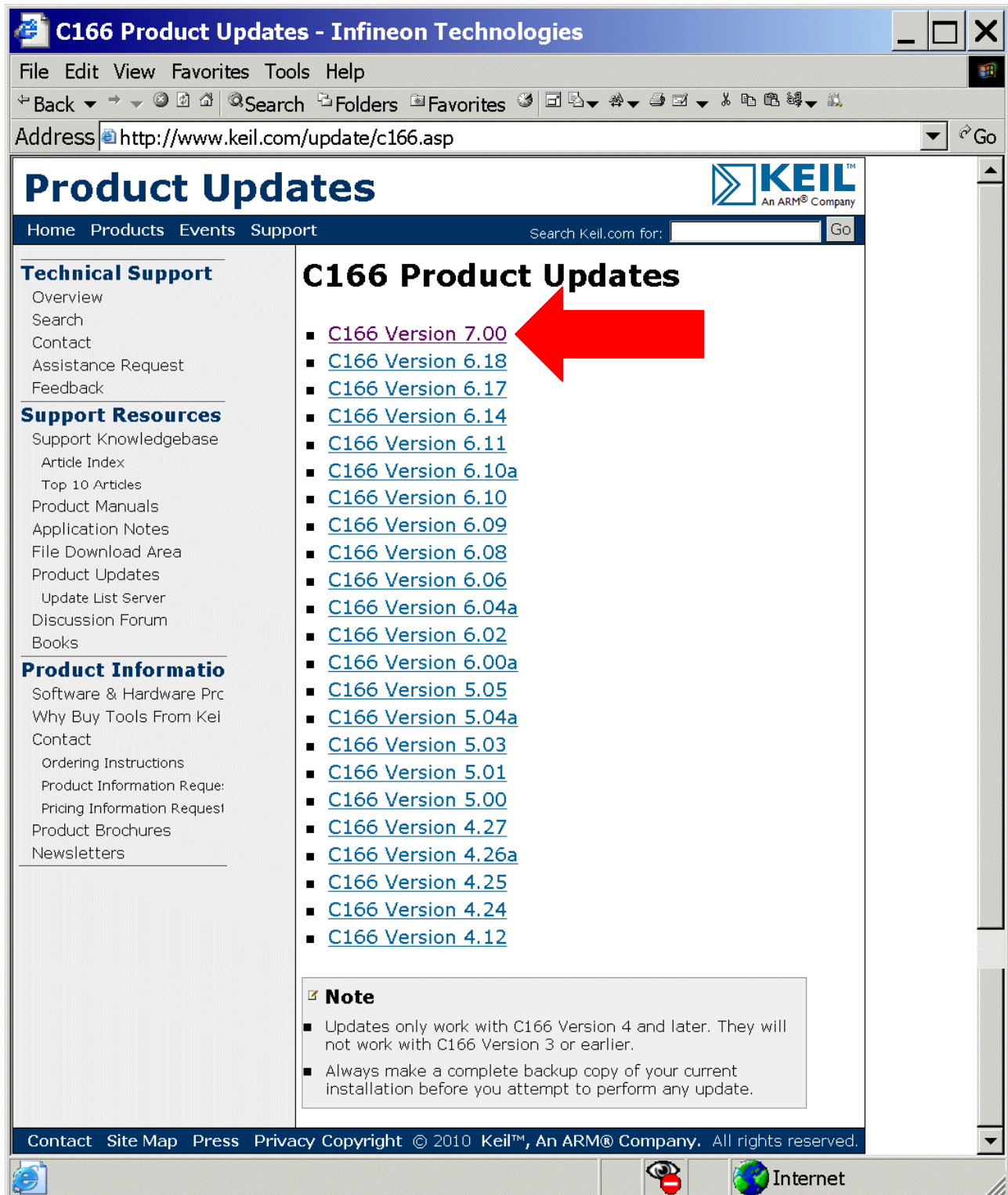
<http://www.keil.com/update/>

Click Product Updates



The screenshot shows a web browser window titled "Keil Product Update Information - Infineon Technologies". The address bar shows "http://www.keil.com/update/". The page has a blue header with the "KEIL" logo and "An ARM® Company". Below the header is a navigation bar with links: Home, Products, Events, Support. A search bar is also present. The main content area is divided into two columns. The left column contains a "Technical Support" section with links to Overview, Search, Contact, Assistance Request, and Feedback. Below this is a "Support Resources" section with links to Support Knowledgebase, Article Index, Top 10 Articles, Product Manuals, Application Notes, File Download Area, Product Updates, Update List Server, Discussion Forum, and Books. The right column has a "Product Updates" section with a sub-header "Overview" and the text "The following product updates are available for download." Below this are three sections: "ARM Development Tools" with links to RealView Microcontroller Development Kit Product Updates, RealView Real-Time Library Product Updates, CARM Product Updates, and ARTX-ARM Product Updates; "C16x/ST10/XC16x Development Tools" with links to C166 Product Updates and ARTX-166 Product Updates; and "Cx51 Development Tools" with links to C251 Product Updates, C51 Product Updates, and LPC Development Studio Product Updates. A red arrow points to the "C166 Product Updates" link. The footer contains links for Contact, Site Map, Press, Privacy, and Copyright, along with the text "© 2010 Keil™, An ARM® Company. All rights reserved." The browser's status bar at the bottom shows "Internet" and a globe icon.

Click C166 Product Updates



C166 Product Updates - Infineon Technologies

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- [C166 Version 6.04a](#)
- [C166 Version 6.02](#)
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- [C166 Version 4.27](#)
- [C166 Version 4.26a](#)
- [C166 Version 4.25](#)
- [C166 Version 4.24](#)
- [C166 Version 4.12](#)

Note

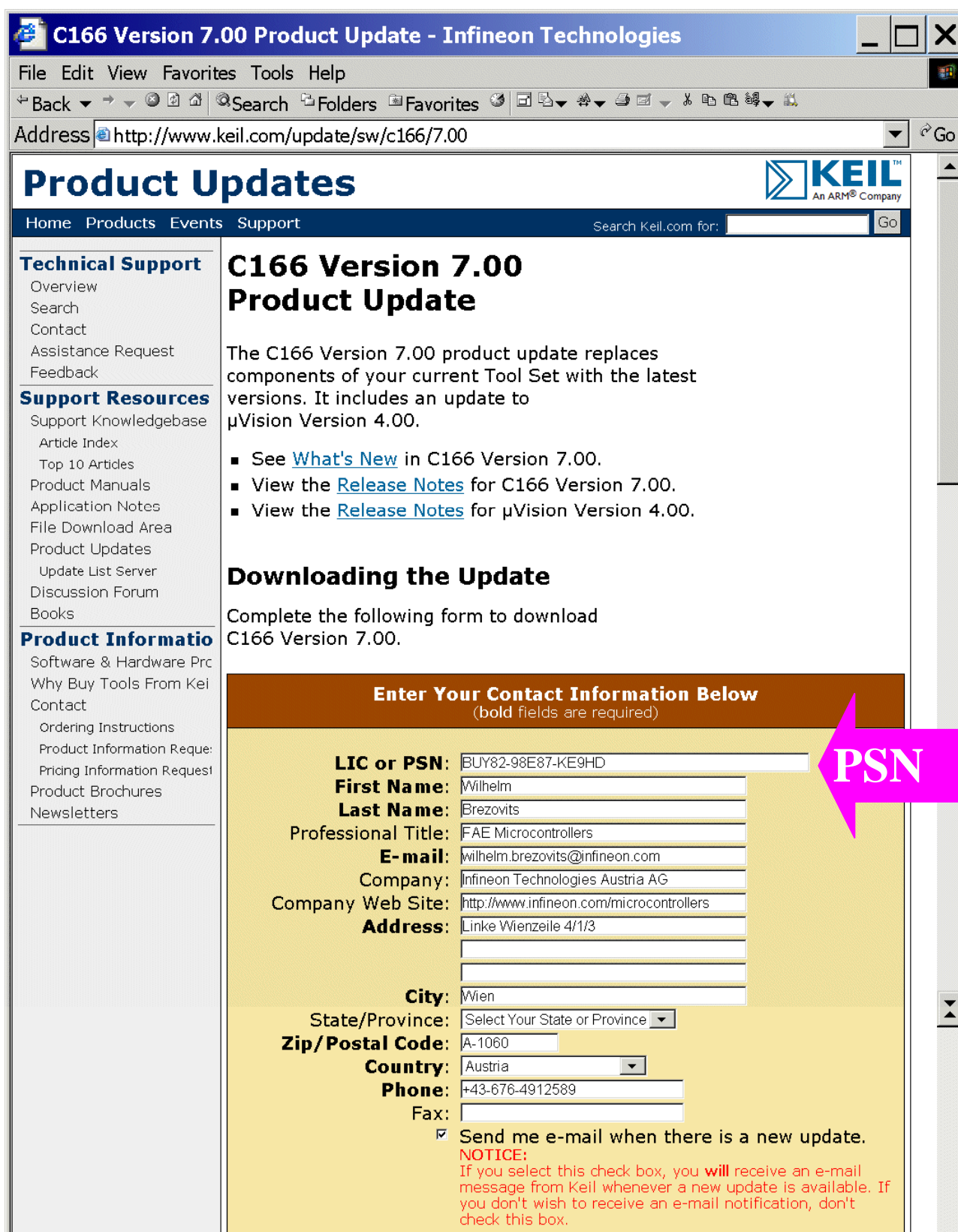
- Updates only work with C166 Version 4 and later. They will not work with C166 Version 3 or earlier.
- Always make a complete backup copy of your current installation before you attempt to perform any update.

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C166 Version 7.00 Product Update

The C166 Version 7.00 product update replaces components of your current Tool Set with the latest versions. It includes an update to µVision Version 4.00.

- See [What's New](#) in C166 Version 7.00.
- View the [Release Notes](#) for C166 Version 7.00.
- View the [Release Notes](#) for µVision Version 4.00.

Downloading the Update

Complete the following form to download C166 Version 7.00.

Enter Your Contact Information Below
(bold fields are required)

LIC or PSN: BUY82-98E87-KE9HD

First Name: Wilhelm

Last Name: Brezovits

Professional Title: FAE Microcontrollers

E-mail: wilhelm.brezovits@infineon.com

Company: Infineon Technologies Austria AG

Company Web Site: <http://www.infineon.com/microcontrollers>

Address: Linke Wienzeile 4/1/3

City: Wien

State/Province: Select Your State or Province

Zip/Postal Code: A-1060

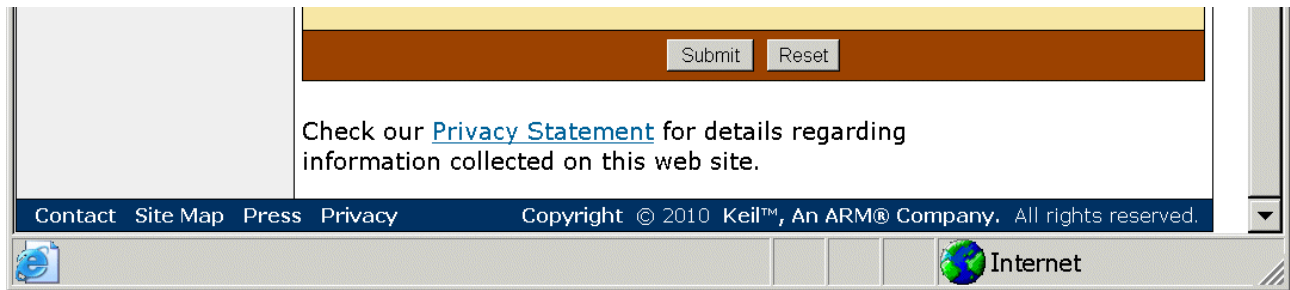
Country: Austria

Phone: +43-676-4912589

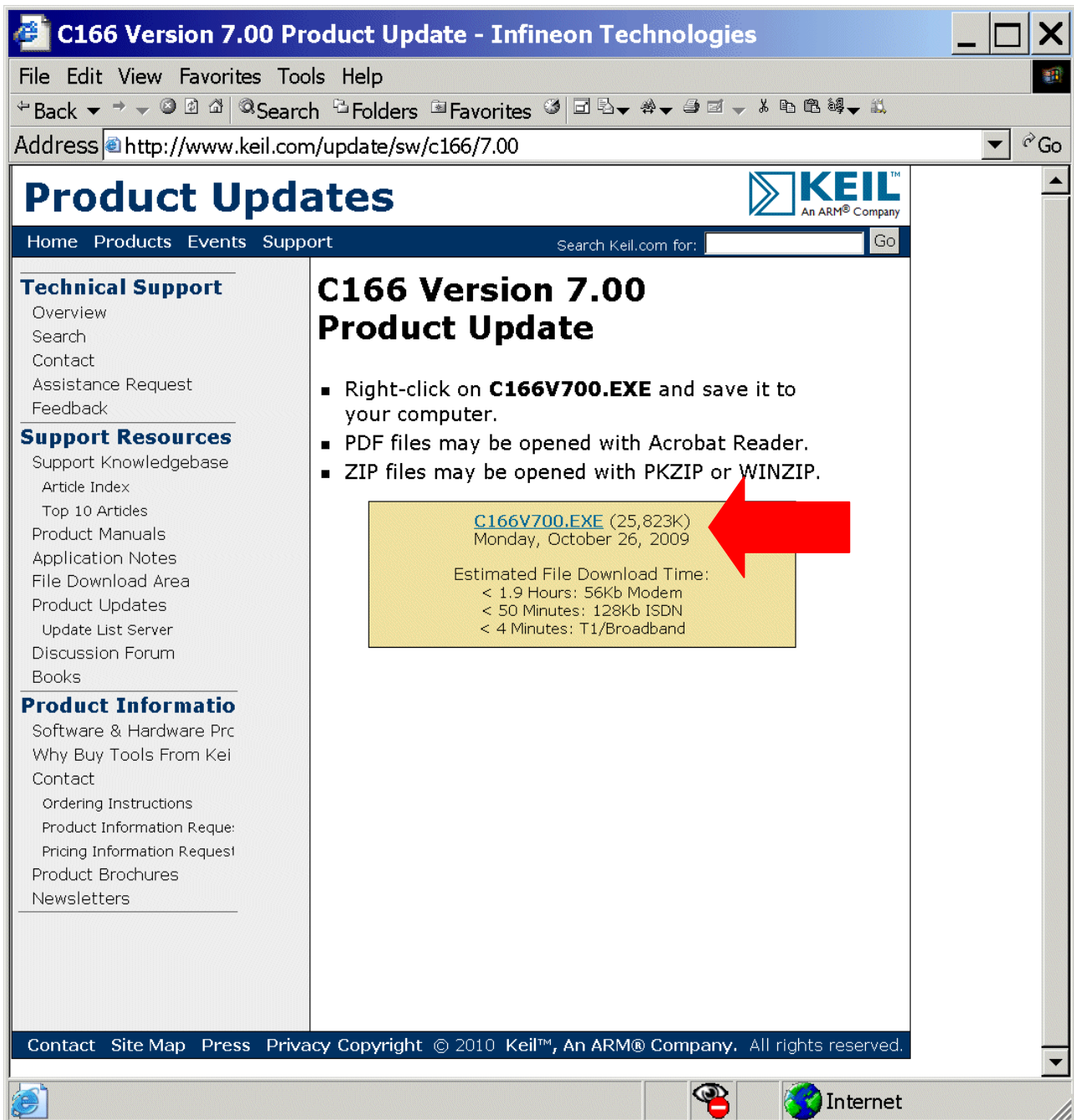
Fax:

☒ Send me e-mail when there is a new update.

NOTICE:
If you select this check box, you **will** receive an e-mail message from Keil whenever a new update is available. If you don't wish to receive an e-mail notification, don't check this box.



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C166 Version 7.00 Product Update

- Right-click on **C166V700.EXE** and save it to your computer.
- PDF files may be opened with Acrobat Reader.
- ZIP files may be opened with PKZIP or WINZIP.


[C166V700.EXE](#) (25,823K)
Monday, October 26, 2009

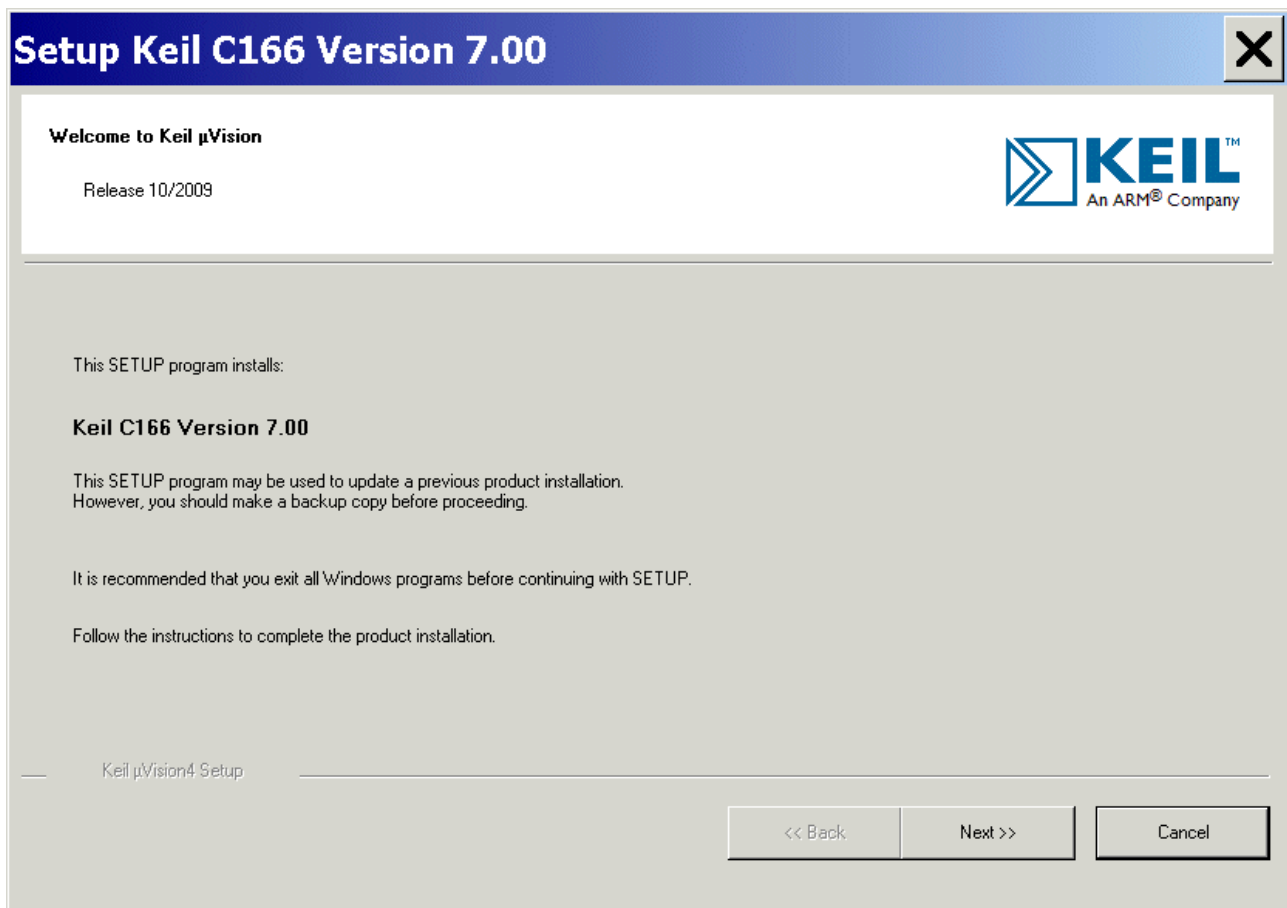
Estimated File Download Time:

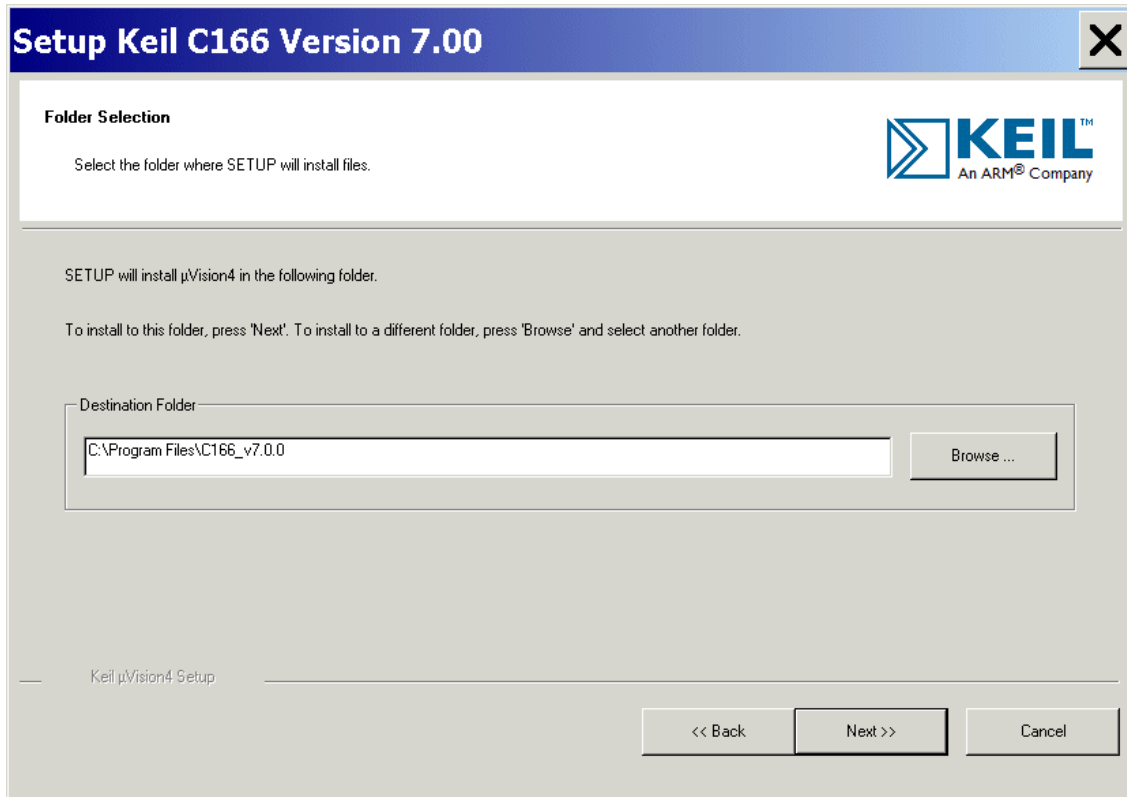
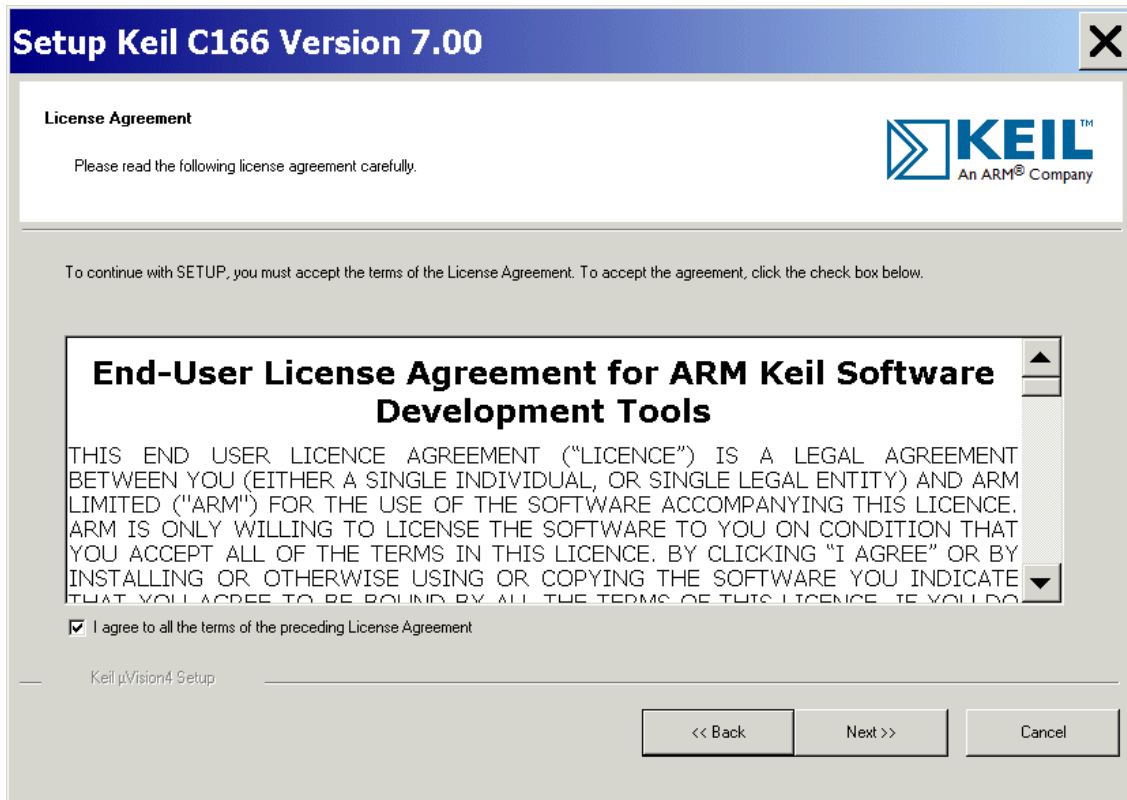
- < 1.9 Hours: 56kb Modem
- < 50 Minutes: 128Kb ISDN
- < 4 Minutes: T1/Broadband

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Internet

Download and **Execute**  **C166V700.EXE** (- or any higher version)
and install the Keil tool chain.





Setup Keil C166 Version 7.00 [X]

Customer Information

Please enter your information.

Please enter your name, the name of the company for whom you work and your E-mail address.

First Name:

Last Name:

Company Name:

E-mail:

Keil µVision4 Setup

<< Back Next >> Cancel


Setup Keil C166 Version 7.00 [X]

Setup Status

µVision Setup is performing the requested operations.

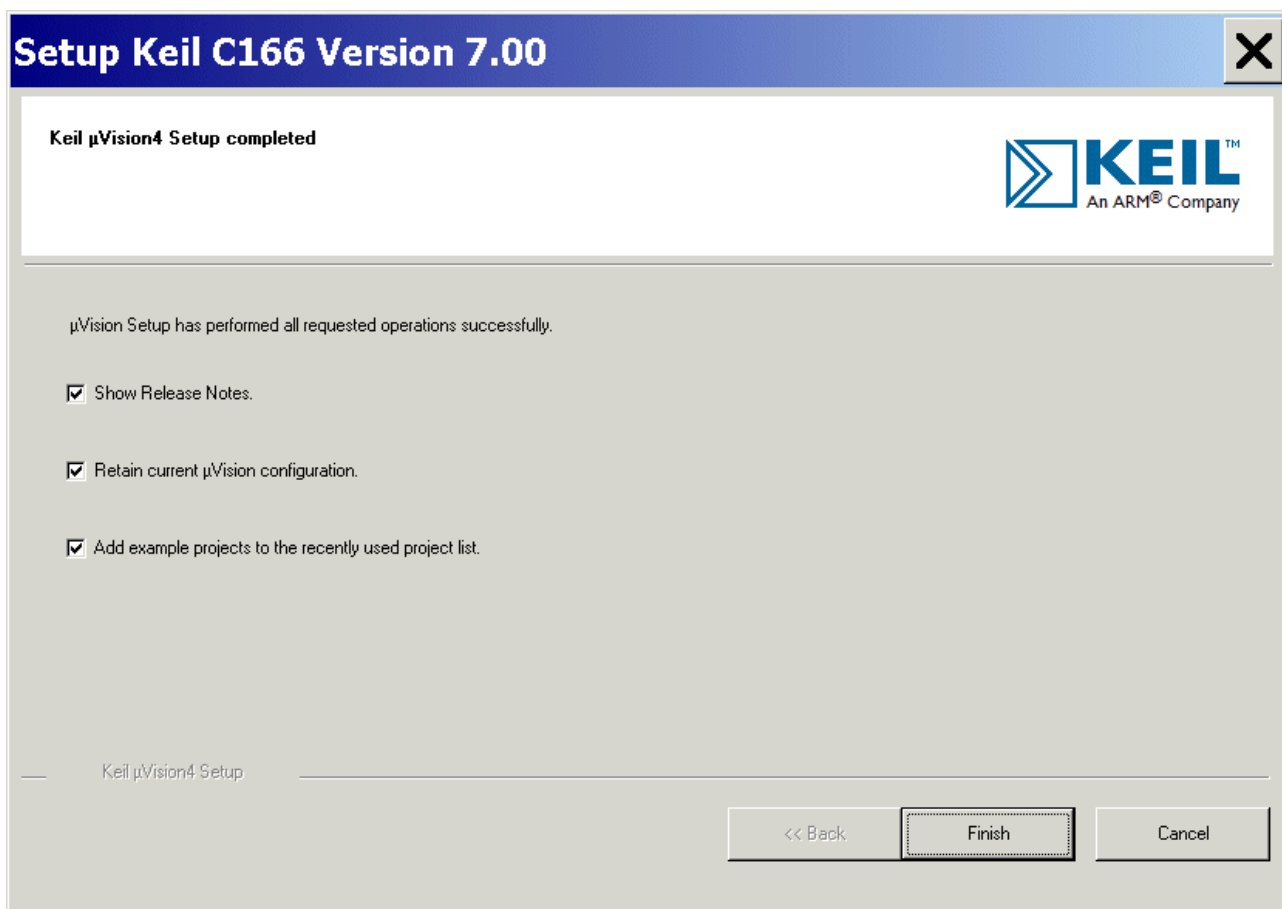
Install Files ...

Installing TRAPS.C.



Keil µVision4 Setup

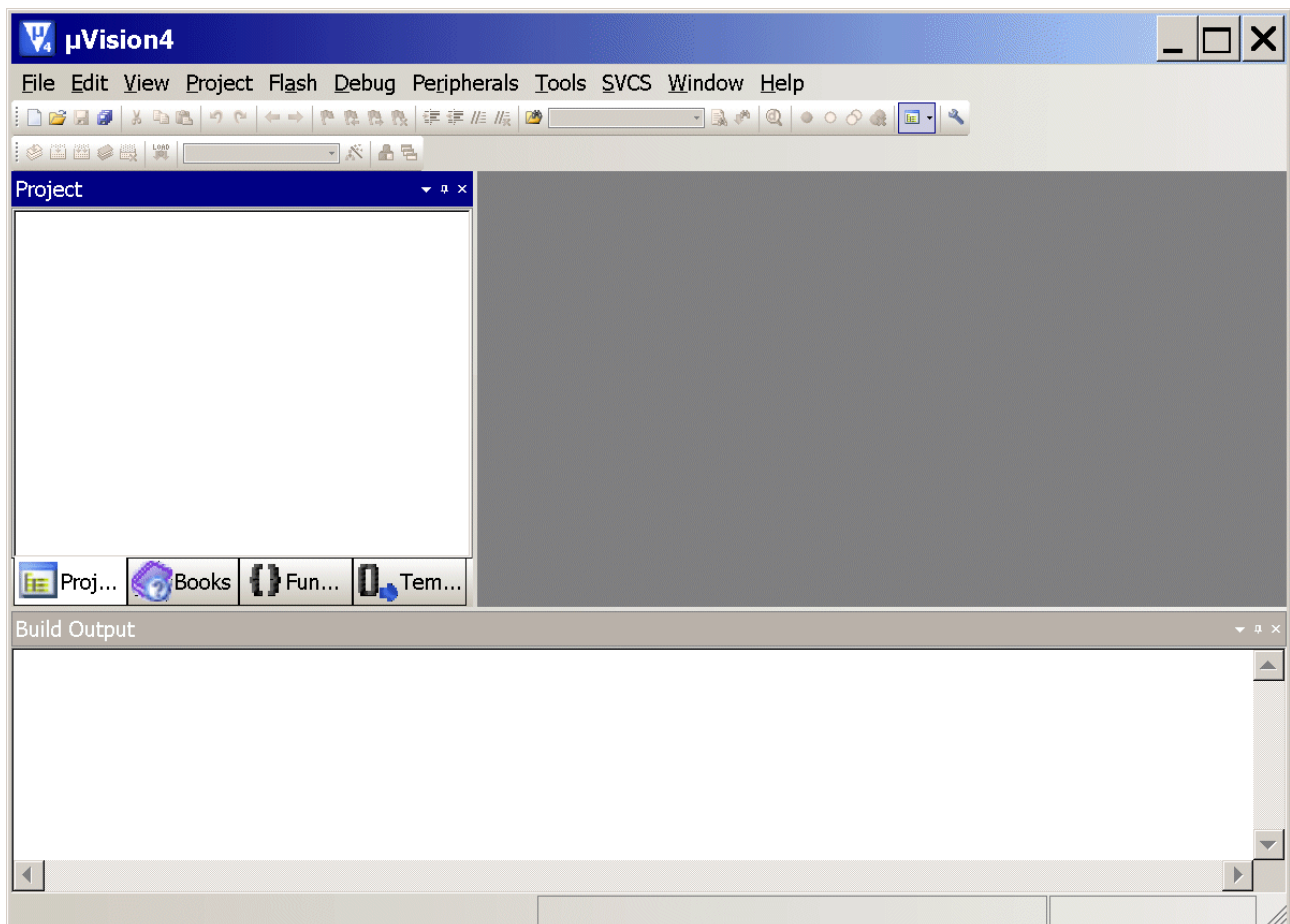
<< Back Next >> Cancel





Start Keil μ Vision4 and open the DAVE Project:

If you see an open project – close it: **Project - Close Project**

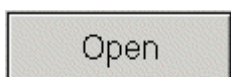
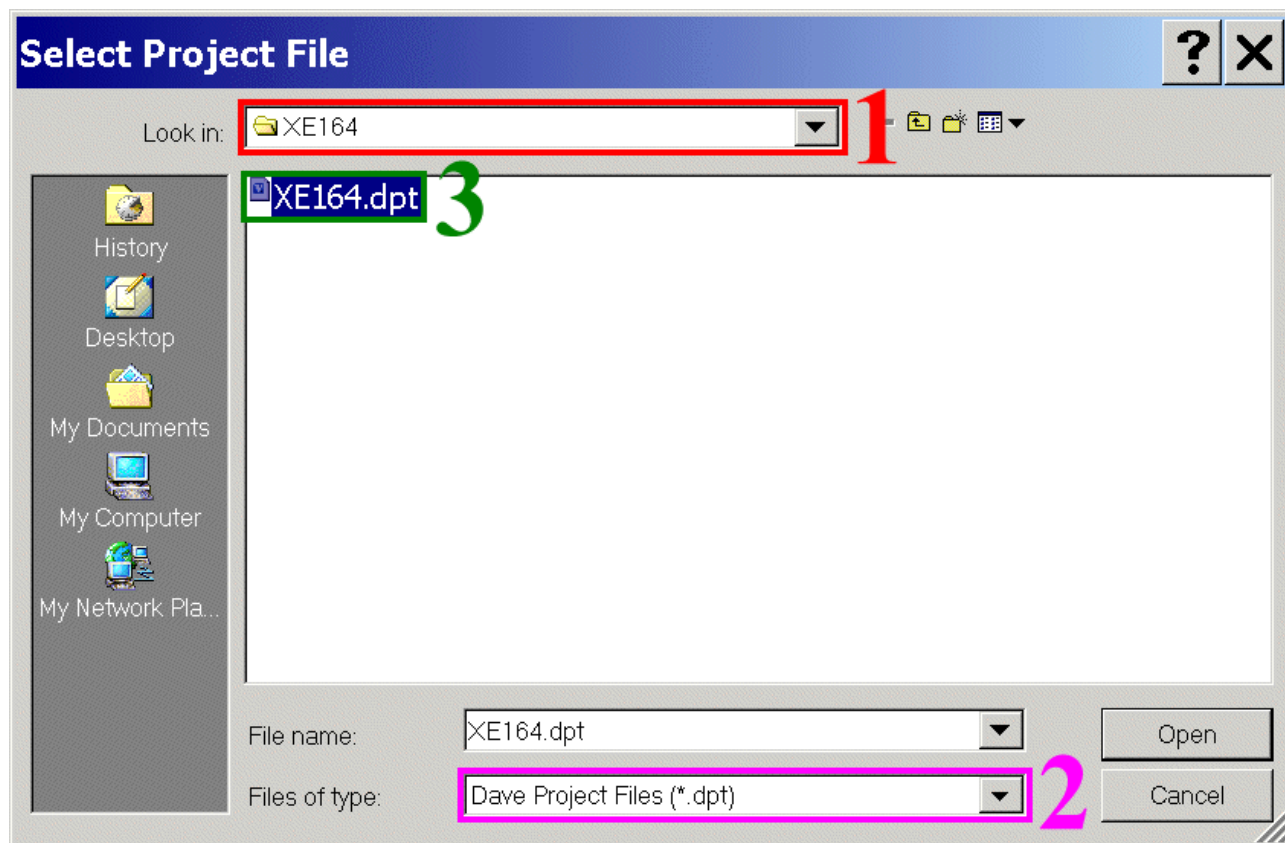


Project - Open Project

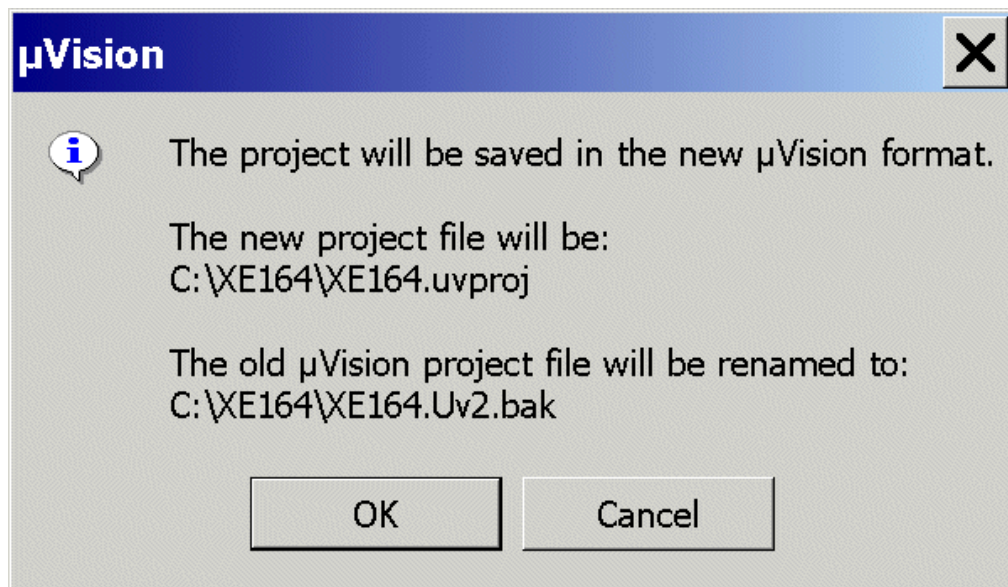
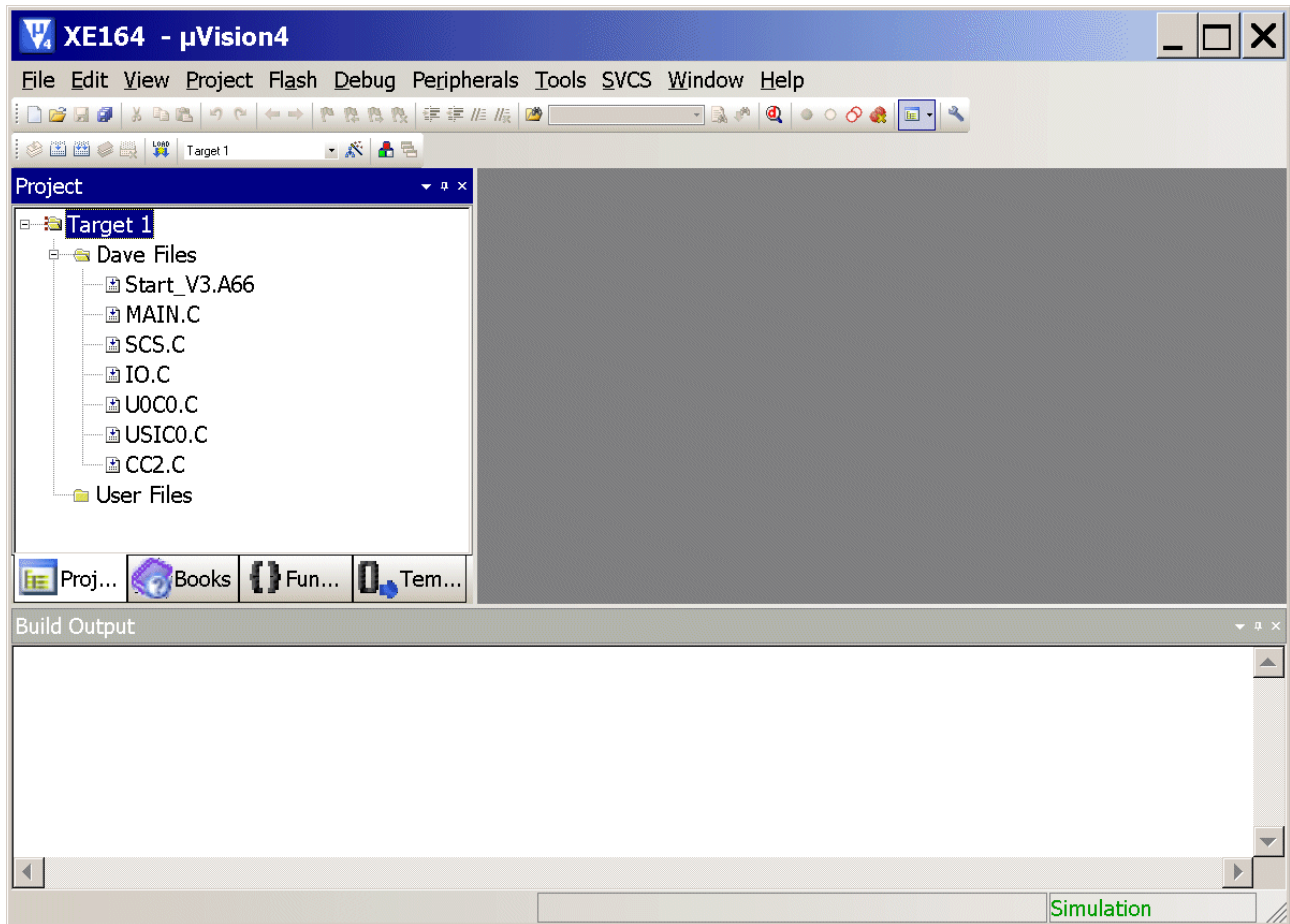
Select Project File: Look in: choose C:\XE164 (1)

Select Project File: Files of type: select Dave Project Files (2)

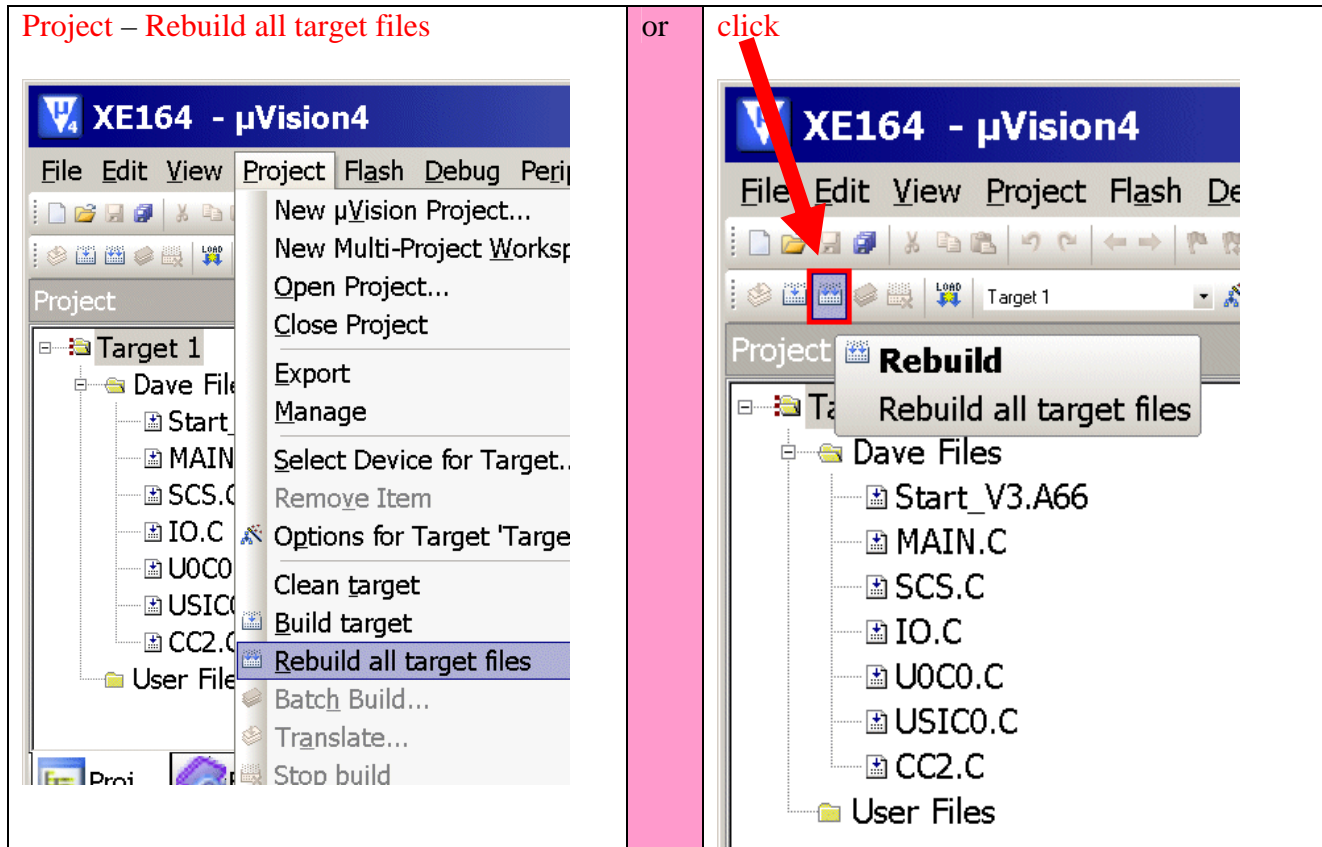
Click XE164.dpt (3)

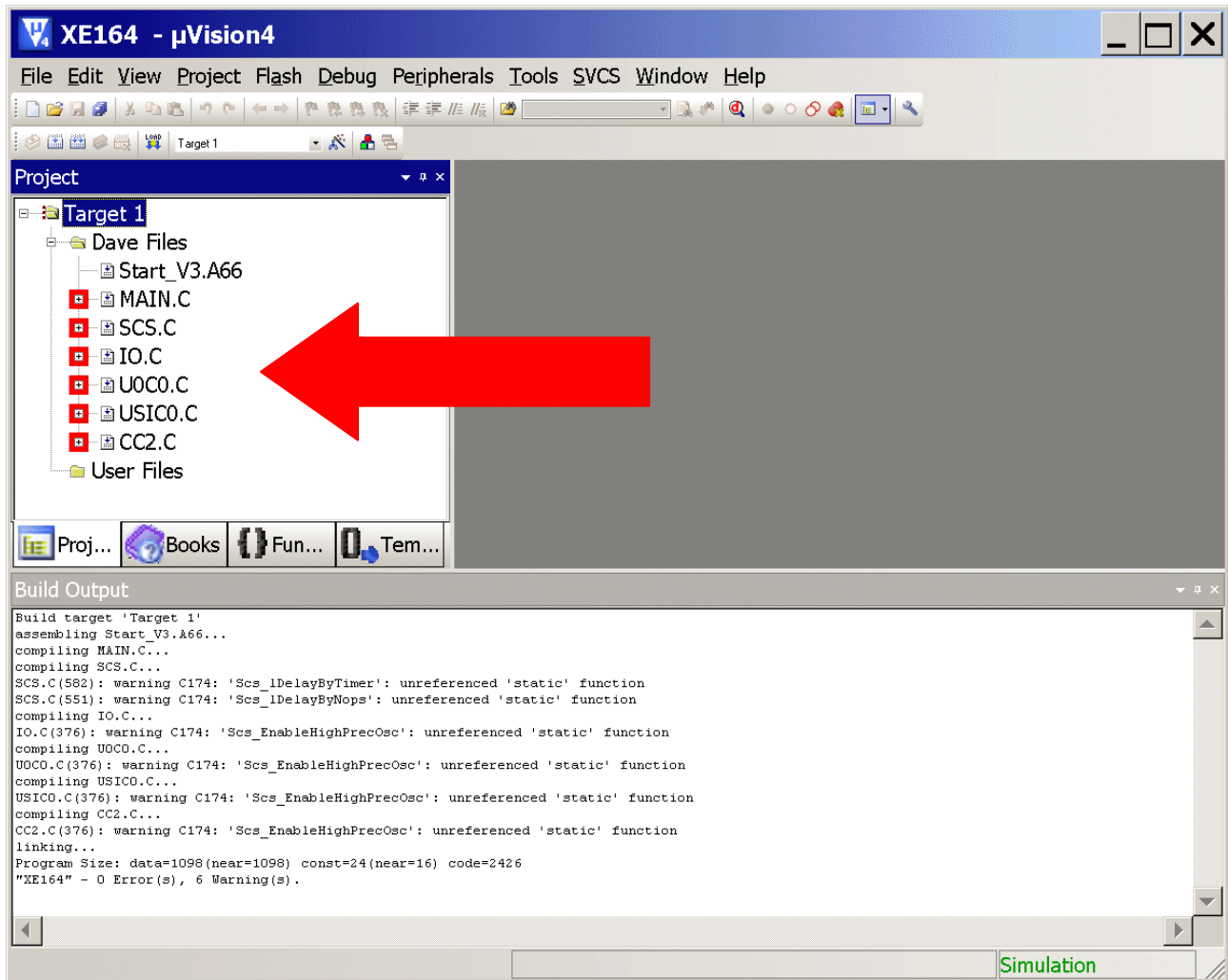


Click



Generate „make“- file:





Note:

This step generates a makefile and shows the include files.

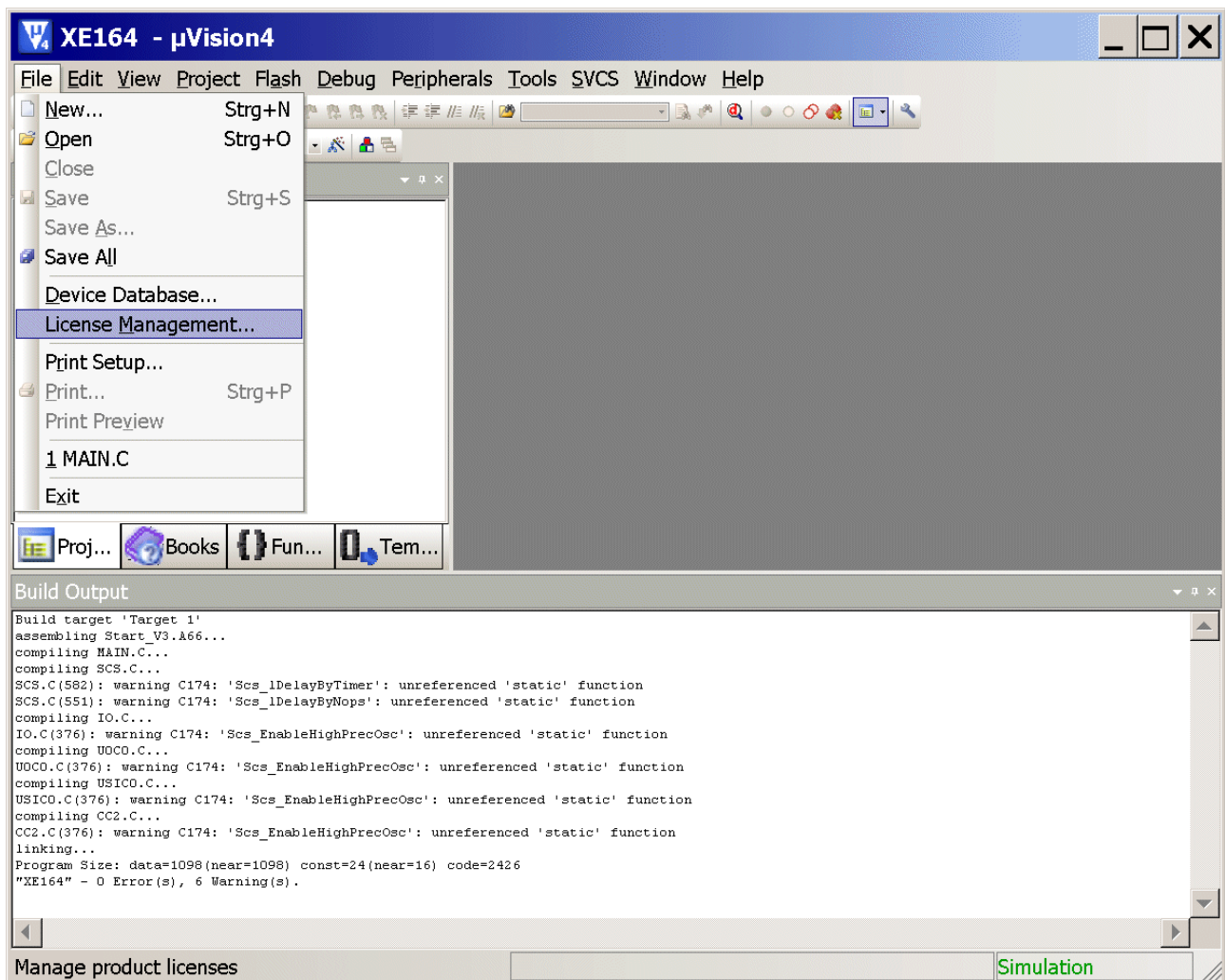


uVision4 License Management

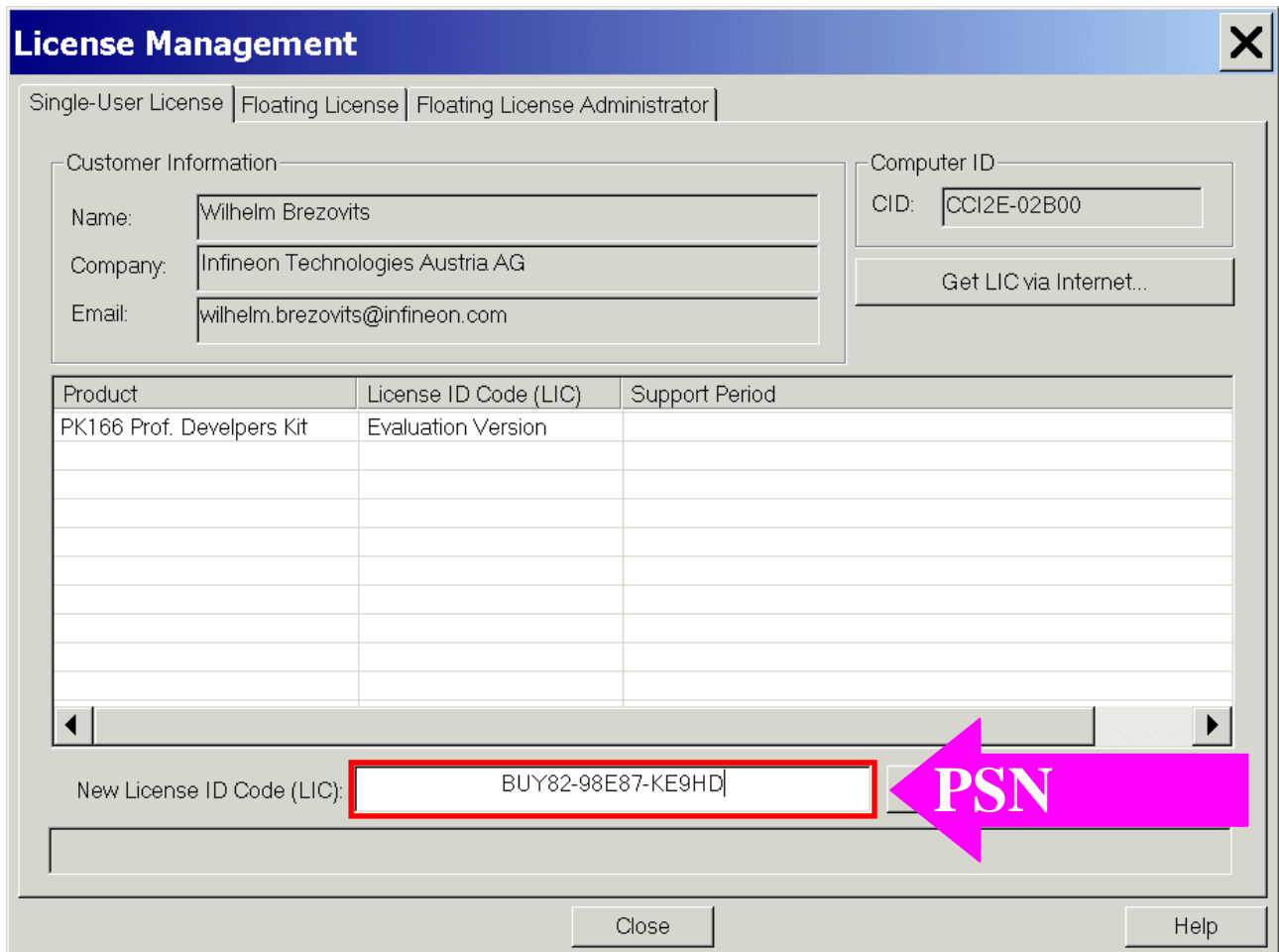
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File - License Management...



License Management: Single-User License: New License ID Code (LIC):
Copy and paste your PRODUCT SERIAL NUMBER (PSN) into the New License ID Code (LIC)
input field in the uVision4 License Manager Dialog.



License Management

Single-User License | Floating License | Floating License Administrator

Customer Information

Name: Wilhelm Brezovits

Company: Infineon Technologies Austria AG

Email: wilhelm.brezovits@infineon.com

Computer ID

CID: CCI2E-02B00

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Product	License ID Code (LIC)	Support Period
PK166 Prof. Developers Kit	Evaluation Version	

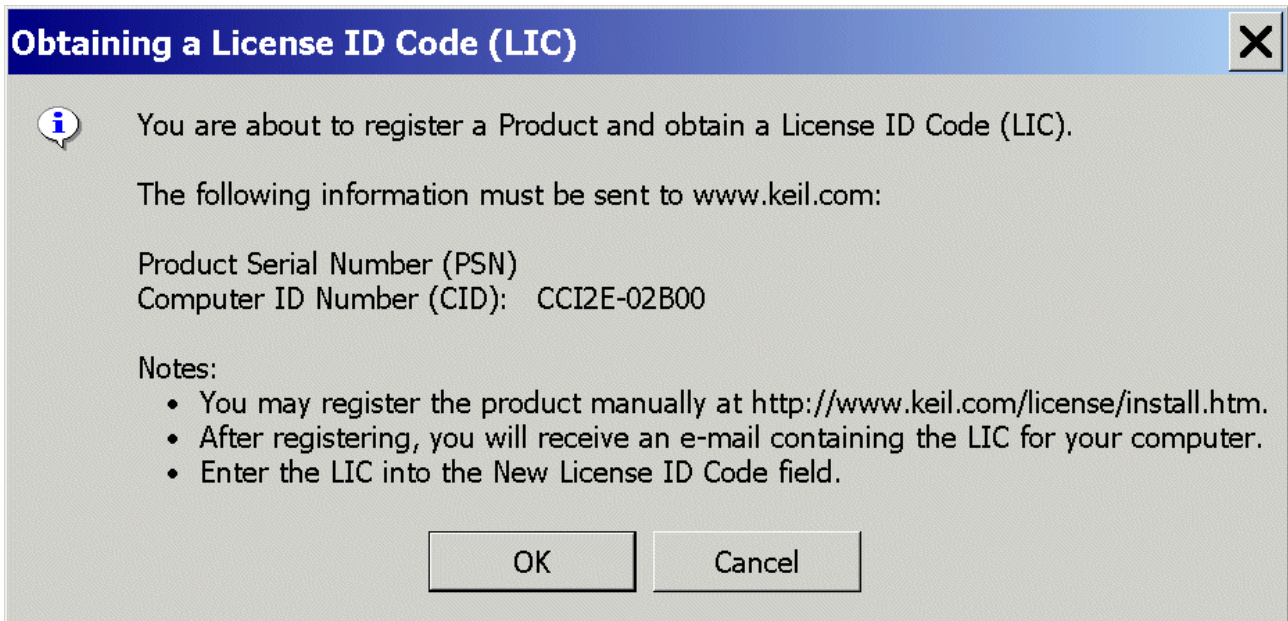
New License ID Code (LIC): BUY82-98E87-KE9HD

PSN

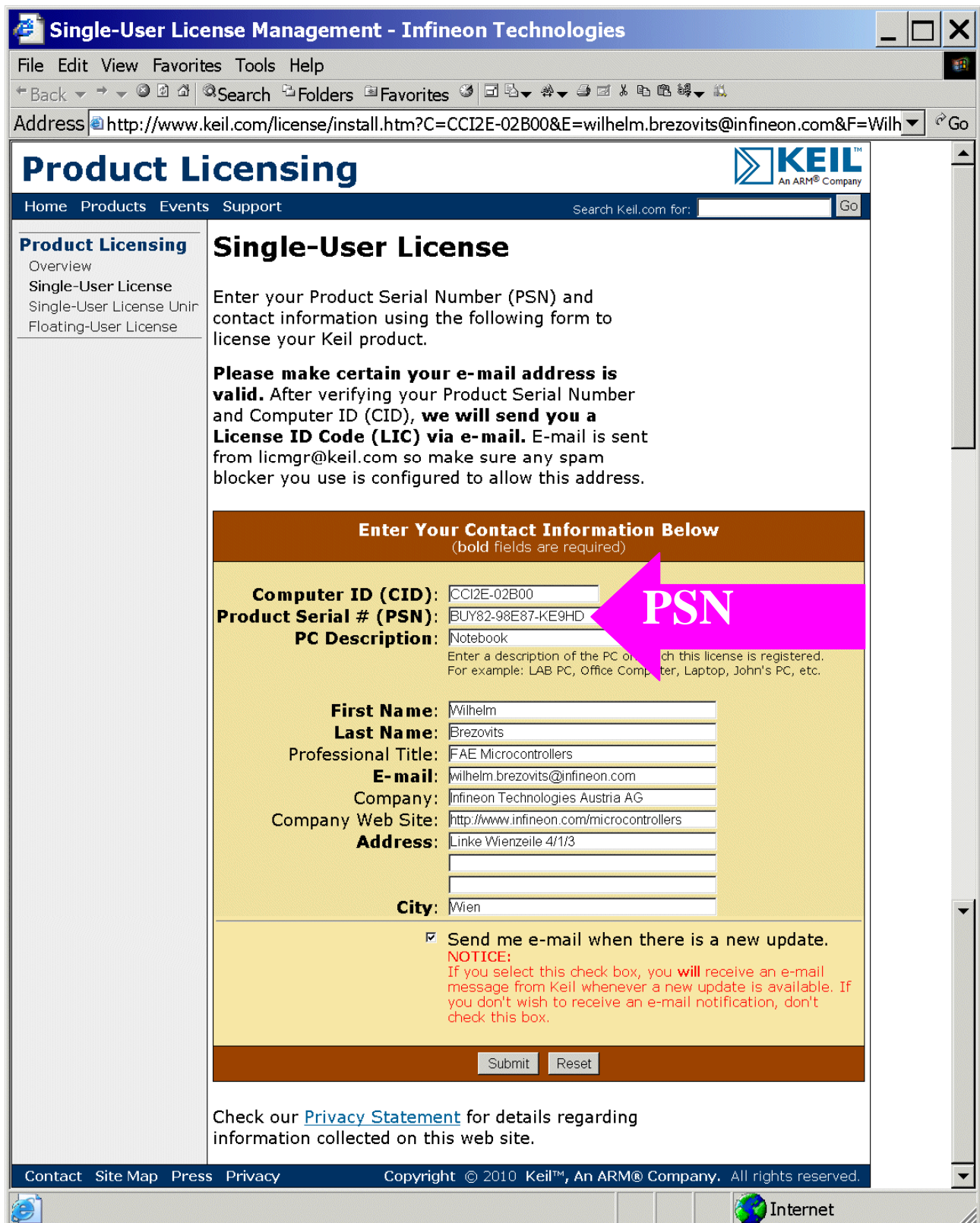
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Please make certain your e-mail address is valid. After verifying your Product Serial Number and Computer ID (CID), **we will send you a License ID Code (LIC) via e-mail.** E-mail is sent from licmgr@keil.com so make sure any spam blocker you use is configured to allow this address.

Enter Your Contact Information Below
(bold fields are required)

Computer ID (CID): CCI2E-02B00

Product Serial # (PSN): BUY82-98E87-KE9HD

PC Description: Notebook
Enter a description of the PC on which this license is registered. For example: LAB PC, Office Computer, Laptop, John's PC, etc.

First Name: Wilhelm

Last Name: Brezovits

Professional Title: FAE Microcontrollers

E-mail: wilhelm.brezovits@infineon.com

Company: Infineon Technologies Austria AG

Company Web Site: <http://www.infineon.com/microcontrollers>

Address: Linke Wienzeile 4/1/3

City: Wien

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- Single-User License Unir
- Floating-User License

Thanks for Licensing Your Product

We have sent your product registration information including the License ID Code (LIC) via e-mail to **wilhelm.brezovits@infineon.com**.

When you receive this e-mail, copy the License ID Code (LIC) and paste it into the **New License ID Code** input field in the µVision License Manager Dialog — Single-User License Tab (available from the File Menu).

If you have multiple Keil products you may [Register Another Product](#) at this time.

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- [LICENSING A PC NOT CONNECTED TO THE INTERNET](#)

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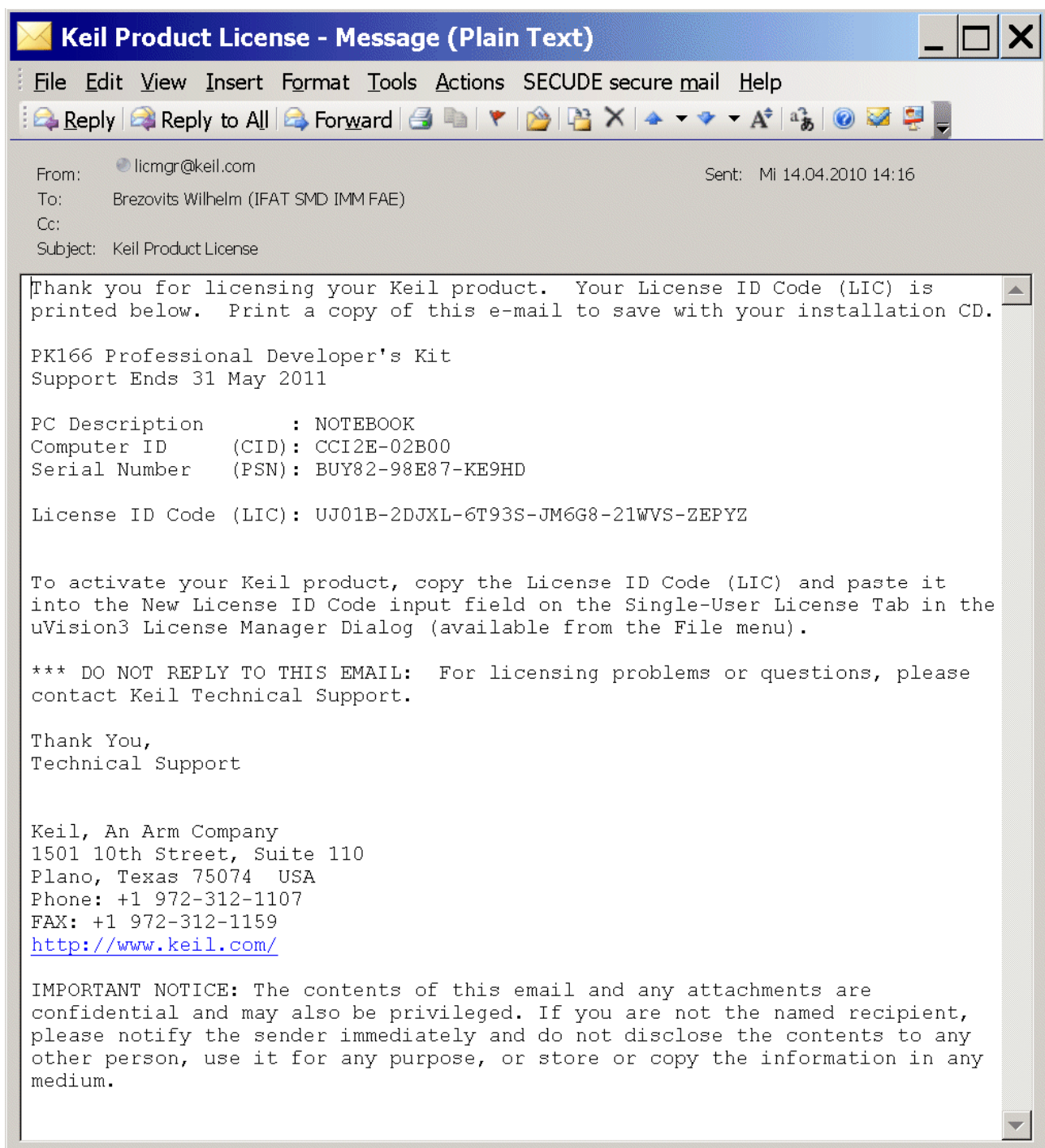
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Customer Information

Name: Wilhelm Brezovits

Company: Infineon Technologies Austria AG

Email: wilhelm.brezovits@infineon.com

Computer ID

CID: CCI2E-02B00

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PK166 Prof. Developers Kit	Evaluation Version	

New License ID Code (LIC): UJ01B-2DJXL-6T93S-JM6G8-21WVS-ZEPYZ

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Close

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Click

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Floating License
Floating License Administrator

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Name:

Company:

Email:

Computer ID

CID:

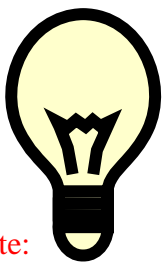
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Product	License ID Code (LIC)	Support Period
PK166 Prof. Developers Kit	UJ01B-2DJXL-6T93S-JM6G8-21WVS-ZEPYZ	Expires: May 2011

New License ID Code (LIC):

*** LIC Added Sucessfully ***

Click



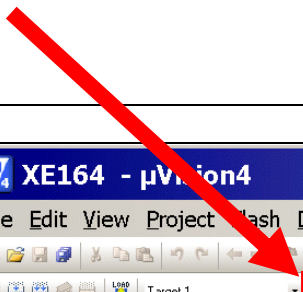
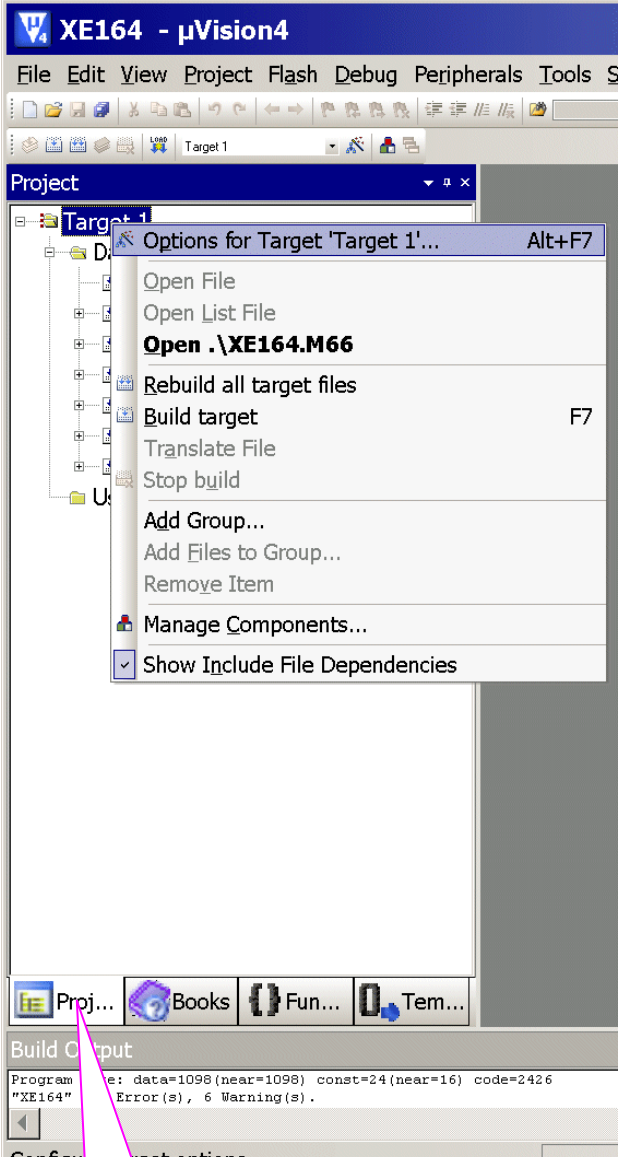
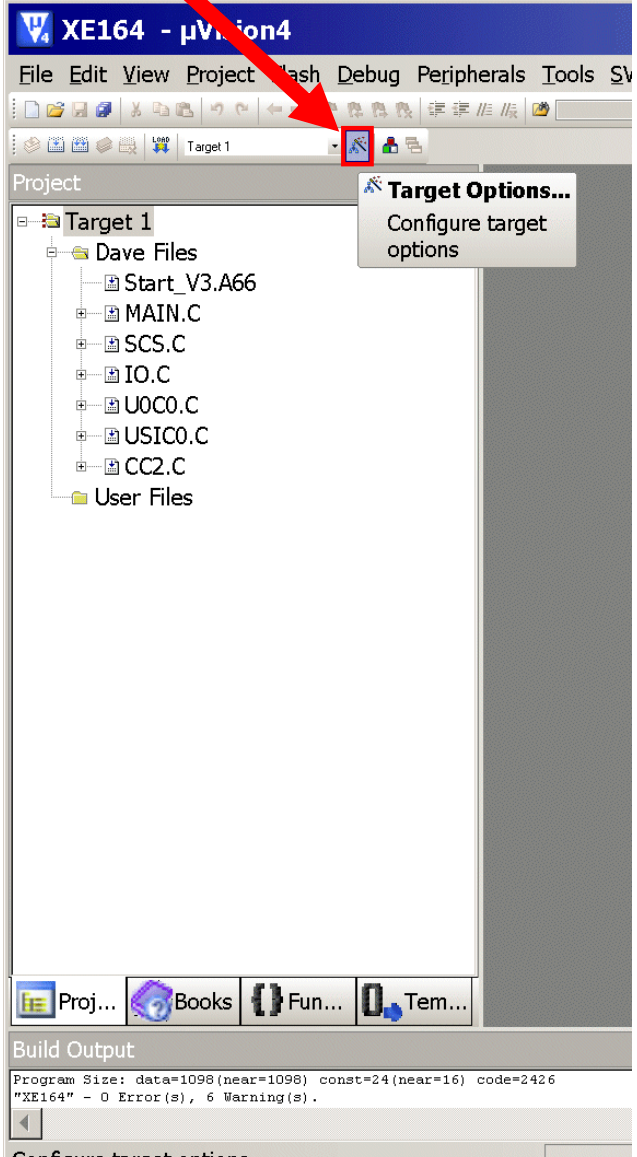
Note:

Now you can write software for Infineon's 16 bit microcontrollers without the limitations (4 KBytes) of the Evaluation Compiler. That means your program may be as large as there is program memory available.



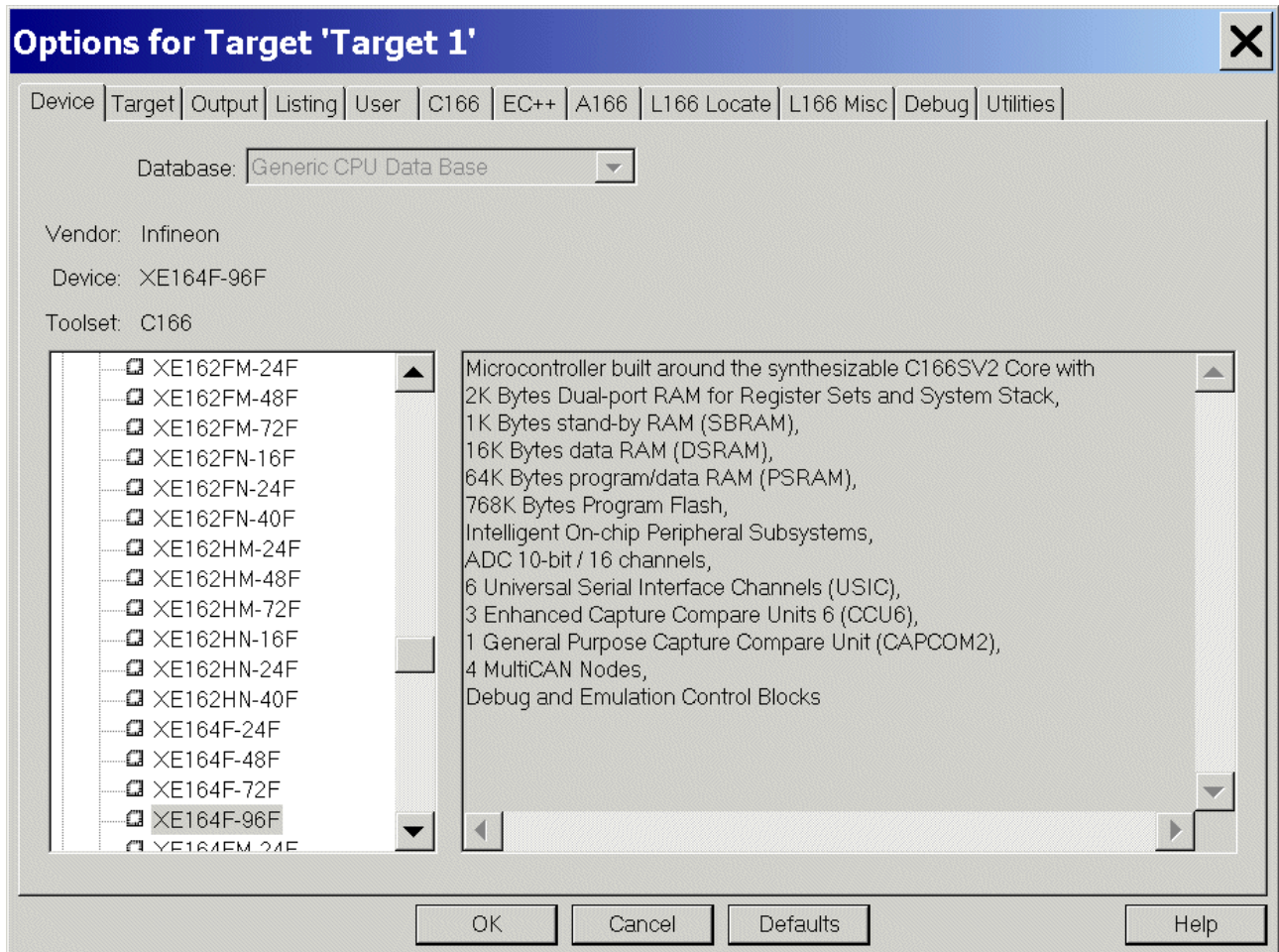
Configure:

Compiler, Assembler, Linker, Locator, Hex-Converter, Build – Control, (Simulator, Debugger,) Listings and Utilities (e.g. OnChip Flash Programming):

<p>mouse position: (Project Workspace, Files): Target1 click right mouse button click Options for Target 'Target1'</p>	<p>or click</p> 
 <p>The screenshot shows the 'Options for Target 'Target 1'...' menu open. The menu includes options like 'Open File', 'Open List File', 'Open .\XE164.M66', 'Rebuild all target files', 'Build target', 'Translate File', 'Stop build', 'Add Group...', 'Add Files to Group...', 'Remove Item', 'Manage Components...', and 'Show Include File Dependencies'.</p>	 <p>The screenshot shows the 'Target Options...' dialog box open, with the text 'Configure target options'.</p>

Project Workspace, Files

Device: check XE164F-96F



Target: Clock(MHz): check 8.0

Target: tick/check ☒ Use On-chip ROM

Target: tick/check ☒ Use On-chip ROM

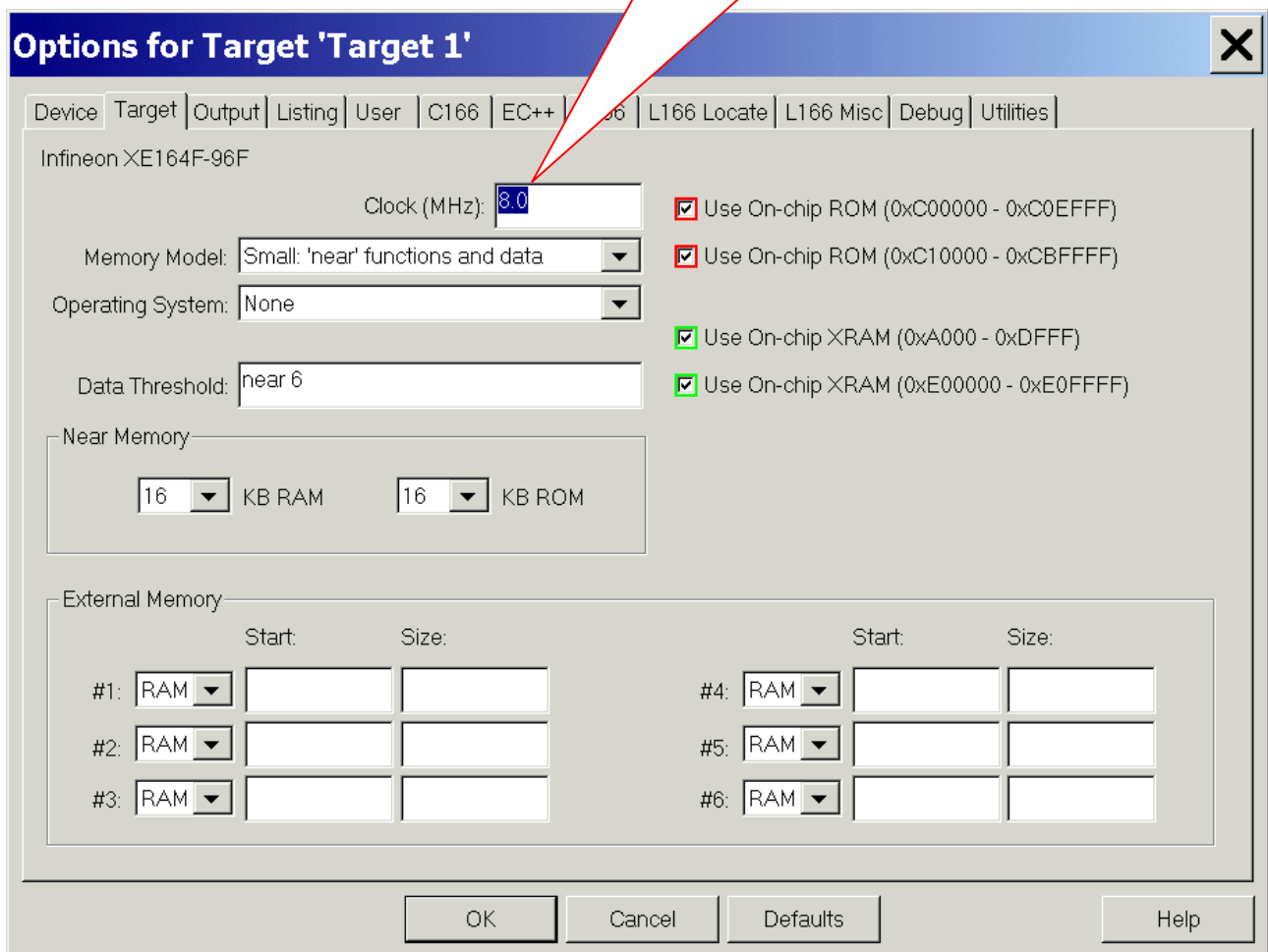
Target: tick/check ☒ Use On-chip XRAM

Target: tick/check ☒ Use On-chip XRAM

Note (Source: DAVE):

Configuration of the System Clock:

- VCO clock used, input clock is connected
- input frequency is 8,00 MHz
- configured system frequency is 66,00 MHz
- system clock is 66.00 MHz



The dialog box 'Options for Target 'Target 1'' contains the following settings:

- Device: Infineon XE164F-96F
- Clock (MHz): 8.0
- Memory Model: Small: 'near' functions and data
- Operating System: None
- Data Threshold: near 6
- Near Memory:
 - 16 KB RAM
 - 16 KB ROM
- External Memory:

	Start:	Size:
#1: RAM		
#2: RAM		
#3: RAM		
#4: RAM		
#5: RAM		
#6: RAM		
- Options:
 - ☒ Use On-chip ROM (0xC00000 - 0xC0EFFF)
 - ☒ Use On-chip ROM (0xC10000 - 0xCBFFFF)
 - ☒ Use On-chip XRAM (0xA000 - 0xDFFF)
 - ☒ Use On-chip XRAM (0xE00000 - 0xE0FFFF)
- Buttons: OK, Cancel, Defaults, Help



Additional information: **Memory Map** (Source: User's Manual):

Options for Target 'Target 1'

Device: Infineon XE164F-96F

Target: Output: Listing: User: C166: EC++: A166: L166 Locate: L166 Misc: Debug: Utilities:

Clock (MHz):

Memory Model:

Operating System:

Data Threshold:

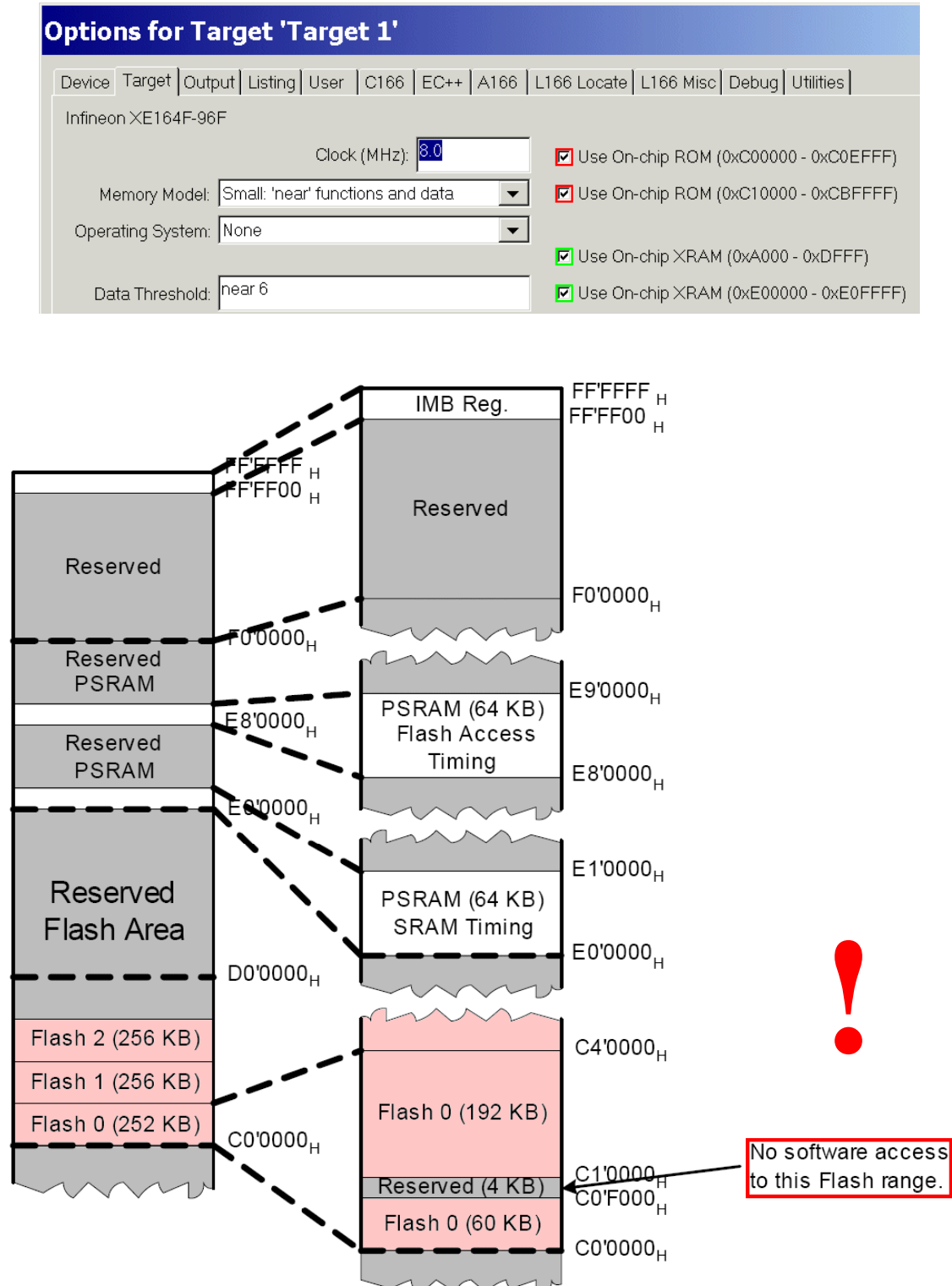
☒ Use On-chip ROM (0xC00000 - 0xC0EFFF)
☒ Use On-chip ROM (0xC10000 - 0xCBFFFF)
☒ Use On-chip XRAM (0xA000 - 0xDFFF)
☒ Use On-chip XRAM (0xE00000 - 0xE0FFFF)

Table 3-1 XE16x Memory Map ¹⁾

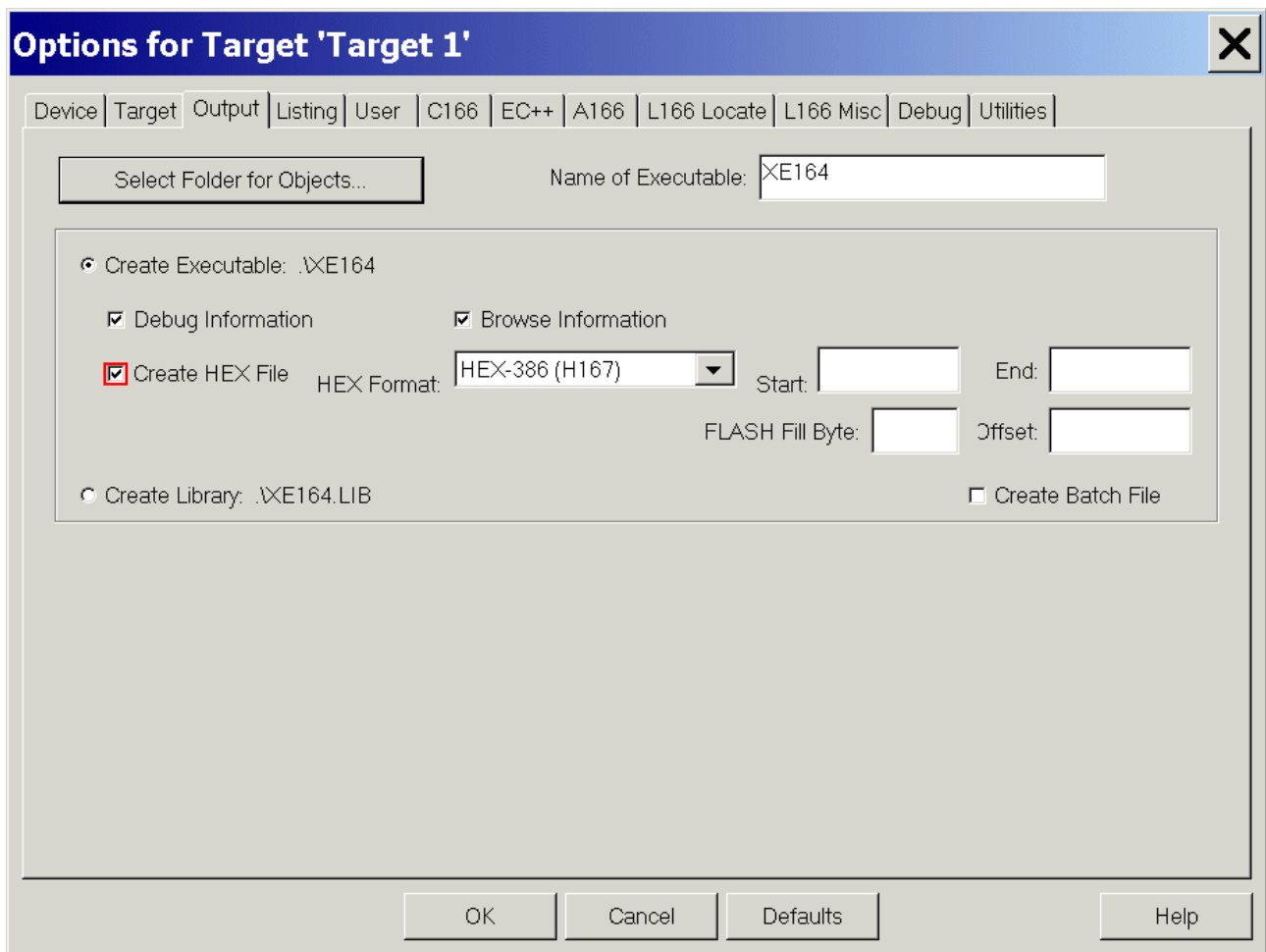
Address Area	Start Loc.	End Loc.	Area Size ²⁾	Notes
IMB register space	FF'FF00 _H	FF'FFFF _H	256 Bytes	
Reserved (access trap)	F0'0000 _H	FF'FEFF _H	< 1 MByte	Minus IMB registers.
Reserved for EPSRAM	E9'0000 _H	EF'FFFF _H	448 KBytes	
EPSRAM	E8'0000 _H	E8'FFFF _H	64 KBytes	PSRAM with Flash timing.
Reserved for PSRAM	E1'0000 _H	E7'FFFF _H	448 KBytes	
PSRAM	E0'0000 _H	E0'FFFF _H	64 KBytes	Program SRAM.
Reserved for Flash	CC'0000 _H	DF'FFFF _H	<1.25 MBytes	
Flash 2	C8'0000 _H	CB'FFFF _H	256 KBytes	
Flash 1	C4'0000 _H	C7'FFFF _H	256 KBytes	
Flash 0	C0'0000 _H	C3'FFFF _H	252 KBytes ³⁾	Minus res. seg.
External memory area	40'0000 _H	BF'FFFF _H	8 MBytes	
External IO area ⁴⁾	20'5800 _H	3F'FFFF _H	< 2 MBytes	Minus CAN/USIC
USIC registers	20'4000 _H	20'57FF _H	6 KBytes	Accessed via EBC
MultiCAN registers	20'0000 _H	20'3FFF _H	16 KBytes	Accessed via EBC
External memory area	01'0000 _H	1F'FFFF _H	< 2 MBytes	Minus segment 0
SFR area	00'FE00 _H	00'FFFF _H	0.5 KBytes	
Dual-port RAM (DPRAM)	00'F600 _H	00'FDFF _H	2 KBytes	
Reserved for DPRAM	00'F200 _H	00'F5FF _H	1 KBytes	
ESFR area	00'F000 _H	00'F1FF _H	0.5 KBytes	
XSFR area	00'E000 _H	00'EFFF _H	4 KBytes	
Data SRAM (DSRAM)	00'A000 _H	00'DFFF _H	16 KBytes	
Reserved for DSRAM	00'8000 _H	00'9FFF _H	8 KBytes	
External memory area	00'0000 _H	00'7FFF _H	32 KBytes	



Additional information: **Memory Map** (Source: User's Manual):



Output: tick ☒ Create HEX File



Options for Target 'Target 1'

Device | Target | **Output** | Listing | User | C166 | EC++ | A166 | L166 Locate | L166 Misc | Debug | Utilities

Select Folder for Objects... Name of Executable: XE164

☒ Create Executable: .\XE164

☒ Debug Information ☒ Browse Information

☒ Create HEX File HEX Format: HEX-386 (H167) Start: End: FLASH Fill Byte: Offset: ☐ Create Batch File

☐ Create Library: .\XE164.LIB

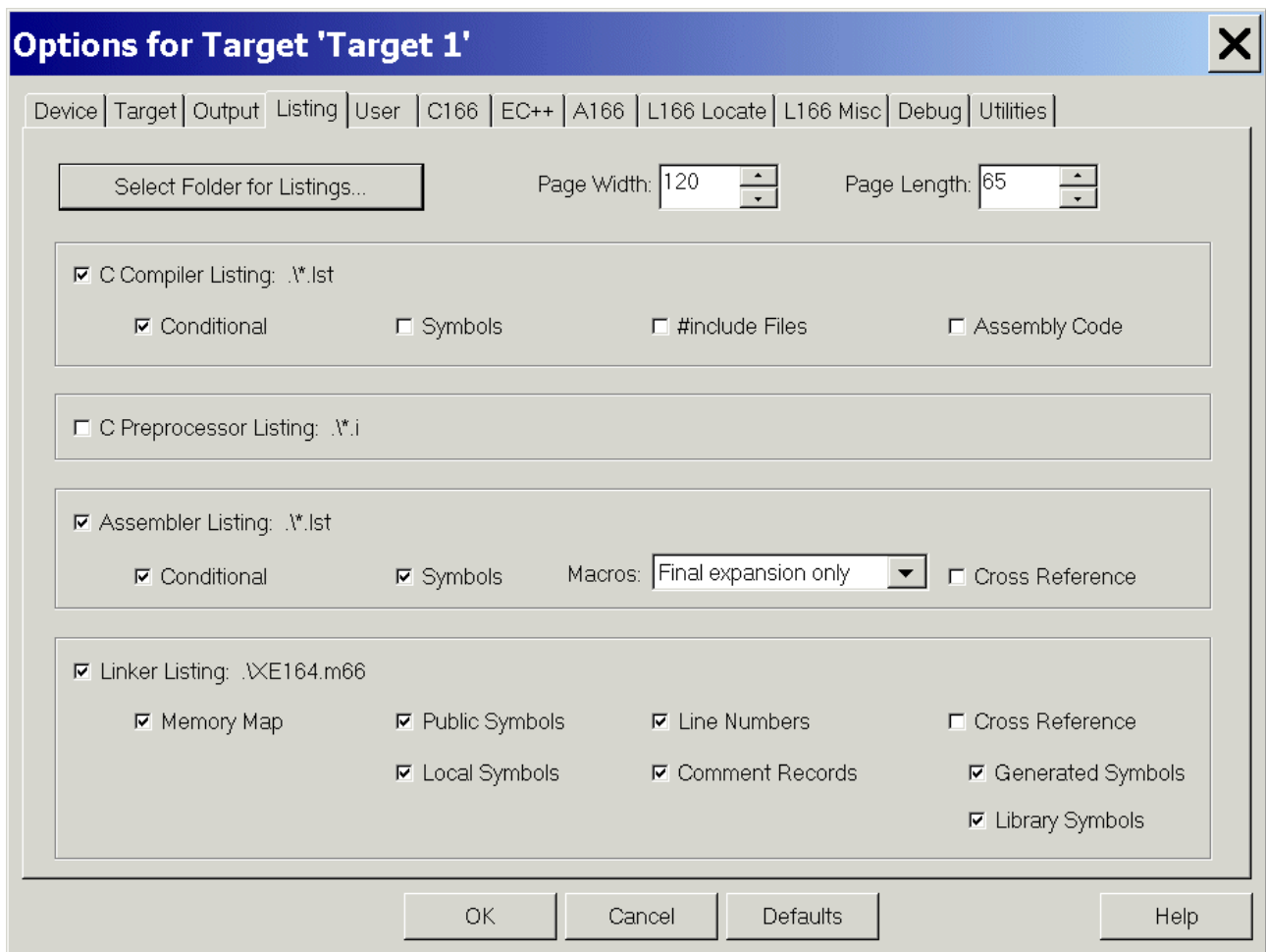
OK Cancel Defaults Help

Note:

The HEX File could be used while working with the program MEMTOOL for OnChip-Flash-Programming via RS232-interface [Bootstrap Loader (BSL) Mode via UART/USIC0_CH0].



Listing: (do nothing)



The dialog box 'Options for Target 'Target 1'' has a blue title bar with a close button (X). It contains several tabs: Device, Target, Output, Listing (selected), User, C166, EC++, A166, L166 Locate, L166 Misc, Debug, and Utilities. The 'Listing' tab is active, showing options for various listing types and their contents.

Options for Target 'Target 1'

Device | Target | Output | **Listing** | User | C166 | EC++ | A166 | L166 Locate | L166 Misc | Debug | Utilities

Select Folder for Listings... Page Width: 120 Page Length: 65

☒ C Compiler Listing: *.lst

☒ Conditional ☐ Symbols ☐ #include Files ☐ Assembly Code

☐ C Preprocessor Listing: *.i

☒ Assembler Listing: *.lst

☒ Conditional ☒ Symbols Macros: Final expansion only ☐ Cross Reference

☒ Linker Listing: .\XE164.m66

☒ Memory Map ☒ Public Symbols ☒ Line Numbers ☐ Cross Reference

☒ Local Symbols ☒ Comment Records ☒ Generated Symbols

☒ Library Symbols

OK Cancel Defaults Help

User: (do nothing)

Options for Target 'Target 1'
✕

Device
Target
Output
Listing
User
C166
EC++
A166
L166 Locate
L166 Misc
Debug
Utilities

Run User Programs Before Compilation of a C/C++ File

☐ Run #1:

...

☐ DOS16

☐ Run #2:

...

☐ DOS16

Run User Programs Before Build/Rebuild

☐ Run #1:

...

☐ DOS16

☐ Run #2:

...

☐ DOS16

Run User Programs After Build/Rebuild

☐ Run #1:

...

☐ DOS16

☐ Run #2:

...

☐ DOS16

☒ Beep When Complete

☐ Start Debugging

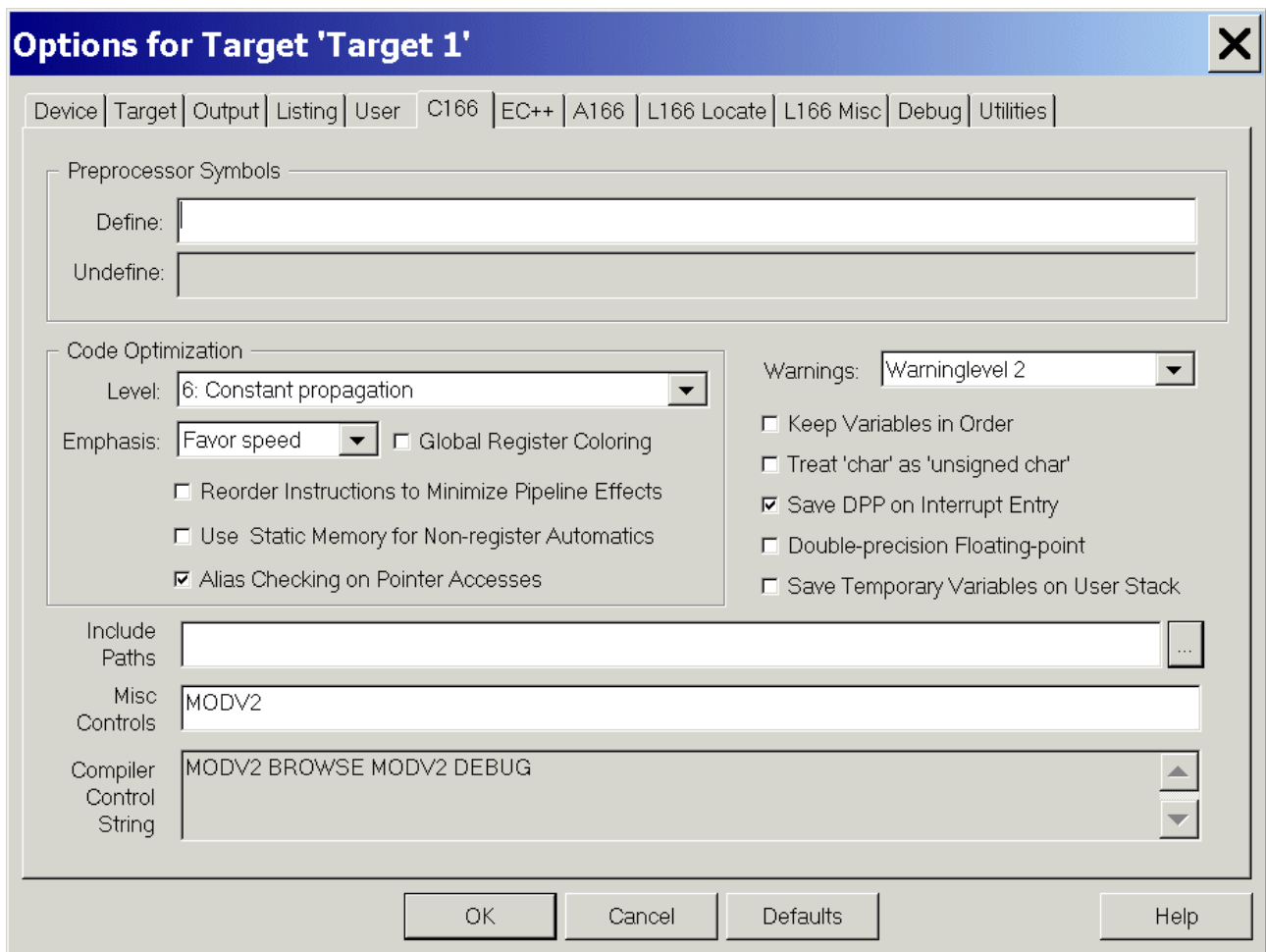
OK

Cancel

Defaults

Help

C166: (do nothing)



Options for Target 'Target 1'

Device | Target | Output | Listing | User | **C166** | EC++ | A166 | L166 Locate | L166 Misc | Debug | Utilities

Preprocessor Symbols

Define:

Undefine:

Code Optimization

Level: **6: Constant propagation**

Emphasis: **Favor speed** ☐ Global Register Coloring

☐ Reorder Instructions to Minimize Pipeline Effects

☐ Use Static Memory for Non-register Automatics

☒ Alias Checking on Pointer Accesses

Warnings: **Warninglevel 2**

☐ Keep Variables in Order

☐ Treat 'char' as 'unsigned char'

☒ Save DPP on Interrupt Entry

☐ Double-precision Floating-point

☐ Save Temporary Variables on User Stack

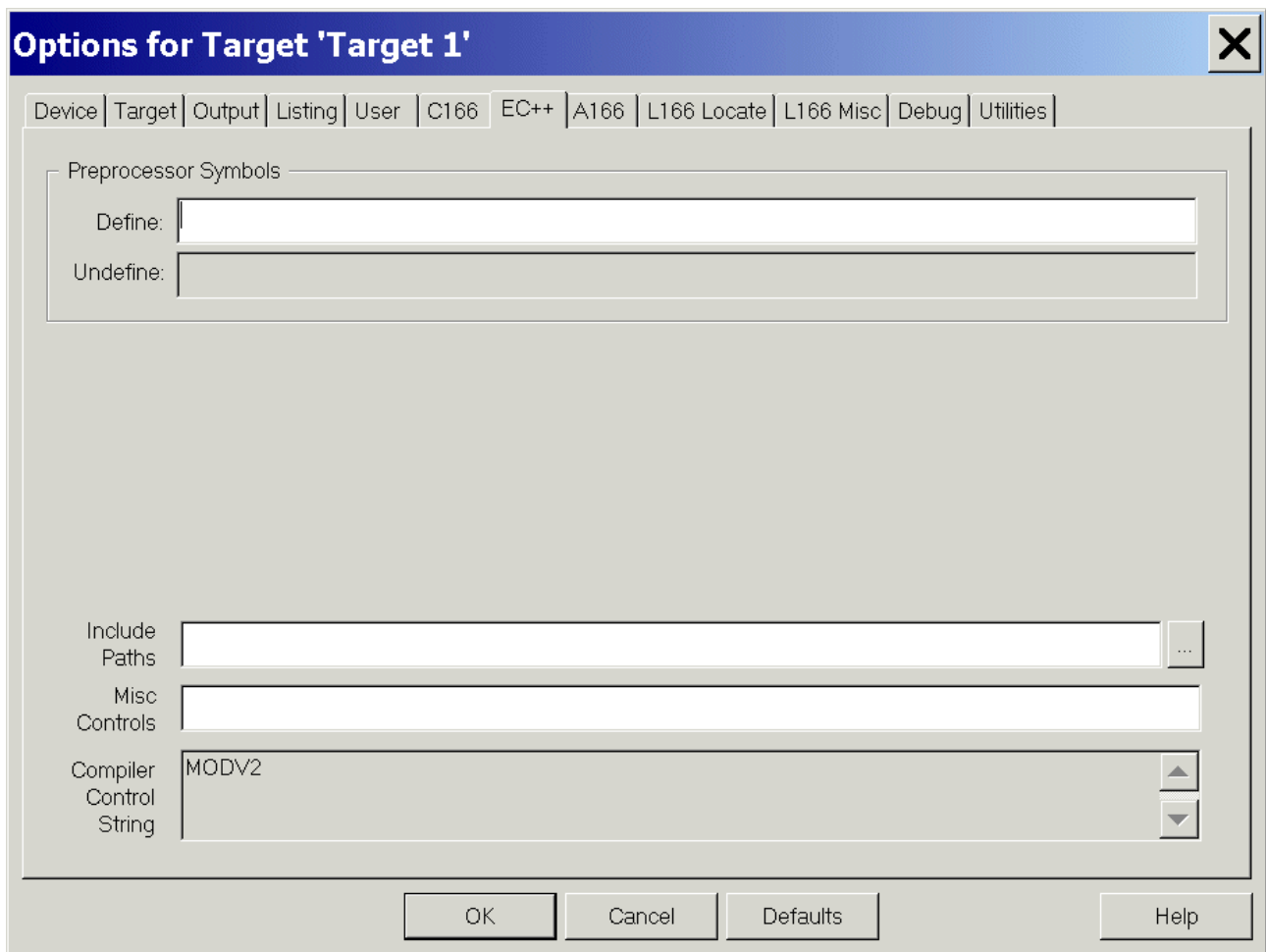
Include Paths: ...

Misc Controls: **MODV2**

Compiler Control String: **MODV2 BROWSE MODV2 DEBUG**

OK Cancel Defaults Help

EC++: (do nothing)



The dialog box is titled "Options for Target 'Target 1'". It features a tabbed interface with the following tabs: Device, Target, Output, Listing, User, C166, EC++, A166, L166 Locate, L166 Misc, Debug, and Utilities. The "EC++" tab is currently selected.

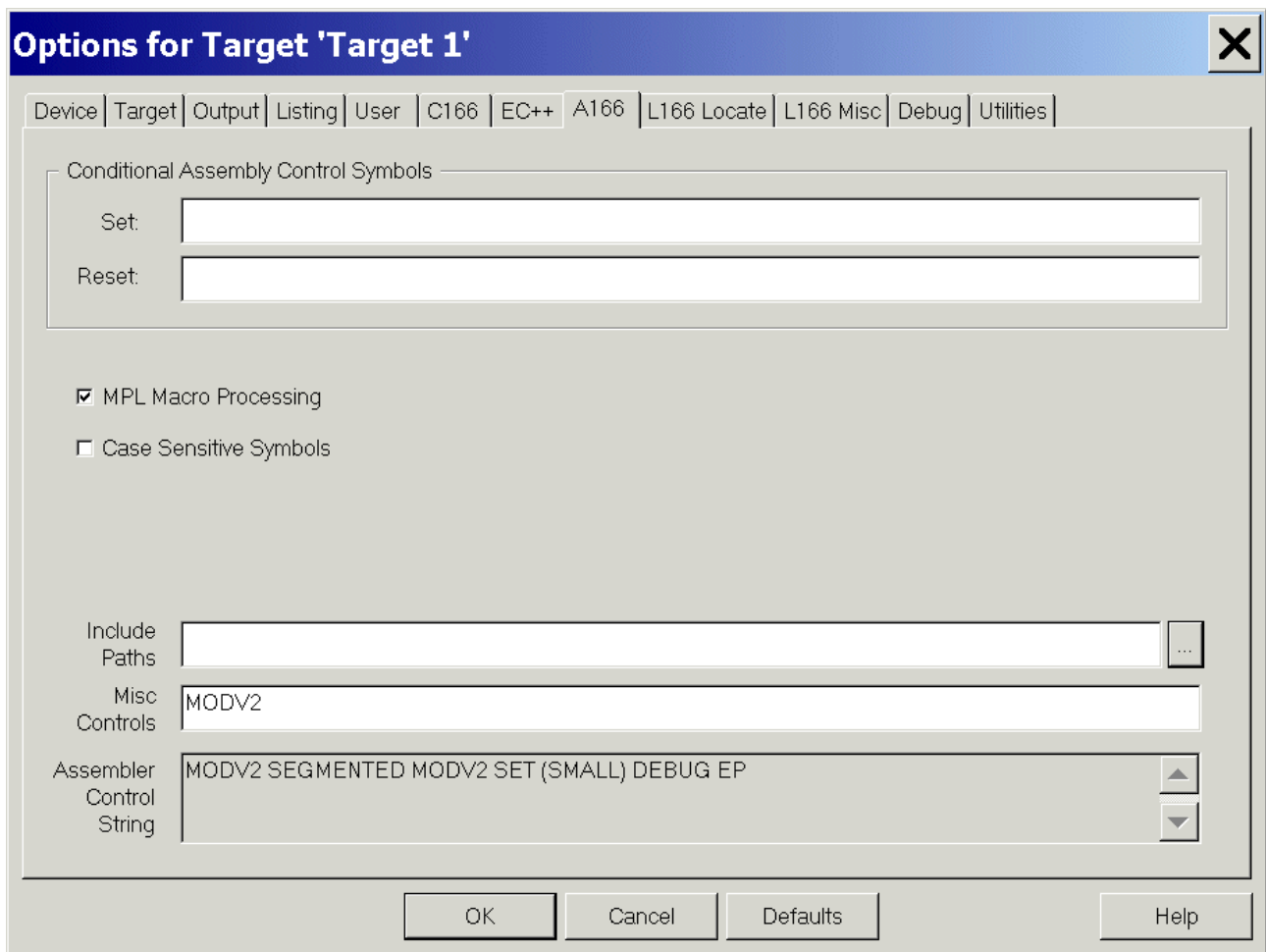
Under the "Preprocessor Symbols" section, there are two text input fields: "Define:" and "Undefine:". Both fields are currently empty.

Below the preprocessor symbols, there are three more input fields:

- "Include Paths": A text input field with a browse button (three dots) to its right.
- "Misc Controls": A text input field.
- "Compiler Control String": A text input field containing the text "MODV2". It has up and down arrow buttons to its right.

At the bottom of the dialog, there are four buttons: "OK", "Cancel", "Defaults", and "Help".

A166: (do nothing)



The dialog box is titled "Options for Target 'Target 1'". It features a tabbed interface with the following tabs: Device, Target, Output, Listing, User, C166, EC++, A166 (selected), L166 Locate, L166 Misc, Debug, and Utilities. The A166 tab is active, showing the "Conditional Assembly Control Symbols" section. This section includes two text input fields labeled "Set:" and "Reset:". Below these are two checkboxes: "MPL Macro Processing" (checked) and "Case Sensitive Symbols" (unchecked). Further down, there is an "Include Paths" section with a text input field and a browse button (...). The "Misc Controls" section contains a text input field with the value "MODV2". The "Assembler Control String" section has a text input field with the value "MODV2 SEGMENTED MODV2 SET (SMALL) DEBUG EP" and up/down arrow buttons. At the bottom of the dialog are four buttons: "OK", "Cancel", "Defaults", and "Help".

L166 Locate: (do nothing)

Options for Target 'Target 1'
✕

Device | Target | Output | Listing | User | C166 | EC++ | A166 | L166 Locate | L166 Misc | Debug | Utilities

☒ Use Memory Layout from Target Dialog

C166 Variable Initialization Tables 0xC10000 - 0xCBFFFF

DPP Usage
☐ DPPUSE

ndata dpp2 ▼

nconst dpp1 ▼

Target Classes

ICODE (0xC00000-0xC0EFFF), NCODE (0xC10000-0xC1FFFF),
 FCONST (0xC00000-0xC0EFFF, 0xC10000-0xCBFFFF), HCONST (0xC00000-0xC0EFFF, 0xC10000-0xCBFFFF),
 XCONST (0xC00000-0xC0EFFF, 0xC10000-0xCBFFFF), NCONST (0xC04000-0xC07FFF),

▲
▼

User Classes

▲
▼

User Sections

▲
▼

Linker Control String

TO "XE164"
 CLASSES (ICODE (0xC00000-0xC0EFFF), NCODE (0xC10000-0xC1FFFF),
 FCONST (0xC00000-0xC0EFFF, 0xC10000-0xCBFFFF), HCONST (0xC00000-0xC0EFFF, 0xC10000-0xCBFFFF), NCONST (0xC04000-0xC07FFF),

▲
▼

OK

Cancel

Defaults

Help

L166 Misc: Interrupt Vector Table Address: insert 0x0C00000

Options for Target 'Target 1'

Device | Target | Output | Listing | User | C166 | EC++ | A166 | L166 Locate | **L166 Misc** | Debug | Utilities

Warnings
Level 2 ▾ Disable Warning Numbers:

☐ use linker control file:
Create... Browse... Edit...

☐ Create Relocatable Output File (LINKONLY) Interrupt Vector Table Address: **0x0C00000**

Assign

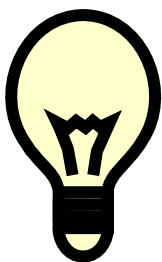
RegBank

Reserve

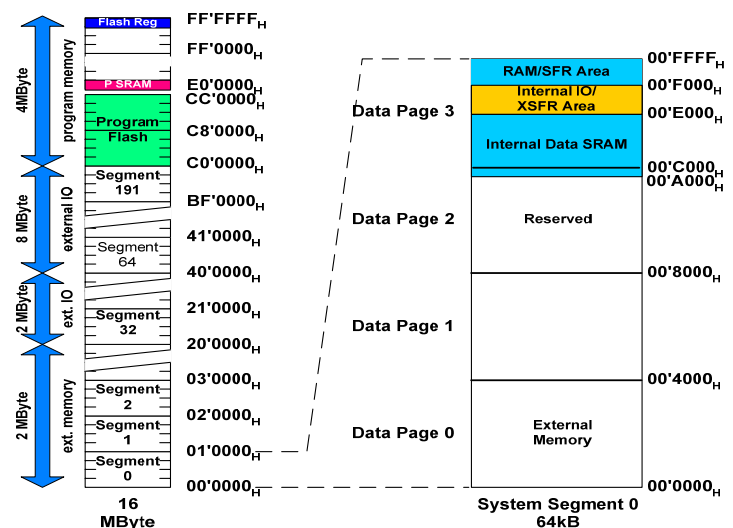
Misc Controls

Linker Control String TO "XE164"
VECTAB (0x0C00000)
CLASSES (ICODE (0xC00000-0xC0EFFF), NCODE (0xC10000-0xC1FFFF),

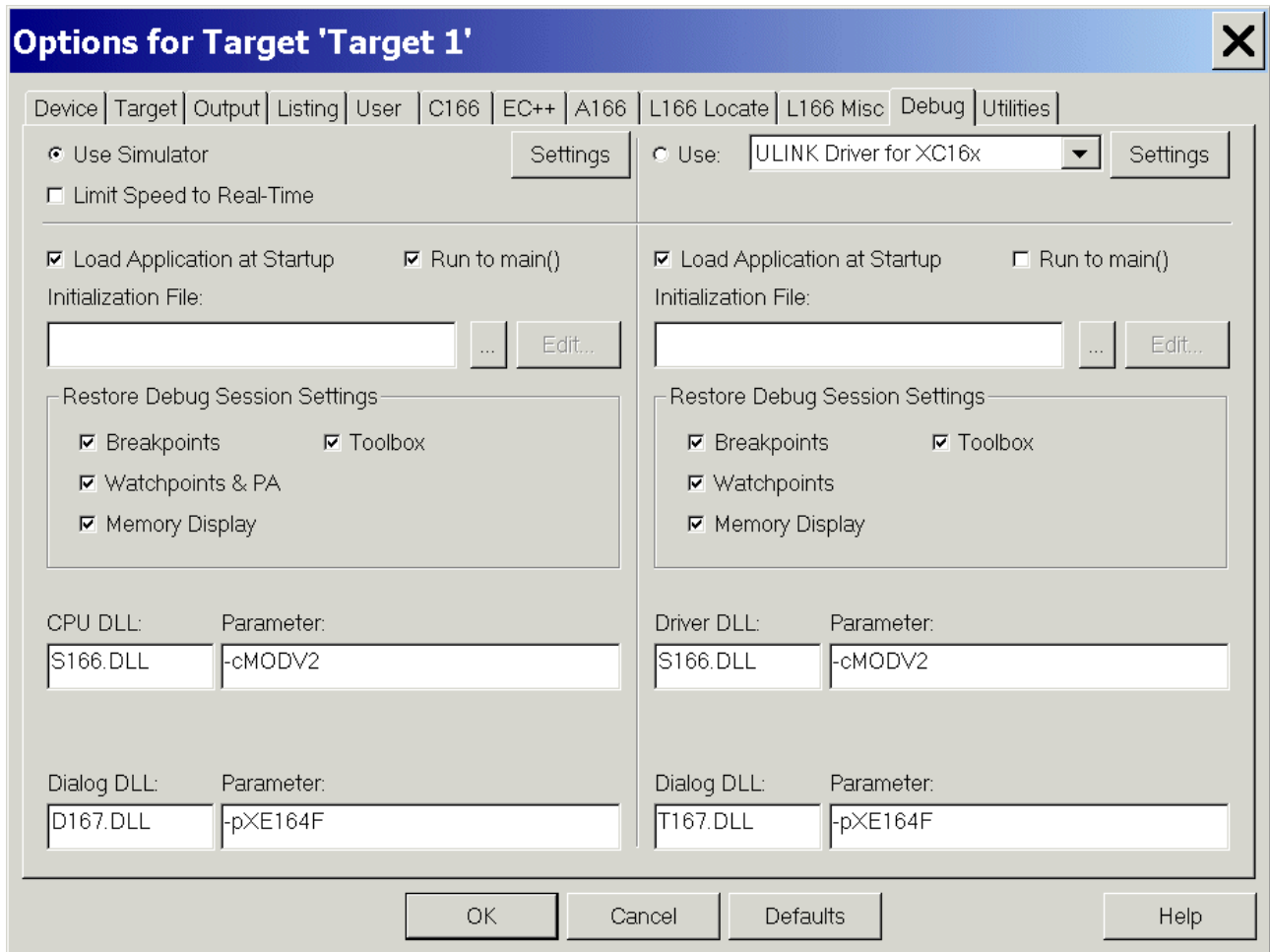
OK Cancel Defaults Help



Note:
The On Chip Flash starts here.



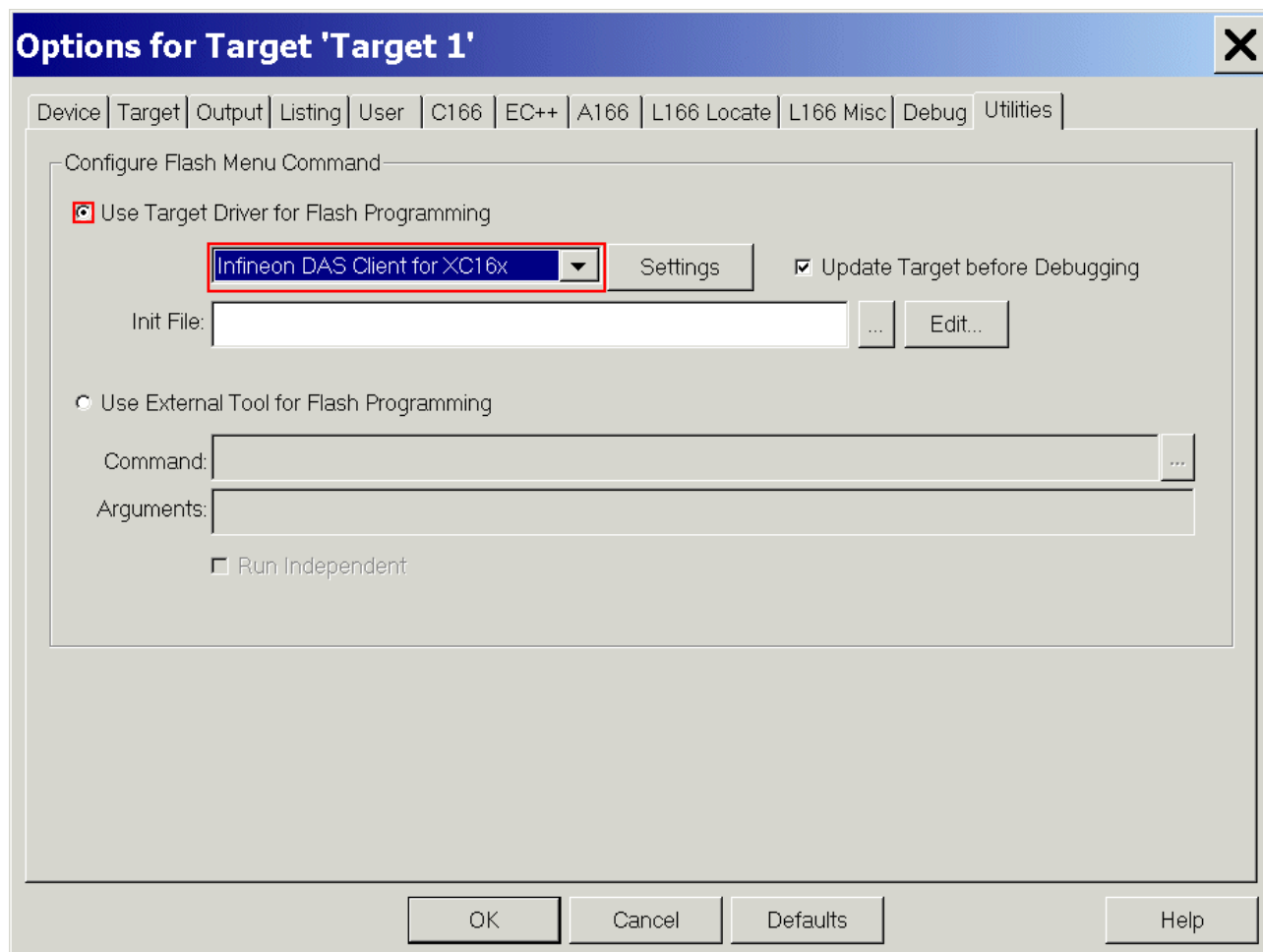
Debug: (do nothing)



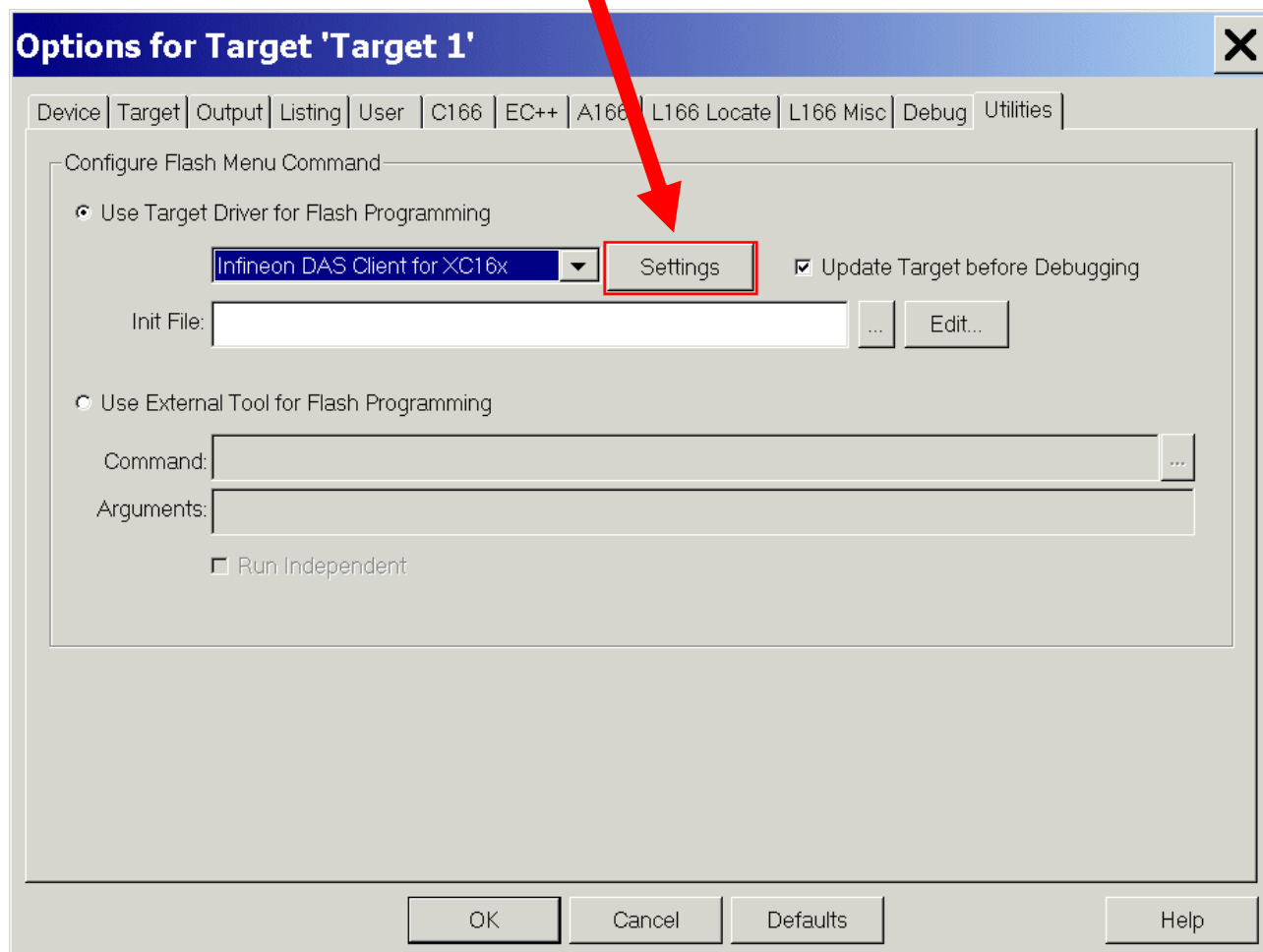
The image shows a screenshot of the 'Options for Target 'Target 1'' dialog box. The 'Debug' tab is selected. The 'Use Simulator' option is checked, and the 'Limit Speed to Real-Time' option is unchecked. The 'Use' dropdown is set to 'ULINK Driver for XC16x'. The 'Load Application at Startup' and 'Run to main()' options are both checked. The 'Initialization File' field is empty. The 'Restore Debug Session Settings' section has 'Breakpoints', 'Toolbox', 'Watchpoints & PA', and 'Memory Display' all checked. The 'CPU DLL' is 'S166.DLL' and the 'Parameter' is '-cMODV2'. The 'Dialog DLL' is 'D167.DLL' and the 'Parameter' is '-pXE164F'. The 'Driver DLL' is 'S166.DLL' and the 'Parameter' is '-cMODV2'. The 'Dialog DLL' is 'T167.DLL' and the 'Parameter' is '-pXE164F'. The 'OK', 'Cancel', 'Defaults', and 'Help' buttons are at the bottom.

Utilities: Configure Flash Menu Command: **check** ☒ Use Target Driver for Flash Programming

Utilities: Configure Flash Menu Command: **select** Infineon DAS Client for XC16x



Utilities: Configure Flash Menu Command: **click** Settings



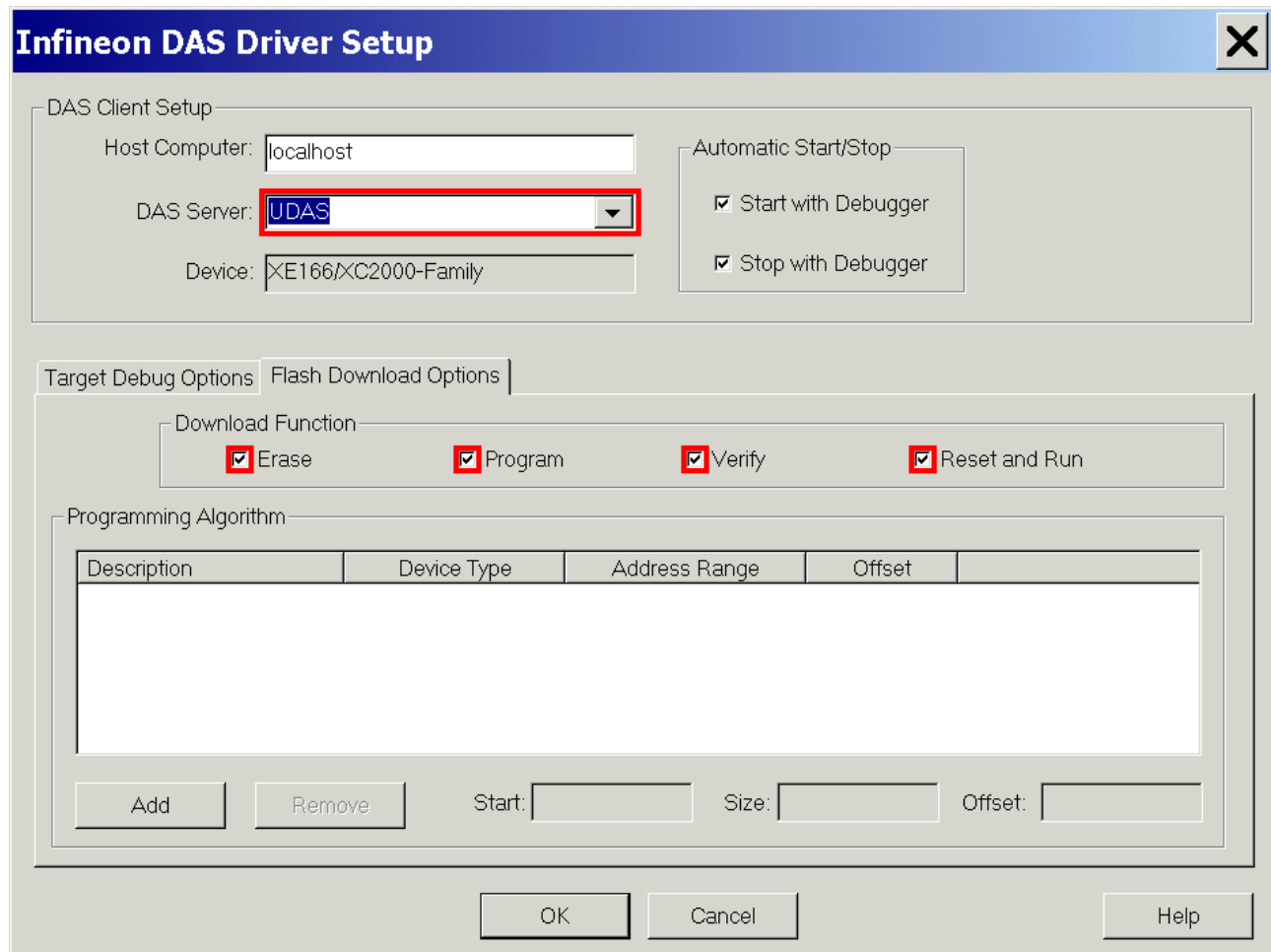
DAS Client Setup: DAS Server: select: UDAS (Universal Device Access Server)

Flash Download Options: Download Function: tick/check: ☒ Erase

Flash Download Options: Download Function: tick/check: ☒ Program

Flash Download Options: Download Function: tick/check: ☒ Verify

Flash Download Options: Download Function: tick/check: ☒ Reset and Run



Infineon DAS Driver Setup

DAS Client Setup

Host Computer: localhost

DAS Server: **UDAS**

Device: XE166/XC2000-Family

Automatic Start/Stop

☒ Start with Debugger

☒ Stop with Debugger

Target Debug Options | Flash Download Options

Download Function

☒ Erase ☒ Program ☒ Verify ☒ Reset and Run

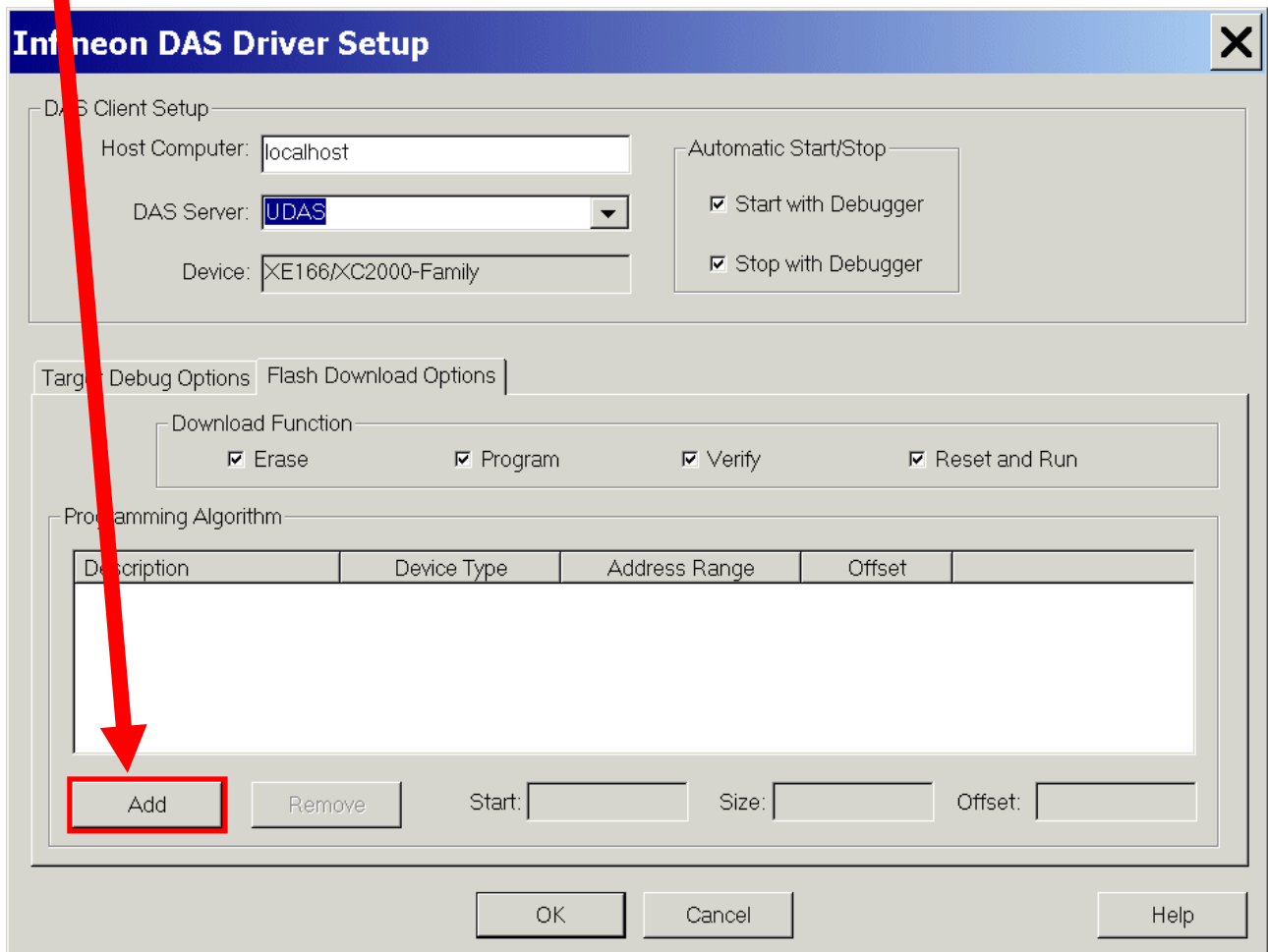
Programming Algorithm

Description	Device Type	Address Range	Offset

Add Remove Start: Size: Offset:

OK Cancel Help

Click Add



The image shows the 'Infineon DAS Driver Setup' dialog box. A red arrow points from the text 'Click Add' to the 'Add' button in the 'Programming Algorithm' section. The dialog box has a title bar with a close button (X). It contains several sections: 'DAS Client Setup' with fields for 'Host Computer' (localhost), 'DAS Server' (UDAS), and 'Device' (XE166/XC2000-Family); 'Automatic Start/Stop' with checkboxes for 'Start with Debugger' and 'Stop with Debugger'; 'Target' tabs for 'Debug Options' and 'Flash Download Options'; 'Download Function' with checkboxes for 'Erase', 'Program', 'Verify', and 'Reset and Run'; and 'Programming Algorithm' which includes a table with columns 'Description', 'Device Type', 'Address Range', and 'Offset'. Below the table are 'Add', 'Remove', 'Start', 'Size', and 'Offset' buttons. At the bottom are 'OK', 'Cancel', and 'Help' buttons.

Infineon DAS Driver Setup

DAS Client Setup

Host Computer: localhost

DAS Server: UDAS

Device: XE166/XC2000-Family

Automatic Start/Stop

☒ Start with Debugger

☒ Stop with Debugger

Target: Debug Options | Flash Download Options

Download Function

☒ Erase ☒ Program ☒ Verify ☒ Reset and Run

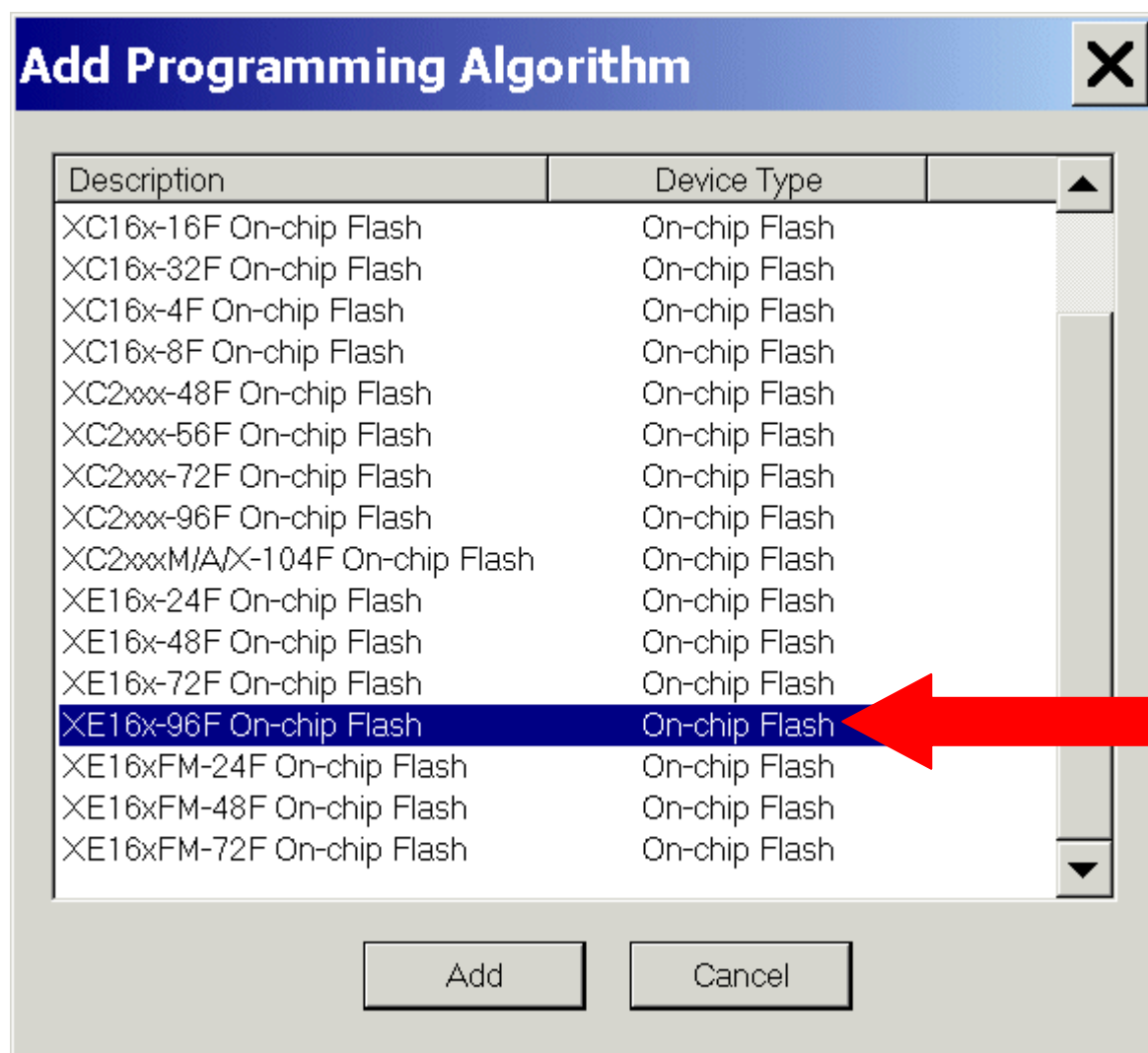
Programming Algorithm

Description	Device Type	Address Range	Offset

Add Remove Start: Size: Offset:

OK Cancel Help

Select: XE16x-96F On-chip Flash



Click



Infineon DAS Driver Setup
✕

DAS Client Setup

Host Computer:
DAS Server:
Device:

Automatic Start/Stop
☒ Start with Debugger
☒ Stop with Debugger

Target Debug Options

Flash Download Options

Download Function

☒ Erase
☒ Program
☒ Verify
☒ Reset and Run

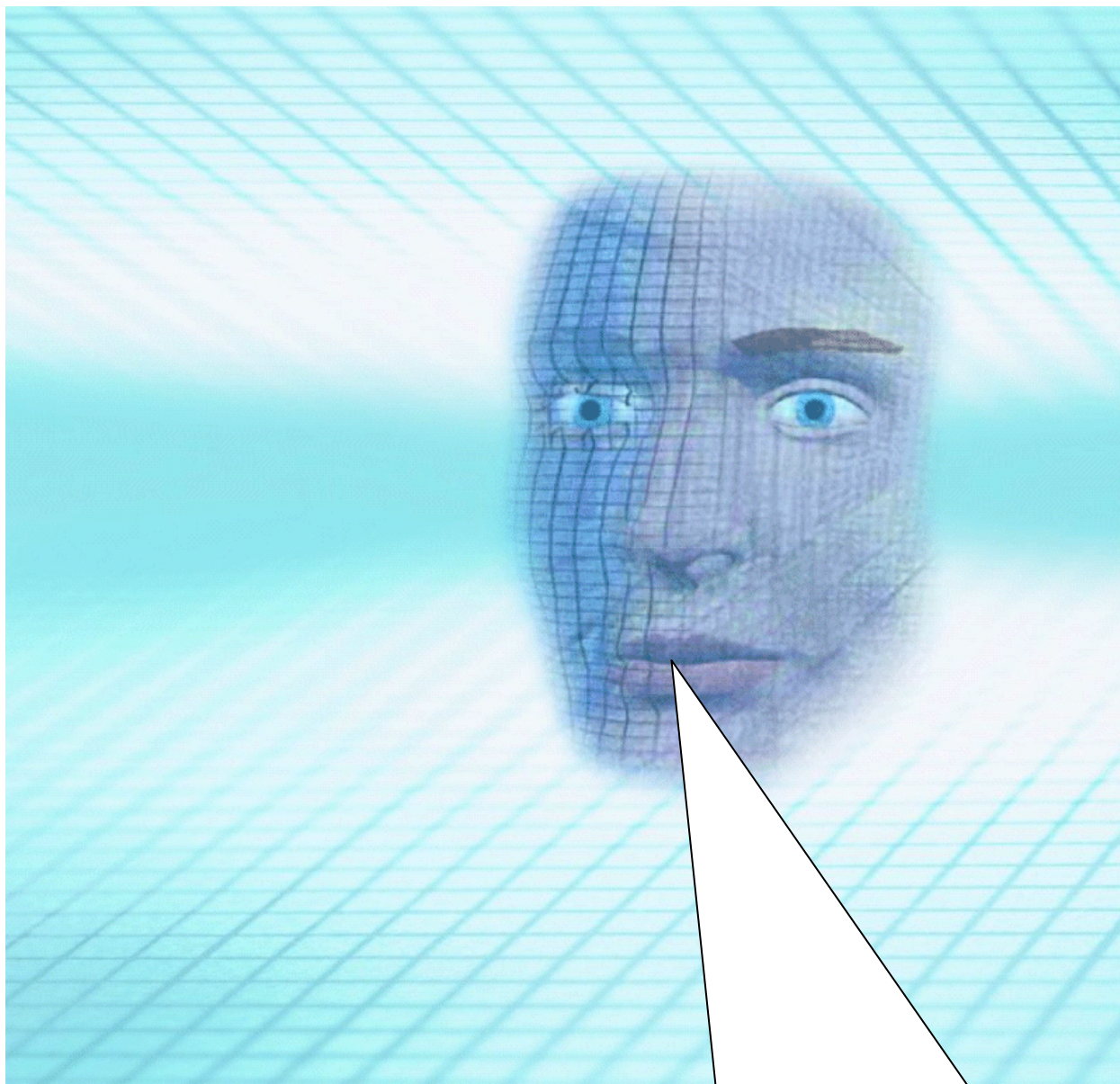
Programming Algorithm

Description	Device Type	Address Range	Offset
XE16x-96F On-chip Flash	On-chip Flash	C00000H - CBFFFFH	000000H

Start:
Size:
Offset:

OK
OK

Insert your application specific program:



Note:

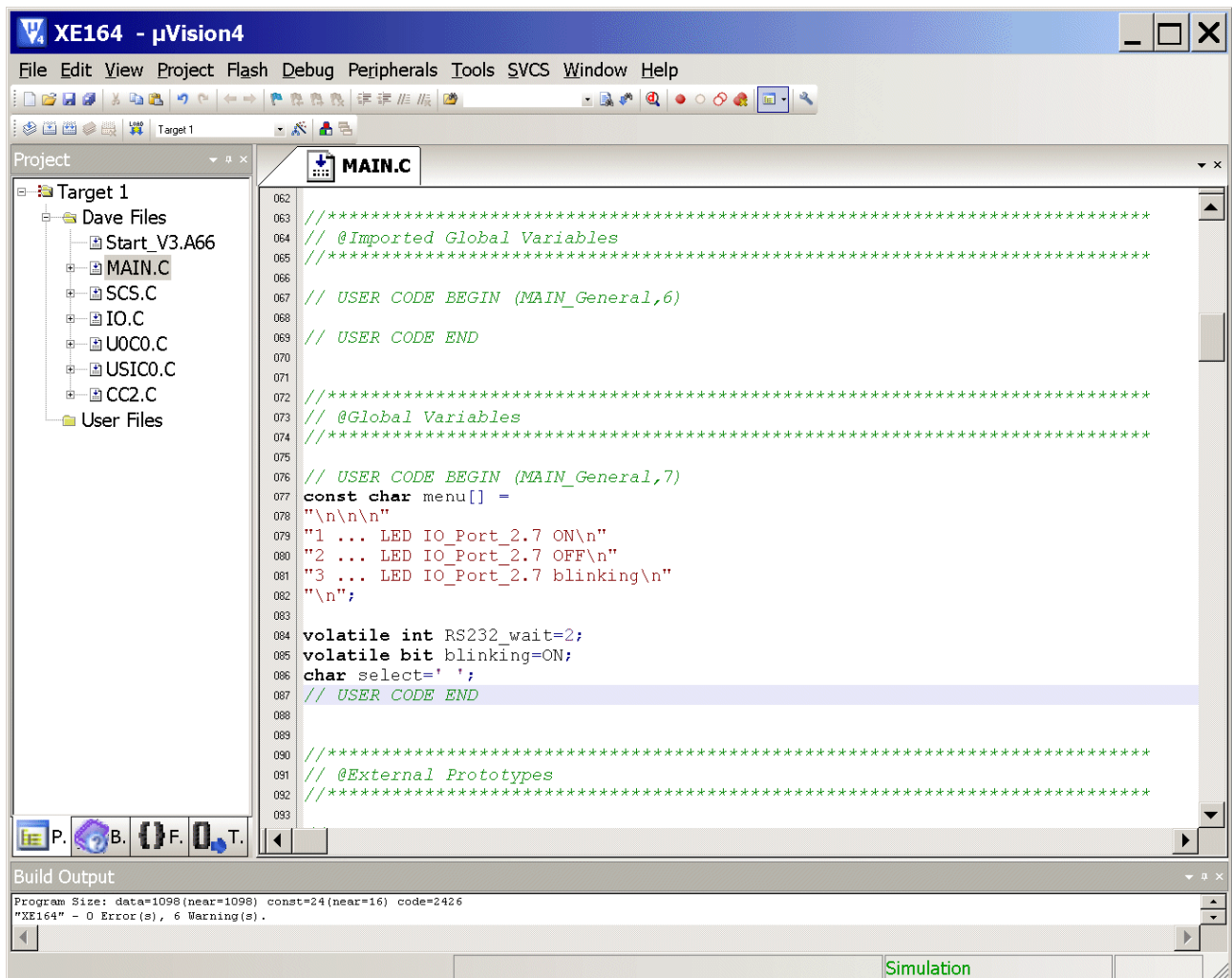
DAvE doesn't change code which is inserted between '`// USER CODE BEGIN`' and '`// USER CODE END`'. Therefore, whenever adding code to DAvE's generated code, write it between '`// USER CODE BEGIN`' and '`// USER CODE END`'.

If you wish to change DAvE's generated code or add code outside these 'USER CODE' sections you will have to insert/modify your changes each time after letting DAvE regenerate code!

Double click **MAIN.C** and insert Global Variables:

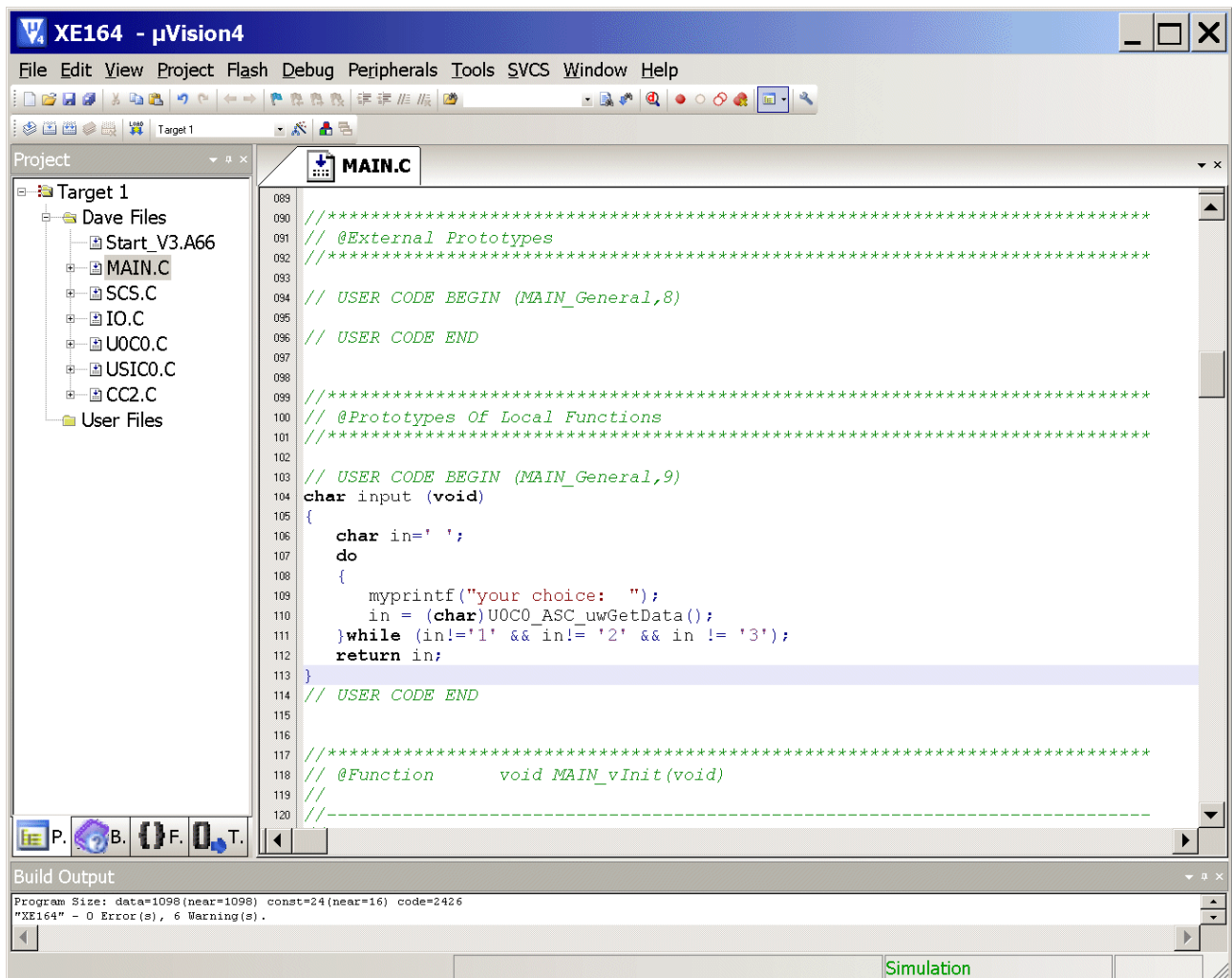
```
const char menu[] =
"\n\n"
"1 ... LED IO_Port_2.7 ON\n"
"2 ... LED IO_Port_2.7 OFF\n"
"3 ... LED IO_Port_2.7 blinking\n"
"\n";

volatile int RS232_wait=2;
volatile bit blinking=ON;
char select=' ';
```



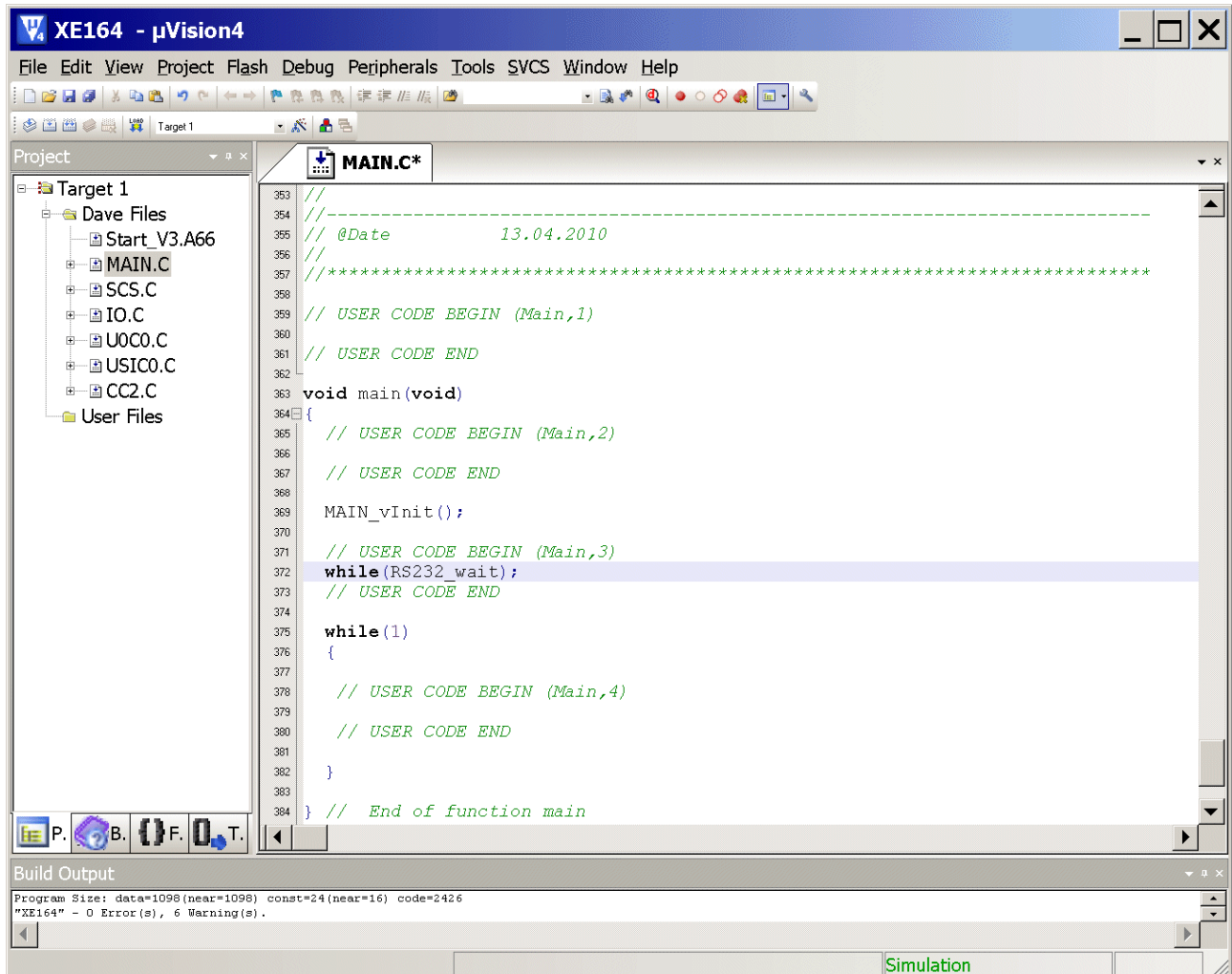
Double click **MAIN.C** and insert the function **input()**:

```
char input (void)
{
    char in=' ';
    do
    {
        myprintf("your choice: ");
        in = (char)U0C0_ASC_uwGetData();
    }while (in!='1' && in!= '2' && in != '3');
    return in;
}
```



Double click **MAIN.C** and insert the following code in the **main** function:

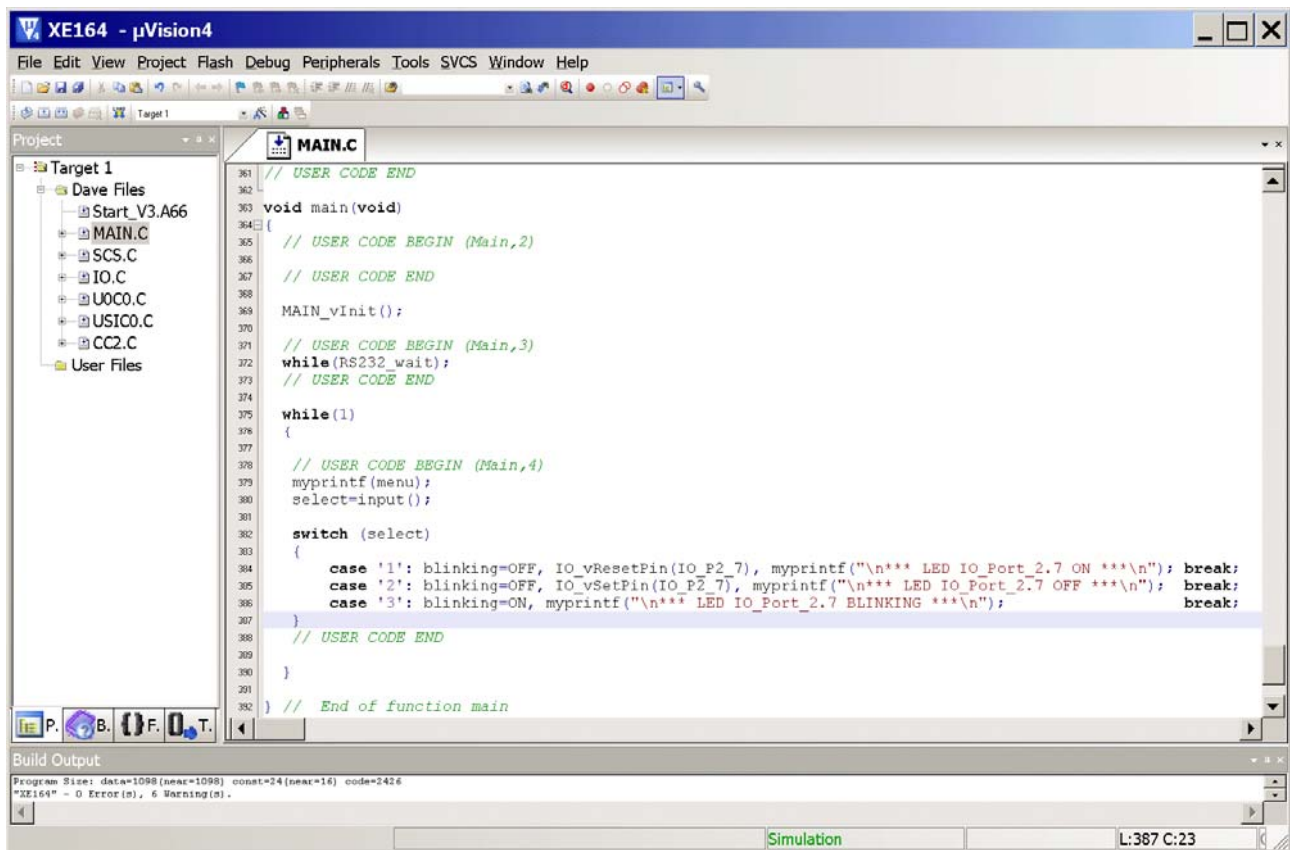
```
while(RS232_wait);
```



Double click **MAIN.C** and insert the following code in the **main** function into the **while(1)** loop:

```
myprintf(menu);
select=input();

switch (select)
{
    case '1': blinking=OFF, IO_vResetPin(IO_P2_7), myprintf("\n*** LED IO_Port_2.7 ON
***\n"); break;
    case '2': blinking=OFF, IO_vSetPin(IO_P2_7), myprintf("\n*** LED IO_Port_2.7 OFF
***\n"); break;
    case '3': blinking=ON, myprintf("\n*** LED IO_Port_2.7 BLINKING ***\n");
break;
}
```





Additional information: **Port Output Modification Register** (Source: User's Manual):

Pn_OMRL (n=6-11)

Port n Output Modification Register LowXSFR (E9C0_H+4*n) Reset Value: XXXX_H

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
PC	PC	PC	PC	PC	PC	PC	PC	PS	PS	PS	PS	PS	PS	PS	PS
7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W

Field	Bits	Type	Description
PSx (x = 0-7)	x	W	Port Set Bit x Setting this bit sets or toggles the corresponding bit in the port output register Pn_OUT (see Table 7-4). On a read access, this bit returns 0.
PCx (x = 0-7)	x + 8	W	Port Clear Bit x Setting this bit clears or toggles the corresponding bit in the port output register Pn_OUT. (see Table 7-4). On a read access, this bit returns 0.

Function of the PCx and PSx bit fields

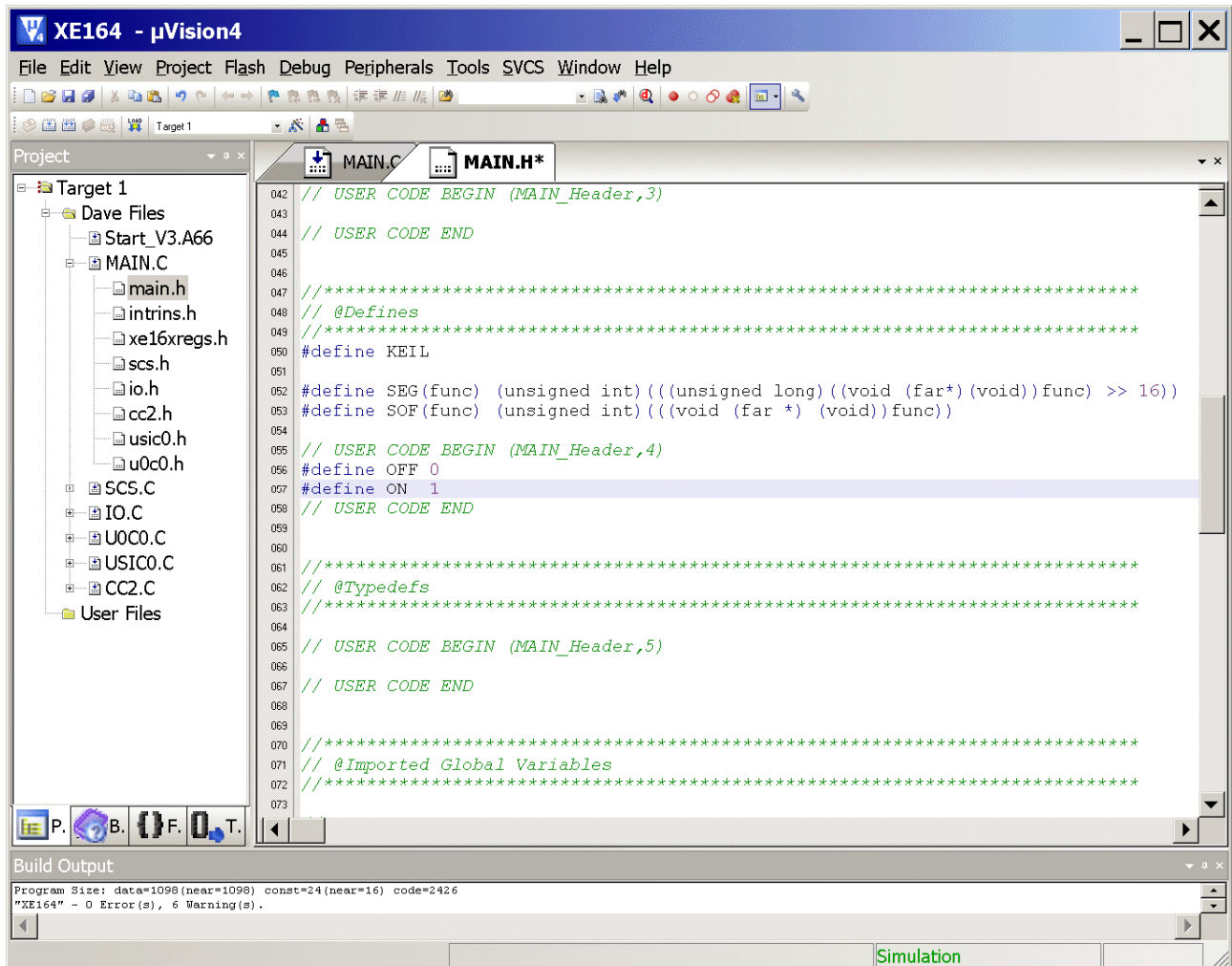
Table 7-4 Function of the Bits PCx and PSx

PCx	PSx	Function
0 or no write access	0 or no write access	Bit Pn_OUT.Px is not changed.
0 or no write access	1	Bit Pn_OUT.Px is set.
1	0 or no write access	Bit Pn_OUT.Px is cleared.
1	1	Bit Pn_OUT.Px is toggled.

Note: If a bit position is not written (one out of two bytes not targeted by a byte write), the corresponding value is considered as 0. Toggling a bit requires one 16-bit write.

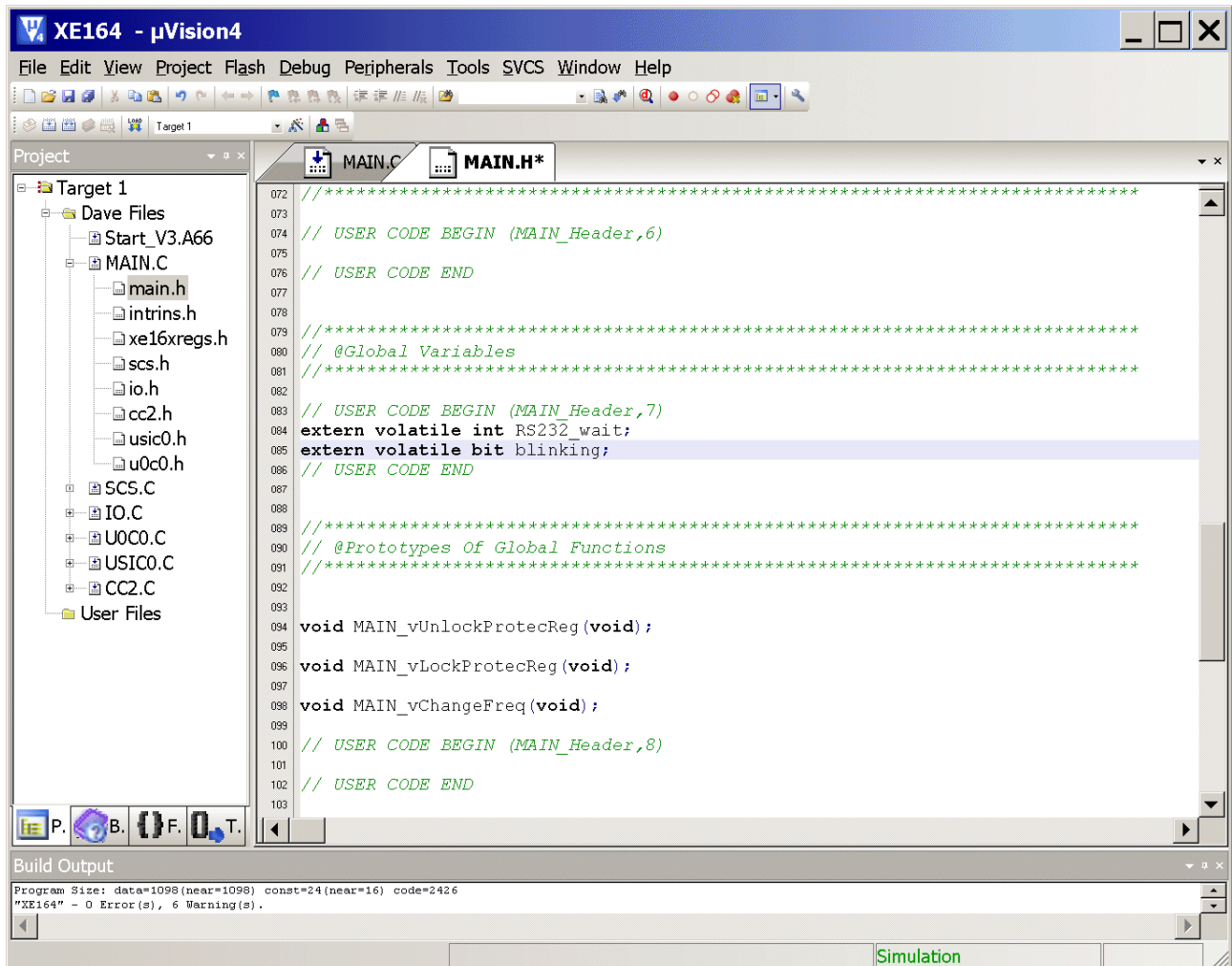
Double click **Main.h** and **insert** the following Defines:

```
#define OFF 0
#define ON 1
```



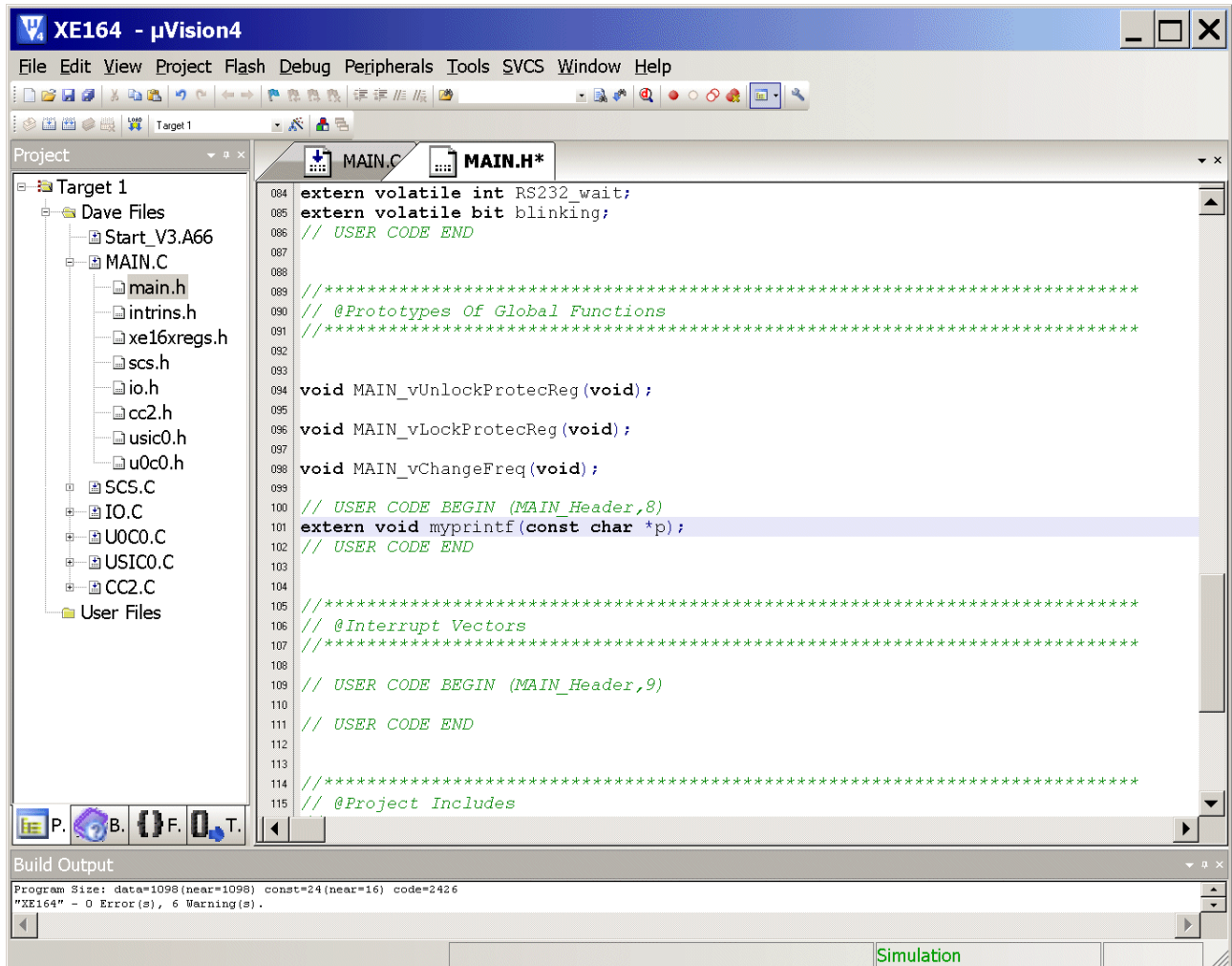
Double click **Main.h** and insert extern declarations "Global Variables":

```
extern volatile int RS232_wait;
extern volatile bit blinking;
```



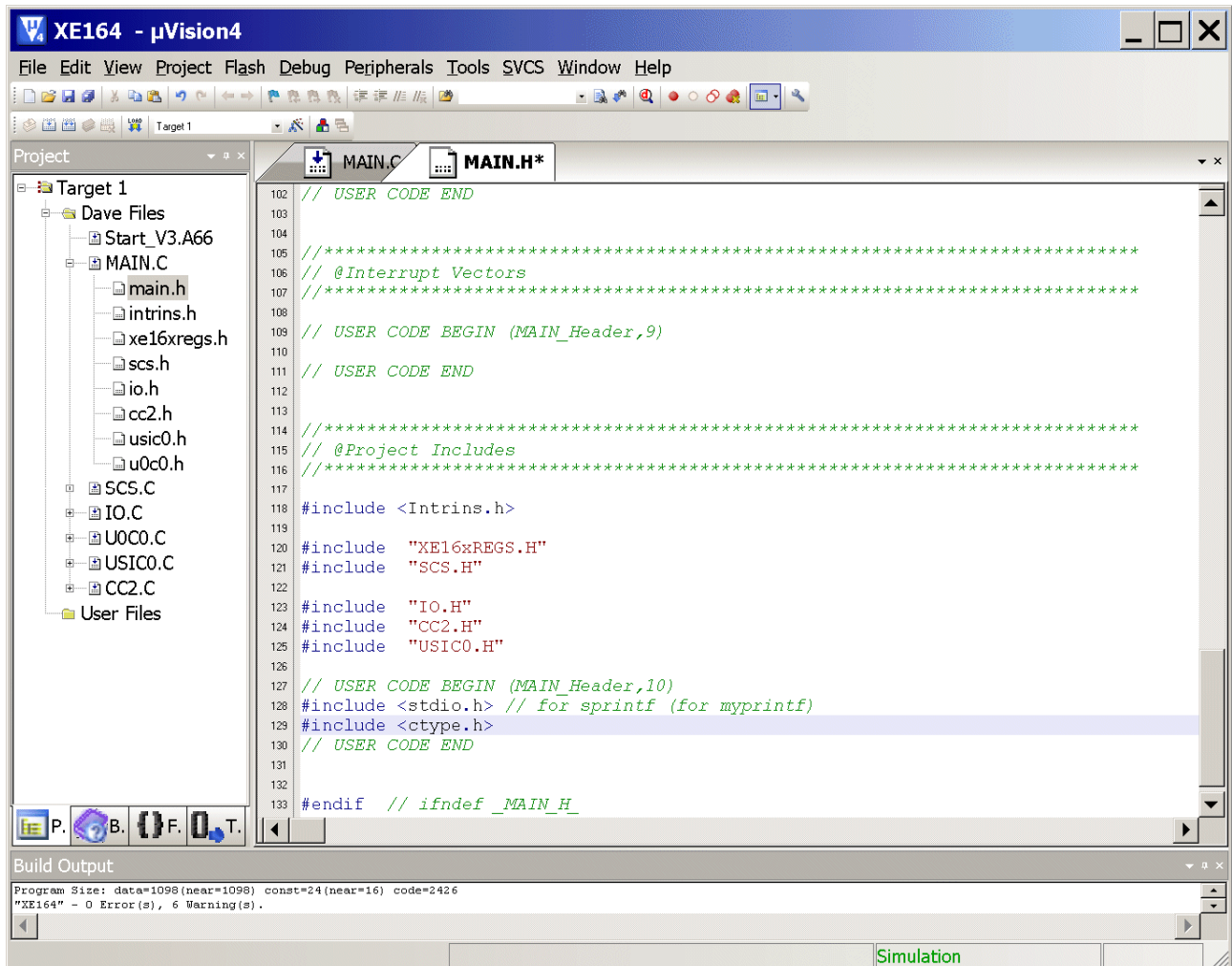
Double click **Main.h** and insert extern declarations "Global Functions":

```
extern void myprintf(const char *p);
```

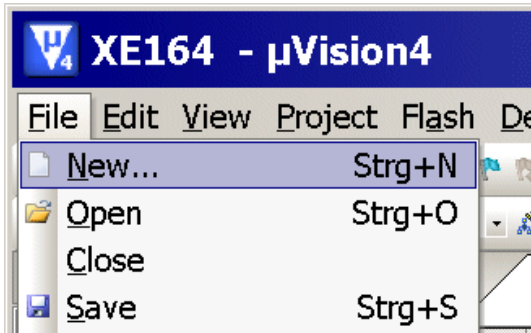


Double click **Main.h** and **insert** include files:

```
#include <stdio.h> // for sprintf (for myprintf)
#include <ctype.h>
```



File – New



Insert:

```
#include "main.h"

void myprintf(const char *p)
{
    while(*p)
    {
        U0C0_ASC_vSendData(*p++);
    }
}

/*

// Example 1 (use of myprintf):
// =====

void main(void)
{
    myprintf("Hello World!\r\n");
}

// Example 2 (use of myprintf):
// =====

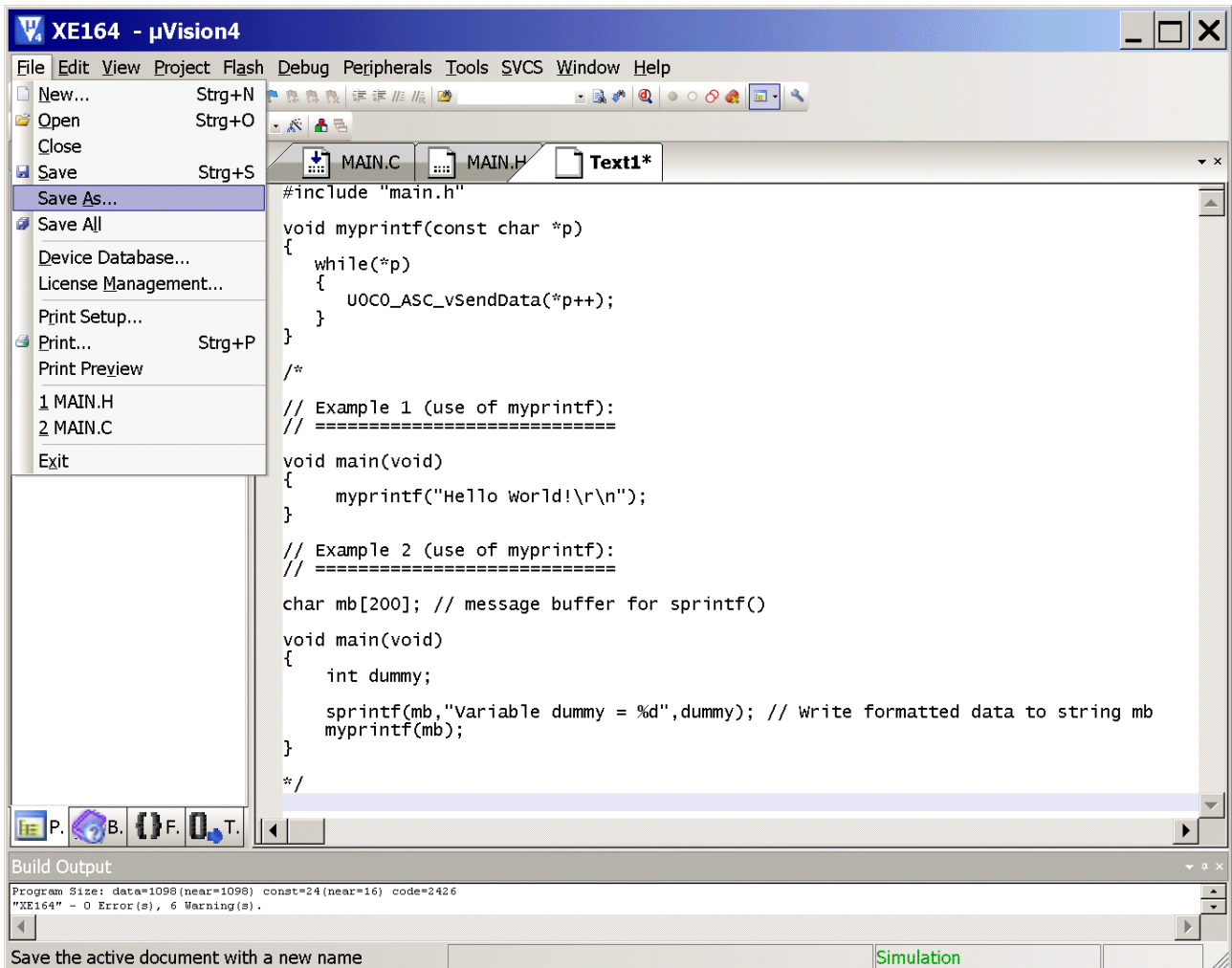
char mb[200]; // message buffer for sprintf()

void main(void)
{
    int dummy;

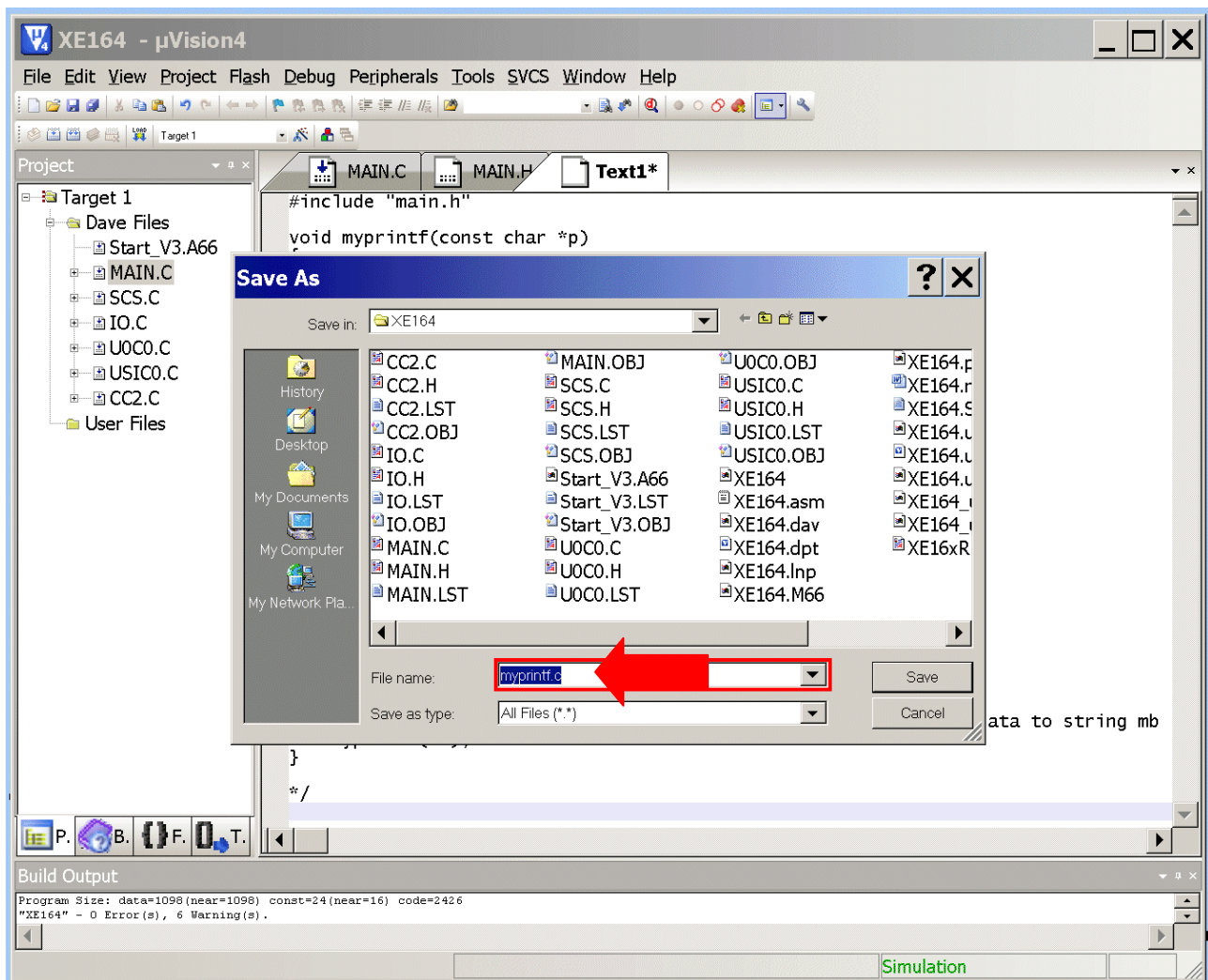
    sprintf(mb,"Variable dummy = %d",dummy); // Write formatted data to string mb
    myprintf(mb);
}

*/
```

File – Save As...



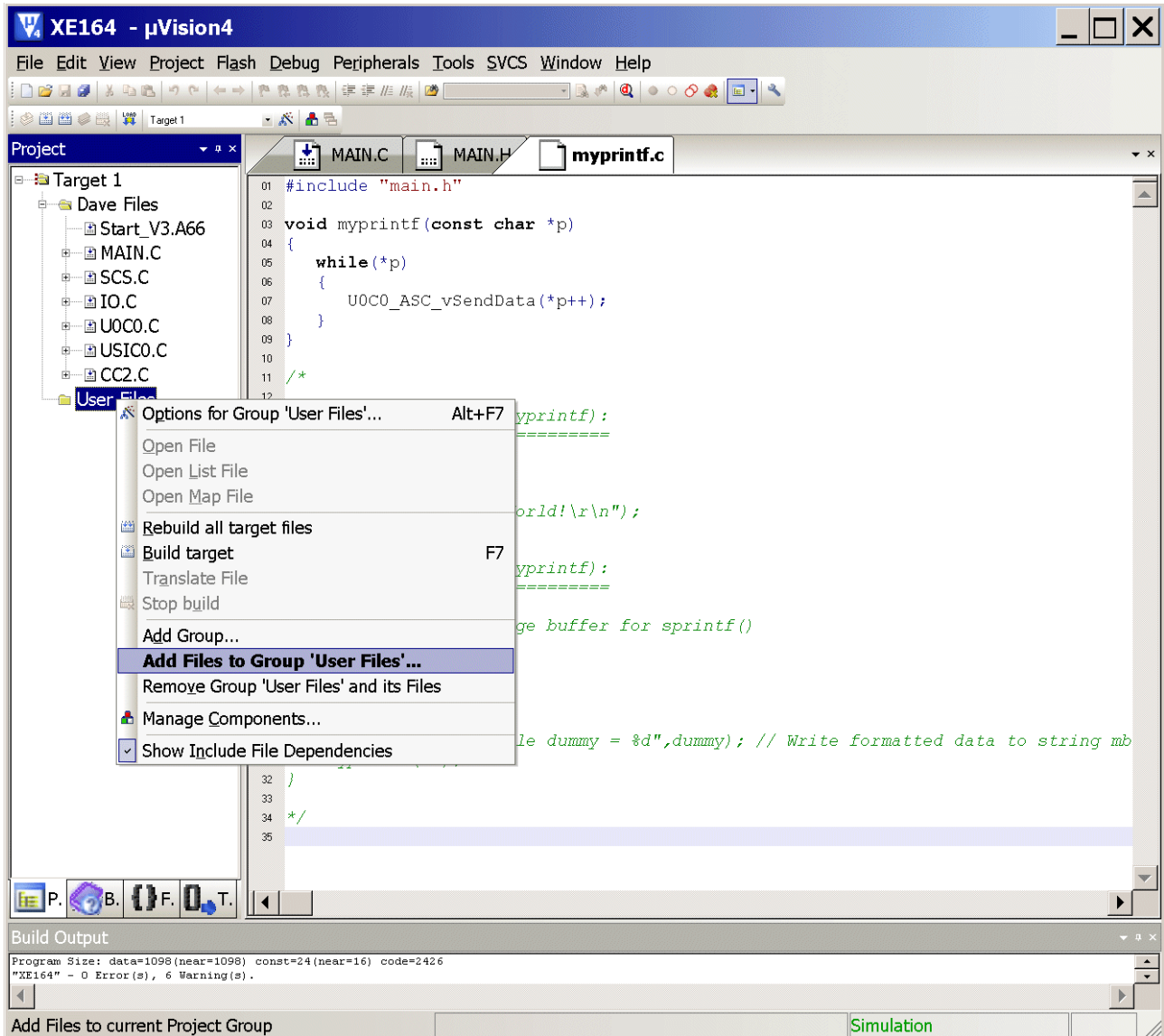
Insert: myprintf.c



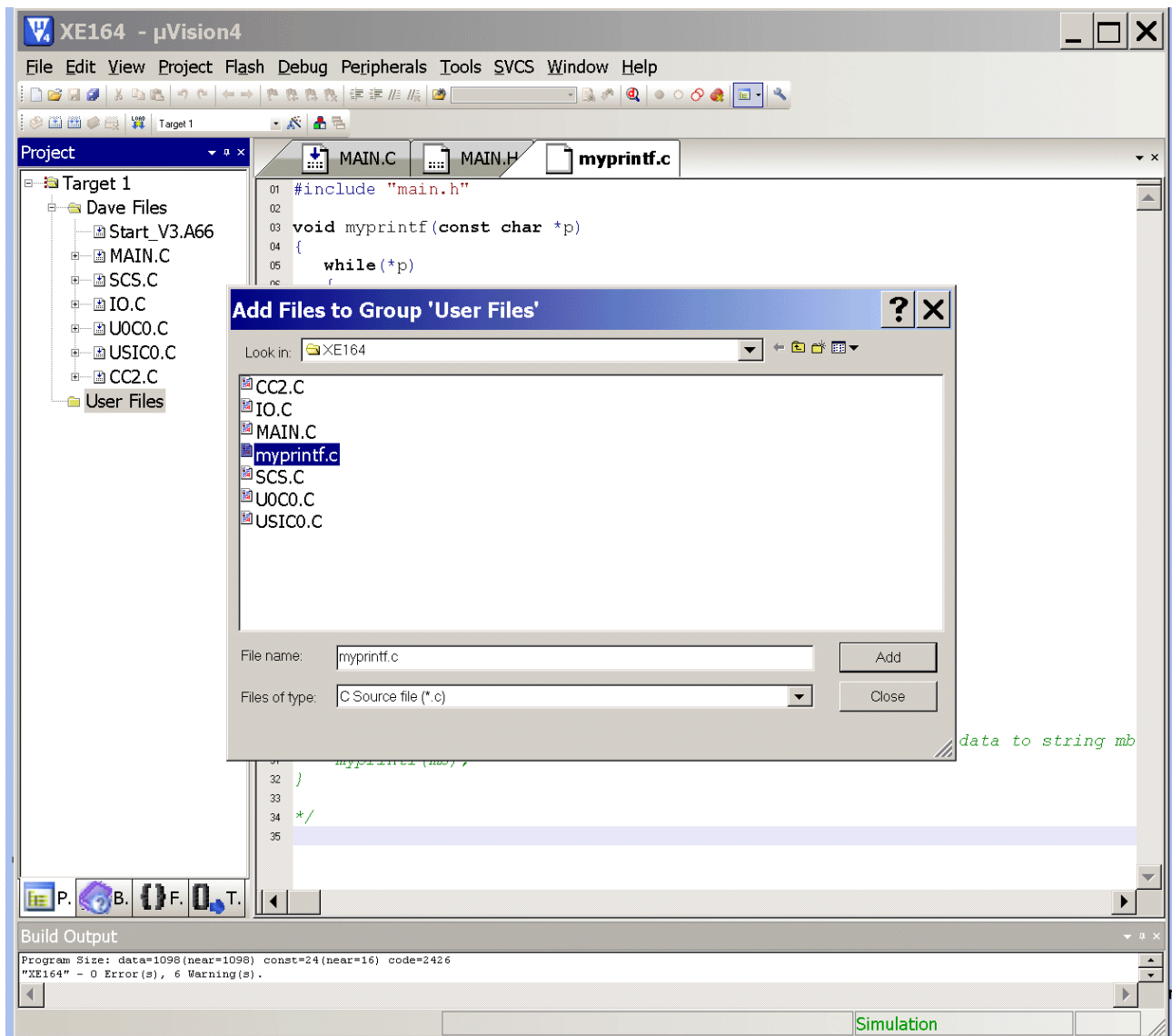
Save



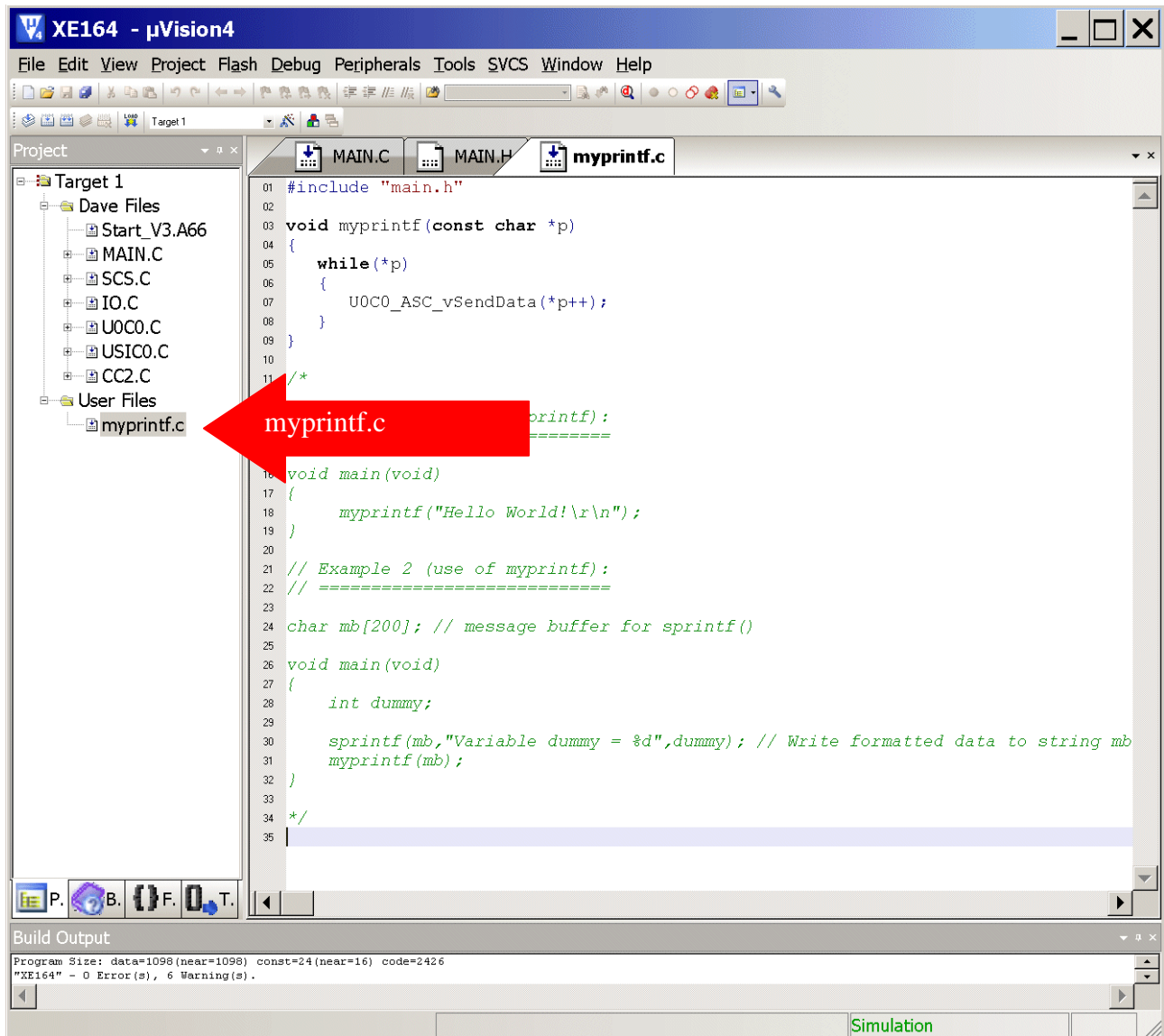
Mouse position: **Project Window**, User Files: **click right mouse button**
click Add Files to Group 'User Files'



Click/select myprintf.c



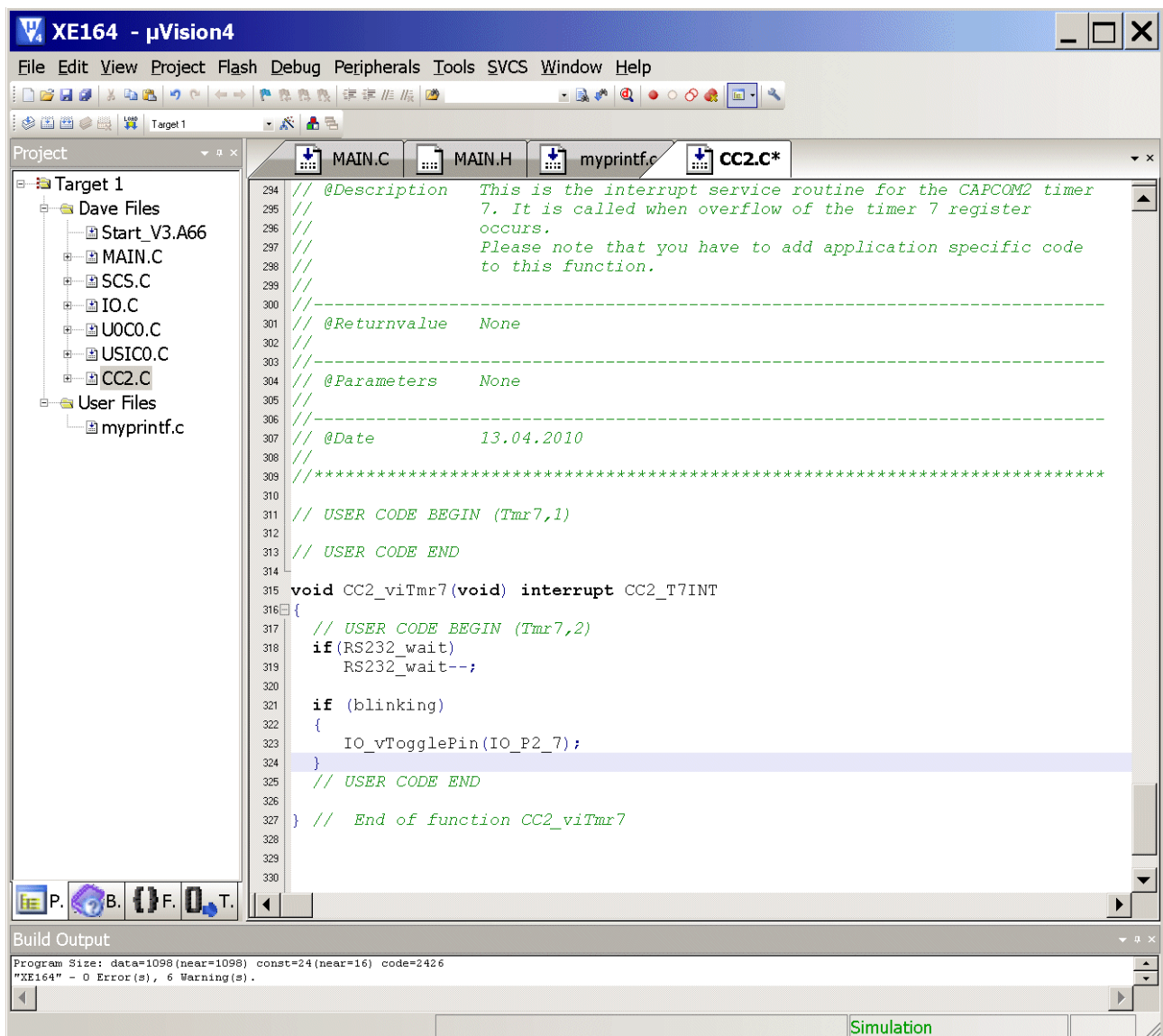
Add
Close



Double click **CC2.C** insert Code (CAPCOM 2 Timer 7 Interrupt Service Routine):

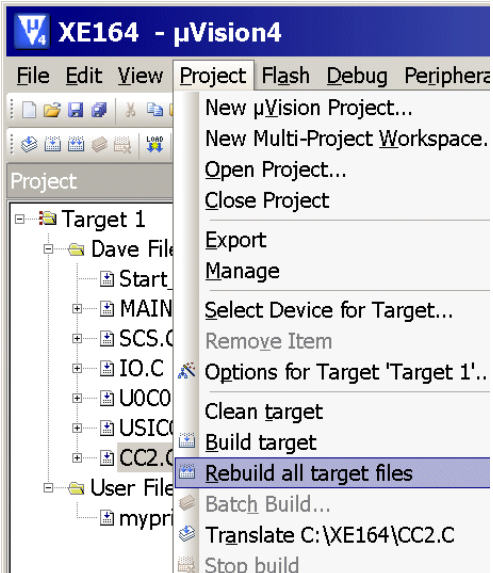
```
if(RS232_wait)
    RS232_wait--;

if (blinking)
{
    IO_vTogglePin(IO_P2_7);
}
```



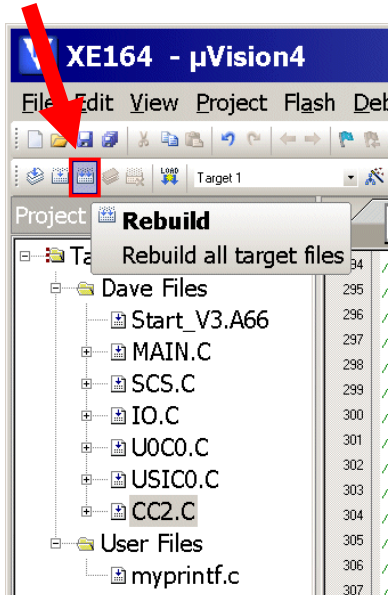
Generate your application program:

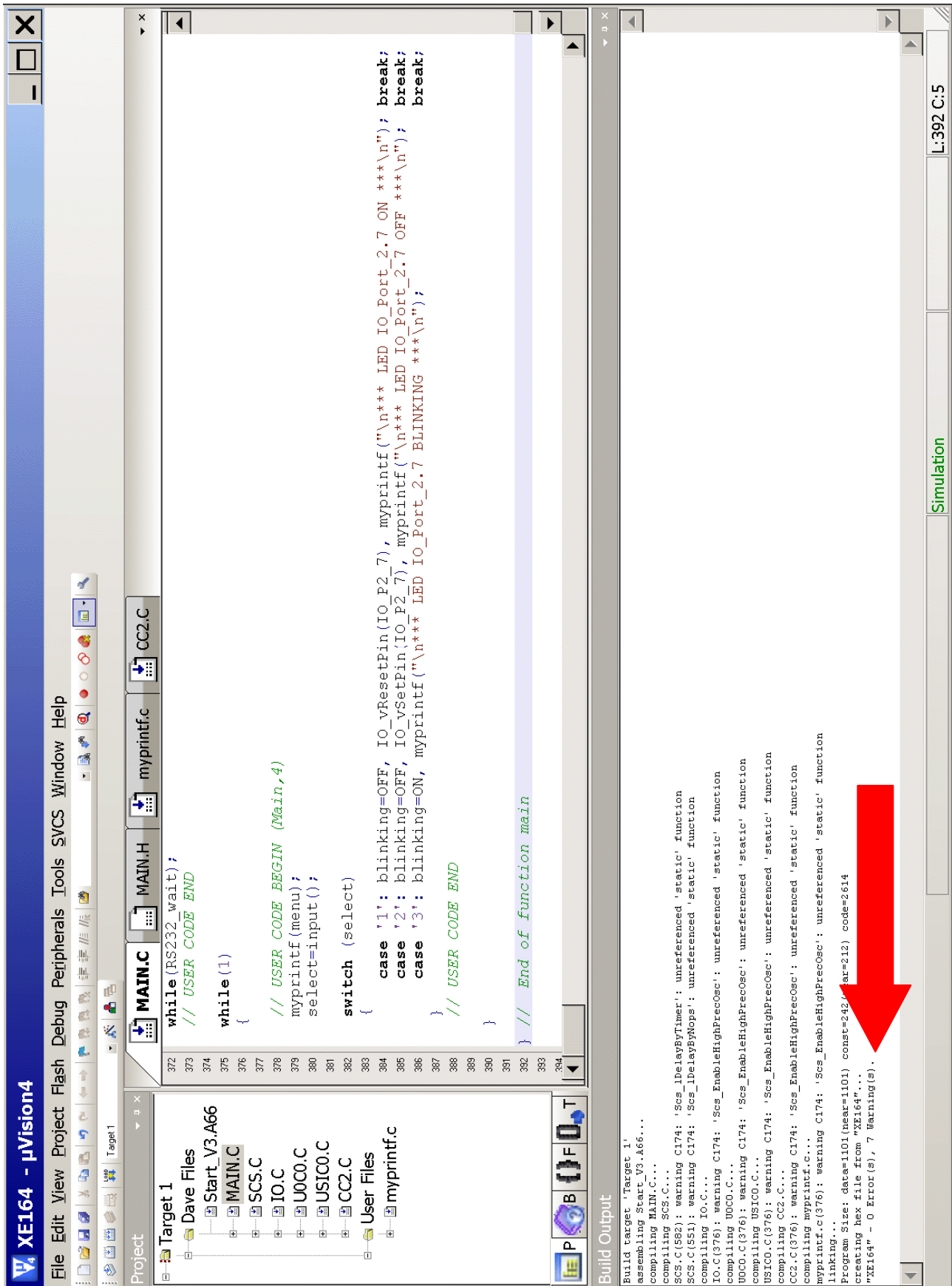
Project – Rebuild all target files



or

click





File Edit View Project Flash Debug Peripherals Tools SVCS Window Help

Project

- Target 1
 - Dave Files
 - Start_V3.A66
 - MAIN.C
 - SCS.C
 - IO.C
 - UOCO.C
 - USICO.C
 - CC2.C
 - User Files
 - myprintf.c

MAIN.C

```

372 while (RS232_wait);
373 // USER_CODE_END
374
375 while (1)
376 {
377     // USER_CODE_BEGIN (Main,4)
378     myprintf(menu);
379     select=input();
380
381     switch (select)
382     {
383     case '1': blinking=OFF, IO_vResetPin(IO_P2_7), myprintf("\n*** LED IO_Port_2.7 ON ***\n"); break;
384     case '2': blinking=OFF, IO_vSetPin(IO_P2_7), myprintf("\n*** LED IO_Port_2.7 OFF ***\n"); break;
385     case '3': blinking=ON, myprintf("\n*** LED IO_Port_2.7 BLINKING ***\n"); break;
386
387     }
388     // USER_CODE_END
389
390 }
391
392 // End of function main
393
394

```

Build Output

```

Build target 'Target 1'
assembling Start_V3.A66...
compiling MAIN.C...
compiling SCS.C...
SCS.C(582): warning C174: 'Scs_IdelayByTimer': unreferenced 'static' function
SCS.C(551): warning C174: 'Scs_IdelayByNops': unreferenced 'static' function
compiling IO.C...
compiling UOCO.C...
UOCO.C(376): warning C174: 'Scs_EnableHighPrecOsc': unreferenced 'static' function
USICO.C(376): warning C174: 'Scs_EnableHighPrecOsc': unreferenced 'static' function
compiling CC2.C...
CC2.C(376): warning C174: 'Scs_EnableHighPrecOsc': unreferenced 'static' function
myprintf.c(376): warning C174: 'Scs_EnableHighPrecOsc': unreferenced 'static' function
linking...
Program Size: data=1101 near=1101 const=242 (near=212) code=2614
creating hex file from "XE164"...
"XE164" - 0 Error(s), 7 Warning(s).

```

Simulation

L:392 C:5



Note:

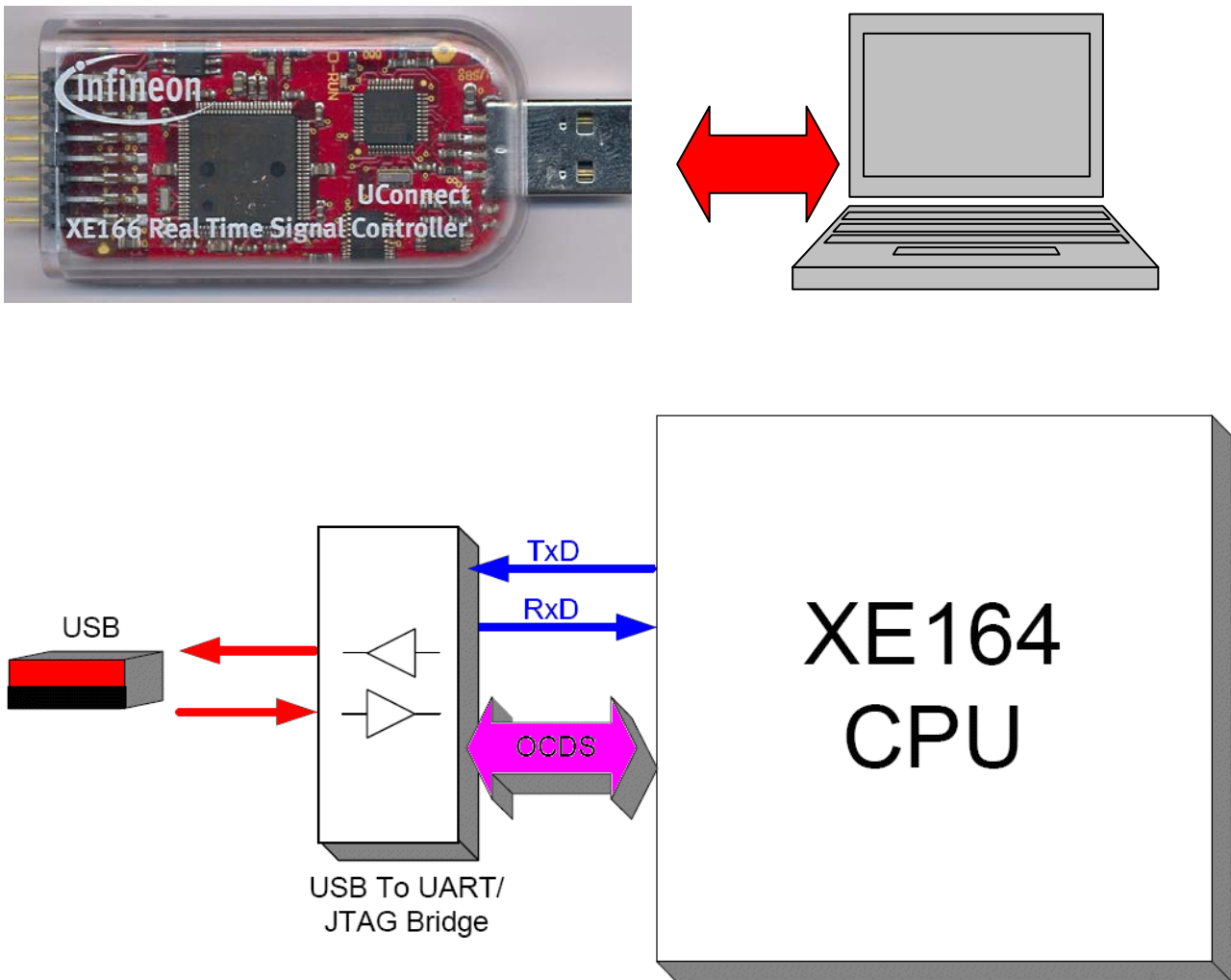
Programming is now complete.

Unfortunately it is not possible to test your program with the Keil Simulator because this feature is currently not supported.

Therefore we are going to **load** (On Chip Flash Programming) and **run** your program on the UConnect-CAN XE164 in the next chapter.

5.) Running your first programming example:

Make sure that the UConnect-CAN XE164 is still connected to the host computer:



USB Connection:

.) used for: **UART communication** (the USIC0_CH0/UART/RS232/serial interface is available via USB as a virtual COM port of the second USB channel of the FTDI FT2232 Dual USB to UART/JTAG interface).

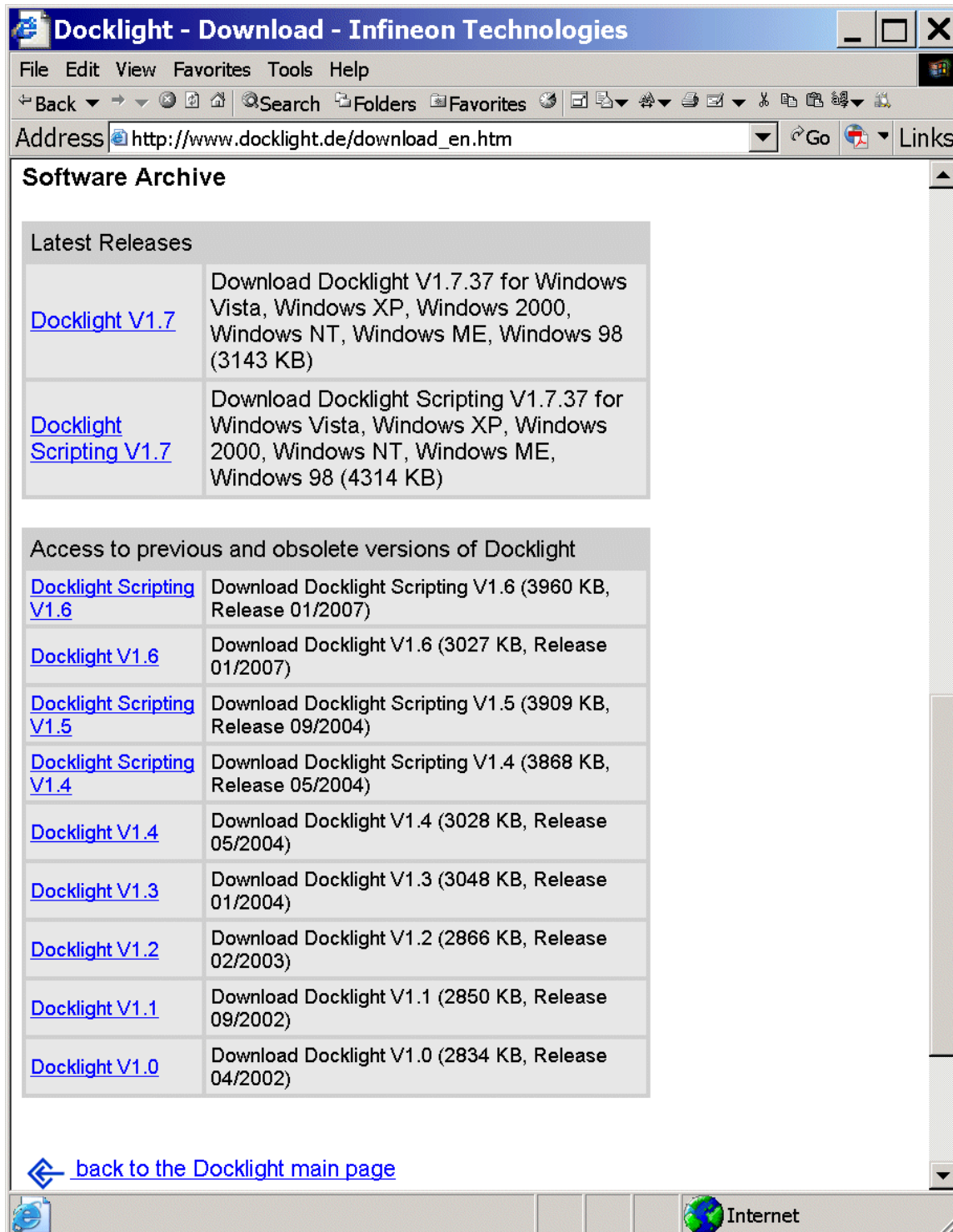
.) used for: **On-Chip-Flash-Programming and Debugging** (first USB channel of the FTDI FT2232 Dual USB to UART/JTAG interface).

.) the USB connection works also as the power supply.



Note:

Now we need a terminal program which is able to handle a virtual COM port (COM12)!
As an example of “any terminal program” we are going to use Docklight.
Docklight can be downloaded @ <http://www.docklight.de> :



The screenshot shows a web browser window titled "Docklight - Download - Infineon Technologies". The address bar shows the URL http://www.docklight.de/download_en.htm. The page content is titled "Software Archive" and lists the latest releases and previous versions of Docklight.

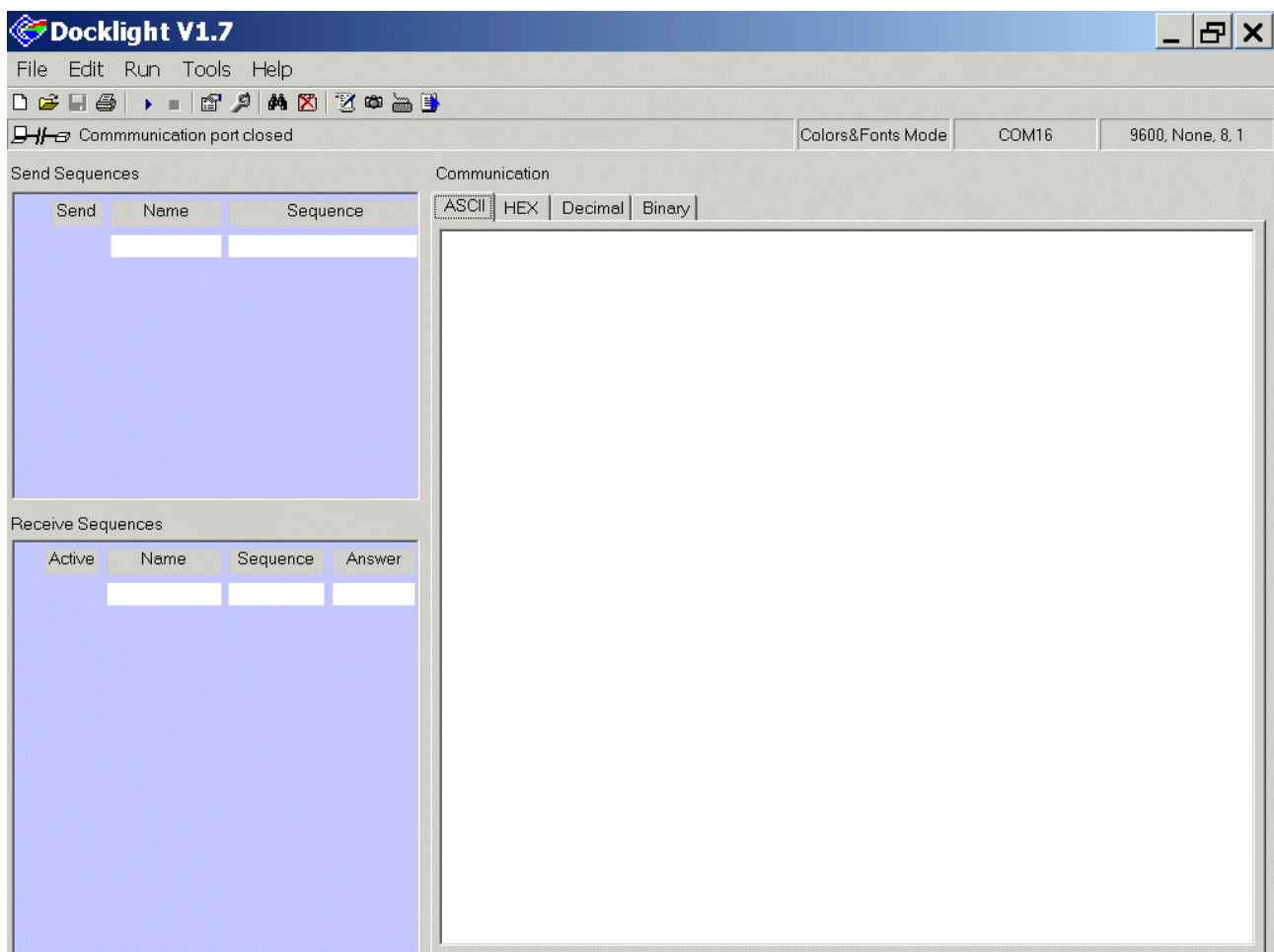
Latest Releases	
Docklight V1.7	Download Docklight V1.7.37 for Windows Vista, Windows XP, Windows 2000, Windows NT, Windows ME, Windows 98 (3143 KB)
Docklight Scripting V1.7	Download Docklight Scripting V1.7.37 for Windows Vista, Windows XP, Windows 2000, Windows NT, Windows ME, Windows 98 (4314 KB)

Access to previous and obsolete versions of Docklight	
Docklight Scripting V1.6	Download Docklight Scripting V1.6 (3960 KB, Release 01/2007)
Docklight V1.6	Download Docklight V1.6 (3027 KB, Release 01/2007)
Docklight Scripting V1.5	Download Docklight Scripting V1.5 (3909 KB, Release 09/2004)
Docklight Scripting V1.4	Download Docklight Scripting V1.4 (3868 KB, Release 05/2004)
Docklight V1.4	Download Docklight V1.4 (3028 KB, Release 05/2004)
Docklight V1.3	Download Docklight V1.3 (3048 KB, Release 01/2004)
Docklight V1.2	Download Docklight V1.2 (2866 KB, Release 02/2003)
Docklight V1.1	Download Docklight V1.1 (2850 KB, Release 09/2002)
Docklight V1.0	Download Docklight V1.0 (2834 KB, Release 04/2002)

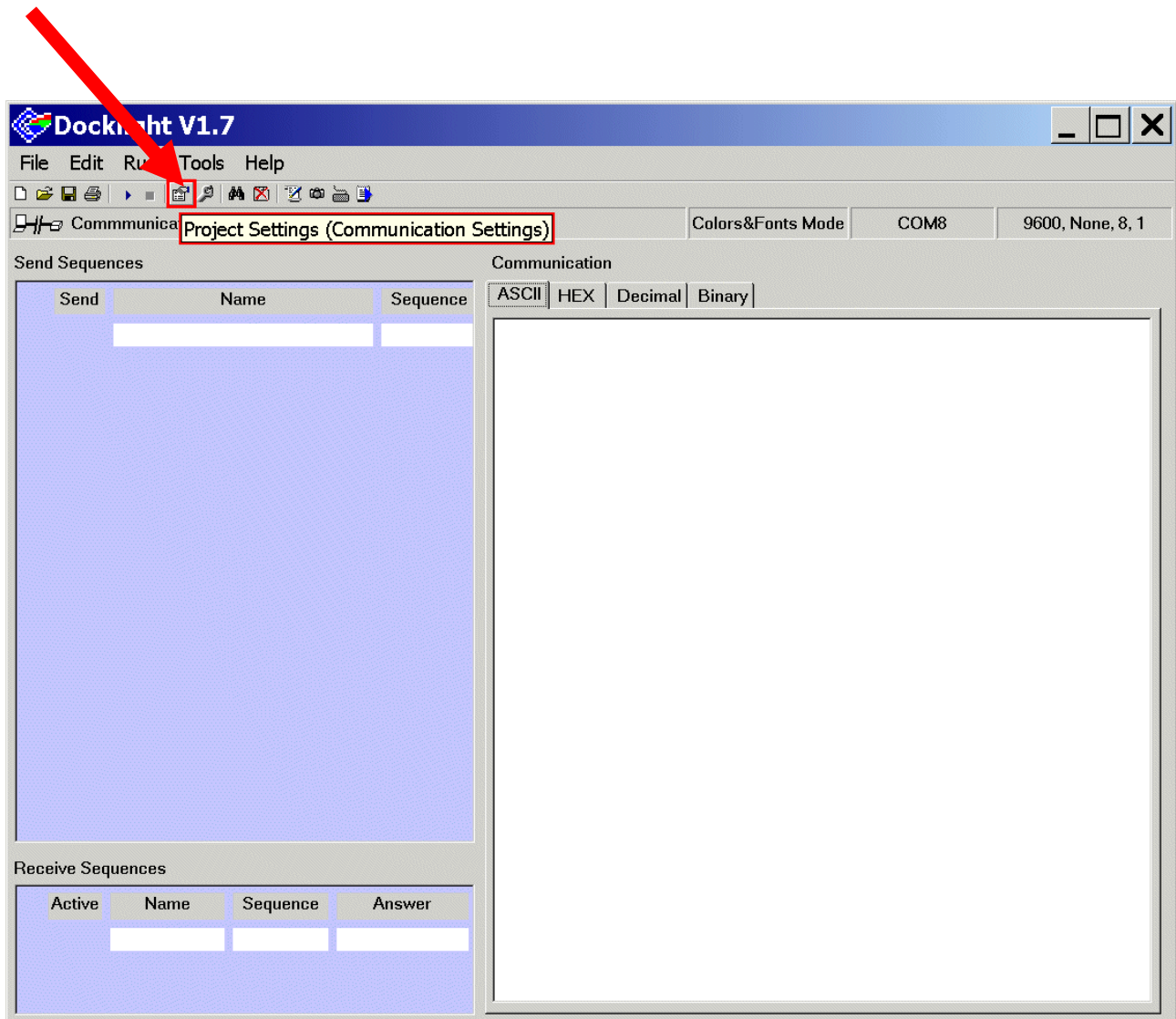
[back to the Docklight main page](#)



Now, **start** Docklight:



Click: Project Settings



Project Settings:

Communication: Communication Mode: click/check ☒ Send/Receive

Project Settings:

Communication: Communication Mode: Send/Receive on comm. channel: select COM12

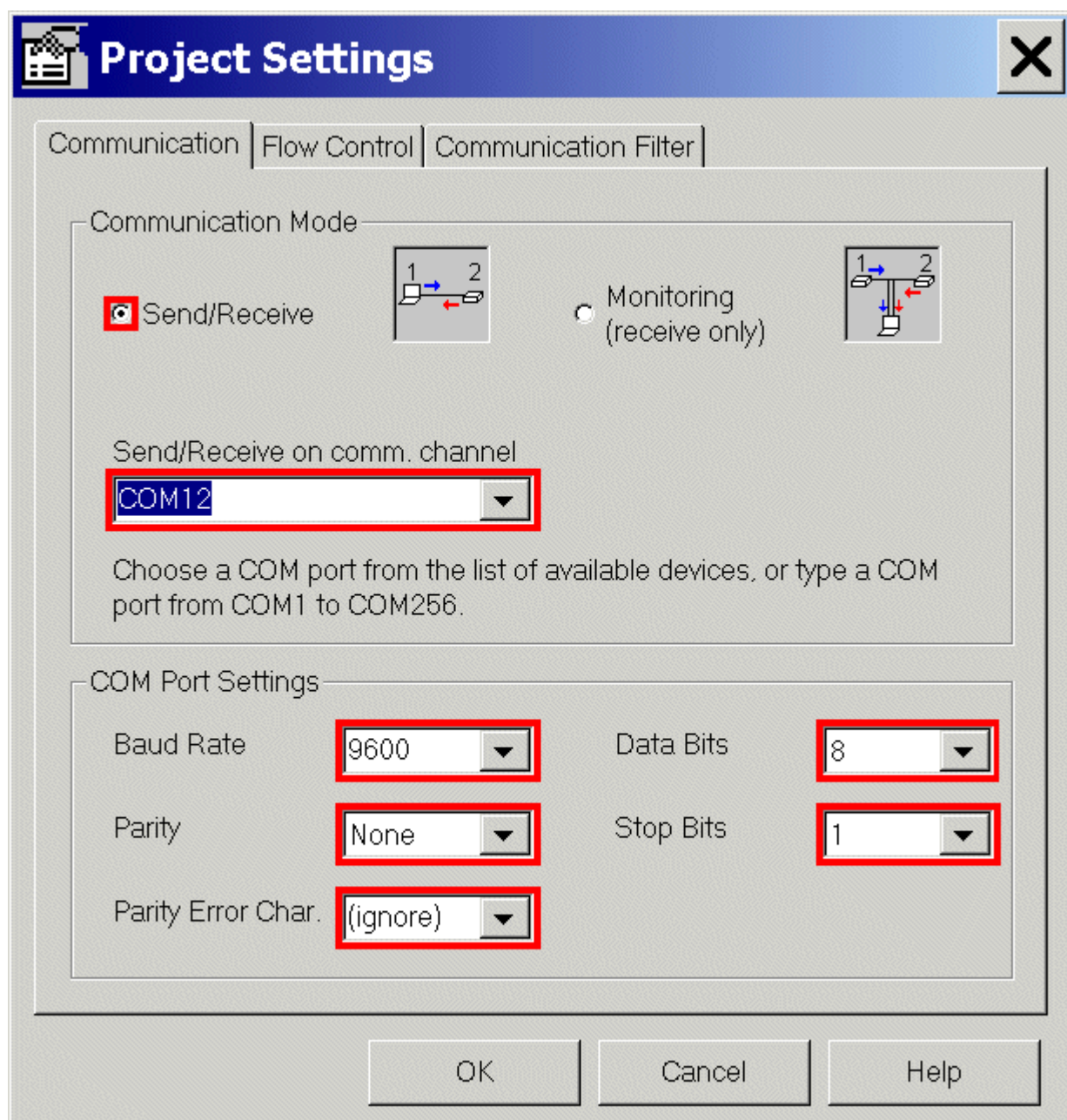
Project Settings: Communication: COM Port Settings: Baud Rate: select 9600

Project Settings: Communication: COM Port Settings: Parity: select None

Project Settings: Communication: COM Port Settings: Parity Error Char.: select (ignore)

Project Settings: Communication: COM Port Settings: Data Bits: select 8

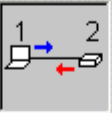
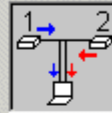
Project Settings: Communication: COM Port Settings: Stop Bits: select 1



Project Settings

Communication | Flow Control | Communication Filter

Communication Mode

☒ Send/Receive  ☐ Monitoring (receive only) 

Send/Receive on comm. channel

COM12

Choose a COM port from the list of available devices, or type a COM port from COM1 to COM256.

COM Port Settings

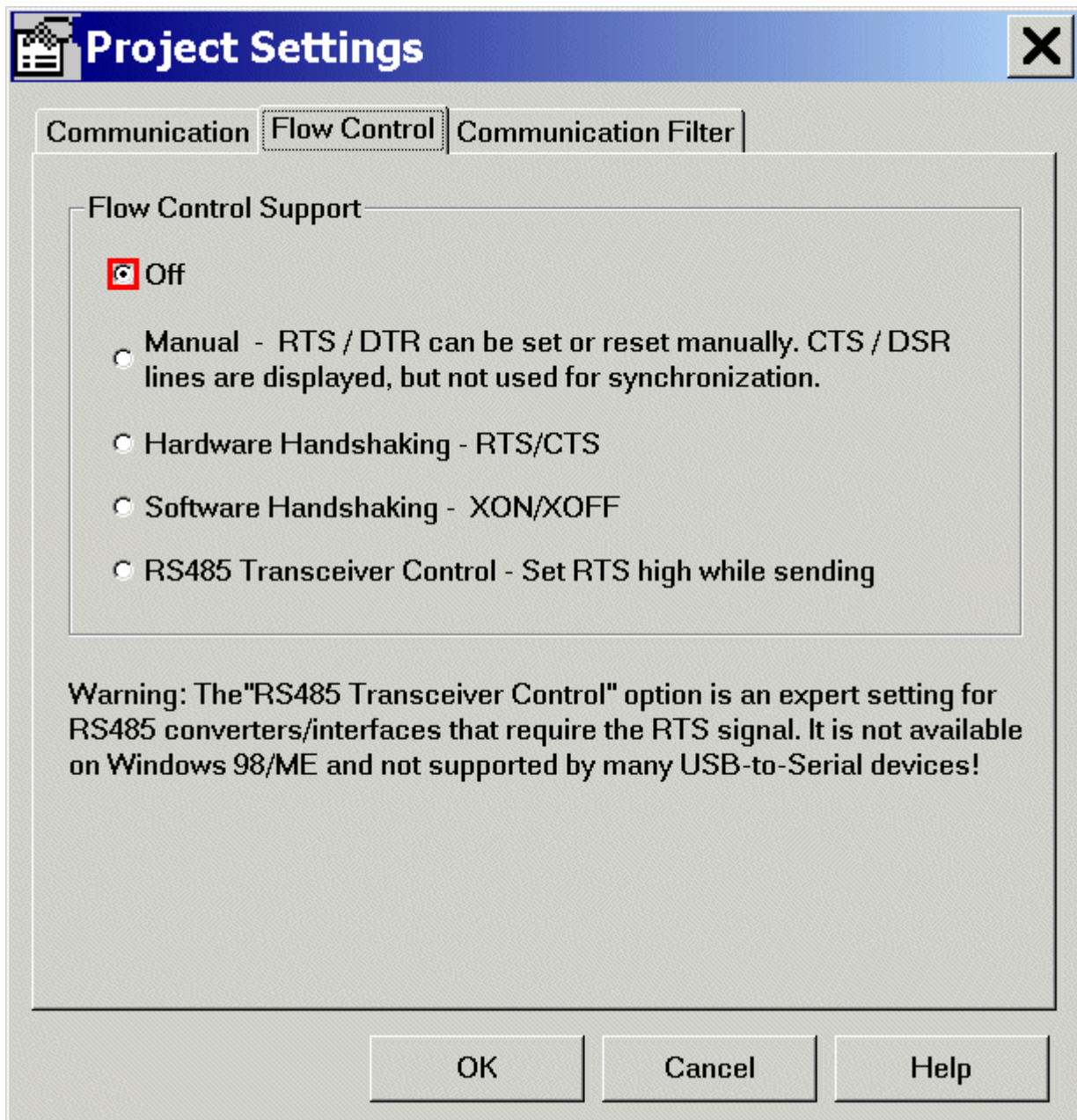
Baud Rate: 9600 Data Bits: 8

Parity: None Stop Bits: 1

Parity Error Char.: (ignore)

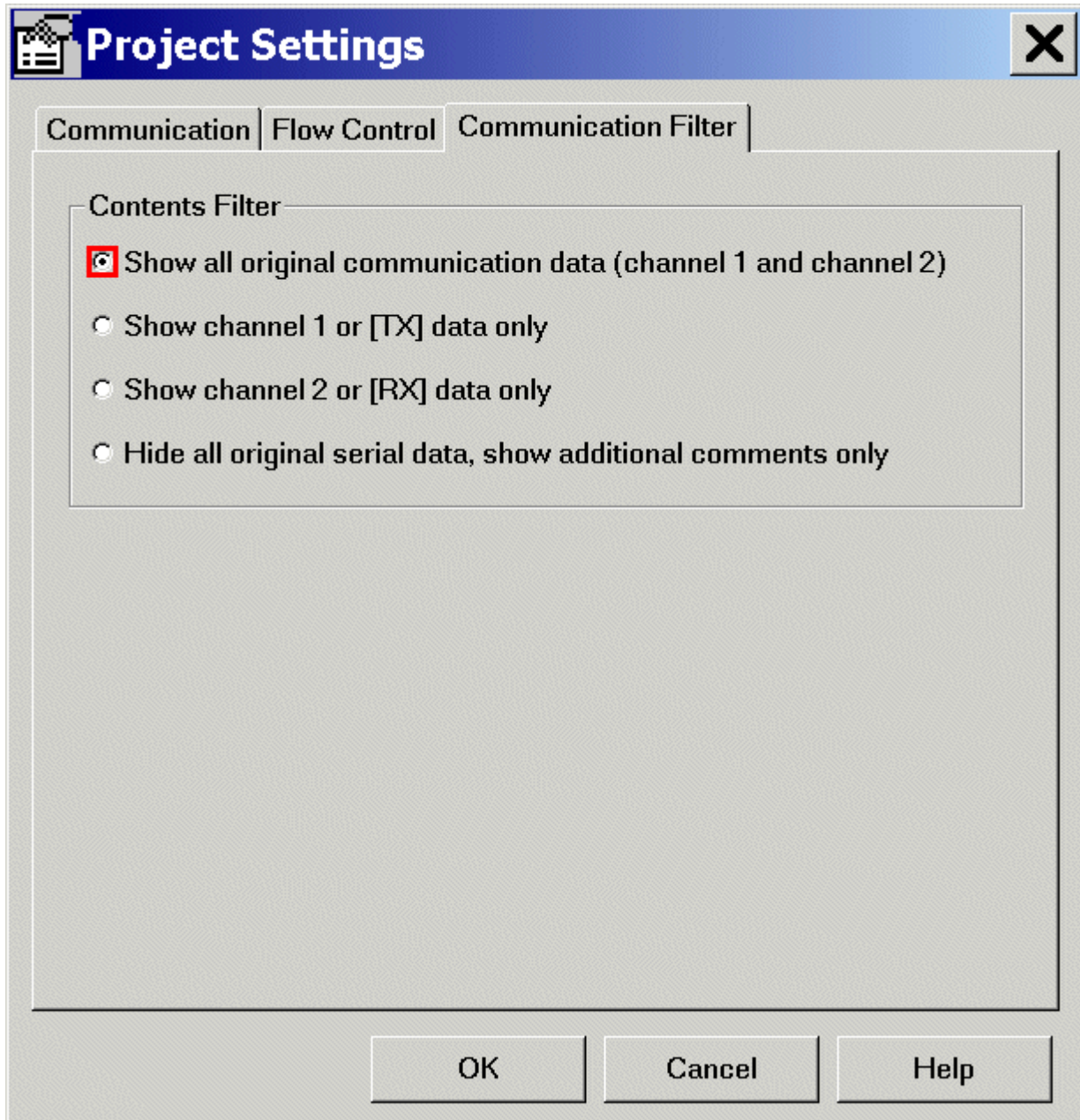
OK Cancel Help

Project Settings: Flow Control: Flow Control Support: click  Off



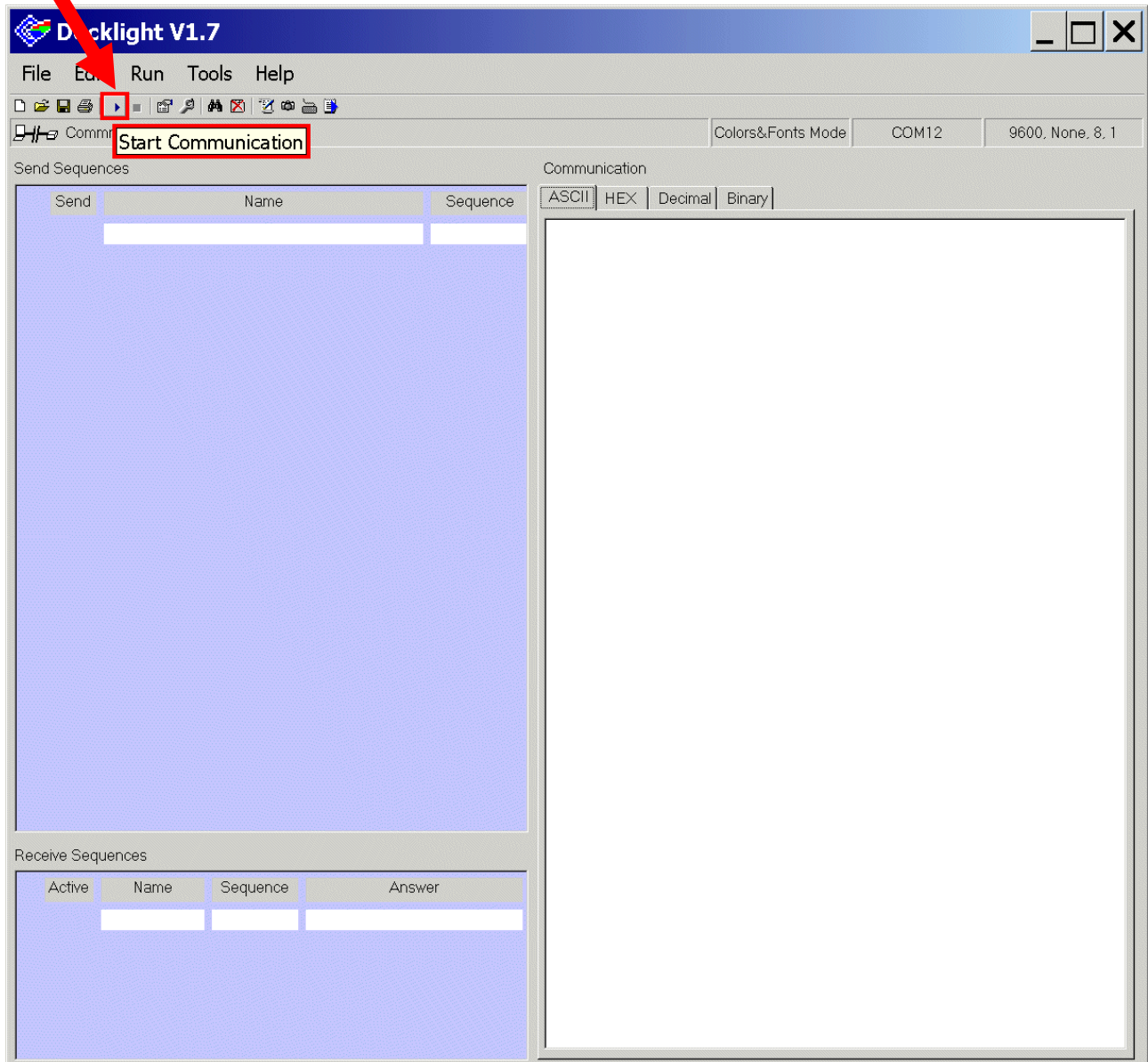
Project Settings:

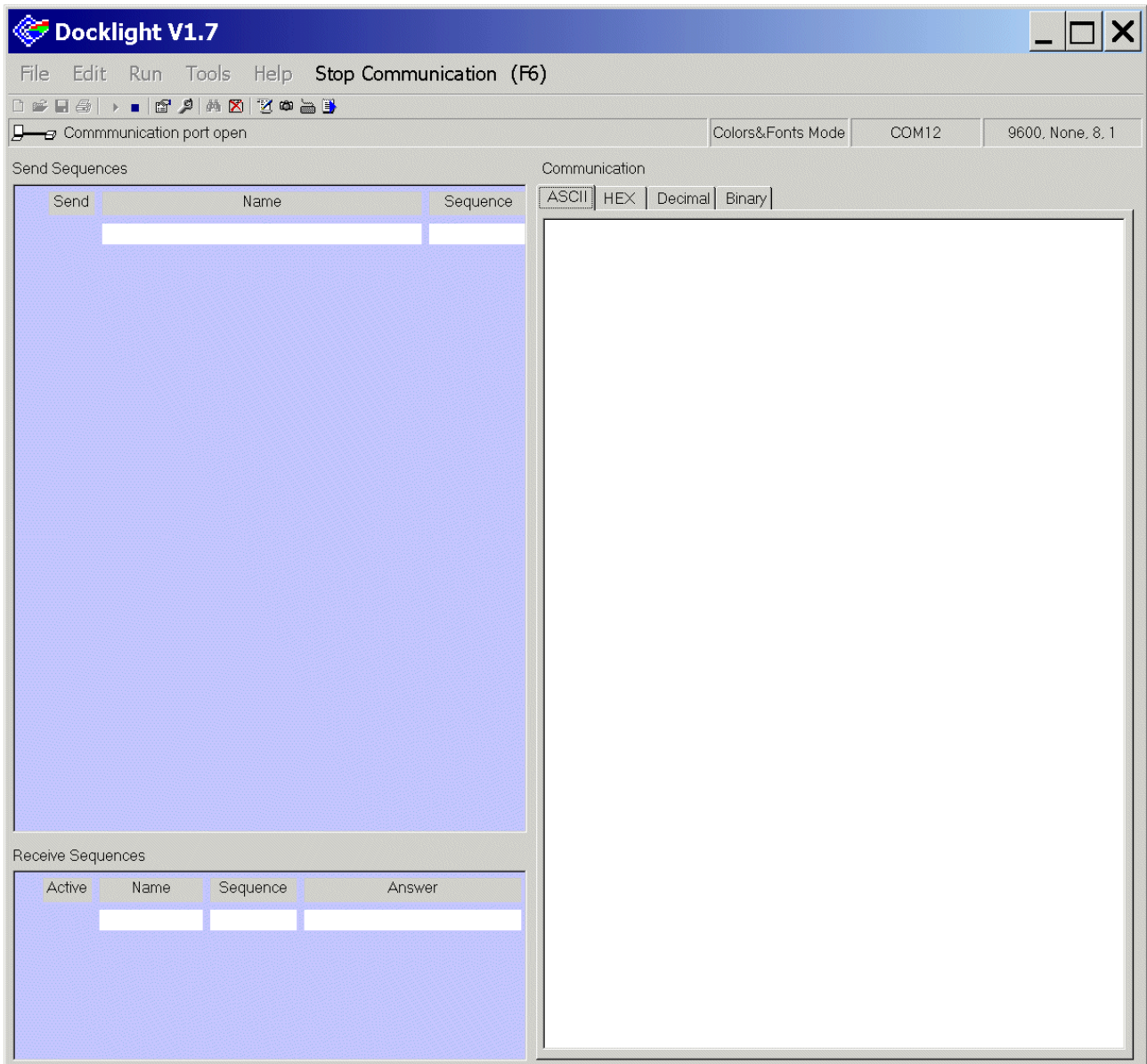
Communication Filter: Contents Filter: **click** ☒ Show all original communication data



OK

Click: 







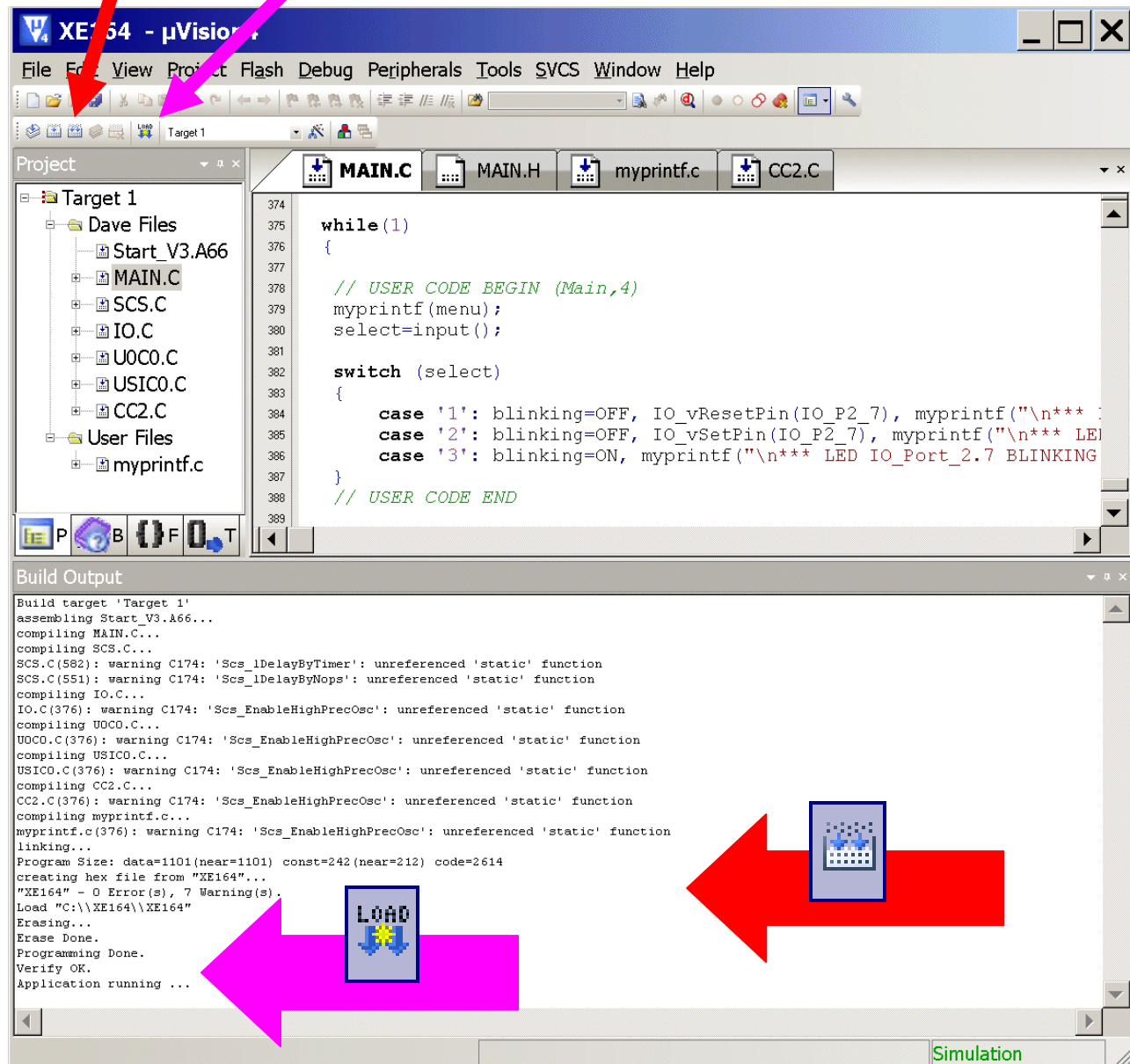
Note:
Docklight is now ready for serial communication!





Go to µVision4:

1.) click:  2.) click: 



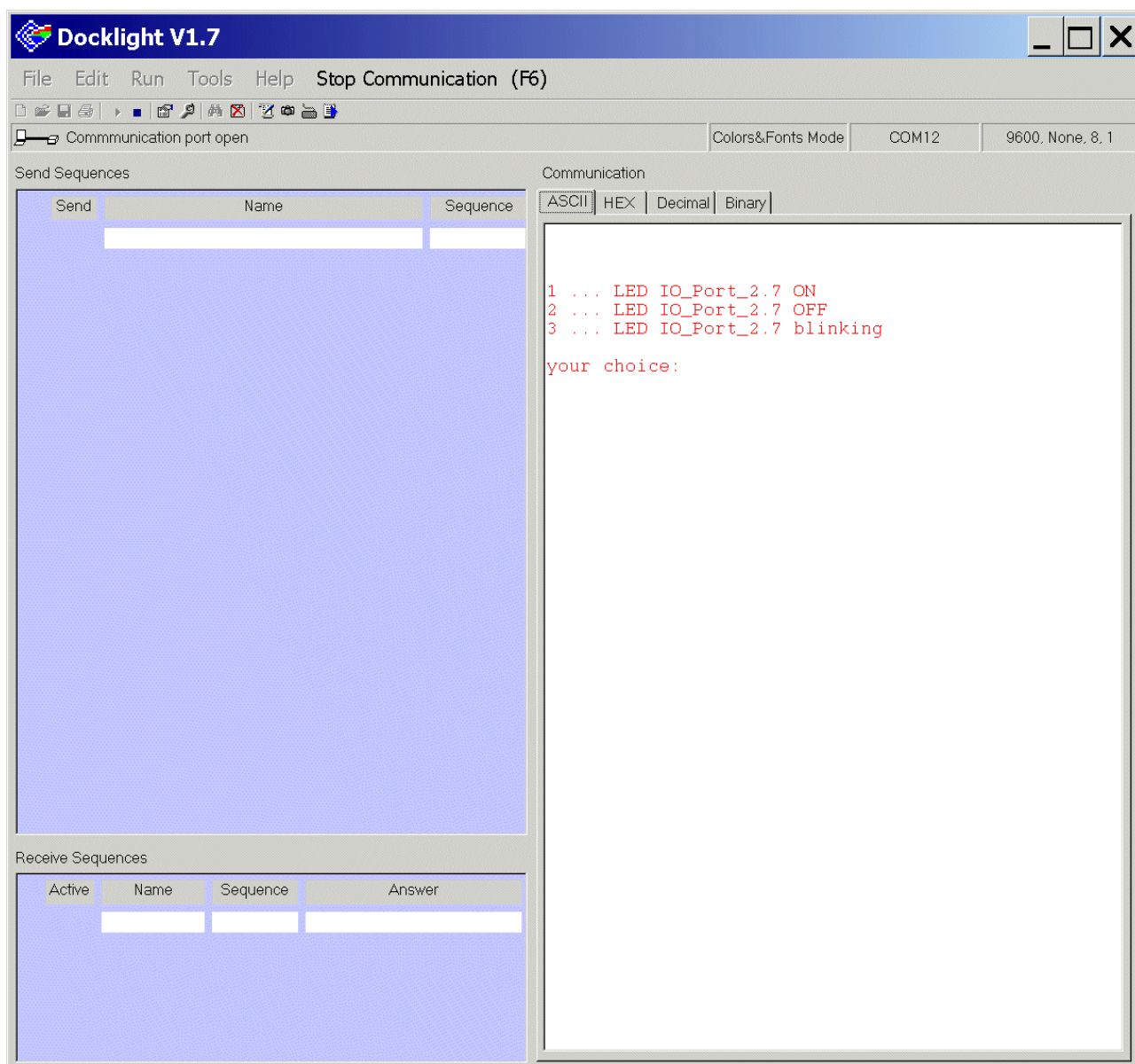
Build Output

```
Build target 'Target 1'
assembling Start_V3.A66...
compiling MAIN.C...
compiling SCS.C...
SCS.C(582): warning C174: 'Scs_IdelayByTimer': unreferenced 'static' function
SCS.C(551): warning C174: 'Scs_IdelayByNops': unreferenced 'static' function
compiling IO.C...
IO.C(376): warning C174: 'Scs_EnableHighPrecOsc': unreferenced 'static' function
compiling U0C0.C...
U0C0.C(376): warning C174: 'Scs_EnableHighPrecOsc': unreferenced 'static' function
compiling USIC0.C...
USIC0.C(376): warning C174: 'Scs_EnableHighPrecOsc': unreferenced 'static' function
compiling CC2.C...
CC2.C(376): warning C174: 'Scs_EnableHighPrecOsc': unreferenced 'static' function
compiling myprintf.c...
myprintf.c(376): warning C174: 'Scs_EnableHighPrecOsc': unreferenced 'static' function
linking...
Program Size: data=1101(near=1101) const=242(near=212) code=2614
creating hex file from "XE164"...
"XE164" - 0 Error(s), 7 Warning(s).
Load "C:\XE164\XE164"
Erasing...
Erase Done.
Programming Done.
Verify OK.
Application running ...
```

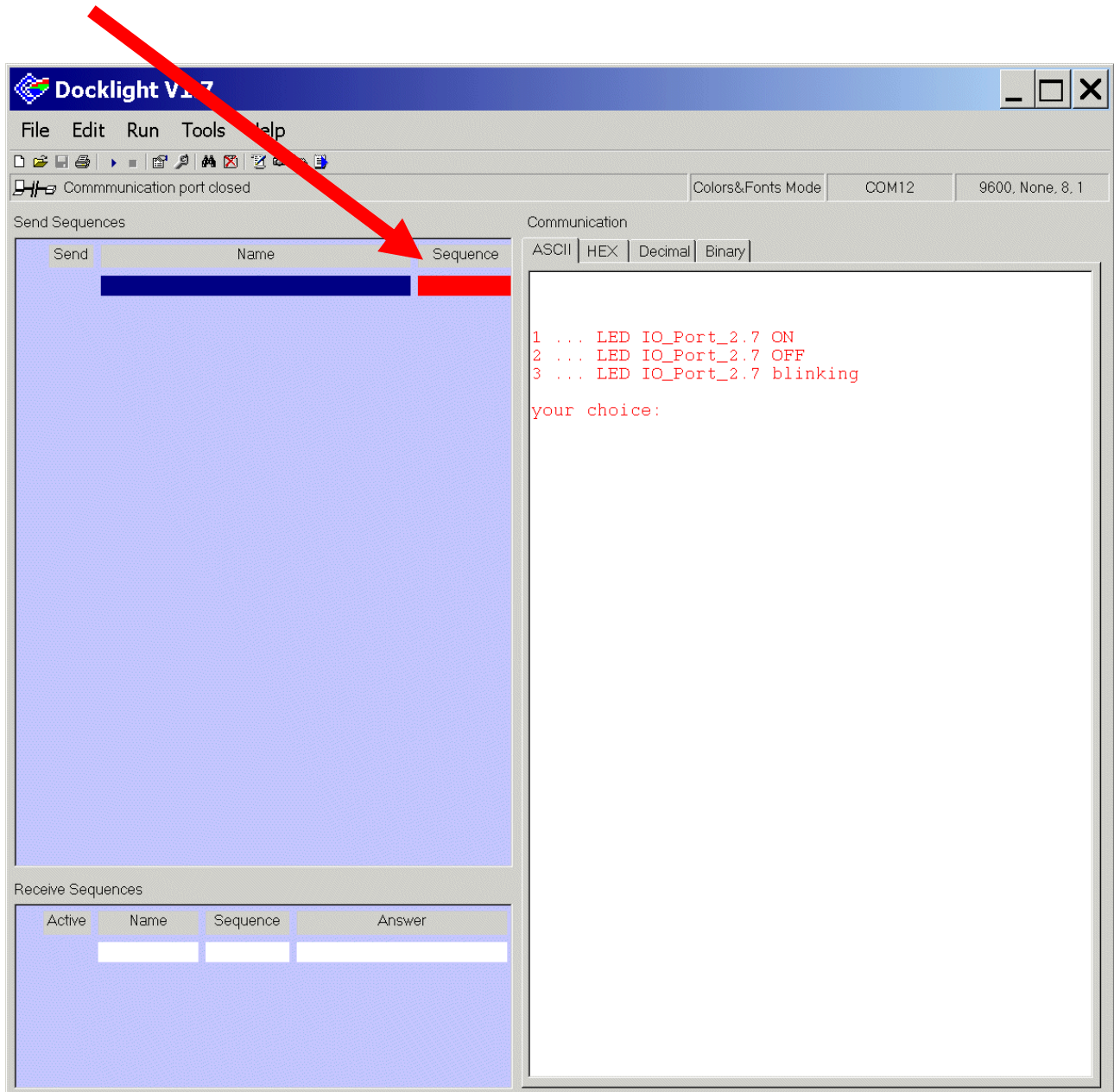
Simulation



Go to Docklight and see the result:

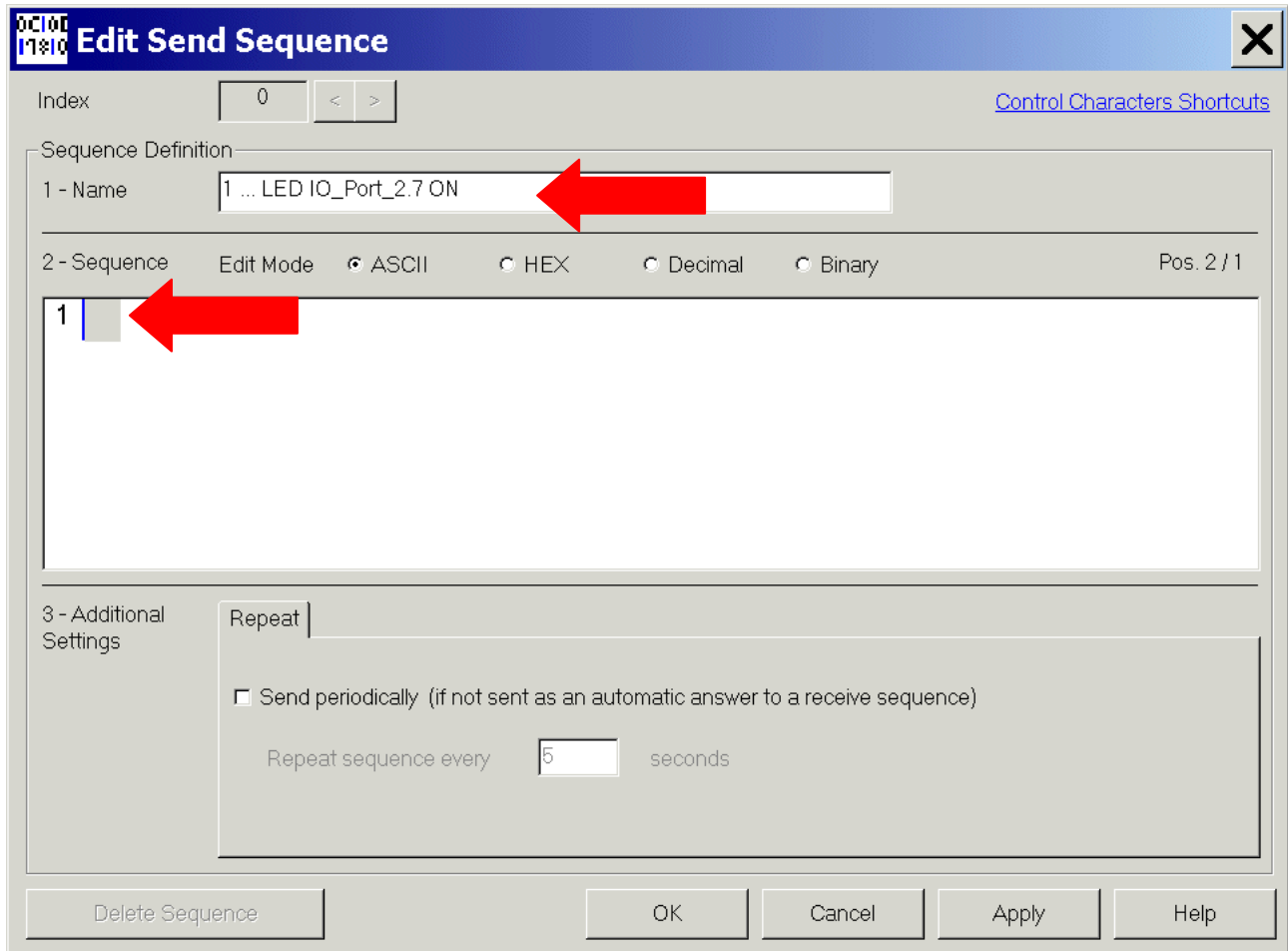


Double click inside the red box:



Edit Send Sequence: Sequence Definition: 1- Name: insert: 1 ... LED IO_Port_2.7 ON

Edit Send Sequence: Sequence Definition: 2- Sequence: insert: 1



Edit Send Sequence

Index: 0

[Control Characters Shortcuts](#)

Sequence Definition

1 - Name: 1 ... LED IO_Port_2.7 ON

2 - Sequence

Edit Mode: ☒ ASCII ☐ HEX ☐ Decimal ☐ Binary

Pos. 2 / 1

1

3 - Additional Settings

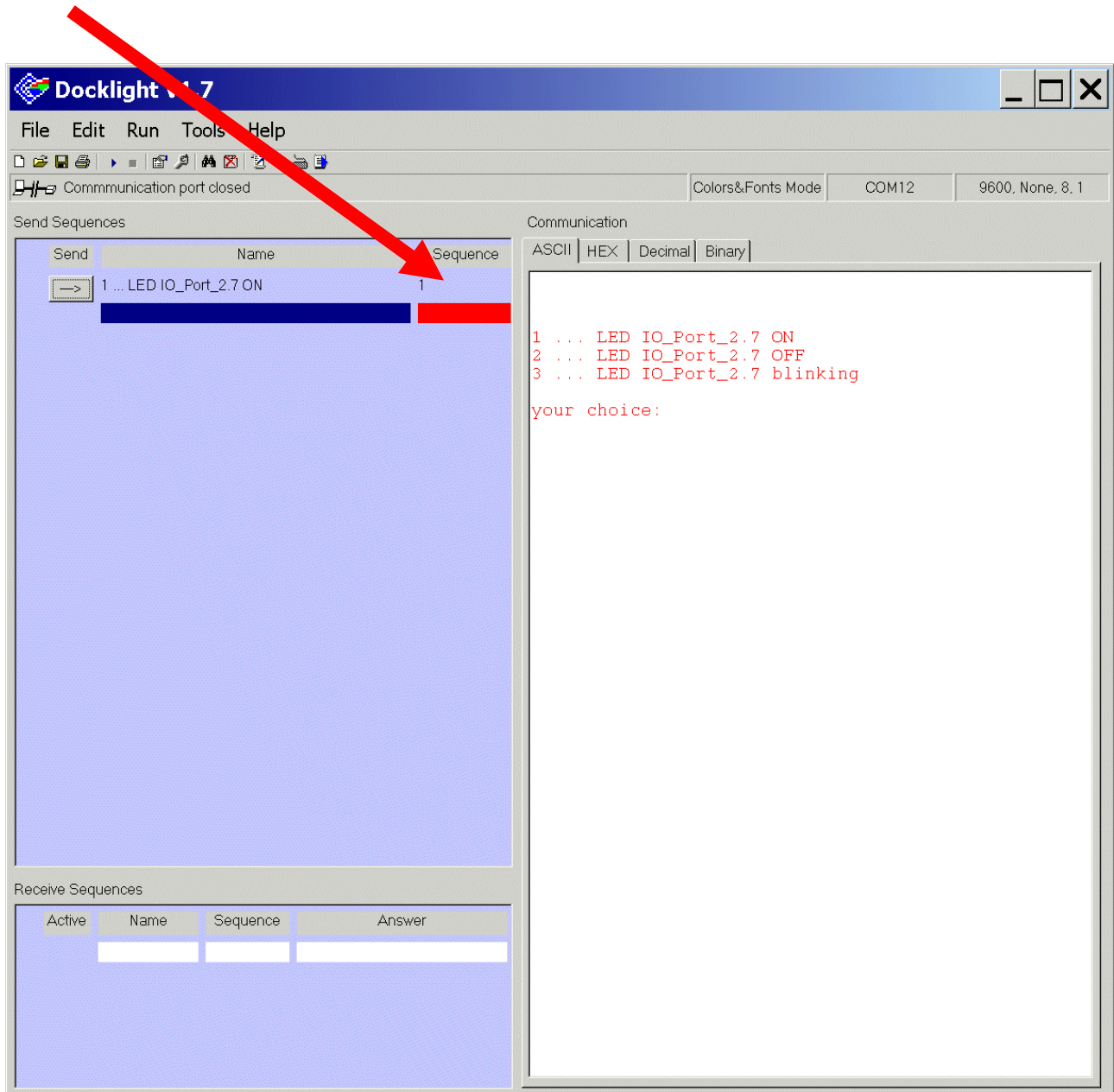
Repeat ☐ Send periodically (if not sent as an automatic answer to a receive sequence)

Repeat sequence every 5 seconds

Delete Sequence OK Cancel Apply Help

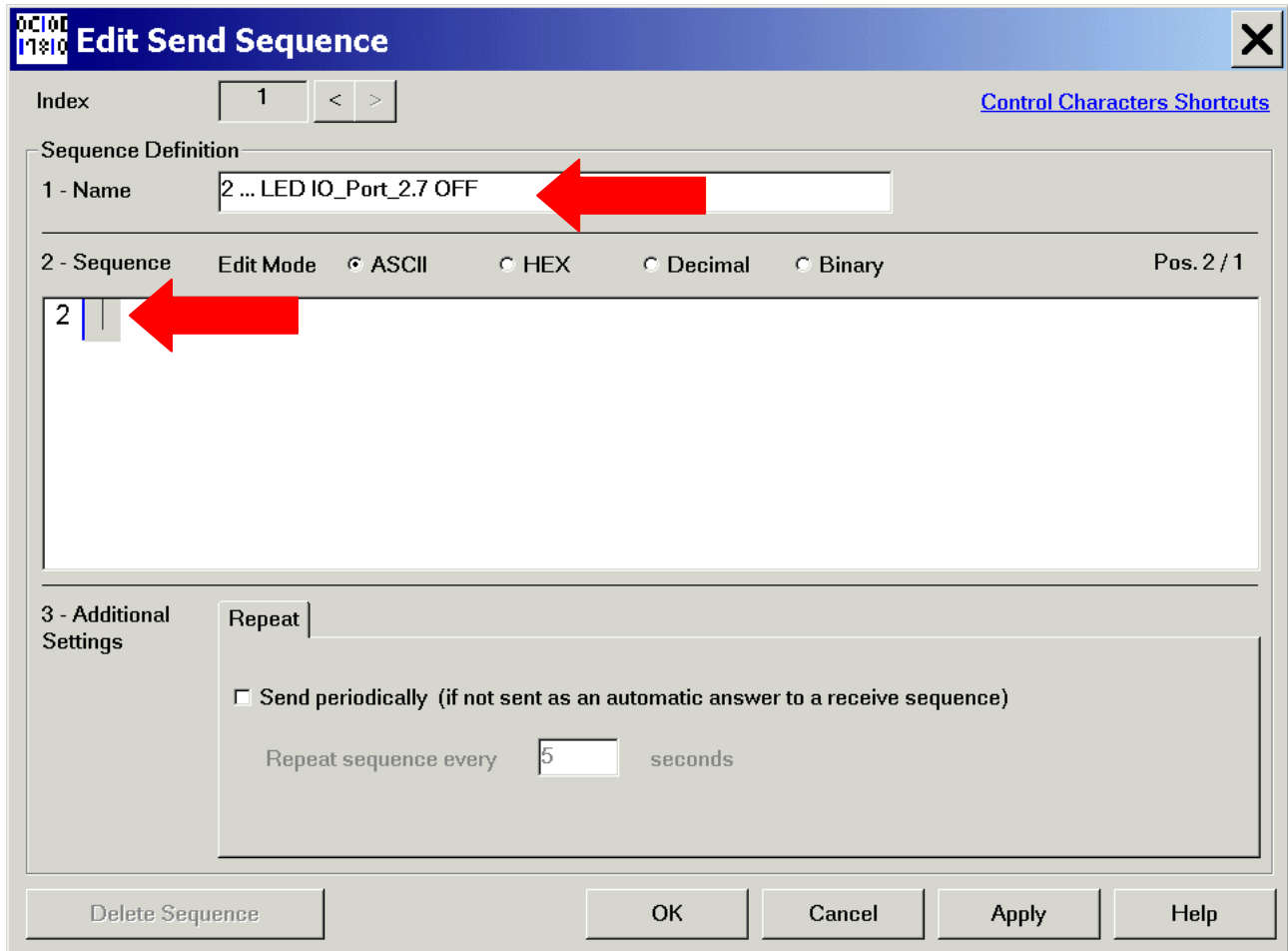
OK

Double click inside the red box:



Edit Send Sequence: Sequence Definition: 1- Name: insert: 2 ... LED IO_Port_2.7 OFF

Edit Send Sequence: Sequence Definition: 2- Sequence: insert: 2



Edit Send Sequence

Index: 1 < >

[Control Characters Shortcuts](#)

Sequence Definition

1 - Name: 2 ... LED IO_Port_2.7 OFF

2 - Sequence: Edit Mode (selected) | ASCII | HEX | Decimal | Binary | Pos. 2 / 1

2

3 - Additional Settings

Repeat

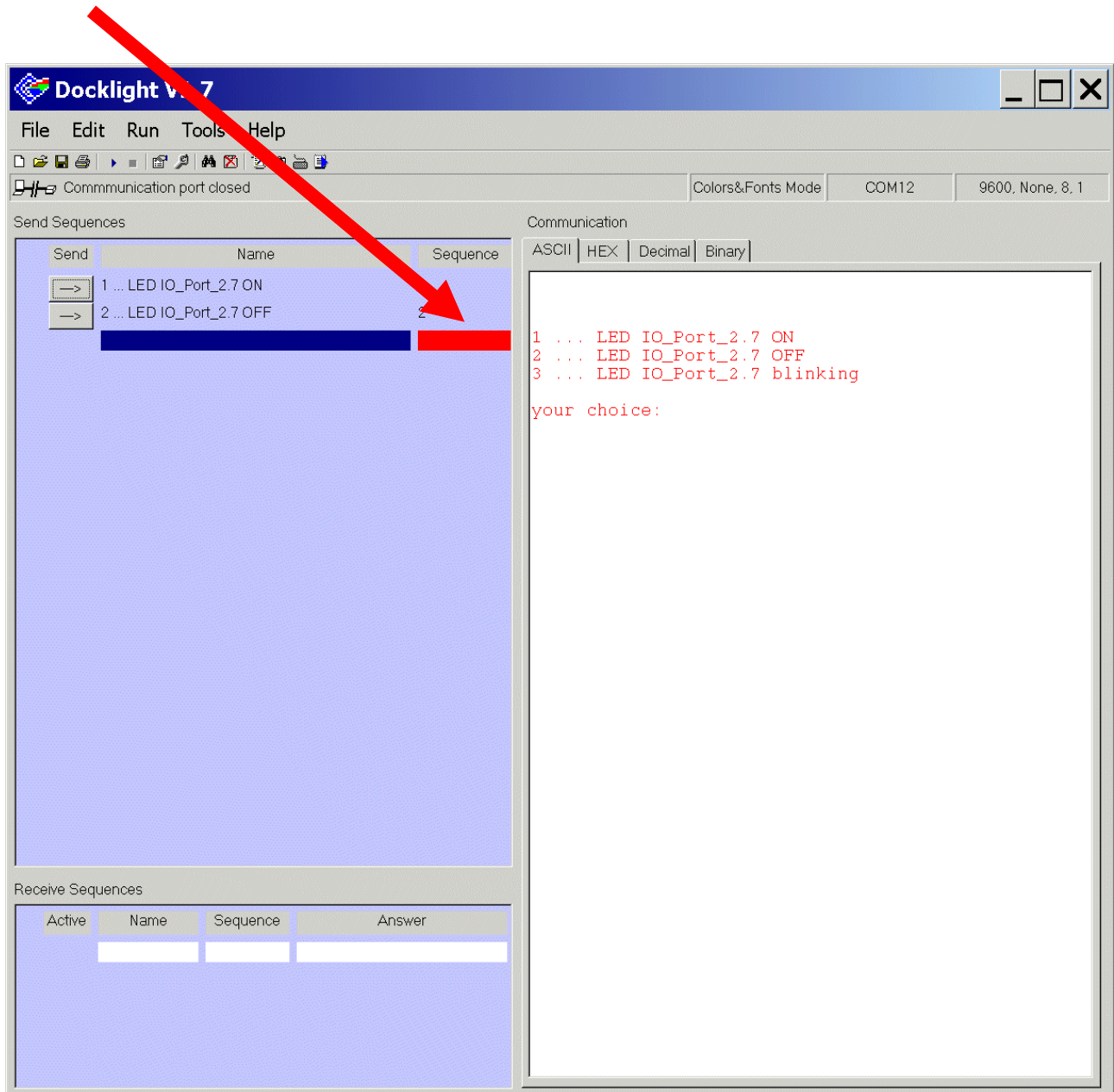
☐ Send periodically (if not sent as an automatic answer to a receive sequence)

Repeat sequence every 5 seconds

Delete Sequence OK Cancel Apply Help

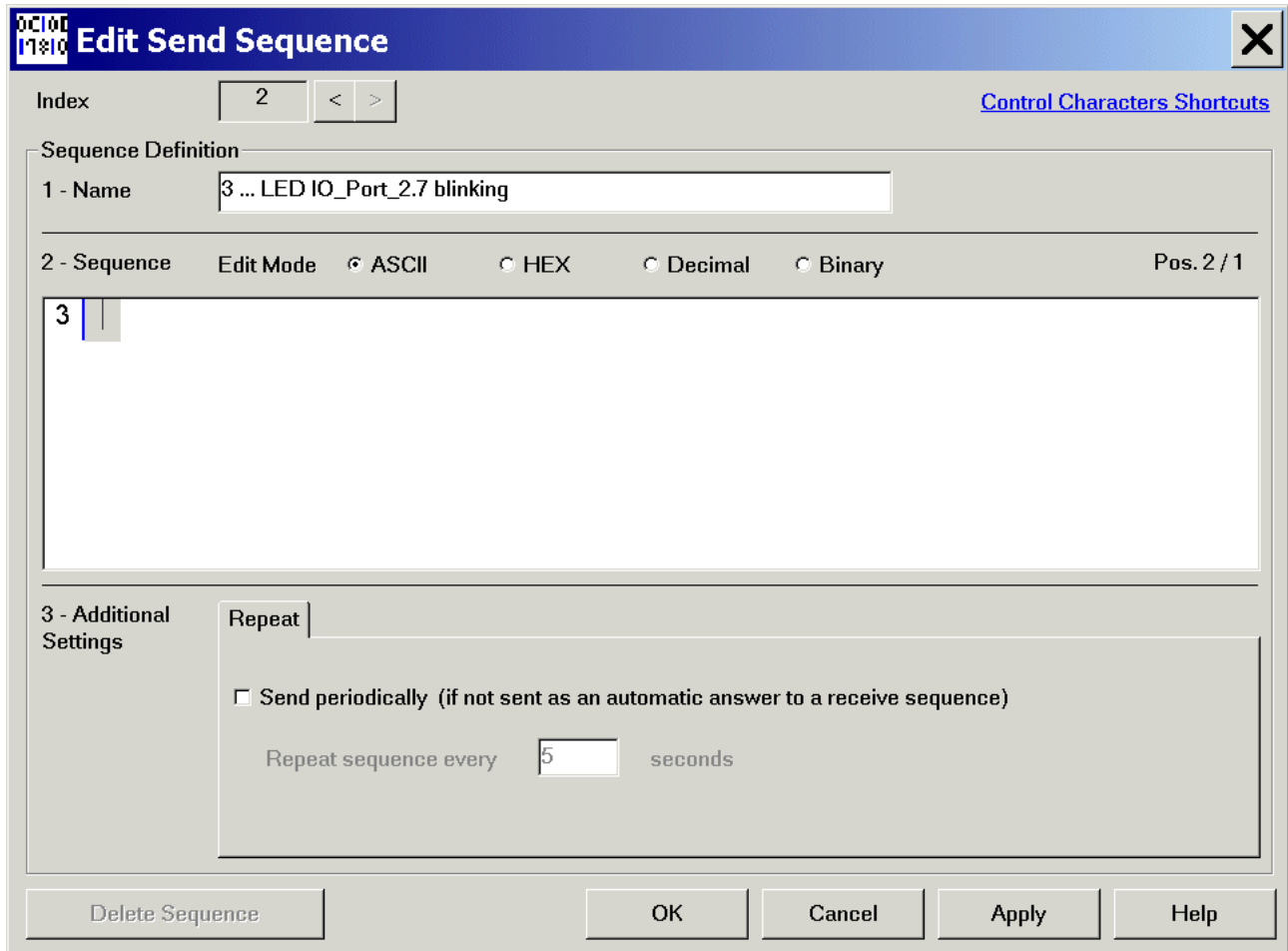
OK

Double click inside the red box:



Edit Send Sequence: Sequence Definition: 1- Name: insert: 3 ... LED IO_Port_2.7 blinking

Edit Send Sequence: Sequence Definition: 2- Sequence: insert: 3



Edit Send Sequence

Index: 2 < > [Control Characters Shortcuts](#)

Sequence Definition

1 - Name: 3 ... LED IO_Port_2.7 blinking

2 - Sequence: Edit Mode: ☒ ASCII ☐ HEX ☐ Decimal ☐ Binary Pos. 2 / 1




3 - Additional Settings

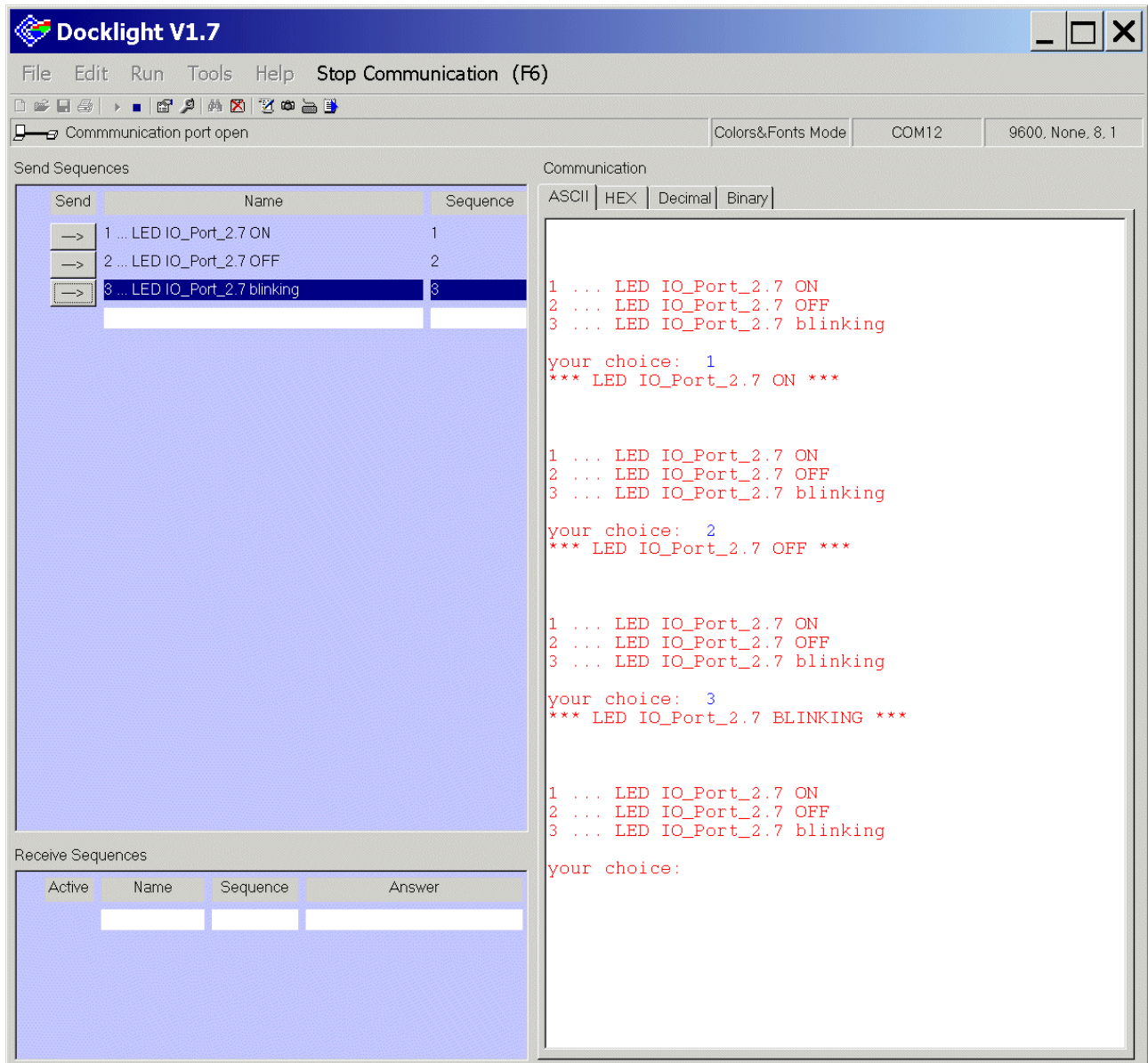
Repeat: ☐ Send periodically (if not sent as an automatic answer to a receive sequence)

Repeat sequence every 5 seconds

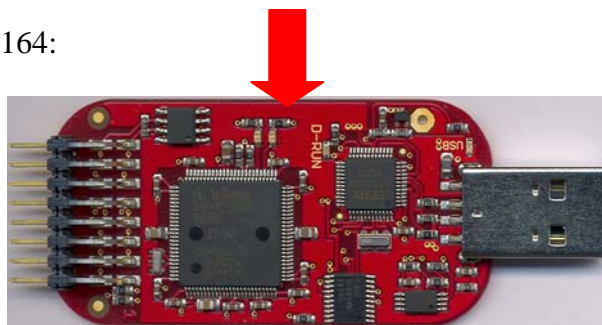
Buttons: Delete Sequence, OK, Cancel, Apply, Help

OK

- Click  1 ... LED IO_Port_2.7 ON or
 Click  2 ... LED IO_Port_2.7 OFF or
 Click  3 ... LED IO_Port_2.7 blinking



and **check** the results on your UConnect-CAN XE164:



Now we close our project and μ Vision 4:

Project - Close Project

File
Exit



Conclusion:

In this step-by-step book you have learned how to use the UConnect-CAN XE164 together with the Keil tool chain.

Now you can easily expand your "hello world" program to suit your needs!

You can connect either a part of - or your entire application to the UConnect-CAN XE164.

You are also able to benchmark any of your algorithms to find out if the selected microcontroller fulfils all the required functions within the time frame needed.

Have fun and enjoy working with XE16x microcontrollers!

Note:

There are step-by-step books for 8 bit microcontrollers (e.g. XC866, XC888 and XC878), 16 bit microcontrollers (e.g. C16x, XC16x and XE16x/XC2xxx) and 32 bit microcontrollers (e.g. TC1796 and TC1130).

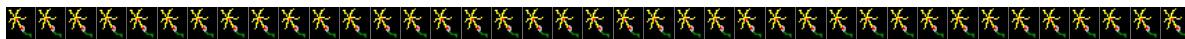
All these step-by-step books use the same microcontroller resources and the same example code.

This means: configuration steps, function names and variable names are identical.

This should give you a good opportunity to get in touch with another Infineon microcontroller family or tool chain!

There are even more programming examples using the same style available [e.g. ADC-examples, CAPCOM6-examples (e.g. BLDC-Motor, playing music), Simulator-examples, C++ examples] based on these step-by-step books.

6.) Feedback (UConnect-CAN XE164, Keil tools, μ Vision4):
Your opinion, suggestions and/or criticisms



Contact Details (this section may remain blank should you wish to offer feedback anonymously):

If you have any suggestions please send this sheet back to:

email: mcdocu.comments@infineon.com

FAX: +43 (0) 4242 3020 5783



Your suggestions:

<http://www.infineon.com>