User's Manual

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78K0/Ix2 LED Control

Demonstration Kit for Renesas Electronics 78K0/Ix2 Lighting ASSP Microcontroller

Renesas Electronics
www.renesas.com

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1. Circumstances not covered by product guarantee

- If the product was disassembled, altered, or repaired by the customer
- If it was dropped, broken, or given another strong shock
- Use at overvoltage, use outside guaranteed temperature range, storing outside guaranteed temperature range
- If the cable of the power adapter, the USB interface cable or the like was bent or pulled excessively
- If a power adapter other than the supplied product was used
- If the product got wet
- If this product is connected to the target system when there is a potential difference between the GND of this product and GND of the target system.
- If the connectors or cables are plugged/unplugged while this product is in the power-on state.
- If excessive load is applied to the connectors or sockets
- If a metal part of the power connection, or another such part comes in contact with an electrostatic charge.
- If the product is used or stored in an environment where an electrostatic or electrical noise is likely to occur.

2. Safety precautions

- Parts of board can become hot during operation!
- Do not look into the LEDs directly; doing so may cause weakening eyesight!
- Be careful of electrical shock. There is a danger of electrical shock if the product is used as described above in **1. Circumstances not covered by product guarantee**.
- The power adapter supplied with the product is exclusively for this product, so do not use it with other products.

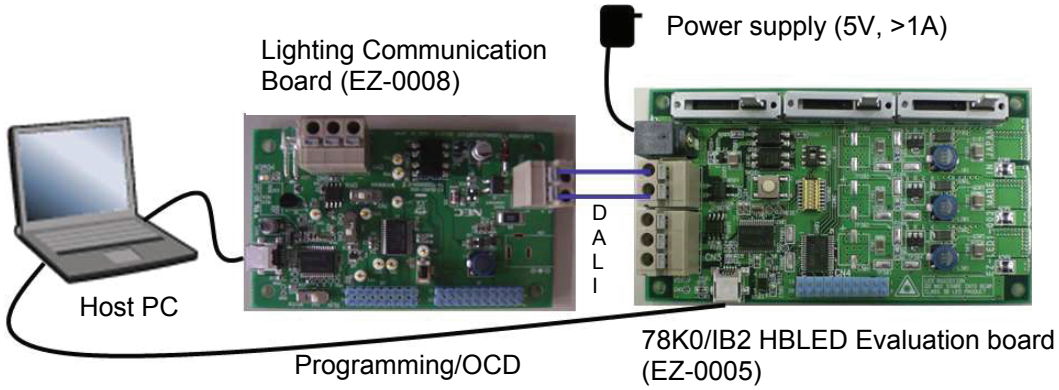
Table of Contents

Chapter 1 Introduction

78K0/IB2 HBLED Evaluation Board is part of the *78K0/Ix2 LED Control* demonstration kit for high brightness LED applications using the 78K0/IB2 microcontroller.

This board can operate by DC 5V power supply provided from AC adapter. 78K0/IB2 controls current of the high brightness LED to be constant. It can also control the evaluation board operating with an analog input. When connecting it with a Lighting Communication Master Evaluation Board (EZ-0008), LEDs can be controlled to dim with DMX512 protocol or DALI protocol.

Figure 1-1 System setup example (OCD mode / DALI protocol control)



1.1 Package contents

- 78K0/IB2 HBLED Evaluation Board (EZ-0005)
- $5V_{DC}$/2.4A power supply
- USB cable
- One set of plastic stands and screws
- 3 connection cables (DALI, DMX512)
- CD-ROM with Applilet EZ for HCD Controller software and an evaluation copy of the IAR Embedded Workbench for 78K with 16Kbyte code size limitation

Please verify that you have received all parts listed in the package contents list attached to the *78K0/Ix2 LED Control* package. If any part is missing or seems to be damaged, please contact the dealer from whom you received your *78K0/Ix2 LED Control* demonstration kit.

1.2 Features

- 3 channels constant current control without driver IC but only a 78K0/IB2 microcontroller
  - Buck topology
  - 300mA per channel
  - 5V supply voltage

- Up to 3 kind of control interface supported
  - DMX512 protocol communication interface
  - DALI protocol communication interface
  - Analog volume control interface
- Programming / On-chip debug supported

1.3 System requirements

HOST PC	A PC supporting Windows XP (32bit), Windows Vista (32bit) or Windows 7 (32bit) is required. A Pentium processor with at least 1 GHz CPU performance, with at least 256 Mbytes of RAM, allowing you to fully utilize and take advantage of the product features. 500 Mbytes of free disk space and an additional 10 Mbytes of free disk space on the Windows system drive. A web browser and Adobe Acrobat Reader to be able to access all the product documentation.
Host interface	USB interface that enables communication based on USB (Ver1.1 or later)

Note: Updates of the IAR Embedded Workbench for 78K, documentation and/or utilities for the *78K0/Ix2 LED Control* Starter Kit, if available, may be downloaded from the Renesas WEB page(s) at http://www.renesas.eu/78K0IX2-LED

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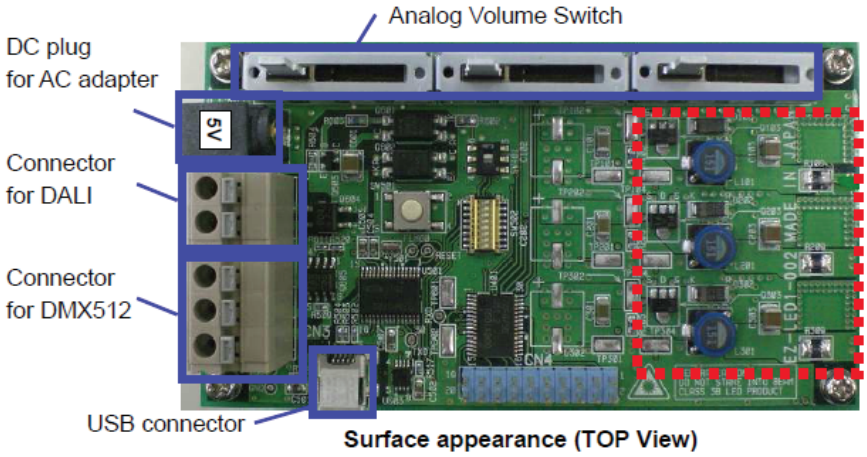
Chapter 2 Hardware

This chapter describes the specification of 78K0/IB2 HBLED Evaluation Board (EZ-0005) delivered with the *78K0/Ix2 LED Control* demonstration kit.

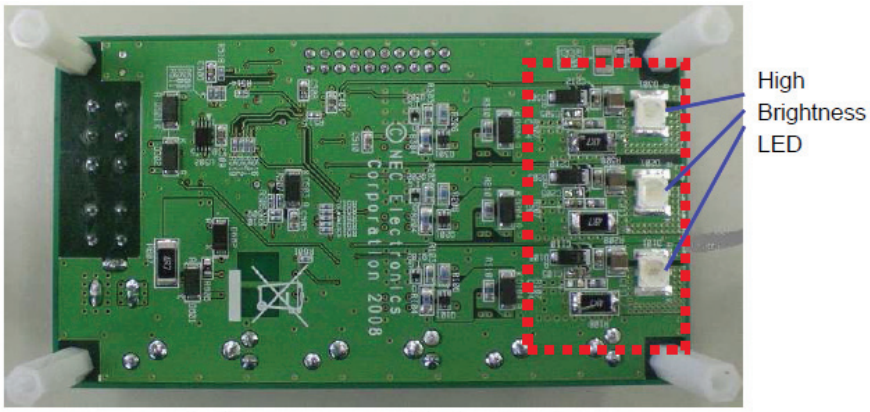
The *78K0/Ix2 LED Control* demonstration kit is assembled with a μPD78F0756 8-bit microcontroller and 3 300mA forward current High Brightness LEDs.

Figure 2-1 Appearance of 78K0/IB2 HBLED Evaluation Board (Top View)



Surface appearance (TOP View)

Figure 2-2 Appearance of 78K0/IB2 HBLED Evaluation Board (Bottom View)



Surface appearance (Bottom View)

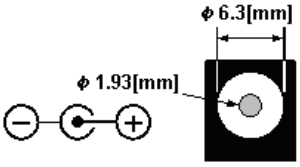
Caution: The part of board especially the area enclosed with RED line becomes high temperature!

Caution: Do not look into the LEDs directly; doing so may cause weakening eyesight!

2.1 Power supply

The following AC adaptor or dc power supplier is recommended to be applied to 78K0/IB2 HBLED Evaluation board via the Switchcraft RAPC722 (Center pin f 1.93mm, Plug f 6.3mm (max)).

Figure 2-3 Polarity and shape of DC plug



- **AC Adaptor**
  Output voltage : 5[V]
  Output current : 2[A] (recommend), over 1[A]
  Connector : refer to figure 4

  Type : Switching regulator type with over current protect circuit. Do not use AC adapter whose output voltage is guaranteed only when rated load current flows.

- **DC power supplier**
  Output voltage : 5[V]
  Output current : over 1[A]
  Connector : refer to Figure 2-3

Note: Use AC adapter adapted to safety standard of each country.

2.2 DIP switch

The 78K0/IB2 HBLED Evaluation Board uses an 8-position DIP switch (SW502) for configuration purposes. The following table shows the various configuration options.

Table 2-1 Board Configuration Options

Switch No.	Setting	
	ON	OFF
SW1-1	RUN mode for 78K0/IB2	PROG/OCD mode for 78K0/IB2
SW1-2	Not specified. Different combination of these three pins can generate varies voltage inputted into ANI0 pin of microcontroller. They are recommended to be used as custom mode selector.	
SW1-3		
SW1-4		
SW1-5	Enable communication between 78K0/IB2 and USB microcontroller	Reserve for USB microcontroller firmware updating without a USB cable.
SW1-6	Enable communication between 78K0/IB2 and USB microcontroller	Reserve for USB microcontroller firmware updating without a USB cable.
SW1-7	Connect TxD6 pin of 78K0/IB2 tom lighting communication circuit DMX512 or DALI	Disconnect TxD6 pin of 78K0/IB2 and communication circuit. User can connect his own communication circuit to 78K0/IB2 through TP601.
SW1-8	Connect RxD6 pin of 78K0/IB2 to lighting communication circuit DMX512 or DALI	Disconnect RxD6 pin of 78K0/IB2 and communication circuit. User can connect his own communication circuit to 78K0/IB2 through TP602.

2.3 DMX512/DALI switch

To select the wanted communication method DALI or DMX512 SW401 has to be set to the regarding position.

Table 2-2 Communication switch setting

Setting	Communication protocol
1,4 side	DMX512 interface
3,6 side	DALI interface

2.4 DMX512 Interface

The 78K0/IB2 HBLED evaluation board provides a DMX512 connector to communicate with other hardware via the DMX512 communication standard. Therefore the connector is connected to the UART6 interface of the µPD78F0756 microcontroller via the SW401 switch.

Table 2-3 DMX-512 Connectors

Pin Number	Function
1	Ground
2	D+
3	D-

2.5 Reset switch

The on-board reset switch (refer to SW501 in the schematics) can be used to reset the µPD78F0576 microcontroller.

2.6 USB programming and debugging interface

The 78K0/IB2 HBLED evaluation board implements an on-board USB programming and debugging interface, using the Renesas Electronics µPD78F0730 USB microcontroller. You can download code to the µPD78F0756 microcontroller from a host computer via a mini-USB cable, and then proceed to debug that code (for information about debugging refer to the regarding chapter).

Chapter 3 *78K0/Ix2 LED Control* installation and operation

3.1 Getting started

The Applilet EZ for HCD Controller allows a GUI based program building and downloading of application programs to the 78K0/IB2 HBLED evaluation board. Therefore it is necessary to have a valid IAR Embedded Workbench for 78K installation on the PC host system. As communication interface between the PC host system and the 78K0/IB2 HBLED evaluation board a standard USB interface line is needed. Before you can download and run a program, software and hardware have to be installed properly.

3.2 CD-ROM contents

The CD-ROM shows following directory structure:

Table 3-1 *78K0/Ix2 LED Control* CD-ROM directory structure

78K0IX2-LED	CD-ROM ROOT
Adobe	- Acrobat Reader for 32Bit Windows OS
Applilet	- Applilet EZ for HCD controller
Doc	- Documentation
dotnet	- Microsoft .net package
Driver	- *78K0/Ix2 LED Control* USB driver files
IAR Embedded Workbench	- IAR Embedded Workbench for 78K
sample program	- Example program for the *78K0/Ix2 LED Control* Starter Kit
WriteEZ5	- Flash Programmer WriteEZ5 incl. PRM file for µPD78F0576

3.3 Pre-programmed Demo-Application

The 78K0/IB2 HBLED evaluation board is pre-programmed with a demonstration code that controls the 3 on-board LEDs based on the Analog Volume Switch position.

Chapter 4 Hardware Installation

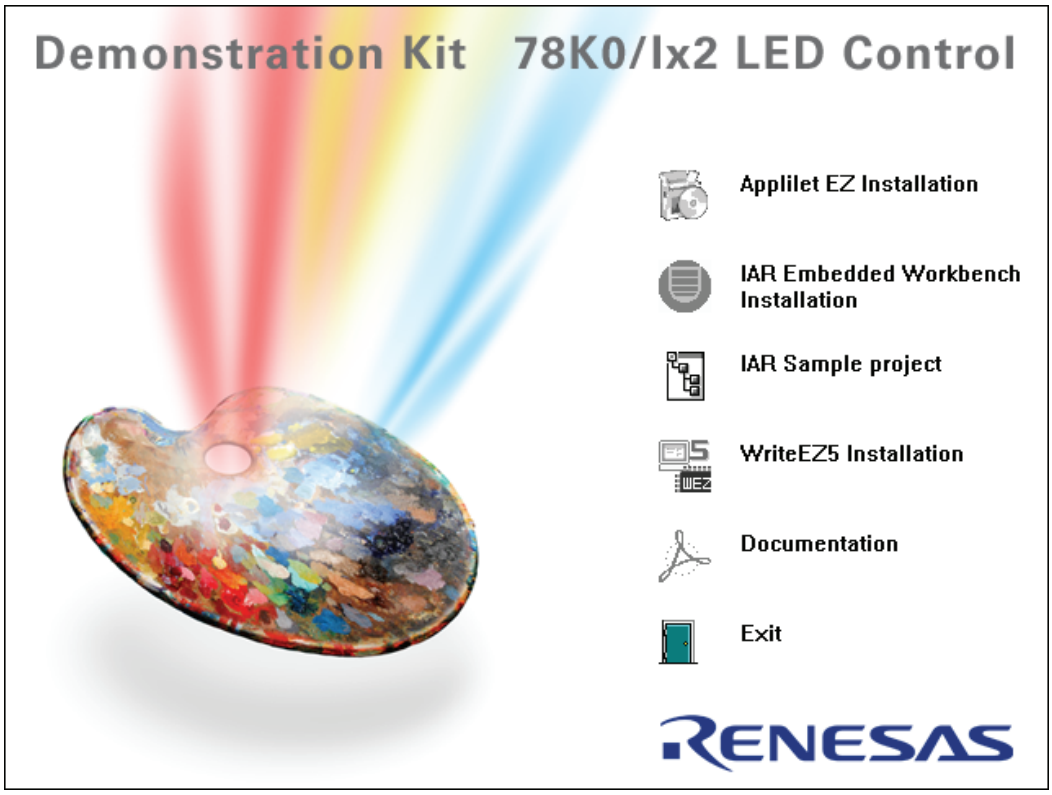
After unpacking the *78K0/Ix2 LED Control* demonstration kit, connect the board via connector CN3 to your host computer using the provided USB interface cable. When 78K0/IB2 HBLED evaluation board is connected, the USB driver needs to be installed on the host machine. Please refer to the following Chapter 5 Software Installation.

Chapter 5 Software Installation

The *78K0/Ix2 LED Control* package comes with the following software packages:

- AppliletEZ for HCD Controller
- IAR Systems Embedded Workbench for 78K 16Kbyte code size limited, including C compiler, assembler, linker, librarian and IAR C-SPY debugger / simulator
- Sample project for the IAR Embedded Workbench for 78K
- WriteEZ5 flash programmer including the PRM file for µPD78F0576

Figure 5-1 *78K0IX2-LED* CDROM autorun.exe



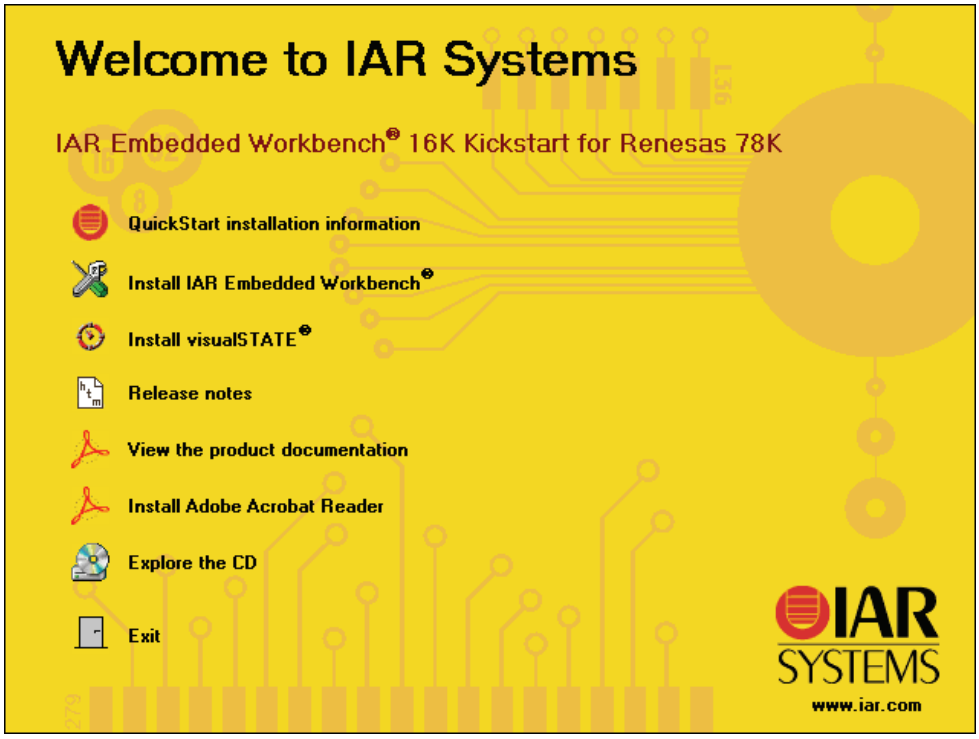
5.1 AppliletEZ for HCD Controller installation

To install the Applilet EZ for HCD Controller just press the regarding button from the Autorun of the CD-ROM provided within the *78K0/Ix2 LED Control* package. The setup dialogues will guide you through the installation process. The installation can also be started by executing the `AppliletEZforHCD_V421E.msi` in the directory "`\Applilet`" of the CD-ROM.

5.2 IAR Systems Embedded Workbench for 78K installation

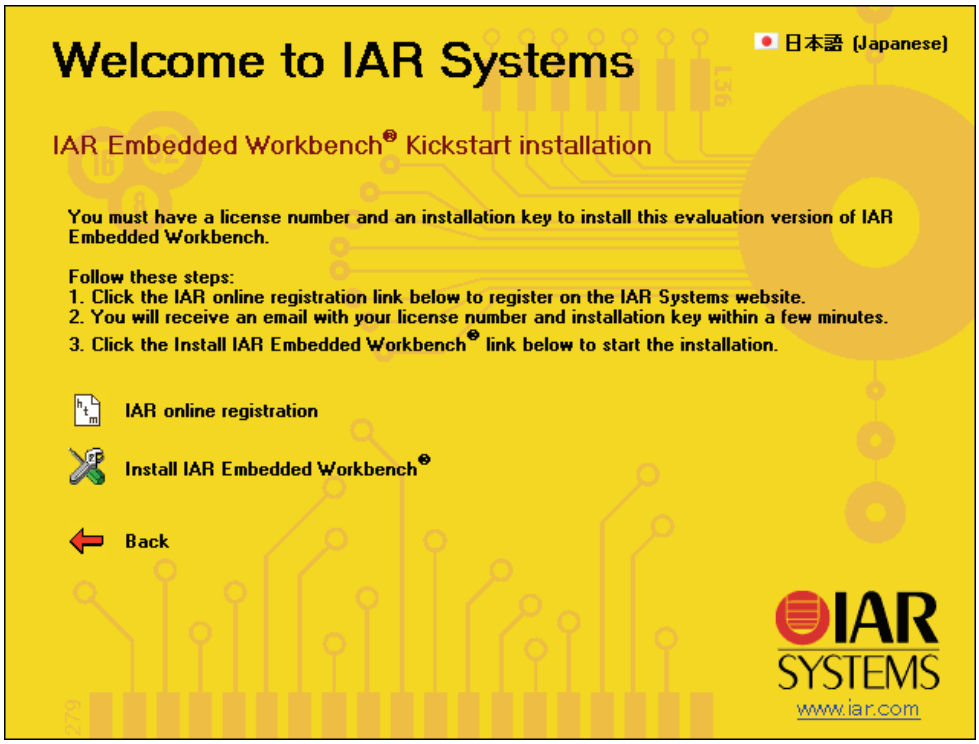
To install the IAR Systems Embedded Workbench for 78K including C-SPY debugger / simulator press the regarding button from the Autorun of the CD-ROM provided within the *78K0/Ix2 LED Control* package. The installation can also be started by executing the `Autorun.exe` program in the directory "`\IAR Embedded Workbench`" of the CD-ROM. The setup dialogues will guide you through the installation process.

Figure 5-2 IAR Embedded Workbench installation screen



Note: To be able to install the IAR Embedded Workbench 16K Kickstart for 78K a License number and key has to be requested, free of charge, via an online registration.

Figure 5-3 IAR Embedded Workbench License request and install



For further information about the IAR Embedded Workbench installation refer to the `InstallationGuide.ENU.pdf` in the directory "`\IAR Embedded Workbench\doc\common\doc`" of the CD-ROM.

5.3 WriteEZ5 installation

To install WriteEZ5 flash programmer just press the regarding button from the Autorun of the CD-ROM provided within the *78K0/Ix2 LED Control* package. The setup dialogues will guide you through the installation process. The installation can also be started by executing the `WriteEZ5_v100_r3_EE.exe` in the directory `"\WRITEEZ5"` of the CD-ROM.

5.4 Sample program installation

To copy the IAR sample project to the Host PC hard drive press the regarding button from the Autorun of the CD-ROM provided within the *78K0/Ix2 LED Control* package. The setup dialogues will guide you through the copying process. The copy can also be started by executing the `78K0IX2-LED_sampleproject_V110.exe` in the directory `"\sample program"` of the CD-ROM.

5.5 USB Driver Installation

In order to use the 78K0/IB2 HBLED evaluation board the USB driver needs to be installed on the host machine. Install the driver according to the following procedure:

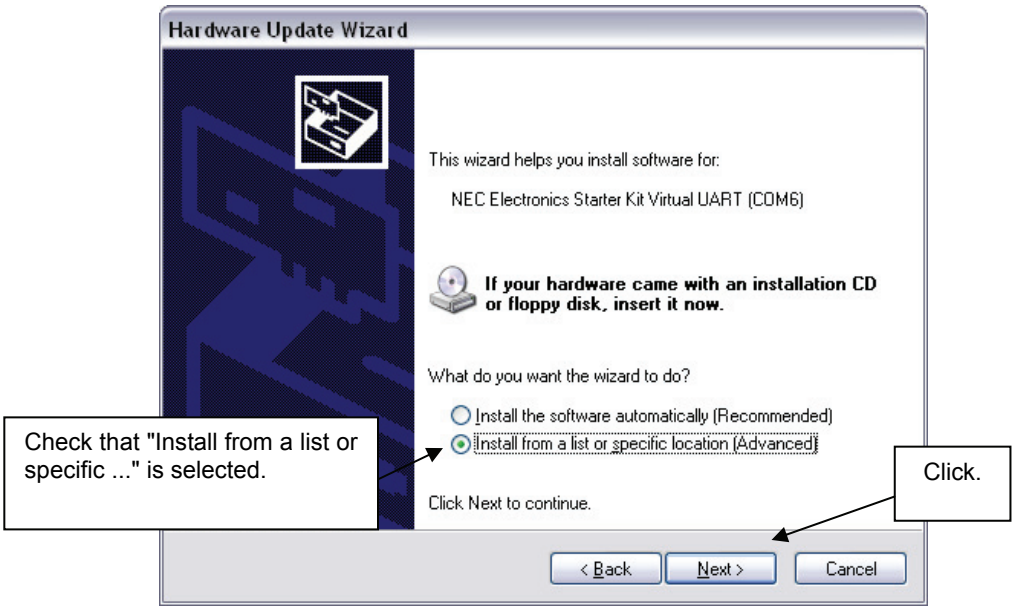
5.5.1 Installation on Windows XP

1. When the 78K0/IB2 HBLED evaluation board is connected with the host machine, the board is recognized by Plug and Play, and the wizard for finding new hardware is started. At first the hardware wizard will ask if windows should search on the windows update web, check "No, not this time" and then click Next>.

Figure 5-4 Found New Hardware Wizard 1 (Windows XP)

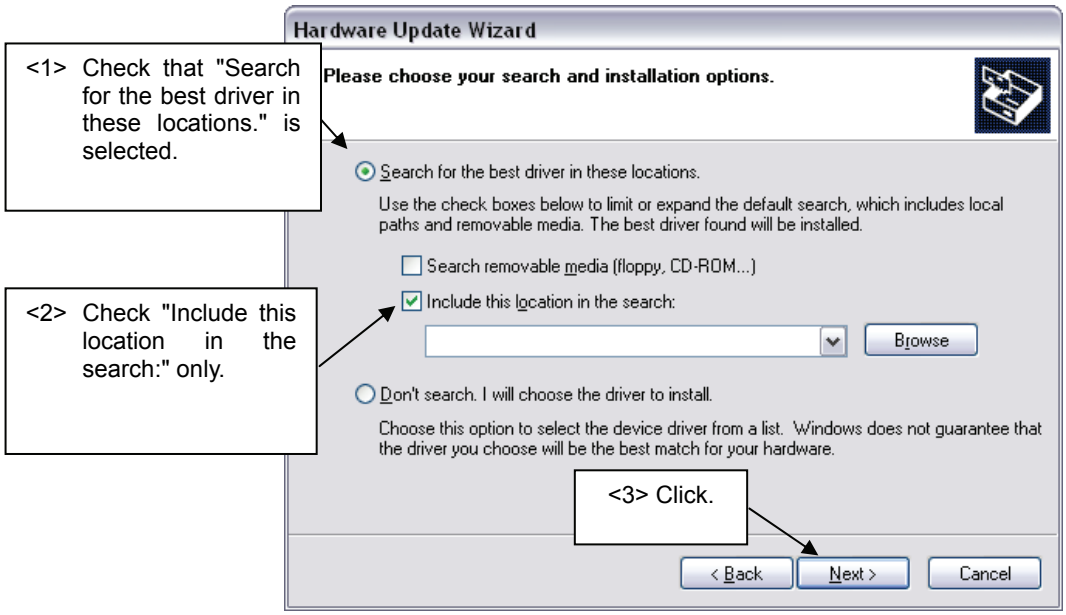
2. Check that "Install from a list or specific location (Advanced)" is selected, then click Next>.

Figure 5-5 Found New Hardware Wizard 2 (Windows XP)



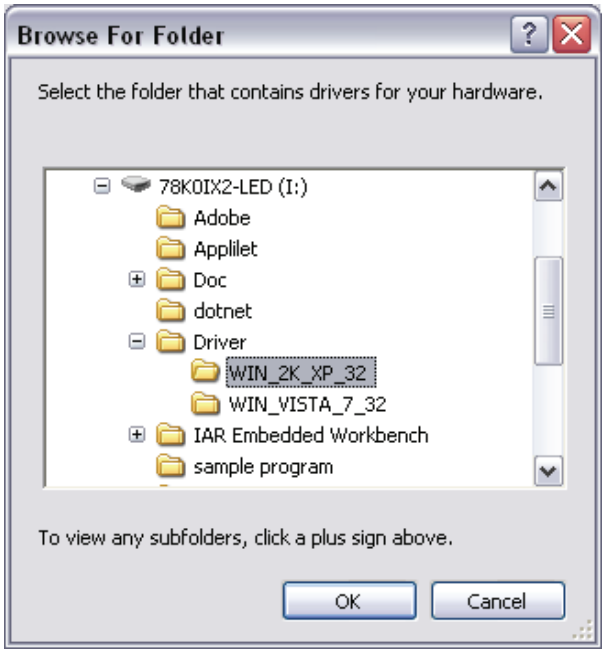
3. Check that "Search for the best driver in these locations." is selected. Select the "Include this location in the search:" check box and then click Browse.

Figure 5-6 Search Location Specification 1 (Windows XP)



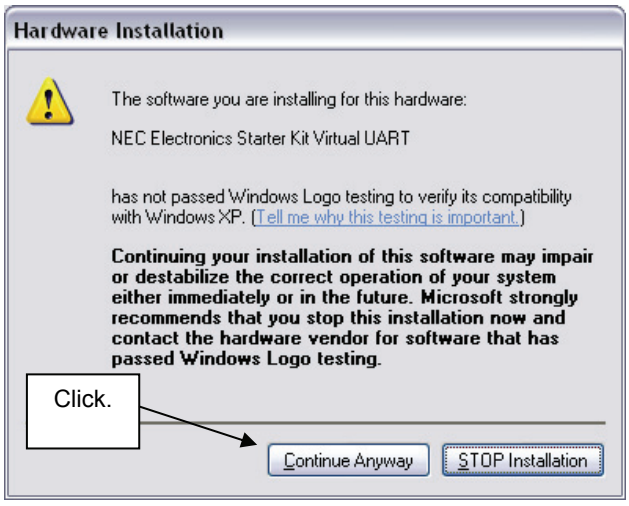
4. Locate the folder "C **CDROM**:\Driver\WIN_2K_XP_32" and click OK.

Figure 5-7 Search Location Specification 2 (Windows XP)



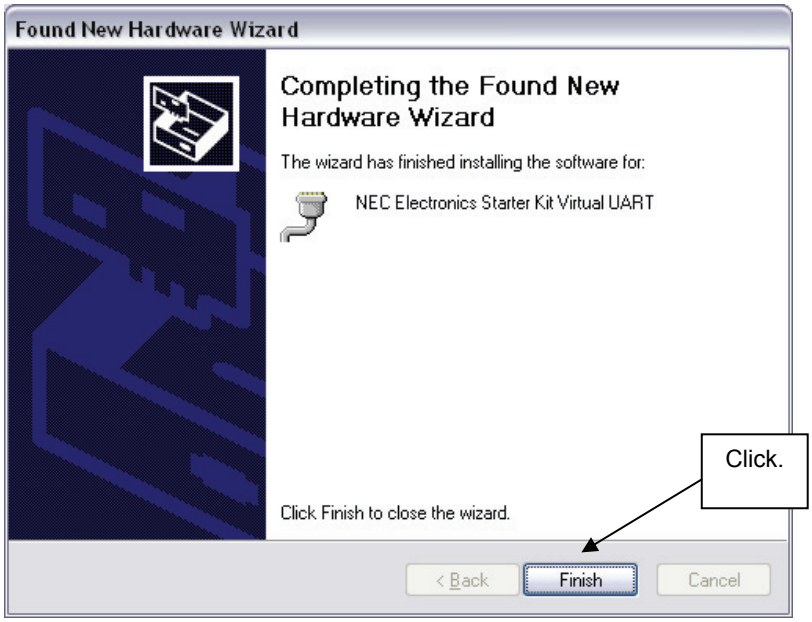
5. As shown below, "NEC Electronics Starter Kit Virtual UART has not passed Windows Logo testing to verify its compatibility with Windows XP." is displayed. Click Continue Anyway.

Figure 5-8 Windows XP Logo Testing (Windows XP)



6. After the installation of the USB driver is completed the window below is displayed. Click Finish to close the hardware wizard.

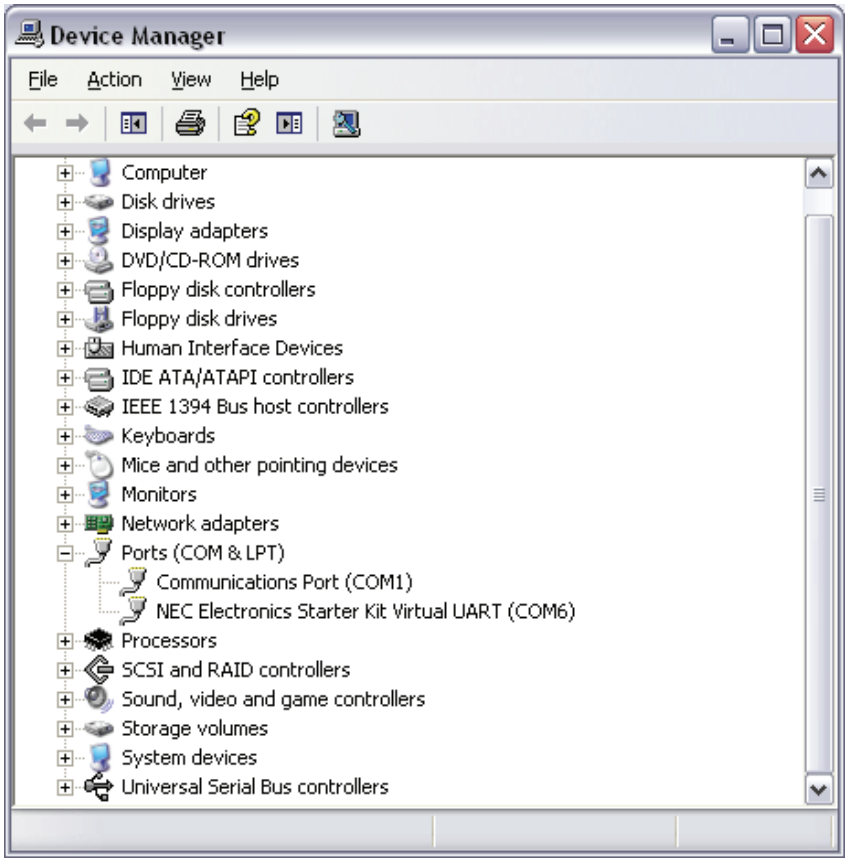
Figure 5-9 USB Driver Installation Completion (Windows XP)



7. After installing the USB driver, check that the driver has been installed normally, according to the procedure below. When using the 78K0/IB2 HBLED evaluation board the “NEC Electronics Starter Kit Virtual UART” should be present like in the figure below.

   Please check in the Windows "Device Manager" within the Windows Properties (“Hardware” tab), that the driver is installed normally.

Figure 5-10 Device Manager driver correctly installed (Windows XP)

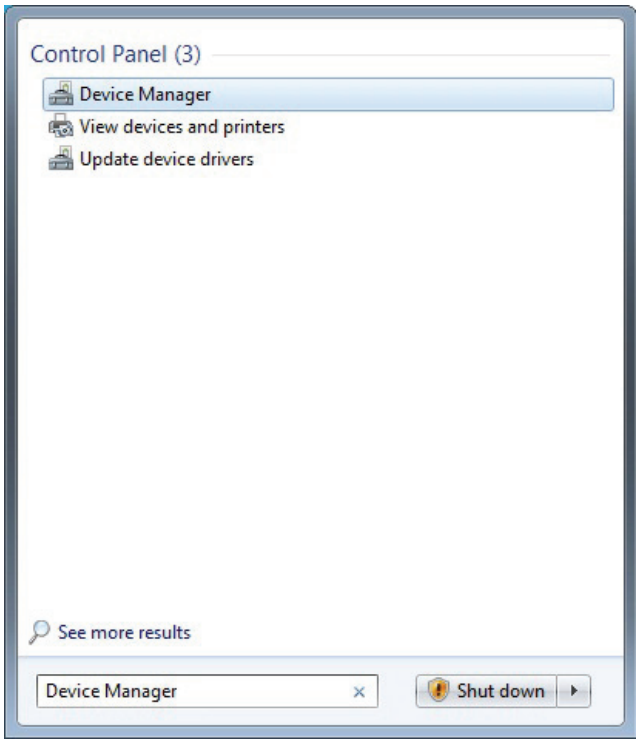


5.5.2 Installation on Windows 7

When the 78K0/IB2 HBLED evaluation board is connected with the host machine, the board is recognized by Plug and Play, and the wizard for finding new hardware is started. When firstly installing a Renesas Demonstration Kit, that uses the Virtual COM port driver, the automatic installation will fail. Therefore the USB driver has to be installed manually. To do so please follow the instructions below:

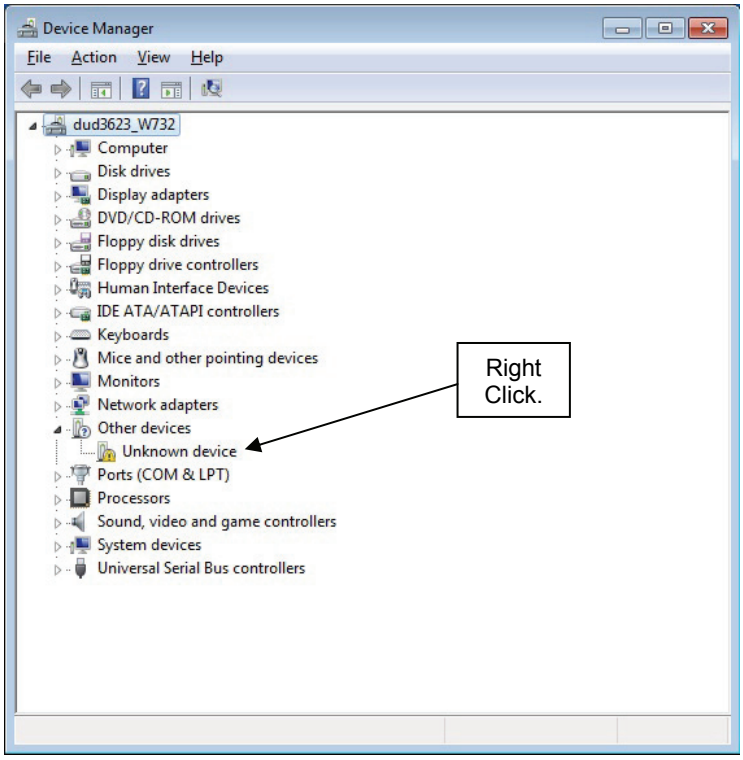
1. Press the Start Button and type “Device Manager” into the text box. Select the Device Manager from the available search results

Figure 5-11 Open device manager (Windows 7)



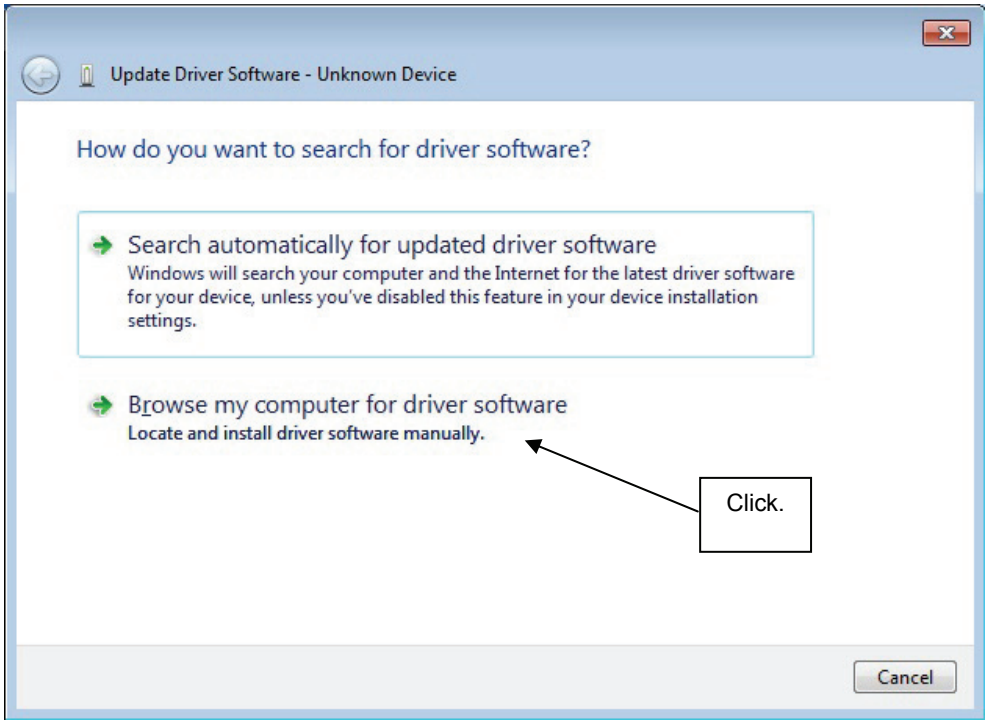
2. The 78K0/IB2 HBLED evaluation board is listed as “Unknown device”. Right click on the “Unknown device” entry and select “Update driver”.

Figure 5-12 Locate Device to manually install USB driver (Windows 7)



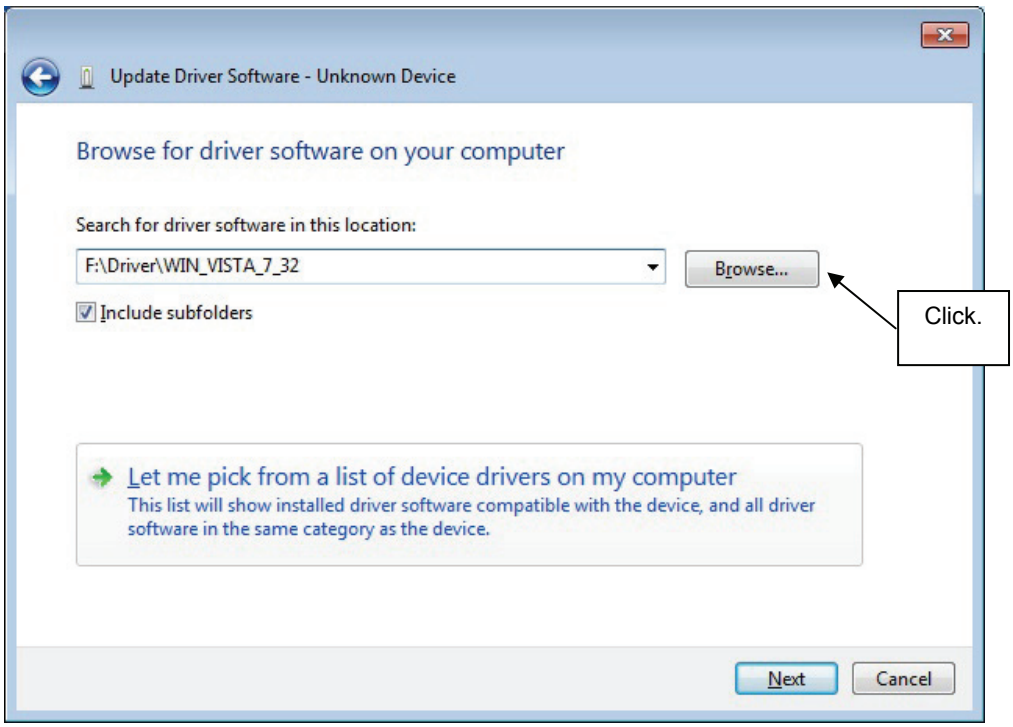
3. Select “Browse my computer for driver software” to locate and install the driver software manually

Figure 5-13 Select driver search method (Windows 7)



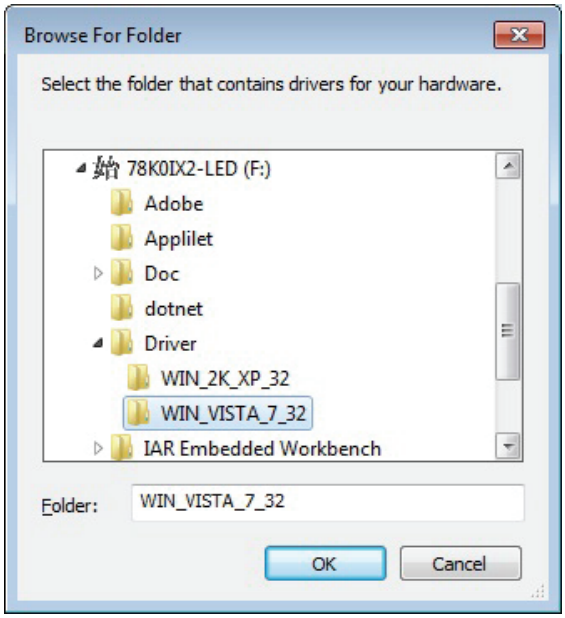
4. Click Browse to locate the USB driver location.

Figure 5-14 Search Location Specification 1 (Windows 7)



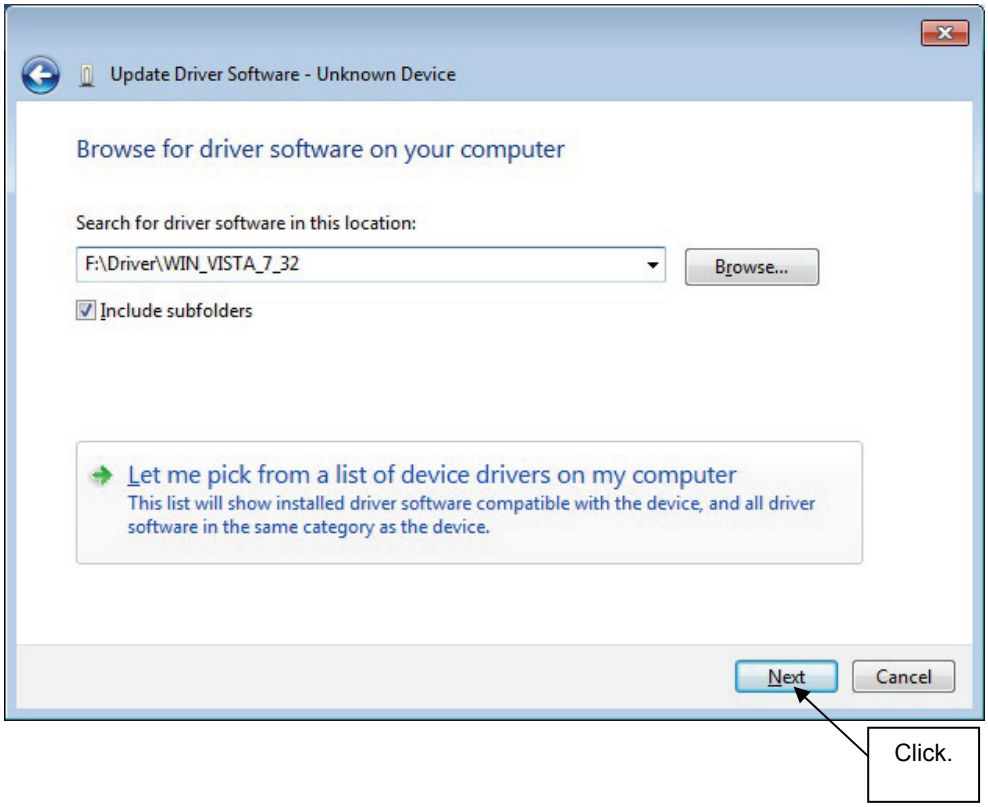
5. Locate the folder "**CDROM**:\Driver\WIN_VISTA_7_32" and click OK.

Figure 5-15 Search Location Specification 2 (Windows 7)



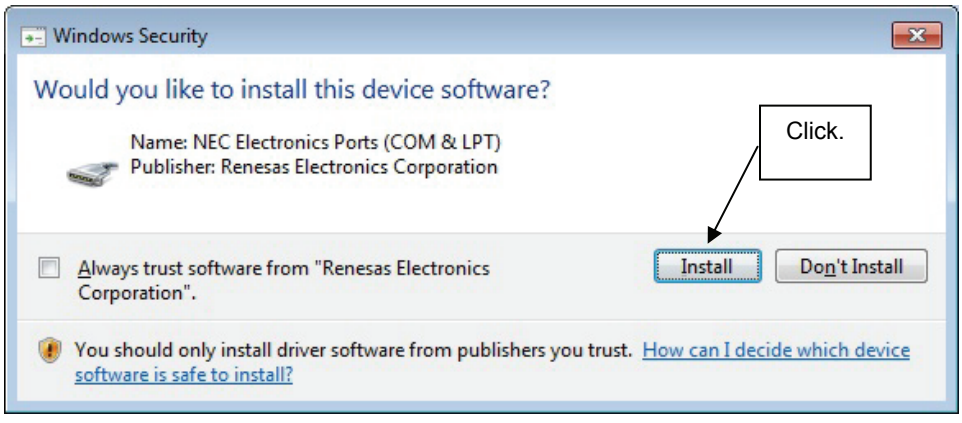
6. Press Next when the correct search path is inserted in the "Search for driver in this location:" field.

Figure 5-16 Search Location Specification 3 (Windows 7)



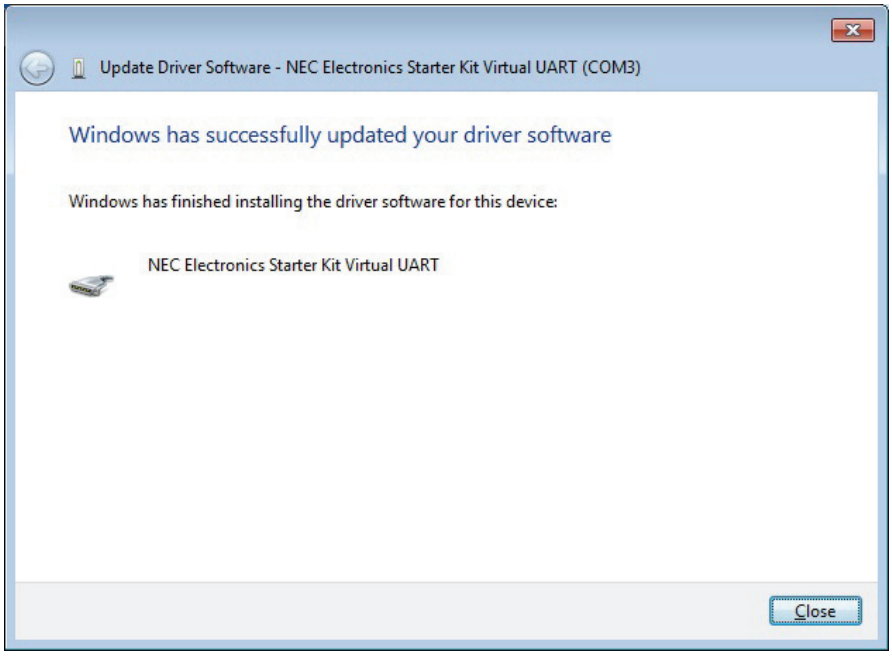
7. Based on the Windows 7 security settings the “Would you like to install this device software” dialogue can pop up. If so press Install.

Figure 5-17 Windows security information (Windows 7)



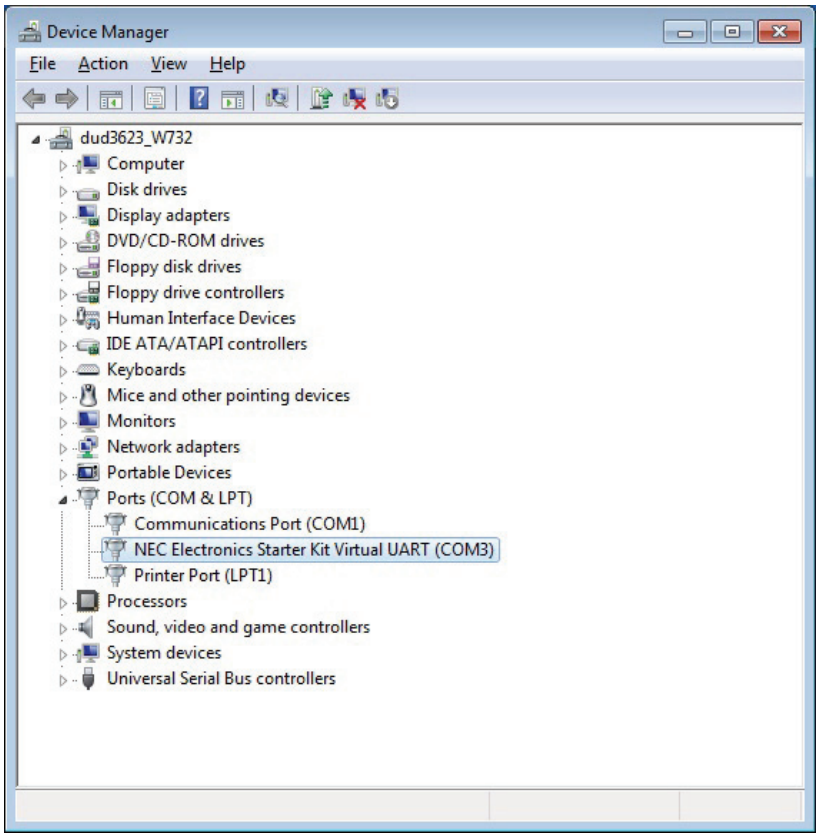
8. After the installation of the USB driver is completed the window below is displayed. Click Close to close the hardware wizard.

Figure 5-18 USB driver installation completion (Windows 7)



9. After installing the USB driver, check that the driver has been installed normally, according to the procedure below. When using the 78K0/IB2 HBLED evaluation board the “NEC Electronics Starter Kit Virtual UART” should be present like in the figure below.

Figure 5-19 Device Manager driver correctly installed (Windows 7)



Chapter 6 Applilet EZ for HCD Controller

Applilet EZ for HCD Controller is a tool used to automatically generate software for microcontroller µPD78F0756, which is used to control the high current driver.

The software can be easily generated by specifying the setting and operation of the µPD78F0756 on the GUI. The generated software can be directly written to the flash memory of the µPD78F0756 via a USB cable and an operation check can be performed by using the 78K0/IB2 HBLED evaluation board.

By using Applilet EZ for HCD Controller, an application system that uses the µPD78F0756 can be introduced without requiring a detailed knowledge of complex programming languages. Furthermore, labor for software development for microcontrollers, which used to take a long time, and operation checking can be significantly reduced.

For a further information please refer to the “Applilet EZ for HCD Controller User’s Manual” which can be found in the **“CDROM:\Doc\Applilet EZ\”** folder.

Chapter 7 Using the Applilet EZ for HCD Controller

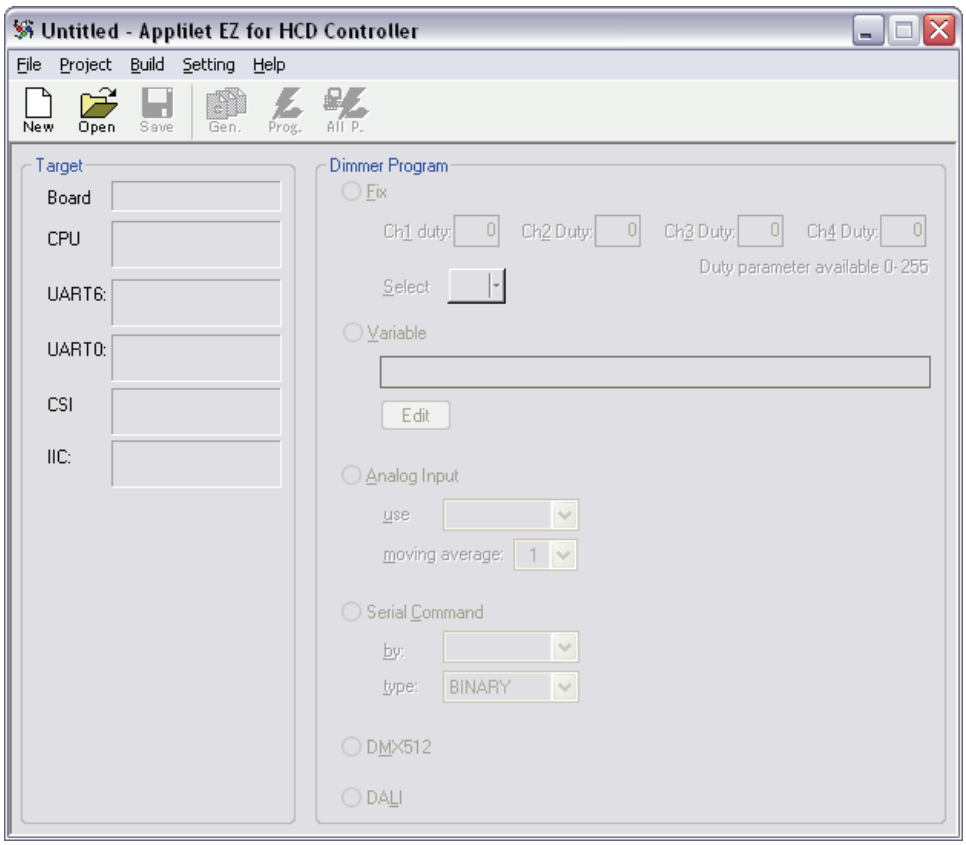
In the following chapter the different functionalities of this tool will be explained in short exercises. Exercise 1 and 2 can be used as short quick start example to light up the LEDs mounted to the 78K0/IB2 HBLED evaluation board. The exercise 3 to 5 will give a further description of the possibilities in usage of the Applilet EZ for HCD Controller.

7.1 Exercise 1 – Applilet EZ for HCD Controller settings

This exercise will go through the Applilet EZ for HCD controller's general settings.

1. Open the Applilet EZ for HCD Controller. Click Start → All Programs → NEC Electronics Tools → Applilet EZ for HCD → Applilet EZ for HCD.

Figure 7-1 Applilet EZ for HCD Controller Main Window

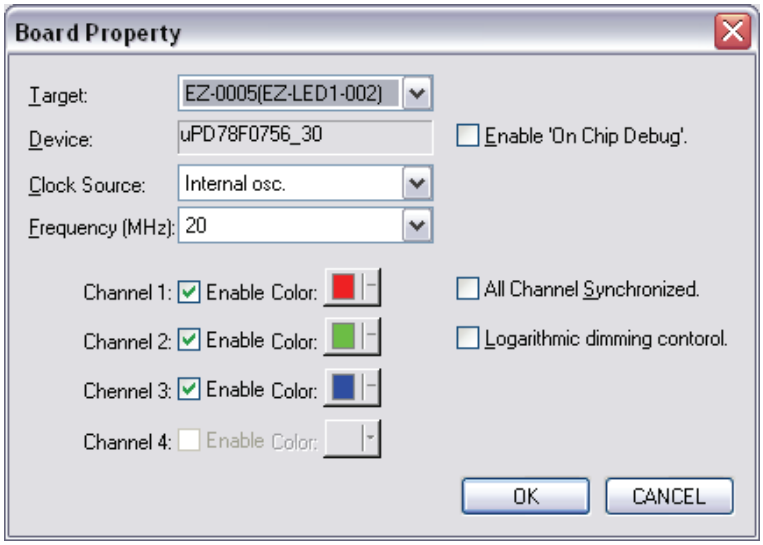


2. Under the Project menu all of the MCU settings will be listed for configuration. **Select CPU**.

Figure 7-2 Applilet EZ for HCD Controller Setting

3. In the CPU settings you will notice that the Target will be EZ-0005(EZ-LED1-002). Under the Clock Source you can select the internal 20MHz oscillator.

Figure 7-3 Applilet EZ for HCD Controller CPU settings



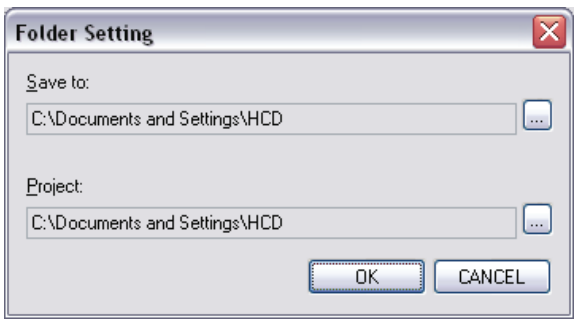
4. The Applilet EZ for HCD Controller is able to use the Renesas Compiler for 78K0 as well as the IAR Embedded Workbench for 78K. To select click **Setting → Compiler** and choose the IAR compiler when using the Applilet EZ for HCD Controller with the *78K0/Ix2 LED Control* starter kit.

Figure 7-4 Applilet EZ for HCD Controller Compiler selection

Note: Make sure that you have installed the selected compiler correctly to your PC host system before building the project.

5. Now take a look at the output folder option, select **Setting → Folders...** These locations will specify the output paths of the generated files. Enter in your desire destination but keep in mind that Applilet EZ will create subdirectories under this folder for each Applilet EZ project. **Click OK**.

Figure 7-5 Applilet EZ for HCD Controller Folder Setting



7.2 Exercise 2 – Fix dimmer program

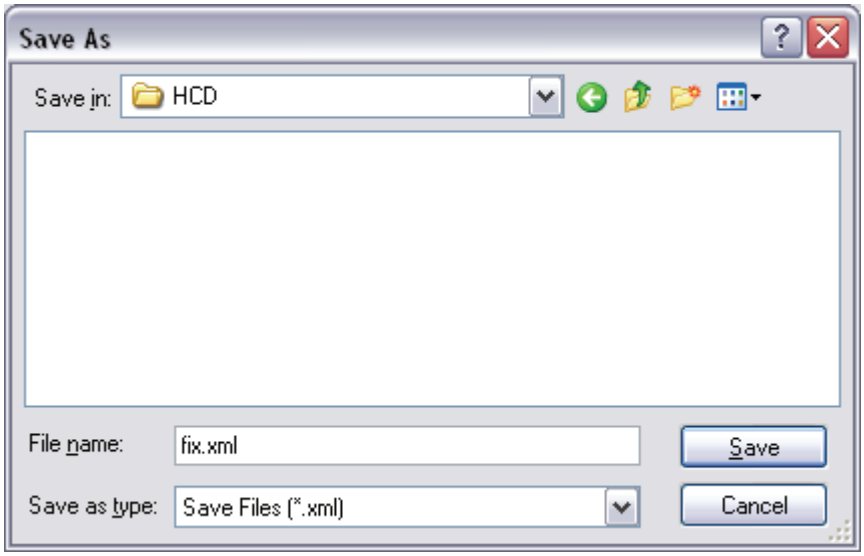
This program set a fixed duty value for each of the 3 LED channels. Make sure that all settings, like explained in Exercise 1, are still correctly set for this exercise.

1. Make sure “Fix” is still selected as the dimmer program
2. Input “2” to all the channels so they are not too bright.

Figure 7-6 Applilet EZ for HCD Controller LED channel settings

3. Save the Applilet EZ project (.xml). We will save the new Applilet EZ project name to fix.xml. **Select File → Save as.. and input “fix.xml” and then click Save.**

Figure 7-7 Applilet EZ for HCD Controller Save File as (fix.xml)



4. Make sure to remove the power cable from the 78K0/IB2 HBLED evaluation board. Click the **All P.** Button. Make sure that **SW502.1** of the Switch Dip is in the **OFF** position which is the programming mode and then **insert the USB connector**.

Figure 7-8 Applilet EZ for HCD Controller All Program button

5. You will be informed about the progress of the compilation.

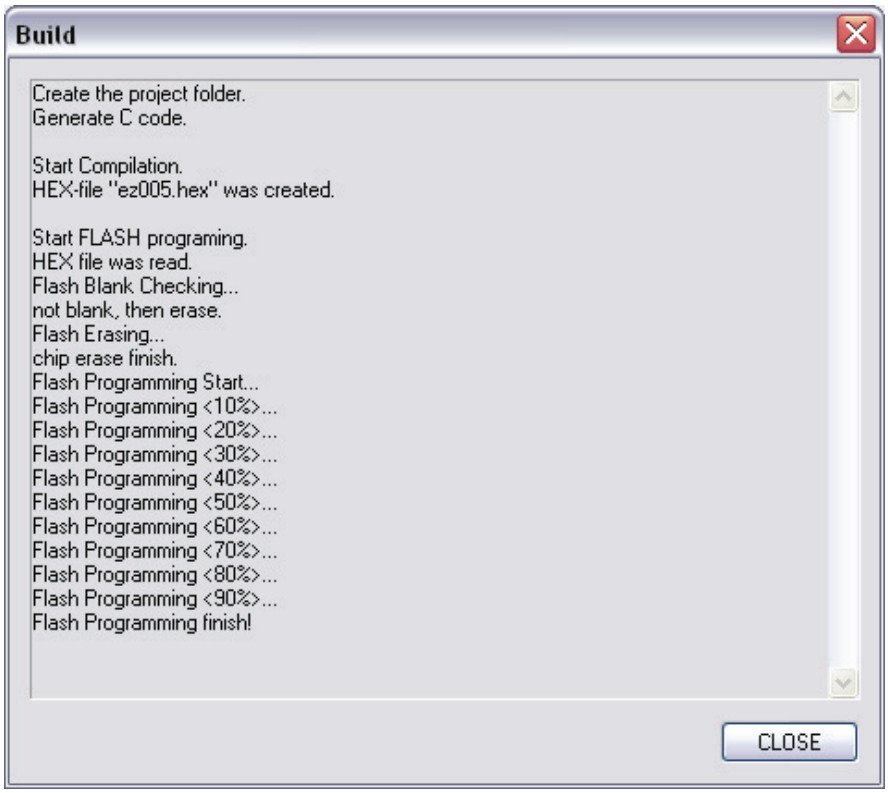
Figure 7-9 Applilet EZ for HCD Controller compilation progress

6. Next click OK when prompt to start flash programming.

Figure 7-10 Applilet EZ for HCD Controller Start Flash programming

7. During the flash procedure you will be informed about the actual status of the download

Figure 7-11 Applilet EZ for HCD Controller Flash programming status



8. **Click CLOSE** to exit the "Build" window. Remove the USB and change SW502.1 to the on position for run mode. Insert the power connector or the USB cable to the board and you should see the LEDs light up to finish this exercise.

   - HP-LED1(channel 1) = Red
   - HP-LED2(channel 2) = Green
   - HP-LED3(channel 3) = Blue

Caution: Do not look into the LEDs directly; doing so may cause weakening eyesight!

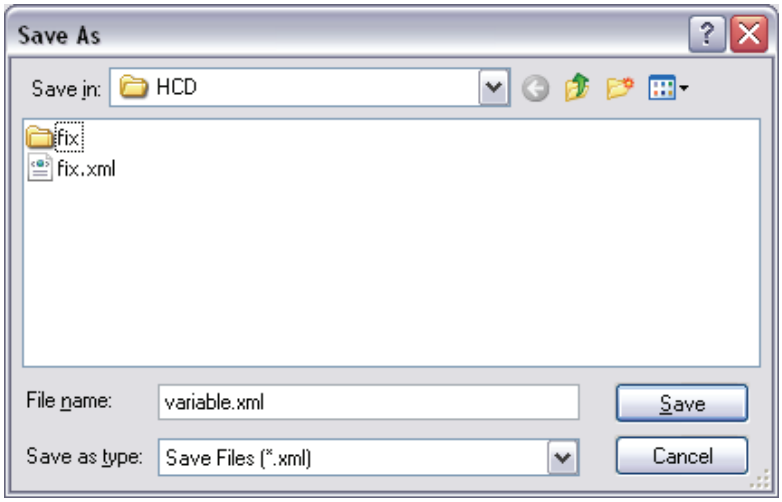
7.3 Exercise 3 – Variable dimmer program

This program sets the duty value for each channel given by drawing pattern data.

1. Make sure that you have set all the settings as explained in Exercise 1.

2. Save the new Applilet EZ project name to variable.xml. **Select File → Save as.. and input "variable.xml" and then click Save**.

Figure 7-12 Applilet EZ for HCD Controller Save File as (variable.xml)

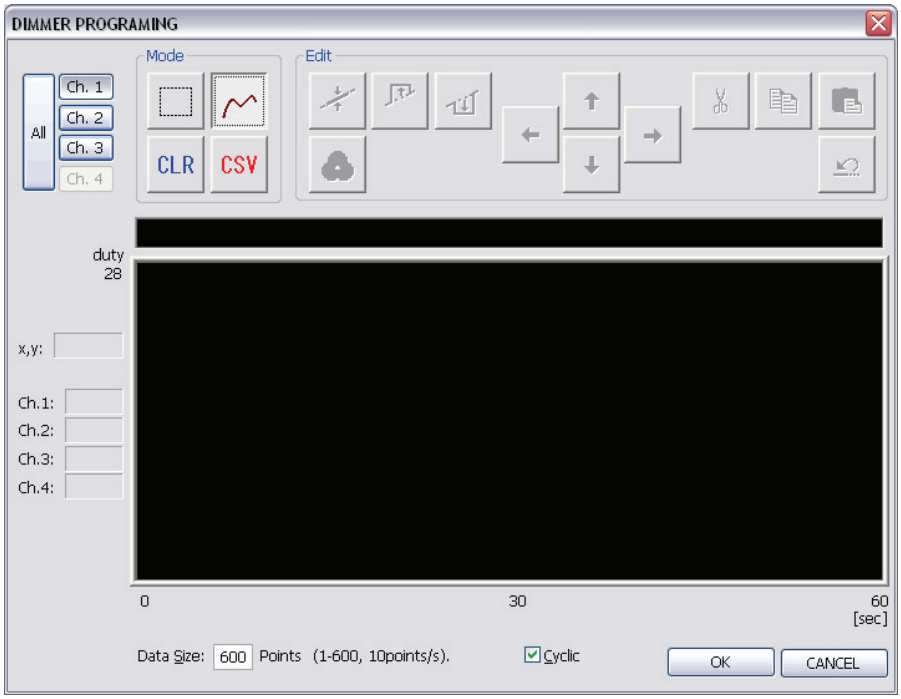


3. Now we have a new Applilet EZ project file and we will change the dimmer program to “Variable”.

Figure 7-13 Applilet EZ for HCD Controller Dimmer Program selection (Variable)

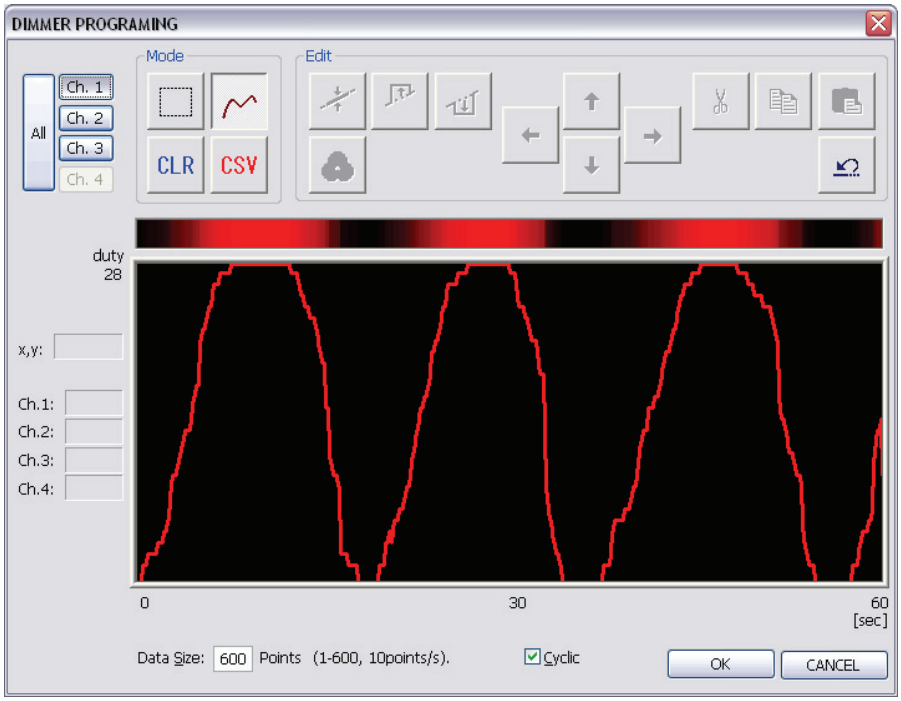
5. Click on the **“Edit”** button under “Variable” and the “Variable Dimmer Control” window will open. Enter **“600”** for the data size and enable the **“Cyclic”** check box. Click the **Ch.1** button to select this channel for modification. Select the line Mode as shown below. This will allow you to draw the PWM duty cycle versus time by using your mouse pointer.

Figure 7-14 Applilet EZ for HCD Controller Variable Dimmer Control settings (clean)



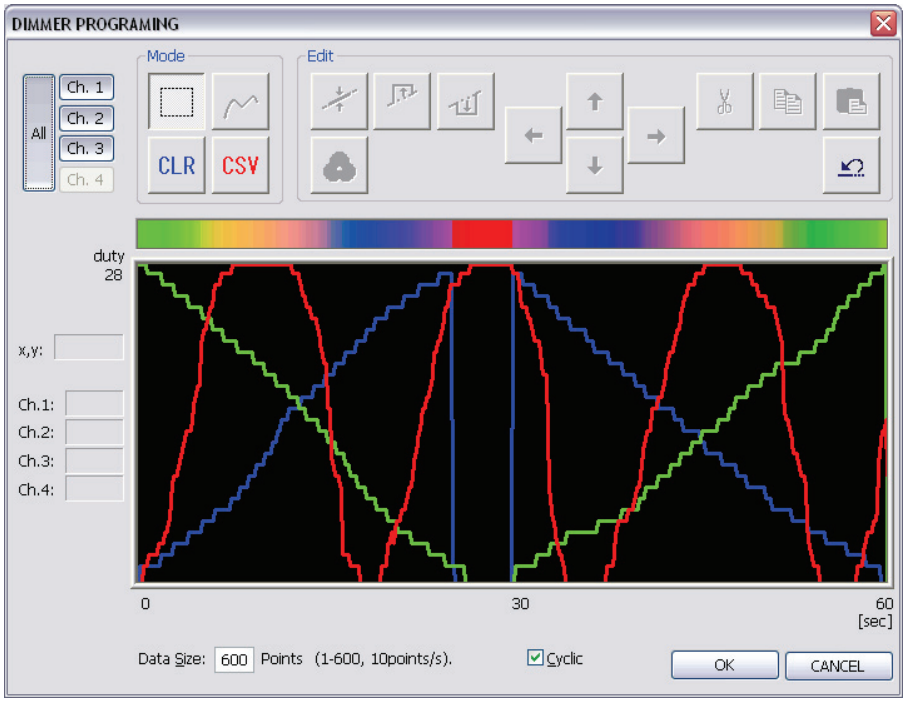
7. Draw something close to the sinusoidal wave below and then click OK.

Figure 7-15 Applilet EZ for HCD Controller Wave Editor (set)



8. Repeat the same process for the red channel to the remaining 2 channels. When done, click on the **OK** button to exit the variable dimmer control window.

Figure 7-16 Applilet EZ for HCD Controller Variable Dimmer Control settings (set)



9. Make sure that the 78K0/IB2 HBLED evaluation board is in programming mode (**SW502.1** set to **OFF**) and the USB cable is connected correctly. **Click the save button and afterwards the All P. button**. After downloading the application disconnect the USB and set the 78K0/IB2 HBLED evaluation board in the run mode as described in Exercise 2 point 7. You should now see the LEDs on the board running the variable dimming application based on the wave table drawn.

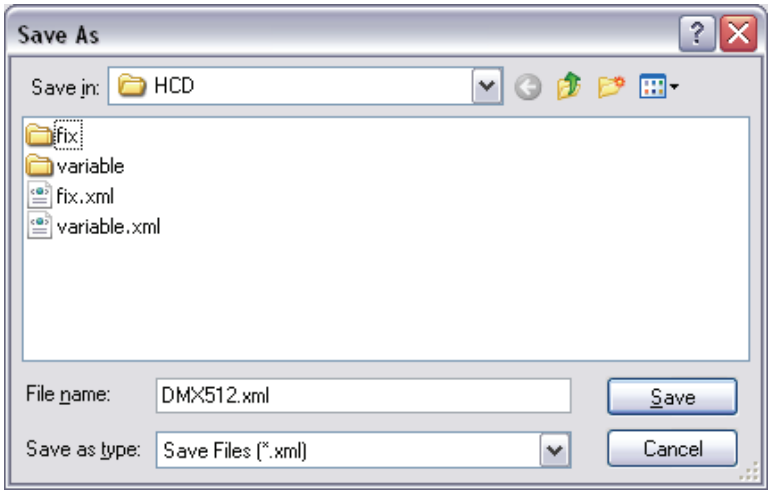
Caution: Do not look into the LEDs directly; doing so may cause weakening eyesight!

7.4 Exercise 4 – DMX512 communication protocol program

This sample shows how to set up the Applilet EZ for HCD Controller to program the DMX512 stack into the µPD78F0756 assembled to the 78K0/IB2 HBLED evaluation board.

1. Make sure that you have set all the settings as explained in Exercise 1.
2. Save the new Applilet EZ for HCD Controller project with the name DMX512.xml. Select **File → Save as..** and input **"DMX512.xml"** and then click Save.

Figure 7-17 Applilet EZ for HCD Controller Save File as (DMX512.xml)

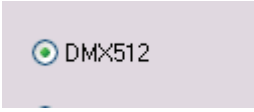


3. Open the DMX512 Property dialogue box by **Project → DMX512…** and check that the settings are chosen as shown below.

Figure 7-18 Applilet EZ for HCD Controller DMX512 Property dialogue box

4. Select the DMX512 Dimmer program.

Figure 7-19 Applilet EZ for HCD Controller DMX512 select



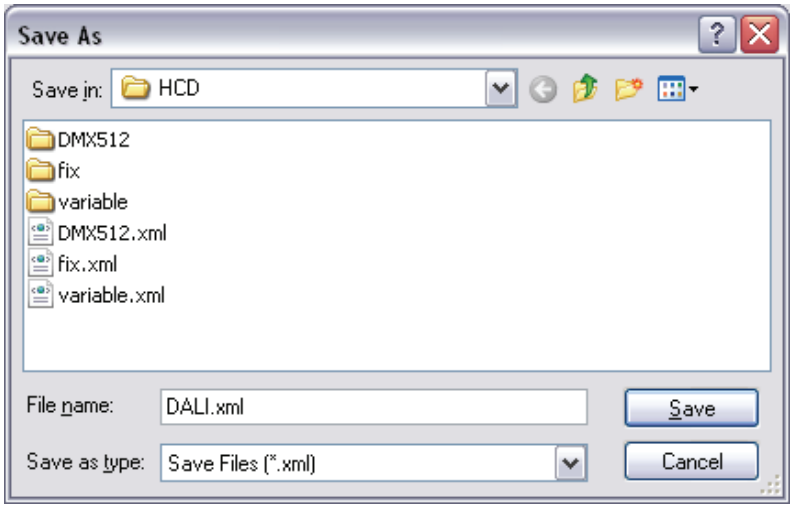
5. Make sure that the 78K0/IB2 HBLED evaluation board is in programming mode (**SW502.1** set to **OFF**) and the USB cable is connected correctly. **Click the save button and afterwards the All P. button**. After downloading the application disconnect the USB and set the 78K0/IB2 HBLED evaluation board in the run mode as described in Exercise 2 point 7. You should now be able to control the LEDs on the 78K0/IB2 HBLED evaluation board via the DMX512 protocol by a connected DMX512 master device (for example the Renesas Electronics demonstration kit 78K0-LIGHTCOMMS)

7.5 Exercise 5 – DALI communication protocol program

This sample shows how to set up the Applilet to program the DALI stack into the µPD78F0756 assembled to the 78K0/IB2 HBLED evaluation board.

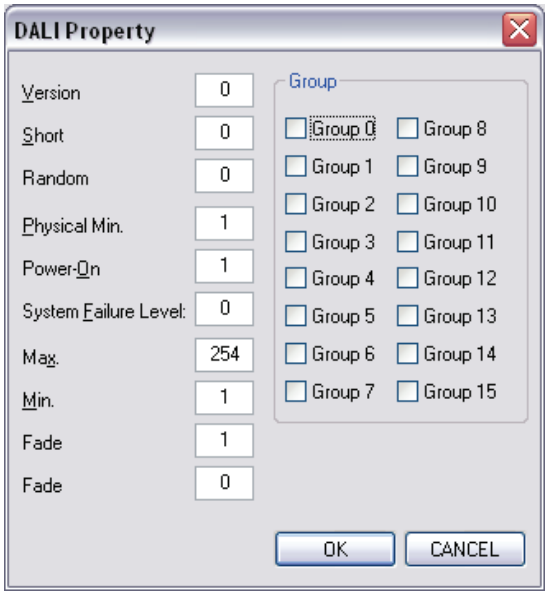
1. Make sure that you have set all the settings as explained in Exercise 1.
2. Save the new Applilet EZ project name to variable.xml. Select **File → Save as..** and input **"DALI.xml"** and then click Save.

Figure 7-20 Applilet EZ for HCD Controller Save File as (DALI.xml)



3. Open the DALI Property dialogue box by **Project → DALI…** and check that the settings are chosen as shown below.

Figure7-21 Applilet EZ for HCD Controller DALI Property dialogue box



4. Select the DALI Dimmer program.

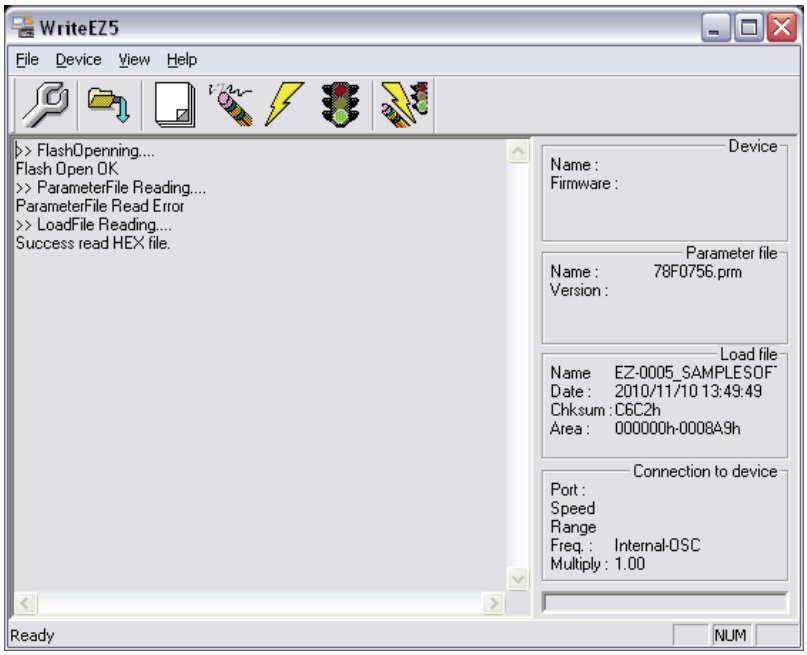
Figure 7-22 Applilet EZ for HCD Controller DALI select

5. Make sure that the 78K0/IB2 HBLED evaluation board is in programming mode (**SW502.1** set to **OFF**) and the USB cable is connected correctly. **Click the save button and afterwards the All P. button**. After downloading the application disconnect the USB and set the 78K0/IB2 HBLED evaluation board in the run mode as described in Exercise 2 point 7. You should now be able to control the LEDs on the 78K0/IB2 HBLED evaluation board via the DALI protocol by a connected DALI master device (for example the Renesas Electronics demonstration kit 78K0-LIGHTCOMMS).

Chapter 8 Flash Programmer WriteEZ5

The WriteEZ5 is a flash programming software to flash hex files to the related device. For installation information refer to the chapter WriteEZ5 installation.

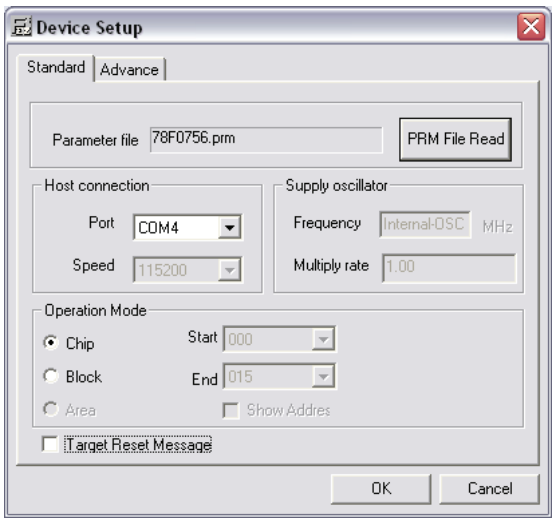
Figure 8-1 WriteEZ5 Startup



8.1 Device Setup

To provide all necessary information about the device to be programmed, only the corresponding flash parameter file must be loaded. The parameter file (*.prm) for the µPD78F0756 is located on the CDROM, in the same folder as the WriteEZ5 setup file. Please use the menu **"Device → Setup…"** to open the following dialogue and the button **"PRM File Read"** to select the parameter file.

Figure 8-2 WriteEZ5 Device Setup Dialogue



Please check that the correct host communication port is selected. The used communication port can be seen in the Windows Device Manager.

8.2 Using WriteEZ5

After a successful device selection the internal flash memory can be blank-checked, erased, programmed and/or verified. WriteEZ5 can be controlled either by menu or by buttons.

Figure 8-3 WriteEZ5 Device Menu

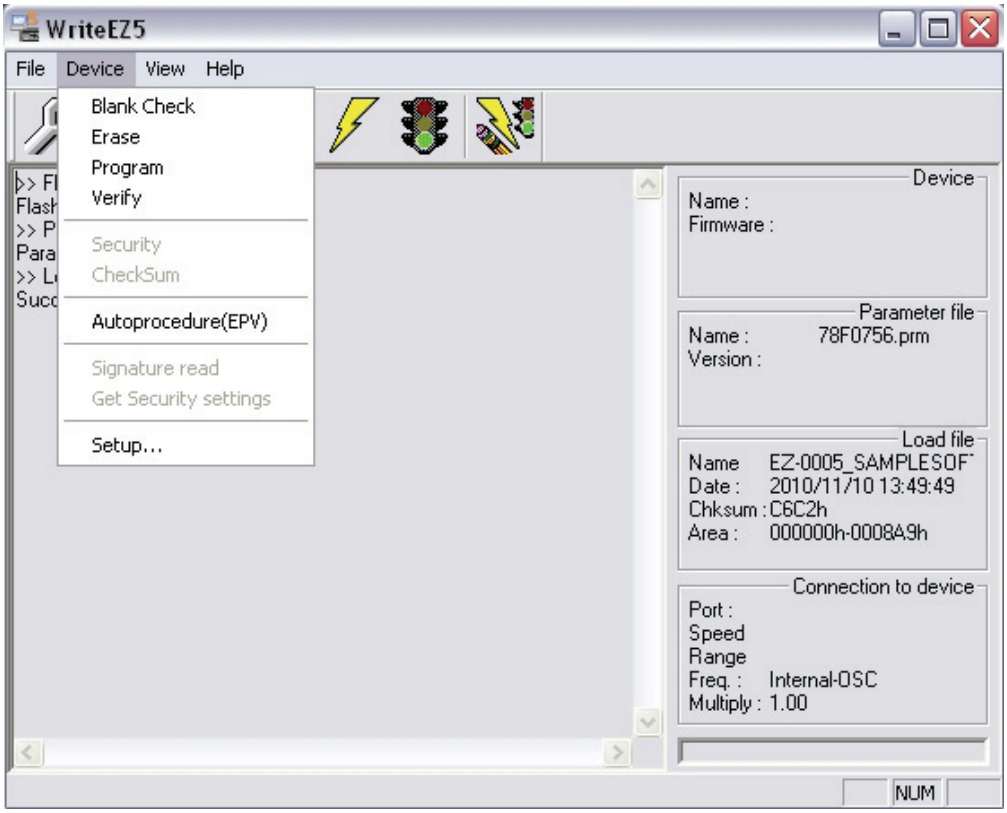


Table 8-1 WriteEZ5 action buttons

	device setup button
	load file button
	blank check button
	erase button
	program button
	verity button
	erase / program / verify button

WriteEZ5 supports Intel-Hex and Motorola S-record file formats as input file

Chapter 9 IAR Embedded Workbench sample project

The following chapter describes the necessary steps to set up an IAR C-SPY debug session using the 78K0/IB2 HBLED evaluation board with the sample project provided on the *78K0/Ix2 LED Control* CD-ROM. This chapter will not deal with deeper information about the IAR Embedded Workbench but only how to start a C-SPY debug session on the evaluation board. For further information about the IAR Embedded Workbench for 78K please refer to the regarding User's manuals from IAR Systems.

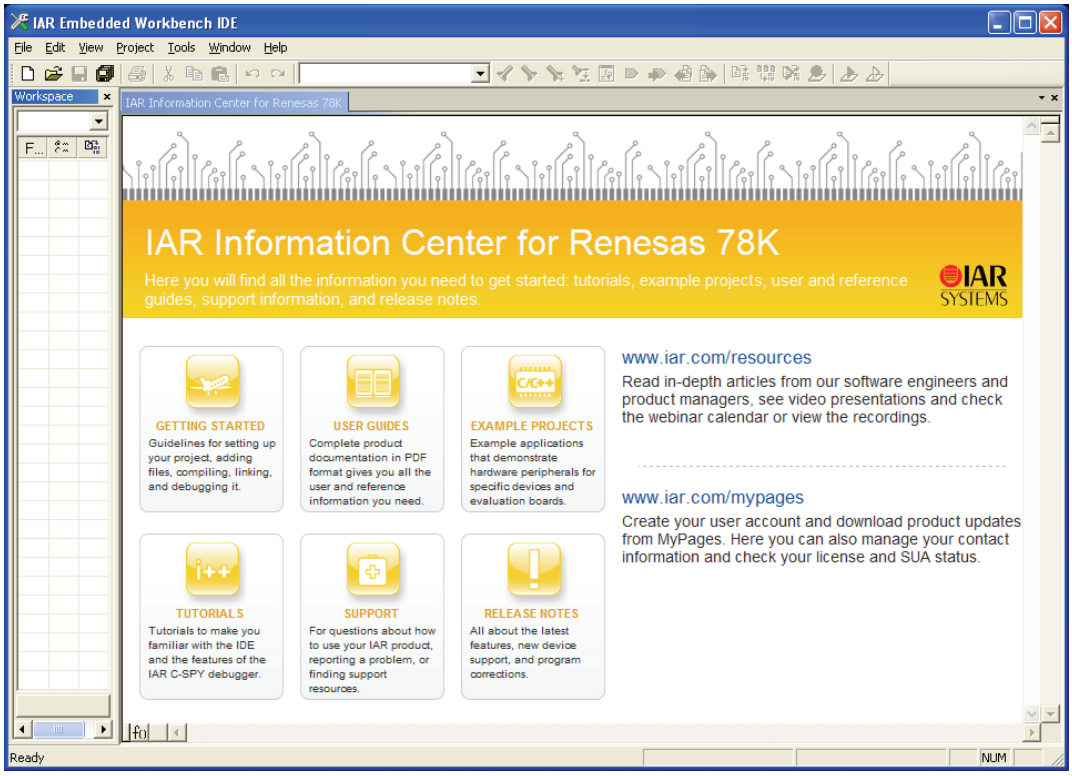
9.1 Load the IAR Embedded Workbench sample project

After copying the IAR sample project to the hard drive of your Host PC as described in chapter 5.4 Sample program installation you shall be able to run this sample project.

To start the IAR Embedded Workbench 16K Kickstart for 78K click **Start → All Programs → IAR Systems → IAR Embedded Workbench for 78K v4.70 Kickstart → IAR Embedded Workbench**.

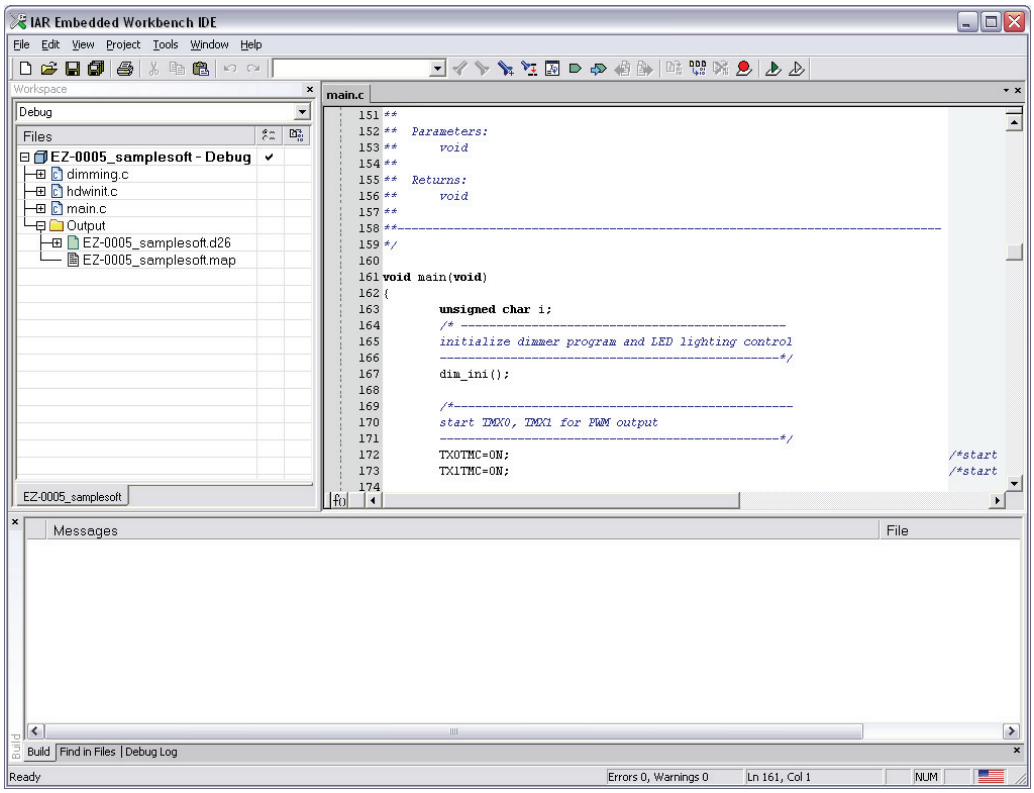
The Embedded Workbench starts up and shows the IAR Information Center for Renesas 78K. To open the sample project workspace press the **File → Open → Workspace…** and locate the **EZ-0005_samplesoft.eww** file in the sample program folder.

Figure 9-1 IAR Embedded Workbench Information Center



The project shall show up on the left side of the IAR Embedded Workbench window in the Workspace view.

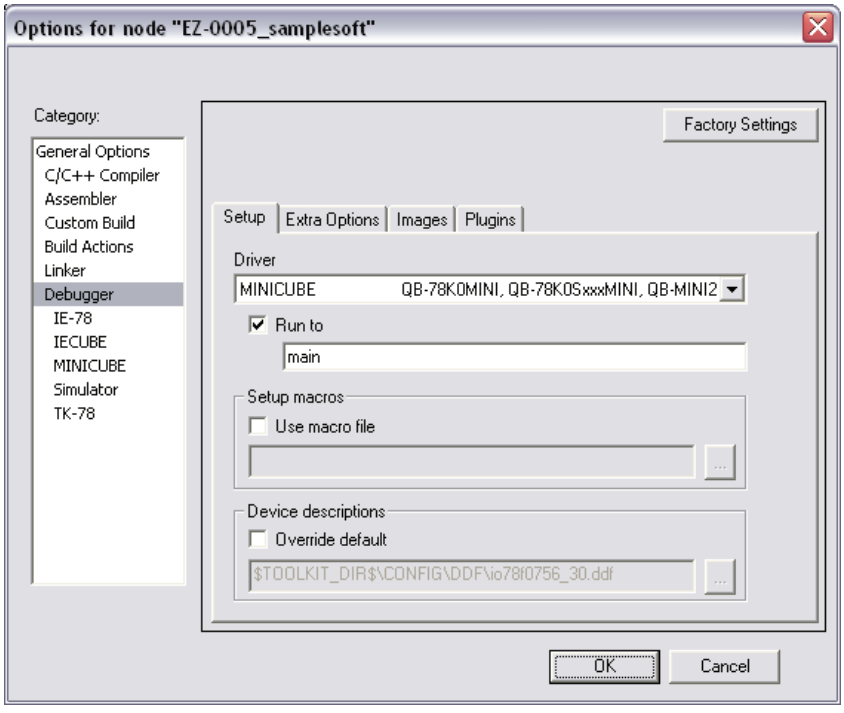
Figure 9-2 IAR Embedded Workbench IDE view



9.2 Build and Debug

Before building the project please check that MINICUBE is selected as Debugger Driver. Therefore open the Debugger settings by clicking **Project → Options** and select the Category **Debugger.**

Figure 9-3 IAR Embedded Workbench Debugger Settings



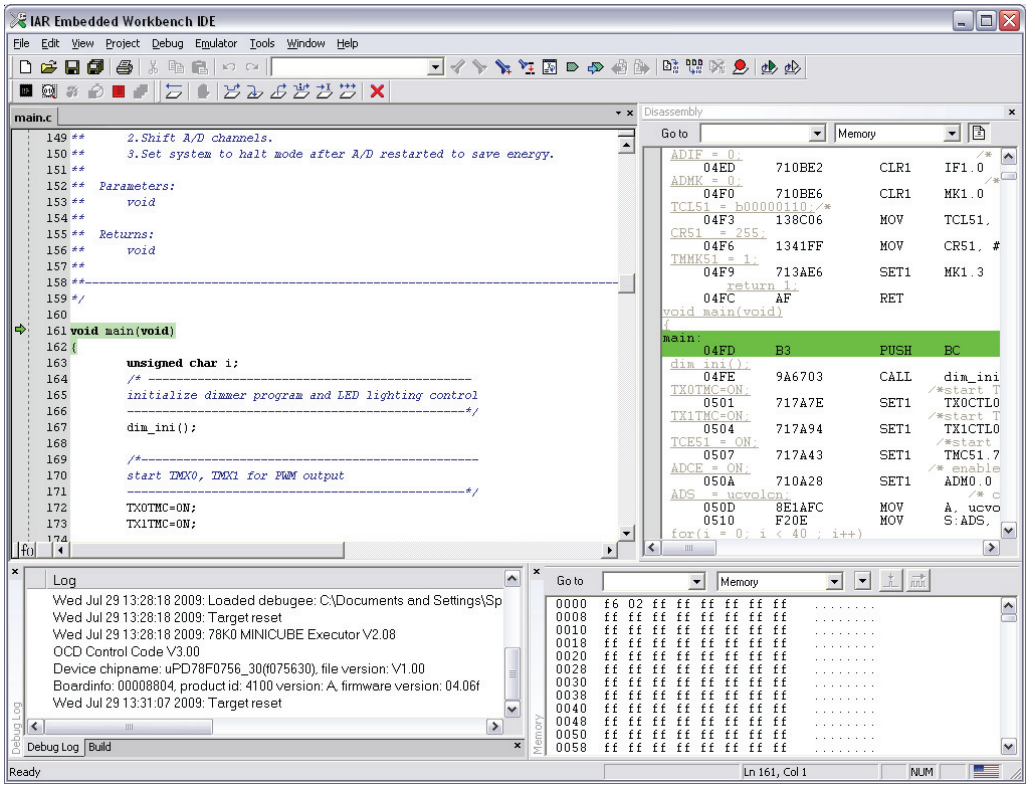
To be able to run the sample project, connect the 78K0/IB2 HBLED evaluation board to the Host PC and the power supply, with the following **SW502** switch setting chosen.

Table 9-1 Switch settings for OCD

SW502 pin	SW502 position
SW502.1	OFF
SW502.2	Don't care
SW502.3	Don't care
SW502.4	Don't care
SW502.5	ON
SW502.6	ON
SW502.7	OFF
SW502.8	OFF

When the 78K0/IB2 HBLED evaluation board is connected correctly to the Host PC and MINICUBE is selected as Debugger driver you shall be able to build, download and debug the sample project. Therefore just press the **Download and Debug** button ( ) or click **Project → Download and Debug**. After downloading the sample project to the target device the IAR C-SPY debugger shows up and the program shall be stopped at the beginning of the **main()** function.

Figure 9-4 IAR C-SPY debugger window



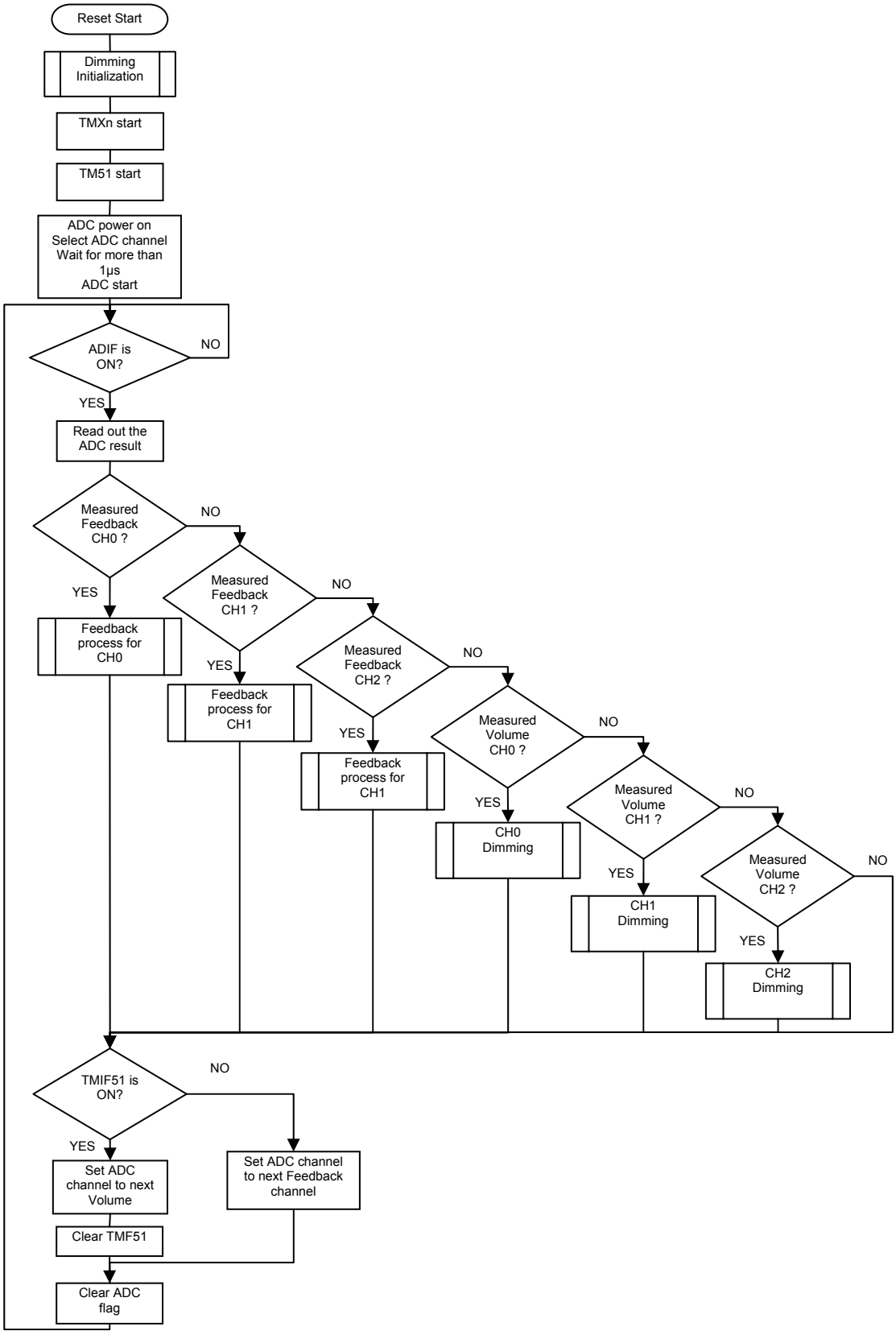
To run the application press the **Run** button . When the program is running you are able to dim the 3 high brightness LEDs (**D101, D201 and D301**), mounted to the 78K0/IB2 HBLED evaluation board, just change the position of the variable resistors **VR601, VR602** and **VR603**.

Caution: **Do not look into the LEDs directly; doing so may cause weakening eyesight!**

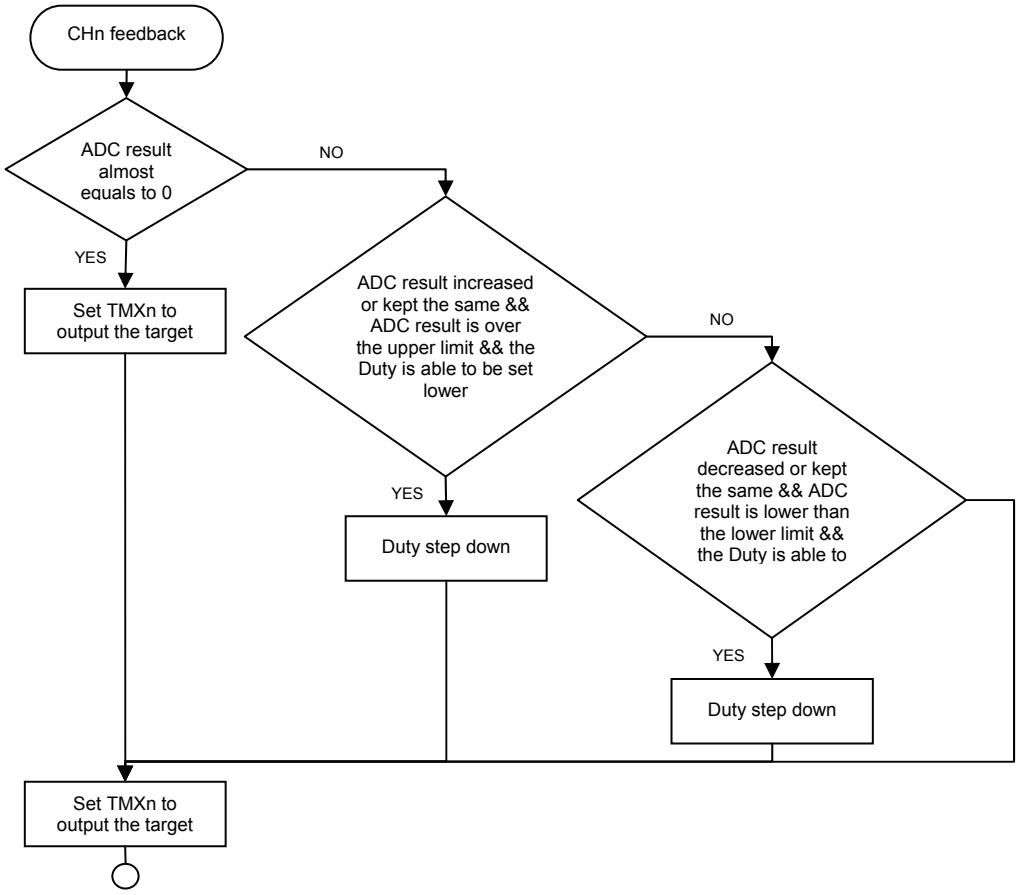
9.3 Sample Project Flow chart

The following flow chart diagrams show the functionality of the *78K0/Ix2 LED Control* IAR Embedded Workbench sample project.

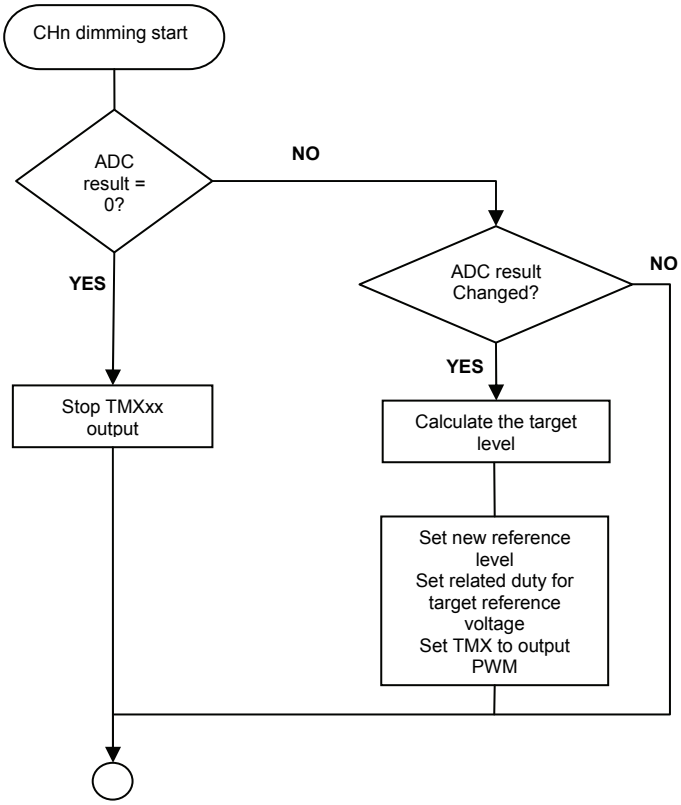
9.3.1 Main loop



9.3.2 CHn feedback function (n = 0, 1, 2)



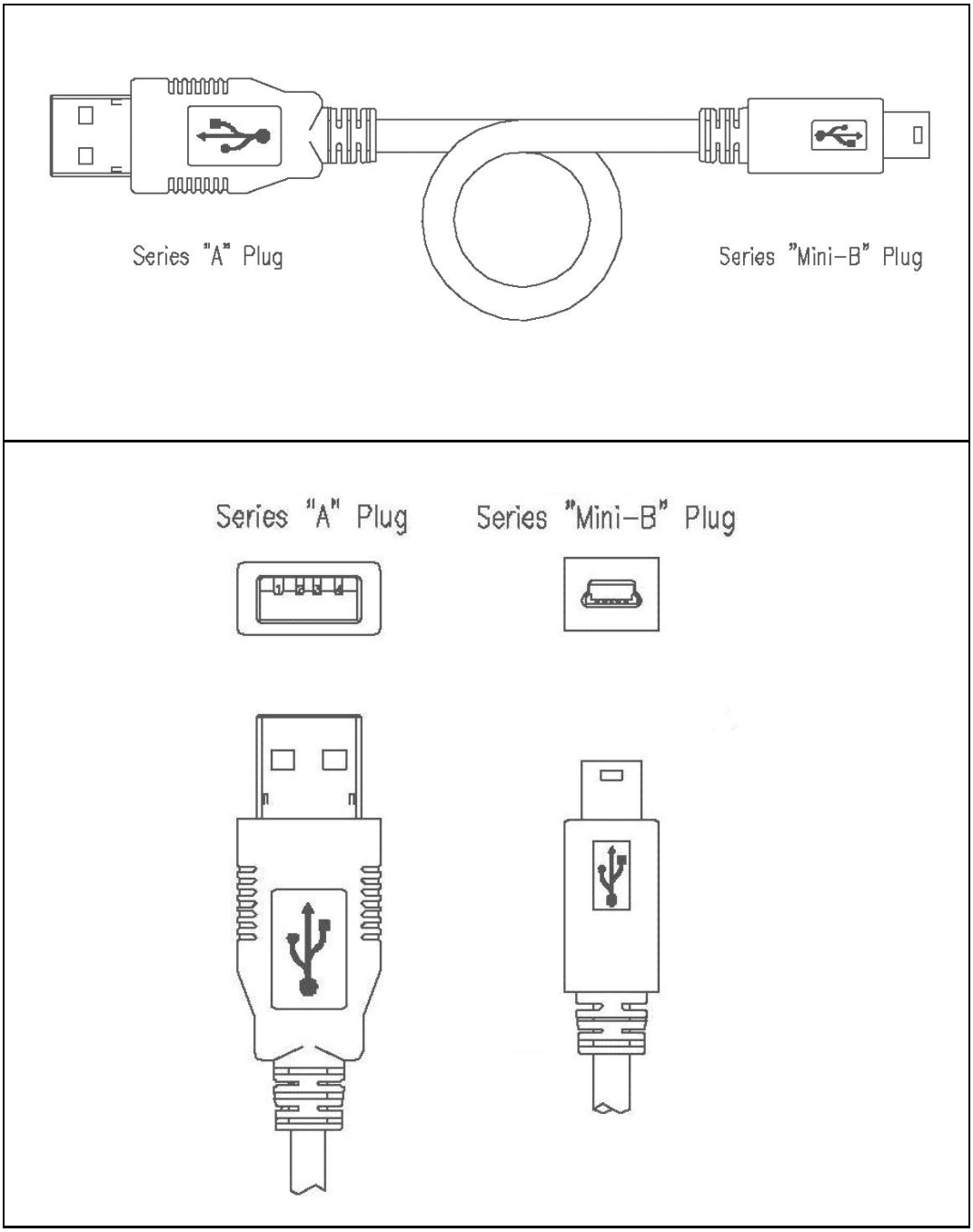
9.3.3 CHn dimming function (n = 0, 1, 2)



Chapter 10 Cables

10.1 USB interface cable (Mini-B type)

Figure 10-1 USB interface cable (Mini-B type)



Chapter 11 Schematics

Please find the schematics attached to this document. To open the attachments view in the Adobe Reader press the paper clip in the lower left corner of the window. To open the attachment double click the EZ-LED1-002_Schematic.pdf.

[MEMO]

78K0/Ix2 LED Control User's Manual

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Colophon 1.0

78K0/Ix2 LED Control

Renesas Electronics Corporation