

User's Manual

StickLIN-78K0

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CAUTION

- Do not give any physical damage to this equipment such as dropping
- Do not superimpose voltage to this equipment.
- Do not use this equipment with the temperature below 0°C or over 40°C.
- Make sure the USB cables are properly connected.
- Do not bend or stretch the USB cables.
- Keep this equipment away from water.
- Take extra care to electric shock.
- This equipment should be handled like a CMOS semiconductor device. The user must take all precautions to avoid build-up of static electricity while working with this equipment.
- All test and measurement tool including the workbench must be grounded.
- The user/operator must be grounded using the wrist strap.
- The connectors and/or device pins should not be touched with bare hands.

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Introduction

Target Reader	This document intended for users for the 78K0 series microcomputer development tools. A basic knowledge of microcomputers, C language, assembles, and Windows™ operating is assumed.
Purpose	This material has aimed the understanding of the customer of a basic operation method of the development tool for 78K0 series appended to StickLIN-78K0 evaluation kit. Readers will be able to further their understanding by actually using the development tool while reading this document.
How to use this manual	This PDF file should be read with Adobe™ Acrobat™ Reader5.0 or later.
Organization	<p>This manual consists of the following contents</p> <p>Chapter 1 Preparations</p> <p>→ This chapter provides an outline of the 78K0 series development used in this guide and describes the sample program installation method.</p> <p>Chapter 2 Experiences</p> <p>→ Experience the basic operations of integrated development environment (PM+) and integrated debugger (ID78K0-QB-EZ) with using sample programs.</p> <p>Chapter 3 Hardware Specifications</p> <p>→ Explain the hardware of StickLIN-78K0.</p> <p>Chapter 4 Troubleshooting</p> <p>→ Describe how to solve troubles you may face, such as errors when starting the integrated debugger (ID78K0-QB-EZ).</p> <p>Chapter 5 Other Information</p> <p>→ It explains the new making method of the PM+ workspace(project), the additional registration method of the source file, and how to use of WriteEZ3.</p>

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CHAPTER 1 Preparation

This chapter provides an outline of the development tools used in this document and describes how to install the sample programs.

The sample program function only for the development tools included in the StickLIN-78K0 evaluation kit in this document

1.1 Development tools / Software

This section outlines the development tools used in this document.

The name of the development tools and their main function are as follows.

● Device file DF788020 V1.00

Since the device file contains the device-specific information, this file is required for using the development tools.

The sample used in this document has been created as a StickLIN-78K0 (uPD78F8020DA)

● Integrated development environment PM+ V6.30

This is an integrated development environment platform that operates on Windows.

An editor with an idea processor function is provided as the Edit window, allowing efficient development linked with development tools such as a compiler and a debugger.

● C compiler CC78K0 W4.00 (size restriction version)

It is "Object size restriction(32Kbyte)" compiler for 78K0 series.

It is a program that translates the source program written by C language for 78K0 series and C language in accordance with ANSI-C into the machine language.

The source program written by C language is input, and the object program that becomes an input of the source program and the linker that becomes an input of the assembler for 78K0 series is output.

● Assembler RA78K0 W4.01 (size restriction version)

It is "Object size restriction(32Kbyte)" assembler for 78K0 series.

The source program written by the assembly language for 78K0 series is input, and the generic name of a series of program that object program of the machine language. The output object program becomes an input of the flash programmer and debugger.

● 78K0 integrated debugger ID78K0-QB-EZ V3.00

This is windows-based software that runs on a host PC.

It is integrated debugger that achieves debug at source level C.

Source debug of the reference, the change in the variable, and the step execution, etc. by such source line can be done easily and efficiently.

● Program for writing to on-chip flash memory of microcontroller WriteEZ3

This is a Windows-based software used to write programs to the on-chip flash memory of a microcontroller.

It is possible to write/delete it to a built-in flash memory of uPD78F8020DA by connecting StickLIN-78K0 with the PC .

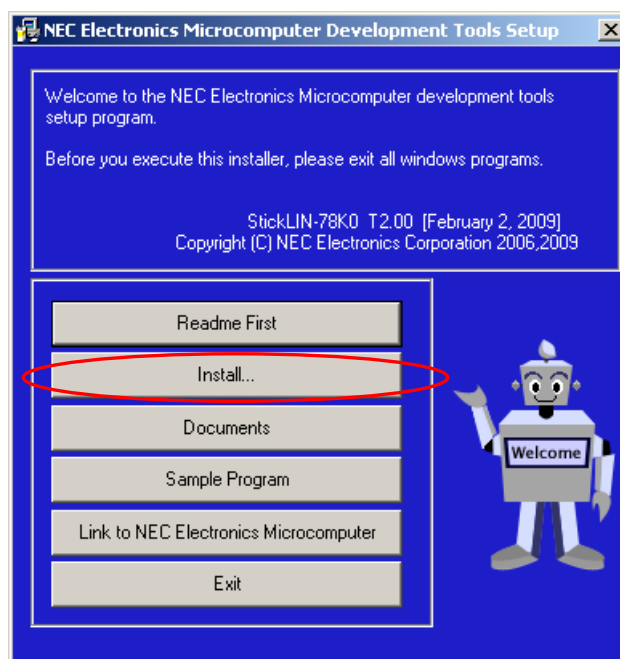
1.2 Installation of Development Tools

1.2.1 Installation Package

The attached CD-ROM includes the development tools and documentations. Users can use the installer to install those development tools and documentations.

1.2.2 Installation of Development Tools

- ① Please insert the CD-ROM in the drive. The installer will show up automatically. If it does not start automatically, please initiate it by double clicking the SETUP.EXE.

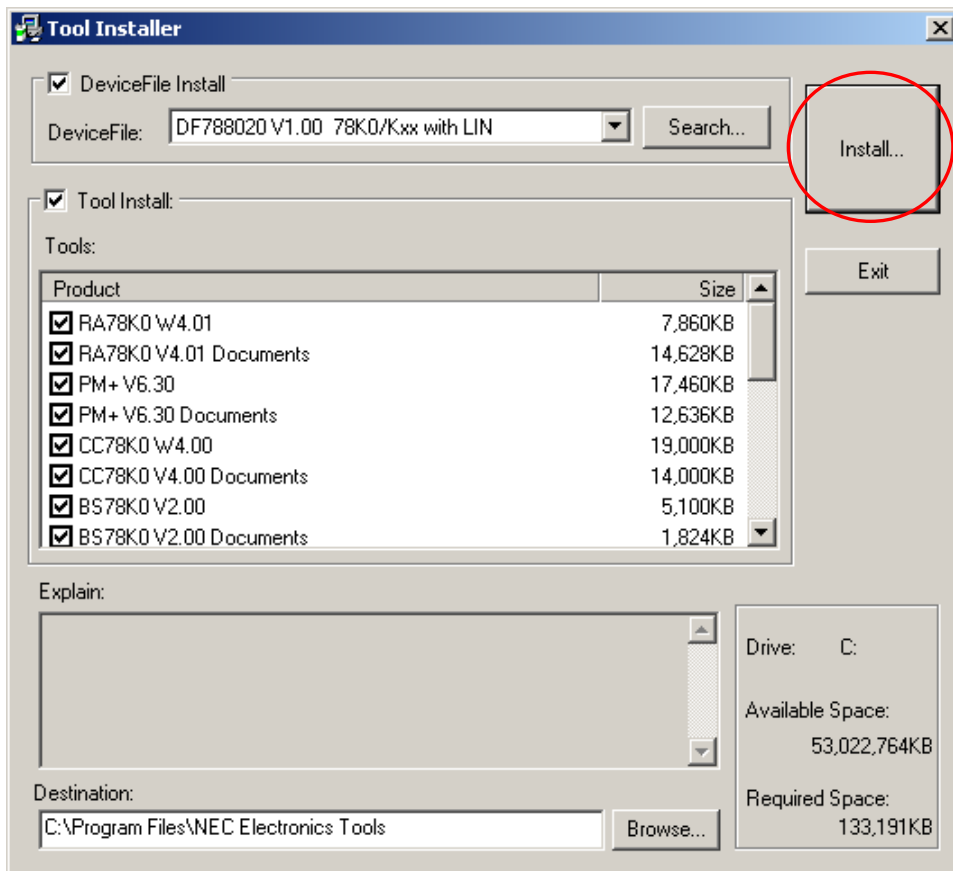


- ② Click the "Install"

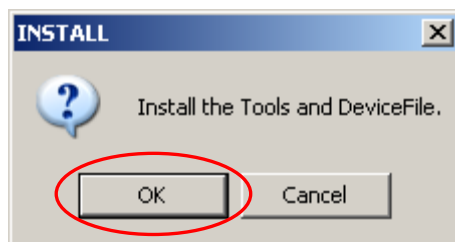
- ③ "Tool Installer" dialog box is opened.
Select products that you need to install.
(as default, all the products that you need to use the StickLIN-78K0 are selected.)
"Explain" area displays an explanation of the selected product.
To change the installation destination, click .

When all the settings are completed, click .

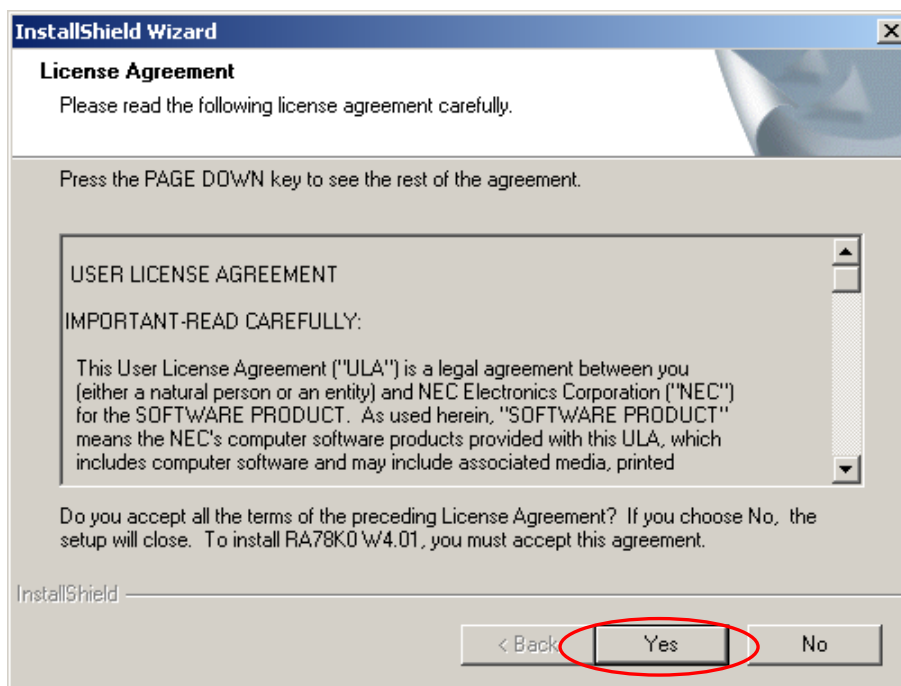
* In this document, it is assumed that users install the programs under "NEC Electronics Tools" directory (default installation directory). Users can find the tools by selecting "Start Menu" -> "Programs" -> "NEC Electronics Tools".



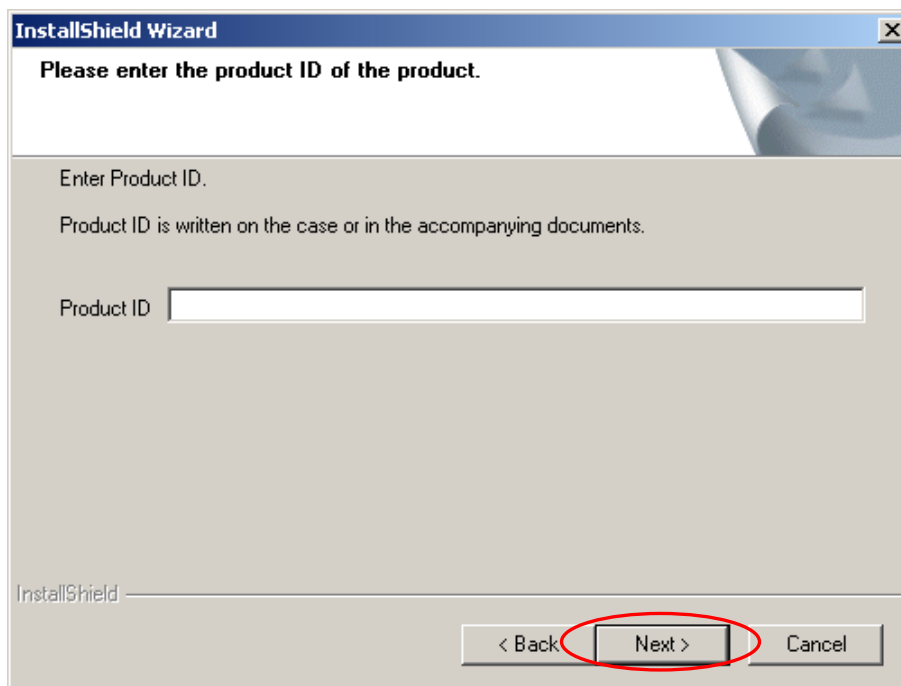
- ④ Click OK when "Install" confirmation dialog box is opened.



- ⑤ Read "software license agreement" and click for continuing the installation. To stop the installation, click .

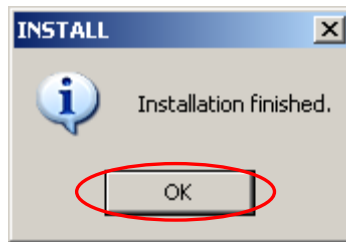


- ⑥ Enter the product ID, and click .
* The product ID is available on the other sheet.



- ⑦ It starts copying the files.

- ⑧ When the installation is completed, the following dialog opens.
Click .



To install this tool in Windows 2000 or XP, the authority of an administrator is necessary. Therefore, please login as an administrator.

Please do not use 2-byte characters, such as umlaut in the directory name, where the product is to be installed.

If the language of the Windows is not English, a file transfer error during installation might be observed. In this case, please abort the installation in the language, and re-install it in an English version of Windows.

The identical problem may be observed, if a language other than English is specified as the system language in the "Regional Settings Properties" tab.

Assembler RA78K0 and C compiler CC78K0 limit the object size to 32Kbyte.

1.3 Sample environment

This section describes the preparations for the sample programs used in this document. The preparations consist of installing the sample programs in the customer's environment.

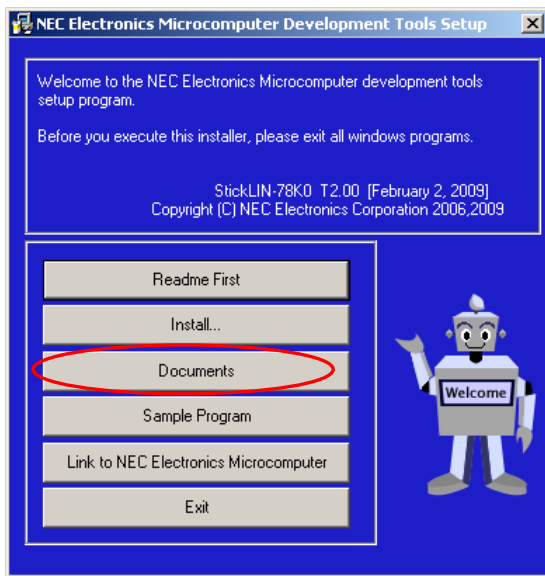
To uninstall the sample programs, delete the folder that was specified as the installation destination.

The installation method and the installation destination are described below.

● Installing the sample programs

Insert the CD-ROM disk provided as part of the StickLIN-78K0 products in the CD-ROM drive. The [NEC Electronics Microprocessor Development Tools Setup] screen automatically appears. (if this screen does not appear automatically, start setup.exe from Explorer. etc.)

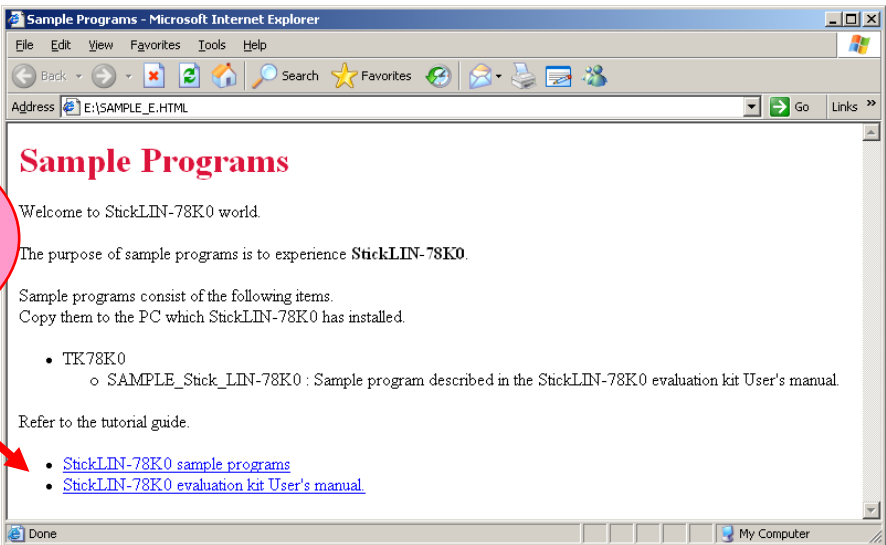
Press the **Sample Program** button to start the WWW browser, and then click the [Stick LIN-78K0 Sample Programs] link.



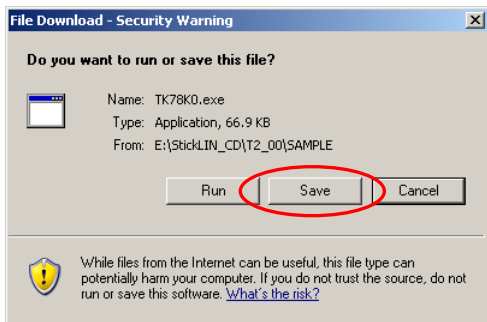
The WWW browser start up.



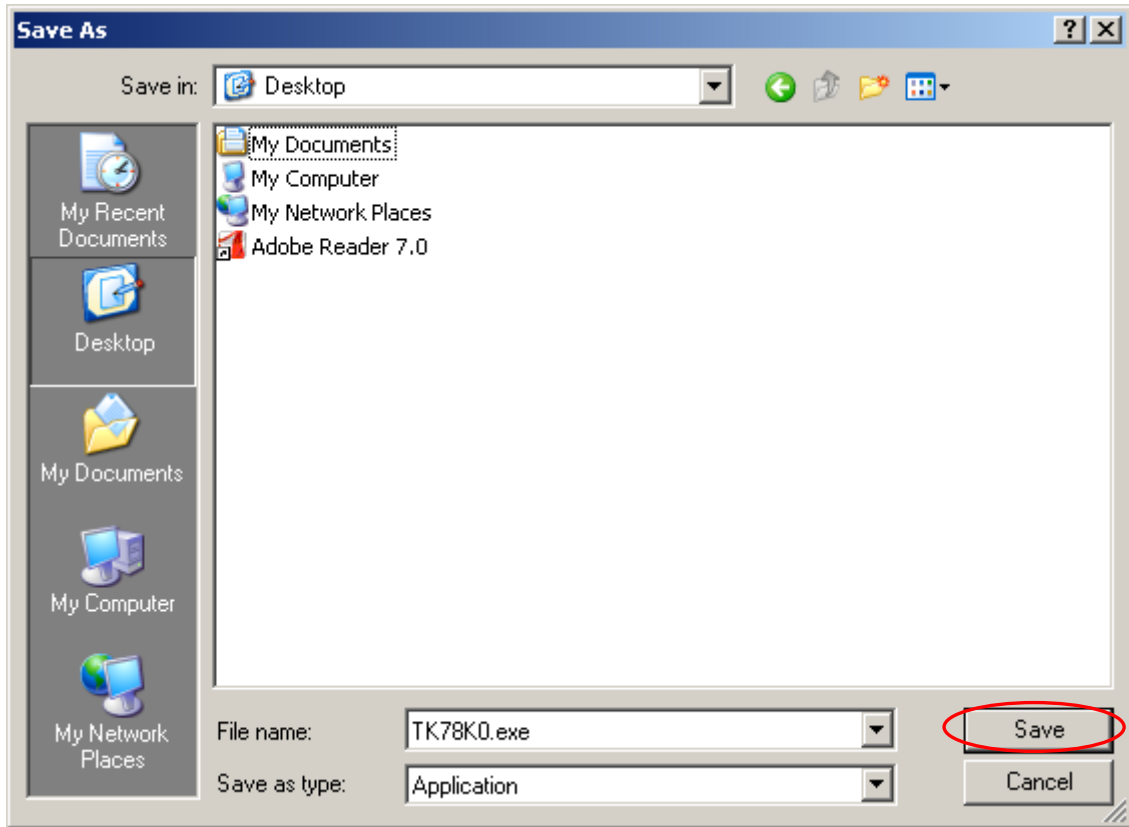
Click the [Stick LIN-78K0 Sample programs] link you can also download the [User's Manual]



When [Stick LIN-78K0 Sample Programs] is clicked, the following download confirmation window appears.



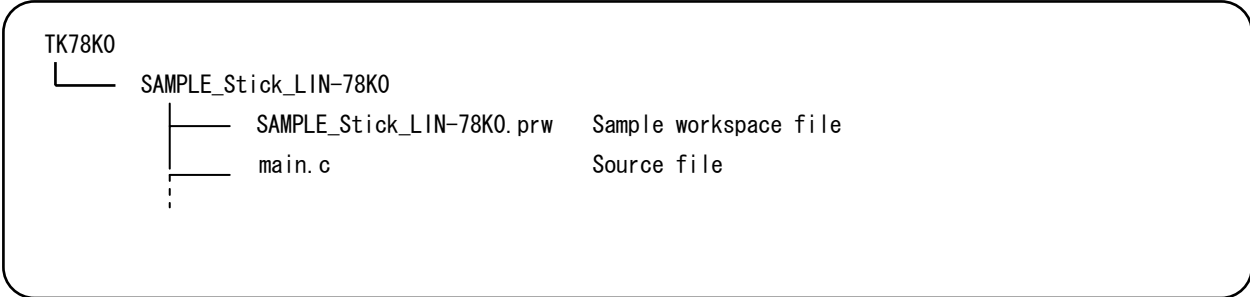
Please push the **Save** button.



After specifying the download destination folder, press the **Save** button. The self-extraction sample program set (TK78K0.exe) is copied to the specified folder. The folder that the "TK78K0" folder is made when this file is executed, and the sample program is stored under the folder in addition is made.

● Folder structure of sample programs

When the sample program set is decompressed, the files are to the following folder structure..



1.4 Installation of USB Driver

"NEC Electronics Starter Kit Virtual UART" USB driver must be installed on PC before you start using the StickLIN-78K0.

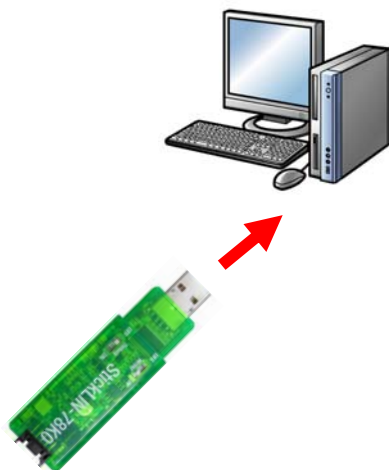
Please, follow the instruction below to install the driver.

"Starter Kit USB Driver" must be installed on the PC. If not, please refer to "1.2 Installation of Development Tools" to install the driver first.

CAUTION:

Do not use a USB hub for connecting StickLIN-78K0.

First, connect the Stick-LIN-78K0 to PC with USB.



Depending on the version of Windows OS, the installation will be differed. Please check your Windows version, and follow the instructions

- Windows XP → "1.4.1 Installation on Windows XP"
- Windows 2000 → "1.4.2 Installation on Windows 2000"

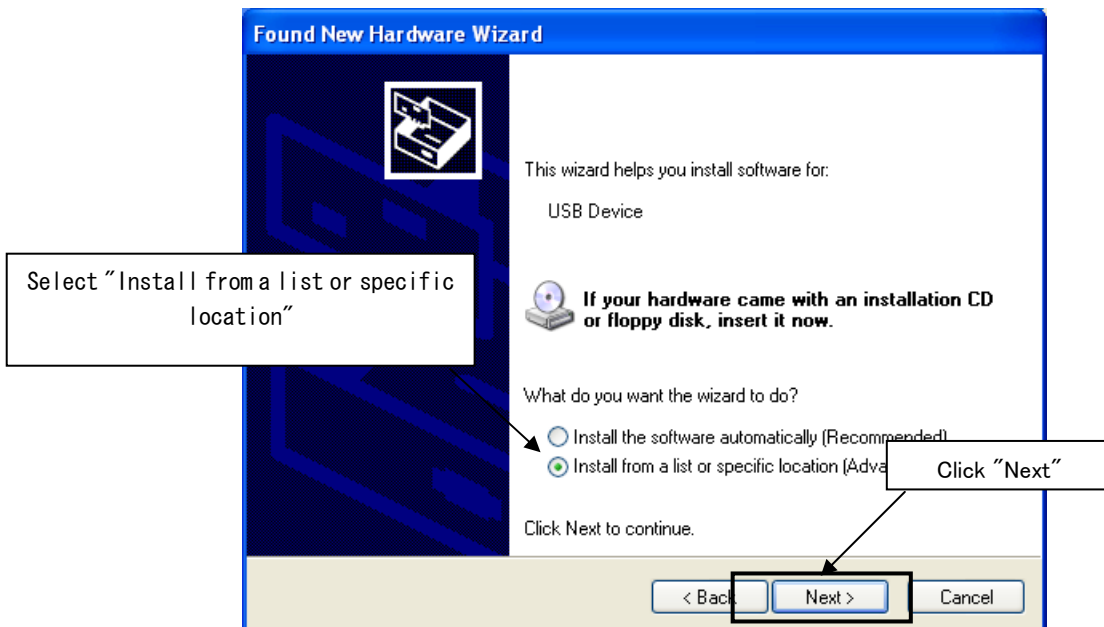
After the installation, go to "1.4.3 Completion of USB Driver Installation"

1.4.1 Installation on Windows XP

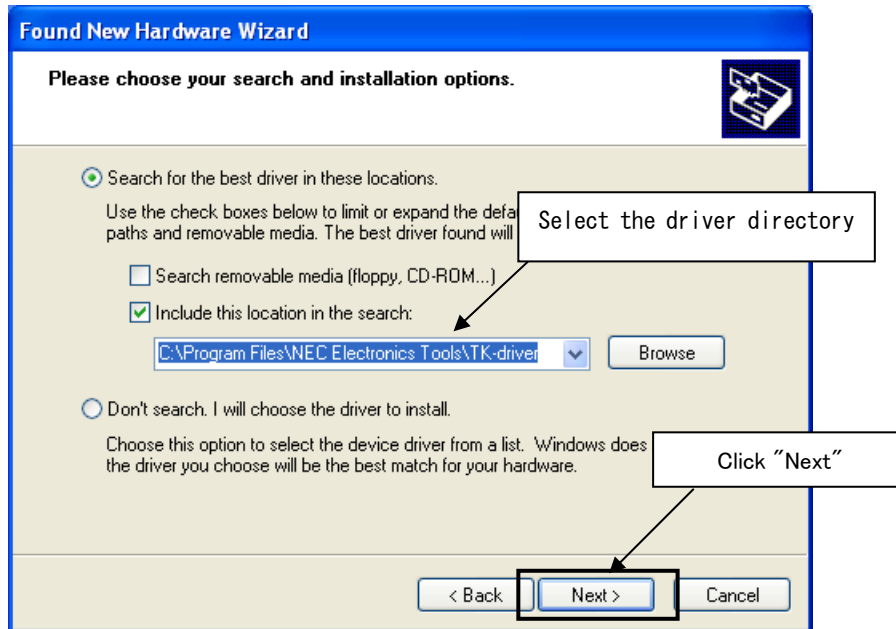
1. Once the StickLIN-78K0 is connected with USB, the "Found New Hardware Wizard" will be started. Select "No, not this time" and click **Next >** .



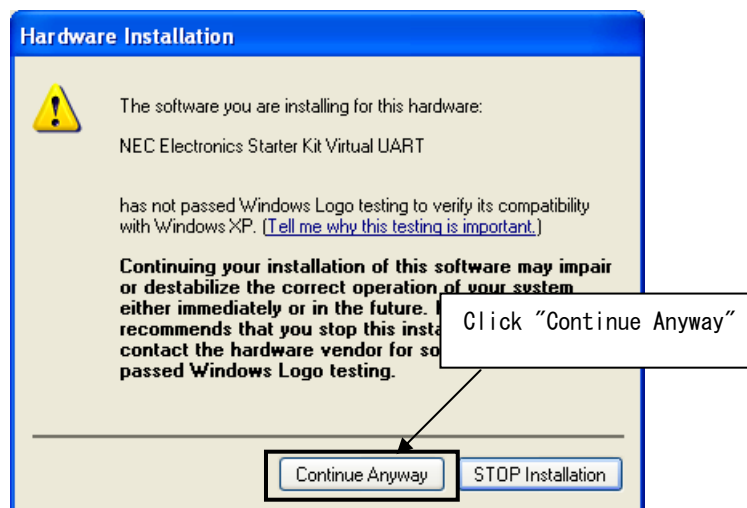
2. Select "Install from a list or specific location" and click **Next >** .



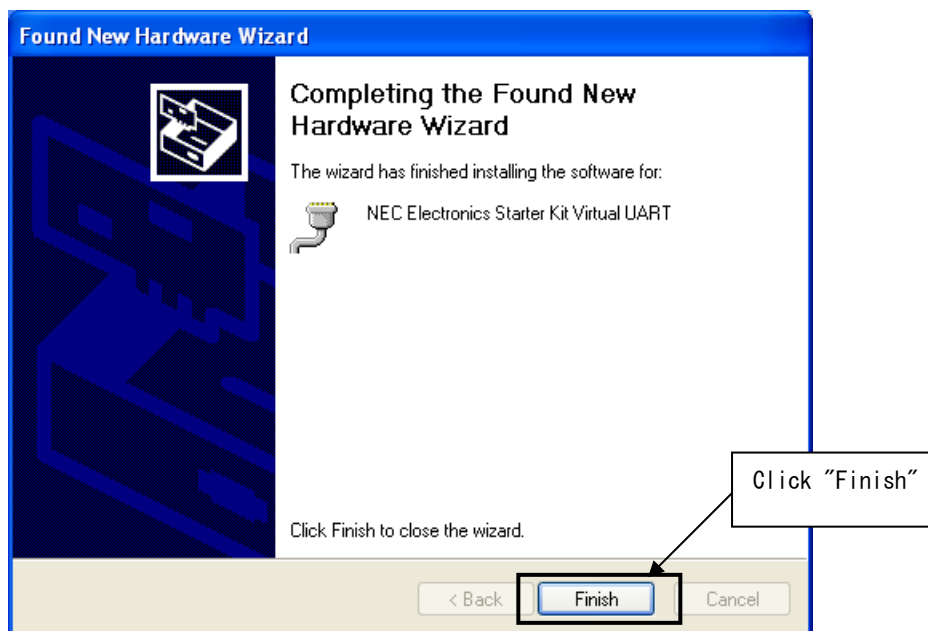
3. Select "Search for the best driver in these locations.", check "Include this location in the search:", and then click "Browse..." to select the driver directory path. The path should be "C:\Program Files\NEC Electronics Tools\TK-driver" as default installation. If the installation directory is not default, then select "TK-driver" under the installation directory. Click **Next >**.



4. If the following dialog is opened, click **Continue Anyway**.



6. The installation of "NEC Electronics Starter Kit Virtual UART" driver is completed. Click **Finish** .



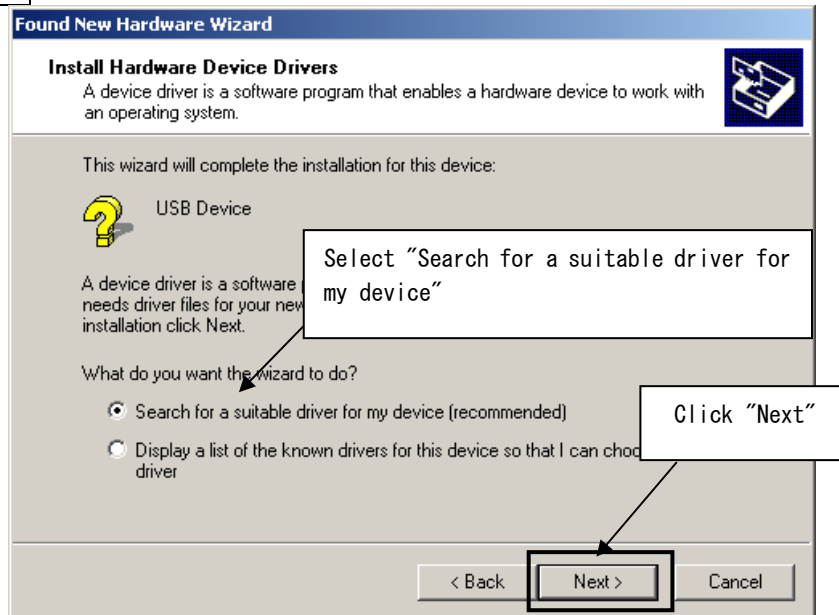
7. Go to "1.4.3 Completion of USB Driver Installation".

1.4.2 Installation on Windows 2000

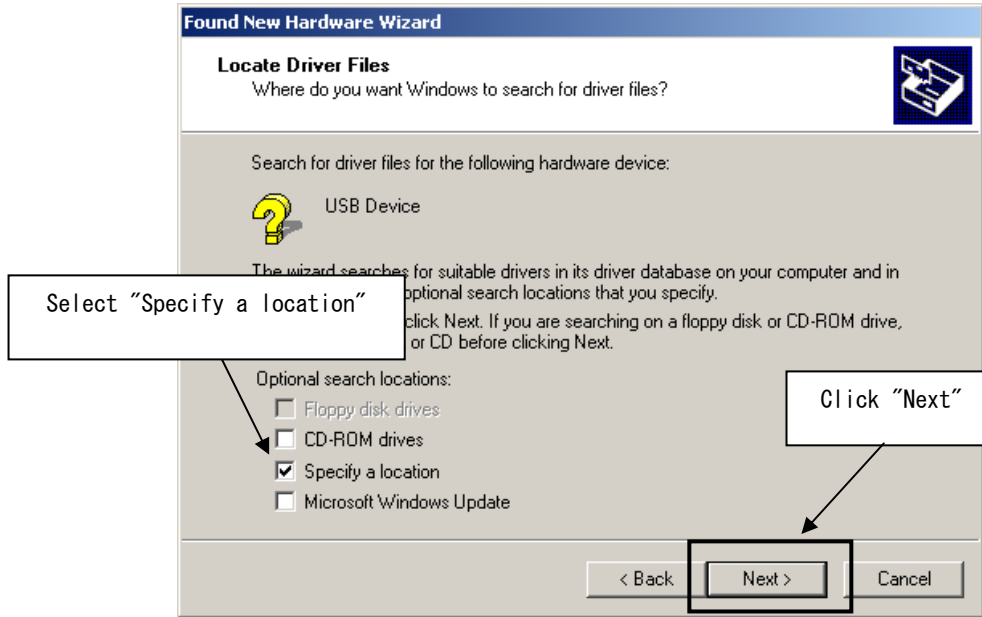
1. Once the StickLIN-78K0 is connected with USB, the "Found New Hardware Wizard" will be started. Select "No, not this time" and click **Next >**.



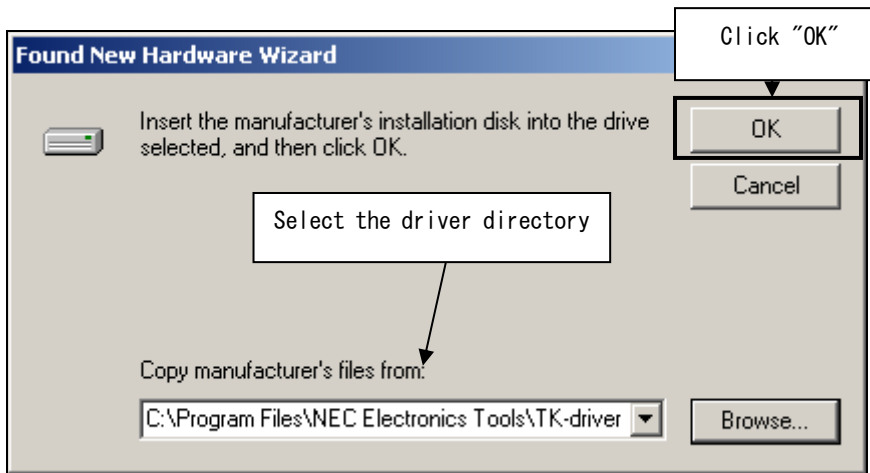
2. Select "Search for a suitable driver for my device". Click **Next >**.



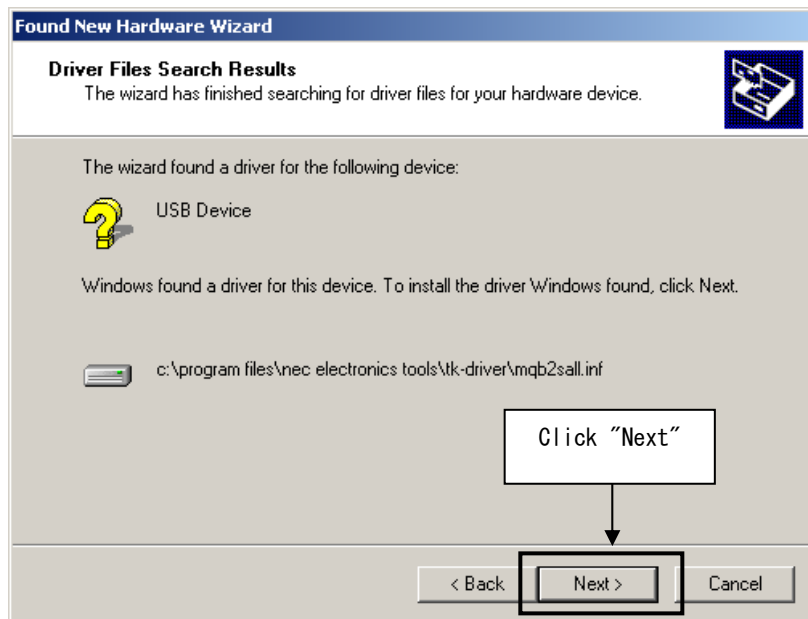
3. Select "Specify a location".
Click **Next >** .



4. Select the driver directory path. The path should be "C:\Program Files\NEC Electronics Tools\TK-driver" as default installation.
If the installation directory is not default, then select "TK-driver" under the installation directory.
Click **OK** .



5. Click **Next >** .



6. The installation of "NEC Electronics Starter Kit Virtual UART" driver is completed. Click **Finish** .



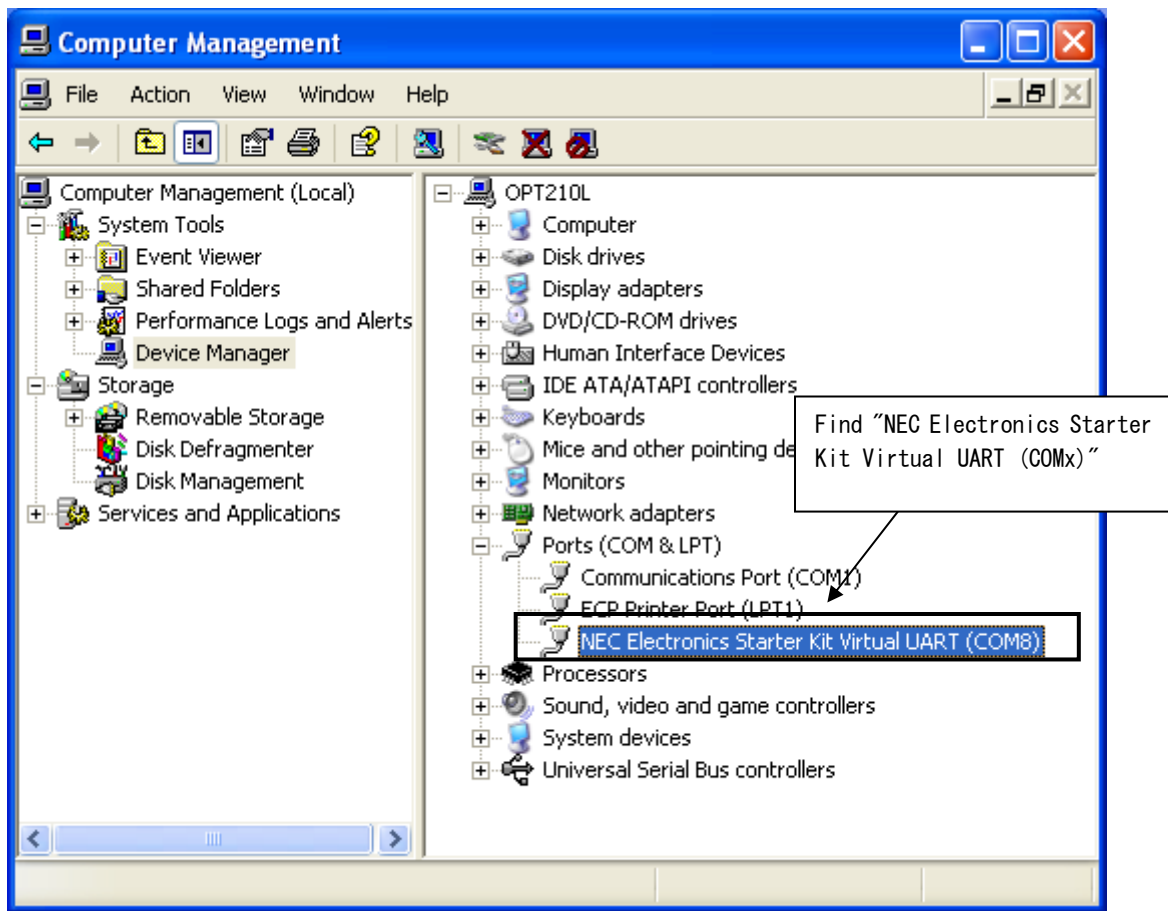
7. Go to "1.4.3 Completion of USB Driver Installation".

1.4.3 Completion of USB Driver Installation

Confirm the USB driver is installed on PC.

Start "Device Manager", and find "NEC Electronics Starter Kit Virtual UART" (without "?" mark) under the "Ports (COM & LPT)".

Device Manager



The screen above shows that the COM port number is "COM8". If ID78K0-QB-EZ is not in use, you can use this port number for connecting StickLIN-78K0. When you change the USB port connection, the COM port number will be changed as well.

CAUTION

- Do not do "Hardware Modification Scan" when you communicate with the target device.

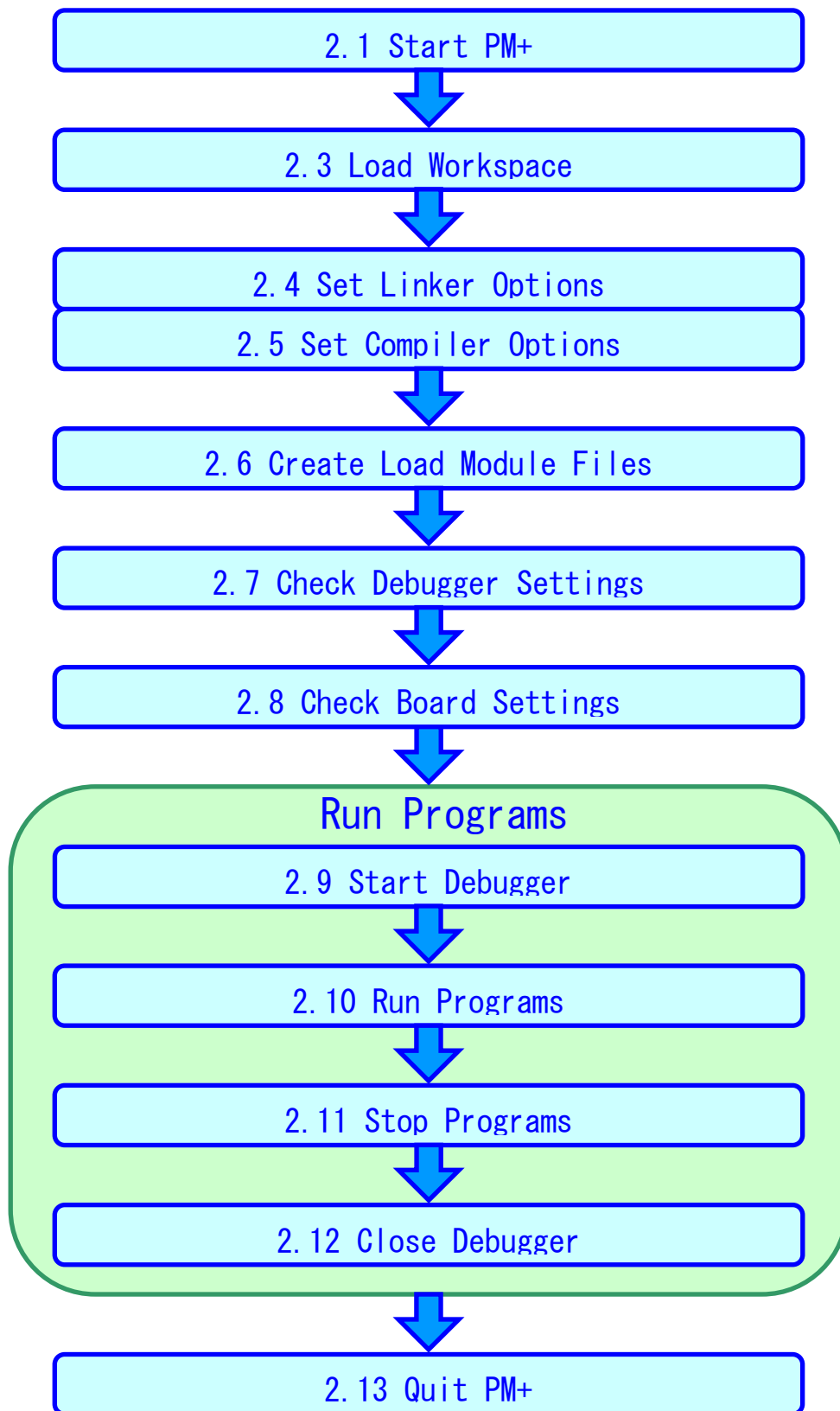
CHAPTER 2 Experiences

This chapter lets the reader experience the operation of the completed StickLIN-78K0 program using the integrated debugger (ID78K0-QB-EZ)

Here, LED1 and LED3 alternately blinks program is used as StickLIN-78K0 sample program.

This chapter is designed to give an understanding of the concrete operation method of the development tools (PM+, ID78K0-QB-EZ) and the outline of the project files required when creating application programs, through building of sample programs and operating ID78K0-QB-EZ.

The overall flow is as follows.



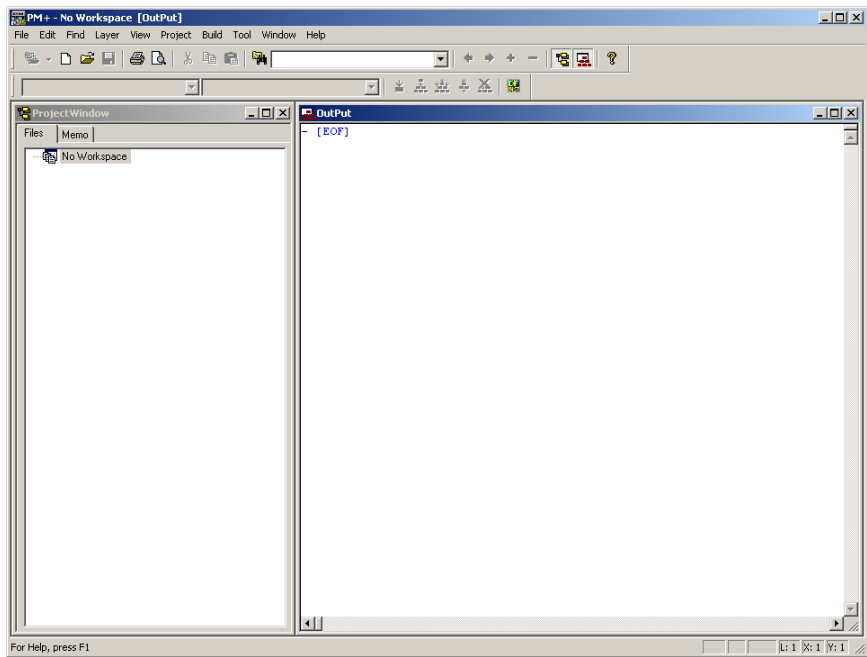
2.1 Start PM+

Let's start using the development tools.

First, start the PM+

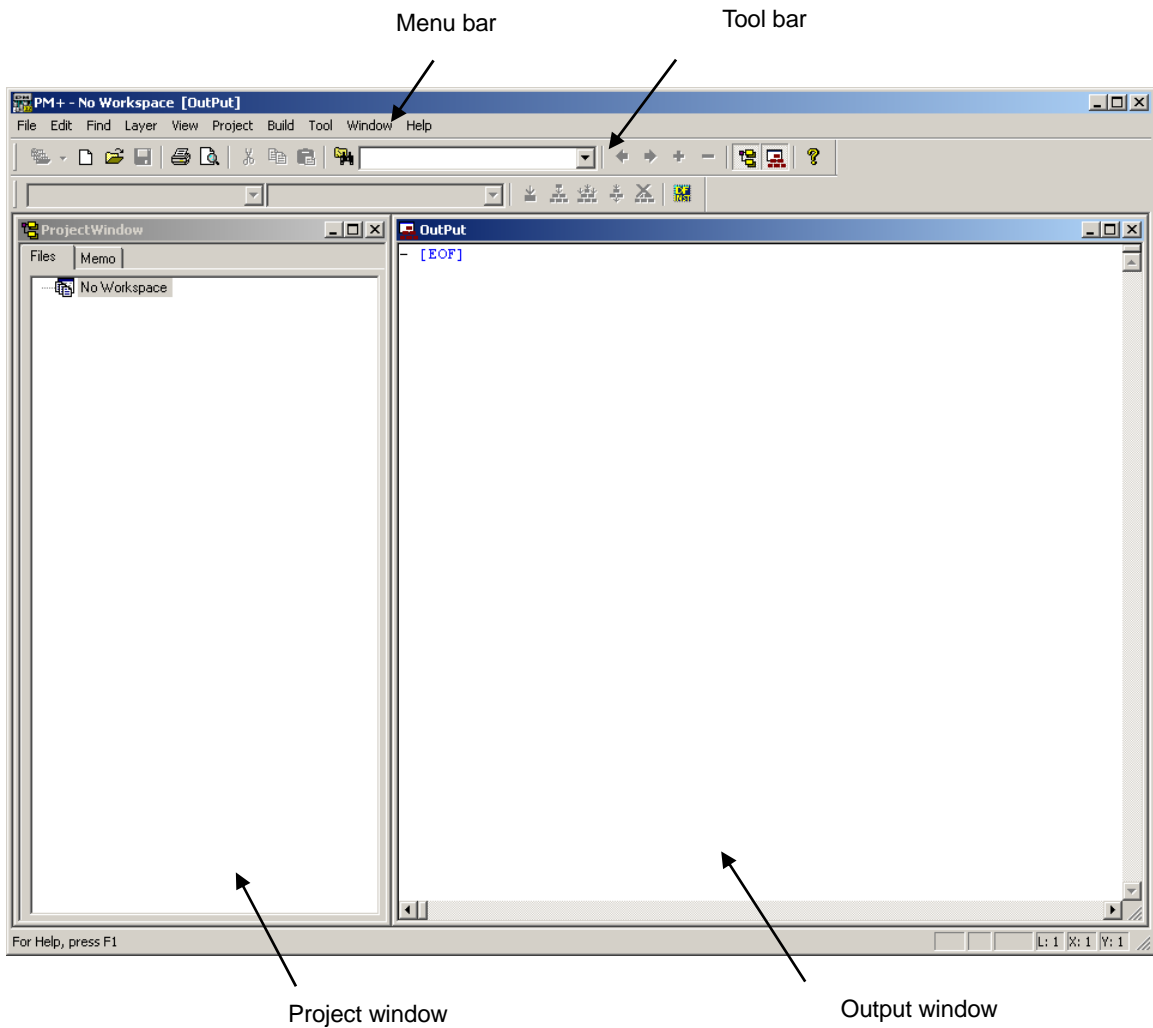
Select "Windows Start Menu" -> "Program" -> "NEC Electronics Tools" -> "PM+" -> "V6.30" -> "PM+ V6.30".

PM+ starts up



2.2 What is PM+

In PM+, application programs and environment setting are handled as a single project, and series of actions such as program creation using the editor, source management, build, and debugging are managed. Also, one of more project files is managed together as a workspace.



- Project window A window in which project names, source files, and include file are displayed using a tree structure.
- Output window A window in which the build execution status is displayed.

➡ For details regarding menu bars and tool bars, refer to "Help" menu in PM+. "Help" on menu bar , then "PM+ Help"

What is a project?

A project is the unit that is managed by PM+. A project refers to an application system and environment development based on PM+.

PM+ saves project information in a "project file".

What is a project file?

A project file contains project information that includes the source files, device name, tool options for compiling, editor, and debugger information.

The file name format is "xxxxx.prj".

Project files are created in the directory you specifies when you create a new workspace.

What is a project group?

A project group is a group comprised of a number of projects in an application system.

The target device of each project must be the same within a project group.

What is a workspace?

A workspace is the unit used to manage all the projects and project group required for one application system.

A workspace file contains one or more project files.

The file name format is "xxxxx.prw".

2.3 Load Workspace (project)

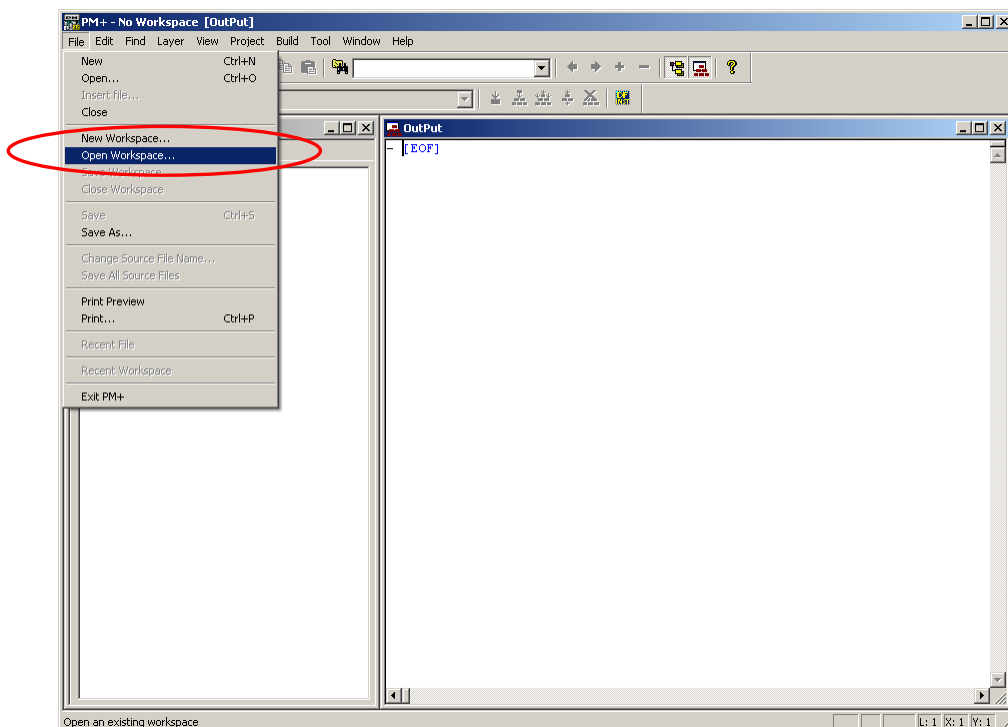
In this chapter, you will use an already created workspace.

➡ The method for creating a new workspace is described in “Chapter 5 Other Information”

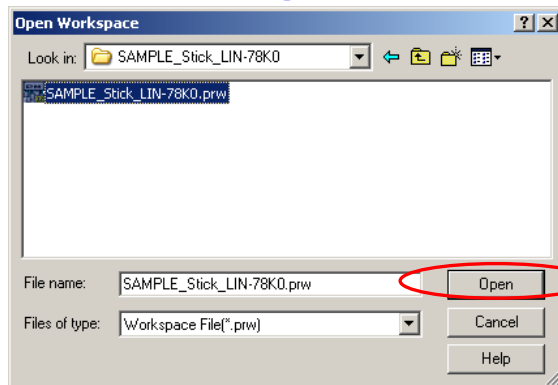
The source file name of the LED blinking program and the uPD78F8020DA setting emulated with ID78K0-QB-EZ are saved to the workspace used in this chapter.

In the PM+ menu, select [File(F)]→[Open Workspace(W)...] and specify “SAMPLE_Stick_LIN-78K0.prw”

➡ If you have not set an environment, refer to “Sample Environment” .



Open the folder in which the sample program is located.

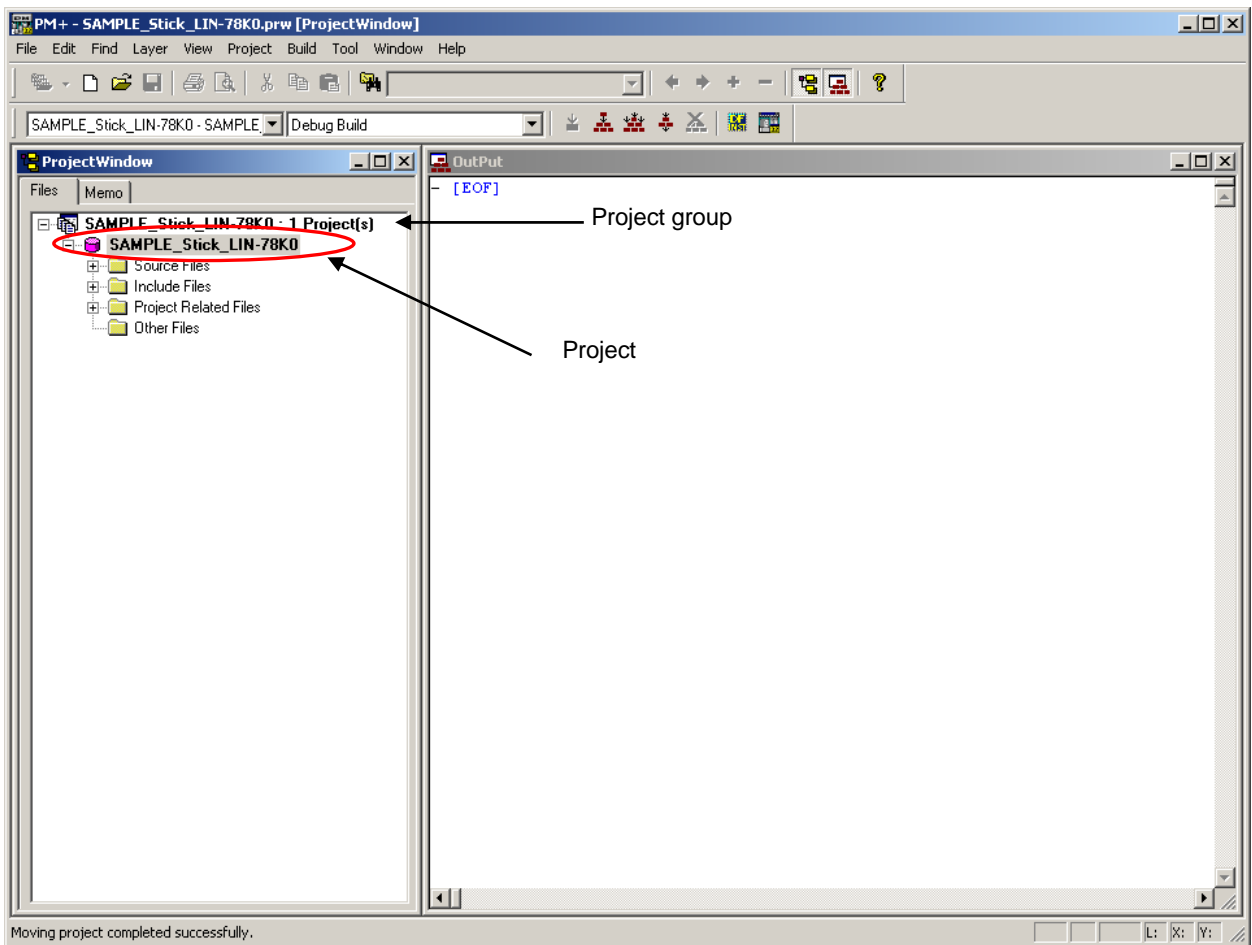


Click” SAMPLE_Stick_LIN-78K0.prw” and then press the **Open** button.



The "SAMPLE_Stick_LIN-78K0.prw" workspace file is read.

Workspace file name :SAMPLE_Stick_LIN-78K0.prw



Only one "StickLIN-78K0" project is included in the "SAMPLE_Stick_LIN-78K0.prw" workspace file. The operations described below are done in relation to this "SAMPLE_Stick_LIN-78K0" project.

2.4 Set Linker Options

The linker options have been set by the project file. However, some option settings will be covered in this section because the linker option settings are important for debugging. Following three settings are covered specifically.

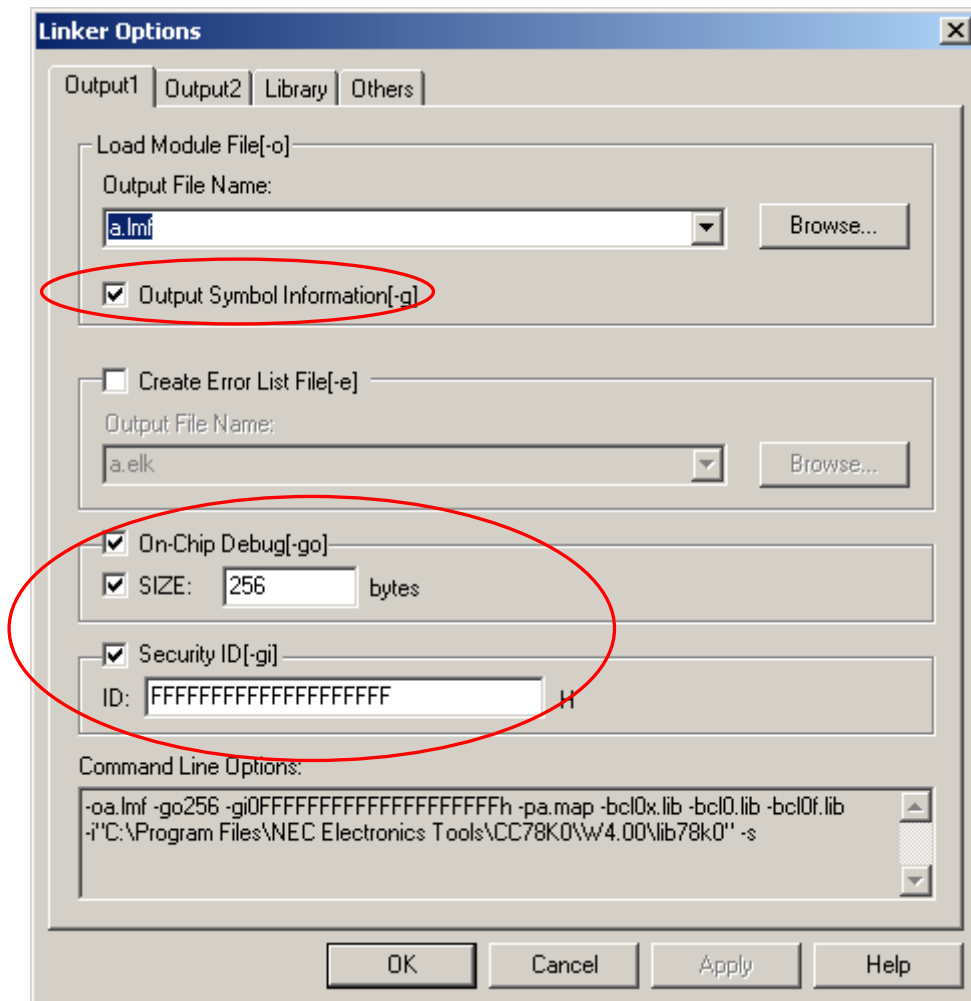
- Outputs from debugging
- On-chip debug (Desable/Enable, security ID)

Select "Tools" on menu bar, then "Linker options....".

2.4.1 "Output1" Tab

Select "Output1" tab on "Linker Options" window. Confirm "Output Symbol Information" and "On-Chip Debug" are checked.

Also, confirm "Security ID" and confirm "FFFFFFFFFFFFFFFF" (20 of "F") is entered at "ID" field if there will not be a problem entering it.



"Output File Name" filed at "Load Module File" specifies the path and file name of output load module file. When "Output Symbol Information" is checked, it outputs the local symbol information in the load module file.

"On-Chip Debug" specifies if you need to use on-chip debug or not. Check this when you wish to use on-chip debug. In this case, you cannot locate segments in the address from 02H to 03H and from 8FH to the bytes specified at "SIZE" + 1.

"Security ID" is the ID code to protect the memory data from others.

The ID code is set with hexadecimal number. The security ID is stored at the address 85H-8EH. For that reason, when a security ID is set, you cannot locate segments in the address 85H-8EH.

If there is a security ID set in the assembler source code and another security ID in this option, the system uses the one in this option.

If you forgot the security ID code in the address 0x85-0x8E or you write 0x00 at 0x84, ID78K0-QB-EZ will not be able to connect.

In this case, run "WriteEZ3" and erase the built-in flash memory.

For details, refer to "5.4 WriteEZ3".

2.5 Set Compiler Options

The compiler options have been set by project file. However, because some compiler options are useful, following two settings are covered specifically in this section.

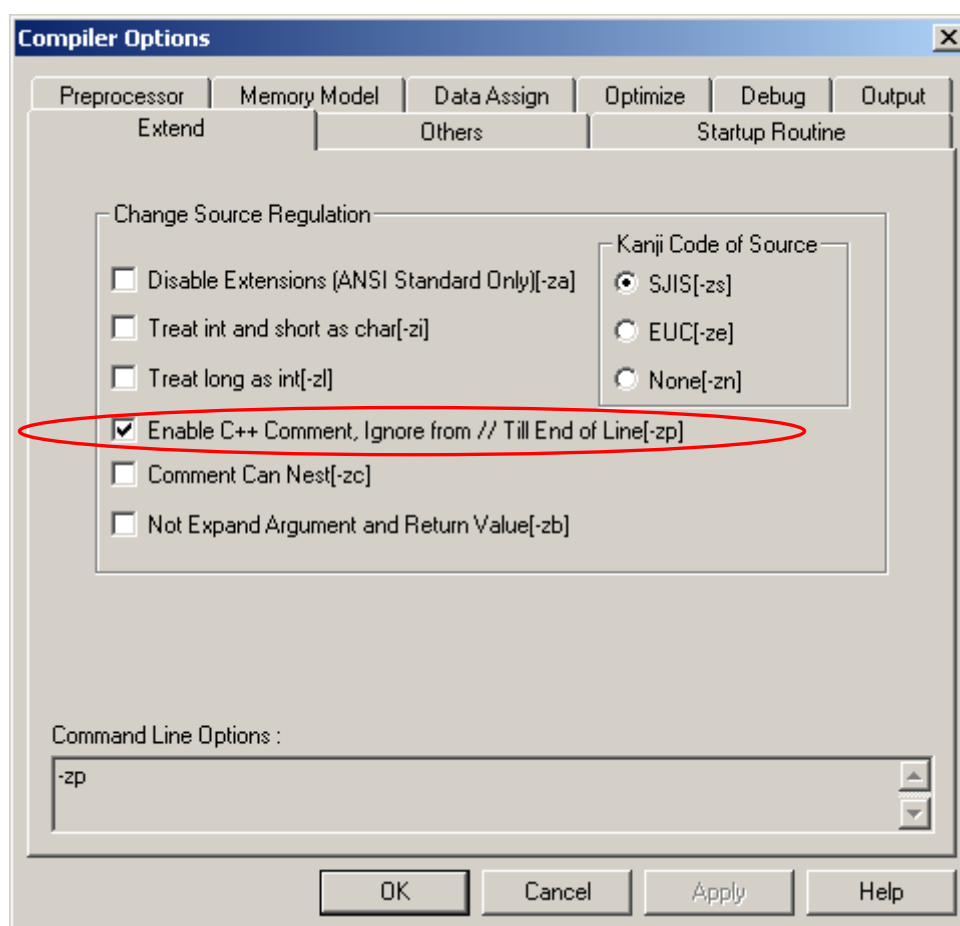
- Enable C++ comments

Select "Tools" on menu bar, then "Compiler options".

2.5.1 "Extend" Tab


Select "Extend" tab, and check "Enable C++ Comment".

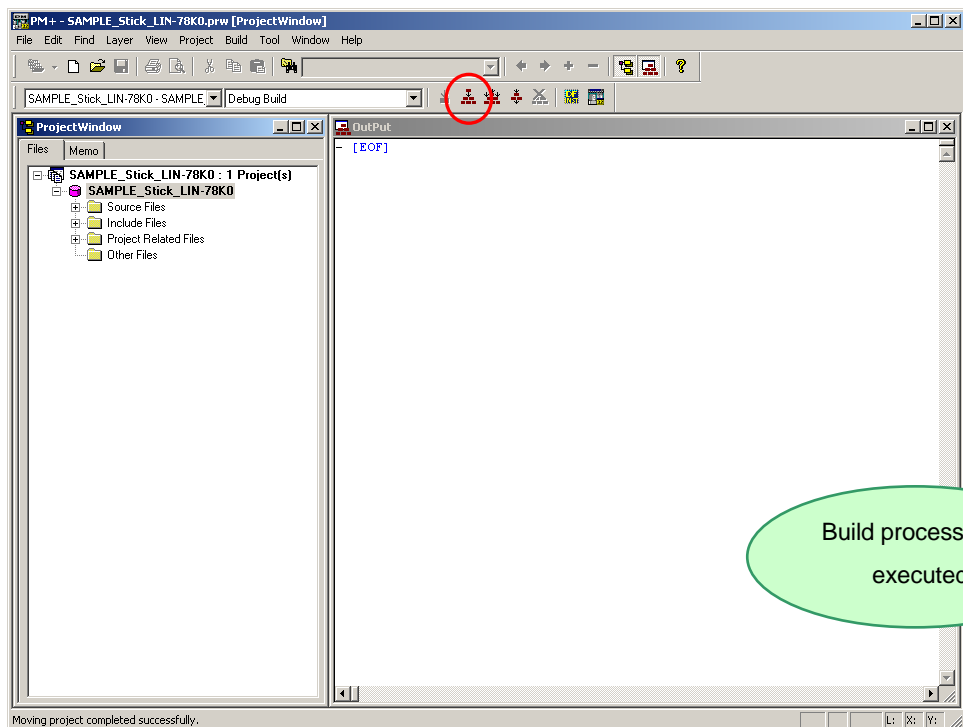
This setting allow you to use the C++ comment using `///
It is useful feature when developing code.`

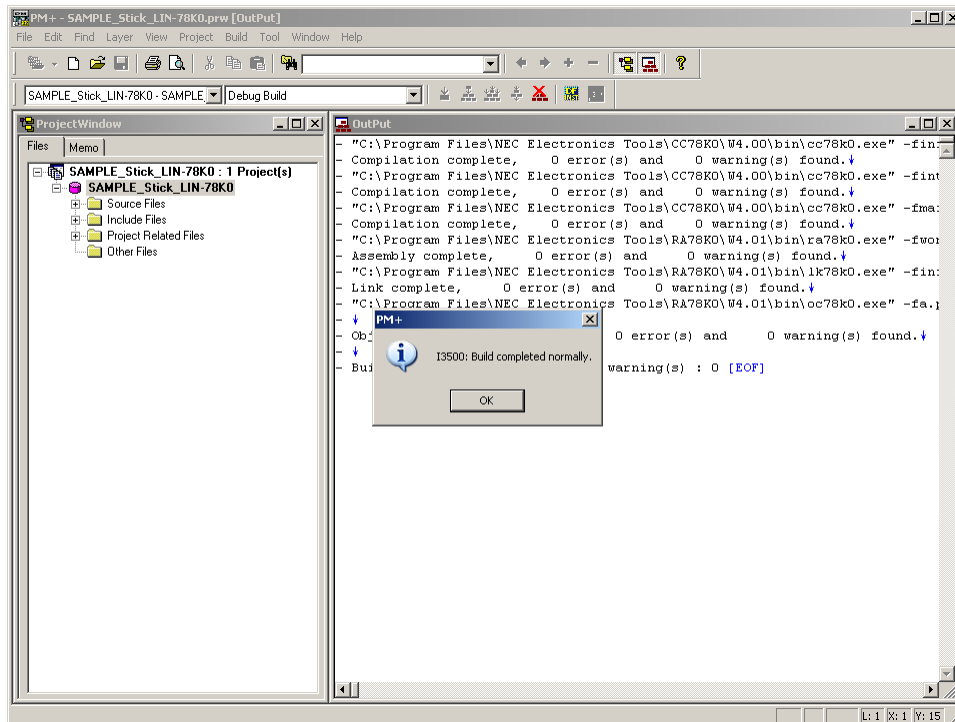


2.6 Create Load Module Files

After developing the source code, you have to create load module files by compiling, assembling, and linking. This process is called build.

Click the build button  , or select "Build" on menu bar, then "Build".





Build has been completed successfully.

What is build?

Build is a function that creates an executable file from source files in a project. PM+ automatically performs compiling, assembling, linking, and other processing actions. To reduce the time for the build, PM+ detects and compiles/assembles only the files that have been updated from the previous build process.

What is rebuild?

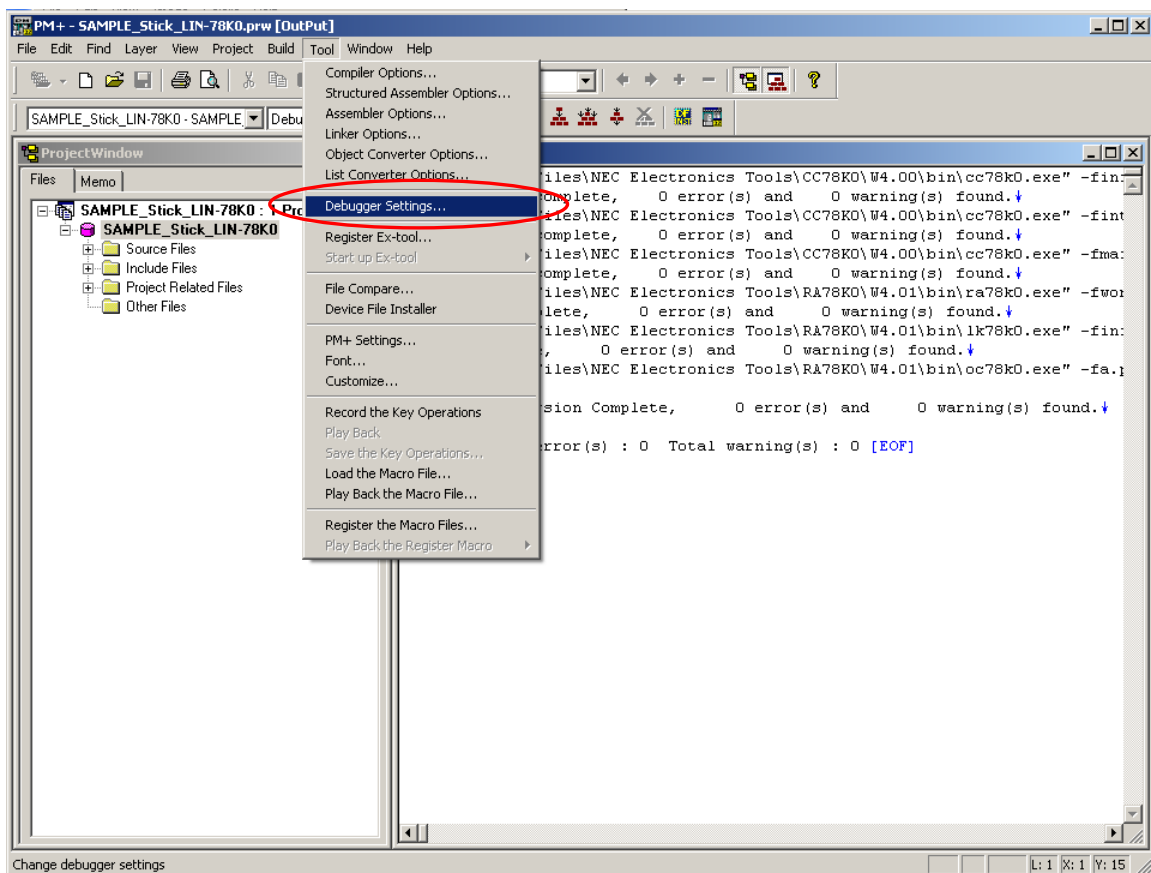
Build compiles and assembles only the source files that have been updated from the previous time, whereas rebuild compiles and assembles all the source files. When setting, such as compiler options, have been changed, you must rebuild instead of build.

2.7 Check Debugger Settings

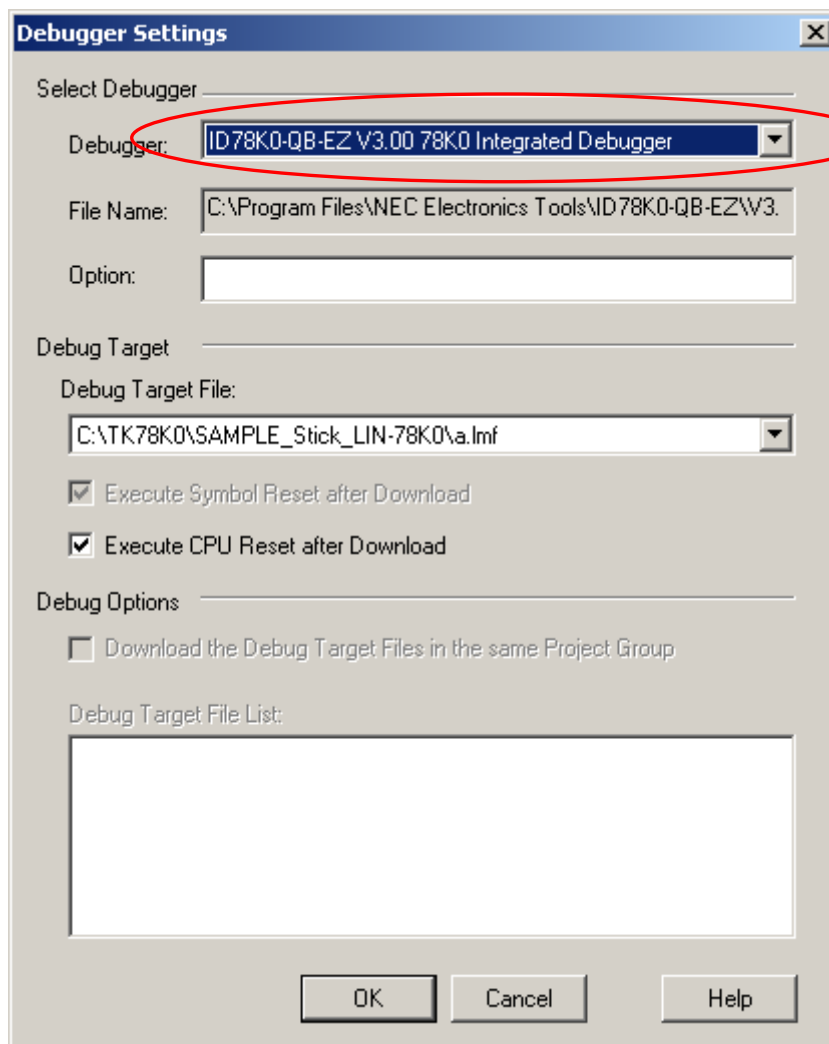
After the build, you should configure the debugger settings.

The debugger settings have been set by the project file as well. However, because those settings are important for debugging, some settings are covered in this section.

Select "Tools" on menu bar, then "Debugger Setting..."



Check if "ID78K0-QB-EZ V3.00 78K0 Integrated Debugger" is selected on "Debugger".



If you cannot select "ID78K0-QB-EZ V3.00 78K0 Integrated Debugger", select "Project" on menu bar, "Project settings" -> "Tool version settings" -> "Detailsetting" -> then select "ID78K0-QB-EZ V3.00".

2.8 Check Board Settings

Before connecting the PC and the StickLIN-78K0 with USB, you should check the setting of Writer SW and Debug SW on the StickLIN-78K0.

- ① Set the Writer SW and Debug SW of the StickLIN-78K0 as follows.


Switch name	setting
Writer	OFF
Debug	ON



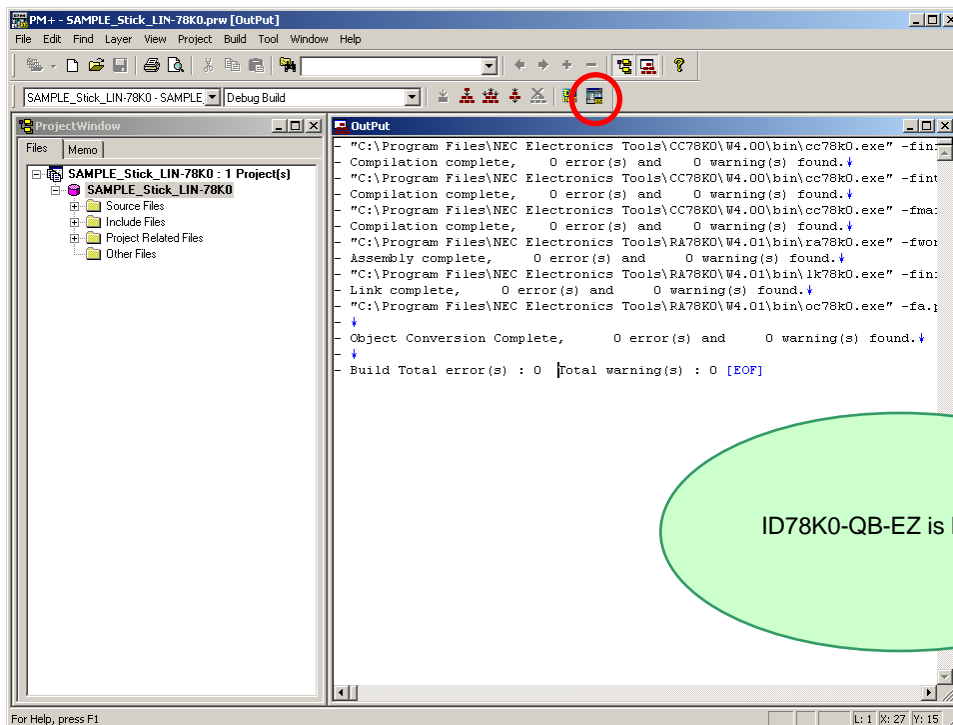
- ② After the switch settings are completed, connect the PC to USB on StickLIN-78K0.

If the "Found New Hardware Wizard" is started, install USB driver with referring "1.4 Installation of USB Driver".

2.9 Start Debugger

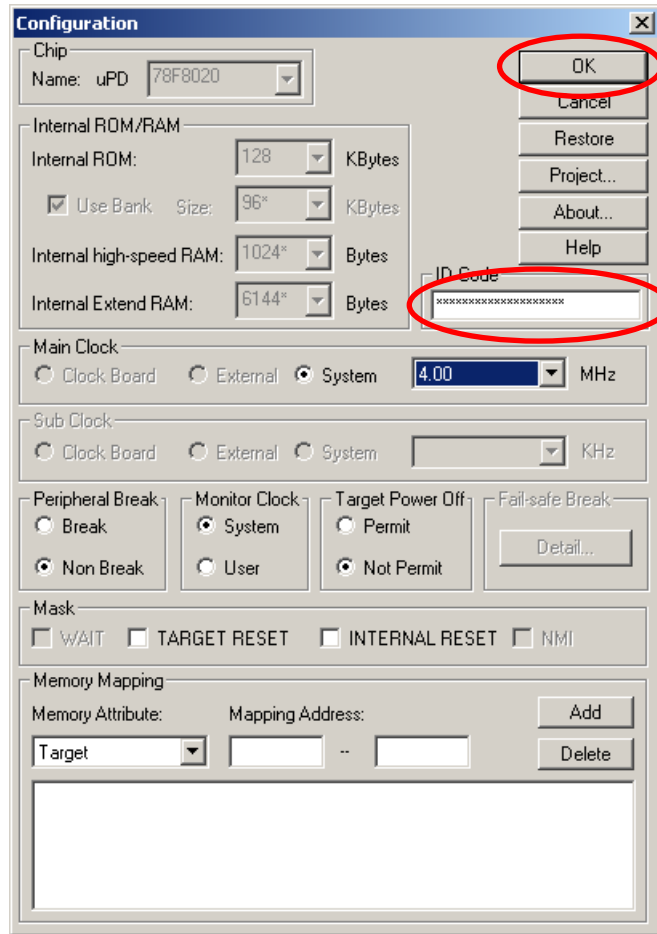
Click the debug button  , or select "Build" on menu bar, then "Debug".

If you do not see the debug button, go to "2.7 Check Debugger Settings" for changing the settings.

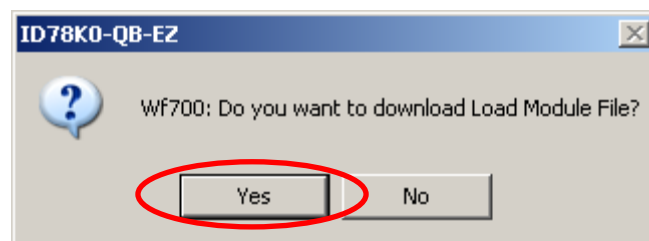


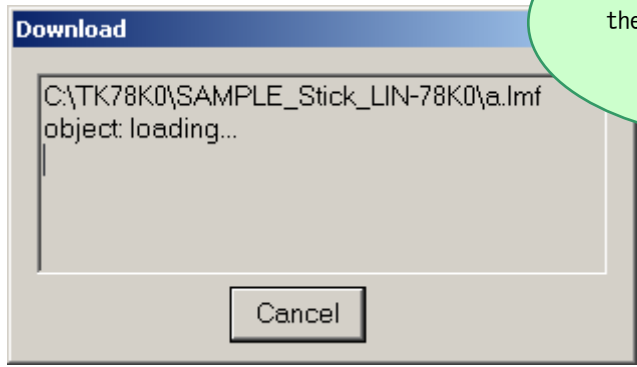
"Configuration" dialog is opened.

Enter "FFFFFFFFFFFFFFFFFFFF" (F x 20) in "ID Code", then click OK .



Click Yes when the confirmation dialog for downloading load module file is opened.

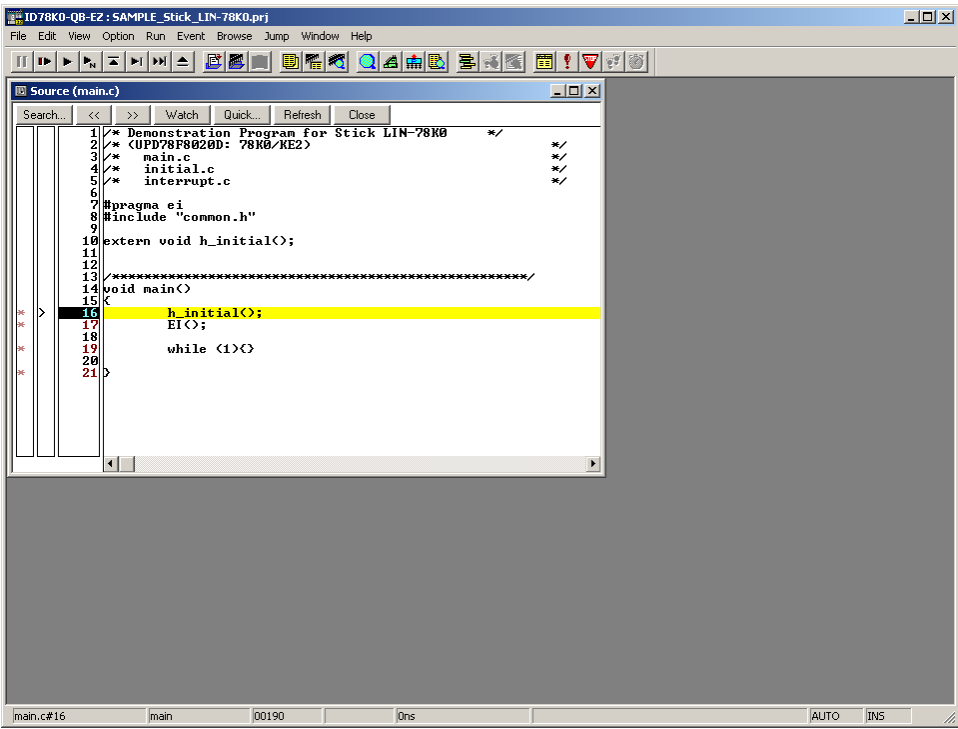




ID78K0-QB-EZ starts and downloading the program to flash memory.



When the download is completed, the source code will be displayed




NOTE:

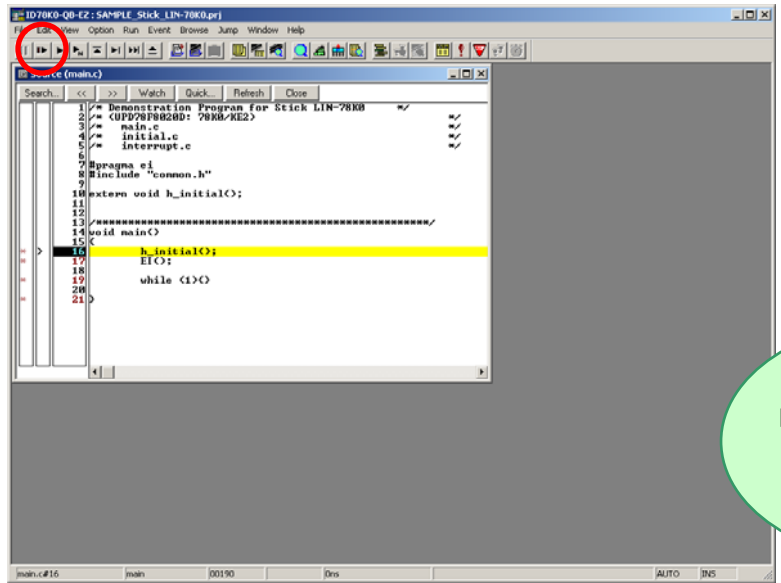
Completion of the download does not mean running the programs. Therefore, even though you press switch on the board, it does not make anything happened. To run the sample program , see "2.10 Run Programs".

2.10 Run Programs

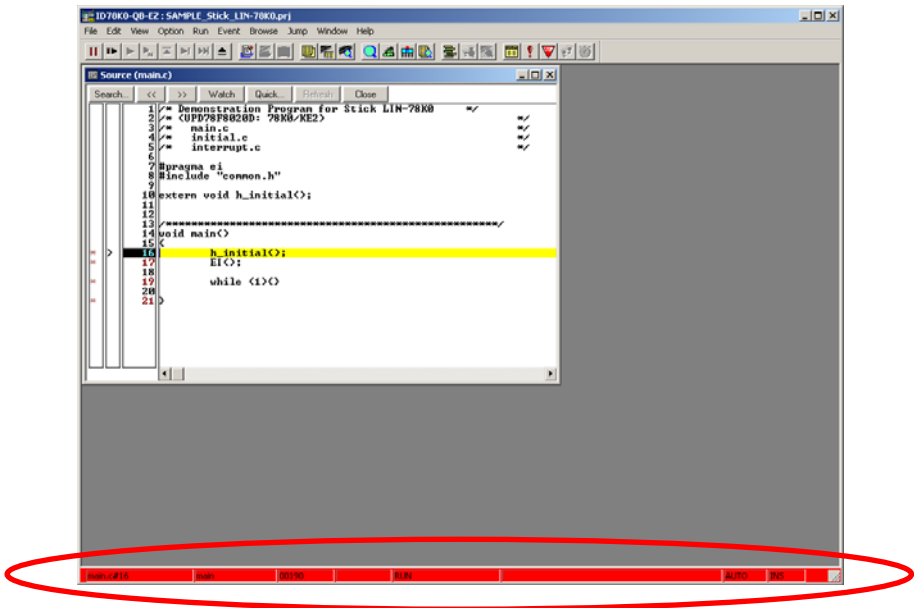
Now, you are ready to run the program.

Click the restart button  , or select "Run" on menu bar, then "Restart".

The sample program runs.

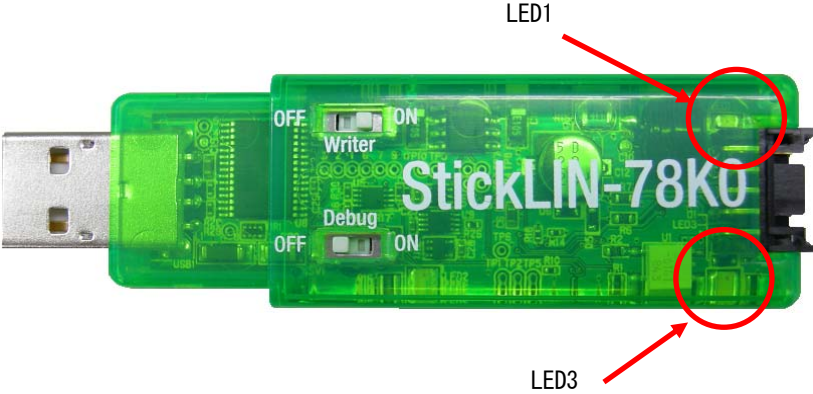



Run the sample program



When programs are running, the status bar will be red.

Next, confirm the LED1 and LED3 blinking.

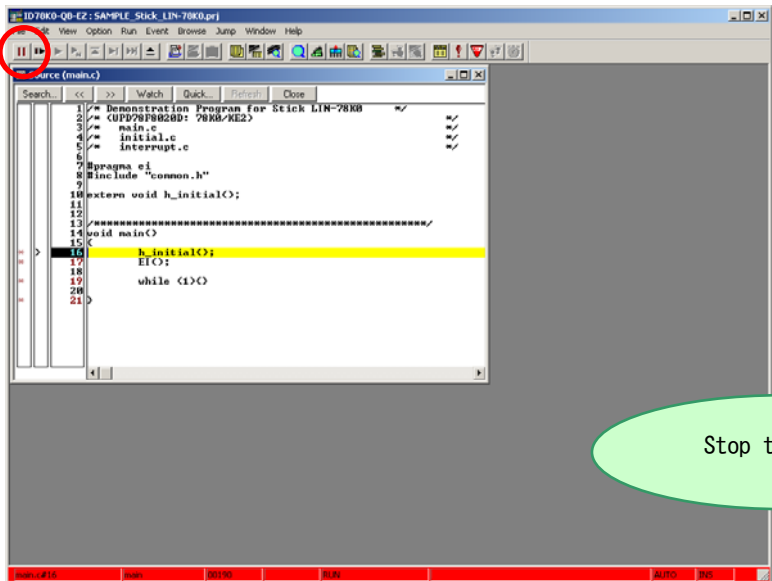


 The above-described procedure checks that the LED blinking program functions normally.

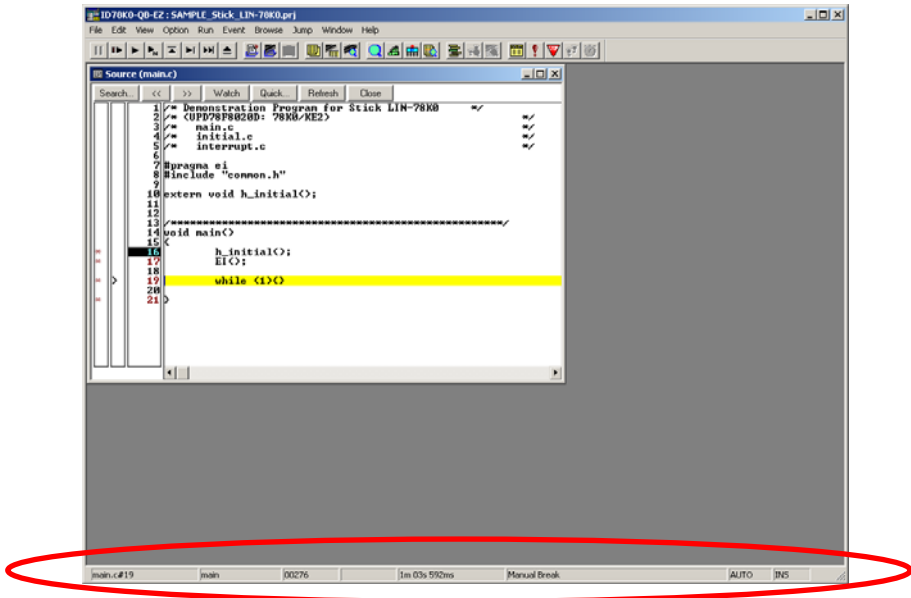
2.11 Stop Programs

Now, you are going to stop the program.

Click the ID78K0-QB-EZ's stop button  , or select "Run" on menu bar, then "Stop".



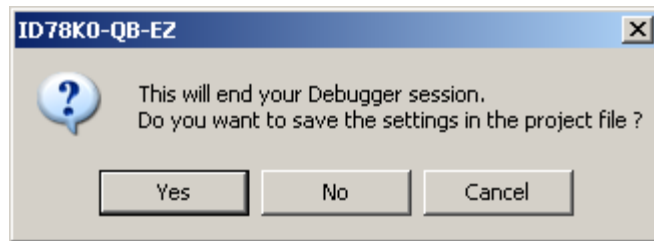
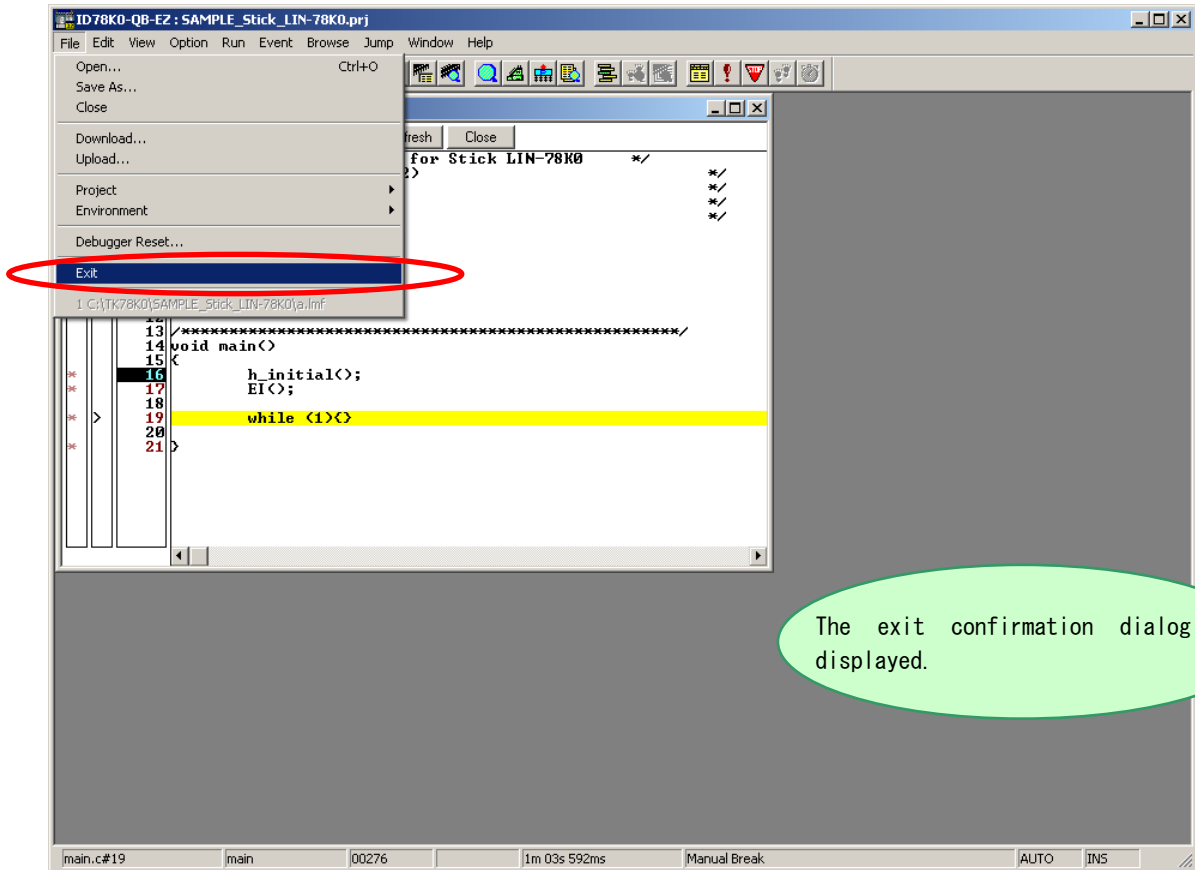
Stop the program



When the program stops, the status bar changes back to the original color.

2.12 Close Debugger

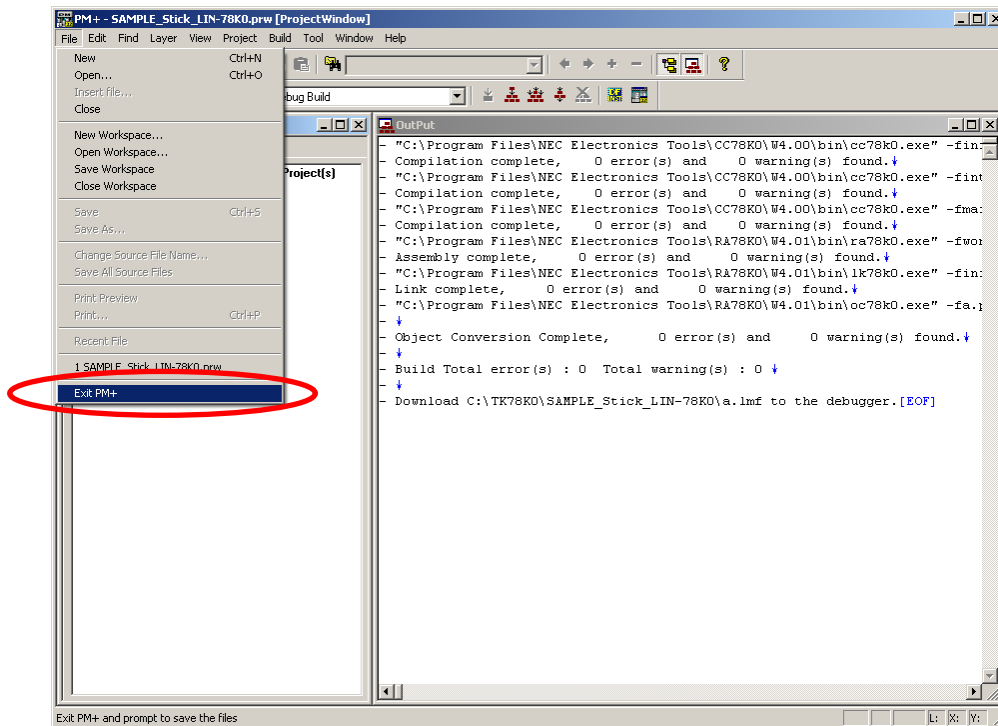
Select "File" on menu bar, then "Exit".



If you click Yes , it saves the settings in the project file, and then closes the ID78K0-QB-EZ. It is recommended to save the settings as it saves the window you used, window size, layout, etc.
If you click No , it does not save the settings and closes the ID78K0-QB-EZ.

2.13 Quit PM+

Select "File" on menu bar, then "Exit PM+".



PM+ is closed.

CHAPTER 3 Hardware Specifications

3.1 Introduction

μ PD78F8020DA is the NEC Electronics 8 bit single chip microcomputer. The features and hardware specification of StickLIN-78K0 are described.

3.1.1 Features

Features of the StickLIN-78K0 are as follows.

- The evaluation board used the NEC Electronics 8bit single chip microcontroller μ PD78F8020DA (The part of 8-bit microcontroller is same as 78K0/KE2). All of the ROM, RAM, circumference circuit and LIN transceiver are efficiently built in one chip on a StickLIN-78K0.
- High-speed operation is realized via the 20MHz internal clock.
- 128 Kbytes of Flash EEPROM, available on the chip,
- StickLIN-78K0 is programmable and debuggable from PC via USB connection without any additional hardware tools.
- μ PD78F0730 (NEC Electronics 8bit single chip microcontroller) is available on board for USB interface.

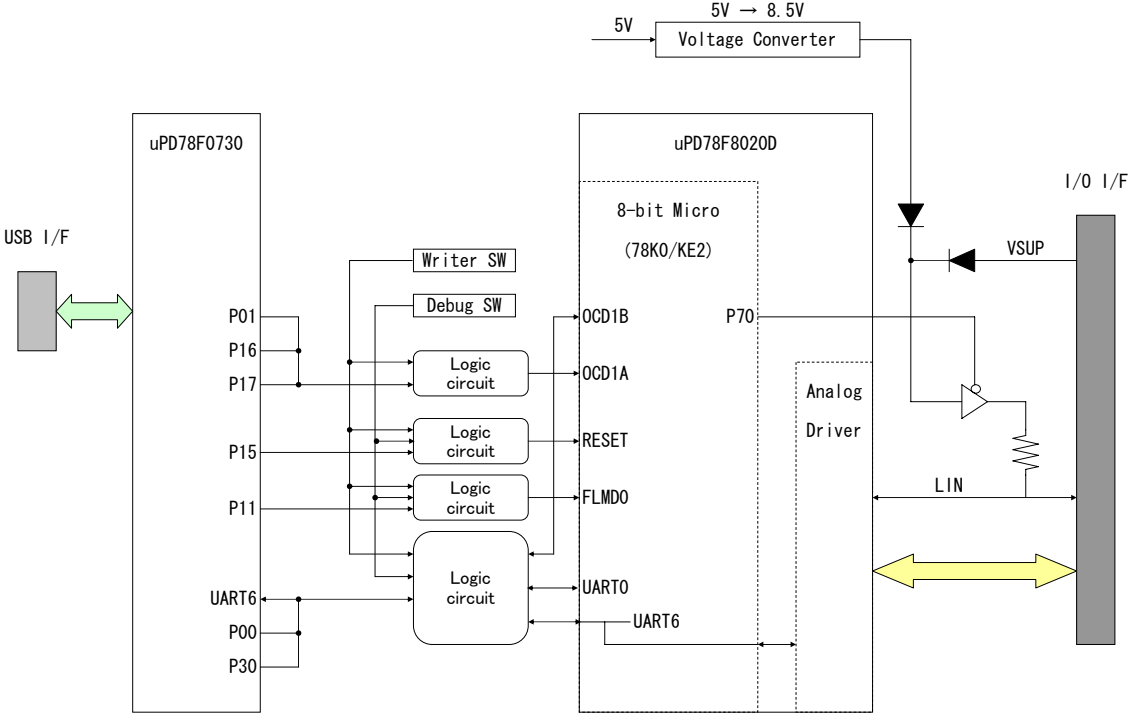
3.1.2 Hardware Overview

Microcontroller	μ PD78F8020DAGB
Clock	20MHz main
Interfaces	USB connector (TypeA) Expansion interface (J1)
Power supply	5.0V by USB, 7.0V-18.0V by Expansion interface

3.1.3 Attached goods list

- StickLIN-78K0
- Development tool/Manual CD-ROM
- Expansion interface cable for LIN (separate cable with clip)

3.1.4 Block Diagram



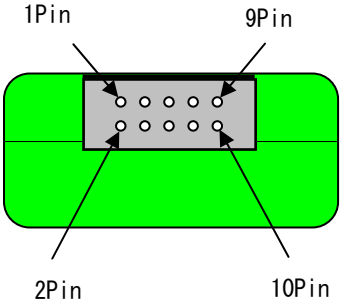
3.2 Interface Connection

3.2.1 J1

Expansion Interface: J1

J1: Hirose DF11-10DP-2DS

J1	Name	Connection to microcontroller	Notes
1	VSUP	(VSUP, HDS)	External Power Supply
2	LIN	LIN	LIN Bus
3	DR1	Dr1	Low side driver Dr1 output
4	DR21	Dr21	Low side driver Dr21 output
5	DR22	Dr22	Low side driver Dr22 output
6	DR22_l	Dr22_l	Driver 22 control signal input
7	DR4	Dr4	High side driver Dr4 output
8	DR21_l	Dr21_l	Driver 21 control signal input
9	GND		
10	SWI	SWI	High voltage SW input



Location of J1: TOP VIEW

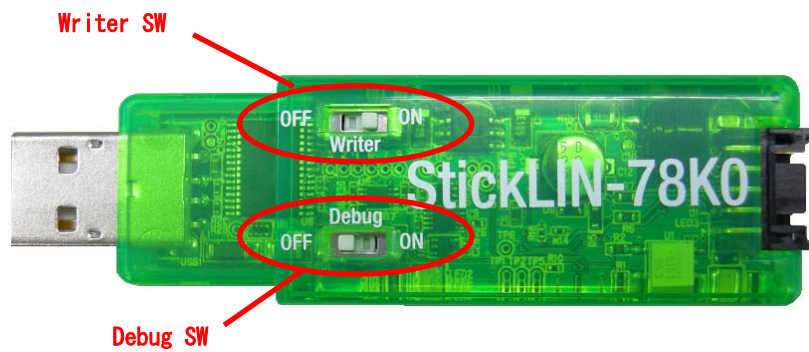
3.3 Switches and LEDs

3.3.1 Switch

Debug SW : The mode selection for Debugging with the ID78K0-QB-EZ.

Writer SW : Programming mode selection for Flash EEPROM on the MCU with WriteEZ3.

Status	Writer SW Setting	Debug SW Setting
Normal Mode	OFF	OFF
Debugging Mode	OFF	ON
Flash Programming Mode	ON	OFF
Forbid SW to set	ON	ON



SW layout (TOP VIEW)

3.3.2 LED1

LED1 is connected to Low side driver DR3.

LED1 status

P33 Output data	DR3 status	LED
High	ON	Green
Low	OFF	Off



LED1: TOP VIEW

3.3.3 LED2: Power Indication

LED2 is a green LED to indicate the availability of power.

LED2 status

Status	LED
Power ON	Green
Power OFF	Off



LED2: TOP VIEW

3.3.4 LED3

LED3 indicate LIN Bus Pull-up.

LED3 status

P70 Output data	LIN Bus Pull-up	LED
Low	Pull-up enable (Master)	Green
High	Pull-up disable (Slave)	Off



LED3: TOP VIEW

3.4 Power Source

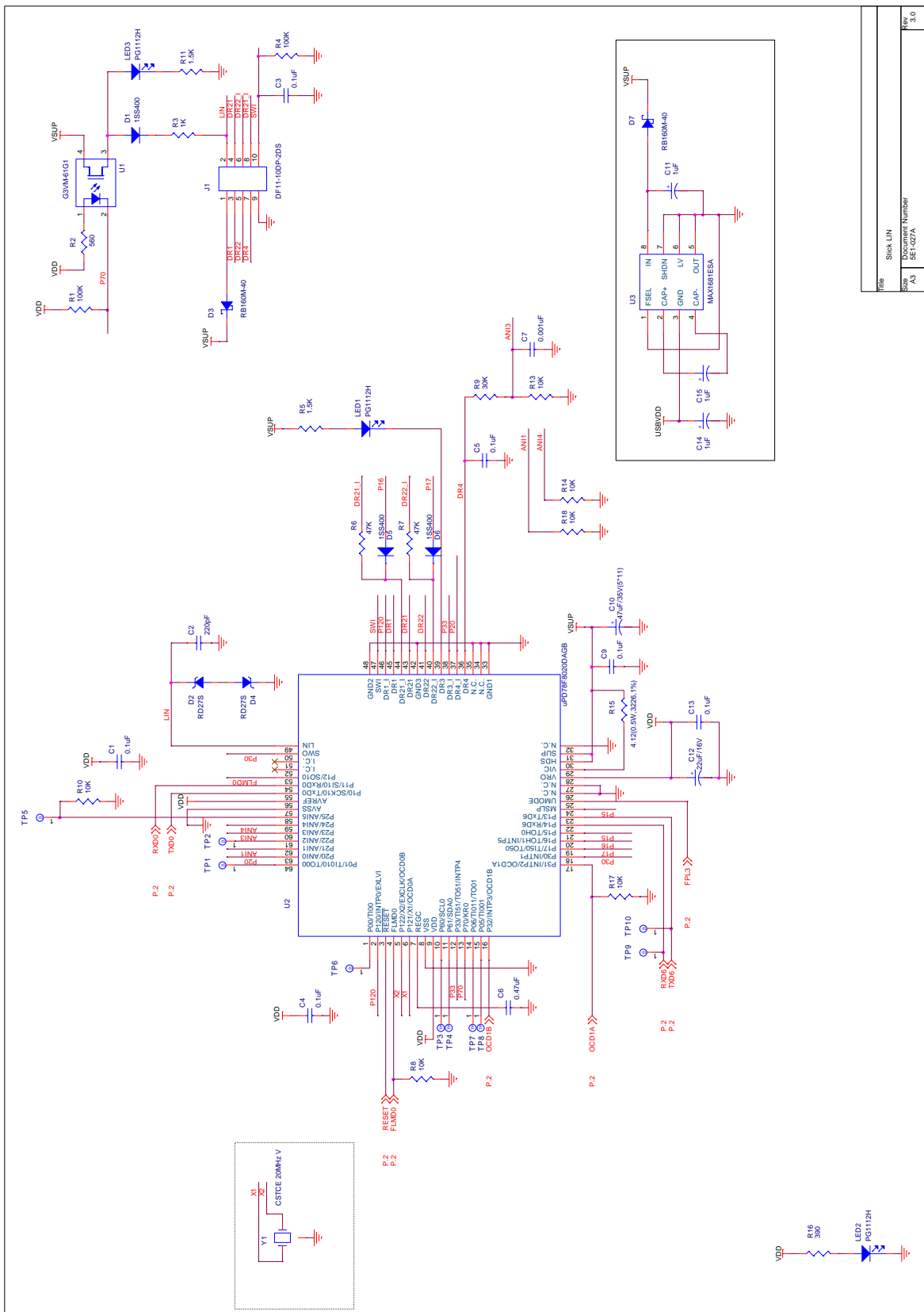
StickLIN-78K0 are able to choice two ways of power source.

Microcontroller power (VDD) and driver module power (VSUP) are both supplied when power source are supplied from either USB or expansion interface (VSUP).

If you supply power using the expansion interface (VSUP), then keep power source voltage DC 7.0V – DC 18.0V.

3.5 Design Data

3.5.1 Circuit Schematics



File	Stick LIN
Size	Document Number
AS	SE1-027A
Date	September, February 03, 2009
Sheet	1 of 2
Rev	3.0

CHAPTER 4 Troubleshooting

This chapter describes how to solve troubles you may face.

4.1 If you cannot find USB driver when you connect PC to the kit

Check Point 1

If you use USB hub, do not use it. (USB hub is not supported)

Check Point 2

Check if you installed "NEC Electronics Starter Kit Virtual UART Driver" in "1.4 Installation of USB Driver". If not, install the driver.

4.2 Error when you start the debugger

There could be several reasons to make errors happen.

The solving processes differ depending on errors. Please check the error message first.

The solving processes for each error are as follows.

4.2.1 "No response from the Emulator..." (A01a0)

Check Point 1

Check if the settings of switches on the kit are correct with referring "2.8 Check Board Settings".

Check Point 2

Erase the flash memory with the WriteEZ3.

Check Point 3

If above check points are confirmed, close the debugger and disconnect the USB cable from PC. Re-connect USB cable properly to both the PC and the kit, and then re-start the debugger.

4.2.2 "Can not communicate with Emulator..." (F0100 or A0109)

Check Point 1

If you use USB hub, do not use it. (USB hub is not supported)

Check Point 2

Check if the settings of switches on the kit are correct with referring "2.8 Check Board Settings".

Check Point 3

Confirm the USB driver installation with referring to "1.4 Installation of USB Driver".

Check Point 4

If above 3 check points are confirmed, close the debugger and disconnect the USB cable from PC. Re-connect USB cable properly to both the PC and the kit, and then re-start the debugger.

4.2.3 "Incorrect ID Code." (Ff603)

This error occurs when the security ID stored on microcontroller built-in flash memory is different from the ID code you entered at the start of debugger.

Security ID entry area at the start of debugger



Check Point 1

Enter correct security ID and click OK on the configuration window.

Check Point 2

If you forgot the security ID, you have to erase the microcontroller built-in flash memory. Before erasing, check if you actually set the security ID with referring to "2.4 Set Linker Options". Also remember the code you set for the security ID.

After this, erase the flash memory with referring to "5.4 WriteEZ3".

CHAPTER 5 Other Information

This chapter describes how to create a new PM+ workspace (project) required for debugging using the integrated debugger (ID78K0-QB-EZ), registering additional source file, and how to use the WriteEZ3.

5.1 Create a new workspace (project)

5.2 Register additional source file

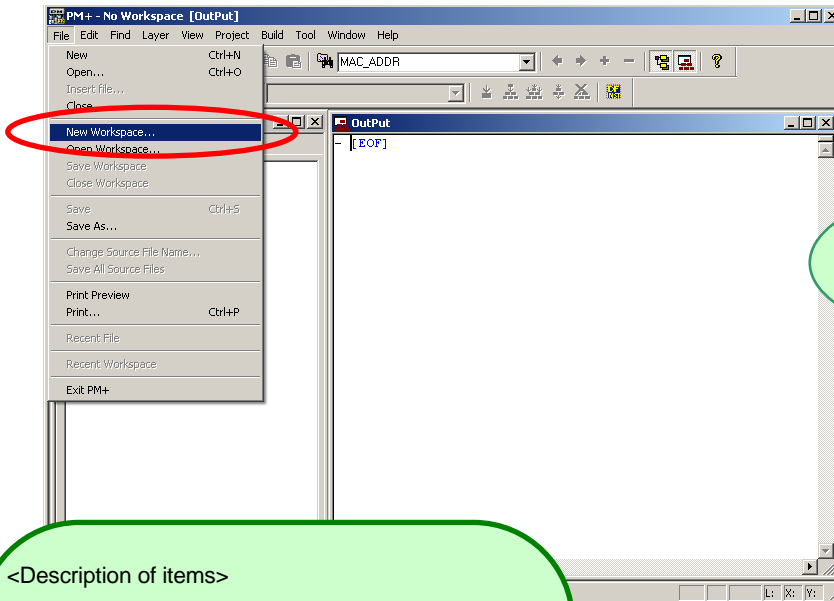
5.3 Debugger tips

5.4 WriteEZ3

5.1 Create a new workspace

Now, create a new workspace and project.

PM+ allows you to create a new workspace with following "New WorkSpace" dialog. Select "File" on PM+ menu bar, then "New Workspace...".



"New WorkSpace" dialog opens

<Description of items>

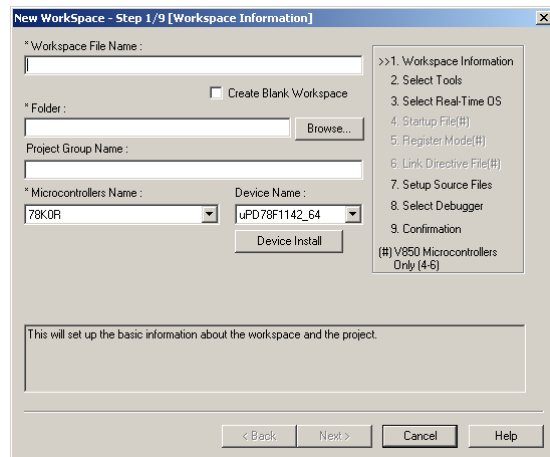
Workspace File Name:
 -> Specify the name of the workspace file that manages the project files.
 .prw is automatically suffixed as the file type.
 A project file (.prj) of the same name is simultaneously created.

Folder:
 -> Specify the folder for saving the workspace file by writing its absolute path.
 This item can be selected from a reference dialog box by pressing the **Browse...** button.

Project Group Name:
 -> Specify this item if wishing to manage multiple projects together in function units.
 If nothing is specified, this item is the same as the workspace file name.

Microcontroller Name:
 -> Specify the name of the microcontroller to be used.

Device Name:
 -> Specify the name of the device to be used.



The concrete information set here is described on the following pages

Input the workspace information setting as follows.

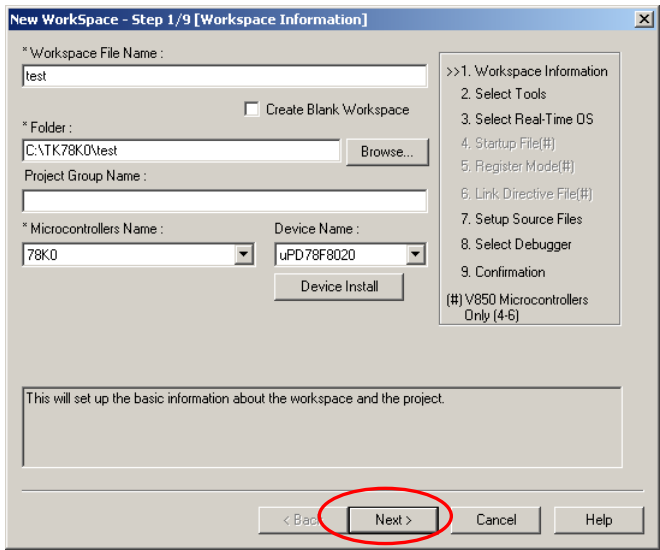
Workspace file name
→ test

Folder
→ C:\¥78K0¥test

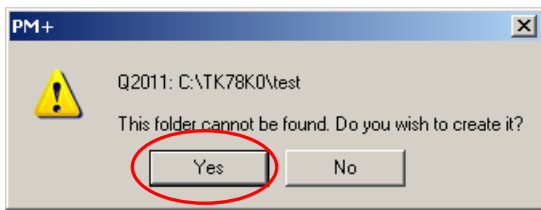
Project Group Name
→ (no input)

Microcontroller Name
→ 78K0

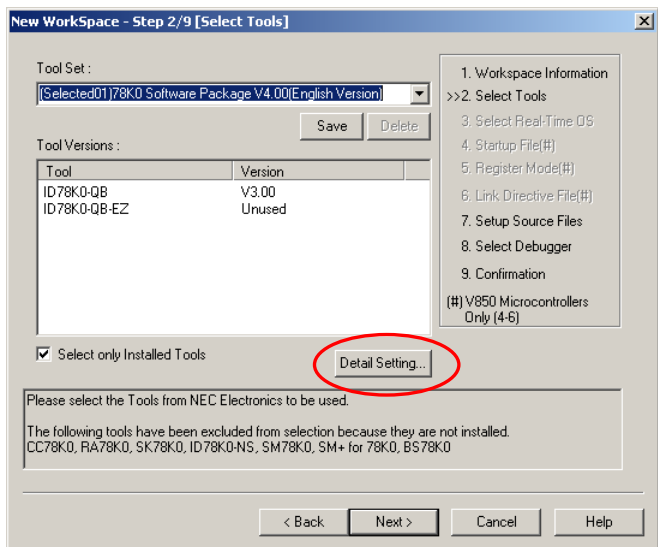
Device Name
→ uPD78F8020



Click **Next >** button

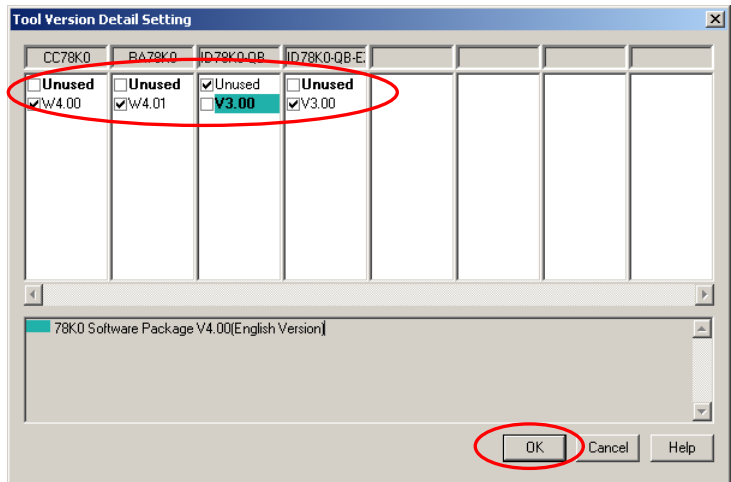


Click **Yes** button

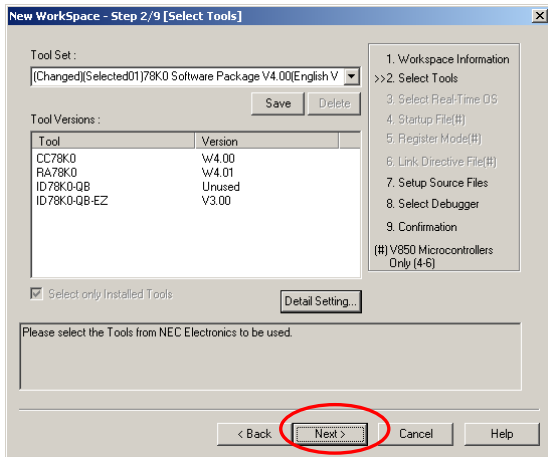


Click **Detail Setting** button

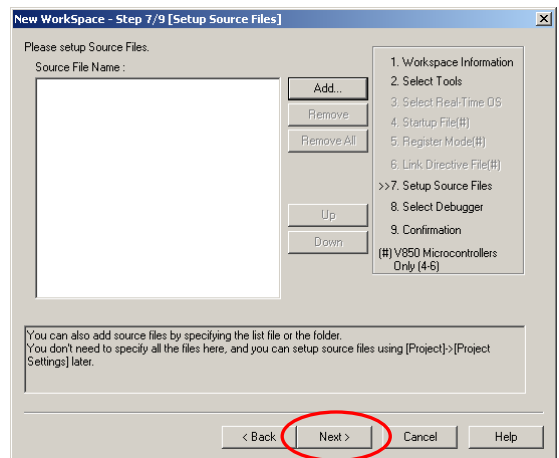
Set the version of tools as follows.
 CC78K0 : W4.00
 RA78K0 : W4.01
 ID78K0-QB-EZ : V3.00



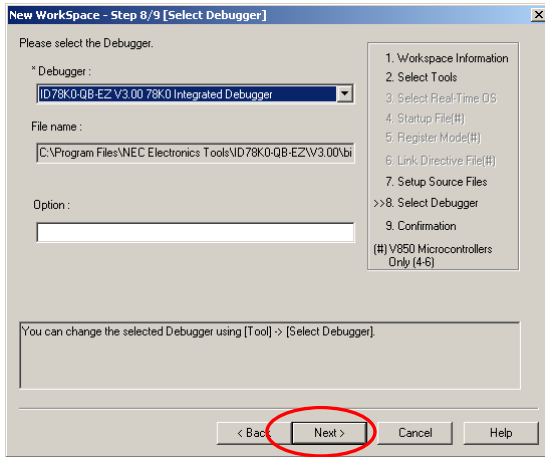
Select tools as above screenshot, then click **OK**.



Click **Next >**



Click **Next >**

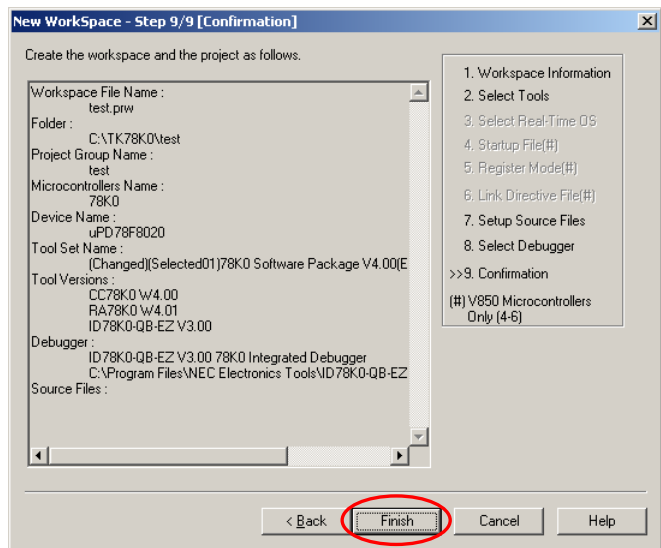


Select ID78K0-QB-EZ V3.00

Click **Next >**

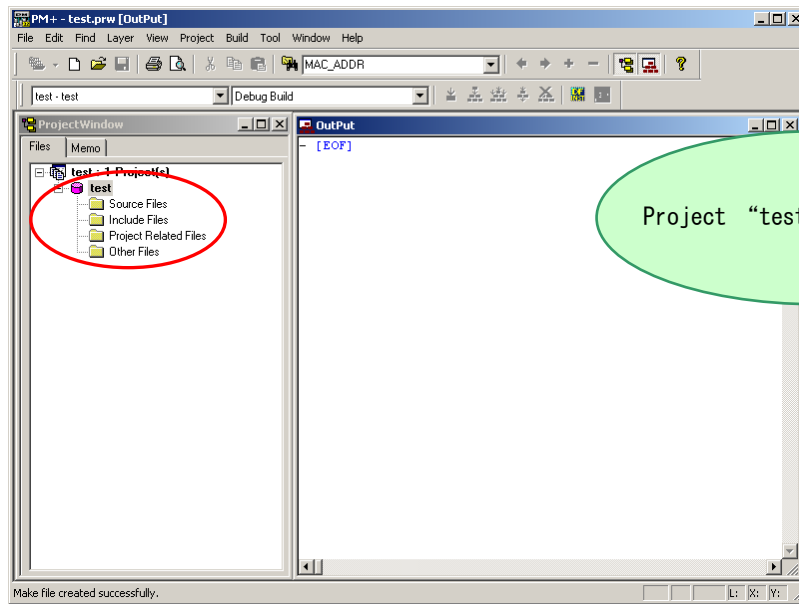


Check the project information settings



Click **Finish**





This completes workspace and project creation.

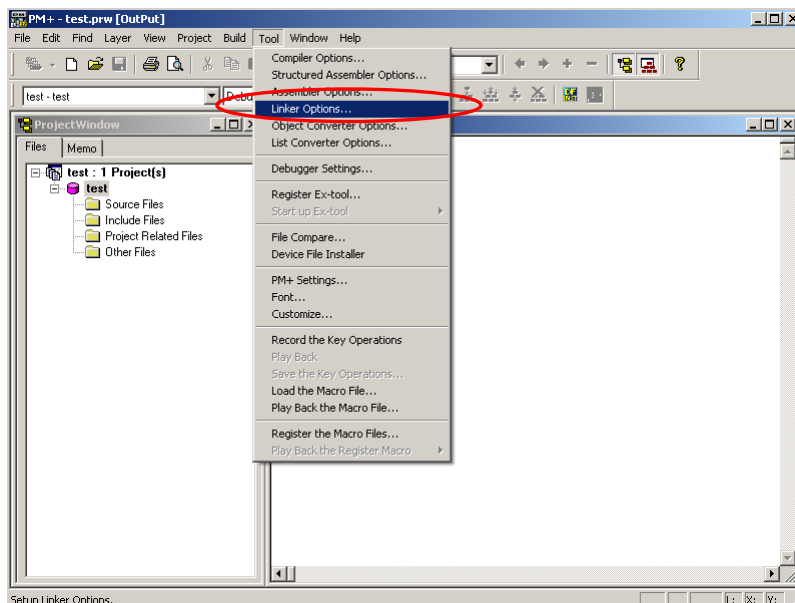
Additional source files can be registered at any time thereafter.

➡ For details, refer to "Registering additional source file"



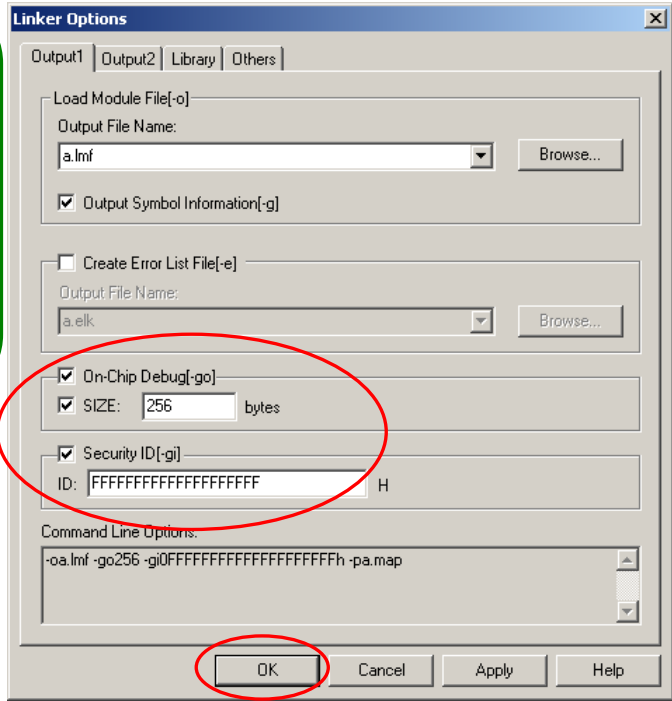
Next, on chip debug function can be used.

[Tool] → [Linker Options...] is selected.





Checks are put in "On-Chip Debug" and "SIZE". Then input a default value of "256" into the "SIZE".
 A check is put in "Security ID".
 The actualities of "FFFFFFFFFFFFFFFF" are taken if there is no problem in the value of ID in security.



Push the **OK** button.

Next, please add the following "word.asm" file and set the method of attesting security ID as the setting of the option byte. Please refer to the user's manual of the device for details of the option byte.
 Refer to "a notice point in use" of ID78K0-QB for the details of the security ID.
 "word.asm" please the file must be included in the sample program, and copy this file and use it.
 Please refer to "Registering additional source file of next page for the method of adding the file.

```

ORG 80H          ; setting of option byte
DB 0, 0, 0, 0   ;

ORG 84H
DB 3             ; The authentication of the security ID is indispensable.

end
    
```

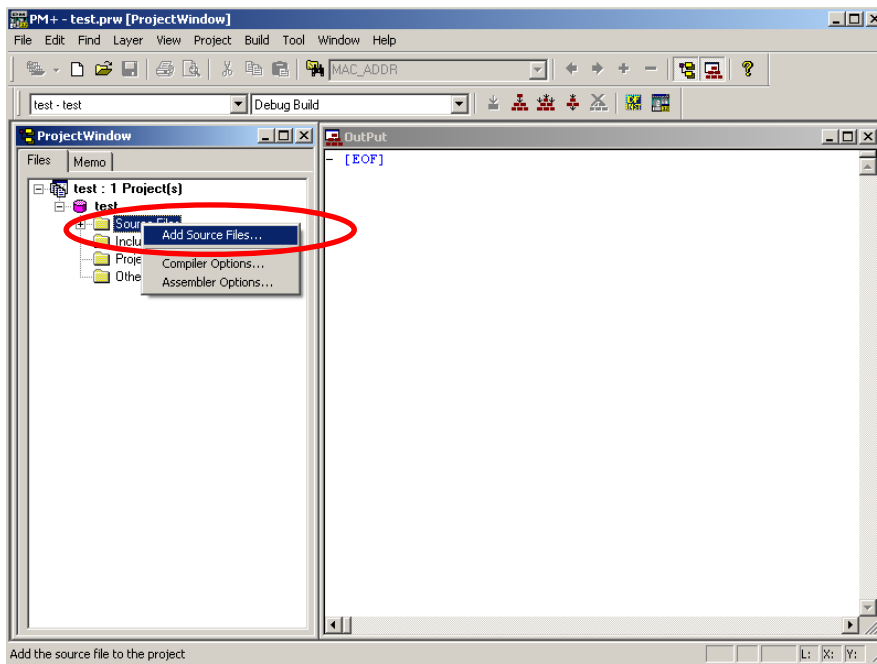
The example of word.asm

5.2 Register additional source file

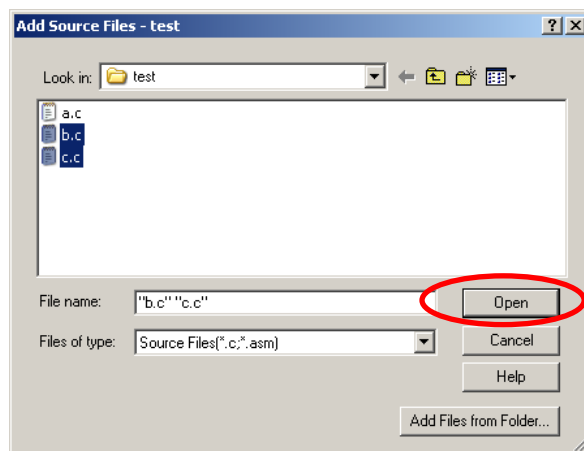
Now, register additional source files.

The following example shows the additional registration of source files “b.c” and “c.c” with source file “a.c” already registered.

Place the cursor on the source file in the Project window of PM+, and select [Add Source Files...] displayed in the right-click menu.



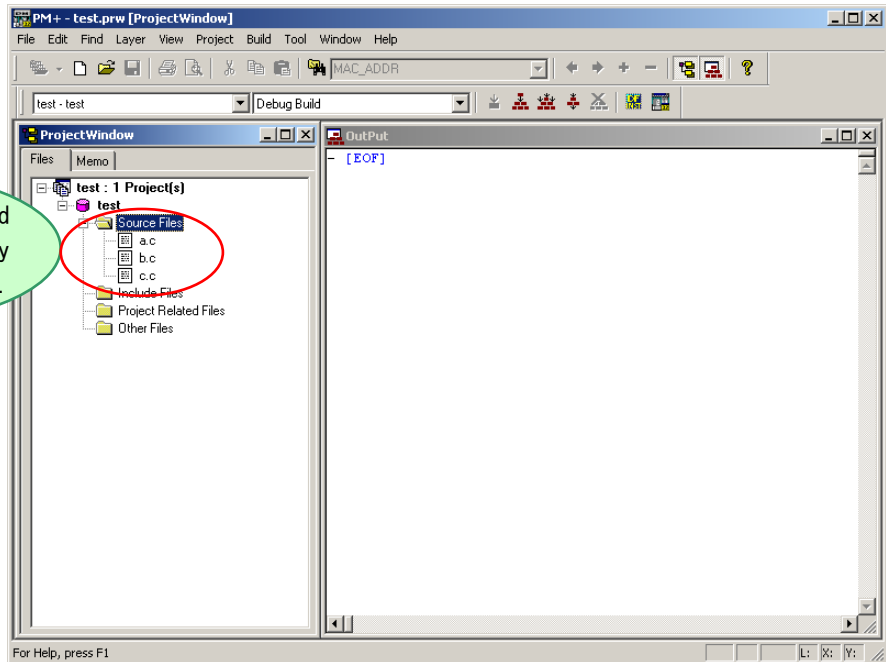
Select source files “b.c” and “c.c”, then click



Multiple source files can be selected by clicking them with pressing key.



Source file "b.c" and "c.c" are additionally registered to the project.



5.3 Debugger tips

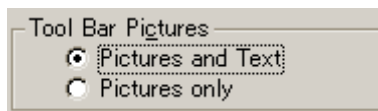
This section describes some useful techniques for the debugger (ID78K0-QB-EZ).

5.3.1 Change display of buttons

Execution controls (run, stop, step-in debugging, reset, etc) and opening functional window can be made by below buttons. However, it could be difficult to know which button does what.



In this case, select "Options" on menu bar, then "Debugger Options". Check "Pictures and Text" on setting area.

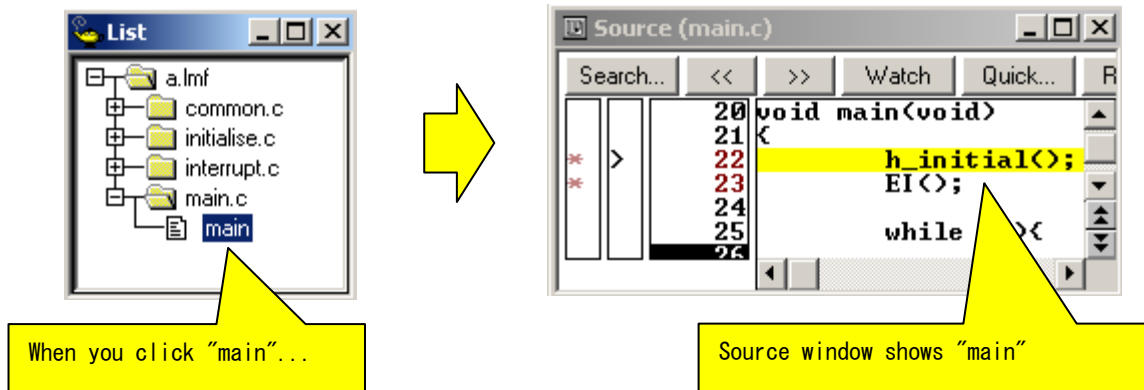


With this setting, the buttons display the text as well, so that it is easier to know what they are.



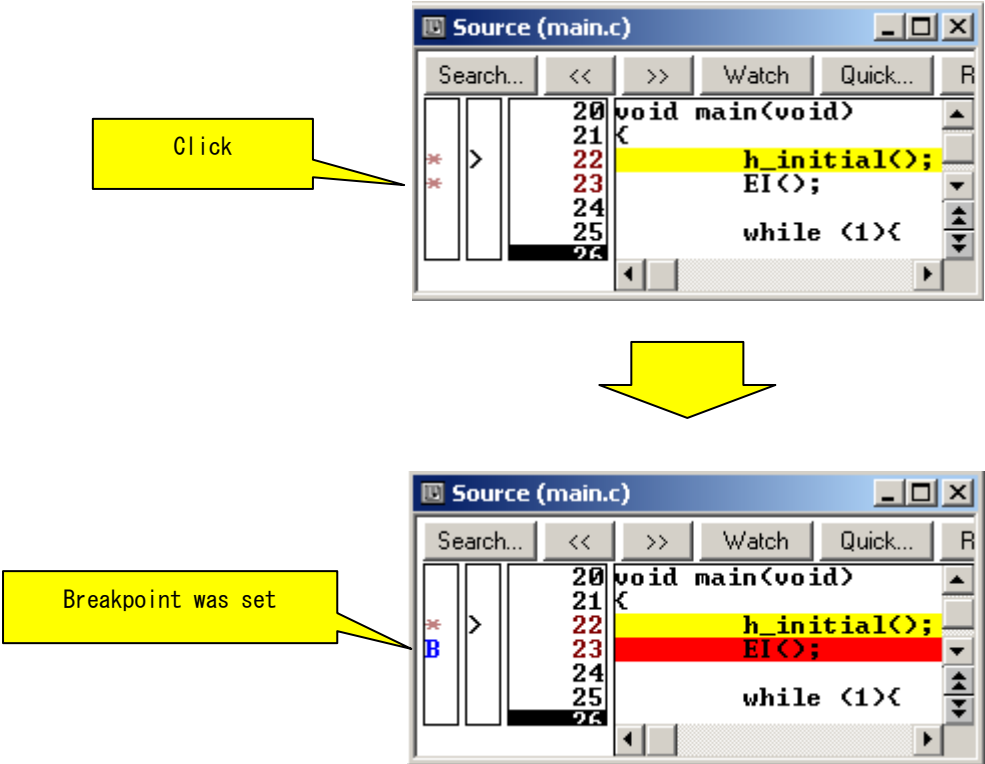
5.3.2 Display source list and function list

When you wish to see source file list or function list, select "Browse" on menu bar, then "Other" -> "List" to open the list window. The information in the windows is synchronized. Therefore, it is not just for referring to the list, but it is useful when you wish to update files or functions.



5.3.3 Set/delete breakpoints

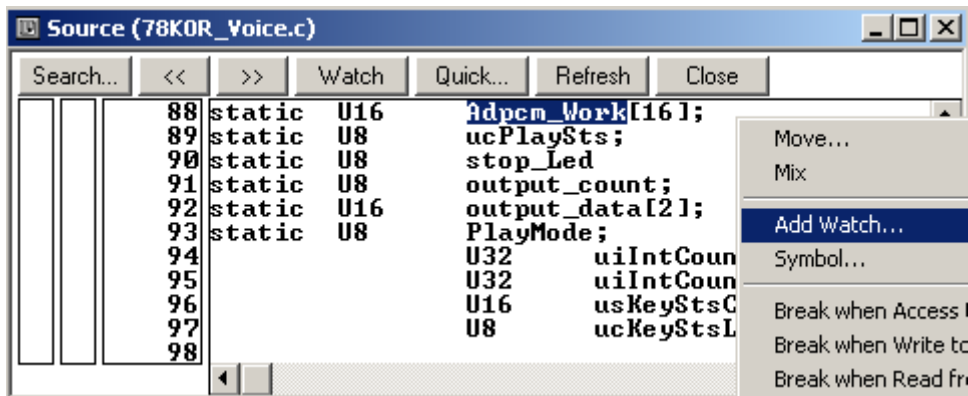
Breakpoints are executed by clicking lines in which " * " is displayed
"B" is displayed in the line where a breakpoint is set.
Breakpoints are deleted by clicking "B".



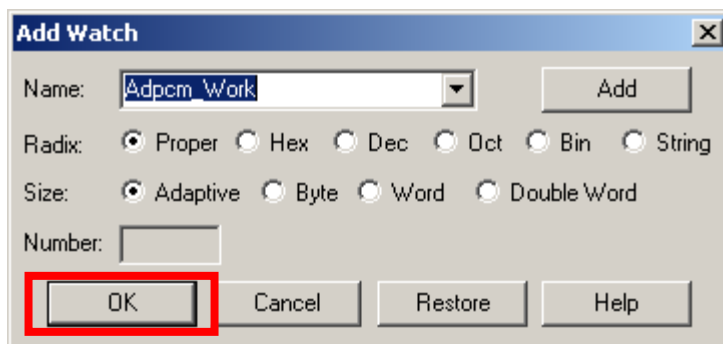
5.3.4 Display global variables

With using Watch Window, you can display global variables. There are several ways to register global variables to watch window. In this section, how to register from source window is described.

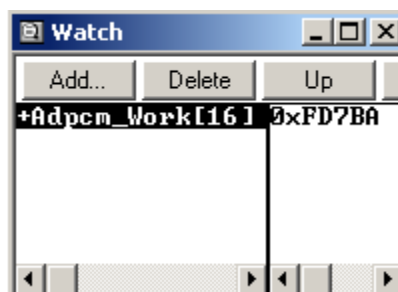
- ① Right-click the variable on source window, then select "Add Watch..."



- ② Add Watch dialog opens. Click **OK**.



- ③ Adding a variable to watch window is completed.

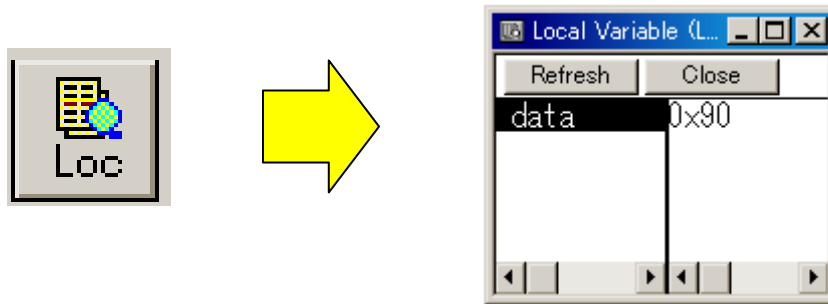


5.3.5 Display local variables

Local variable window is used to display local variables.

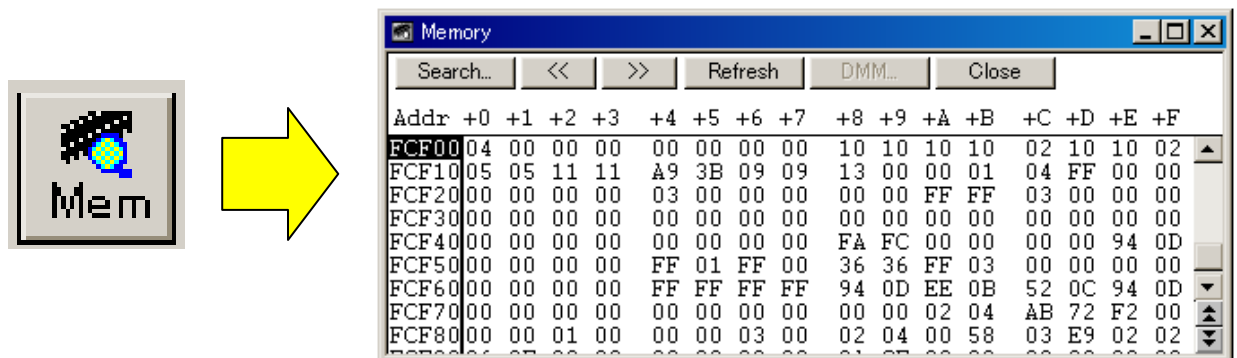
By clicking the button below, you can open the local variable window.

Unlike global variables, local variables cannot be displayed when programs are running.

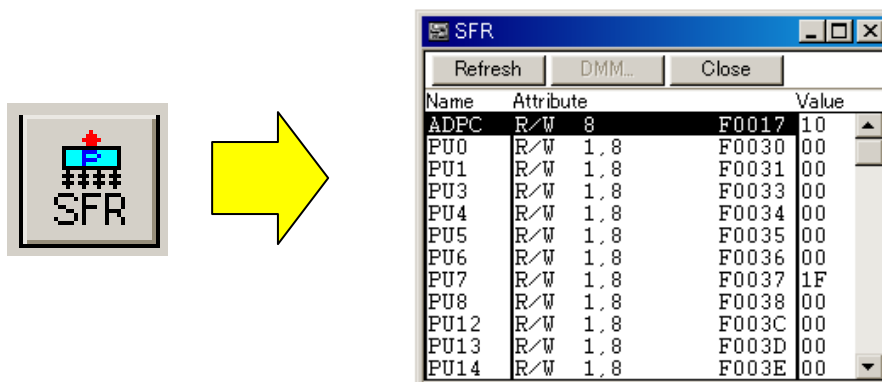


5.3.6 Display memory and SFR contents

By clicking the button below, you can open the memory window.



By clicking the button below, you can open the SFR window.



5.4 WriteEZ3

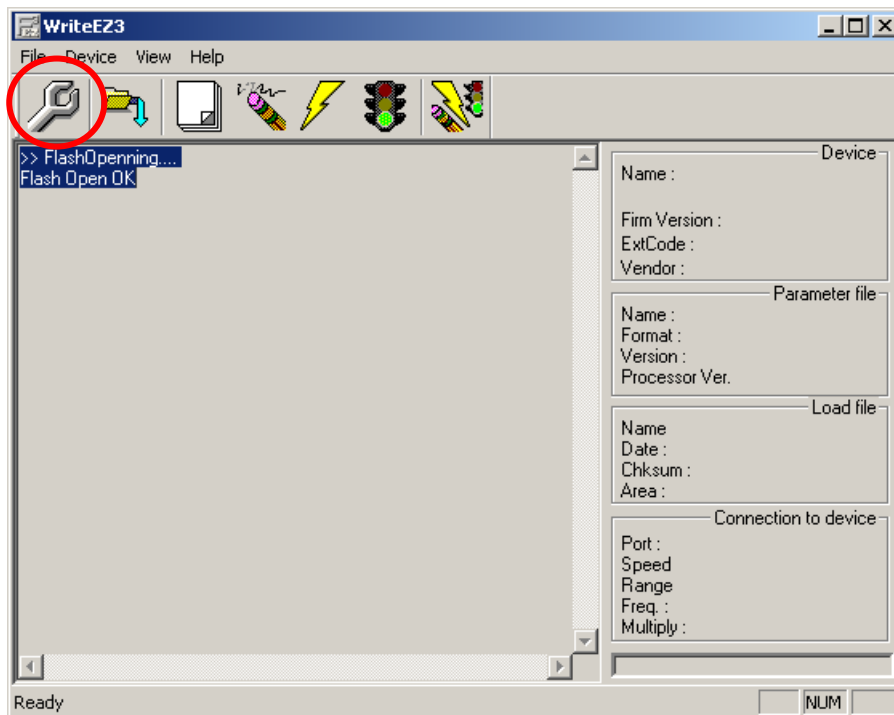
If you forgot the security ID or if you set On-Chip Debug Option Byte to disable the on-chip debug function, you cannot start debugger. In this case, you need to delete the setting values of security ID and On-Chip Debug Option Byte. Use WriteEZ3 to erase the flash memory.

WriteEZ3 cannot be installed from an integrated installer. Please execute
 ¥WriteEZ3¥WriteEZ3.exe
 from the Explorer etc.
 The hardware for WriteEZ3 is incorporated in StickLIN-78K0.

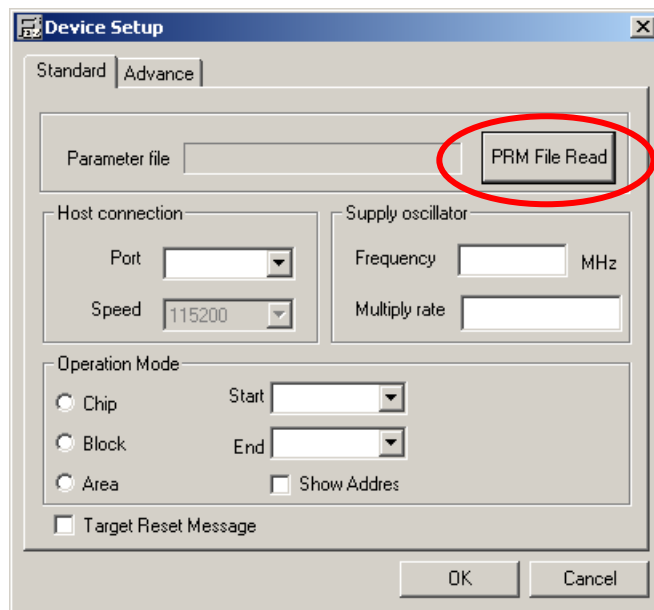
- ① The switch of StickLIN-78K0 is set as follows, and connects StickLIN-78K0 to PC.

Switch name	setting
Writer	ON
Debug	OFF

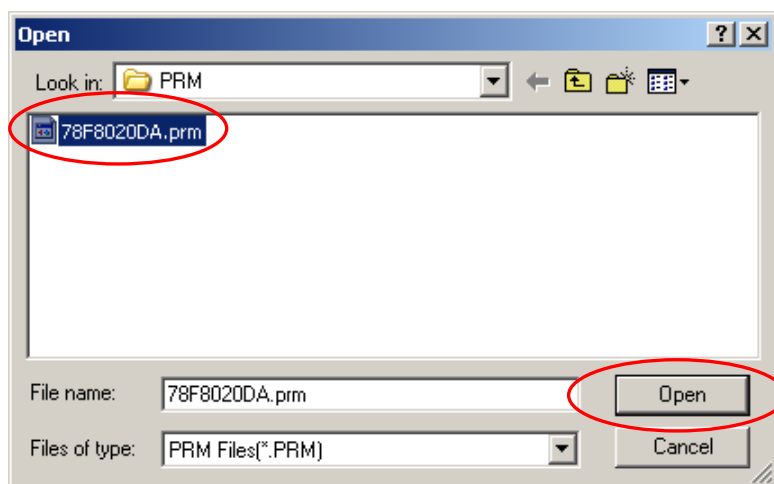
- ② Please execute “¥WriteEZ3¥WriteEZ3.exe”. if you find “Security Warning”, click “Run”



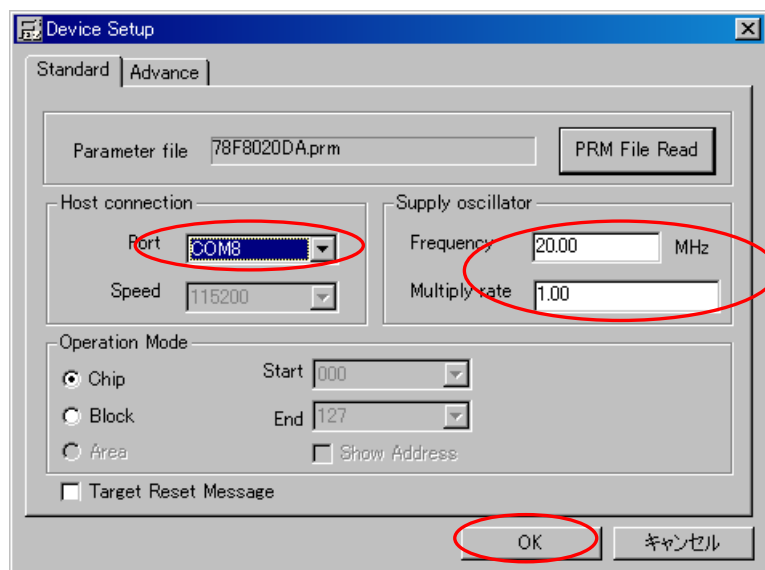
- ③ Push the 「Setup」 button.



④ Push the 「PRM File Read」 button.



⑤ Please select “78F8020DA .prm” in the directory of “¥PRM” in the CD-ROM.

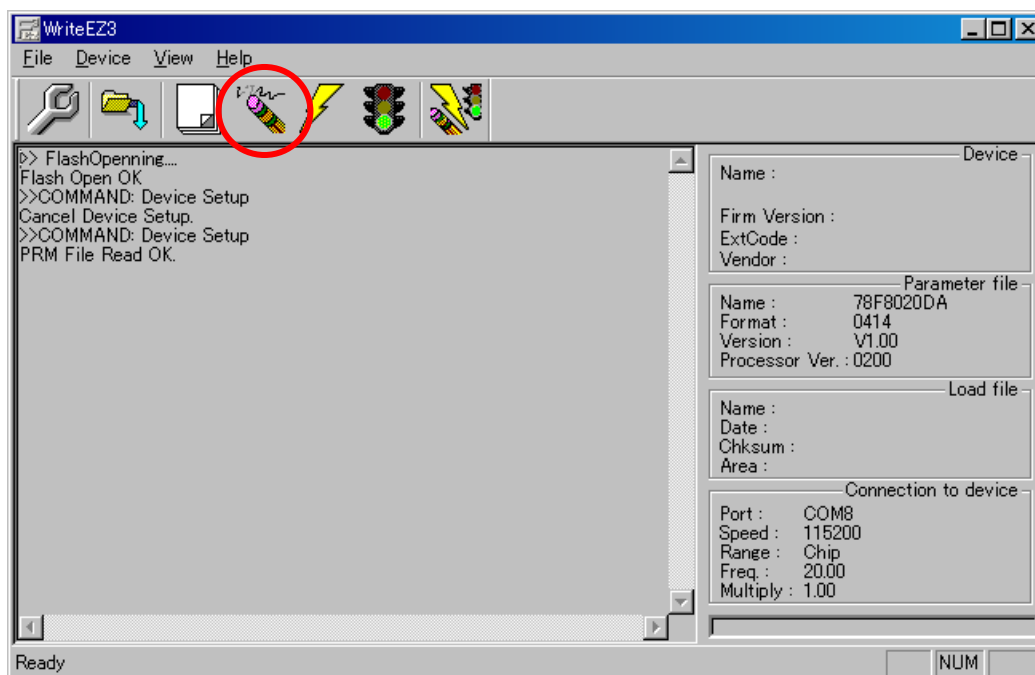


⑥ "Port" selects the COM port number where StickLIN-78K0 is allocated.

※ Only the COM port number that the personal computer has is displayed in this pull-down menu.

Input "20.00" to "Frequency"

Input "1.00" to "Multiply rate", and click "OK"



⑦ "Erase" The deletion of the flash memory begins when the button is pushed.

⑧ StickLIN-78K0 is detached from the PC.