User's Manual

TK-RF8058+SB

ZigBee™/RF4CE™-ready
Wireless Network Evaluation Board

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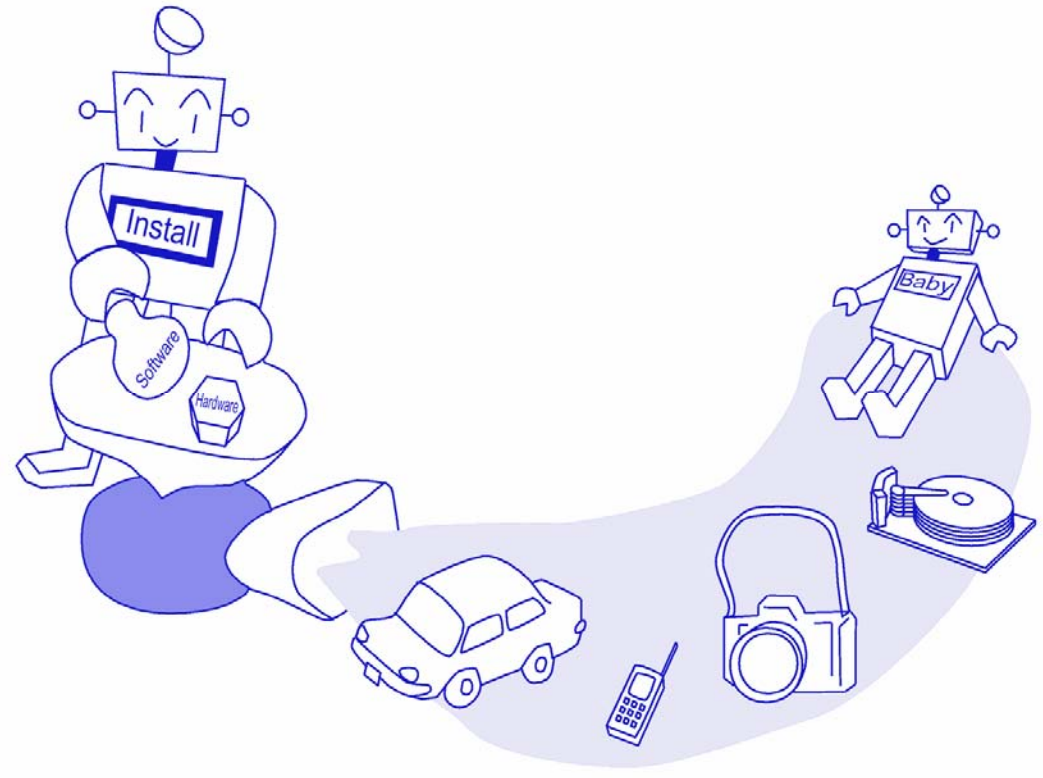
Welcome to the world of TK-RF8058+SB.

You are now being navigated to the design environment of the µPD78F8058 microcontroller for developing wireless network applications. Please follow the tutorial step by step.



[NOTES]
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TESSERA TECHNOLOGY INC. would like to inform, that the standard quality assurance procedure(s) have not been fully applied to this product and its documentation and that TESSERA TECHNOLOGY INC. cannot assure the full and error free function and/or the standard quality level.
[CAUTION]
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.

[FCC WARNING & NOTICE]

●Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

●The intended use of the product is generally not for the general public. It is generally for industry/commercial use by the professional electric engineer. To be in compliance with FCC 15.203 requirements, the product must be installed by professional installers with approved antenna that was included in the product.

Class B:
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

● Reorient or relocate the receiving antenna.
● Increase the separation between the equipment and receiver.
● Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
● Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
●this device may not cause harmful interference, and
●this device must accept any interference received, including interference that may cause undesired operation.

●The host device shall also comply with the certification labeling requirements of each of the modules it contains.
●A reference to the enclosed module displaying its FCC ID certification number.
Recommended wording:
Contains FCC ID: X8U0001

Contents

1 Introduction

Target Reader — Software development engineers who wish to become familiar with the development environment of the 78K0R microcontrollers. It is assumed that the readers have been familiar with basics of microcontrollers, C and assembler languages, and the Windows™ operating system.

Purpose — For readers to become familiar with the design environment and the application examples of wireless networks.

Overview — This manual consists of the following contents

Chapter 1 Introductions
→Overview of this manual

Chapter 2 Preparations
→Introduction of soft tools, and sample programs and installation

Chapter 3 Experiences
→ Guide to the basic operations of PM + and the integrated debugger using sample programs.

Chapter 4 Hardware Specifications
→Explain the hardware of TK-RF8058+SB

Chapter 5 Troubleshooting
→Describe how to solve troubles you may face, such as errors when starting the integrated debugger (ID78K0R-QB)

Chapter 6 Other Information
→Introduce other information, such as how to create a new workspace (project) on integrated development environment (PM+), how to register additional source file, and some useful tips of the integrated debugger.
The circuit diagrams of demonstration kit are included in this chapter.

Chapter 7 Mode Setting of the Board
→ Explanation of switch setting.

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2 Preparations

This chapter introduces the development environment and describes how to install the sample programs. The sample program can be tested on this hardware platform of the evaluation kit.

2.1 Development Tools, Sample Programs, and the MAC Library

This section outlines the development tools, sample programs and the MAC library used in this tutorial.

2.1.1 Integrated Development Environment PM + V6.31

This is a project manager, where you work for editing the source code, compiling it, and initiating the debugger. The project manager works on MS Windows 2000 or XP.

2.1.2 Device file DF788058 e1.00b

A device file contains an MCU specific information. It instructs the development tools what kind of an MCU the tools shall work for.

2.1.3 C Compiler CC78K0R W2.12 : Code size limited version

This is a free compiler for the 78K0R microcontrollers. The object code size is limited to 64 Kbytes. It works on MS Windows 2000 or XP.

2.1.4 Assembler RA78K0R W1.33 : Code size limited version

This is a free assembler for the 78K0R microcontrollers. The object code size is limited to 64 Kbytes. It works on MS Windows 2000 or XP. The RA78K0R Assembler Package contains Structured Assembler Preprocessor, Assembler, Linker, Object Converter, Librarian, and List Converter.

2.1.5 78K0R integrated debugger ID78K0R-QB V3.60

The Integrated Debugger ID78K0R-QB offers a debug environment on your PC, where the MS Windows 2000 or XP runs, if the TK board is connected to the PC with USB. The USB I/F accesses to the OCD, On Chip Debug, interface on the microcontroller.

2.1.6 Built-in Flash Memory Writing Program WriteEZ5

This is the Windows software to write programs on built-in flash memory. By connecting TK-RF8058+SB and PC with bundled USB cable, you can write/delete programs on the built-in flash memory.

2.1.7 78K0R Starter Kit Setting

If you forget about the security ID or if you set “Does not erases data of flash memory in case of failures in enabling on-chip debugging”, you can

erase the flash memory by using this starter kit.

2.1.8 Starter kit USB driver

This is a software driver for PC to access to the USB interface of the TK-RF8058+SB board.

2.1.9 The RF Test Program

The RF Test Program is used in [chapter 3 Experiences].

The RF Test Program is provided in the form of the C source codes.

If you wish to tailor the RF Test Program to meet your specific needs, you can edit the source code, re-compile it with debug build to generate a load module file, then, start the debugger to load the tailored execution code on to the microcontroller for further debugging on the project manager PM +.

Alternatively, if debugging is not required, you can make a release build to achieve a new hex file, on the project manager PM +.

As a general remark, please respect your local regulation of electro-magnetic emission. In general, it is suggested to use the TK-RF8058+SB board in a radio anechoic chamber.

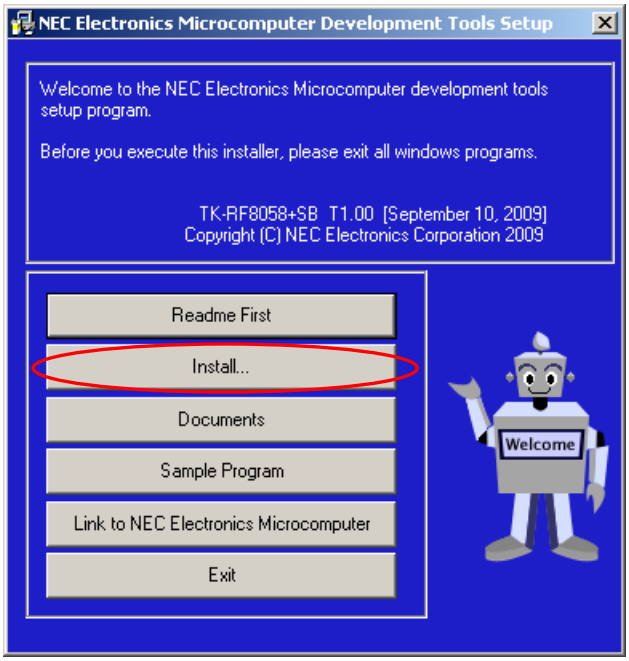
2.2 Installation of Software Development Tools

2.2.1 Start-up of the installation CD-ROM

The attached CD-ROM contains Development Tools, documents and sample soft ware.
You can install it using an installer.

2.2.2 Installation of the software development tools.

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.



<1> Readme First
The contents of the CD-ROM, and some notes are available.
Please read it at first.

<2> Install…
Click “Install” to start installation of development tools.
For details, please refer to the next section.

<3> Documents

Manuals of development tools and the evaluation kit are available in PDF files.

When this button is clicked, the WWW browser will start. Adobe® Acrobat® Reader is available in the CD-ROM.

<4> Sample Program

Click this button to start the WWW browser for the sample program and the tutorial.

<5> Link to NEC Electronics Microcontrollers

Click this button to start the WWW browser display the link to the NEC Electronics Microcontroller web site (http://www.necel.com/micro/index_e.html)

The NEC Electronics Microcontroller web page provides with the latest product/tool information and FAQs.

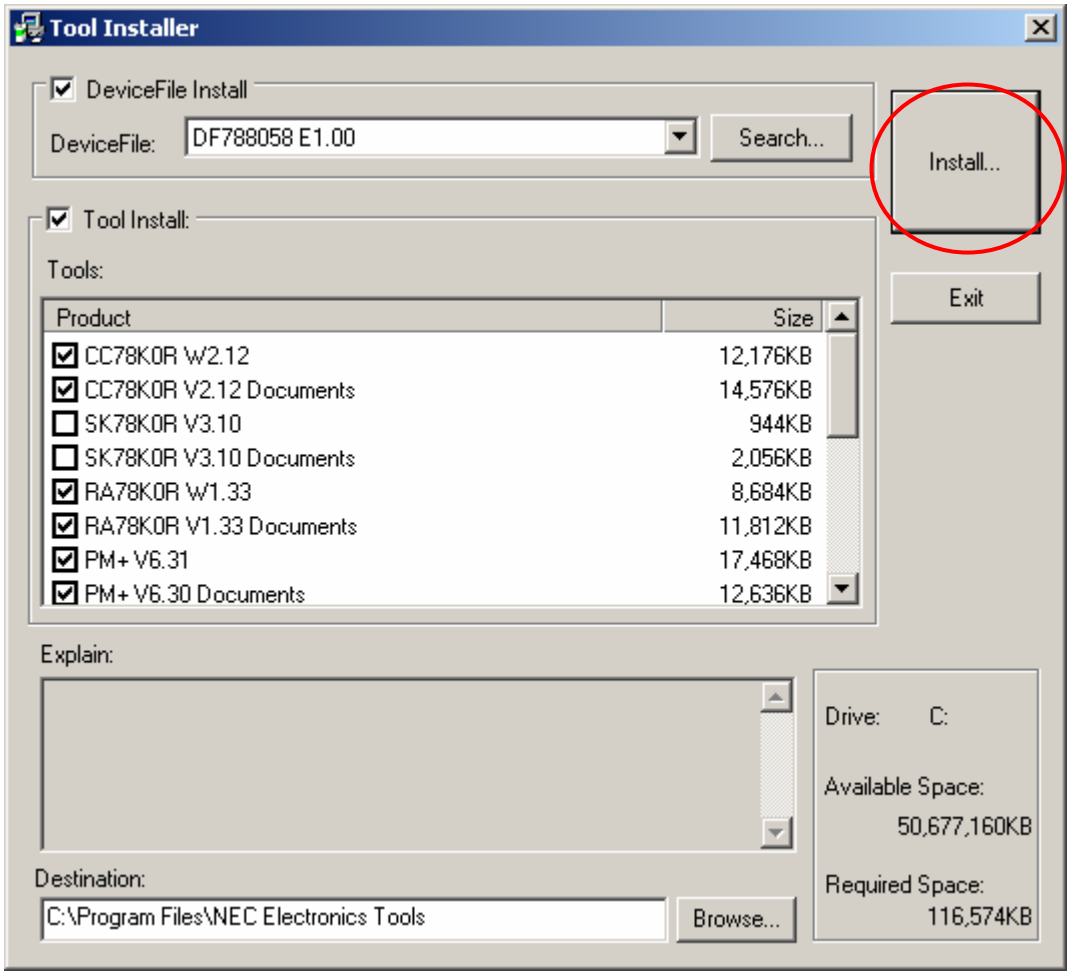
<6> Exit

Terminate the setup.

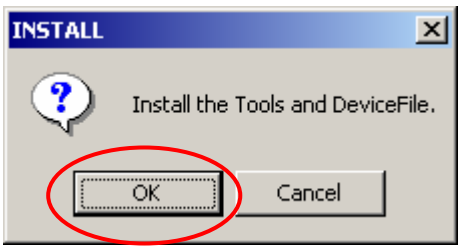
① Select products that you need to install.
(as default, all the products that you need to use the demostration kit are selected.)
"Explain" area displays an explanation of the selected product.
To change the installation destination, click Browse··· .

When all the settings are completed, click Install··· .

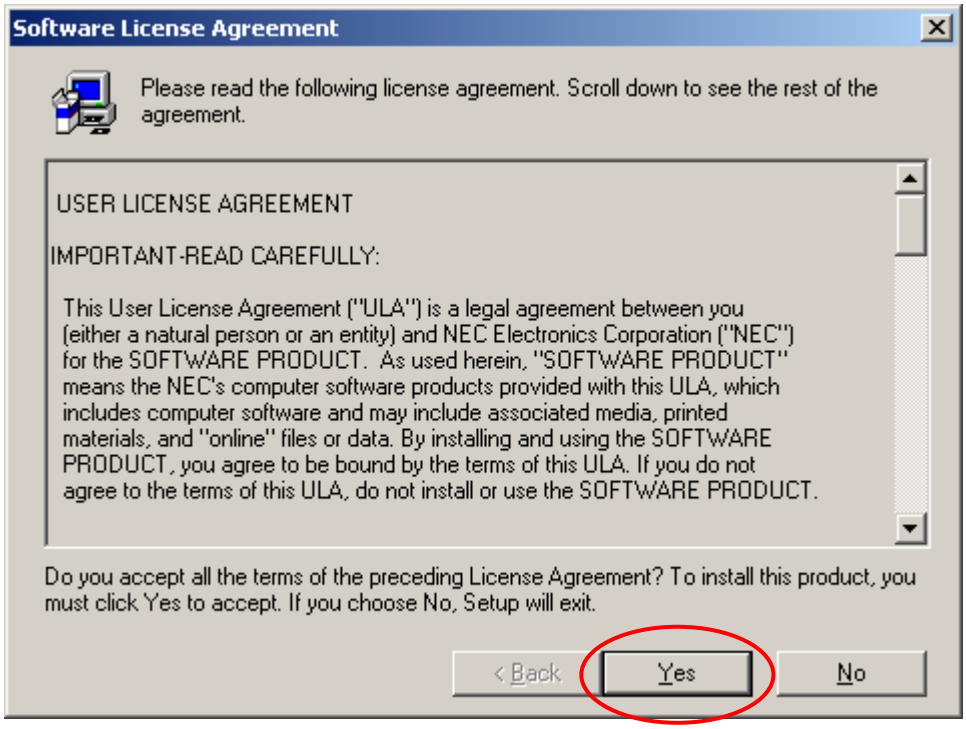
* In this document, it is assumed that users install the programs under "NEC Electronics Tools" directory (default installation directory). Users can find the tools by selecting “Start Menu” -> "Programs" -> "NEC Electronics Tools".



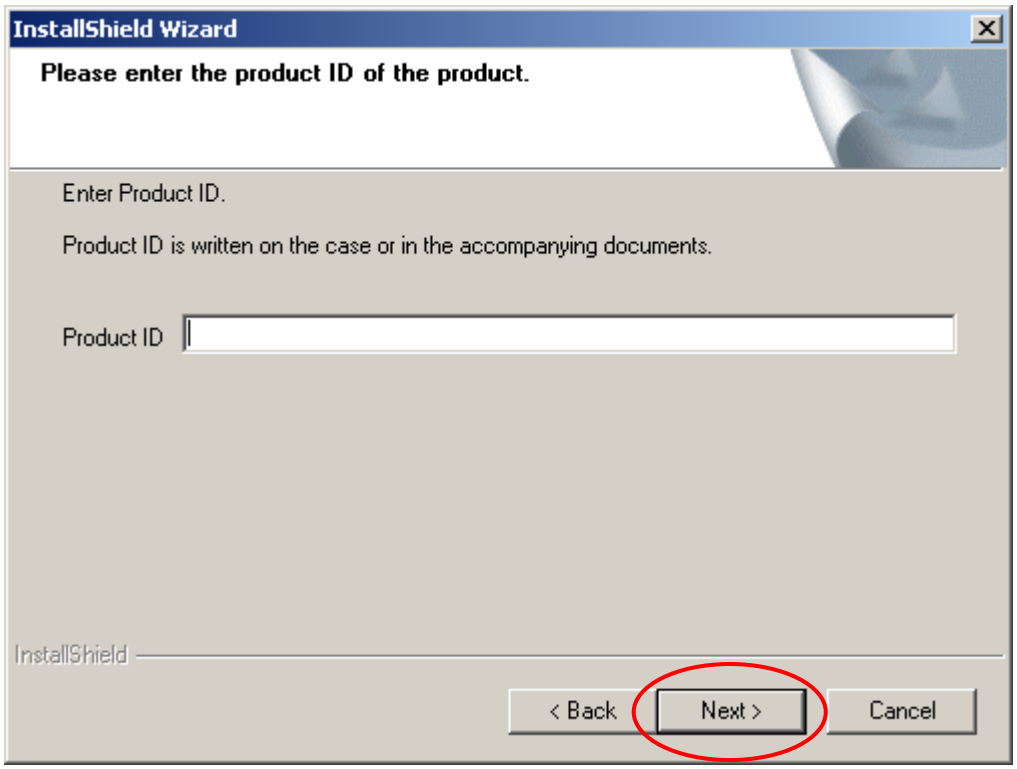
② Click OK when "Install" comfirmation dialog box is opened.



③ Read "software license agreement" and click Yes for continuing the installation.To stop the installation, click No .

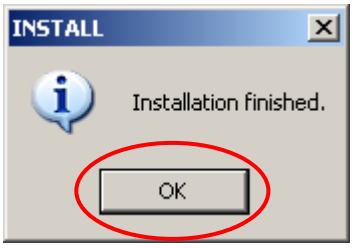


④ Enter the product ID, and click Next .
* The product ID is available on the “README.html” the other sheet.



⑤ It starts copying the files.

⑥ When the installation is completed, the following dialog opens. Click [OK] .



⑦ "NEC Electronics Starter Kit Virtual UART" USB driver must be installed on PC before you connect to TK-RF8058+SB . Install the USB driver by referring "2.3USB Driver".

Notes on the installation authority

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

Notes on the install-directory

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

Note on the version of Windows

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.

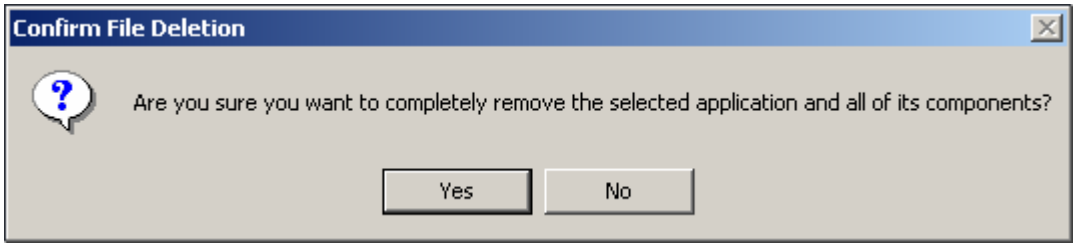
The identical problem may be observed, if a language other than English is specified as the system language in the “Regional Settings Properties” tab.

2.2.3 Uninstall

<1> Start "Add /Remove Programs" in the Control Panel.
(Example here is based on Windows2000)

<2> Select the tool that you want to uninstall from the list displayed in "Install/Uninstall" and click [Add/Remove...].

<3> A dialog box for confirming deletion of files will be displayed. Click Yes. Deleting of the files will be started.



<4> When the completion message is displayed, click OK.

Caution:
Deletion of some files may be asked during uninstallation. Normally, deletion of these files causes no problem.

<5> This completes uninstalling this tool.

2.2.4 File Configuration in PC

Software Development Tools are installed in "C:¥Program Files¥NEC Electronics Tools" on default setting.
When you use the tools, please open the tools from [Start menu] -> [Programs]->[NEC Electronics Tools].

2.3 USB Driver

You need to install “NEC Electronics Starter Kit Virtual UART” in your PC.

When TK-RF8058+SB is used, it is necessary to install the “NEC Electronics Starter Kit Virtual UART” driver in the host machine. Please install the driver according to the following procedures with appending CD in the drive.

"Starter Kit USB Driver" must be installed on the PC. If not, please refer to "2.2 Installation of Software Development Tools" to install the “Starter Kit USB Driver” first.

Attention **Do not use a USB hub for connecting TK-RF8058+SB .**

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

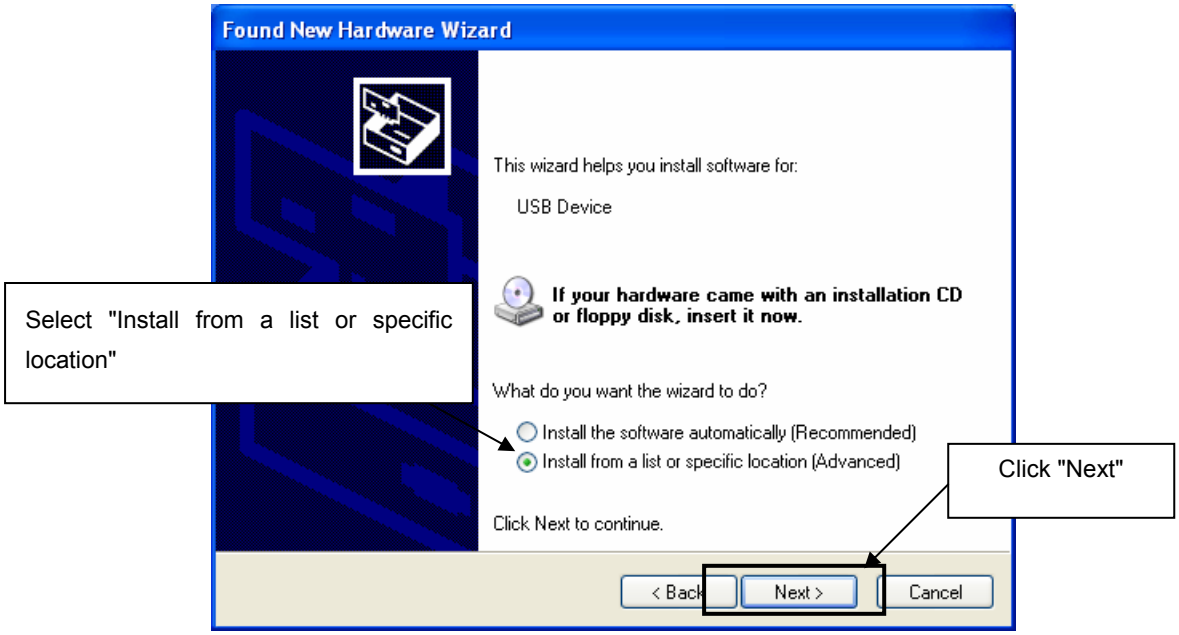
- Windows XP -> "2.3.1Install to Windows XP"
- Windows 2000 -> "2.3.2Install to Windows2000"

After the installation, go to "2.3.3Confirmation of the installation"

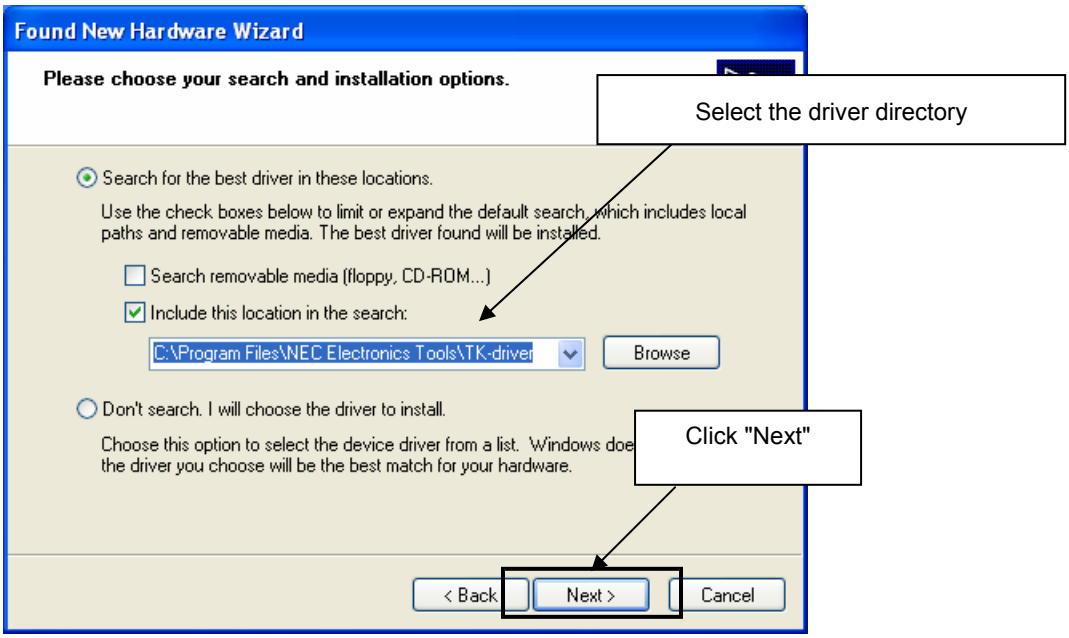
2.3.1 **Install to Windows XP**

1. Once the TK-RF8058+SB is connected with USB, the "Found New Hardware Wizard" will be started. Select "No, not this time" and click [Next >] .

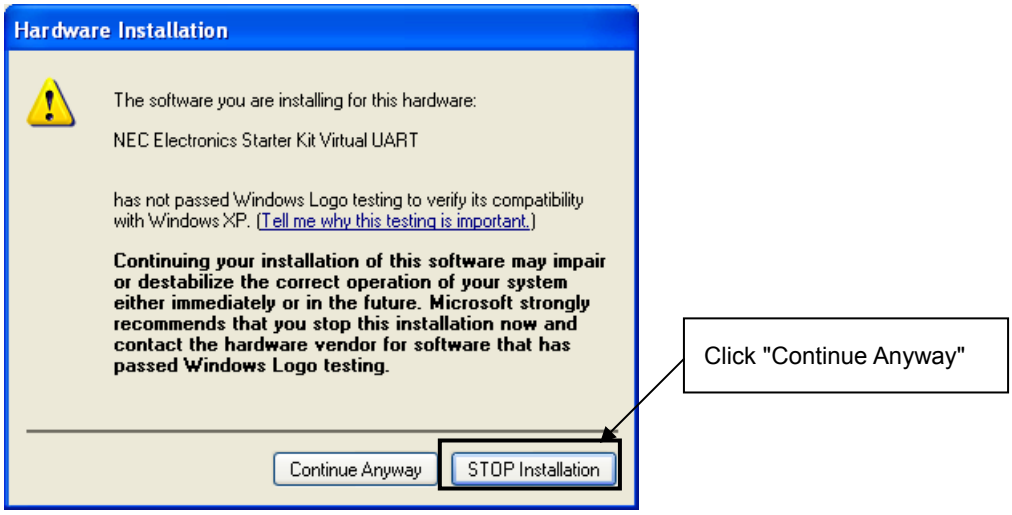
2. Select "Install from a list or specific location" and click [Next >] .



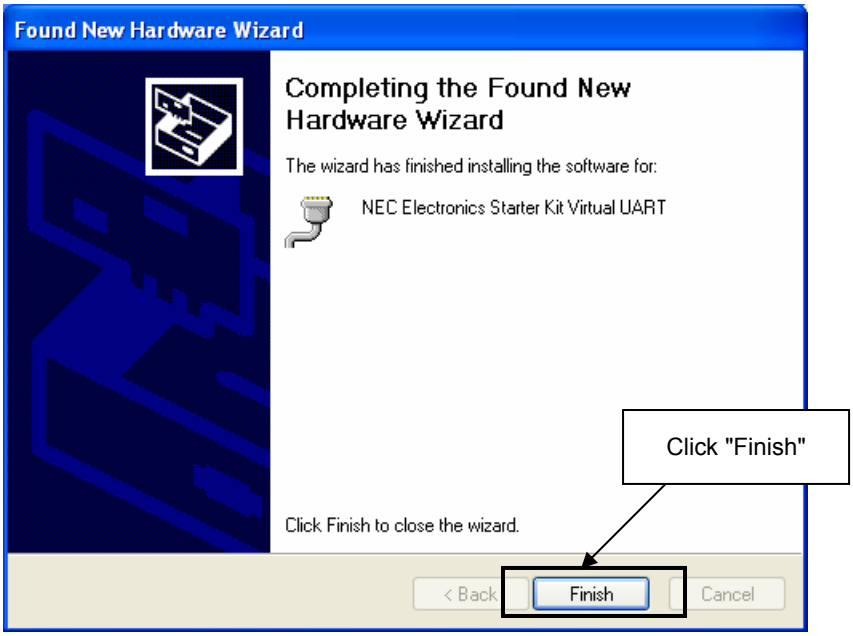
3 . Select "Search for the best driver in these locations." , check "Include this location in the search:", and then click "Browse..." to select the driver directory path. The path should be "C:¥Program Files¥NEC Electronics Tools¥TK-driver" as default installation. If the installation directory is not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



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



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

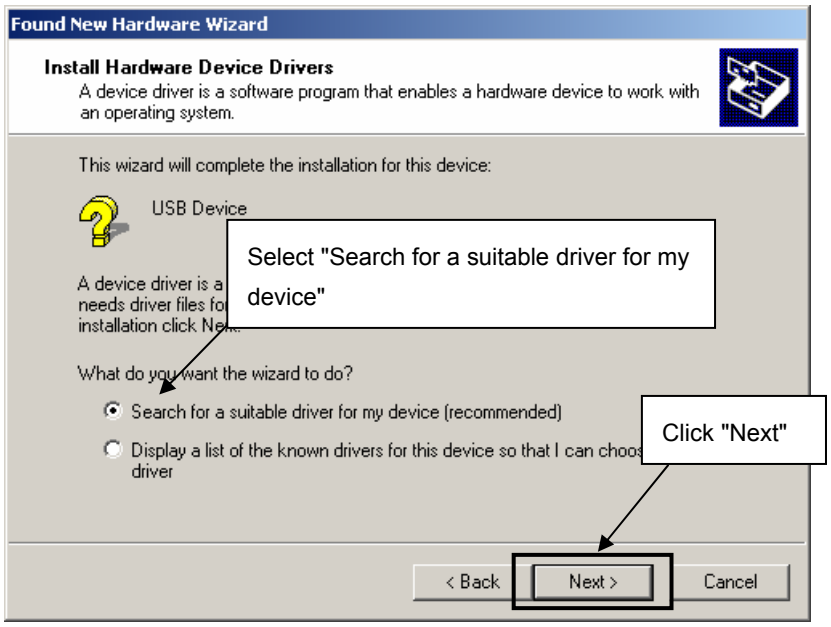


6. Go to "1.3.3 Completion of the installation".

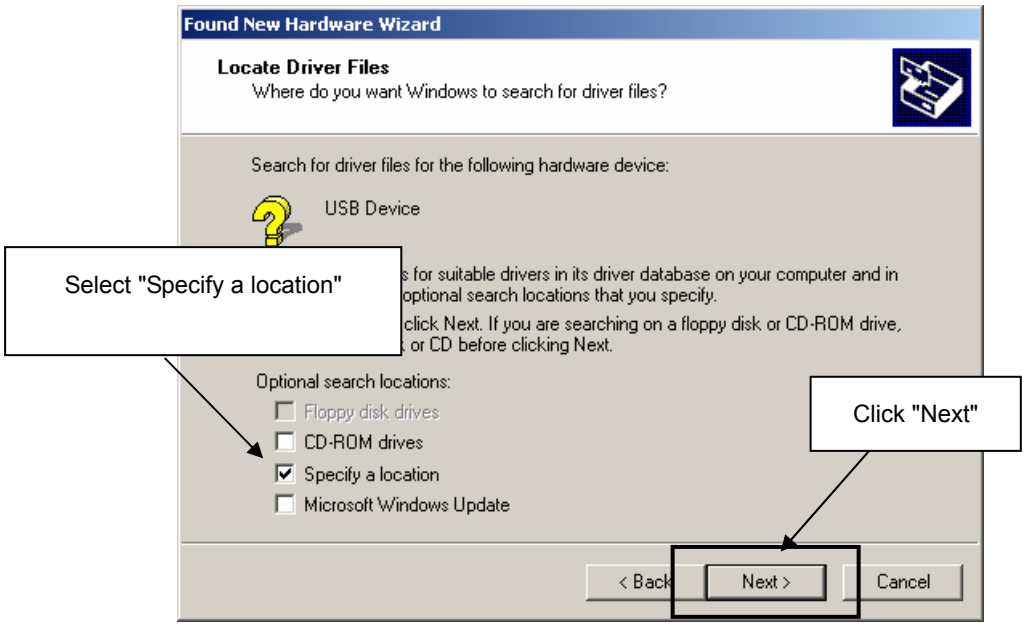
2.3.2 **Install to Windows2000**

1. Once the TK-RF8058+SB is connected with USB, the "Found New Hardware Wizard" will be started.
   Select "No, not this time" and click [Next >] .

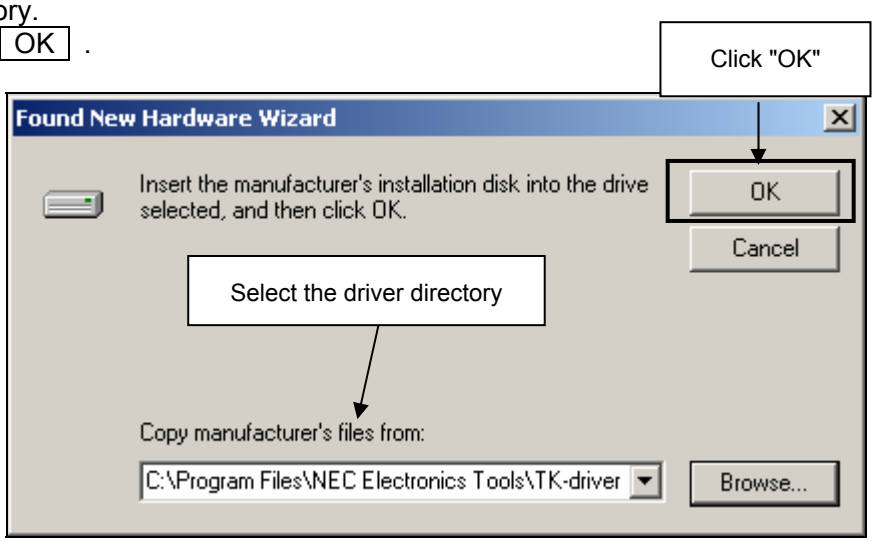
2. Select "Search for a suitable driver for my device".
Click Next > .



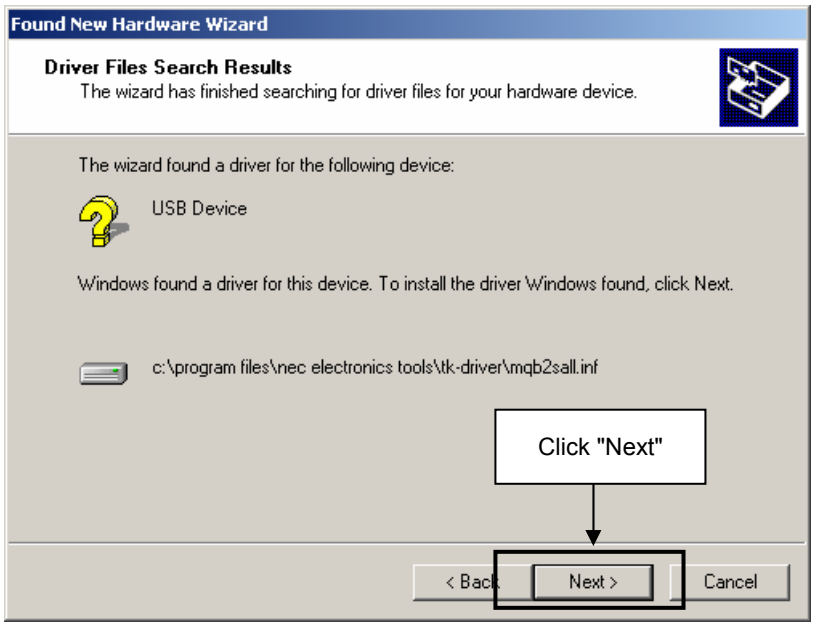
3. Select "Specify a location".
Click Next > .



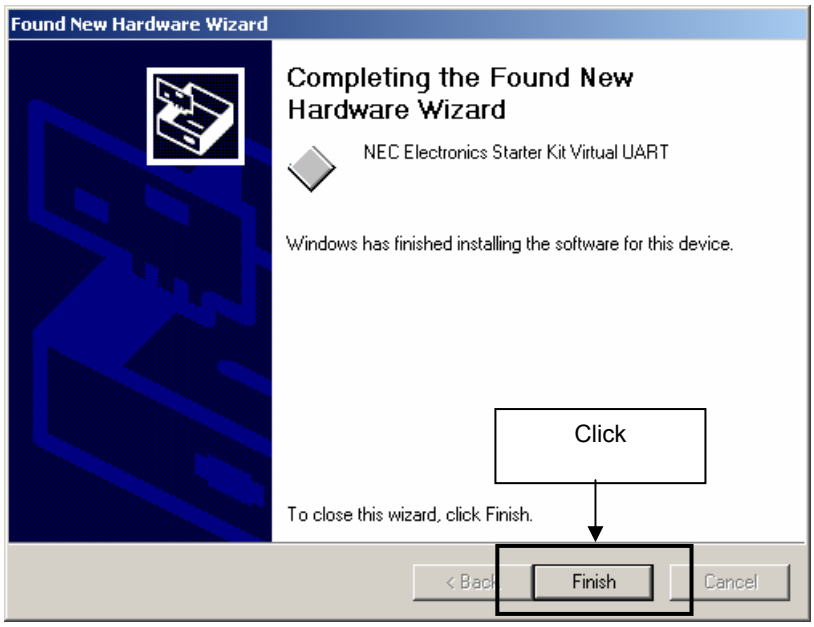
4. Select the driver directory path. The path should be "C:¥Program Files¥NEC Electronics Tools¥TK-driver" as default installation.
If the installation directory is not default, then select "TK-driver" under the installation directory.
Click OK .



5. Click Next > .



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

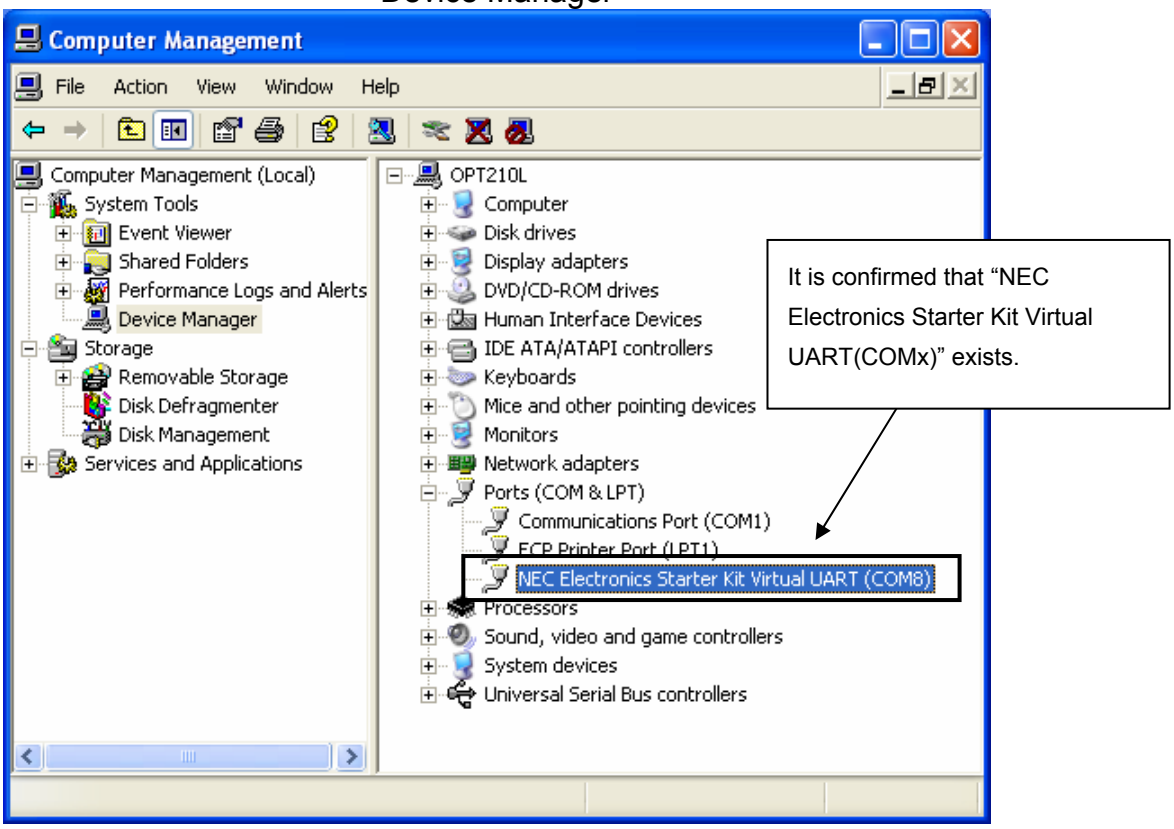


7 . Go to "1.3.3 Confirmation of the installation".

2.3.3 Confirmation of the installation

Please confirm “NEC Electronics Starter Kit Virtual UART(COMx)” in the device manager of system in the control panel of the MS Windows.

Device Manager



The screen above shows that the COM port number is "COM8". If ID78K0R-QB is not in use, you can use this port number for connecting TK-RF8058+SB.
When you change the USB port connection, the COM port number will be changed as well.

Select this COM port number when you use WriteEZ5.

CAUTION

・Do not do “Hardware Modification Scan” when you communicate with the target device.

2.4 Sample Environment

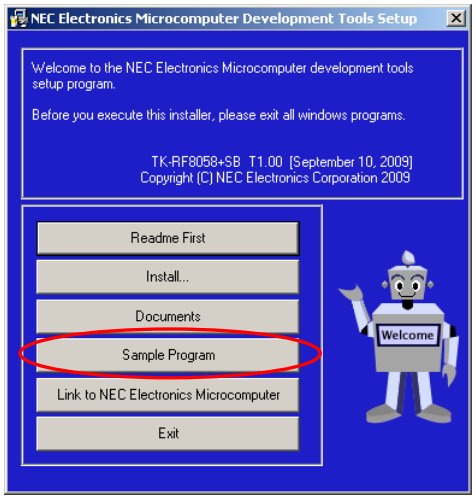
This section explains the overview and preparation of sample programs.
You need to install the sample programs on your system first before using them.

How to install the sample programs and where they should be intalled on your system will be explained.

2.4.1 Installation of the sample programs

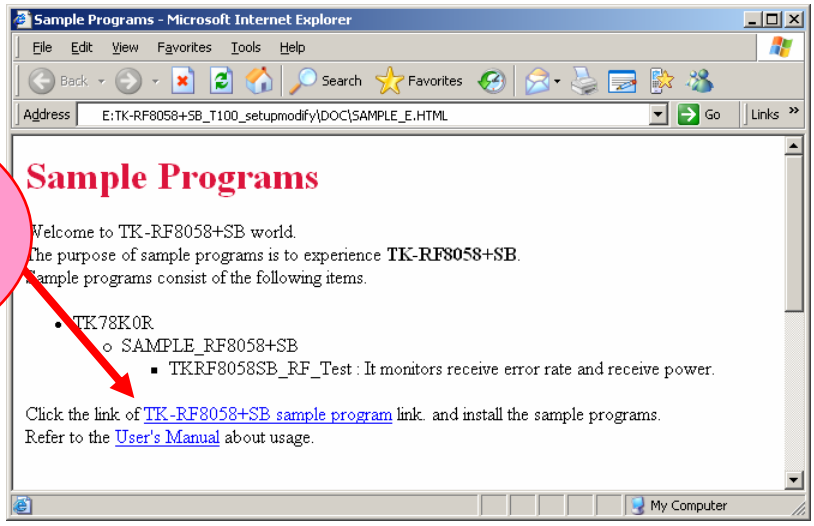
Insert the CD-ROM disk in the CD-ROM drive of your PC. The [NEC Electronics Microprocessor Development Tools Setup] screen automatically appears.(if this screen does not appear automatically, start setup.exe from Explorer. etc.)

Press the Sample Program button to start the WWW browser, and then click the [TK-RF8058+SB Sample Programs] link.

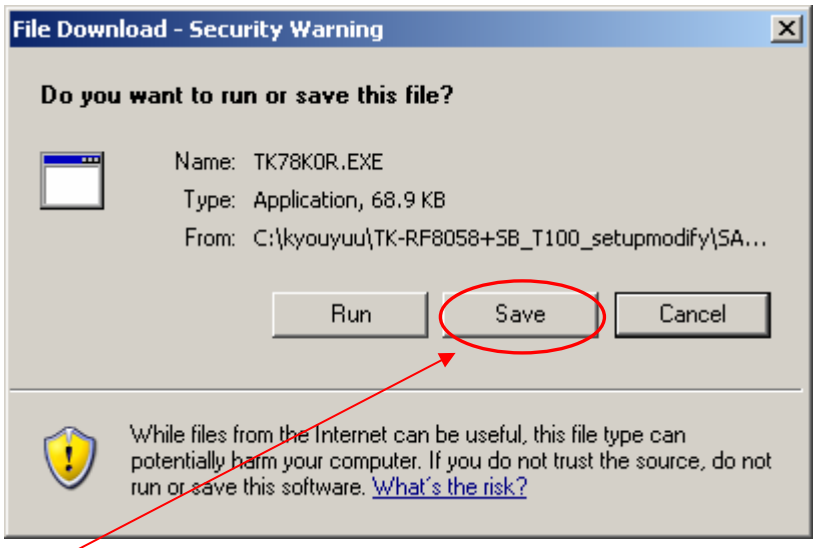


The WWW browser starts up.

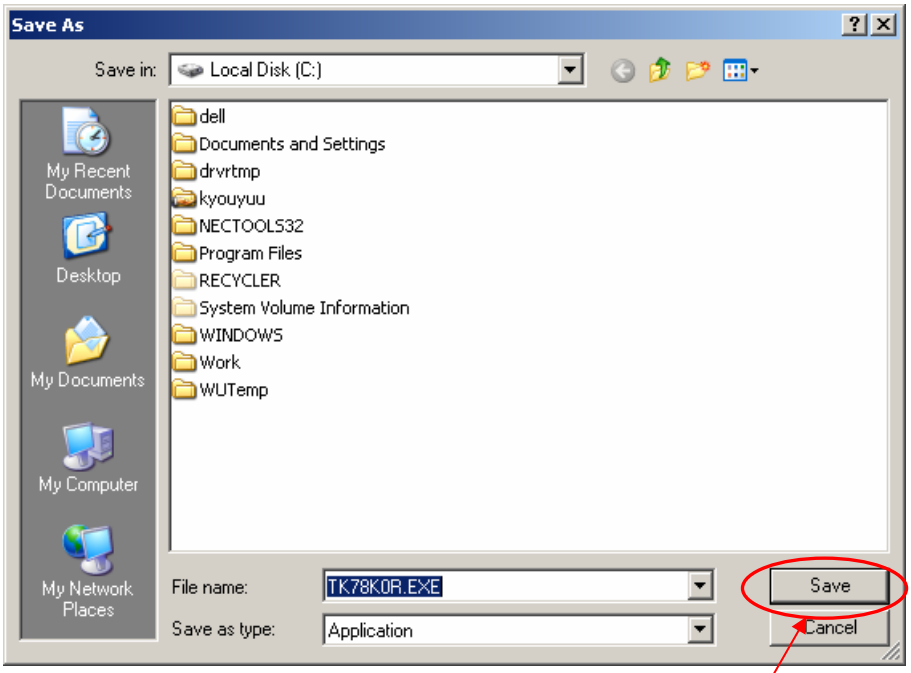
Click the [TK-RF8058+SB Sample programs] link you can also download the [User's Manual]



When[TK-RF8058+SB Sample Programs] is clicked, the following download confimation window appears.



Click the Save butten.



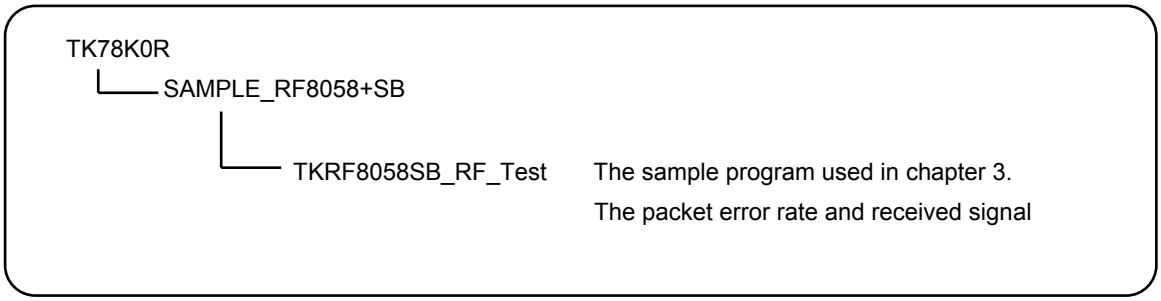
After specifying the download destination folder, click the Save button.

The self-extraction sample program (TK78K0R.exe) is copied to the specified folder.

The folder that the "TK78K0R" folder is made when this file is executed, and the sample program is stored under the" TK78K0R" folder.

2.4.2 File Configuration of the sample program

The sample programs ware the following folders.



3 Experiences

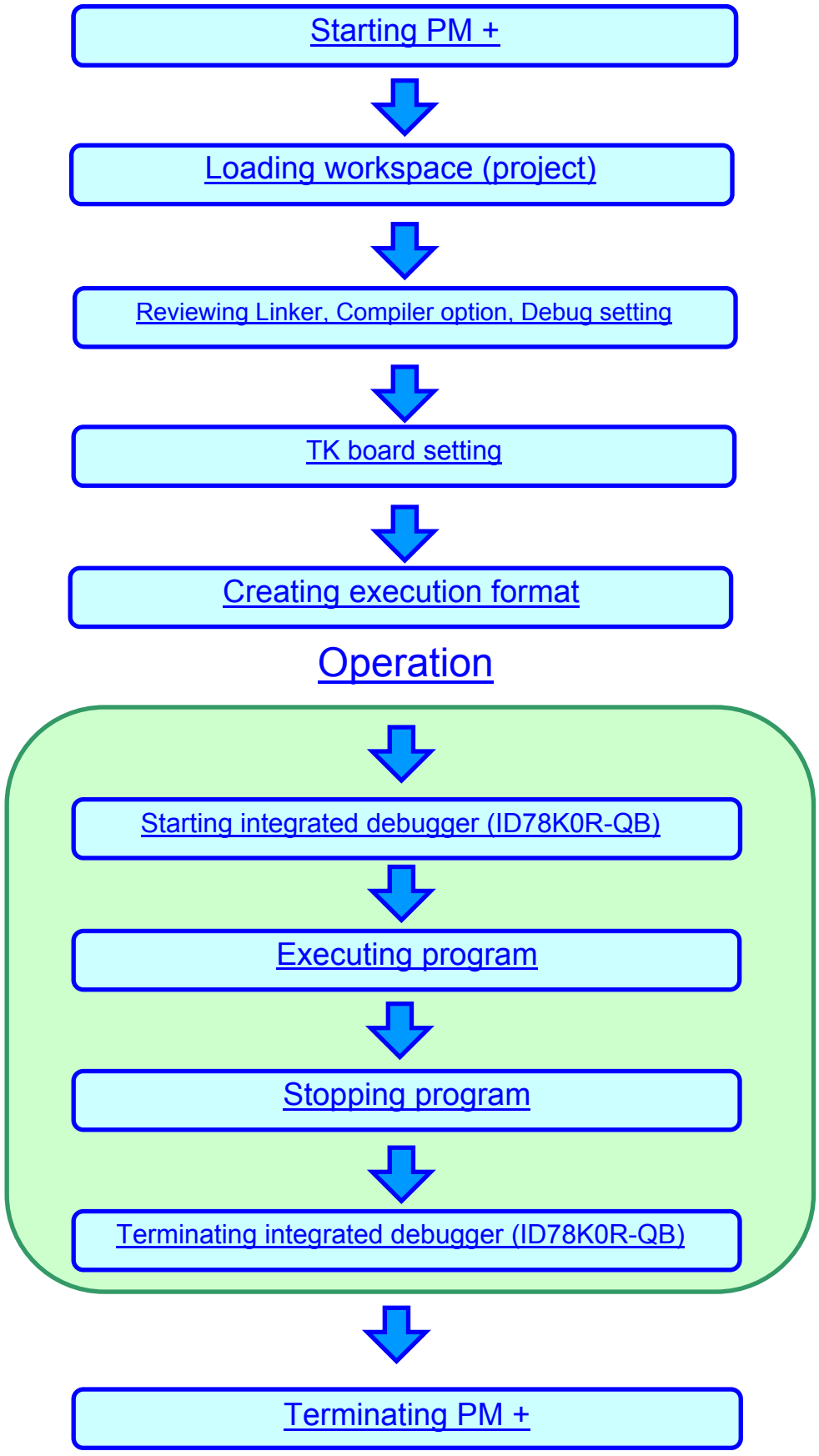
Now you are ready to experience the operation of the TK-RF8058+SB using the integrated development environment, PM +.

As a program for the TK-RF8058+SB, the RF test program (RF_Test) which you installed in "2.4.1Installation of the sample programs" is used.

Later in this chapter, you will learn how to generate an executable file, how to download it to the Flash, and how to execute the program.

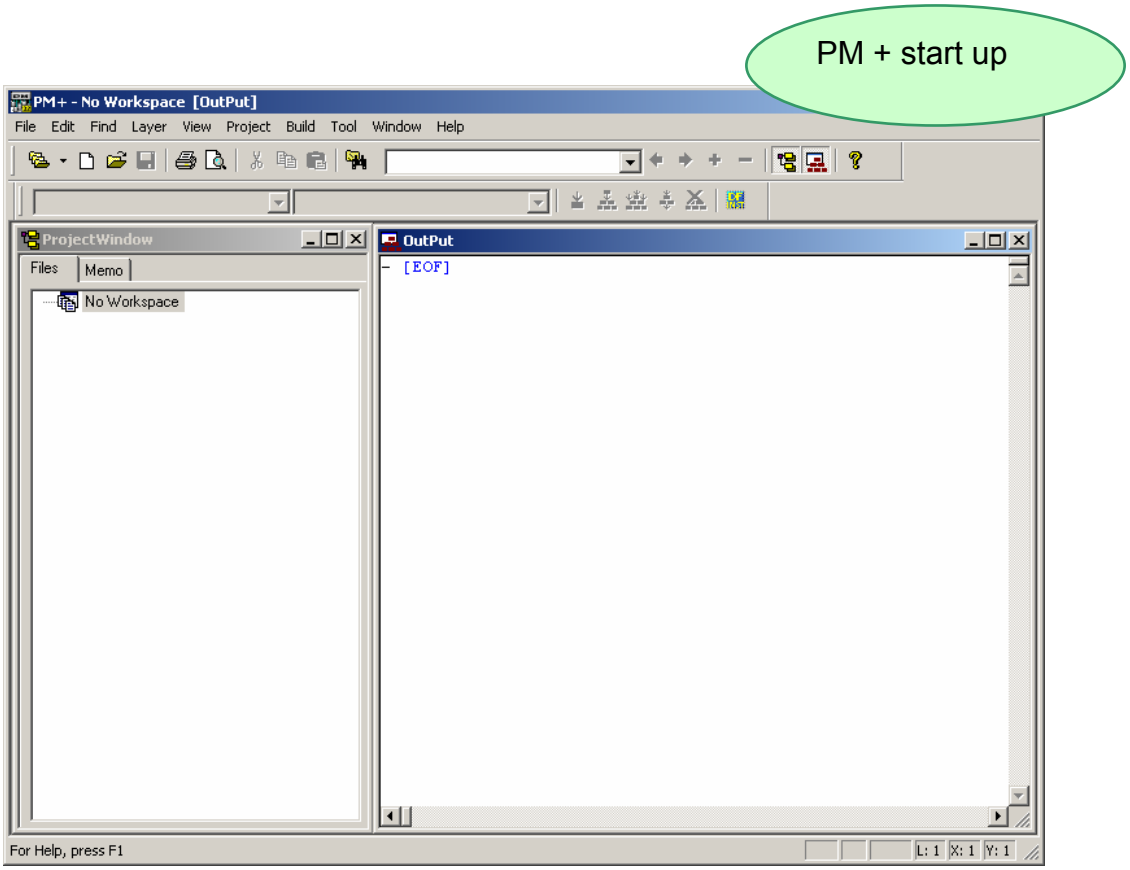
You can understand the basic operation of the development tools (PM+, ID78K0R-QB) and the basics of the project files that you need when you develop application programs.

The overall flow is as follows.



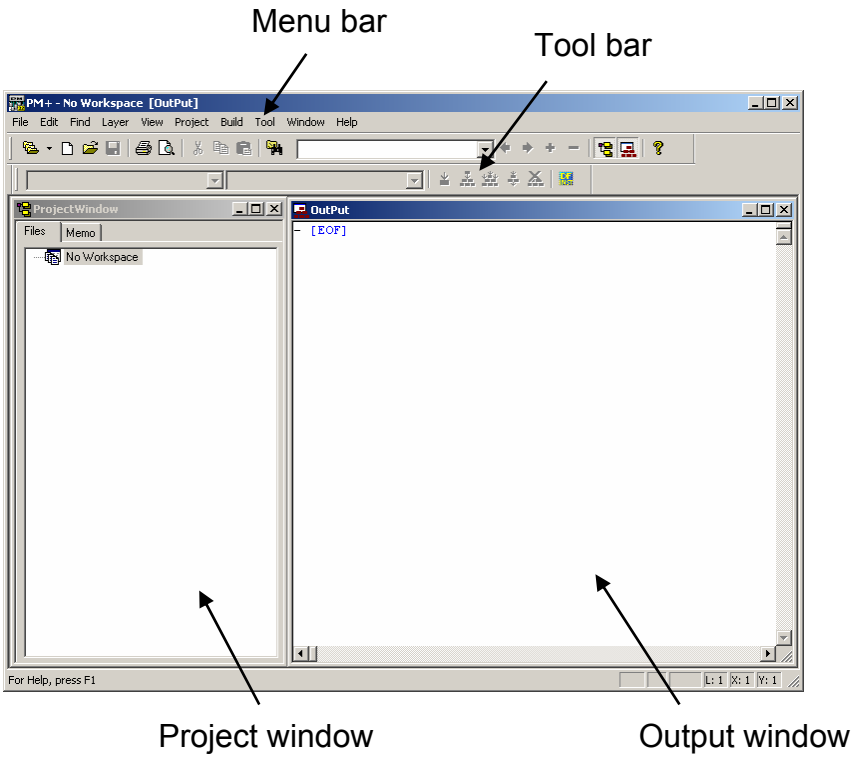
3.1 Starting PM +

In the Windows Start menu, select [Programs]->[NEC Electronics Tools]->[PM + V6.31]



3.2 Introduction to 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 the PM + User's Manual.

What is a project?

A project is the unit in which PM + executes management, and refers to an application system and environment development based on PM +.

PM + complies project information and saves it in a “project file”, from which it is then referenced.

What is a project file?

A project file is a file to which information such as the source file to be used in the project, the device name, the tool options for complying, and the editor and debugger to be used have been saved as “project information”.

The file name format is “ΔΔΔΔprj”.

Project files are created in folders that are set when creating new workspaces.

What is a project group?

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

The target devices of each project that can be registered to one project group must be the same.

What is a workspace?

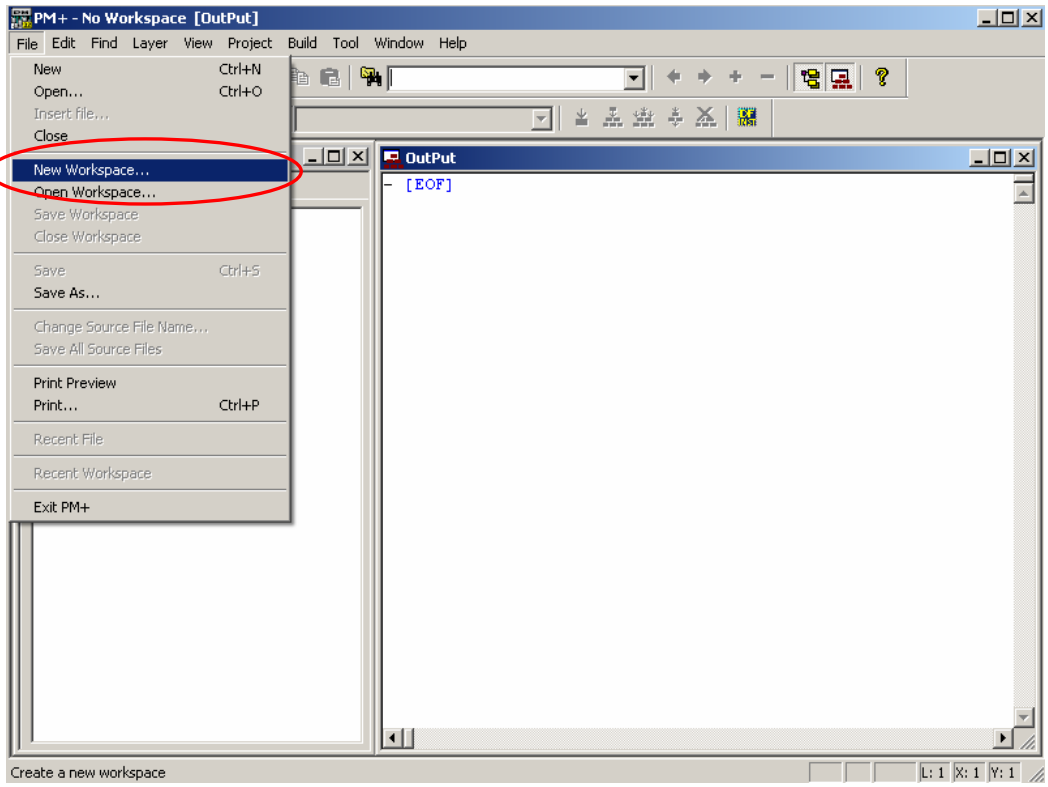
A workspace is the unit used to manage all the projects or project group required for one application system.

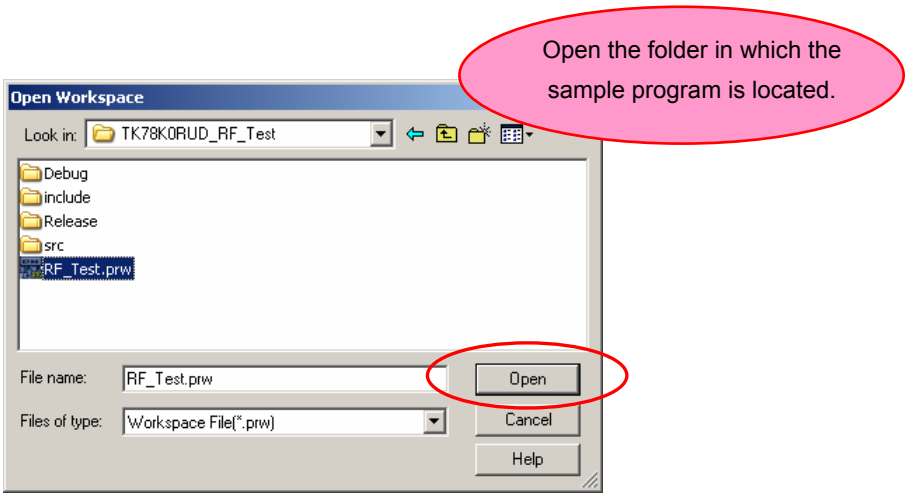
The file name of multiple project files is saved to a workspace file for referencing.

The file name format is “ΔΔΔΔprw”.

3.3 Loading Workspace (Project)

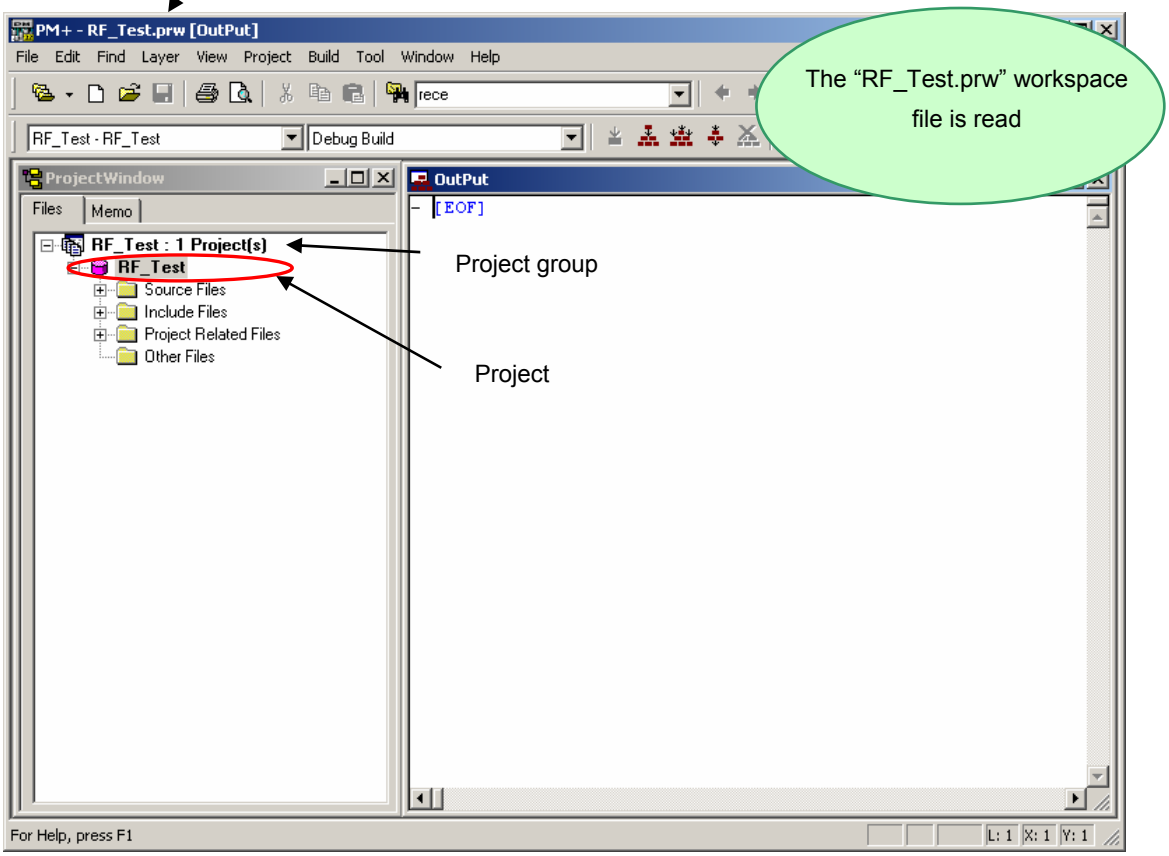
In this section, you will use the workspace that you created in "2.4Sample Environment"
For creating a new workspace, refer to "6.1Create a new workspace".
The workspace has information about the build environment for the sample programs.
Select "File" on menu bar and "Open Workspace…".
Then, select “C:¥TK78K0R¥SAMPLE_RF8058+SB¥TKRF8058SB_RF_Test¥RF_Test.prw” .





"RF_Test.prw"and then press the Open button.

Workspace file name :RF_Test.prw



3.4 Configuration of Linker Option

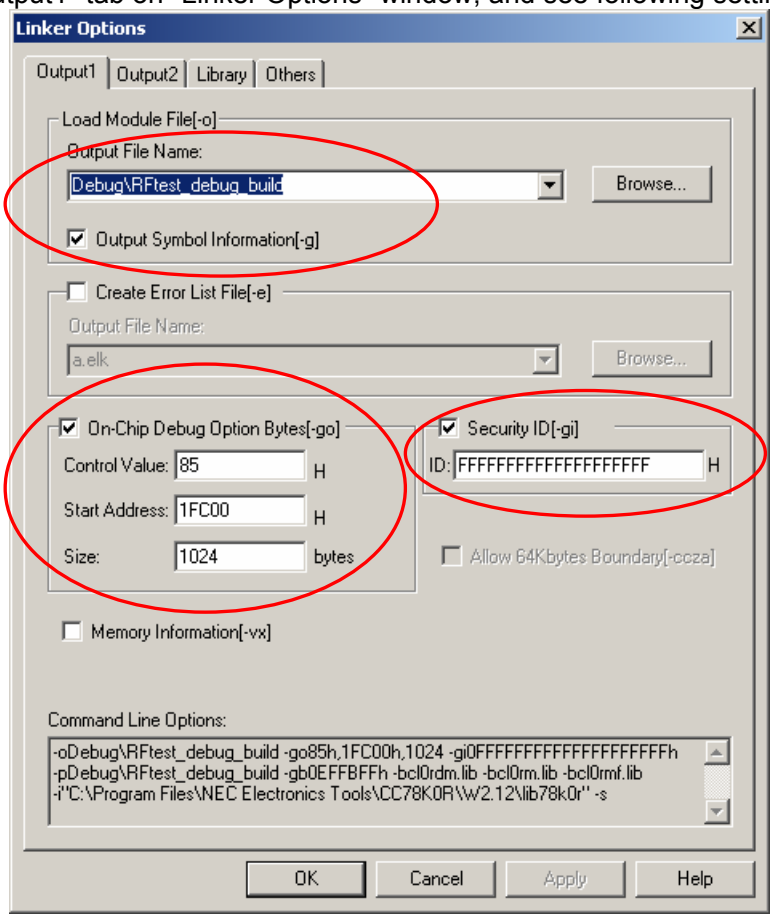
The linker options have been set by the project file. However, some option settings will be covered in this section because the linker option settings are important for debugging. Following three settings are covered specifically.

- Outputs from debugging
- On-chip debug (bytes, security ID)
- Watchdog timer

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

3.4.1 "Output1" Tab

Select "Output1" tab on "Linker Options" window, and see following settings.



- Load Module File settings

Check "Output Symbol Information".

This enables to do source level debugging (setting break points, monitoring variables in watch window, etc).

Also, you can specify the load module file name.

- On-Chip Debug Option Byte

Check "On-Chip Debug Option Byte". Enter "85" in "Control value". This setting enables the on-chip debugging function of the microcontroller.

*For details of "Control value", refer to the user's manual of 78K0R/KG3 (U17894E).

See "Start address" is set to "1FC00", and "Size" is set to "1024".

These settings reserve the memory address area for the monitor program (the flash memory area that the debugger uses for on-chip debugging).

In this case, the "Control value" is allocated to the address of C3H in flash memory, and FFH is set to the next address. Because of this, the following areas could not be set the segments.

<Address area that reserved by on-chip debugging>

- 2H, 3H
- CEH-D7H
- From the address set in "Start address" to the byte set in "Size"

- Security ID

Check "Security ID", and enter the security ID which is a unique ID code (10 bytes) to authenticate when the debugger is launched.

The security ID is stored in the flash memory (C4H-CDH), and checked if it is the same as the code entered in Linker options dialog when the debugger is launched.

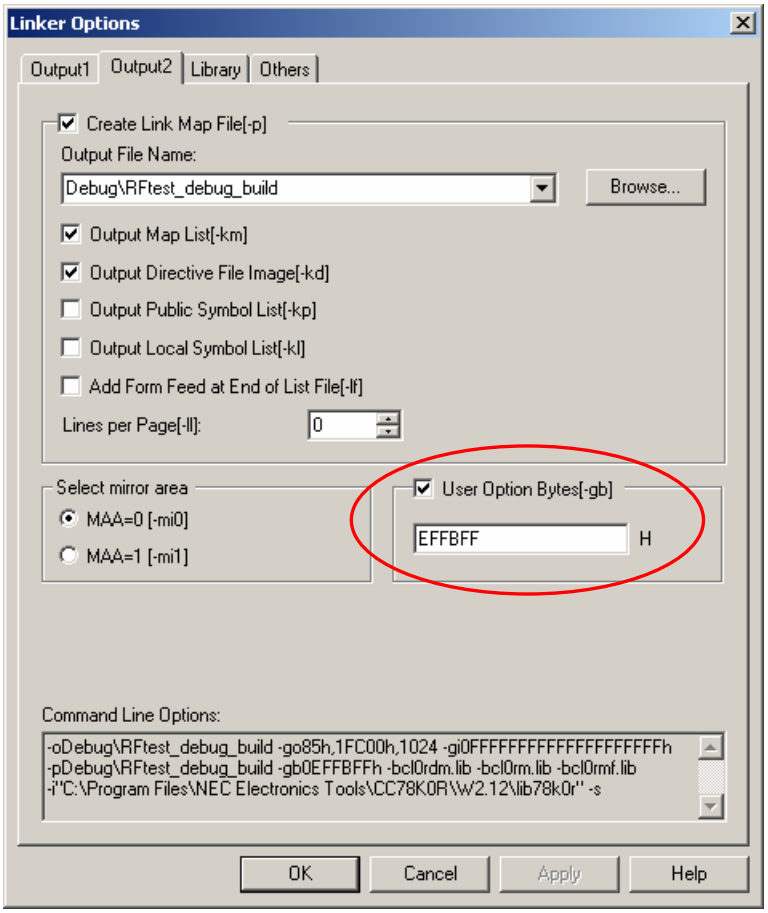
The debugger will not be launched when the security ID is unmatched. By using this function, you can secure the programs from leaks.

If you do not need to set the security, it is recommended to set the security ID "FFFFFFFFFFFFFFFFFFFF" as this is the initial code.

If you forget about the security ID (stored in the address of C4H-CDH) or if you set wrong on-chip debug option byte, you will not be able to use the debugger (ID78K0R-QB).
In this case, you need to use ″WriteEZ5″ to erase the built-in flash memory. By erasing the flash memory, the security ID is set to ″FFFFFFFFFFFFFFFFFFFF″.
For details, refer to "6.4Erase of flash memory".

3.4.2 "Output2" Tab

Select "Output2" tab on "Linker Options" window, and see following settings.



- User Option Byte

Check "User Option Byte", and then enter "EFFBFF". Here, you can do the setting of watchdog timer, low-voltage detector, and system reserved memory area. The 3 bytes you entered are stored at C0H-C2H on flash memory:

- C0H: setting for watchdog timer
- C1H: setting for low-voltage detector
- C2H: setting for system reserved memory area (must be set as FFH)

This time, you disabled the watchdog timer and the default start function of low-voltage detector.
For details, refer to the user's manual for uPD78F8058.

3.5 Configuration of Compiler Option

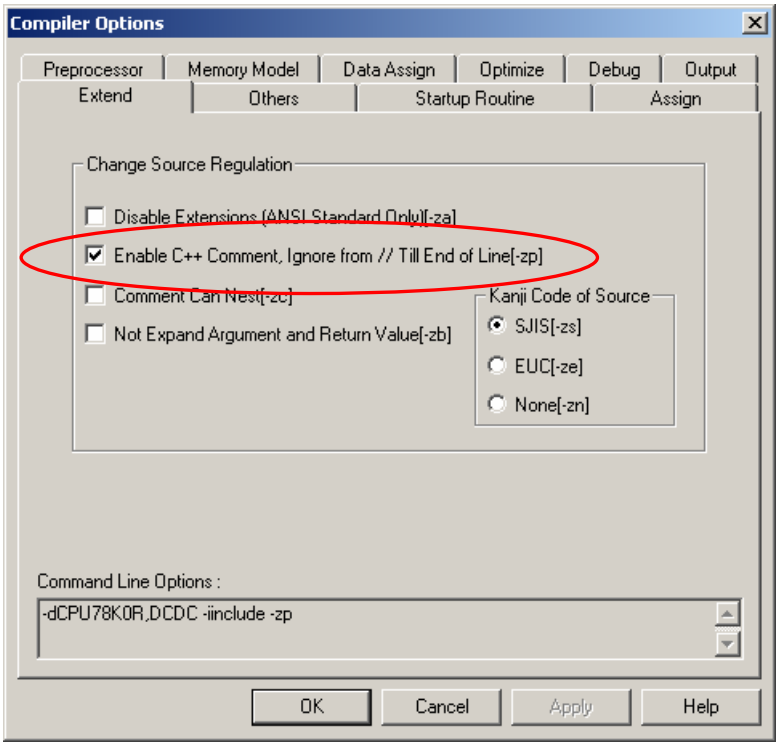
The compiler options have been set by project file. However, because some compiler options are useful, following two settings are covered specifically in this section.

- Enable C++ comments
- Use multiplier and divider

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

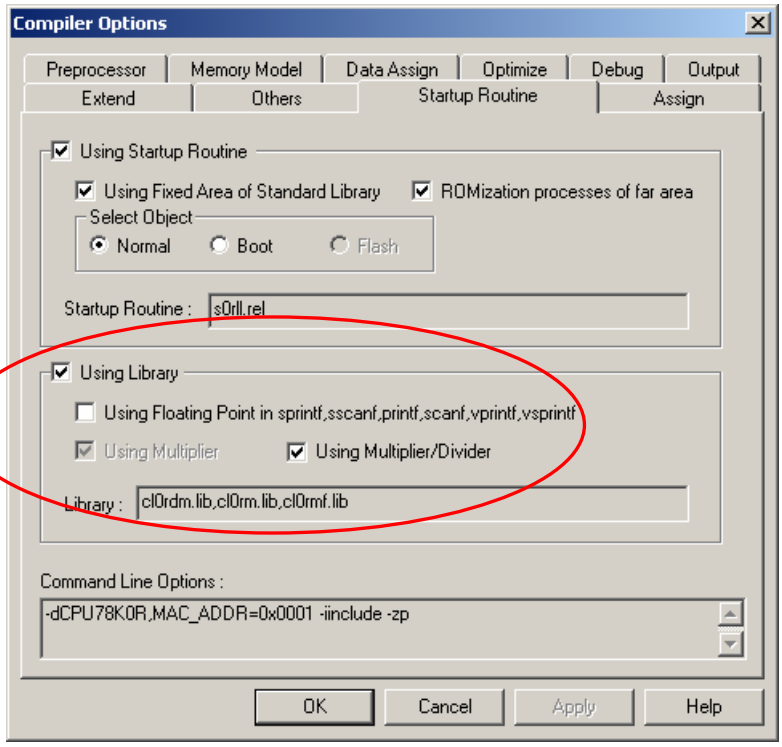
3.5.1 "Extend" Tab

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.



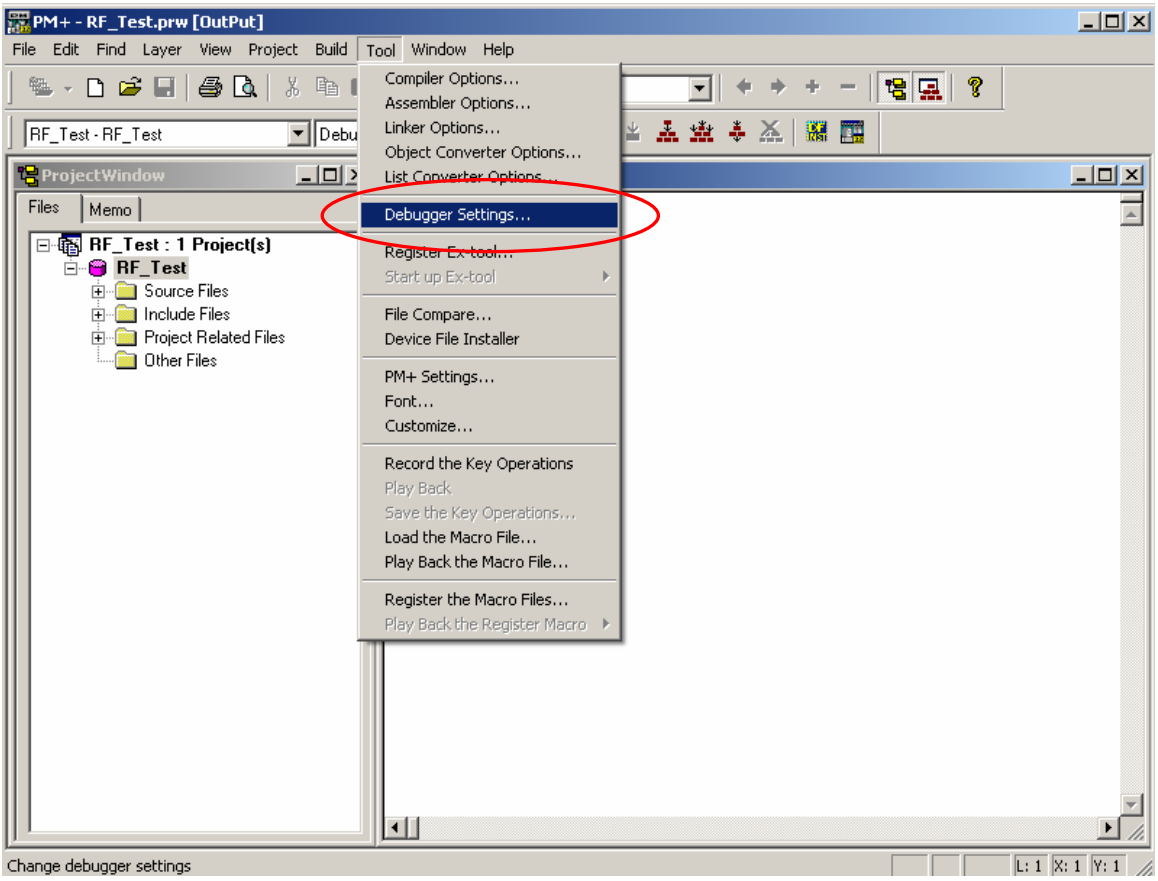
3.5.2 "Startup Routine" Tab

Select "Startup Routine" tab, and check "Using Library" and "Using Multiplier/Divider". The Microcontroller has feature of multiplier/divider to increase those calculation speed.

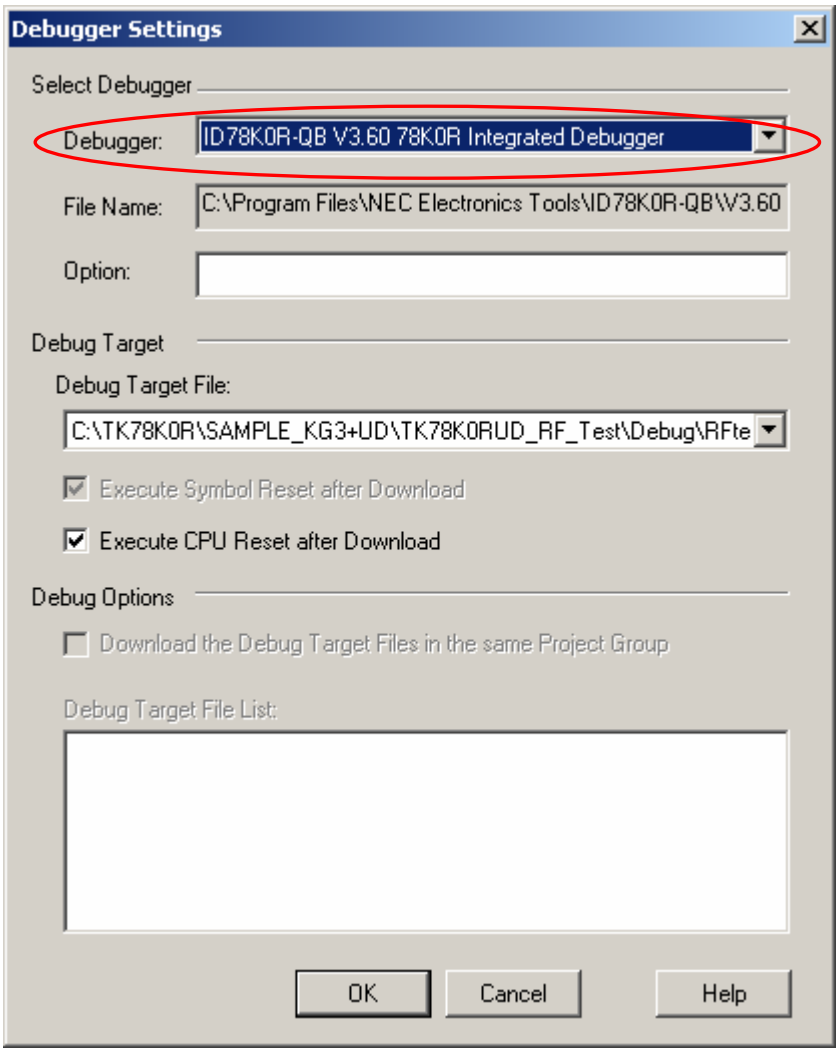


3.6 Configuration of Debugger setting

Please Choose [Tool] -> [Debugger Setting] at the pull-down menu.



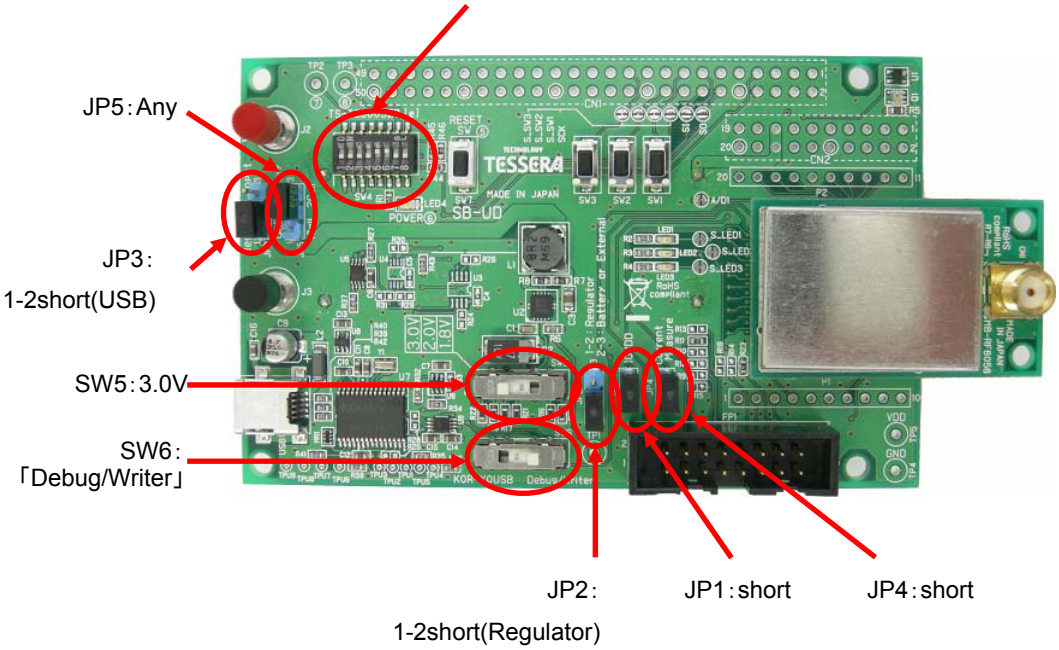
Check if "ID78K0R-QB V3.60 78K0R Integrated Debugger" is selected on "Debugger".



3.7 TK board setting

Please set the switches on the TK-RF8058+SB board as follows.

SW4 setting							
1	2	3	4	5	6	7	8
ON	ON	ON	ON	ON	ON	OFF	OFF

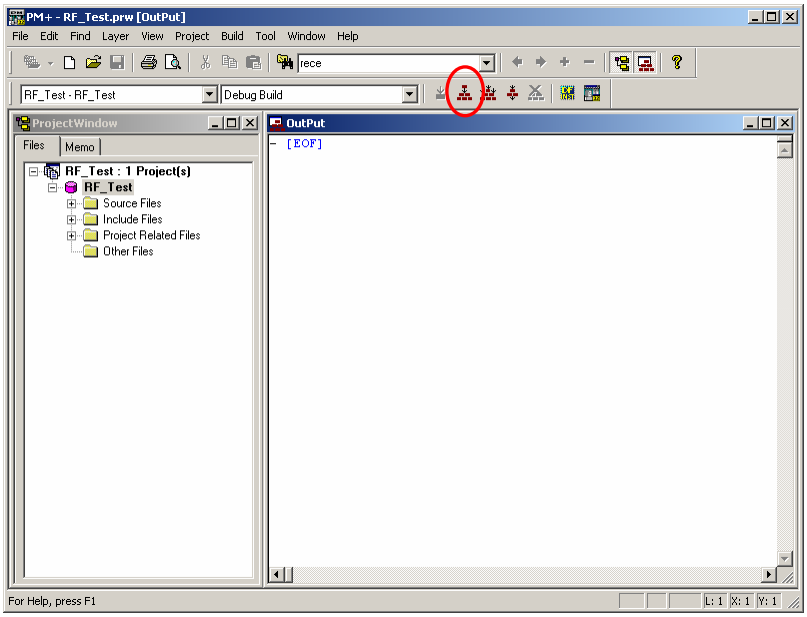


After the switch settings are completed, connect the PC to USB1 on TK-RF8058+SB with USB cable.If the "Found New Hardware Wizard" is started, install USB driver with referring "2.3USB Driver".

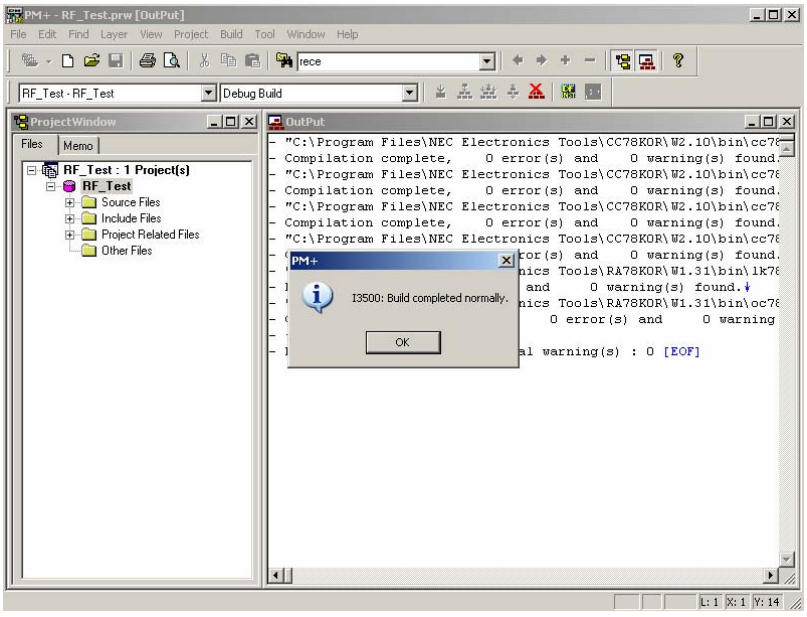
3.8 Creating execution format

Please go back to PM +.

Please re-compile the project by clicking the  button at the menu bar.



Build process is executed



Build has been completed successfully.

What is build ?

Build is a function that creates an executable file, etc., from a source file registered to a project.
PM + automatically performs compiling, linking, and other processing actions.
On the second and subsequent build, PM + also automatically delects files that have been updated from the previous build processing, and complies and assembles only the relevant files, thereby reading the time required for build processing.

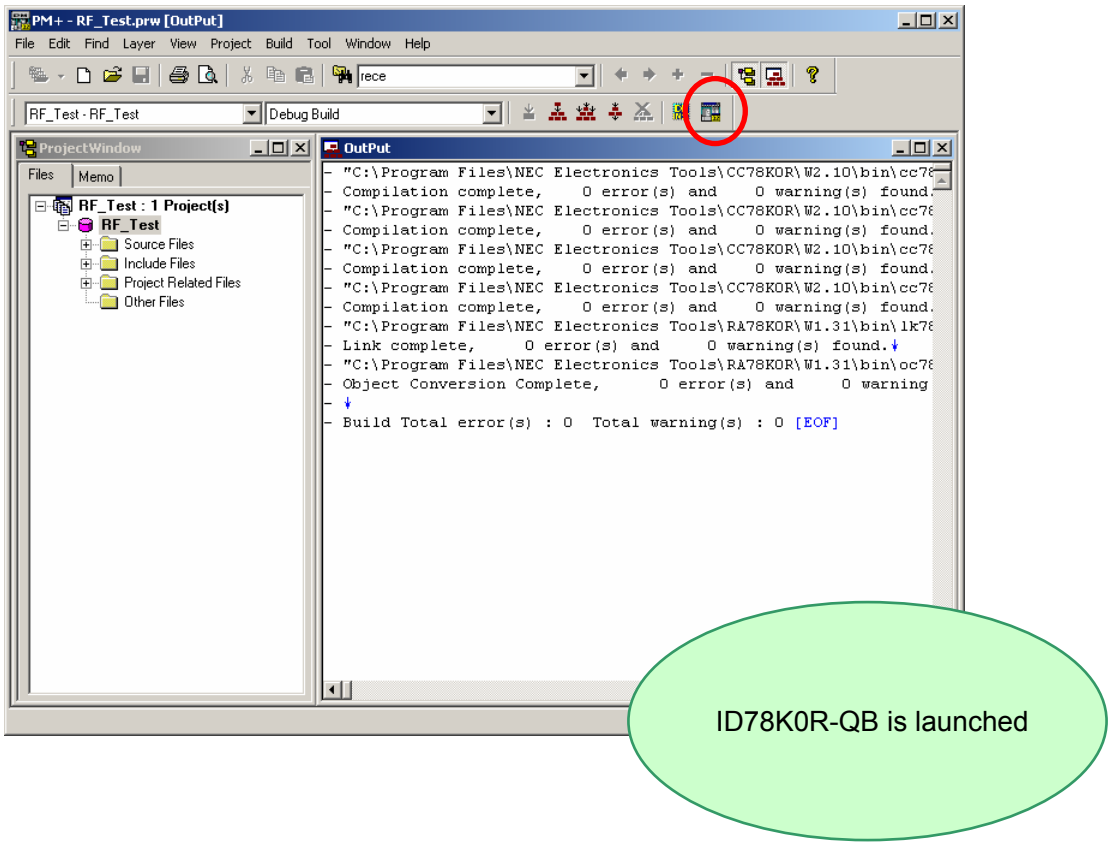
What is rebuild ?

Build compiles and assembles only the source files that have been updated since the previous time, whereas rebuild compiles and assembles all the source files.
When setting, such as compiler options, have been changed, not build, but rebuild, must be Selected.

3.9 Starting integrated debugger (ID78K0R-QB)

Please select the Debug button  , of PM +, or in the menu, select [Build(B)] →[Debug(D)].

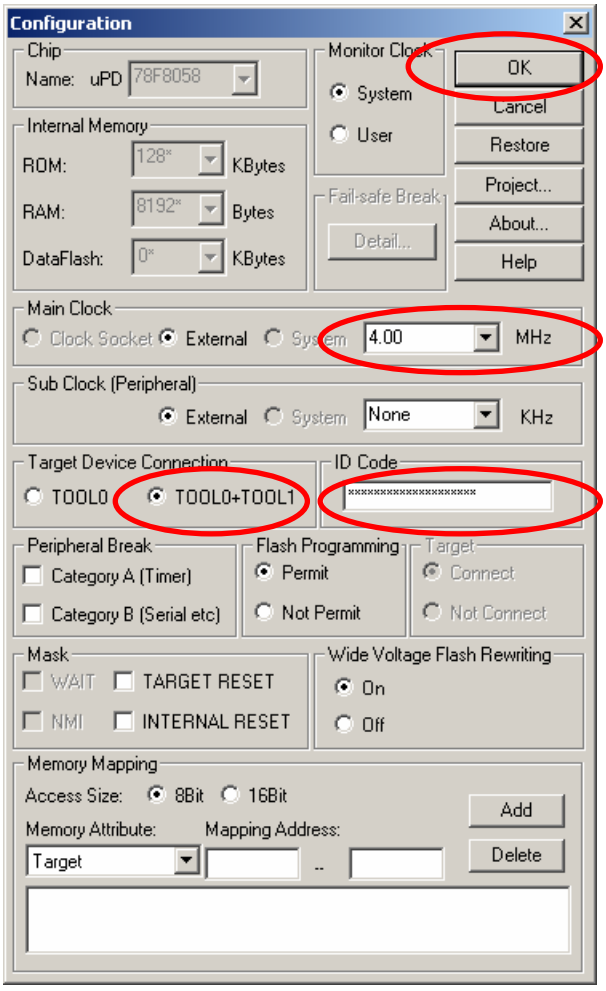
If the debug button is not displayed, in the menu, select [Tool]→[Debugger Setting...]“ID78K0R-QB V3.60 78K0R Integrated Debugger”



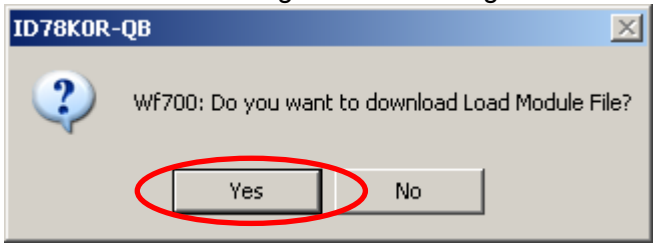
Then, you will see the Configuration dialog.

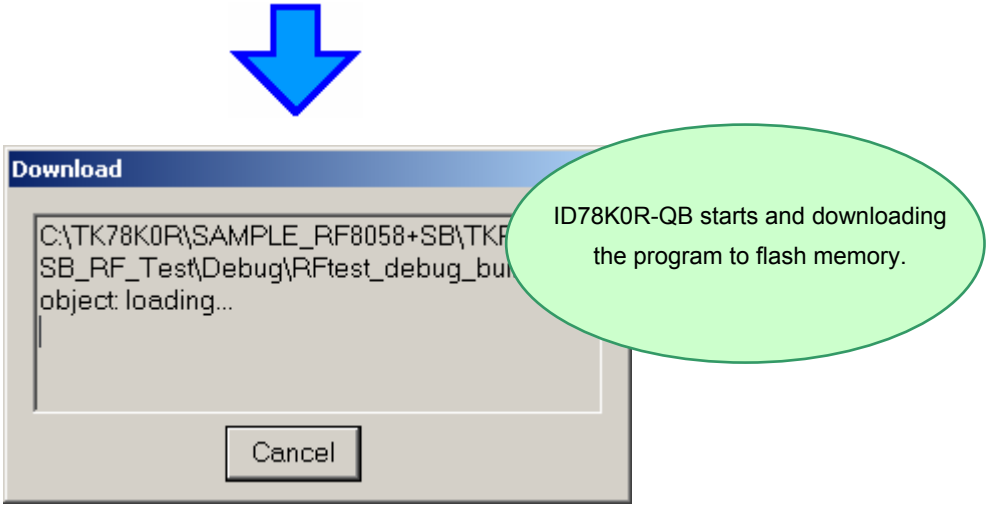
Please choose “Tool0+Tool1” in the "Target Device Connection", and choose "4.00MHz" in the "Main Clock", then, please input 20 Fs, 0xFFFFFFFFFFFFFFFFFFFF, in the ID Code.

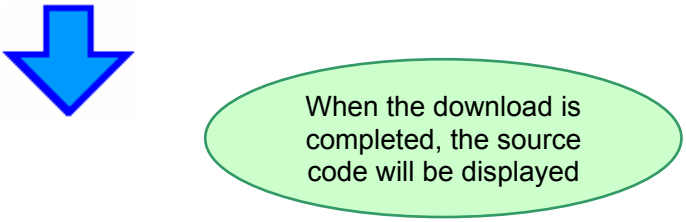
Then, please click “OK”.

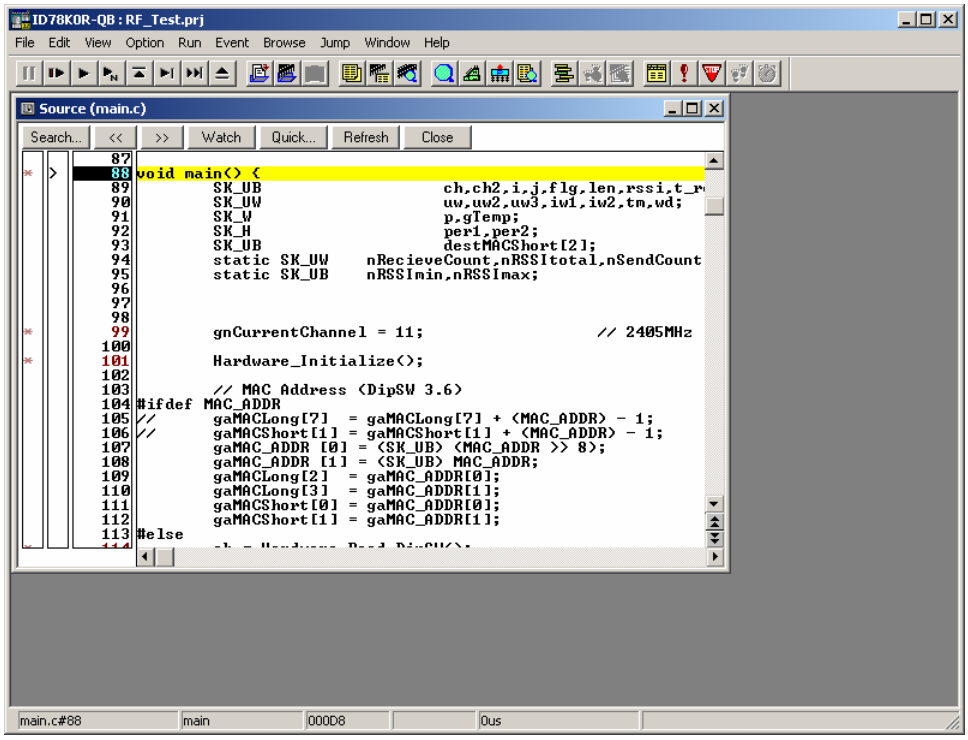


Click [Yes] when the confirmation dialog for downloading load module file is opened.





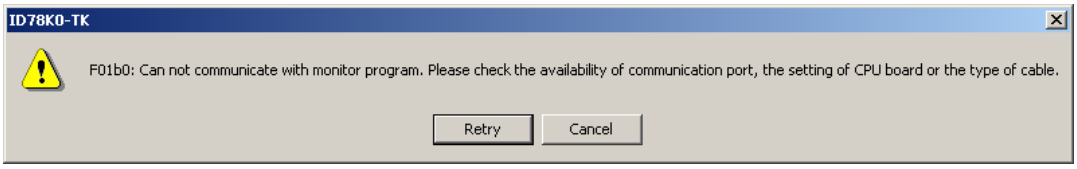




NOTE:

Completion of the download does not mean running the programs. To run the sample programs, go to "3.11 Executing program".

Normally, if communication with the CPU fails, the following error messages are output.



If you observe the message please confirm the following items.

1. Please confirm the switch on the board is set as follows.

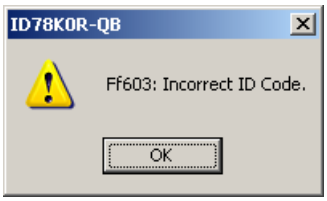
SW4	Bit1	ALL ON
	Bit2	
	Bit3	
	Bit4	
	Bit5	ON
	Bit6	ON
	Bit7	OFF
	Bit8	OFF

SW6	「Debug/Writer」
SW5	3.0V
JP3	1-2short(USB)
JP5	Any
JP2	1-2 short (Regulator)
JP1	Short
JP4	Short

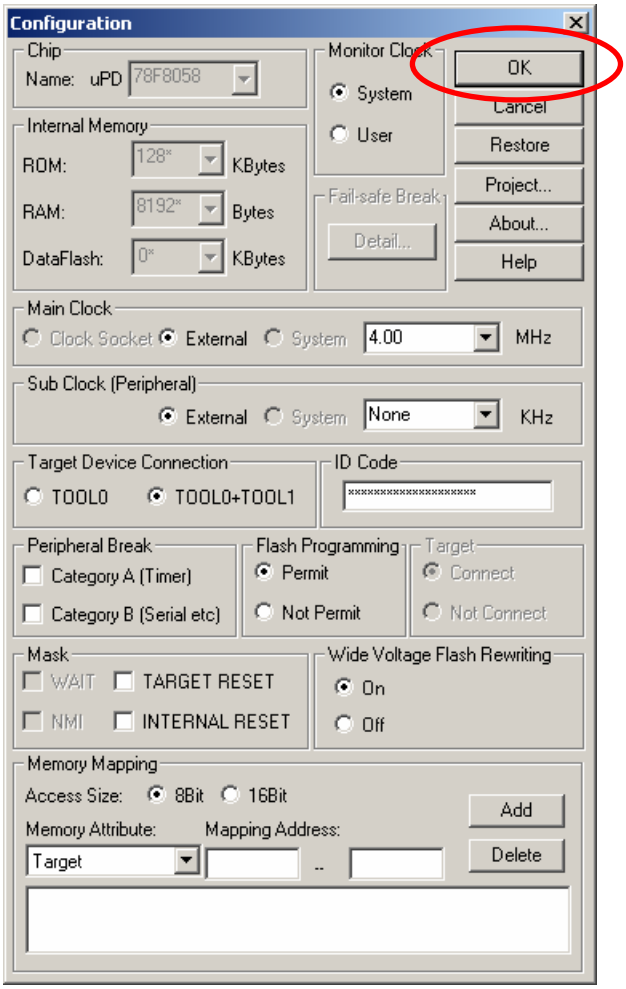
2. Please confirm the power LED4 is lighted.

After checking the above items, start ID78K0R-QB again.

If the ID code is wrong, you may find the following messages on the display.



The following "Configuration" screen is displayed when OK is pushed and input a correct ID code, please.



The default setting of the ID code is ”0xFFFFFFFFFFFFFFFFFFFF”. You can set an alternative ID code on the linker option tab.

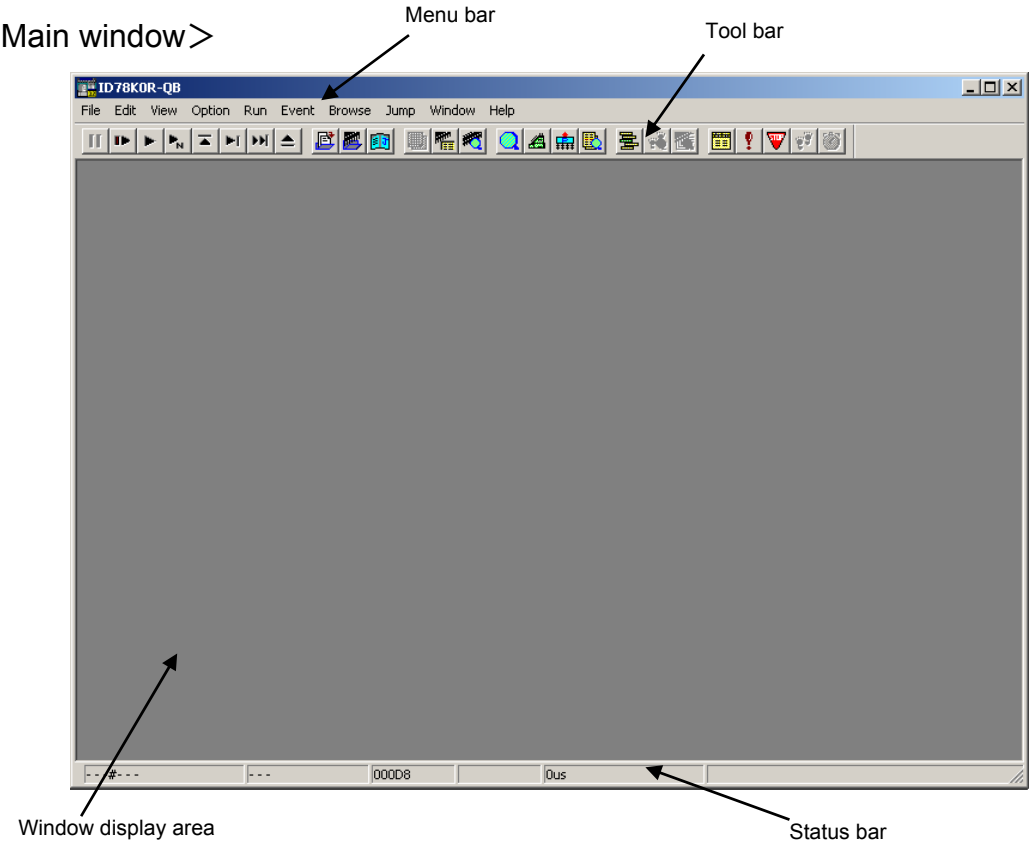
If the setting of On-Chip Debug Option Byte is "Does not erase data of flash memory in case of failures in enabling on-chip debugging" and if you forget the security ID, you need to erase the flash memory completely.

To erase the flash memory, please refer to the section 6.4, “Erasing the Flash Memory”.

3.10 Introduction of the integrated debugger（ID78K0R-QB）

ID78K0R-QB displays the internal status of the CPU and controls monitor functions in the main window.
The initial screen of ID78K0R-QB is as follows.

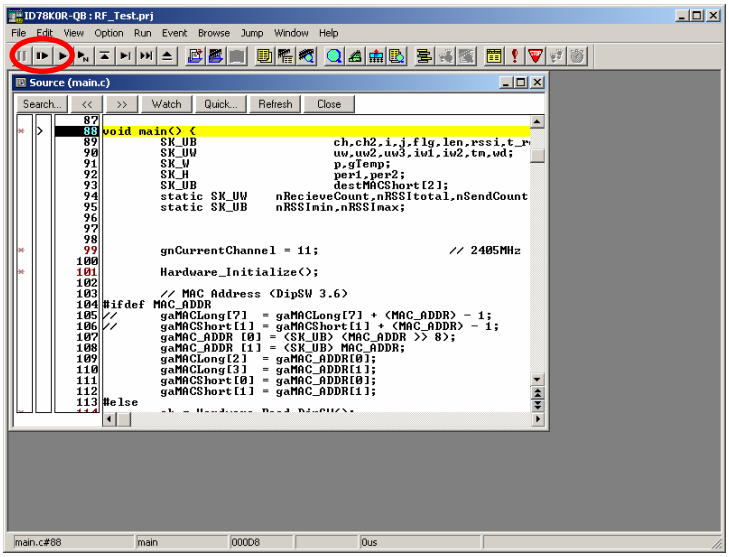
< Main window>



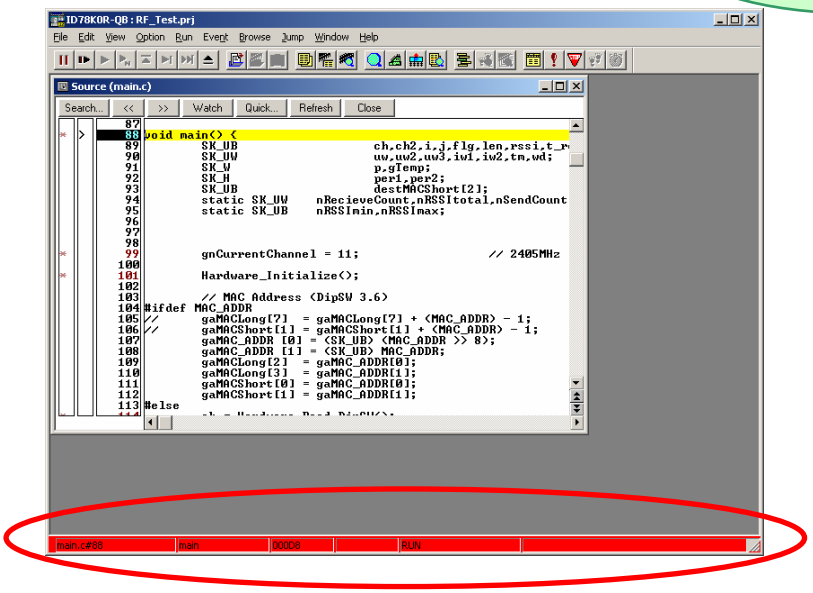
For more details, please refer to the user's manuals of ID78K0R-QB.

3.11 **Executing a program**

If you click “GO”  , the execution of the code will start.
You can know it by the red bar at the bottom.



Execute the program

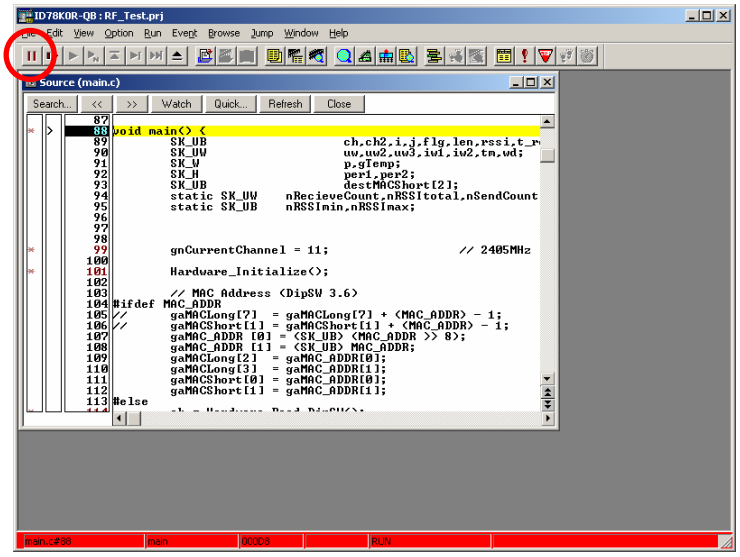


While a program is running, the status bar will be red.

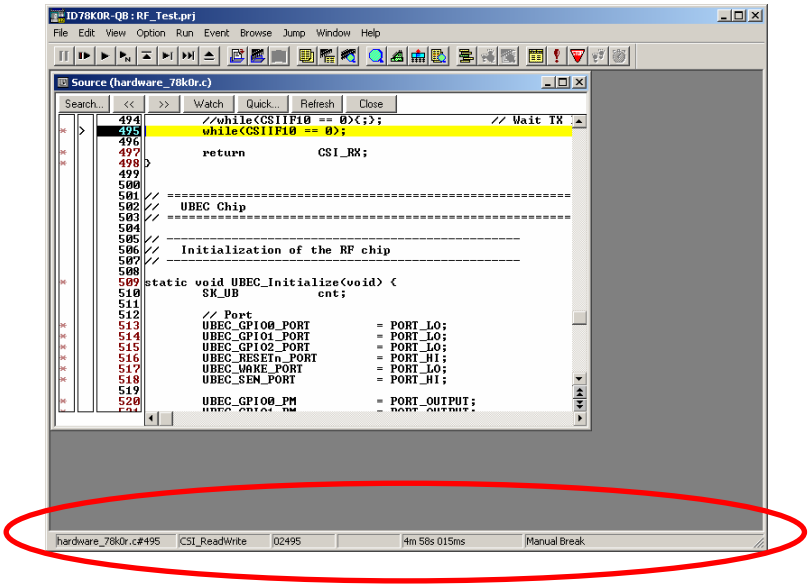
3.12 **Stop a program**

Now, you are going to stop the program.

Press the ID78K0R-QB's stop button  , or in the menu, select [Run]→[Stop].



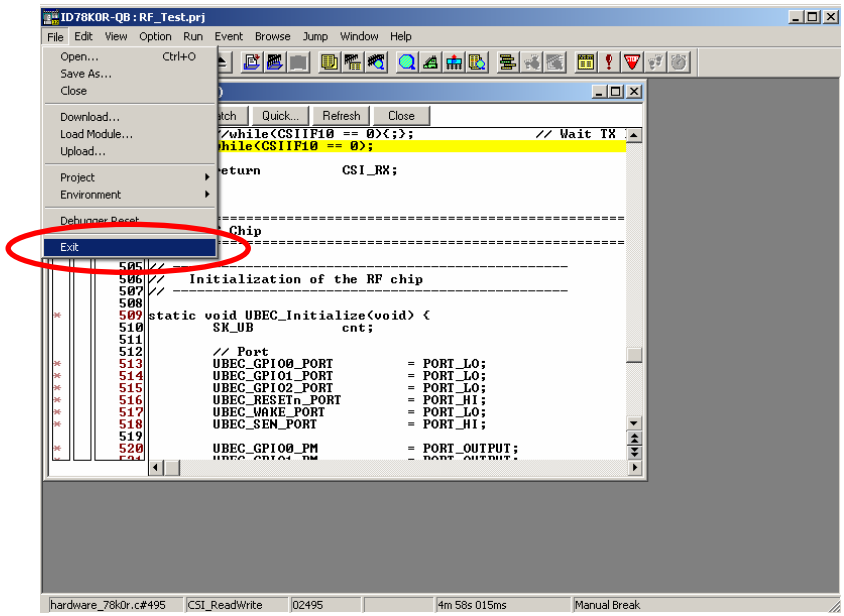
Stop the program



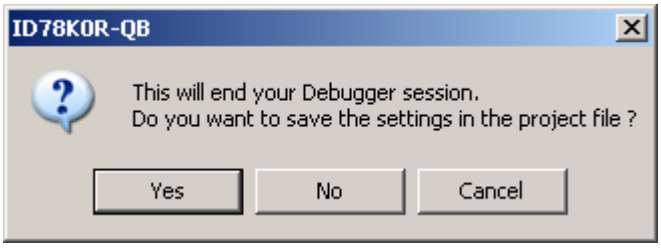
When the program stops, the status bar changes back to the original color.

3.13 Terminating integrated debugger (ID78K0R-QB)

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



The Exit confirmation dialog box is displayed.

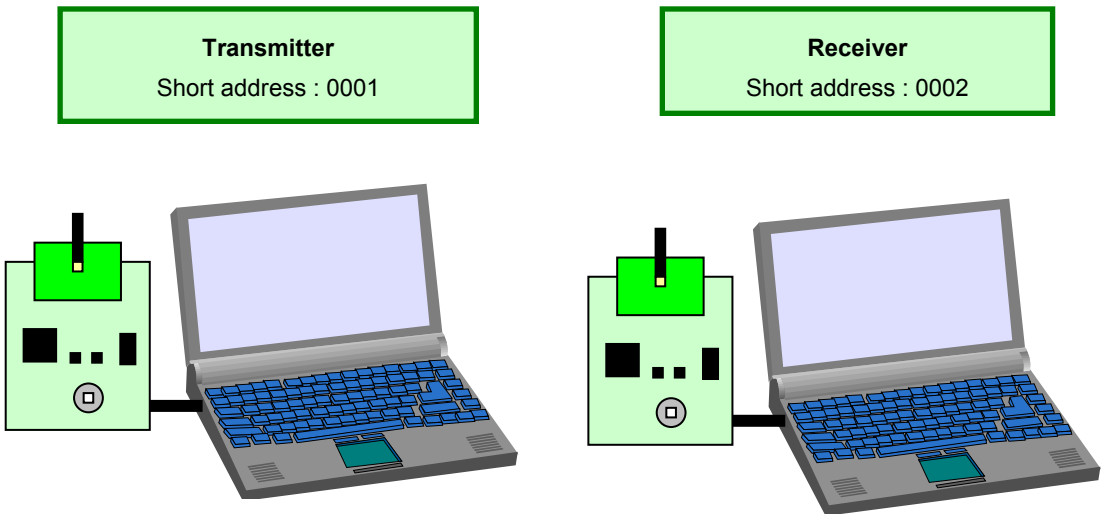


If you push the “Yes”, ID78K0R-QB is terminated after preserving a present environment.
If you push the “No”, ID78K0R-QB is terminated without preserving a present environment.

3.14 The RF Test Program

3.14.1 Procedure for one to one transmit/receive test

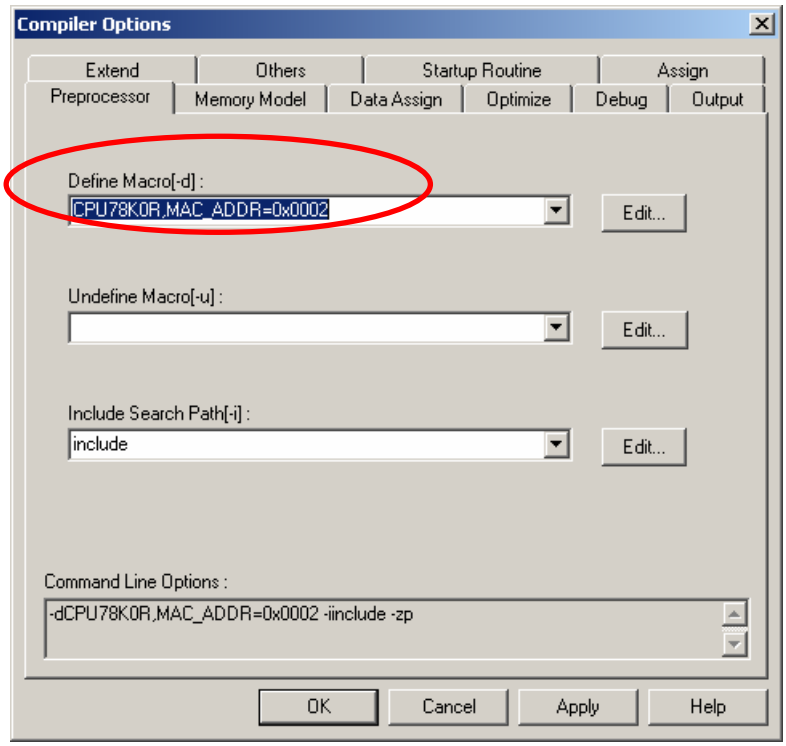
Assumption here in this section is, you have two TK-RF8058+SB boards, in one of which the execution code for the “RF_TEST” was programmed by the debugger. You also prepare two PCs or one PC with more than one usb interface.
We will use the board you have downloaded the executable program with the short address 0x0001 as a transmitter. We now learn how to prepare an executable program for receiver side, which may be assigned a short address of 0x0002.



Settings for a receiver

1). Please start-up the PM+ from the “C:/TK78K0R/SAMPLE_RF8058+SB/TKRF8058SB_RF_Test/RF_Test.prw”
2). Please choose [Tool(T)] → [Compiler Options] → [Preprocessor]

3). Please alter the Macro Definition from “CPU78K0R,**MAC_ADDR=0x0001”** to “CPU78K0R,**MAC_ADDR=0x0002”.**



4). Now, you set the short address of the receiver at 0x0002.
5). Please set the switches on the receiver as follows,

SW4	Bit1	ALL ON
	Bit2	
	Bit3	
	Bit4	
	Bit5	ON
	Bit6	ON
	Bit7	OFF
	Bit8	OFF

SW6	Debug/Writer
SW5	3.0V
JP3	1-2short (USB)
JP5	Any
JP2	1-2 short (Regulator)
JP1	Short
JP4	Short

6). Then, please rebuild it by pushing the  button, or select [Biild(B)]→[rebuild(R)].
7). You will follow the instructions in the chapter 3.9.
8). If you complete the download of the load module file, please close the debugger.
9). Then, please remove the USB cable.

10). Then, the board setting is configured as follows as a receiver.

SW4	Bit1	ALL OFF
	Bit2	
	Bit3	
	Bit4	
	Bit5	ON
	Bit6	ON
	Bit7	OFF
	Bit8	OFF

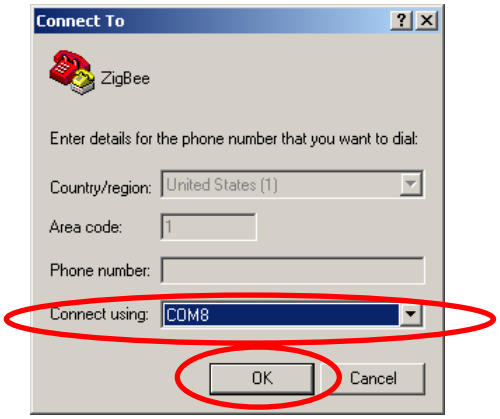
SW6	「K0R-K0USB」
SW5	3.0V
JP3	1-2 Short(USB)
JP5	Any
JP2	1-2 Short (Regulator)
JP1	Short
JP4	Short

11). Connect the board with a PC by a USB cable, then you will find the Power LED lit on the board.

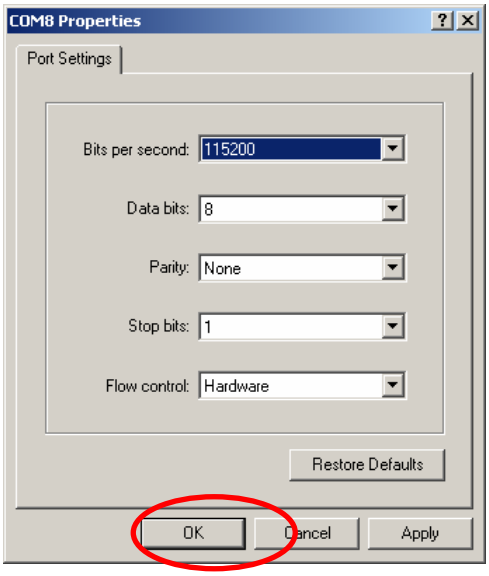
12). Then, we need a hyperterminal on the PC.

13). On MS-Windows in your PC, please select [All Programs] -> [Accessory] -> [Communication] -> [HyperTerminal]

14). You may assign your favorite name on a connection. Then, click OK.



15). You need to learn the COM port number you connected the USB cable. If you don't know the com port number, please find it at [Control Panel] → [System] → [Hardware] → [Device Manager] → [Port (COM and LPT)].

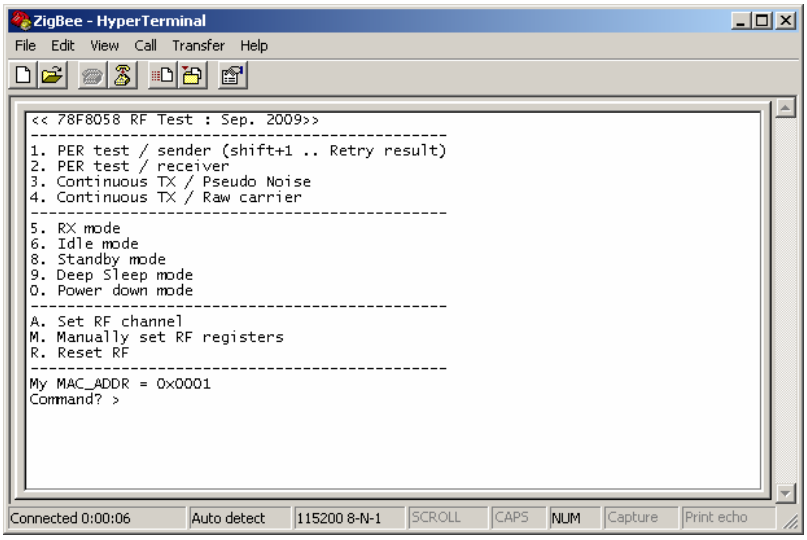


Bits per second	115200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

(Property -> Setting -> ASCII)
Local Echo OFF
No Line Feed

16).Please set the COM port at 115200 bps, 8 data bits, no parity, 1 stop bit, and no flow control.
Then, please click “OK”.

17).Then, please reset the receiver board by pressing the SW7.
18).Now you will find the following opening menu in the window.



19). Please select “2” from the MENU to start the board as a receiver.

```
Command? >2 (PER test/reciever)

[My Profile]
--------------------------------------
   MAC : 22:95:00:02:00:00:00:47
Short : 0002
PanID : 2514
--------------------------------------
[Set channel to 11 (Cmd)]
```

20). If you see the display as shown above, the receiver set-up has been completed.

Settings for a transmitter

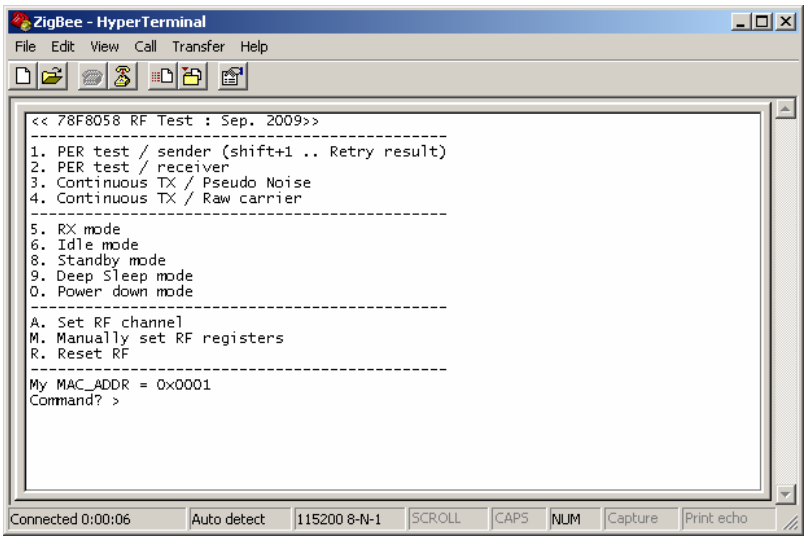
1). Please configure the board of a transmitter as follows,

SW4	Bit1	ALL OFF
	Bit2	
	Bit3	
	Bit4	
	Bit5	ON
	Bit6	ON
	Bit7	OFF
	Bit8	OFF

SW6	「K0R-K0USB」
SW5	3.0V
JP3	1-2 short(USB)
JP5	Any
JP2	1-2 short(Regulator)
JP1	Short
JP4	Short

2). Please connect the transmitter board to a PC. Please confirm the LED lit on the board.
3). Please start-up a hyperterminal for a transmitter.
4). Please reset the transmitter board by pressing the SW7.

5). Now you will find the following opening menu in the window.



6). Please select the command “1” to start the Packet Error Rate test.

```
Command? >1 (PER test/sender)

[My Profile]
----------------------------------------
   MAC : 22:95:00:01:00:00:00:47
Short : 0001
PanID : 2514
----------------------------------------
Send to (Short addr) ? :
```

7). If you see “Send to (Short addr) ? :”, please input the receiver address of 0002.
8). Then, you will be asked how many packets you wish to consume in the PER test.
9). You may input “1000”.
10). Then, you will be asked the interval of packets in msec.
11). You may input 3 msec.
12). Then, the PER test will be executed.

13). You will see,

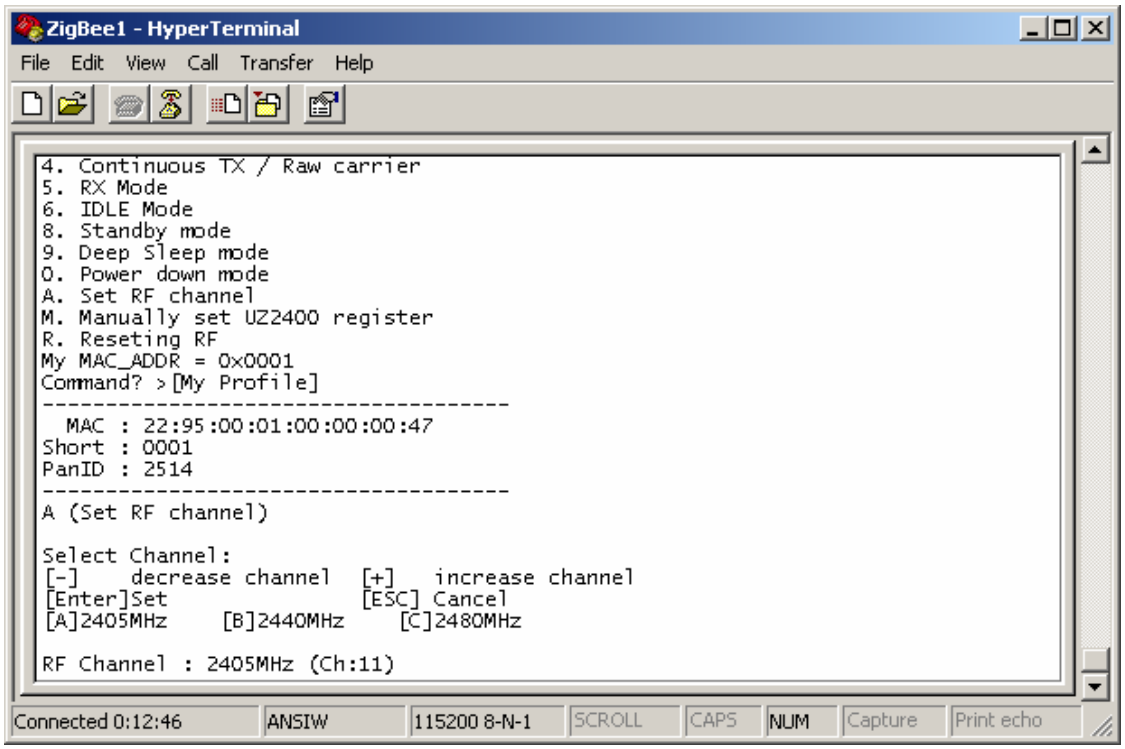
Sent: The number of packets sent.
Received: The number of the received packets.
PER: The calculated PER in %.
RSSI: The maximum and minimum RSSI values in the PER test

[Note]
PER= Packet Error Rate
RSSI= Received Signal Strength Indication

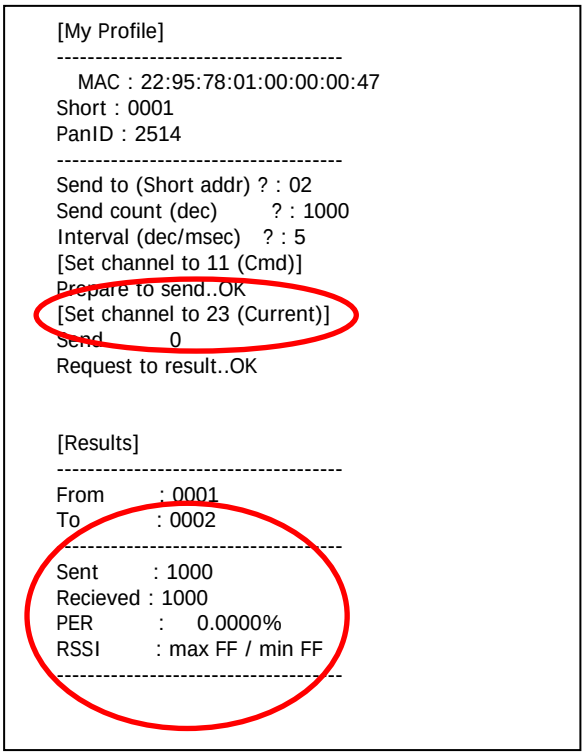
```
----------------------------------------
Send to (Short addr) ? : 2
Send count (dec)       ? : 1000
Interval (dec/msec)    ? : 3
[Set channel to 11 (Cmd)]
Prepare to send..OK
[Set channel to 11 (Current)]
Request to result..OK


[Results]
----------------------------------------
From        : 0001
To          : 0002
----------------------------------------
Sent        : 1000
Recieved : 1000
PER         :     0.0000%
RSSI        : max FF / min D0
----------------------------------------

Press any key to the menu
```

21).Channel setting

In the previous example, you may have also found the RF channel used in this test is the Channel 11. The channel is specified by the IEEE 802.15.4 specification.
The channel 11 is assigned at 2405 MHz. You can change the channel in the PER test in 5MHz step to the maximum channel of 26th at 2480 MHz.
To do it, please press “A” in the command prompt. Then, please choose the channel by [+], [-], [A], [B], or [C]. In the example below, the channel 23th, 2465 MHz, was selected.

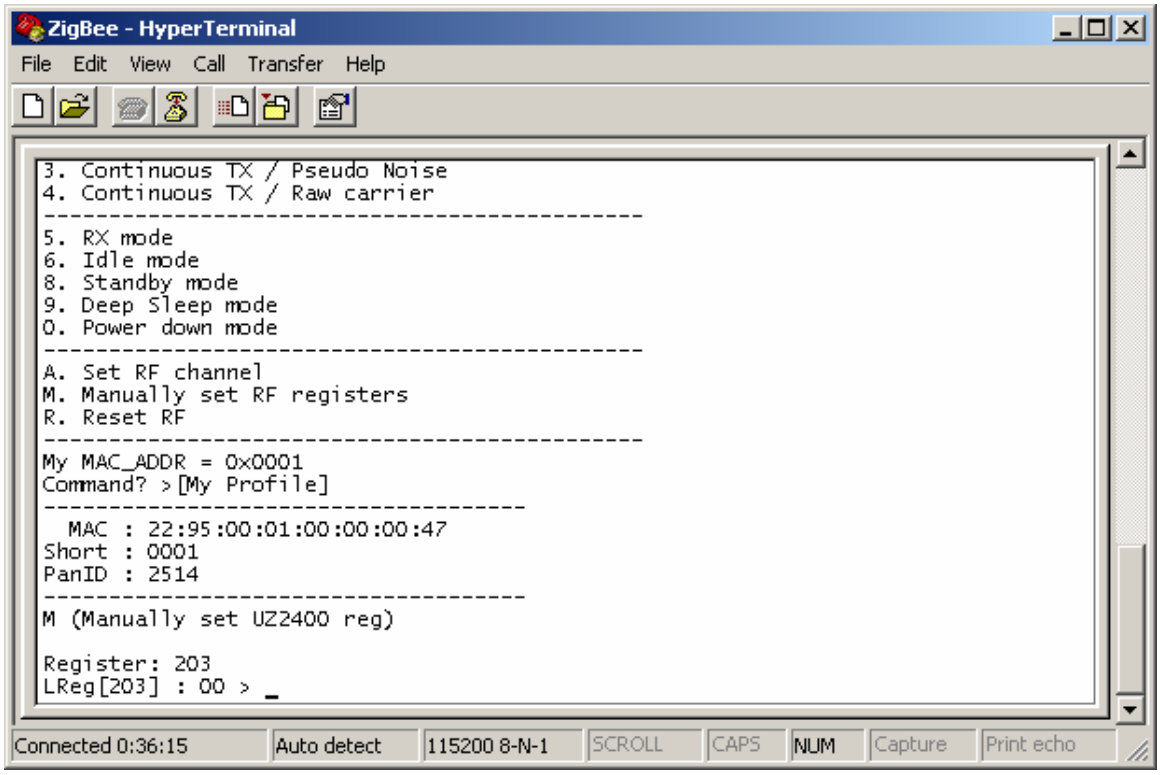


To execute the PER test at the channel 23, press [Enter] in your keyboard, then, choose “1” to initiate the PER test mode. Then, you may input 1000 packet in 5 msec interval to see the following example. Please confirm the channel used is 23th in the display. Please note the receiver will learn which channel is to be used for the test automatically.



22).Adjusting the output power

You may wish to control the output power in the PER test.
For it, please select “M” in the menu.
You will be asked the register ID. Please input “203”.
Then you will see, “LREG[203] : 00 >1F”.
It means the current value at the register [203] is 0x00, which means 0 dB.
0x00 is the reset default.



The register bits are defined as follows,

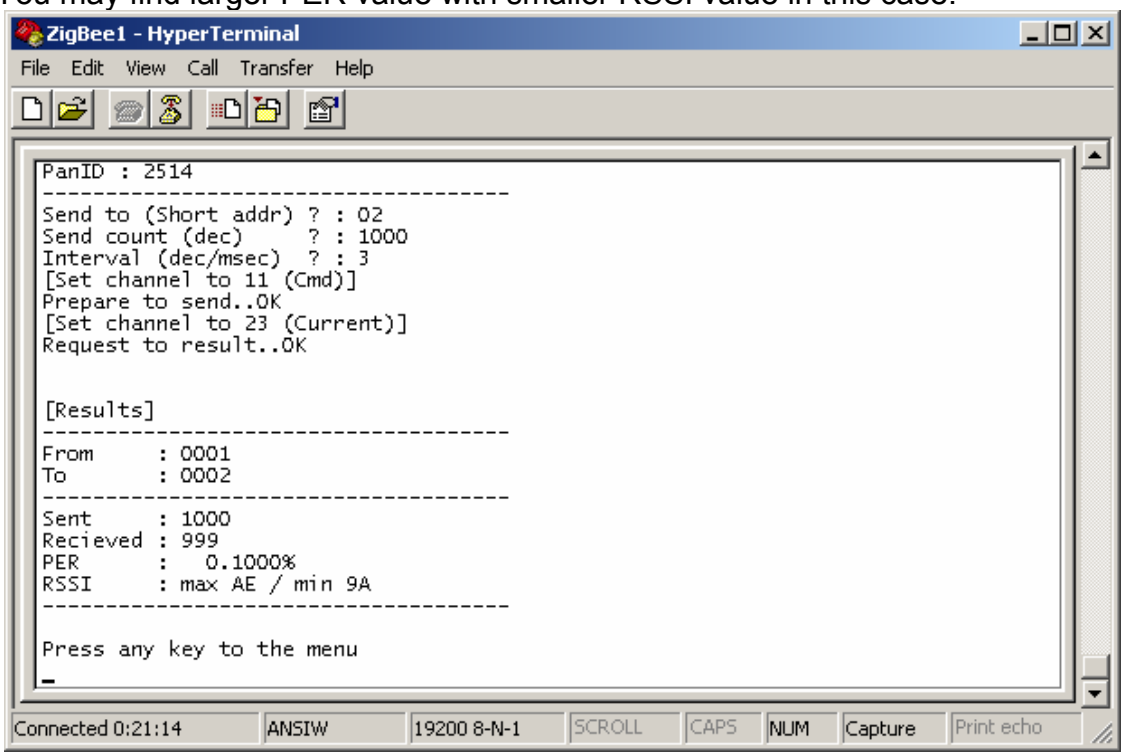
LREG[203]: [7:3] -> small scale tuning
000000: 0 dB
000001: -0.1dB
|
111111: -8.30 dB

For instance, if you wish -8 dB, please input “1F”, as follows,

“LREG[203] : 00 > 1F”

Then, you will start the PER test.

You may find larger PER value with smaller RSSI value in this case.



Please note this adjustment is applied only to the transmitter. The receiver always sends back the test results with the 0 dB output power using the channel 11th.

3.14.2 PER test / receiver

The Menu 2 sets the board to the receiver in the PER test.
If you have two PCs, you can connect two boards to each of two PCs, then, you will apply this mode to one of them.

3.14.3 Continuous TX / Pseudo Noise

The Menu 3 initiates the modulated RF transmission. The data carried are pseudo random numbers. You can define the channel using the menu 9, and the output power using the menu 0.

3.14.4 Continuous TX / Raw carrier

The Menu 4 initiates the carrier transmission. The output power is not 0 dB as a reset default. You can define the channel using the menu 9.

3.14.5 RX Mode

The Menu 5 initiates the receiver mode.

3.14.6 IDLE MODE

The Menu 6 sets the UZ2400 into the IDLE mode.

3.14.7 Standby MODE

The Menu 8 sets the UZ2400 into the Standby mode.

3.14.8 Deep Sleep mode

The Menu 9 sets the UZ2400 into the Deep Sleep mode.

3.14.9 Power down mode

The Menu 0 sets the UZ2400 into the Power down mode.

3.14.10 Set RF channel

The Menu A allows you to set the RF channel.

3.14.11 Manually set UZ2400 register

The Menu M allows you to set the UZ2400 registers.
Please refer to the datasheet for the definition of registers.

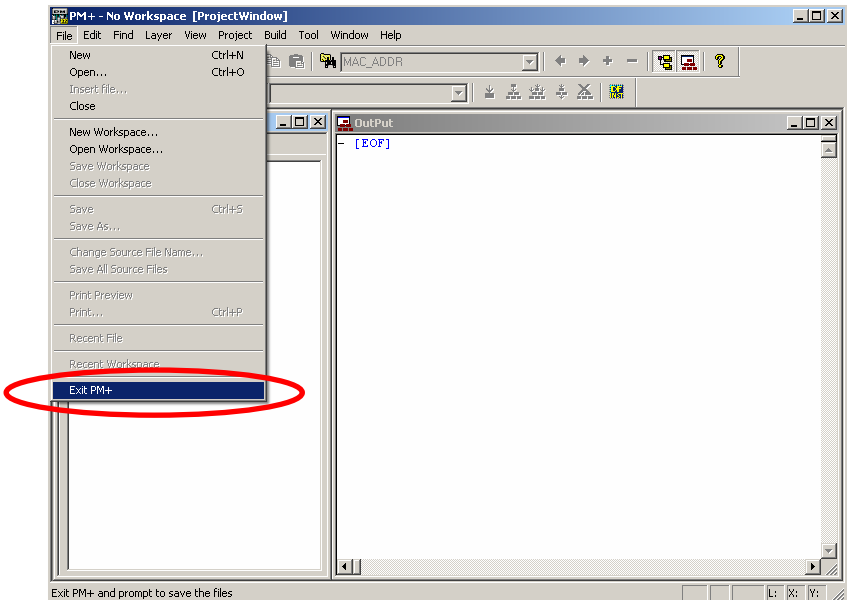
3.14.12 Resetting RF

The Menu R allows you to reset the UZ2400 registers.

3.15 Terminating PM +

In the PM + menu, select [File]→[Save Workspace].
Then, select [File]→[Close Workspace].

In the PM + menu, select [File]→[Exit PM +].



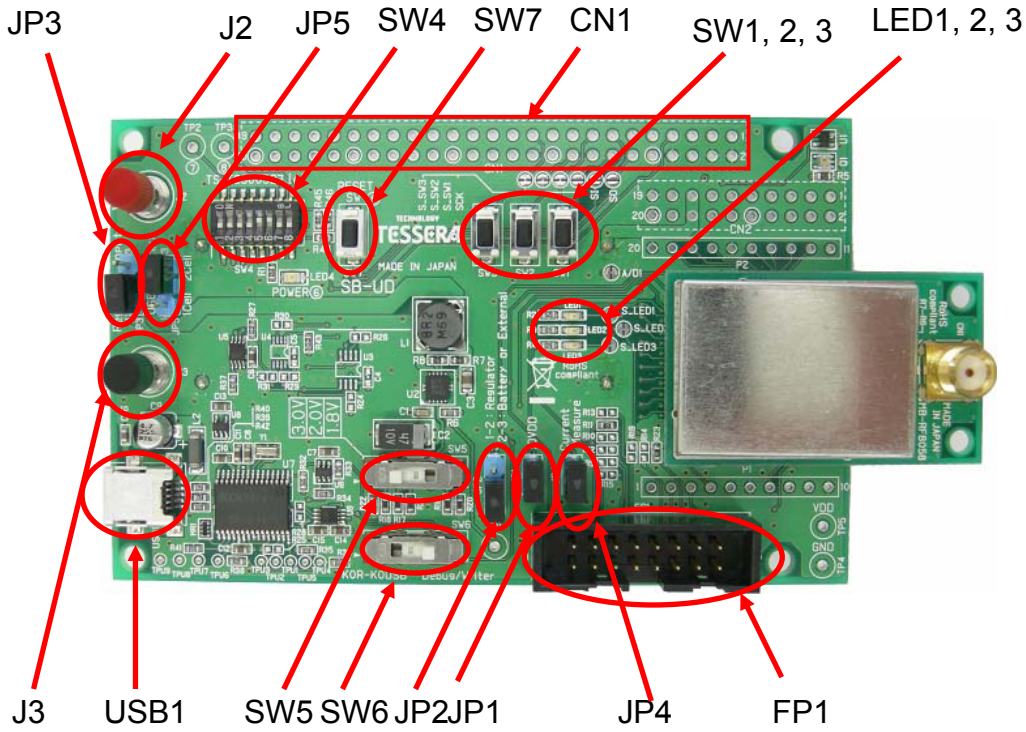
PM + ends.

4 Hardware Specifications

In this chapter, the hardware of TK-RF8058+SB will be explained.

Microcontroller	μPD78F8058
Clock	CPU main system clock: 20/8/1MHz (Internal oscillator) 16/8/4/2/1MHz (Generated from the 32MHz main clock) CPU subsystem clock:32.768KHz
Interface	USB connector(MiniB) Extension connector(CN1: not mounted) External Power Supply Terminals (J2,J3) MINICUBE2 connector(FP1)
Power supply voltage	USB Power: 5.0V One AA battery: 1.5V Two AA batteries: 3.0V External Power Supply at J2 and J3: 1.8V - 3.6V
Input/output for operation check use	・LED x3 : Only LED1 is connected to the MB-RF8058 module. ・Push switch x3: Only SW1 is connected ・Dip switch (SW4) ・Reset switch (SW7) ・Temperature sensor (U1: not used) ・Illminance sensor (Q1: not used) ・7LED x3
Other hardware	・Power LED(LED4) ・Voltage regulation selection by SW5 to 3.0V, 2.0V, or 1.8V

4.1 Layout of hardware functions



4.2 Hardware Functions

4.2.1 SW4 (Dip Switch)

Mode setting

1 bit	ALL ON → USB TK debugger ALL OFF → PC HyperTerminal mode
2 bit	
3 bit	
4 bit	
5 bit	Pull-up for RESET terminal(ON)／ no pull-up (OFF)
6 bit	Power LED ON/OFF
7 bit	Not used (TP2)
8 bit	Not used (TP3)

4.2.2 SW5

Selection of the regulator

1.8V	1.8V output to the module
2.0V	2.0V output to the module
3.0V	3.0V output to the module

Caution) Never alter the SW5 settings while a power source is being applied.
The regulator chip may be destroyed.
Alter the SW5 settings after the SW3 jumper pin is removed.

4.2.3 SW6

Serial Communication Mode Setting

K0R-K0USB	UART- USB for HyperTerminal
Debug/Writer	For ID78K0R-QB or WriteEZ5

4.2.4 JP1

Power supply to peripheral circuits such as LEDs and the temp sensor.

4.2.5 JP2

Selection of a power source

1-2 short-circuit	Regulation output of 1.8V, 2.0V, or 3.0V
2-3 short-circuit	No regulation from two batteries or the external power source

4.2.6 JP3

Selection of a power source to the regulator

1-2	USB
2-3	Battery

4.2.7 JP4

A jumper to measure a consumed current on the module.
If you don't execute measurement, please keep short-circuited.

If you measure a consumed current to the module, please use external power supply or two batteries for precision measurement.

4.2.8 JP5

A selection of one battery or two batteries.

1-2	One battery
2-3	Two batteries

4.2.9 SW1,SW2,SW3

SW3 and SW4 are tact switches. The port inputs are short-circuited to ground, while they are being pushed, and kept open otherwise. Therefore please set the on-chip pull-up registors(PU1) during initializing routine of your program code. (For more detail, please refer to the User's manual of the μPD 78F8058CPU.)

	Connected MCU pin	Note
SW1	P15/RTCDIV/RTCCL/GPIO2	GPIO2 belongs to the RF part
SW2	Not connected	
SW3	Not Connected	

4.2.10 SW7

SW7 is the reset switch. CPU can be reset by pushing.

4.2.11 LED4

LED4 indicates if power is being applied to the board, if SW4-5 is on.
If you want to save power by turning the LED4 off, please set SW4-5 to off.

4.2.12 LED1, LED2, and LED3

LED1, LED2, and LED3 are available for applications. To make an LED on, please set the output port LOW.

Connection of LED1, LED2, and LED3

	Connected MCU pin	Note
LED1	P16/TI01/TO01/INTP5/GPIO3	GPIO2 belongs to the RF part
LED2	Not connected	
LED3	Not connected	

4.2.13 FP1

The connector for MINICUBE2.

Please set the side switches of MINICUBE2 to “M1” and “T”.

4.2.14 J2 and J3

J2 and J3 is a pair of terminals to input power supply from an external power source. The accepted range of power source is from 1.8V to 3.6V.

4.3 Summary of Power Supply Settings

Summary of power supply settings

	USB Power	An external source At J2 and J3	Two batteries	One battery
JP3	1-2 connected (USB)	Any	1-2 connected (USB)	2-3 connected (Battery)
JP5	Any	1-2 connected (1Cell)	2-3 connected (2Cells)	1-2 connected (1Cell)
JP2	1-2 connected (Regulator)	2-3 connected (Battery or External)		1-2connected (Regulator)

4.4 Solder-short pad

The solder-short pad offers a way to modify the circuit on the module.
The solder-short pad looks like the picture below.
To open it, please cut the narrow part by a knife. To connect them back, please form a solder bridge on the pad.

Solder-short pad (Open)

Solder-short pad (Short)

Solder-short pad name	Factory default	Connection
S_LED1	Short	Connection between P16/TI01/TO01/INTP5/GPIO3 and LED1
S_LED2	Short	Connection to LED2 No connection to the MB-RF8058 board.
S_LED3	Short	Connection to LED3 No connection to the MB-RF8058 board
S_SW1	Short	Connection from SW1
S_SW2	Short	Connection from SW2 No connection to the MB-RF8058 board
S_SW3	Short	Connection from SW3 No connection to the MB-RF8058 board
AD1	Short	Analogue output from the temperature sensor No connection to the MB-RF8058 board
AD2	Short	Analogue output from the illumination sensor No connection to the MB-RF8058 board
SCK	Open	Not used
SI	Open	Not used
SO	Open	Not used

5 Troubleshooting

This chapter describes how to solve troubles you may face.

5.1 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 "Starter Kit USB Driver" in "1.2 Installation of Development Tools". If not, install the driver.

Check Point 3
: Check if the settings of the switch on the kit are correct with referring to "1.3 Installation of USB Driver".

Check Point 4
: If above 3 check points are confirmed, disconnect the USB cable from PC and re-connect again. It should show the "Found New Hardware Wizard" wizard. Operate the installation with referring to "1.3 Installation of USB Driver". After the installation, make sure you go through "1.3.3 Completion of USB Driver Installation" to confirm the USB driver installation.

5.2 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.

5.2.1 "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 the switch on the kit are correct with referring "1.3 Installation of USB Driver".

Check Point 3

Confirm the USB driver installation with referring to "1.3.3 Completion of USB Driver Installation".

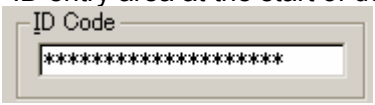
Check Point 4

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.

5.2.2 "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 "3.4Configuration of Linker Option". Also remember the code you set for the security ID.

After this, erase the flash memory with referring to "6.4Erase of flash memory".

5.2.3 "The on-chip debug function had been disabled in the device." (F0c79)

This error occurs when the value at address C3H (On-chip debug option byte) in microcontroller built-in flash memory is incorrect. You need to erase the flash memory.

Check Point 1

Check if you actually set the correct on-chip debug option byte with referring to "3.4Configuration of Linker Option". If it is not correct, then set correctly.

Check Point 2

Erase the flash memory with referring to "6.4Erase of flash memory".

5.2.4 "Disabling the on-chip debug function is prohibited." (F0c33)

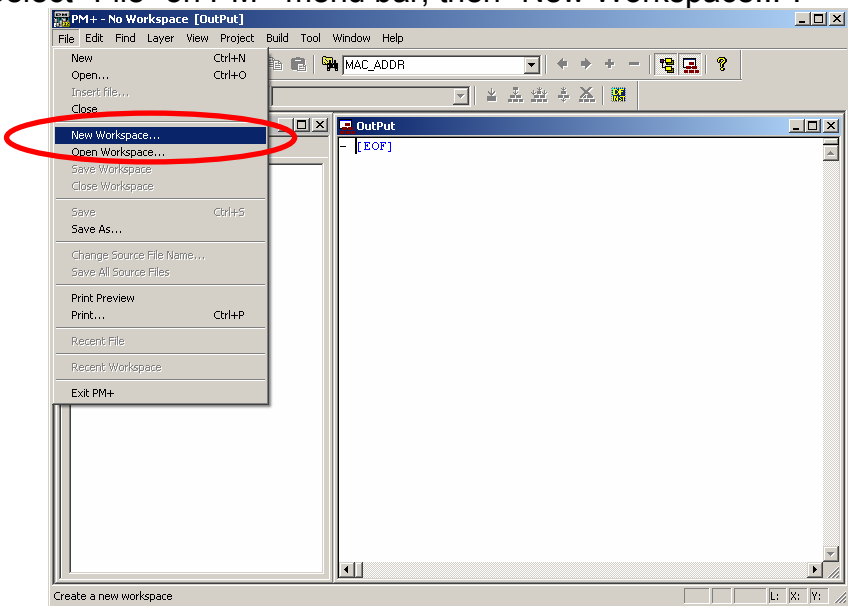
Basically, this error occurs when you start (download) the debugger without doing the settings described at "3.4Configuration of Linker Option". Do the same checking processes as"4.2.3 The on-chip debug function had been disabled in the device. (F0c79)".

6 Other Information

This chapter explains some useful operation techniques of development tools and circuit diagram of the kit for developing of user programs.

6.1 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>

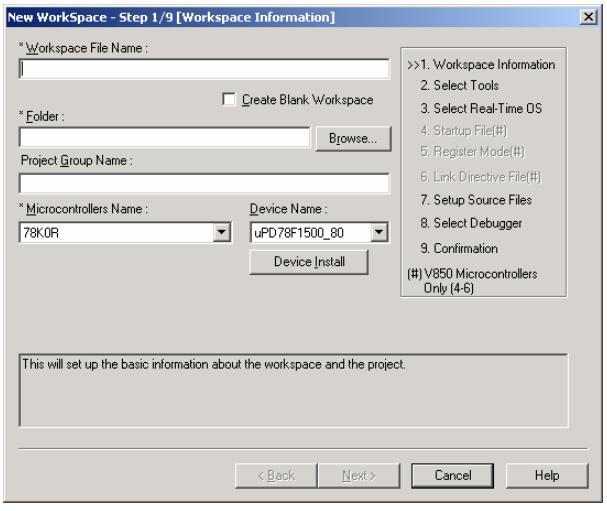
Workspace File Name:
-> Specify the name of the workspace file that manages the project files.
.prw is automatically suffixed as the file type.
A project file (.prj) of the same name is simultaneously created.

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.

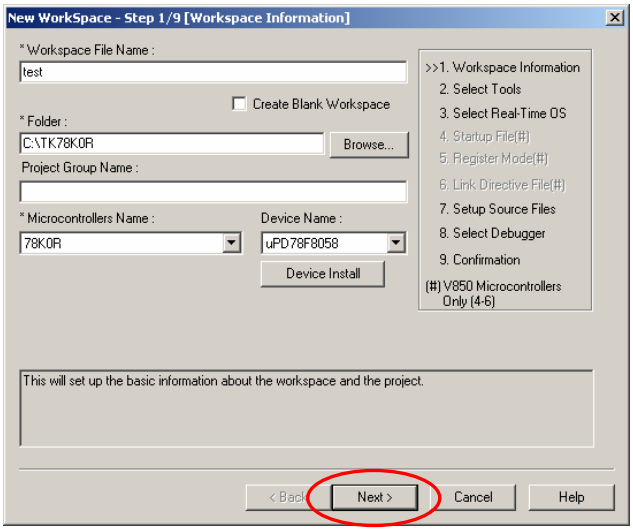
Workspace file name
→ test

Folder
→ C:¥TK78K0R

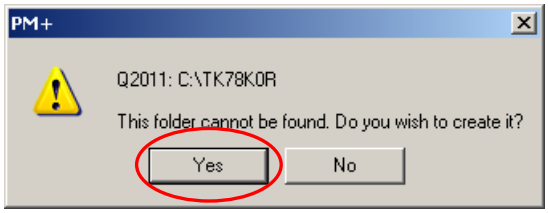
Project Group Name
→ (no input)

Microcontroller Name
→ 78K0R

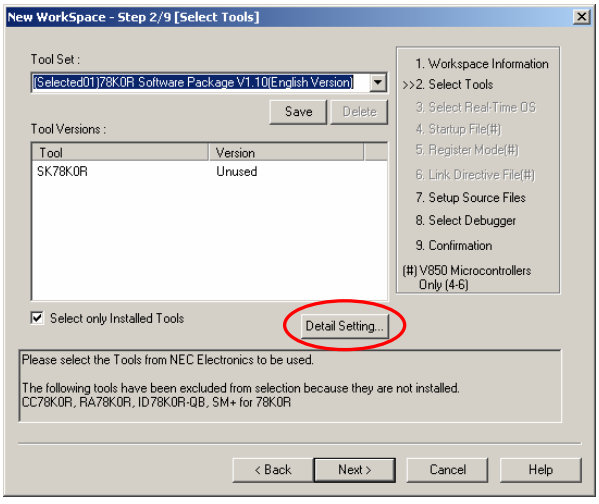
Device Name
→ uPD78F8058



Click [Next >] button

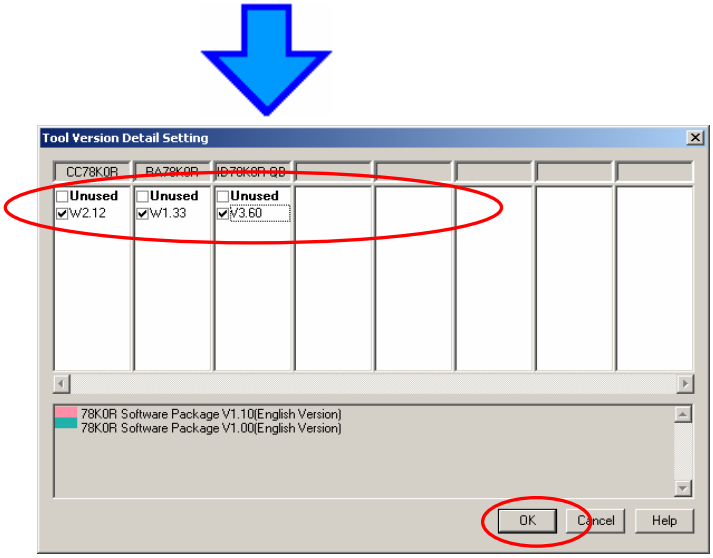


Click [Yes] button

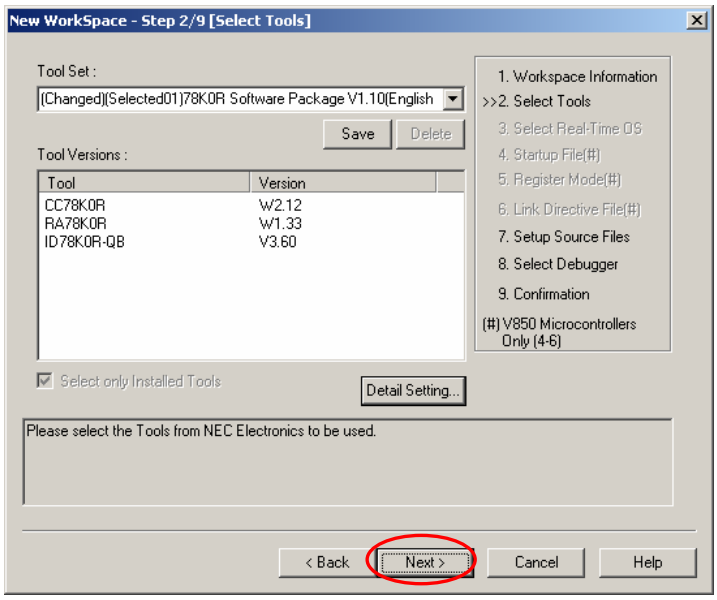


Click [Detail Setting] button

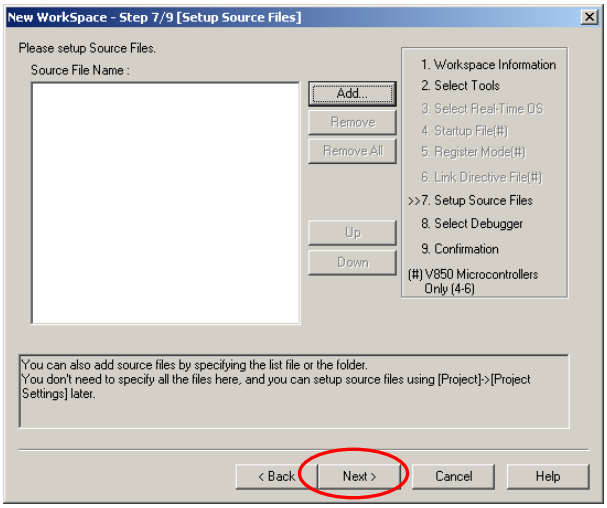
Set the version of tools as follows.
CC78K0R：W2.12
RA78K0R：W1.33
ID78K0R-QB：V3.60



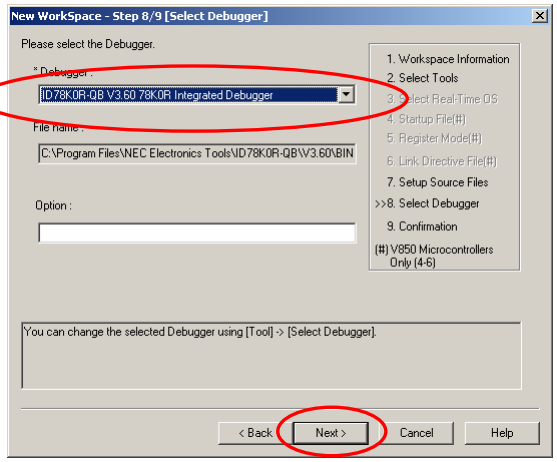
Select tools as above screenshot, then click OK .



Click Next >



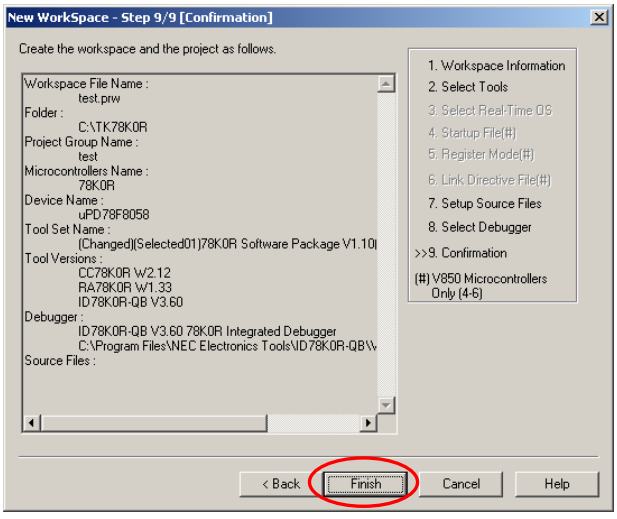
Click Next >



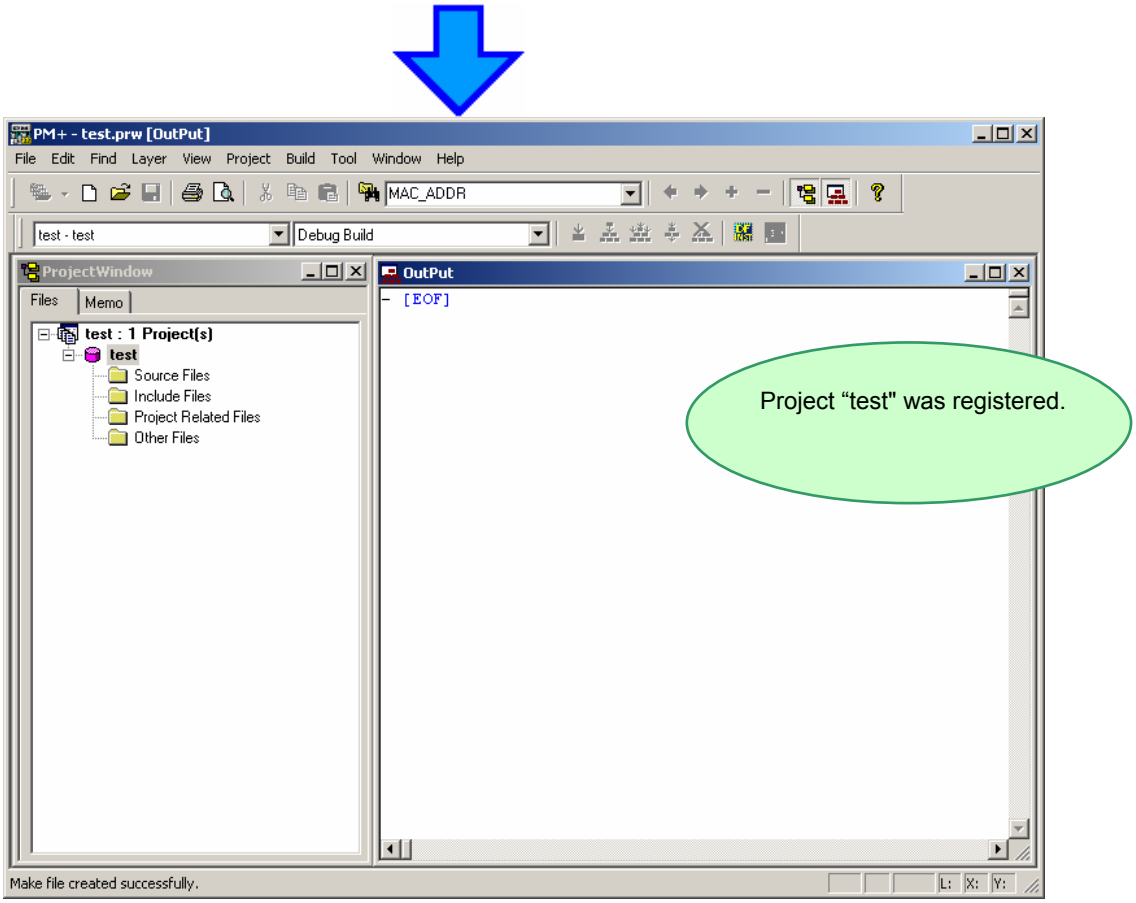
Click Next >

Select ID78K0R-QB V3.60

Check the project information settings



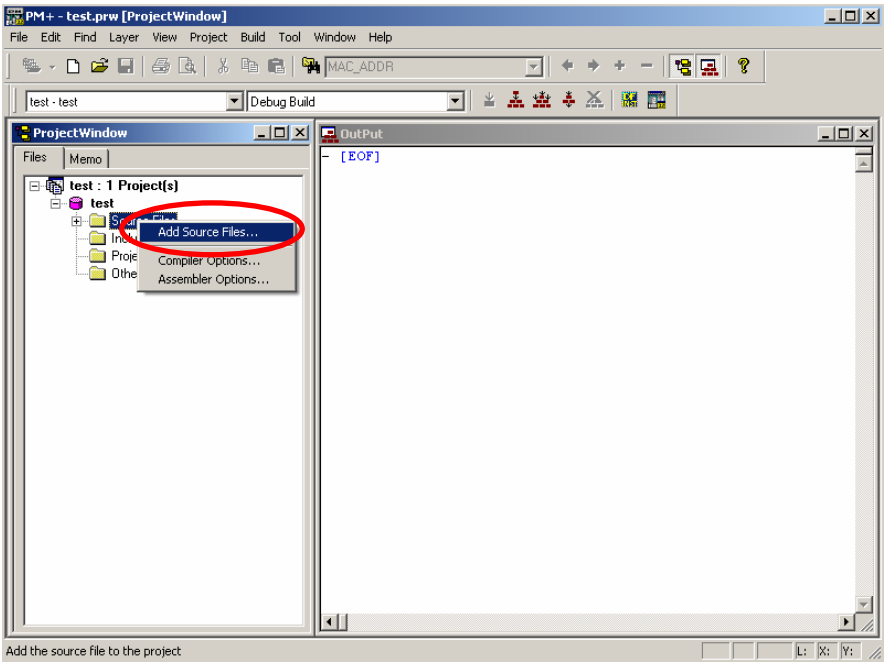
Click Finish



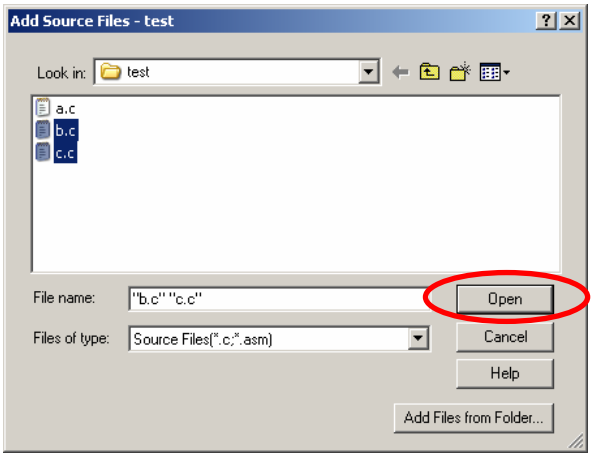
This completes workspace and project creation.
Additional source files can be registered at any time thereafter.
For details, refer to "7.2 Register additional source file".
Also, you need to do the settings for on-chip debug. Please refer to "3.4 Set Linker Options", "3.5 Set Compiler Options", and "3.7 Check Debugger Settings".

6.2 Registration of new source files

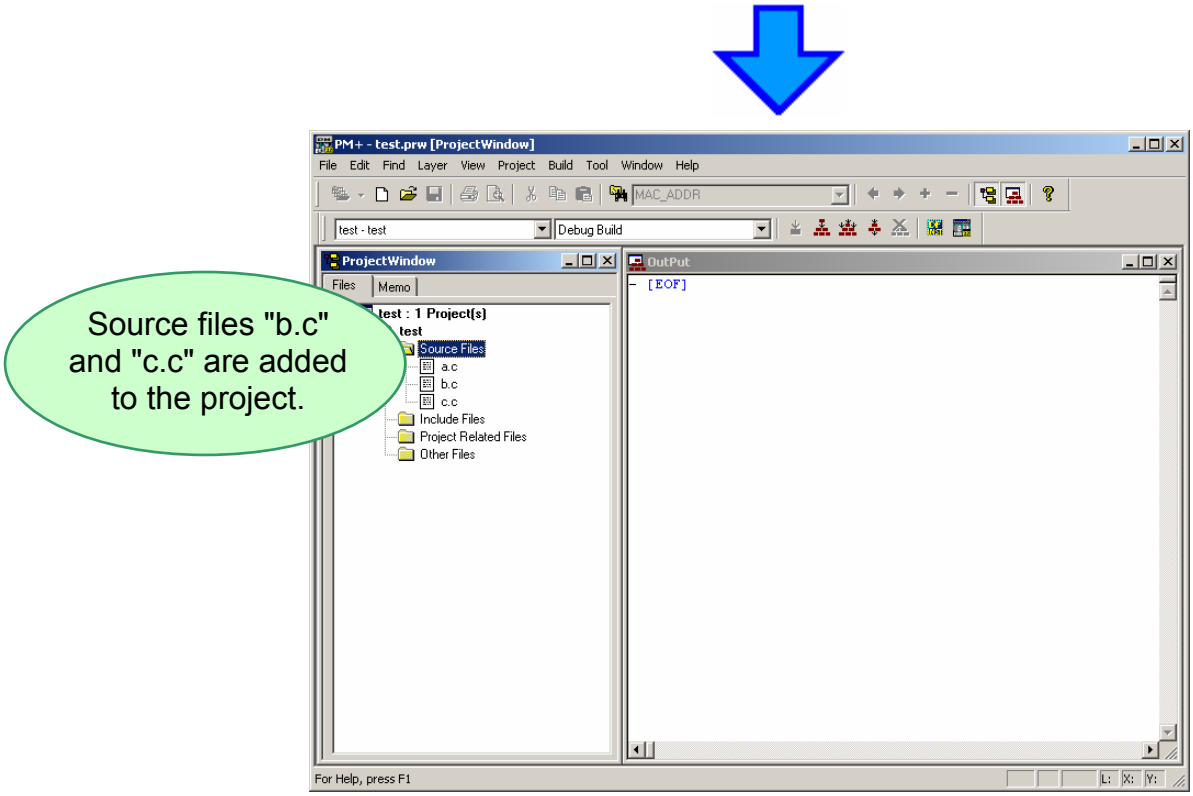
Now, we learn how to register new source files.
The following example shows how to register two additional source files of “b.c” and “c.c” with source file “a.c” already registered.
Place the cursor on a source file in the Project window of PM+, and select [Add Source Files…] displayed in the right-click menu.



Select source files "b.c" and "c.c", then click Open



Multiple source files can be selected by clicking them while keep pressing Ctrl key.


Source files "b.c" and "c.c" are added to the project.
PM+ - test.prw [ProjectWindow]
File Edit Find Layer View Project Build Tool Window Help
MAC_ADDR
test - test
Debug Build
ProjectWindow
Files
Memo
test : 1 Project(s)
test
Source Files
a.c
b.c
c.c
Include Files
Project Related Files
Other Files
OutPut
[EOF]
For Help, press F1

6.3 Debugger tips

This section describes some useful techniques for the debugger (ID78K0R-QB).

6.3.1 Change display of buttons

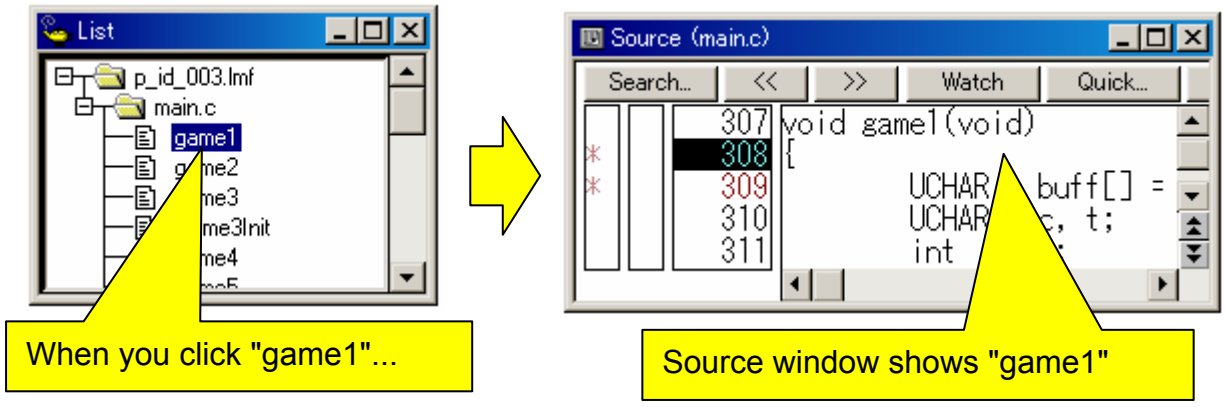
Execution controls (run, stop, step-in debugging, reset, etc) and opening functional window can be made by below buttons. However, it could be difficult to know which button does what.

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.

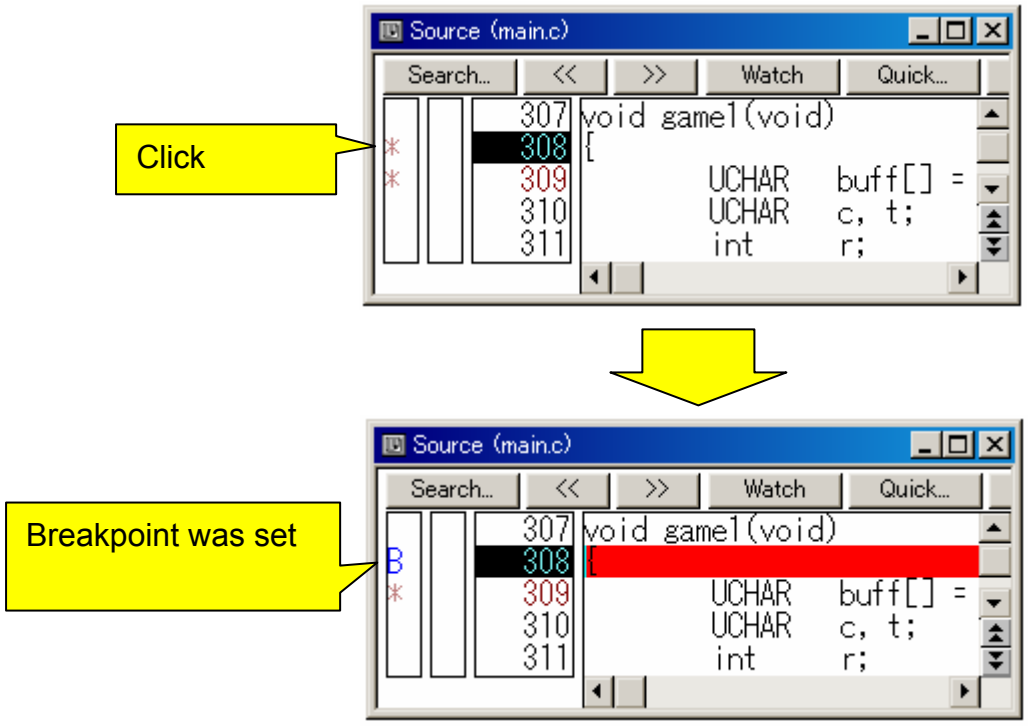
6.3.2 Display source list and function list

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.



6.3.3 Set/delete breakpoints

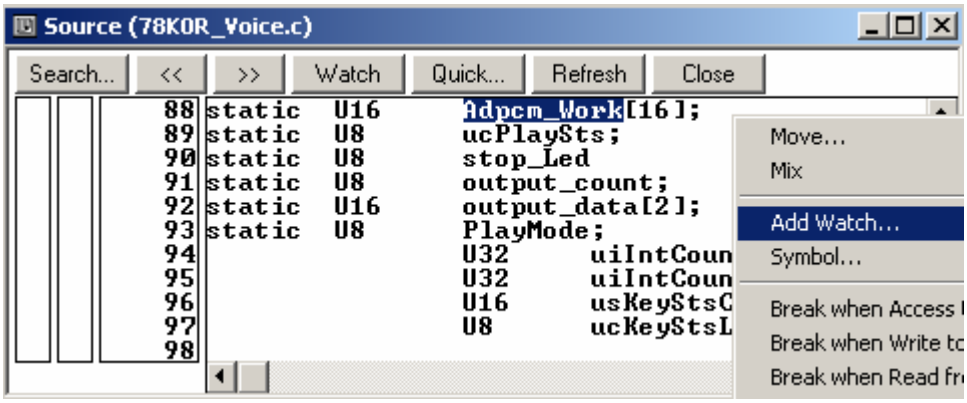
Breakpoints are executed by clicking lines in which " * " is displayed
"B" is displayed in the line where a breakpoint is set.
Breakpoints are deleted by clicking "B".



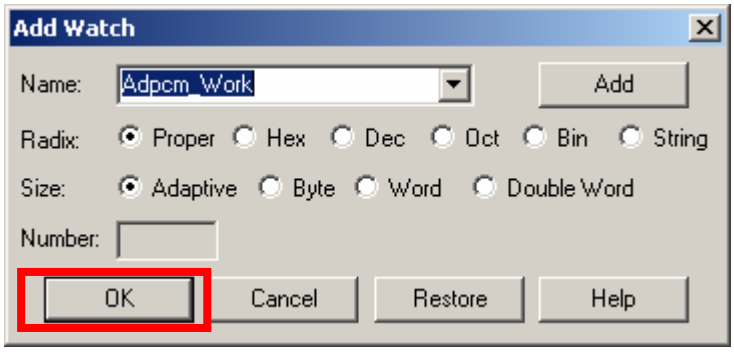
6.3.4 Display global variables

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.

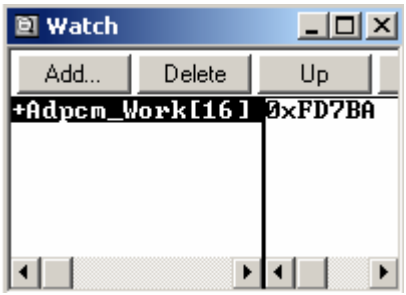
①Right-click the variable on source window, then select "Add Watch..."



②Add Watch dialog opens. Click [OK] .

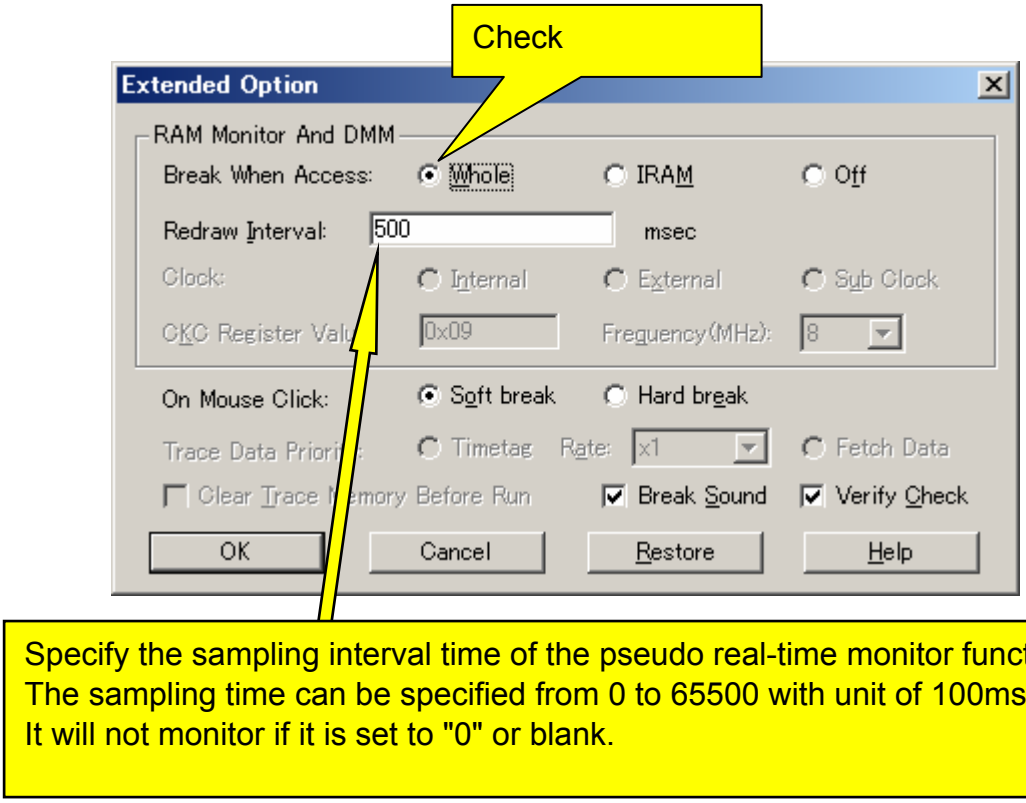


③Adding a variable to watch window is completed.



6.3.5 Display global variables while programs are running

RAM, general-purpose register, and SFR can be referred by the pseudo real-time monitor function even when the programs are running.
Select "Option" on menu bar, then "Extended Option...". Configure the settings for "RAM Monitor And DMM".



Specify the sampling interval time of the pseudo real-time monitor function.
The sampling time can be specified from 0 to 65500 with unit of 100ms.
It will not monitor if it is set to "0" or blank.

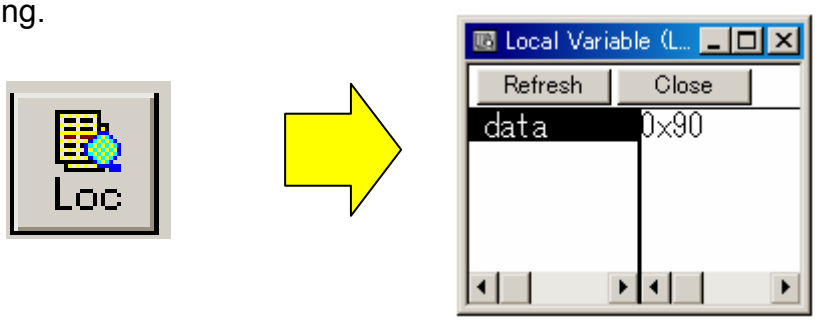
This completes the settings.

Note:

- The user program momentarily breaks upon a read.
- Do not use the pseudo real-time monitor function while using the memory window. It uses the system resources significantly as it monitors the displaying memory as well.
- It is recommended to close the memory window when you use the pseudo real-time monitor function.

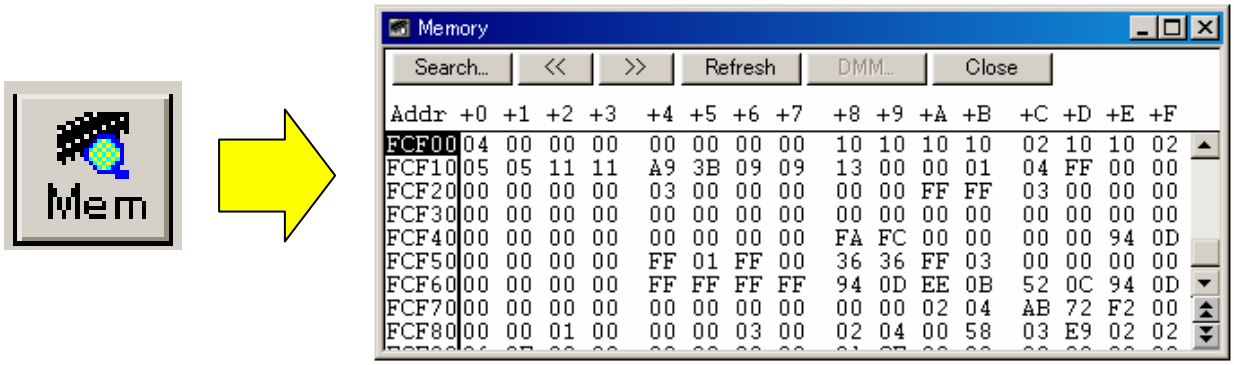
6.3.6 Display local variables

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.

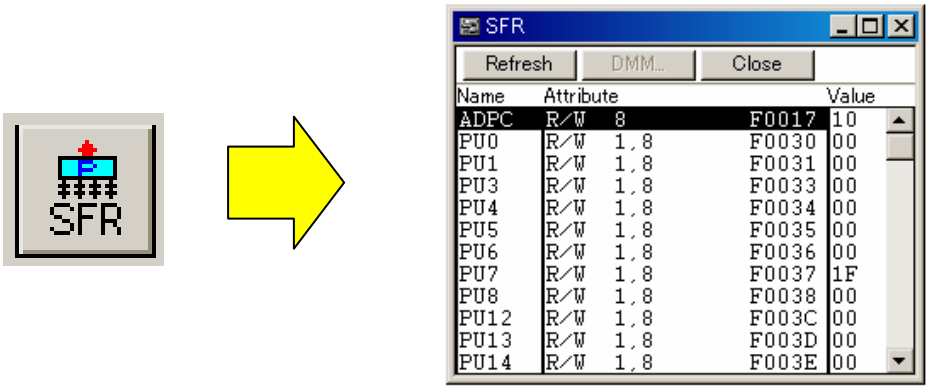


6.3.7 Display memory and SFR contents

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



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

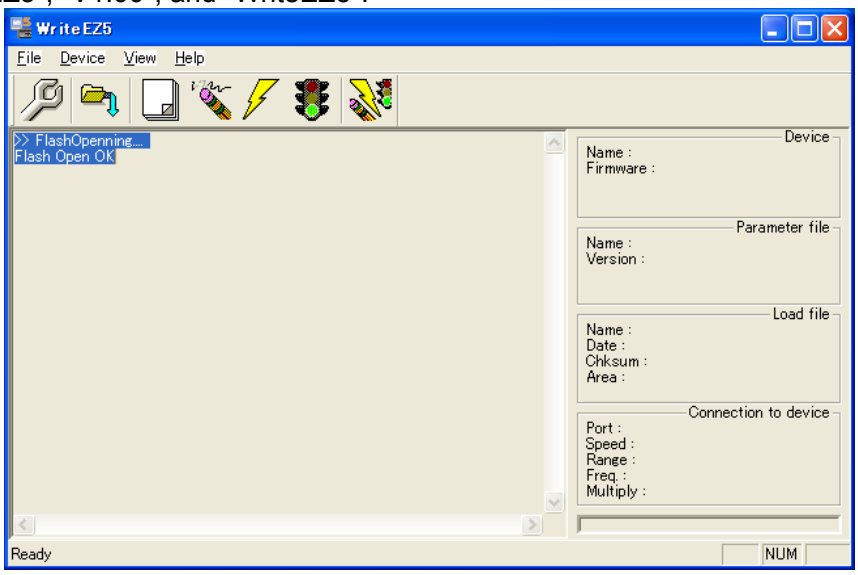


6.4 Erase of flash memory

If the On-Chip Debug Option Byte is set to "Do not erase data of flash memory in case of failures in enabling on-chip debugging" and if you forget the security ID, you need to erase the flash memory completely.
To erase the flash memory, please follow the steps below.

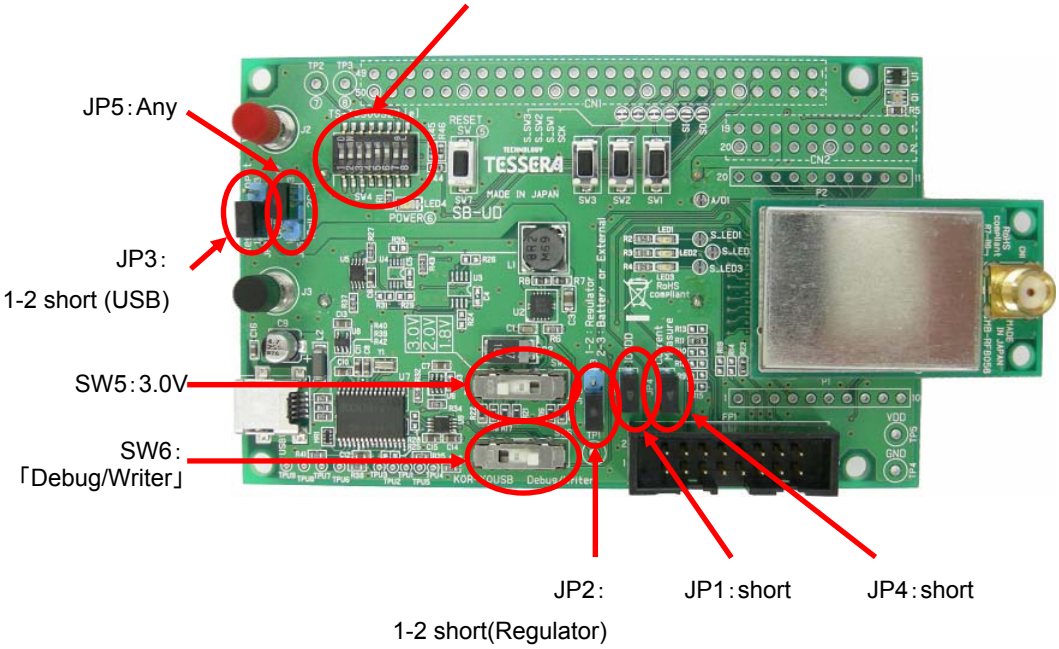
WriteEZ5 is installed at "1.2.2 Installation of Development Tools".

① Start WriteEZ5 by selecting "Windows Start" menu, "Programs", "NEC Electronics Tools", "WriteEZ5", "V1.00", and "WriteEZ5".



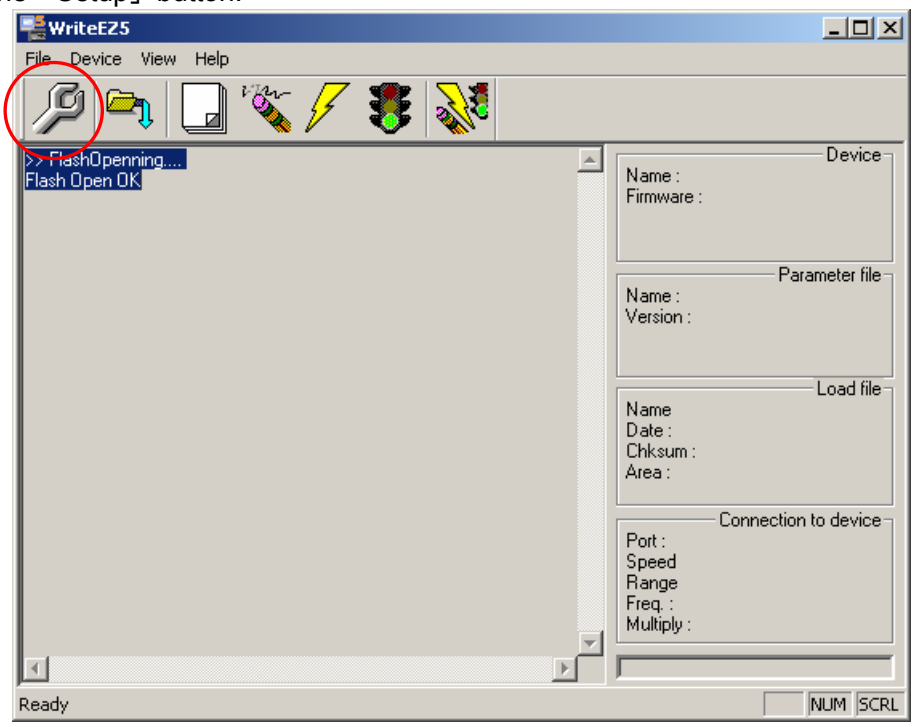
② The switch of TK-RF8058+SB is set as follows.

SW4 setting							
1	2	3	4	5	6	7	8
ON	ON	ON	ON	ON	ON	OFF	OFF

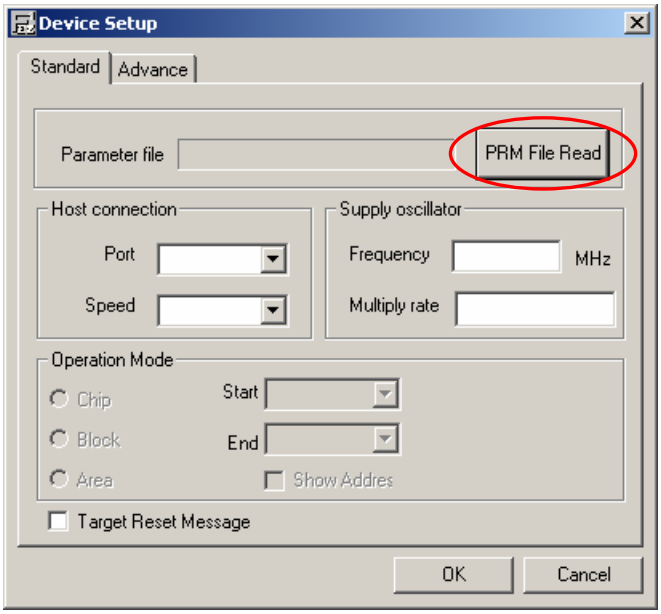


③ Then, please connect the “USB1” connector on the TK-RF8058+SB board with the USB connector of your PC.

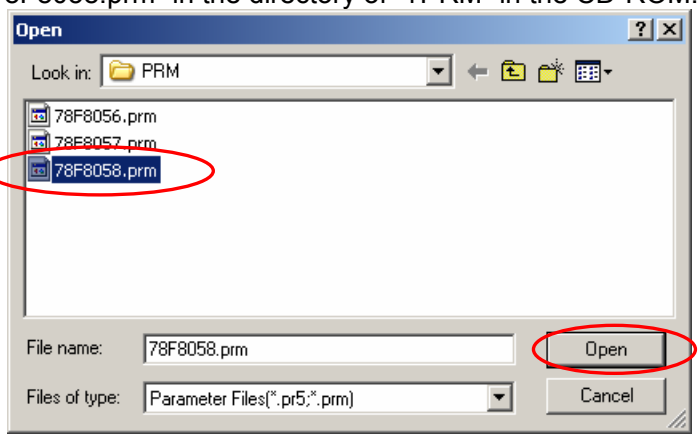
④ Push the「Setup」button.



⑤ Push the「PRM File Read」button.

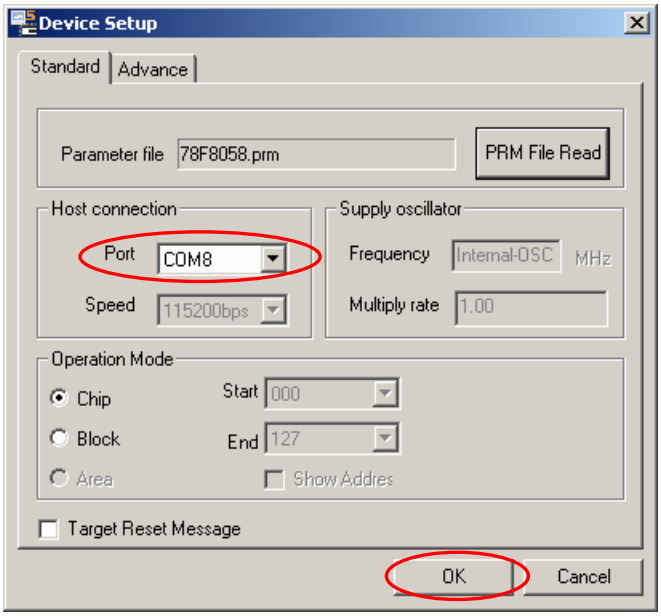


⑥ Please select “78F8058.prm” in the directory of “¥PRM” in the CD-ROM.

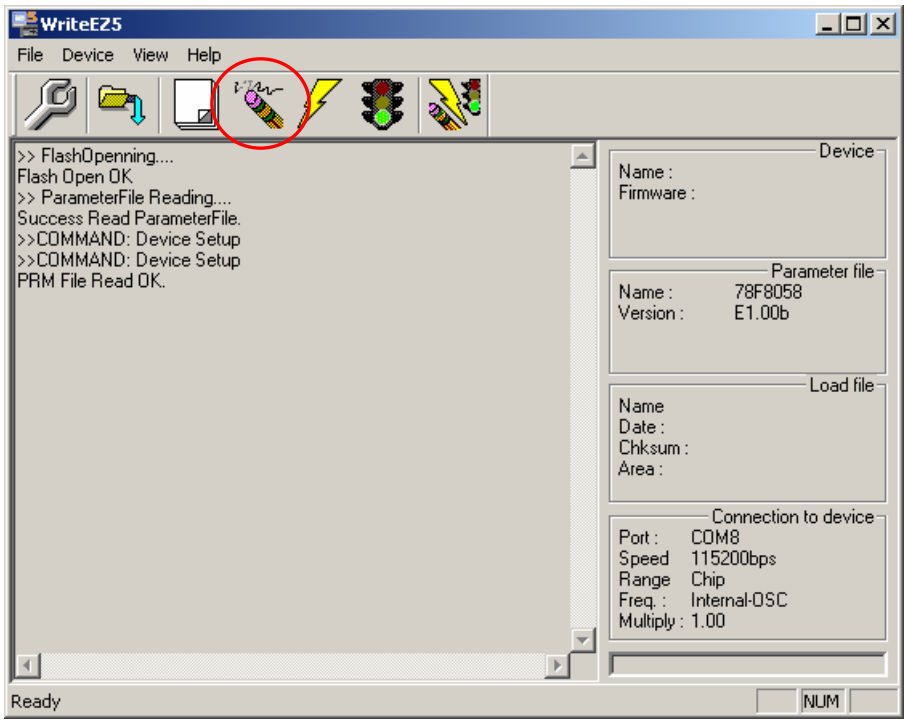


⑦ "Port" selects the COM port number where TK-RF8058+SB is allocated.

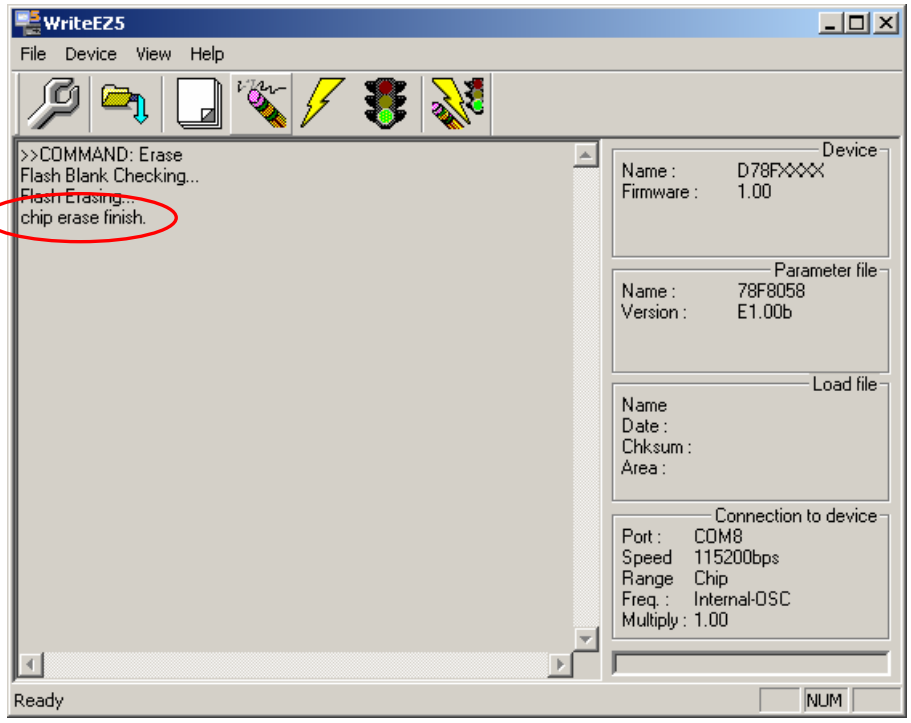
∗ Only the COM port number that the personal computer has is displayed in this pull-down menu.



⑧ "Erase" The deletion of the flash memory begins when the button is pushed.



⑨ If Flash EEPROM has been erased successfully, “chip erase finish” will be displayed as shown below.



※ ID Code

The ID Code is a mechanism to prevent an unwelcome third party from accessing your source code by initiating the debugger. Therefore, it is recommended to modify the ID Code from the default value to secure your original source code. However, once you modify it, then, if you forget the security ID or mistakenly over-write 0x00(value) to the address of 0xC3, the debugger ID78K0R-QB is unable to access to the CPU via OCD interface. In this case, you have to start over from erasing all data in the Flash EEPROM. Then, you can define the new ID Code. You may load your source code from the debugger with a load module file.

6.5 BOM List, Circuit diagram & Pin Connection

Here is the BOM List, circuit diagram & Pin Connection of the evaluation kit.

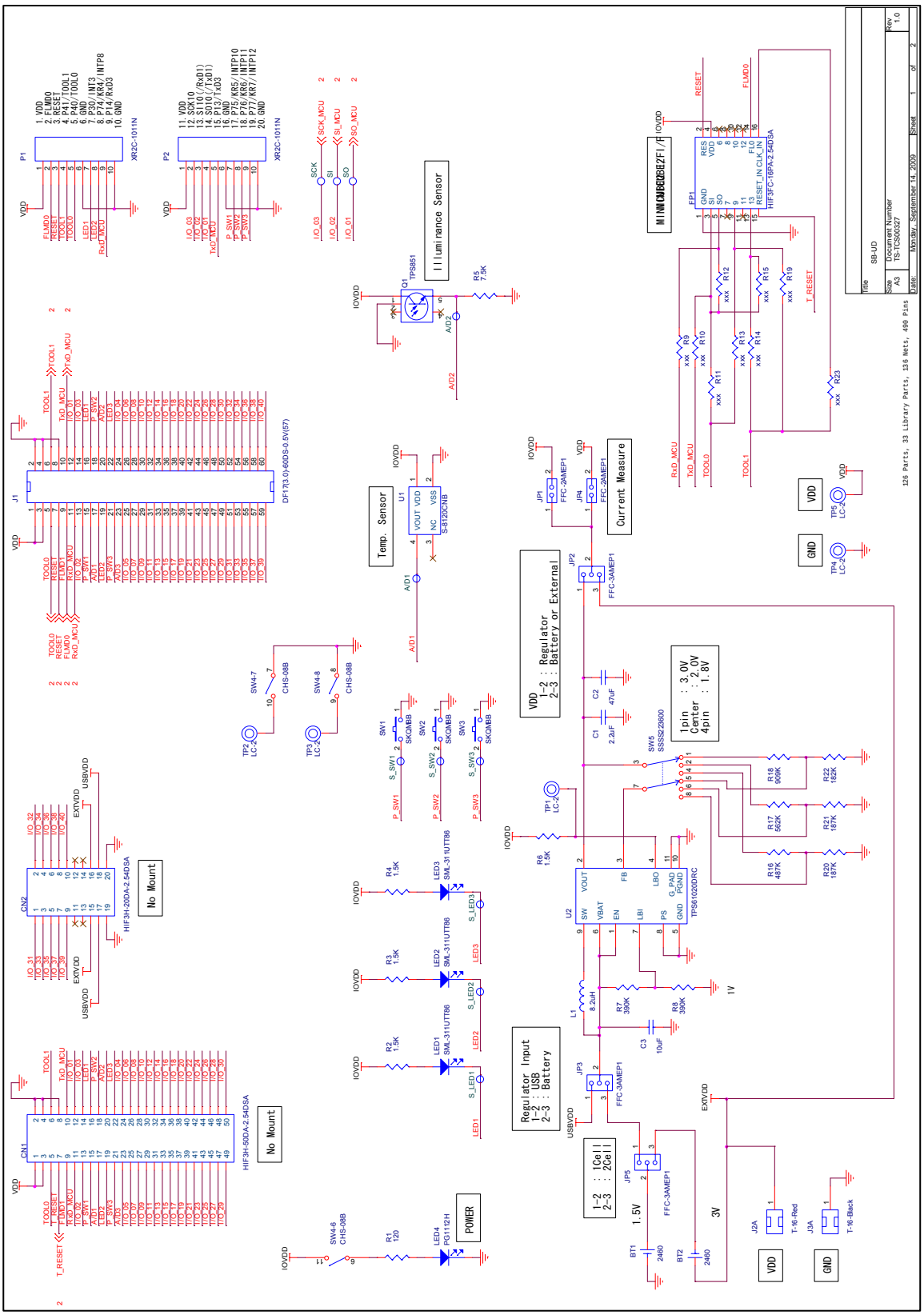
● SB-UD board BOM list

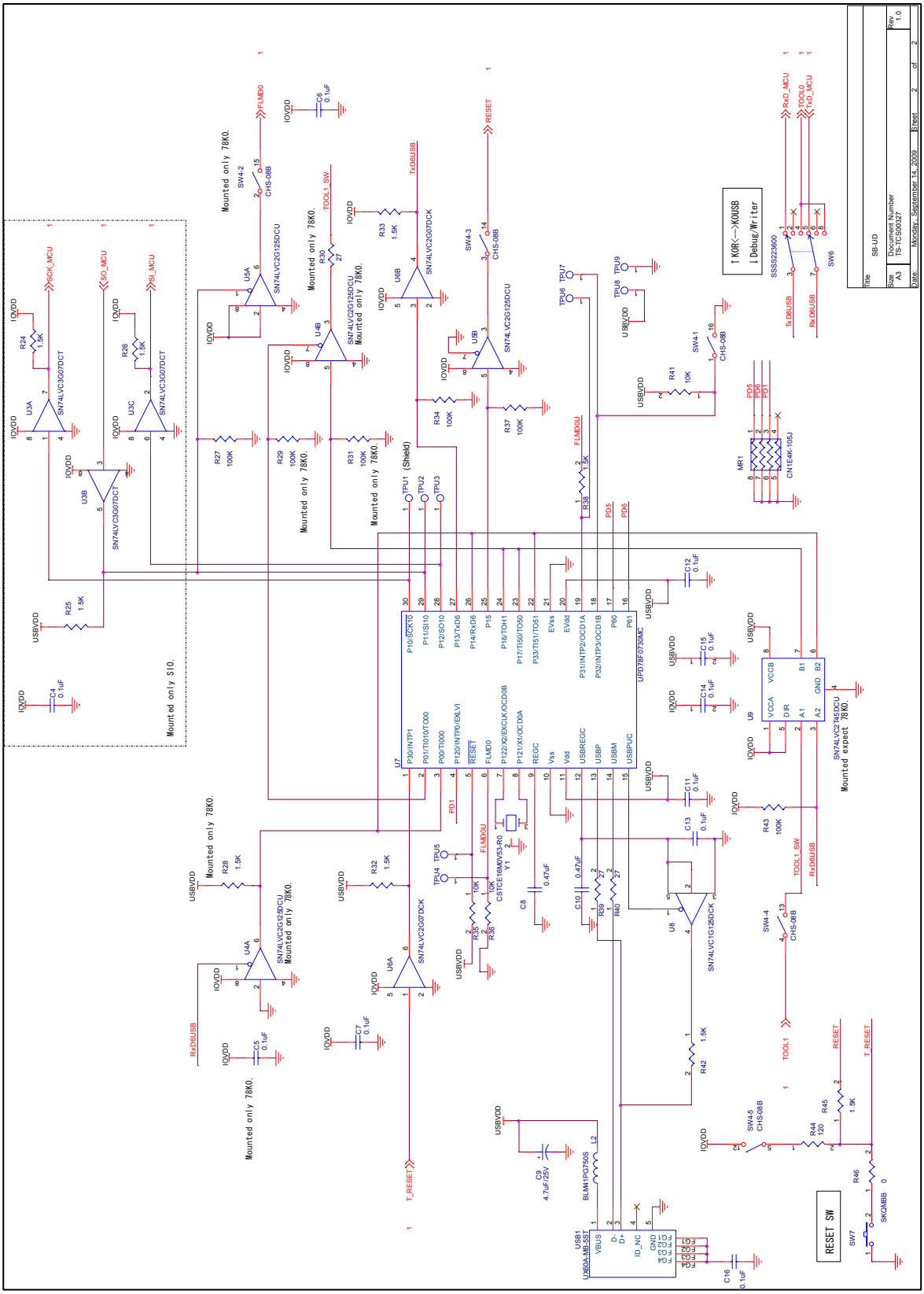
No.	Mount Quantity	Mount Parts Reference	Unmount Parts Reference	Type	Parts No	Maker	Note
1	0		S_SW1,S_LED1,A/D1,S_SW2, S_LED2,A/D2,S_SW3,S_LED3	Short Pad	SS		
2	0		SO,SI,SCK	Short Pad	SO		
3	2	BT1,BT2		Batt case	2460	KEYSTONE	
4	0		CN1	Connecter	HIF3H-50DA-2.54DSA	HIROSE	
5	0		CN2	Connecter	HIF3H-20DA-2.54DSA	HIROSE	
6	1	C1		Chip ceramic cap	2.2uF		
7	1	C2		Tantal cap	F931A476MCC	NICHICON	
8	1	C3		Chip ceramic cap	10uF		
9	8	C6,C7,C11,C12,C13, C14,C15,C16	C4,C5	Chip ceramic cap	0.1uF		
10	2	C10,C8		Chip ceramic cap	0.47uF		
11	1	C9		Aluminum Electrolytic Cap	4.7uF/25V		
12	1	FP1		Connecter	HIF3FC-16PA-2.54DSA	HIROSE	
13	2	JP1,JP4		Connecter	FFC-2AMEP1	HONDA	
14	3	JP2,JP3,JP5		Connecter	FFC-3AMEP1	HONDA	
15	1	J1		Connecter	DF17(3.0)-60DS-0.5V(57)	HIROSE	
16	1	J2		Terminal	T-16-Red	SATO PARTS	
17	1	J3		Terminal	T-16-Black	SATO PARTS	
18	3	LED1,LED2,LED3		LED	SML-311UTT86	STANLY	
19	1	LED4		LED	PG1112H	ROHM	
20	1	L1		inductor	CDRH5D28NP-8R2NC	Sumida	
21	1	L2		Filter	BLM41PG750S	MURATA	
22	1	MR1		resister module	CN1E4K-105J	KOA	
23	0		P2,P1	Connecter	XR2C-1011N	OMRON	for A&D
24	1	Q1		IC	TPS851	TOSHIBA	
25	2	R1,R44		Chip resister	120		
26	8	R2,R3,R4, R32,R33,R38,R42,R45	R24,R25,R26,R28	Chip resister	1.5K		
27	1	R5		Chip resister	7.5K		
28	2	R7,R8		Chip resister	390K		
29	1	R16		Chip resister	487K		
30	1	R17		Chip resister	562K		
31	1	R18		Chip resister	909K		
32	2	R20,R21		Chip resister	187K		
33	1	R22		Chip resister	182K		
34	4	R27,R34,R37,R43	R29,R31	Chip resister	100K		
35	2	R39,R40	R30	Chip resister	27		
36	4	R6,R35,R36,R41		Chip resister	10K		
37	0			Chip resister	100		
38	4	SW1,SW2,SW3,SW7		Switch	SKQMBB	ALPS	
39	1	SW4		Switch	CHS-08B	COPAL	
40	2	SW6,SW5		Switch	SSSS223600	ALPS	
41	0		TPU1,TPU2,TPU3,TPU4,TPU5, TPU6,TPU7,TPU8,TPU9	Trough hole	TPU		
42	0		TP1,TP2,TP3,TP4,TP5	Terminal	LC-2	MAC8	
43	1	USB1		Connecter	UX60A-MB-5ST	HIROSE	
44	1	U1		IC	S-8120CNB	SII	
45	1	U2		IC	TPS61020DRC	TI	
46	0		U3	IC	SN74LVC3G07DCT	TI	For SIO I/F
47	1	U5	U4	IC	SN74LVC2G125DCU	TI	
48	1	U6		IC	SN74LVC2G07DCK	TI	
49	1	U7		IC	UPD78F0730MC	NECEL	
50	1	U8		IC	SN74LVC1G125DCK	TI	
51	1	U9		IC	SN74LVC2T45DCU	TI	
52	1	Y1		IC	CSTCE16M0V53-R0	MURATA	
53	5	JP1,JP2,JP3,JP4,JP5		Jumper	HIF3GA-2.54SP	HIROSE	
54	0		R9,R10,R12,R13,R14, R15,R19	Chip resister			For K0R
55	3	R11,R23,R46		Chip resister	0		For K0R

● MB-RF8058 board BOM list

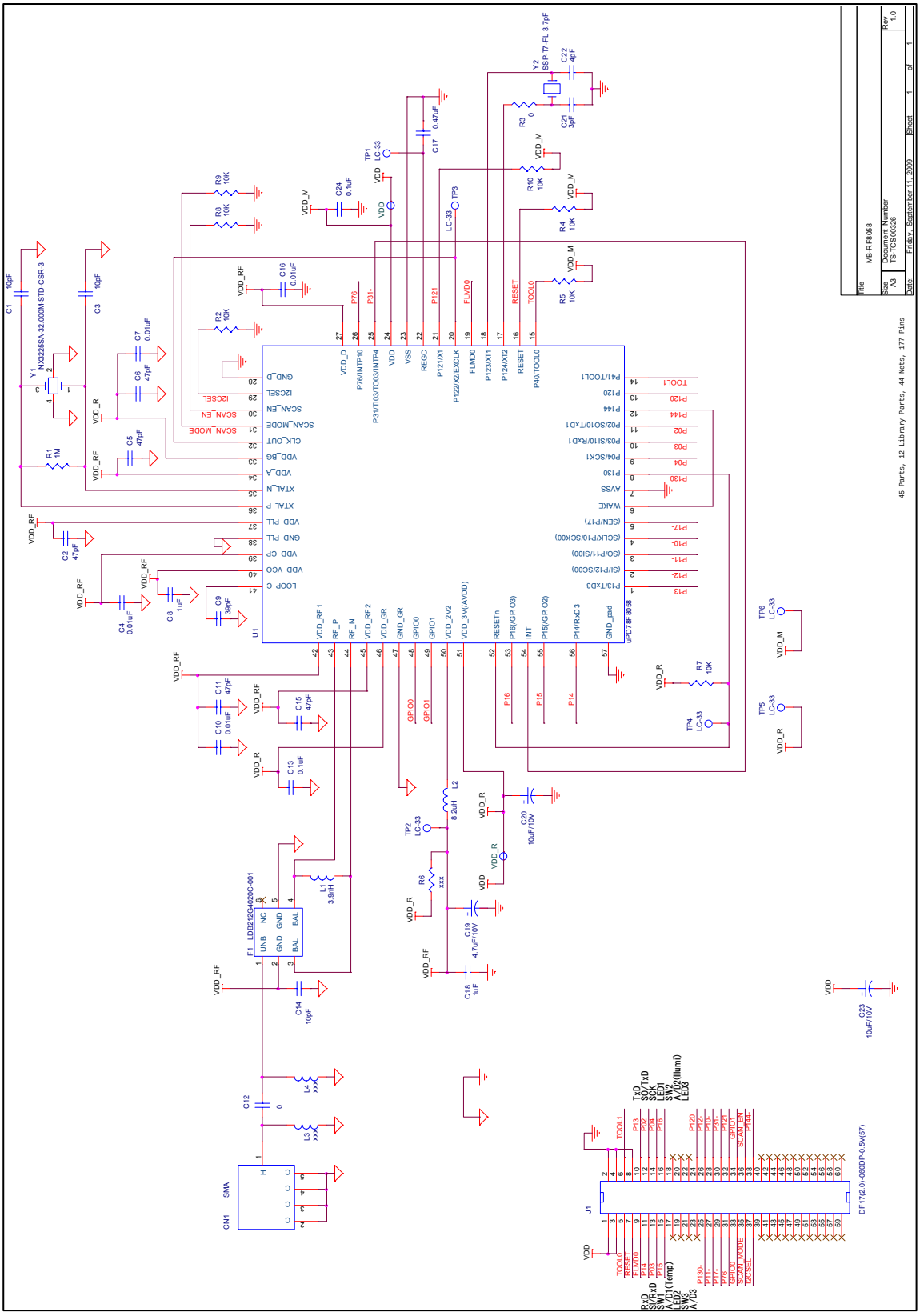
No.	Mount Quantity	Mount Parts Reference	Unmount Parts Reference	Type	Parts No	Manufacturer
1	1	CN1		Connecter	901-144-8RFX	AMPHENOL
2	5	C2,C5,C6,C11,C15		Chip ceramic cap	47pF	
3	4	C4,C7,C10,C16		Chip ceramic cap	0.01uF	
4	2	C8,C18		Chip ceramic cap	1uF	
5	1	C9		Chip ceramic cap	39pF	
6	1	C12		Chip resister	0	
7	2	C24,C13		Chip ceramic cap	0.1uF	
8	3	C14,C1,C3		Chip ceramic cap	10pF	
9	1	C17		Chip ceramic cap	0.47uF	
10	1	C19		Chip ceramic cap	4.7uF/10V	
11	2	C23,C20		Chip ceramic cap	10uF/10V	
12	1	C21		Chip ceramic cap	3pF	
13	1	C22		Chip ceramic cap	4pF	
14	1	F1		Filter	LDB212G4020C-001	MURATA
15	1	J1		Connecter	DF17(2.0)-060DP-0.5V(57)	HIROSE
16	1	L1		inductor	LQG15HN3N9S02	Murata
17	1	L2		inductor	LQH2MCN8R2M02	MURATA
18	0		L3,L4	inductor		
19	1	R1		Chip resister	1M	
20	7	R2,R4,R5,R7,R8,R9,R10		Chip resister	10K	
21	1	R3		Chip resister	0	
22	0		R6	Chip resister		
23	0		TP1,TP2,TP3,TP4	Check Pin	LC-33	
24	1	U1		IC	uPD78F8058	NECEL
25	0		VDD_R,VDD	Short pad	SS	
26	1	Y1		Resonator	NX3225SA-32.000M-STD-CSR-3	NDK
27	1	Y2		Resonator	SSP-T7-FL 3.7pF	SII

● SB-UD board schematic




Mounted only S10.
Mounted only 78K0.
Mounted expect 78K0.
SN74LVC3G07DCT
SN74LVC2G125DCU
SN74LVC2G07DCK
SN74LVC1G125DCK
SN74LVC2T45DCU
UPD78F0730AMC
CHS-08B
CN1E4K-105J
SSSS223600
USB1
UX60A-MB-5ST
BLM41PG750S
CSTCE16M0V53-R0
SKQMBB
RESET SW
↑ KOR<—>KOUSB
↓ Debug/Writer
SCK_MCU
SO_MCU
SI_MCU
RxD_MCU
TxD_MCU
TxD6USB
RxD6USB
TOOL0
TOOL1
TOOL1_SW
RESET
T_RESET
FLMD0
FLMD0U
IOVDD
USBVDD
Title
SB-UD
Size
A3
Document Number
TS-TCS00327
Rev
1.0
Date:
Monday, September 14, 2009
Sheet
2
of
2

● MB-RF8058 board schematic

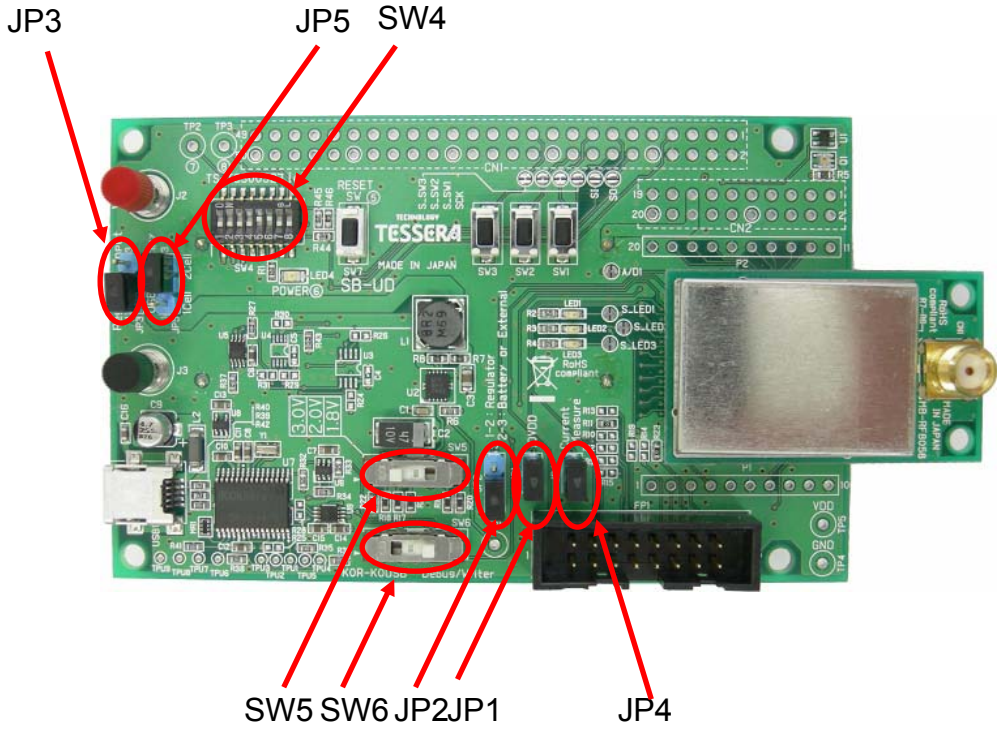


- SB-UD board CN1 Pin connecting list

Pin number	Net name	uPD78F8058 Signal Port Connection	Requirement for using the signal
1	VDD	–	
2	GND	–	
3	VDD	–	
4	GND	–	
5	TOOL0	–	
6	TOOL1	–	
7	T_RESET	–	
8	GND	–	
9	FLMD1	–	
10	TxD_MCU	P13/TxD3	Don't use the USB connection as debugging or serial communication when you use this signal.
11	RxD_MCU	P14/RxD3	
12	I/O_01	P02/SO10/TxD1	–
13	I/O_02	P03/SI10/RxD1/SDA10	–
14	I/O_03	P04/SCK10/SCL10	–
15	P_SW1	P15/RTCDIV/RTCCL/GPIO2	Separate a switch with cutting the solder short pad for use as general-purpose port.
16	LED1	P16/TI01/TO01/INTP5/GPIO3	Separate a LED with cutting the solder short pad for use as general-purpose port.
17	A/D1	–	
18	P_SW2	–	
19	LED2	–	
20	A/D2	–	
21	P_SW3	–	
22	LED3	–	
23	A/D3	–	
24	I/O_04	P120/INTP0/EXLVI	–
25	I/O_05	–	
26	I/O_06	–	
27	I/O_07	–	
28	I/O_08	–	
29	I/O_09	–	
30	I/O_10	–	
31	I/O_11	P76/INTP10	–
32	I/O_12	P121/X1	This port has a pull-up resister.
33	I/O_13	GPIO0	RF transceiver port
34	I/O_14	GPIO1	RF transceiver port
35	I/O_15	–	
36	I/O_16	–	
37	I/O_17	–	
38	I/O_18	–	
39	I/O_19	–	
40	I/O_20	–	
41	I/O_21	–	
42	I/O_22	–	
43	I/O_23	–	
44	I/O_24	–	
45	I/O_25	–	
46	I/O_26	–	
47	I/O_27	–	
48	I/O_28	–	
49	I/O_29	–	
50	I/O_30	–	

7 Mode setting of the board

The combination table of the switch of this board is shown.



Mode Setting Table

	User mode on USB power with Debugging and Flash programming with MINICUBE2, and UART-USB conversion to a HyperTerminal. (NOTE)	Debug/Flash programming mode via USB without MINICUBE2 using ID78K0R-QB/WriteEZ5
SW4	(Dip switch) 1-4 → ALL OFF 5 → ON (Pull-up the RESET pin) 6 → ON (Power LED on) 7,8 → Any	(Dip switch) 1-6 → ALL ON 7,8 → Any
SW6	「K0R-K0USB」	「Debug/Writer」
SW5	1.8V, 2.0V or 3.0V	1.8V, 2.0V or 3.0V
JP3	1-2 (USB) short	1-2 (USB) short
JP5	Any	Any
JP2	1-2 short	1-2 short
JP1	short	short
JP4	short	short

(NOTE): The side switches of MINICUBE2 have to be set to “M1” and “T”.