Welcome to the world of TK-850/JH3E+UD.
You are now sailing into the design environment of the V850ES microcontroller for developing wireless networks to Ethernet gateway applications. Please follow the user's manual step by step.

User’s Manual

TK-850/JH3E+UD

ZigBee™-ready
Wireless Networks to Ethernet Gateway
V850ES 32 bit Microcontroller Evaluation Board

User's manual

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Contents

Preface

Targeted Readers

Software engineers, who wish to become familliar with the design environment of V850 microcontrollers to develop and evaluate applications on the TK-850/JH3E+UD evaluation boards. Readers are expected to possess the basic knowledge of microcontrollers, C language, and Windows™ OS.

Objective

Readers will learn how to play around the TK-850/JH3E+UD evaluation board with the V850 design environment.

Construction

This manual consists of the following chapters

Chapter 1 Installation
→ Installation of the sample program and preparation of the TK-850/JH3E+UD boards.

Chapter 2 Experiences
→ Experience how to operate the project manager PM+, compiler, and the integrated debugger while preparing the implementation of the sample program.

Chapter 3 Hardware Specifications
→Explain the hardware of TK-850/JH3E+UD

Chapter 4 Troubleshooting
→Describe how to solve troubles you may face, such as errors when starting the integrated debugger (ID850QB)

Chapter 5 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 6 Sample Prgram
→How to use the sample program "RF Test Program" and “Ethernet gateway program”

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

NOTES

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.

Trademarks

Chapter1 Installation

This chapter introduces the development tools and explains the installation of the sample program. The sample program can be tested on this hardware platform of the evaluation kit.

1.1 Development Tools

The following development tools are utilized in the TK-850/JH3E+UD board.

- ## Integrated development environment PM + V6.32

  PM+ stands for Project Manager. It is an integrated development environment platform, working on MS Windows. Editor, compiler, and debugger are managed on PM +.

- ## Device File DF3786 V1.00

  The Device File loads the CPU hardware information into the development tools.
  The sample program in this tutorial was compiled for V850ES/JH3-E, based on the information in the device file.

- ## C compiler CA850 W3.40 (Code size limited version)

  C compiler for the V850 microcontrollers. The object code size is limited to 128 Kbyte.
  This compiles C code for V850 and ANSI-C code program into assembler code.
  This produces object code and linker.

- ## Integrated debugger ID850QB V3.60

  Debugging tasks are performed by the debugger ID850QB with the monitor program stored in the Embedded Flash EEPROM in the microcontroller via USB-UART interface. Once the debugger is initiated, object user code is automatically downloaded onto the on-chip Flash EEPROM.

- ## Flash EEPROM programmer WriteEZ5

  The programmer is a piece of software, operating on MS Windows. It programs, erases, and verifies object code in the embedded Flash EEPROM in the microcontroller, via USB cable from PC.

- ## Starter kit USB driver

  This is a software driver for PC to access to the USB interface of the TK-850/JH3E+UD board.

- ## The RF Test Program

  The RF Test Program is explained in [chapter 6 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 board in a radio anechoic chamber.

- ## Ethernet gateway sample program

  The Ethernet gateway sample program supplies network information of the 78K0R UD Stick in the wireless network via Ethernet.

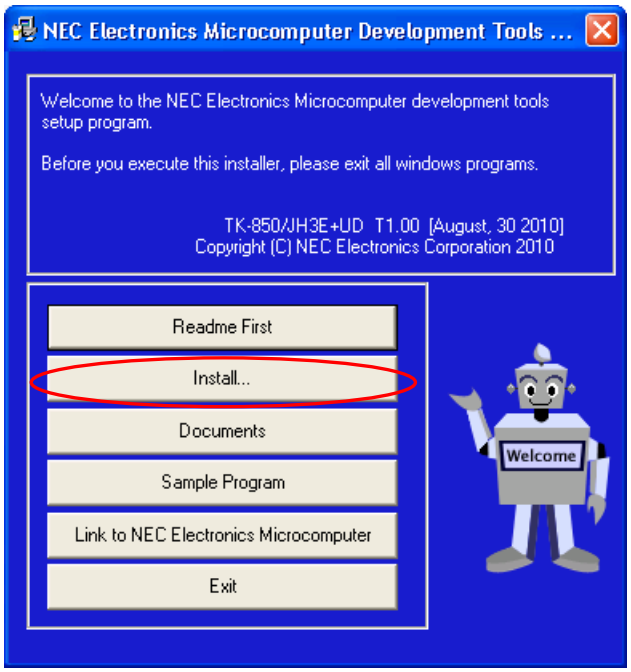
1.2 Installation of Software Development Tools

1.2.1. Explanation of this CD-ROM

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

1.2.2. Installation of the software development tools

Insert the CD-ROM in the CD-ROM drive. The installer is started automatically.
If it does not start automatically, start SETUP.EXE from Explorer, etc.



<1> Selecting Install… from “NEC Electronics Microcomputer Development Tools Setup” opens the following dialog box.

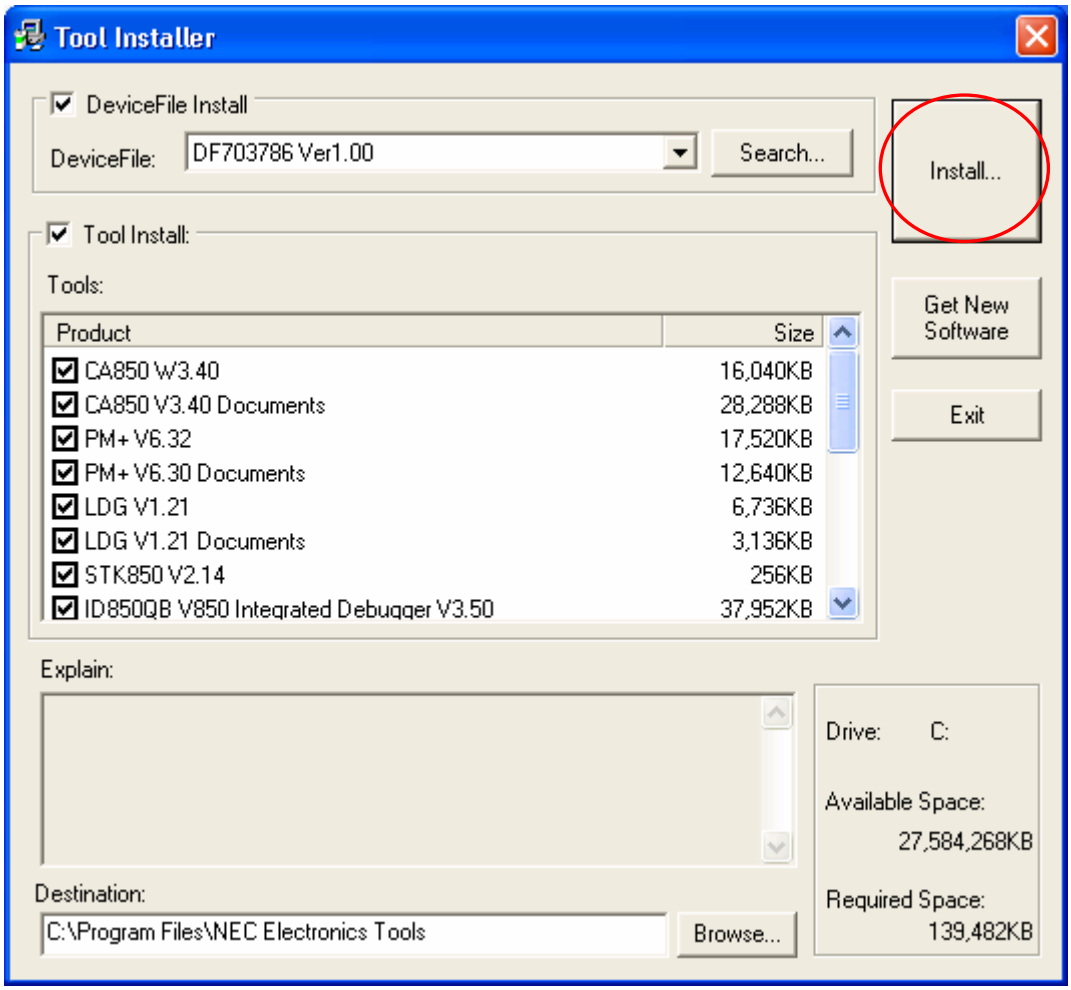
Select the device file and the tool to be installed using the check box.

By selecting Search…, a device file product can be selected by device name

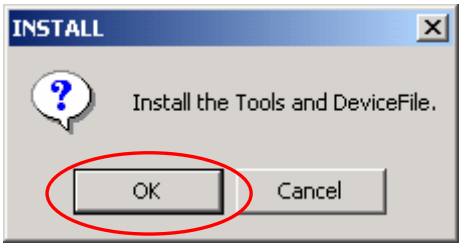
“Explain” displays an explanation of the selected device file or tool.

To change the installation destination, select Browse….

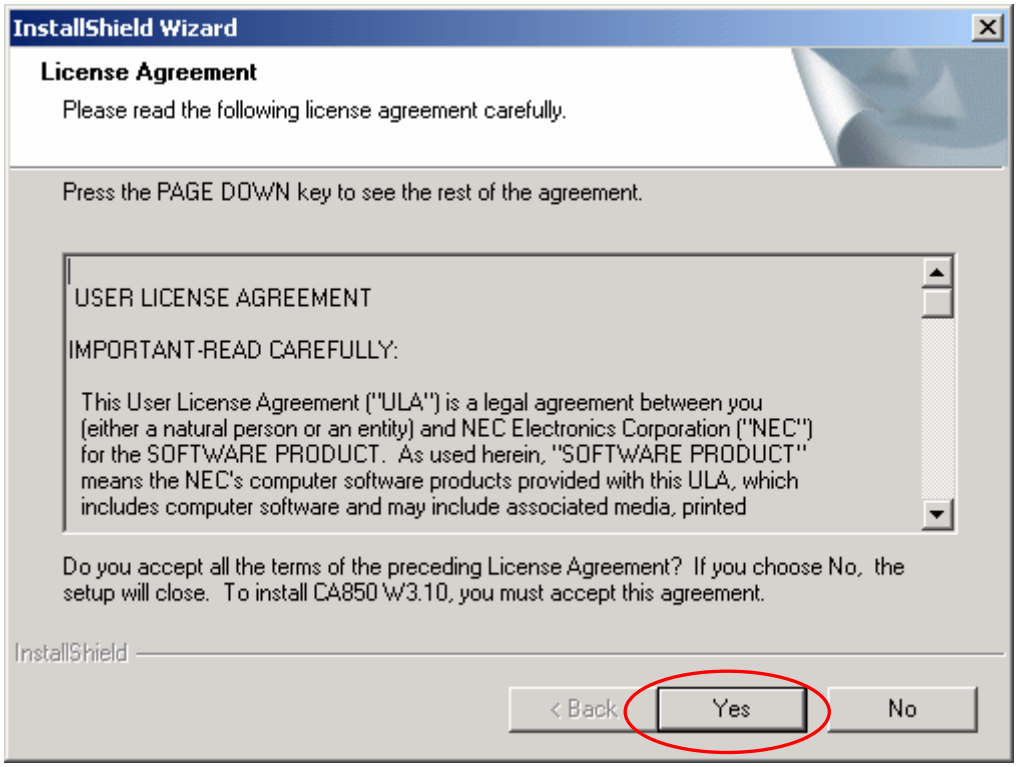
When all the settings are complete, select Install….



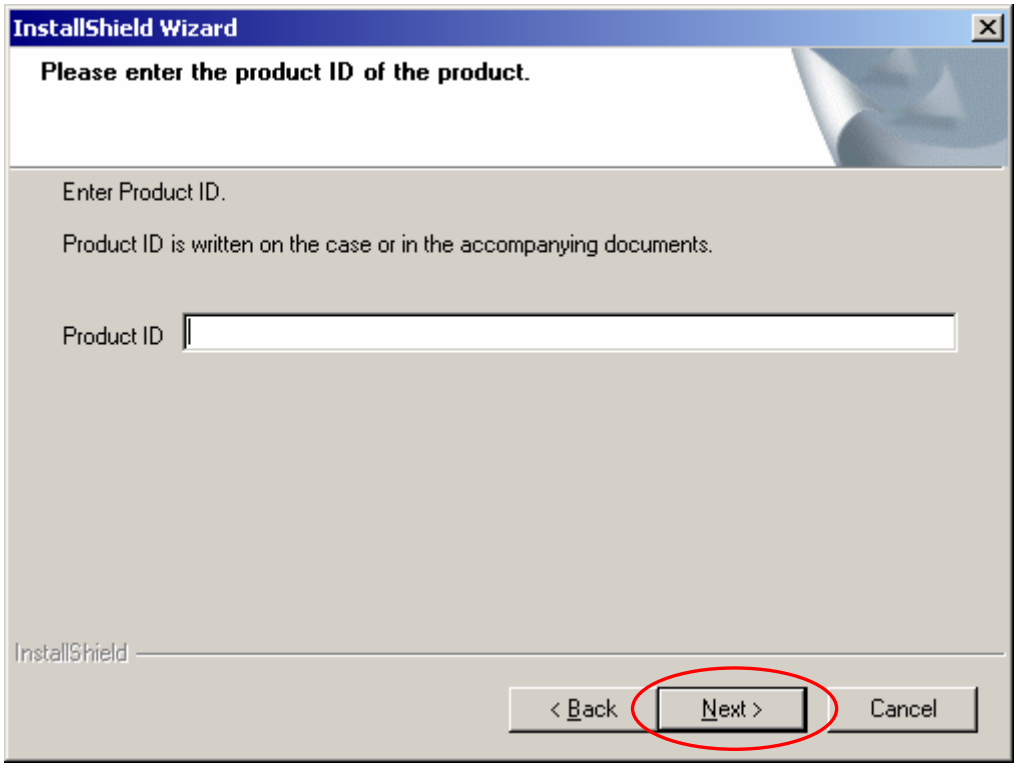
<2> To install each development tool, click OK when the install confirmation screen is displayed. To stop installation, click Cancel.



<3> To install each development tool, click Yes when the software license agreement screen is displayed. To stop installation, click No.



<4> Enter the product ID. The product ID is shown on the attached documents [README.HTML].



<5> Copying the files is started.

<6> If the setup have completed, a dialog box indicating completion of setup is displayed. Click the [OK] button. This completes installation of each development tool.

Notes on the installation

- Support OS: Windows XP and Windows 2000 (only English version)
- Administrator authority is required for this installation.
- Do not use 2-byte and /*:<>?|"¥;, characters for installation directory name and also do not select installation directory path that contains those characters.

Limitation

- C compiler CA850 W3.40 limit the object size to 128 Kbyte.

About ID850

ID850QB can set following break points.

Hardware Break	2 points
Software Break	4 points (Internal flash memory)

1.2.3. Structure of Installed Files

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].

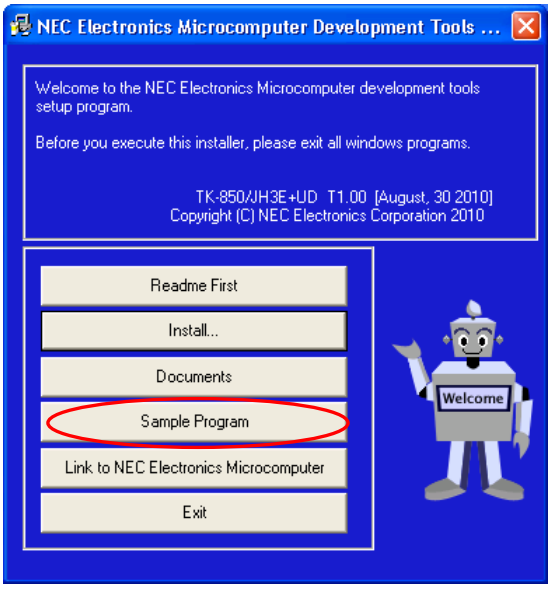
1.3 Sample Environment

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.

The installation method and the installation destination are cescribed below.

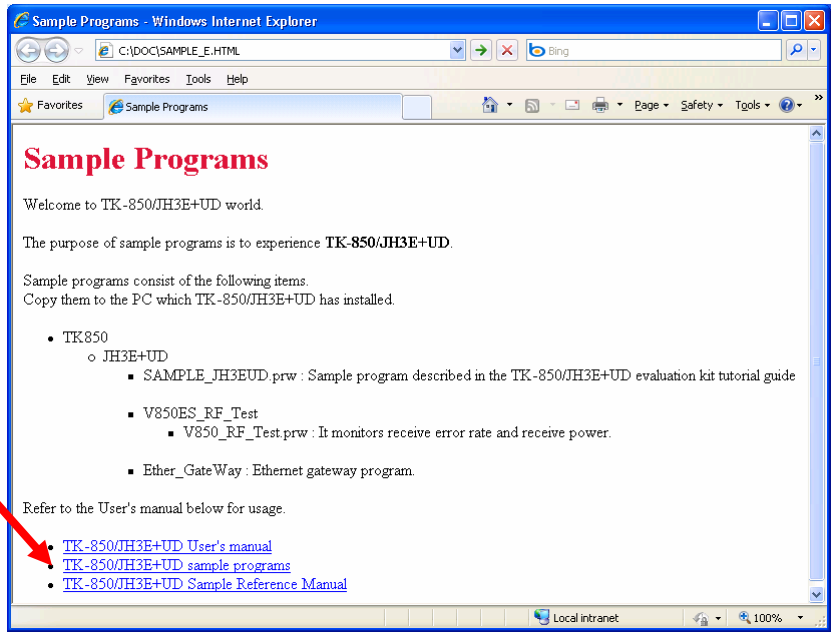
1.3.1. Installing the sample program

Insert the TK-850/JH3E+UD CD-ROM in your PC. The [NEC Electronics Microprocessor Development Tools Setup] screen will automatically show up. (if this screen does not show up automatically, please start setup.exe from Explorer.)
Press the Sample Program button to start the Internet Explorer, and then click the [Sample Program] link.

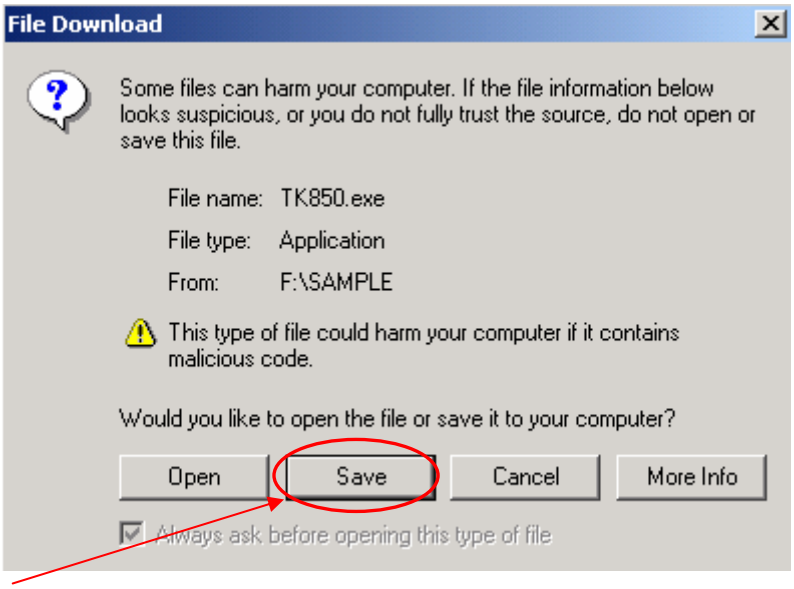


Internet Explorer will show up

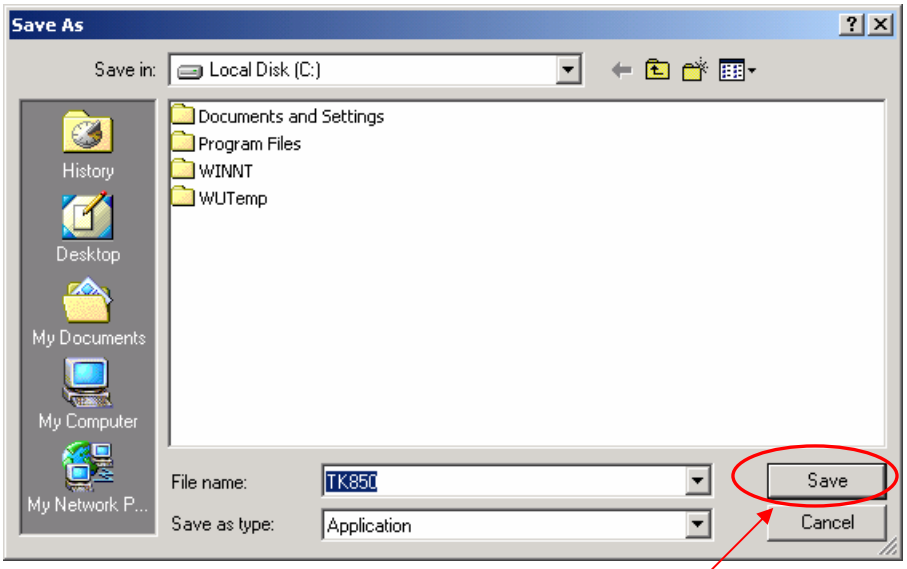
Click the [TK-850/JH3E+UD Sample Program] link.
The lower line is the link to download this tutorial.



① Click the “TK-850/JH3E+UD Sample Programs” link , the following download confimation window appears.



② Click the Save butten.

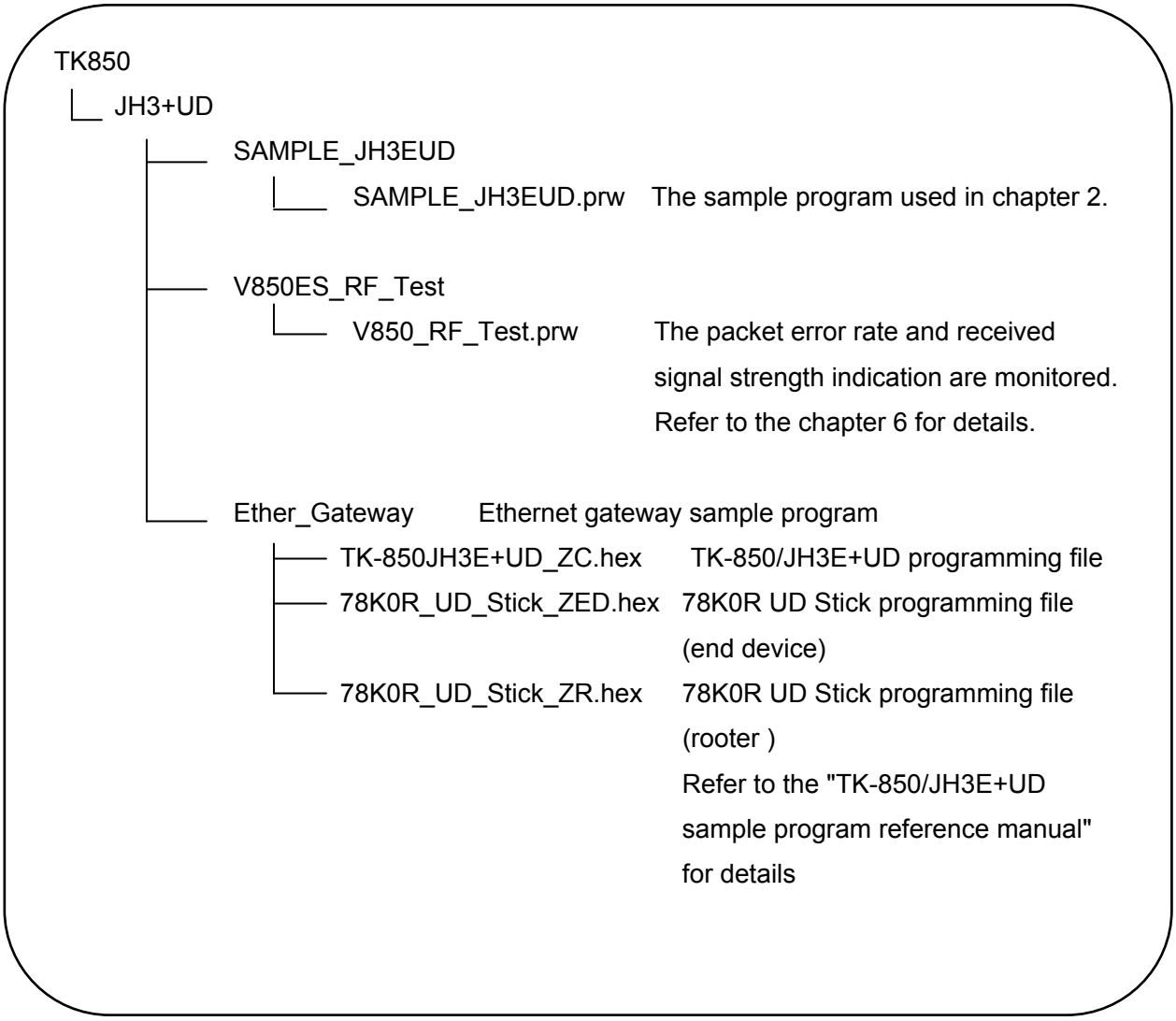


③ After specifying the download destination folder, click the Save button.

④ The self-extraction sample program (TK850.exe) is copied to the specified folder.
The folder that the “TK850” folder is made when this file is executed, and the sample program is stored under the”TK850” folder.

1.3.2. File Configuration of the sample program

The sample programs ware the following folders.



1.4 USB Driver

"NEC Electronics Starter Kit Virtual UART" USB driver must be installed on PC before you start using the TK-850/JH3E+UD.
Please, follow the instruction below to install the driver.
"Starter Kit USB Driver" must be installed on the PC. If not, please refer to "1.2Installation of Software Development Tools" to install the driver first.

CAUTION:

Do not use a USB hub for connecting TK-850

First, connect the TK-850 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

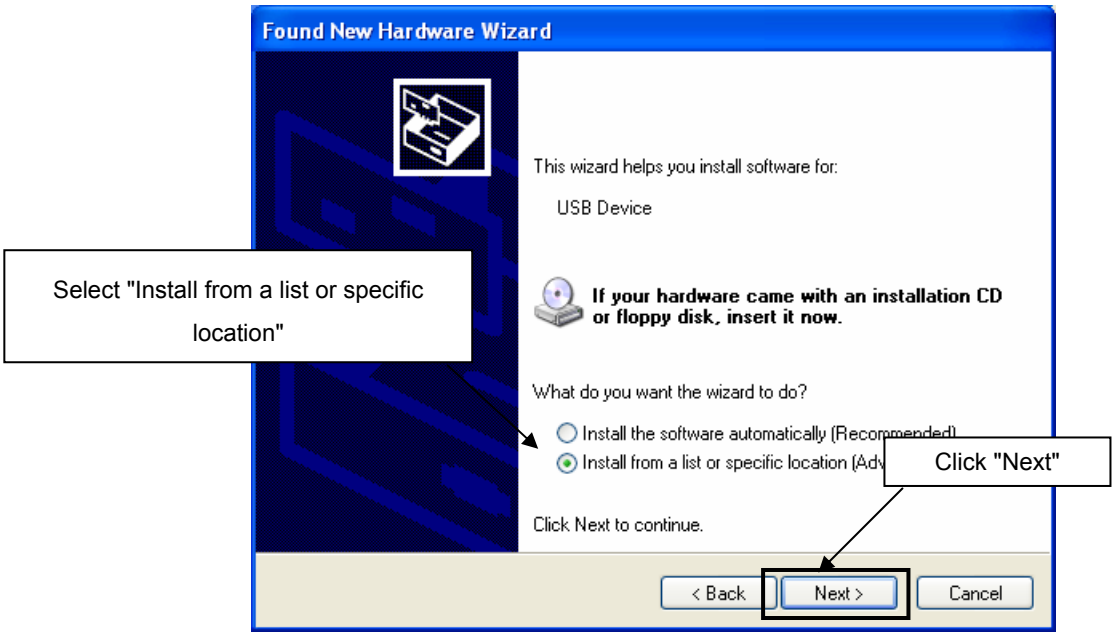
- Windows XP -> "1.4.1 Installation on Windows XP"
- Windows 2000 -> "1.4.2 Installation on Windows 2000"

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

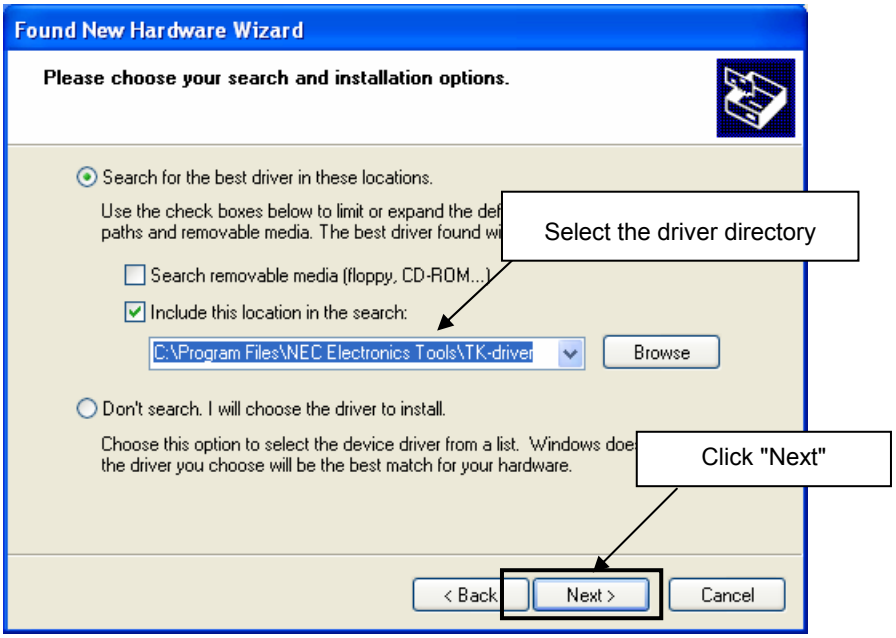
1.4.1. Installation on Windows XP

1. Once the TK-850/JH3E+UD is connected with USB, the "Found New Hardware Wizard" will be started. Select "No, not this time" and click Next > .

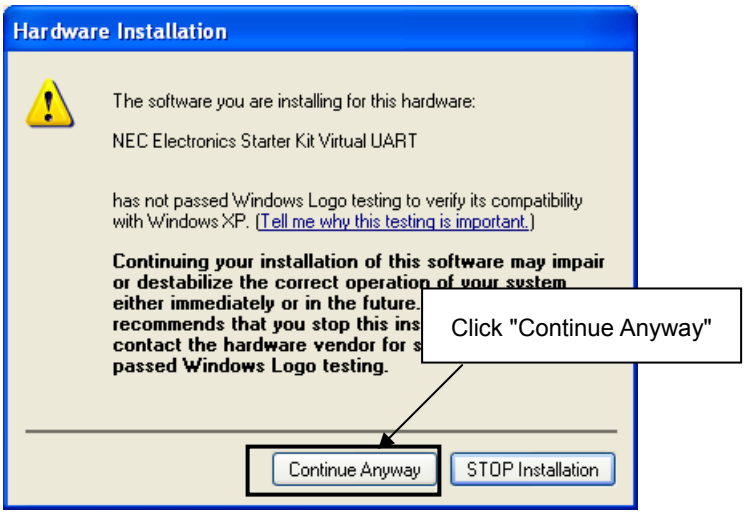
2. Select "Install from a list or specific location" and click Next > .



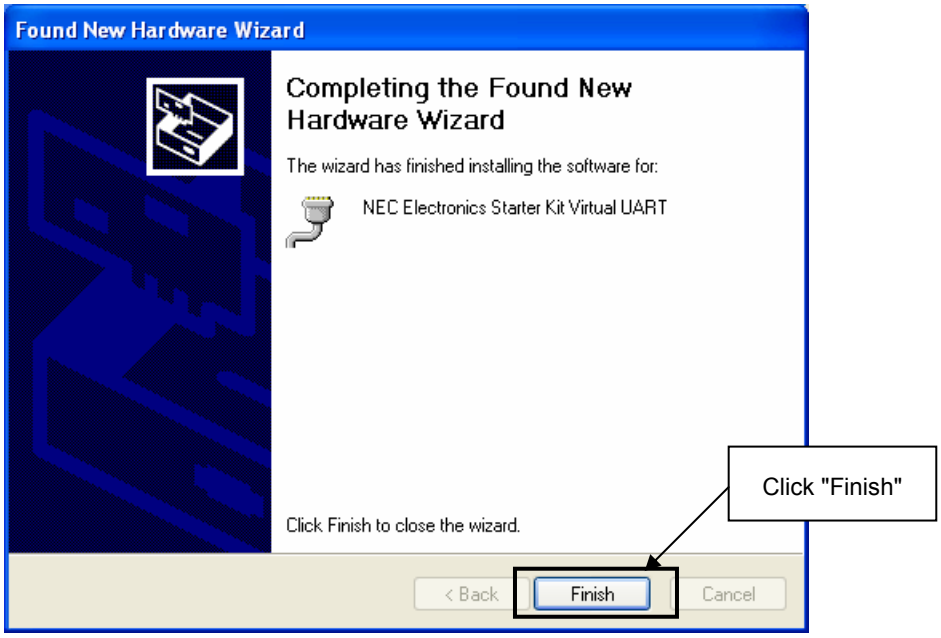
3. Select "Search for the best driver in these locations.", check "Include this location in the search:", and then click "Browse..." to select the driver directory path. The path should be "C:¥Program Files¥NEC Electronics Tools¥TK-driver" as default installation. If the installation directory is not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



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



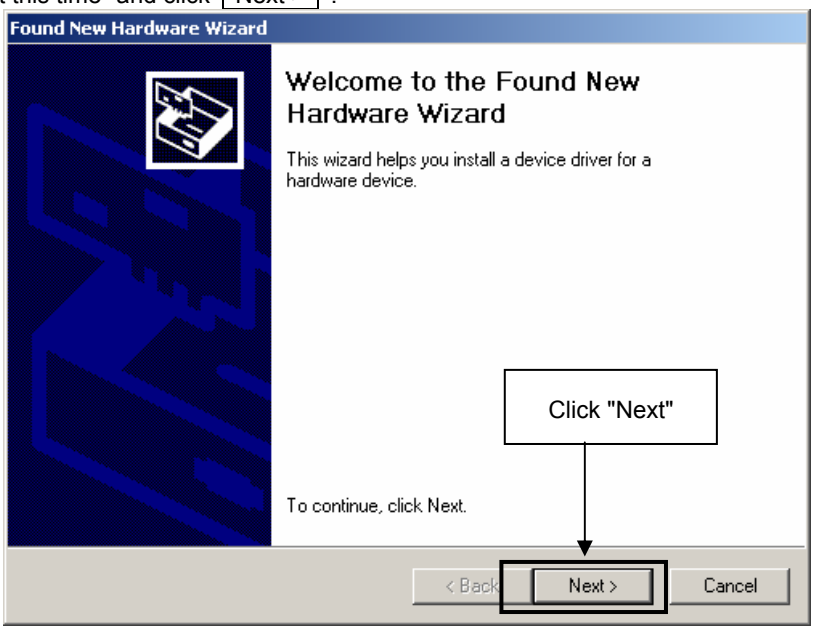
5. The installation of "NEC Electronics Starter Kit Virtual UART" driver is completed.
Click Finish .



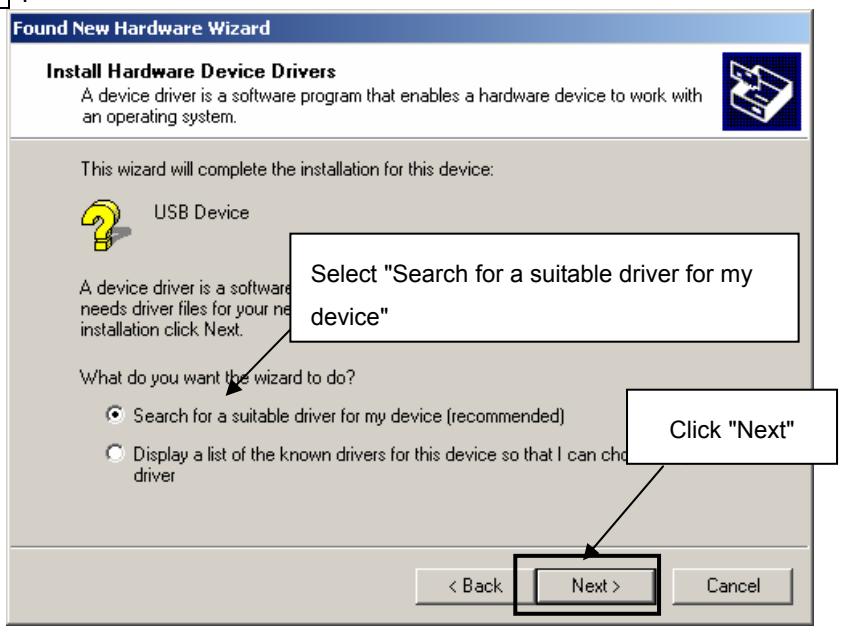
6. Go to "1.4.3 Completion of USB Driver Installation".

1.4.2. Installation on Windows 2000

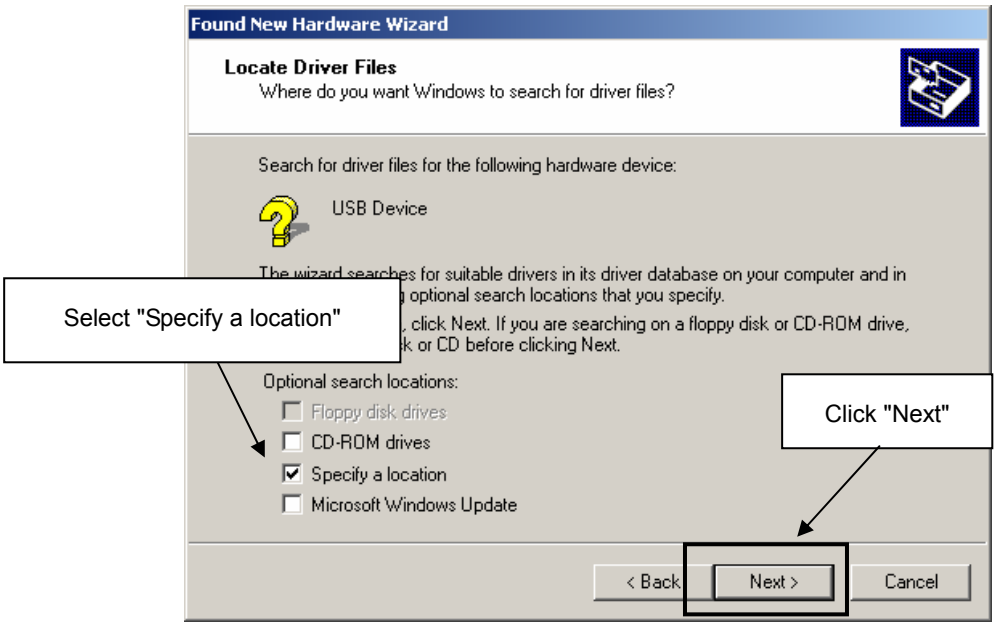
1. Once the TK-850/JH3E+UD is connected with USB, the "Found New Hardware Wizard" will be started. Select "No, not this time" and click Next > .



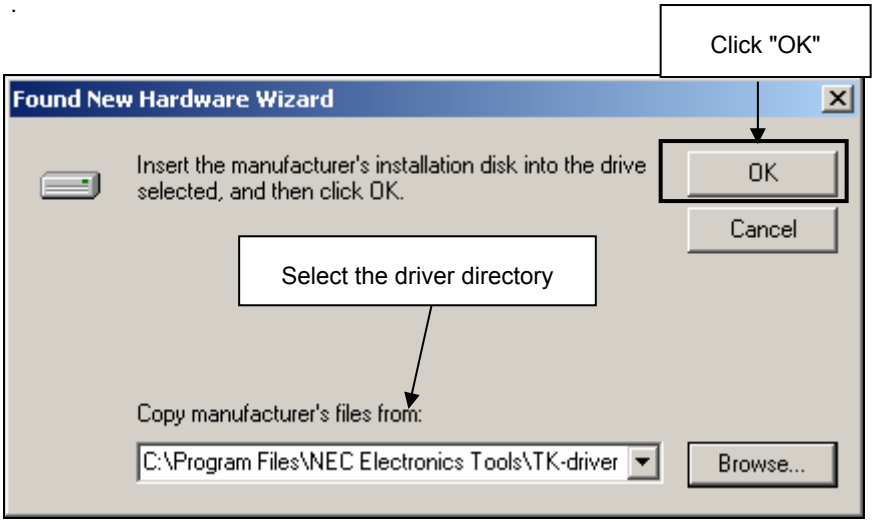
2. Select "Search for a suitable driver for my device".
Click Next > .



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] .

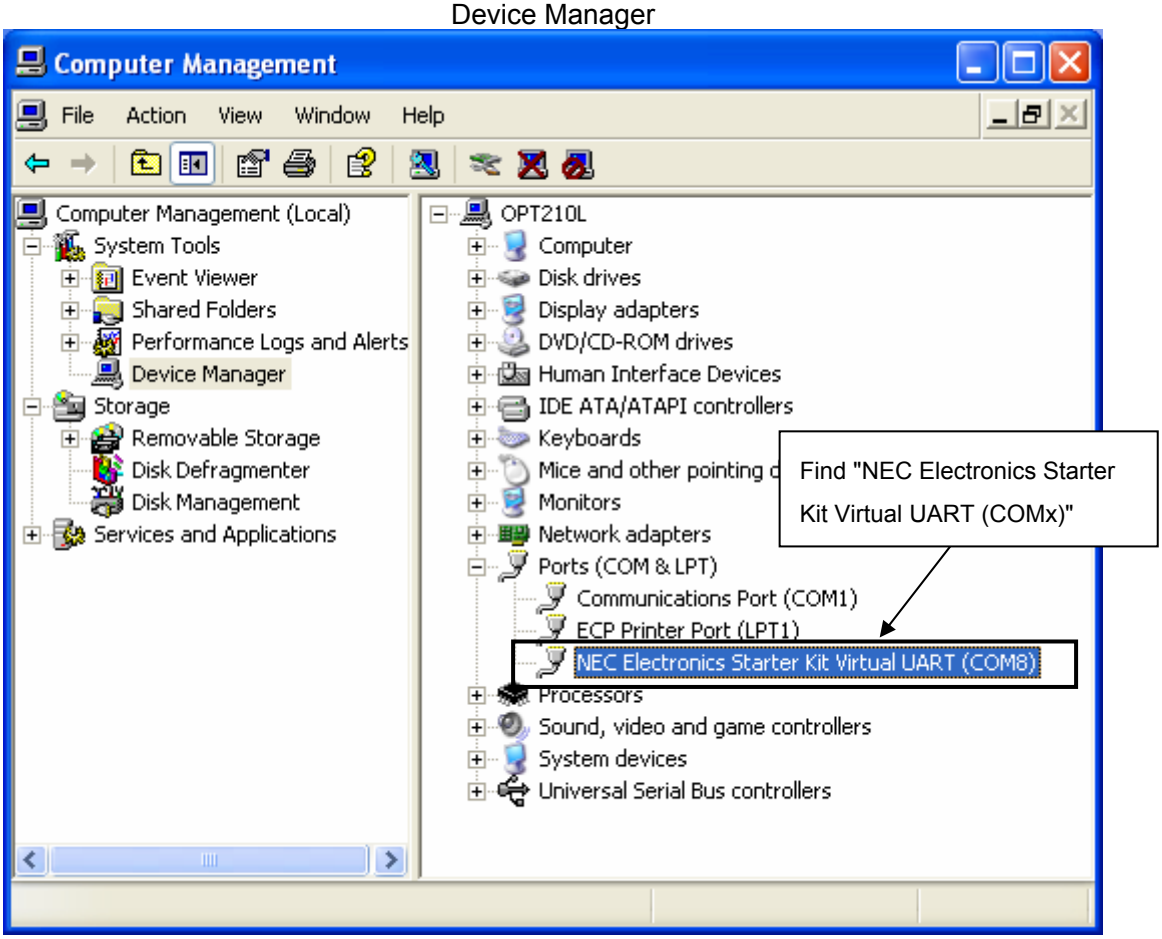
7. Go to "1.4.3 Completion of USB Driver Installation".

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 ID850QB is not in use, you can use this port number for connecting TK-850/JH3E+UD.
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.

Chapter2 **Experiences**

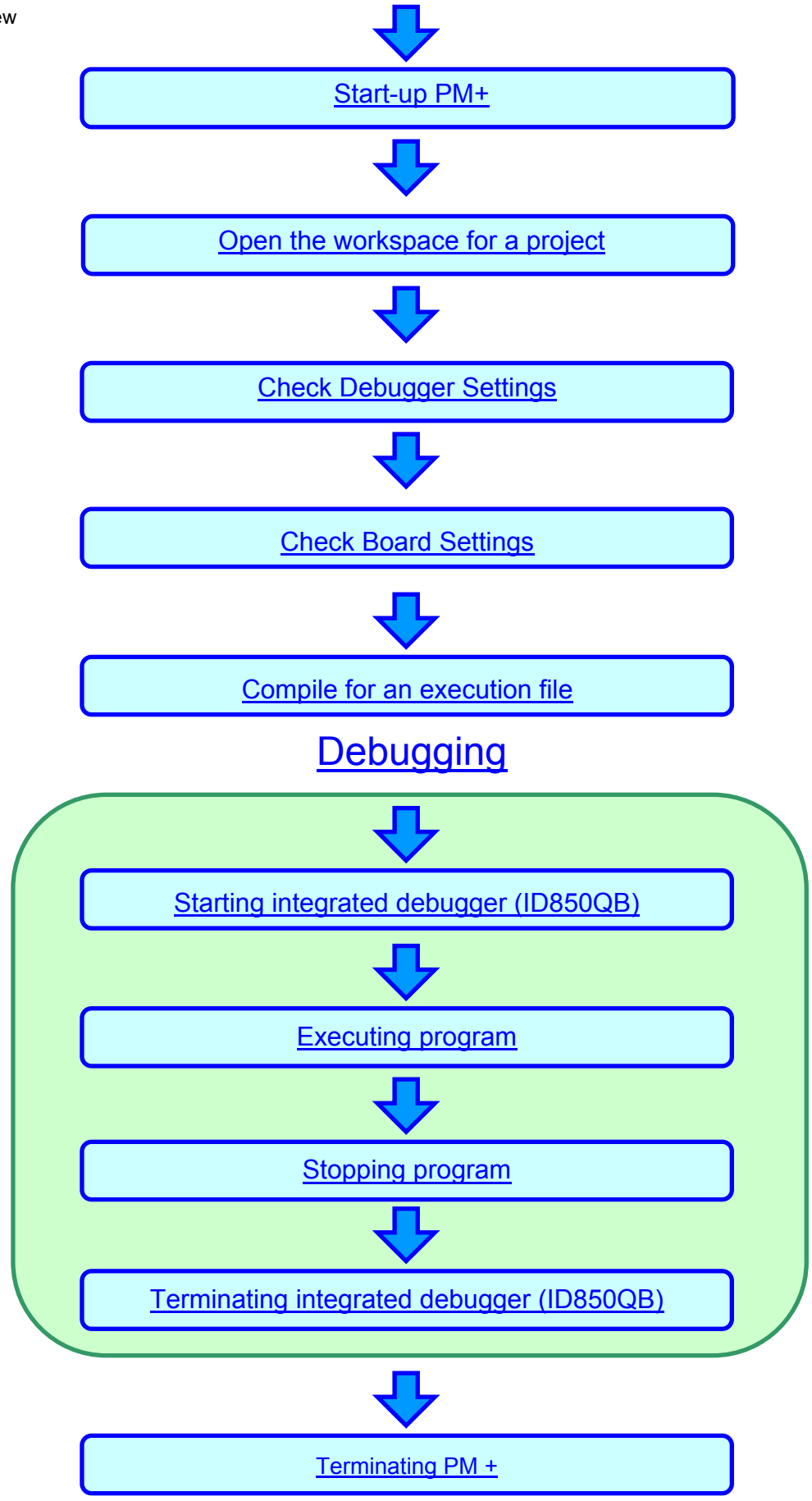
In this chapter, you will experience how to use the development tools with using the sample programs. The development tools are :

- Integrated Development Environment, PM+
- Integrated Debugger, ID850QB

You will use the programs that you prepared in "1.3Sample Environment", as the sample programs for TK-850/JH3E+UD

You will be able to understand how to use the development tools and the concept of project files which you need for producing application programs.

Overview

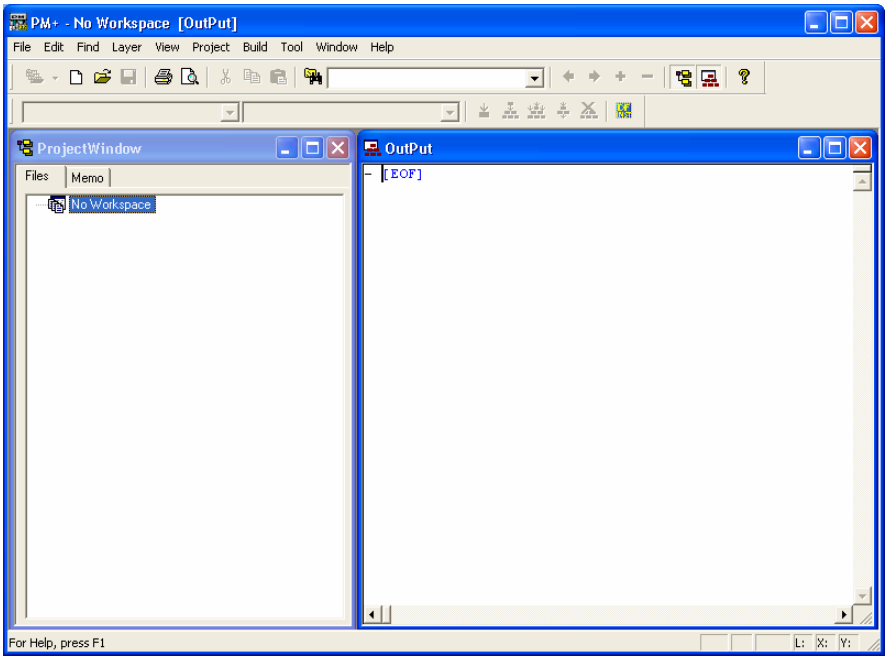

Start-up PM+
Open the workspace for a project
Check Debugger Settings
Check Board Settings
Compile for an execution file
Debugging
Starting integrated debugger (ID850QB)
Executing program
Stopping program
Terminating integrated debugger (ID850QB)
Terminating PM +

2.1 Starting up PM+

Now you start to experience development tools.

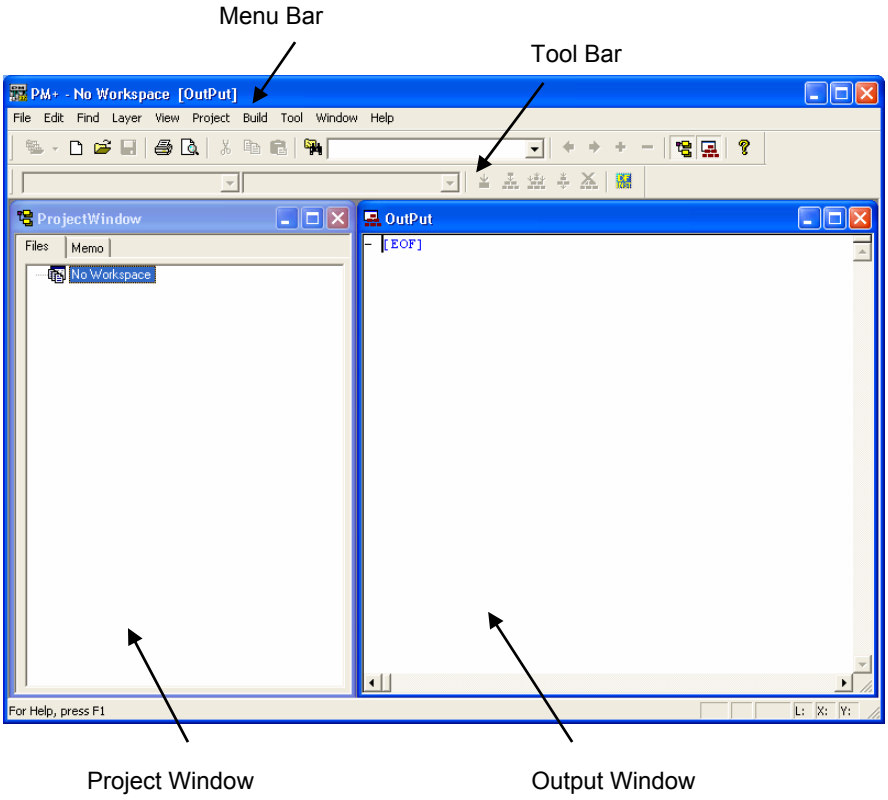
To start up PM+, please select [Programs] -> [NEC Electronics Tools] -> [PM+ V6.32] in the Windows start menu.

PM+ Strats up



2.2 How PM+ looks like

In PM+, a project is defined. A project comprises of (an) application program(s) and environment. In a project, editing, building, and debugging of source codes are managed by PM+. PM+ also defines a work space. A work space comprises of one or more projects, and managed by PM+.



Project Window: A window where the project names, source files, and include files are displayed in a tree structure

Output Window: A window where build execution status is displayed

For details of the menu bar and the tool bar, please 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 “ΔΔΔΔ.prj”.

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.

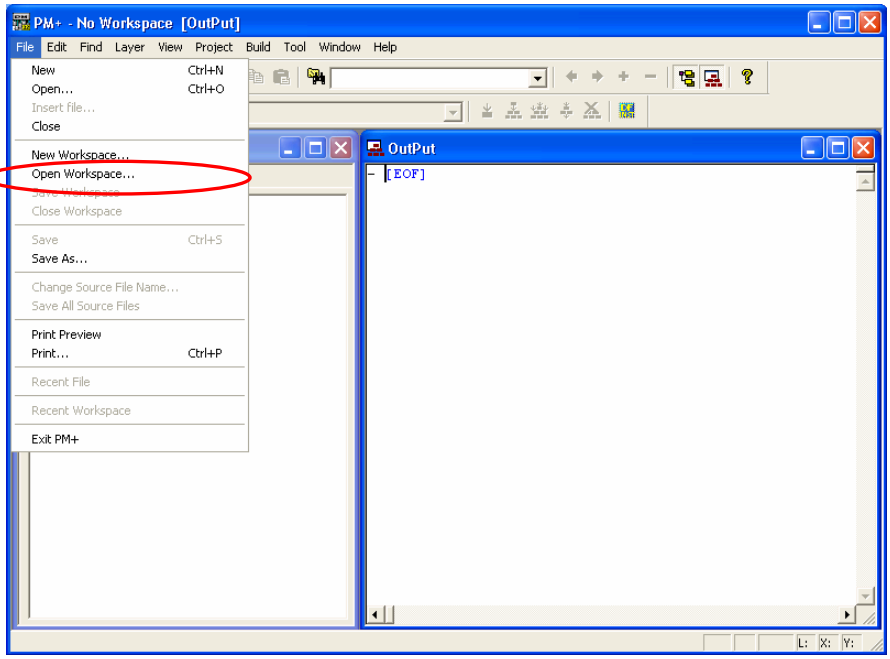
The file name of multiple project files is saved to a workspace file for referencing.

The file name format is “ΔΔΔΔ.prw”.

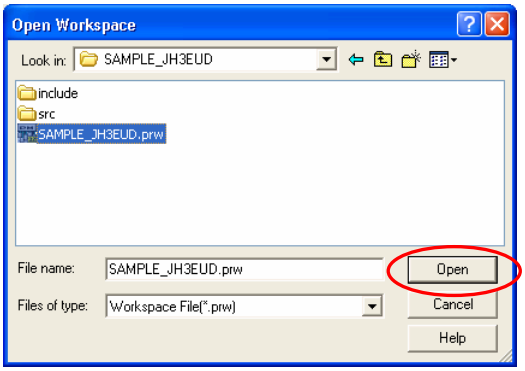
2.3 Open a workspace (projects)

In this section, you will use the workspace that you created in "1.3Sample Environment"
For creating a new workspace, refer to "Chapter 5 Other Information".
The workspace has information about the build environment for the sample programs.

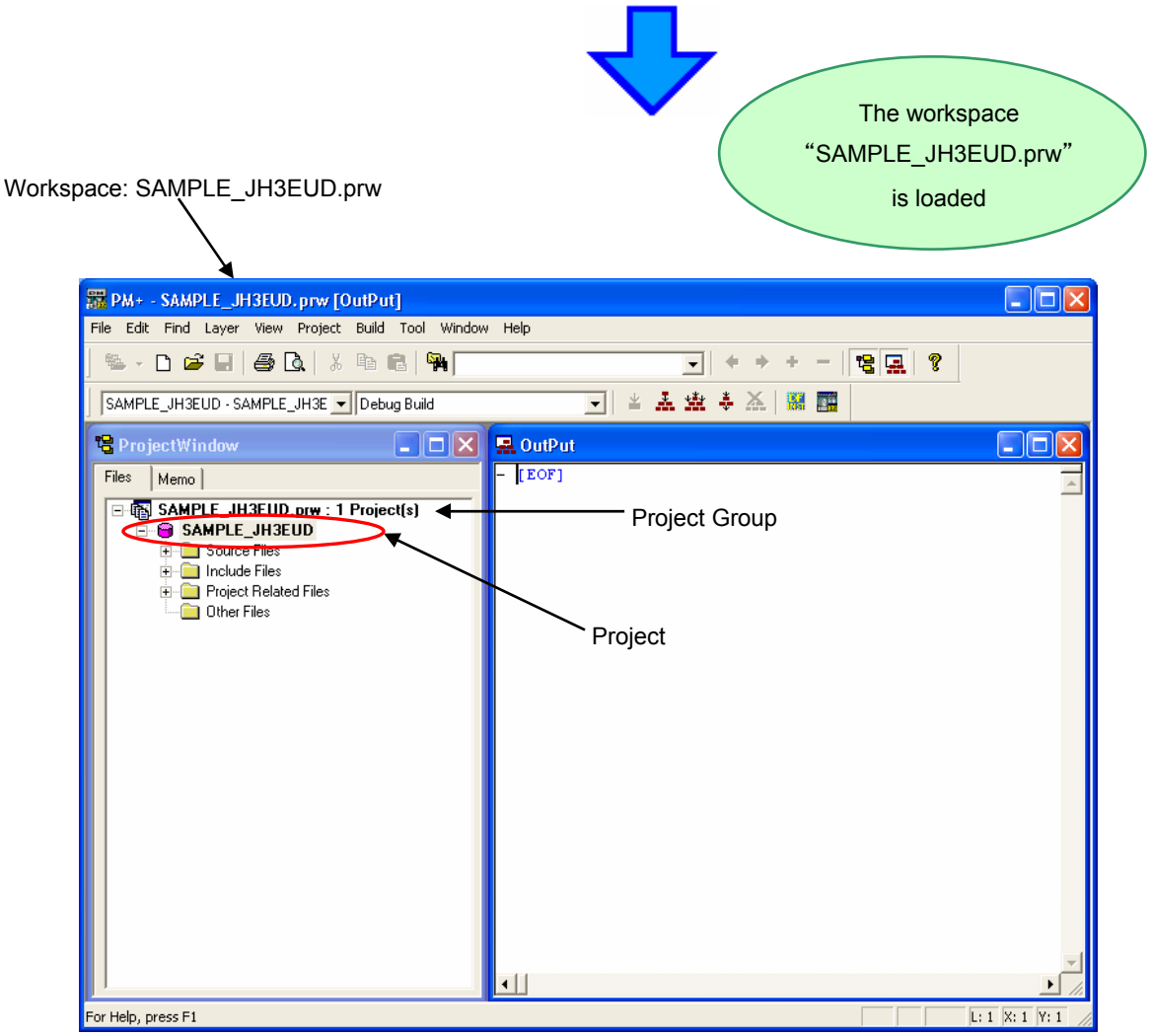
Select "File" on menu bar and "Open Workspace…".
Then, select "SAMPLE_JH3EUD.prw" under the directory
"C:¥TK850¥JH3E+UD¥SAMPLE_JH3EUD".



Please open the directory you installed the sample program



If you select the ”SAMPLE_JH3EUD.prw” file, please open it by the OPEN button.

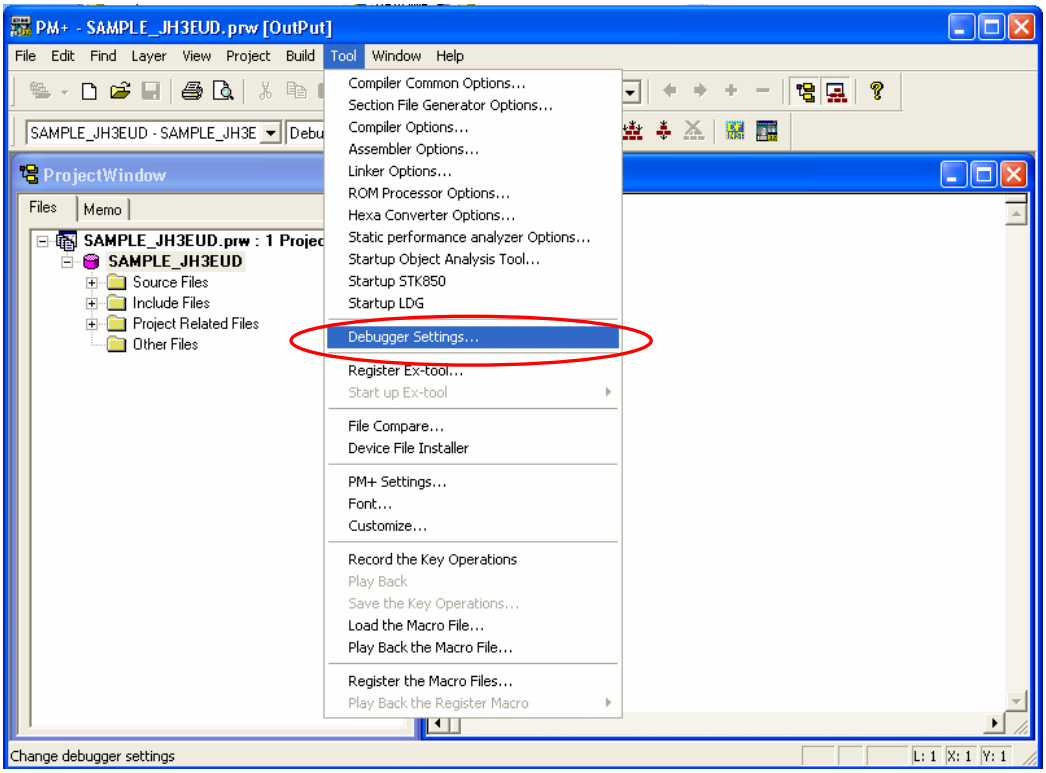


The workspace file "SAMPLE_JH3EUD.prw" contains one project called "SAMPLE_JH3EUD". You will use this project "SAMPLE_JH3EUD".

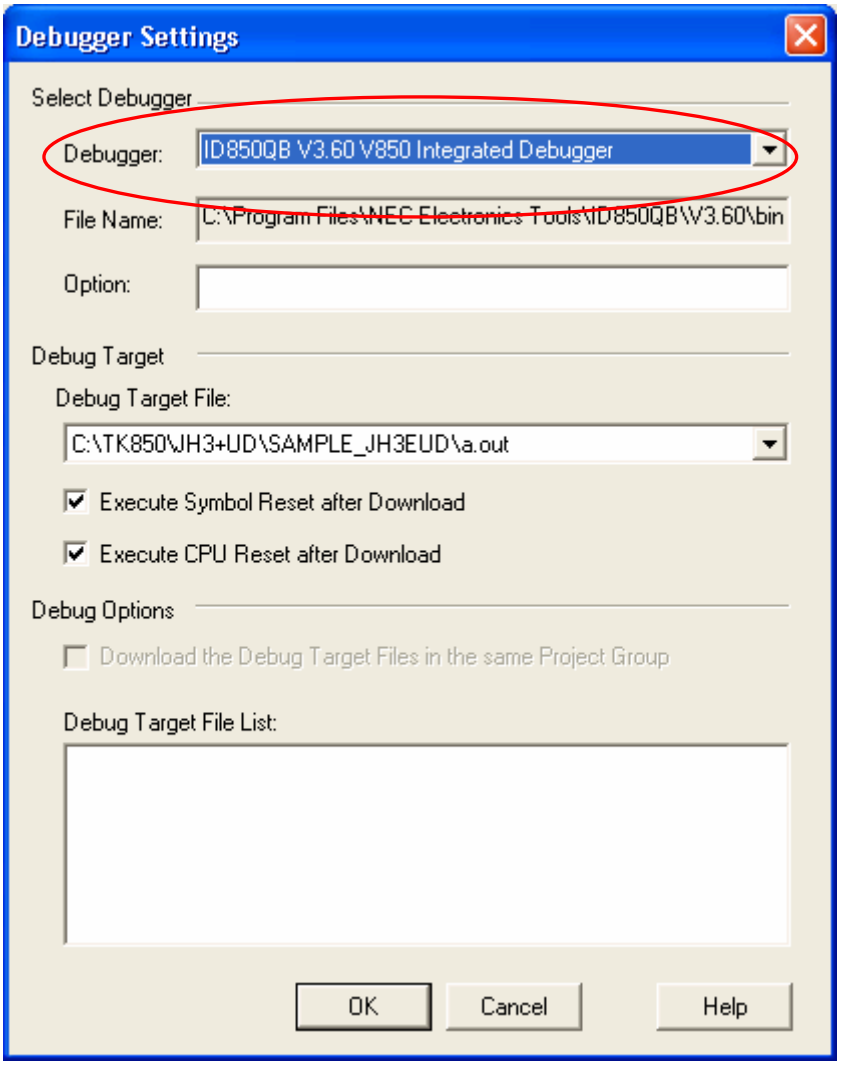
2.4 Check Debugger Settings

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 "ID850QB V3.60" is selected on "Debugger".



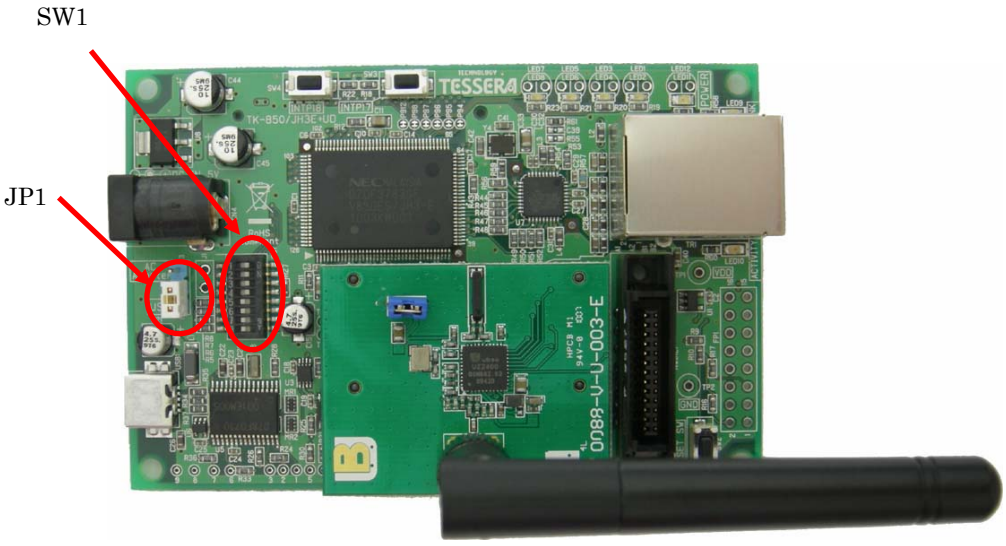
If you cannot select "ID850QB V3.60", select "Project" on menu bar, "Project settings" -> "Tool version settings" -> "Detail settings" -> then select "ID850QB V3.60".

2.5 Check Board Settings

Before connecting the PC and the TK-850/JH3E+UD with USB, you should check the setting of swiches on the board.

Set the switches of the TK-850/JH3E+UD as follows.

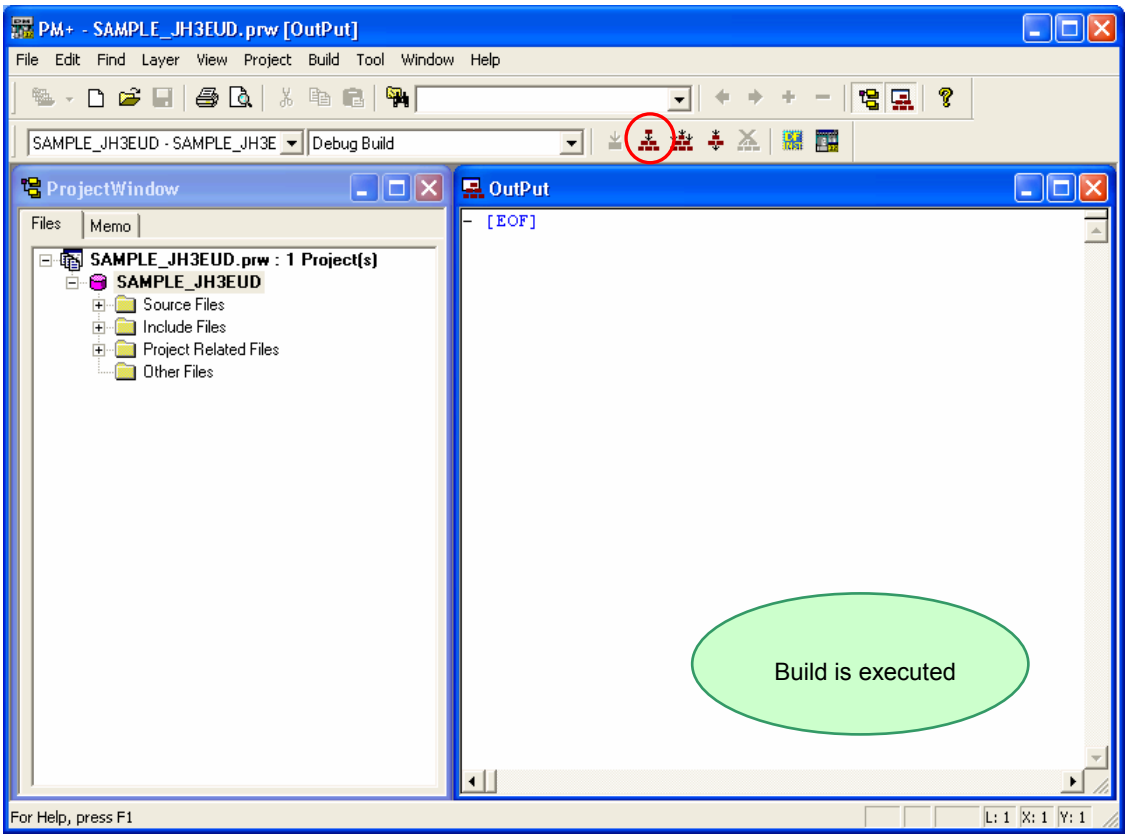
JP1		1-2 short (USB side)
SW1	Bit1	OFF
	Bit2	ON
	Bit3	ON
	Bit4	ON
	Bit5	OFF
	Bit6	OFF
	Bit7	OFF
	Bit8	OFF

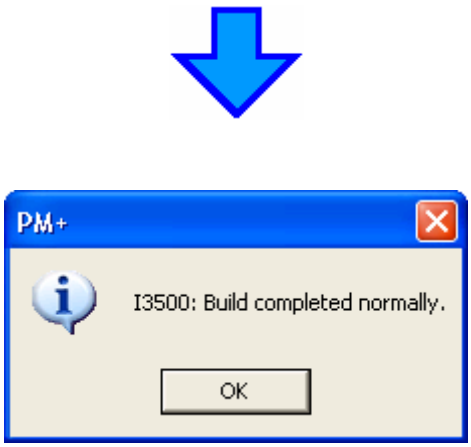


2.6 Compile for an execution file

You now create the execution file of the project. This task is called Build.

Please select the build button , or from the menu [Build], please select [Build].





Build is completed.

What is build ?

Build is a function that creates an execution file, etc., from a source file registered to the project.
PM+ automatically performs compiling, linking, and other processes.
On the second and subsequent builds, PM+ automatically detects files that have been updated from the previous build process, and complies and assembles only the modified files, thereby saving the time required for build.

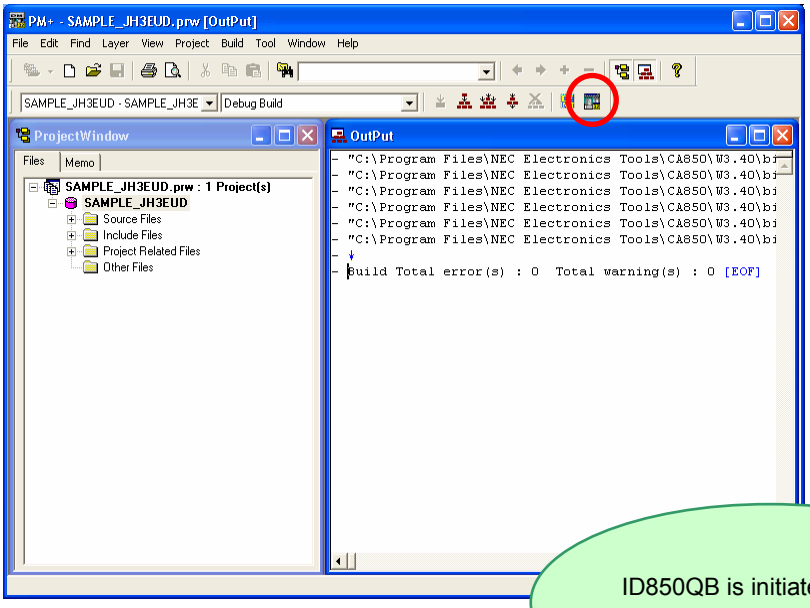
What is rebuild ?

Build compiles and assembles only the source files that have been modified since the previous build, whereas rebuild compiles and assembles all of the source files.
If you have modified compiler options or other settings, you have to execute rebuild.

2.7 Start Debugger

In the PM+ window, please select the debug button  , or please select [Build] -> [Debug] in the menu.

If you do not see the debug button, please select [Tools] -> [Debuggers] in the menu of the PM+, then, choose “ID850QB V3.60 Integrated Debugger”.

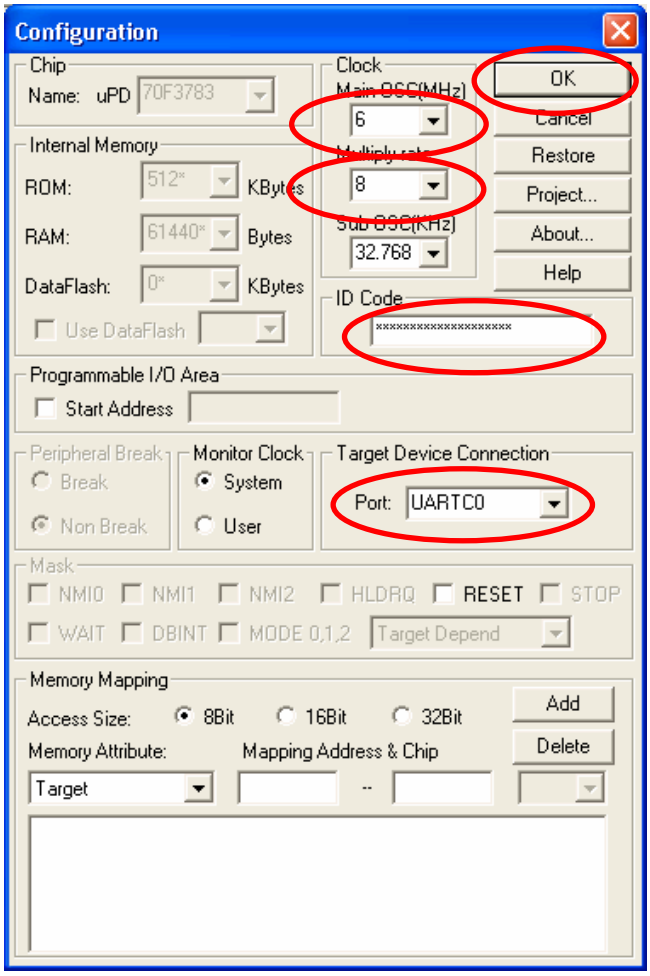


ID850QB is initiated, and the Configuration window will show up

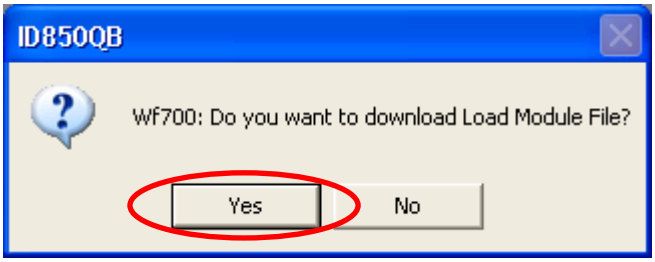
"Configuration" dialog is opened. Follow the settings below and click "OK".

- Enter "6" in "Main OSC"
- Enter "8" in "Multiply rate"
- Enter "FFFFFFFFFFFFFFFFFFFF" (F x 20) in "ID Code".
- Select "UARTC0" in "Port" at "Target Device Connection" area

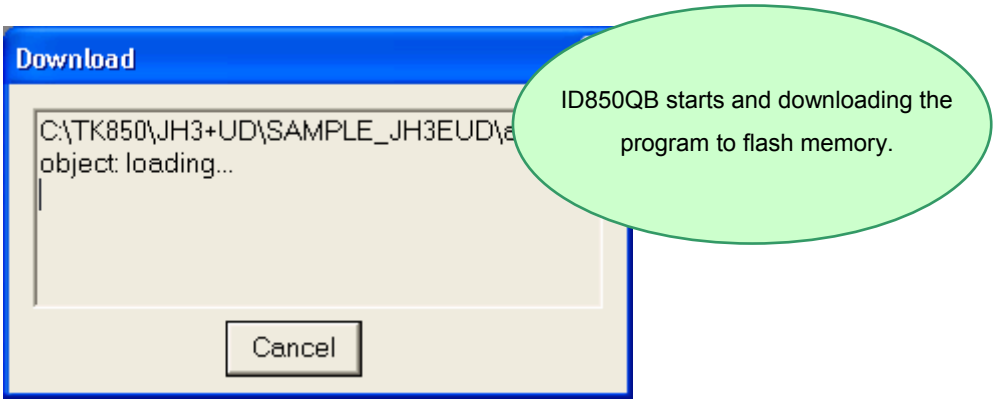
then click OK .

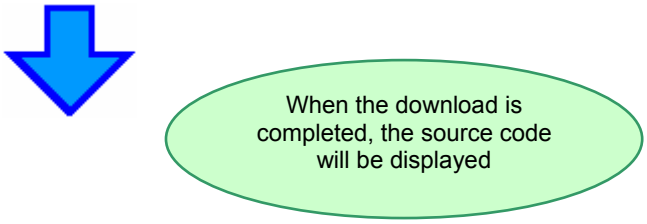


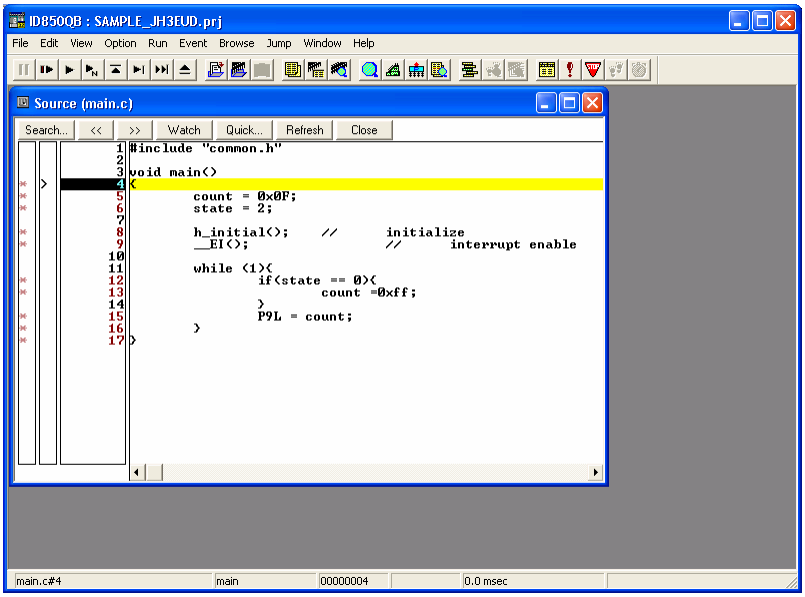
Click Yes when the confirmation dialog for downloading load module file is opened.



Please click YES to download the load module file.







NOTE:

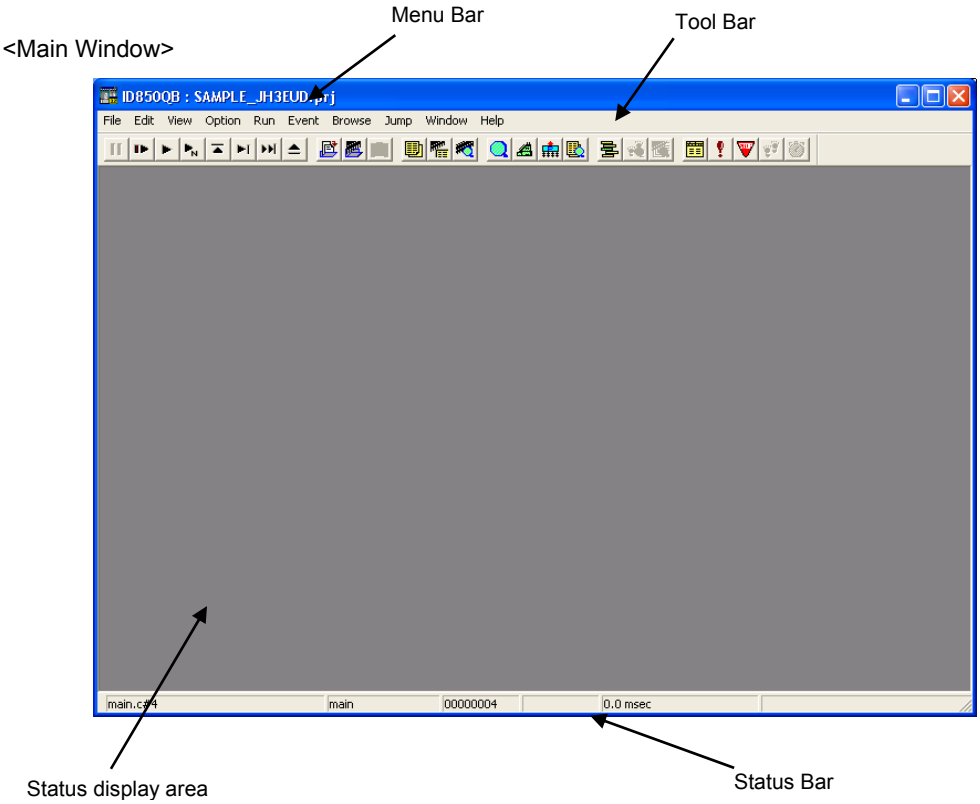
Completion of the download does not mean running the programs. Therefore, even though you press switch on the board, it does not make anything happened. To run the sample program demonstration, see "2.9Execute the program".

2.8 Integrated DebuggerID850QB

Integrated DebuggerID850QB displays the status information in the CPU. It also controls the monitor program.

The default opening window of ID850QB looks like as follows,

<Main Window>

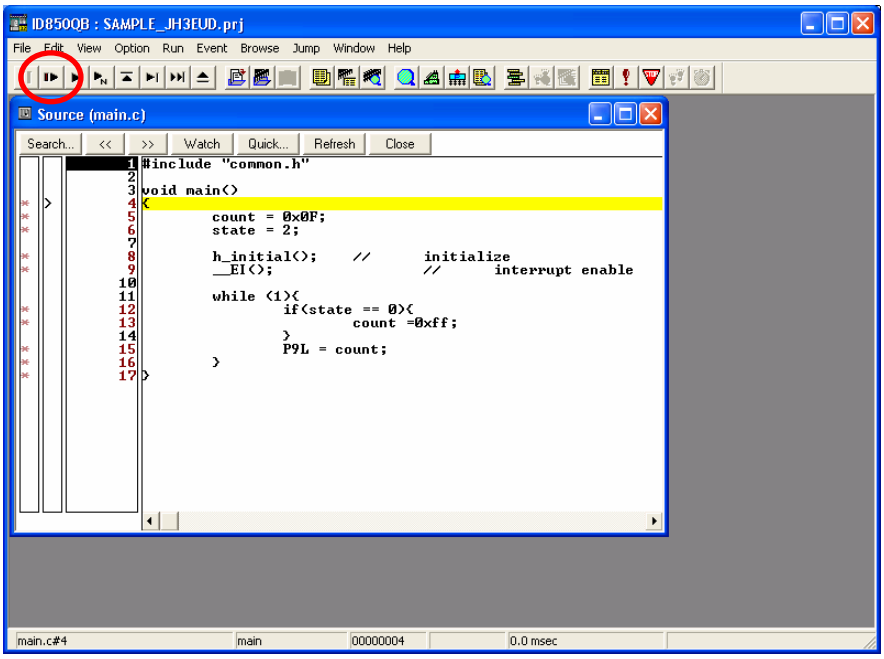


For more detail, please refer to the user's manual of ID850QB Operation.

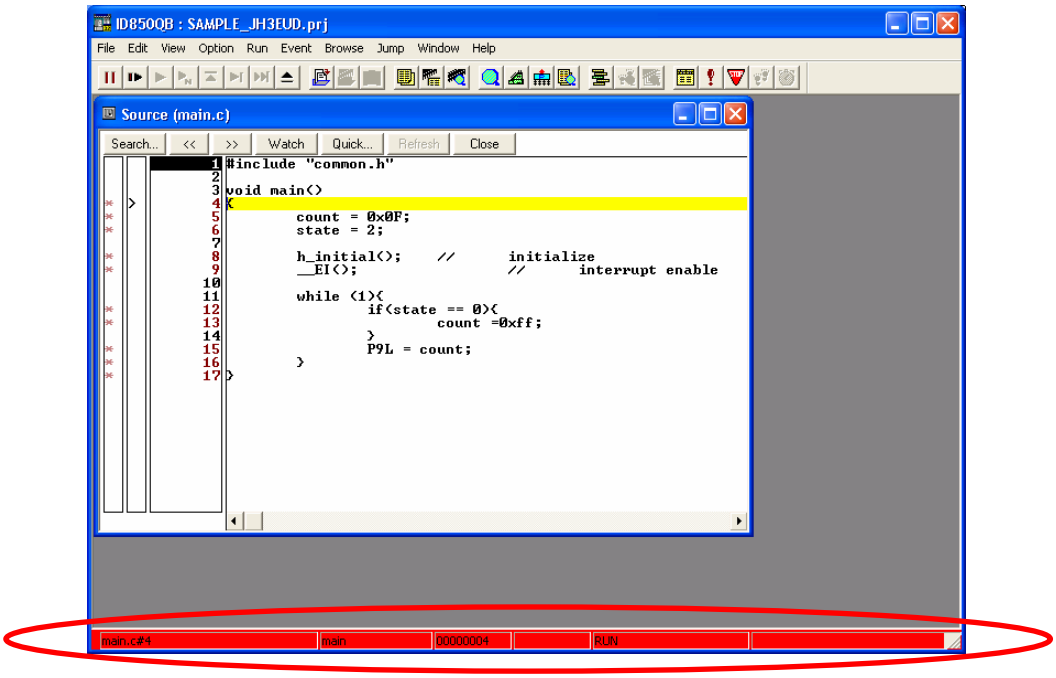
2.9 Execute the program

You now execute the program in the debugger.

In the ID850QB window, please press the re-start button , or please select [Run]→[Restart] in the menu bar.

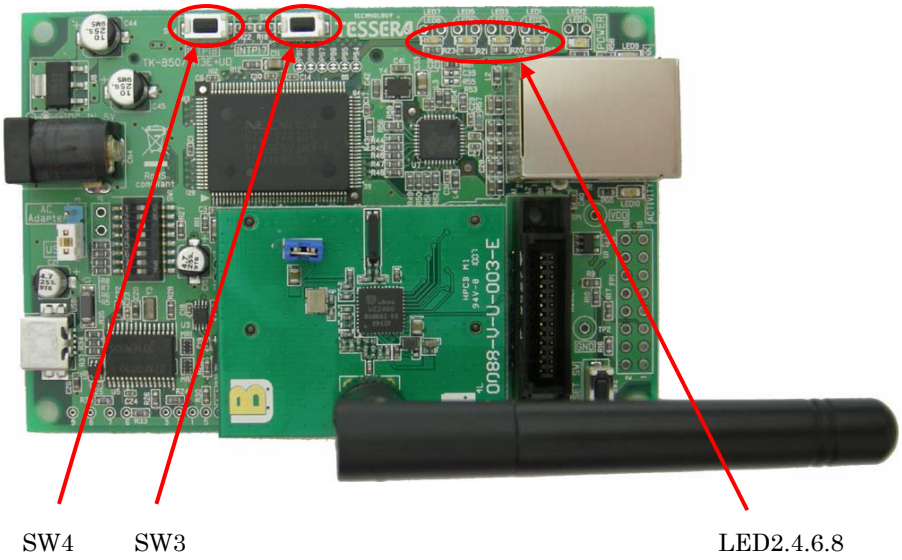


Run the sample program



While the program is being executed, the status bar is red.

The LED2,4,6,8 will be turns on.
The LED starts count up, when SW3 is pushed.
LED count up is stopped, when SW3 is pushed again.
The LED will be turned off, when SW4 is pushed.



You could confirm the sample program is working.

- The programs downloaded by ID850QB cannot use without ID850QB connection.

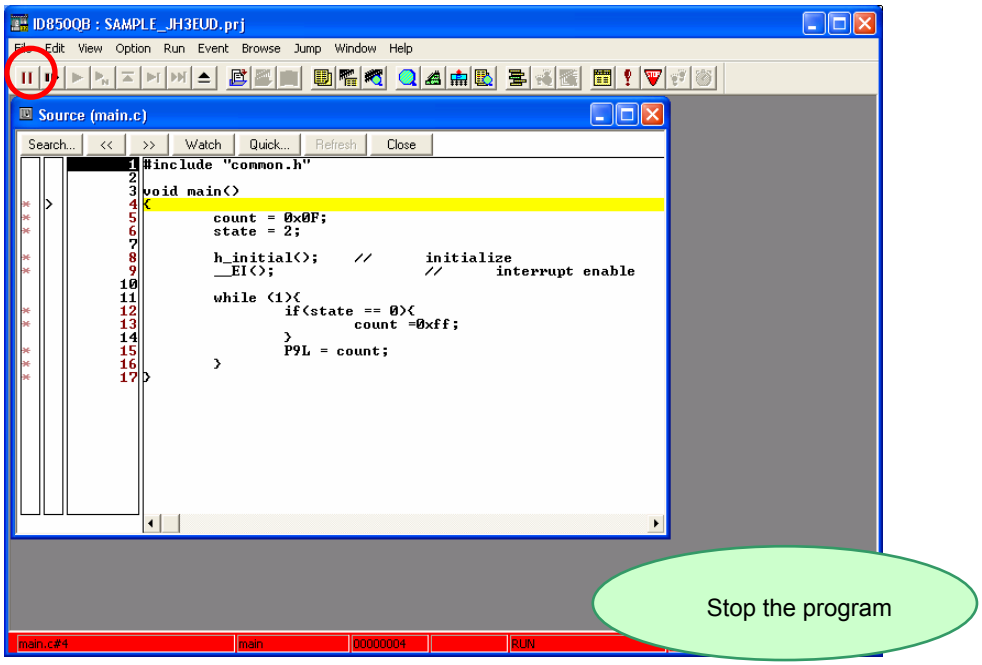
  For stand-alone operation, write the HEX file by WriteEZ5.

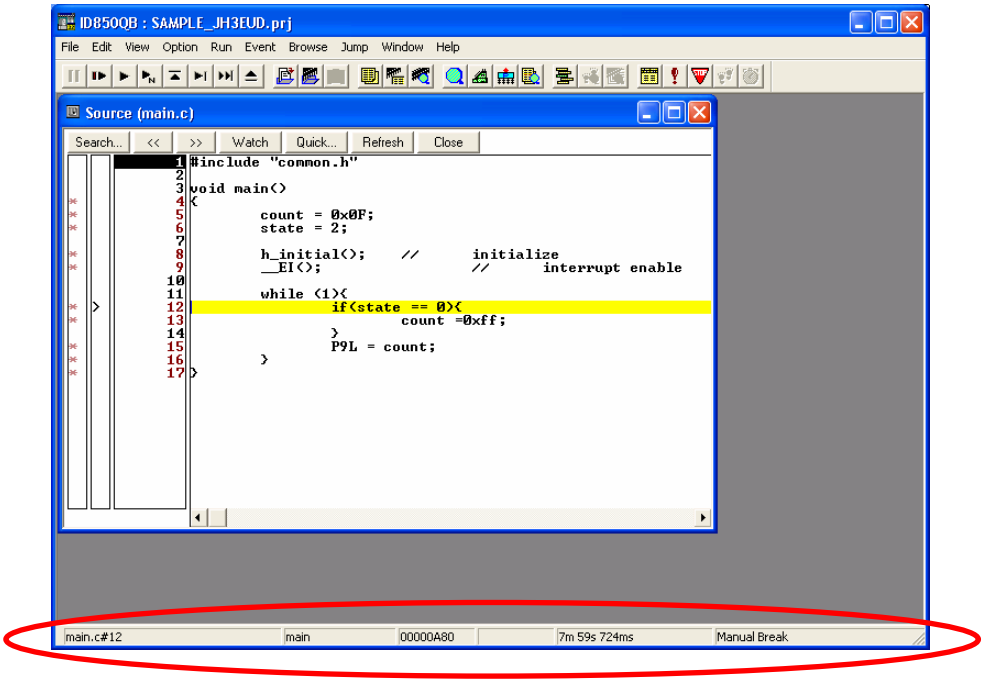
  For more information about the WriteEZ5, refer to "5.4 WriteEZ5" document.

2.10 Stop Programs

Now, you are going to stop the program.

Click the stop button , or select "Run" on menu bar, then "Stop".

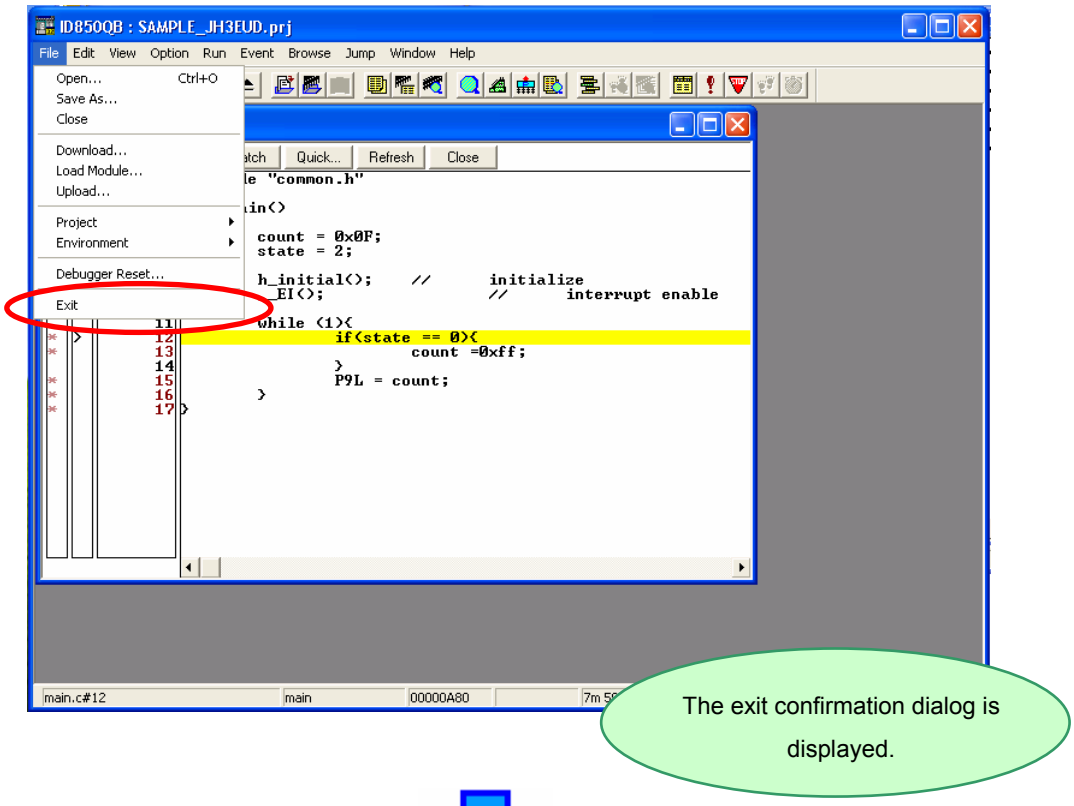


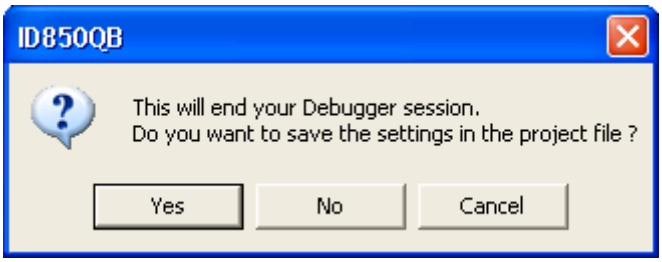


When the program stops, the status bar changes back to the original color.

2.11 Terminate PM+

To terminate PM+, please select [File] -> [Exit PM+].

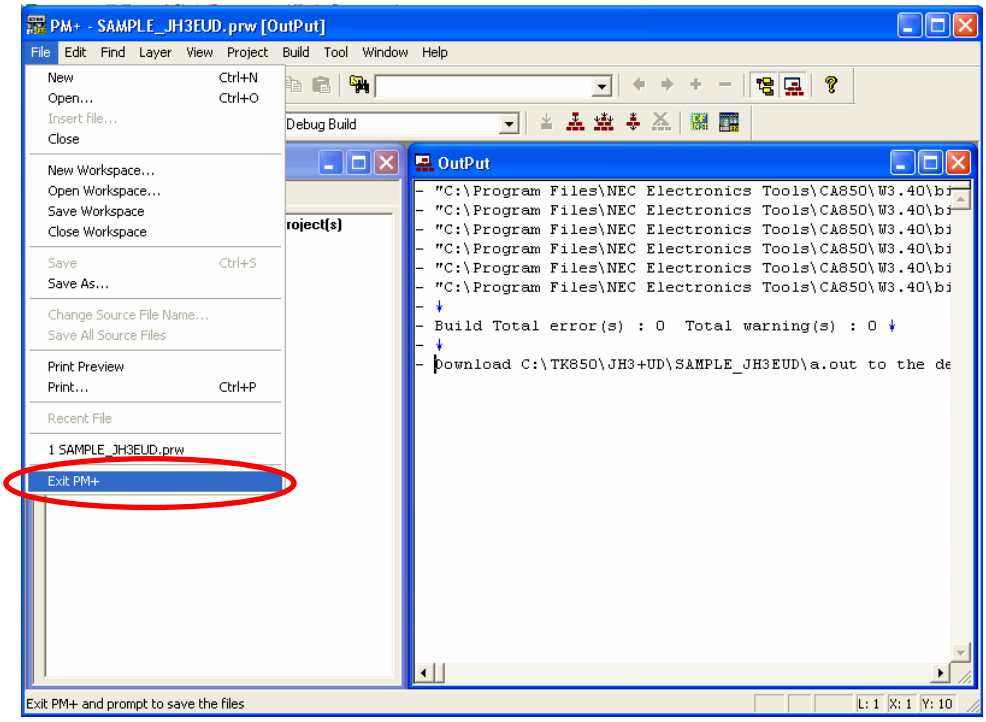




If you click Yes , it saves the settings in the project file, and then closes the ID850QB. It is recommended to save the settings as it saves the window you used, window size, layout, etc.
If you click No , it does not save the settings and closes the ID850QB.

2.12 Quit PM+

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



PM+ is closed.

The experiences section ends now.

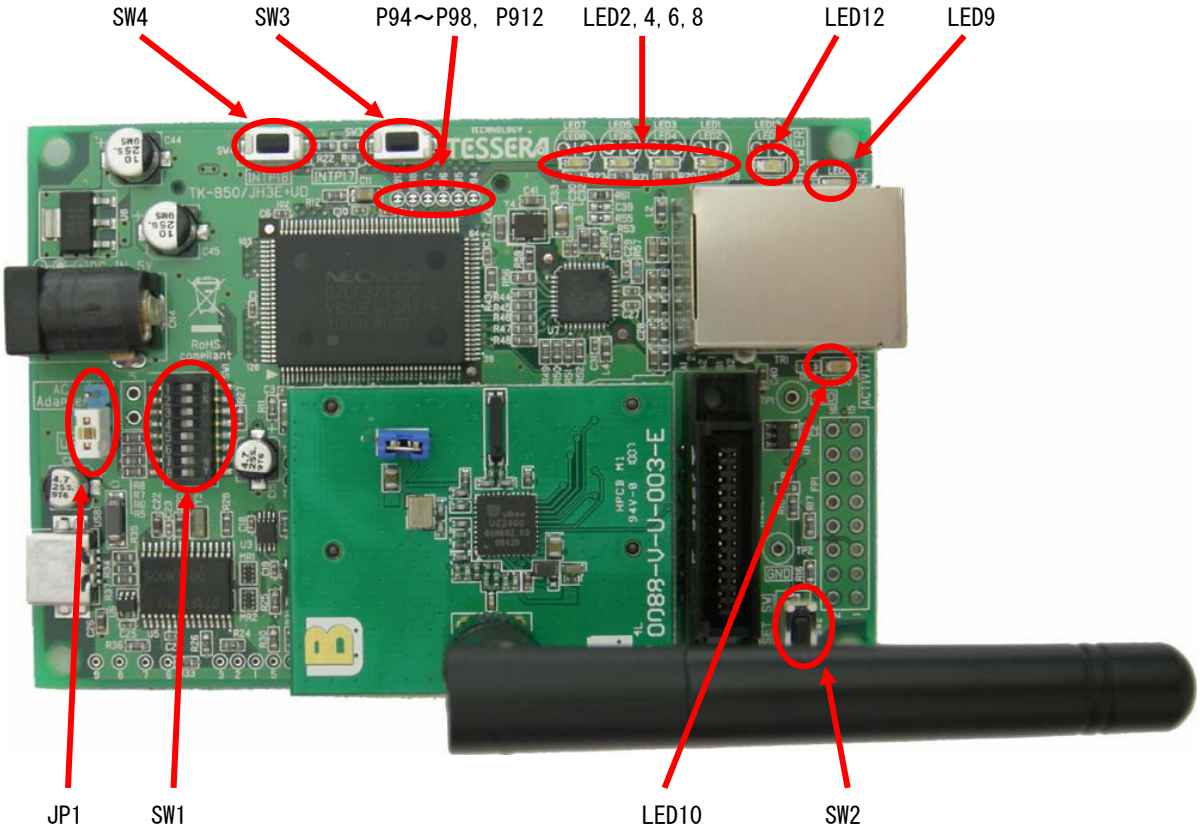
You can find more information how to use the development tool and information about other useful features in "Chapter 5 Other Information".

Chapter3 **Hardware Specifications**

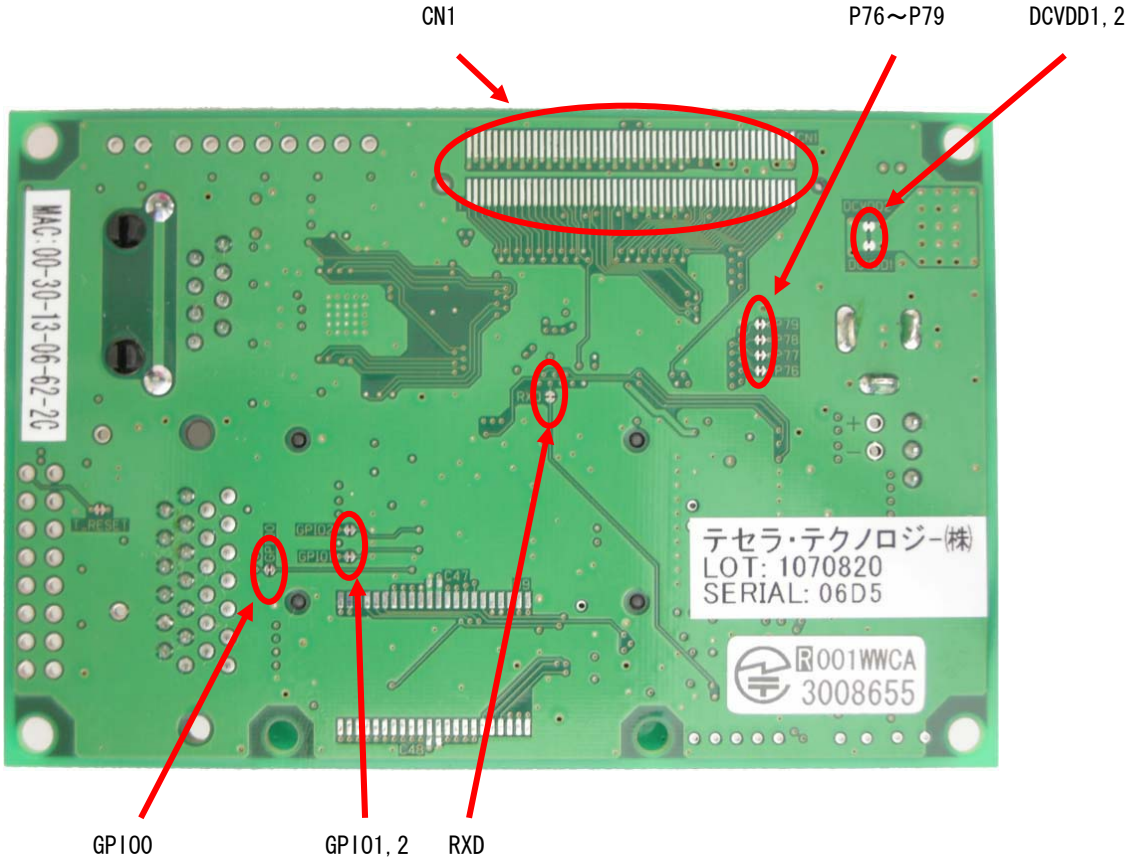
In this chapter, the hardware of TK-850/JH3E+UD will be explained.

Microcontroller	μPD70F3783　V850ES/JH3-E
Clock	External main system clock: 48MHz (6MHz x8) Sub-clock: 32.768KHz
Interface	USB (MINI B connecter) Connecter for N-Wire（KEL connecter） Connecter for Ethernet (RJ-45, TDK TLA-6T718) Connecter for AC adopter (DC5V) SMA connecter (RF output) Expansion connector （only pad） Connecter for MINICUBE2（only pad）
Dimension	90mm x 60mm
Power supply voltage	5V

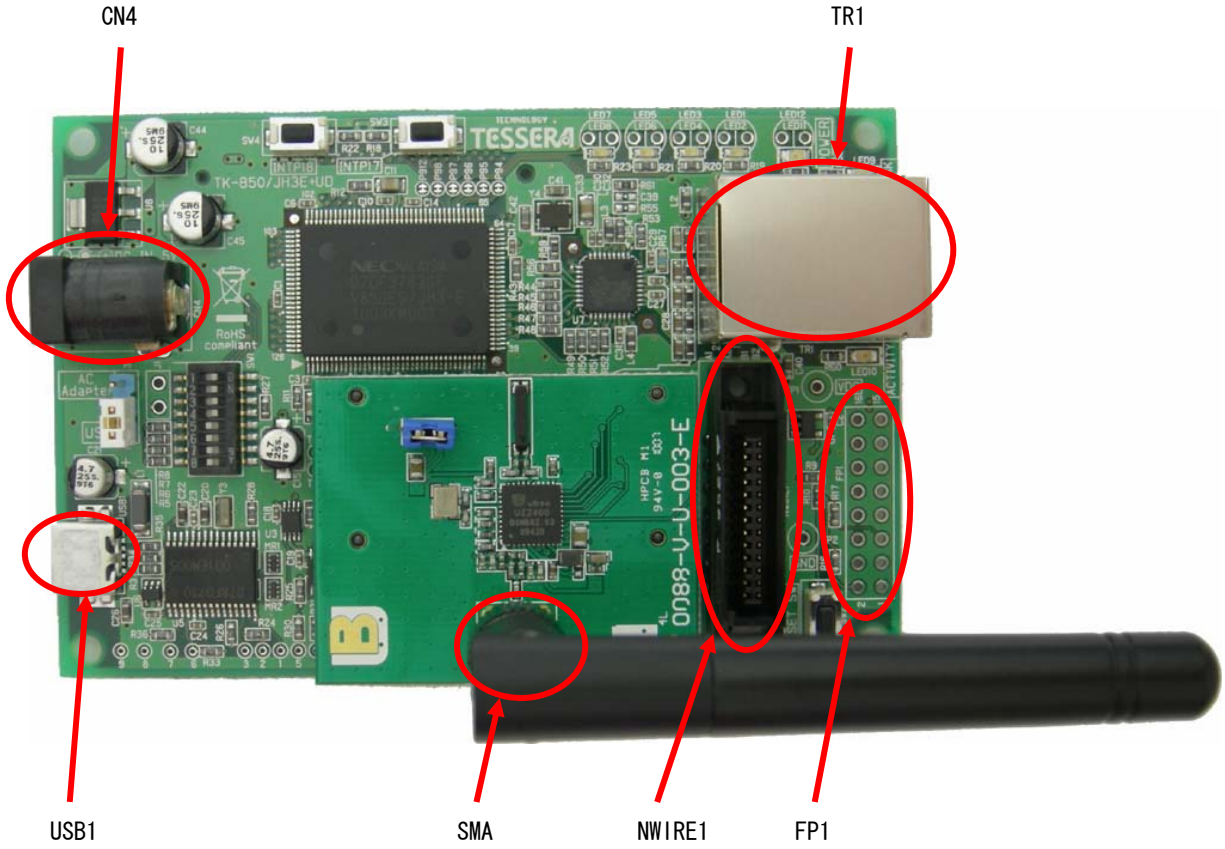
3.1 Layout of hardware functions 1



3.2 Layout of hardware functions 2



3.3 Layout of connecter



3.4 Hardware Functions

3.4.1. SW1

The bit 1-4 on SW1 are for mode settings, Bit5-8 of SW1 are connected to ”P76/ANI6”～”P79/ANI9” for general-purpose input port.

● Set as shown in the following table if you wish to debug using bundled ID850QB through USB1

SW1

Bit1	OFF
Bit2	ON
Bit3	ON
Bit4	ON

***** When you debug through USB1, it communicates with the host machine through P30 and P31 pins. Therefore, you cannot use these pins.

● Please change to the following settings when writing the program to the flash memory with built-in CPU by using WriteEZ5. (The hardware of WriteEZ5 is built into TK-850/JH3E+UD.)

SW1

Bit1	OFF
Bit2	ON
Bit3	ON
Bit4	ON

● To run the programs stored in built-in flash memory by WriteEZ5, use following settings and re-supply power.

SW1

Bit1	OFF
Bit2	OFF
Bit3	OFF
Bit4	ON

● Please change to the following settings when you connect N-Wire emulator.

SW1

Bit1	OFF
Bit2	OFF
Bit3	OFF
Bit4	ON

● Bit5-8 of SW1 is connected with the following terminals CPU.

There are connecting to pull-up resister. When the switch is pushed down, it sends signal "Low".

SW1

Bit5	P76
Bit6	P77
Bit7	P78
Bit8	P79

3.4.2. SW2

This is the reset switch. You can reset the microcontroller by pressing this switch.

3.4.3. SW3 (INTP17)

SW3 is the push switch connected to ” P98/TENC01/INTP17/A8” pin in CPU. There are connecting to pull-up resister. When the switch is pushed down, it sends the signal of "Low".

3.4.4. SW4 (INTP18)

SW4 is the push switch connected to ” P912/TOAB1OFF/INTP18/A12” pin in CPU. There are connecting to pull-up resister. When the switch is pushed down, it sends the signal of "Low".

3.4.5. LED11 (POWER)

This is the POWER LED. It is lighted when it gets power supply.

3.4.6. LED9, LED10

The table shows the status of Ethernet transceiver.

	Display	Function
LED9	LINK	Link ON Indication
LED10	ACTIVITY	Activity Indication

3.4.7. LED2,4,6,8

LED can be lit with P94-P97.

Please set the port mode to the output and output “Low” signal from the port.

	Port
LED2	P94
LED4	P95
LED6	P96
LED8	P97

3.4.8. JP1

JP1 are the jumper switch pin of selection the power supply.

JP1	
1-2 short	It is supplied power from USB1 connector (for debug).
2-3 short	It is supplied power from AC adapter (+5V) connected to CN4.

3.4.9. CN4

CN4 is the power supply connecter of the AC adaptor.

You can choose the power supplier by setting the JP1 to 2-3 short and connect 5V AC adapter.

3.4.10. J1

This is the connector for external power supply.

3.4.11. NWIRE1 Connector

These are connector for N-Wire emulator.

It can connect N-Wire emulator of QB-V850MINI2 etc.

The connector from KEL Corp. "8830E-026-170S" is mounted on NWIRE1.

3.4.12. FP1

This is the interface for connecting MINICUBE2.

As a connector is not mounted, you need to solder 16pin connector ("FFC-16BMEP1" from Honda Tsushin Kogyo Co., Ltd.) on FP1.

3.4.13. USB1

This is the USB interface for debugging.

You can use this when you need to debug or make serial communication using P30 and P31.

3.4.14. TR1

This is the interface for Ethernet communication.

TLA-6T718 from TDK Corp. is used for RJ-45 connector.

LAN8700C from SMSC is used for Ethernet transceiver.

3.5 solder-short pad label

When using a circumference board connector (CN1) without using a circuit on board, in order to separate a circuit on board, the terminal of CPU can be customized by making the pad for solder short opening.
Pad for solder-short has shape like the figure below.

When you make an open circuit, cut the narrow part of the Pad with a knife.
To make short circuit, join the separated Pad with a soldering iron etc.

Solder-short pad
（opened shape）

Solder-short pad
Shorted shape

Solder-short pad name	State when shipping it	Connection
P94～P97	Short	LED,2,4,6,8 Open when using it for other usages
DCVDD1,2	Short	VDD<-> Regulator output Open, when you supply the power from CN1.
RXD	Short	P30/TXDC0 Open when P30 isn't used for USB1 communication interface.
P912	Short	P912 <-->SW4 Open when using it for other usages
T_RESET	Short	4Pin U1 <--> T_RESET signal. Open when the Reset IC isn’t used for.
GPIO0	Short	RFIC GPIO0 <==> P40 Open when the port is using with CN1
GPIO1	Short	RFIC GPIO1<==> P41 Open when the port is using with CN1
GPIO2	Short	RFIC GPIO2<==> P42 Open when the port is using with CN1

Chapter4 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 "1.4USB Driver". If not, install the driver.

Check Point 3
If above 2 check points are confirmed, disconnect the USB cable from PC and re-connect again.

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. "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 "2.5Check Board Settings".

Check Point 3
Confirm the USB driver installation with referring to "1.4USB 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.

4.2.2. "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. Also remember the code you set for the security ID.

After this, erase the flash memory with referring to "5.4 WriteEZ5".

4.2.3. Monitor memory cannot be accessed. (F0c72)

Check Point 1

Check if the settings of switches on the kit are correct with referring "2.5Check Board Settings".

Check Point 2

Erase the flash memory with referring to "5.4 WriteEZ5".

Check Point 3

If above 2 check points are confirmed, disconnect the USB cable from PC and re-connect again.

And, retry starting the debugger.

Chapter5 Other Information

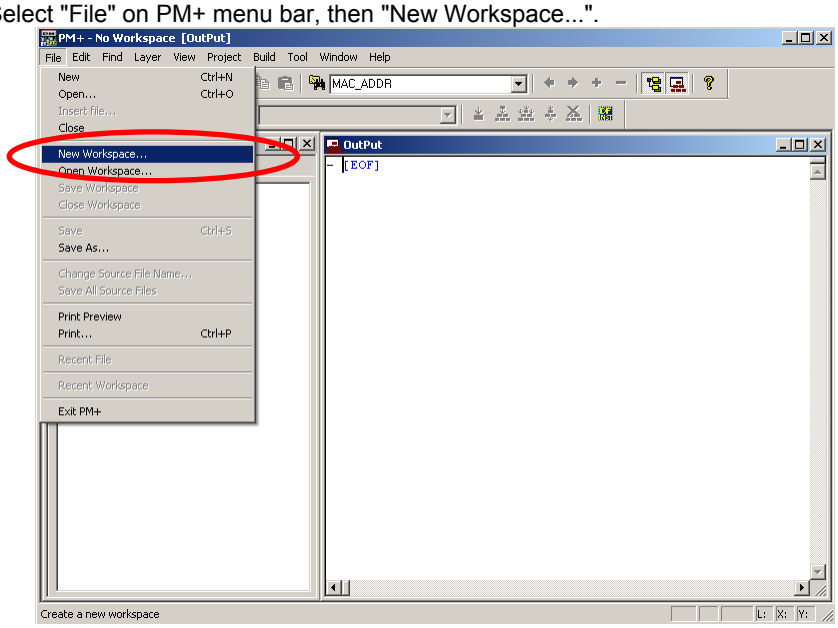
This chapter explains some useful operation techniques of development tools and circuit diagram of the kit for developing of user programs.

5.1 Create a new workspace

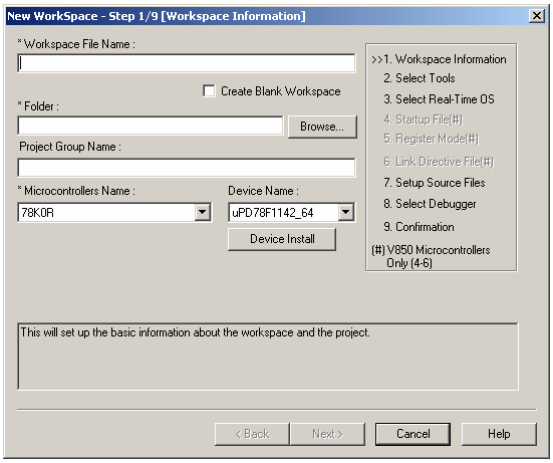
Now, create a new workspace and project.

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.

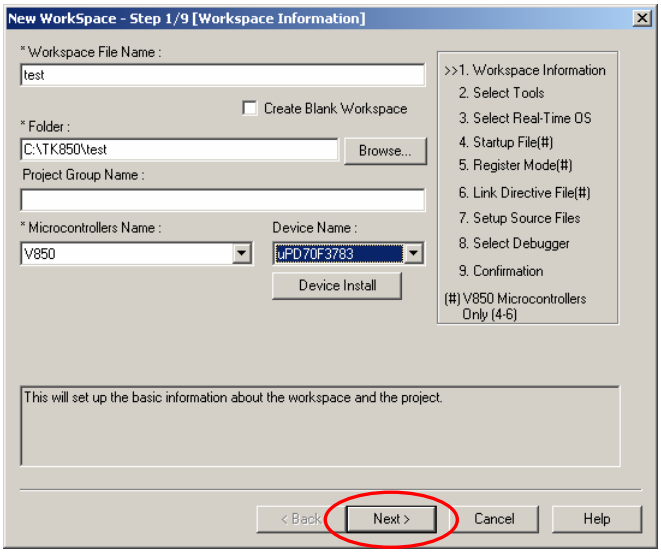
Workspace file name
→ test

Folder
→ C:¥TK850¥test

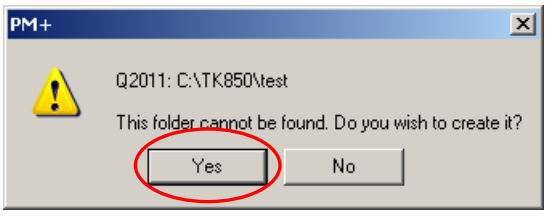
Project Group Name
→ (no input)

Microcontroller Name
→ V850 Series

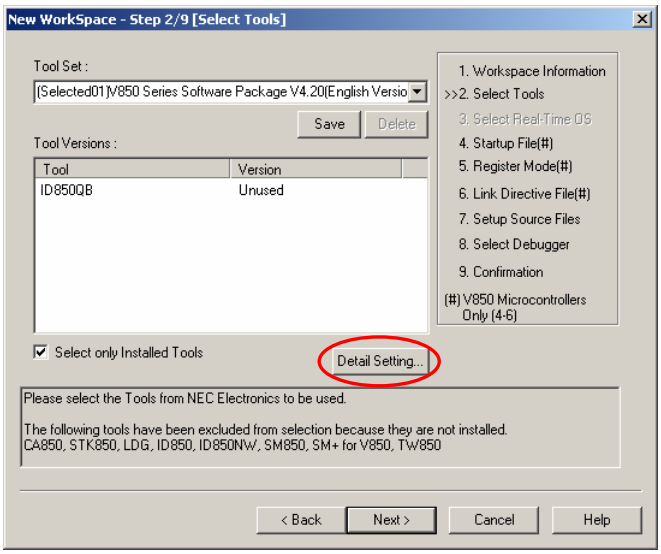
Device Name
→ uPD70F3783



Click Next > button

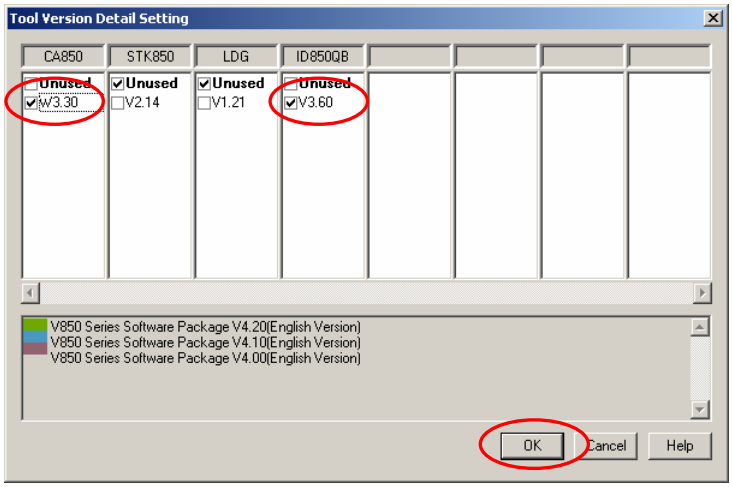


Click Yes button

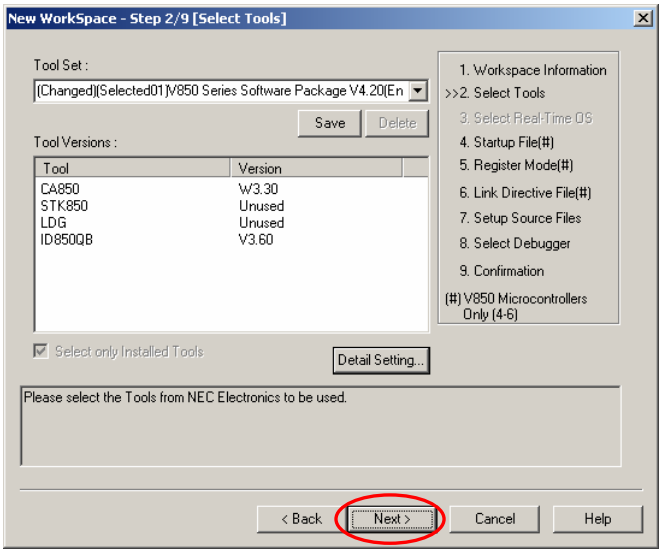


Click Detail Setting button

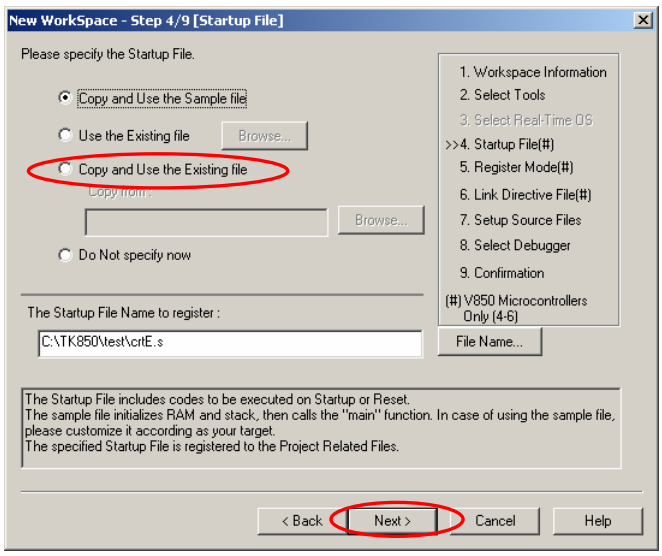
Set the version of tools as follows.
CA850 : W3.30
ID850QB : V3.60



Select tools as above screenshot, then click OK .



Click Next >

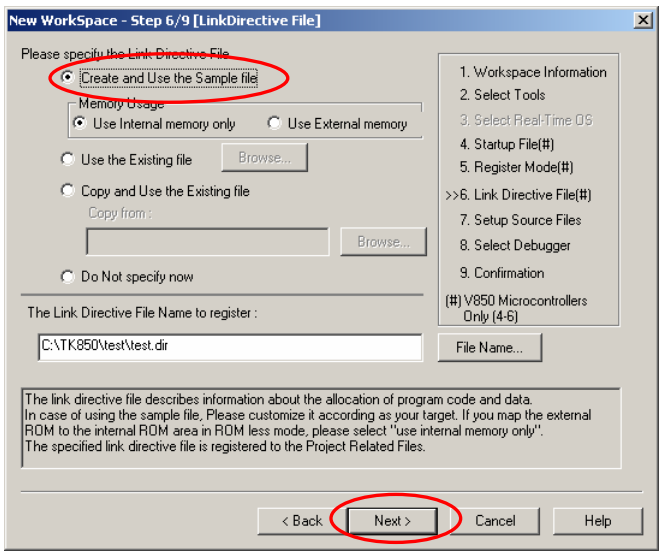


Select the “Copy and Use the Sample file”.

Press the Next > button.

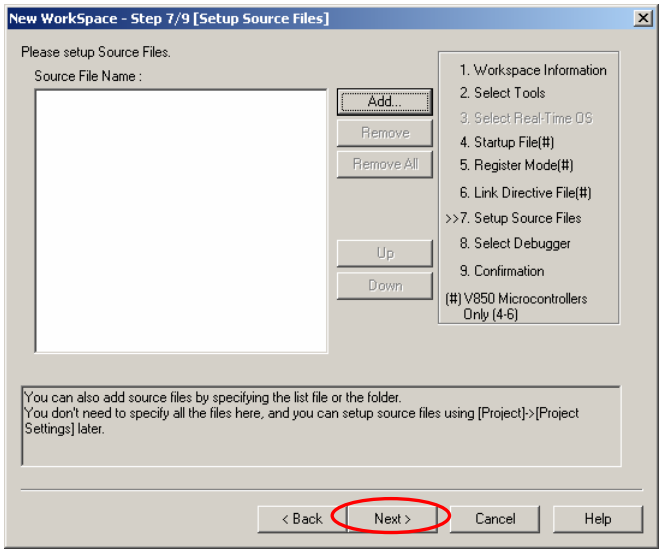
Select the “ 32-Register Mode”.

Press the Next > button.



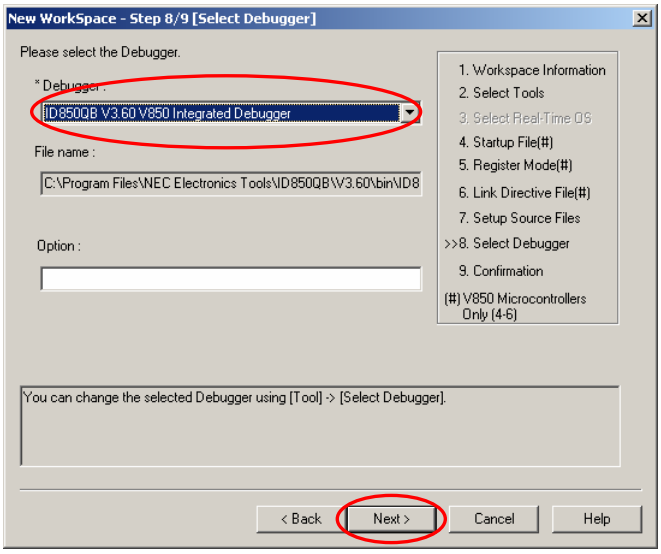
Select the “Create and Use the sample file”

Press the Next > button.

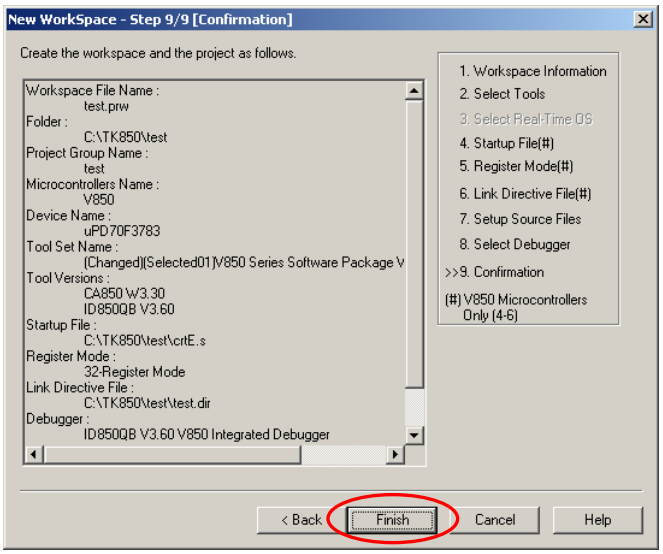


Press the Next > button.

Select the “ID850QB V3.60”

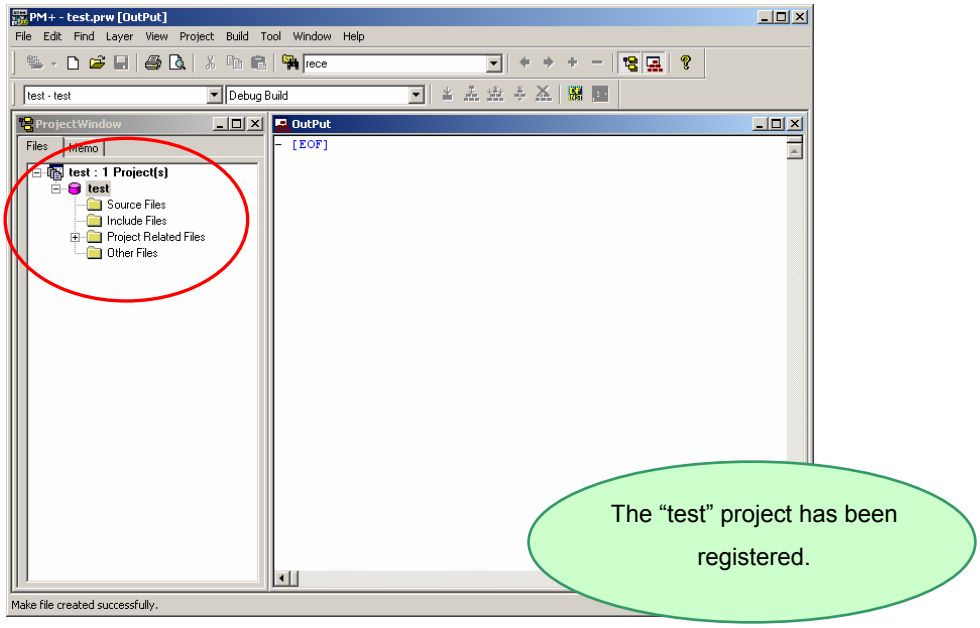


Press the Next > button.



Press the Finish button.

Check the project information setting contents.



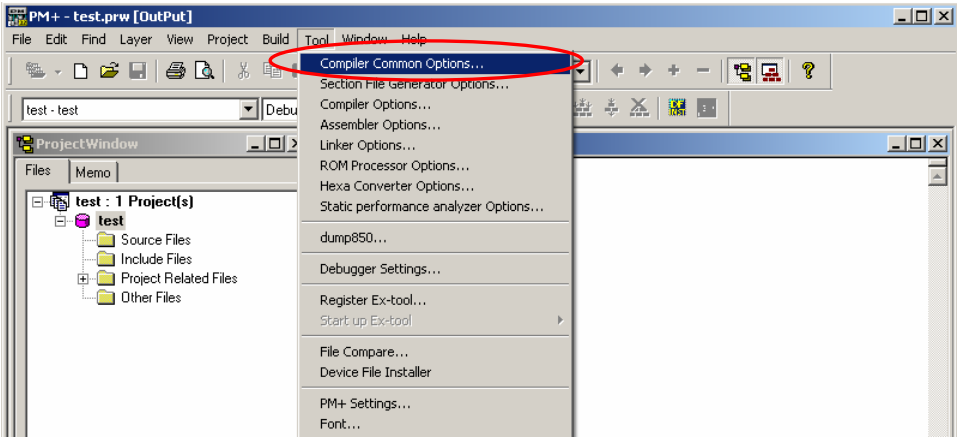
This completes workspace and project creation.

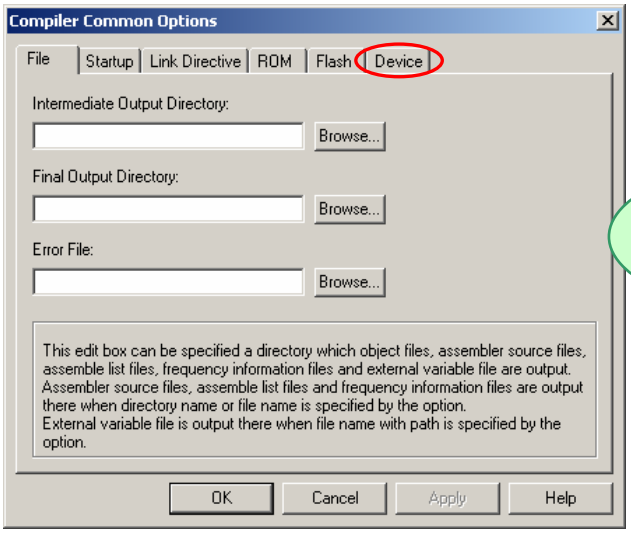
Additional source files can be registered at any time thereafter.

For details, refer to “Registering additional source files”.

Next, setup the security ID

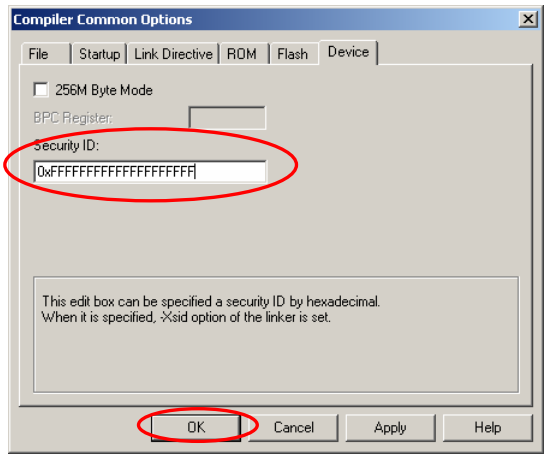
In the PM +, [Tool] → [Compiler common Options...] is selected.





Compiler Common Options setting is open.

Click the “Device” tab.



Press the OK button.

Security ID settings are complete

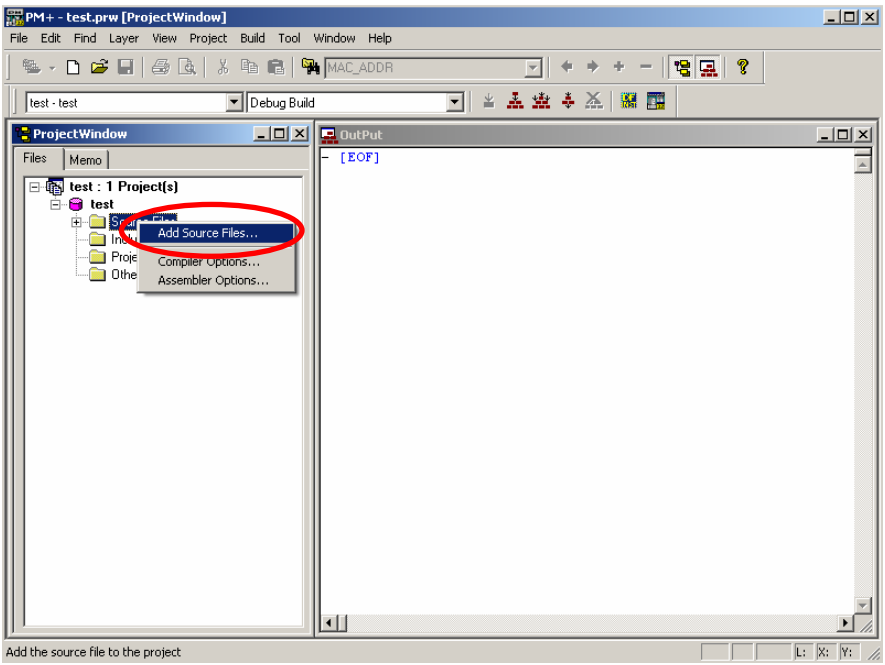
The actualities of "FFFFFFFFFFFFFFFFFFFF"(20 of F) are taken if there is no problem in the value of ID in security.

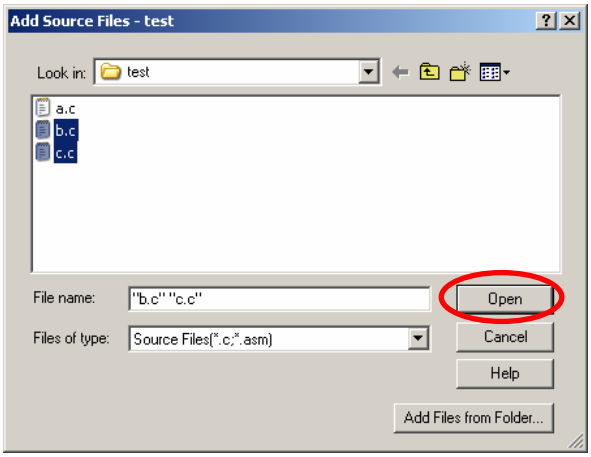
5.2 Register additional source file

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.

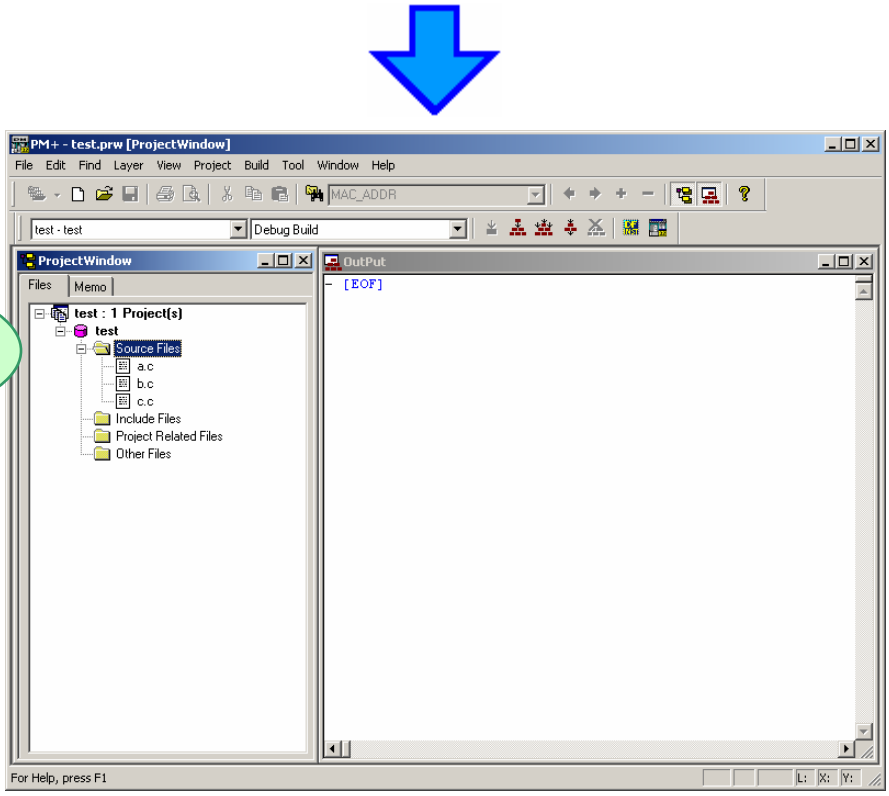
Place the cursor on the source file in the Project window of PM+, and select [Add Source Files…] displayed in the right-click menu.





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

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



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

5.3 Debugger tips

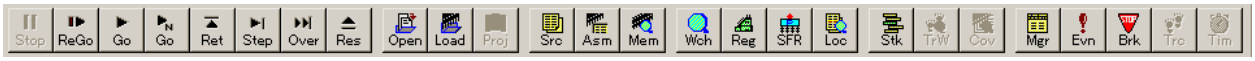
This section describes some useful techniques for the debugger (ID850QB).

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.

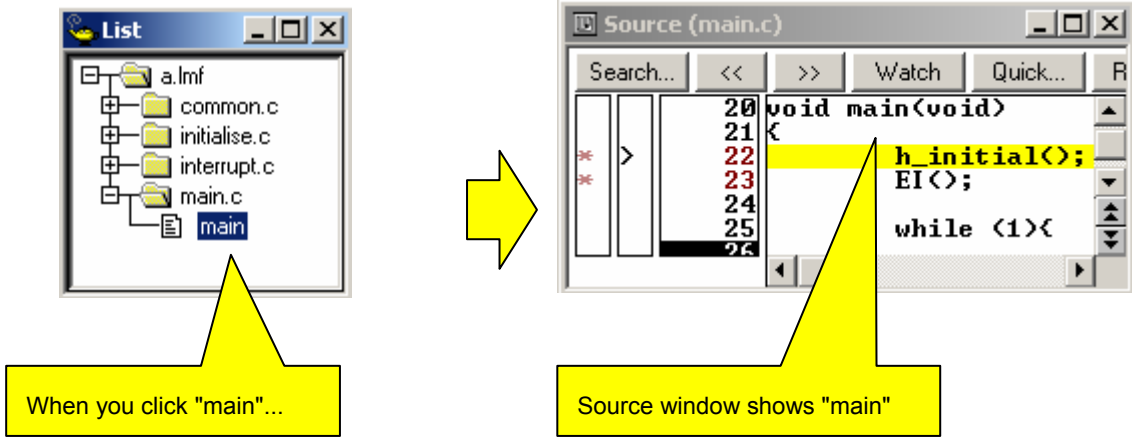
In this case, select "Options" on menu bar, then "Debugger Options". Check "Pictures and Text" on setting area.

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.

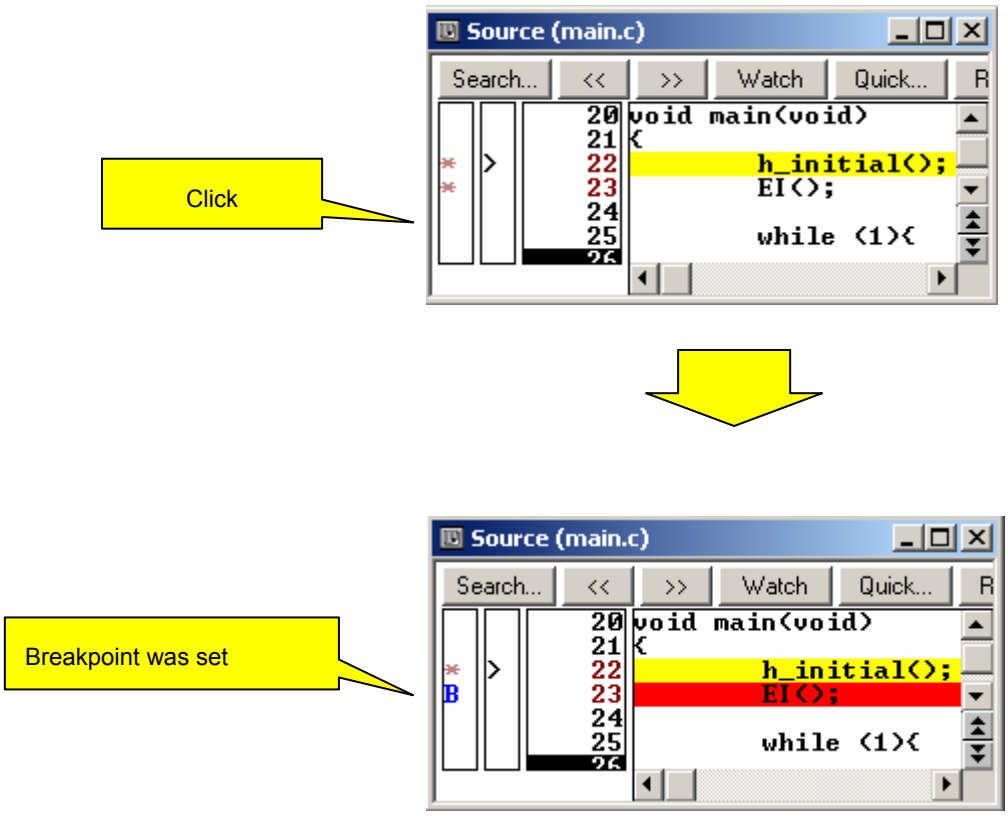


5.3.3. Set/delete breakpoints

Breakpoints are executed by clicking lines in which " * " is displayed

"B" is displayed in the line where a breakpoint is set.

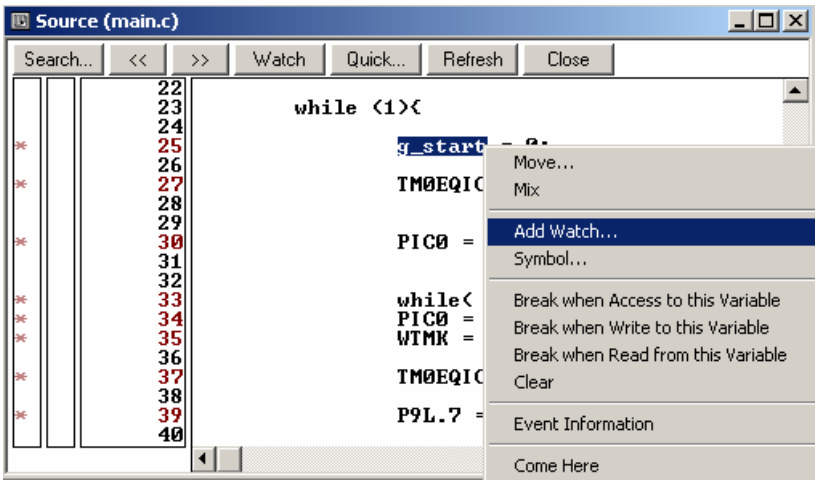
Breakpoints are deleted by clicking "B".



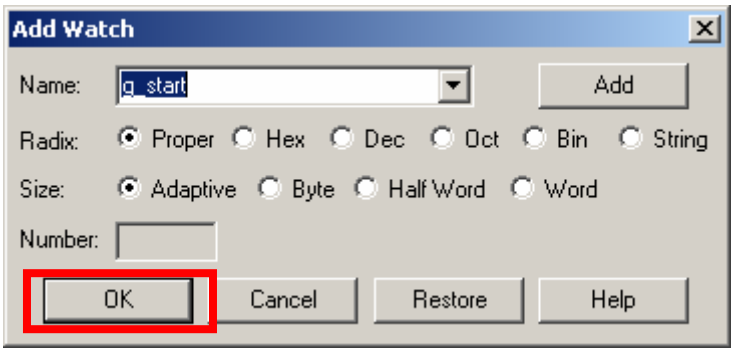
5.3.4. Display global variables

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.

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



Add Watch dialog opens. Click OK .

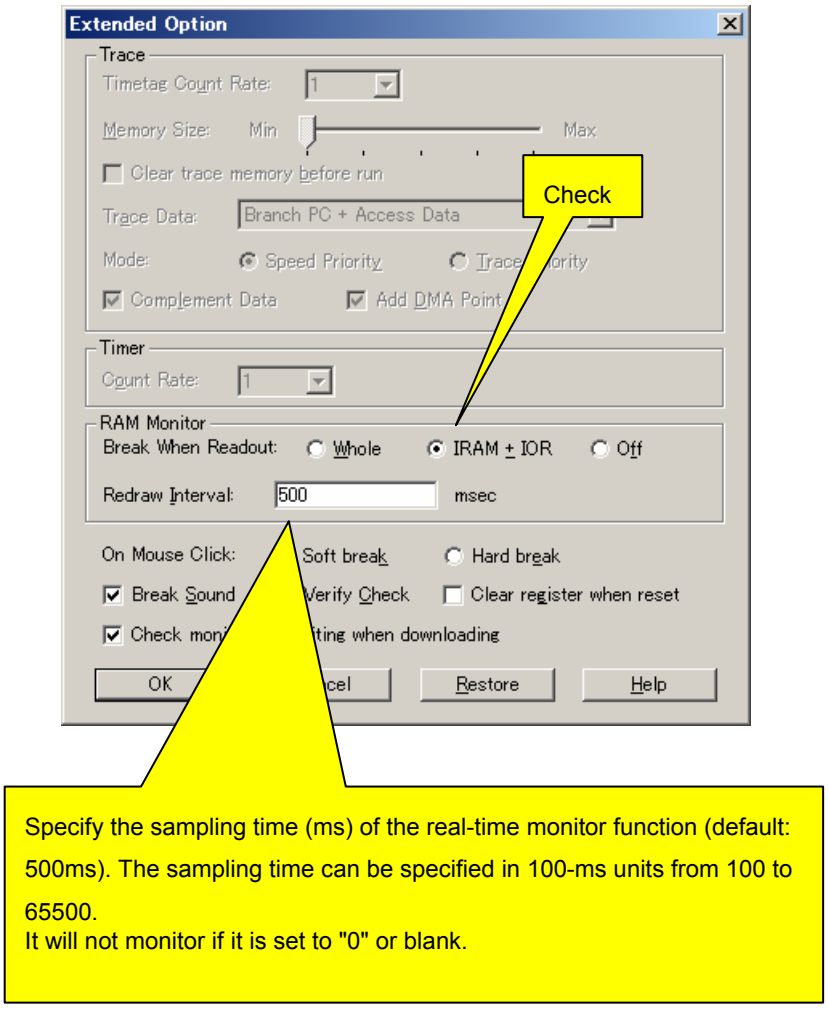


Adding a variable to watch window is completed.

5.3.5. Display global variables (internal RAM) 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" menu -> "Extended Option...". Follow below settings.



Note:

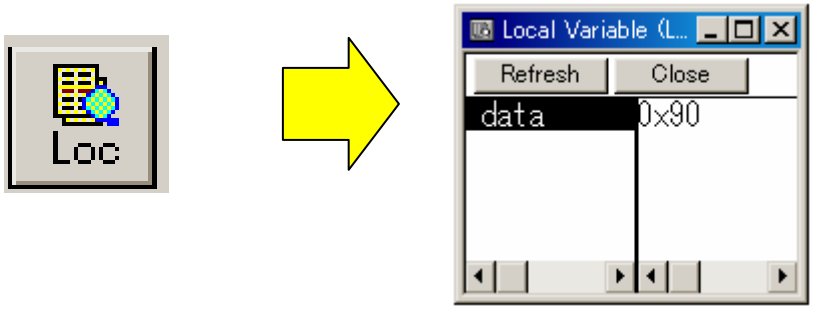
- The user program momentarily breaks upon a read.
- Do not use the pseudo real-time monitor function while using the memory window. It uses the system resources significantly as it monitors the displaying memory as well.
- It is recommended to close the memory window when you use the pseudo real-time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

5.3.6. Display local variables

Local variable window is used to display local variables.

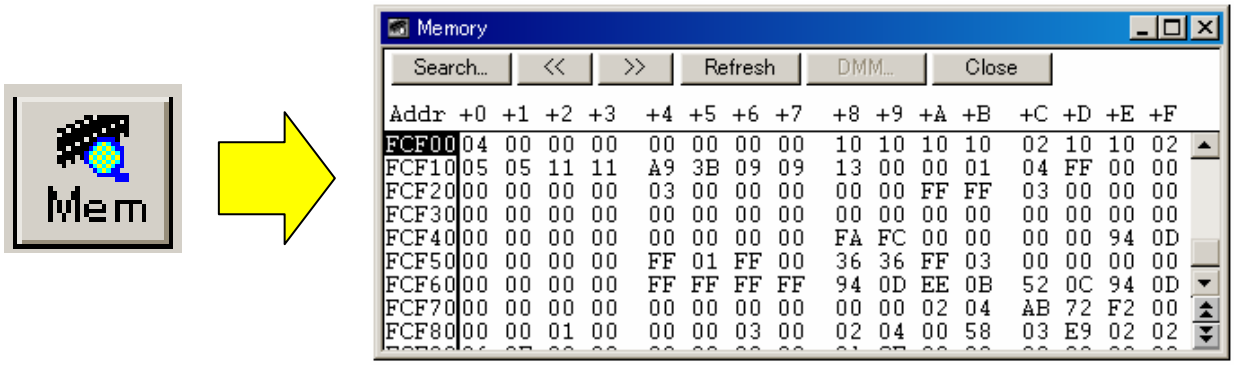
By clicking the button below, you can open the local variable window.

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

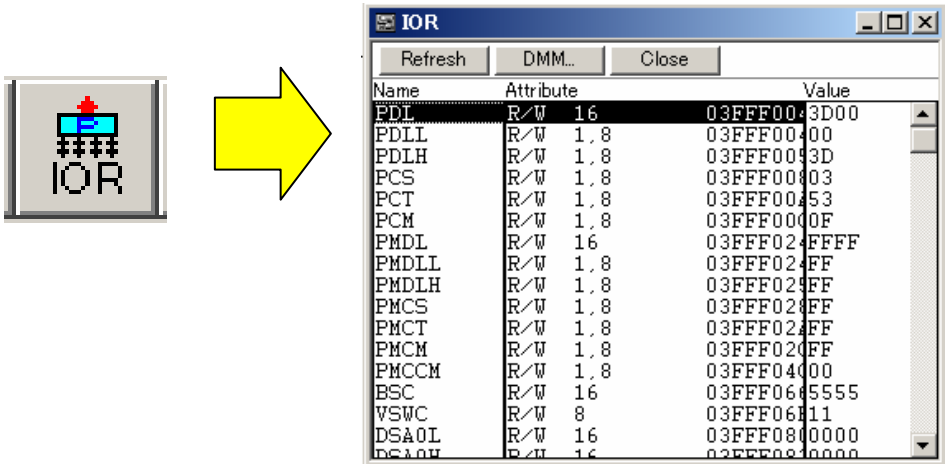


5.3.7. Display memory and SFR contents

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



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



5.4 WriteEZ5

Since the program downloaded by ID850QB includes monitoring files for debugging, it cannot run stand-alone. However, if you use WriteEZ5 to write programs, it does not write monitoring files. Therefore, it can run stand-alone.
Also, 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 WriteEZ5 to erase the flash memory.

WriteEZ5 is installed at "1.2Installation of Software Development Tools".
Start WriteEZ5 by selecting "Windows Start" menu, "Programs", "NEC Electronics Tools", "WriteEZ5", "V1.00", and "WriteEZ5".

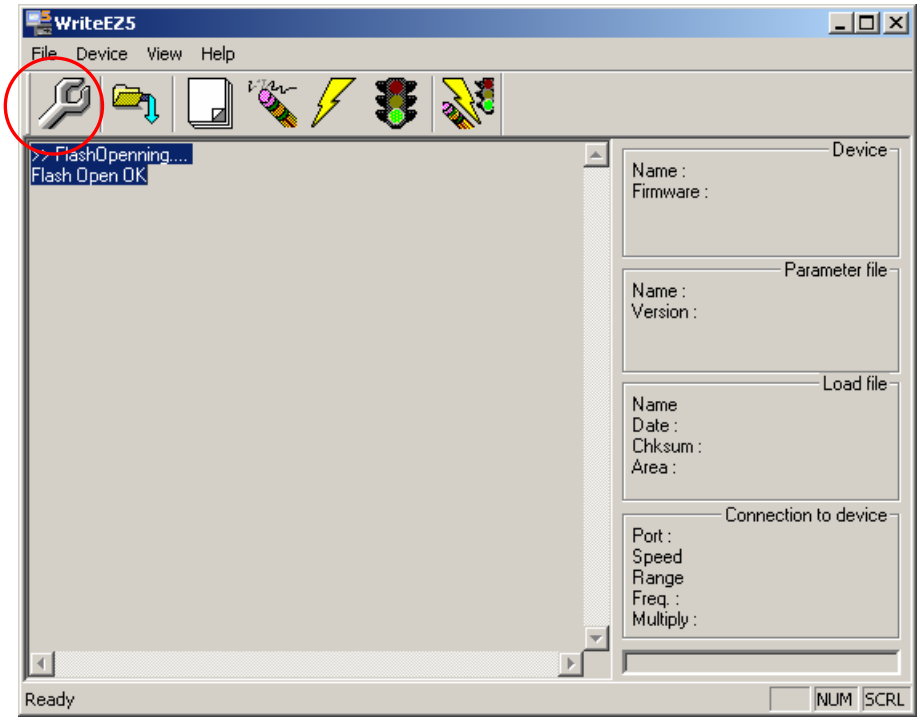
The hardware for WriteEZ5 is incorporated in TK-850/JH3E+UD.

① The switch of TK-850/JH3E+UD is set as follows, and connects TK-850/JH3E+UD to PC.

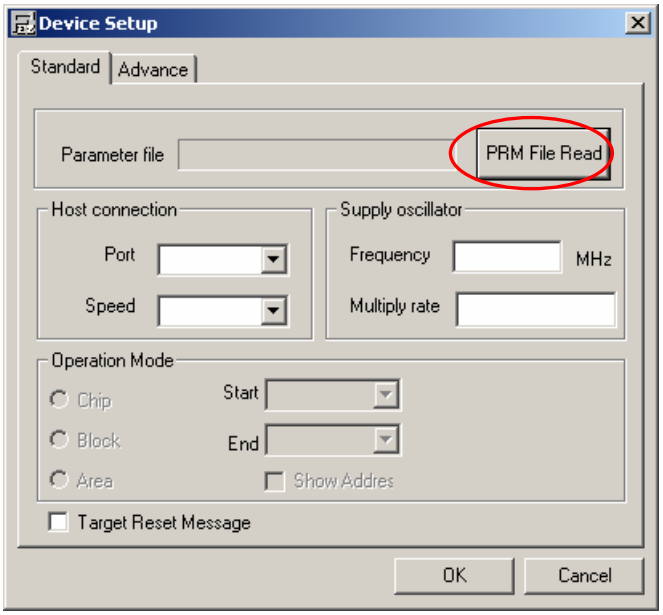
SW1

Bit1	OFF
Bit2	ON
Bit3	ON
Bit4	ON

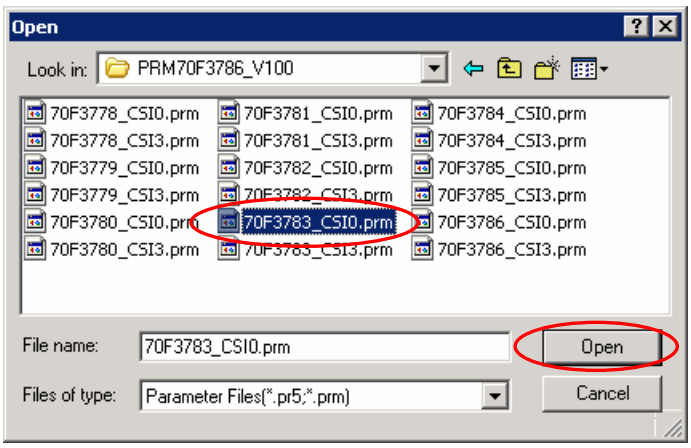
② Please execute WriteEZ5.



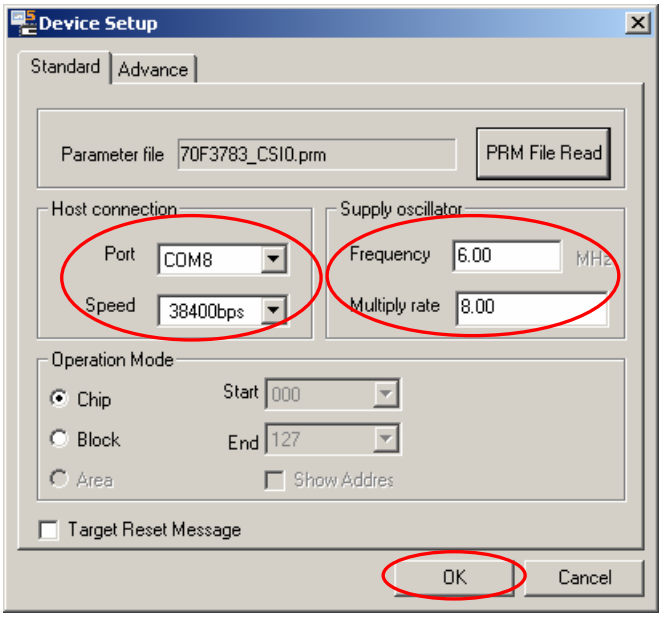
③ Push the「Setup」button.



④ Push the「PRM File Read」button.



⑤ Please select “70F3783_CSI0.prm” in the directory of “¥PRM¥PRM70F3786_V100” in the CD-ROM.



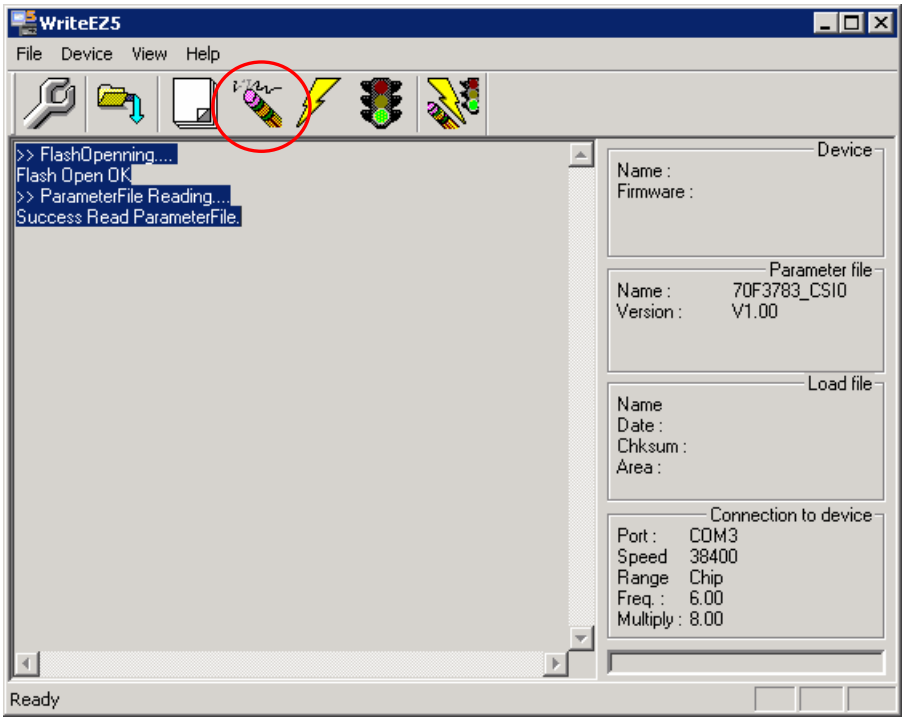
⑥ "Port" selects the COM port number where TK-850/JH3E+UD is allocated.

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

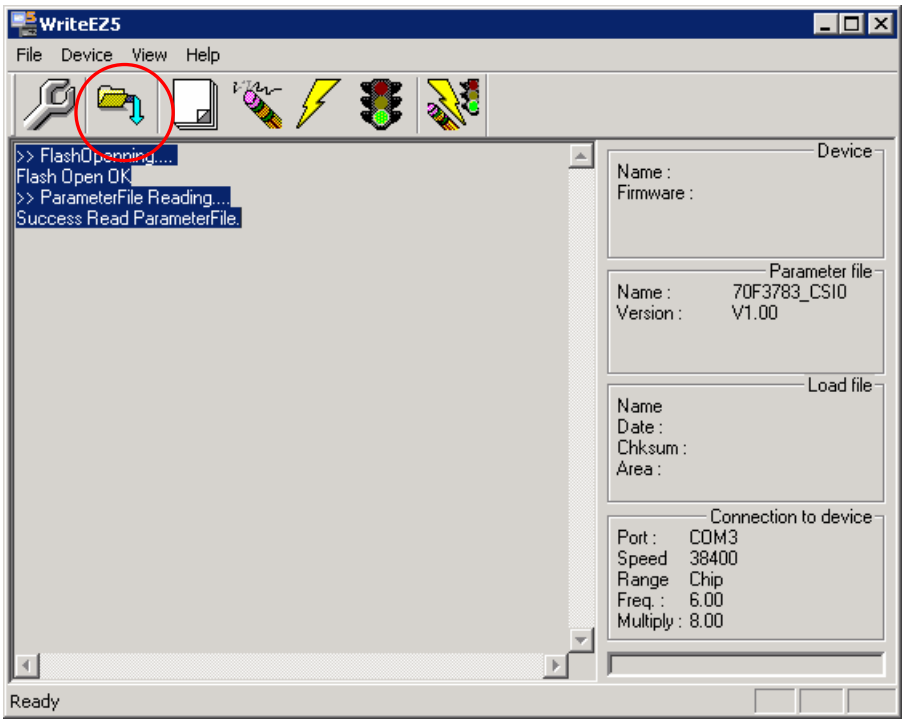
Input “6.00” to “Frequency”

Input “8.00” to “Multiply rate”

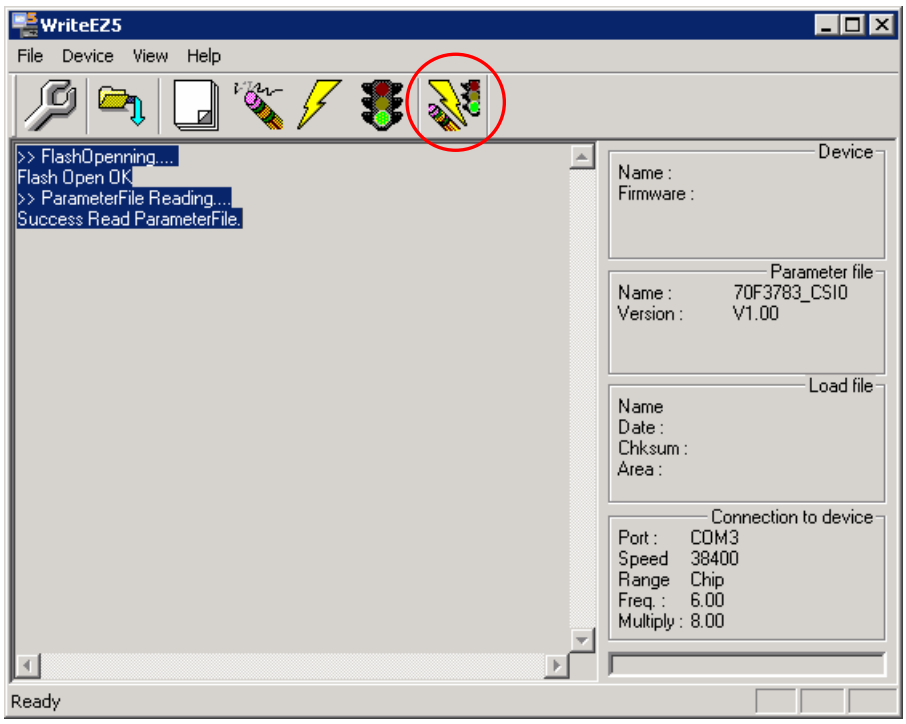
Input “38400” to “Speed”, and chick “OK”



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



⑧ When you write the program, click “load” then select writing HEX file.



⑨ Hex file writing will be start by clicking “AutoProcedure” .

5.5 Parts list, Circuit diagram

From following page, it shows the parts list and the circuit diagram of the kit.

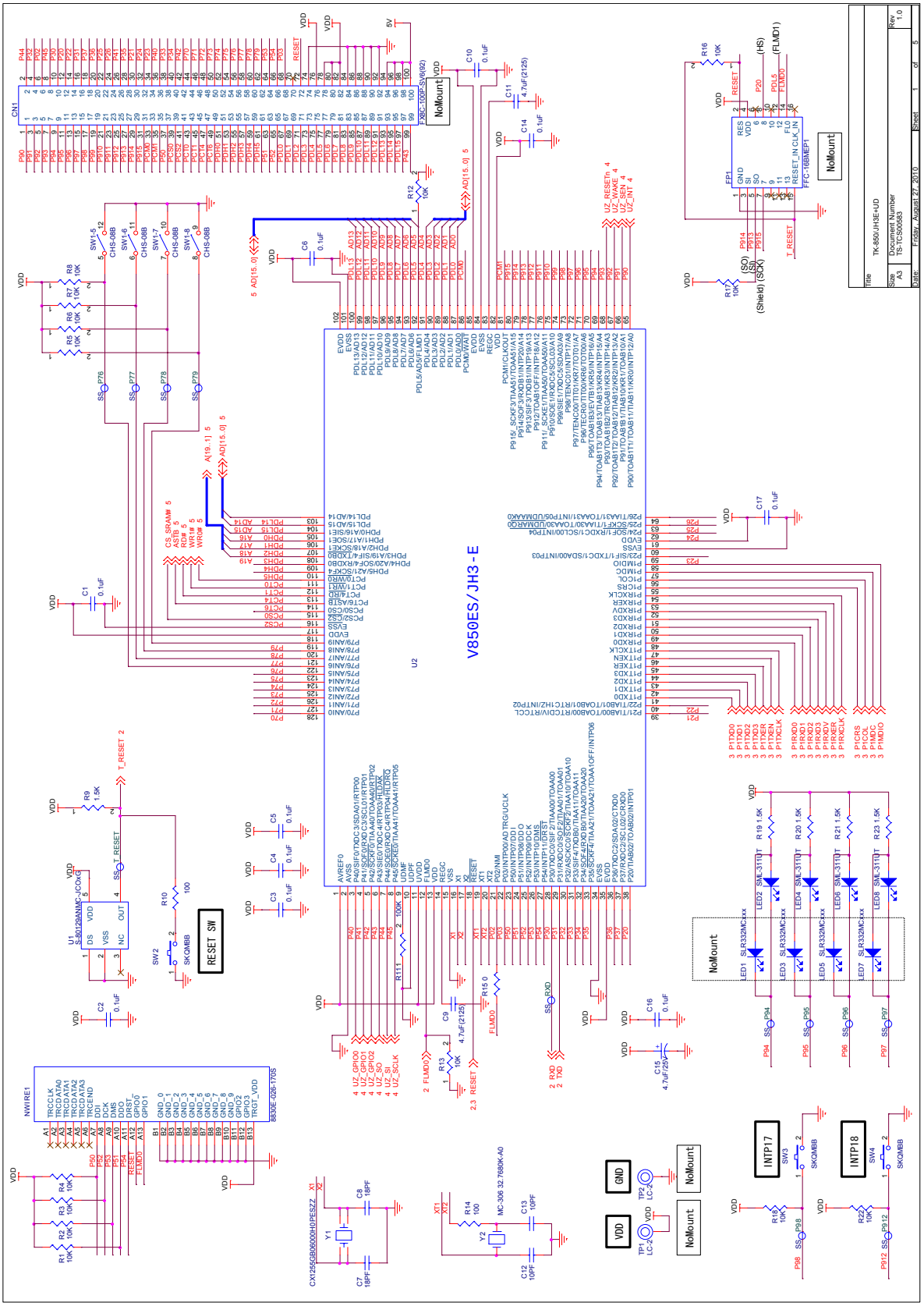
●CPU board parts list

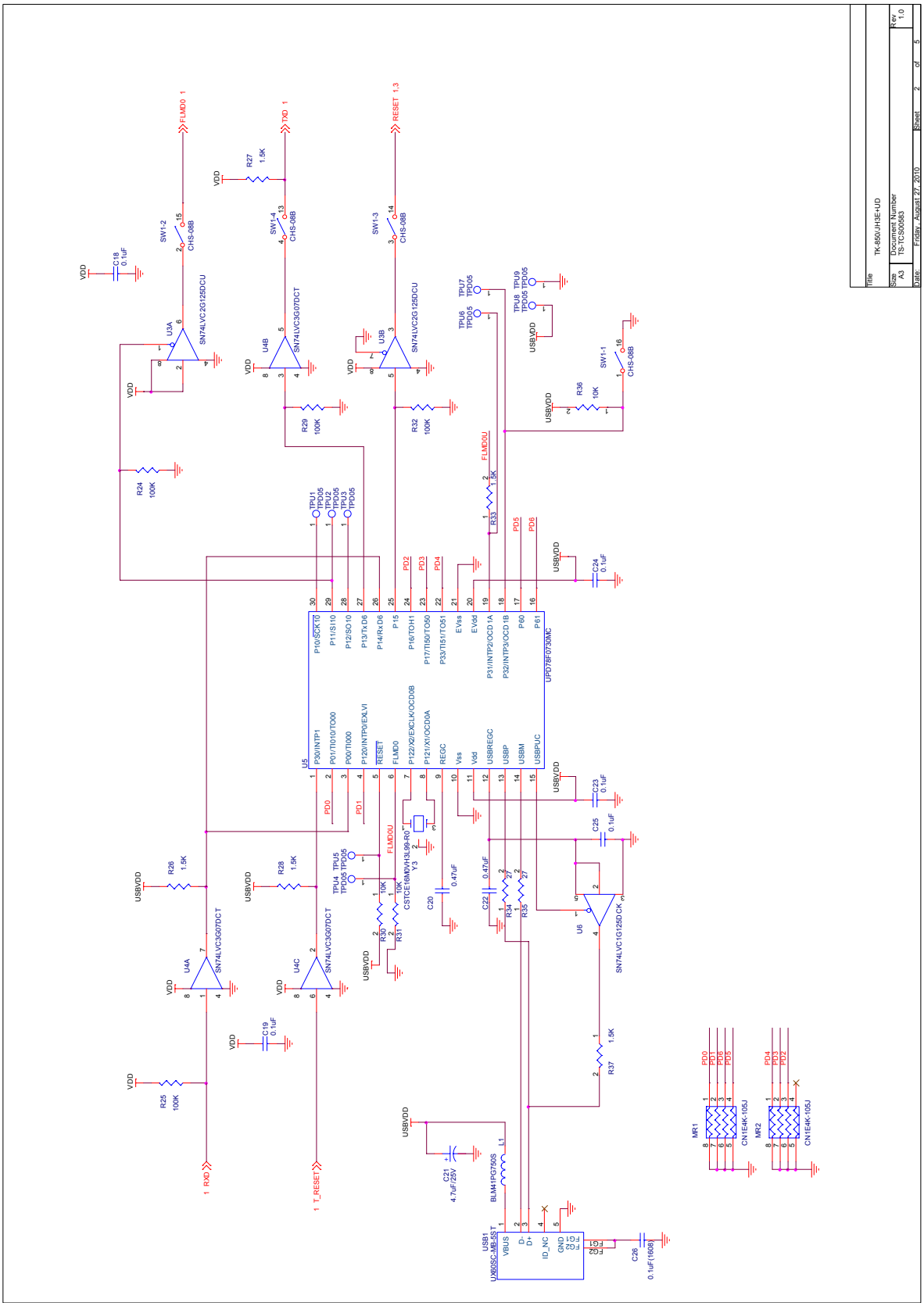
No.	Mount Quantity	Mount Parts Reference	Unmount Parts Reference	Type	Parts No	Maker	Note
1	0		CN1	Connecter	FX8C-100P-SV6(92)	HIROSE	
2	2	CN3,CN2		Connecter	TFM-110-02-S-D-A-K-TR	SAMTEC	
3	1	CN4		Connecter	HEC0470-01-630		
4	23	C1,C2,C3,C4,C5,C6,C10, C14,C16,C17,C18,C19,C23, C24,C25,C27,C28,C29,C30, C31,C32,C43 C50	 C46,C47,C48, C49	Chip ceramic cap	0.1uF		C46～C49 Option
5	2	C7,C8		Chip ceramic cap	18PF		
6	3	C9,C11,C33		Chip ceramic cap	4.7uF(2125)		
7	6	C12,C13,C34,C35,C36,C37		Chip ceramic cap	10pF		
8	2	C21,C15		Aluminum Electrolytic Cap	4.7uF/25V		
9	2	C20,C22		Chip ceramic cap	0.47uF		
10	2	C40,C26		Chip ceramic cap	0.1uF(1608)		
11	1	C38		Chip ceramic cap	0.022uF/50V		
12	0		C39,R55,R62,R63,R64,R65, R66	Chip ceramic cap	xxx		
13	2	C42,C41		Chip ceramic cap	7PF		
14	2	C45,C44		Aluminum Electrolytic Cap	10uF/25V		
15	0		DCVDD1,DCVDD2	Pad	SSP		
16	0		FP1	Connecter	FFC-16BMEP1	HONDA	
17	0		GPIO1,GPIO2,P76,P77,P78, P79,P94,P95,P96,P97,P98, P912,T_RESET,RXD,GPIO0	Pad	SS		
18	1	JP1		Connecter	FFC-3AMEP1	HONDA	
19	0		J1	Connecter	FFC-2AMEP1	HONDA	
20	0		LED1,LED3,LED5,LED7	LED	SLR-332MC	ROHM	
21	4	LED2,LED4,LED6,LED8		LED	SML-311UT	ROHM	
22	3	LED9,LED10,LED11		LED	PG1112H	ROHM	
23	0		LED12	LED	SLR-332VC	ROHM	
24	1	L1		Filter	BLM41PG750S	Murata	
25	3	L2,L3,L4		Filter	BLM18PG600SN1	Murata	
26	2	MR2,MR1		resister module	CN1E4K-105J	KOA	
27	1	NWIRE1		Connecter	8830E-026-170S	KEL	
28	18	R1,R2,R3,R4,R5,R6,R7,R8, R12,R13,R16,R17,R18,R22, R30,R31,R36,R44		Chip resister	10K		
29	11	R9,R19,R20,R21,R23,R26, R27,R28,R33,R37,R43		Chip resister	1.5K		
30	12	R10,R14,R45,R46,R47,R48, R49,R50,R51,R52,R53,R54		Chip resister	100		
31	5	R11,R24,R25,R29,R32		Chip resister	100K		
32	5	R15,R59,R61,R67,R68		Chip resister	0		
33	2	R34,R35		Chip resister	27		
34	4	R38,R39,R40,R41		Chip resister	49.9(1%)		
35	1	R42		Chip resister	10(1%, 0.1W)		
36	1	R56		Chip resister	1M		
37	1	R57		Chip resister	12.4K(1%, 0.1W)		
38	3	R58,R60,R69		Chip resister	270		
39	1	SW1		DIP SW	CHS-08B	COPAL	
40	3	SW2,SW3,SW4		DIP SW	SKQMBB	ALPS	
41	0		TPU1,TPU2,TPU3,TP3,TPU4, TP4,TPU5,TP5,TPU6,TPU7, TPU8,TPU9	Pad	TPD05		
42	0		TP1,TP2	Check Pin	LC-2	MAC8	
43	1	TR1		Connecter	TLA-6T718	TDK	
44	1	USB1		Connecter	UX60SC-MB-5ST	HIROSE	
45	1	U1		IC	S-80129ANMC-JCOxG	SII	
46	1	U2		IC	uPD70F3783GF-GAT-AX	NECEL	
47	1	U3		IC	SN74LVC2G125DCU	TI	
48	1	U4		IC	SN74LVC3G07DCT	TI	
49	1	U5		IC	UPD78F0730MC	NECEL	
50	1	U6		IC	SN74LVC1G125DCK	TI	
51	1	U7		IC	LAN8700(i)	SMSC	
52	1	U8		IC	LM1117MPX-3.3	NS	
53	0		U9	IC	IS61WV51216BLL-10TLI	ISSI	Option
54	0		U11,U10	IC	SN74LVC573APW	TI	Option
55	0		U12	IC	SN74LVC08APW	TI	Option
56	1	Y1		Resonator	CX1255GB06000H0PESZ Z	Kyocera	
57	1	Y2		Resonator	MC-306 32.7680K-A0	EPSON	
58	1	Y3		Resonator	CSTCE16M0VH3L99-R0	Murata	
59	1	Y4		Resonator	NX3225GA-25.000M-STD -CRG-2	NDK	

●RF board parts list

No.	Mount Quantity	Mount Parts Reference	Unmount Parts Reference	Type	Parts No	Manufacturer
1	2	C37,C43		Chip ceramic cap	C0402CRNP09BNR50	Yageo
2	1	C38		Chip ceramic cap	CC0402CRNP09BN1R8	Yageo
3	2	C1,C53		Chip ceramic cap	C0402ZRY5V5BB105	Yageo
4	1	L3,L5		Chip ceramic inductor	LQG15HN5N1S02	Murata
4R					AL02BT5N1M	Viking
5	1	L4		Chip ceramic inductor	LQG15HN6N8J02	Murata
6	1	R5		Chip resister	RC0402JR-0710M	Yageo
7	4	C5,C39,C52,C63		Chip ceramic cap	C0402ZRY5V7BB103	Yageo
8	2	C2,C4		Chip ceramic cap	C0805ZKY5V6BB106	Yageo
9	1	C3		Chip ceramic cap	C0603ZRY5V6BB475	Yageo
10	2	C21,C54		Chip resister	C0402JRNP09BN150	Yageo
11	1	XTAL_2		Resonator	G5 Series 32.768kHz	Ecera
12	1	XTAL_1		Resonator	7M32000044	TXC
13	2	C60,C64		Chip resister	C0402JRNP09BN330	Yageo
14	1	C48		Chip ceramic cap	C0402JRNP09BN390	Yageo
15	5	C19,C40,C44,C55,C57		Chip ceramic cap	CC0402JRNP09BN470	Yageo
16	1	C45		Chip resister	C0402ZRY5V7BB104	Yageo
17	0		R1	Chip resister	RC0402JR-070R	Yageo
18	1	L2		inductor	LQH2MCN8R2M02	Murata
19	1	CON2		Connecter		HO YANG SYONE
20	2	CN3,CN4		Connecter	SFM-110-02-S-D-A	MetaTech
21	1	S1		Connecter	7865NS502BD000B	BO-JIANG
22	1	U1		UZ2400.D		UBEC

●CPU board circuit diagram

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TK-8850JH3E+UD
Size
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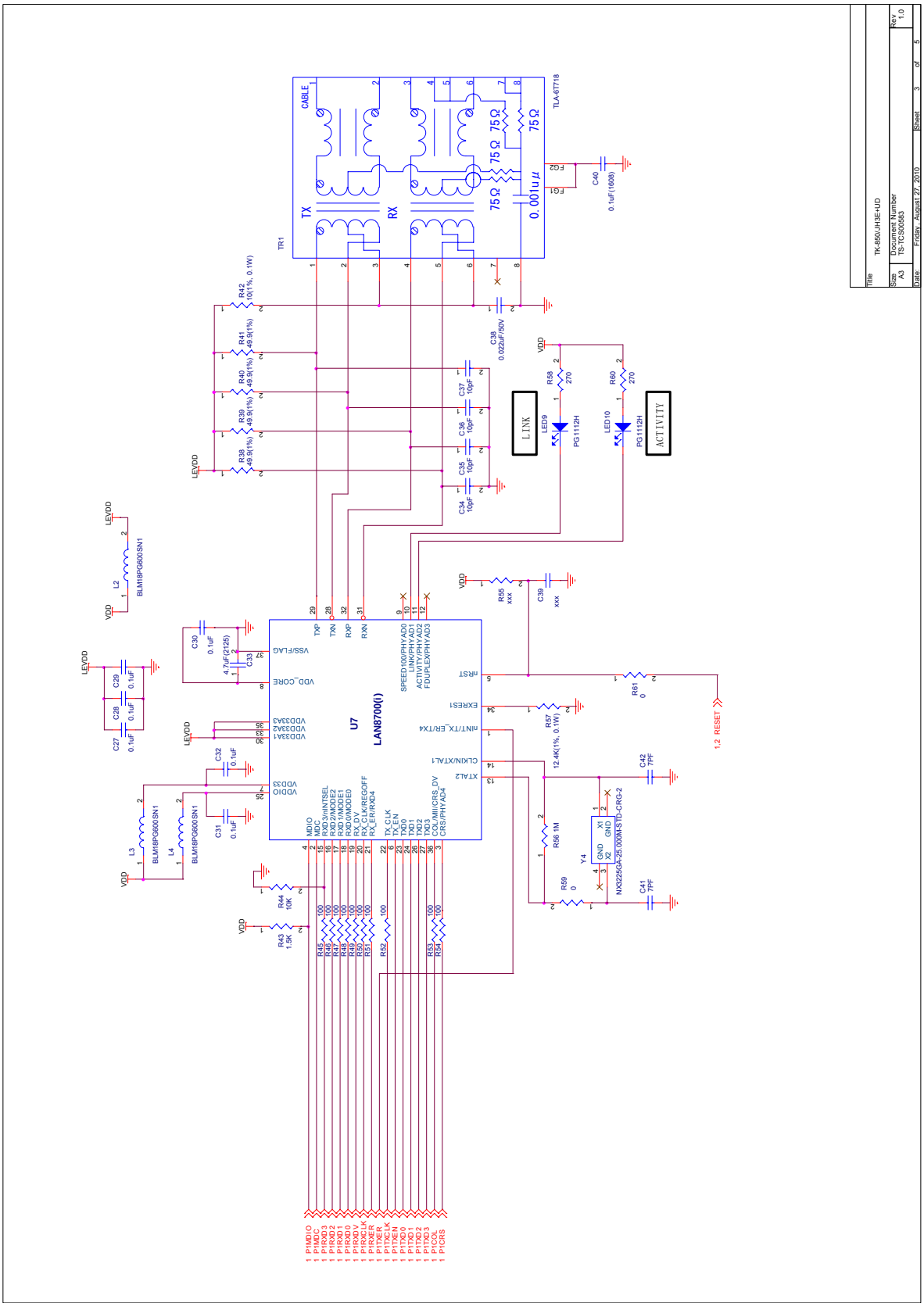
TS-TC800583
Rev
1.0
Date:
Friday, August 27, 2010
Sheet
2
of
5
U5
UPD78F0730MC
U4A
U4C
U4B
U3A
U3B
SN74LVC3G07DCT
SN74LVC2G125DCU
SN74LVC1G125DCK
SW1-1
SW1-2
SW1-3
SW1-4
CHS-08B
USB1
UX60SC-MB-5ST
Y3
CSTCE16M0V13L99-R0
L1
BLM41PG750S
MR1
MR2
CN1E4K-105J
VDD
USBVDD
FLMD0 1
TXD 1
RESET 1,3
1 RXD
1 T_RESET
FLMD0U
RESET
PD0
PD1
PD2
PD3
PD4
PD5
PD6
R24 100K
R25 100K
R26 1.5K
R27 1.5K
R28 1.5K
R29 100K
R30 10K
R31 10K
R32 100K
R33 1.5K
R34 27
R35 27
R36 10K
R37 1.5K
C18 0.1uF
C19 0.1uF
C20 0.47uF
C21 4.7uF/25V
C22 0.47uF
C23 0.1uF
C24 0.1uF
C25 0.1uF
C26 0.1uF(1608)
TPU1 TPD05
TPU2 TPD05
TPU3 TPD05
TPU4 TPD05
TPU5 TPD05
TPU6 TPD05
TPU7 TPD05
TPU8 TPD05
TPU9 TPD05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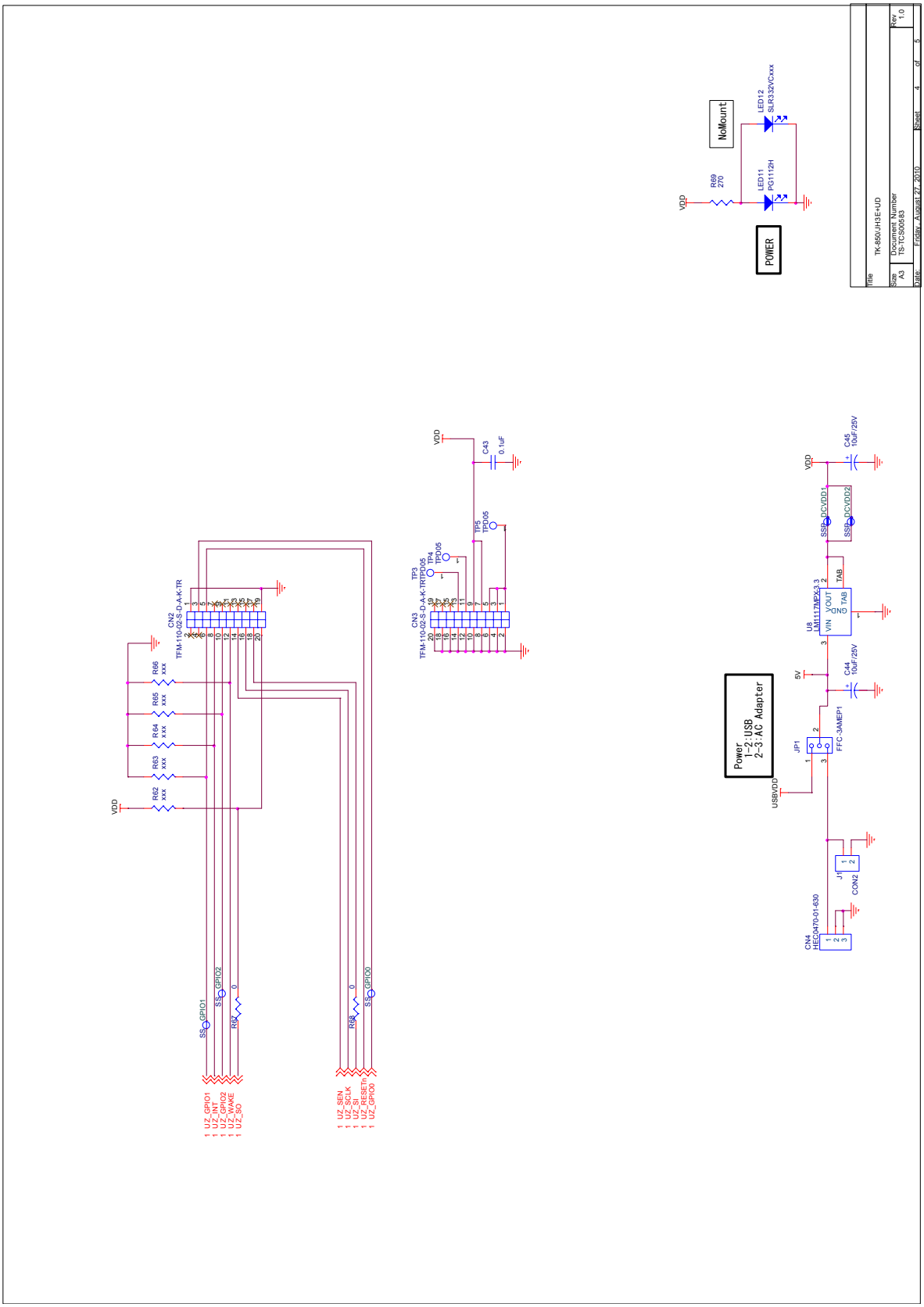
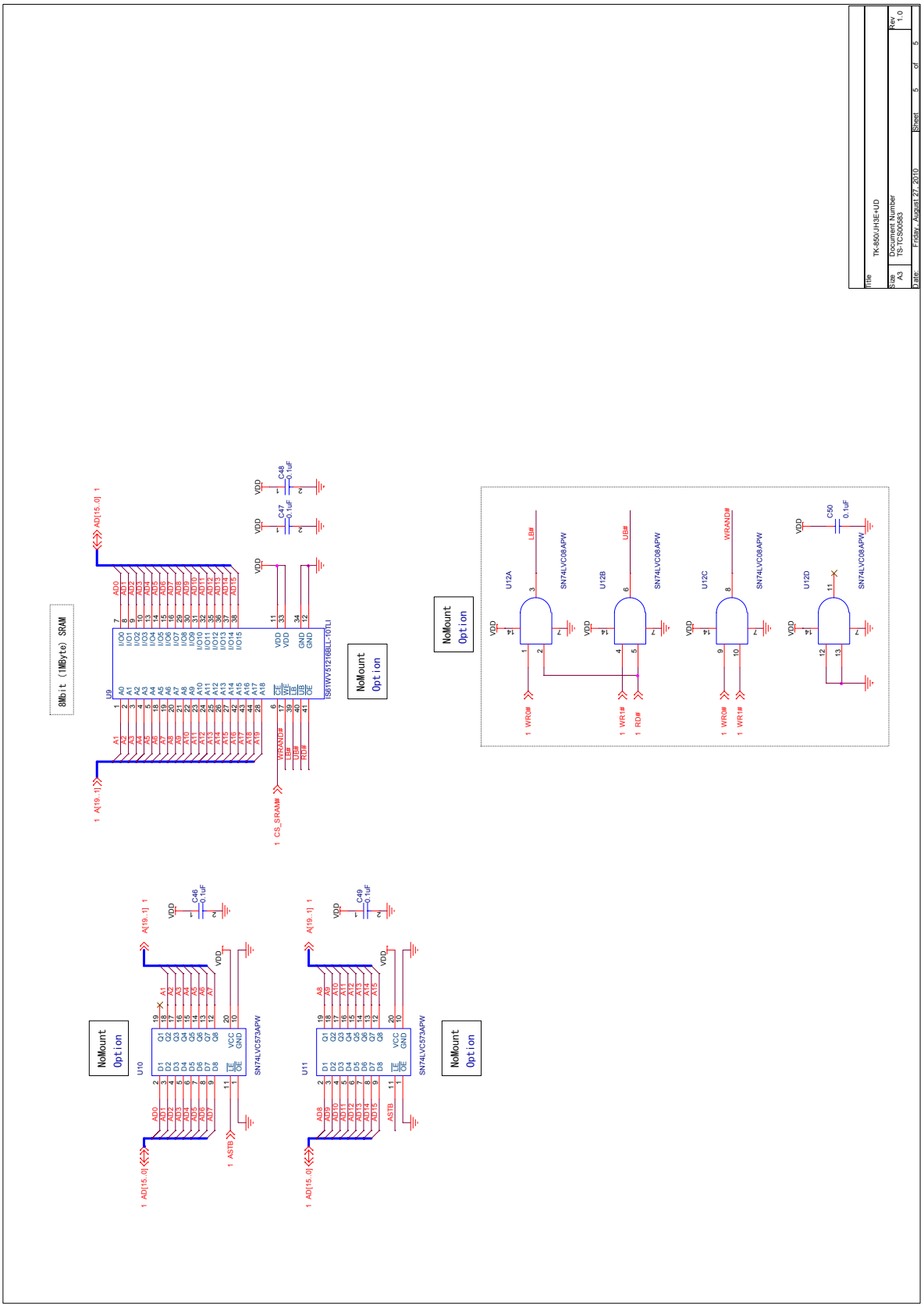
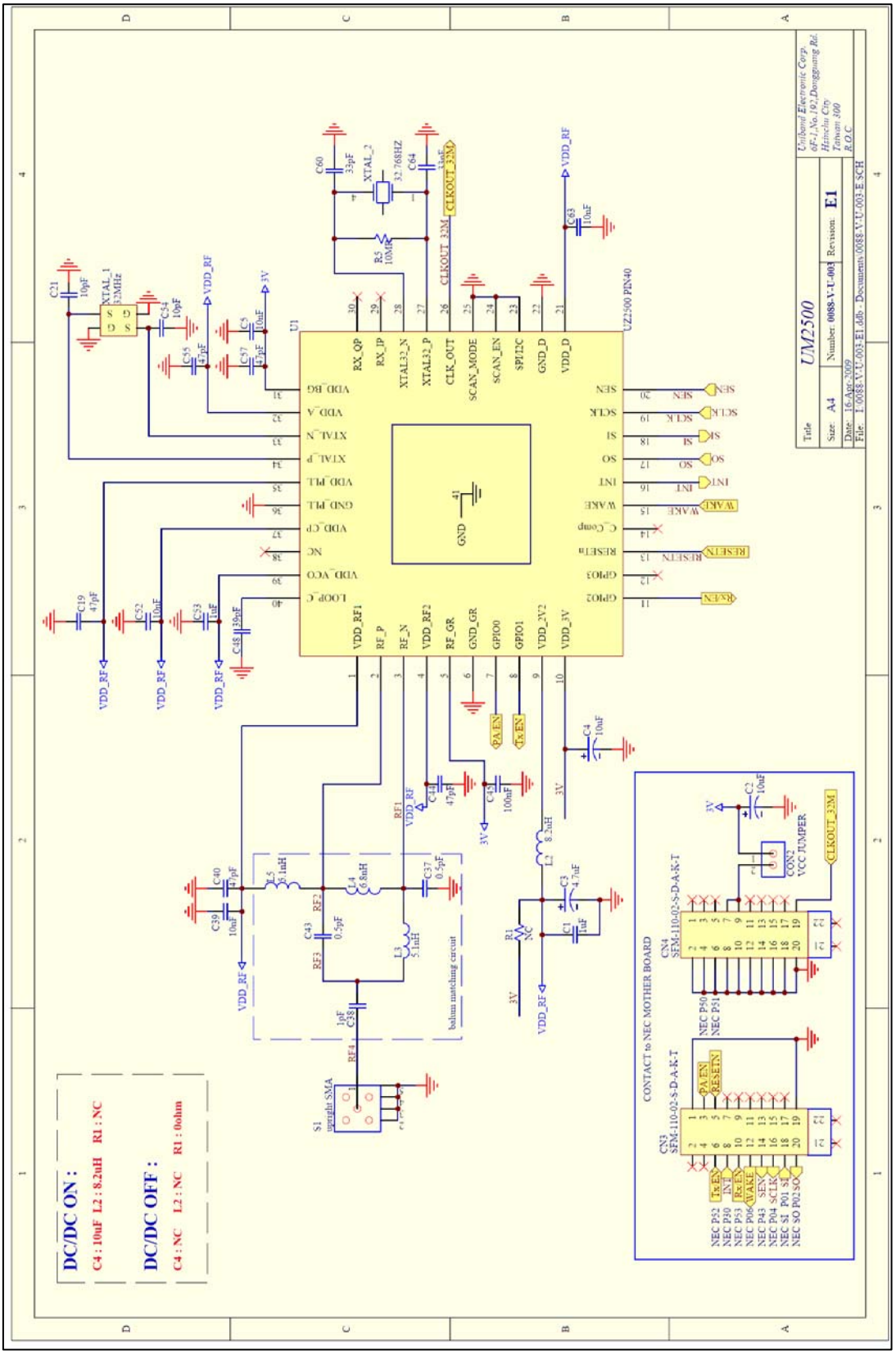
Document Number
TS-TC0500583
Rev
1.0
Friday, August 27, 2010
Sheet 3 of 5
TLA-6T718
CABLE
TX
RX
TR1
75Ω
0.001uμ
C40
0.1uF(1608)
C38
0.022uF/50V
R42
10(1%, 0.1W)
R41
49.9(1%)
R40
49.9(1%)
R39
49.9(1%)
R38
49.9(1%)
C37
10pF
C36
10pF
C35
10pF
C34
10pF
LINK
ACTIVITY
LED9
LED10
PG1112H
R58
270
R60
270
U7
LAN8700(i)
R55
xxx
C39
xxx
R61
0
R57
12.4K(1%, 0.1W)
R56 1M
R59
0
Y4
X1
NX3225GA-25.000M-STD-CRG-2
C42
7PF
C41
7PF
R44
10K
R43
1.5K
C30
0.1uF
C33
4.7uF(2125)
C29
0.1uF
C28
0.1uF
C27
0.1uF
C32
0.1uF
C31
0.1uF
L2
L3
L4
BLM18PG600SN1
1.2 RESET
P1MDIO
P1MDC
P1RXD3
P1RXD2
P1RXD1
P1RXD0
P1RXDV
P1RXCLK
P1RXER
P1TXCLK
P1TXEN
P1TXD0
P1TXD1
P1TXD2
P1TXD3
P1COL
P1CRS


TK-8850JH3E+UD
Document Number
TS-TC500583
Friday, August 27, 2010
POWER
NoMount
LED12
SLR332VCxxx
LED11
PG1112H
R69
270
VDD
CN2
TFM-110-02-S-D-A-K-TR
CN3
TFM-110-02-S-D-A-K-TRTPD05
TP3
TP4
TP5
TPD05
C43
0.1uF
R66
R65
R64
R63
R62
XXX
R67
R68
0
SS_GPIO1
SS_GPIO2
SS_GPIO0
1 UZ_GPIO1
1 UZ_INT
1 UZ_GPIO2
1 UZ_WAKE
1 UZ_SO
1 UZ_SSN
1 UZ_SCLK
1 UZ_SI
1 UZ_RESETn
1 UZ_GPIO0
Power
1-2: USB
2-3: AC Adapter
USBVDD
JP1
FFC-3AMEP1
5V
U8
LM1117MPX-3.3
VIN
VOUT
GND
TAB
C44
10uF/25V
C45
10uF/25V
SS_DCVDD1
SS_DCVDD2
J1
CON2
CN4
HEC0470-01-630


8Mbit (1MByte) SRAM
IS61WV51216BLL-10TLI
SN74LVC573APW
SN74LVC08APW
NoMount Option
C46 0.1uF
C47 0.1uF
C48 0.1uF
C49 0.1uF
C50 0.1uF
Title
TK-850UH3E+UD
Size A3
Document Number IS-YC5050683
Rev 1.0
Date: Friday, August 27, 2010
Sheet 5 of 5

● RF board circuit diagram



Chapter6 **Sample Program**

This chapter introduces the usage of other sample programs.

6.1 RF Test Program

This chapter describes how to run the RF test program using TK-850/JH3E+UD and TK-78K0R/KG3+UD.
The RF test program can monitor the “Packet Error Rate”, “Received Signal Strength Indication”, etc.
The RF test program uses USB interface on TK board for the serial port. If you try to write programs with using ID850QB debugger, the monitor program will be written as well. This causes programs not to work appropriately. Therefore, you need to use the flash memory program software (WriteEZ5) to write programs.

6.1.1. Procedure for one to one transmit/receive test

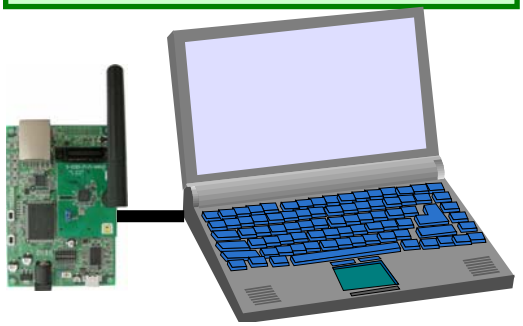
For the RF test, prepare one TK-78K0R/KG3+UD board and write the program "TK78K0RUD_RFTEST.hex", which is bundled with TK-78K0R/KG3+UD.

In the same way, prepare one TK-850/JH3E+UD board, write the program "C:¥TK850¥JH3E+UD¥V850ES_RF_Test¥Release¥RF_TEST.hex", by using WriteEZ5.
For writing programs to flash memory, refer to "5.4WriteEZ5".

* The RF Test Program uses USB interface on TK board for the serial port. If you try to write programs with using ID850QB debugger, the monitor program will be written as well. This causes programs not to work appropriately. Therefore, you need to use the flash memory program software to write programs. In the same way, you cannot debug the programs using ID850QB.

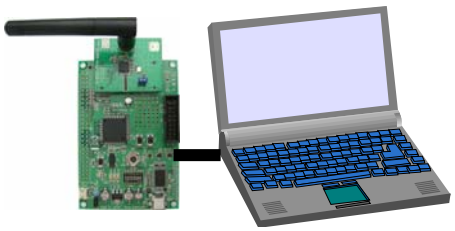
(Hereinafter, TK-850/JH3E+UD board and TK-78K0R/KG3+UD board are reffered as to the transmitter and the receiver, respectively).

Transmitter TK-850/JH3E+UD
Write "V850_RF_Test"



Short address：0001

Receiver TK-78K0R/KG3+UD
Write "TK78K0RUD_RFTEST"



Short address：0002

Please set the switches on the receiver board (TK-78K0R/KG3+UD) as follows.

JP1		1-2 Short (USB side)
SW1	Bit1	OFF
	Bit2	OFF
	Bit3	OFF
	Bit4	OFF
	Bit5	OFF
	Bit6	**ON for address setting**
	Bit7	OFF for address setting
	Bit8	**ON for the Receive mode**

The above example is for the short address of 0002.

There are four ways of the address setting as follows,

		Short Address			
		0001	0002	0003	0004
SW1	Bit6	OFF	ON	OFF	ON
	Bit7	OFF	OFF	ON	ON

By setting SW1-8 to ON, it becomes the receive mode. If you set them to OFF, it becomes HyperTerminal key input mode (this mode will be explained later in this document)
Please connect the receiver board (TK-78K0R/KG3+UD) to your first PC with a USB cable.

Now the receiver board(TK-78K0R/KG3+UD) is ready.

Next, you will set the transmitter (TK-850/JH3E+UD) and PC.
Please set the transmitter (TK-850/JH3E+UD) board as follows,

JP1		1-2 short(USB side)
SW1	Bit1	OFF
	Bit2	OFF
	Bit3	OFF
	Bit4	ON
	Bit5	OFF
	Bit6	OFF
	Bit7	OFF
	Bit8	OFF

This board is designated as the transmitter.

Then, please connect it to your PC with a USB cable.

Then, please identify the COM port number of the USB in your PC
at [Control Panel] → [System] → [Hardware] → [Device Manager] → [Ports (COM&LPT)]

Hyper Terminal

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

Setting of HyperTerminal

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

(Property -> Setting -> ASCII)

Local Echo OFF

No Line Feed

Reset the transmitter board.

Press RESET (SW2) on transmitter board (TK-850/JH3E+UD).

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

```
------------------------------------------------
1. PER test / sender (shift+1 .. Retry result)
2. PER test / receiver
3. Continuous TX / Pseudo Noise
4. Continuous TX / Raw carrier
------------------------------------------------
5. RX mode
6. Idle mode
8. Standby mode
9. Deep Sleep mode
0. Power down mode
------------------------------------------------
A. Set RF channel
C. Disable CSMA/CA
M. Manually set RF registers
P. Packet receive report: RSSI/LQI
T. Packet Transmission for the command P
R. Reset RF
------------------------------------------------
My MAC_ADDR = 0x0001
Command? >
```

Execution of the Transmit/Receive Test

To initiate the PER, Packet Error Rate, test, please press “1” in the menu. You will see [My Profile], then, be asked for the destination of the PER test, as shown below.

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

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

Now, you may input “0002”.

Then, you will be asked how many packets you wish to consume in the PER test.

You may input “1000”.

Then, you will be asked the interval of packets in msec.

You may input 3 msec.

Then, the PER test will be executed.

You will see,

the number of packets sent, that is, 1000 as you input,

the number of the received packets,

the calculated PER in %

and the maximum and minimum RSSI values in the PER test.

[Note]

PER= Packet Error Rate

RSSI= Received Signal Strength Indication

```
Send to (Short addr) ? : 1 (PER test/sender)

[My Profile]
---------------------------------------
   MAC : 22:95:00:01:00:00:00:47
Short : 0001
PanID : 2514
---------------------------------------
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
Received : 1000
PER          :     0.0000%
RSSI        : max ff / min 9d
---------------------------------------

Press any key to the menu
```

RSSI is expressed in the hexagonal value of 256 levels, which indicates the signal strength in the received signal. For more details of the RSSI value, please refer to the datasheet of the UZ2400 RF chip.

Please note the PER and the RSSI are measured at the receiver side.

The receiver does not send back the test packets, but only the test result.

6.1.2. 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.
In your current case, your receiver board is now being connected to the debugger. Therefore, you cannot access to these menu to utilize this mode setting. Alternatively, you have set the receiver board to the receiver mode by setting the switch 1-8.

6.1.3. 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 A, and the output power using the menu 0.

6.1.4. 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 A.

6.1.5. RX Mode

The Menu 5 initiates the receiver mode.

6.1.6. IDLE MODE

The Menu 6 sets the UZ2400 into the IDLE mode.

6.1.7. Sleep MODE

The Menu 7 sets the UZ2400 into the Deep Sleep mode.

6.1.8. Standby MODE

The Menu 8 sets the UZ2400 into the Standby mode.

6.1.9. Set RF channel

The Menu A allows you to set the RF channel.

6.1.10. Manually set UZ2400 register

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

6.1.11. Resetting RF

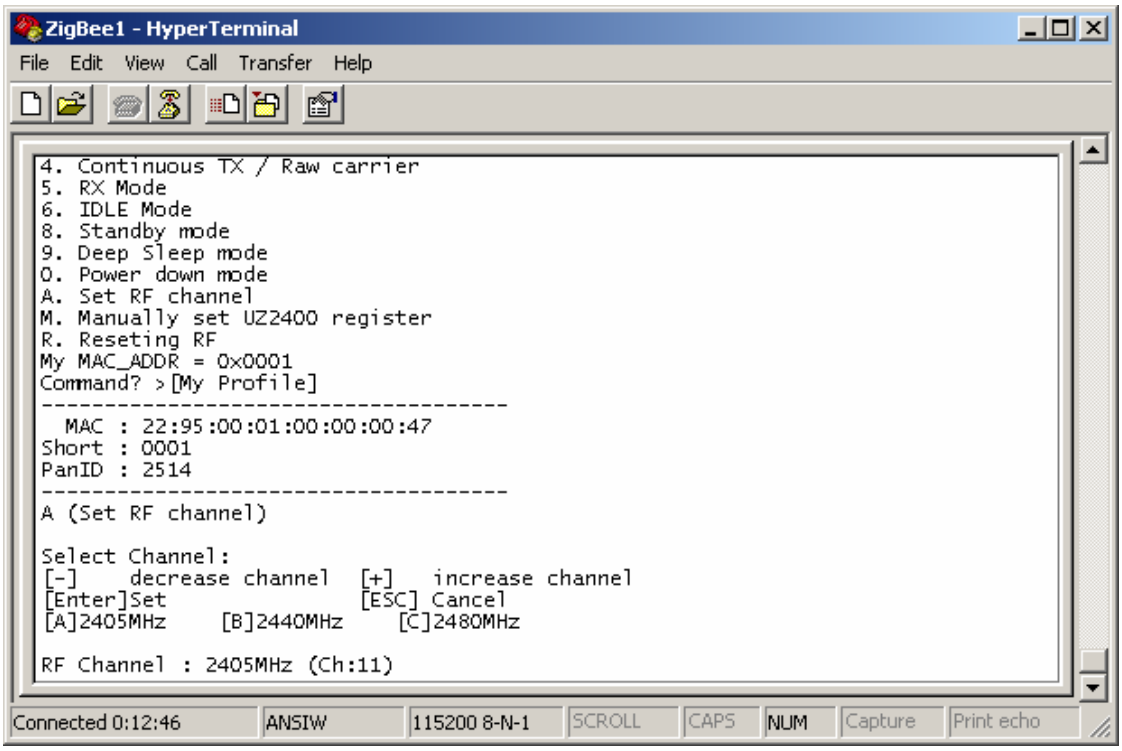
The Menu R allows you to reset the UZ2400 registers.

6.1.12. Channel setting

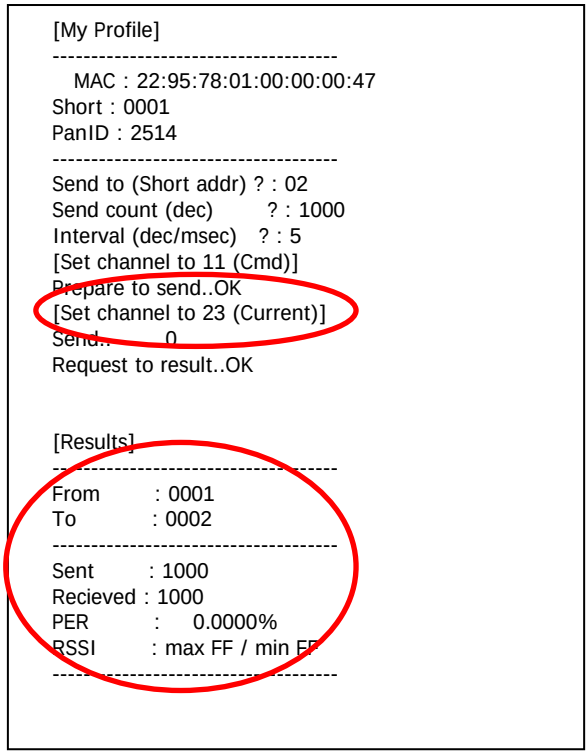
In the previous example, you may have also found the RF channel used in this test is the Channel 11. The channel is specified by the IEEE 802.15.4 specification.

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.



6.1.13. 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 “274”.
Then you will see, “LREG[274] : 00 >”.
It means the current value at the register [274] is 0xC4h, which means 0 dB.
0xC4h is the reset default.

The register bits are defined as follows,

LREG[274]: [7:6] -> large scale tuning
C4: 0 dB
81: -8 dB
09: -16 dB
01: -24 dB

LREG[203]: [7:3] -> small scale tuning
000000: 0 dB
000001: -0.1dB
|
111111: -8.00 dB

For instance, if you wish -8 dB, please input “81”, as follows,

“LREG[274] : C4 > 81”

Then, you will start the PER test.

6.2 Ethernet gateway sample program

This Ethernet gateway sample program starts working automatically as Zigbee coordinator when it is turned on, and you can collect network information of the Zigbee network via Ethernet.

For use, write [TK-850JH3E+UD_ZC.hex] to the TK-850/JH3E+UD with the WriteEZ5.

Refer to the "TK-850/JH3E+UD sample program reference manual" for details.

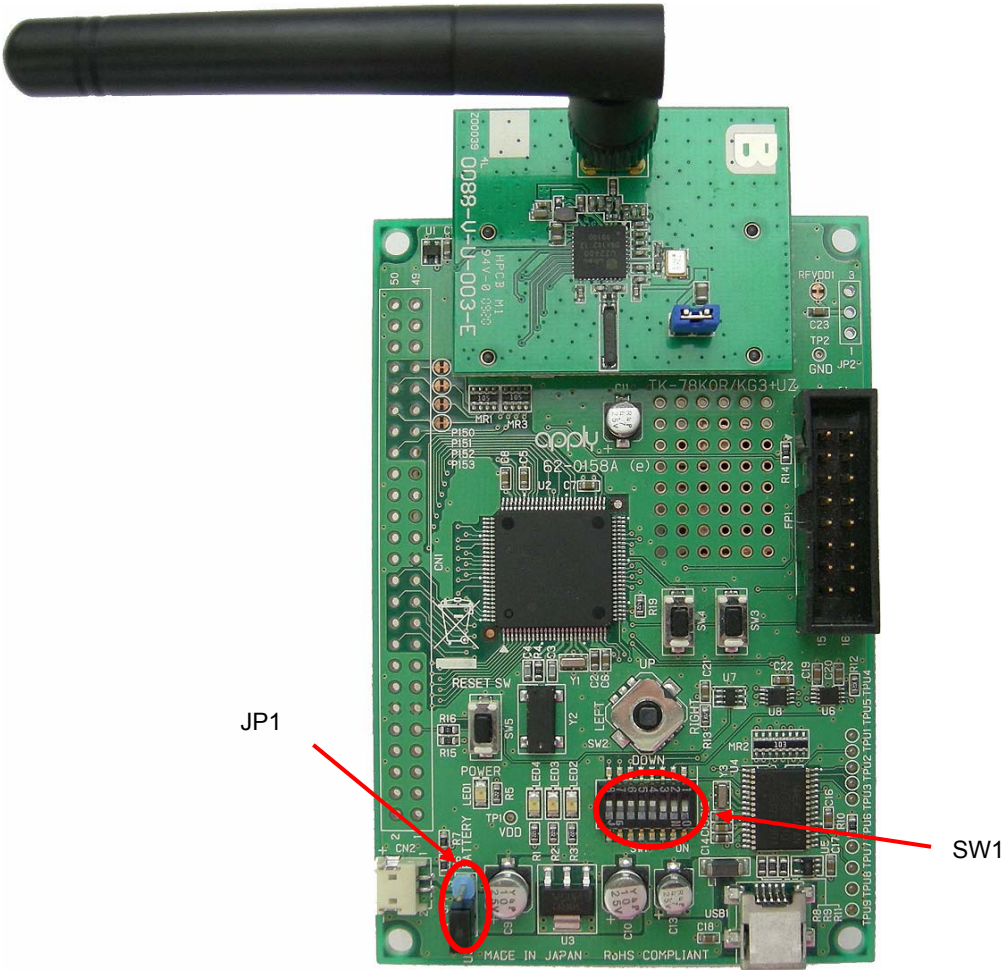
Chapter7 Mode setting of the TK-850/JH3E+UD board

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

Case / Switch	Normal mode	Debug, WriteEZ5 Mode with USB	N-Wire emulator
SW1 - 1	OFF	OFF	OFF
SW1 - 2	OFF	ON	OFF
SW1 - 3	OFF	ON	OFF
SW1 - 4	OFF/ON ＊	ON	OFF/ON ＊
SW1 - 5	Don’t care	Don’t care	Don’t care
SW1 - 6	Don’t care	Don’t care	Don’t care
SW1 - 7	Don’t care	Don’t care	Don’t care
SW1 - 8	Don’t care	Don’t care	Don’t care

＊ Set this ON when you use serial communication through USB connection.

Mode setting of the TK-78K0R/KG3+UD board



SW \ Usage case		Normal (Written program works)	Debug (USB Connection)
JP1		Select by power supply source	1-2short (USB side)
SW1	Bit1	OFF	ON
	Bit2	OFF	ON
	Bit3	OFF	ON
	Bit4	ON	OFF
	Bit5	ON	OFF