User's Manual
TK-850/JH3U-SP

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CAUTION

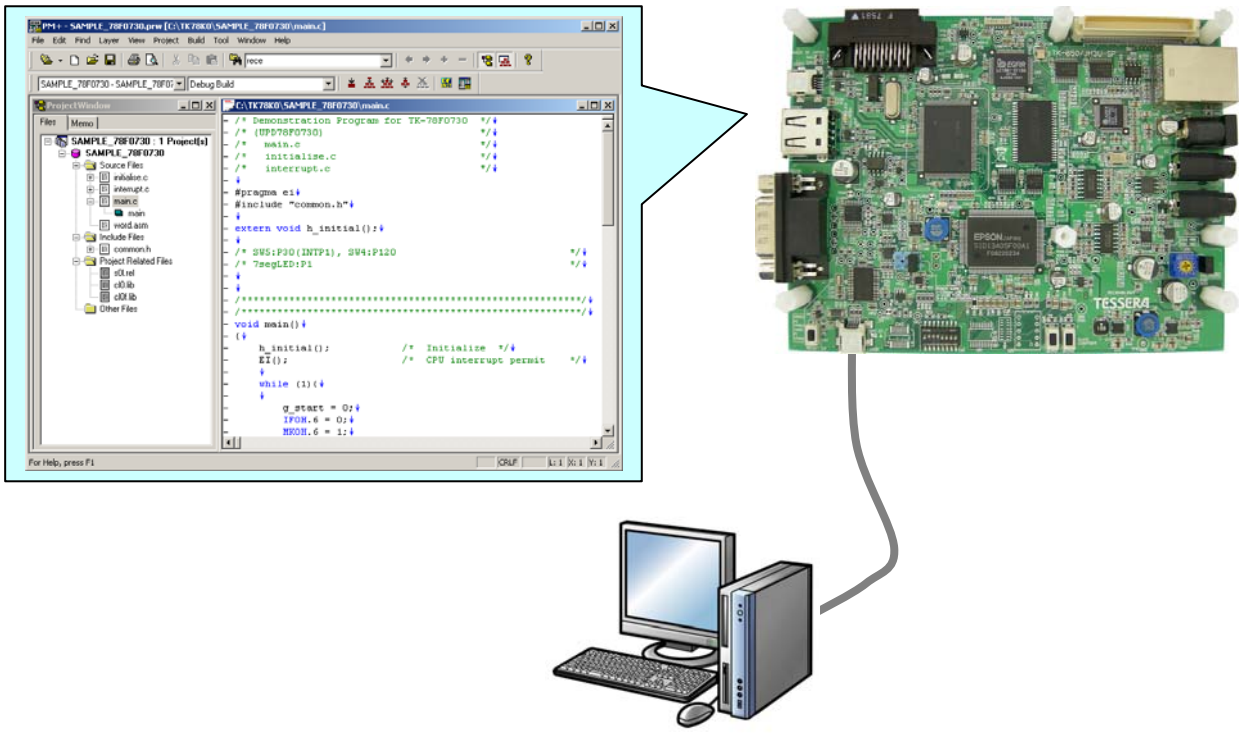
・Do not give any physical damage to this equipment such as dropping
・Do not superimpose voltage to this equipment.
・Do not use this equipment with the temperature below 0℃ or over 40℃.
・Make sure the USB cables are properly connected.
・Do not bend or stretch the USB cables.
・Keep this equipment away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

Contents

Introduction

TK-850/JH3U-SP is the evaluation kit for development using "V850ES/JH3-U", NEC Electronics 32bit all flash microcontroller.
The user only needs to install the development tools and USB driver, and connect the host machine with the target board to start the code development, build, monitoring the output, and debugging code.
(This demonstration kit uses the on-chip debug feature from the microcontroller itself, without emulator connection)

Configuration for Debugging



Overview This manual consists of the following contents.
Read chapter 1 and 2 first for installing the development tools and using the sample programs.
Read chapter 3-5 for customizing the sample programs and the hardware.

Chapter 1: Preparations
Install the development tools

Chapter 2: Experiences
Experience the basic operations of integrated development environment (PM+) and integrated debugger (ID850QB) with using sample programs.

Chapter 3: Hardware Specifications
Explain the hardware of TK-850/JH3U-SP

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.

Reader This manual is intended for development engineers who wish to become familiar with the development tools for the V850.
It is assumed that the readers have been familiar with basics of microcontrollers, C and Assembler languages, and the Windows™ operating system.

Purpose This manual is intended to give users an understanding of the features, hardware configurations, development tools for the V850.

CHAPTER 1　Preparation

This chapter describes following topics:

- Overview and installation of development tools
- Installation of development tools
- Overview and preparation of sample programs

Users can experience the development flow such as coding, build, debugging, and test, by using the development tools bundled with TK-850/JH3U-SP.

1.1 Development Tools / Software

- Device file DF703771 V1.00

  A device file contains device specific information. So, users need a device file to use the development tools.

- Integrated Development Environment (IDE) PM+ V6.31

  The IDE works on Windows operation system.
  Users can develop a system efficiently by using the editor with idea processor function, compiler, and debugger.

- C Compiler CA850　W3.20 (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.

- V850 Integrated Debugger ID850QB V3.50

  This is the tool for debugging the object program generated by C compiler and assembler. The debugger enables to do C source level debugging. With the debugger, you can debug the code easily and efficiently by refering and changing variables, using step-in debuging function, and so on.

- Built-in Flash Memory Writing Program WriteEZ1

  This is the Windows software to write programs on built-in flash memory.
  By connecting TK-850/JH3U-SP and PC with bundled USB cable, you can write/delete programs on the built-in flash memory.

- Sample program

  The explanation uses Mass storage class (MSC) sample program in user's manual.

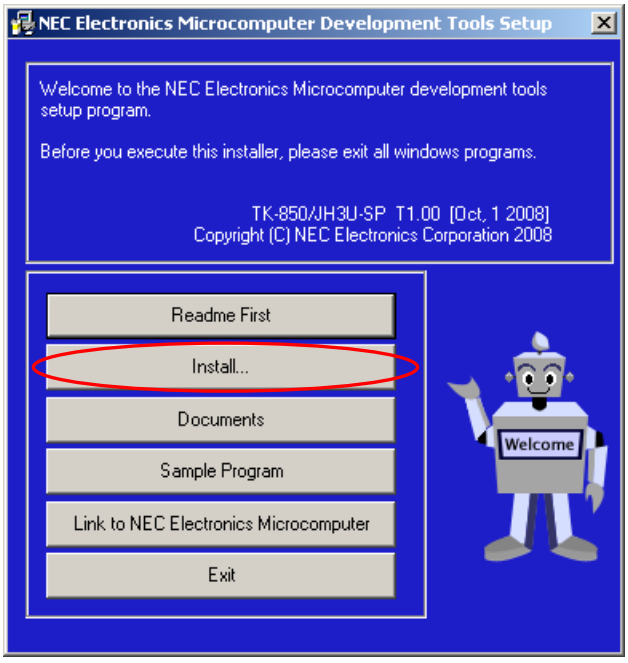
1.2 Installation of Development Tools

1.2.1 Installation Package

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

1.2.2 Installation of Development Tools

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



<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

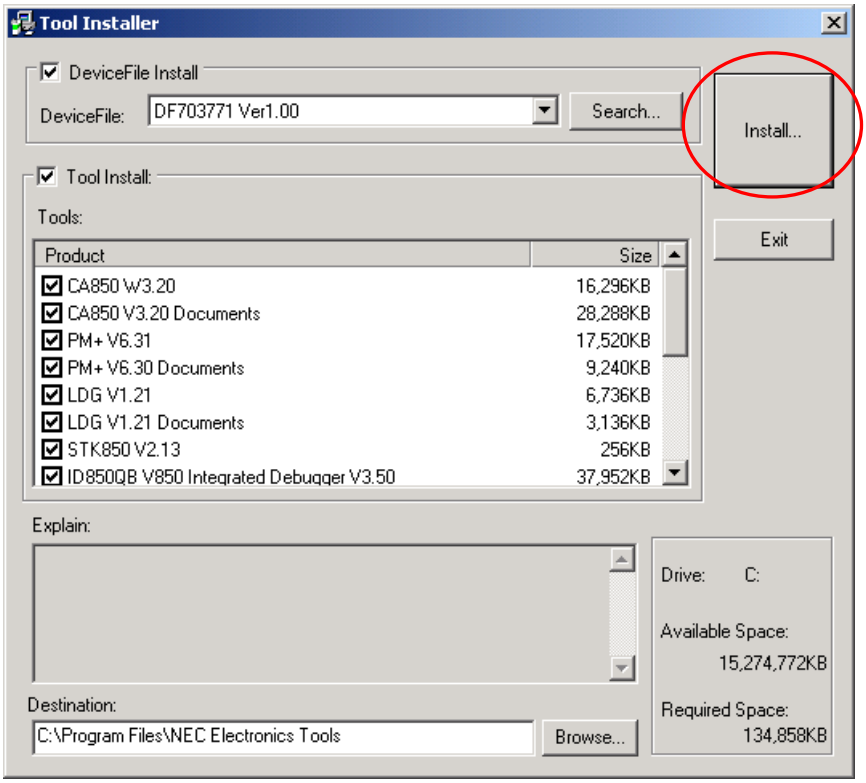
Terminate the setup.

② Click the "Install"

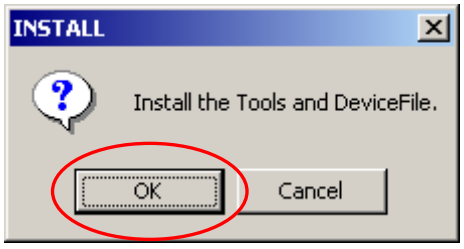
③ "Tool Installer" dialog box is opened.
Select products that you need to install.
(as default, all the products that you need to use the TK-850/JH3U-SP are selected.)
"Explain" area displays an explanation of the selected product.
To change the installation destination, click Browse··· .

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

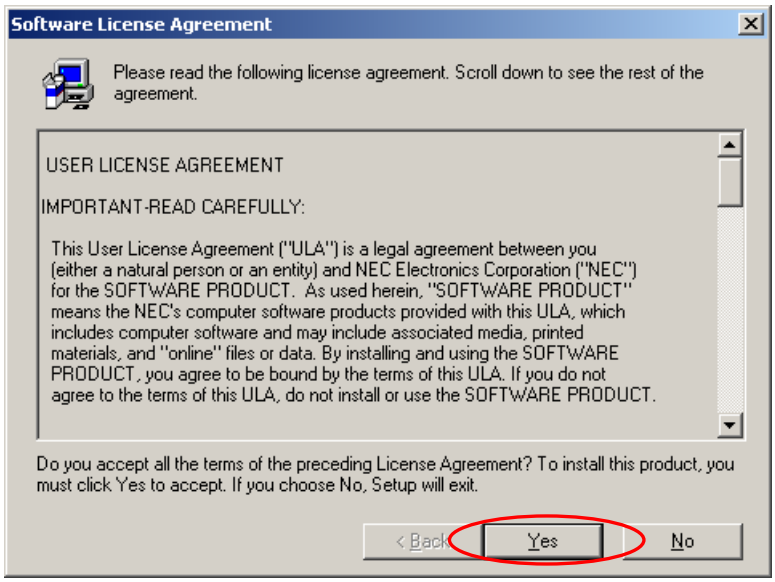
* In this document, it is assumed that users install the programs under "NEC Electronics Tools" directory (default installation directory). Users can find the tools by selecting "Start Menu" -> "Programs" -> "NEC Electronics Tools".



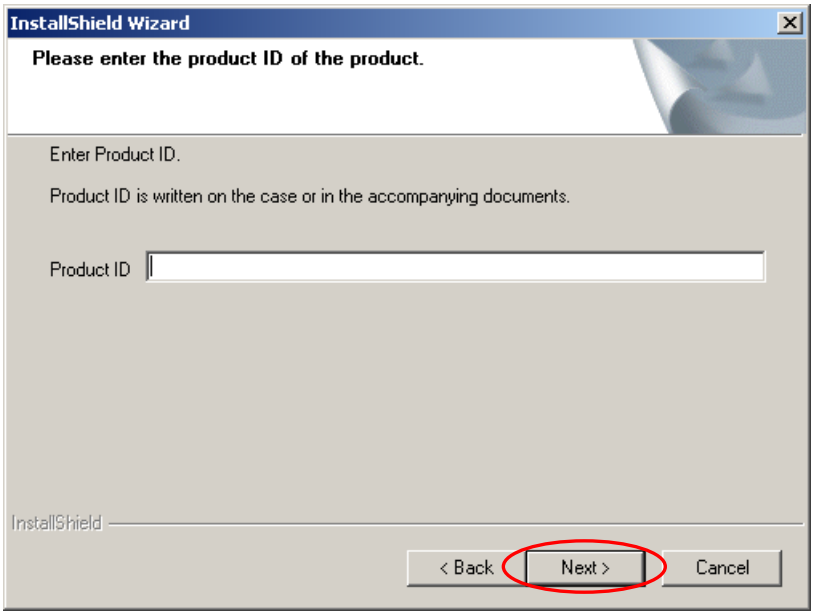
④ Click OK when "Install" comfirmation dialog box is opened.



⑤ Read "software license agreement" and click [Yes] for continuing the installation.
To stop the installation, click [No] .

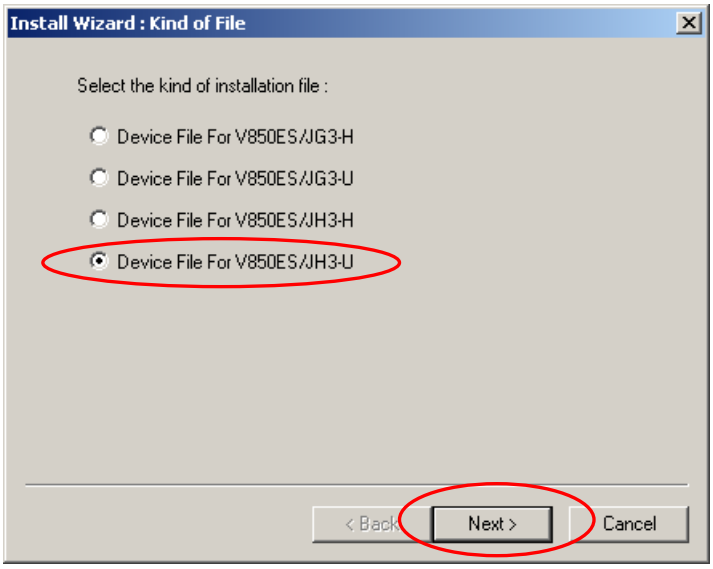


⑥ Enter the product ID, and click [Next] .
＊ The product ID is available on the other sheet.

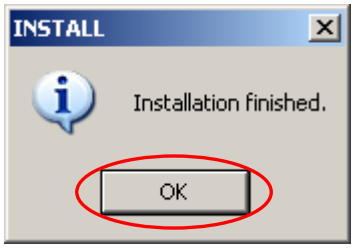


⑦ It starts copying the files.

⑧ If the "install Wizard :Kind of File" dialog displayed, Select "Device File For V850ES/JH3-U". Click OK .



⑨ When the installation is completed, the following dialog opens. Click OK .



Notes on the installation authority

To install this tool in Windows 2000 or XP, the authority of an 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.

Limitation

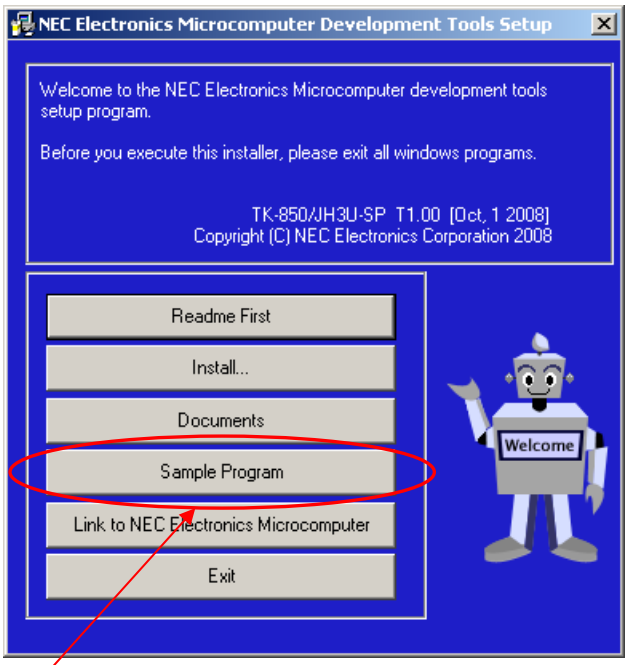
Assembler RA850 and C compiler CA850 limit the object size to 128Kbyte.

1.3 Sample Programs

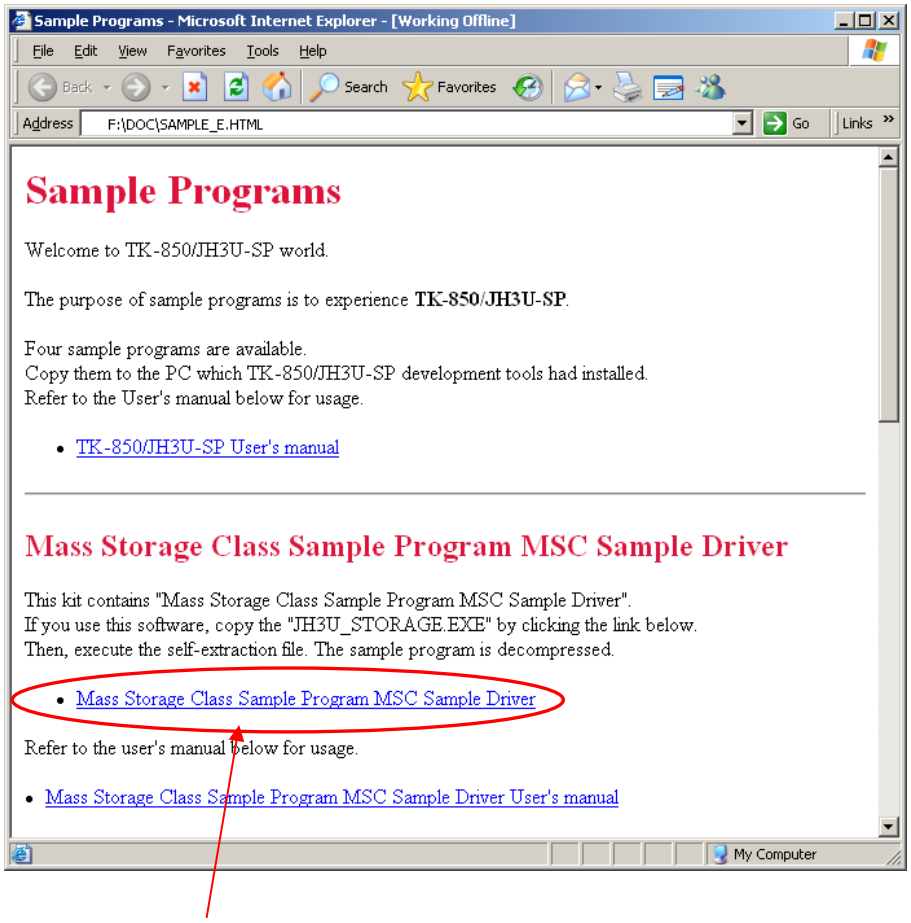
This section explains the overview and preparation of sample programs.

1.3.1 Preparation of Sample Programs

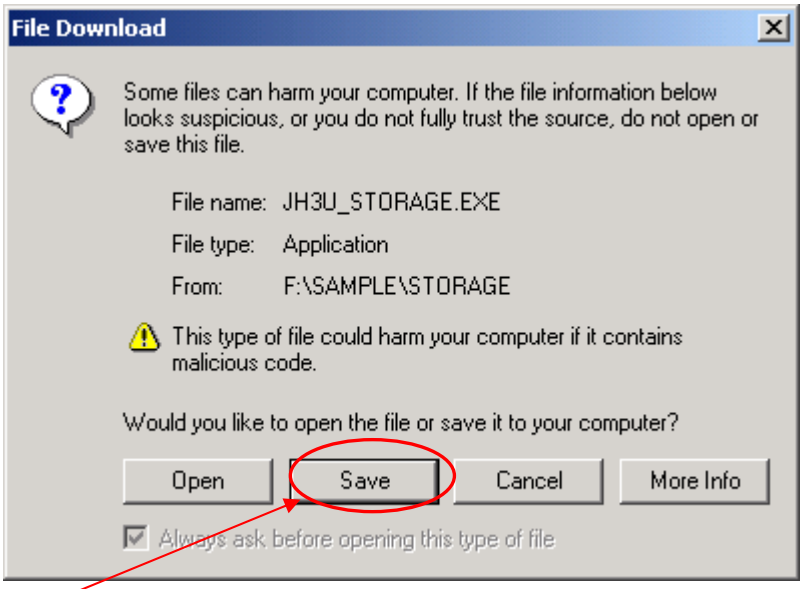
① Insert the CD-ROM disk in the CD-ROM drive of your PC. The [NEC Electronics Microprocessor Development Tools Setup] screen automatically appears.(if this screen does not appear automatically, start setup.exe from Explorer. etc.)



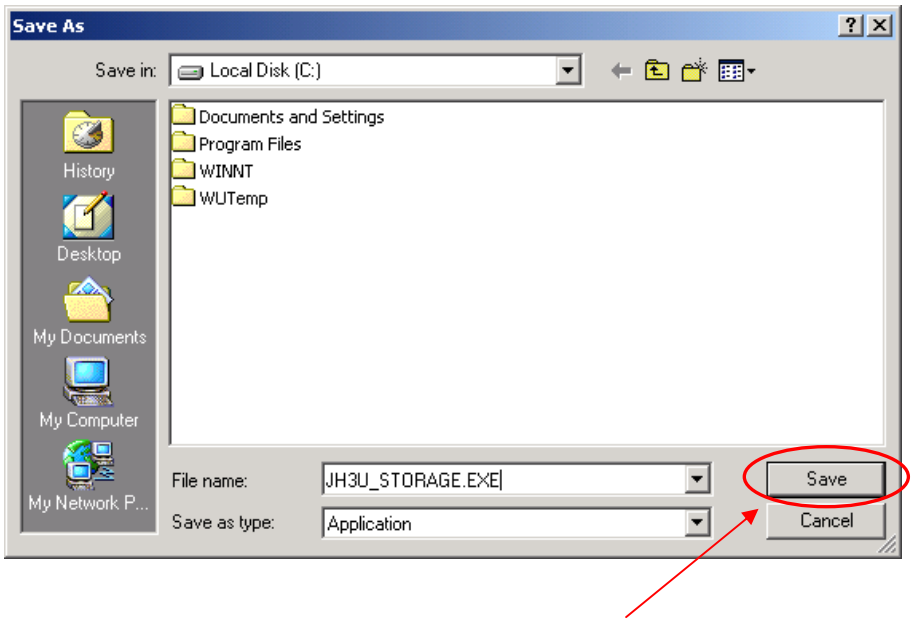
② Press the Sample Program button to start the WWW browser.



③ Click the "Mass Storage Class Sample Program MSC Sample Driver " link , the following download confimation window appears.



④ Click the Save butten.

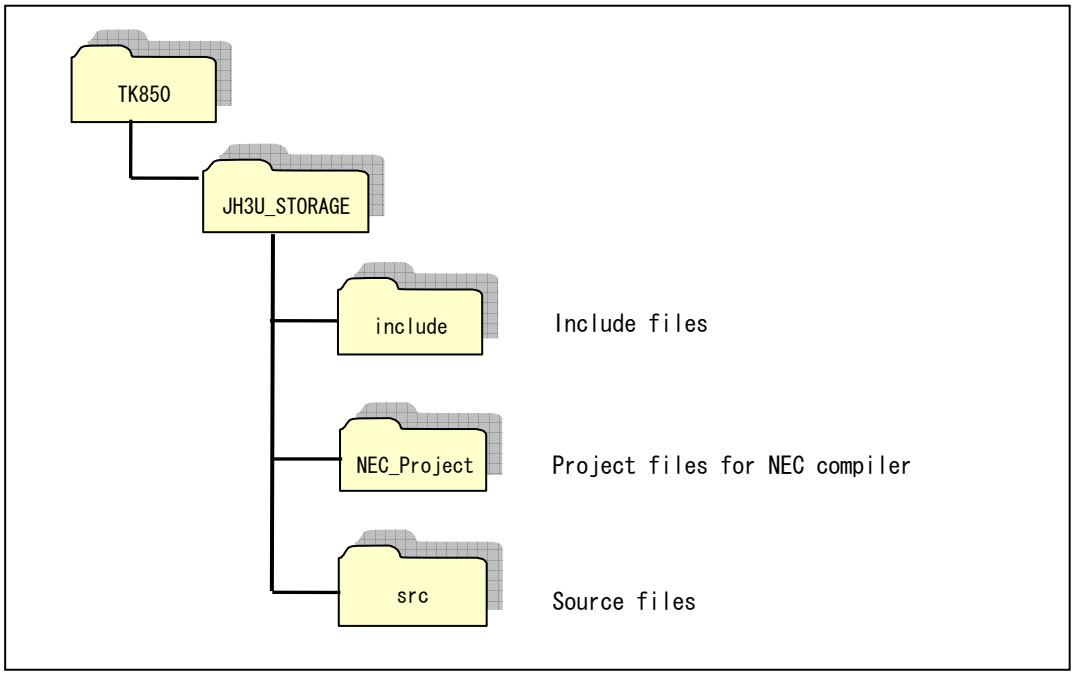


⑤ After specifying the download destination folder, click the Save button.

⑥ The self-extraction sample program (JH3U_STORAGE.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 Overview of Sample Programs

The "Mass Storage Class Sample Program MSC Sample Driver" consist of following folders.



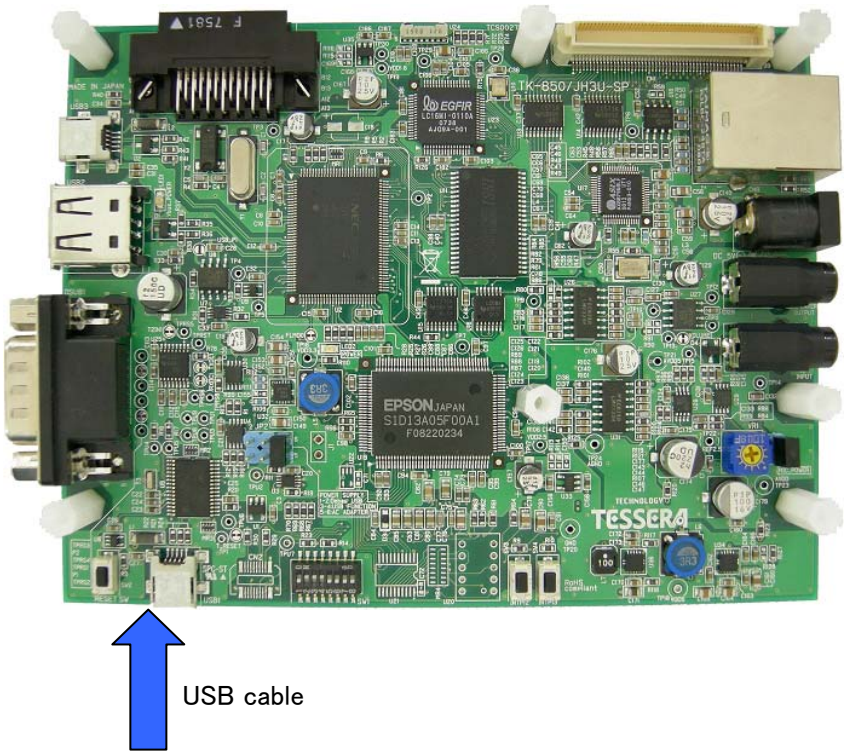
1.4 Installation of USB Driver

"NEC Electronics Starter Kit Virtual UART" USB driver must be installed on PC before you start using the TK-850/JH3U-SP.
Please, follow the instruction below to install the driver.
"Starter Kit USB Driver" must be installed on the PC. If not, please refer to "1.2 Installation of Development Tools" to install the driver first.

CAUTION:

Do not use a USB hub for connecting 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

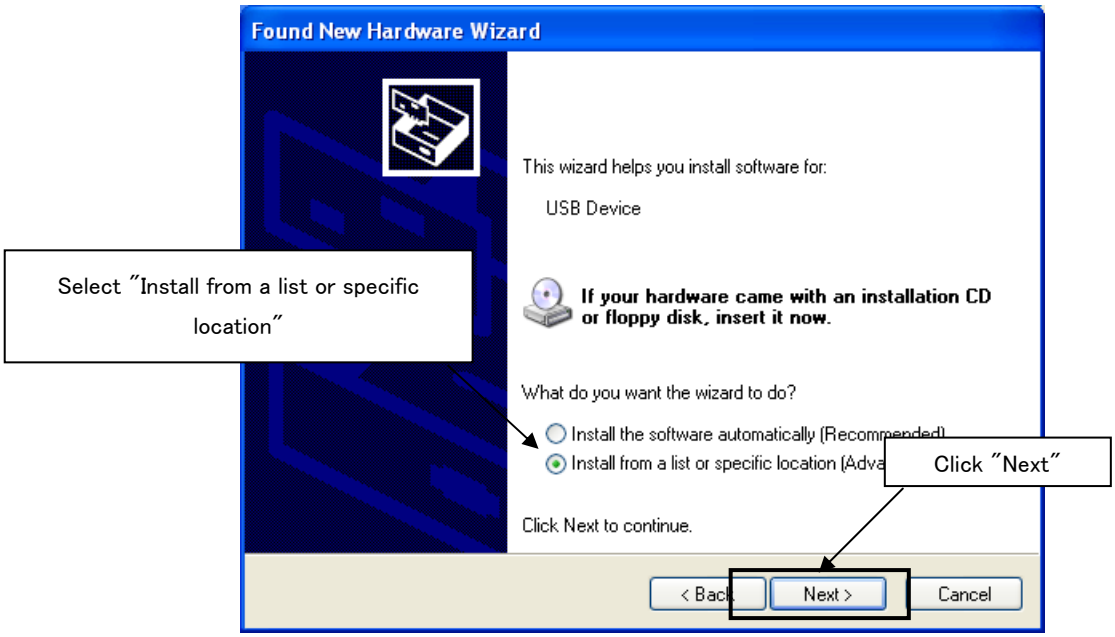
- Windows XP -> "1.4.1 Installation on Windows XP"
- Windows 2000 -> "1.4.2 Installation on Windows 2000"

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

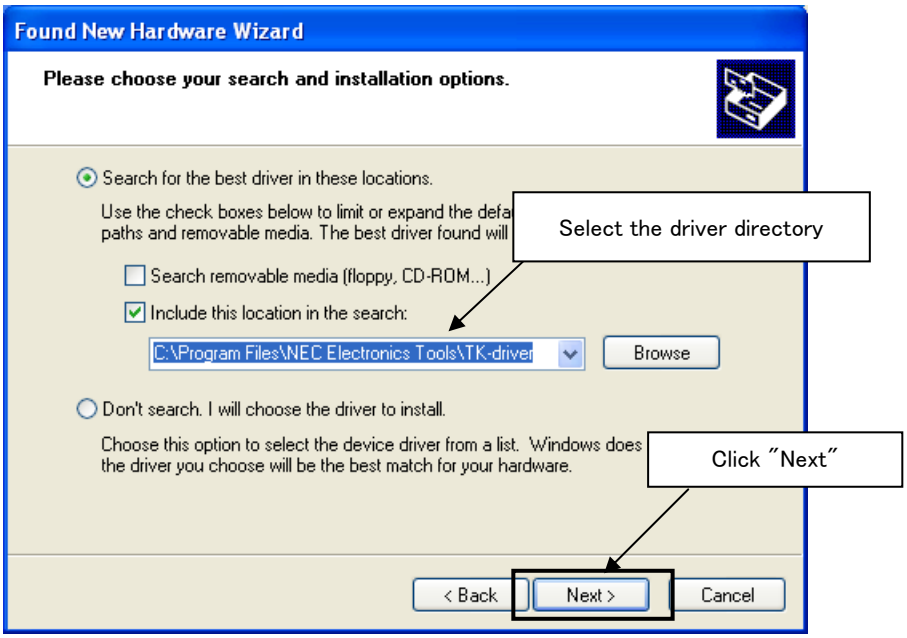
1.4.1 Installation on Windows XP

1. Once the TK-850/JH3U-SP is connected with USB, the "Found New Hardware Wizard" will be started.
   Select "No, not this time" and click Next > .

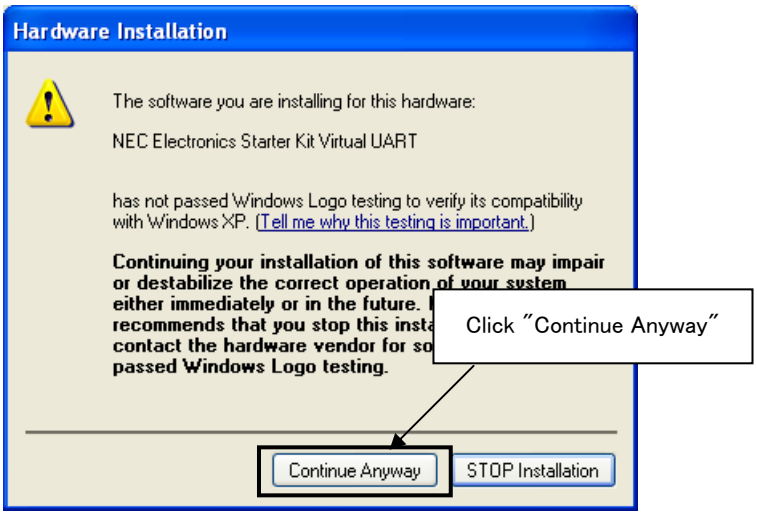
2. Select "Install from a list or specific location" and click Next > .



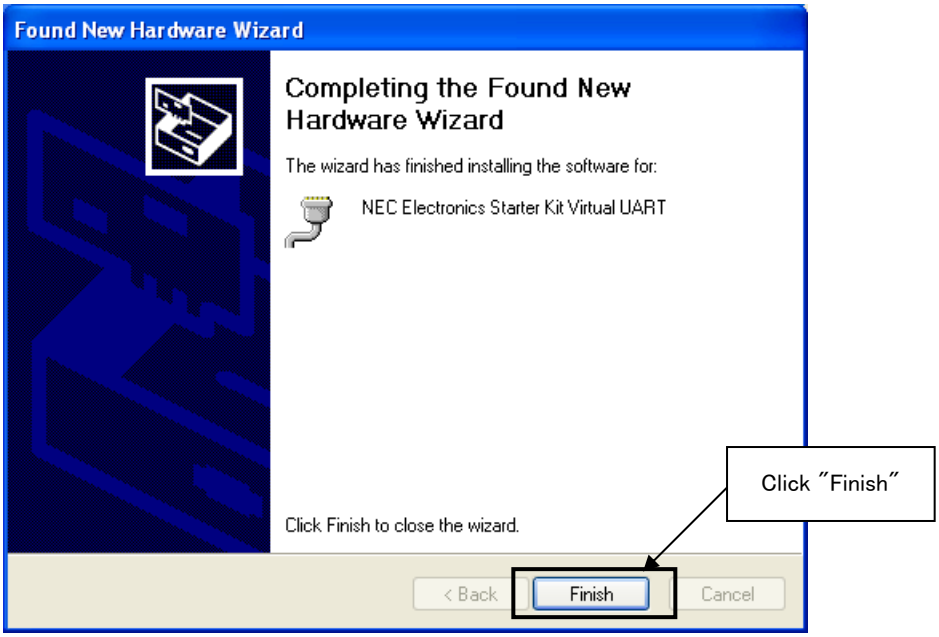
3. Select "Search for the best driver in these locations.", check "Include this location in the search:", and then click "Browse..." to select the driver directory path. The path should be "C:¥Program Files¥NEC Electronics Tools¥TK-driver" as default installation. If the installation directory is not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

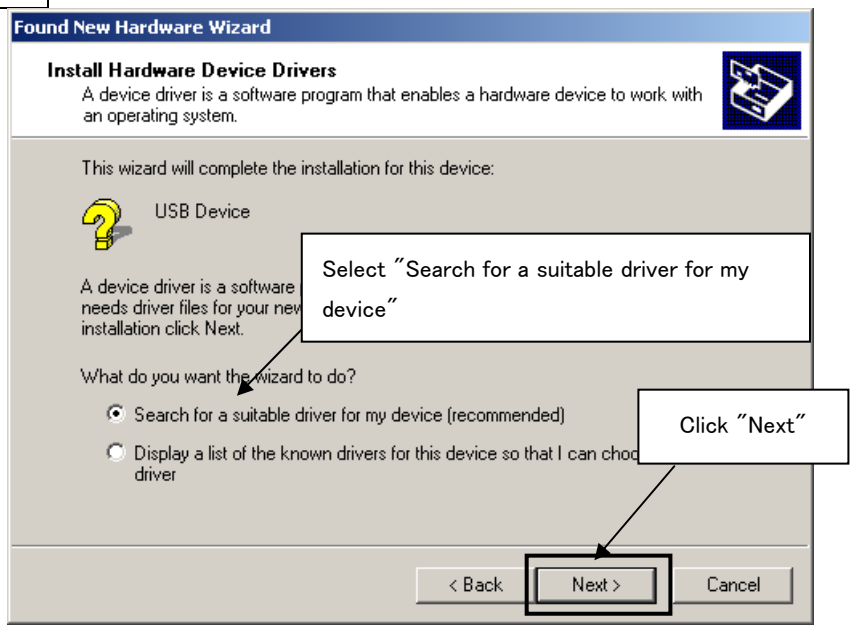


6. Go to "1.4.3 Completion of USB Driver Installation".

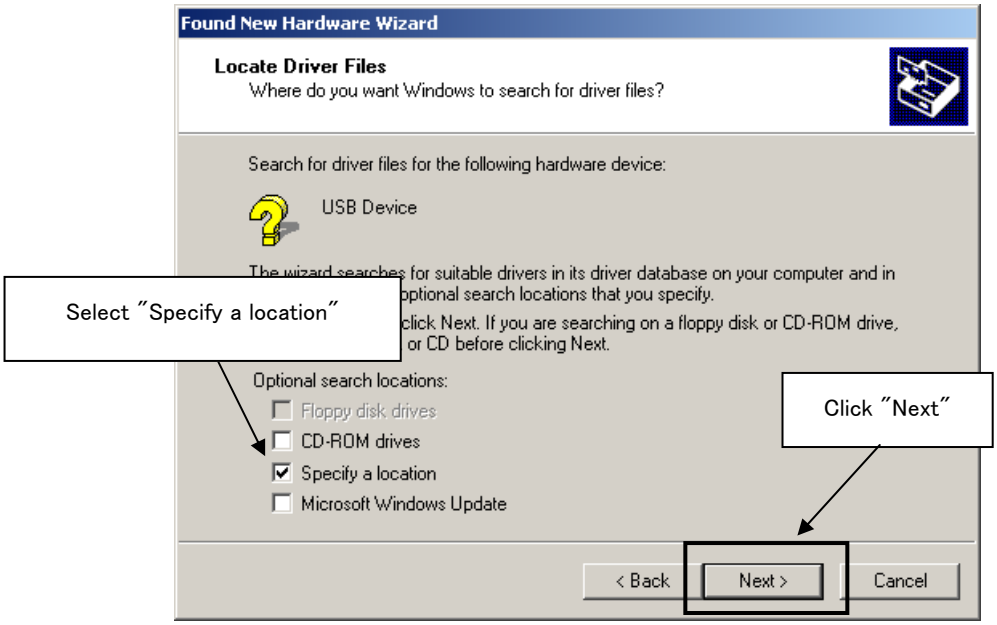
1.4.2 Installation on Windows 2000

1. Once the TK-850/JH3U-SP is connected with USB, the "Found New Hardware Wizard" will be started.
   Select "No, not this time" and click [Next >] .

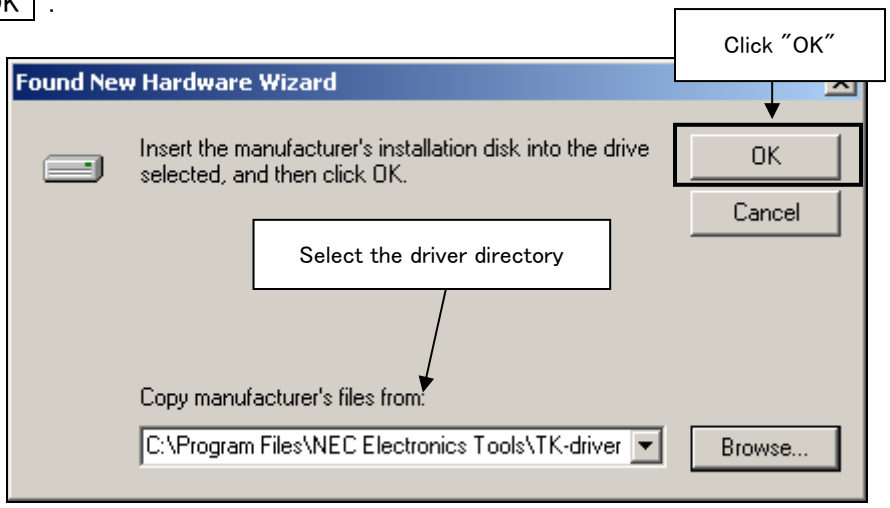
2. Select "Search for a suitable driver for my device".
   Click [Next >] .



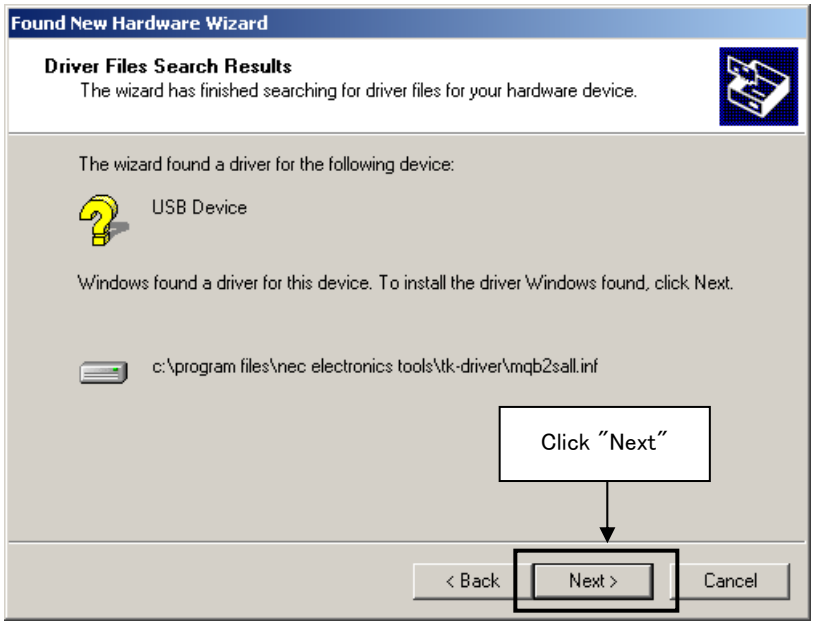
3. Select "Specify a location".
   Click [Next >] .



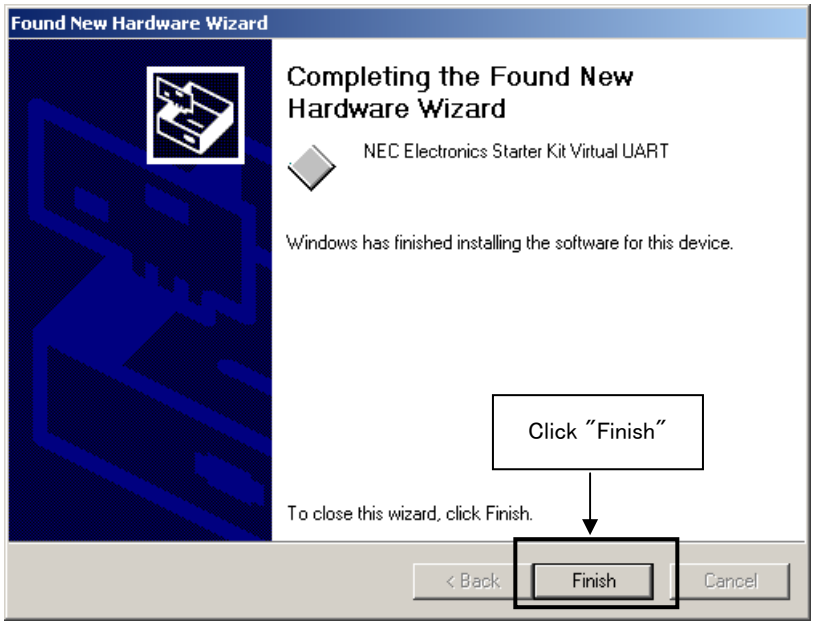
4. Select the driver directory path. The path should be "C:¥Program Files¥NEC Electronics Tools¥TK-driver" as default installation.
   If the installation directory is not default, then select "TK-driver" under the installation directory.
   Click [OK] .



5. Click Next > .



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



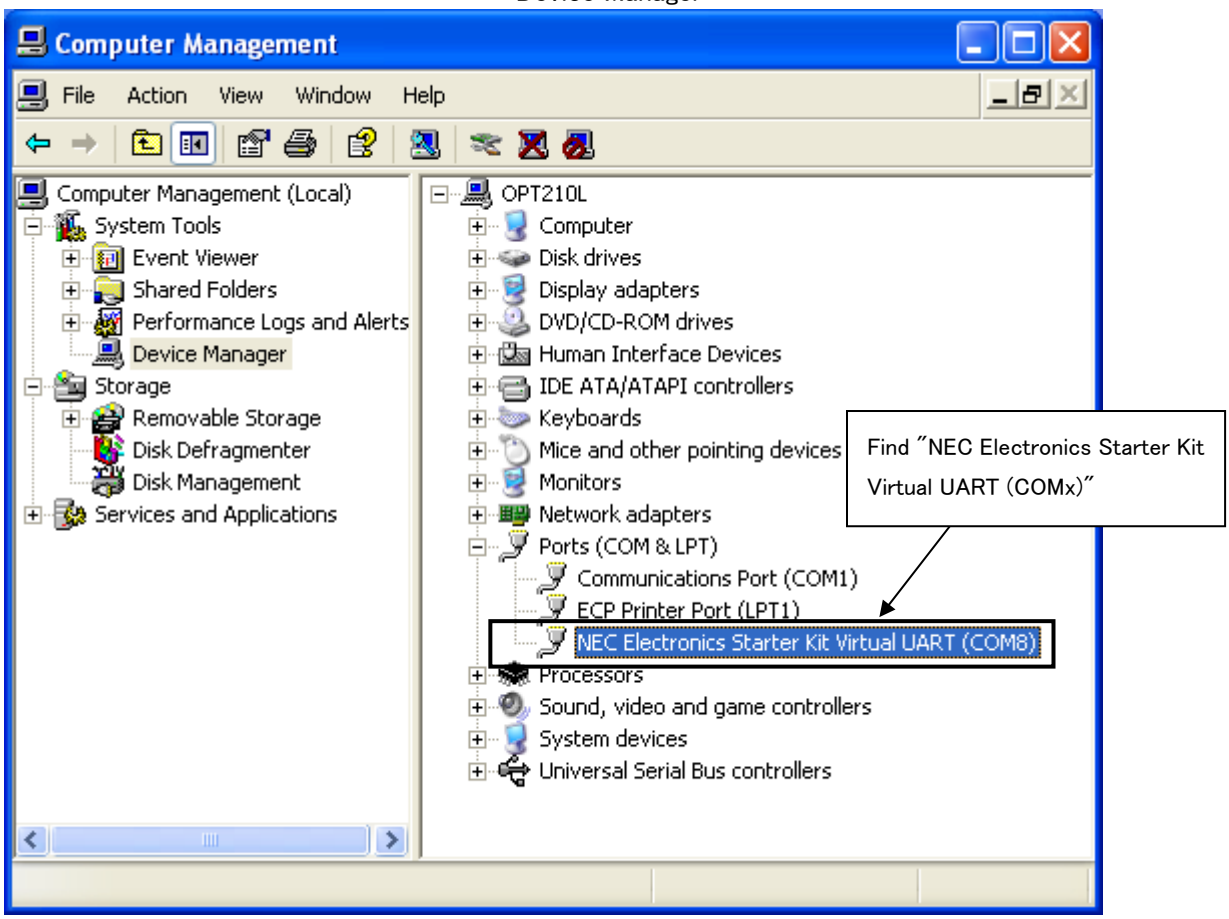
7. Go to "1.4.3 Completion of USB Driver Installation".

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/JH3U-SP.
When you change the USB port connection, the COM port number will be changed as well.

CAUTION

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

CHAPTER 2　Experiences

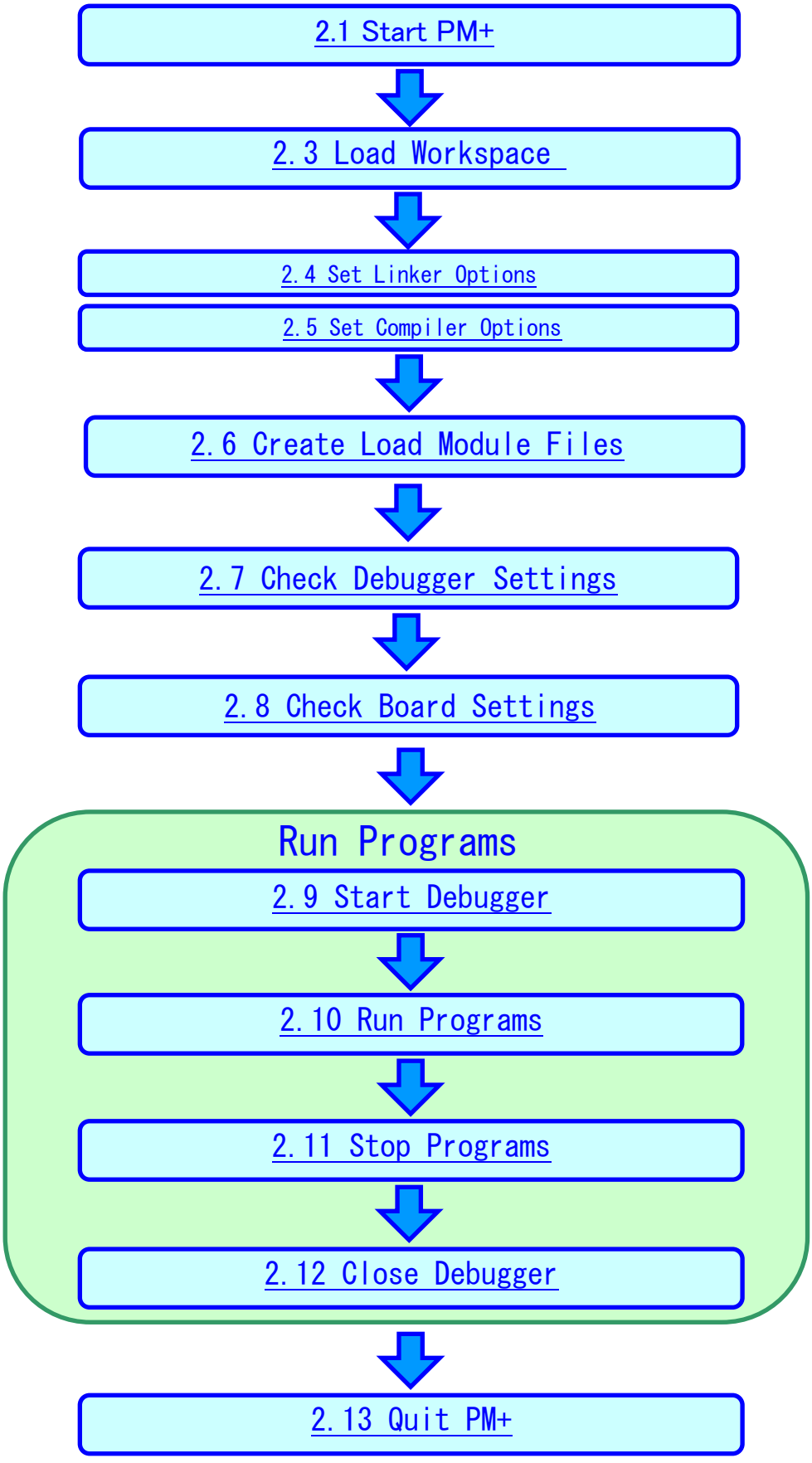
In this chapter, you will experience how to use the development tools with using the sample programs.
The development tools are :

- Integrated Development Environment (IDE), PM+
- Integrated Debugger, ID850QB

You will use the programs that you prepared in "1.3 Sample Programs", as the sample programs for TK-850/JH3U-SP

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.

The overall steps are as follows:

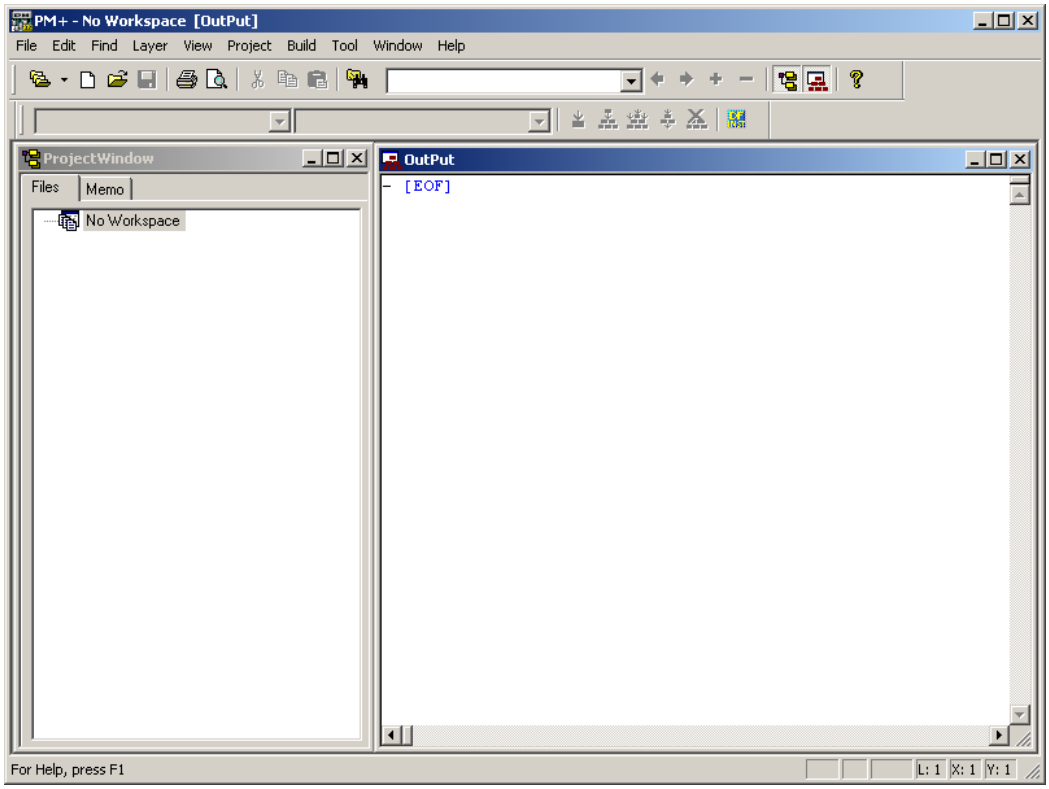


2.1 Start PM+

Let's start using the development tools.

First, start the PM+
Select "Windows Start Menu" -> "Program" -> "NEC Electronics Tools" -> "PM+ V6.31".

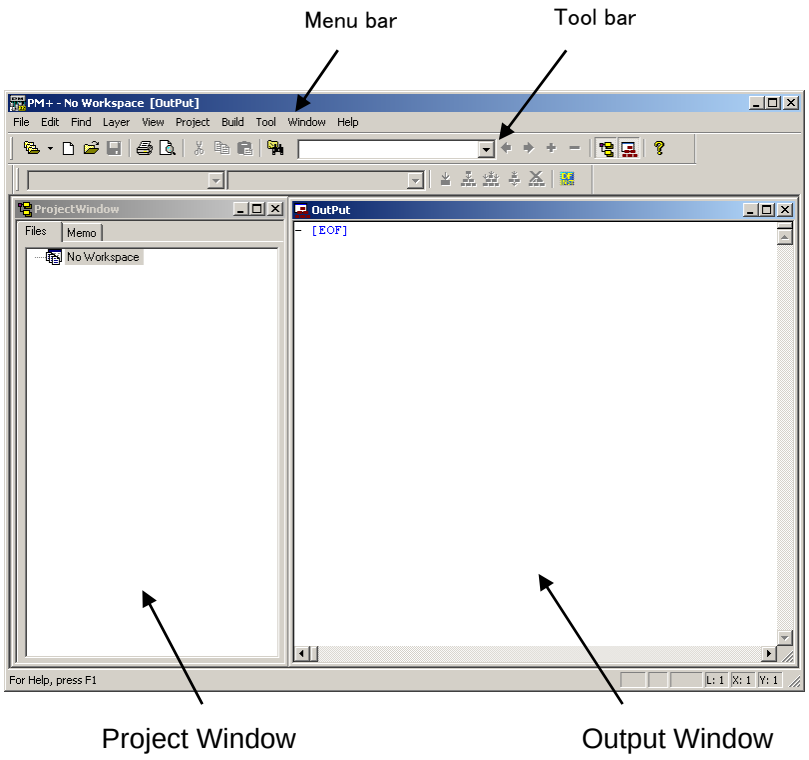
PM+ starts up



2.2 What is PM+

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

Also, one of more project files is managed together as a workspace.



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

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

What is a project?

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

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

What is a project file?

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

The file name format is "xxxxx.prj".

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

What is a project group?

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

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

What is a workspace?

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

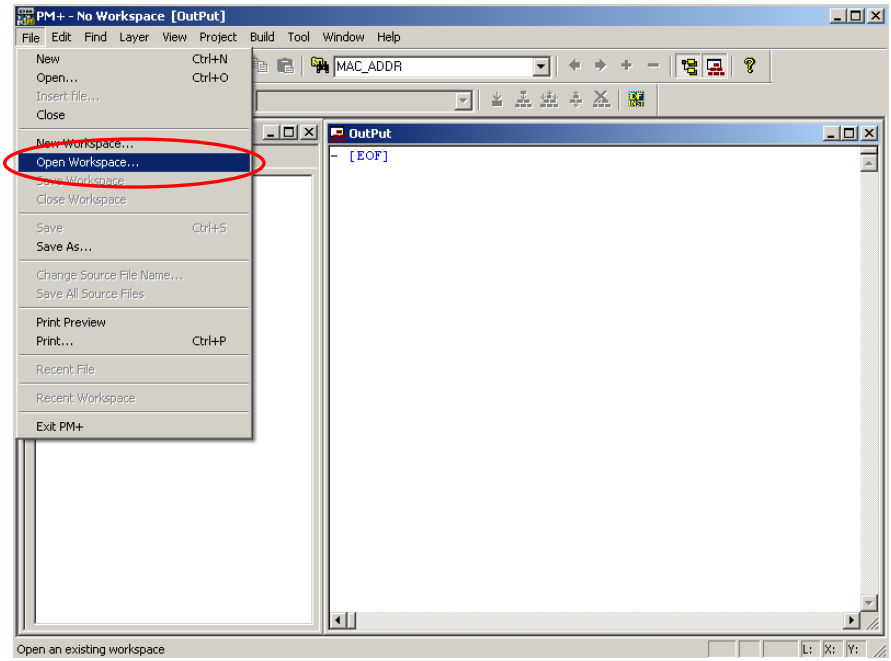
A workspace file contains one or more project files.

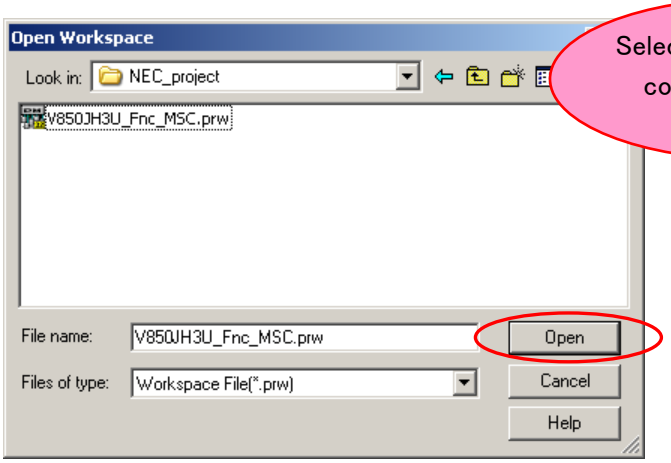
The file name format is "xxxxx.prw".

2.3 Load Workspace (project)

In this section, you will use the workspace that you created in "1.3 Sample Programs"
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 "V850JH3U_Fnc_MSC.prw " under the directory "C:¥TK850¥JH3U_STORAGE¥NEC_project".

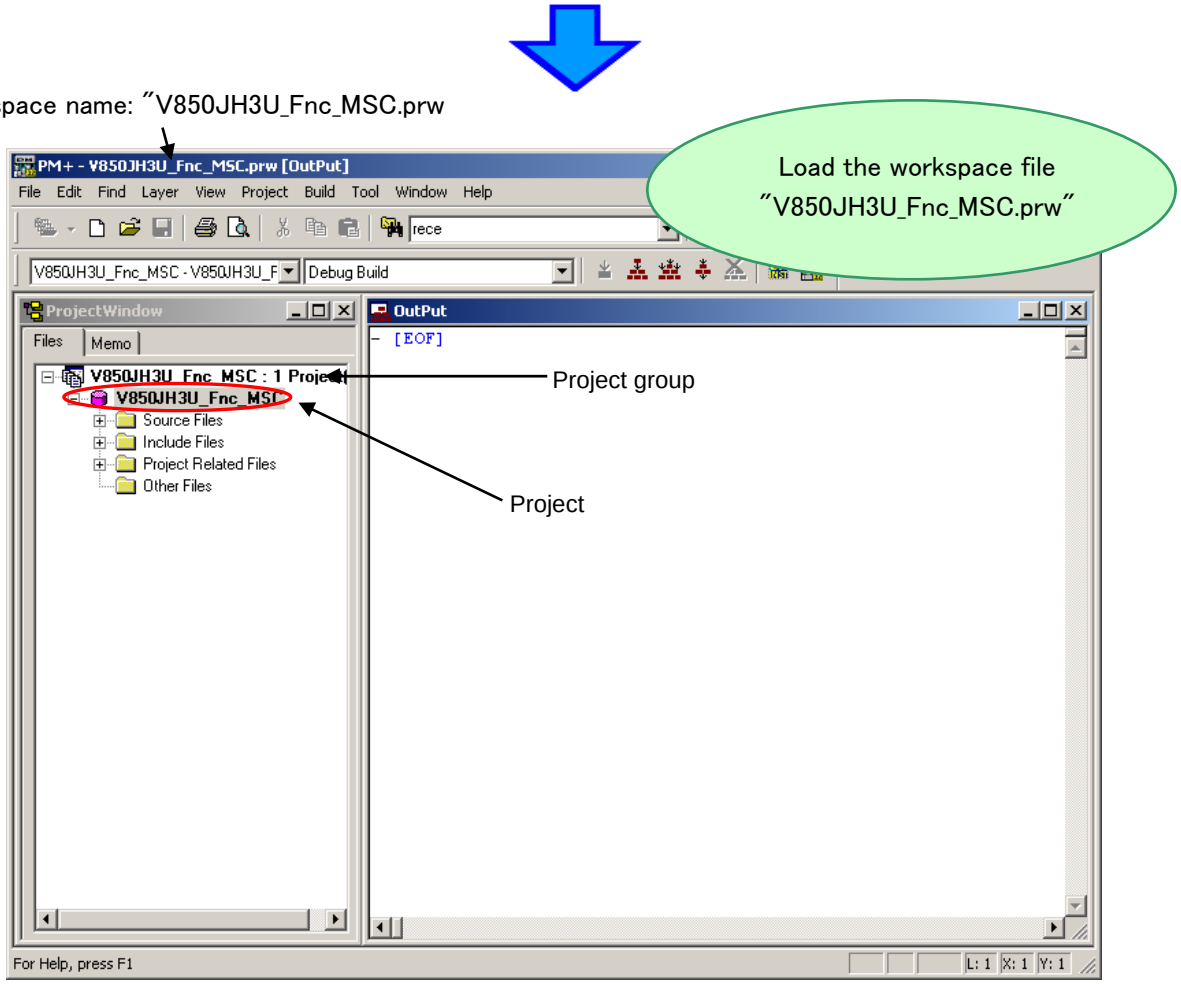




Select the directory that contains the sample programs.

Select "V850JH3U_Fnc_MSC.prw", then click Open .

Workspace name: "V850JH3U_Fnc_MSC.prw



The workspace file "V850JH3U_Fnc_MSC.prw" contains one project called "V850JH3U_Fnc_MSC". You will use this project "V850JH3U_Fnc_MSC".

CAUTION:

Please ignore when you get a prompt saying "files could not be found". This may occurred when the installation directory is not a default.

2.4 Set Options

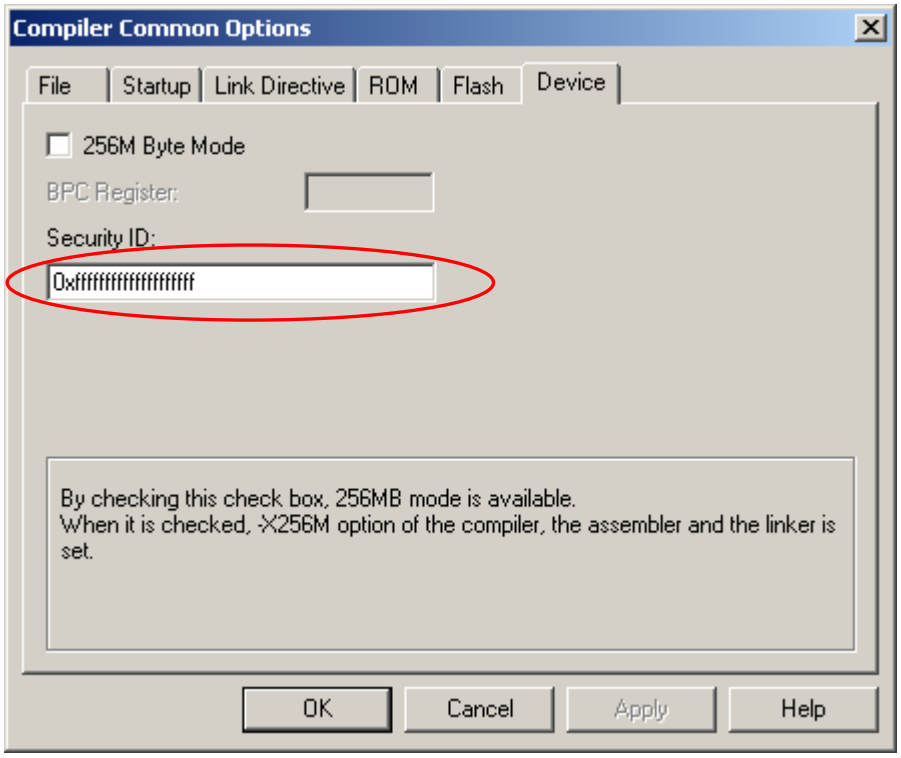
The compiler options have been set by project file. However, because some compiler options are useful, following two settings are covered specifically in this section.

- Enable C++ comments
- On-chip debug (Disable/Enable, security ID)

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

2.4.1 "Extend" Tab

Select "Device" tab on "Compiler Common Options" window, and check following settings.



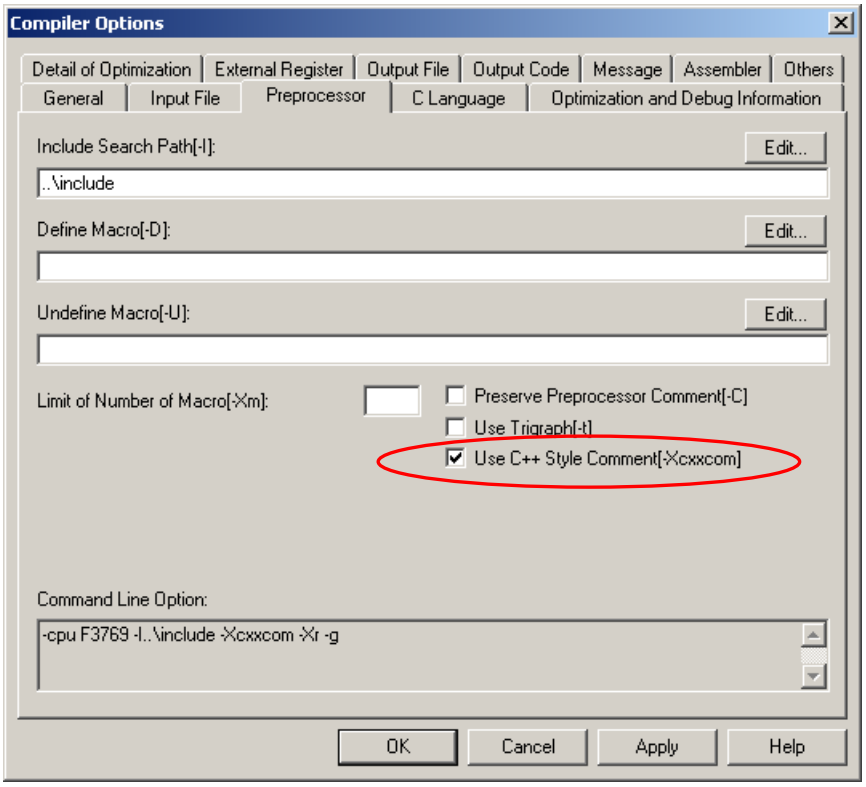
Set the security ID. The security ID is a specific ID code (10 bytes) used for the authentication when the debugger is starting. The security ID is stored at the address 70H-79H in the microcontroller built-in flash memory. The security ID in the flash memory and the ID entered in the configuration dialog are compared when the debugger is starting. When the ID does not match, the debugger cannot be started. Therefore, it is useful to protect the program data in the memory from others.

If you do not need to care about the security, it is recommended to enter "FFFFFFFFFFFFFFFFFFFF". (When you erase the data in the flash memory, the ID is set to this value.)

If you forgot the security ID code stored in the address 70H-79H, the debugger (ID850QB) will not be able to start.
In this case, you need to use "WriteEZ1" to erase the built-in flash memory. By erasing the flash memory, the security ID is set to "FFFFFFFFFFFFFFFFFFFF".
For details, refer to "5.4 WriteEZ1".

2.4.2 "Preprocessor" Tab

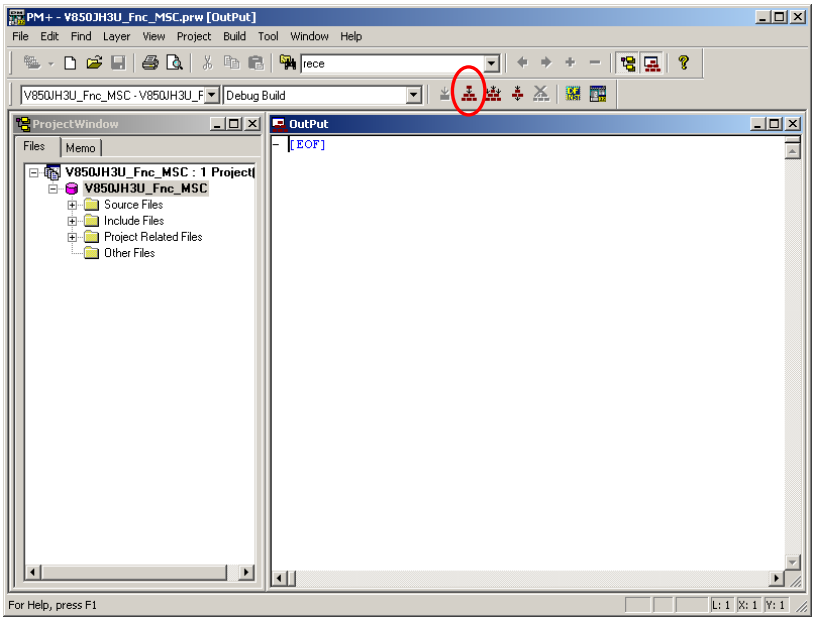
Select "Tool" on menu bar in PM+, then "Compiler Options...".
Select "Preprocessor" tab, and check "Use C++ Style Comment".
This setting allow you to use the C++ comment using "//".
It is useful feature when editing programs.

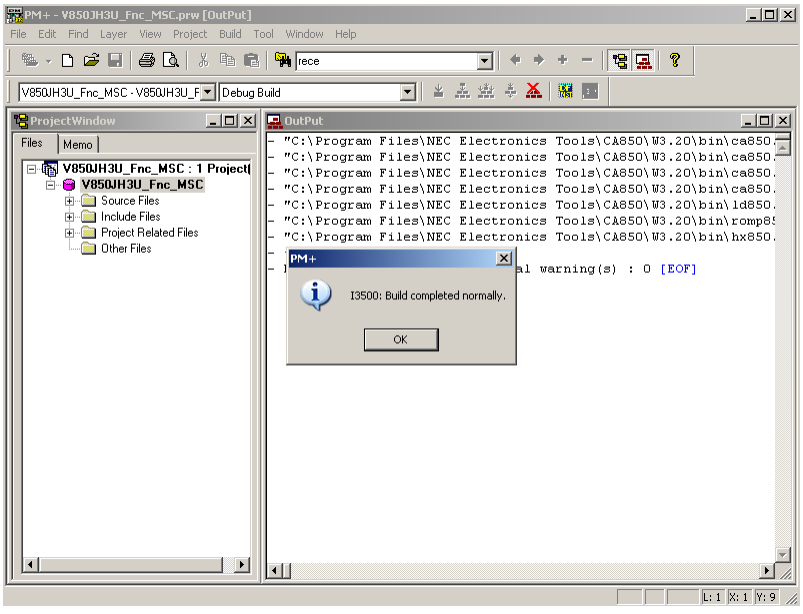


2.5 Create Load Module Files

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

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





Build has been completed successfully.

What is build?

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

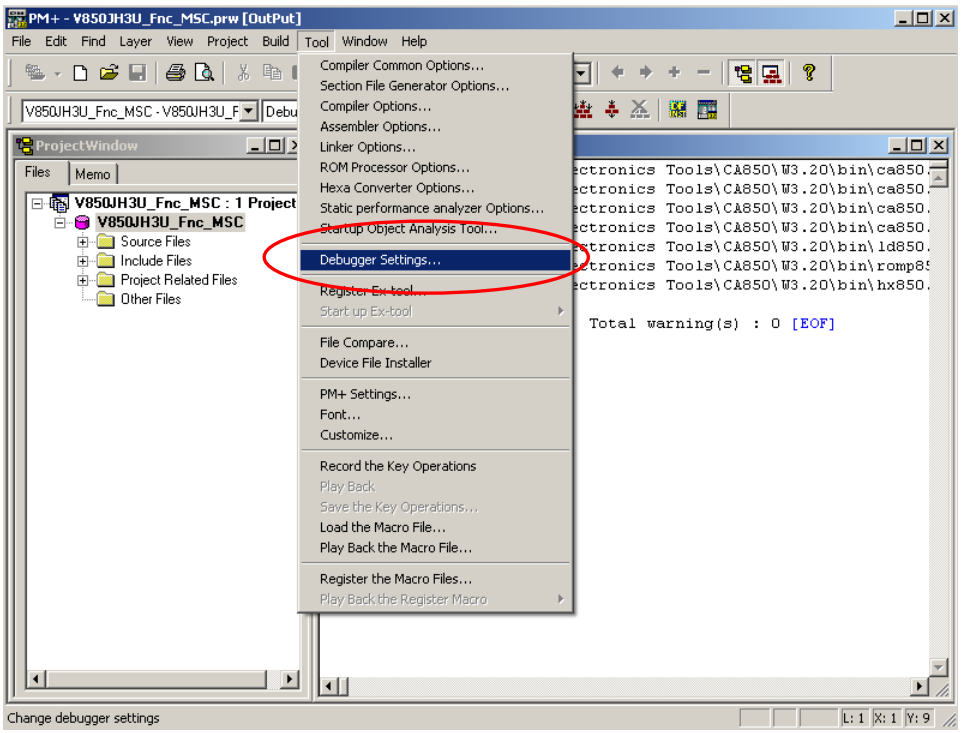
What is rebuild?

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

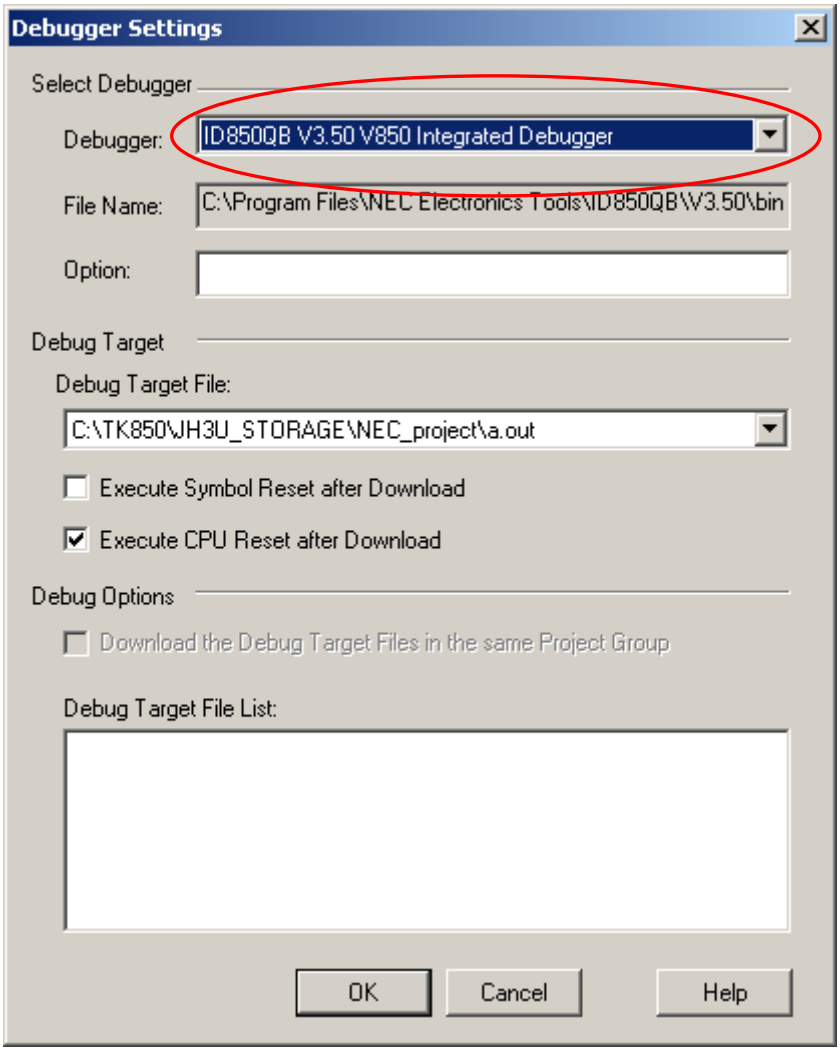
2.6 Check Debugger Settings

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

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



Check if "ID850QB V3.50 V850 Integrated Debugger" is selected on "Debugger".



If you cannot select "ID850QB V3.50 V850 Integrated Debugger", select "Project" on menu bar, "Project settings" -> "Tool version settings" -> "Detailsetting" -> then select "ID850QB V3.50".

2.7 Check Board Settings

Before connecting the PC and the TK-850/JH3U-SP with USB, you should check the setting of SW1 on the board.

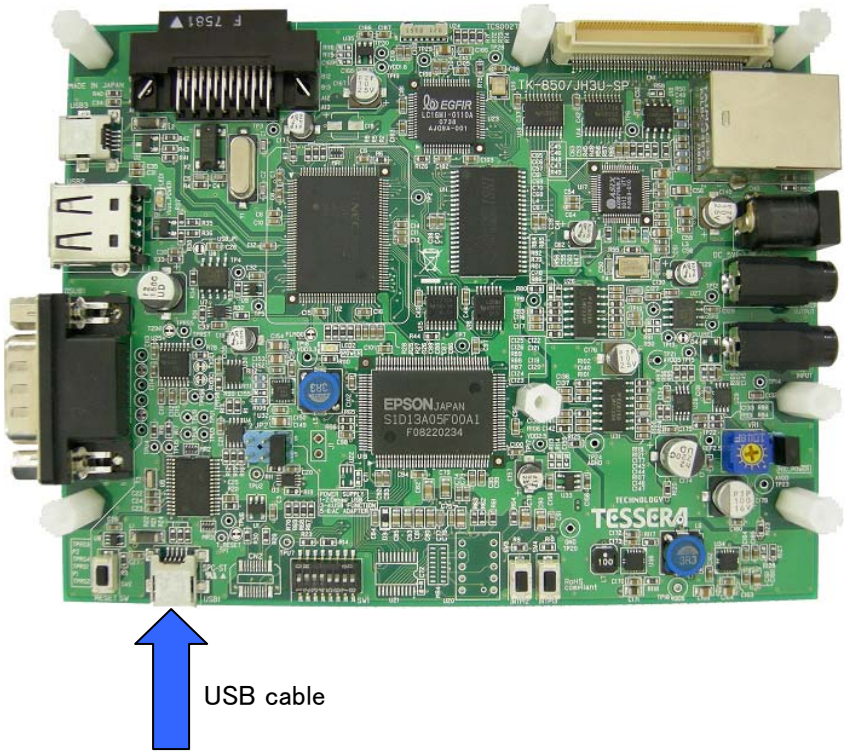
① Set JP2 and SW1 as shown below.

JP1 : 1-2 short

SW1

Bit1	OFF
Bit2	ON
Bit3	ON
Bit4	ON

② Connect USB1 connecter on TK-850/JH3U-SP and PC with USB cable.

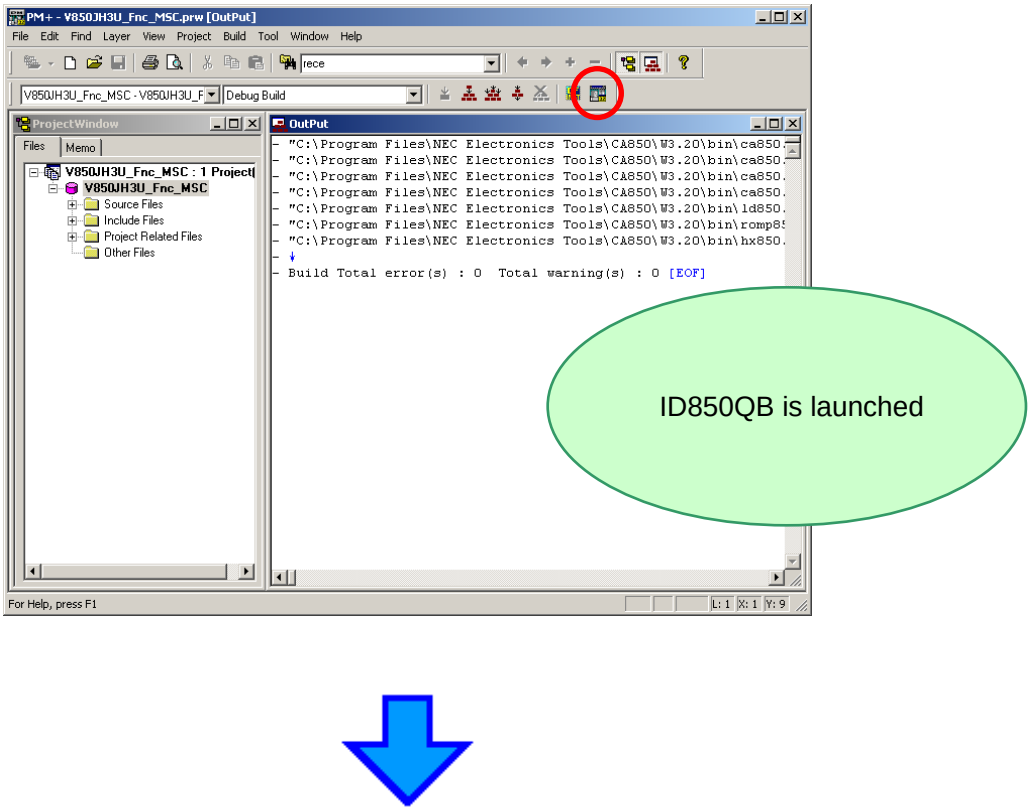


2.8 Start Debugger (ID850QB)

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

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

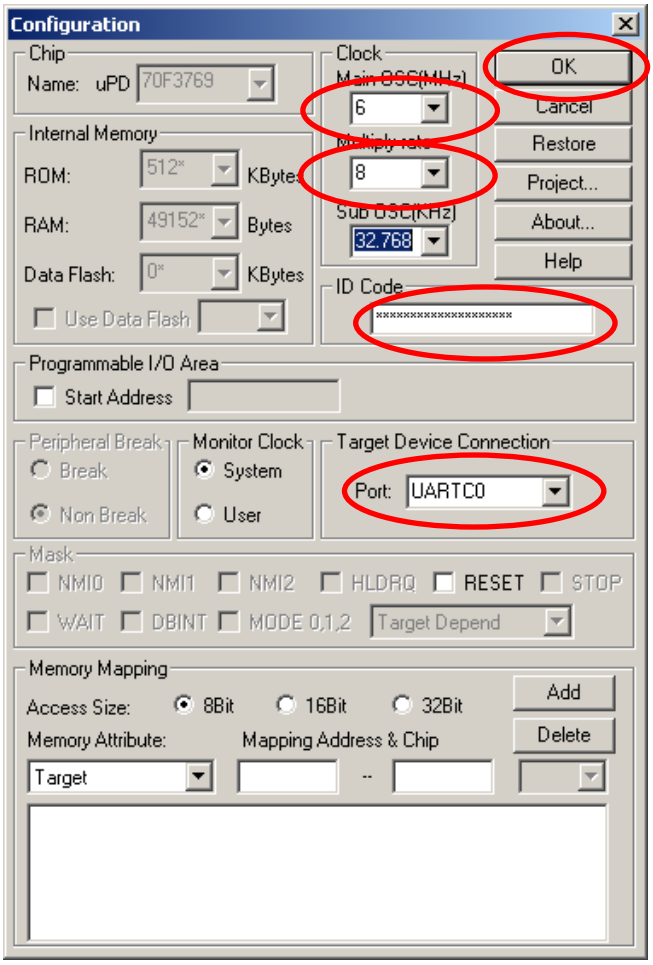
The steps to start the debugger will be explained below.



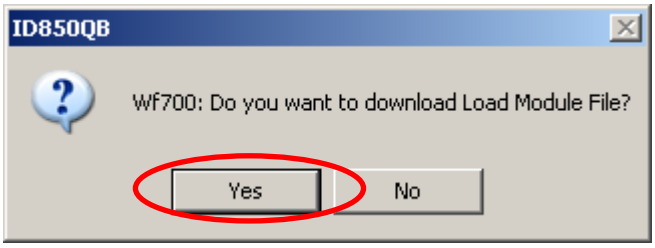
"Configuration" dialog is opened. Follow the settings below and click "OK".

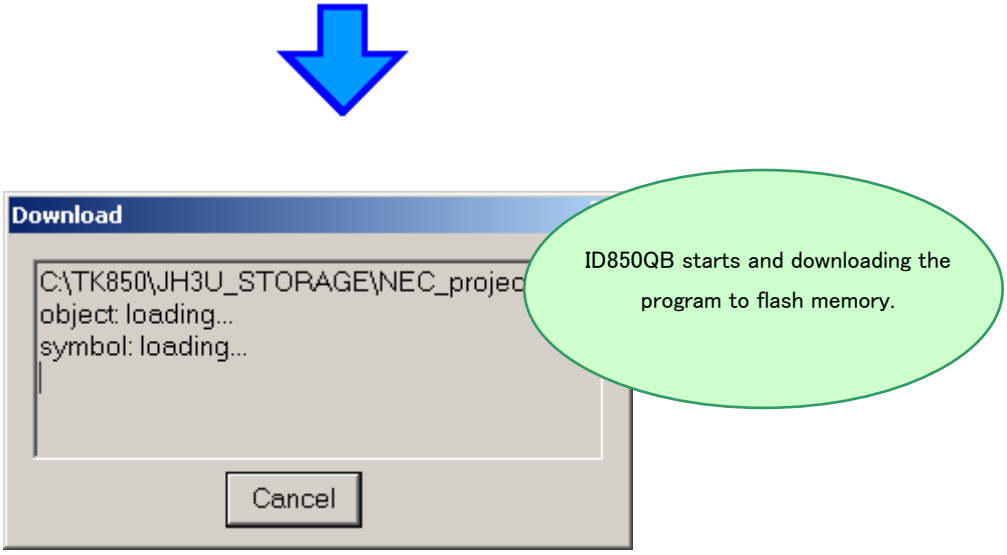
- Enter "6" in "Main OSC"
- Enter "8" in "Multiply rate"
- Enter "FFFFFFFFFFFFFFFFFFFF" (F x 20) in "ID Code".
- Select "UARTD0" in "Port" at "Target Device Connection" area

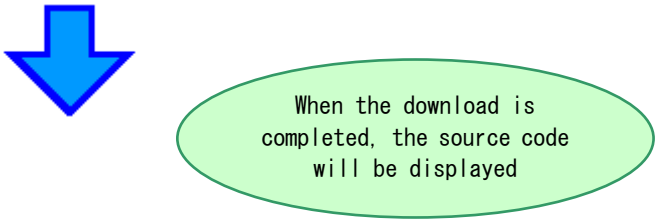
then click OK .

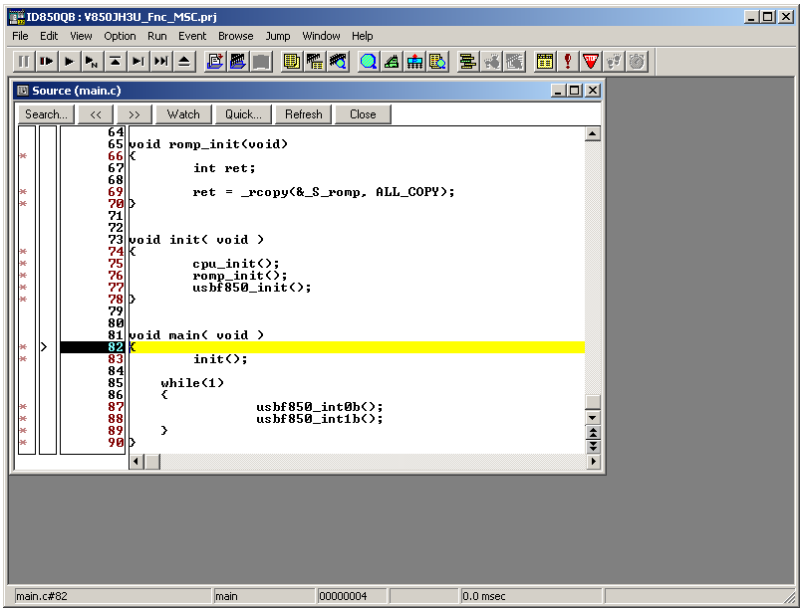


Click Yes when the confirmation dialog for downloading load module file is opened.









NOTE:

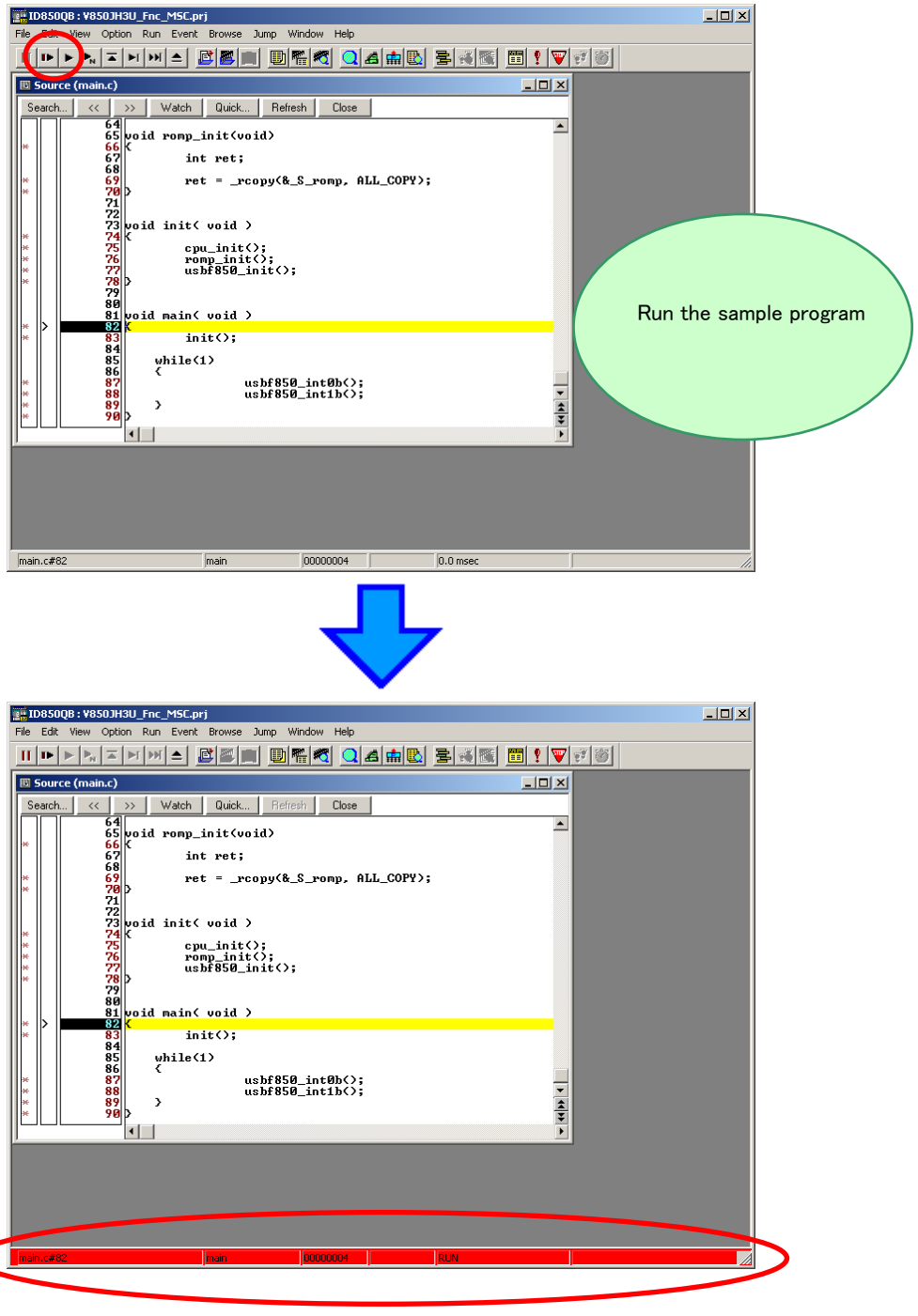
Completion of the download does not mean running the programs. Therefore, even though you press switch on the board, it does not make anything happened. To run the sample program demonstration, see "2.9 Run Programs".

2.9 Run Programs

Now, you are ready to run the program.

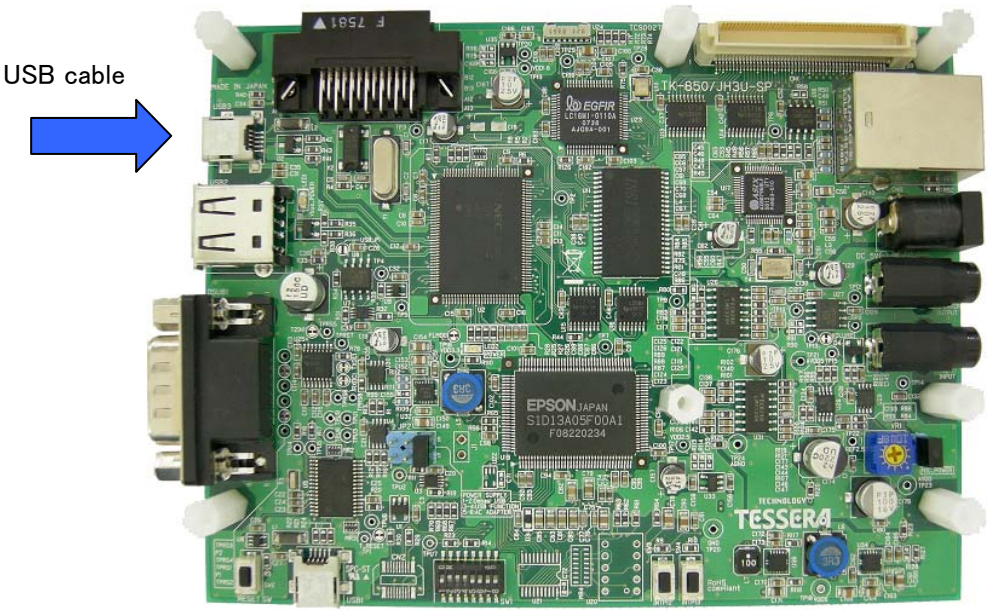
Click the restart button  , or select "Run" on menu bar, then "Restart".

The sample program runs.

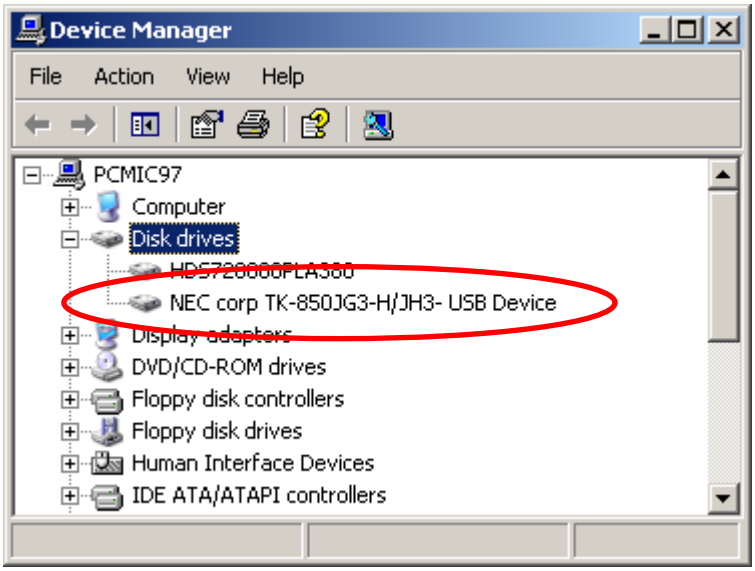


When programs are running, the status bar will be red.

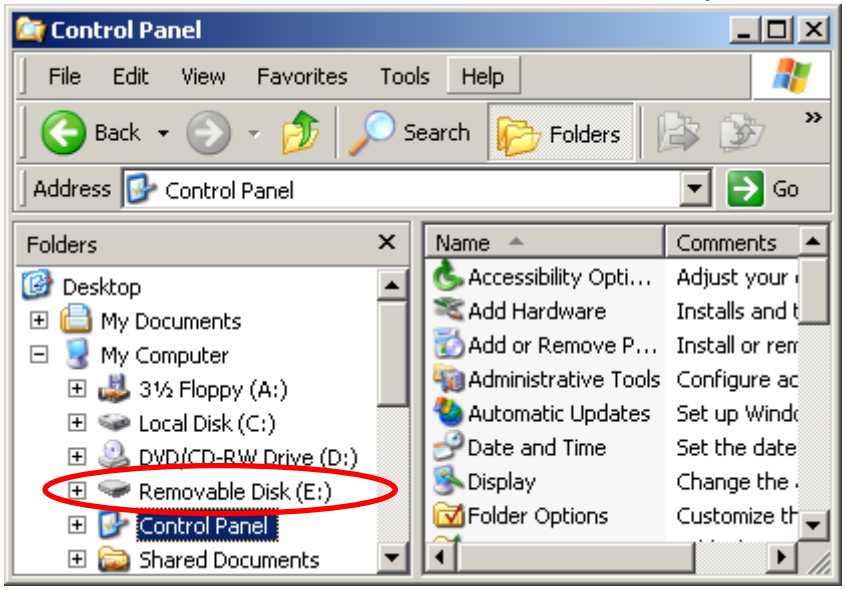
Connect USB3 and PC with another USB cable while USB1 is still connected.



When it is connected to PC, the driver is automatically installed. It is detected as "NEC corp TK-850JG3-H/JH3- USB Device" under disk drive.



Also, the removable disk is added as a disk drive.
This drive is not formatted. You can use this as 24KB removable disk when you format it.



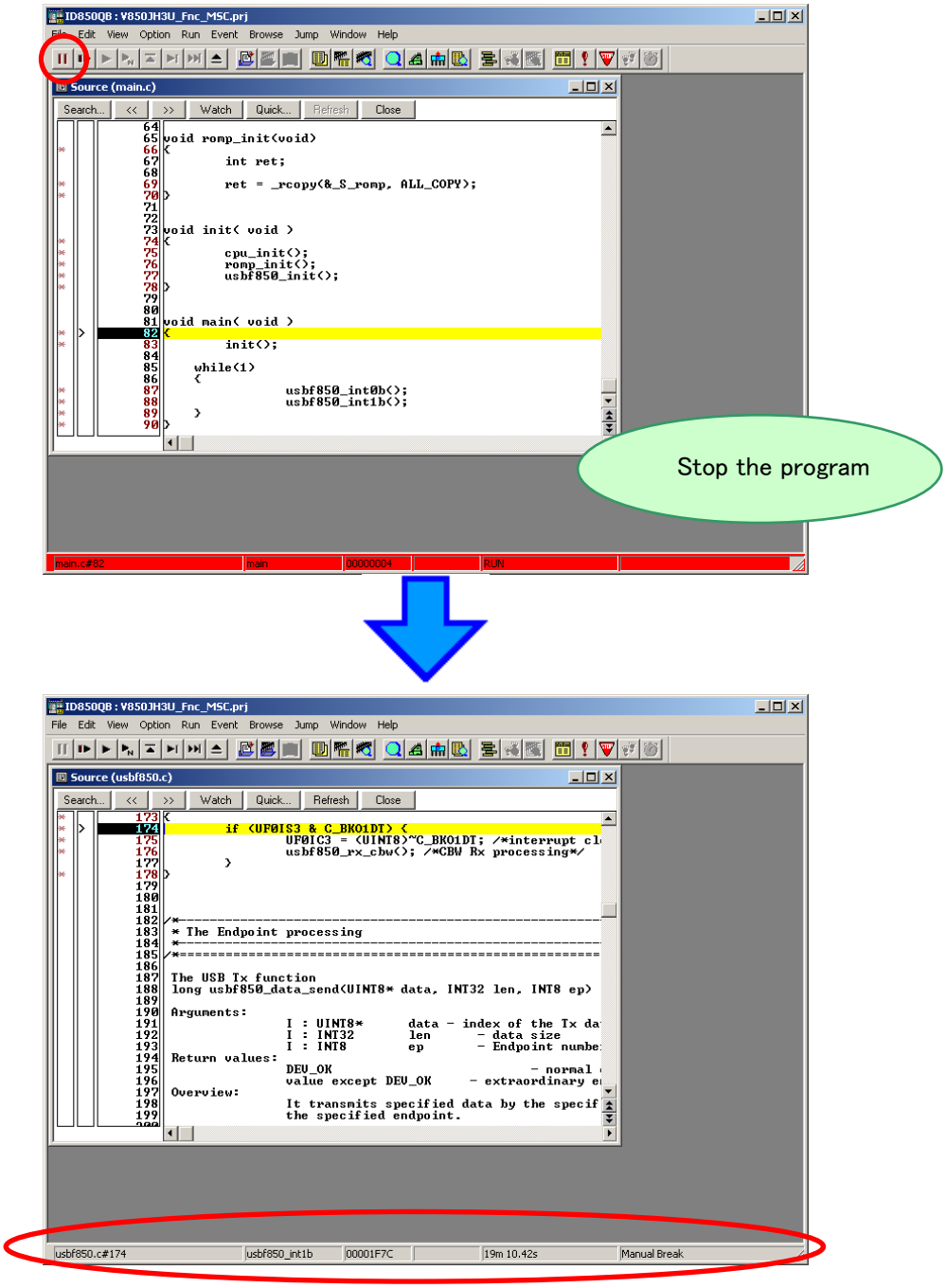
Now you could check the mass storage class (MSC) sample program is functioning.

- The program downloaded with ID850QB cannot be executed without ID850QB connection.
  If you need to execute it with stand-alone, use WriteEZ1 to write HEX file.
  For more information, refer to "5.4 WriteEZ1".

2.10 Stop Programs

Now, you are going to stop the program.

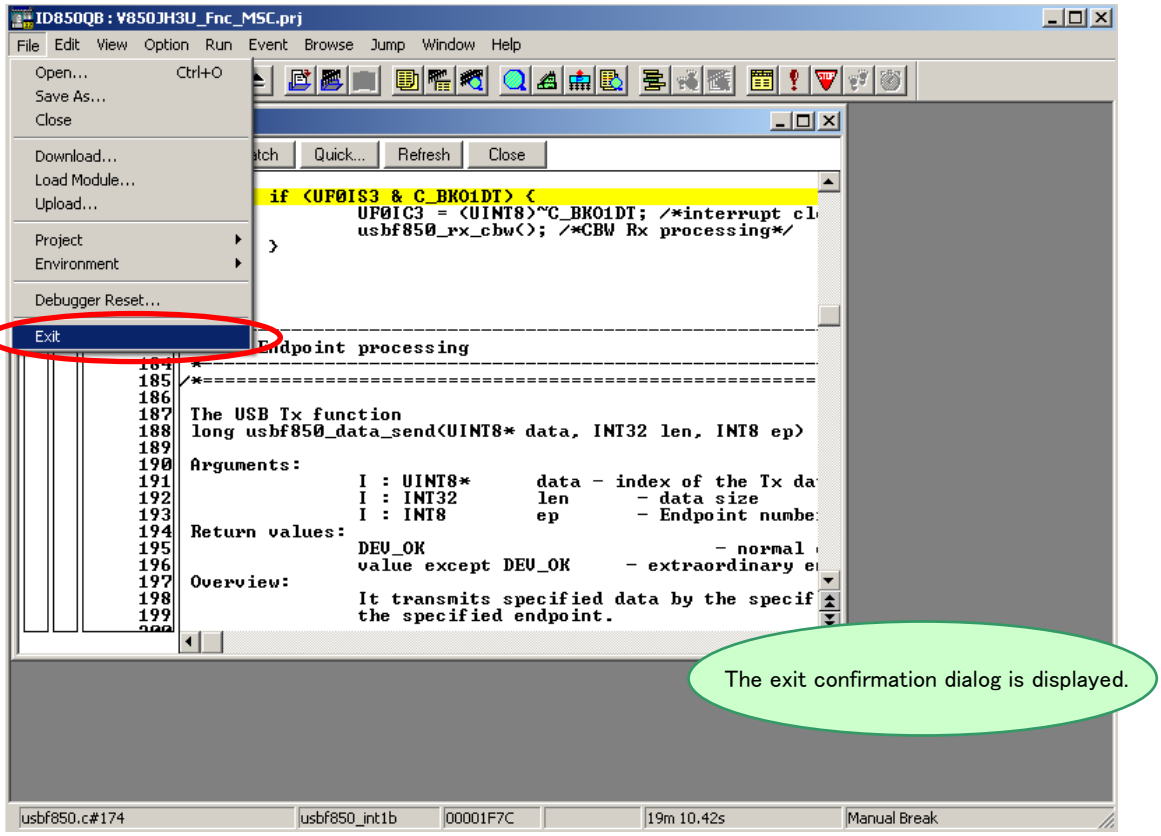
Click the stop button , or select "Run" on menu bar, then "Stop".

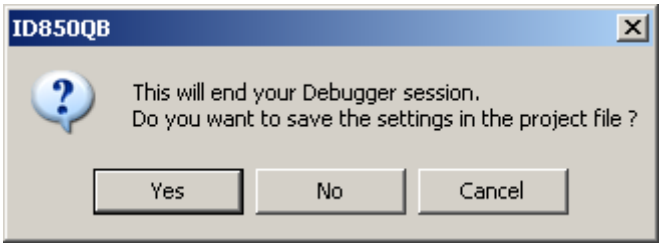


When the program stops, the status bar changes back to the original color.

2.11 Close Debugger (ID850QB)

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

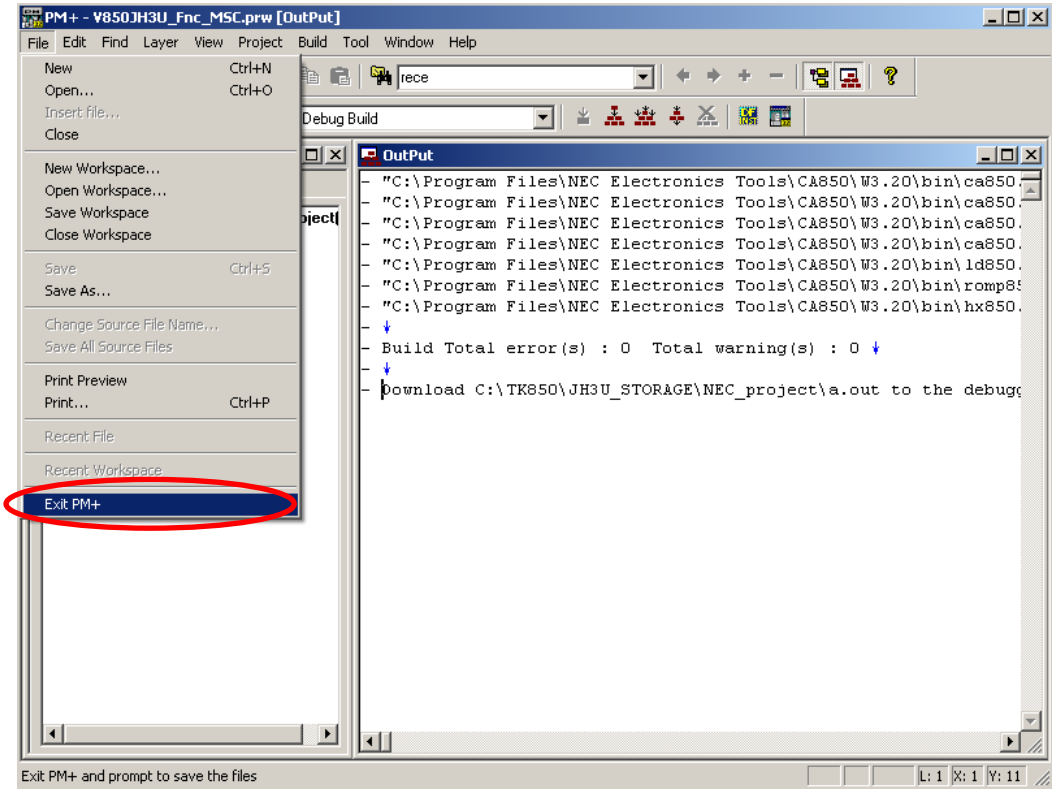




If you click Yes , it saves the settings in the project file, and then closes the ID850QB. It is recommended to save the settings as it saves the window you used, window size, layout, etc.
If you click No , it does not save the settings and closes the ID850QB.

2.12 Quit PM+

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



PM+ is closed.

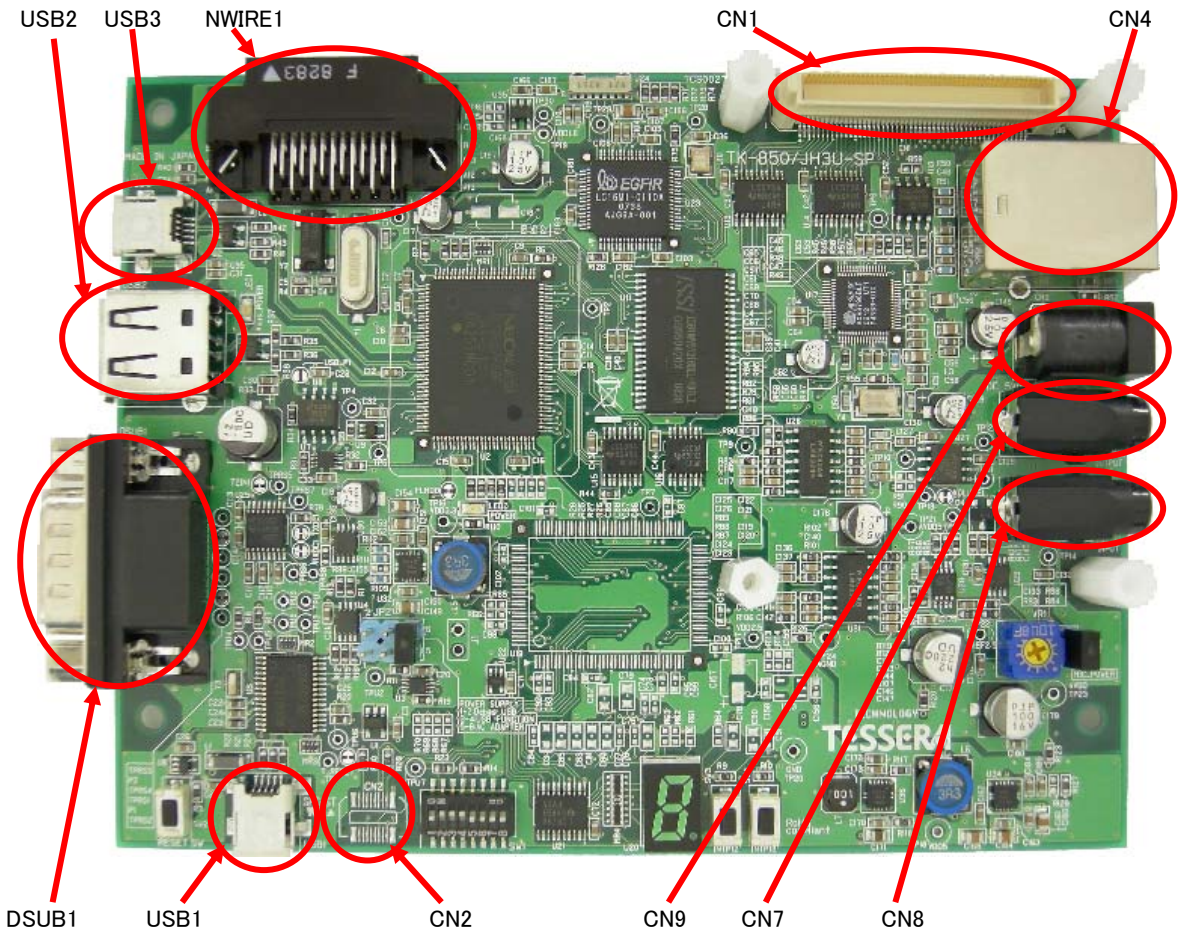
The experiences section ends now.
You can find more information how to use the development tool and information about other useful features in "Chapter 5 Other Information".

CHAPTER 3　Hardware Specifications

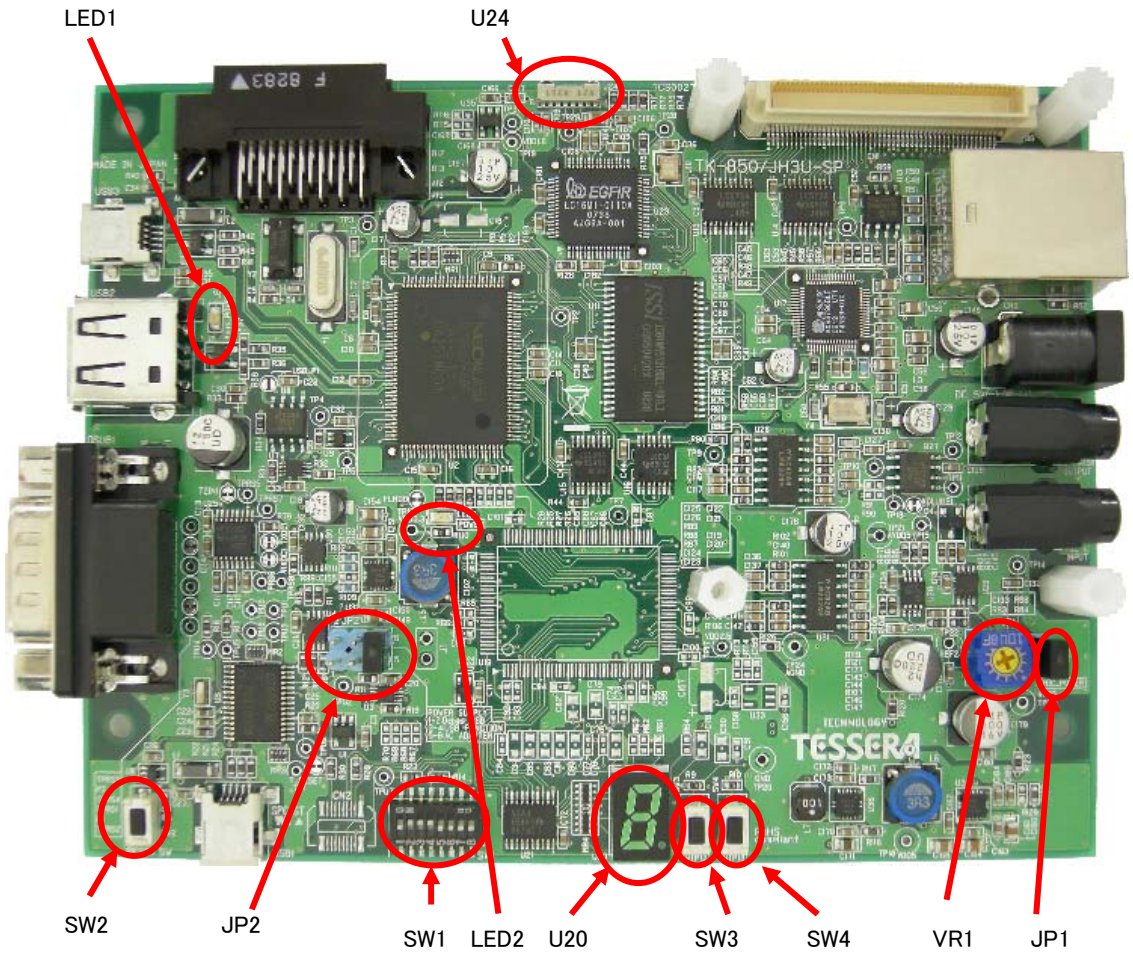
In this chapter, the hardware of TK-850/JH3U-SP will be explained.

Microcontroller	μPD70F3769　※V850ES/JH3-U
Clock	External main system clock: 48MHz (6MHz x8) Sub-clock: 32.768KHz
Interface	USB (A receptacle) x1 USB (MINI B connecter) x2 Connecter for N-Wire (For KEL connecter) Connecter for MINICUBE2 (For SICA connecter only pad) Dsub-9Pin x1 Expansion connector (50Pin) RJ-45 connecter IrDA communication interface Audio input (φ3.5mm monaural jack) Audio output (φ3.5mm monaural jack) AC adopter jack (5V)
Other unit	Touch panel LCD (for LCD version) 7Seg-LED (for no LCD version)
Dimension	100mm x 136mm
Power supply voltage	5V

3.1 Connecter Layout



3.2 Function Layout



3.3 Hardware Functions

3.3.1 SW1

The bit 1-4 on SW1 are for mode settings, Bit5-8 of SW1 are connected to "P78/ANI8"～" P711/ANI11" for general-purpose input port.

● For the use of ID850QB, use following settings.

SW1

Bit1	OFF
Bit2	ON
Bit3	ON
Bit4	ON

＊ When ID850QB is used, these terminals cannot be used because it communicates with the host machine by using and the terminal P30 and P31.

● Please change to the following settings when writing it in the flash memory with built-in CPU by using WriteEZ1. (The hardware of WriteEZ1 is built into TK-850/JH3U-SP.)

SW1

Bit1	OFF
Bit2	ON
Bit3	ON
Bit4	ON

● To run the programs stored in built-in flash memory by WriteEZ1, use following settings and re-supply power.

SW1

Bit1	OFF
Bit2	OFF
Bit3	OFF
Bit4	OFF ※

※If you need to use USB1 as virtual serial port, set Bit4 to ON.

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

SW1

Bit1	OFF
Bit2	OFF
Bit3	OFF
Bit4	OFF

● Please change to the following settings when you use virtual serial COM port.

SW1

Bit1	OFF
Bit2	OFF
Bit3	OFF
Bit4	ON ※

※If you need to use USB1 as virtual serial port, set Bit4 to ON.

● Bit5-8 are connected to following CPU pins.
As they are connected to pull-up resister, "ON" means "Low" and "OFF" means "High".

SW1

Bit5	P78
Bit6	P79
Bit7	P710
Bit8	P711

3.3.2 SW2 (RESET SW)

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

3.3.3 SW3 (INTP12)

SW3 is the push switch connected to "P98/SOF1/INTP12/A8" pin in CPU. There are connecting to pull-up resister. When the switch is pushed down, it sends the signal of "Low".

3.3.4 SW4 (INTP13)

SW4 is the push switch connected to "P99/SCKF1/INTP13/A9" pin in CPU. There are connecting to pull-up resister. When the switch is pushed down, it sends the signal of "Low".

3.3.5 LED1

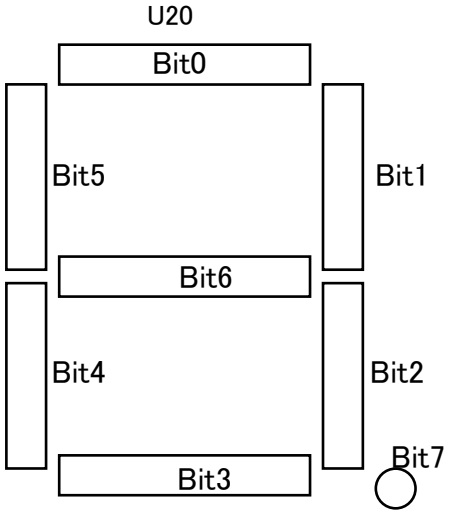
This is the Bus Power LED for USB2 connecter. It is lighted when USB2 connecter gets power supply.

3.3.6 LED2 (POWER)

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

3.3.7 U20 (for no LCD version)

This is the 7Seg-LED.
7Seg-LED display can be changed by accessing the address between 600000h and 6FFFFFh.



Example of displayed figure and set data.

0	0xC0	5	0x92
1	0xF9	6	0x83
2	0xA4	7	0xf8
3	0xB0	8	0x80
4	0x99	9	0x98

3.3.8 JP1

JP1 is a jumper short pin to select power supply for CN8 MIC INPUT.
Set the jumper to short when you connect electret condenser microphone.

3.3.9 JP2

JP2 is a jumper short pin to select power supply.

1-2 short	Use power supply from USB1 connecter.
3-4 short	Use power supply from USB3 connecter.
5-6 short	Use power supply from AC adapter connected to CN9.

Caution

When you use USB host connection with USB2 or use LCD display, you must use power supply from AC adapter.

3.3.10 CN1

CN1 is an extended connecter.
FX8C-100P-SV6 connecter by Hirose Electric Co., LTD. is mounted.

3.3.11 CN2

CN2 is a connecter pad for MINICUBE2 connection (connecter is not mounted).

3.3.12 CN4

CN4 is RJ-45 connecter socket for Ethernet connection.

3.3.13 CN7

CN7 is an audio output connecter.
P10/ANO0 signal output is output through low-pass filter.
Connect φ3.5mm mini plug.

3.3.14 CN8

CN8 is an audio input connecter.
P72/ANI2 inputs signal through low-pass filter.
Connect φ3.5mm mini plug.

3.3.15 CN9

CN4 is the power supply connecter of the AC adaptor.
You can supply the power by setting the JP2 to 5-6 short and connect AC adapter.

3.3.16 J1

This is the connector for external power supply. (DC5V)

3.3.17 NWIRE1 Connector

These are connector for N-Wire emulator.
It can connect N-Wire emulator of IE-V850E1-CD-NW etc.
8831E-026-170L-F connecter by KEL Corp. is mounted.

3.3.18 USB1 Connecter

This is a connecter for on-chip debug and flash memory writing.
This can be used as a virtual serial COM port by setting SW1.

3.3.19 USB2 Connecter

This is a connecter for USB host connection.

Caution
When you use USB host connection with USB2 or use LCD display, you must use power supply from AC adapter.

3.3.20 USB3 Connecter

This is a connecter for USB function connection.

3.3.21 DSUB1 Connecter

This is a Dsub-9Pin connecter for RS-232C communication.
RS-232C communication can be made with using P90/TXDC1 and P91/RXDC1.

3.3.22 U24 (IrDA Infrared communication module)

This is an IrDA infrared communication module.

3.3.23 VR1

This is an initial level volume control for the audio input (CN8) signal.

3.4 solder-short pad label

When using an external connector 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

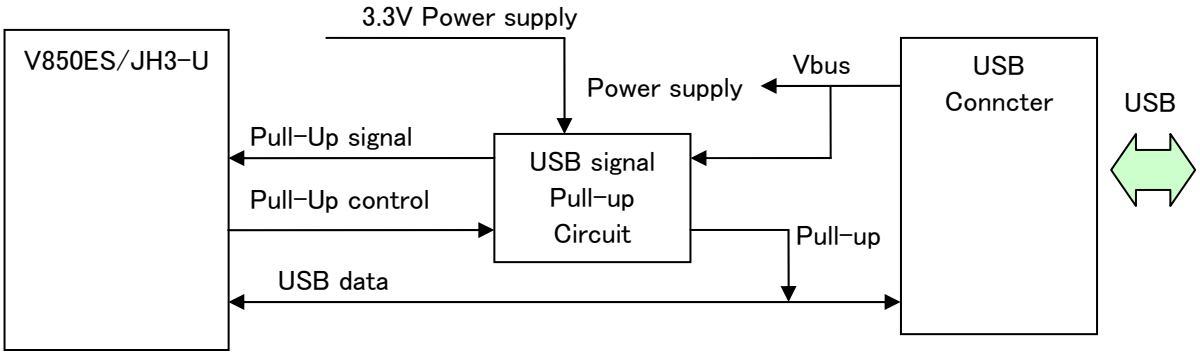
Solder-short pad name	State when shipping it	Connection
T_RESET	Short	Connect reset IC to T_RESET signal Open when reset IC is not in use.
FLMD0	Short	FLMD0 to P37 on CPU Short when built-in flash memory is rewritten by self
USB_P1	Open	USB Host bus power switch output Short when you set maximum bus power output current to 1A.
TXDC1	Short	Connect P90/TXDC1 and RS-232C driver. Open when you use it not for RS-232C.
RXDC1	Short	Connect P91/RXDC1 and RS-232C driver. Open when you use it not for RS-232C.
P1	Short	Connect RTC and CTS of RS-232C. Open when RTC and CTS should be disconnected.
P2	Short	Connect DSR and DTR of RS-232C. Open when DSR and DTR should be disconnected.
VOLUME1	Short	Audio output volume signal and P11/ANO1 Open when P11/ANO1 should be disconnected.

3.5 Explanation of unit

3.5.1 USB function

●USB connecter　　Mini B receptacle

USB Function block diagram



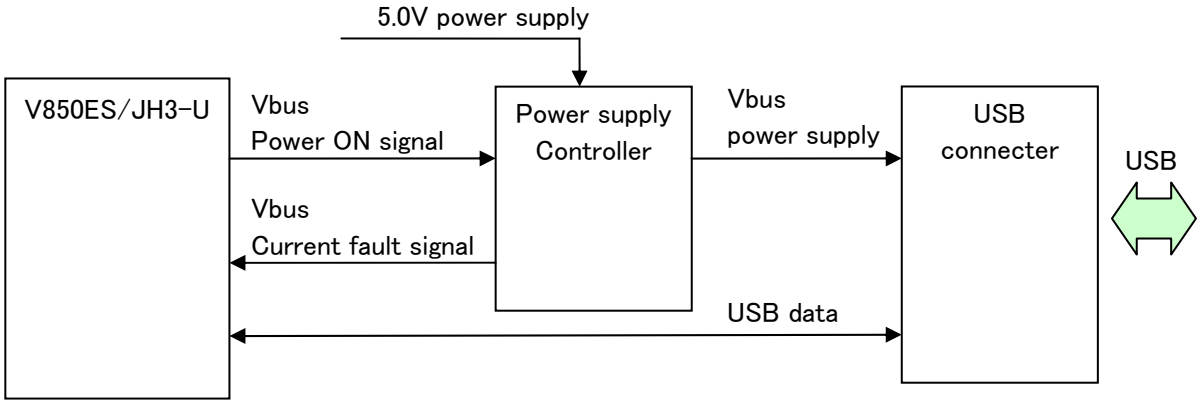
V850ES/JH3-U pin	Connecter	V850ES/JH3-U Signal direction	Note
UDPF	D+	I/O	3.3V 1.5kΩPull-up
UDMF	D-	I/O	
P41/SOF0/RXDC4/SCL01	-	Out	D+ Pull-up control
P42/_SCKF0/INTP10	-	In	D+ Pull-up signal

3.5.2 USB Host

●USB connecter　　A receptacle

●When you use USB host connection with USB2, you must use power supply from AC adapter for supplying USB bus power.

USB Host block diagram



V850ES/JH3-U pin	Connecter	V850ES/JH3-U Signal direction	Note
UDPH	D+	I/O	
UDMH	D−	I/O	
P34/TIAA10/TOAA10/TOAA1OFF/INTP09/PPON	−	Out	Vbus Power ON
P35/TIAA11/TOAA11/RTC1HZ/OCI	−	In	Vbus Current fault signal

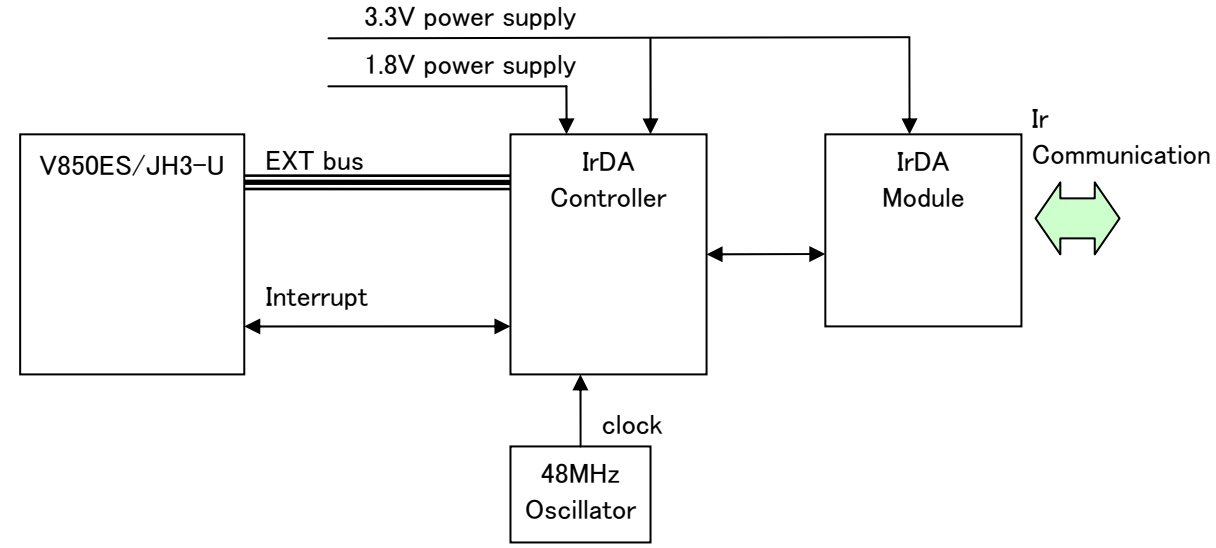
3.5.3 IrDA infrared communication

●IrDA controller ITX E-Globaledge LC16MI-0110A

●IrDA module ROHM RPM971-H14

●IrDA controller register base address 0x400000

IrDA block diagram

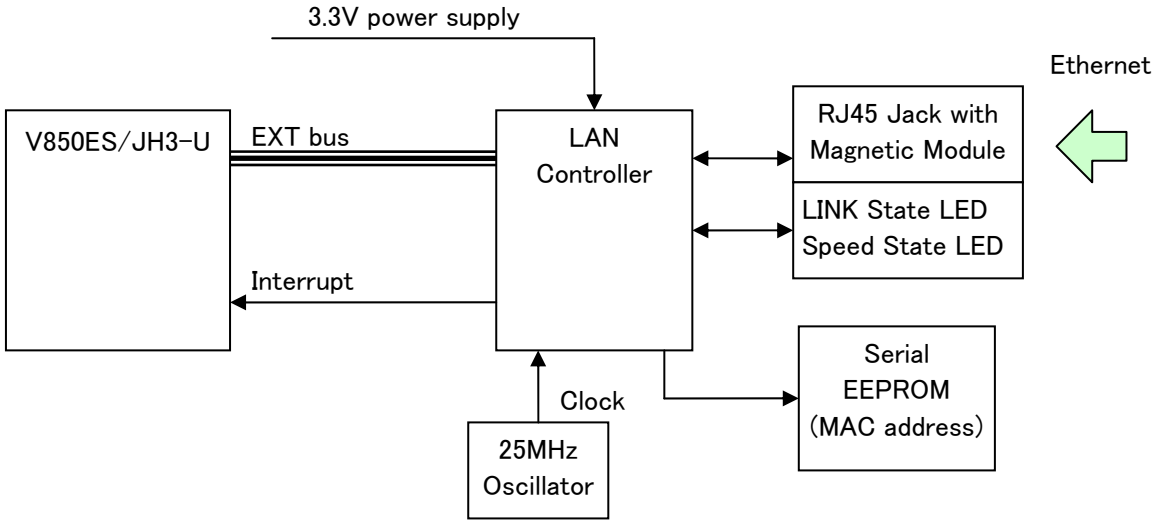


IrDA controller pin	V850ES/JH3-U pin	V850ES/JH3-U Signal direction	Note
A0～A7	A1～A8	Out	
D0～D7	AD0～AD7	I/O	
_RD	_RD	Out	
_WE	_WR1	Out	
_CS	→		Connect to address decoder
_INTR	P05/INTP04	In	Interrupt to CPU
_RESET	→		Connect to reset circuit
XIN/CLK48M	-	-	Input from shared USB clock

3.5.4 Ethernet

- ●LAN controller ASIX AX88796B
- ●RJ45 Jack With Magnetic Module TAIMAG RJLBC-248TA1
- ●Ethernet controller register address 0x500000

Ethernet block diagram



LAN controller pin	V850ES/JH3-U pin	V850ES/JH3-U Signal direction	Note
SA0～SA5	A1～A5	Out	
D0～D15	AD0～AD15	I/O	
nRD	_RD	Out	
nWE	_WR1	Out	
nCS	→		Connect to address decoder
nRESET	→		Connect to reset circuit
IRQ	P04/INTP03	In	Interrupt to CPU

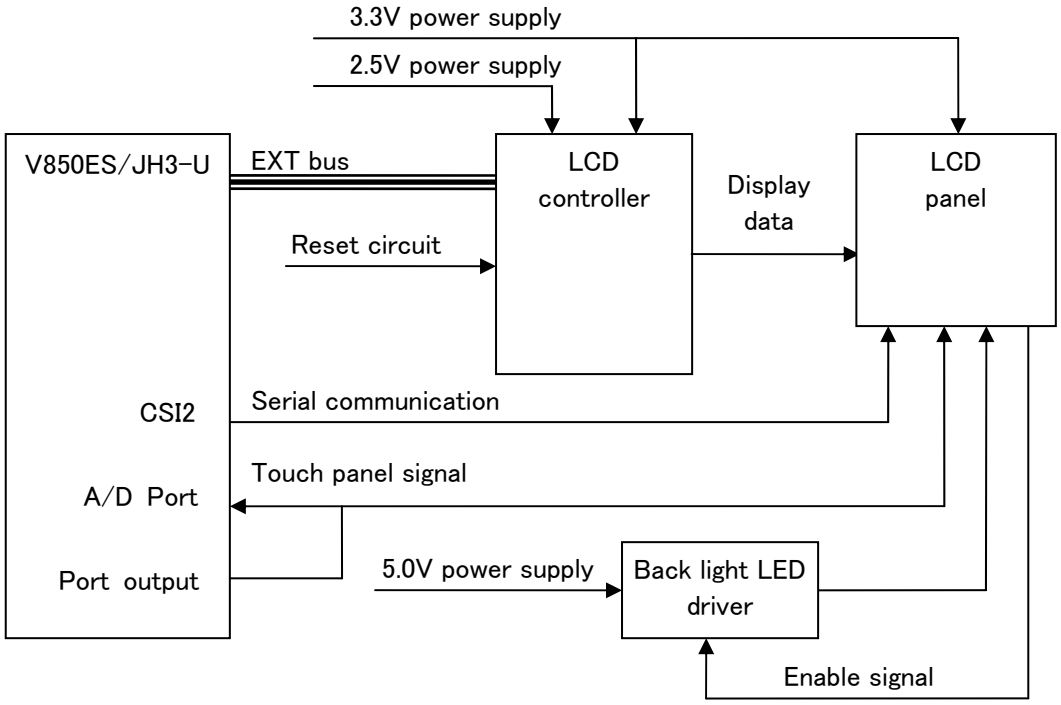
3.5.5 Touch panel LCD (LCD version only)

- ●LCD panel CASIO COM50T5117GTC (5.0inch QVGA color)
- ●LCD controller Epson S1D13A05F00AB00B
- ●LCD controller register base address 0x600000
- ●LCD controller memory base address 0x680000

Caution

When you use LCD display, you must use power supply from AC adapter.

Touch Panel LCD block diagram



LCD controller

LCD controller pin	V850ES/JH3-U pin	V850ES/JH3-U Signal direction	Note
AB[17:1]	A1～A17	Out	
DB[15:0]	AD0～AD15	I/O	
CS#	→		Address decode
AB0	→		GND
M/R#	A19	Out	
CLKI	CLKOUT	Out	Bus clock
RD/WR#	_RD	Out	
RD#	_RD	Out	
WE0#	_WR0	Out	
WE1#	_WR1	Out	
WAIT#	_WAIT	In	
RESET#	→		Connect to reset circuit

Touch panel LCD connection

LCD panel	V850ES/JH3-U pin	V850ES/JH3-U Signal direction	Note
YU	P97/SIF1/TIAA20/TOAA20/A7	OUT	Output port
XR	P96/TIAA21/TOAA21/INTP11/A6	OUT	Output port
YL	P71/ANI1	A/D in	A/D input
	P95/TIAA30/TOAA30/A5	OUT	Output port
XL	P70/ANI0	A/D in	A/D input
	P94/TIAA31/TOAA31/TENC00/EVTT00/A4	OUT	Output port
SCL	P23/_SCKF2/KR5/RTP05	CSI	LCD control
SI	P22/SOF2/KR4/RTP04	CSI	LCD control
/ CS	P21/SIF2/TIAB00/KR3/TOAB00/RTP03	Out	LCD control
/RESET	→		Connect to reset circuit
BLON	→		Back light enable output

3.5.6 SRAM

- 1Mbyte (8Mbit) SRAM is installed.
- SRAM memory base address　0x100000

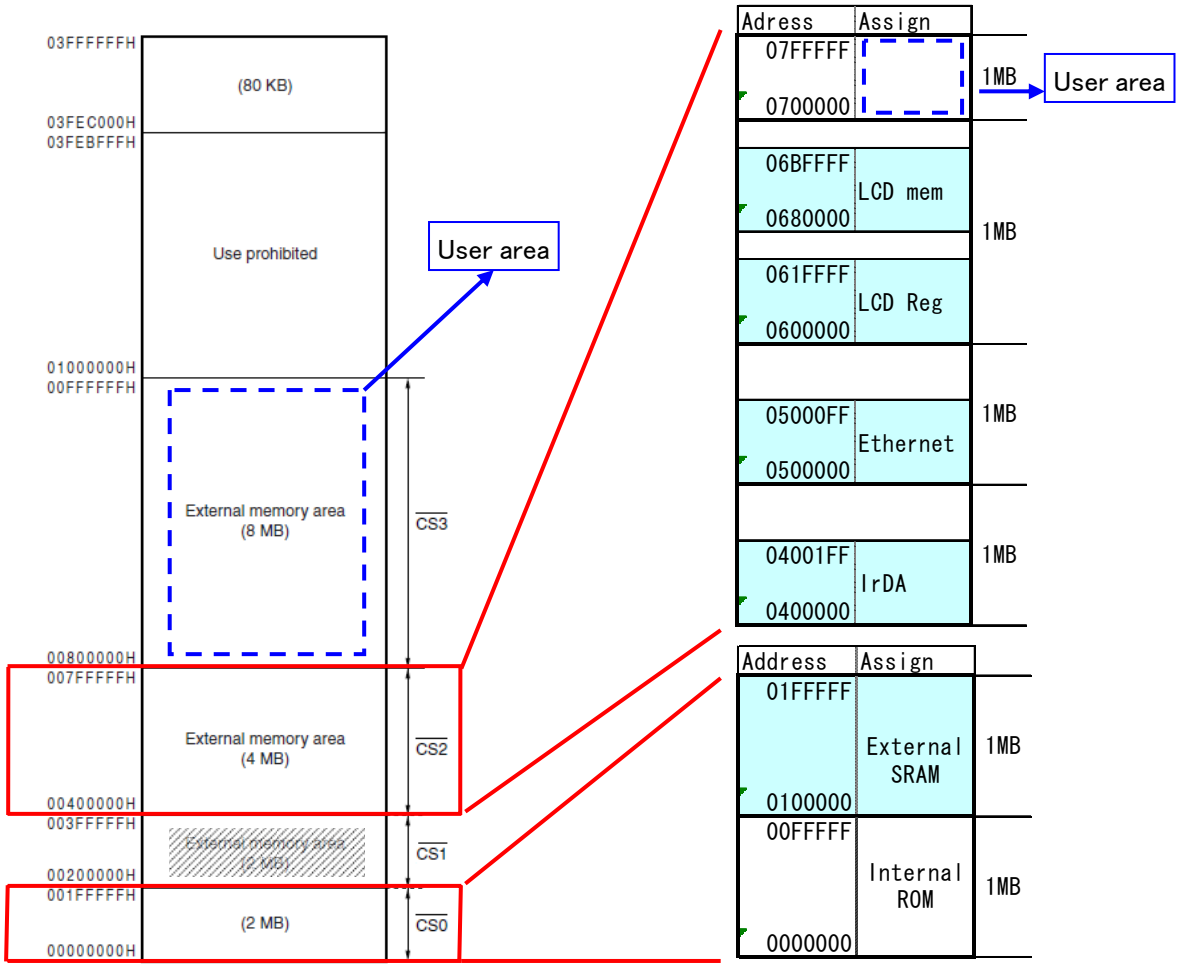
3.5.7 External bus interface

1.1. External bus I/F devices

Device	Address pin	Accessing condition	Note
IrDA controller	A0-7	16bit access	The device is 8bit
LAN controller	SA0-5	16bit access	A1 is 2Byte pin
LCD controller	M/R, AB1-17	16bit access	AB1 is 2Byte pin
SRAM	A0-18	16bit access	1MByte

1.2. Address mapping

●The address decoder assigns 4 devices to 010 0000H～01FFFFFH (CS0 area)と 040 0000H～07F FFFFH (CS2 area).



1.3. External memory address area

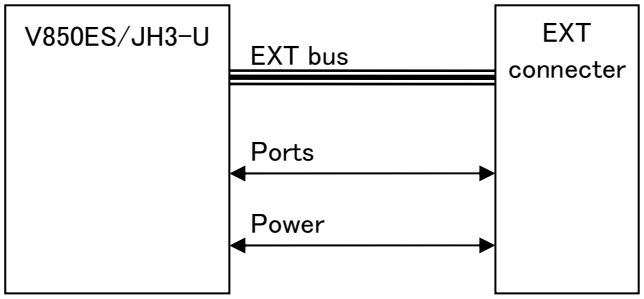
●070 0000H～07F FFFFH (CS2 area) 1MByte size

●080 0000H～0FF FFFFH (CS3 area) 8MByte size

3.5.8 External connecter

●You can connect external bus signals to external devices with external connecter (CN1) (HIROSE FX8C-100P-SV4)

External conncter block diagram



External connecter connections

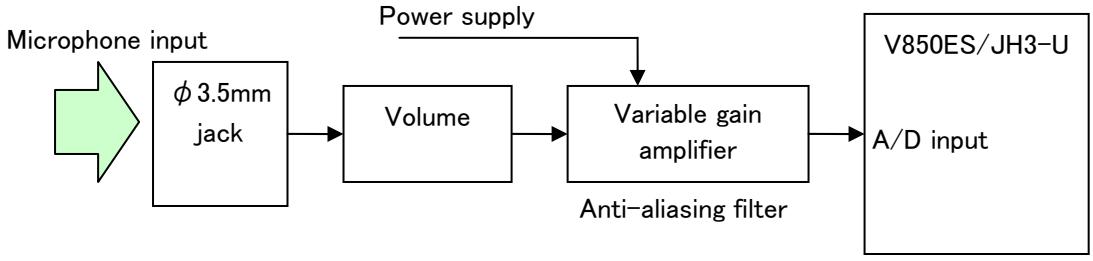
No.	V850ES/JH3-U pin	Bus
1	A0	●
3	A1	●
5	A2	●
7	A3	●
9	A4	●
11	A5	●
13	A6	●
15	A7	●
17	A8	●
19	A9	●
21	A10	●
23	A11	●
25	A12	●
27	A13	●
29	A14	●
31	A15	●
33	PCM0/WAIT	●
35	PCM1/CLKOUT	●
37	CS_USER_n	●
39	PCS2/CS2	●
41	PCS3/CS3	●
43	PCT0/WR0	●
45	PCT1/WR1	●
47	PCT4/RD	●
49	PCT6/ASTB	●
51	PDH0/A16	●
53	PDH1/A17	●
55	PDH2/A18	●
57	PDH3/A19	●
59	PDH4/A20	●
61	PDH5/A21	●
63	PDH6/A22	●
65	PDH7/A23	●
67	PDL0/AD0	●
69	PDL1/AD1	●
71	PDL2/AD2	●
73	PDL3/AD3	●
75	PDL4/AD4	●
77	PDL5/AD5/FLMD1	●
79	PDL6/AD6	●
81	PDL7/AD7	●
83	PDL8/AD8	●
85	PDL9/AD9	●
87	PDL10/AD10	●
89	PDL11/AD11	●
91	PDL12/AD12	●
93	PDL13/AD13	●
95	PDL14/AD14	●
97	PDL15/AD15	●
99	PCM2/HLDAK	●

No.	V850ES/JH3-U pin	Bus
2	PCM3/HLDRQ	●
4	P00/INTP00	
6	P01/INTP01	
8	P02/NMI	
10	P11/ANO1	
12	P20/TIAB03/KR2/TOAB03/RTP02	
14	P24/INTP05	
16	P25/INTP06	
18	P32/ASCKC0/SCKF4/TIAA00/TOAA00	
20	P33/TIAA01/TOAA01/RTCDIV/RTCCL	
22	P36/TXDC3/SCL00/UDMARQ0	
24	P37/RXDC3/SDA00/UDMAAK0	
26	P40/SIF0/TXDC4/SDA01	
28	P50/TIAB01/KR0/TOAB01/RTP00/UDMARQ1	
30	P51/TIAB02/KR1/TOAB02/RTP01/UDMAAK1	
32	P60/TOAB1T1/TIAB11/TOAB11	
34	P61/TOAB1B1/TIAB10/TOAB10	
36	P62/TOAB1T2/TIAB12/TOAB12	
38	P63/TOAB1B2/TRGAB1	
40	P64/TOAB1T3/TIAB13/TOAB13	
42	P65/TOAB1B3/EVTB1	
44	P74/ANI4	
46	P75/ANI5	
48	P76/ANI6	
50	P77/ANI7	
52	P90/KR6/TXDC1/SDA02/A0	
54	P91/KR7/RXDC1/SCL02/A1	
56	P92/TENC01/TIT01/TOT01/A2	
58	P93/TECR0/TIT00/TOT00/A3	
60	P94/TIAA31/TOAA31/TENC00/EVTT00/A4	
62	P95/TIAA30/TOAA30/A5	
64	P96/TIAA21/TOAA21/INTP11/A6	
66	P97/SIF1/TIAA20/TOAA20/A7	
68	P914/TIAA51/TOAA51/INTP17/A14	
70	P915/TIAA50/TOAA50/INTP18/A15	
72	RESET	
74	AGND	
76	3.3VAnalog (AVDD)	
78	3.3VDigital (VDD3.3)	
80	3.3VDigital (VDD3.3)	
82	3.3VDigital (VDD3.3)	
84	GND	
86	GND	
88	GND	
90	GND	
92	GND	
94	VDD5V (VDD)	
96	VDD5V (VDD)	
98	VDD5V (VDD)	
100	VDD5V (VDD)	

3.5.9 Audio input

- ●You can capture analogue audio signal with the V850ES/JH3-U internal A/D converter.
- ●Monaural microphone level input.
  (Set the JP1 to short when you connect electret condenser microphone.)
- ●φ3.5mm Monaural mini plug input
- ●Anti-aliasing filter Fc = 3.6kHz
- ●Filter structure = Three 2nd order low pass filters (-36dB/oct)
- ●Variable gain amplifier Micro Chip MCP6S91

Audio input block diagram



Connecter pin	V850ES/JH3-U pin	V850ES/JH3-U signal direction	Note
Audio Input	P72/ANI2	A/D input	Preamp、filter, variable gain amp passed.

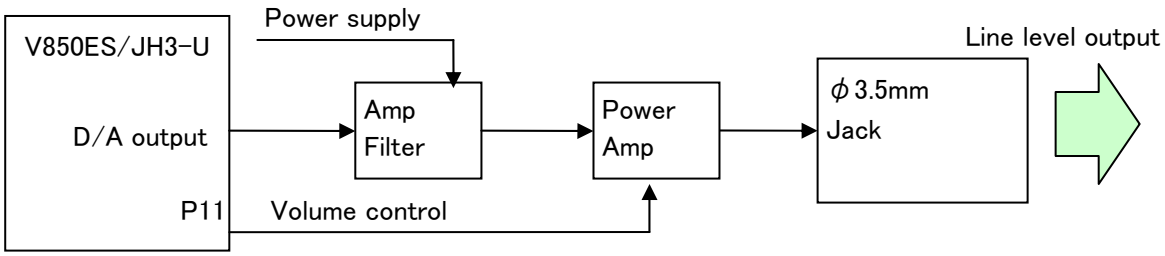
Variable gain amplifier connection

Pin	V850ES/JH3-U pin	V850ES/JH3-U signal direction	Note
CS	P40/SIF0/TXDC4/SDA01	Out	Chip select
SI	P22/SOF2/KR4/RTP04	Out	
SCK	P23/_SCKF2/KR5/RTP05	Out	

3.5.10 Audio output

- ●Monaural line level output. (Speaker drive acceptable)
- ●You can output analogue audio signal with the V850ES/JH3-U internal D/A converter.
- ●Anti-aliasing filter Fc = 3.6kHz
- ●Filter structure = Three 2nd order low pass filters (-36dB/oct)
- ●φ3.5mm Monaural/stereo mini plug output
- ●Amplifier With volume control National Semiconductor LM4865M

Audio output block diagram



Connecter pin	V850ES/JH3-U pin	V850ES/JH3-U signal direction	Note
Audio Output	P10/ANO0	D/A output	Output to filter circuit

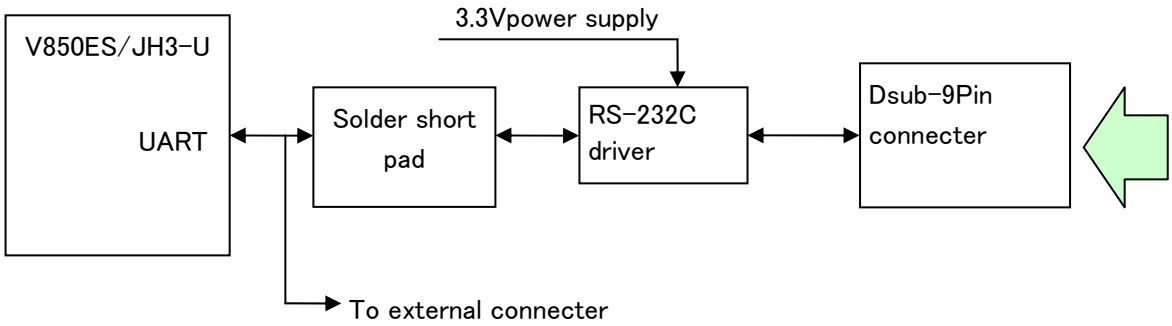
Power amplifier connection

Pin	V850ES/JH3-U pin	V850ES/JH3-U signal direction	Note
DC Vol	P11/ANO1	D/A output	Volume control

3.5.11 RS-232C

- ●DSUB1 is the RS-232C serial communication connecter
- ●You can cut the RS-232C driver output by cutting the solder short pad （TXDC1、RXDC1） for using the 3.3V level UART communication with external connecter
- ●RS-232C driver IC MAX3232
- ●Connecter D-sub 9Pin plug

RS-232C block diagram



Driver IC	V850ES/JH3-U pin	V850ES/JH3-U signal direction	Note
TXD	P90/KR6/TXDC1/SDA02/A0	Out	UARTC1
RXD	P91/KR7/RXDC1/SCL02/A1	In	UARTC1

RS-232C connecter pin connection (D-sub 9Pin plug)

1pin	N.C.	6pin	Connected to Pin4 (＊1)
2pin	RXD	7pin	Connected to Pin8 (*2)
3pin	TXD	8pin	Connected to Pin7 (*2)
4pin	Connected to Pin6 (＊1)	9pin	N.C.
5pin	GND	Shell	N.C.

＊1：You can cut the signal connection by cutting the solder short pad “P2”.

＊2：You can cut the signal connection by cutting the solder short pad “P1”.

CHAPTER 4 Troubleshooting

This chapter describes how to solve troubles you may face.

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

Check Point 1

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

Check Point 2

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

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 "2.7 Check Board Settings".

Check Point 3

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

Check Point 4

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

4.2.2 "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 "2.5 Set Options". Also remember the code you set for the security ID.
After this, erase the flash memory with referring to "5.4 WriteEZ1".

4.3 Monitor memory cannot be accessed. (F0c72)

Check Point 1

Check if the settings of switches on the kit are correct with referring "2.7 Check Board Settings".

Check Point 2

Erase the flash memory with referring to "5.4 WriteEZ1".

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.

CHAPTER 5 Other Information

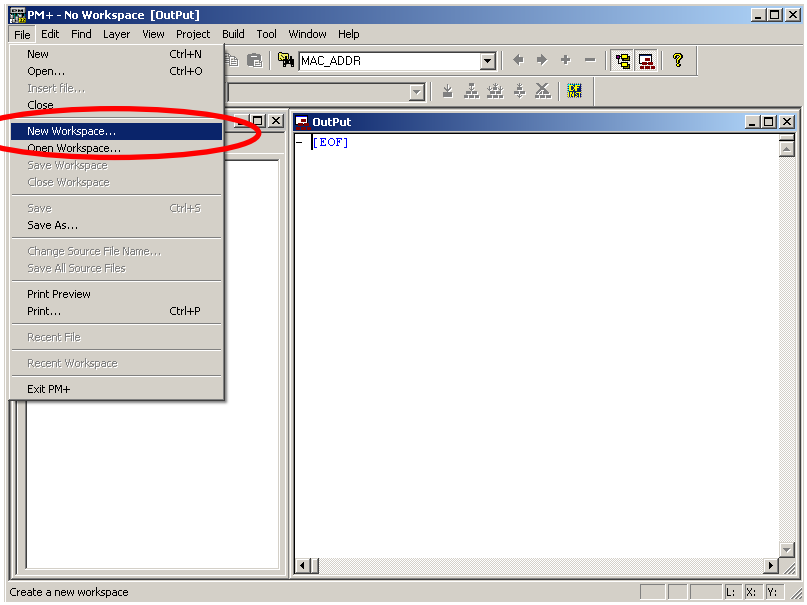
This chapter explains some useful operation techniques of development tools and circuit diagram of the kit for developing of user programs.

5.1 Create a new workspace

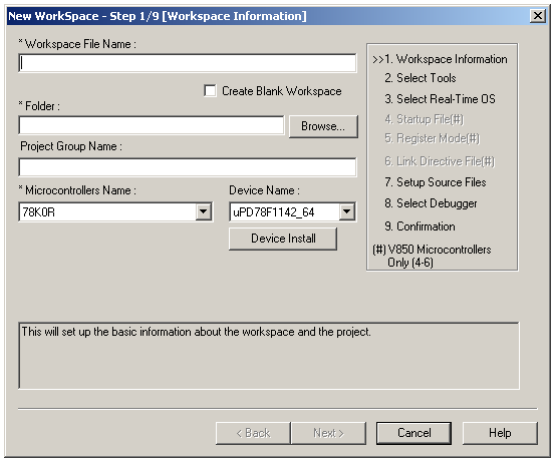
Now, create a new workspace and project.

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.

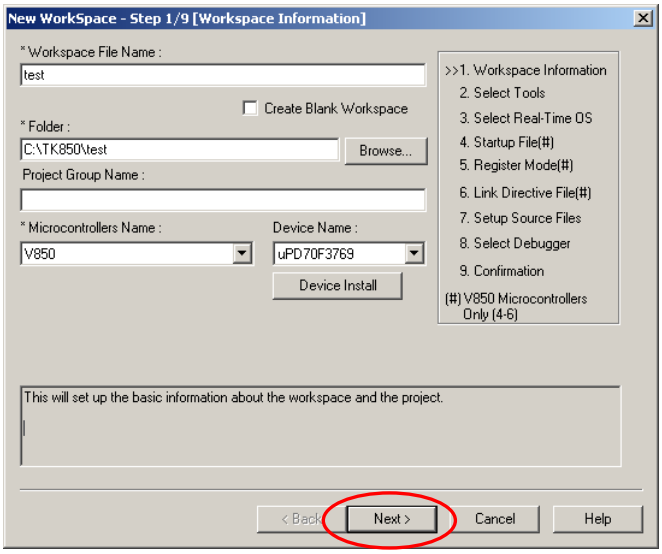
Workspace file name
→ test

Folder
→ C:¥TK850¥test

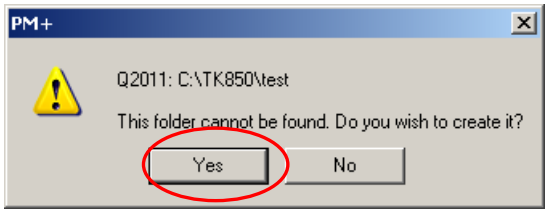
Project Group Name
→ (no input)

Microcontroller Name
→ V850

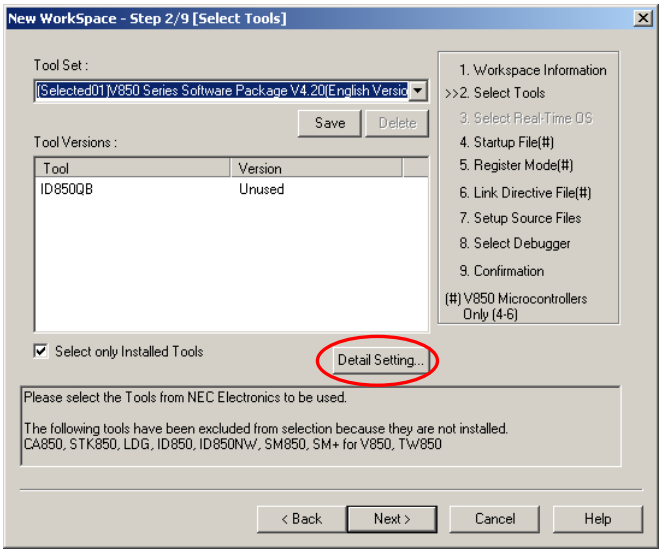
Device Name
→ uPD70F3769



Click Next > button

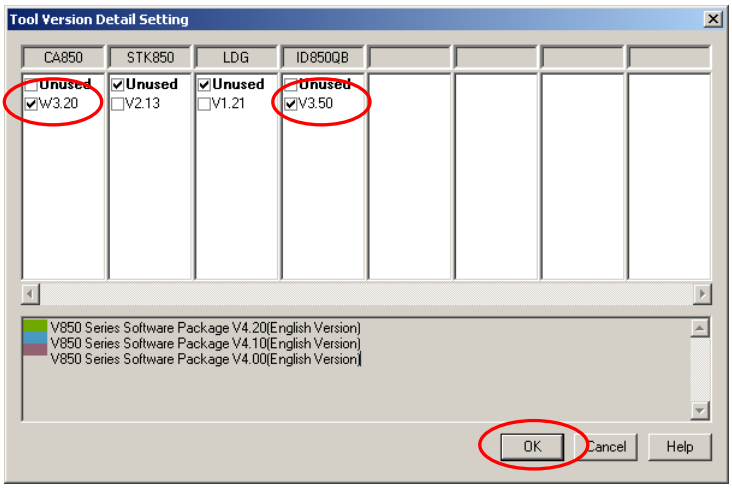


Click Yes button

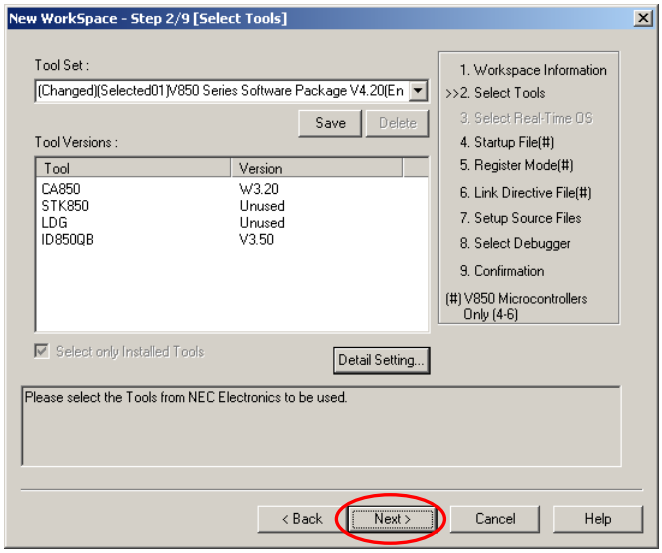


Click Detail Setting button

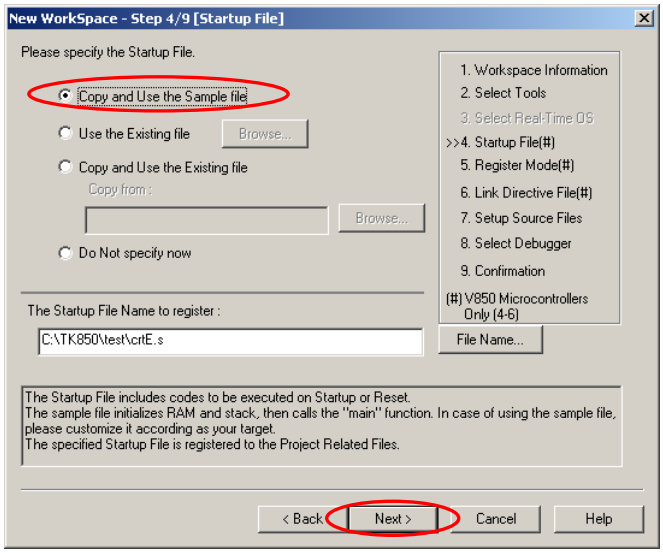
Set the version of tools as follows.
CA850 : W3.20
ID850QB : V3.50



Select tools as above screenshot, then click OK .

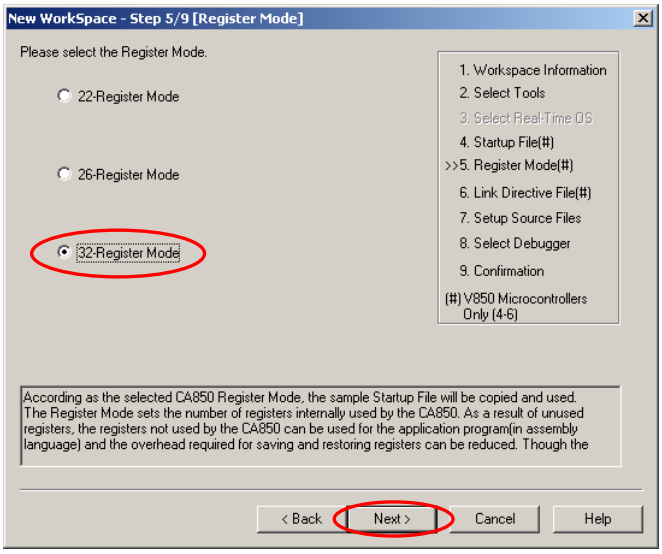


Click Next >



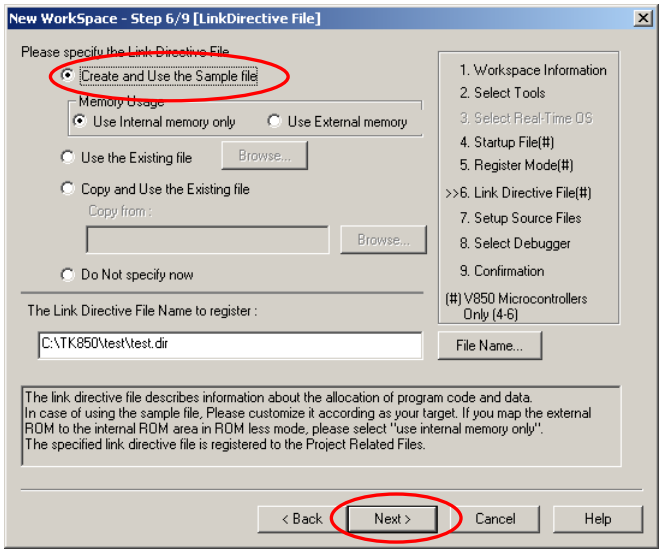
Select the "Copy and Use the Sample file".

Press the Next > button.



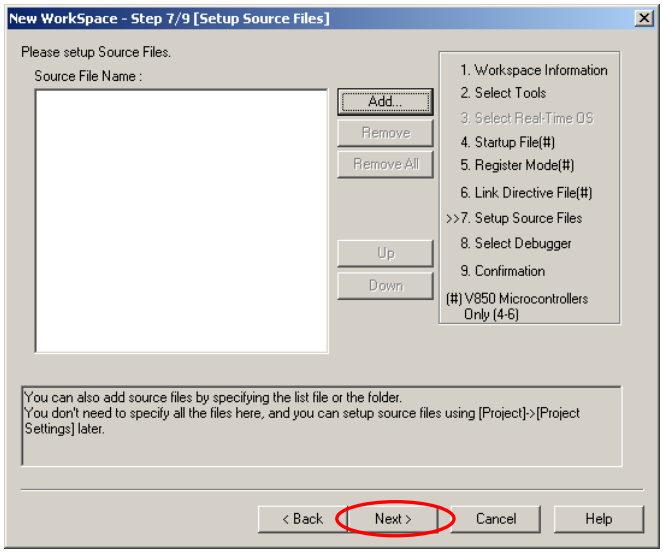
Select the " 32-Register Mode".

Press the Next > button.



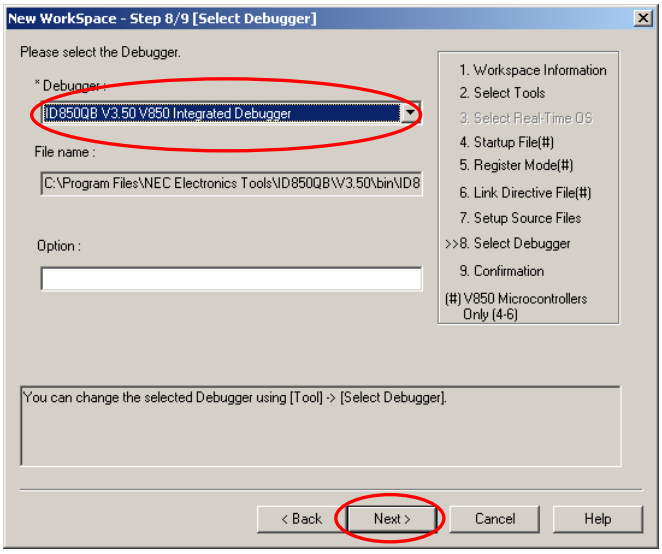
Select the "Create and Use the sample file"

Press the Next > button.

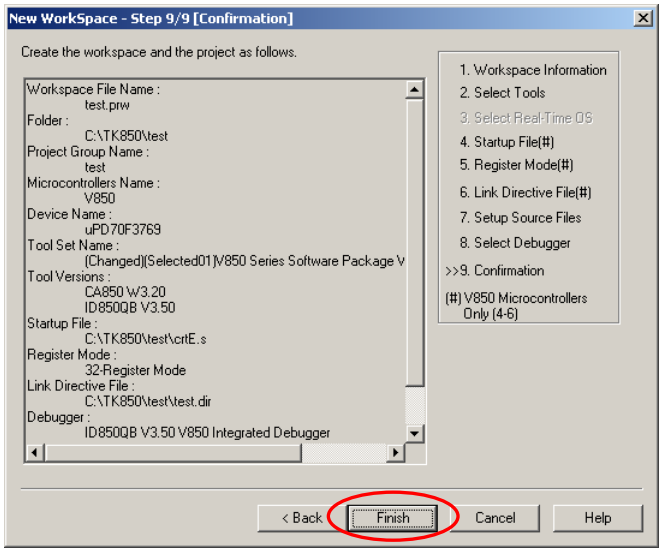


Press the Next > button.

Select the "ID850QB V3.50"

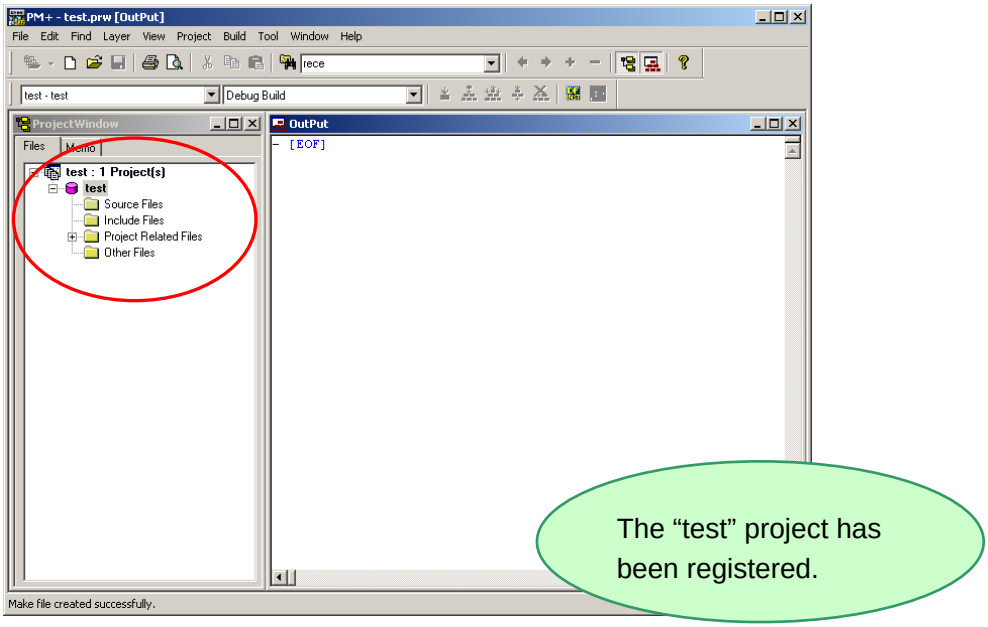


Press the Next > button.



Press the Finish button.

Check the project information setting contents.



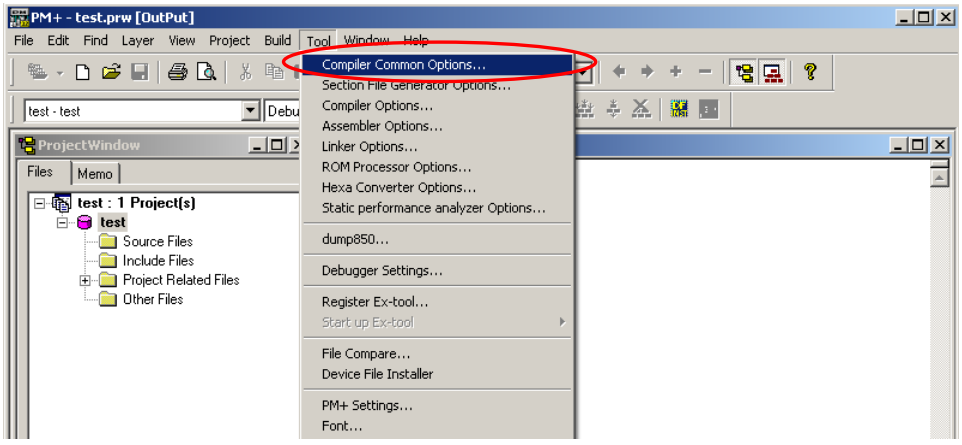
This completes workspace and project creation.

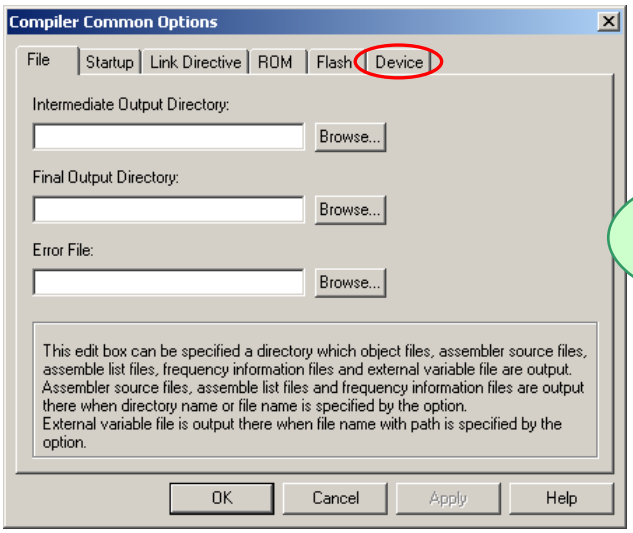
Additional source files can be registered at any time thereafter.

For details, refer to "Registering additional source files".

Next, setup the security ID

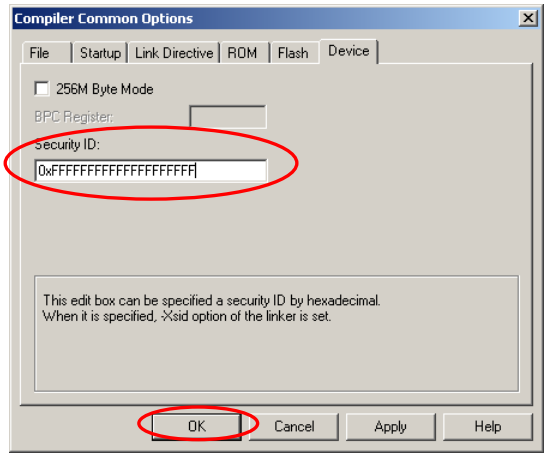
In the PM +, [Tool] → [Compiler common Options...] is selected.





Compiler Common Options setting is open.

Click the "Device" tab.



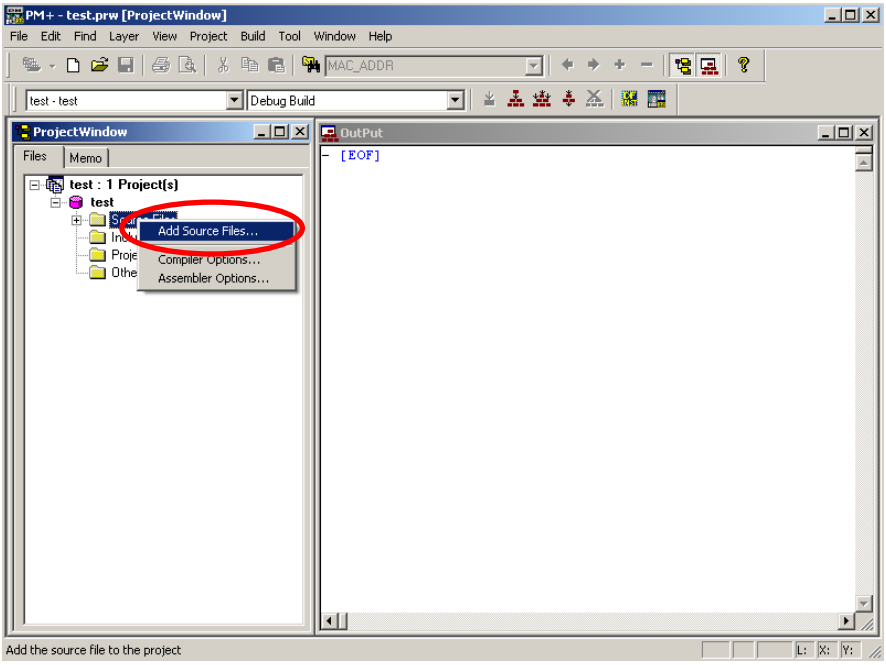
The actualities of "FFFFFFFFFFFFFFFFFFFF"(20 of F) are taken if there is no problem in the value of ID in security.

Press the OK button.

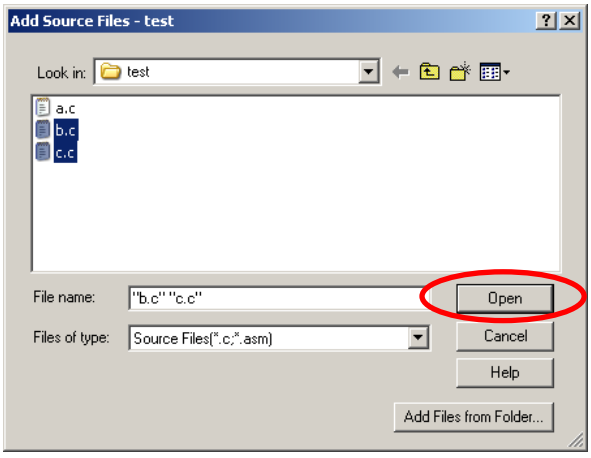
Security ID settings are complete

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.

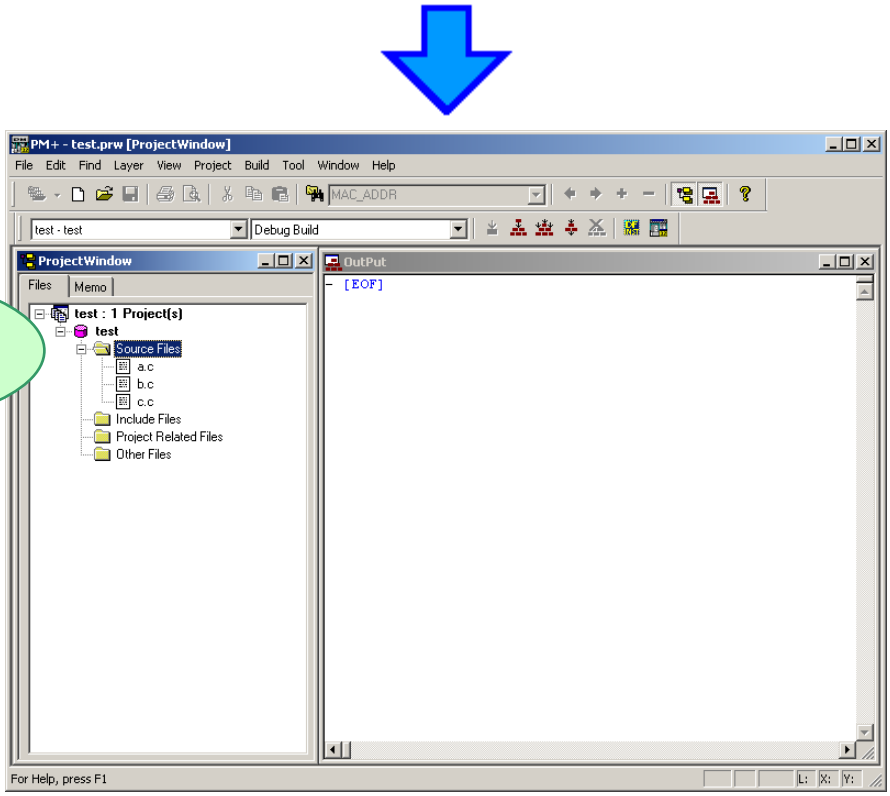


Select source files "b.c" and "c.c", then click Open



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

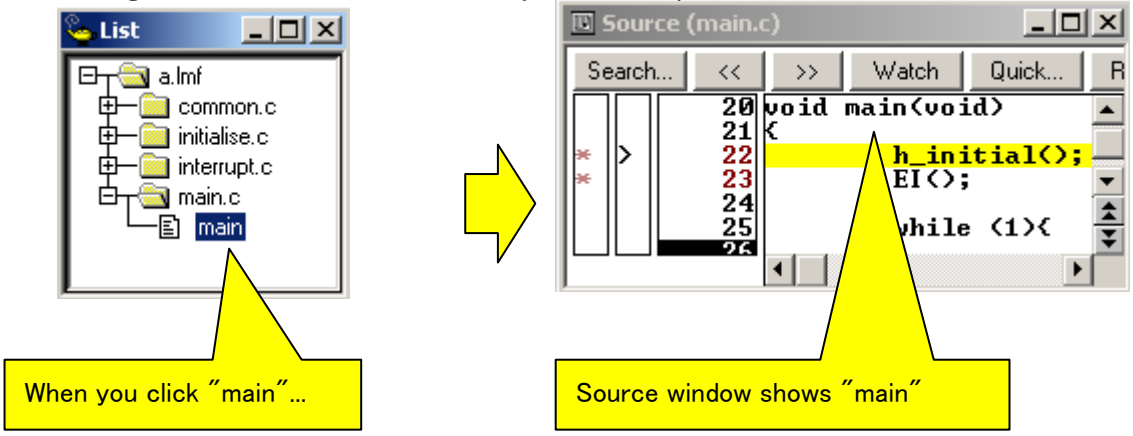
Execution controls (run, stop, step-in debugging, reset, etc) and opening functional window can be made by below buttons. However, it could be difficult to know which button does what.

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.

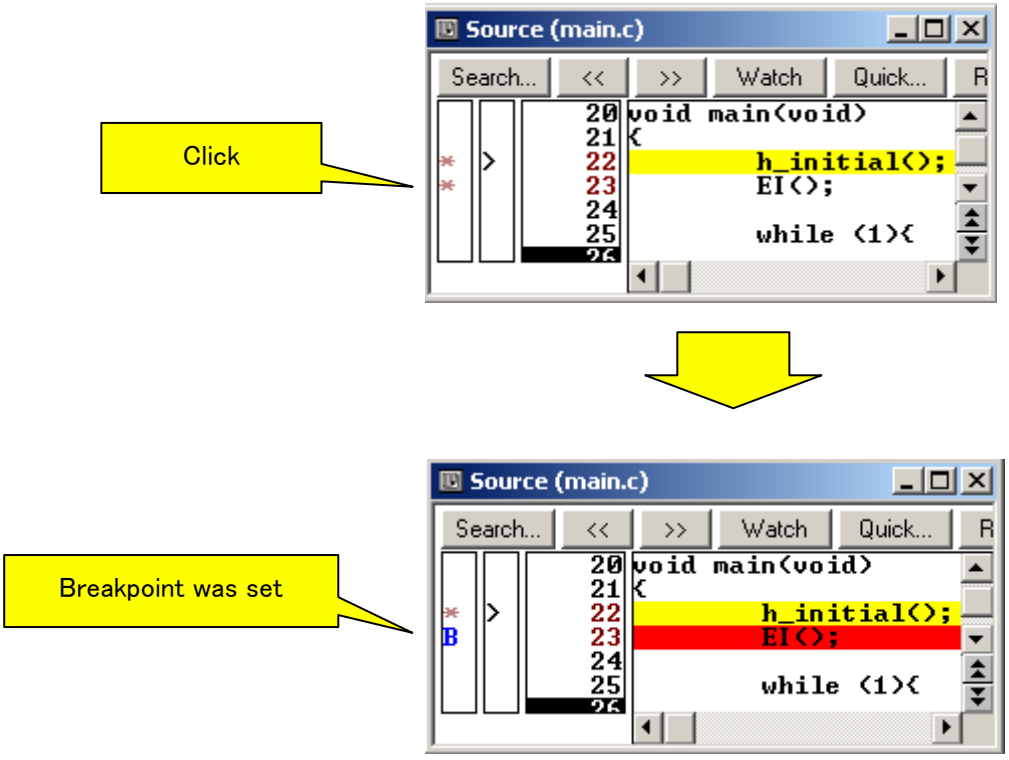
5.3.2 Display source list and function list

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

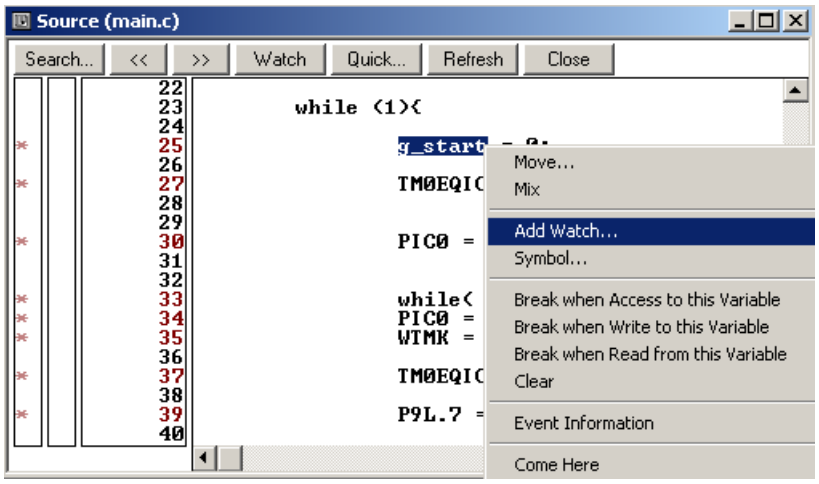
Breakpoints are executed by clicking lines in which " * " is displayed
"B" is displayed in the line where a breakpoint is set.
Breakpoints are deleted by clicking "B".



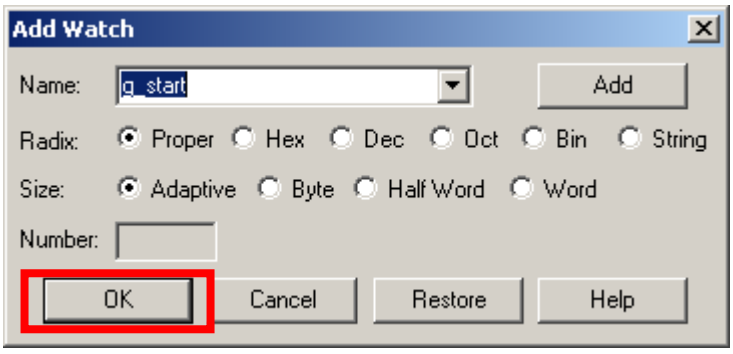
5.3.4 Display global variables

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.

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



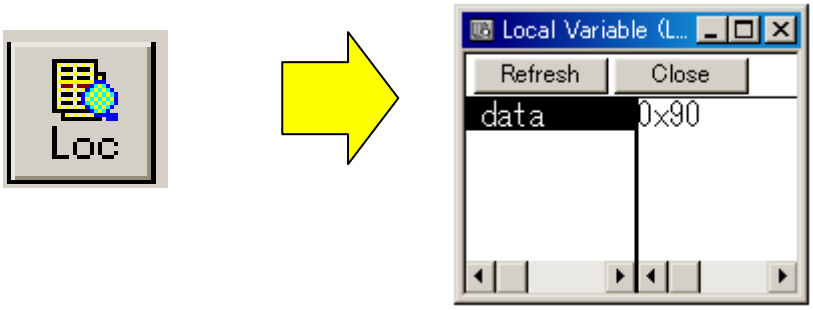
②Add Watch dialog opens. Click OK .



③Adding a variable to watch window is completed.

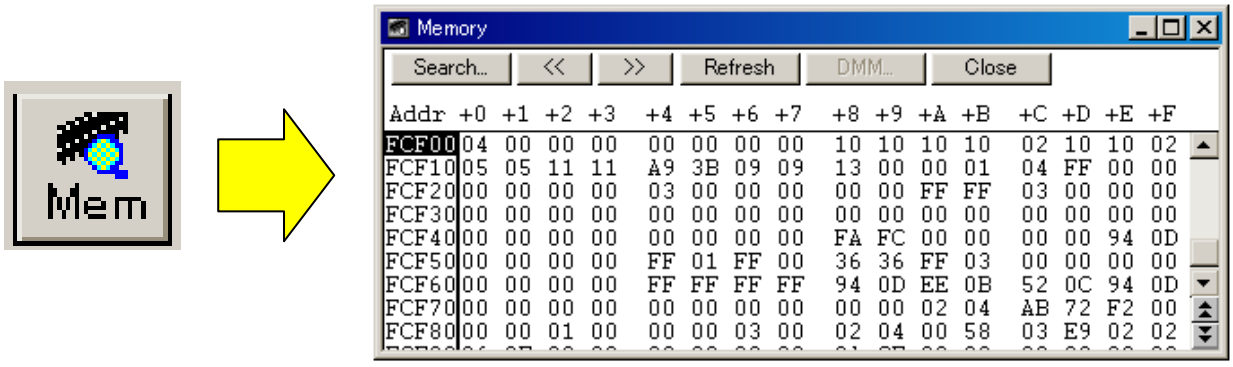
5.3.5 Display local variables

Local variable window is used to display local variables.
By clicking the button below, you can open the local variable window.
Unlike global variables, local variables cannot be displayed when programs are running.

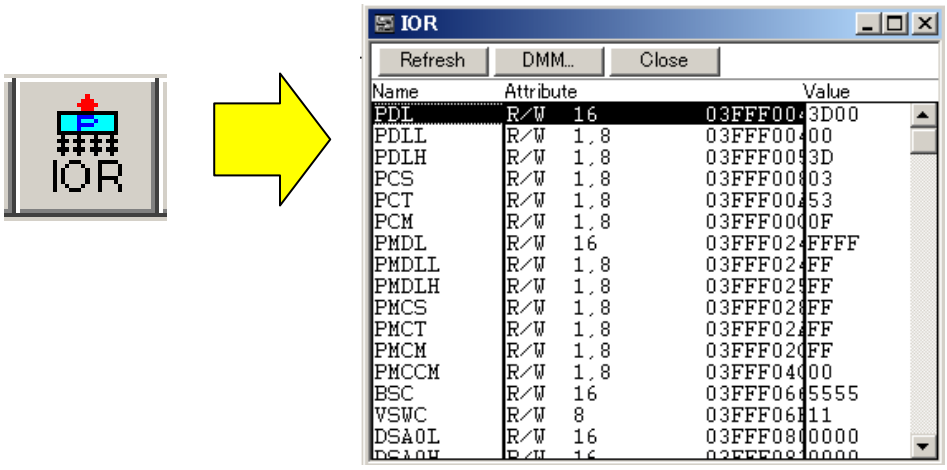


5.3.6 Display memory and SFR contents

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



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



5.4 WriteEZ1

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 WriteEZ1 to erase the flash memory.

WriteEZ1 cannot be installed from an integrated installer. Please execute

¥WriteEZ1¥WriteEZ1.exe

from attached CD.

The hardware for WriteEZ1 is incorporated in TK-850/JH3U-SP.

Down loaded program by ID850QB which is down load with monitor file for debugging is not run stand-alone.

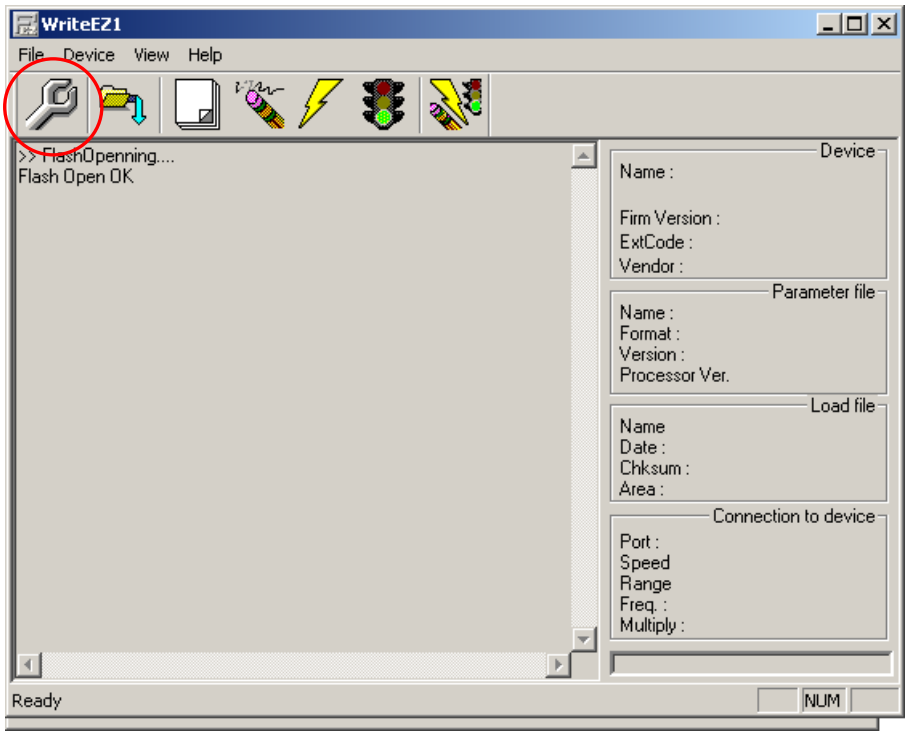
The program written by WriteEZ1 which is not including the monitor file is able to run standalone.

① The switch of TK-850/JH3U-SP is set as follows, and connects TK-850/JH3U-SP to PC.

SW1

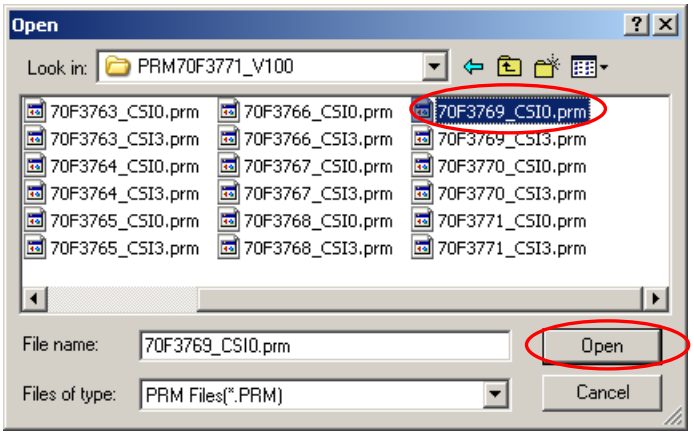
Bit1	OFF
Bit2	ON
Bit3	ON
Bit4	ON

② Please execute "¥WriteEZ1¥WriteEZ1.exe" from attached CD.

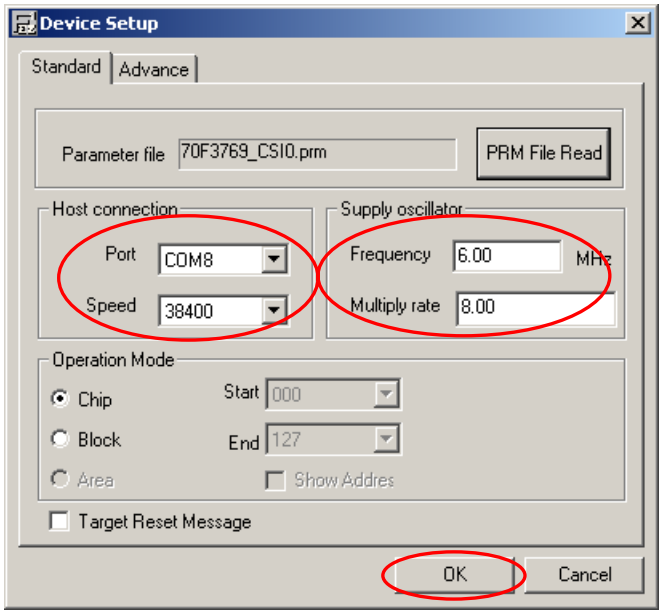


③ Push the「Setup」button.

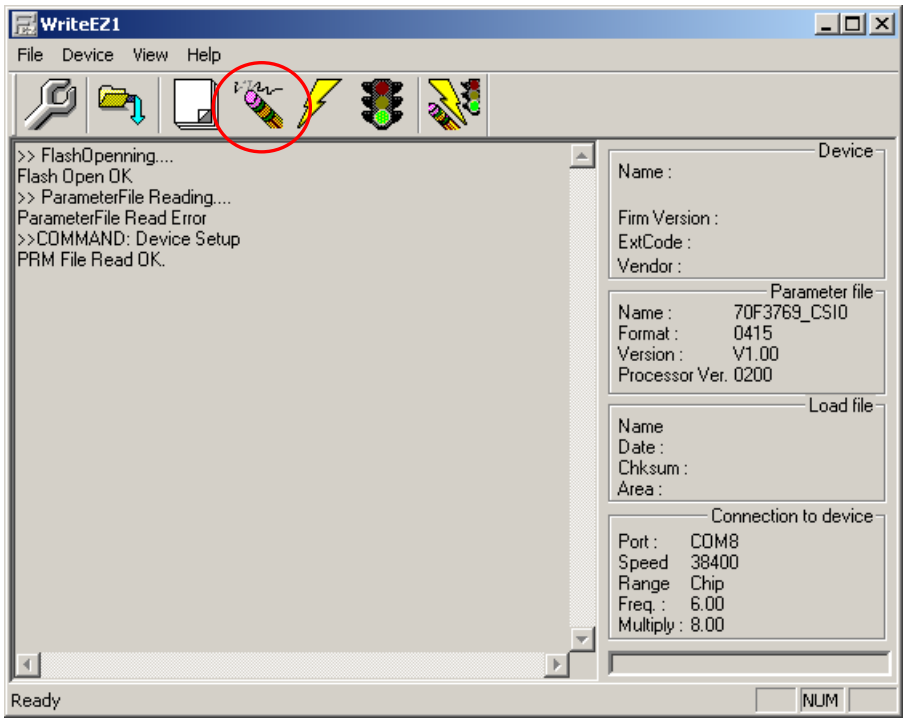
④ Push the「PRM File Read」button.



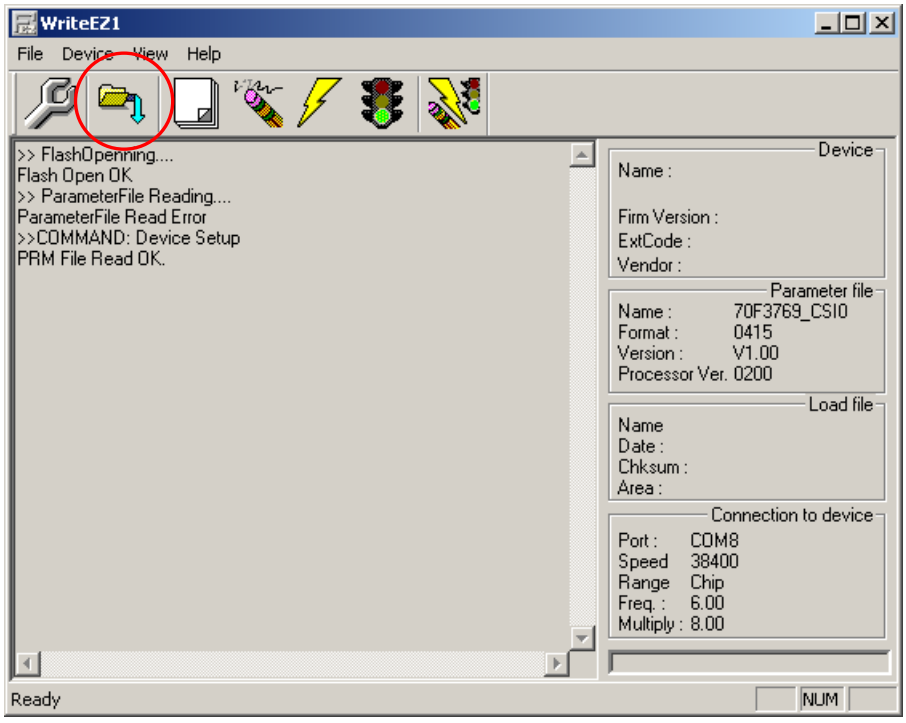
⑤ Please select “70F3769_CSI0.prm” in the directory of “¥PRM¥PRM70F3771_V100” in the CD-ROM.



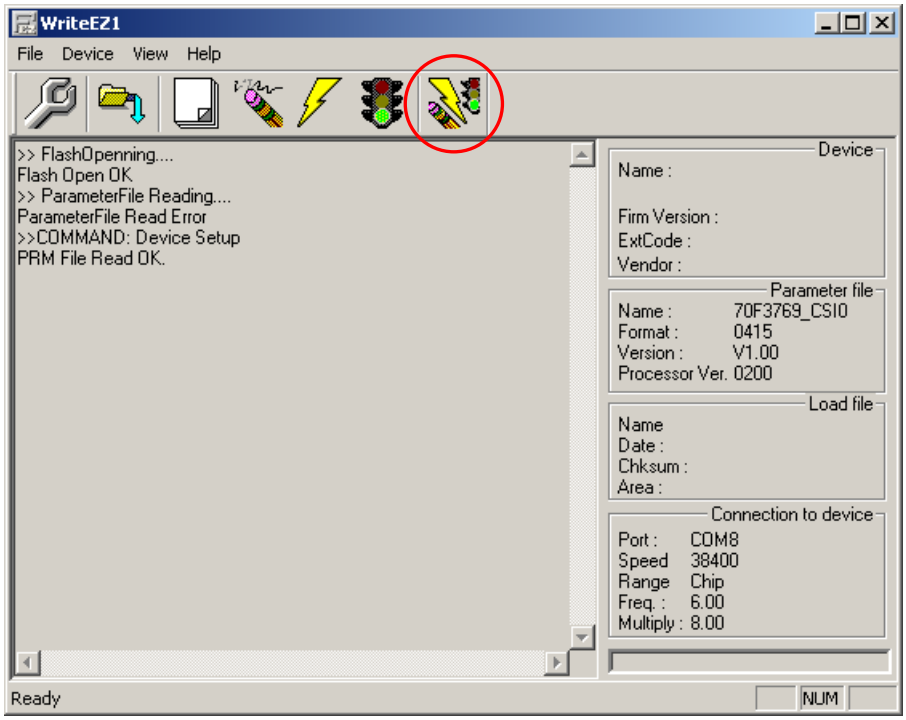
⑥ "Port" selects the COM port number where TK-850/JH3U-SP is allocated.
※Only the COM port number that the personal computer has is displayed in this pull-down menu.
Input “6.00” to “Frequency”
Input “8.00” to “Multiply rate”
Input “38400” to “Speed”, and chick “OK”



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



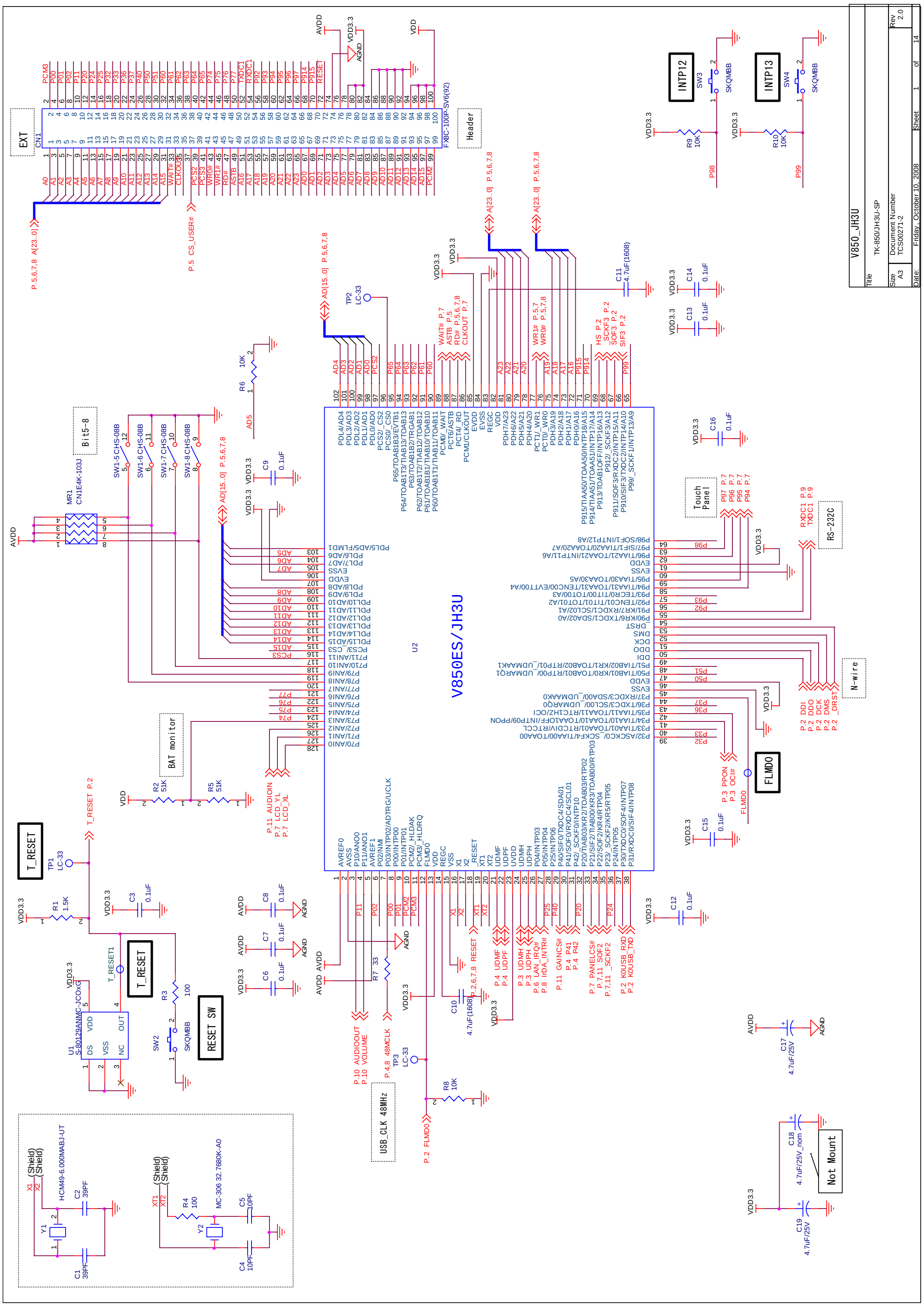
⑧ When you write the program, click “load” then select writing HEX file.

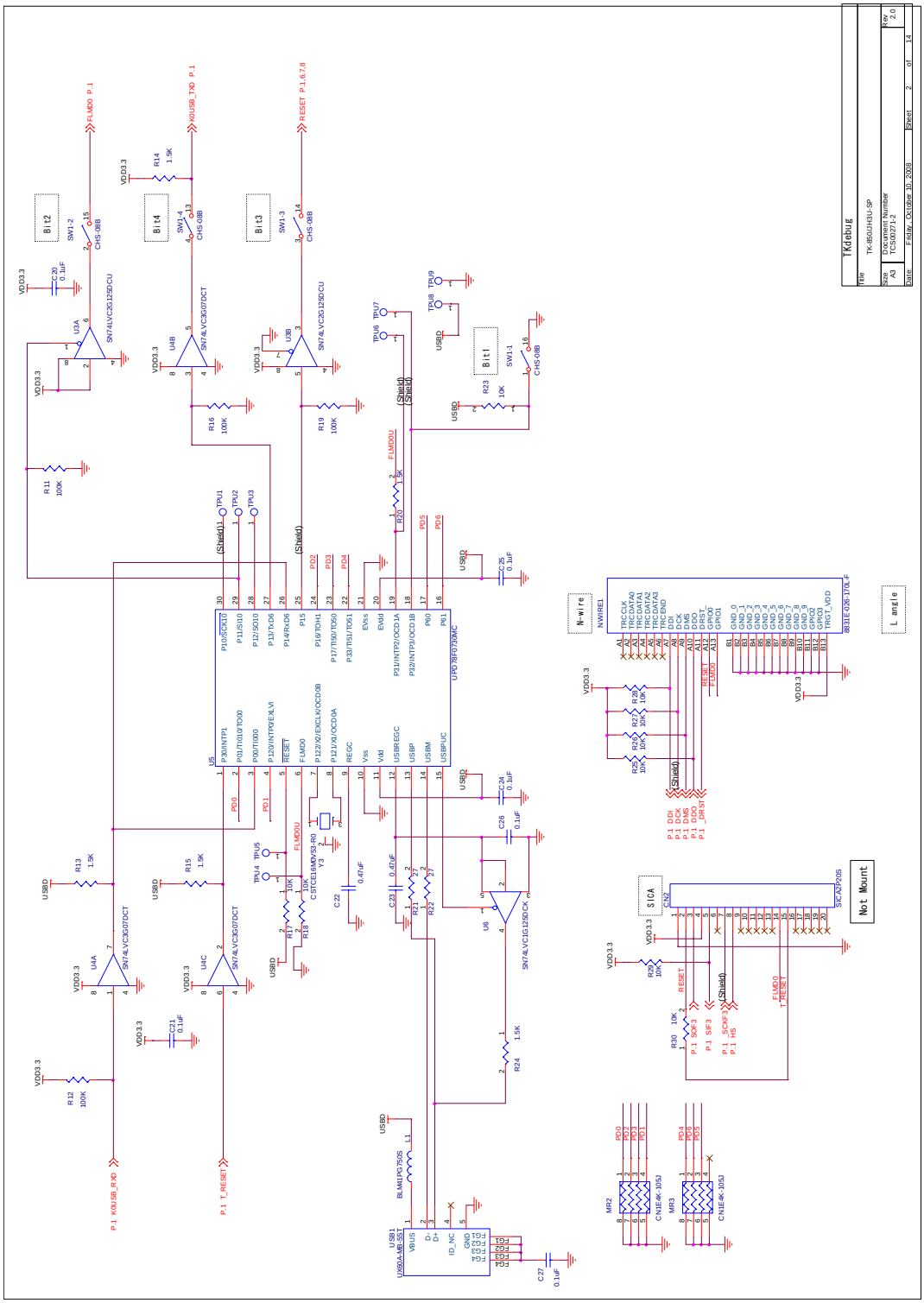


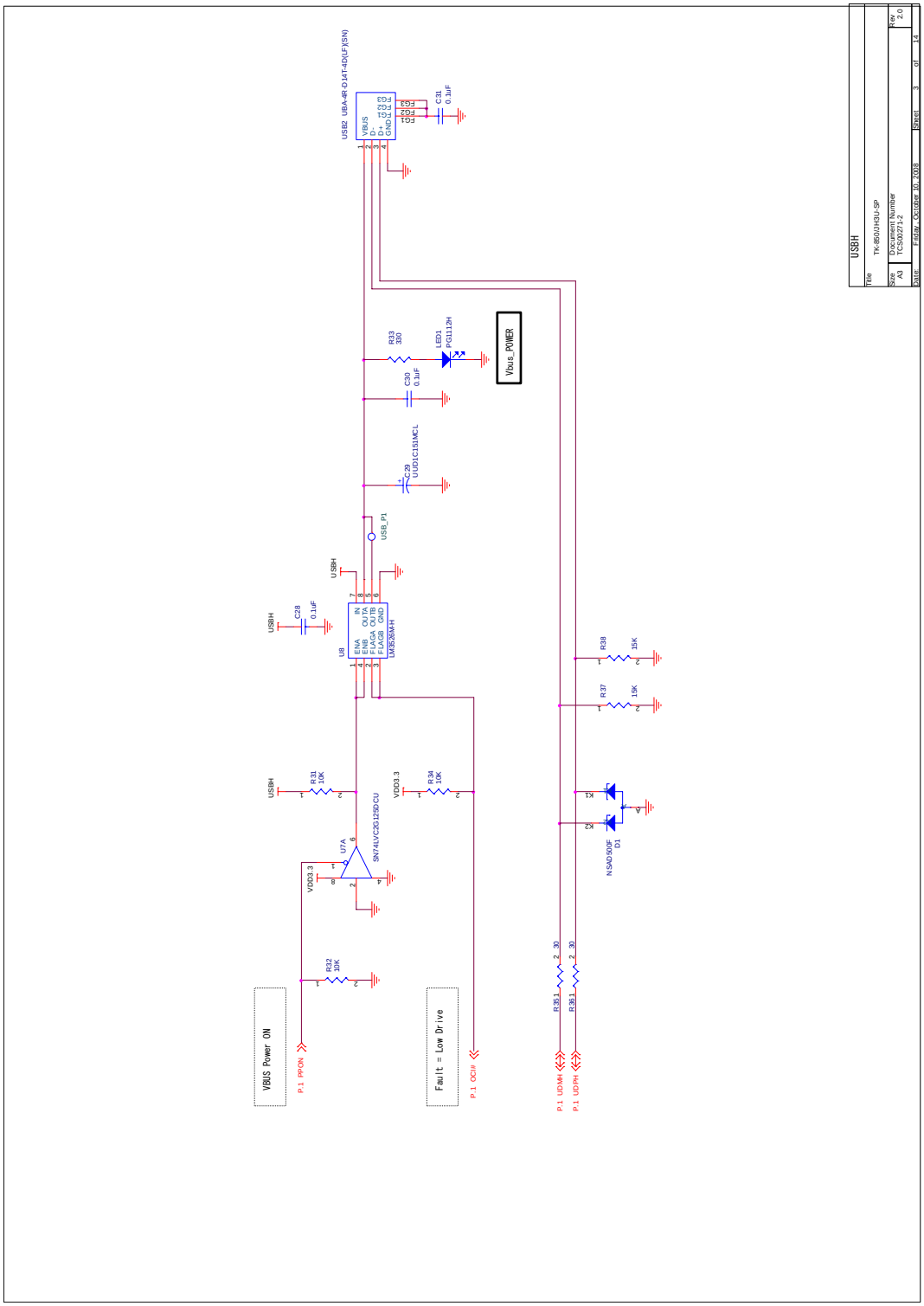
⑨ Hex file writing will be start by clicking "AutoProcedure" .

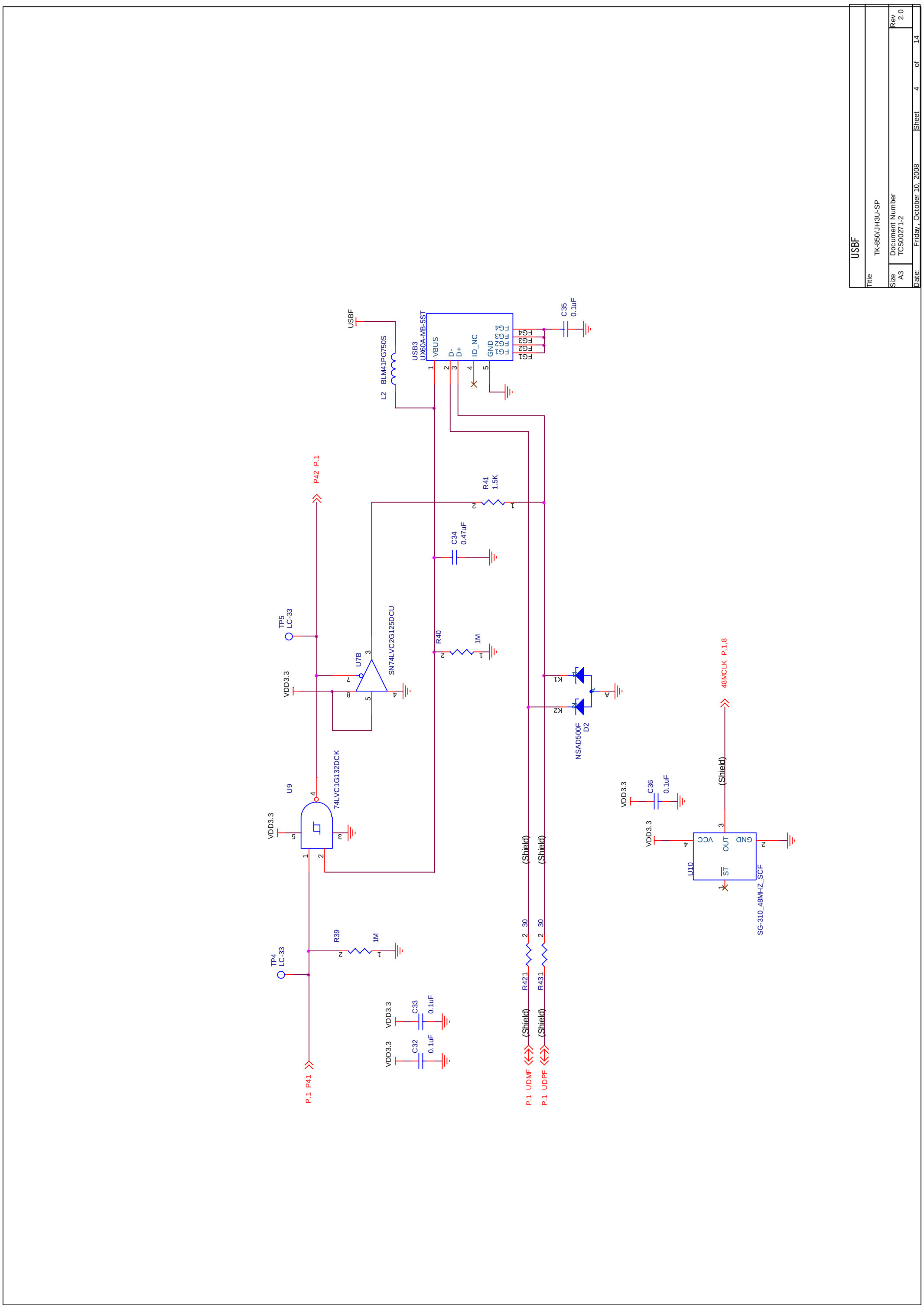
5.5 Circuit diagram

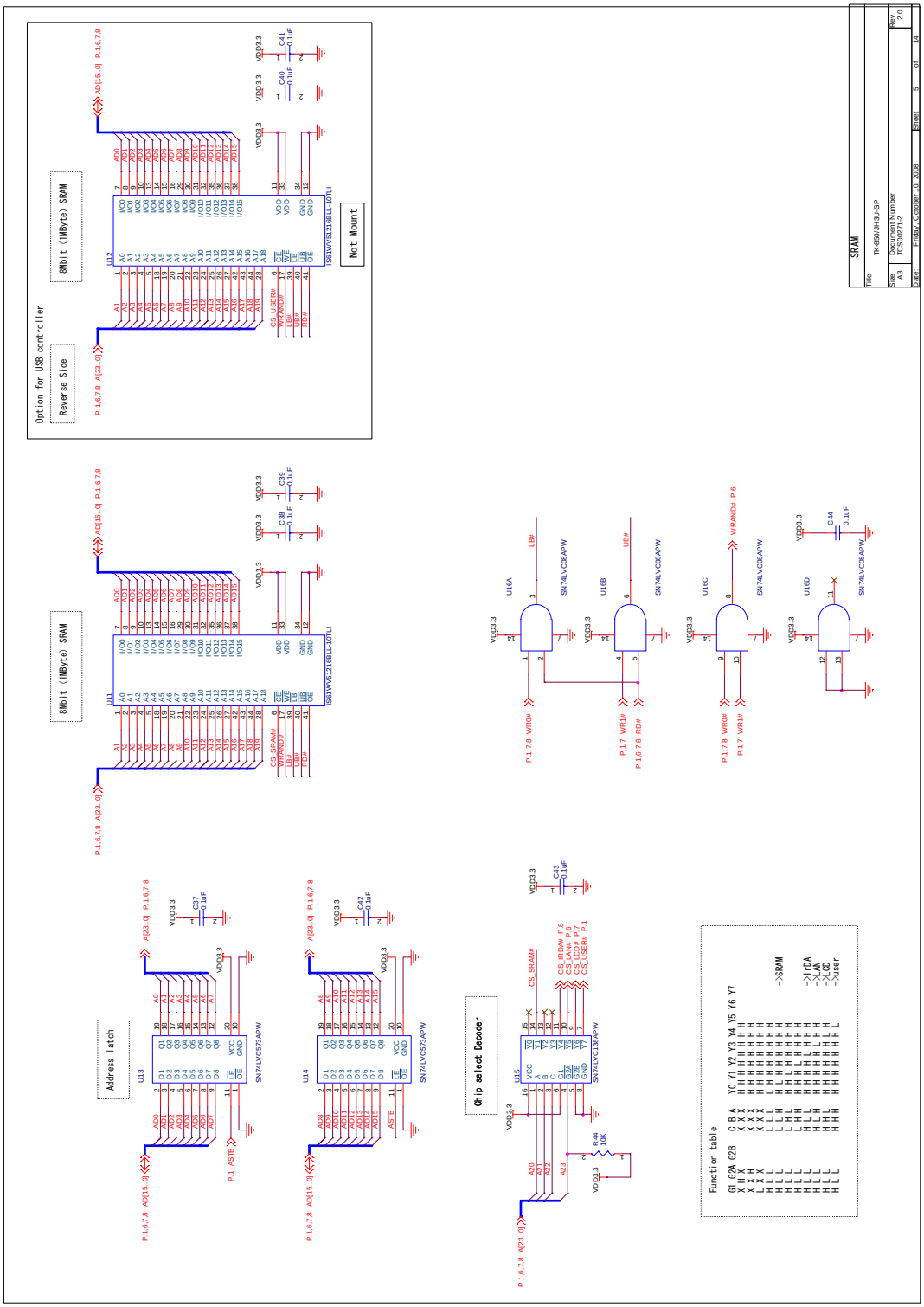
From following page, it shows the circuit diagram of the kit.

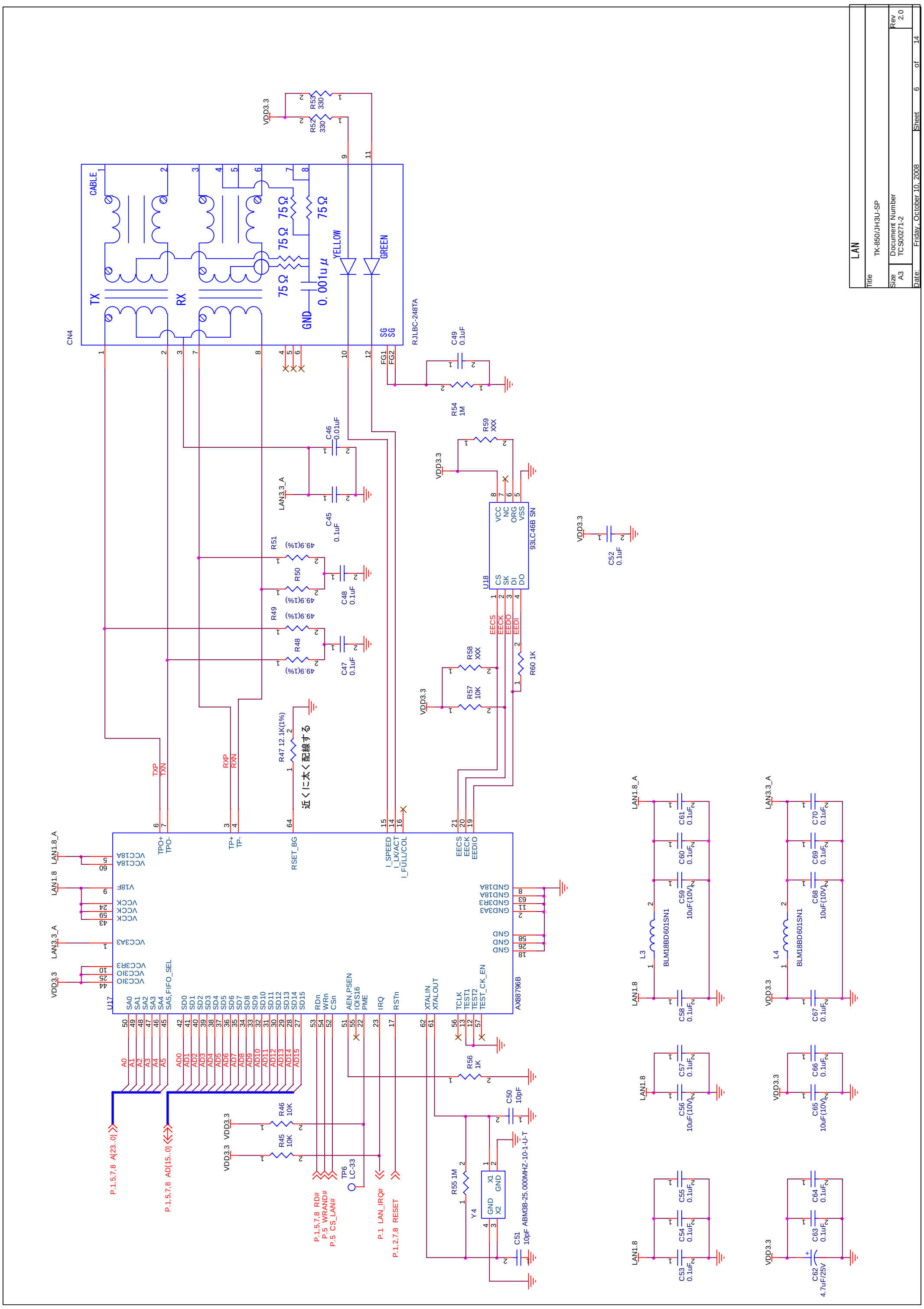

V850_JH3U
TK-850/JH3U-SP
TCS00271-2
Friday, October 10, 2008
V850ES/JH3U
EXT
Header
T_RESET
RESET SW
INTP12
INTP13
FLMD0
RS-232C
N-wire
Touch Panel
BAT monitor
USB_CLK 48MHz
Not Mount

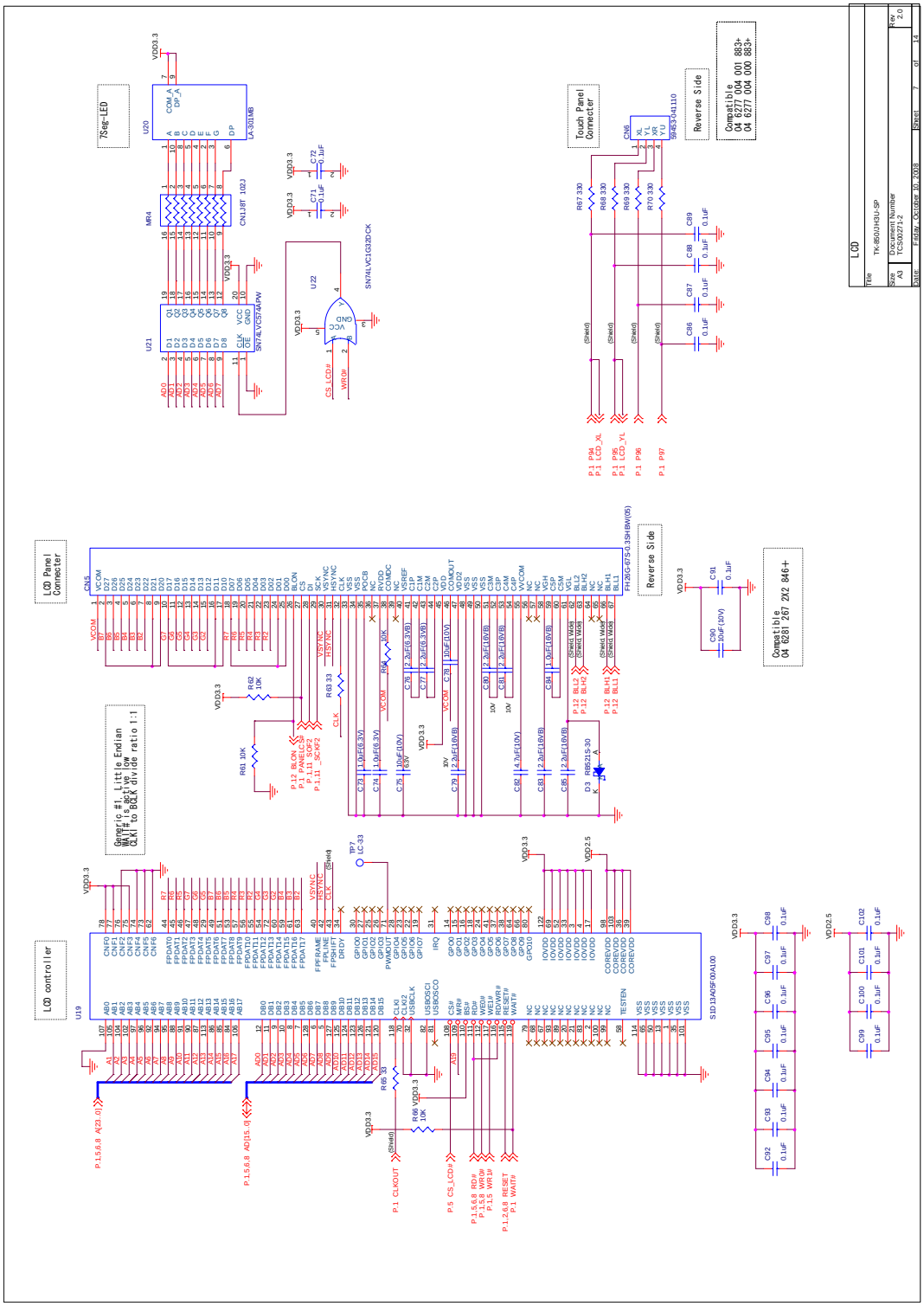


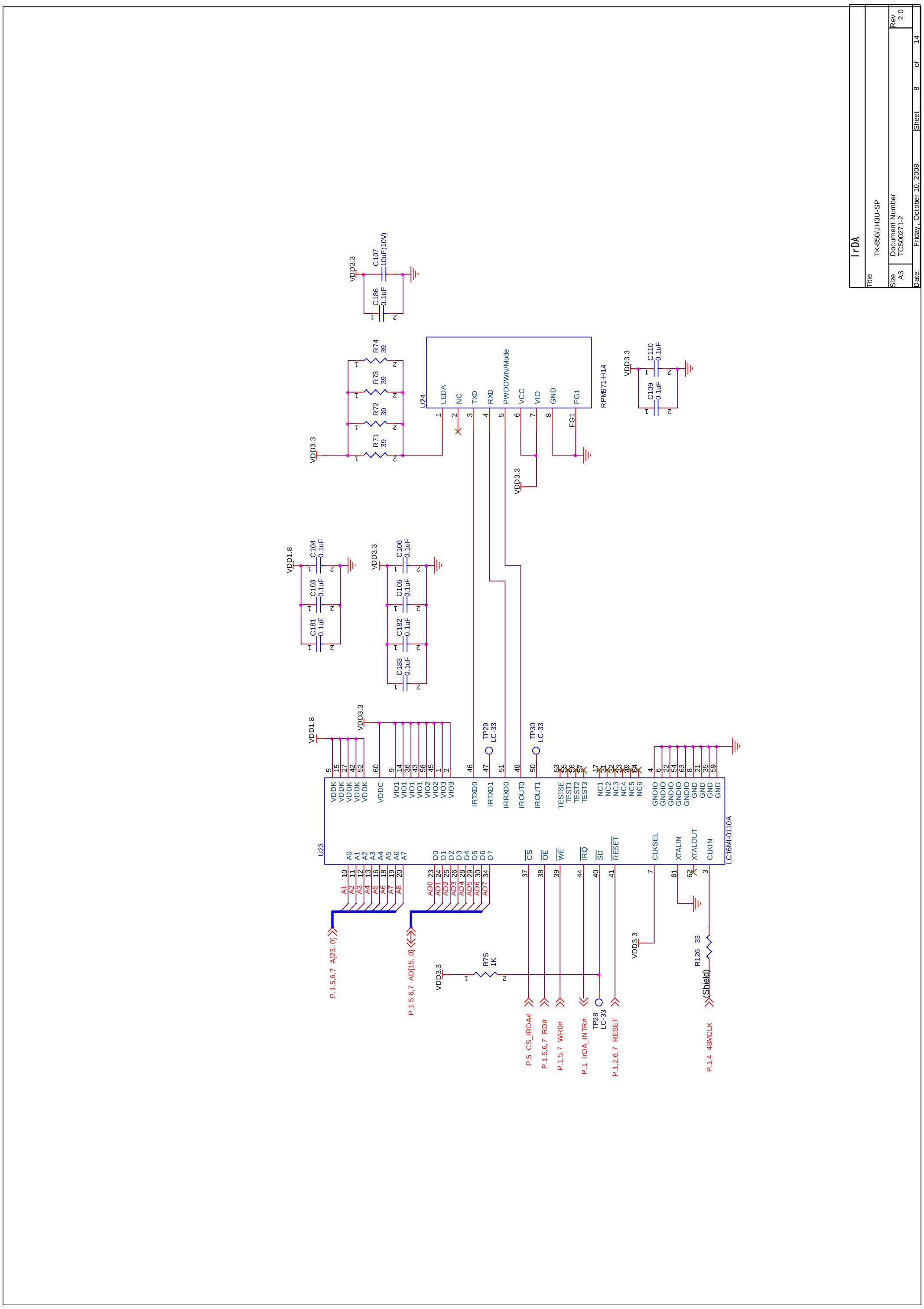

USBH
VBUS_POWER
VBUS Power ON
Fault = Low Drive
P.1 PPON
P.1 OCI#
P.1 UDMH
P.1 UDPH

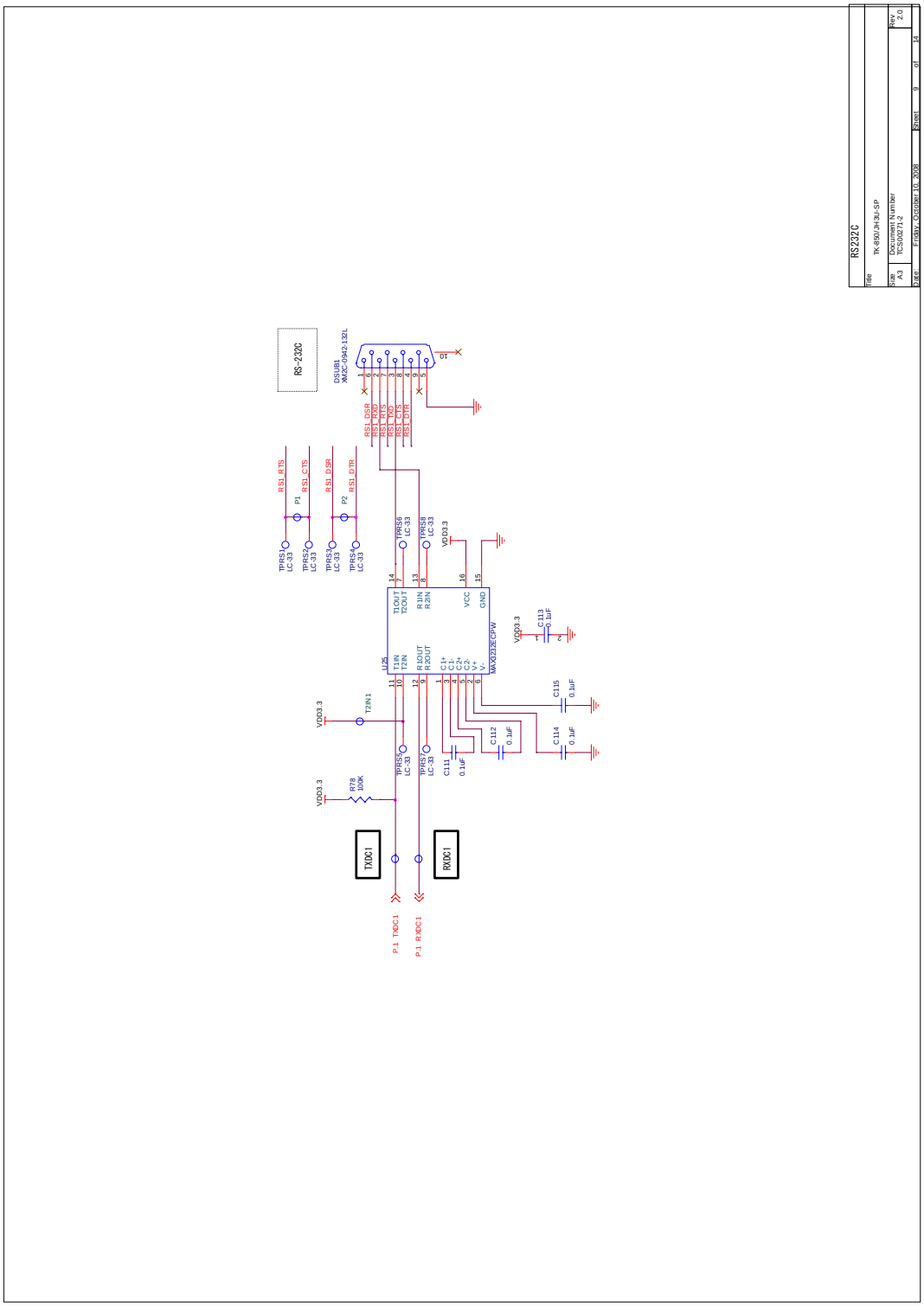

USBF
Title
TK-850/JH3U-SP
Size
A3
Document Number
TCS00271-2
Rev
2.0
Date
Friday, October 10, 2008
Sheet
4
of
14
USB3
UX60A-MB-5ST
VBUS
D-
D+
ID_NC
GND
FG1
FG2
FG3
FG4
L2
BLM41PG750S
C35
0.1uF
R41
1.5K
C34
0.47uF
R40
1M
R39
1M
U7B
SN74LVC2G125DCU
U9
74LVC1G132DCK
TP4
LC-33
TP5
LC-33
VDD3.3
P42 P.1
P.1 P41
C32
0.1uF
C33
0.1uF
R42
30
R43
30
(Shield)
P.1 UDMF
P.1 UDPF
NSAD500F
D2
K1
K2
A
48MCLK P.1,8
C36
0.1uF
U10
VCC
OUT
GND
ST
SG-310_48MHZ_SCF

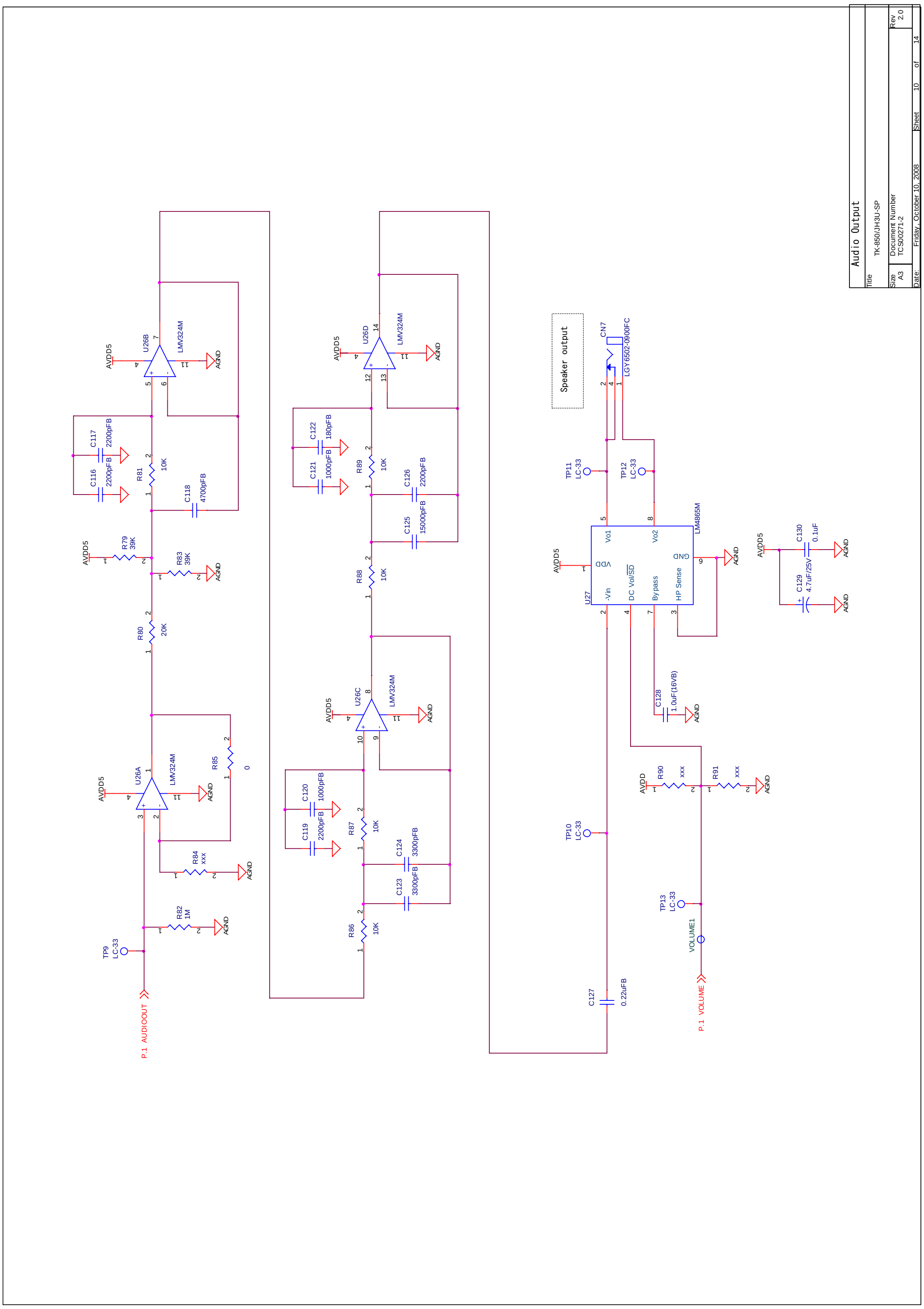

Option for USB controller
Reverse Side
8Mbit (1MByte) SRAM
Not Mount
Address latch
Chip select Decoder
SRAM
TK-850/JH3U-SP
Document Number
TCS00271-2
Friday, October 10, 2008
Function table
->SRAM
->IrDA
->LAN
->LCD
->User

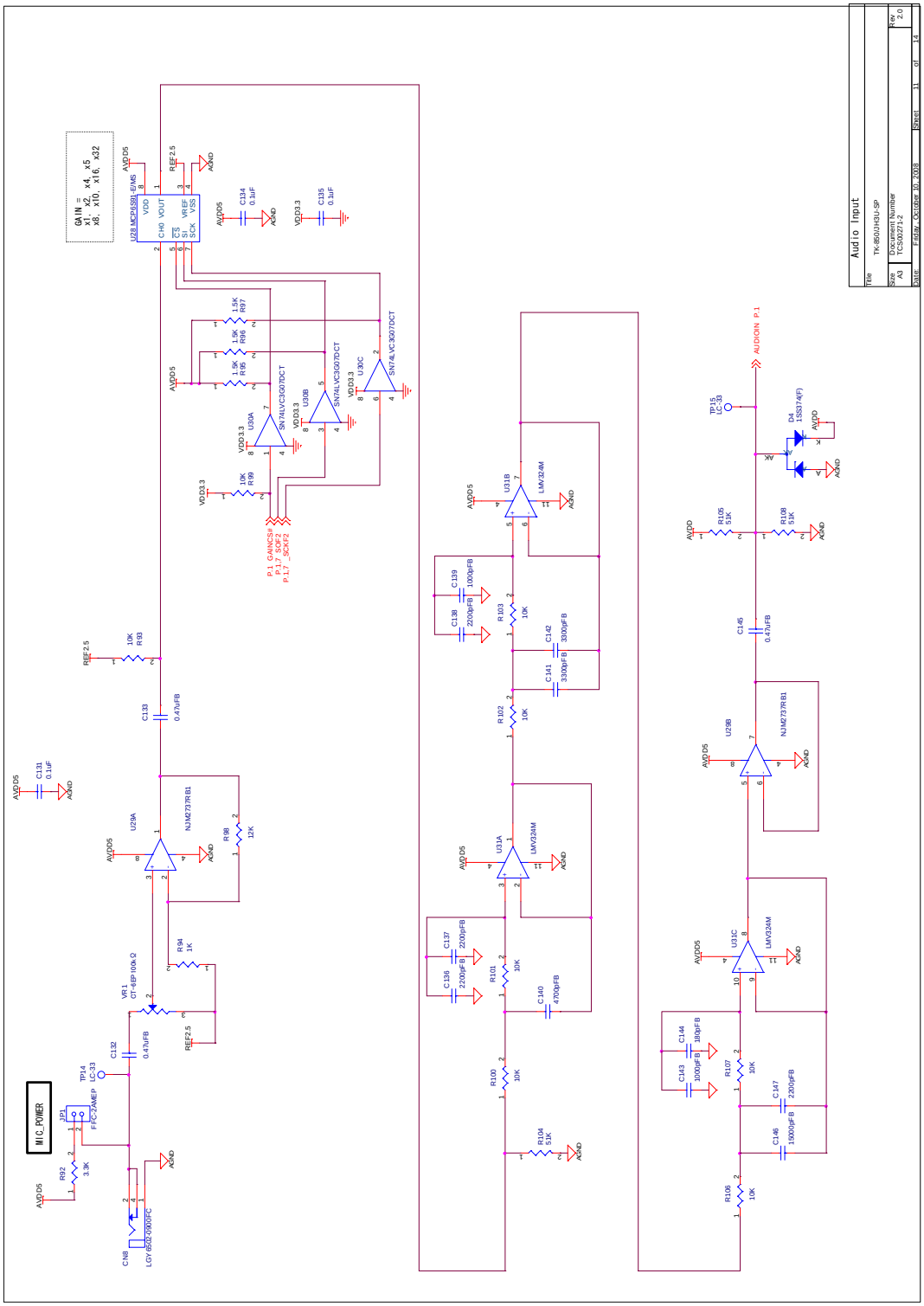

LAN
TK-850/JH3U-SP
TCS00271-2
A3
Friday, October 10, 2008
Sheet 6 of 14
Rev 2.0
CN4
RJLBC-248TA
U17
AX88796B
U18
93LC46B SN

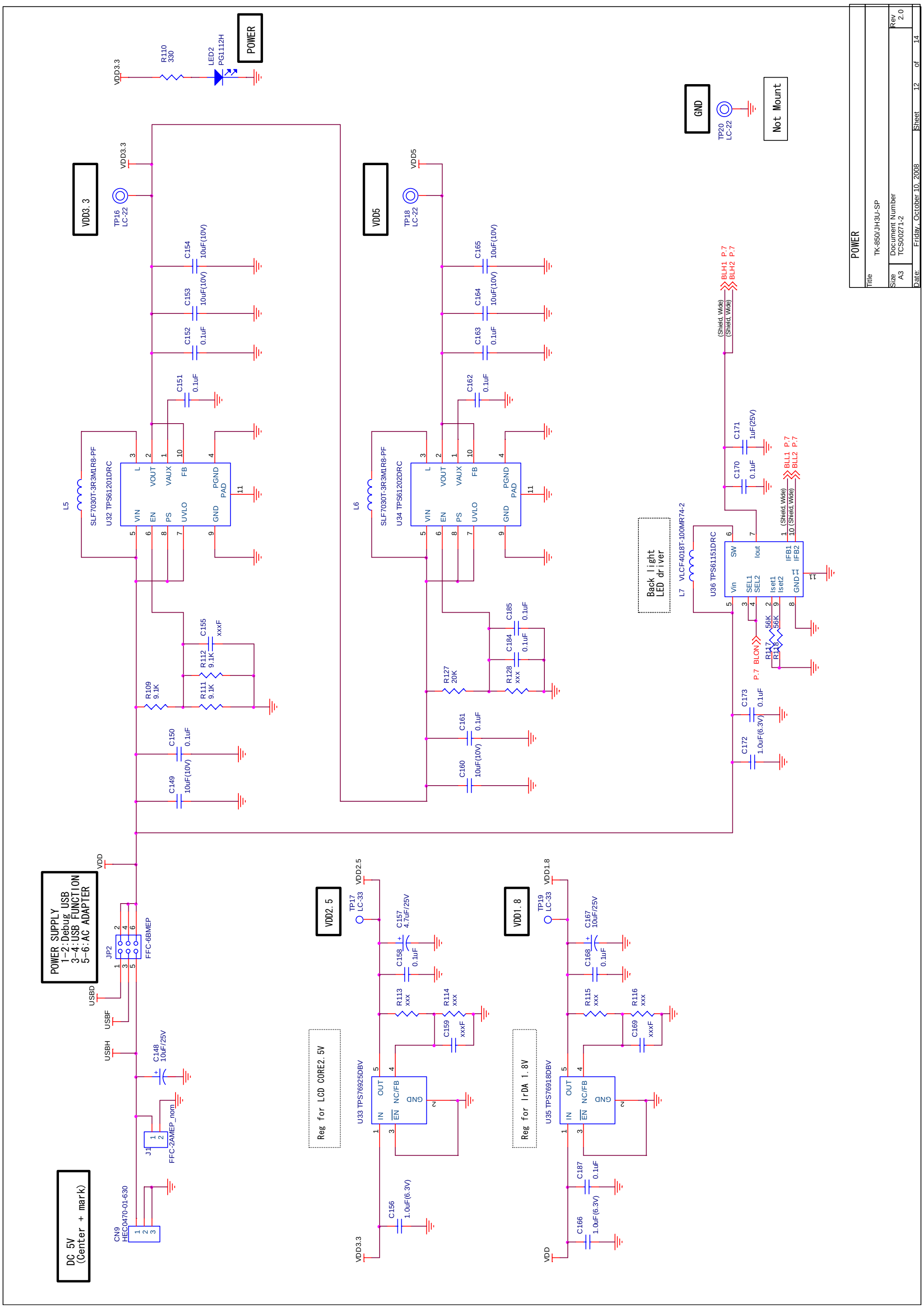


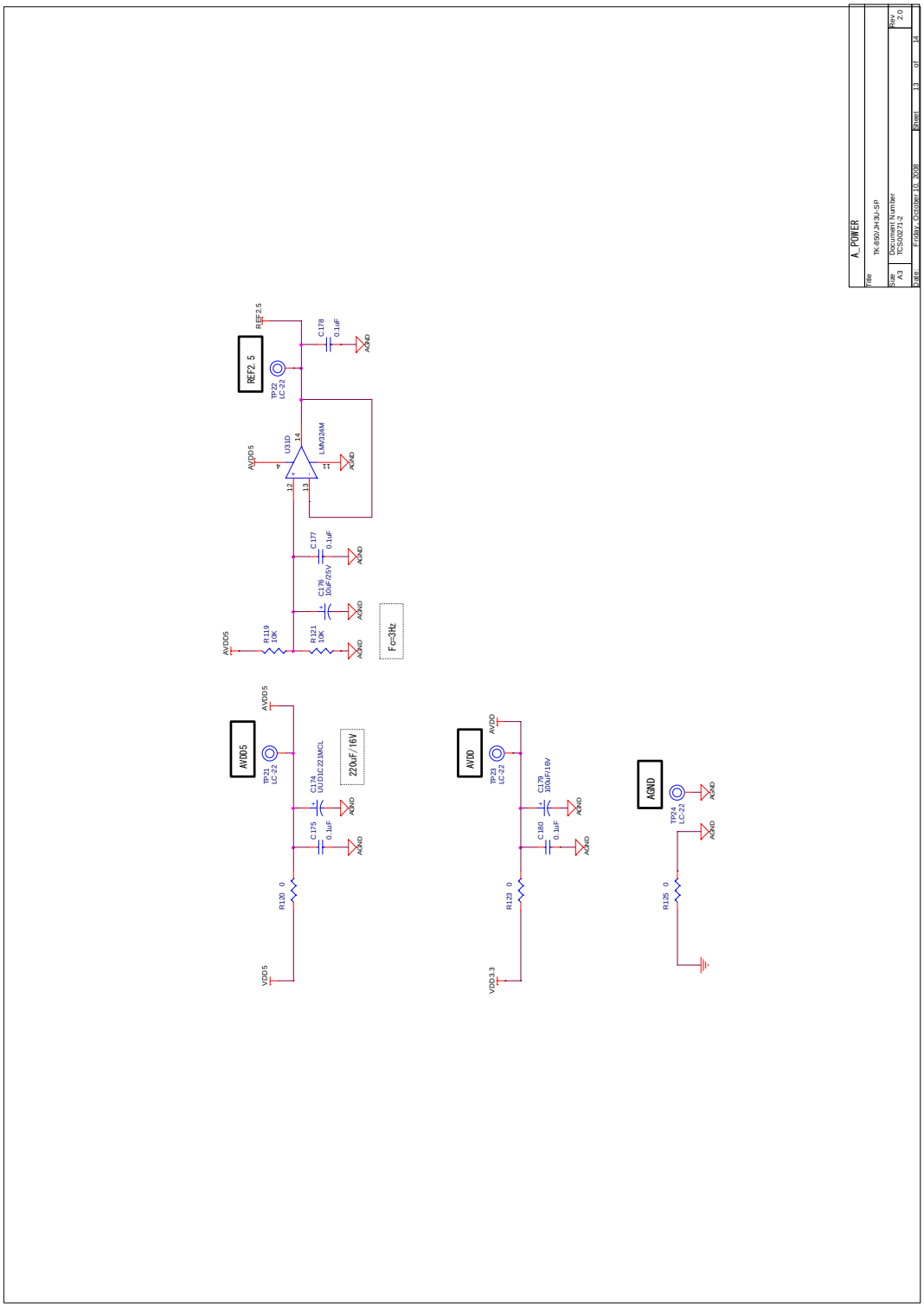

IrDA
Title
TK-850/JH3U-SP
Size
A3
Document Number
TCS00271-2
Rev
2.0
Date:
Friday, October 10, 2008
Sheet 8 of 14


RS232C
Title
TK-850/JH3U-SP
Size
A3
Document Number
TCS00271-2
Rev
2.0
Date
Friday, October 10, 2008
Sheet
9
of
14
RS-232C
DSUBL
XM2C-0942-132L
RS1_DSR
RS1_RTS
RS1_TXD
RS1_RXD
RS1_CTS
RS1_DTR
P1
P2
TPRS1
TPRS2
TPRS3
TPRS4
TPRS5
TPRS6
TPRS7
TPRS8
LC-33
VDD3.3
U25
MAX3232ECPW
T1OUT
T2OUT
R1IN
R2IN
VCC
GND
T1IN
T2IN
R1OUT
R2OUT
C1+
C1-
C2+
C2-
V+
V-
C111
C112
C113
C114
C115
0.1uF
T2IN1
R78
10K
TXDC1
RXDC1
P.1 TXDC.1
P.1 RXDC.1


Audio Output
Title
TK-850/JH3U-SP
Size
A3
Document Number
TC500271-2
Rev
2.0
Date
Friday, October 10, 2008
Sheet
10
of
14
Speaker output


Audio Input
TK-850/JH3U-SP
TCS00271-2
Friday, October 10, 2008
MIC_POWER
AUDIOIN P-1
NJM2737RB1
LMV324M
SN74LVC3G07DCT
MCP6S91-E/MS


POWER
VDD3.3
VDD5
GND
Not Mount
Back light LED driver
VDD2.5
VDD1.8
Reg for LCD CORE2.5V
Reg for IrDA 1.8V
POWER SUPPLY USB
1-2:Debug USB
3-4:USB FUNCTION
5-6:AC ADAPTER
DC 5V (Center + mark)
TK-850/JH3U-SP
TCS00271-2
Friday, October 10, 2008


A_POWER
TK-850/JH3U-SP
Document Number
TCS00271-2
Friday, October 10, 2008
REF2.5
REF2_5
C178
0.1uF
TP22
LC-22
AVDD5
U31D
LM324M
C177
0.1uF
C176
10uF/25V
R119
10K
R121
10K
Fc=3Hz
AVDD5
TP21
LC-22
C174
UUD1C221MCL
220uF/16V
C175
0.1uF
R120
0
VDD5
AVDD
TP23
LC-22
C179
100uF/16V
C180
0.1uF
R123
0
VDD3.3
AGND
TP24
LC-22
R125
0
AGND