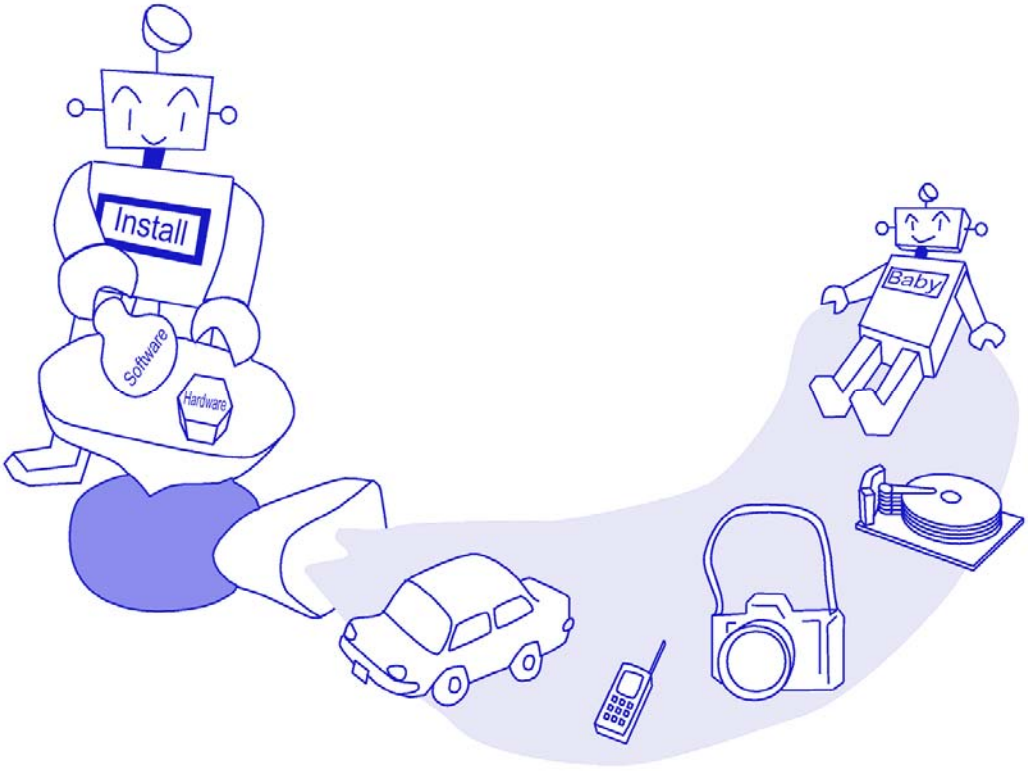
Tutorial Guide

StickCAN V850 Development Kit



TESSERA Technology INC.

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Introduction

Reader

This manual is intended for development engineers who are new to those development tools for V850 series.

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 basic operation of development tools for V850 series that are included in the StickCAN V850 Development Kit.

Users can understand more by reading this manual and using the development tools together.

Document Structure

This document consists of the following contents.

Chapter 1: Preparations

Overview of the development tools for V850 series and Installation of sample programs

Chapter 2: Experiences

Experience the basic operations of PM+ and integrated debugger with using sample programs. Also, it introduces other information, such as how to create a new workspace (project) on PM+ and how to register additional source files.

Chapter 3: PG-FPL

Installation and operation of PG-FPL

Chapter 4: CAN Software Driver

Installation of CAN software driver

Chapter 5: Sample Program

Information about bundled sample programs

Chapter 6: Simplified CAN Monitor

Information about sample application that can monitor the communication of high-speed CAN (500Kbps).

Trademarks

Chapter 1 Preparation

This chapter describes overview of development tools and installation of sample programs.
The sample programs can be run with only using the development tools that is included in StickCAN V850.

1.1 Software / Development Tools

1.1.1 Integrated Development Environment (IDE) PM+ V6.30

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

1.1.2 Device file DF3377.800 V1.10

A device file contains device specific information. So, users need a device file to use the development tools. The sample in this document is made for V850ES/FG3 (μPD70F3377).

1.1.3 C Compiler CA850 W3.10 (code size limited version)

C compiler for the V850 series. The object code size is limited to 128 Kbyte.
It compiles C language and ANSI-C compliant C language that are written for V850 series into machine language. It inputs source program written in C language, and outputs source program for assembler input and object program for linker input.

1.1.4 Integrated Debugger ID850QB-EZ V3.41

The Windows base software works on host PC.
It enables to debug by performing communication between the monitoring program that is stored in the microcontroller built-in flash memory and USB.

1.1.5 USB Driver

This is the driver to detect the StickCAN V850 as COM port when the StickCAN V850 is connected to PC.

1.1.6 Built-in Flash Memory Writing Program FPL

This is the Windows software to write programs on microcontroller built-in flash memory.
By connecting the StickCAN V850 with using the bundled USB cable, it can write/delete programs on V850ES/FG3 built-in flash memory.

1.1.7 CAN Software Driver

CAN Software Driver provides the application program interface (API) function to be able to communicate on V850 32bit microcontroller with CAN function and 78K0 8bit microcontroller from NEC Electronics Corporation.

1.1.8 Sample Program

This can send packets to the other node connected with CAN at certain intervals. This program uses the CAN software driver. For details, refer to "Chapter 5 Sample Program".

1.1.9 Simplified CAN Monitor

This is a stand-alone sample application using StickCAN V850. It can monitor and display the communication of high-speed CAN (500Mbps). User can customize the source file for V850ES/FG3, which is stored in StickCAN V850.

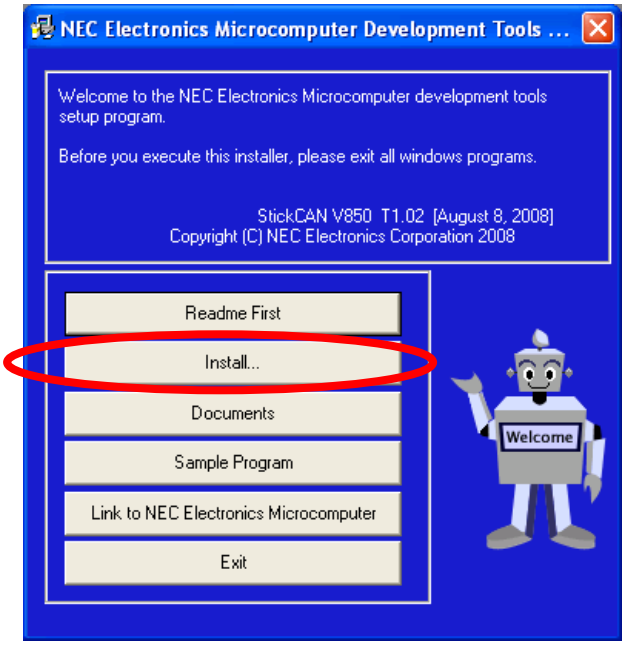
1.2 Development Environment

1.2.1 Contents of CD-ROM

The bundled CD-ROM includes the development tools, documentations, and sample program. Users can use the installer to install them (except FPL and parameter files).

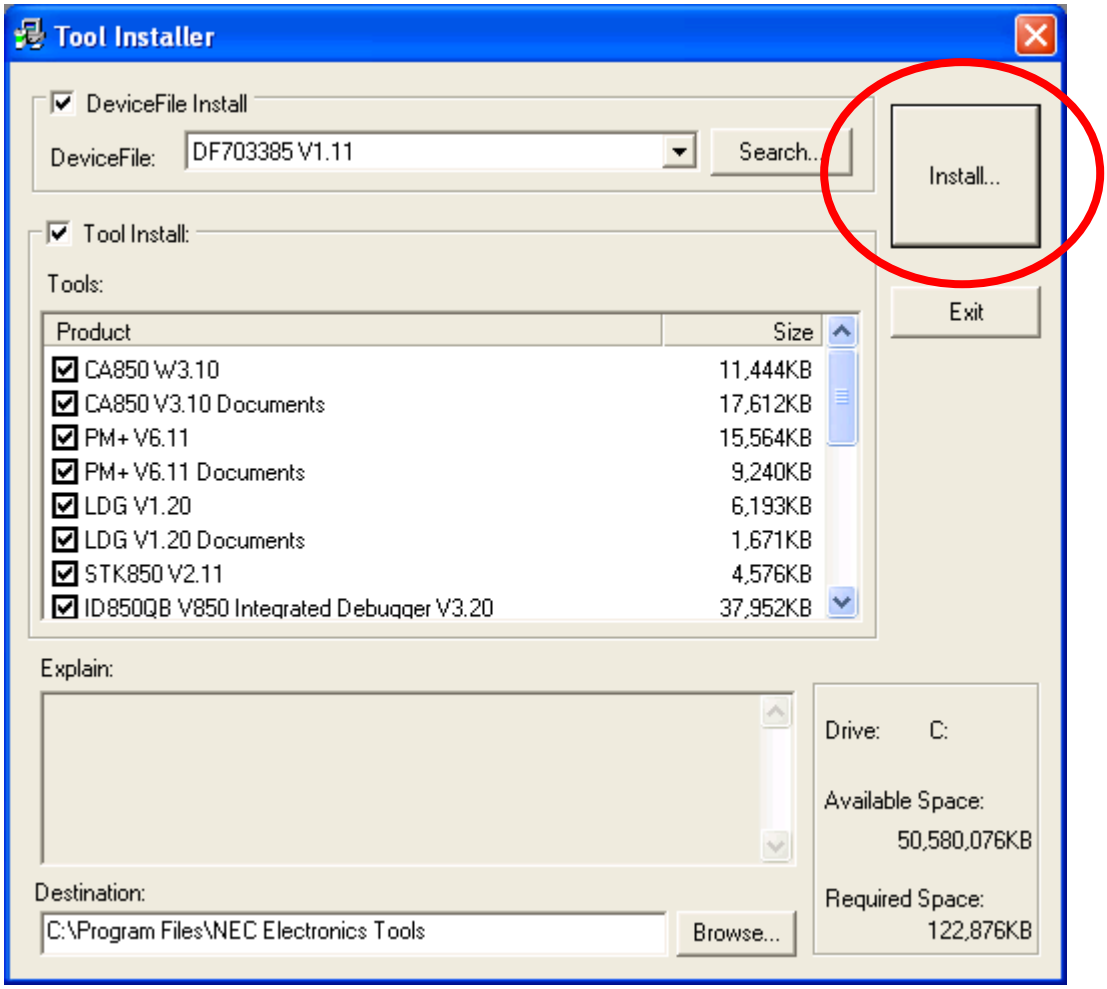
1.2.2 Installation of Development Environment

Please insert the CD-ROM in the drive. The installer will show up automatically.
If it does not start automatically, please start SETUP.EXE from Windows Explorer.

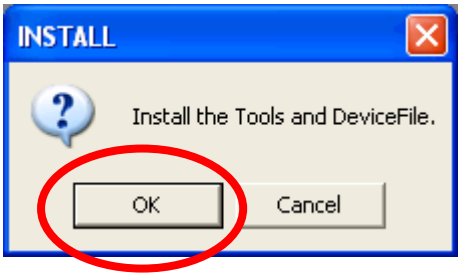


1) Click "Install…" on "NEC Electronics Corporation Microcontroller Development Tools Setup".
The dialog box shown below is opened.
Select tools that you need to install.
"Explain" area displays an explanation of the selected tool.
To change the installation destination, click "Browse…".

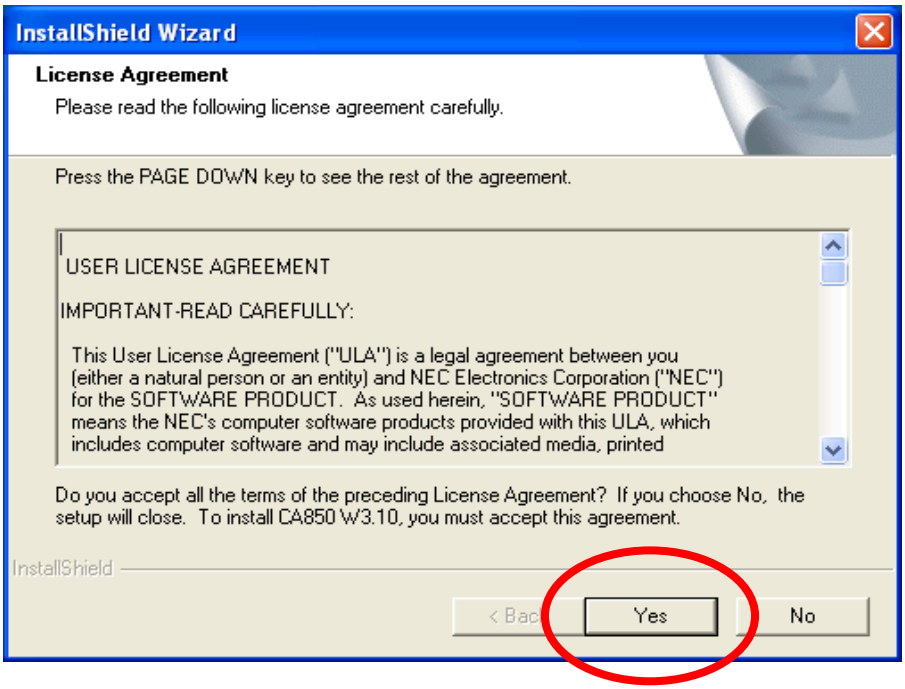
When all the settings are completed, click "Install…".



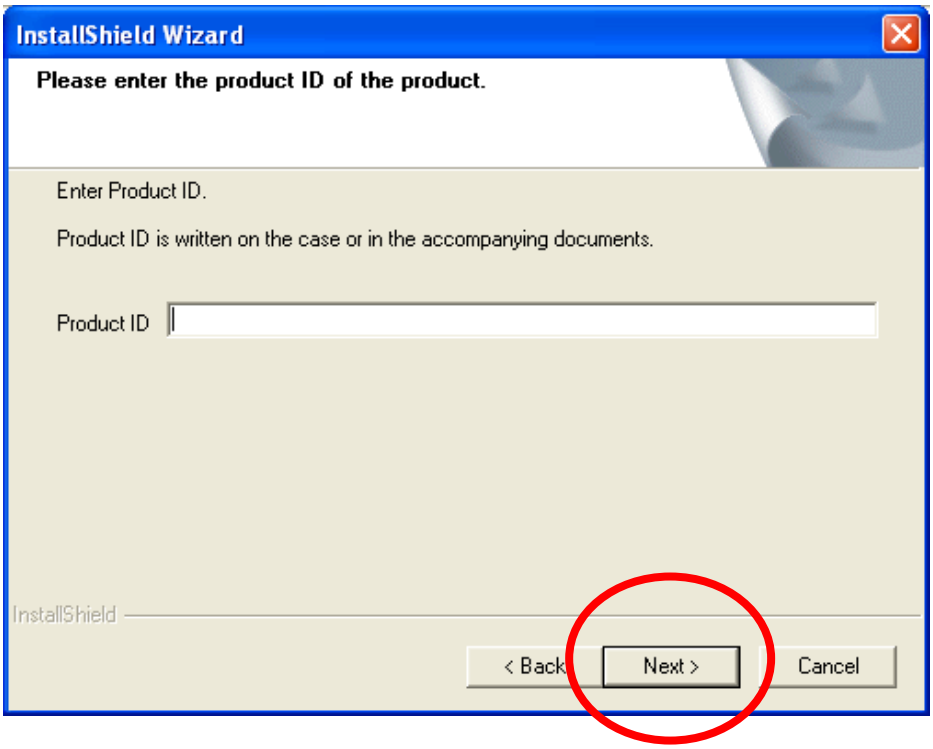
2) Click "OK", when following dialog box is displayed.



3) Agree with the license agreement and click "Yes" for continuing the installation.
To stop the installation, click "No".

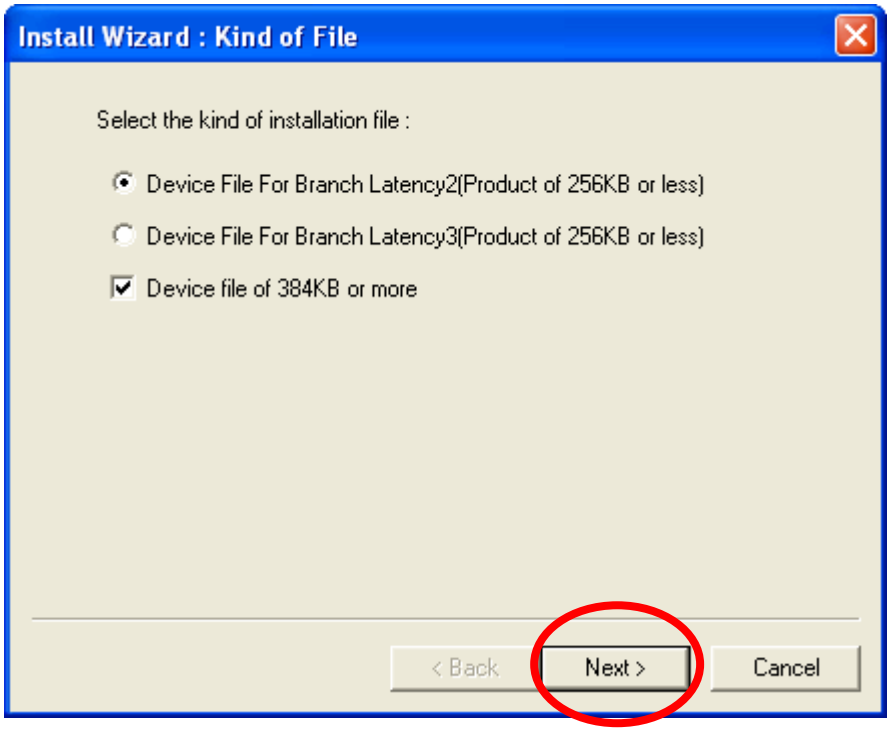


4) Enter the product ID, and click "Next".
* The product ID is available on the attached sheet and "Readme First" file in CD-ROM.

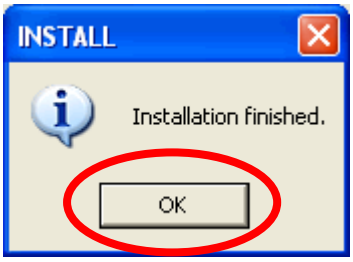


5) It starts copying the files.

6) In the middle of installation, "Select the kind of installation file" screen opens. Click "Next".



7) When the installation is completed, the following dialog opens. Click "OK".
Installation of the development tools is completed.



8) USB driver "NEC Electronics Starter Kit Virtual UART" should be installed on PC before you connect the StickCAN V850 to PC. Refer to "1.3 Installation of USB Driver" to install the USB driver.

[Notes on the installation authority]

- Administrator authority is required to install the product on Windows 2000/XP.

[Notes on the installation directory]

- Do not use space or 2-byte characters for the installation directory. It may cause unexpected errors.
- This product only supports Japanese version of Windows. You can not install this on the Windows other than Japanese version.

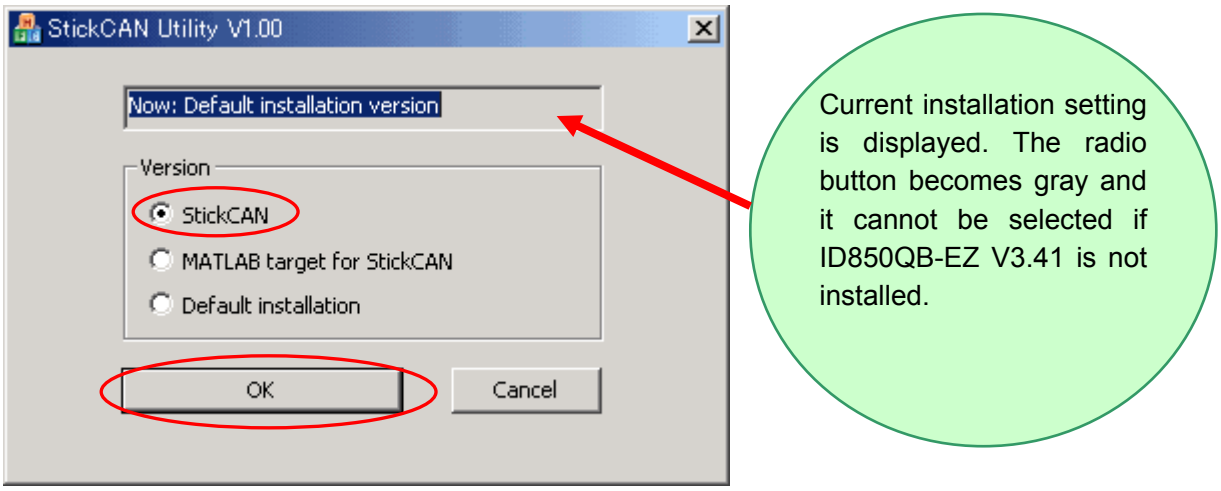
1.2.3 Structure of Installed Files

As default, development tools are installed in the directory "C:¥Program Files¥NEC Electronics Tools". When you need to use the tools, Click "Start menu", then select "Programs", "NEC Electronics Tools" to start those development tools.

1.2.4 Change Software Structure

Execute the program "¥StickCAN_UTL¥StickCanUtl.exe" in CD-ROM with using Windows Explorer.

Select "StickCAN", and click "OK".



Setting is completed when the dialog is closed.

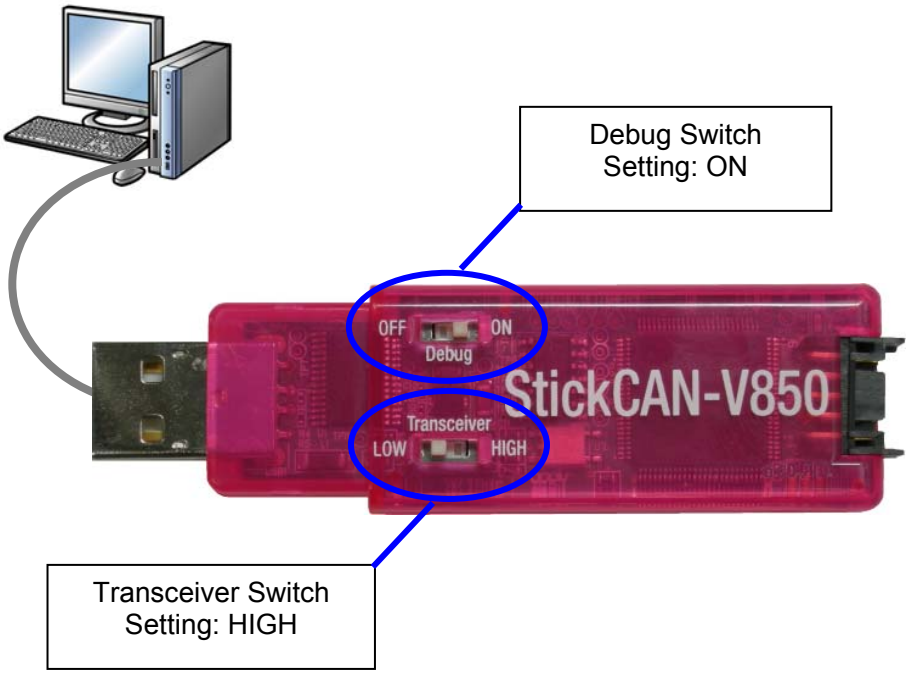
If you wish to use the StickCAN V850 as MATLAB target, select "MATLAB target for StickCAN". When you need to change the setting to default, select "Default installation".

1.3 Installation of USB Driver

When you use StickCAN V850, you need to install "NEC Electronics Starter Kit Virtual UART" driver on the PC. Follow the instruction below to install the driver.
In this section, it is assumed that the "Starter Kit USB Driver" has been installed in "1.2 Development Environment".

[Note]
Do not use USB hub to connect StickCAN V850. It may cause unexpected errors.

First, connect StickCAN V850 to PC. Check the switches are set as shown below.



From the next step, the instruction will be differed depending on Windows version.

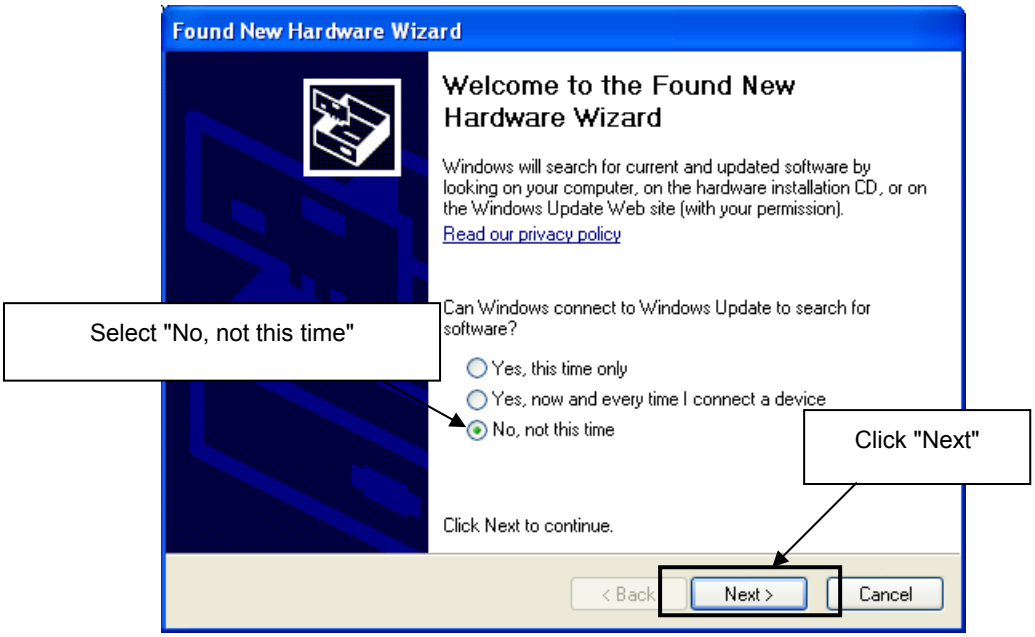
- Installation on Windows XP
- Installation on Windows 2000

When the installation is completed, move on to "1.3.3 Confirm USB Driver Installation".

1.3.1 Installation on Windows XP

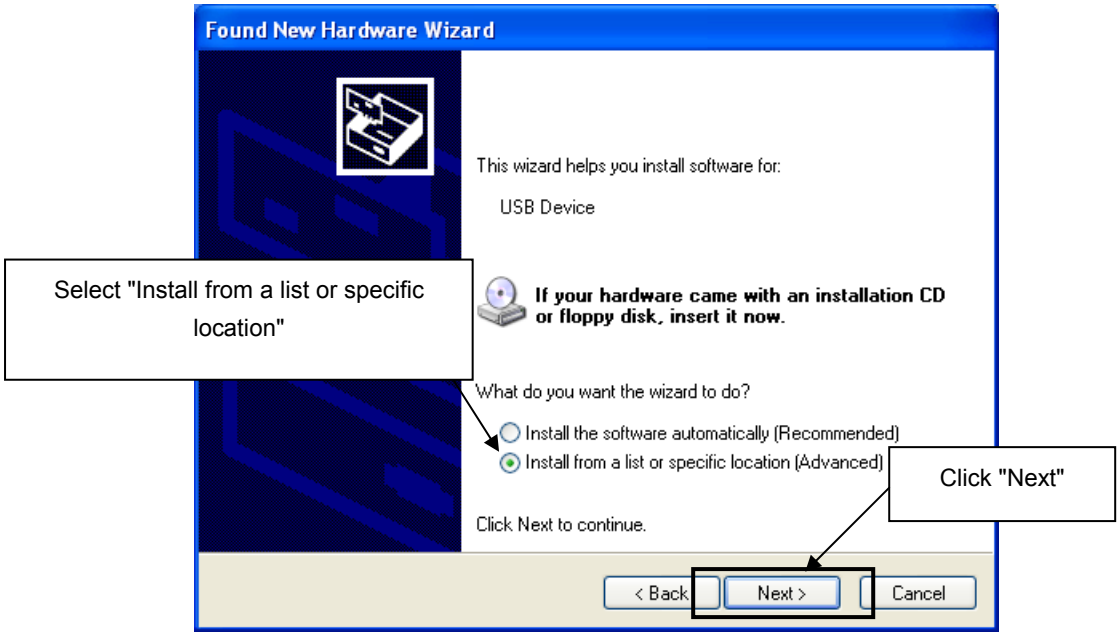
1) When the StickCAN V850 is connected to PC, it is detected with plug and play and starts "Found New Hardware Wizard".
Select "No, not this time", and click "Next".

Found New Hardware Wizard 1 (Windows XP)



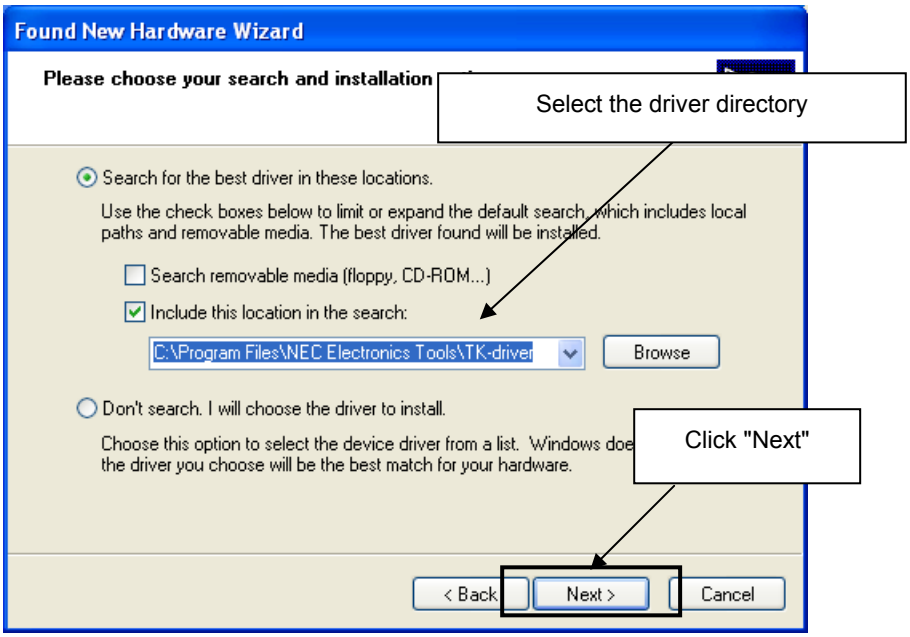
2) Select "Install from a list or specific location" and click "Next".

Found New Hardware Wizard 2 (Windows XP)



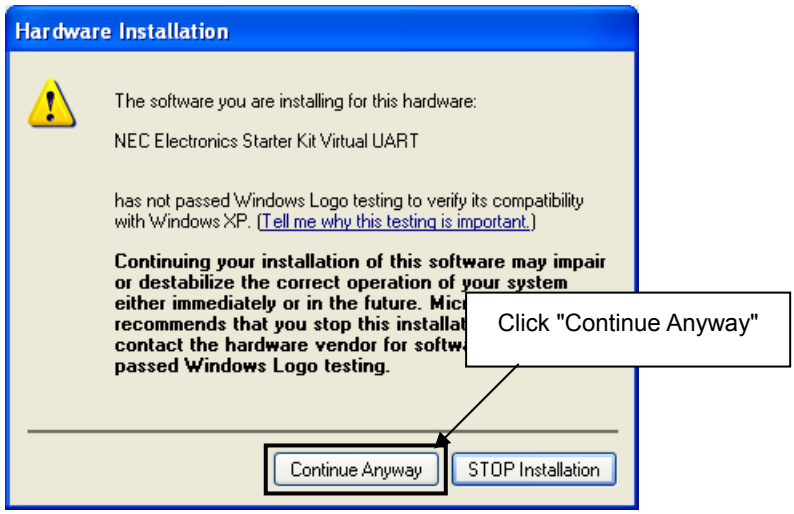
3) Select "Search for the best driver in these locations", check "Include this location in the search", and then click "Browse...". Select the driver directory path "C:¥Program Files¥NEC Electronics Tools¥TK-driver" if it is the default installation path, and then click "Next".
If the installation directory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

Found New Hardware Wizard 3 (Windows XP)



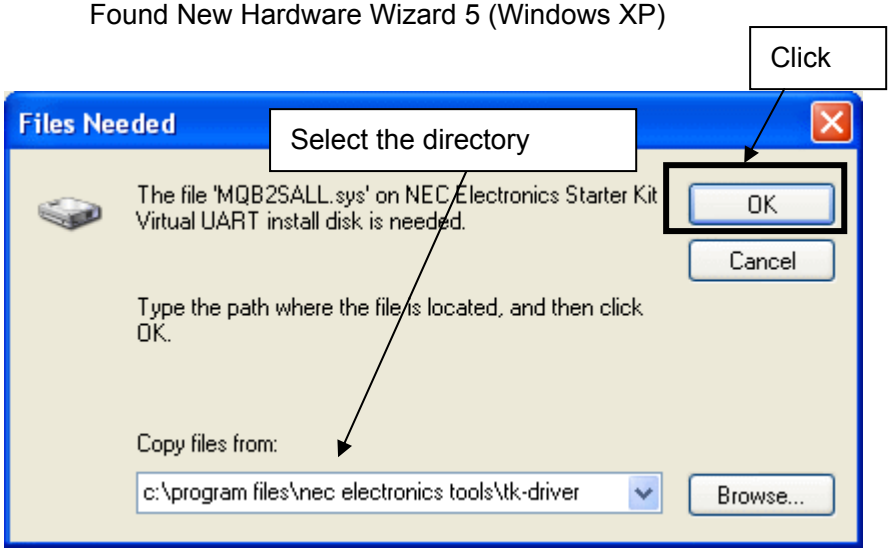
4) If the following dialog is opened, click "Continue".

Found New Hardware Wizard 4 (Windows XP)



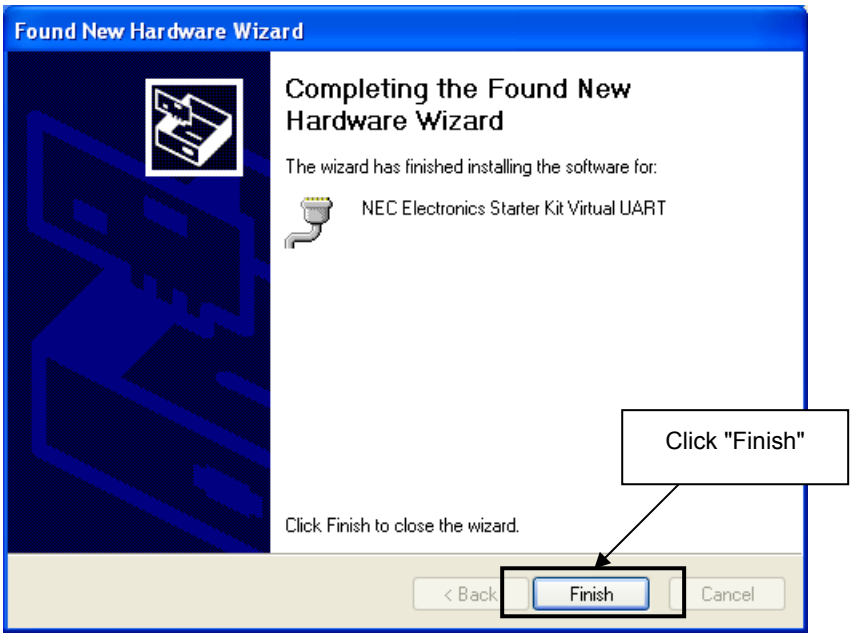
5) If the following dialog is opened, select the driver directory path, "C:¥Program Files¥NEC Electronics Tools¥TK-driver", and then click "OK".

Found New Hardware Wizard 5 (Windows XP)



6) When the following dialog is opened, the installation of "NEC Electronics Starter Kit Virtual UART" driver is completed.
Click "Finish".

Found New Hardware Wizard 6 (Windows XP)



7) Go to "1.3.3 Confirm USB Driver Installation".

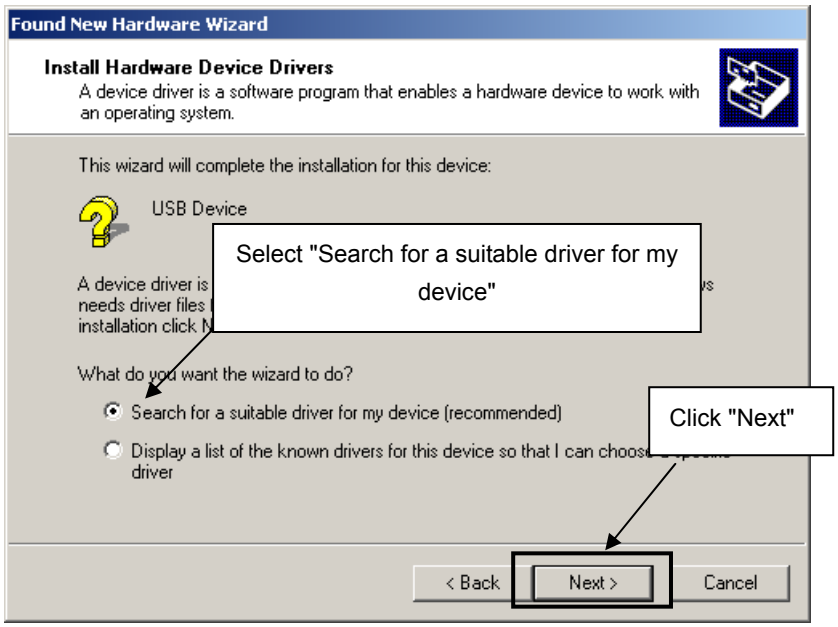
1.3.2 Installation on Windows 2000

1) When the StickCAN V850 is connected to PC, it is detected with plug and play and starts "Found New Hardware Wizard".
Click "Next".

Found New Hardware Wizard 1 (Windows 2000)

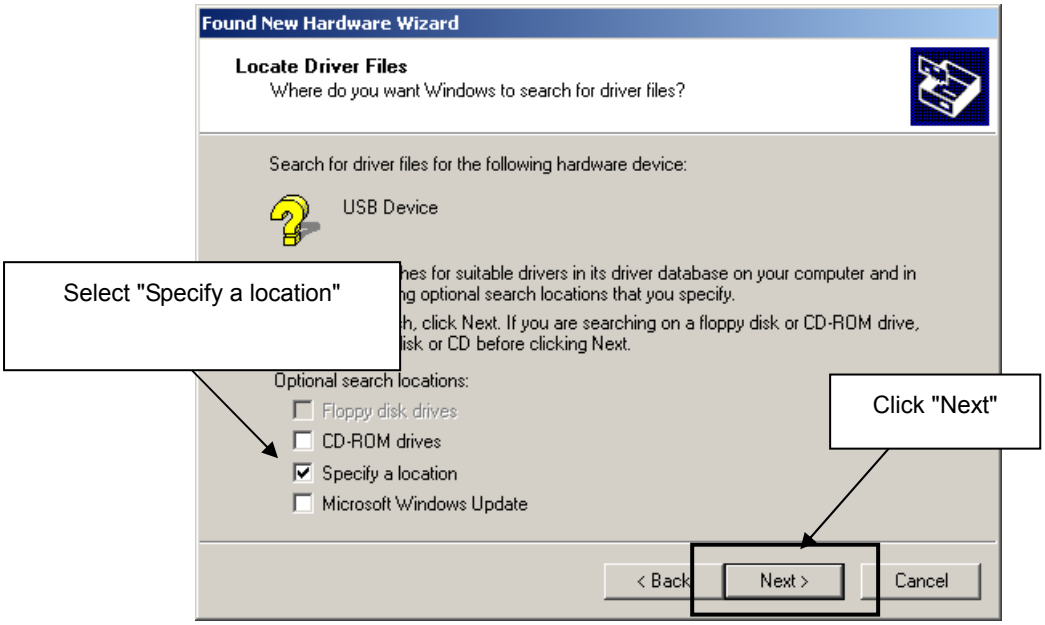
2) When following dialog is shown, confirm "Search for a suitable driver for my device" is selected, and click "Next".

Found New Hardware Wizard 2 (Windows 2000)



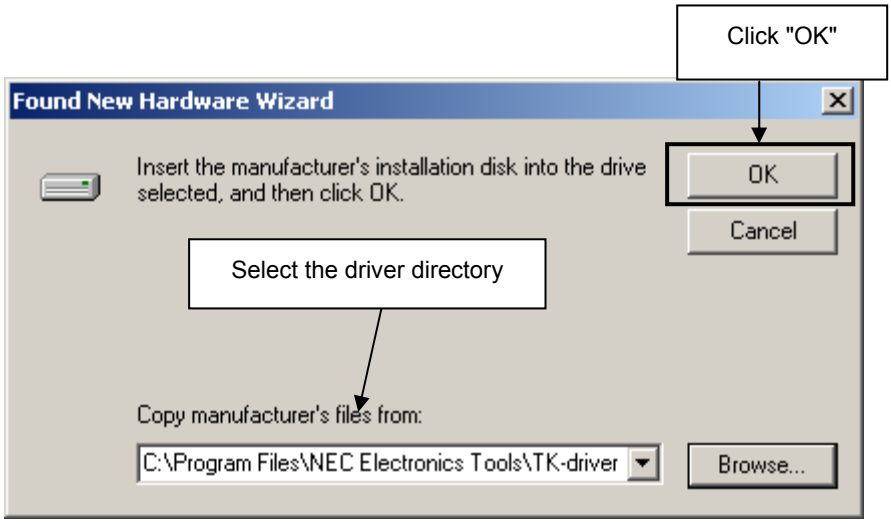
Check only on the "Specify a location", and then click "Next".

Found New Hardware Wizard 3 (Windows 2000)



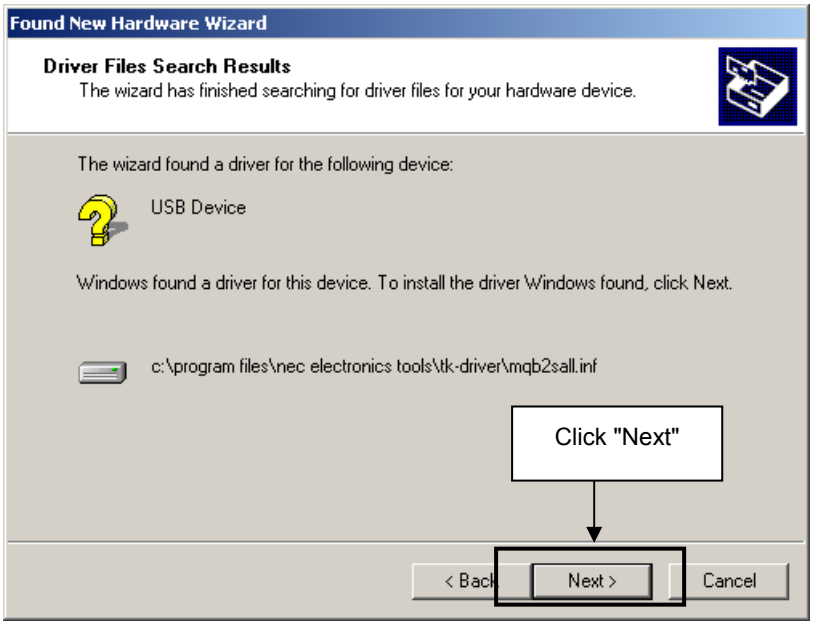
4) If it is default installation, enter the driver directory path "C:¥Program Files¥NEC Electronics Tools¥TK-driver" in "Copy manufacturer's files form", and then click "OK".
If the installation directory is not default, then select "TK-driver" under the installation directory.

Found New Hardware Wizard 4 (Windows 2000)



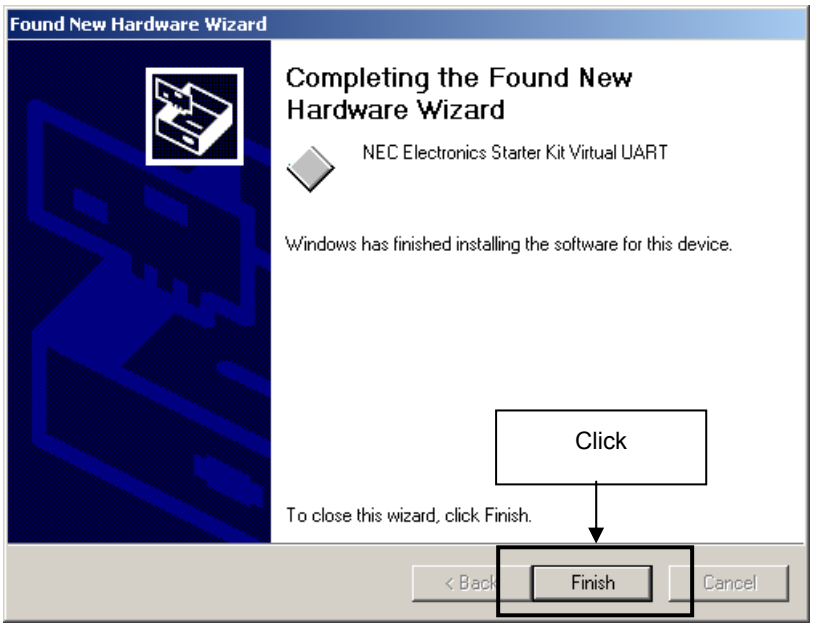
5) Click "Next".

Found New Hardware Wizard 5 (Windows 2000)



6) Click "Finish" to complete the installation of "NEC Electronics Starter Kit Virtual UART" driver

Found New Hardware Wizard 6 (Windows 2000)



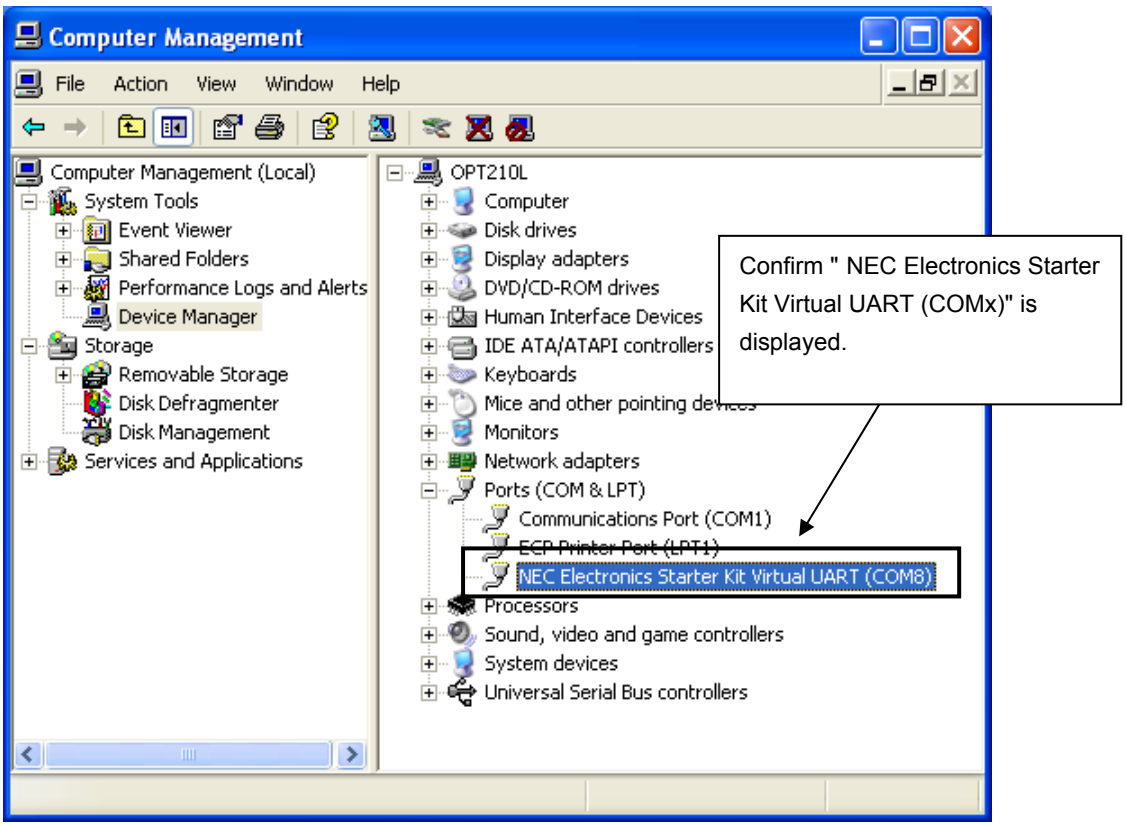
7) Go to "1.3.3 Confirm USB Driver Installation".

1.3.3 Confirm USB Driver Installation

After the installation of USB driver, you can confirm the driver is installed appropriately.

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

Device Manager



The screen above shows that the COM port number is "COM8". If ID850QB-EZ is not in use, you can use this port number for connecting StickCAN V850.
When you change the USB port, the COM port number will be changed as well.

Specify the port number that you just set when you use FPL (Flash Programmer) or Simplified CAN Monitor.

[CAUTION]
Do not do “Hardware Modification Scan” when you communicate with the microcontroller.

1.4 Sample Program

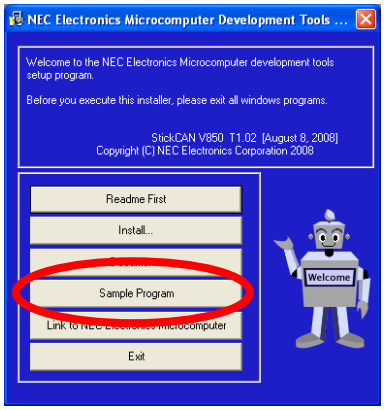
This section explains the preparation of sample program. To use the sample program, you need to install the sample program itself on development environment.

Installation of sample program and installation location will be described.

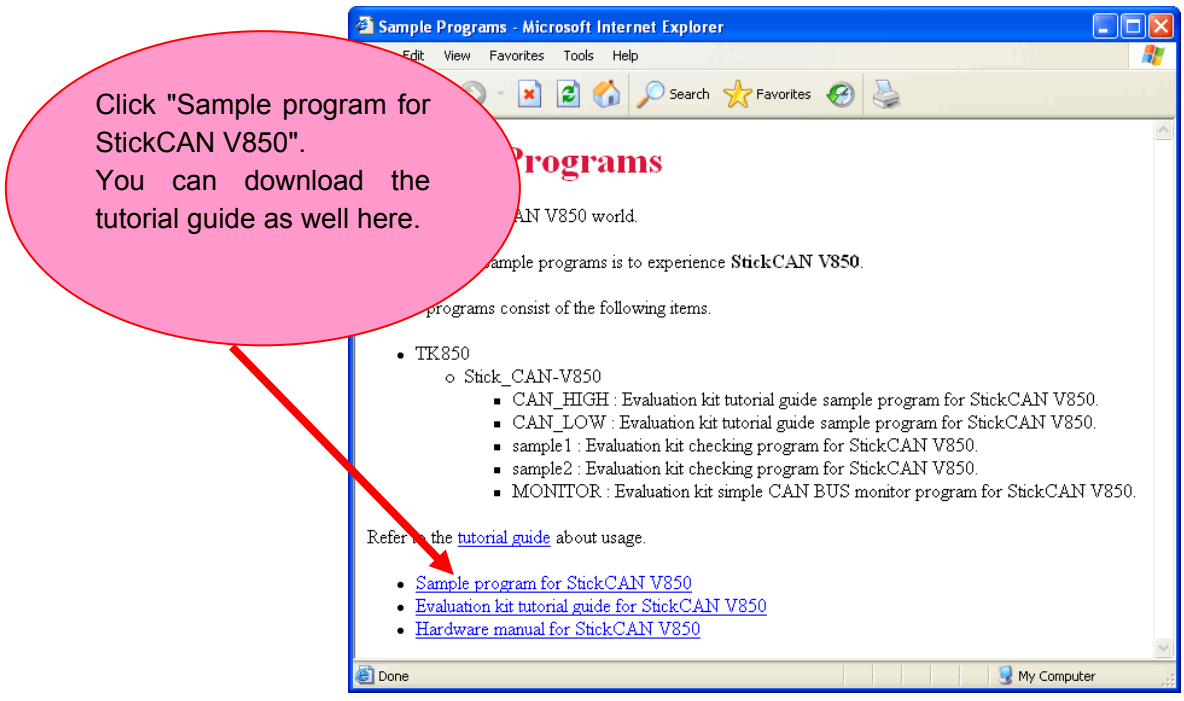
1.4.1 Installation of Sample Program

Please insert the CD-ROM that is bundled with StickCAN V850 in the drive. The "NEC Electronics Microcontroller Development Tools Setup" screen will show up automatically.
If it does not start automatically, please start it by double clicking the setup.exe from Windows Explorer.

When you click "Sample Program" button, a browser window opens. Click "Sample program for StickCAN V850" on the browser.

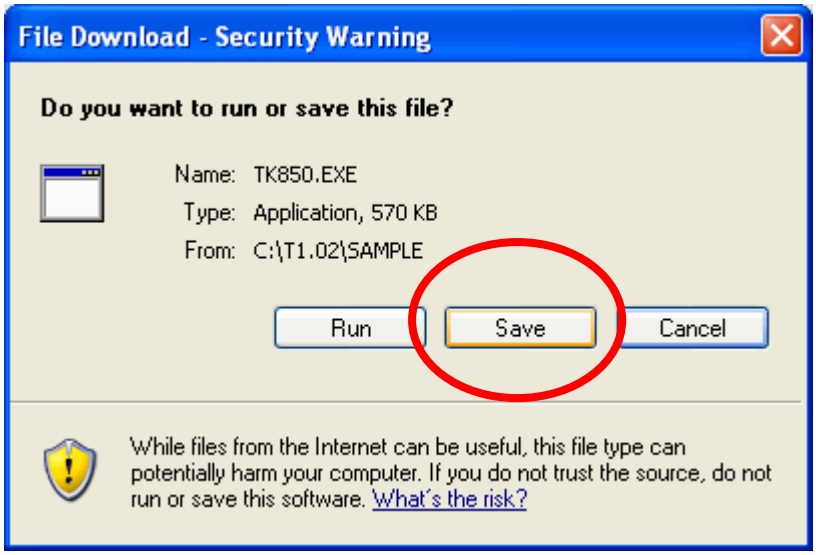


The browser window opens

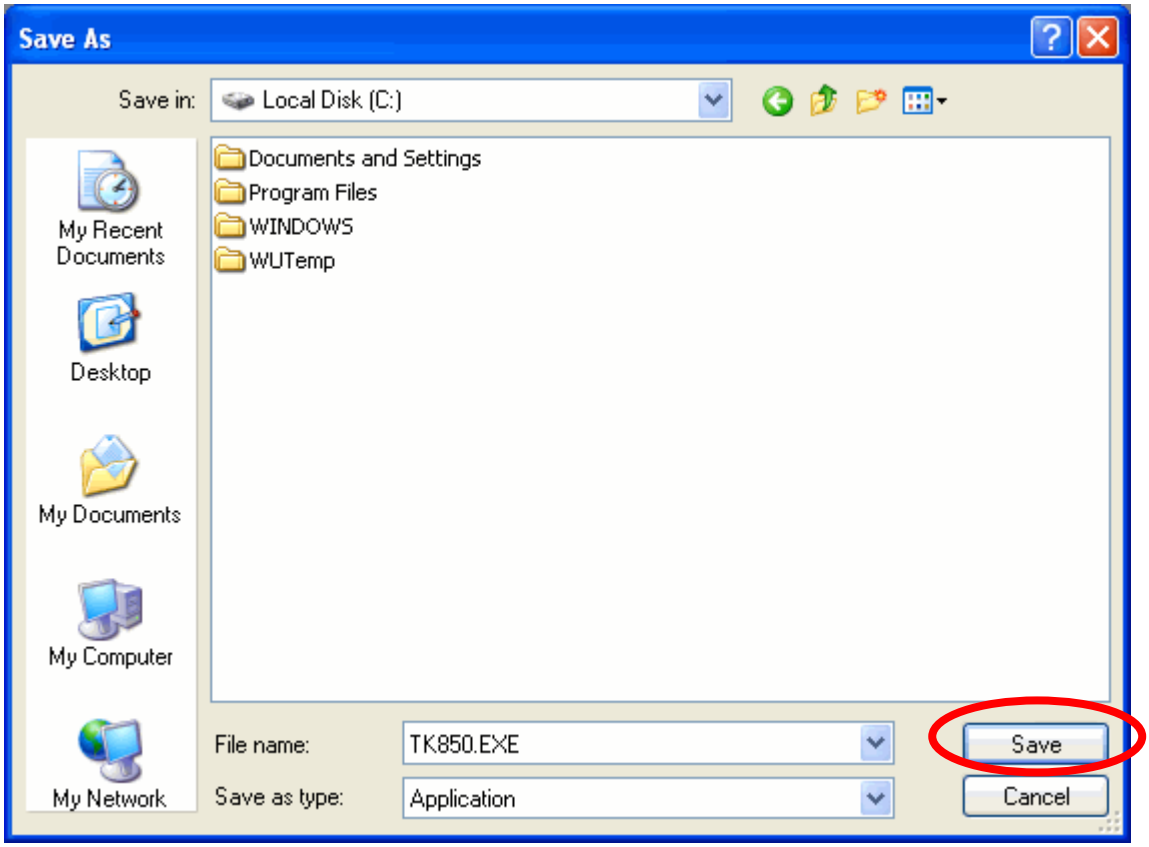


Click "Sample program for StickCAN V850".
You can download the tutorial guide as well here.

When it is clicked, dialog to confirm the file download is displayed.



Click "Save".



After specifying the directory to download, click "Save". The self-extracting file for the set of sample program (TK850.exe) is copied in the specified directory. When you execute this file, "TK850" directory is created, and then directories for the sample program are created in the "TK850" directory.

1.4.2 Structure of Sample Programs

The sample program for V850ES/FG3 (μPD70F3377) consists of following directories.

```
C:¥
  │
  └── TK850
        │
        └── STICK_CAN-V850
              │
              ├── CAN_HIGH          Sample directory for high-speed CAN
              │     │
              │     ├── PRJ         Project files
              │     │
              │     ├── 500KBPS     CAN software driver
              │     │
              │     ├── SRC         Source files
              │     │
              │     ├── OBJ         Intermediate files
              │     │
              │     └── ROM         Output files
              │
              ├── CAN_LOW           Sample directory for low-speed CAN
              │     │
              │     ├── PRJ         Project files
              │     │
              │     ├── 125KBPS     CAN software driver
              │     │
              │     ├── SRC         Source files
              │     │
              │     ├── OBJ         Intermediate files
              │     │
              │     └── ROM         Output files
              │
              ├── sample1           Compiled sample 1
              │     ├── CAN_HIGH …
              │     └── CAN_LOW …
              ├── sample2           Compiled sample 2
              │     ├── CAN_HIGH …
              │     └── CAN_LOW ..
              └── MONITOR           Simplified CAN monitor
```

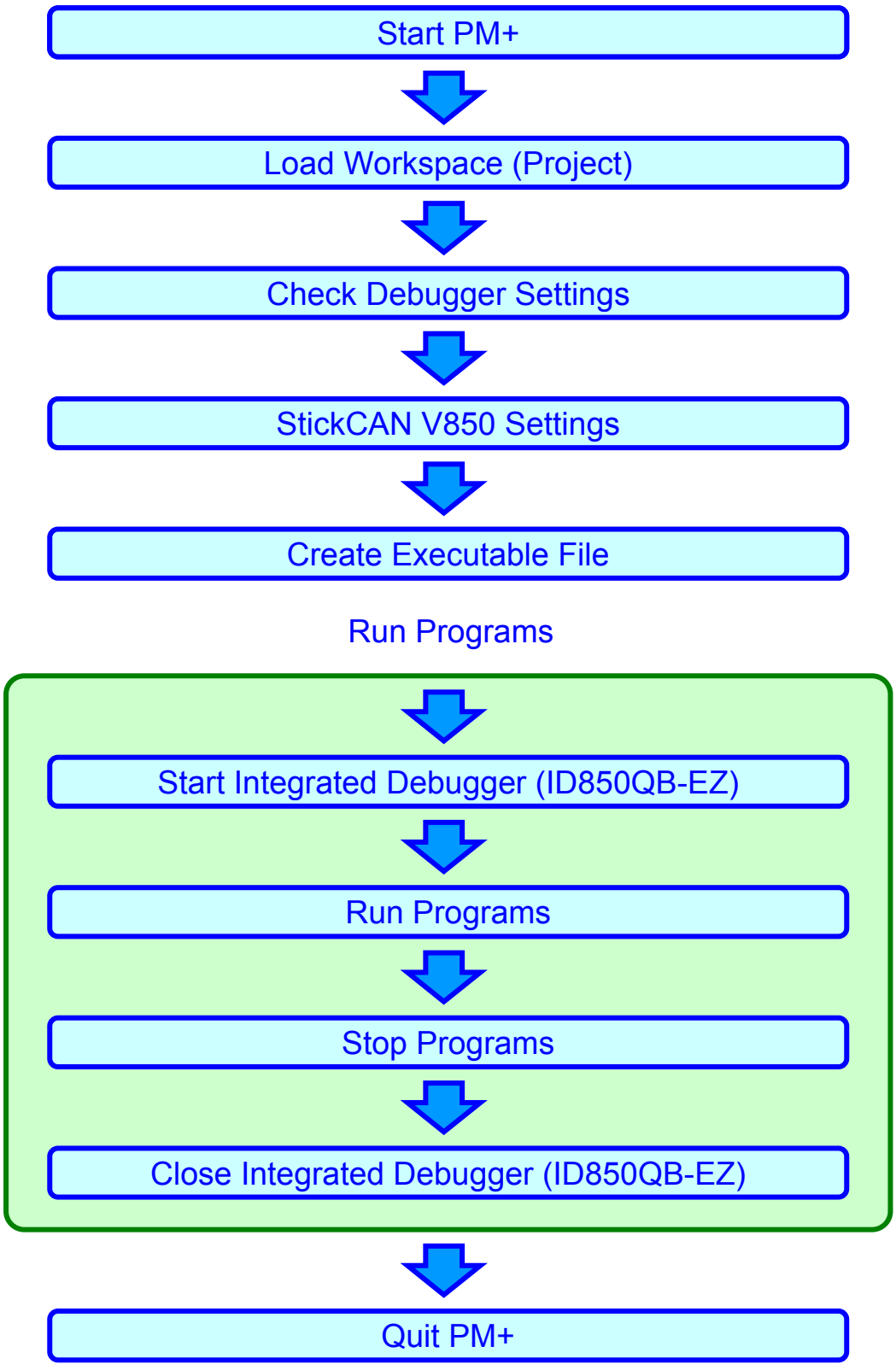
Chapter 2 Experiences

In this chapter, you will experience the development tool for V850ES/FG3.

You will use the programs that you prepared in "1.3 Sample Programs", as the sample programs for EB-850/JG2+TFT.

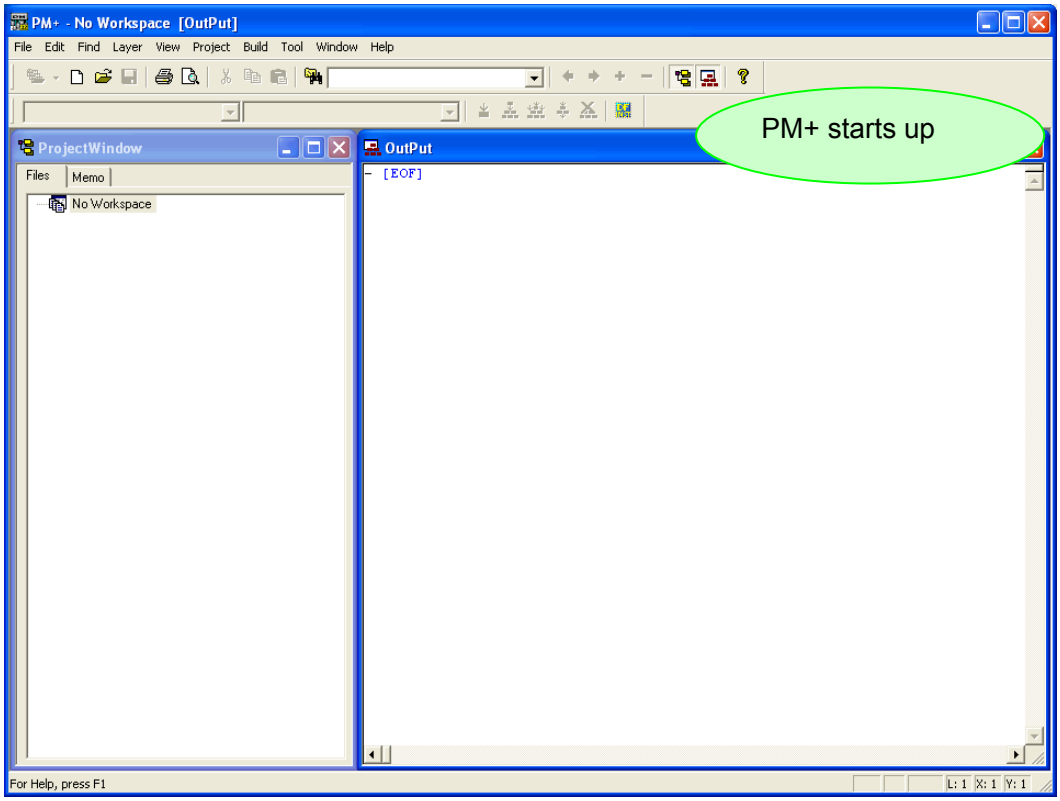
By building the sample programs and operating the program with ID850QB-EZ, you will be able to understand the basic operation of the development tools (PM+, ID850QB-EZ) and the concept of project files which you need to be aware for developing application programs.

The overall steps are as follows:



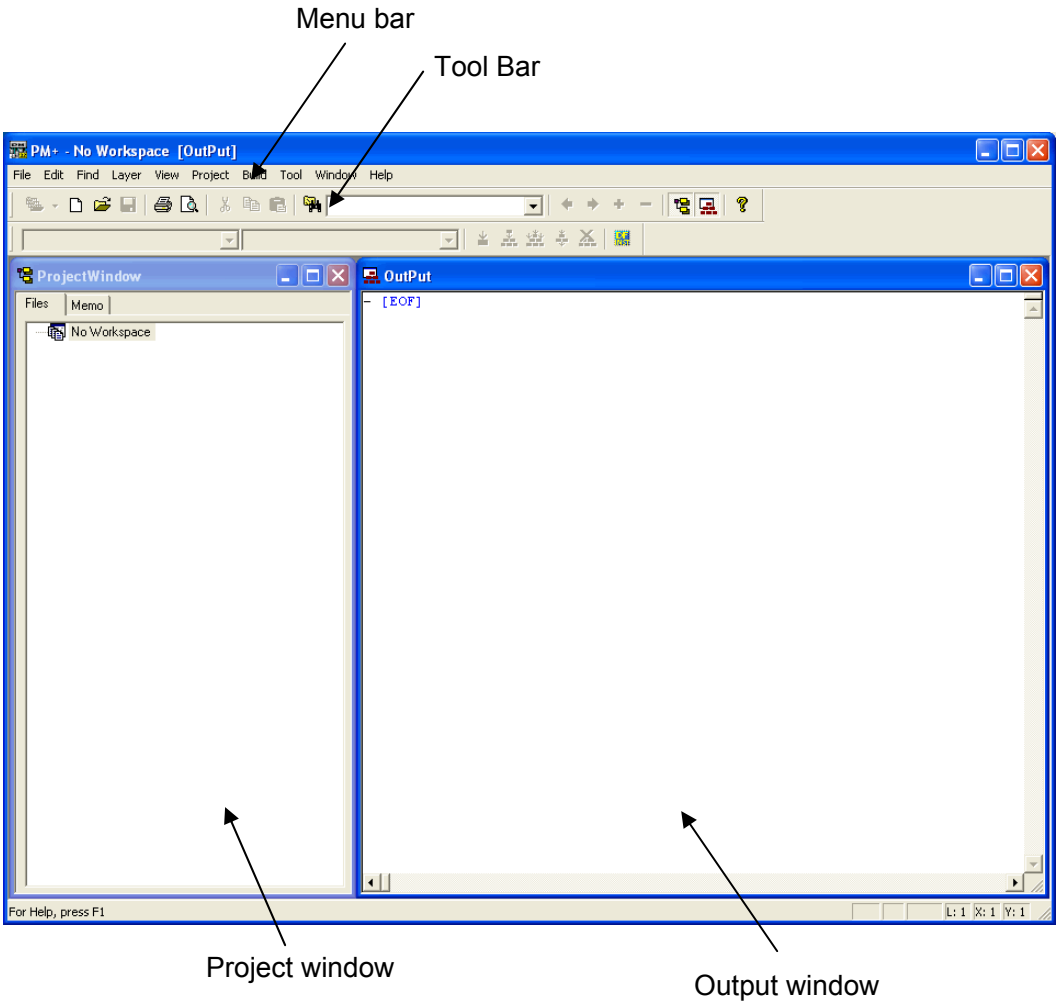
2.1 Start PM+

Let's start using the development tools.
First, start the PM+.
Select "Windows Start Menu" -> "Programs" -> "NEC Electronics Tools " -> " PM+ V6.30".



2.2 What is PM+

In PM+, application programs and environment settings are handled as a single project. It manages series of actions such as programming with the editor, source management, build, and debugging. Also, one or more project files are managed as a workspace.



Project window:

A window in which the project names, source files, and include files are displayed with a tree structure.

Output window:

A window in which the build execution status is displayed.

➪ For details about the menu bar and tool bar, refer to PM+ user's manual.

What is a project?

A project is the unit that PM+ manages. A project refers to application systems developed on PM+ and environment on PM+.
PM+ saves and loads 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 related 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 groups 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)

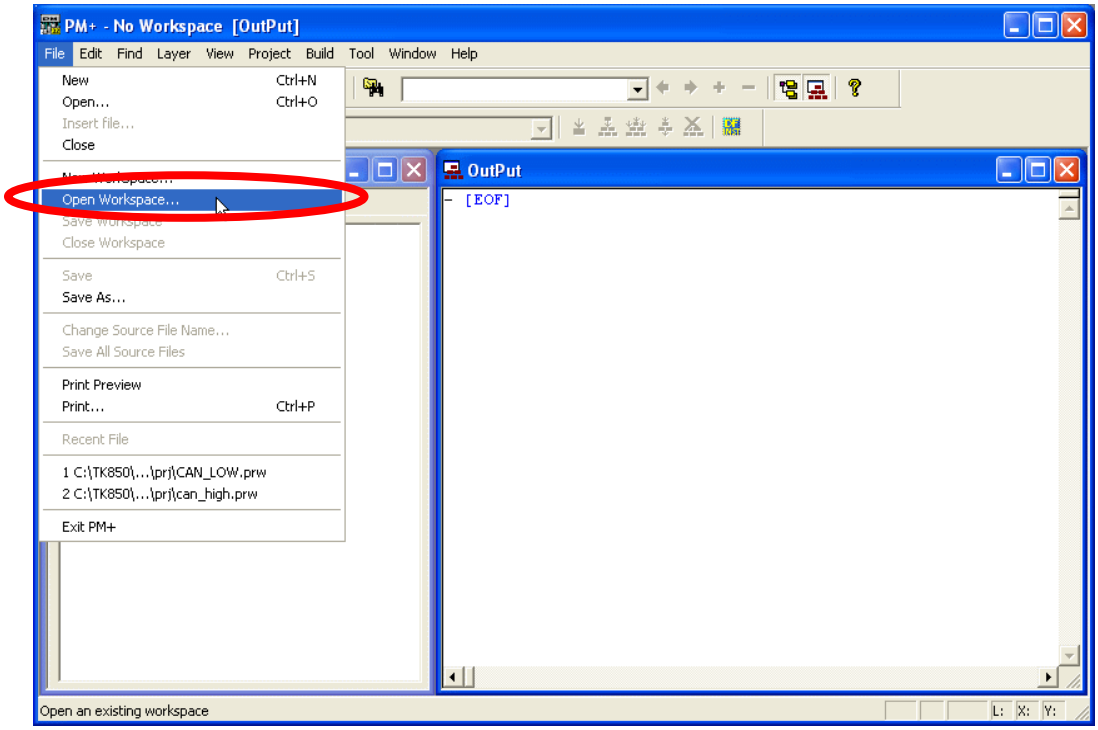
In this section, you will be using the pre-created workspace.

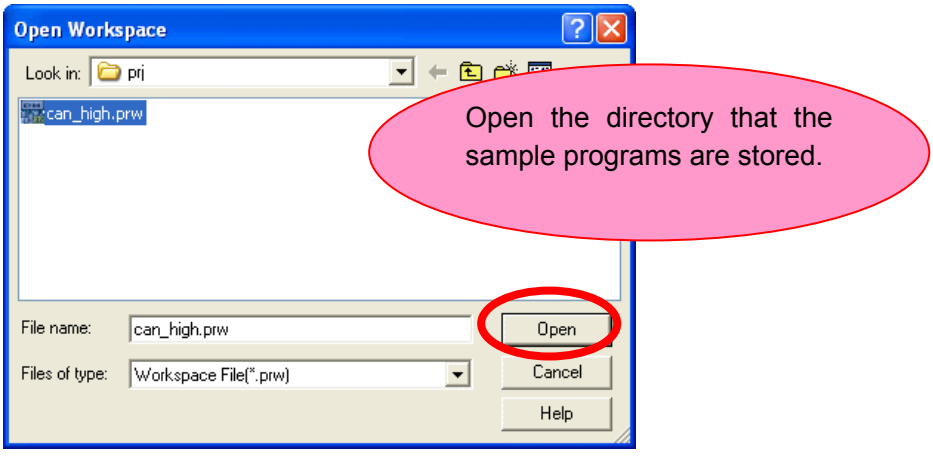
➪ For creating a new workspace, refer to "2.12 Create a New Workspace".

The workspace has the completed sample CAN control application files and project settings.

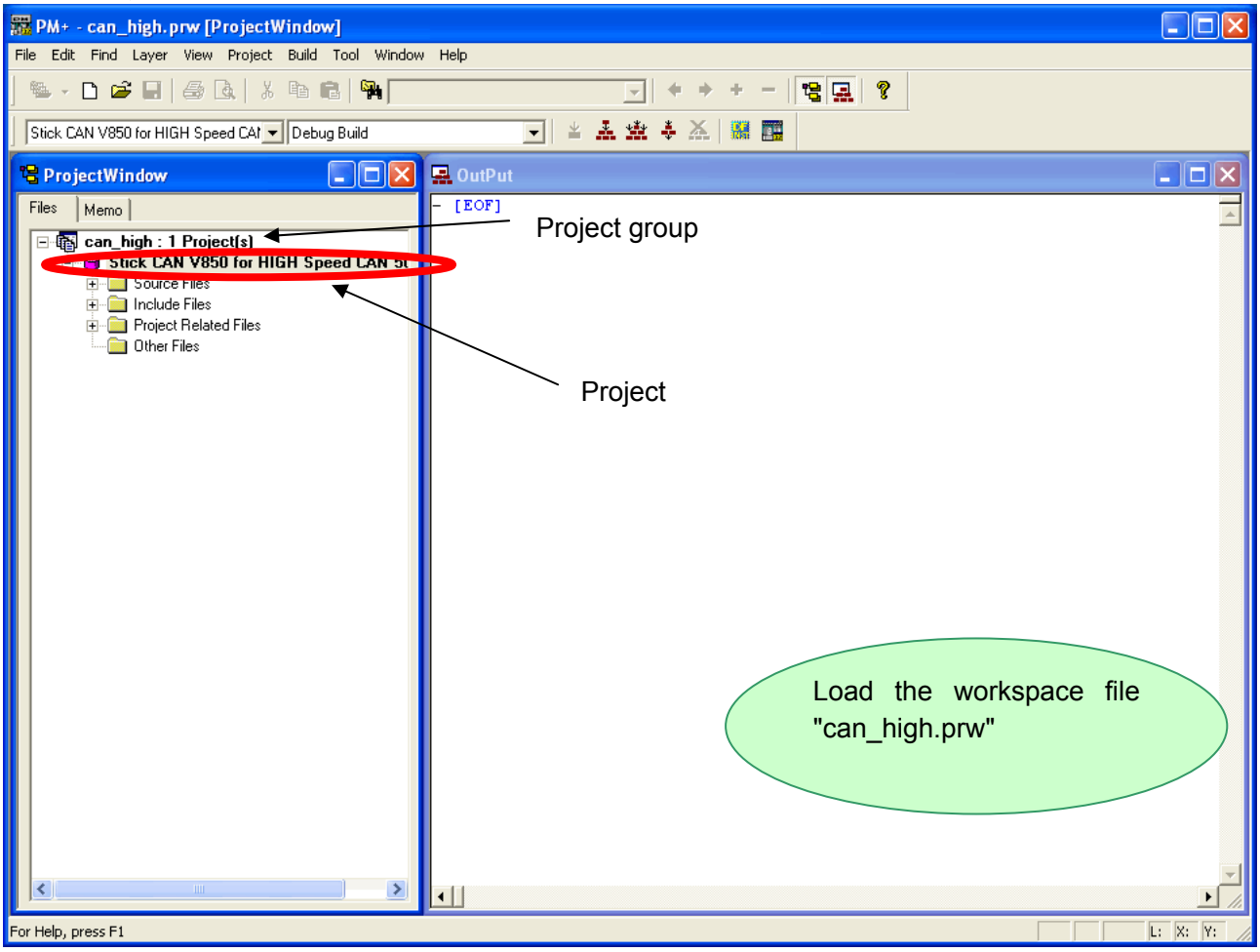
Select "File" on menu bar and "Open Workspace…".
Then, select "C:¥TK850¥STICK_CAN-V850¥CAN_HIGH¥PRJ¥can_high.prw".

➪ If you have not set the environment, refer to "1.4 Sample Program".





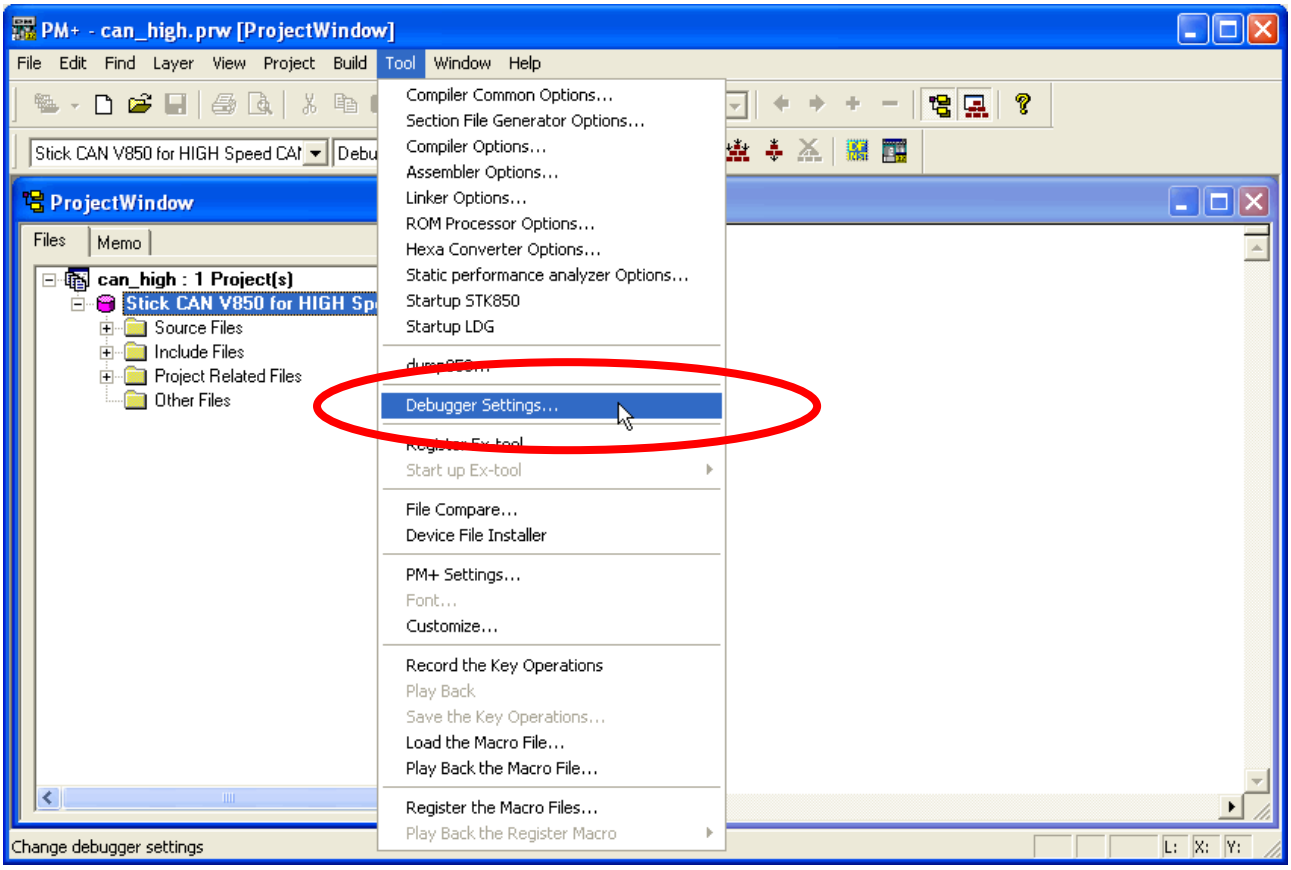
Workspace name: can_high.prw



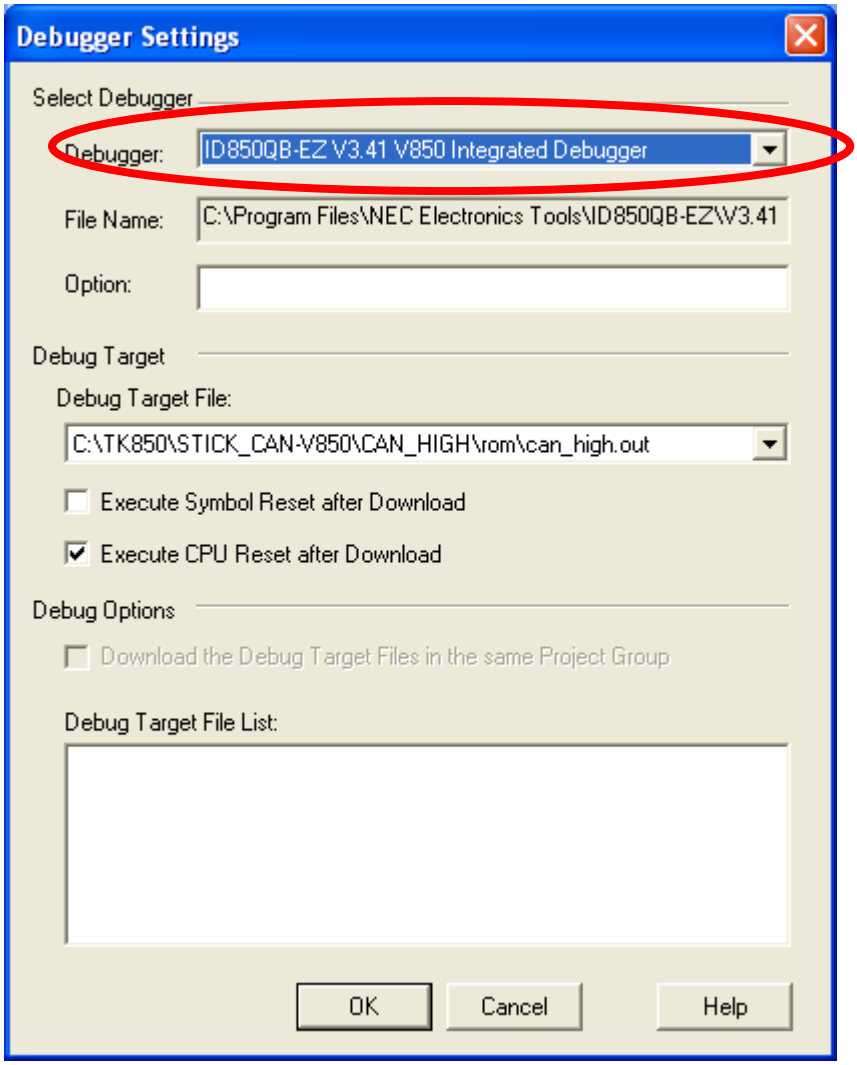
The workspace file "can_high.prw" contains one project called "StickCAN V850 for HIGH Speed CAN 500Kbps". You will use this project "StickCAN V850 for HIGH Speed CAN 500Kbps".

2.4 Check Debugger Settings

Select "Tool" on menu bar in PM+, then "Debugger Settings...".



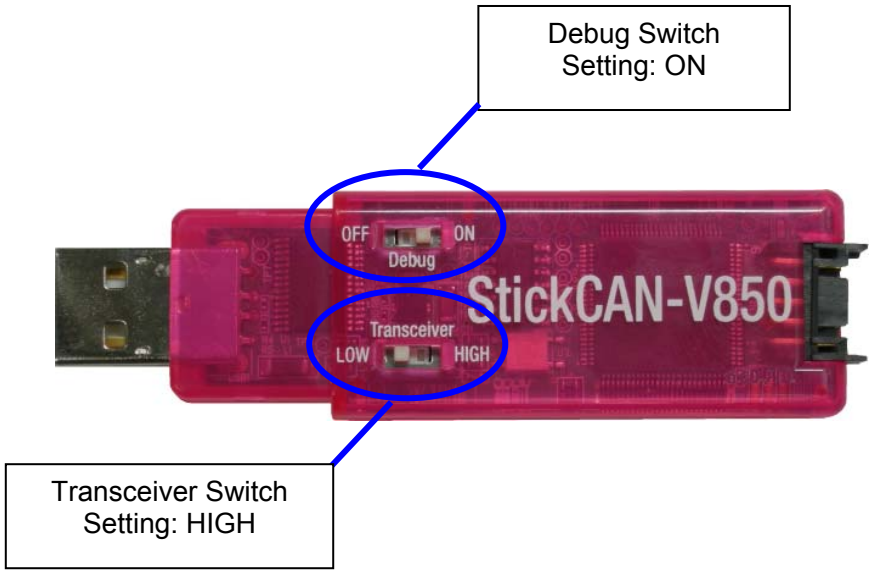
Check if "ID850QB-EZ V3.41 V850 Integrated Debugger" is selected on "Debugger".



If you cannot select "ID850QB-EZ V3.41 V850 Integrated Debugger", use menu bar to select "Project", "Project settings" -> "Tool version settings" -> "Detail setting…" -> then select " ID850QB-EZ V3.41 V850 Integrated Debugger" on "Tool Version Detail Setting".

2.5 StickCAN V850 Settings

Set the switches of StickCAN V850 as shown below.



When you set the switches, connect the StickCAN V850 USB connector to PC.
If there is distance between StickCAN V850 and the PC, use bundled USB extension cable.

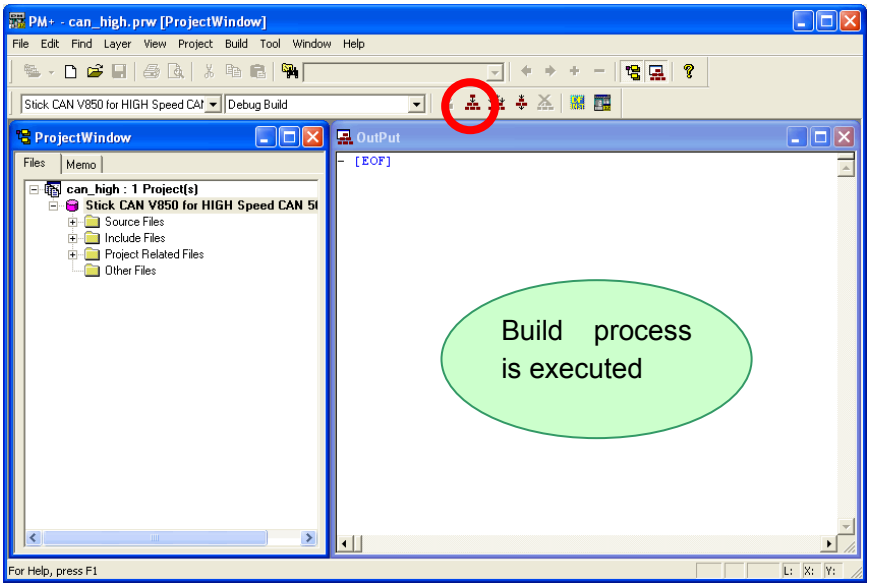
If "Found New Hardware Wizard" screen is displayed, install USB driver with referring "1.3 Installation of USB Driver".

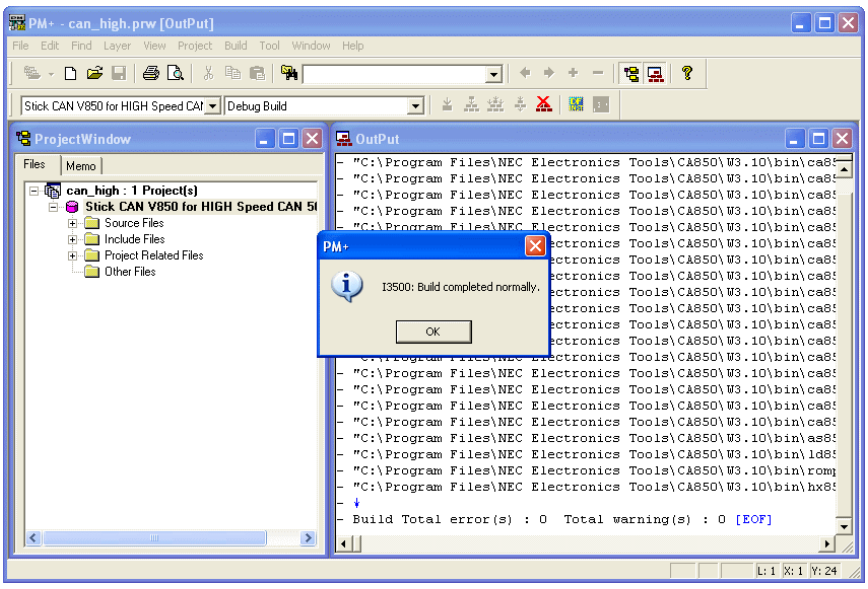
[Note]
ID850QB-EZ can debug only one StickCAN V850. Do not start the debugger with connecting more than one StickCAN V850.

2.6 Create Executable Files

Now, you are going to create an executable file. This process is called build.

Click the build button  in PM+, 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.

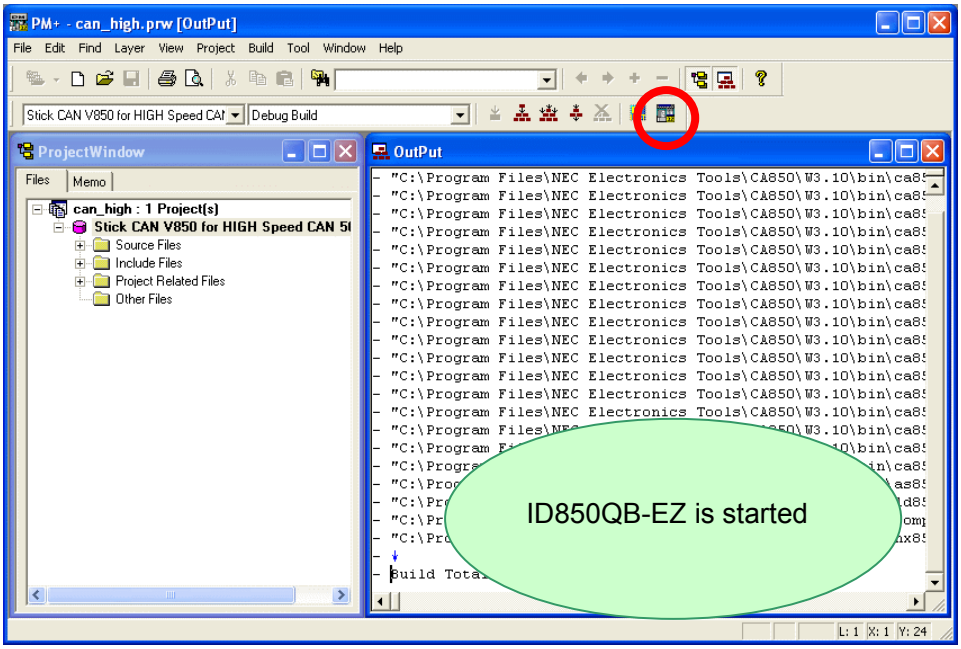
What is rebuild?

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 the settings, such as compiler options, have been changed, you must rebuild instead of build.

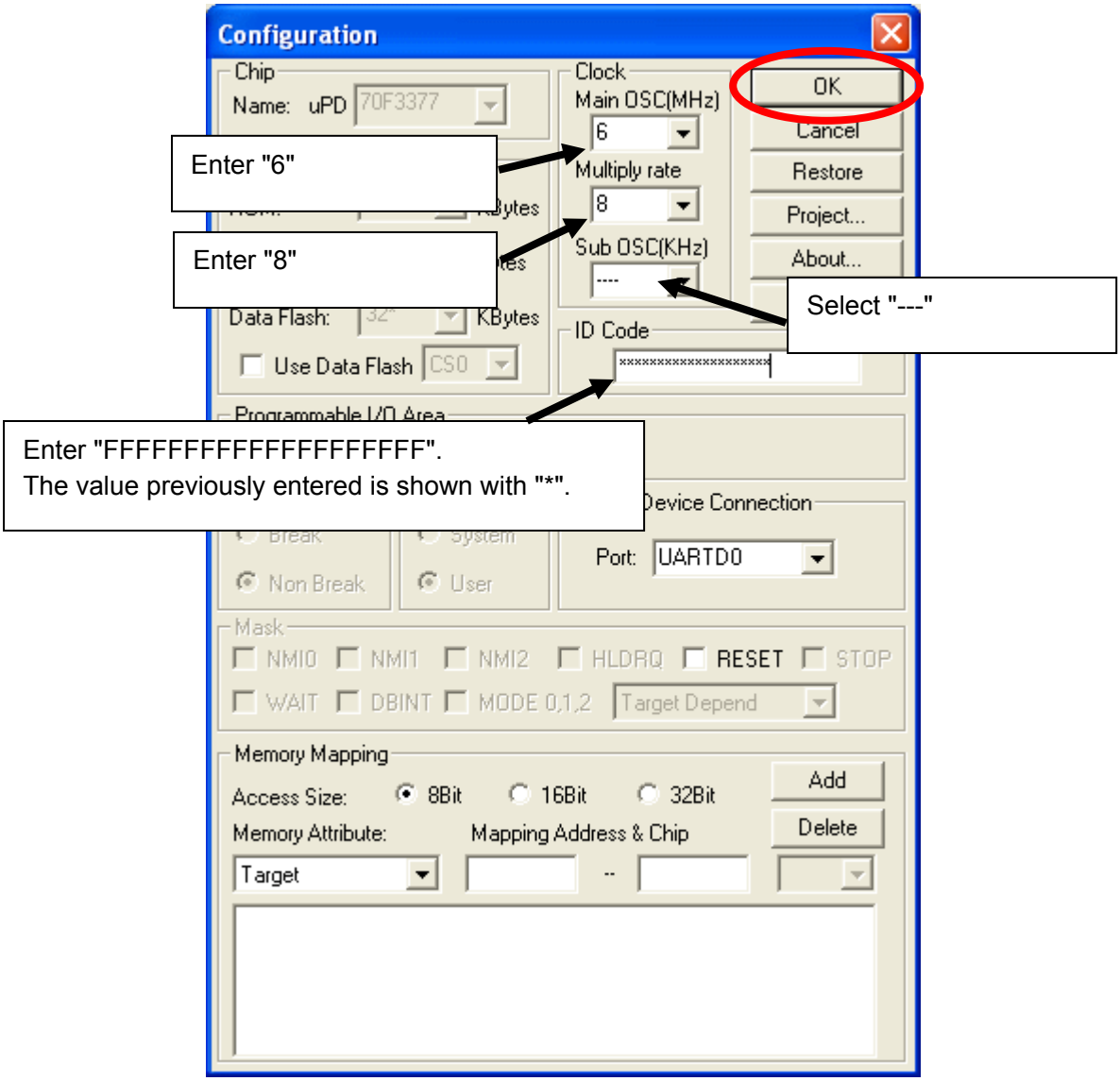
2.7 Start Debugger

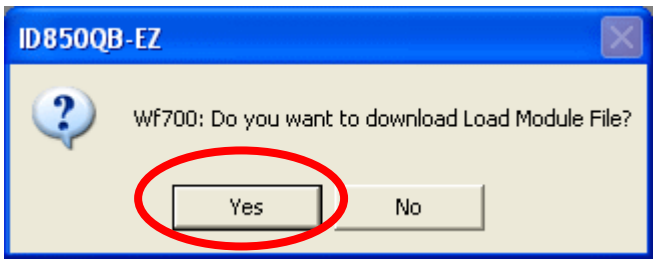
Click the debug button  in PM+, or select "Build" on menu bar, then "Debug".

If you do not see the debug button, select "Tool", "Debugger settings…", then "ID850QB-EZ V3.41 V850 Integrated Debugger".

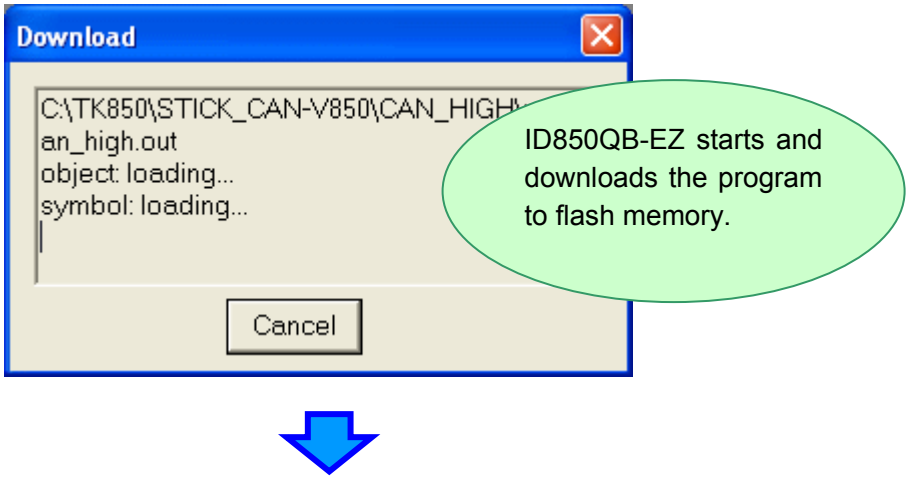


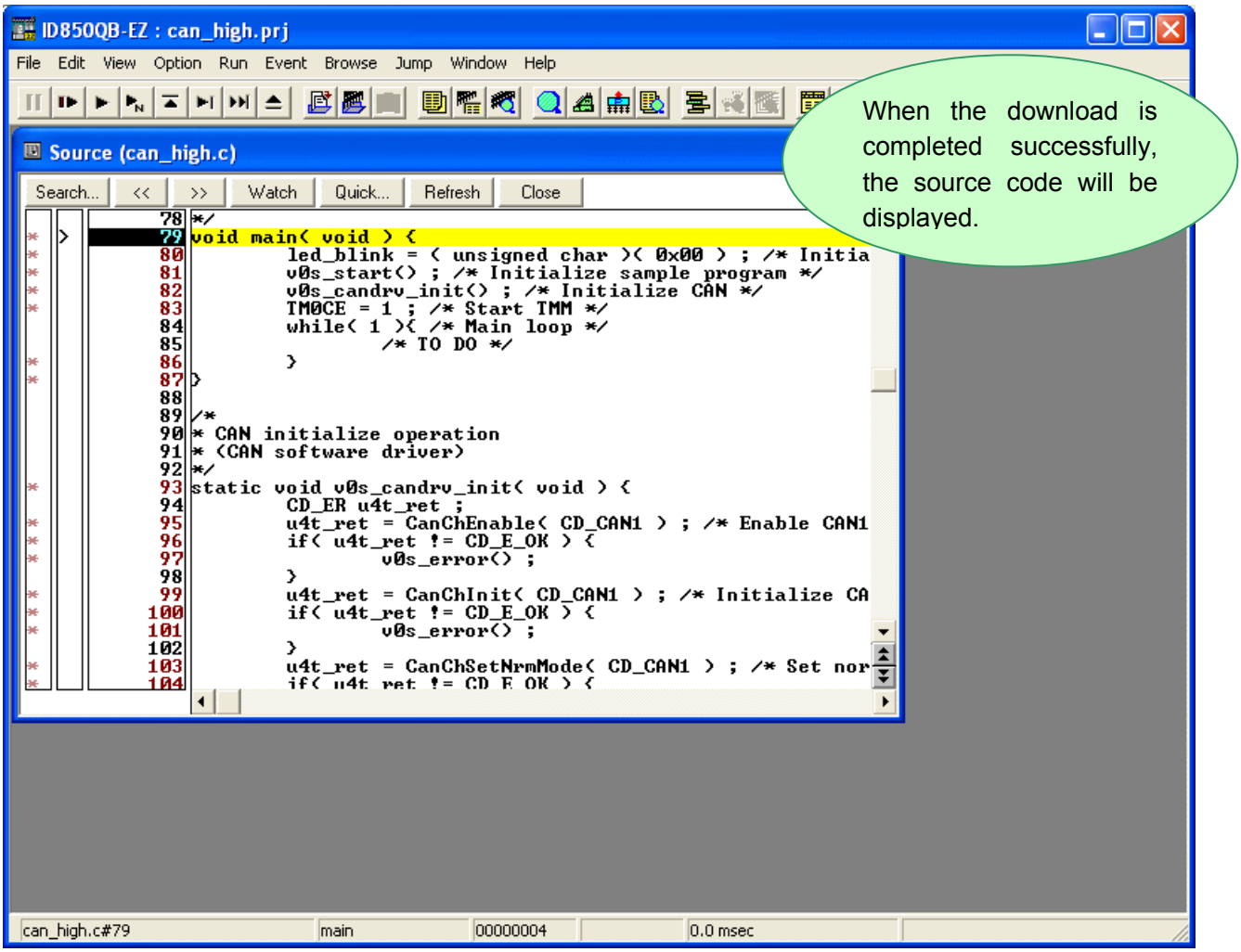
"Configuration" dialog is opened. Enter "6" in "Clock Main OSC", "8" in "Multiply rate", select "---" in "Sub OSC", enter "FFFFFFFFFFFFFFFFFFFF" (F x 20) in "ID Code", and then click "OK".





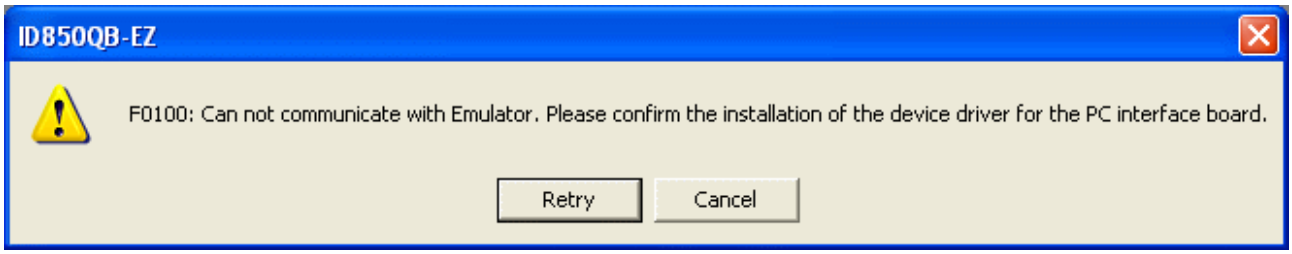
Click "Yes" when the confirmation dialog for downloading load module file is opened.


Download
C:\TK850\STICK_CAN-V850\CAN_HIGH\
an_high.out
object: loading...
symbol: loading...
Cancel
ID850QB-EZ starts and downloads the program to flash memory.


ID850QB-EZ : can_high.prj
File Edit View Option Run Event Browse Jump Window Help
Source (can_high.c)
Search... << >> Watch Quick... Refresh Close
78 */
79 void main(void) {
80 led_blink = (unsigned char)(0x00) ; /* Initia
81 v0s_start() ; /* Initialize sample program */
82 v0s_candrv_init() ; /* Initialize CAN */
83 TM0CE = 1 ; /* Start TMM */
84 while(1){ /* Main loop */
85 /* TO DO */
86 }
87 }
88
89 /*
90 * CAN initialize operation
91 * (CAN software driver)
92 */
93 static void v0s_candrv_init(void) {
94 CD_ER u4t_ret ;
95 u4t_ret = CanChEnable(CD_CAN1) ; /* Enable CAN1
96 if(u4t_ret != CD_E_OK) {
97 v0s_error() ;
98 }
99 u4t_ret = CanChInit(CD_CAN1) ; /* Initialize CA
100 if(u4t_ret != CD_E_OK) {
101 v0s_error() ;
102 }
103 u4t_ret = CanChSetNrmMode(CD_CAN1) ; /* Set nor
104 if(u4t_ret != CD_E_OK) {
can_high.c#79 main 00000004 0.0 msec
When the download is completed successfully, the source code will be displayed.

When you cannot start the debugger, you will see the errors shown below. Solve the error by referring to them.

1) F0100: Can not communicate with Emulator. Please confirm the installation of the device driver for the PC interface board.



Check the USB driver settings with referring "1.3 Installation of USB Driver".

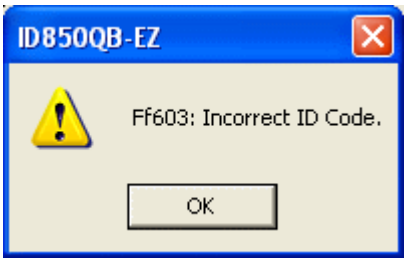
2) F0c26: FLMD terminal is in a write-protected state.

Check the switch settings are correct.
This error occurs when Debug switch is OFF.

3) F0c72: Monitor memory cannot be accessed.

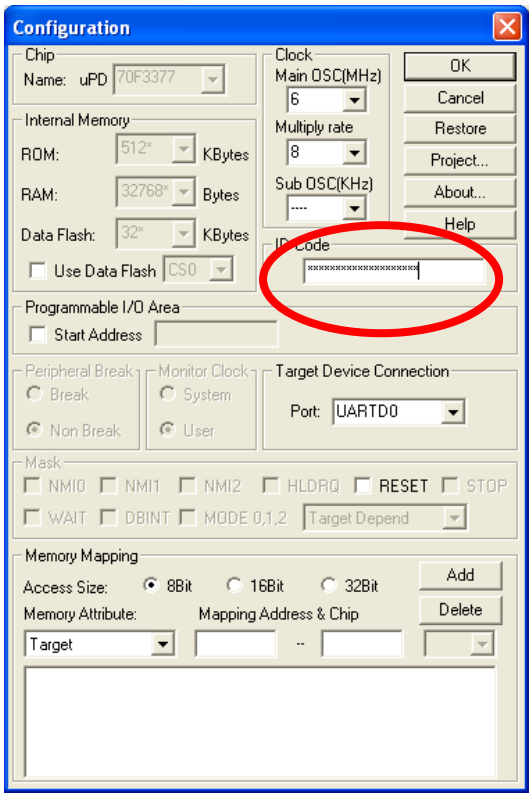
Check if "Clock Main OSC" in "Configuration" dialog is set to "6".
This error occurs when the clock that set in CPU and debugger setting are different.

4) Ff603: Incorrect ID Code.



This error occurs when the ID code is incorrect. Also, this may occurred when you start the debugger the first time. Enter "FFFFFFFFFFFFFFFFFFFF" (F x 20) for the ID code.

When you click "OK", "Configuration" dialog opens. Enter the correct ID code.

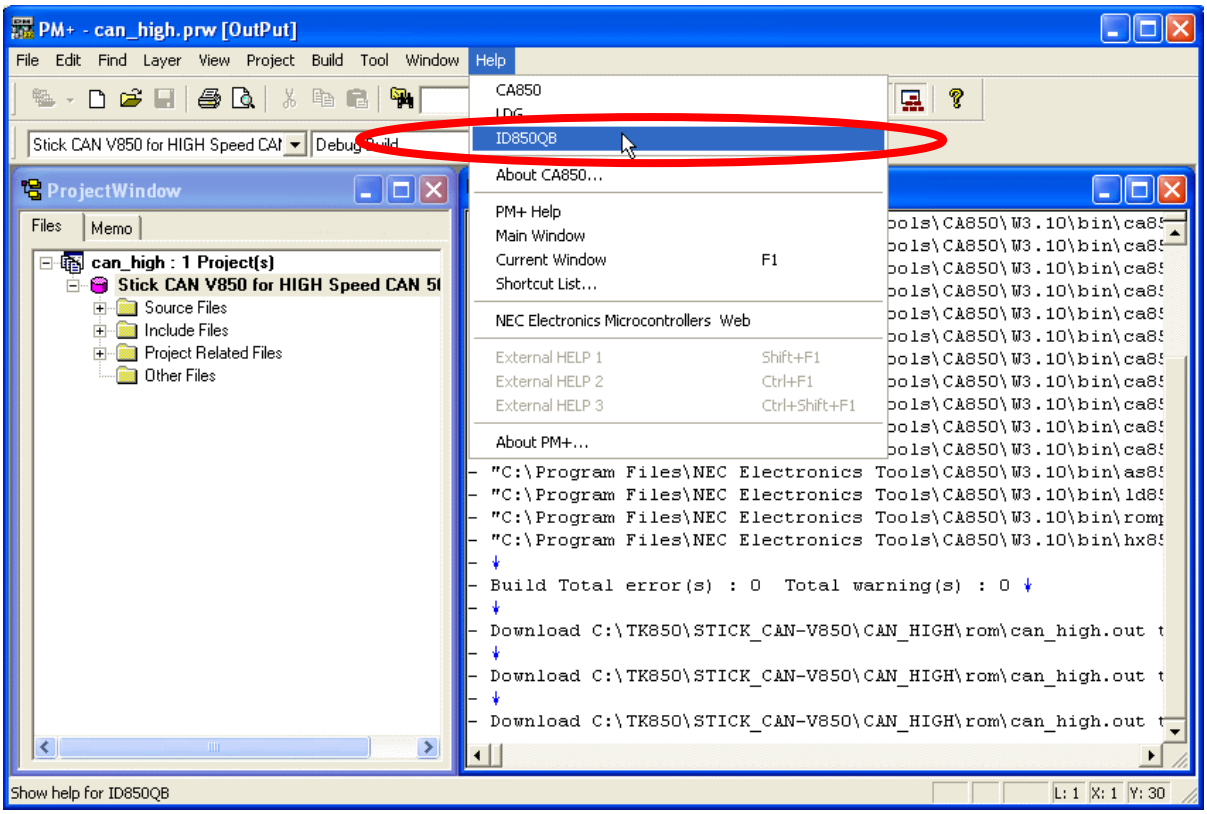


The workspace uses "FFFFFFFFFFFFFFFFFFFF" for the ID code.
This ID code can be changed in "Device" tab on "Compiler Common Options Settings".

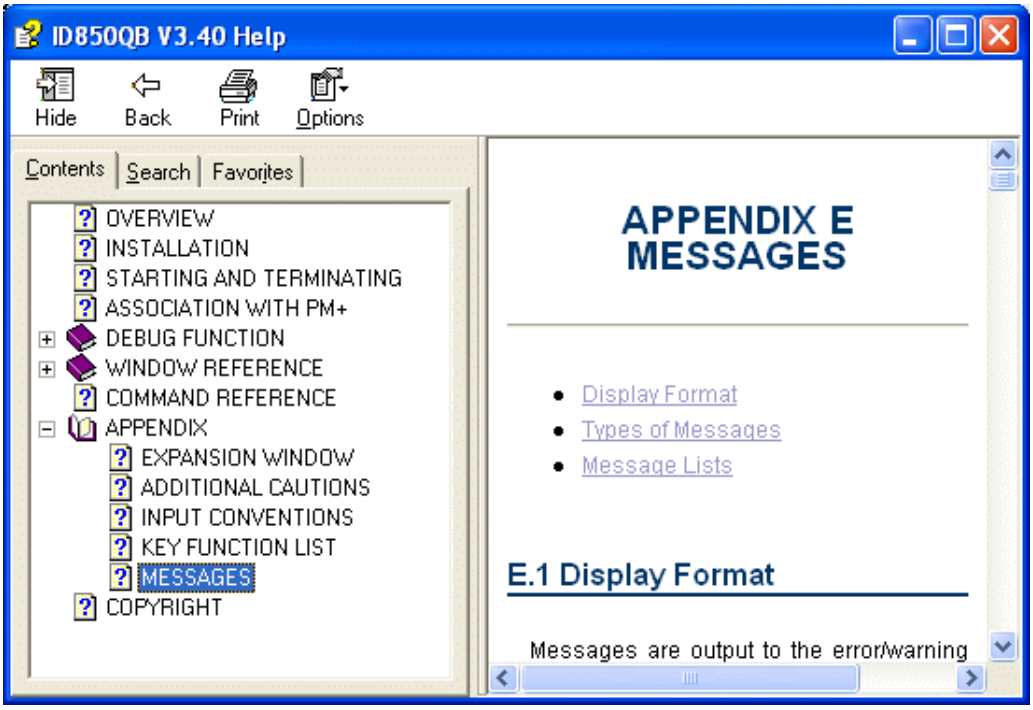
ID code is set for protecting the program from others to use the debugger and to modify the program.

If you forgot the security ID, you need to erase the microcontroller built-in flash memory. Install FPL from bundled CD-ROM and erase the flash memory.
For more information about PG-FPL, refer to "Chapter 3 FPL".

5) Other errors.
When other errors are occurred, select "Help" on menu bar, then "ID850QB".



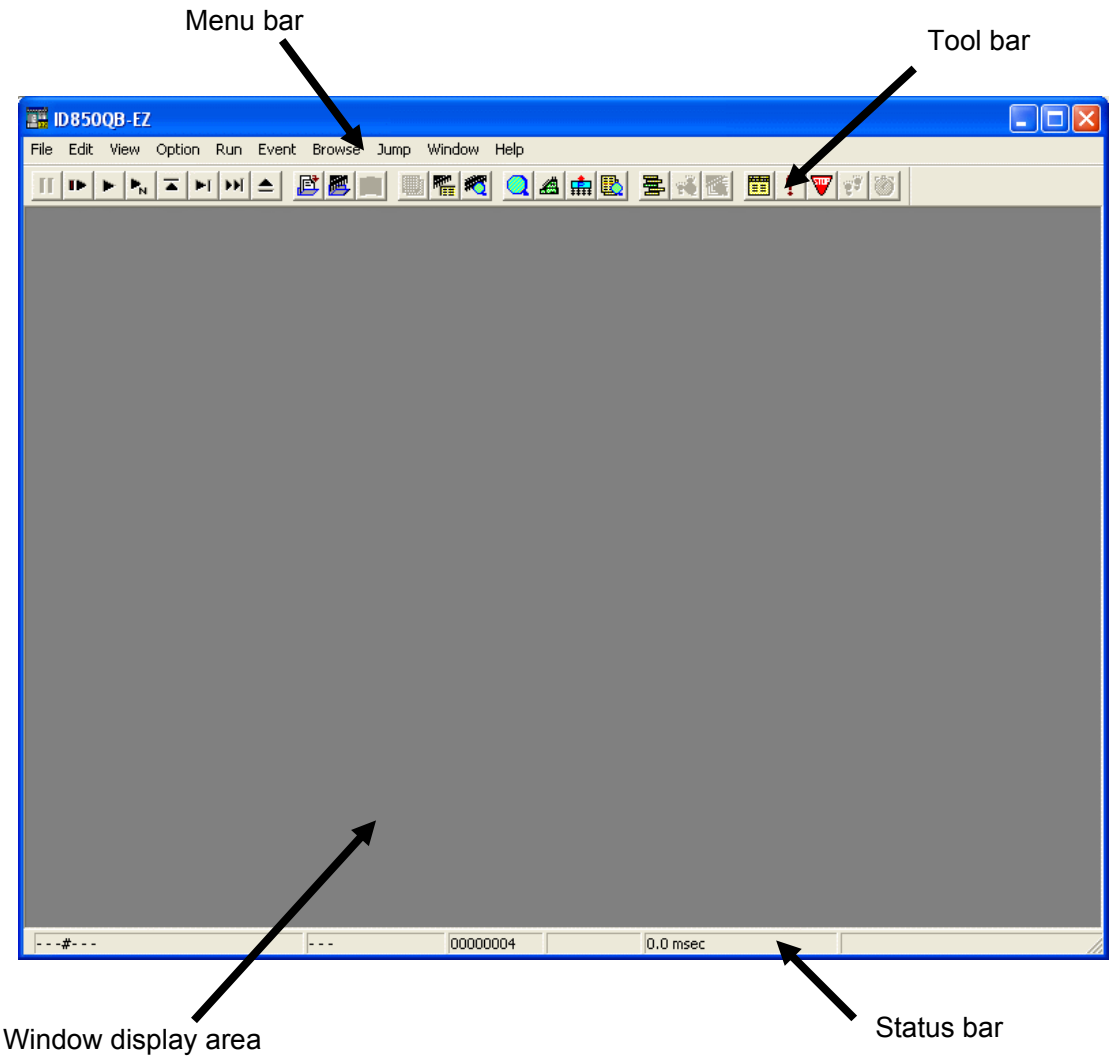
Select "Contents", "APPENDIX", "MESSAGES", and then find out the relevant error messages.



2.8 Integrated Debugger (ID850QB-EZ)

ID850QB-EZ displays CPU core status in the main window and controls monitor program.

Initial screen of ID850QB-EZ is shown below.



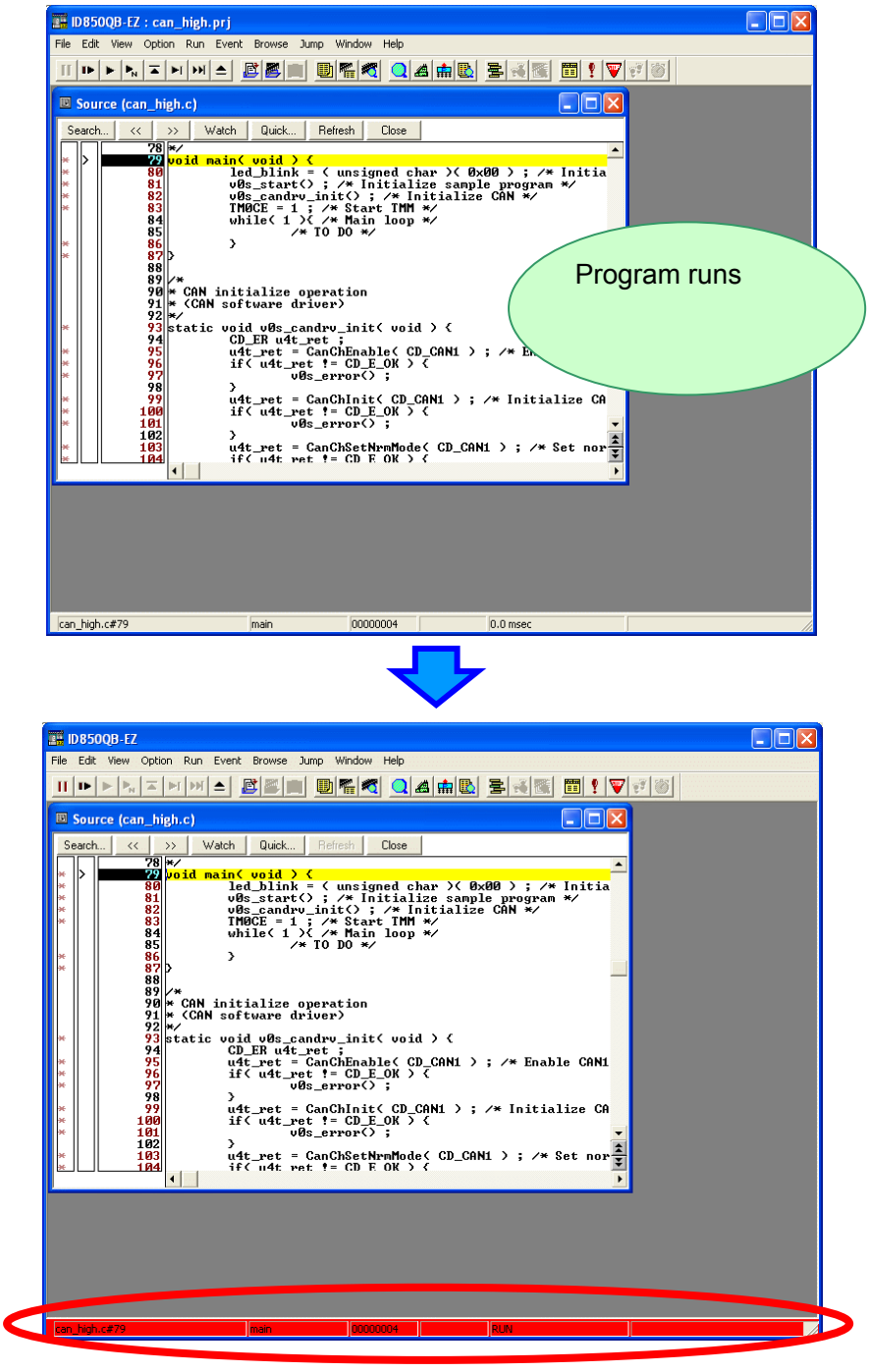
➪ For more information about display areas, menu bar, and tool bar, refer to "ID850QB Integrated Debugger User's Manual - Operation".

2.9 Run Programs

Now, you are ready to run the program.

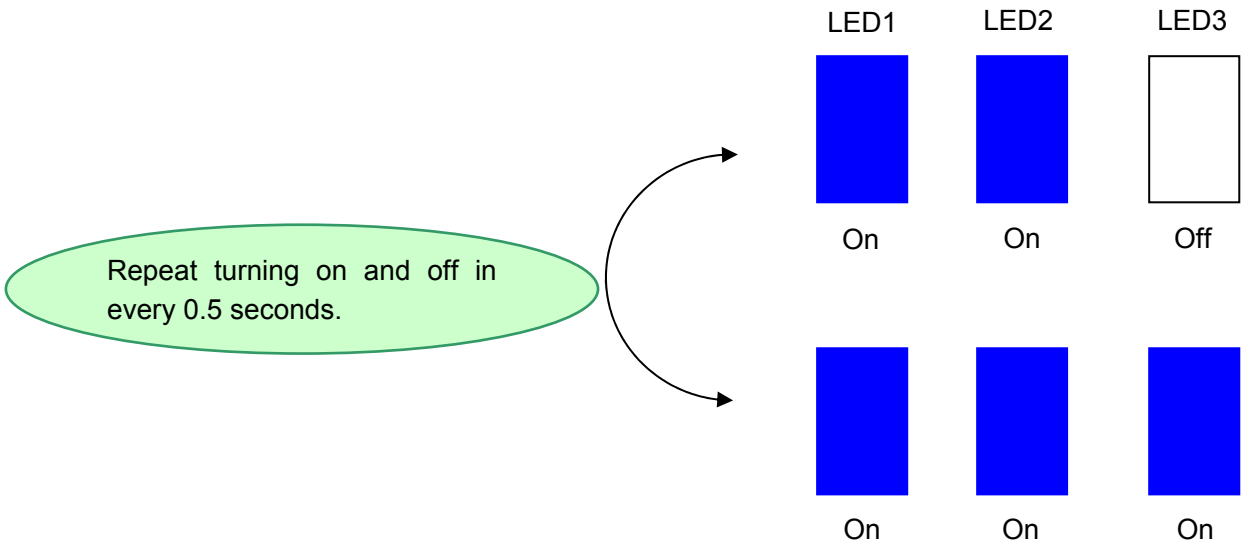
Click the restart button  in ID850QB-EZ, or select "Run" on menu bar, then "Restart".

The sample program runs.



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

LEDs are controlled by the sample program. When program is running, LED1 and LED2 light up and LED3 repeats turning on and off in every 0.5 seconds.

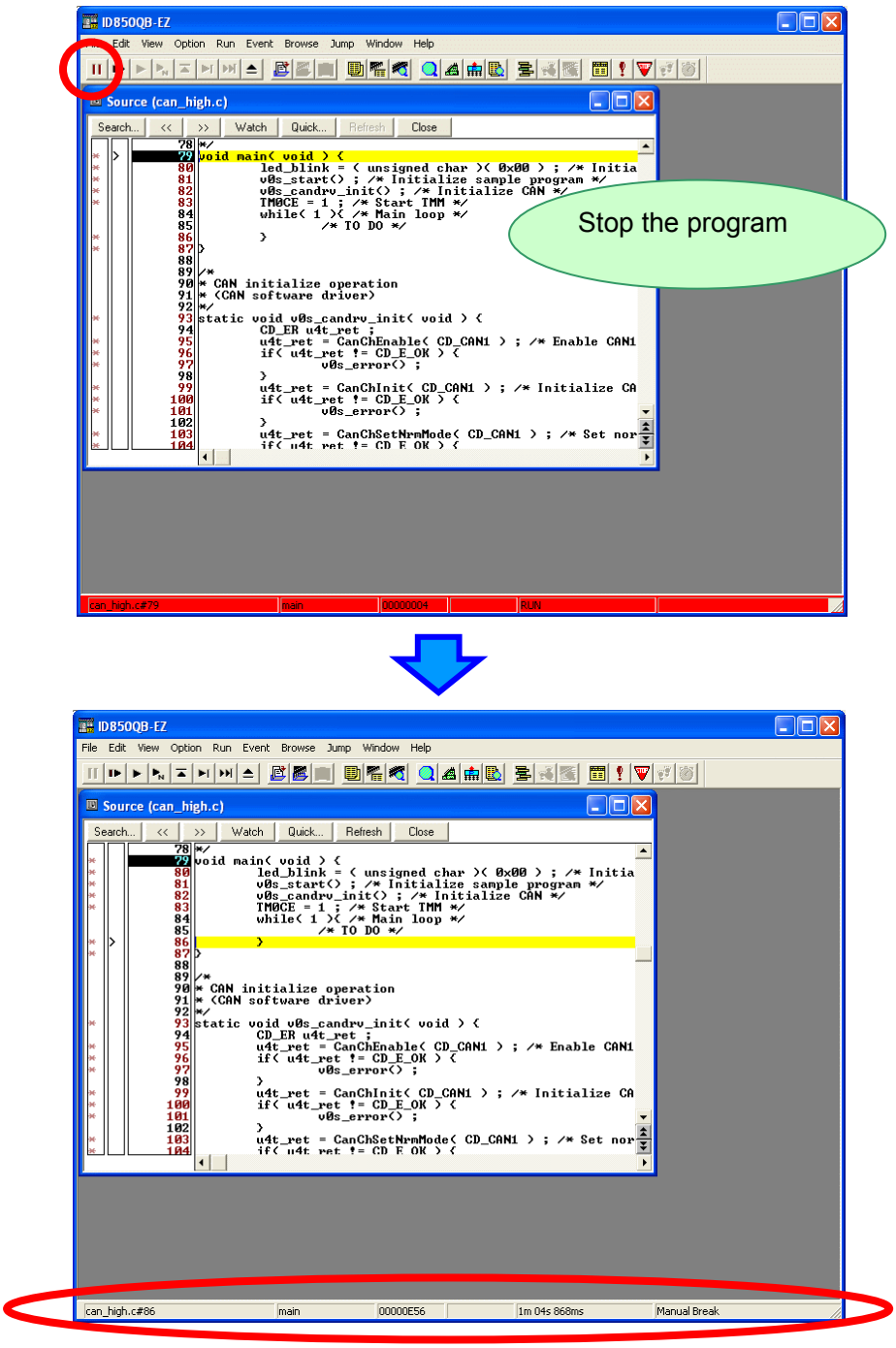


By check the LEDs, you can confirm the sample program is working.

2.10 Stop Programs

Now, you are going to stop the program.

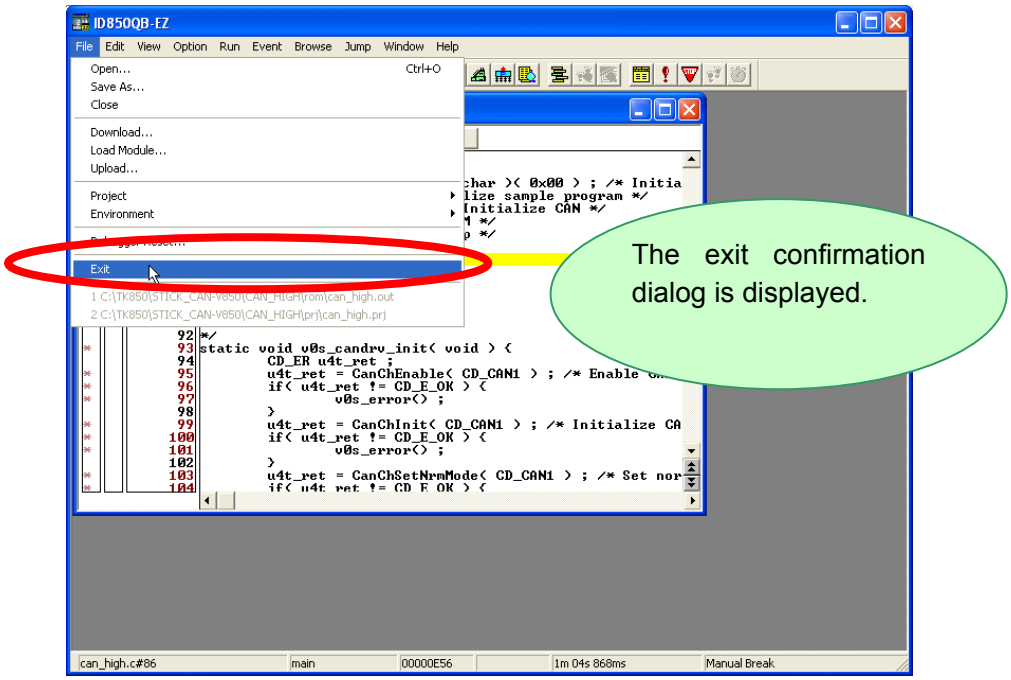
Click the stop button  in ID850QB-EZ, or select "Run" on menu bar, then "Stop".

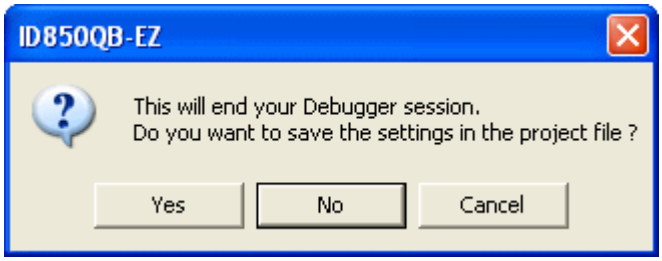


When the program stops, the status bar changes back to the original color.

2.11 Close Integrated Debugger (ID850QB-EZ)

Select "File" on ID850QB-EZ menu bar, then "Exit".



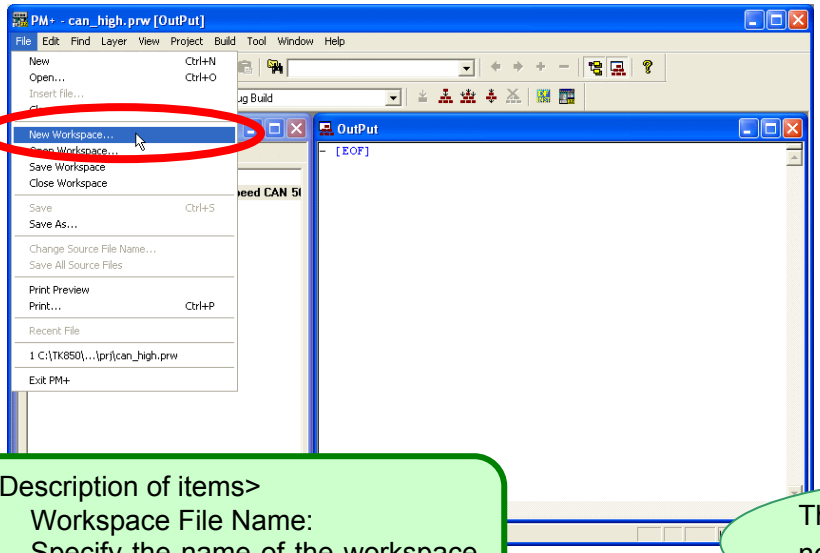


If you click "Yes", it saves the current settings in the project file, and then closes the ID850QB-EZ.
If you click "No", it does not save the current settings and closes the ID850QB-EZ.

2.12Create a New Workspace

Now, create a new workspace and project.
PM+ allows you to create a new project including all the information needed for build by following the step-by-step dialog.
How to select existing start-up file and link directive file will be described.

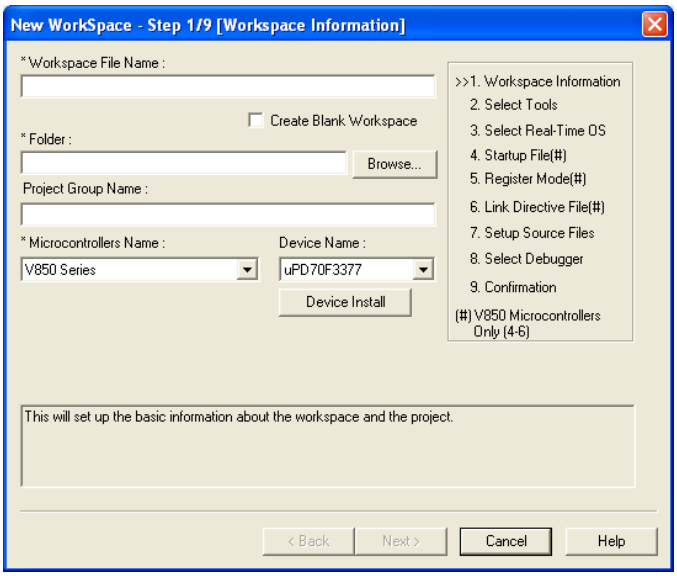
Select "File" -> "New Workspace..." in the menu bar of PM+.



<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 entering its absolute path.
  This item can be selected from a reference dialog box by clicking 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.
- Series Name:
  Specify the series name of the device to be used.
- Device Name:
  Specify the name of the device to be used.

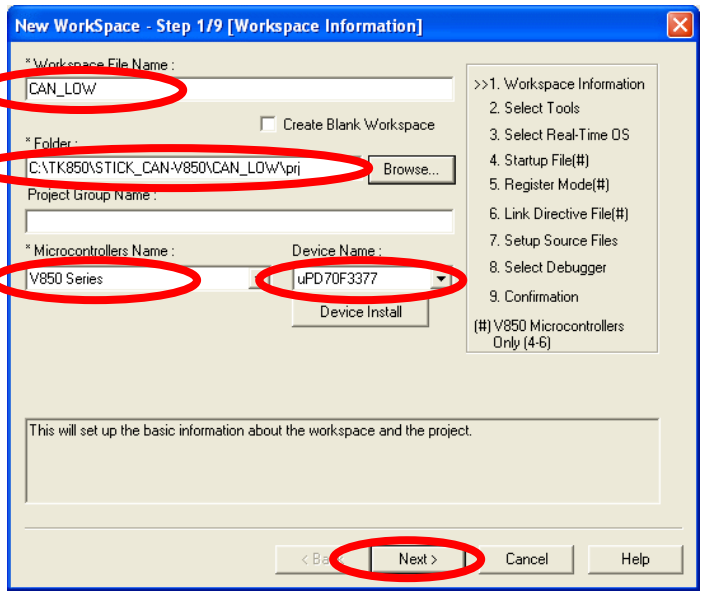
The dialog box for creating new workspace is displayed



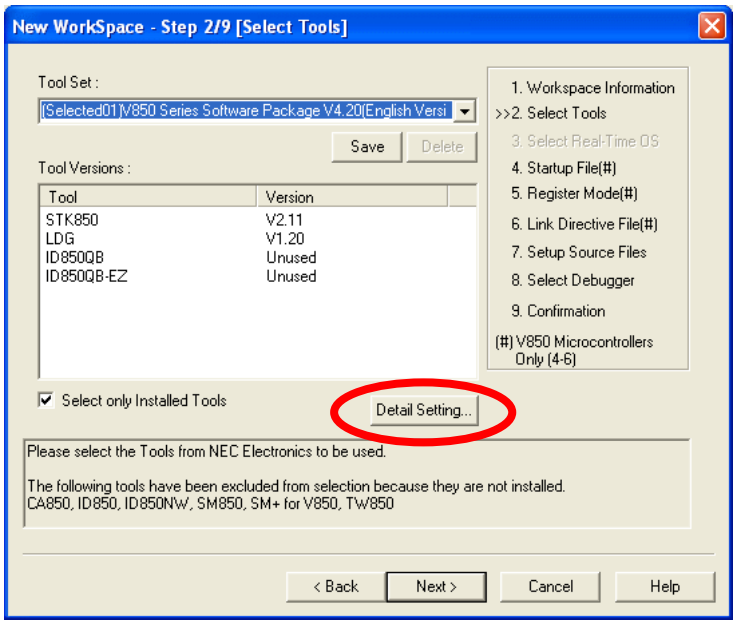
Details about the settings are described in the next page

Input the workspace information setting as follows.

- Workspace file name
  → CAN_LOW
- Folder
  →
  C:¥TK850¥STICK_CAN-V850¥CAN_LOW¥PRJ
  (Click "Browse")
- Project Group Name
  → Don't input this item.
- Series Name
  → V850 Series
- Device Name
  → µPD70F3377



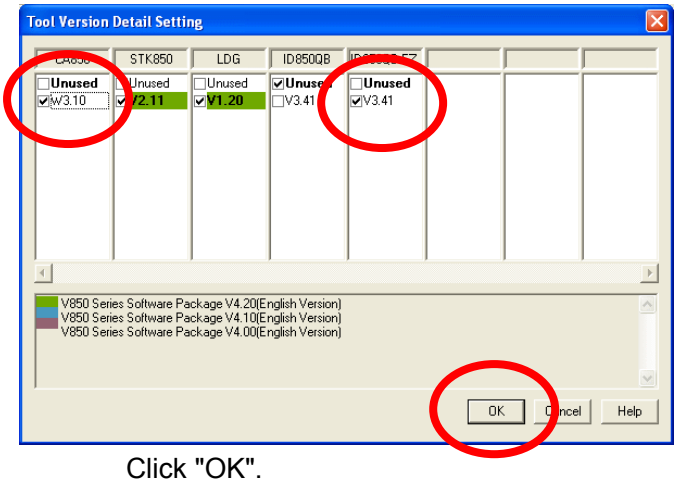
Click "Next" button.



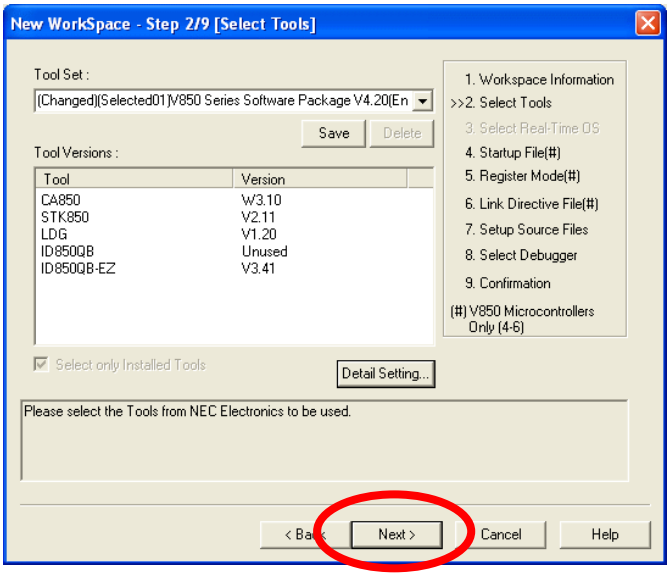
Click "Detail Setting…" button for the settings of tools.

Set the version of tools as follows.

CA850: W3.10
ID850QB-EZ: V3.41

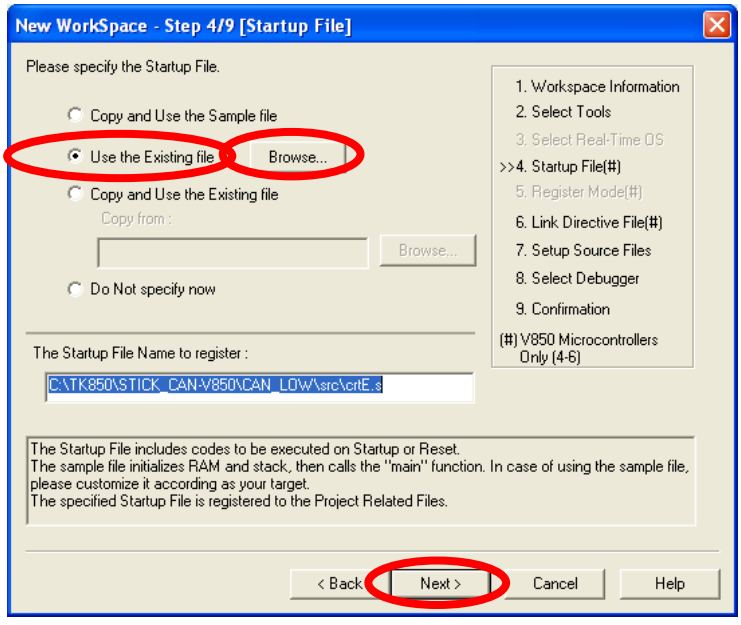


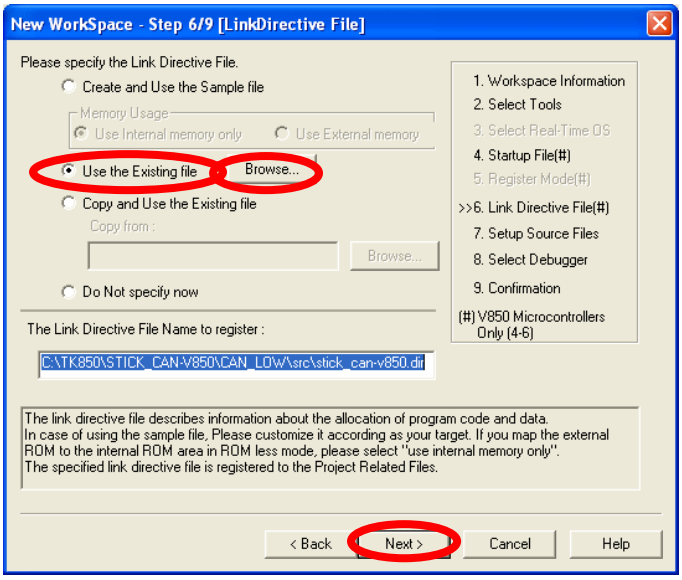
Click "OK".



Select "Use the Existing file"

The Startup File Name to register:
→
C:¥TK850¥STICK_CAN-V850¥CAN_LOW¥SRC¥crtE.s
(Click "Browse")

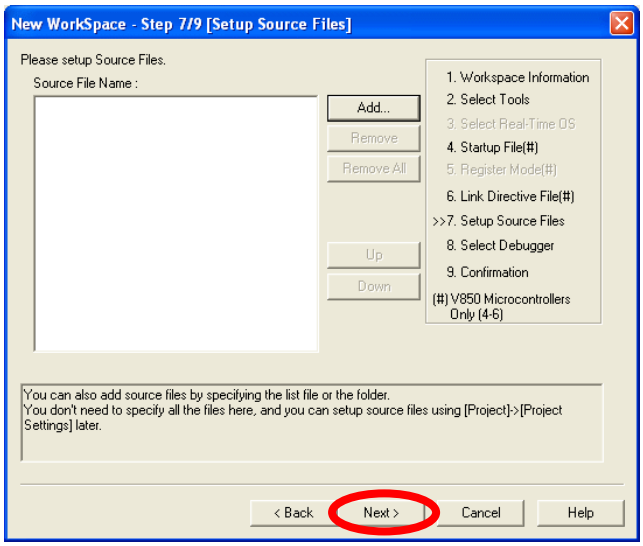




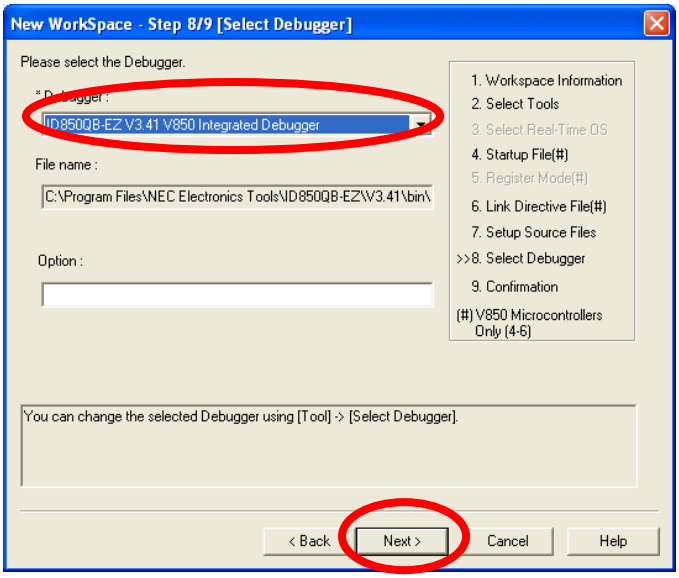
Select "Use the Existing file"

The Link Directive File Name to register:
→
C:¥TK850¥STICK_CAN-V850¥CAN_LOW¥SRC¥stick_can-v850.dir
(Click "Browse")

Click "Next".

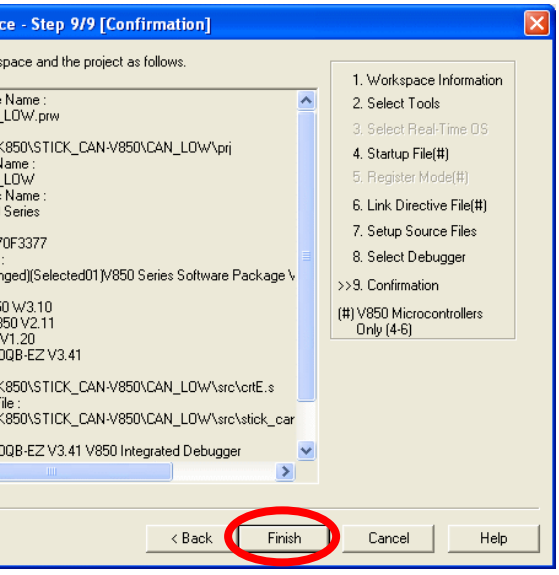


Click "Next".



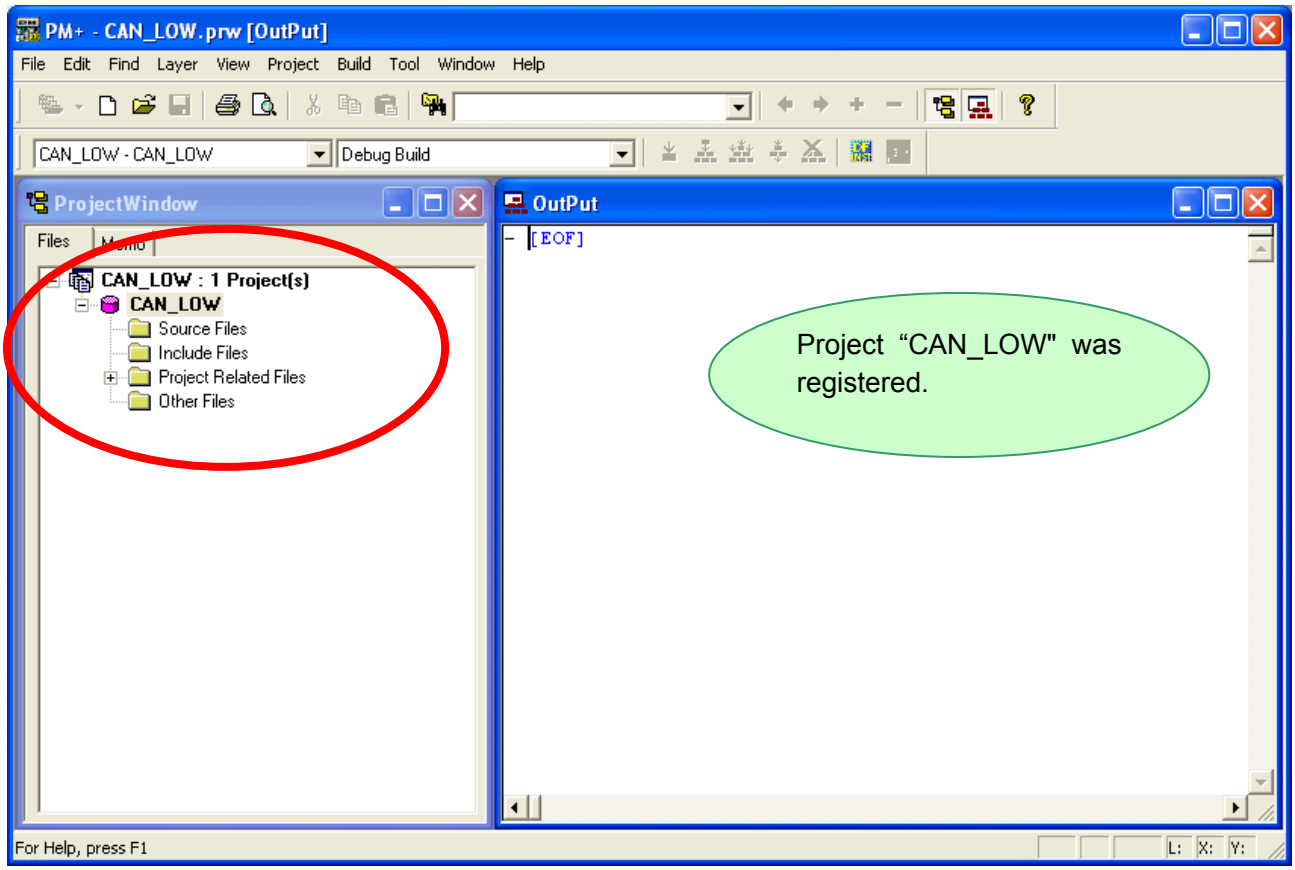
Select "ID850QB-EZ V3.41 V850 Integrated Debugger" in "Debugger".

Click "Next".



Check the project information settings

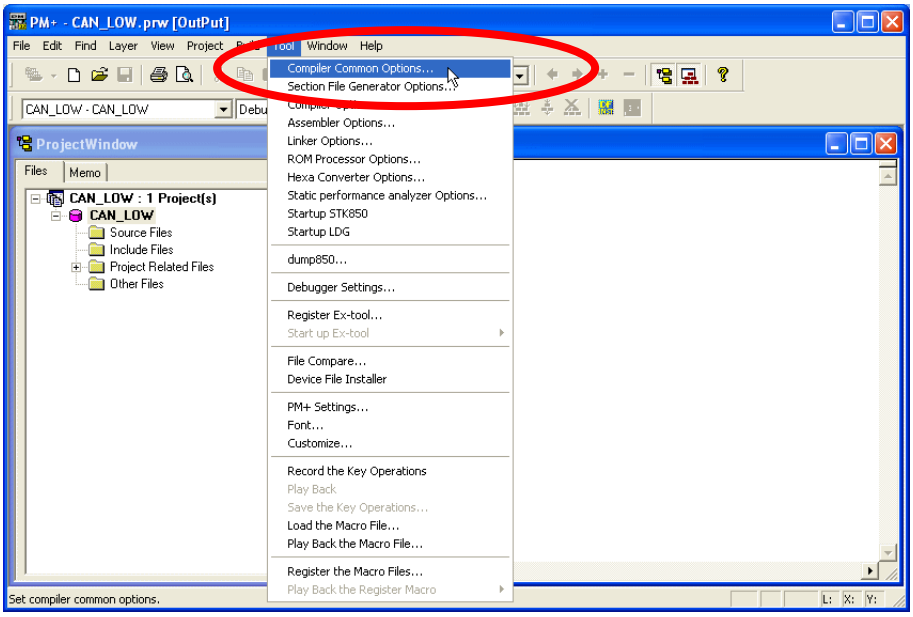
Click "Finish".



This completes workspace and project creation.
Additional source files can be registered at any time thereafter.

➪ For details, refer to "2.13 Register Additional Source File".

Next, you are going to set the output file directory, object output for ROM processor, and the security ID.
Select "Tool" on menu bar, then "Compiler Common Options...".

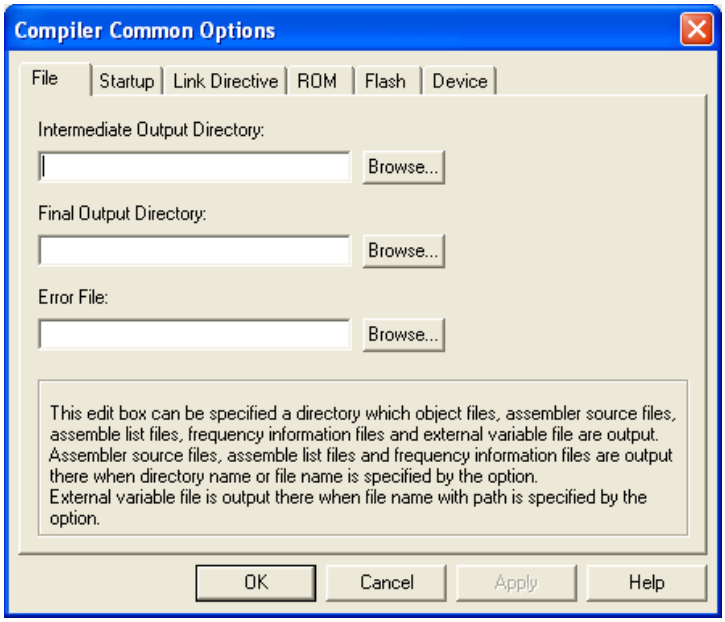


"Compiler Common Options" dialog opens.

<Description of items>

- Intermediate Output Directory:
  Specify the directory to store intermediate output files such as object files.
  (Click "Browse")
- Final Output Directory:
  Specify the directory to store executable object files and HEX files.
  (Click "Browse")
- Error file:
  Manage multiple projects with units of functions.
  (Click "Browse")

If you do not set these, files are output in the directory that the project files are stored.



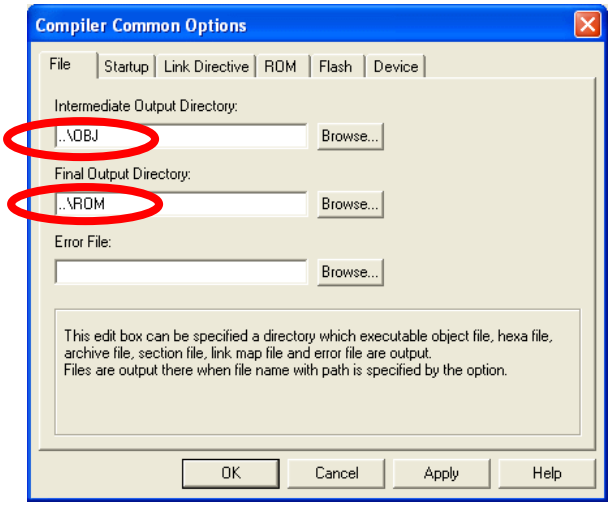
Details about the settings are described in the next page

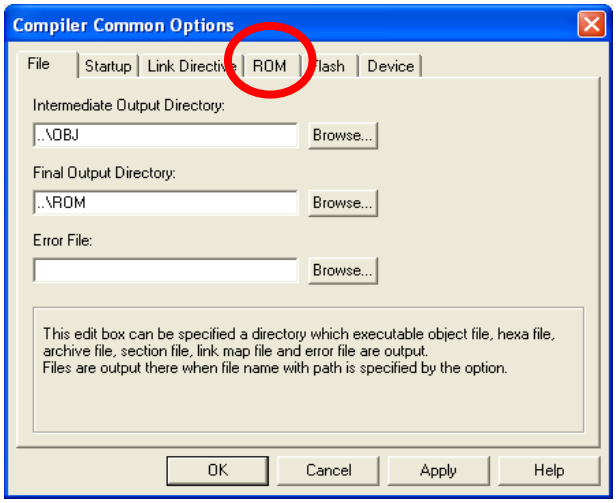
Set the workspace information as shown below.

Intermediate Output Directory:
→
..¥OBJ

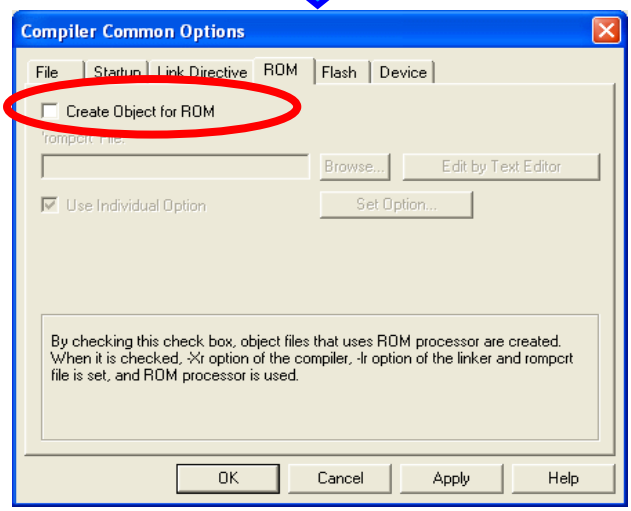
Final Output Directory:
→
..¥ROM

Error file:
→ Don't input this item.

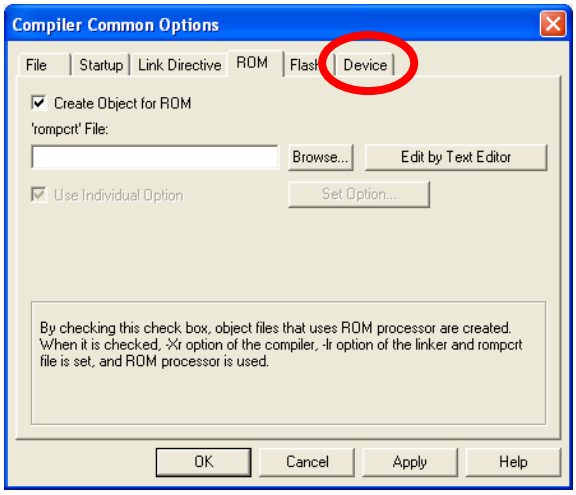




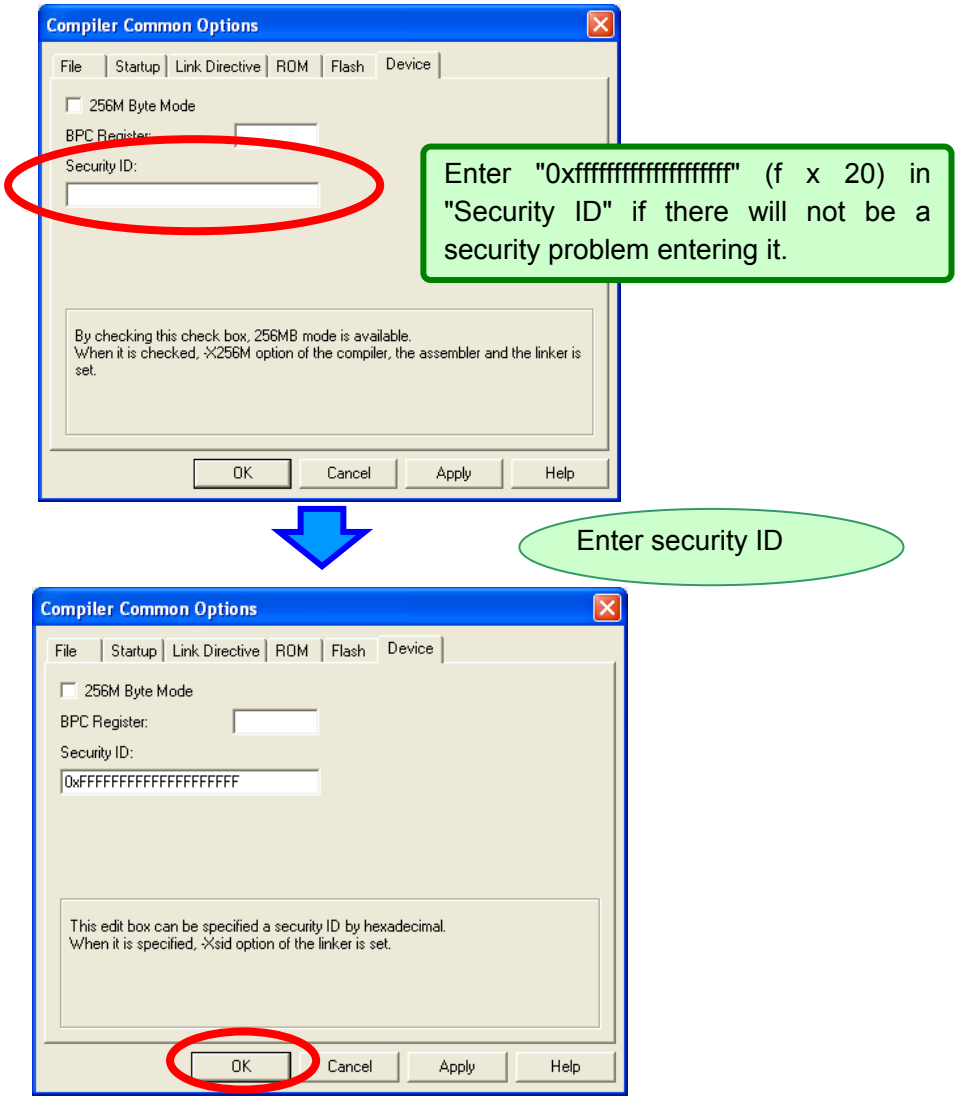
Select "ROM" tab.



Check "Create Object for ROM".



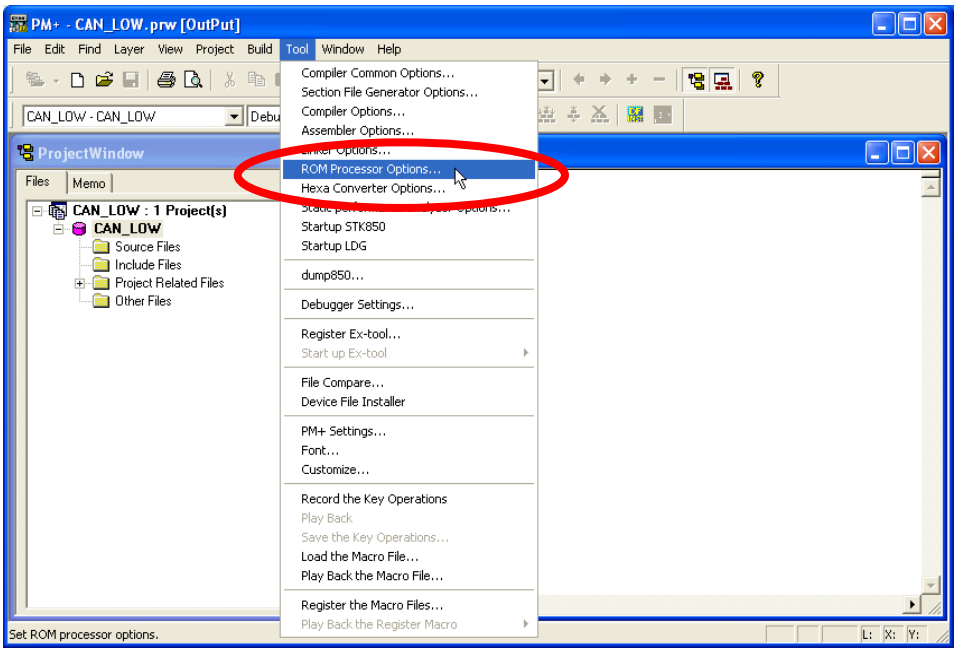
Select "Device" tab.



Click "OK".

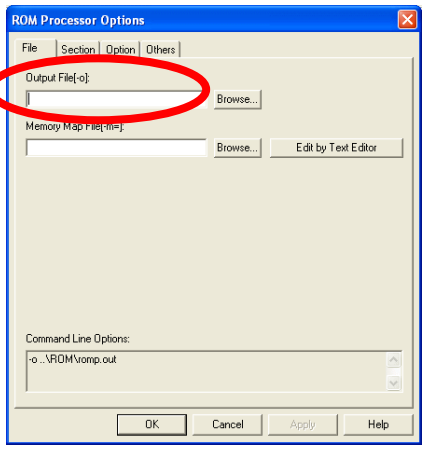
This completes the setting of the output file directory, object output for ROM processor, and the security ID.

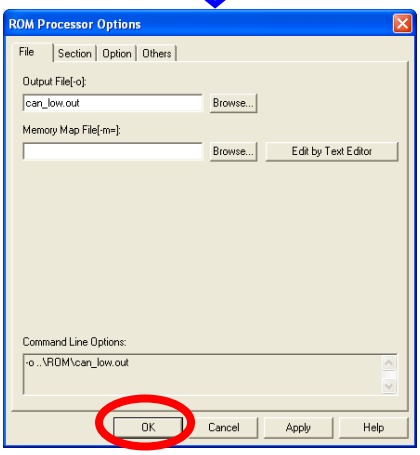
Next, you are going to specify the output file name for ROM object file.
Select "Tool" on menu bar, then "ROM Processor Options...".



Enter "can_low.out" in "Output file" field.

If you skip this setting, the output file name becomes "romp.out".





Click "OK".

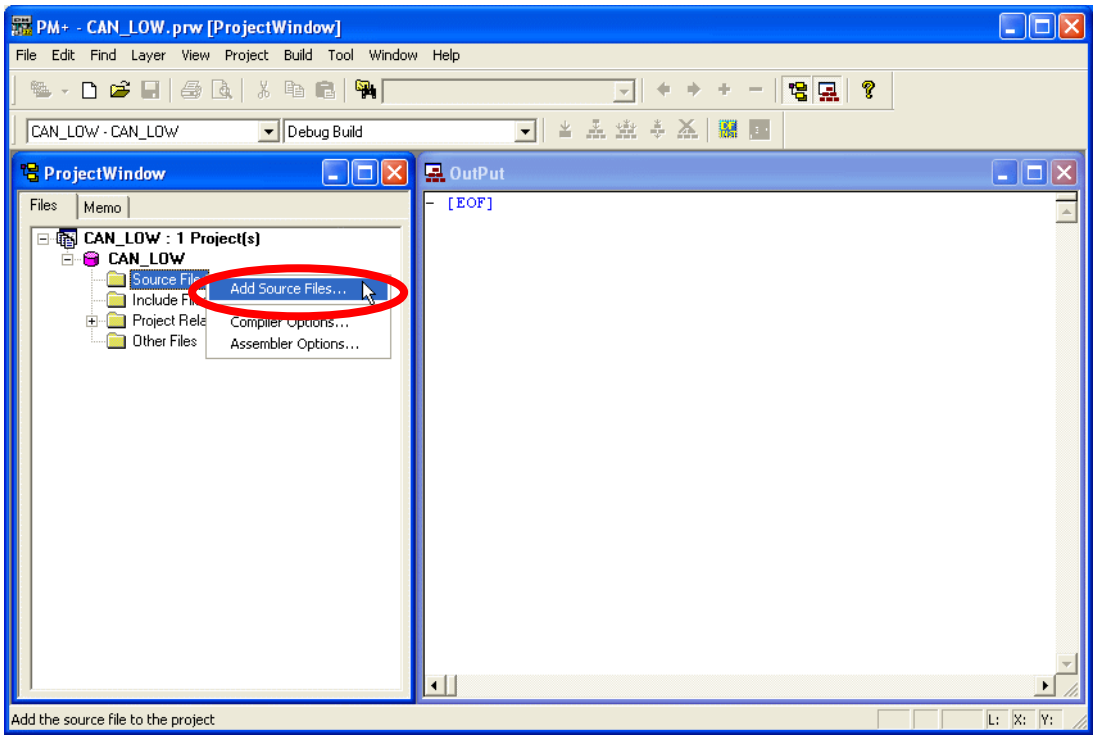
This completes the setting of the output file name of ROM object.

2.13Register Additional Source File

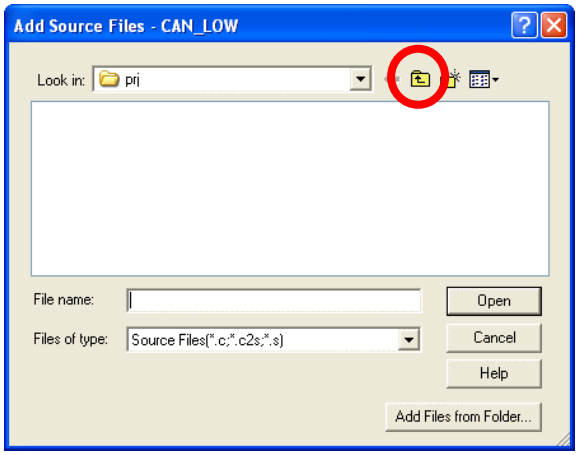
This section explains how to register additional source files to a project.
It is assumed that the directory is structured as shown below.

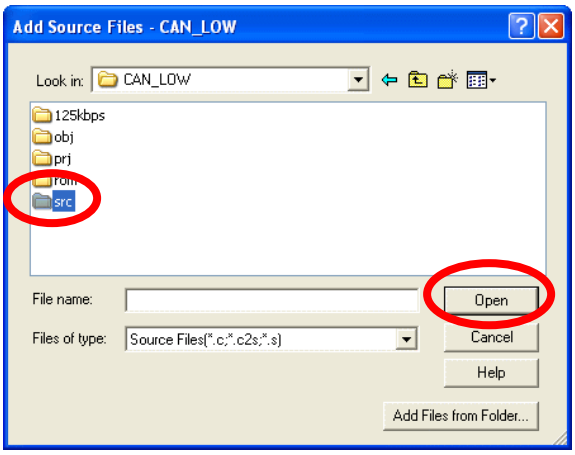
```
C:¥TK850
    └── STICK_CAN-V850
        └── CAN_LOW          Sample directory for low-speed CAN
            ├── PRJ          Project files
            ├── 125KBPS      CAN software driver
            └── SRC          Source files
```

The following example shows that the additional source files “CAN_LOW.C” and a set of files to structure CAN software driver will be registered to a project which does not have any source files.
Place the cursor on the source file in the PM+ project window, and select "Add Source Files…" displayed in the right-click menu.

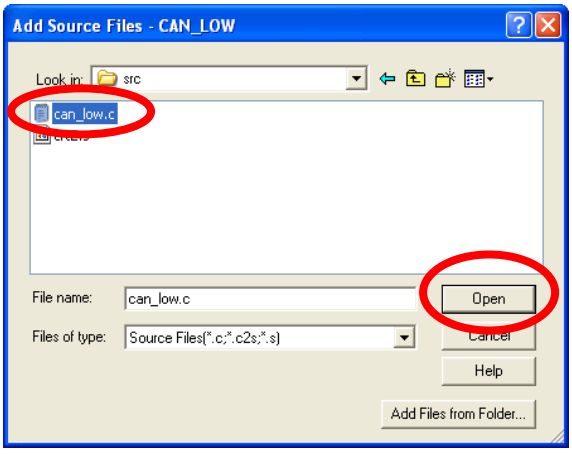


Click  to move to higher directory.

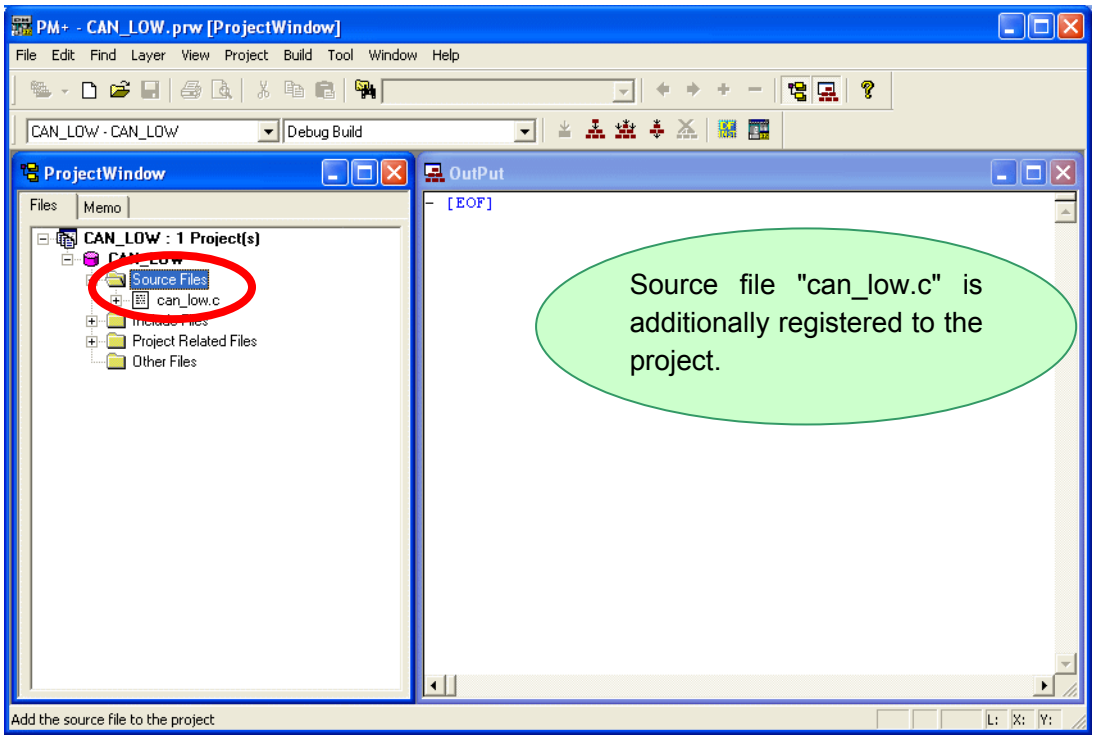




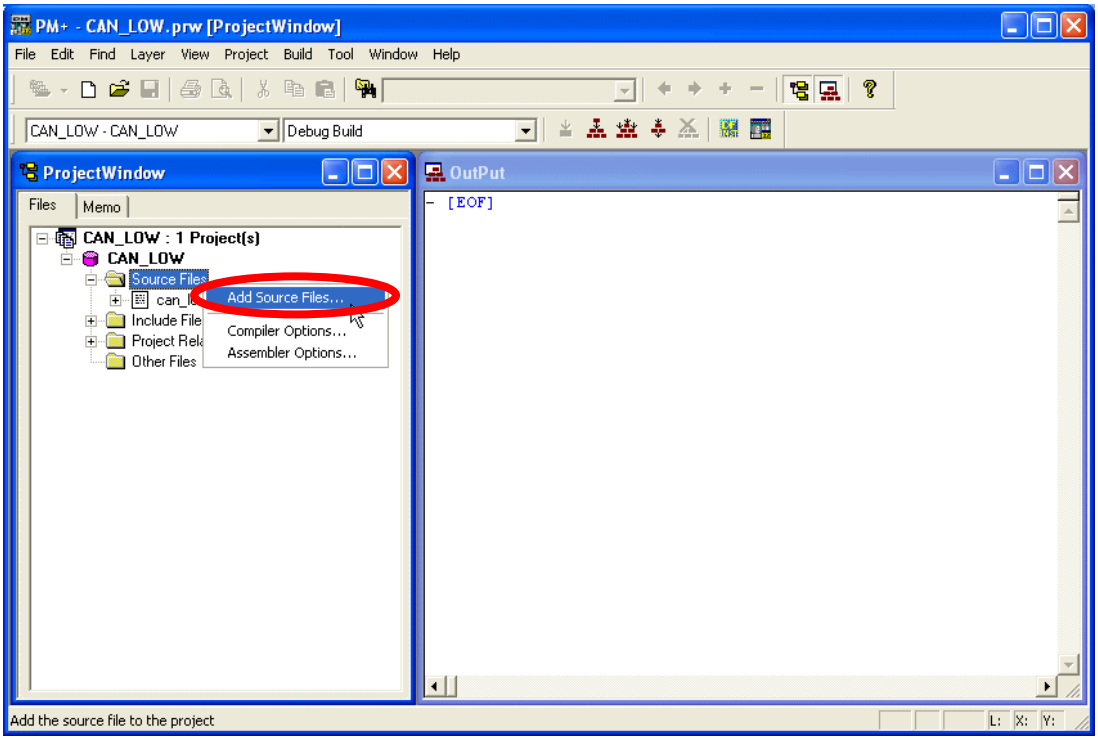
Select "src", and then click "Open" button.

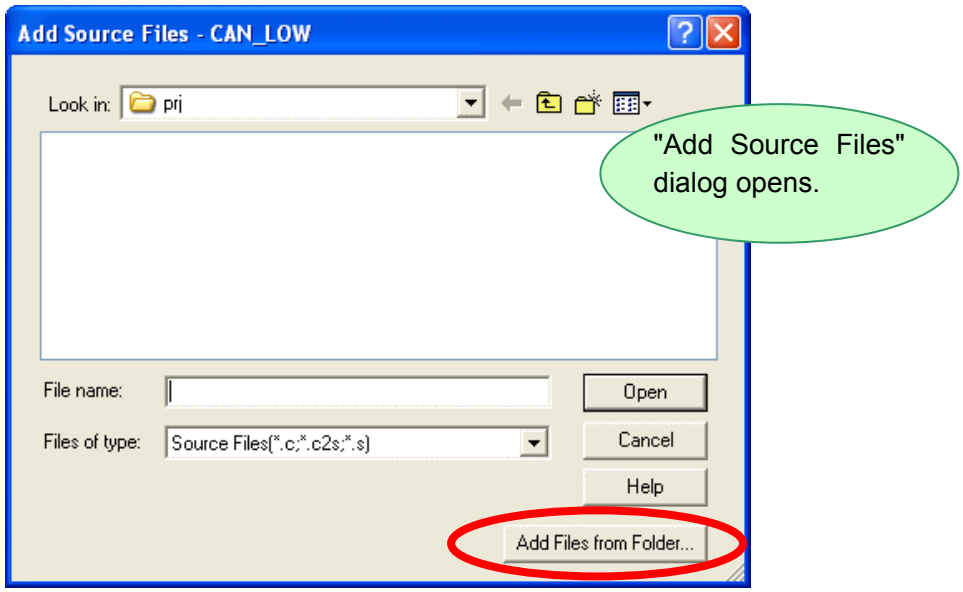


Select the source file "can_low.c", and then click "Open" button.

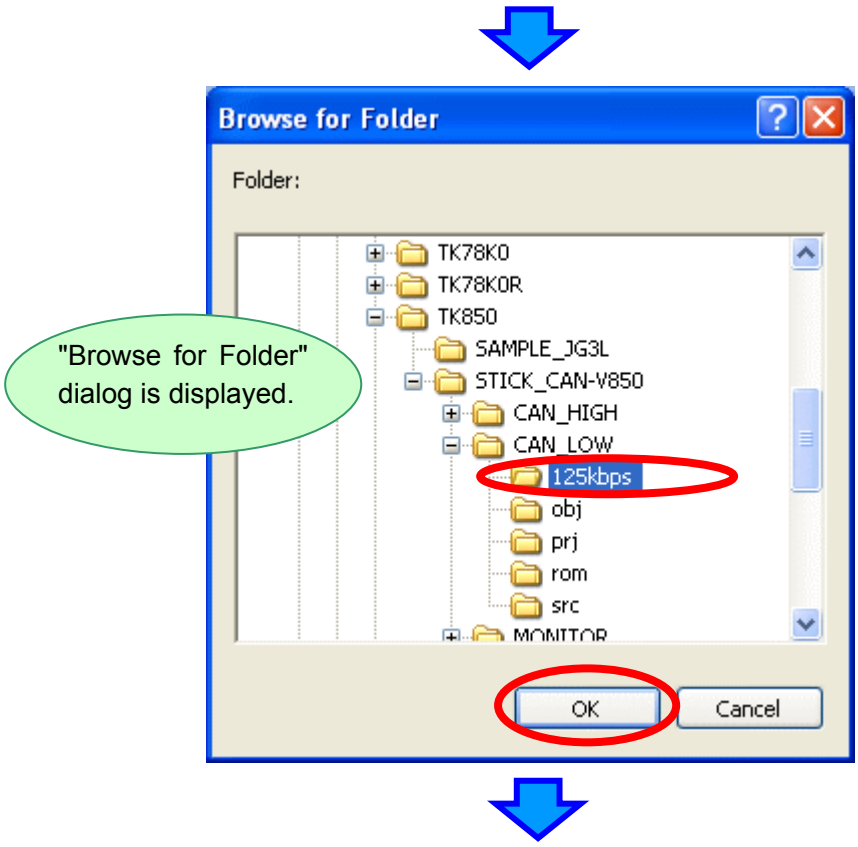


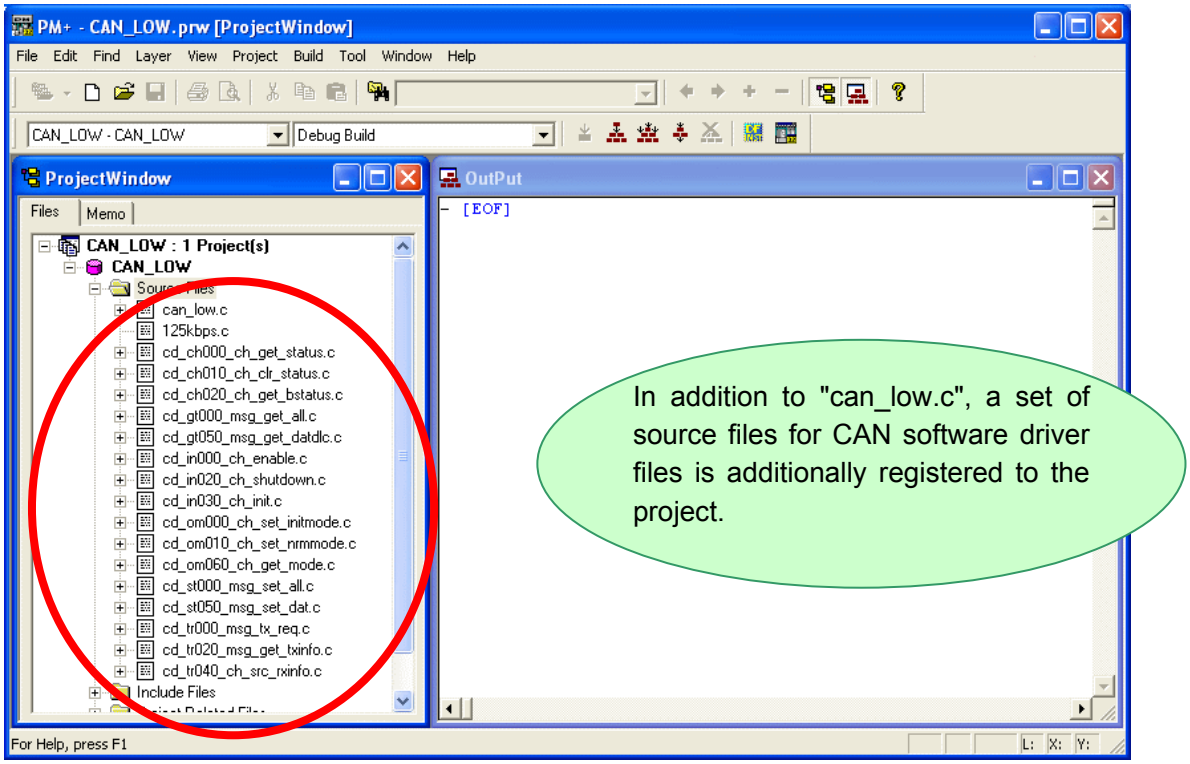
Again, place the cursor on the source file in the PM+ project window, and select "Add Source Files…" displayed in the right-click menu.



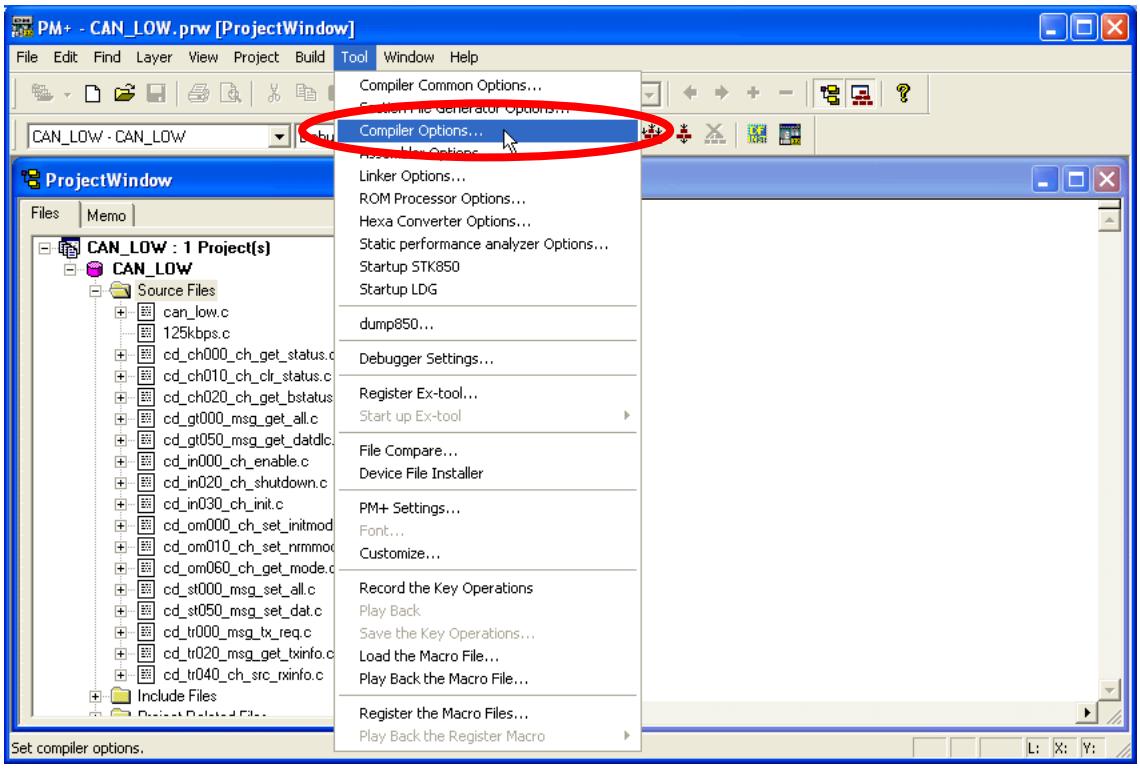


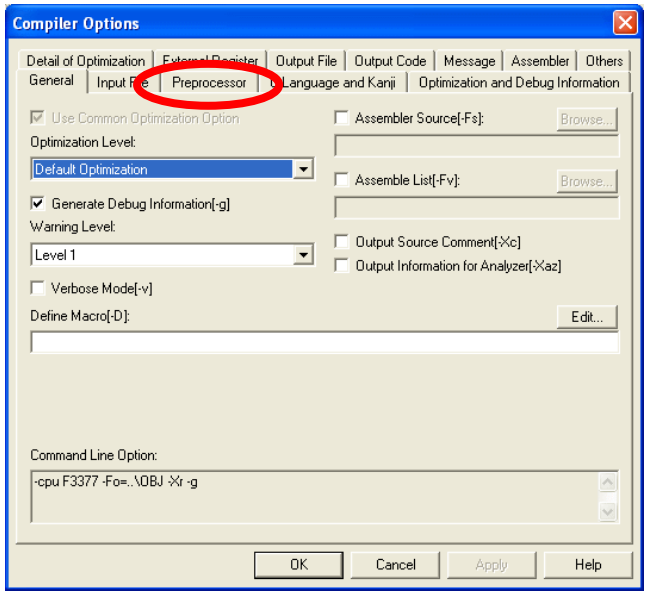
Click "Add Files from Folder..." button.



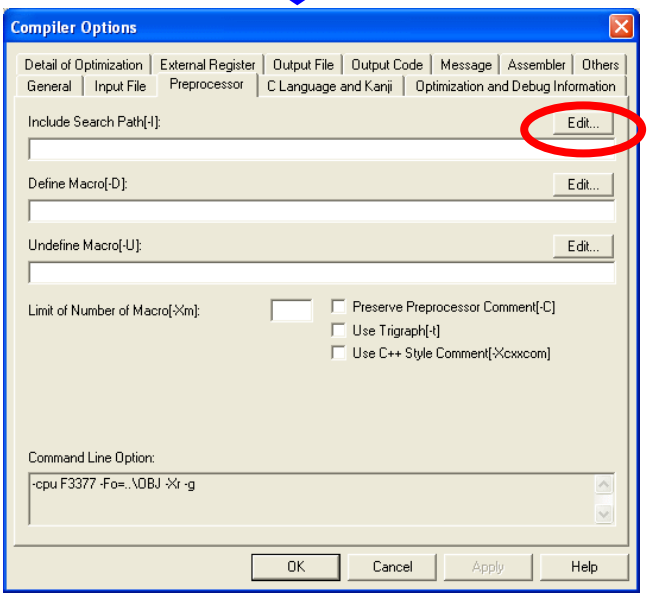


Now, you are setting the path of include files that is used by CAN software driver.
Select "Tool" on menu bar, then "Compiler Options...".

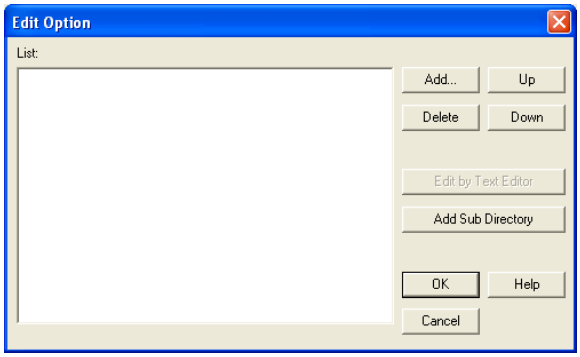




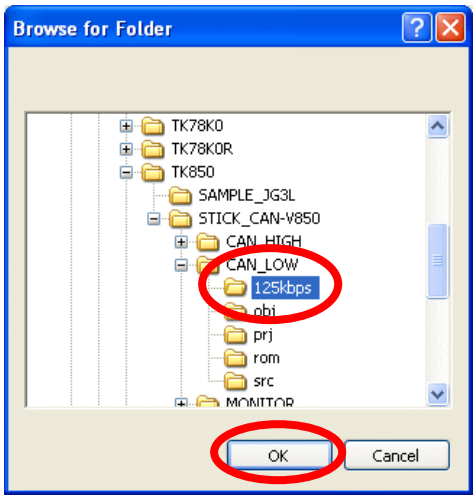
Click "Preprocessor" tab.



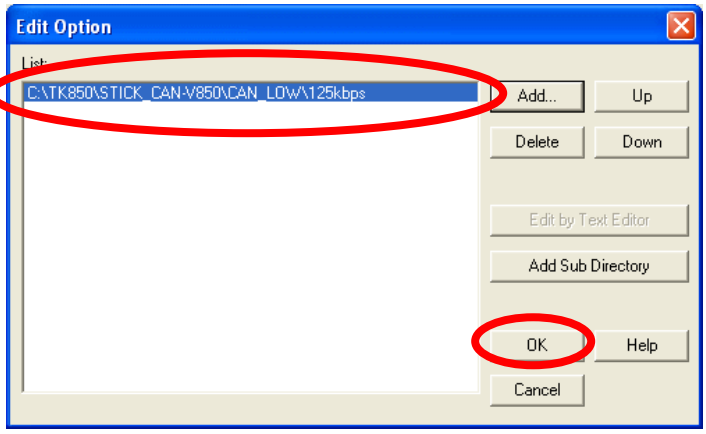
Click "Edit..." button.



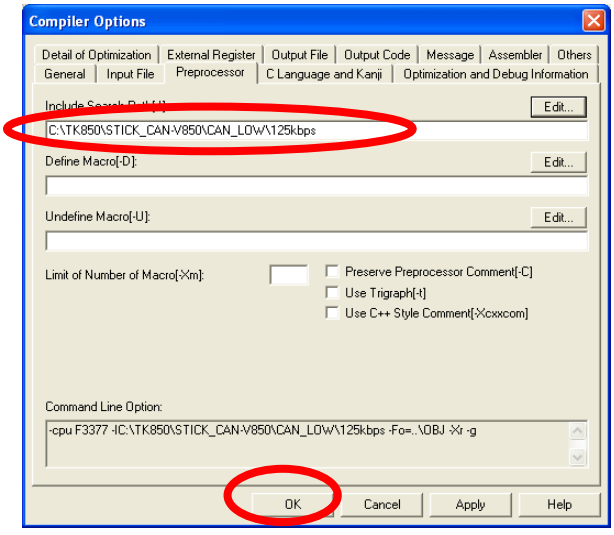
Click "Add…" button



Select the directory "125Kbps", and then click "OK".



Confirm that a path is added to the list, and click "OK".

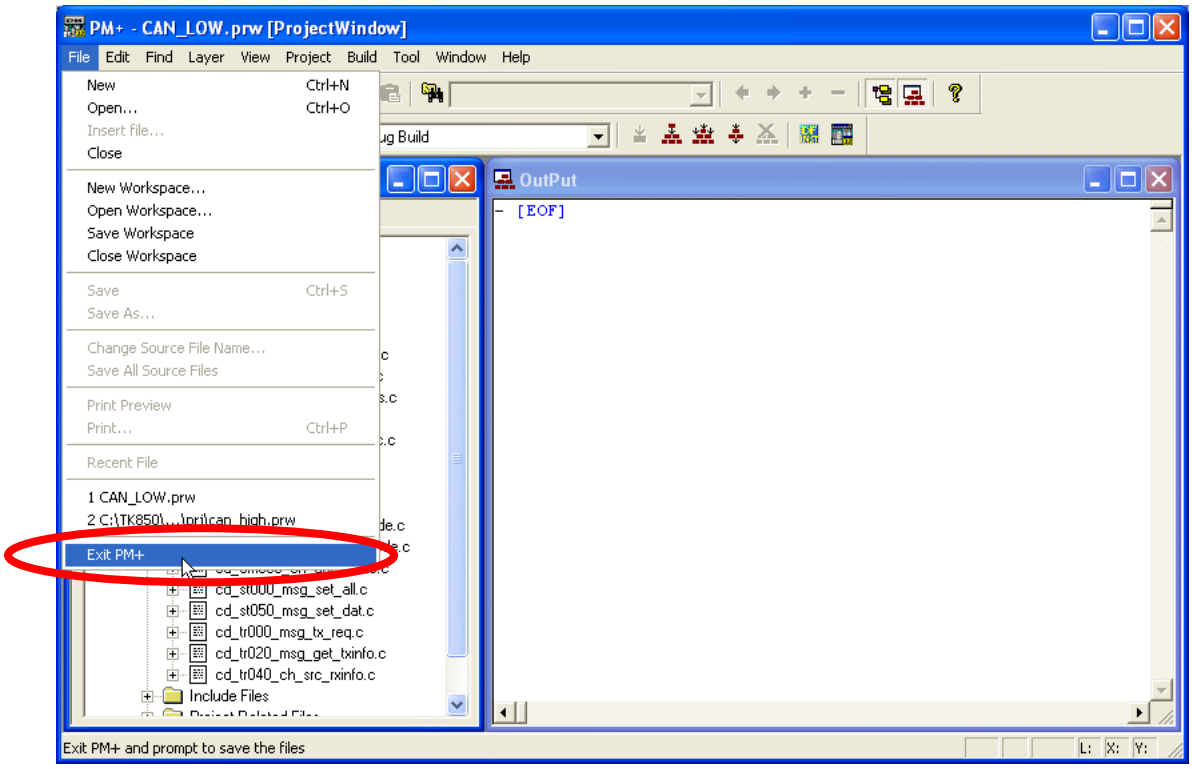


Confirm that the path for include files is added, and click "OK".

This completes the registration of additional source files and setting the path for include files.

2.14Quit PM+

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



PM+ is closed.

Chapter 3 FPL

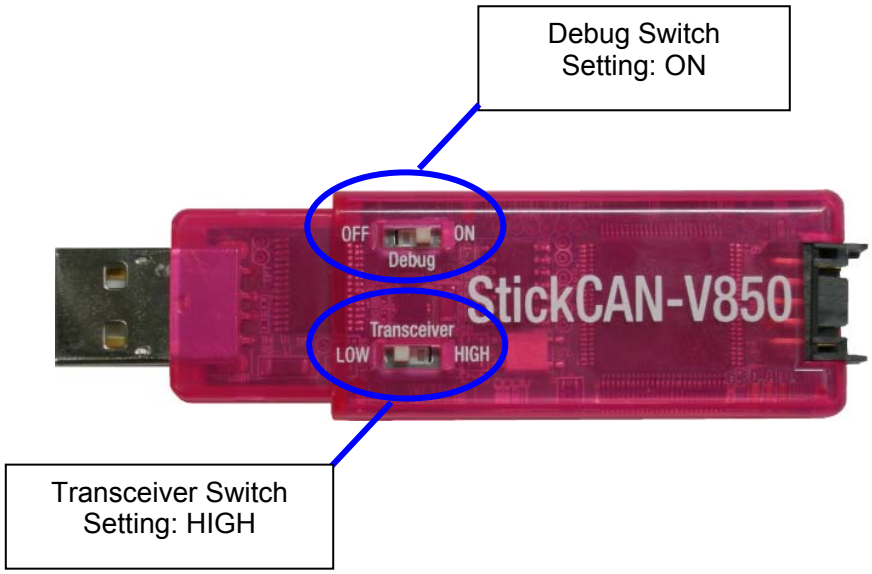
FPL is a flash memory programming software that works on Windows.
This can write Hex application program on the flash memory in V850ES/FG3 (μPD70F3377) in StickCAN V850 via USB interface.
All the hardware required for writing is embedded in StickCAN V850.

3.1 Installation of FPL

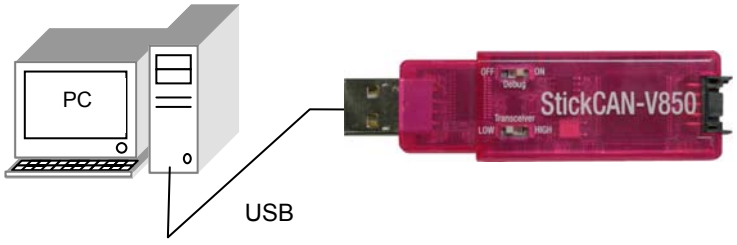
Start "¥FPL¥FPL_E160a.msi" in the bundled CD-ROM with Windows Explorer. Installation of PG-FPL starts.
FPL cannot be installed from the integrated installer.

3.2 FPL Usage

Leave the setup CD-ROM in the drive.
Set the StickCAN V850 switches as shown below.

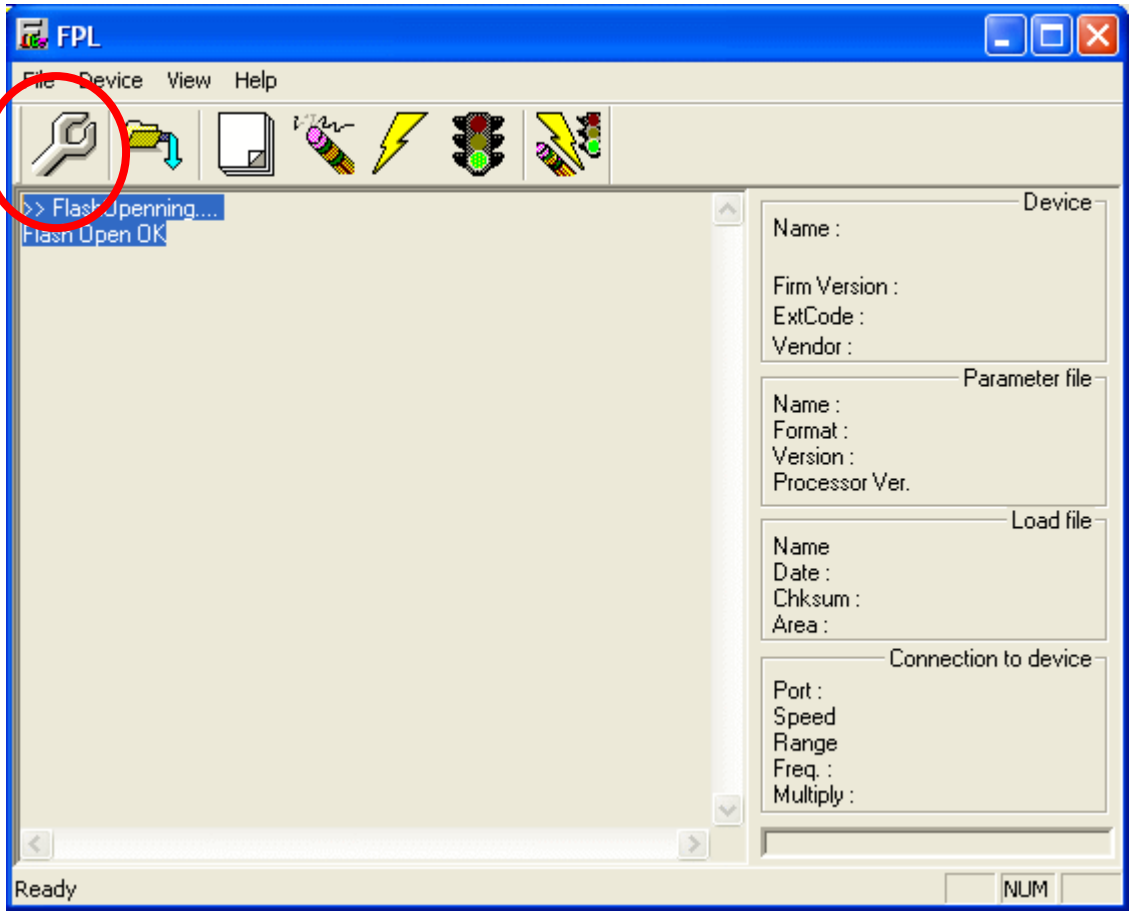


After setting the switch, connect the StickCAN V850 to PC.

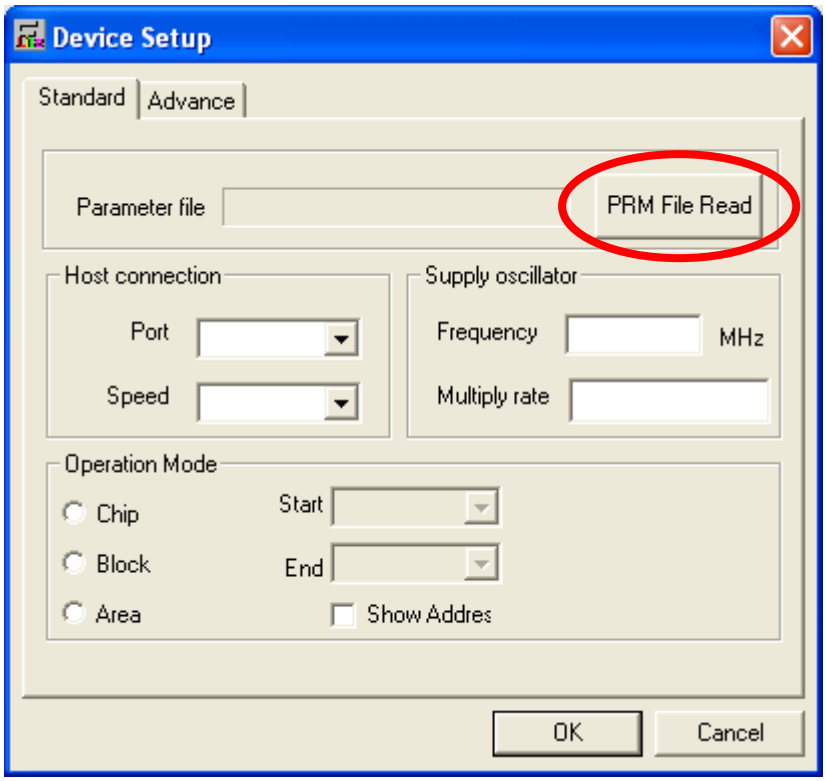


Select "Windows Start Menu" -> "Programs" -> "NEC Electronics Tools " -> "FPL" -> "FPL_E160a" -> "FPL" to start PG-FPL.

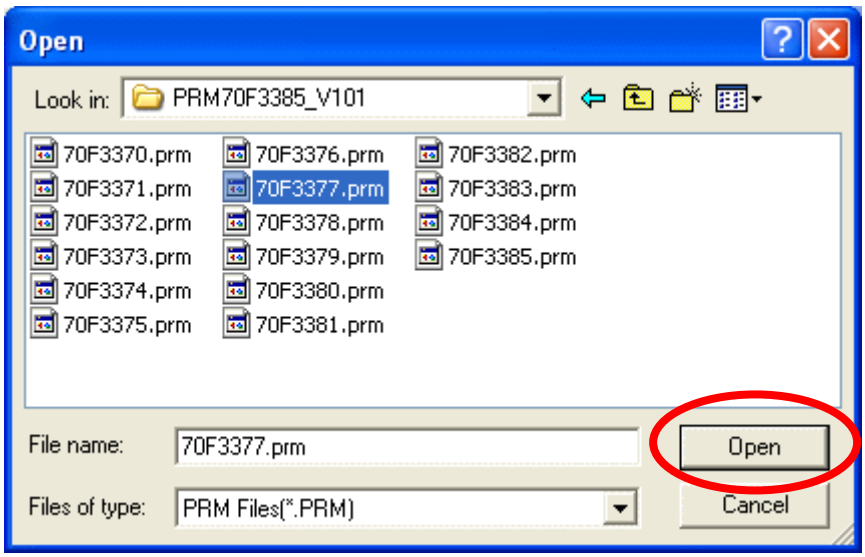
When FPL is launched, click  icon.



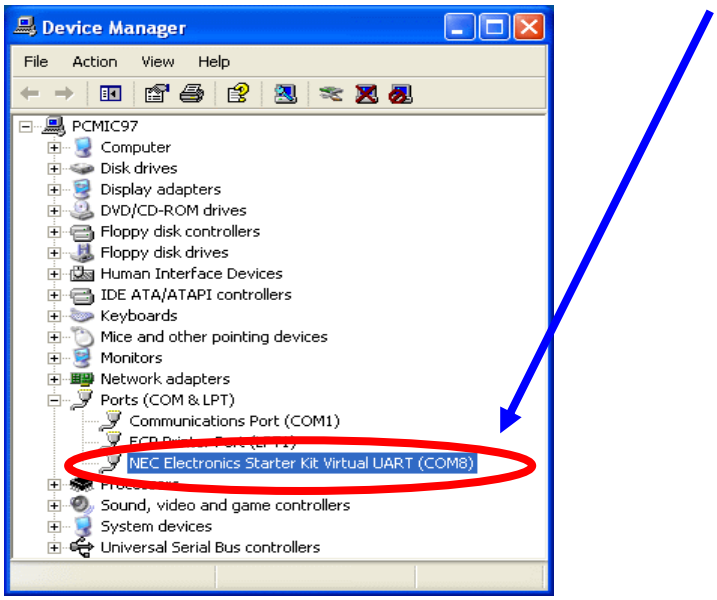
When "Device Setup" window is opened, click "PRM File Read".



Select "70F3377.prm" under the directory "¥PRM¥PRM70F3385_V101" in CD-ROM, and click "Open".

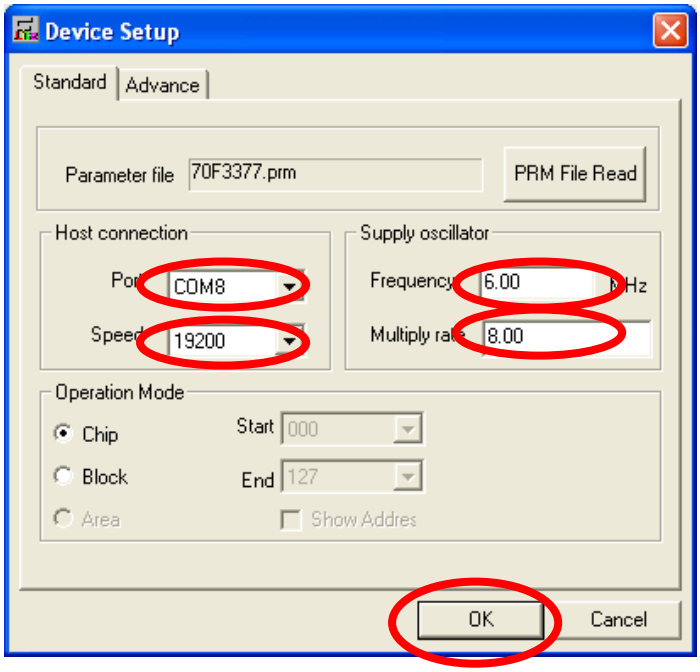


- Select the port number assigned to StickCAN V850 in the "Port" field.
  If you do not know the COM port number, check the COM port number of "NEC Electronics Starter Kit Virtual UART" that can be displayed by selecting "Windows Start Menu" -> "Control panels" -> "System" -> "Hardware" -> "Device manager" -> "Port (COM, LPT)".



- Enter "19200" in "Speed"
- Enter "6.00" in "Frequency"
- Enter "8.00" in "Multiply"

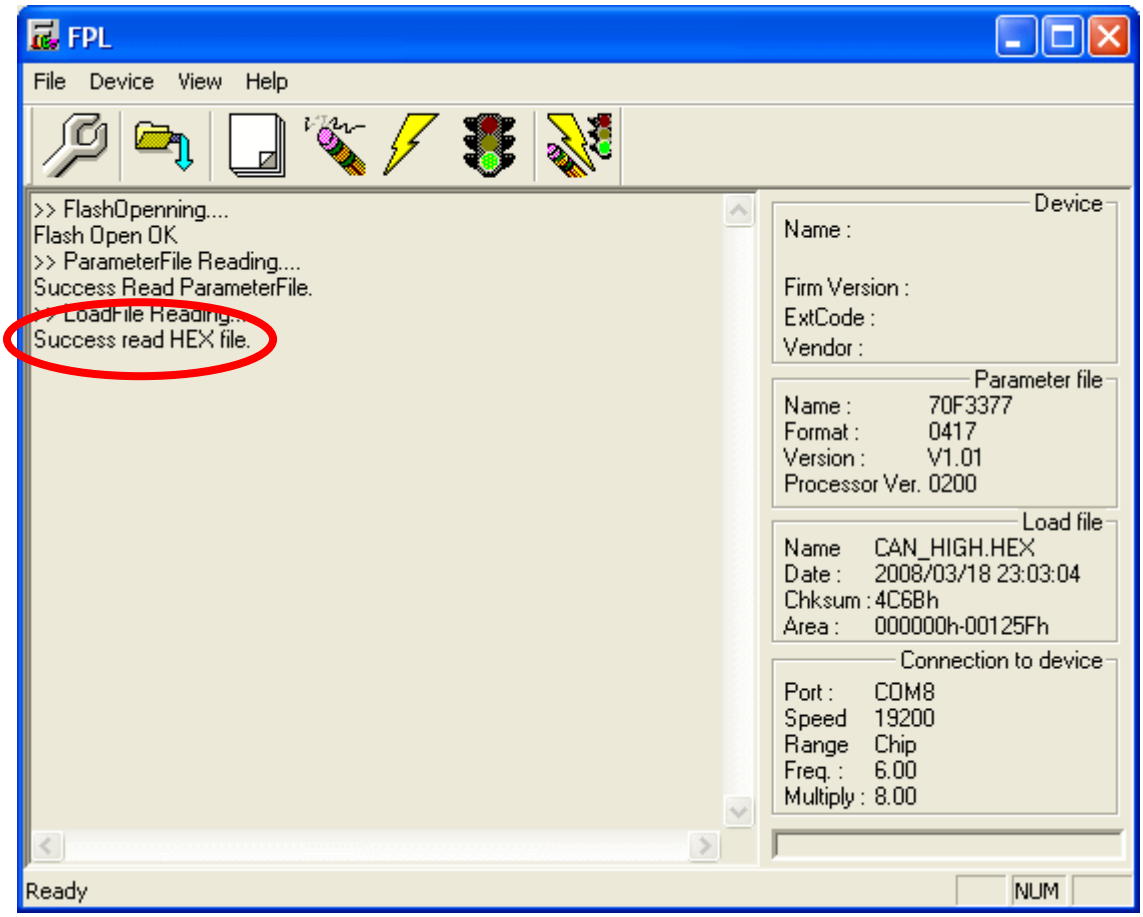
Click "OK".



If old version of PG-FPL is installed on PC, there could be a possibility that you can check the COM in device manager but cannot find the COM in "Port" selection. In this case, delete a file "FPL.ini" under the "windows" directory and re-install FPL.

Next, load HEX file into FPL.

Click  , and open "C:¥TK850¥STICK_CAN-V850¥CAN_HIGH¥ROM¥can_high.hex" that you have created in "2.6 Create Executable Files".
It should display "Success read HEX file" like the screen below.

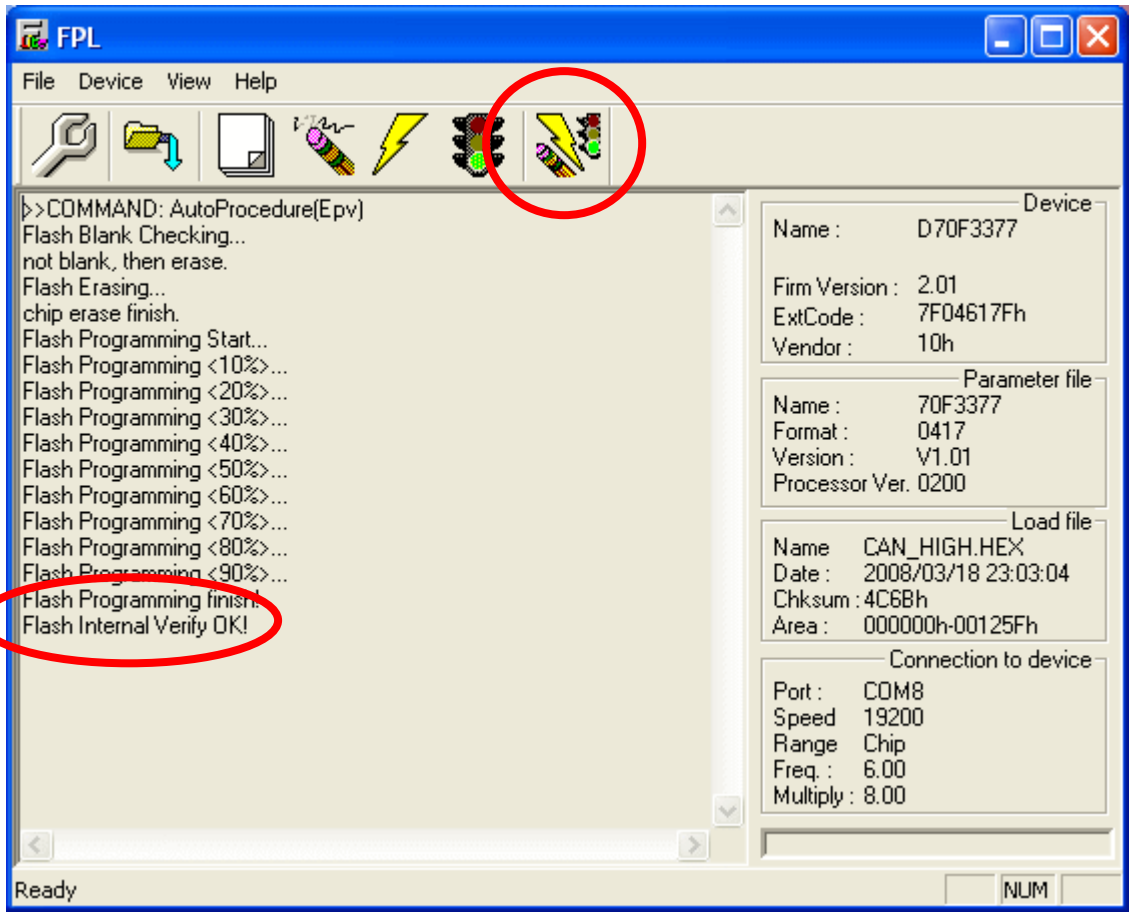


Now, click  to start writing.

When  is clicked, it executes "Erase" and "Program" command.

When "Flash internal Verify OK!" is displayed, it means that the writing process has been completed.
Program has been written on flash memory successfully.
Disconnect StickCAN V850.

In the same way, you can program on the second, third board.



When you wish to run the program in V850ES/FG3 that is written by FPL as stand-alone automatically, set the debug switch on StickCAN V850 to OFF, and then connect it to PC.

You can initialize the V850ES/FG3 (erase the flash memory) by clicking  .

Chapter 4 CAN Software Driver

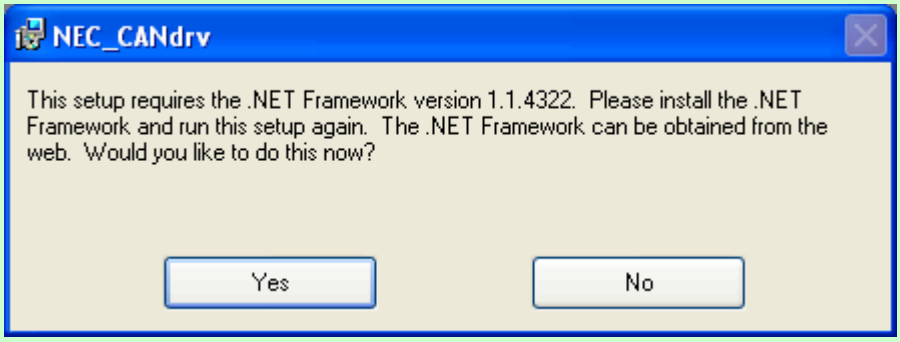
CAN software driver provides application program interface (API) functions to realize communication function to CAN communication functioned V850 32bit microcontroller and 78K0 8bit microcontroller from NEC Electronics.

4.1 Installation of CAN Software Driver

Start "¥SAMPLE_E¥NEC_CANdrv_J_V220.msi" in the bundled CD-ROM with Windows Explorer.

If you have not installed "Microsoft .NET Framework Version 1.1" on the system, following dialog opens while installing. Follow the steps to install "Microsoft .NET Framework Version 1.1".

If you cannot have the "Microsoft .NET Framework Version 1.1" through internet, use "¥SAMPLE¥dotnetfx_V1.1.exe" in the bundled CD-ROM for "Microsoft .NET Framework Version 1.1" distribution version package.



4.2 Start CAN Software Driver

Start the CAN software driver by selecting "Windows Start Menu" -> "Programs" -> "NEC_CANdrv" -> "CAN Configurator".

For details about specifications and usages of CAN software driver, refer to the attached document "CAN Software Driver User's Manual".

Chapter 5 Sample Program

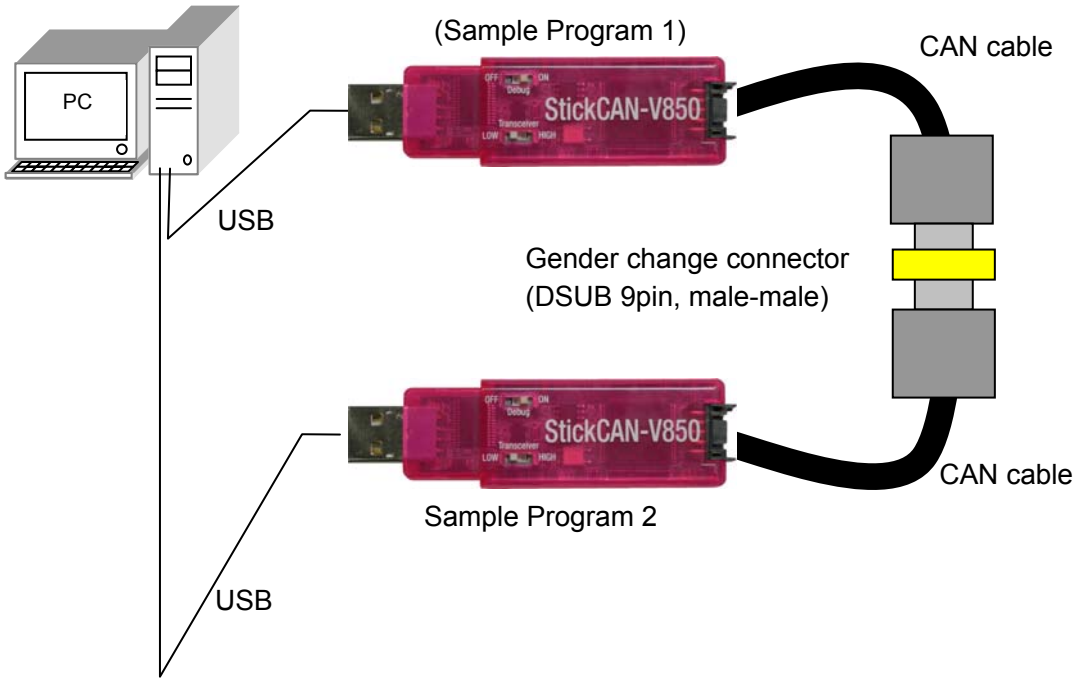
This is a sample program that lights up LED in certain cycle time and sends data frames to CAN bus. Two kinds of sample programs, which are for high-speed CAN (500kbps) and low-speed CAN (125kbps), are included in the CD-ROM.

CAUTION:
If you have not used the debugger after installing development tools, follow "2.1 Start PM+" through "2.7 Start Debugger" to set the ID code to "FFFFFFFFFFFFFFFFFFFF" before using the sample programs.

Sample Program Overview
Sample program 1 repeats sending date to CANID 0x100 through 0x200.
Sample program 2 repeats sending date to CANID 0x200 through 0x100.
Also, both programs light up or blink LED1/LED2 depending on the receiving CAN data.
Two-way communication can be checked by connecting two StickCAN V850 that those two programs are written on.

Structure
Two StickCAN V850 are required for checking the sample program operations.
Connect two StickCAN V850 with using CAN cables and a commercial DSUB 9pin gender change connector (male-male).

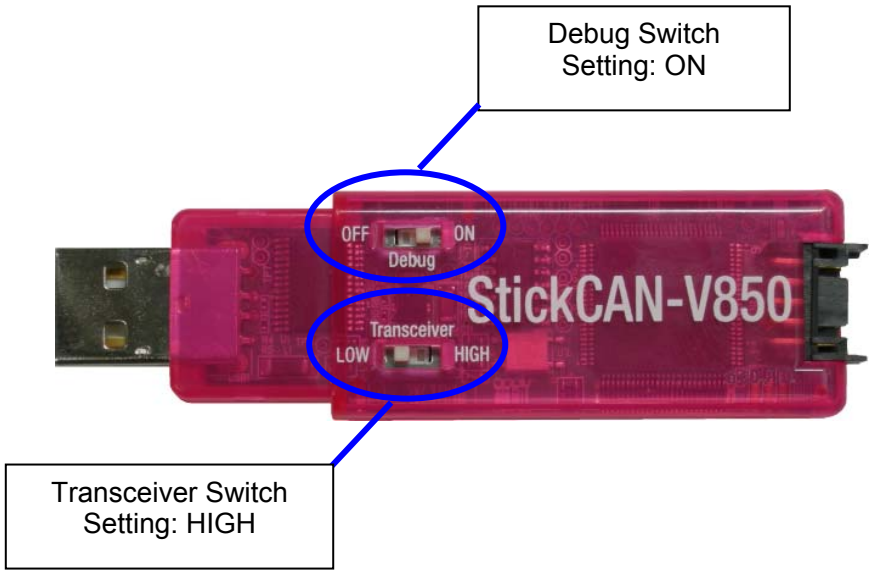
The Structure is shown below.



5.1 StickCAN V850 Preparation

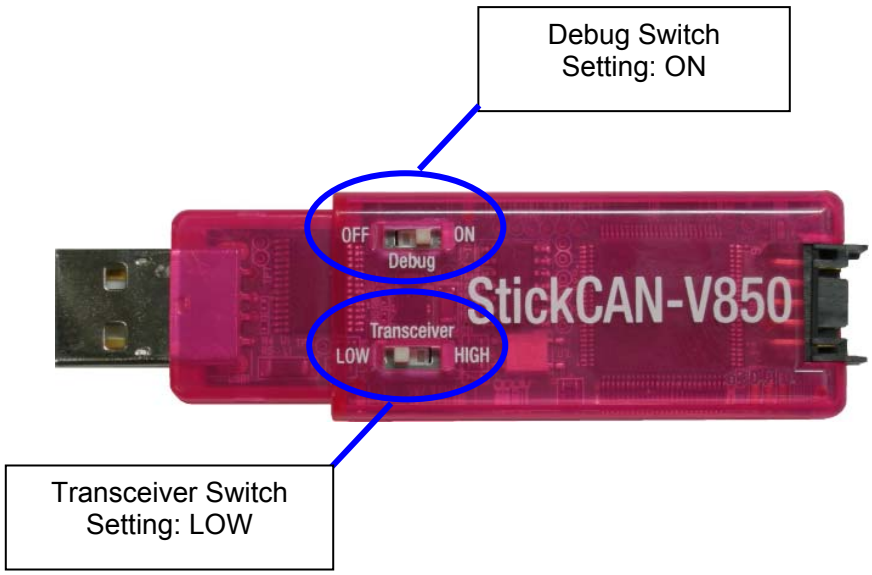
5.1.1 For High-Speed CAN

Set switches on both StickCAN V850 as shown below.



5.1.2 For Low-Speed CAN

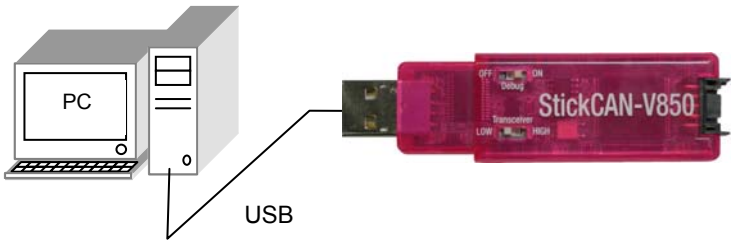
Set switches on both StickCAN V850 as shown below.



5.2 Download Programs

5.2.1 For High-Speed CAN

Connect one StickCAN V850 to PC.



Load "C:¥TK850¥STICK_CAN-V850¥SAMPLE1¥CAN_HIGH¥PRJ¥can_high.prw" on PM+, and then start the debugger.

For the information how to load a workspace (project), refer to the section from "2.1 Start PM+".

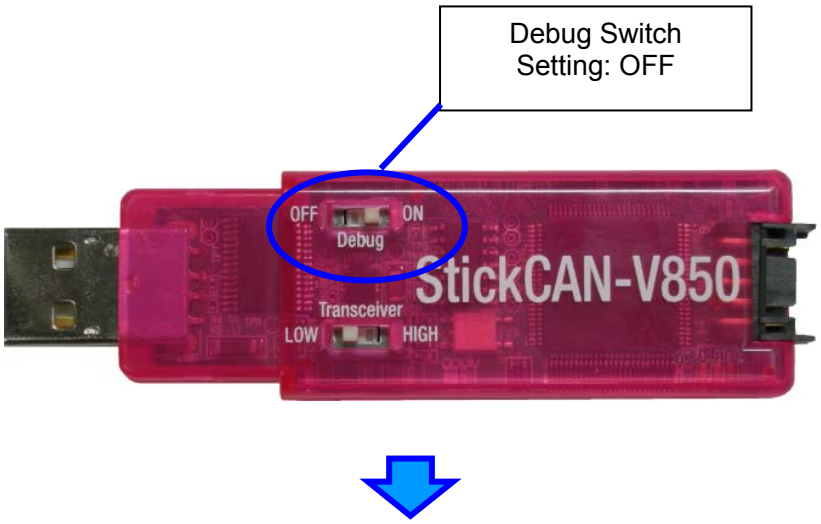
When the download is completed, close the debugger and disconnect the StickCAN V850 from PC.

Connect another StickCAN V850 to PC.

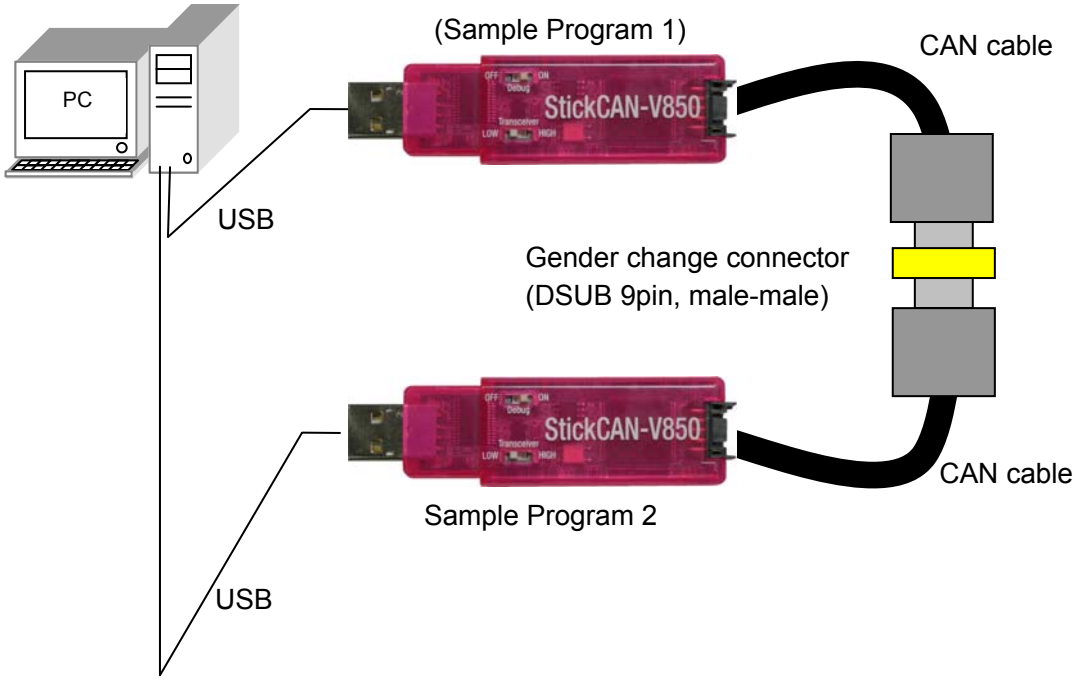
Load "C:¥TK850¥STICK_CAN-V850¥SAMPLE2¥CAN_HIGH¥PRJ¥can_high.prw" on PM+, and then start the debugger.

When the download is completed, close the debugger and disconnect the StickCAN V850 from PC.

Set the Debug switch on both StickCAN V850 to OFF.

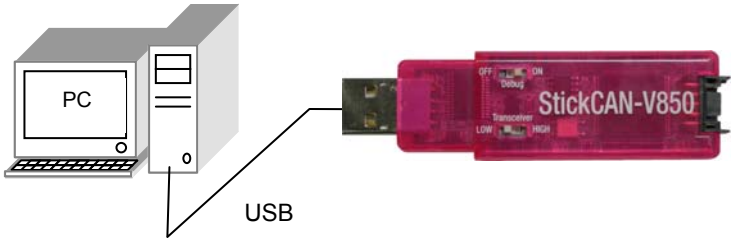


Connect both StickCAN V850 together with CAN cables and gender change connector (male-male).
Connect both StickCAN V850 to PC



5.2.2 For Low-Speed CAN

Connect one StickCAN V850 to PC.



Load "C:¥TK850¥STICK_CAN-V850¥SAMPLE1¥CAN_LOW¥PRJ¥can_high.prw" on PM+, and then start the debugger.

For the information how to load a workspace (project), refer to the section from "2.1 Start PM+".

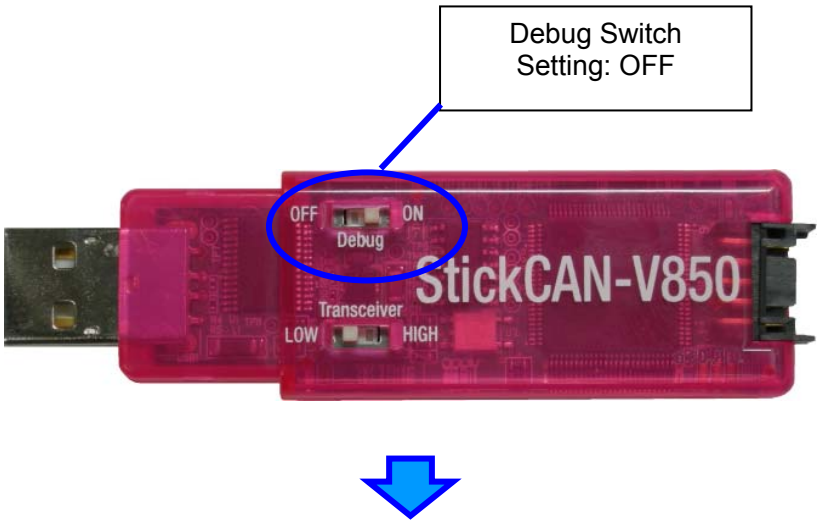
When the download is completed, close the debugger and disconnect the StickCAN V850 from PC.

Connect another StickCAN V850 to PC.

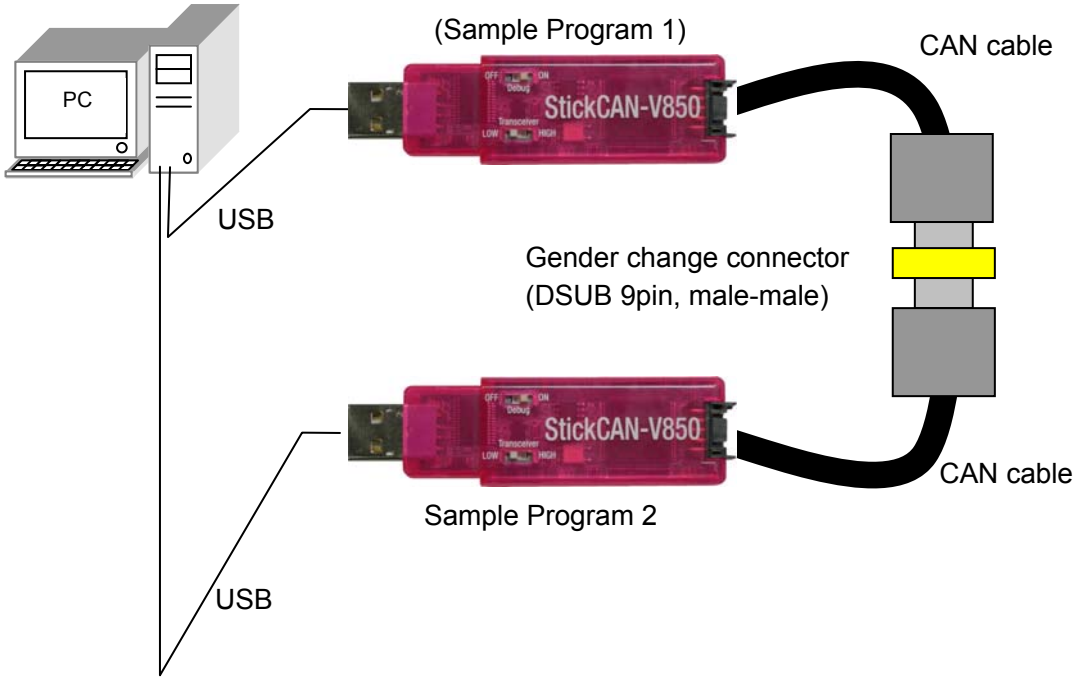
Load "C:¥TK850¥STICK_CAN-V850¥SAMPLE2¥CAN_LOW¥PRJ¥can_high.prw" on PM+, and then start the debugger.

When the download is completed, close the debugger and disconnect the StickCAN V850 from PC.

Set the Debug switch on both StickCAN V850 to OFF.



Connect both StickCAN V850 together with CAN cables and gender change connector (male-male).
Connect both StickCAN V850 to PC



5.3 Operation Check

If you can see LED1 and LED2 on both StickCAN V850 are lighted up, it means the program is running correctly.
LED3 blinks with the timing of CAN communication.

This completes the checking of program operations.
Disconnect the StickCAN V850.
Note that you need to set the Debug switch back to ON before using debugger.

Chapter 6 Simplified CAN Monitor

This is a sample application that works with stand-alone using StickCAN V850.
It can monitor/display the high-speed CAN (500Kbps) communication.

Note that sometimes its GUI does not work on the environment such as Windows 2000.

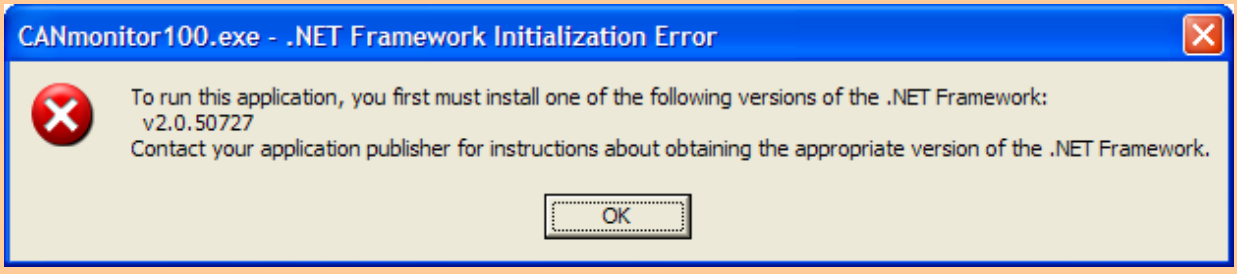
6.1 Installation of Simplified CAN Monitor

Copy "¥SAMPLE_E¥can_monitor.exe" in the bundled CD-ROM to any directory with Windows Explorer.
The file "setting.config" is created in the same directory as "can_monitor.exe".

6.2 Installation of Microsoft .NET Framework Version 2.0

As "can_monitor.exe" uses "Microsoft .NET Framework Version 2.0", you need to install "Microsoft .NET Framework Version 2.0" before you start using the GUI.

If you have not installed "Microsoft .NET Framework Version 2.0" on the system, following dialog opens while executing "can_monitor.exe".

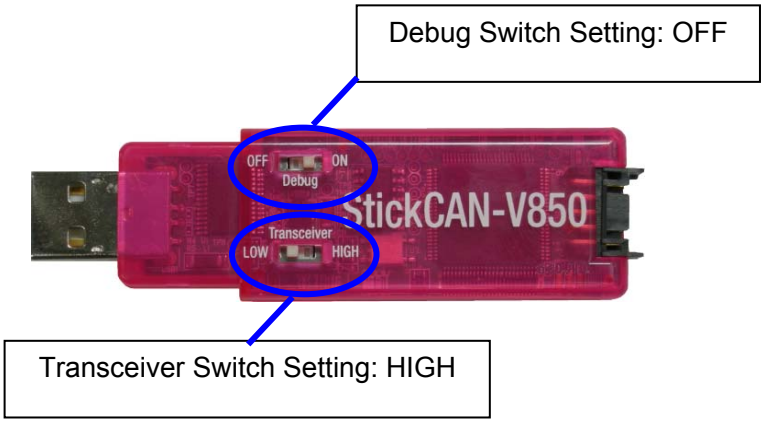


6.3 Write on StickCAN V850

You are going to write program that support the simplified CAN monitor for V850ES/FG3.
Write "C:¥TK850¥STICK_CAN-V850¥MONITOR¥can_mon.hex" on StickCAN V850 using FPL (flash programmer).
For the information about FPL usage, refer to "Chapter 3 FPL".

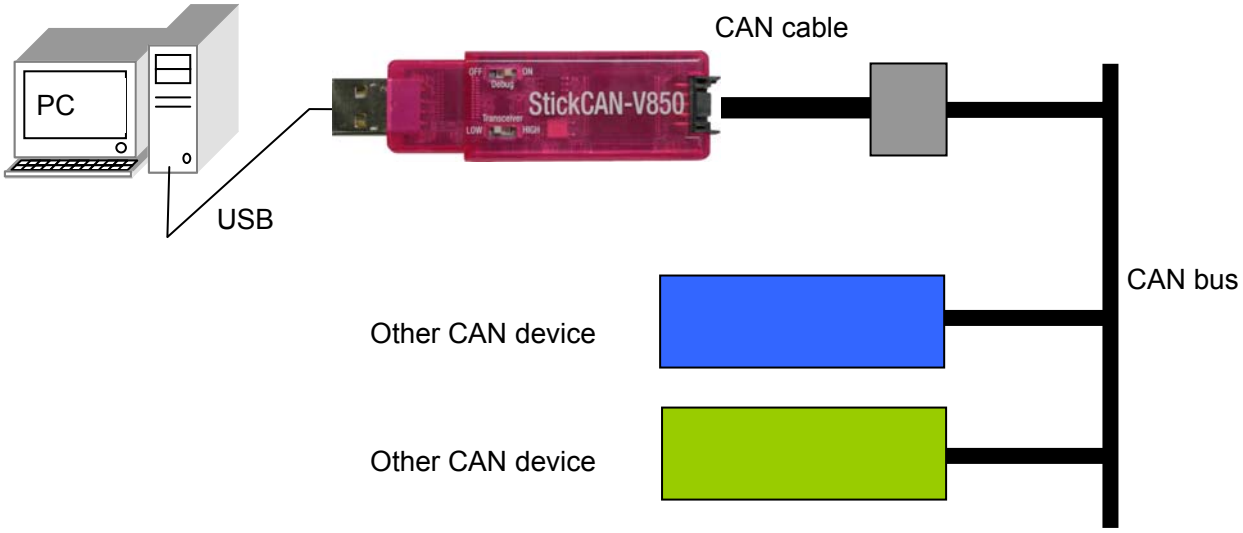
6.4 StickCAN V850 Settings

Set the Debug switch to OFF, the Transceiver switch to HIGH on StickCAN V850, and then connect it to PC.



6.5 Simplified CAN Monitor Connection Structure Example

This is the structure example when you monitor the CAN communication with Simplified CAN Monitor.

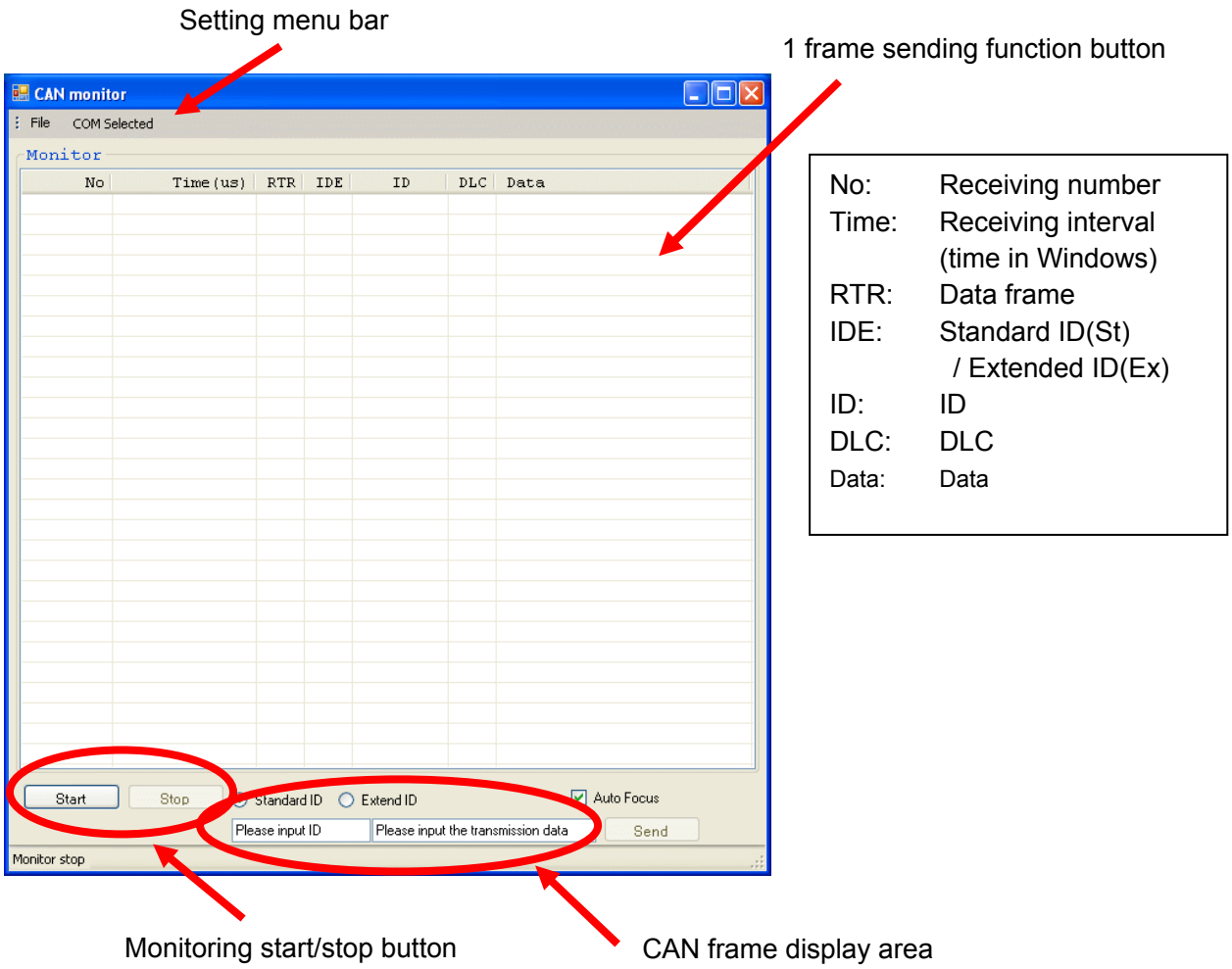


6.6 Start Simplified CAN Monitor

GUI starts by double-clicking "can_monitor.exe" that is copied to the hard disc previously.

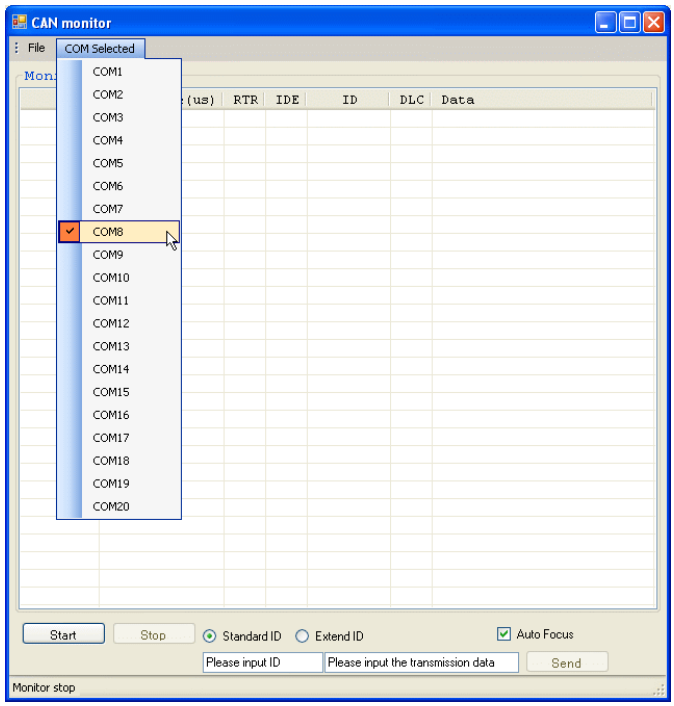
6.7 Simplified CAN Monitor GUI

The GUI is explained in this section.
The functions are described in following pages.

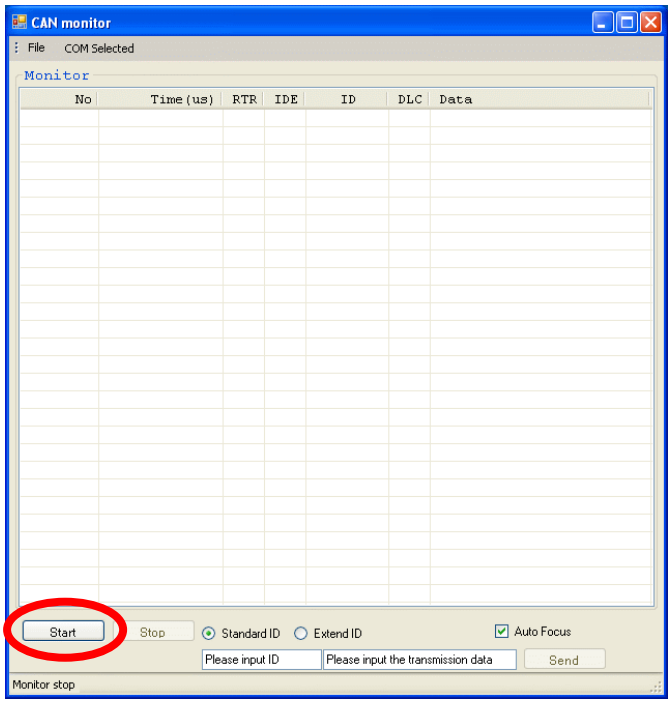


6.8 Simplified CAN Monitor GUI Operation

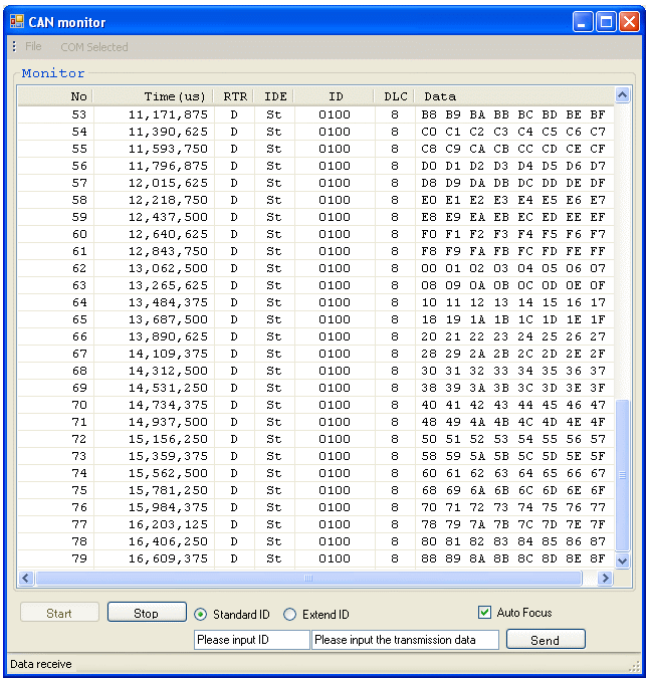
Select the COM port that StickCAN V850 is connected to.



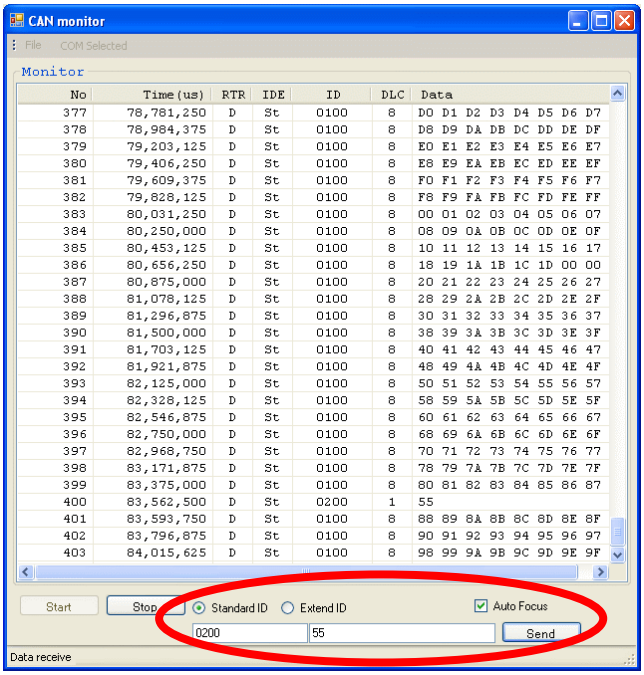
Click "Start" to start monitoring.



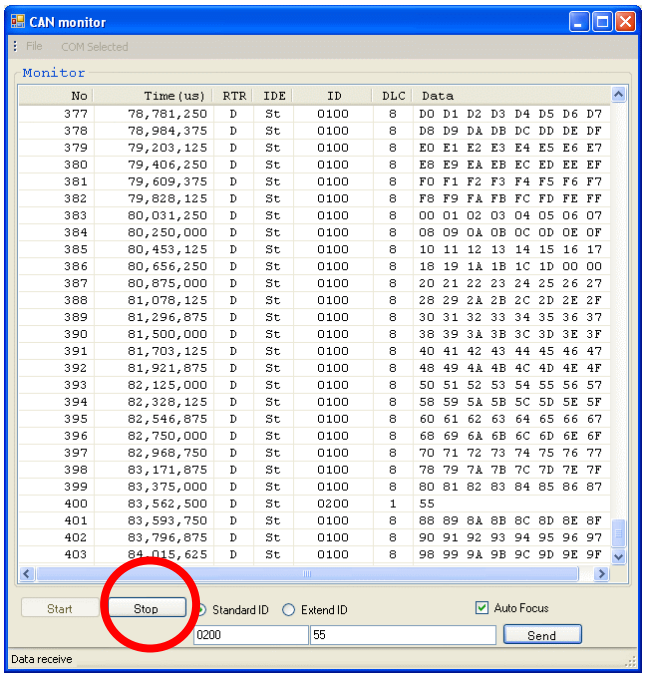
Data frames communicating in CAN bus are displayed sequentially.
It returns ACK the data frames that can be received by the Simplified CAN Monitor.



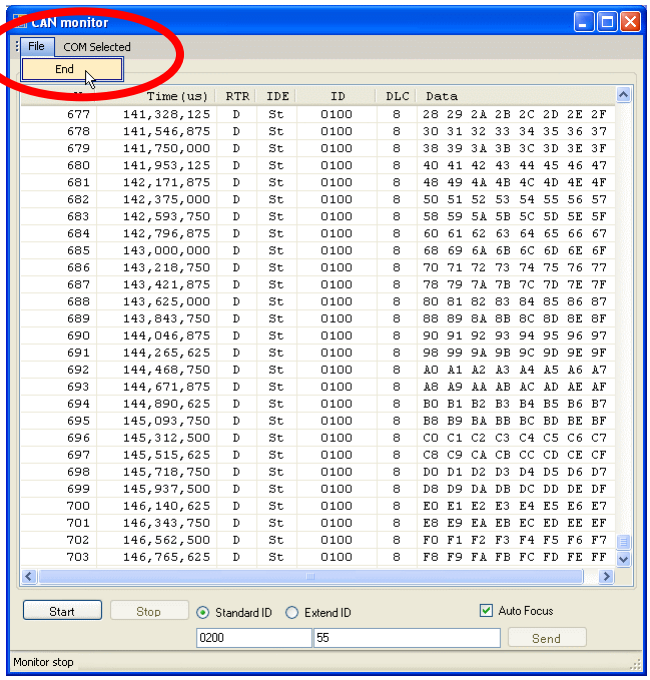
If you wish to send a data frame, set ID and data, and then click "Send".
The ID format is 4 digits for standard ID and 8 digits for extended ID.
You need to prefix "0" on top to adjust the number of digits.



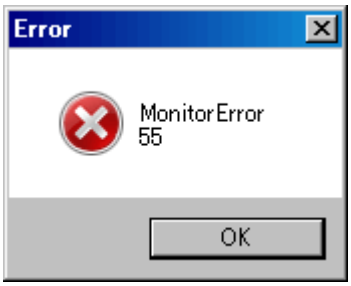
Click "Stop" to stop monitoring.



When you select "File" then "End" on menu bar, or click the "x" button on right-top of the window, it saves the COM port setting and closes the Simplified CAN Monitor.



If you start monitoring in the middle of CAN communication, an error dialog may be displayed on GUI of Simplified CAN Monitor. Just click "OK" to resume the process.



6.9 Customization of Simplified CAN Monitor

The source file of V850ES/FG3 Simplified CAN Monitor is available under the directory "¥SAMPLE¥TK850¥STICK_CAN-V850¥MONITOR¥Src" in the CD-ROM.
Users can customize the source file for user needs such as baud rate and transceiver settings.

The monitor program uses UARTD0 function of V850ES/FG3 (TXDD0, RXDD0 pins). As ID850QB-EZ uses the same pins, user cannot debug the Simplified CAN Monitor program.

The Simplified CAN Monitor is a sample program. Please be aware that technical questions such like program operations cannot be accepted or responded.