TPS-1

TPS-1 Solution Board Startup Manual

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Introduction

This manual describes how to use the TPS-1 Solution Board, which allows you to evaluate LSI TPS-1 for PROFINET communication without requiring proprietary hardware on the user side.

Target Device

TPS-1

Contents

1. Overview

1.1 Overview

This manual describes how to use the TPS-1 Solution Board using TPS-1.

The TPS-1 Solution Board is used for evaluation of TPS-1 series communication, and has the following interfaces:

- 10Base-T / 100Base-TX (PROFINET)
- UART(USB mini-B)
- External interfaces (SPI, parallel I/O interface, parallel bus interface and others)
- Other: LEDs, switches, etc.

2. TPS-1 Solution Board Hardware Configuration

2.1 Board Lists

The TPS-1 Solution Board is made up of the three boards shown below. The TPS-1 main board can be connected to an I/O board or CPU board and used to evaluate parallel I/O interfaces, as well as CPU parallel and serial host interfaces (SPIs).

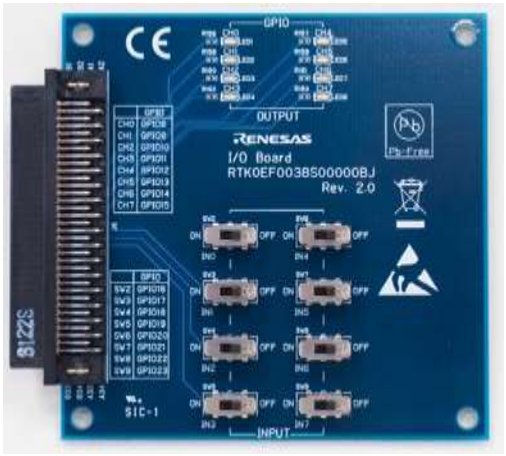
1) TPS-1 main board: Dedicated board for PROFINET communication

2) I/O board: Used to check operation of the parallel I/O interface

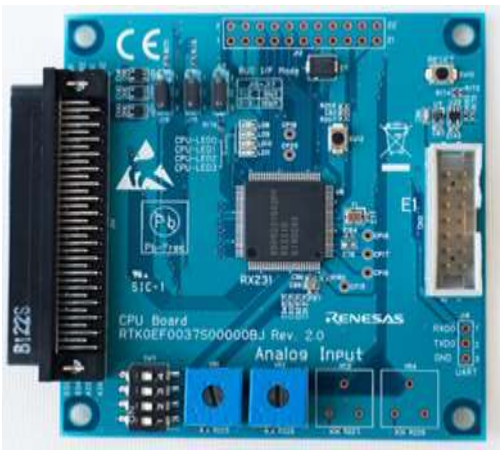
3) CPU board: Used to confirm parallel and serial host interface (SPIs) operations (comes with RX231)

1) TPS-1 main board

2) I/O board



3) CPU board



Note: The I/O board and CPU board operate when connected to the main board.

Figure 2-1 Board Lists

3. General Specifications

3.1 Electrical specifications

This chapter describes the electrical specifications and performance of the board, in table format.

Item		Specification
Power supply	Rated voltage	5V DC
	Status LED(PWR)	Red

3.2 Specifications

Item	Specification		
Main LSI	TPS-1 (Operating frequency 100MHz)		
Interface	Ether	2ch	RJ-45(w/ built-in pulse-trans)
	USB	1ch(Mini-B)	Virtual COM port(UART)
	JTAG	1ch	10-pin half pitch for ICE connection
	External I/F	68pins	FX2-68P-1.27DSL (71) by HIROSE
LED	Power	1bit	Red LED
	PROFINET	4bits	Red LED / Green LED/Yellow LED
	PHY_Link	1bit(2ch) each	Green LED
	Activ	1bit(2ch) each	Green LED
Power supply	DC jack/USB	+5.0V	
Operating temperature	0 to +55℃		

3.3 Environmental Specifications and Weight

Item		Specification
Physical environment	Ambient operating temperature	0 to +55℃
	Ambient storage temperature	-25 to +70℃
	Ambient operating humidity	30 to 90%RH (no condensation)
	Ambient storage humidity	30 to 90%RH (no condensation)
	Usage atmosphere	No corrosive gas
Weight	Main board	50 g
	CPU board	30 g
	IO board	25 g
Dimensions	Main board	74mm(W)×74mm(D)×34mm(H) (excluding protuberances)
	CPU board	74mm(W)×74mm(D)×11mm(H) (excluding protuberances)
	I/O board	74mm(W)×74mm(D)×10mm(H) (excluding the protuberance)

3.4 Communication Specifications

Item	Specification	
Communication protocol	PROFINET IO	
Communication control IC	TPS-1	
PROFINET	PHY	Internal
	Communication system	IEEE802.3u(100base-TX)
	Insulation system	Pulse transformer insulation
	External interface	RJ45 x 2ch
Status LED	BF (red), SF (red), READY (green), MT (yellow) ACT0 (yellow), ACT1 (yellow), Link0 (green), Link1 (green)	

4. TPS-1 Main Board Blocks and Descriptions

4.1 TPS-1 Main Board Block Diagram

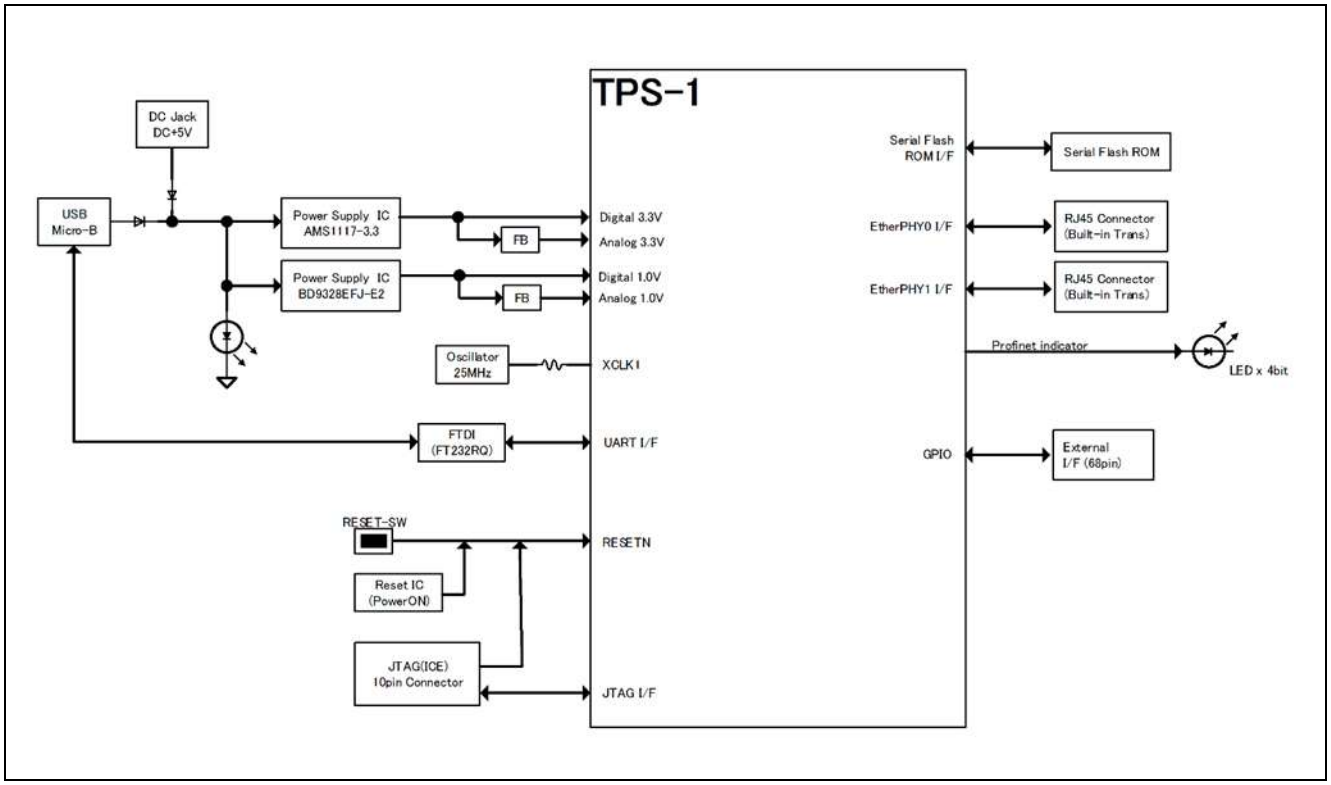


Figure 4-1 TPS-1 Main Block Diagram

4.2 TPS-1 System Clock

The oscillator supplies 25 MHz as the TPS-1 standard clock. The TPS-1 system clock is quadrupled internally to 100 MHz .

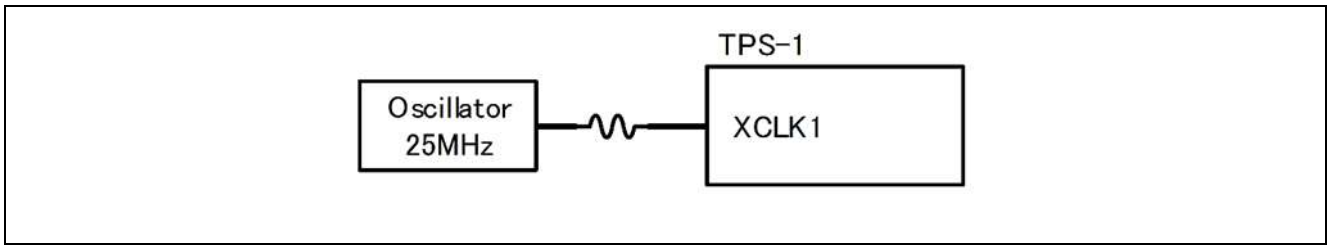


Figure 4-2 Clock Circuit

4.3 External Memory (Serial Flash Memory)

A serial flash (1 Mbyte) memory is mounted on as the TPS-1 stack, storing the PROFINET IO stack and device information.

Changes to other models is made easy with these compatible sockets.

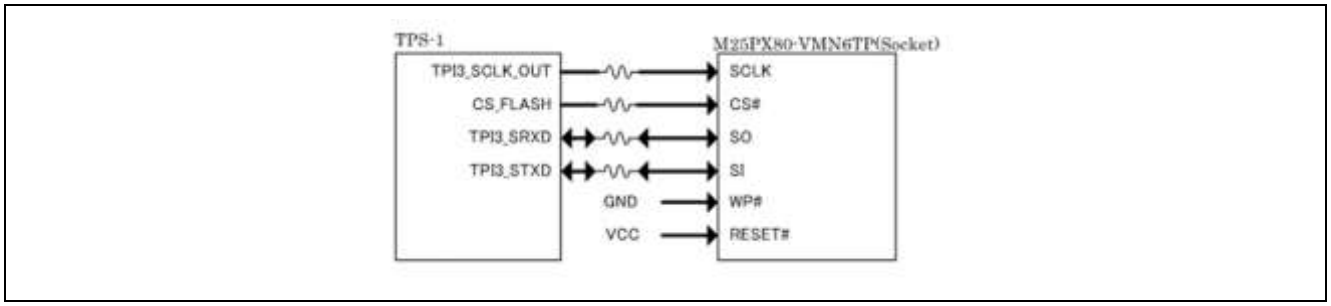


Figure 4-4 Serial Flash Memory

4.4 Power Supply

A 5V DC power supply can be input through the DC jack or a USB to power the TPS-1.

The POWER LED (green) lights up when 5.0V is being supplied.

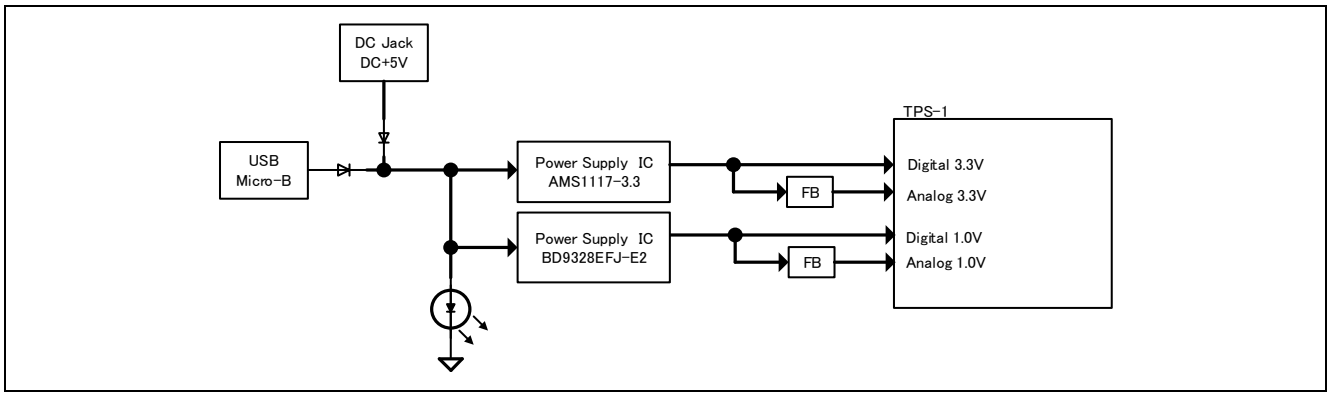


Figure 4-5 Power Supply

4.5 PROFINET IO

PROFINET IO communication from the TPS-1 is carried out via a built-in PHY. The board is equipped with a 2-channel RJ45 connector (built into the transformer) as an external connector.

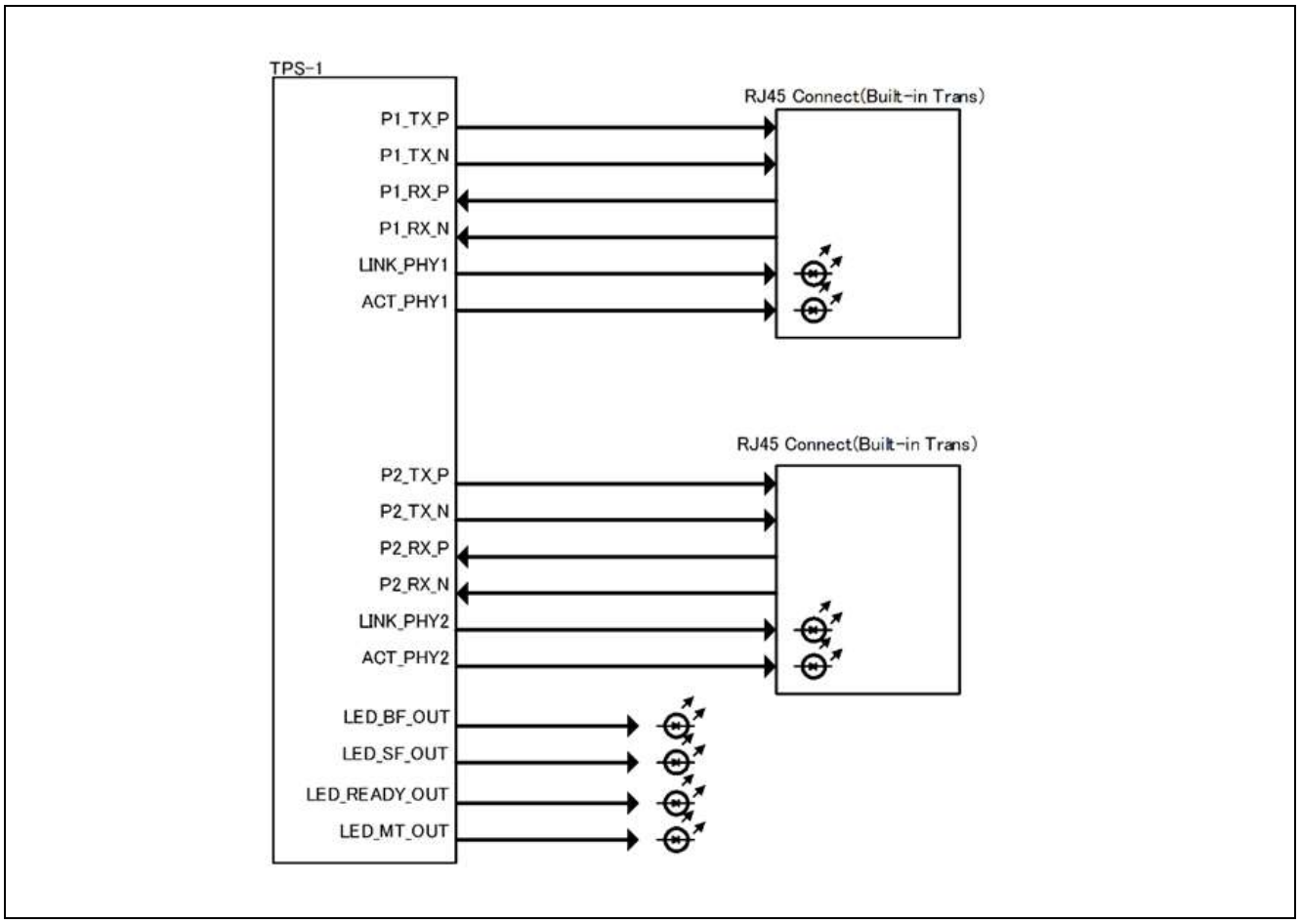


Figure 4-6 PROFINET IO Communication

4.6 UART

UPS to USB conversion LSI (FT 232 RQ) is mounted on the TPS-1 Main board. The TPS-1 Main board performs asynchronous communication with a PC by connecting a USB connector. The board is equipped with USB micro-B connectors.

The Terminal Program described later in this document can be used to communicate with TPS-1 via USB, allowing the TPS-1 to be set or firmware updated.

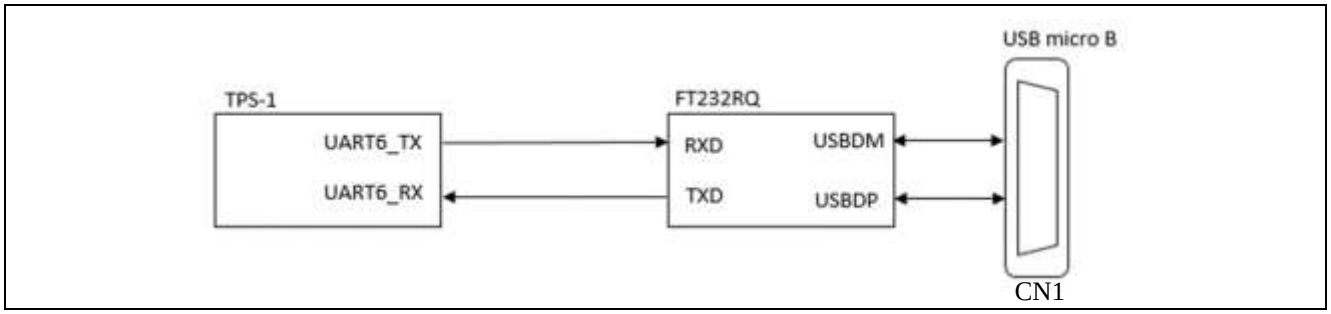


Figure 4-7 UART

CN1

Pin no.	Signal name
1	VBUS
2	USB_DM
3	USB_DP
4	GND
5	GND

4.7 Reset Circuit

The Reset IC triggers a reset of TPS-1 when the power is turned on.

Pressing the Reset switch with the power on resets the system through the reset IC.

TPS-1 can also be reset from the CPU board when TPS-1 is connected to a CPU board, in case the reset processing has been added to the RX231 sample program.

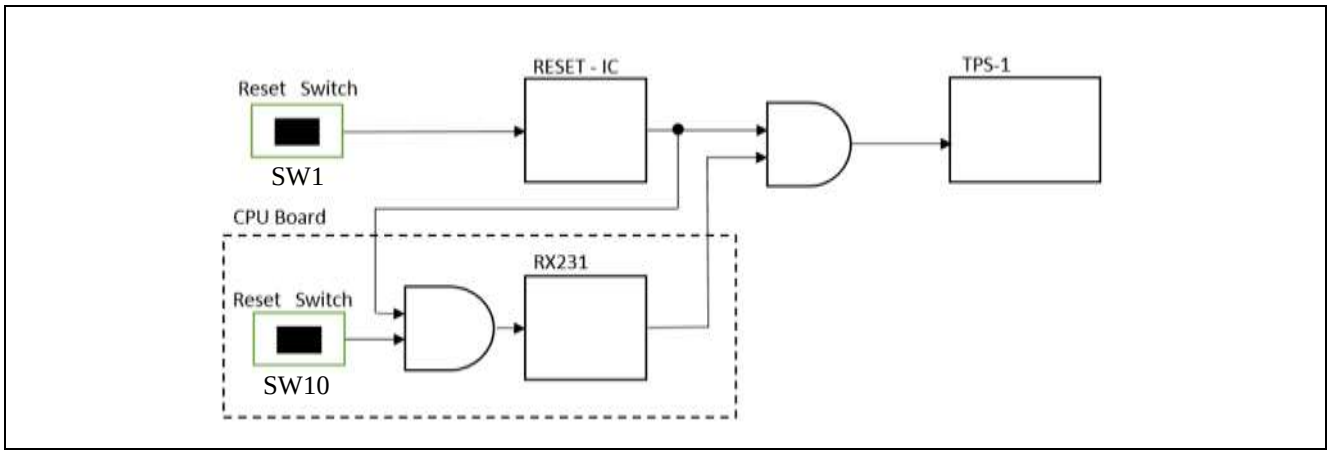


Figure 4-7 Reset Circuit

4.8 LEDs

4.8.1 PROFINET indicator

Reference No.: LD1, LD2, LD3, LD4

Part Model No.: BR1111C-TR, PG1111C-11-TR, FY1111C-TR

These are red, green and yellow 4-bit LEDs used to check PROFINET operations.

BF (red)

SF (red)

READY (green)

MT (yellow)

4.8.2 Power indicator

Reference No.: LD5

Part Model No.: BR1111C-TR

This is a red 1-bit LED used to monitor the power supply.

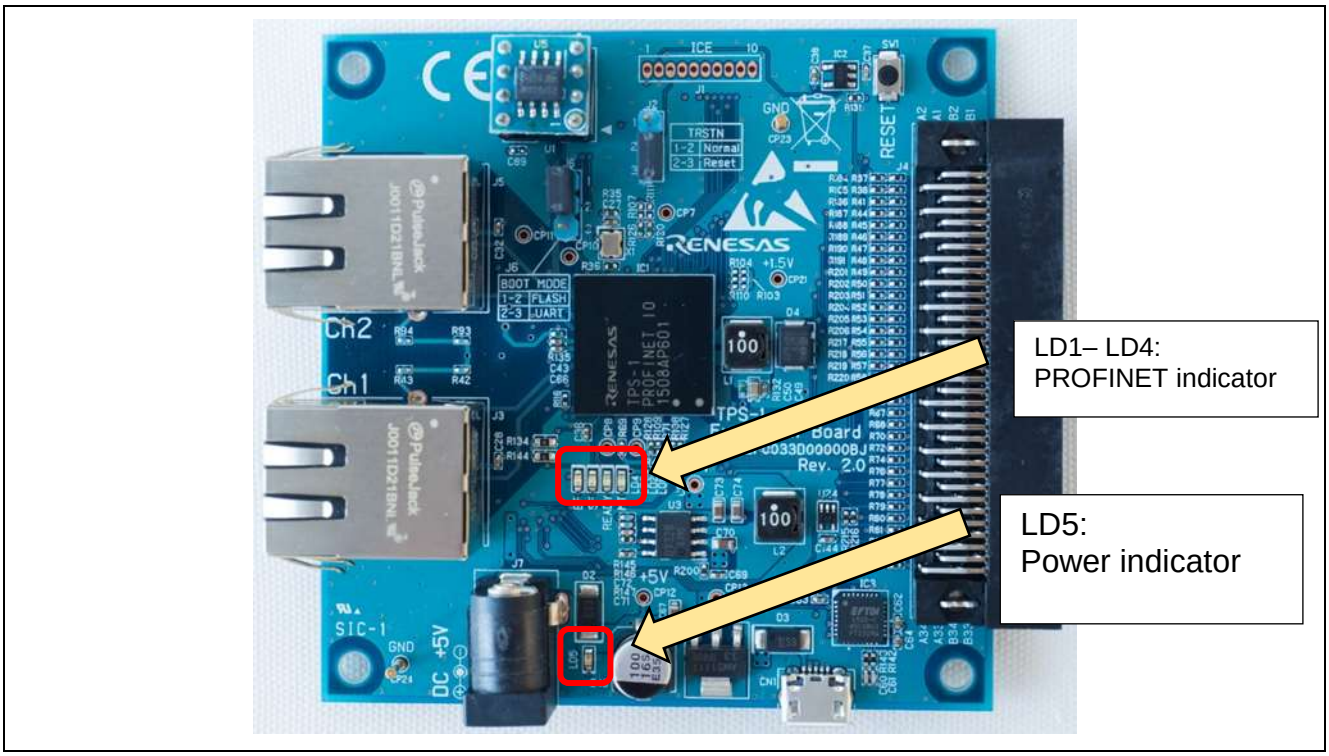


Figure 4-9-2 LEDs (TPS-1 main board)

4.9 Mode Switches

This section describes the mode switches on the board.

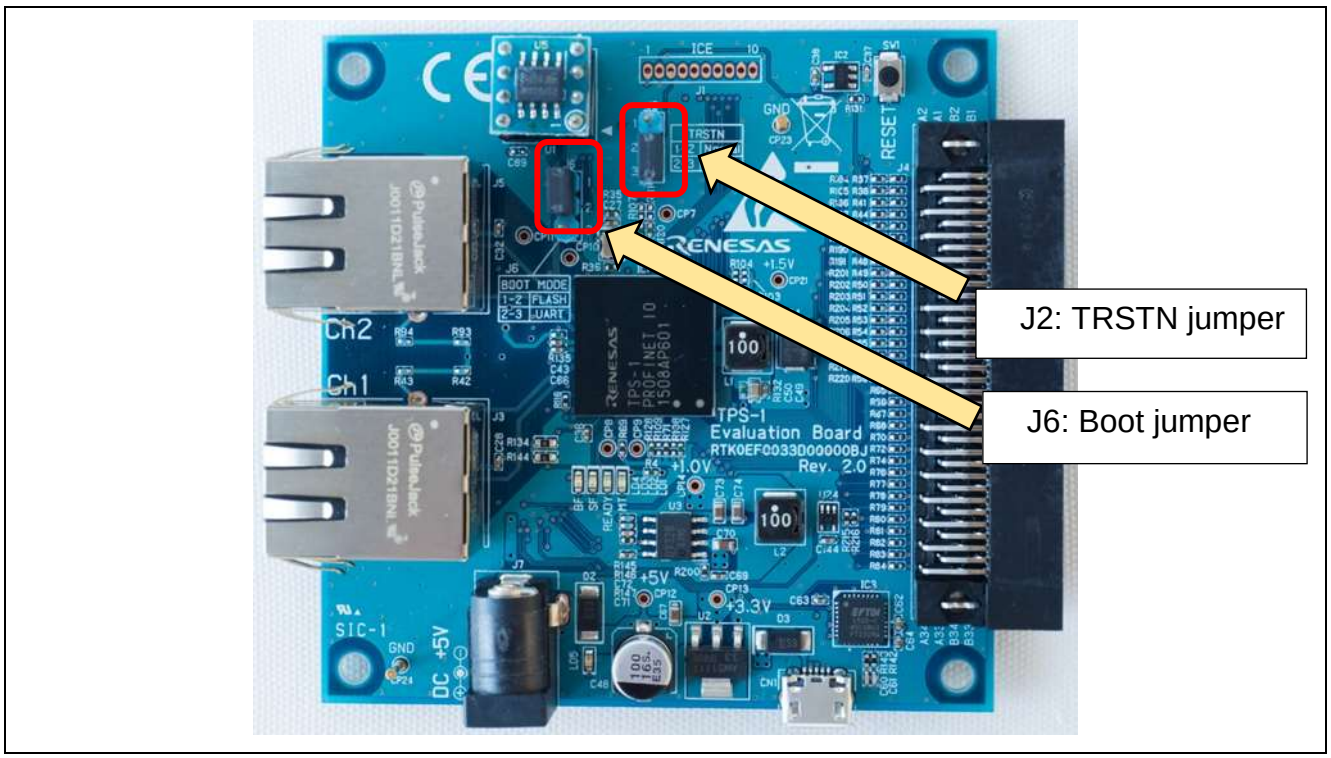


Figure 4-10 Mode Switches (TPS-1 main board)

4.9.1 TRSTN jumperJ2

This is the switching jumper for the JTAG interface. Set Jumper J2 to 2-3 because it is not used with this board.

J2

Jumper	Function
1-2	Normal
2-3	RESET

4.9.2 Boot mode switching jumper J6

This is the switching jumper for the Boot mode. Normally, please set to Flash mode.

If there is no data written to the flash memory, this system starts up in UART mode regardless of the boot mode setting. Switch to the UART mode to erase the data written to the flash memory.

J6

Jumper	BOOT
1-2	Flash
2-3	UART

4.10 Multi-board Interface J14

This connector enables connection to I/O and CPU boards.

Figure 4-11-1 Multi-interface Connector (TPS-1 main board)

Pin number	Terminal Name			Pin number	Terminal Name		
	Main board	CPU board	IO board		Main board	CPU board	IO board
A1	GPIO0	WE_EN	-	B1	GPIO34	DBUS-A12	-
A2	GPIO1	DBUS-RDZ	-	B2	GPIO35	DBUS-A13	-
A3	GPIO2	DCSZ1	-	B3	GPIO36	DBUS-A14	-
A4	GPIO3	BE1	-	B4	GPIO37	DBUS-A15	-
A5	GPIO4	BE2	-	B5	GPIO38	Reset_Host_SPI	-
A6	GPIO5	DBUS-WAITZ	-	B6	GPIO39	SFRM	-
A7	GPIO6	DBUS-D0	-	B7	GPIO40	SMOSI1	-
A8	GPIO7	DBUS-D1	-	B8	GPIO41	SCK1	-
A9	GPIO8	DBUS-D2	GPIO8	B9	GPIO42	SMISO1	-
A10	GPIO9	DBUS-D3	GPIO9	B10	GPIO43	SHDR	-
A11	GPIO10	DBUS-D4	GPIO10	B11	GPIO44	-	-
A12	GPIO11	DBUS-D5	GPIO11	B12	GPIO45	-	-
A13	GPIO12	DBUS-D6	GPIO12	B13	GPIO46	-	-
A14	GPIO13	DBUS-D7	GPIO13	B14	GPIO47	-	-
A15	GPIO14	DBUS-D8	GPIO14	B15	INT_OUT	INT	-
A16	GPIO15	DBUS-D9	GPIO15	B16	WD_IN	WD_IN	-
A17	GPIO16	DBUS-D10	GPIO16	B17	WD_OUT	WD_OUT	-
A18	GPIO17	DBUS-D11	GPIO17	B18	-	-	-
A19	GPIO18	DBUS-D12	GPIO18	B19	TPS1_RST_IN	TPS1_RST	-
A20	GPIO19	DBUS-D13	GPIO19	B20	RESETN	RSTN	-
A21	GPIO20	DBUS-D14	GPIO20	B21	TPS1-T1	T1	-
A22	GPIO21	DBUS-D15	GPIO21	B22	TPS1-T2	T2	-
A23	GPIO22	TPS-A0	GPIO22	B23	TPS1-T3	T3	-
A24	GPIO23	DBUS-A1	GPIO23	B24	TPS1-T4	T4	-
A25	GPIO24	DBUS-A2	-	B25	TPS1-T5	T5	-
A26	GPIO25	DBUS-A3	-	B26	TPS1-T6	T6	-
A27	GPIO26	DBUS-A4	-	B27	VDD33	VDD33	VDD33
A28	GPIO27	DBUS-A5	-	B28	VDD33	VDD33	VDD33
A29	GPIO28	DBUS-A6	-	B29	VDD33	VDD33	VDD33
A30	GPIO29	DBUS-A7	-	B30	VDD33	VDD33	VDD33
A31	GPIO30	DBUS-A8	-	B31	GND	GND	GND
A32	GPIO31	DBUS-A9	-	B32	GND	GND	GND
A33	GPIO32	DBUS-A10	-	B33	GND	GND	GND
A34	GPIO33	DBUS-A11	-	B34	GND	GND	GND

Figure 4-11-2 Multi-interface Connector Pin Layout (TPS-1 main board)

5. CPU Board

5.1 Overview

With the built-in RX231, the CPU board can be connected to the TPS-1 main board, enabling 8-bit and 16-bit serial and parallel host interfaces.

5.2 Connectors, Switches and LEDs

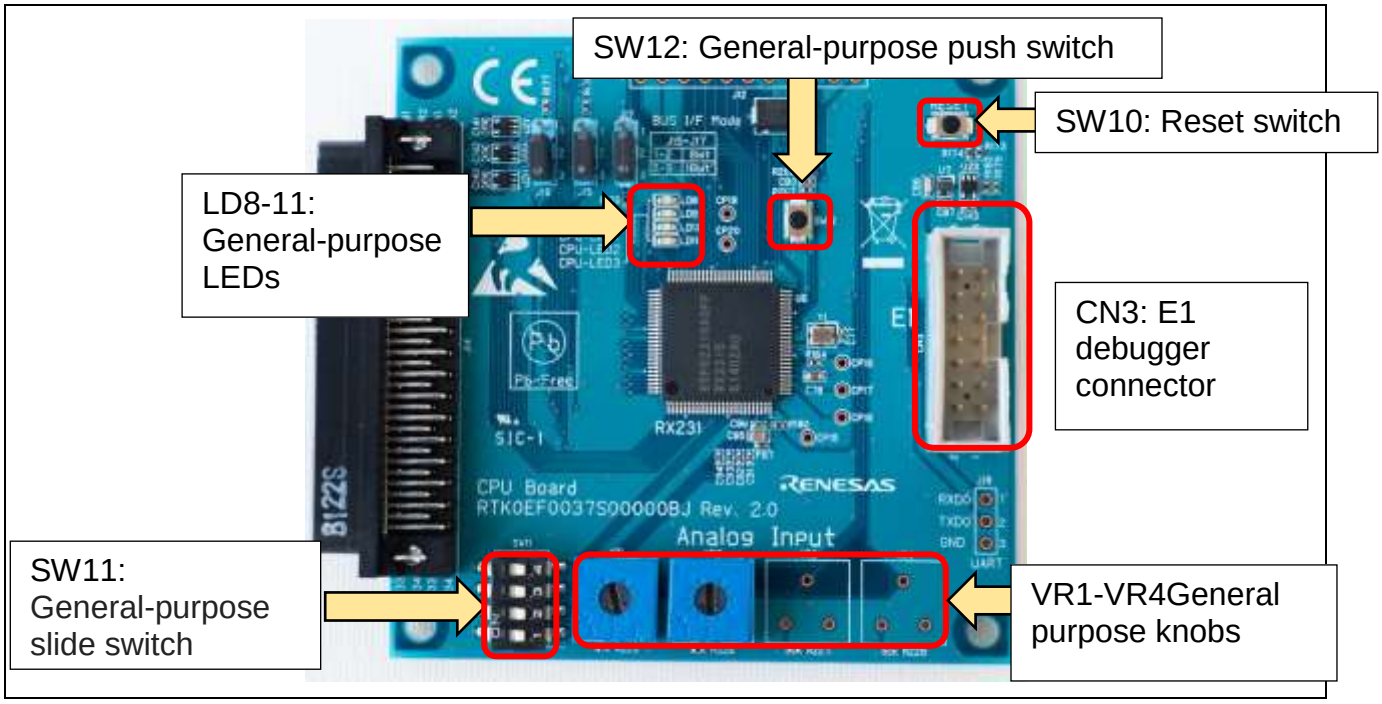


Figure 5-2 Connectors, Switches, and LEDs (CPU board)

5.2.1 Reset Switch SW10

Push SW10 to reset the CPU.

(See section “4.7 Rest Circuit” about detailed circuit.)

5.2.2 General-purpose Slide Switch SW11

The board comes with a general-purpose slide switch. The switch ON/OFF status can be retrieved through the CPU port.

SW11

SW Pin No.	Terminal name(TPS-1)
1	P44
2	P45
3	P46
4	P47

5.2.3 General-purpose Push Switch SW12

The board comes with a general-purpose push switch. The status can be retrieved as a trigger signal through the CPU port.

SW12

SW Pin No.	Terminal name(TPS-1)
1	P31

5.2.4 General-purpose LEDs LED8-LED11

These LEDs are mounted for general-purpose use.

Reference No.	Terminal name(TPS-1)
LED8	PC0
LED9	PC1
LED10	PC2
LED11	PC3

5.3 Parallel Host Interface Bus Width Switching Jumpers

These jumpers are used to switch the width of the parallel host interface between 8 and 16 bits.

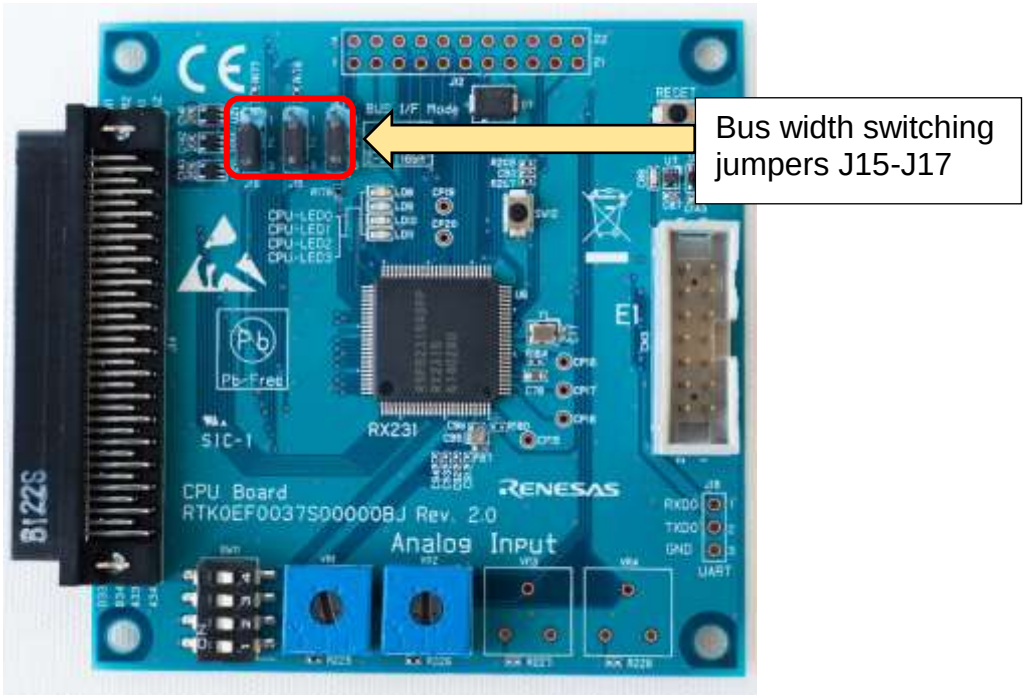


Figure 5-3 Bus Width Switching Jumpers

5.3.1 Bus width switching

Set the jumpers as follows to change the bus width.

J15-J17

Jumper	Bus width
1-2	8bit
2-3	16bit

6. I/O Board

6.1 Overview

When connected to the TPS-1 main board, this board can function as a remote I/O and can be used to confirm parallel IO operations. The board has 8 LEDs and 8 slide switches, enabling 8-bit I/O operations for both input and output.

6.2 Switches and LEDs

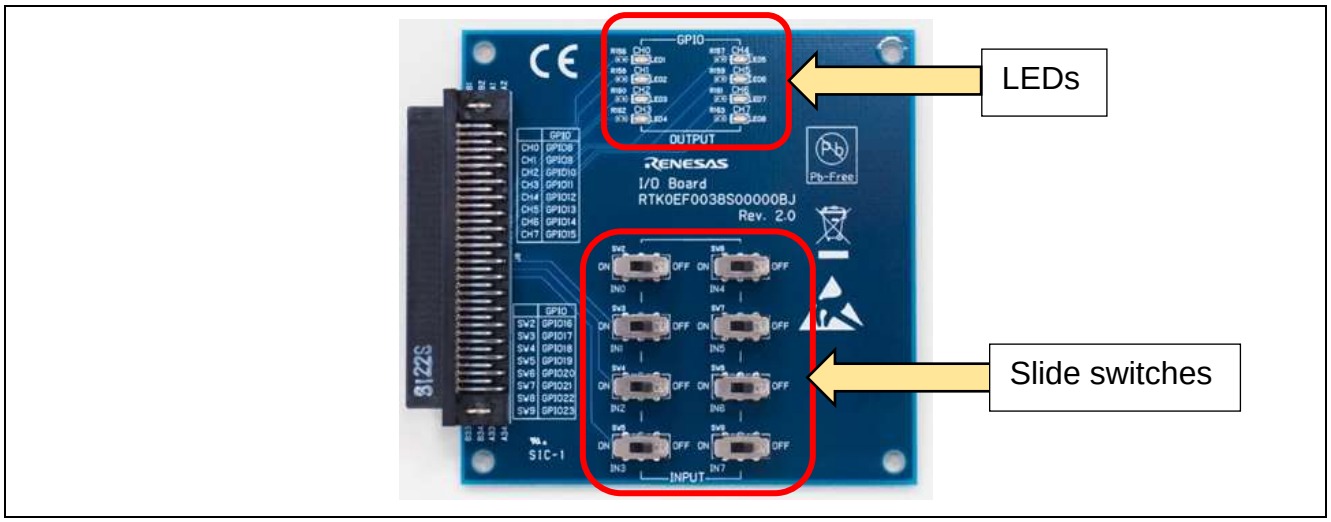


Figure 6-1 LEDs and Switches

6.2.1 LEDs for Output Display

Channel	TPS-1Signal Name	LED
CH0	GPIO8	LED1
CH1	GPIO9	LED2
CH2	GPIO10	LED3
CH3	GPIO11	LED4
CH4	GPIO12	LED5
CH5	GPIO13	LED6
CH6	GPIO14	LED7
CH7	GPIO15	LED8

6.2.2 Slide Switches for Input

Channel	TPS-1Signal Name	Switch
IN0	GPIO16	SW2
IN1	GPIO17	SW3
IN2	GPIO18	SW4
IN3	GPIO19	SW5
IN4	GPIO20	SW6
IN5	GPIO21	SW7
IN6	GPIO22	SW8
IN7	GPIO23	SW9

7. Setting Up theTPS-1 Environment

7.1 Preparing the TPS-1 Development Toolkit

7.1.1 Downloading the PROFINET TPS-1 Development Toolkit

After registering as a user on the Phoenix Contact website, download the PROFINET TPS-1 Development Toolkit. Note that you will not be able to download the toolkit until a few days after registering as a user.

Phoenix Contact URL:

https://www.phoenixcontact-software.com/en/downloads

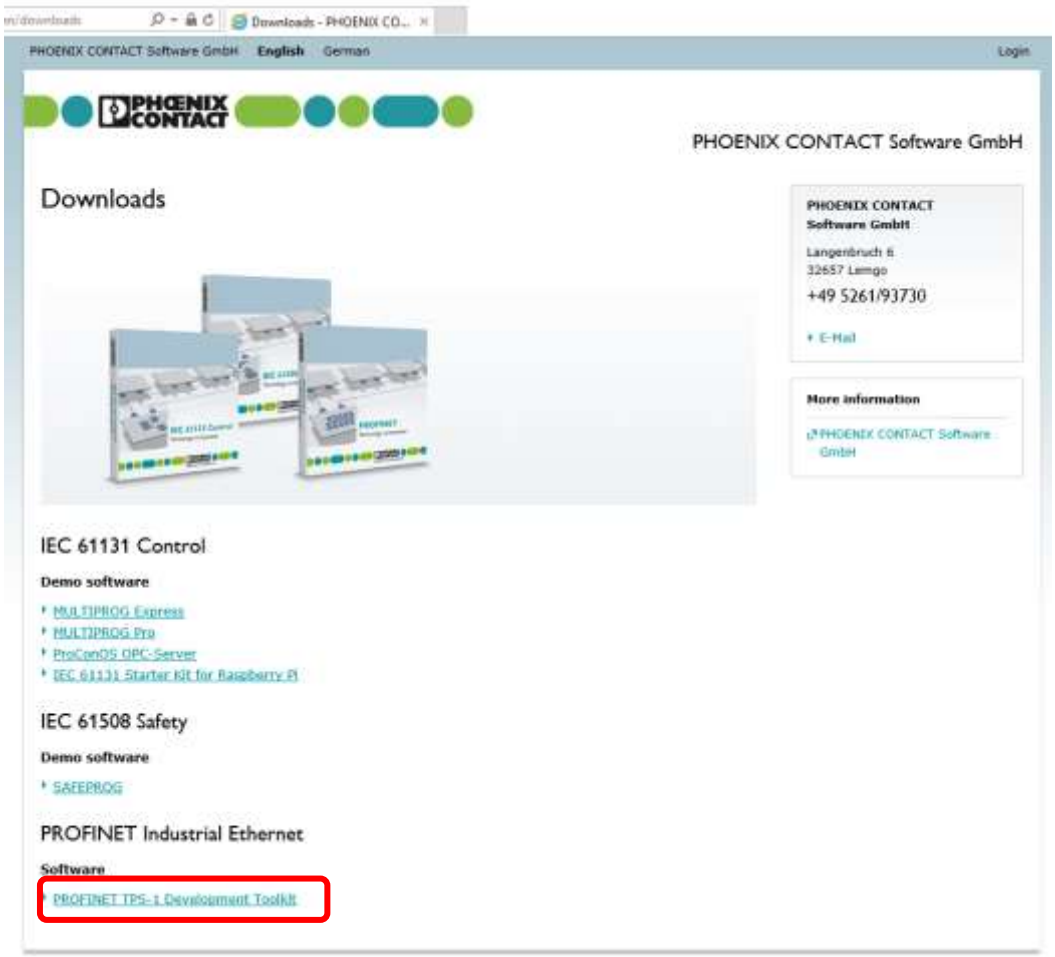


Figure 7-1-1 Download Site for TPS-1 Development Toolkit

7.1.2 Application Installation

Install the applications in the TPS-1 Development Toolkit.

Execute each of the following applications:

TPS Development Toolkit V.x.x.x.xx/TPS Configurator/Setup/TPS Configurator.msi

TPS Development Toolkit V.x.x.x.xx/TPS FWUpdater/TPS FWUpdater.msi

TPS Development Toolkit V.x.x.x.xx/PROFINET Configurator/PROFINET Configurator.exe

TPS Development Toolkit V.x.x.x.xx/PROFINET Smart Control/PROFINET Smart Control.msi

7.1.3 Preparing the GSDML File

In this section, prepare the GSDML file. This description uses the GSDML file created by Renesas Electronics as a sample.

The TPS Development Toolkit V.xxxxx is referred to as TDT from here on.

All GSDML files are saved together in under TDT/GSDML.

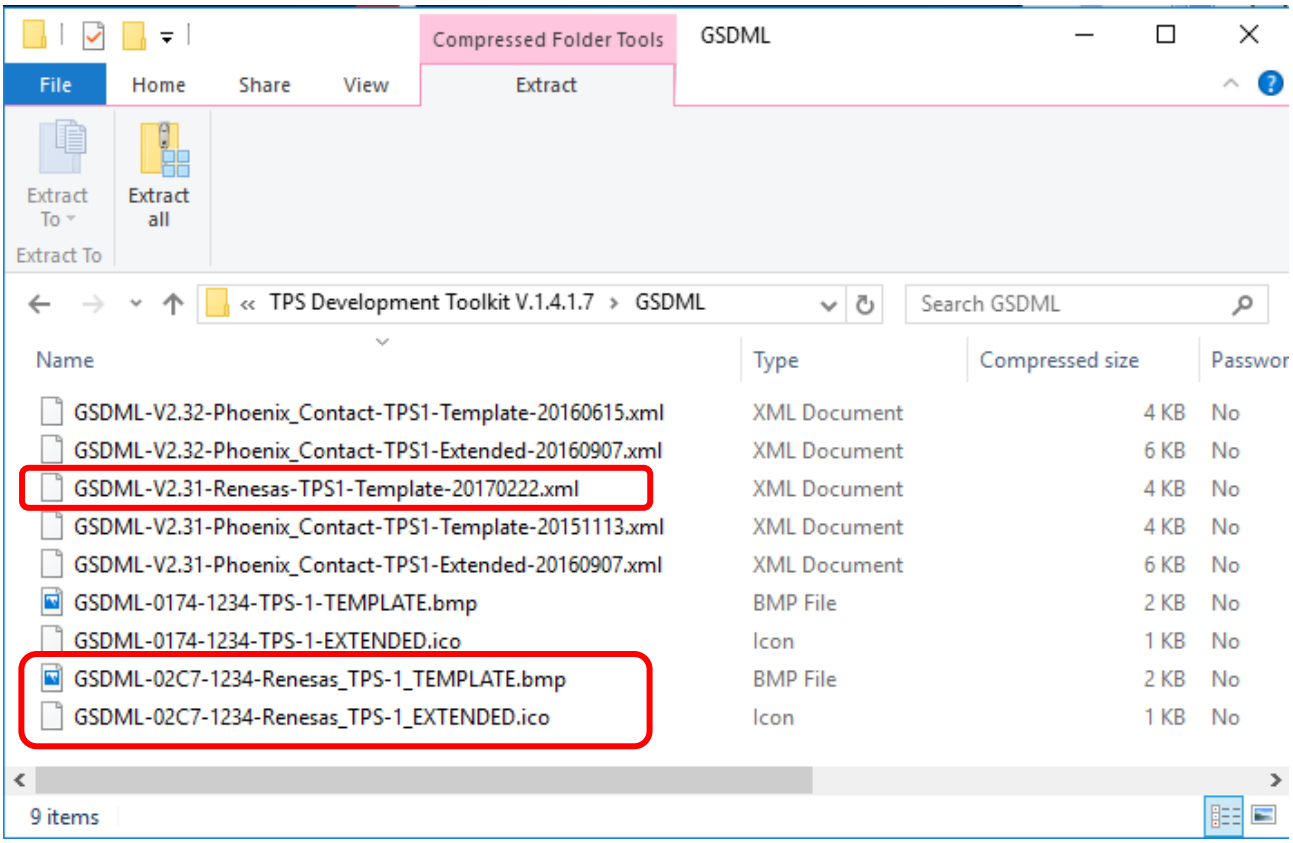


Figure 7-1-2 Preparing the GSDML File

8. TPS-1 Stack Preparation

8.1 Creating a TPS-1 Stack Image File

Here you will create an image file for writing to the flash memory.

8.1.1 Setting the Vendor ID and Device ID

- Open the header file (TDT/TPS_Stack/hdr.txt) and change the third line to whatever VendorID_DeviceID you would like to use, and then save. This document uses the Renesas Vendor ID (HEX) as an example in explanations.
  Vendor ID 02C7 (Renesas)
  Device ID 1234

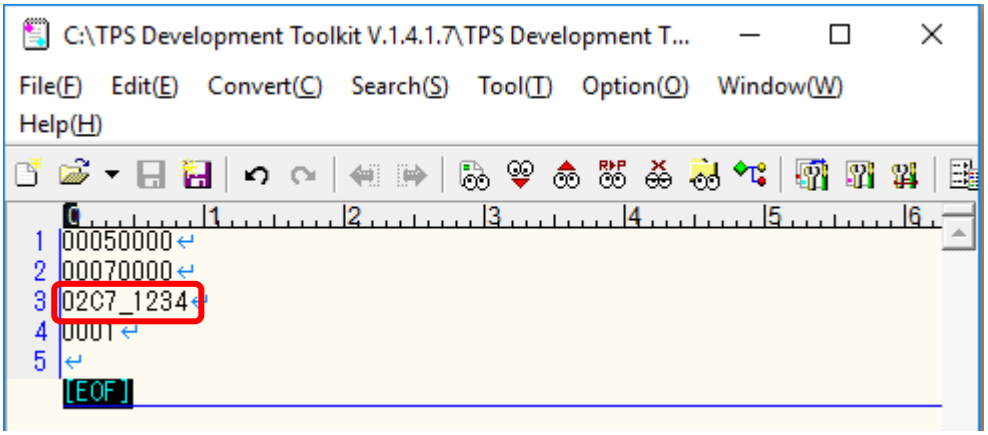


Figure 8-1-1 Vendor ID and Device ID Settings

8.1.2 Creating an image file

1) Double-click on the following batch file:
TDT/TPS_Stack/make_Target_Image.bat
The following two image files are created in the folder:

TPS_Target_Debug.img

TPS_Target_Release.img

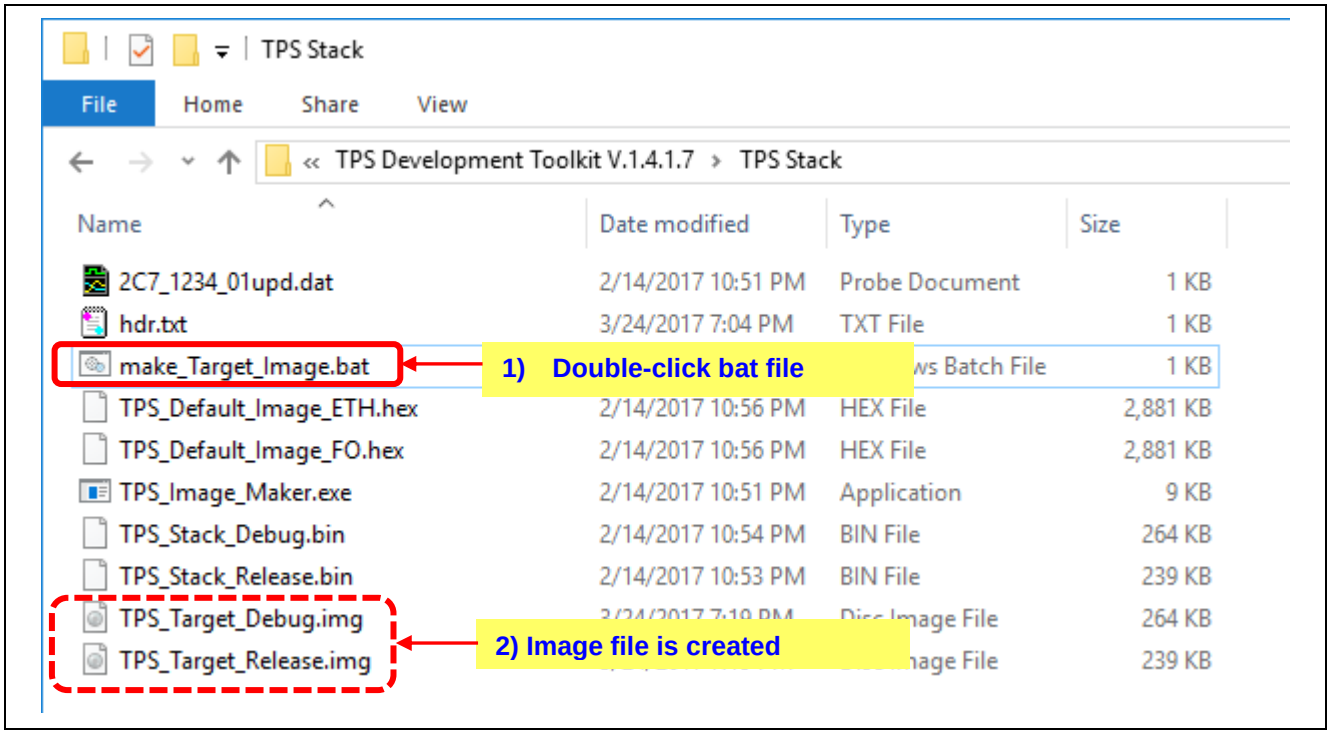


Figure 8-1-2-1 Creating an Image File

2) Rename the DAT file.
Rename **TDT/TPS_Stack/0174_1234_lupd.dat** as **VenderID_DeviceID_01upd.dat** to match the Vendor ID and Device ID specified in the header file.

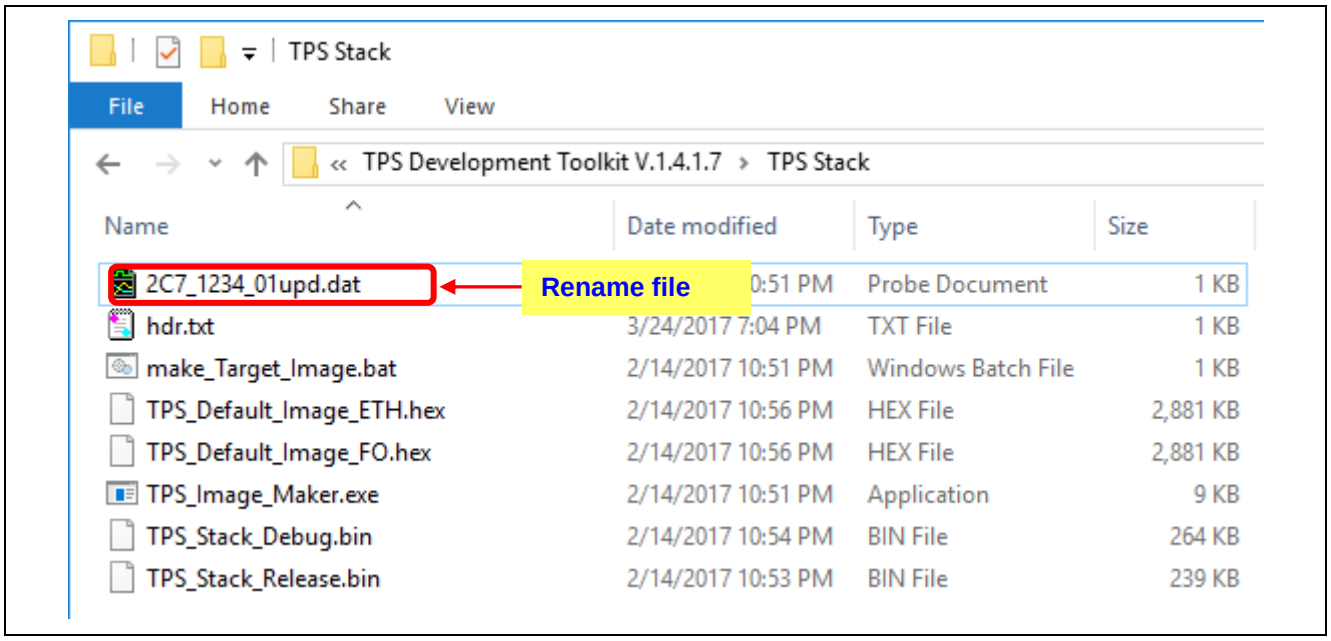


Figure 8-1-2-2 Renaming the DAT File

8.2 Creating a TPS-1 Ethernet Updater Image File

8.2.1 Changing the header file

- Open the header file (TDT/TPS_UpdaterETH/updhdr.txt) and change the third line to whatever VendorID_DeviceID you would like to use, and then save.
  Vendor ID: 02C7 (Renesas)
  Device ID: 1234

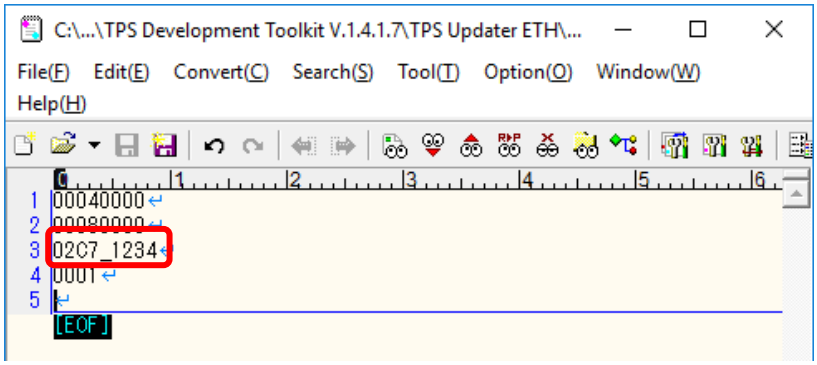


Figure 8-2-1 Vendor ID and Device ID Settings

8.2.2 Creating an image file

- Double-click on the following file to create an image file in the same folder:
  TDT/TPS_UpdaterETH/make_Updater_Image.bat

  TPS_UpdaterTarget.img

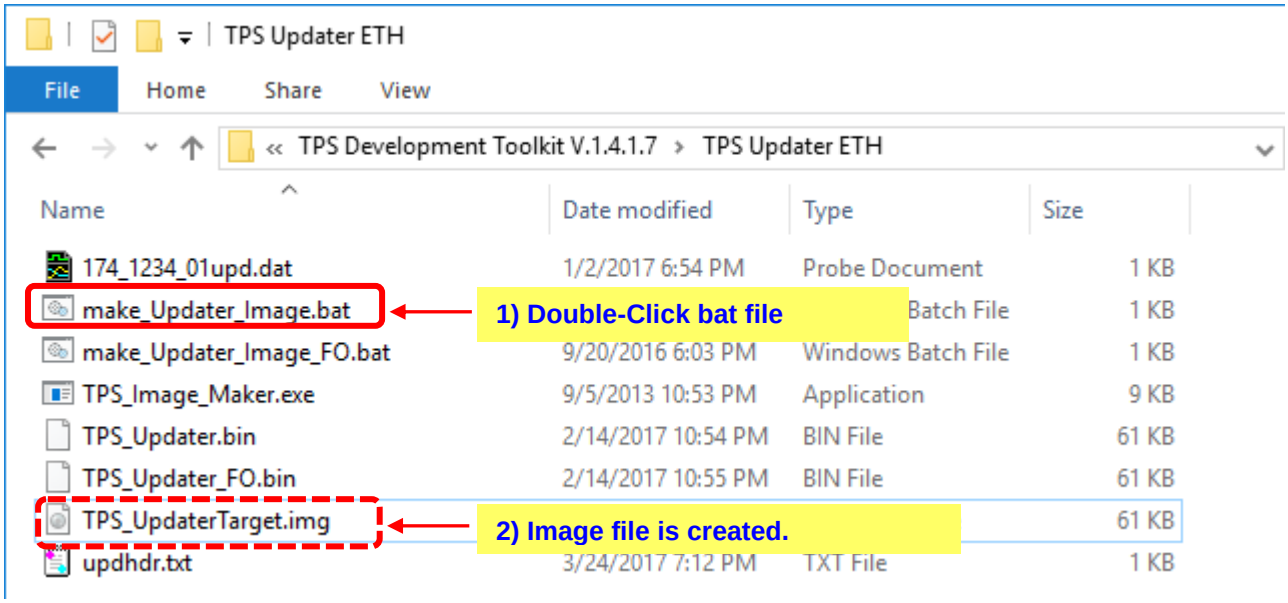


Figure 8-2-2-1 Creating an Image File

- 2) Rename DAT file.

Rename TDT/TPS_Update ETH/0174_1234_01upd.dat as VenderID_DeviceID_01upd.dat, making sure it matches the VendorID and DeviceID specified in the header file.

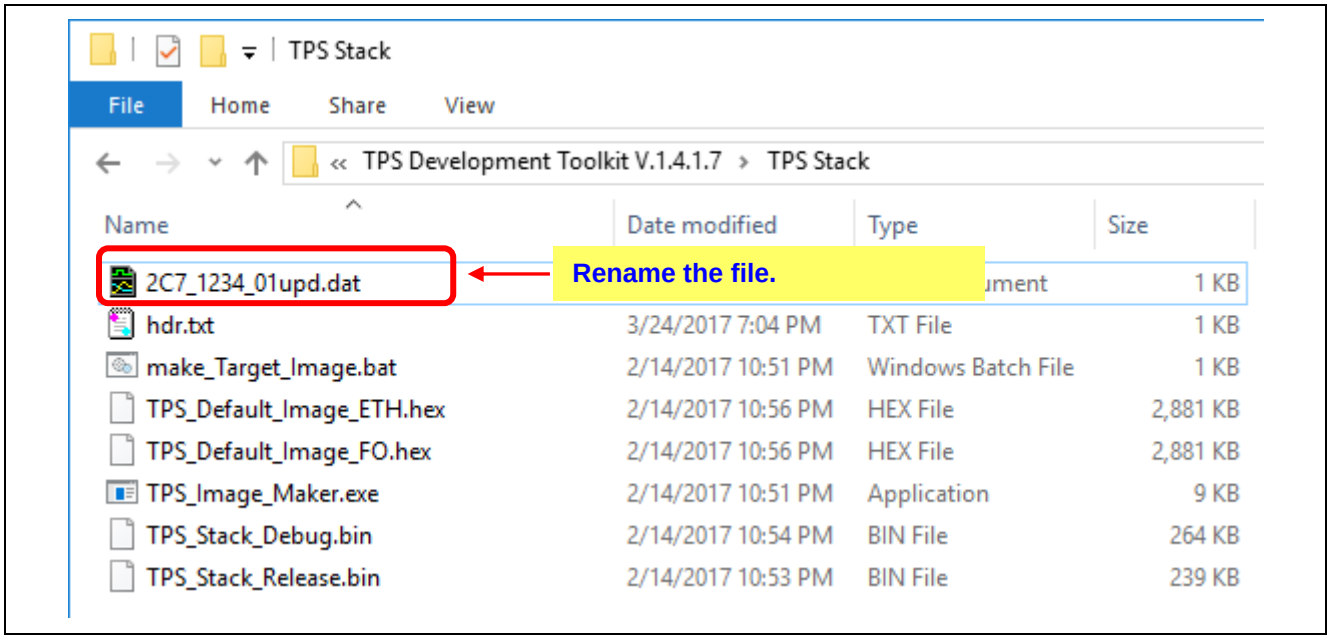


Figure 8-2-2-2 Renaming the DAT File

8.3 Creating a TPS FWUpdater Work Folder

8.3.1 Creating a work folder

- Create any work folder that you like. In this example, we will use TFTP_WORK as the Work folder name.
- TDT/TFTP_WORK

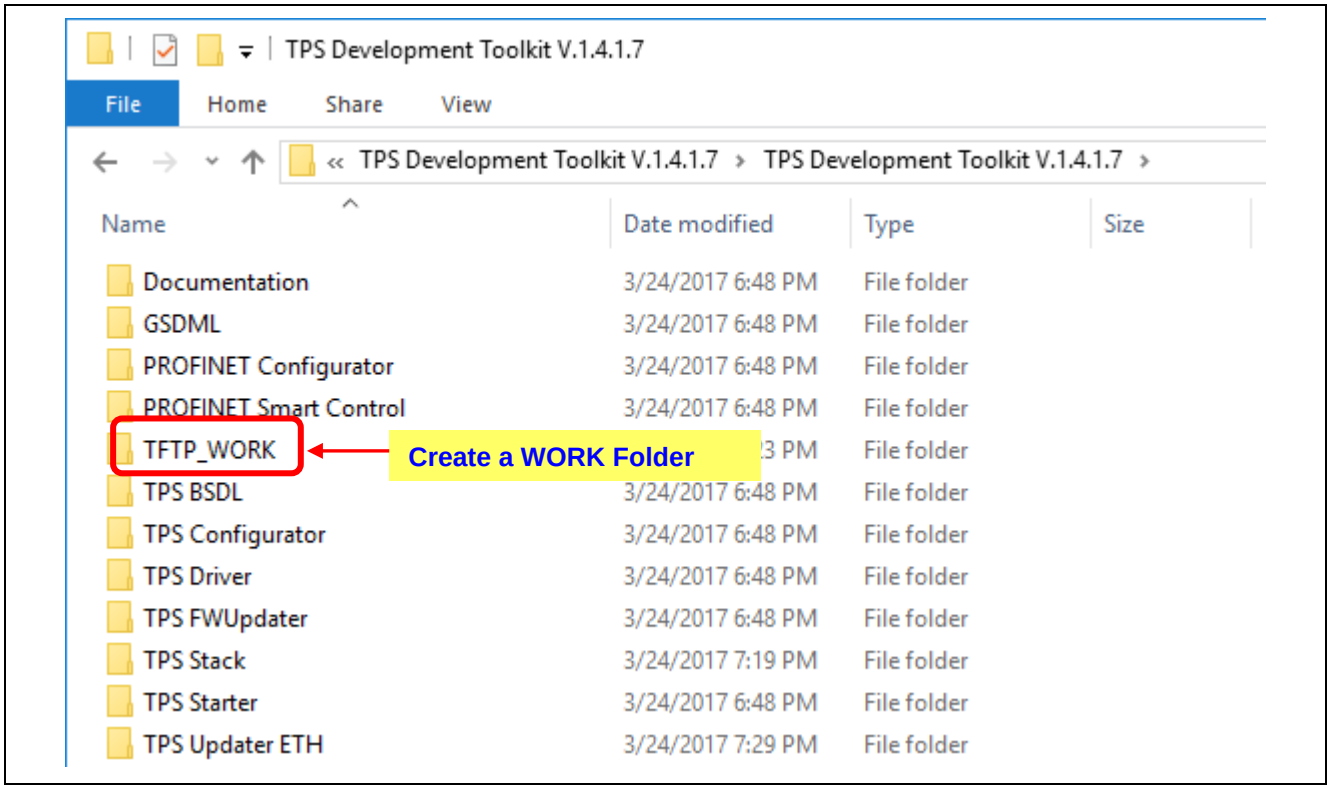


Figure 8-3-1 Creating a WORK File

8.3.2 Copying image files to the work folder

- Copy the following files to the work folder that was created.
  TDT/TPS_Stack/ 02C7_1234_lupd.dat
  TDT/TPS_Stack/ TPS_Target_Debug.img
  TDT/TPS_Stack/ TPS_Target_Release.img
  TDT/TPS_UpdaterETH/ TPS_UpdaterTarget.img

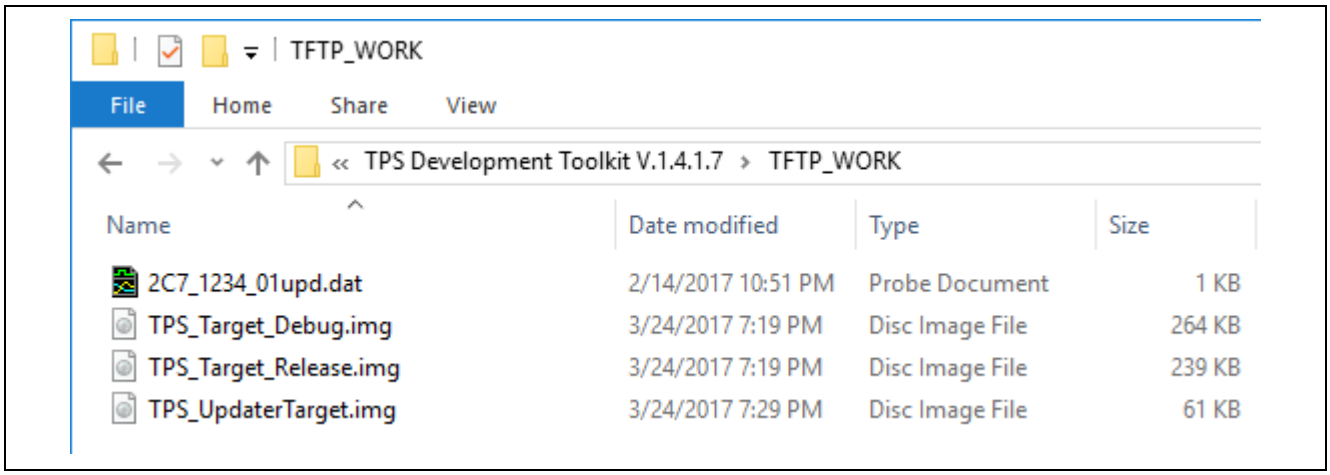


Figure 8-3-2 Copying Image Files

9. Setting up theTPS-1 Solution Board

9.1 Connecting the TPS-1 Main Board and Computer

9.1.1 Computer network settings

- Enter the network settings for the computer as shown below.
  TCP/IPv4 setting
  IP Address 192.168.16.105

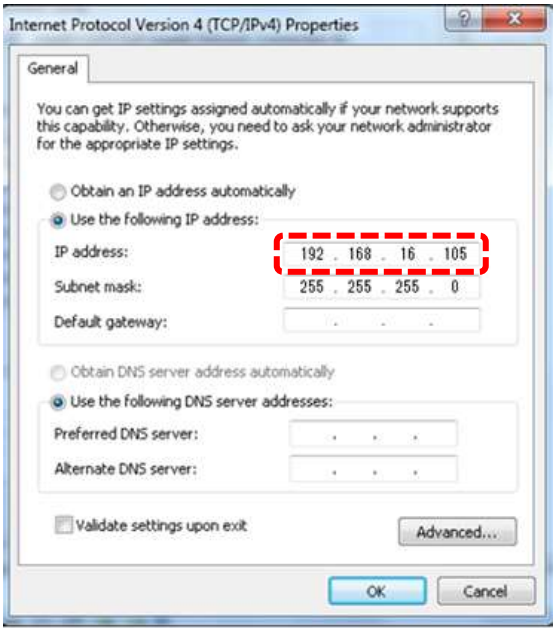


Figure 9-1-1 Network Settings

9.1.2 Connecting the TPS-1 Main Board and Computer

- Set the Boot setting for the TPS-1 Main board to FLASH mode.
- Connect the computer and TPS-1 Main board using a LAN cable.
- Use a USB cable to connect the computer and the TPS-1 Main board.
  Install the USB-to-UART driver on the computer.

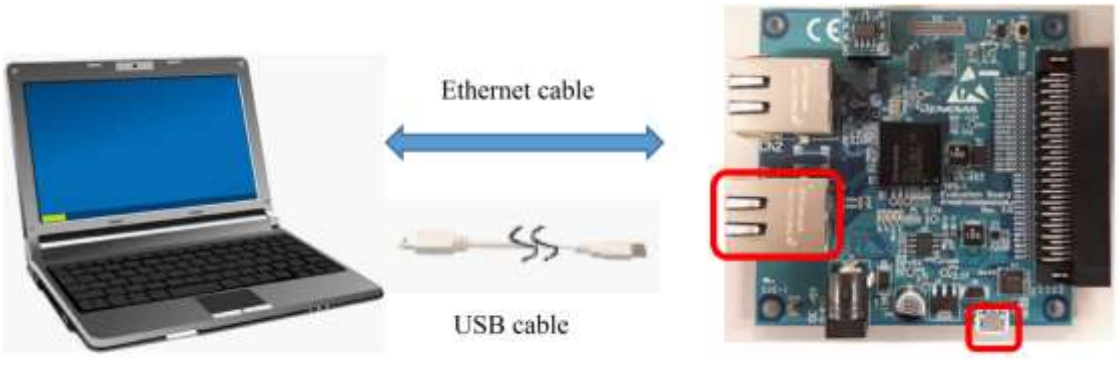


Figure 9-1-2 Connecting the Board and Computer

9.1.3 Terminal program settings

In this document, we will use TeraTerm as an example.
This Terminal Program carries out communications between the host computer and the COM port of the RS-232C interface.
Using the host computer, boot the Terminal Program (Tera Term) and set the serial port (baud rate: 115200). Set the line return code to “CR” for both receiving and transmission.

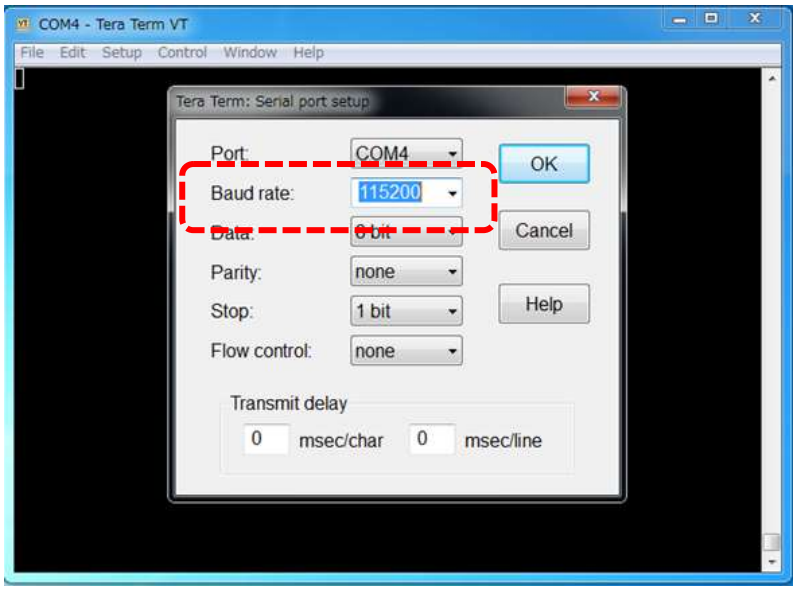


Figure 9-1-3-1 Terminal Software Settings (1)

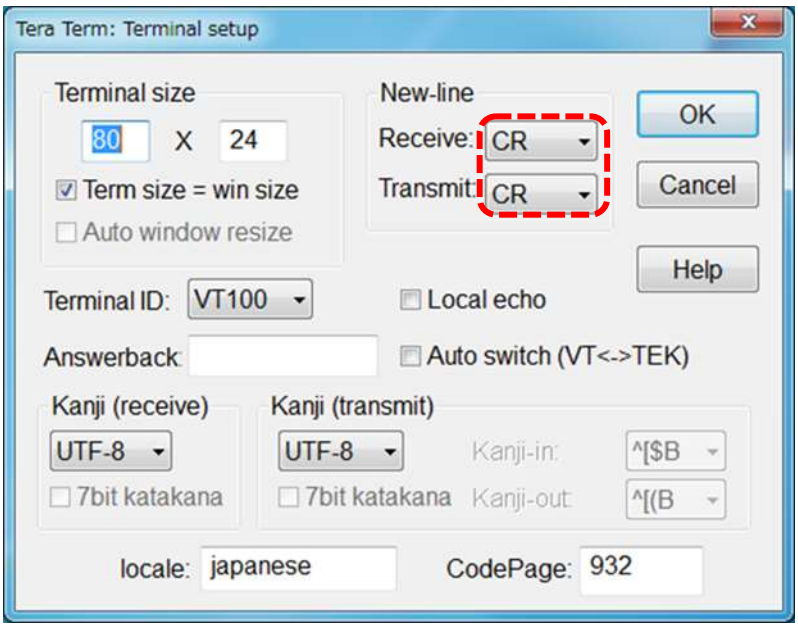


Figure 9-1-3-2 Terminal Software Settings (2)

10. Booting the TPS-1 Solution Board

10.1 TPS-1 Configuration Settings

10.1.1 Sending the Starter program (TPS_Starter.s)

1) Boot Tera Term.
2) Press the Reset switch on the TPS-1 Main board.
3) Enter “s” on the Tera Term screen and press the Enter key on the computer.
4) The message shown below is displayed on the Tera Term screen.

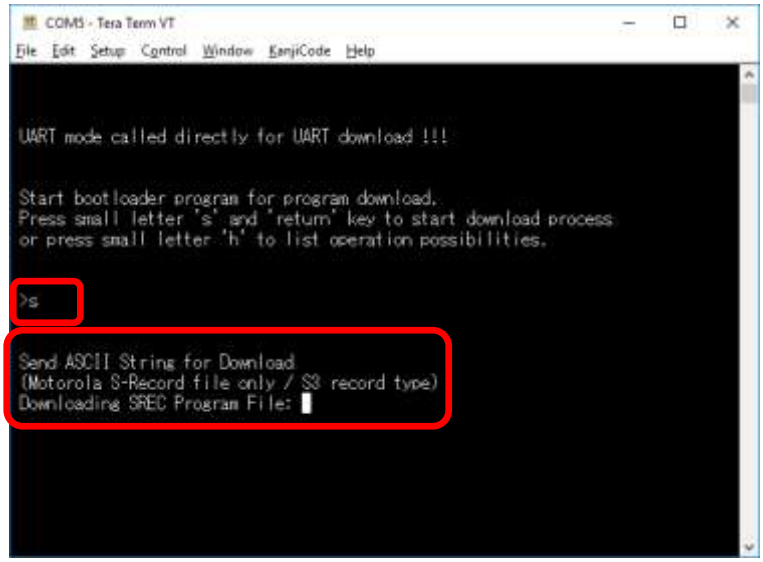


Figure 10-1-1-1 Sending the Starter Program (1)

When the above message is displayed, send the file.

Click **File→Send file…**

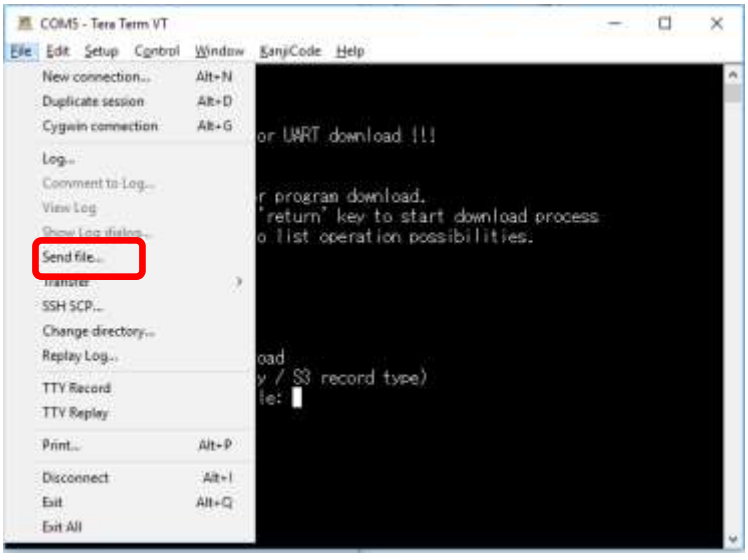


Figure 10-1-1-2 Sending the Starter Program (2)

Open the folder (TDT/TPS_Starter/), select “TPS_Start.s”, and click **Open**.

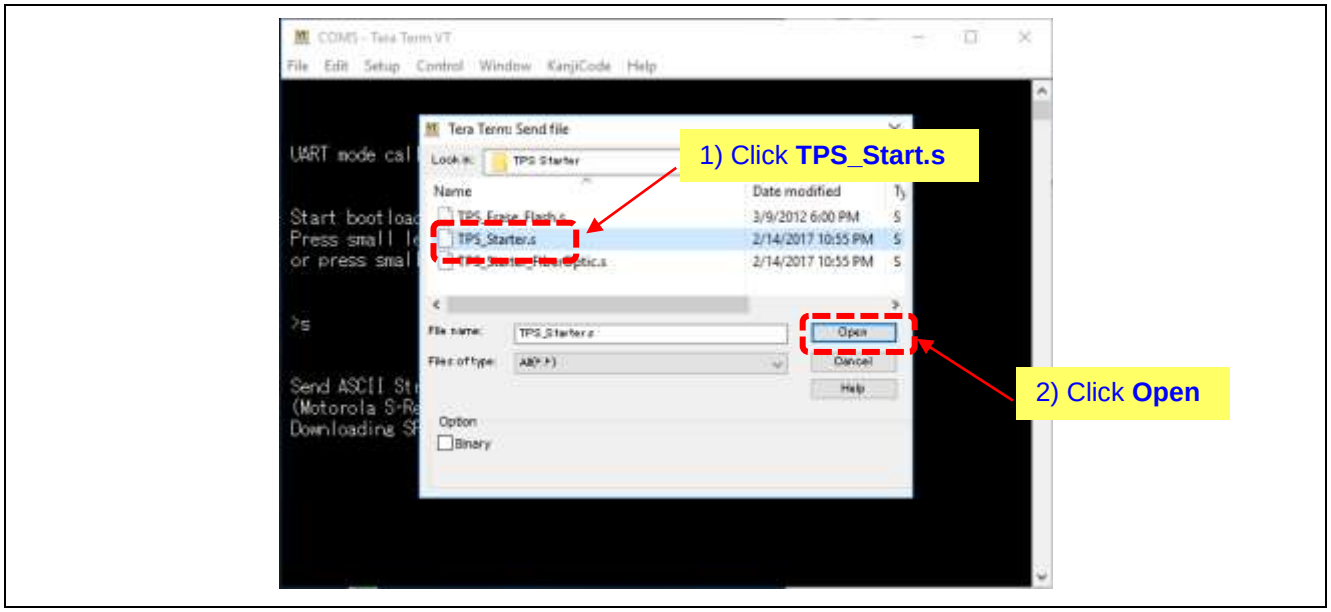


Figure 10-1-1-3 Sending the Starter Program (3)

File transfer begins.

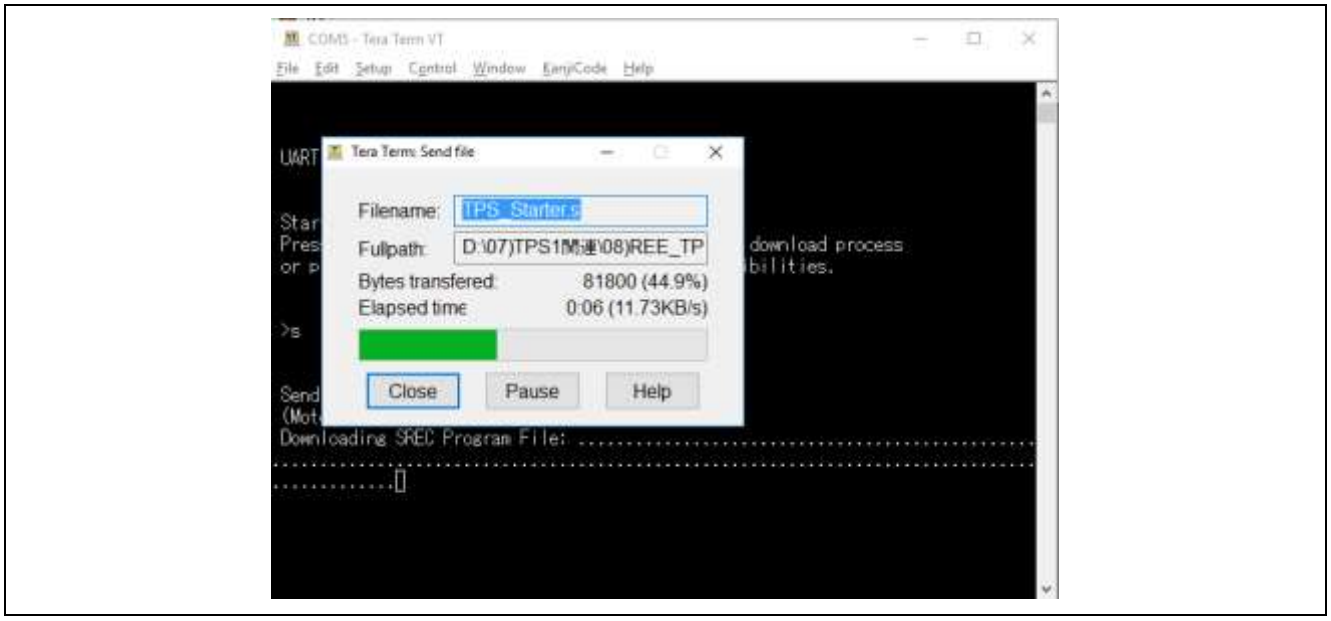


Figure 10-1-1-4 Sending the Starter Program (4)

When the file has been sent, the following screen is displayed:

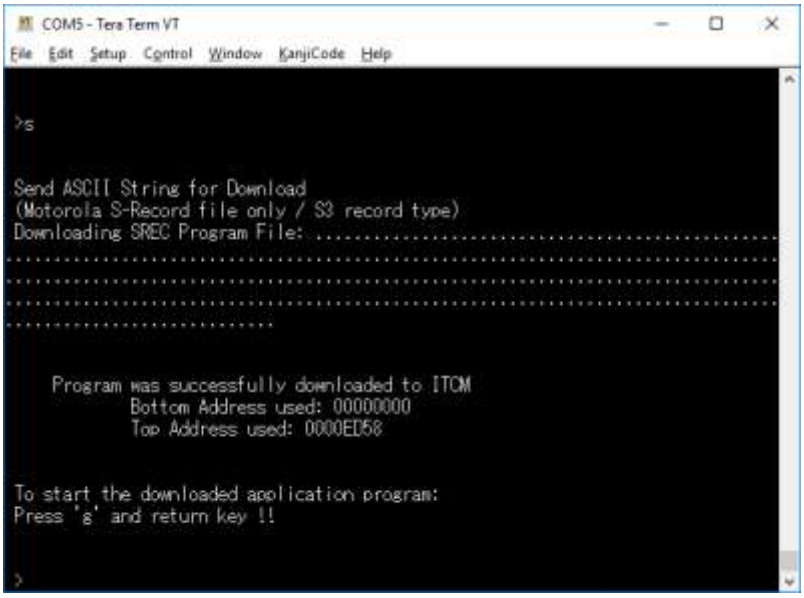


Figure 10-1-1-5 Sending the Starter Program (5)

Input “g” and press the Enter key on the computer to complete the process.

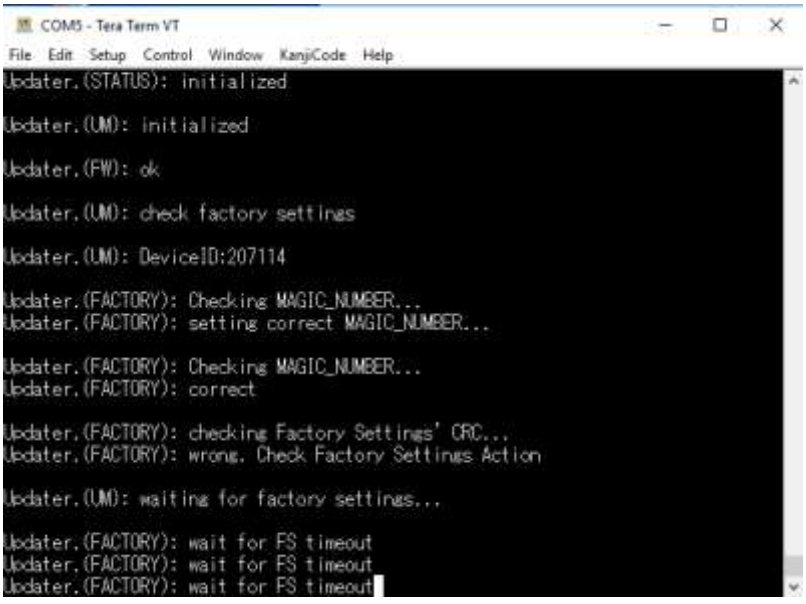


Figure 10-1-1-6 Sending the Starter Program (6)

The system waits for the factory settings.

Caution: Once a certain amount of time has elapsed, an error will occur. The procedure for handling when an error occurs is described below.

If the following error message is displayed, press the RESET switch on the main board.

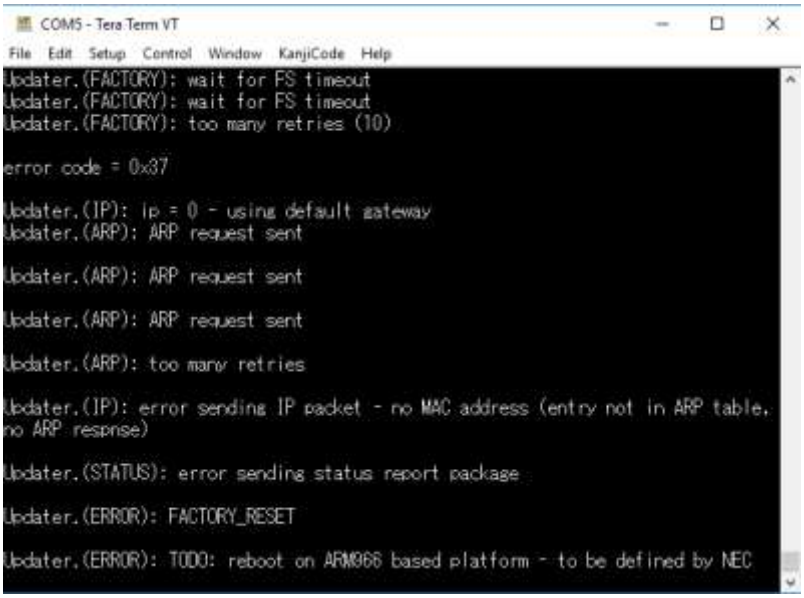


Figure 10-1-1-7 Sending the Starter Program (7)

After pressing the RESET switch, the following screen will appear.
Input “g” and press the ENTER key.

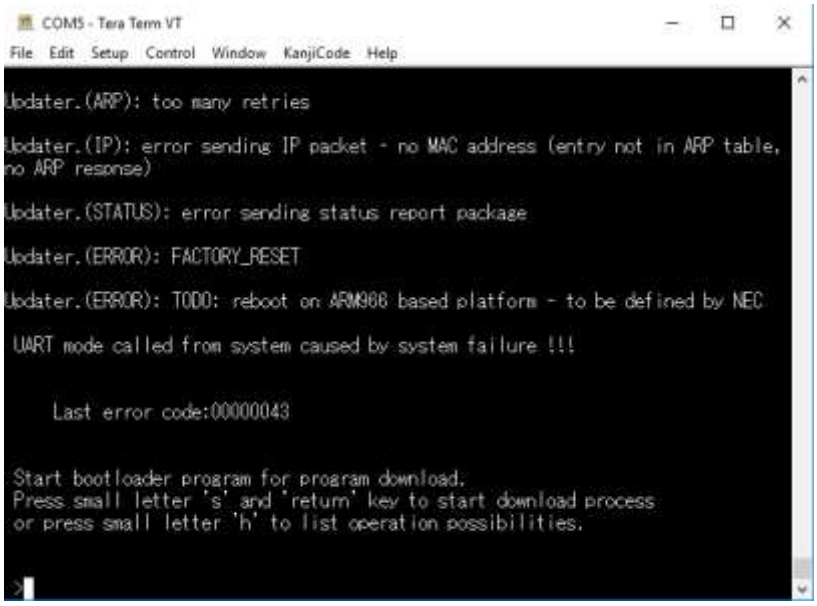


Figure 10-1-1-8 Sending the Starter Program (8)

This returns the system to the Factory Settings wait state, as shown here.

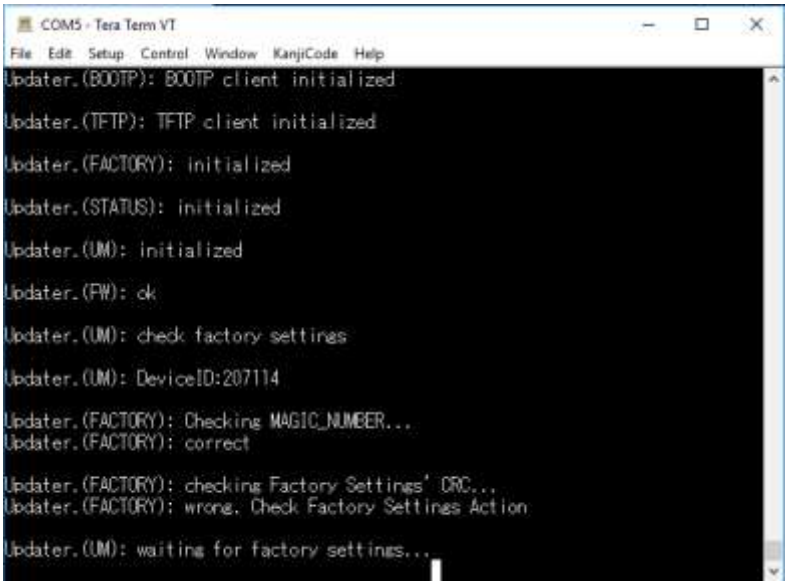


Figure 10-1-1-9 Sending the Starter Program (9)

10.1.2 TPS Configurator Settings for Operation Modes

- Boot TPS Configurator.
- Enter the settings for 1) to 3) below, based on the interface being used.

1) TPS-1 host serial interface (SPI)

Hardware setting: Connect the CPU board. No particular settings such as jumper pin settings are required.

Figure 10-1-2-1 SPI Board Setting

TPS-1 Configurator settings (1): General Settings tab
Set the parameters as shown in the following figure.

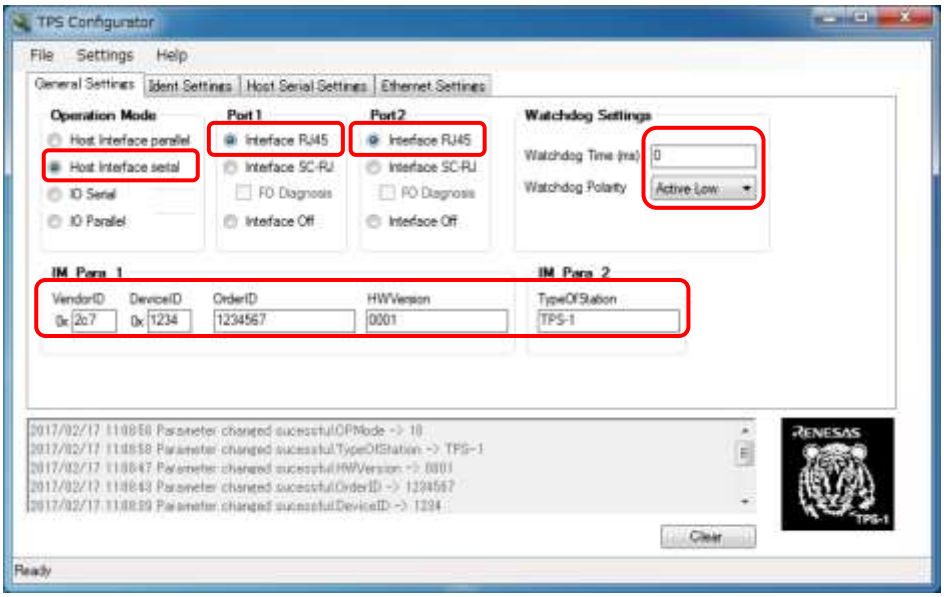


Figure 10-1-2-2 SPI Configurator Settings (1)

TPS-1 Configurator settings (2): Host Serial Settings tab
Set the parameters as shown in the following figure.

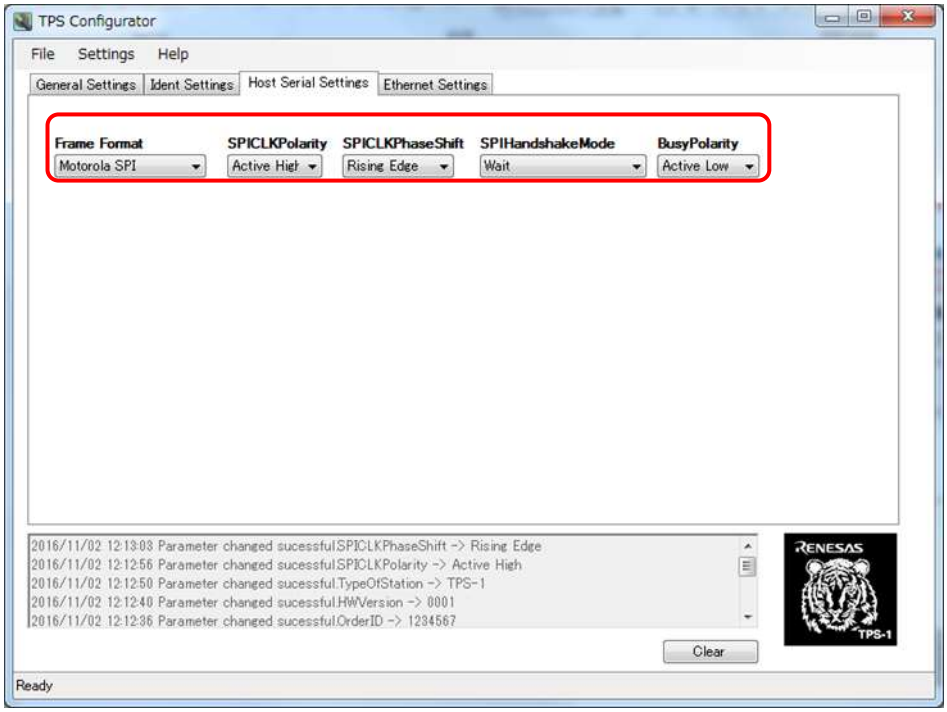


Figure 10-1-2-3 SPI Configurator Settings (2)

After completing the above settings, proceed to “10.1.3 Send TPS Configurator Settings”.

2) TPS-1 host parallel interface (8-bit)

Hardware settings: Connect the CPU board, and set jumper pins J15-J17 to the 1-2 side.

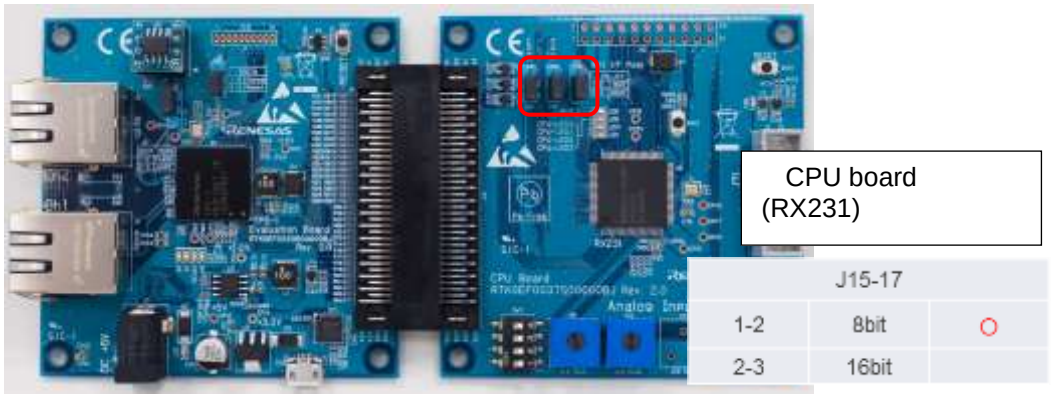


Figure 10-1-2-4 8-Bit Host Parallel Interface Board Setting

TPS-1 Configurator settings (1): General Settings tab
Set the parameters as shown in the following figure.

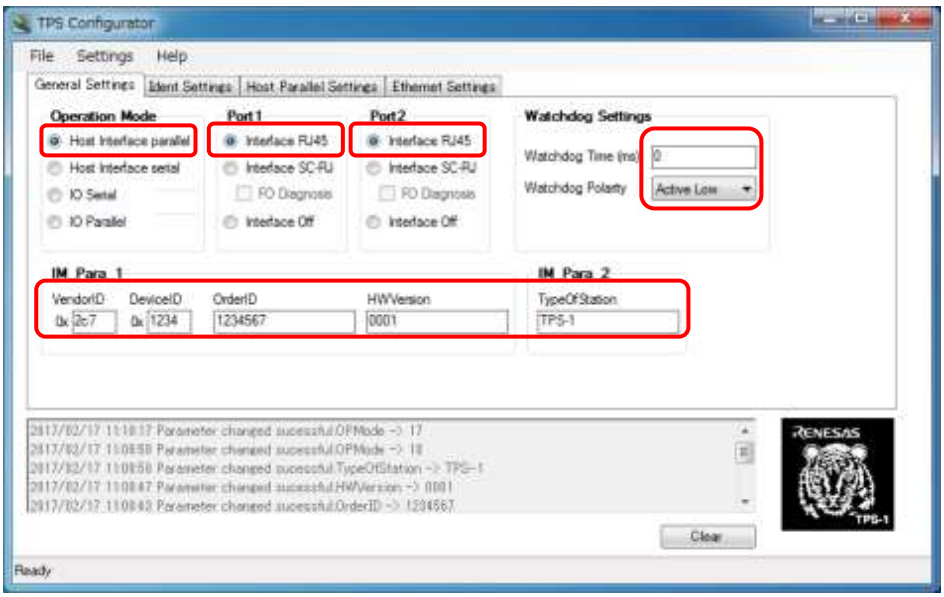


Figure 10-1-2-5 8-Bit Host Parallel Interface Configurator Settings (1)

TPS-1 Configurator settings (2): Host Parallel Settings tab
Set the parameters as shown in the following figure.

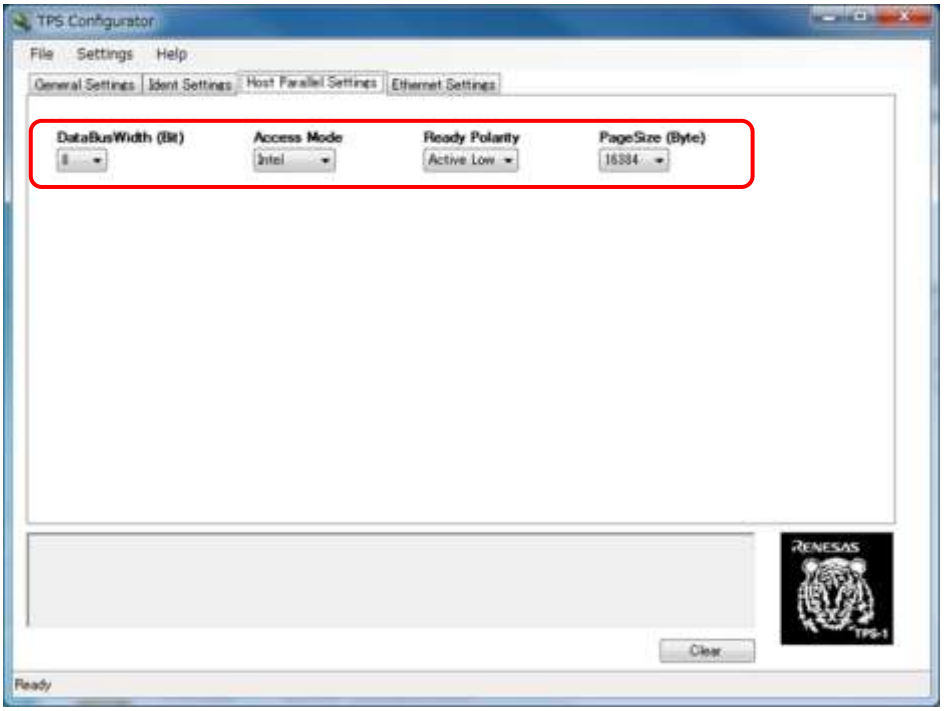


Figure 10-1-2-6 8-Bit Host Parallel Interface Configurator Settings (2)

After completing the above settings, proceed to “10.1.3 Send TPS Configurator Settings”.

3) TPS-1 Host parallel interface (16-bit)

Hardware settings: Connect the CPU board, and set jumper pins J15-J17 to the 2-3 side.

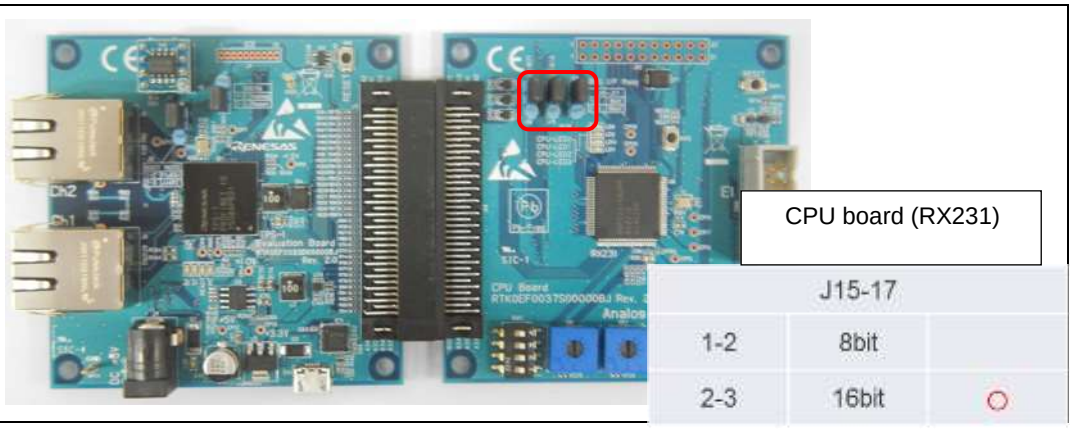


Figure 10-1-2-6 16-Bit Host Parallel Interface Board Settings

TPS-1 Configurator settings (1): General Settings tab
Set the parameters as shown in the following figure.

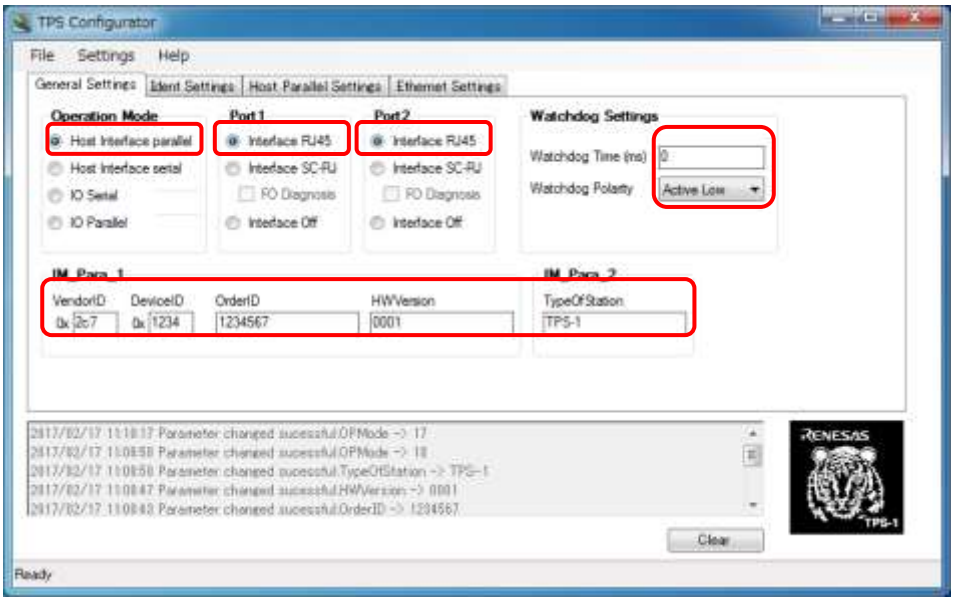


Figure 10-1-2-7 16-Bit Host Parallel Interface Configurator Settings (1)

TPS-1 Configurator settings (2): Host Parallel Settings tab
Set the parameters as shown in the following figure.

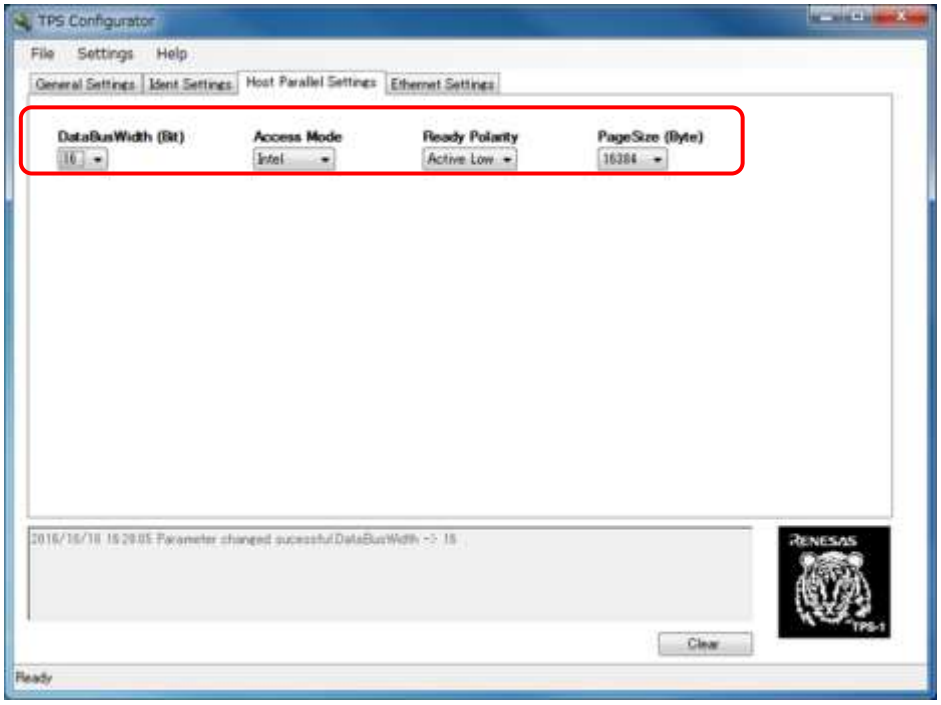


Figure 10-1-2-8 16-Bit Host Parallel Interface Configurator Settings (2)

After completing the above settings, proceed to “10.1.3 Send TPS Configurator Settings”.

4) TPS-1 parallel I/O interface

Hardware settings: Connect the I/O board. No jumper pin or other settings are necessary.

Figure 10-1-2-8 Parallel I/O Interface Board Setting

TPS-1 Configurator settings (1): General Settings tab
Set the parameters as shown in the following figure.

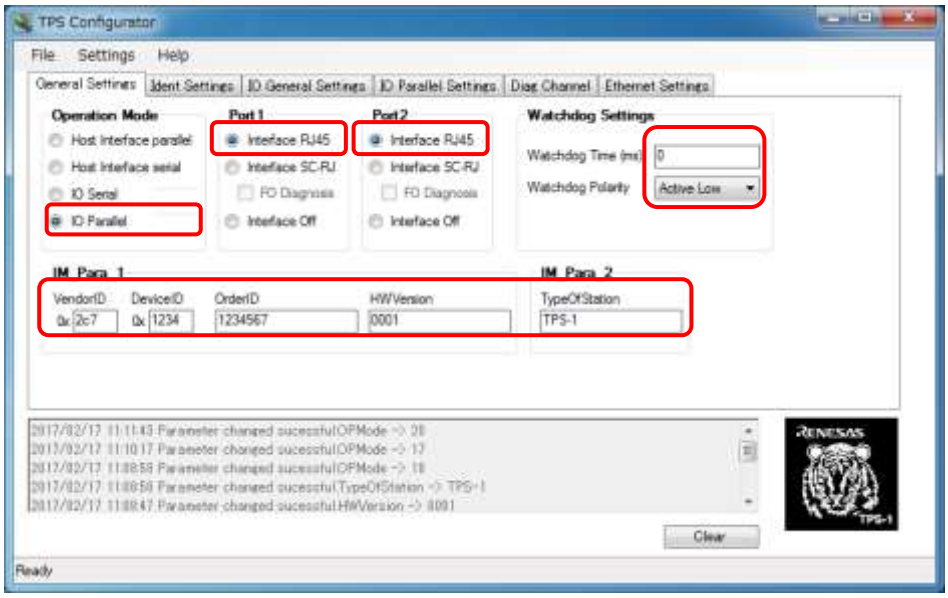


Figure 10-1-2-9 Parallel I/O Interface Configurator Settings (1)

TPS-1 Configurator settings (2): IO General Settings
Set the parameters as shown in the following figure.

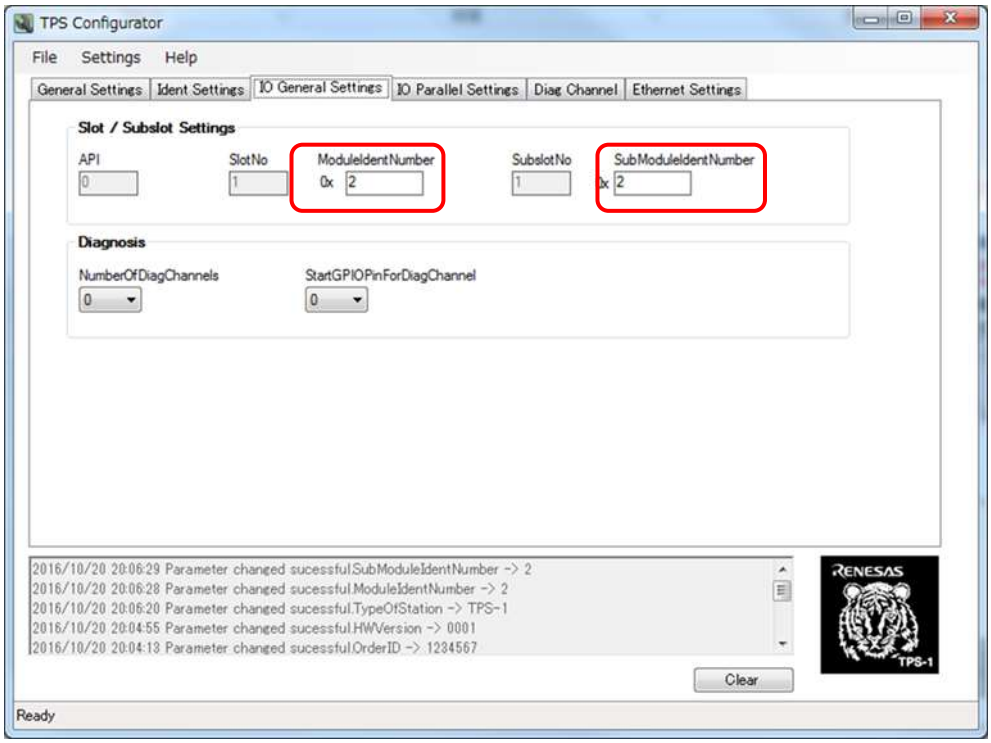


Figure 10-1-2-10 Parallel I/O Interface Configurator Settings (2)

TPS-1 Configurator settings (3): IO Parallel Settings tab
Set the parameters as shown in the following figure.

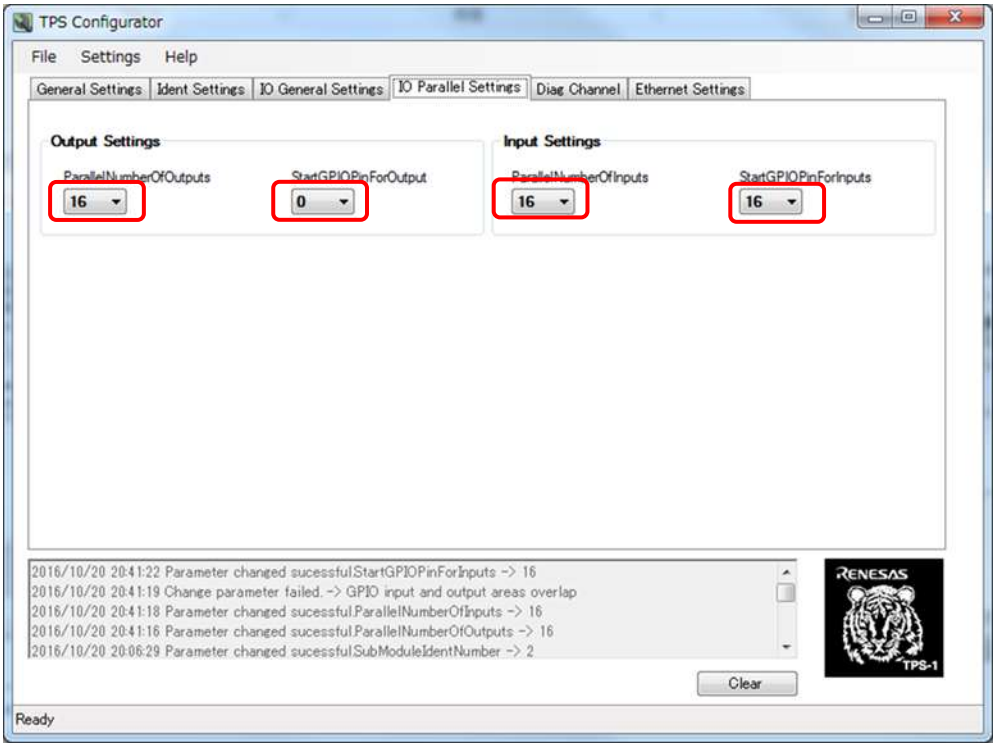


Figure 10-1-2-11 Parallel I/O Interface Configurator Settings (3)

After completing the above settings, proceed to “10.1.3 Send TPS Configurator Settings”.

10.1.3 Send TPS Configurator Settings

When the settings in 10.1.2 TPS Configurator Settings for Operation Modes are complete, select the Ethernet Settings tab in TPS Configurator and enter the Ethernet settings. Enter the user address for the MAC address. In the example shown here, we have entered “Renesas Electronics Corporation”.

Destination IP : 192.168.16.227
Secure IP : 192.168.16.105
MAC Ethernet : 74.90.50.00.FC.B8
MAC Port1 : 74.90.50.00.FC.B9
MAC Port2 : 74.90.50.00.FC.BA

The first three bytes of the MAC address, 74-90-50, specify “Renesas Electronics Corporation”.
After entering all settings, click **Send Configuration**.

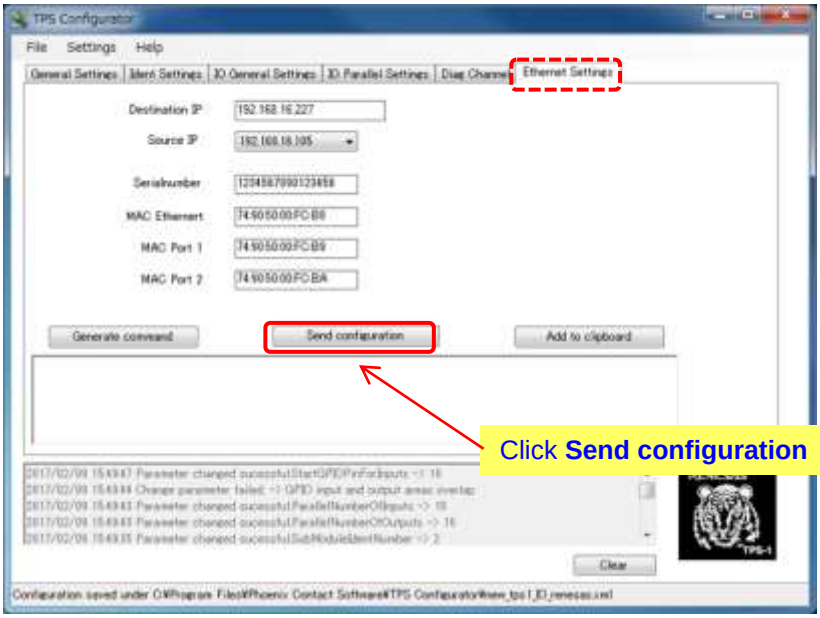


Figure 10-1-2-12 Ethernet Settings Screen

When the message shown below is displayed, the process is complete. Lastly, click **OK**.

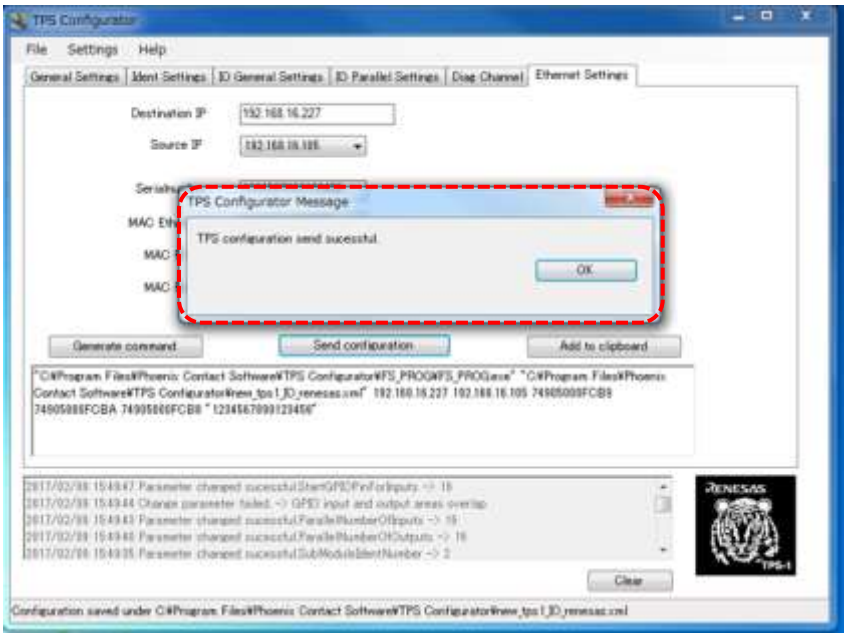


Figure 10-1-2-13 Configurator Completed Screen

10.2 TPS-1 Firmware Updates

10.2.1 Editing DAT files for TPS FWUpdater (Part 1)

- Open the DAT file for TPS FWUpdater (VendorID_DeviceID_01upd.dat) found in the work folder that was created.
  Rewrite with the following settings:
  UpdateTarget = 0
  NextBoot = 1
  UpdateUpdater = 1

Note) In this document, TPS_Target_Debug.img is used assuming application development. Please use TPS_Target_Release.img when commercializing.

Please rewrite the file name specified by TargetFName in the VenderID_DeviceID_01upd.dat file to TPS_Target_Release.img, when using the release version

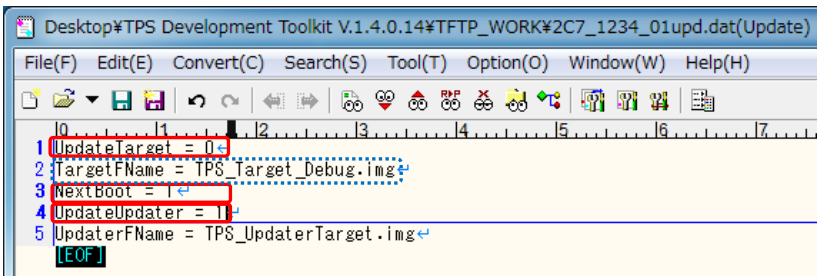


Figure 10-2-1 FW Update Procedure (1)

10.2.2 Booting TPS FWUpdater

- If the Preferences screen is not displayed when TPS FWUpdater boots, open the settings screen using Tools→ Preferences.
  Use Select Network Adapter to select 192.168.16.105.
  In the root directory, select the work folder that was created (in the example, this is TFTP_WORK).
  Click **OK** to close the Preferences screen.

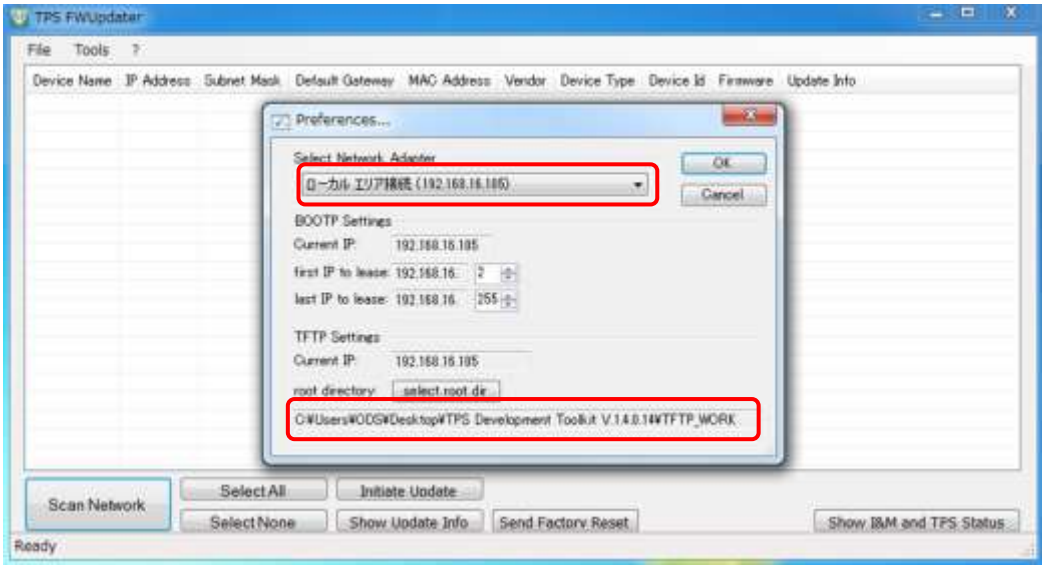


Figure 10-2-2 FW Update Procedure (2)

10.2.3 TPS-1 Ethernet updater image file write check

- OpenTools→Bootp/Tftp Logfile.
- Wait until the following logs are output:

  Incoming readrequest for file : TPS_UpdaterTarget.img
  Incoming writerequest for file : 192_168_16_2_upd.sts

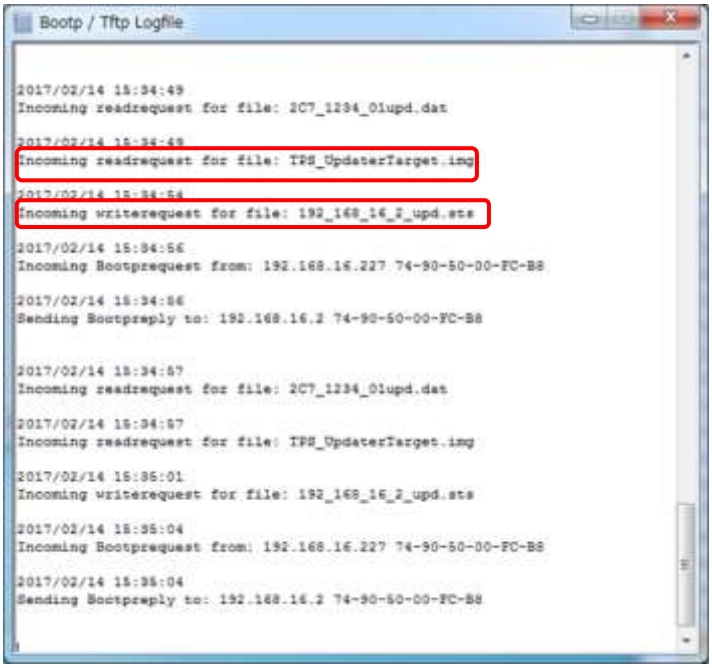


Figure 10-2-3 FW Update Procedure (3)

10.2.4 Checking the image file write results

- Open the status file 192.168.2_ups.sts which is in the work folder.
- Check to make sure that the 10th line, right under [Update Updater], reads “performed=yes”.

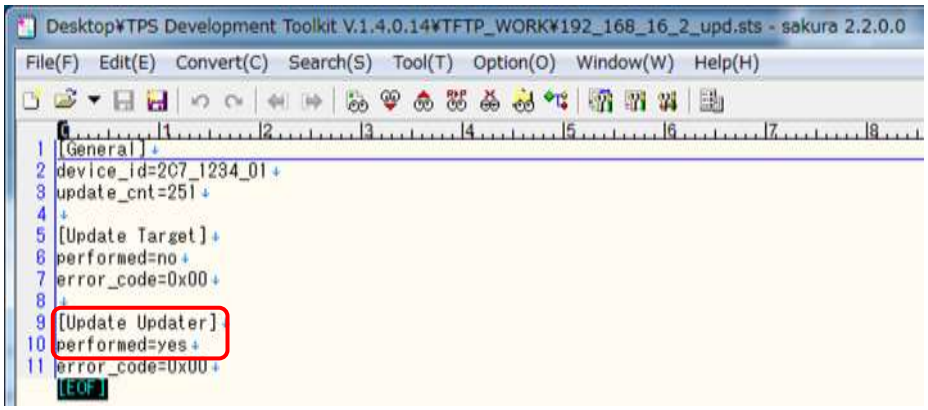


Figure 10-2-4 FW Update Procedure (4)

10.2.5 Editing DAT files for TPS FWUpdater (Part 2)

- Open the DAT file for TPS FWUpdater (VendorID_Device_ID_01upd.dat), which is found in the work folder.
- Rewrite with the following settings:
  UpdateTarget = 1
  NextBoot = 0
  UpdateUpdater = 0

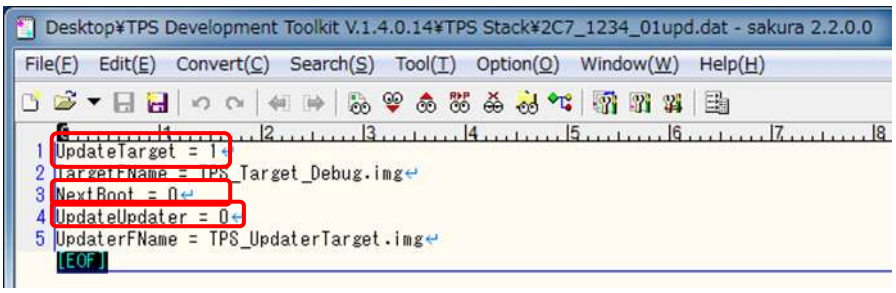


Figure 10-2-5 FW Update Procedure (5)

10.2.6 Checking TPS-1 stack image file write

- Reference Bootp/Tftp Logfile, and wait until the following logs have been output:
  Incoming readrequest for file : TPS_Target_Debug.img
  Incoming writerequest for file : 192_168_2_upd.sts

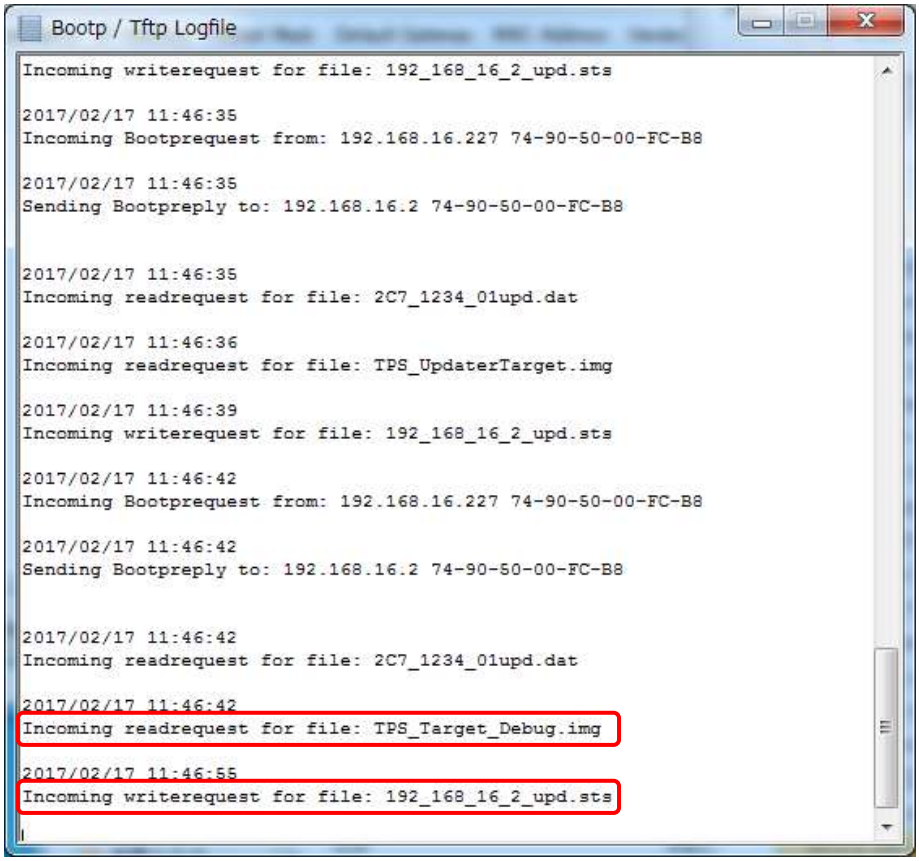


Figure 10-2-6 FW Update Procedure (6)

10.2.7 Checking the image file write results

- Open the status file 192.168.2_ups.sts, which is found in the work folder.
- Check to make sure that the 6th line, right under [Update Target], reads “performed=yes”.
- If it reads “performed=yes”, the FW update is complete.

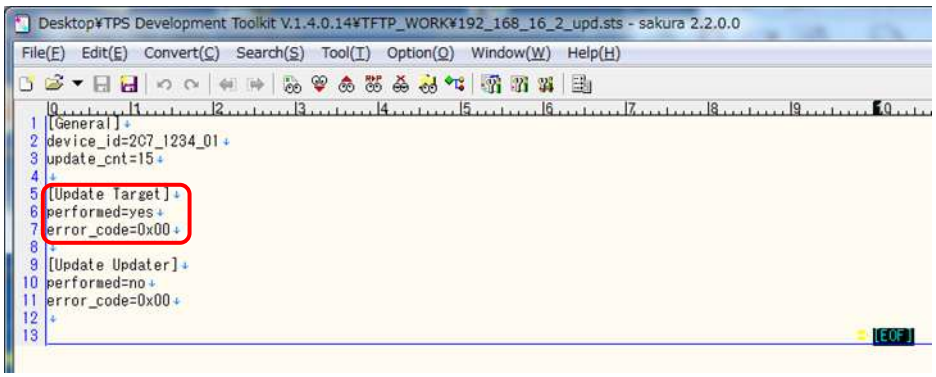


Figure 10-2-7-1 FW Update Procedure (7)

Post FW update log:
When the update completes successfully, the following screen is displayed in the Terminal Program.

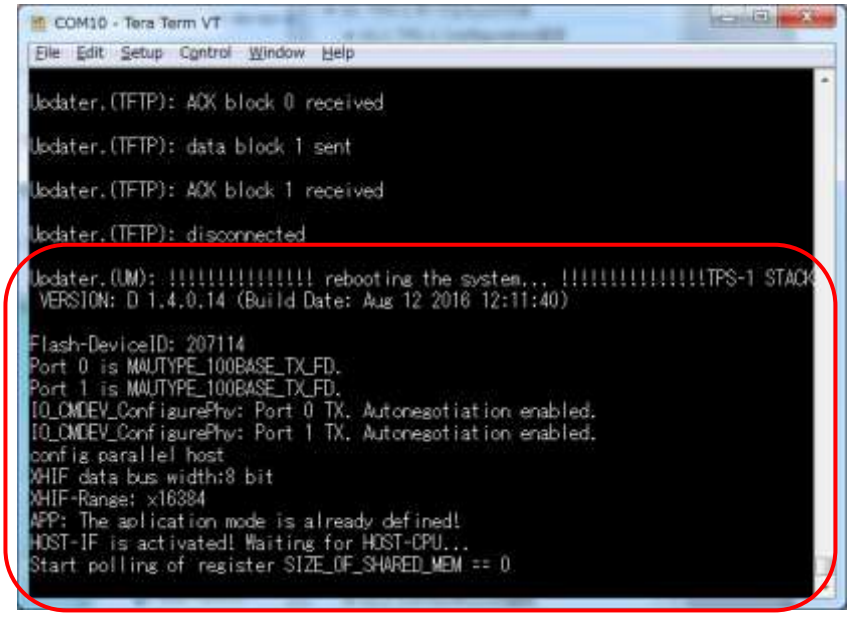


Figure 10-2-7-2 FW Update Procedure (8)

10.2.8 After FW update is complete

- Open the DAT file for TPS FWUpdater (VendorID_Device_ID_01upd.dat), which is found in the work folder.
- Enter the following settings to complete the process.
  UpdateTarget = 0
  NextBoot = 1
  UpdateUpdater = 1

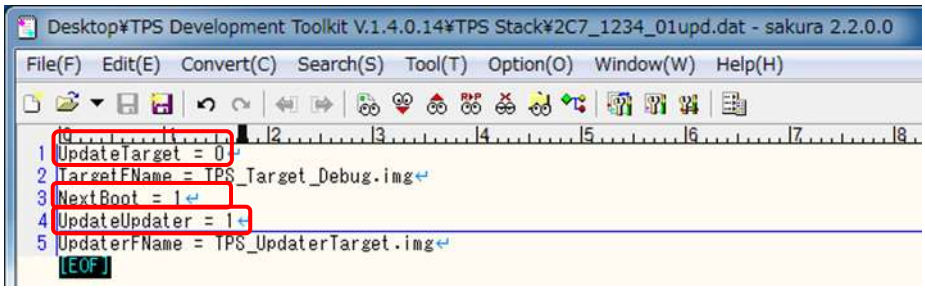


Figure 10-2-8-1 FW Update Procedure (9)

When in parallel I/O mode using the I/O board, TPS-1 becomes the Host. Writing to the stack on the TPS-1 Main board will generate the following Terminal Program display screen, and switch to READY state.

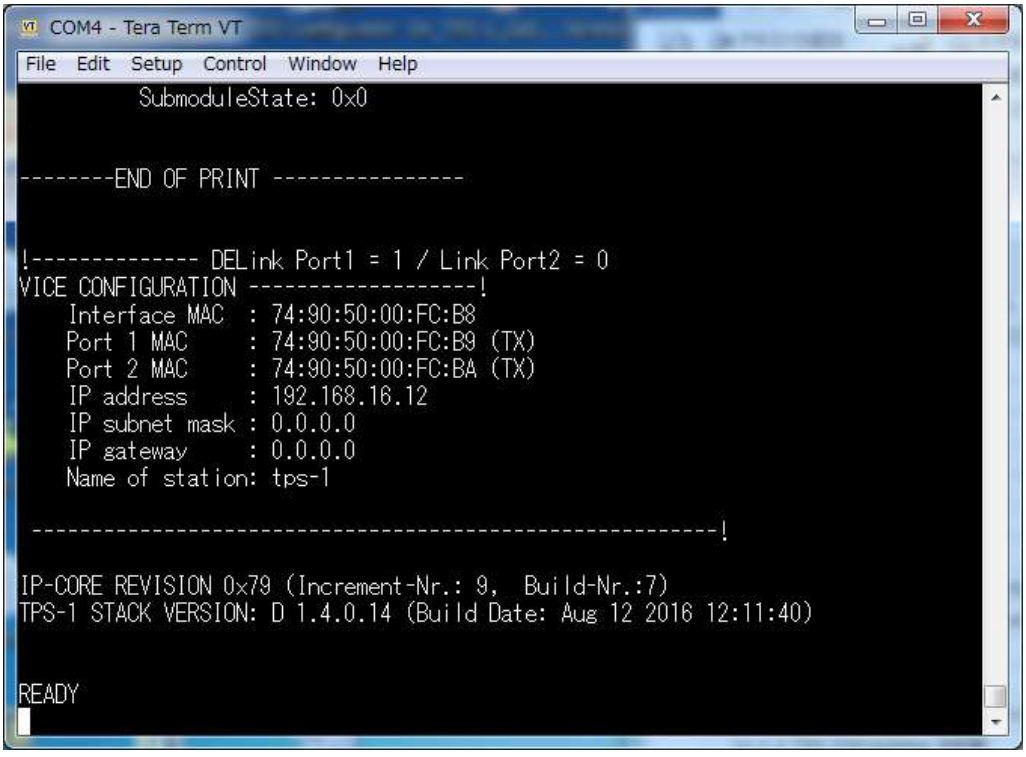


Figure 10-2-8-2 FW Update Procedure (10)

11. Writing a Sample Program for the CPU Board

11.1 Connecting the CPU board (RX231) and Computer

- Connect the TPS-1 main board and CPU board.
- Using a USB cable, connect the computer and CPU board through the E1 emulator.
- Supply 5V DC power to the TPS-1 main board through the USB or DC jack.

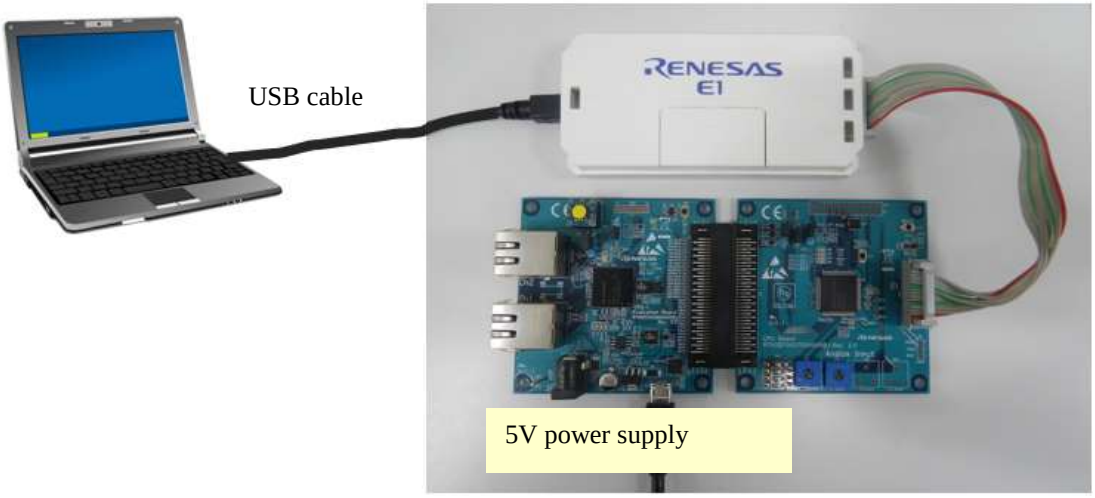


Figure 11-2 CPU board (RX231) and PC Connection

11.2 CPU Compiler Package Installation

This explanation in this section assumes that the CPU compiler package “CS+” has already been installed on the computer and that the E1 Emulator is ready for use.

11.2.1 Writing an RX231 sample program

Click on the project file (rx231_tps1_sampl.mtpj) in the sample program.
CS+ boots, and the following screen is displayed.

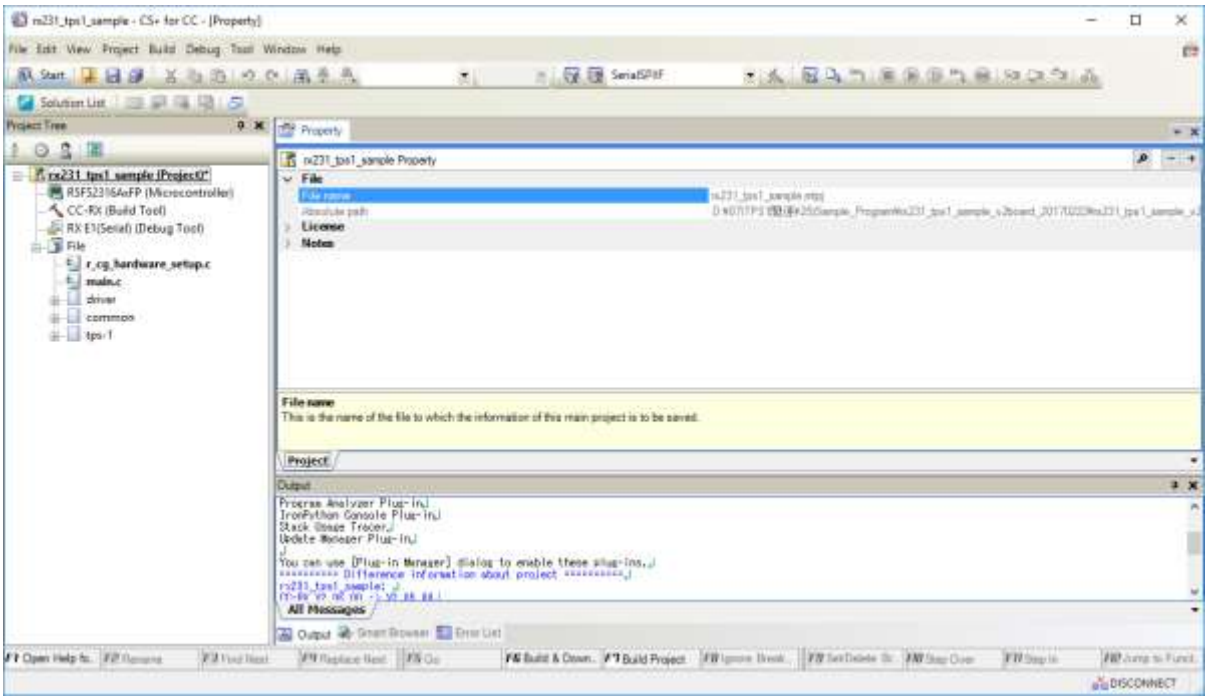


Figure 11-2-1-1Sample Program Writing (1)

Select a build option (parallel 16-bit, parallel 8-bit or serial SPI IF), based on the interface being used.

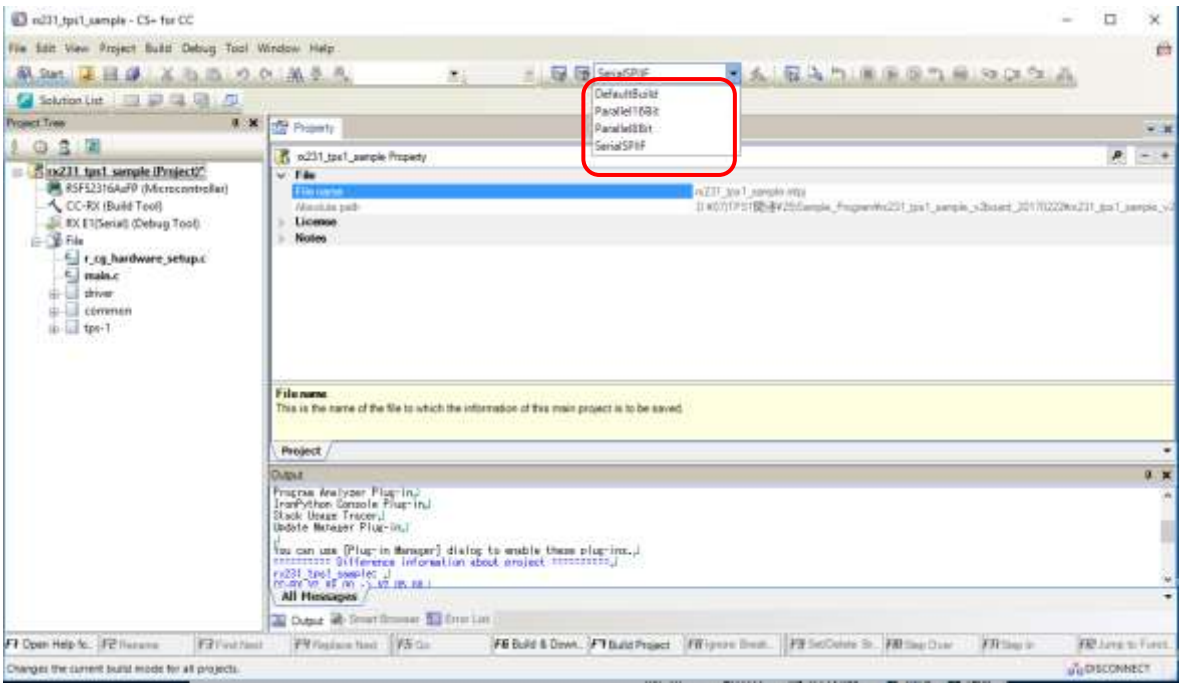


Figure 11-2-1-2 Sample Program Writing (2)

Build the program and download it to Tools.
Go to **Debug** (D) → Download to **Build & Download** (B).

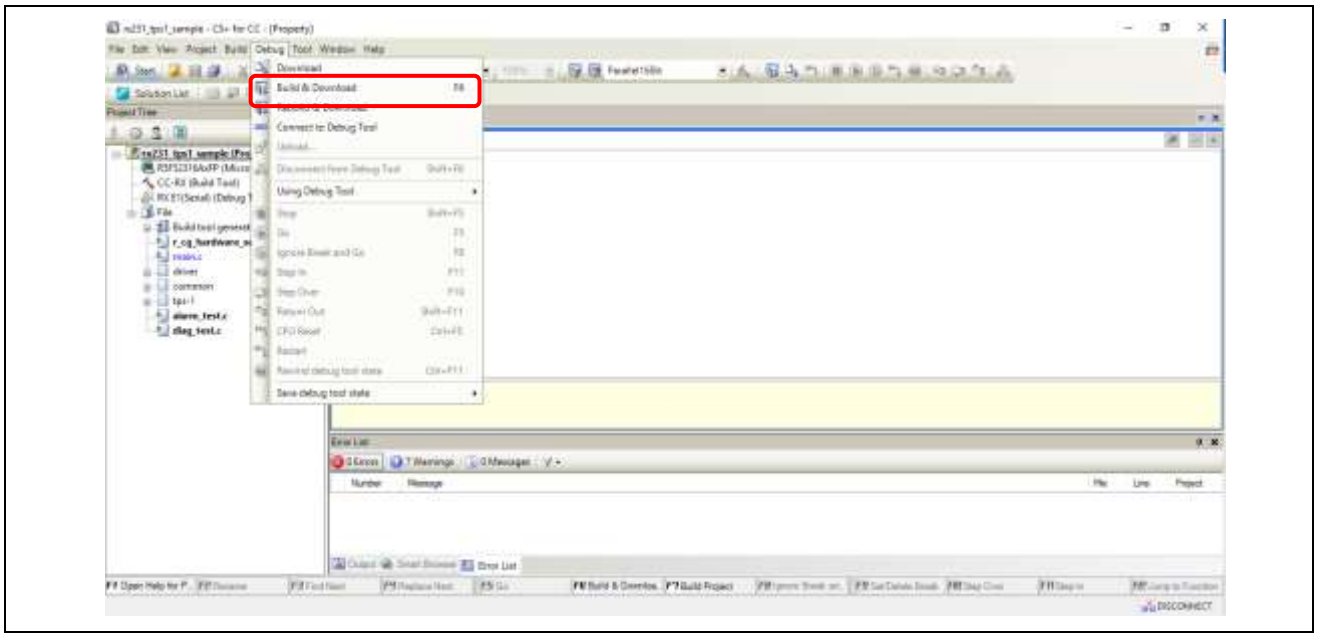


Figure 11-2-1-3 Sample Program Writing (3)

Select “Execute”. Go to **Debug** (D) and select **Go** (G).

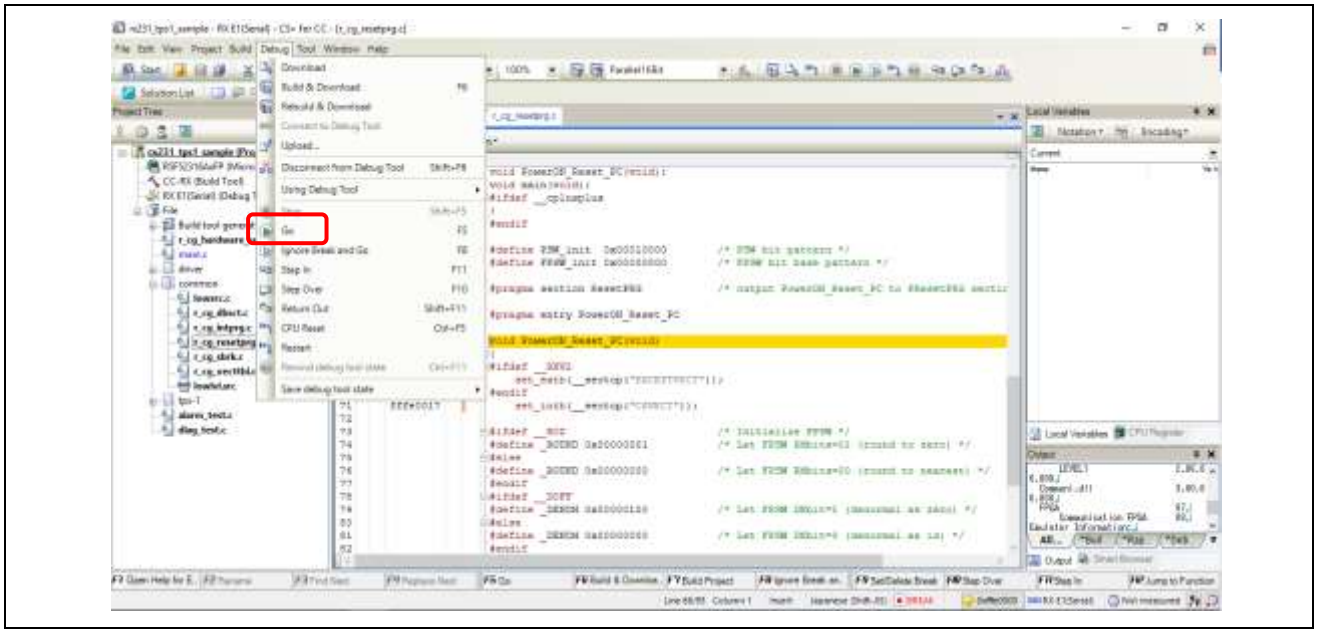


Figure 11-2-1-4 Sample Program Writing (4)

When the program has been executed and the CPU operates as the Host, the following screen appears in the Terminal Program, indicating that the system is in the READY state.
When using an I/O board in the parallel I/O mode, because the TPS-1 becomes the Host, writing a stack on the TPS-1 main board side produces the READY state, as shown on the screen below.

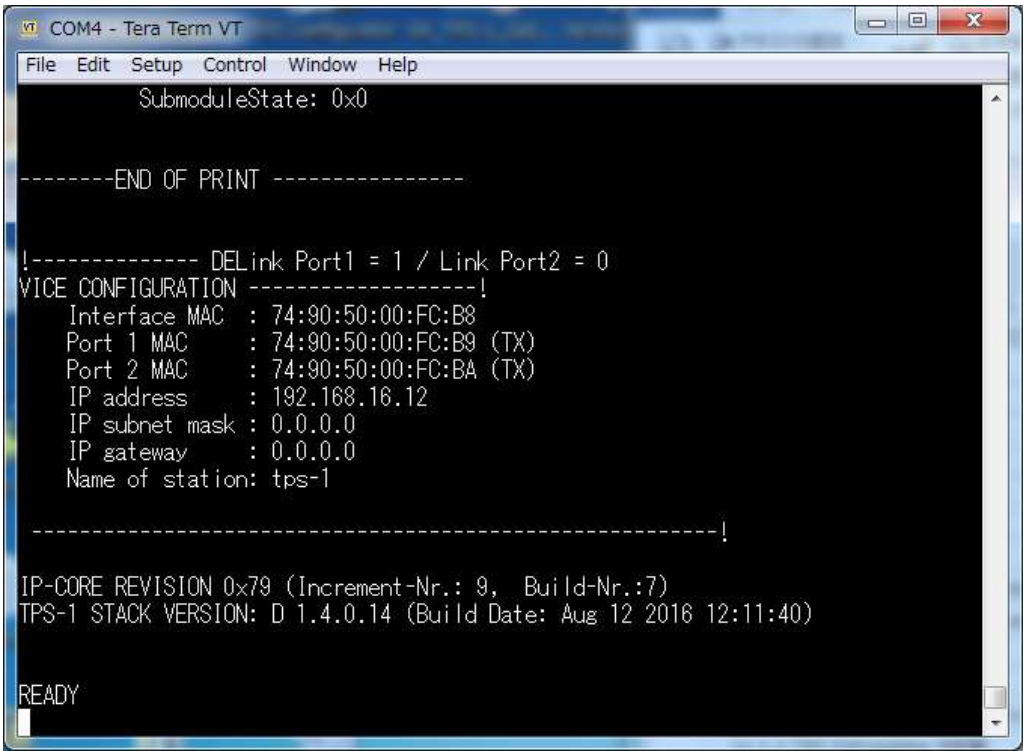


Figure 11-2-1-5 Sample Program Writing (5)

After the firmware writing is complete, select Debug →Stop to stop the writing process.
Select **Debug** (D), then **Stop** (S).

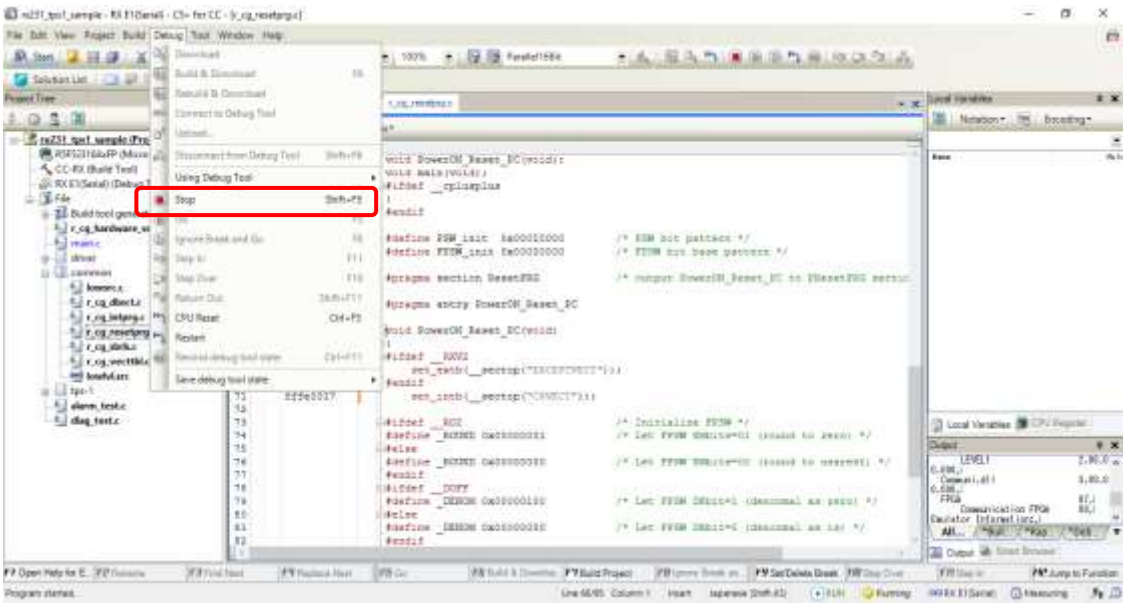


Figure 11-2-1-6 Sample Program Writing (6)

Select Disconnect from Debug => Debugging Tool to exit.
Select **Debug** (D), then **Disconnect from Debug Tool**(N).

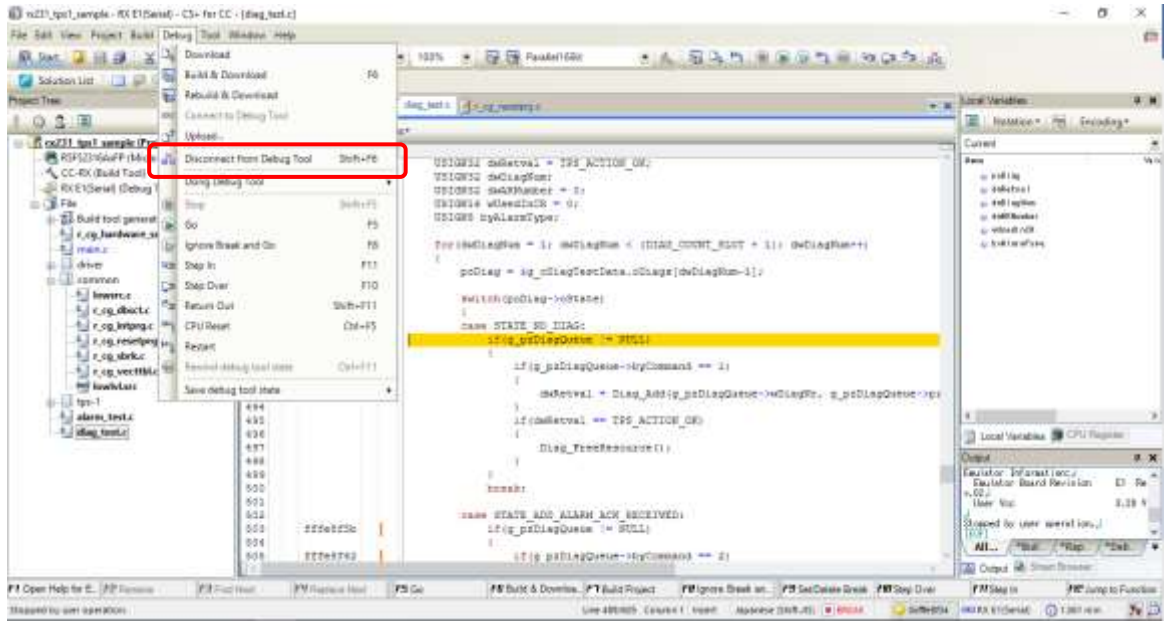


Figure 11-2-1-7 Writing Sample Program (7)

12. Startup PROFINET Communication

12.1 Defining PROFINET Device Names

Define the PROFINET devices names as you like. This document uses “TPS-1”.

12.1.1 Creating a settings file

Boot Netnames+, which comes with PROFINET Configurator.
Then click **Refresh**.

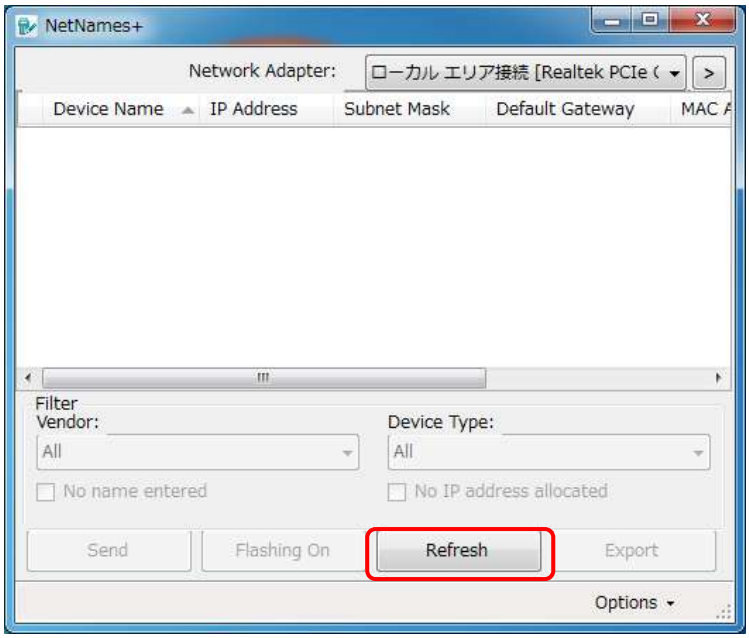


Figure 12-1-1-1 Device Name Setting (1)

When the network settings noted on the screen below are displayed, enter “TPS-1” for Device Name.

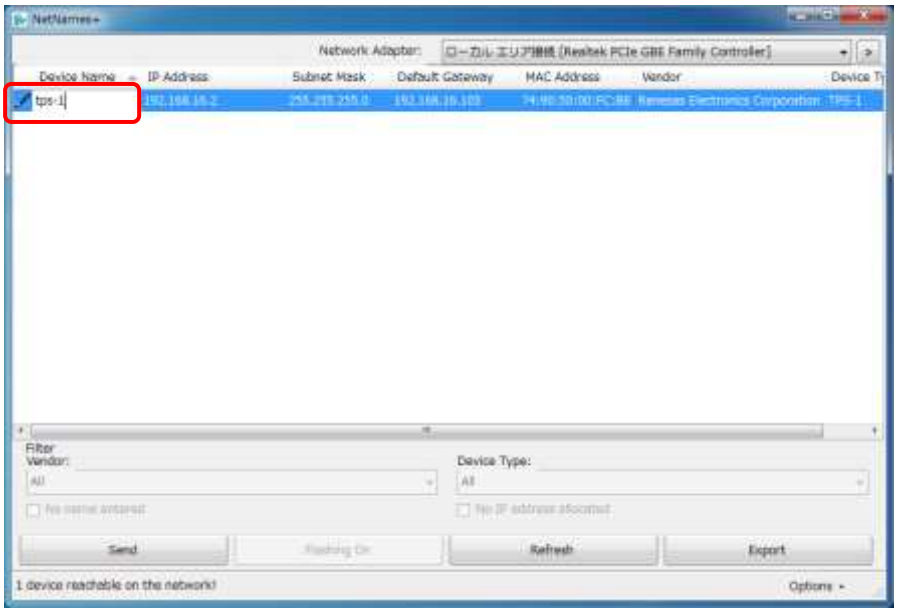


Figure 12-1-1-2 Device Name Setting (2)

Click **Send** to complete the setting procedure.

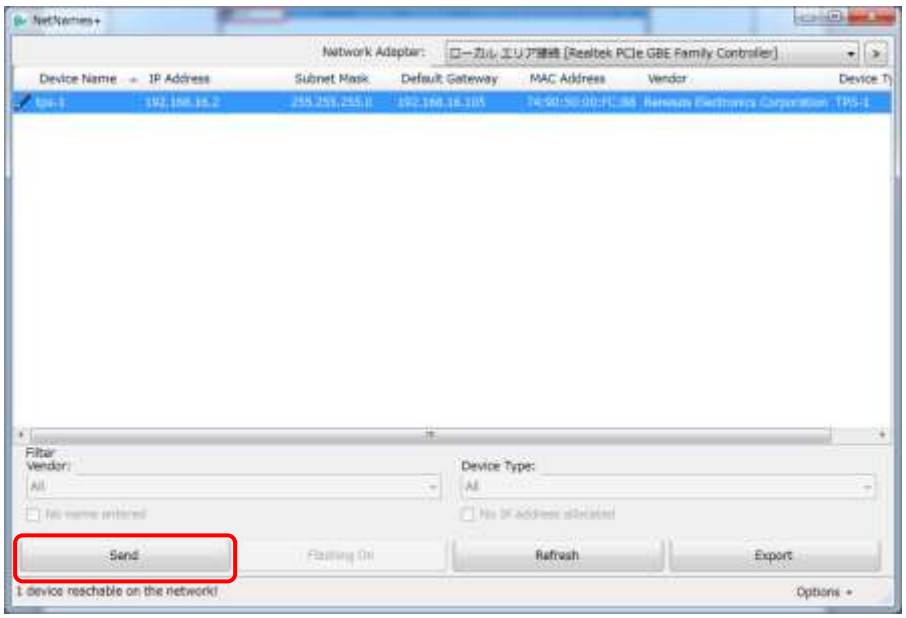


Figure 12-1-3 Device Name Setting (3)

12.1.2 PROFINET Configurator

Boot PROFINET Configurator.

12.1.2.1 Reading the settings file.

Open the settings file.

Under the tool bar, select **File**, then **Open**.

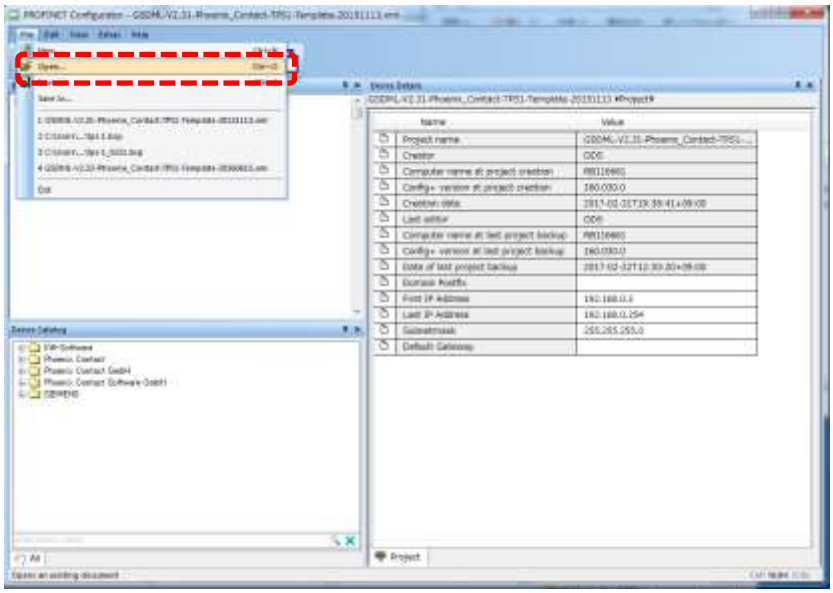


Figure 12-1-2-1 PROFINET Configurator Settings (1)

Select the settings file. Please select the prepared file as shown below.

TDT/PROFINET Configurator/Example Project/tps-1.zcp

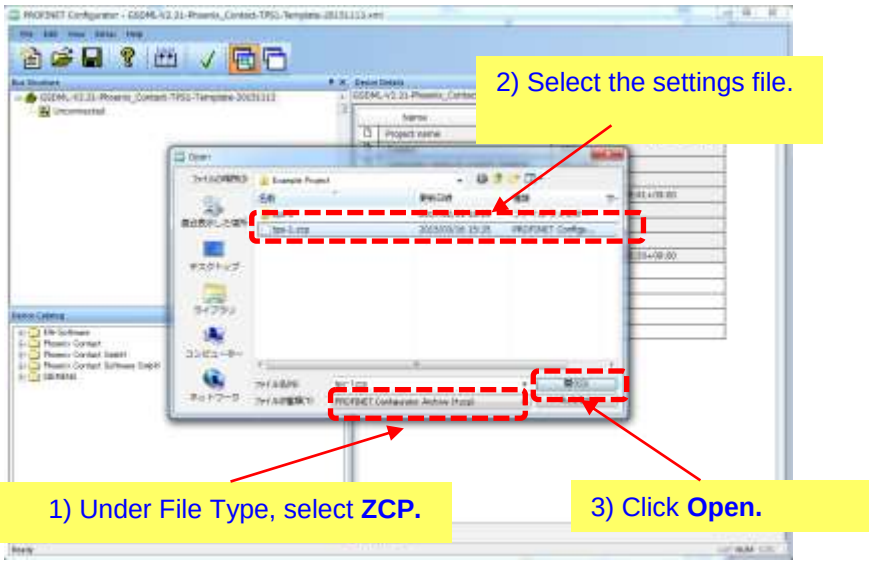


Figure 12-1-2-2 PROFINET Configurator Settings (2)

Click **Yes**.

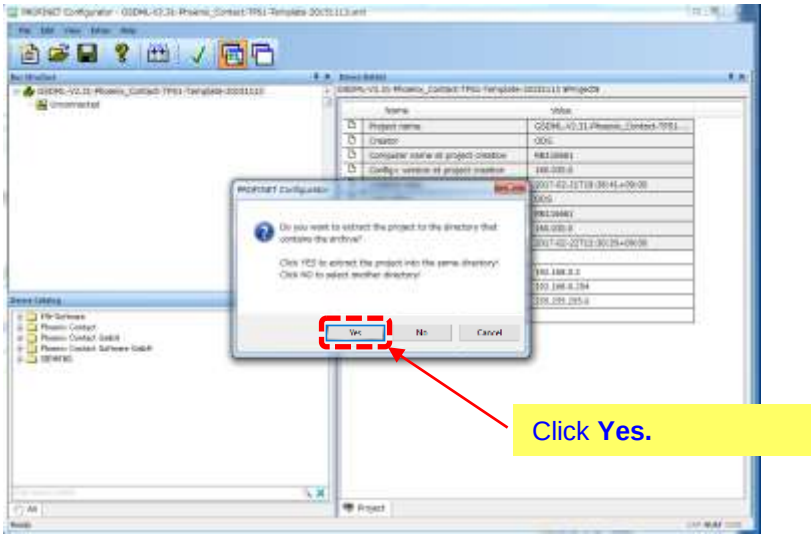


Figure 12-1-2-3 PROFINET Configurator Settings (3)

12.1.2.2 Register the device

Register the device to be connected in Device Catalog.
1) Right-clicking in the **Device Catalog** area opens a sub-window.
2) Left-click on **Import GSD File**.

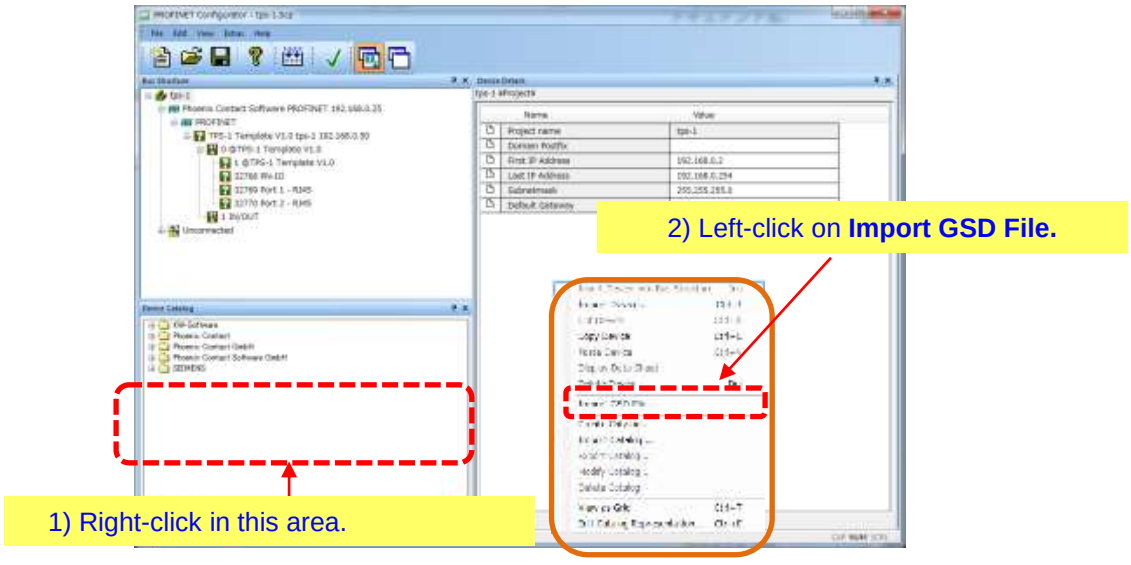


Figure 12-1-2-4 PROFINET Configurator Settings (4)

Select the previously prepared GSDML file, and click **Open**.

In this example, we explain how to open the GSDML file prepared by Renesas Electronics.

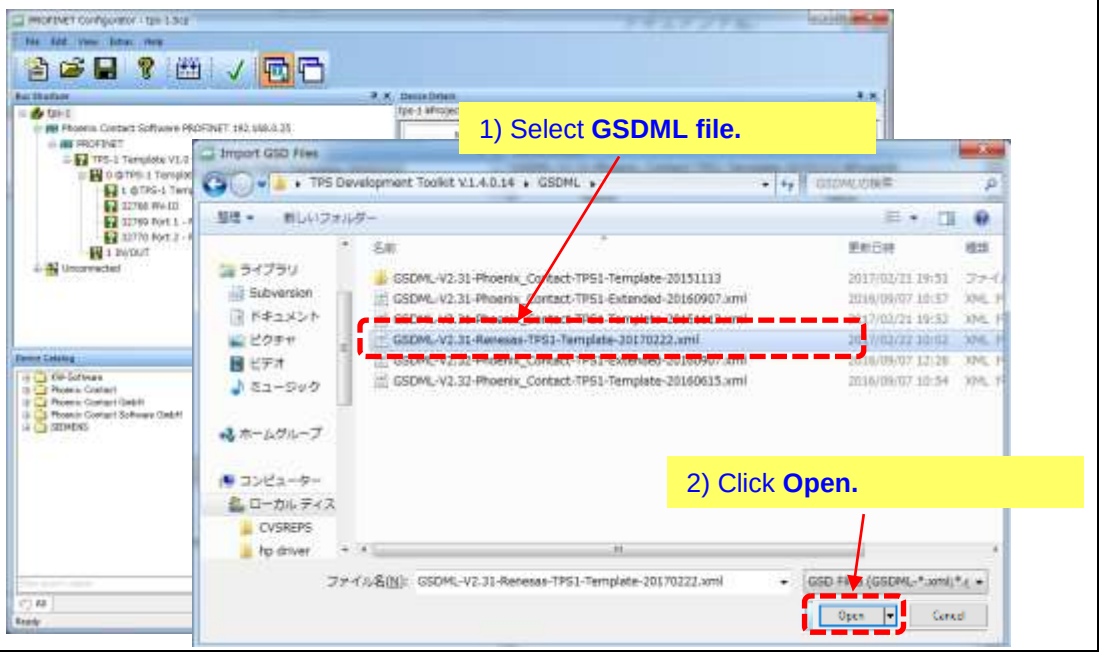


Figure 12-1-2-5 PROFINET Configurator Settings (5)

In the example used here, **Renesas Electronics** selected to be added to Device Catalog.

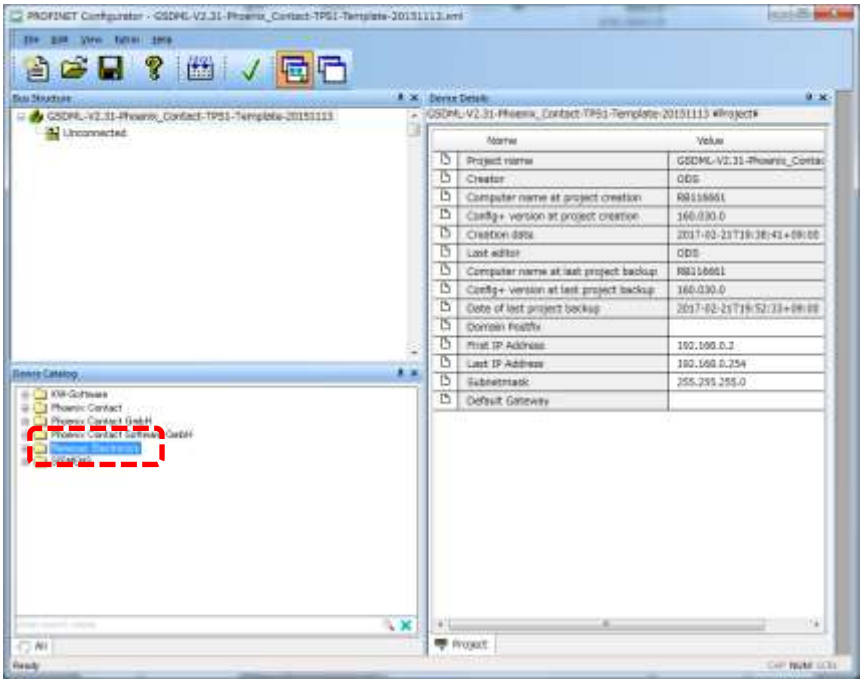


Figure 12-1-2-6 PROFINET Configurator Settings (6)

12.1.2.3 Create the topology.

Delete any unnecessary devices. In the example, the devices inside the red line shown below will be deleted.

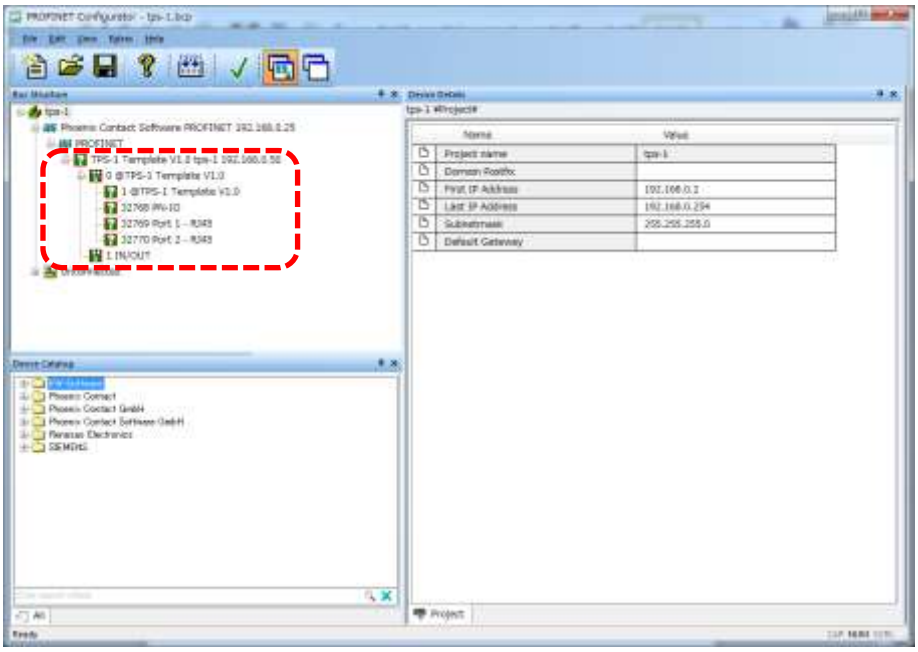


Figure 12-1-2-7 PROFINET Configurator Settings (7)

1) Select **PROFINET** under Bus Structure.

2) To form the topology, select the device(s) to be added from Device Catalog.

In the example used here, **Renesas Electronics** is selected as the device to be added.

Open the sub-layers under **Renesas Electronics**, and double-click on the location shown below.

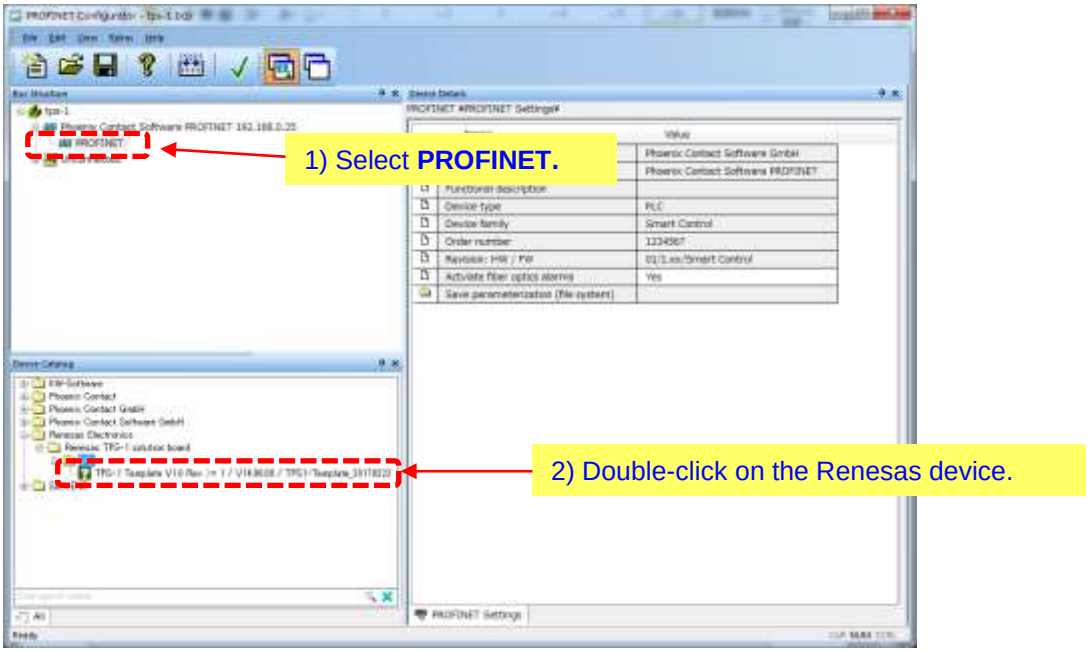


Figure 12-1-2-8 PROFINET Configurator Settings (8)

The PROFINET device is added to the bus structure.

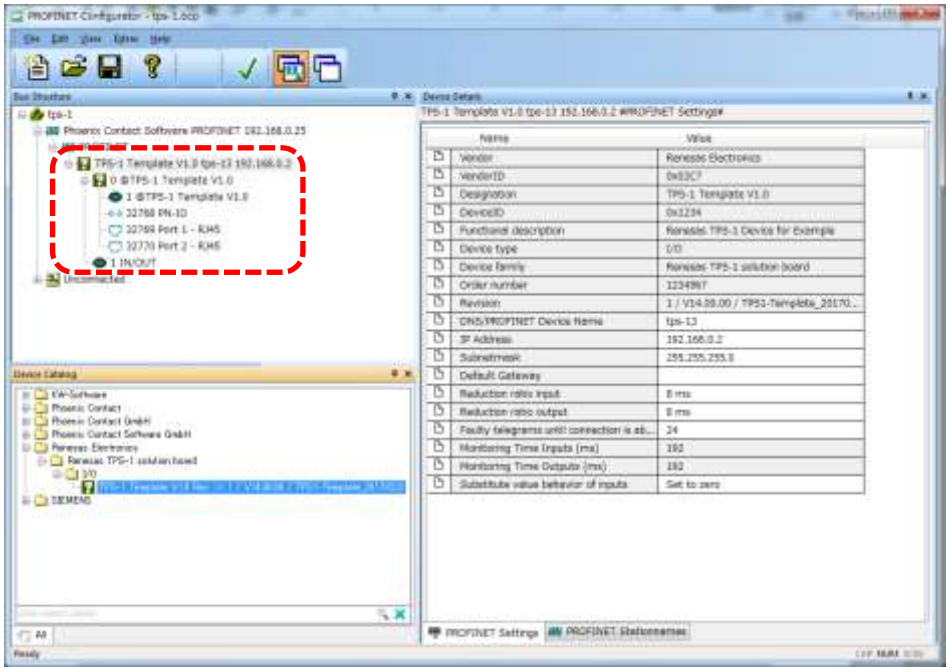


Figure 12-1-2-9 PROFINET Configurator Settings (9)

Specify the IP address range for the PROFINET device.
1) From Bus Structure, select **tps-1**.
2) Specify “Last IP Address”.
3) Set the “First IP Address”.
4) Set the “Subnet Mask”.
The values to be set are shown in the figure below.

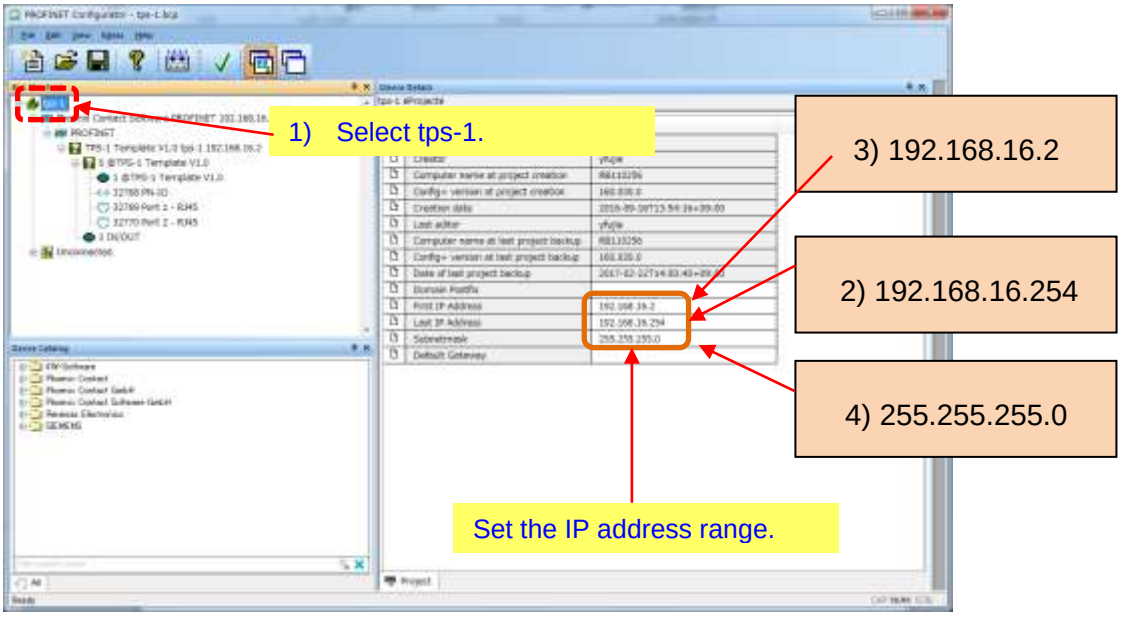


Figure 12-1-2-10 PROFINET Configurator Settings (10)

Enter the settings for the PROFINET IO controller.
1) From Bus Structure, select “Phoenix Contact Software PROFINET 192.168.16.201”.
2) From Device Details, enter IP Address and Subnetmask.
The following examples shows the IP address setting.

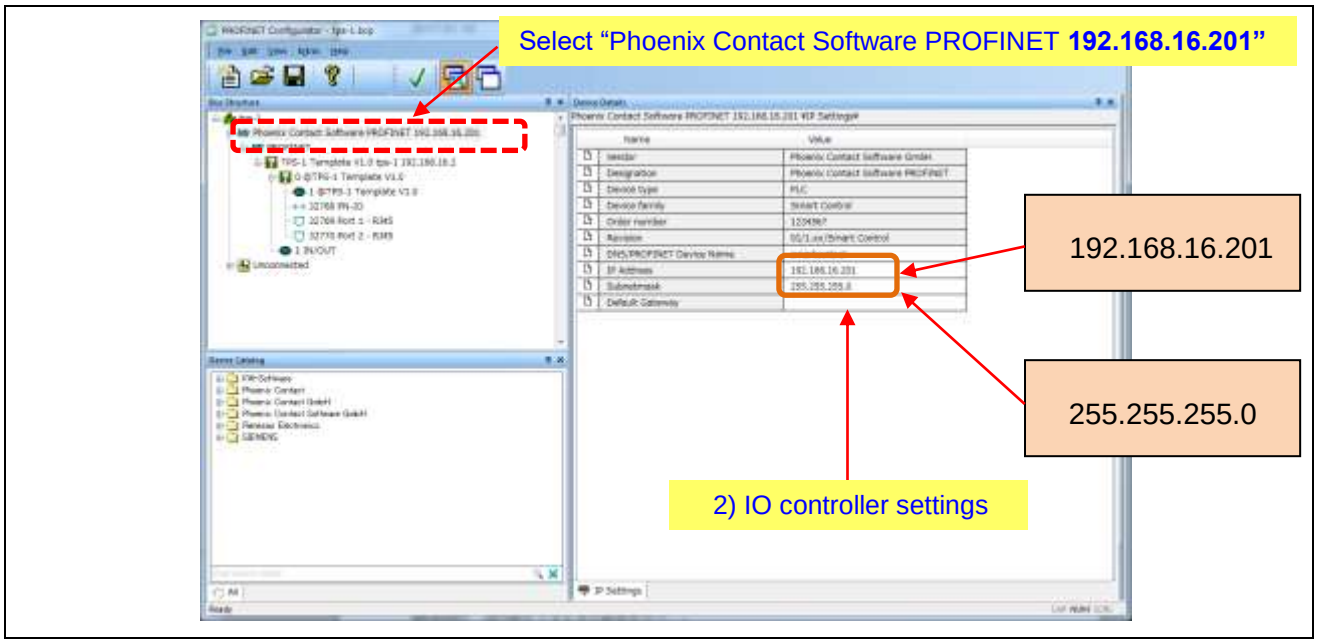


Figure 12-1-2-11 PROFINET Configurator Settings (11)

Specify the PROFINET OUTPUT folder.
1) Select **PROFINET** under Bus Structure.
2) In PROFINET/PROFINET Settings, double click on **Save parameterization**.

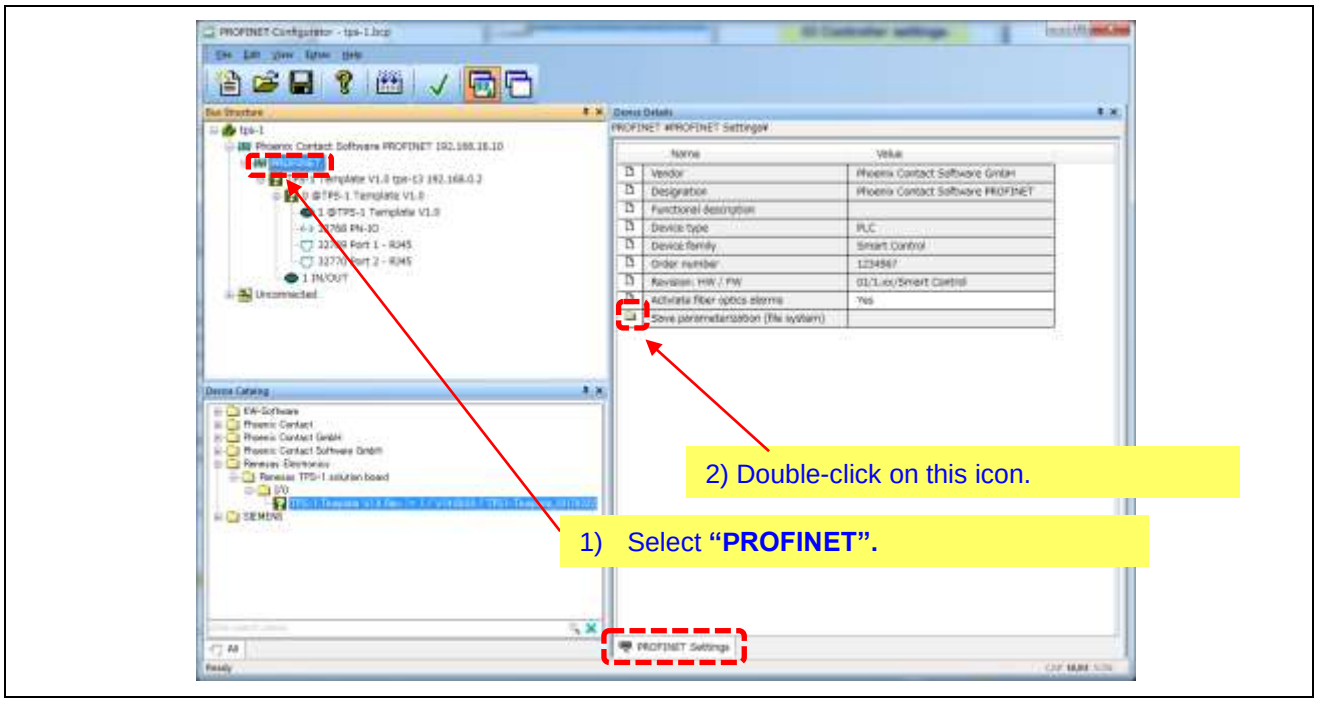


Figure 12-1-2-12 PROFINET Configurator Settings (12)

Under “Path for download to the file system”, select the folder called TDT/PROFINET Configurator/Example Project/.

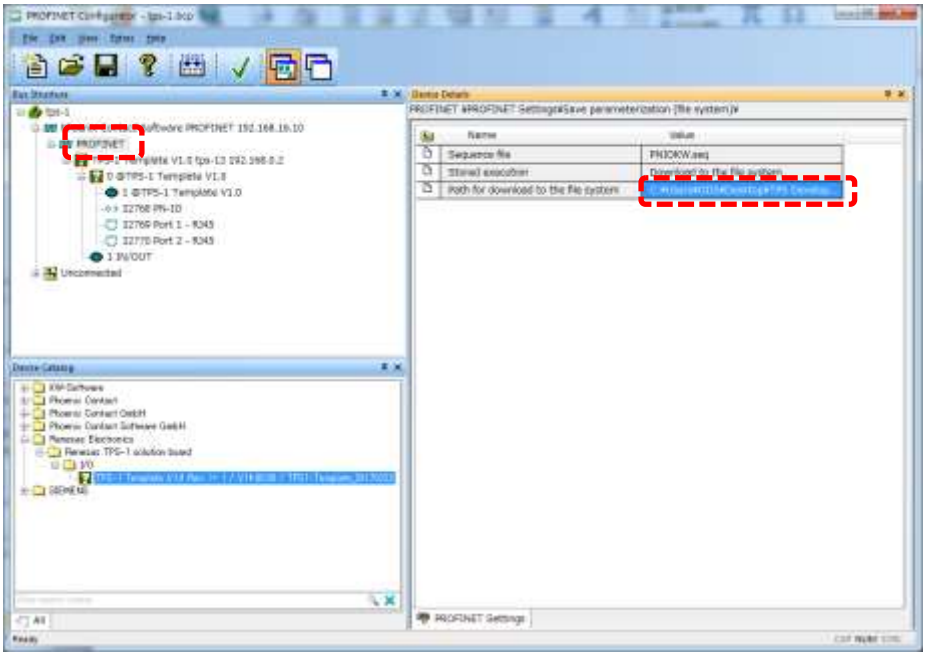


Figure 12-1-2-13 PROFINET Configurator Settings (13)

Set the registered PROFINET devices.
1) As shown below, select the PROFINET device under Bus Structure.
2) Select PROFINET Setting under Device Details.
3) Confirm the IP address and Subnetmask value under Device Details.

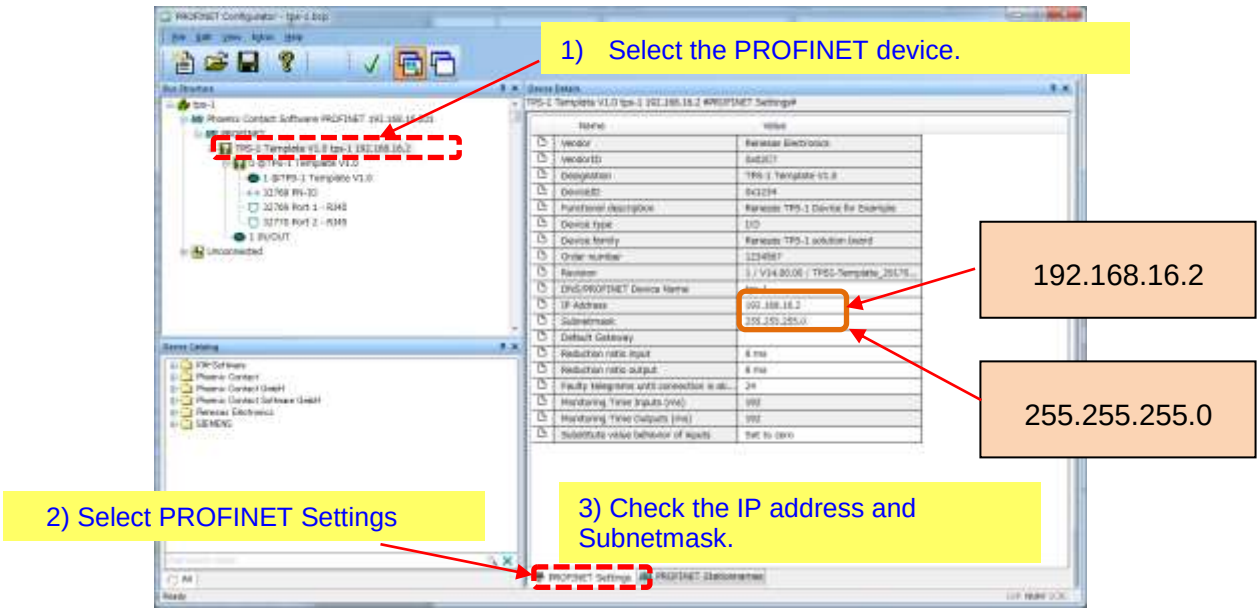


Figure 12-1-2-14 PROFINET Configurator Settings (14)

1) Switch the tab from **PROFINET Setting** to **PROFINET Stationnames**.
   TPS-1 devices that can be used will be displayed.
2) Click on the TPS-1 device.
3) Click **Assign Name**.

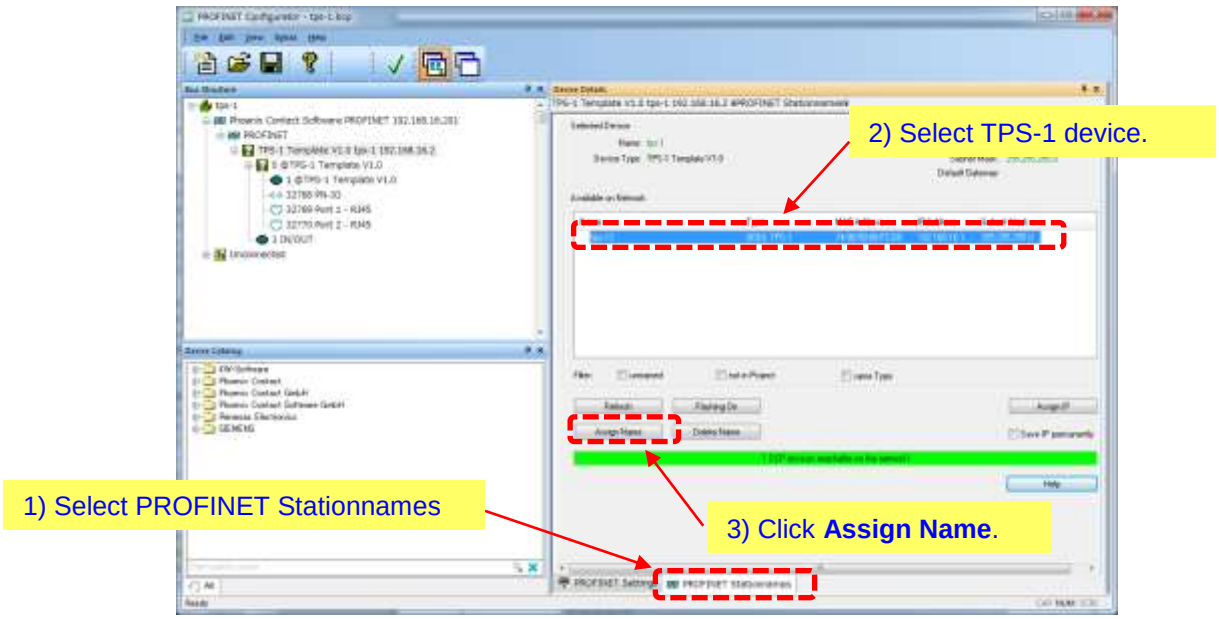


Figure 12-1-2-15 PROFINET Configurator Settings (15)

The device allocation process is completed when the following is displayed.

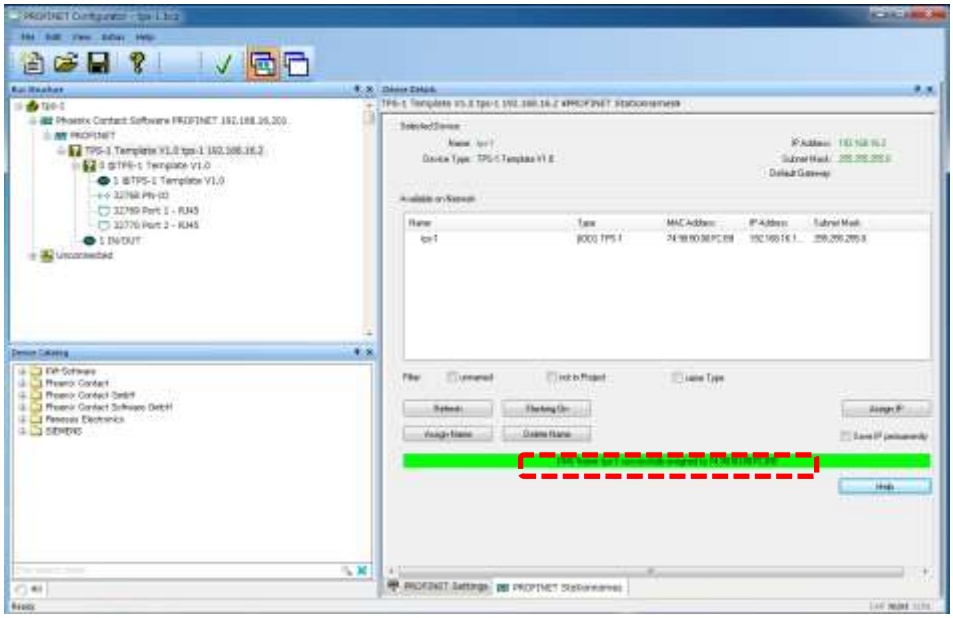


Figure 12-1-2-16 PROFINET Configurator Settings (16)

Execute Parameterize.
1) Under Bus Structure, select **PROFINET**.
2) Click **Parameterize**.

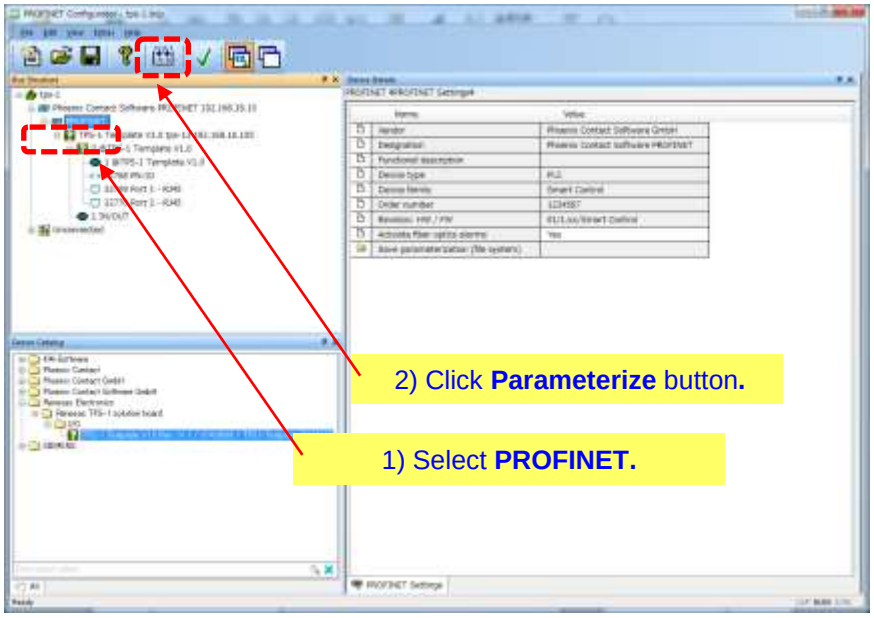


Figure 12-1-2-17 PROFINET Configurator Settings (17)

Click **Execute**, and then click **"Y" for Yes**.

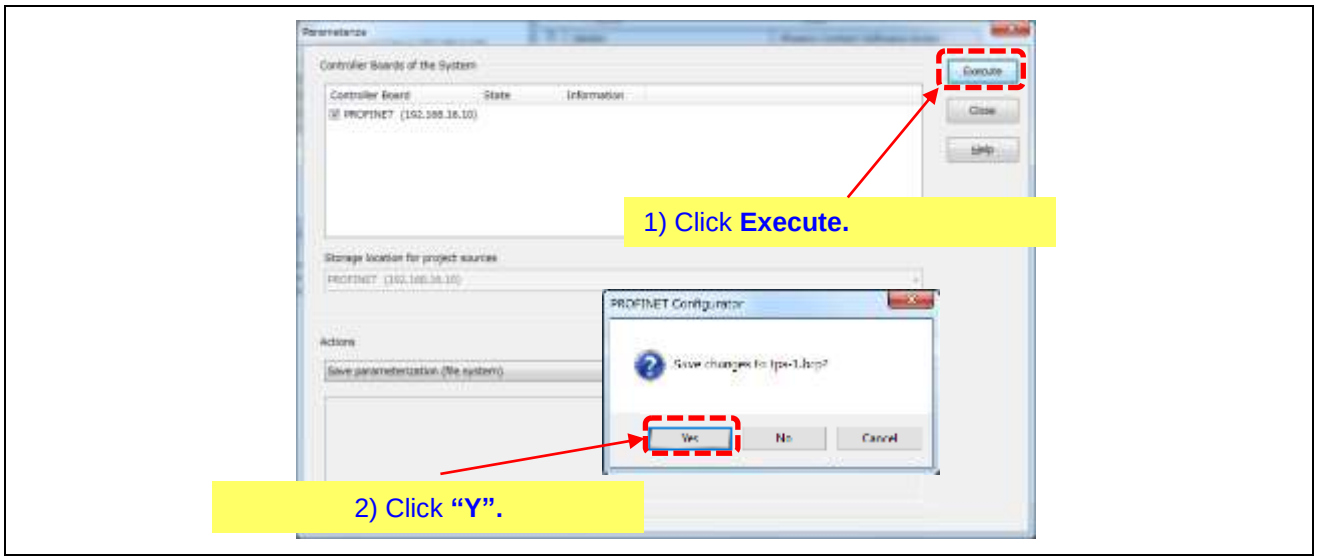


Figure 12-1-2-18 PROFINET Configurator Settings (18)

1) "Completed" will show as the state.
2) Click **Close** to complete the process.

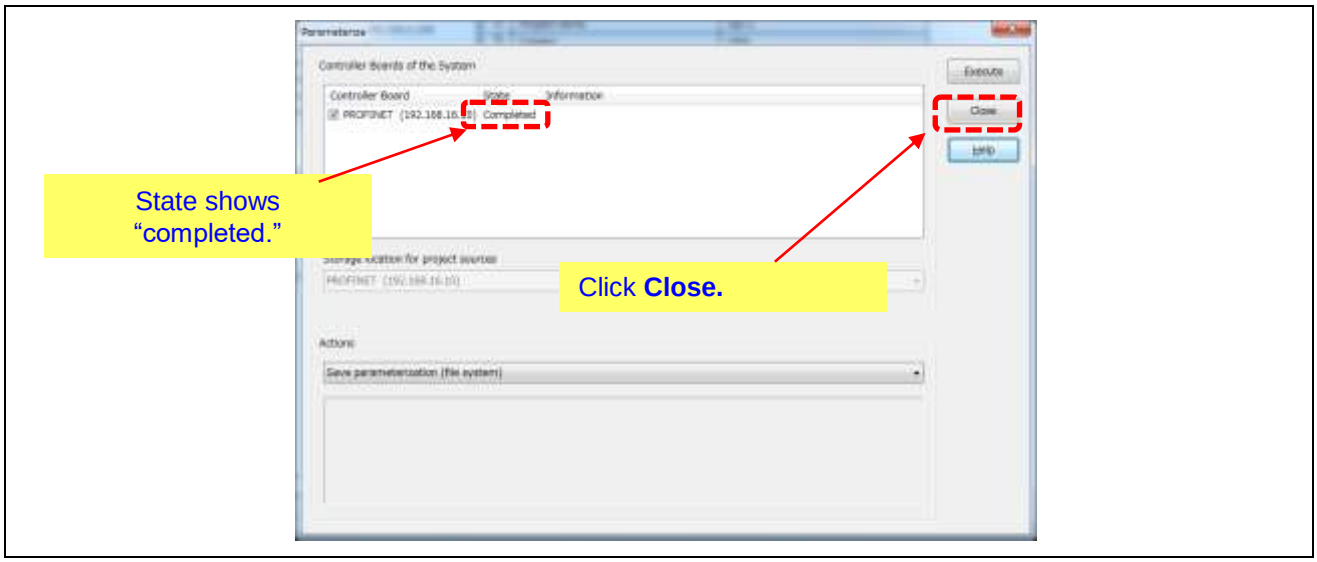


Figure 12-1-2-19 PROFINET Configurator Settings (19)

12.2 Connecting the Software PLC

12.2.1 PROFINET Smart Control Express

Boot PROFINET Smart Control Express.
Load the XML file called “IPPNIO”. (Application → Parse XML-File)
TDT/PFOFINET Configurator/Example Project/IPPNIO.xml

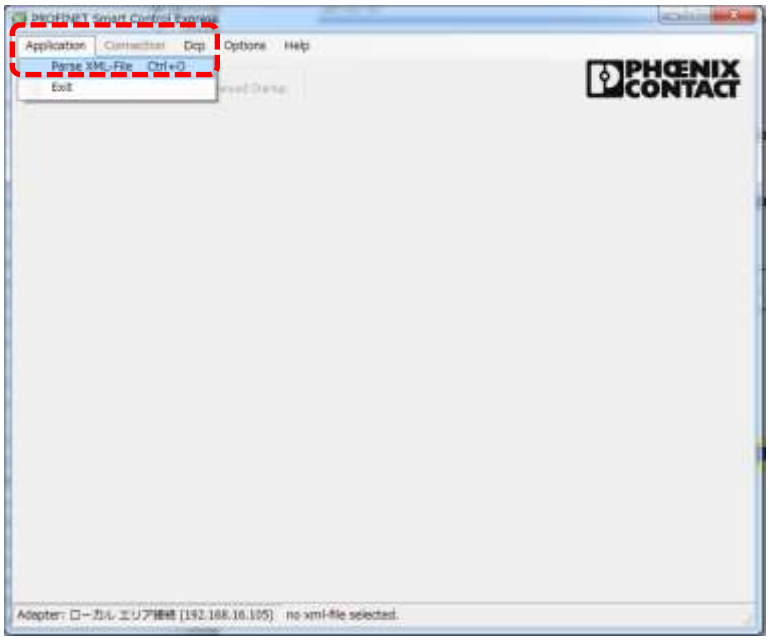


Figure 12.2.1 Booting PROFINET Smart Control Express (1)

Under Device Selection, select TPS-1.

Figure 12.2.2 Booting PROFINET Smart Control Express (2)

Click **START AR**.

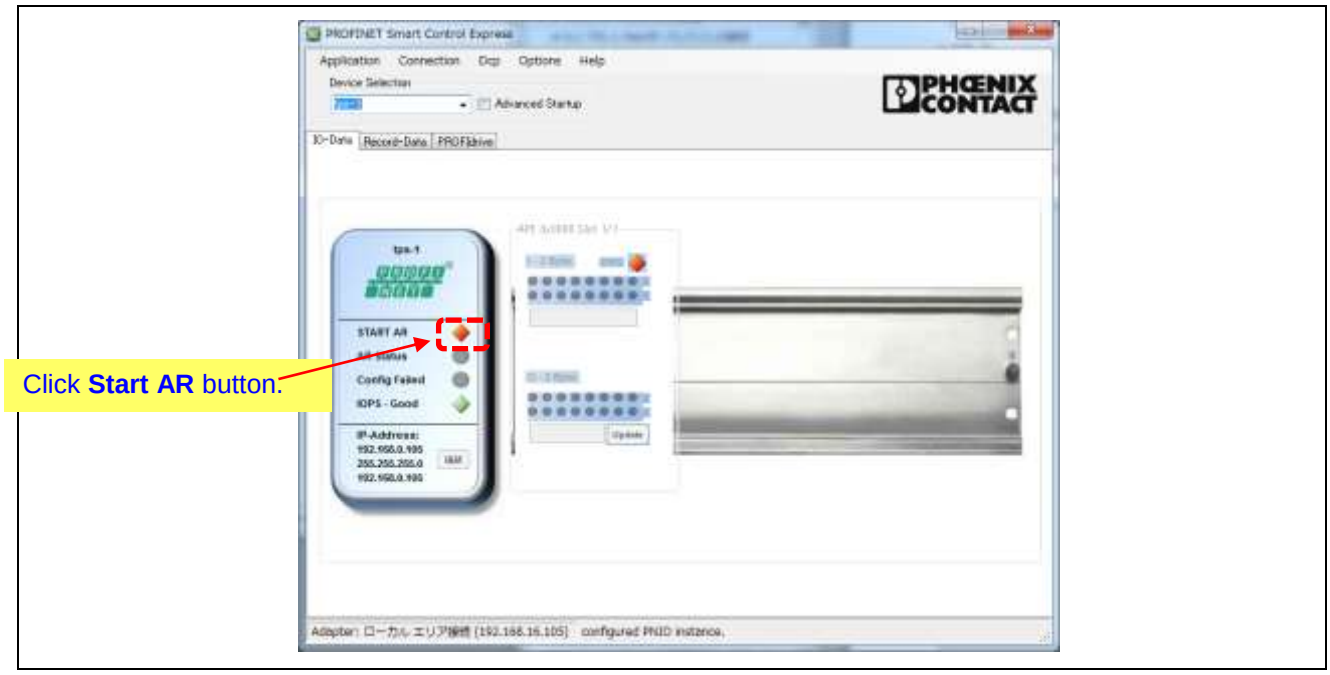


Figure 12.2.3 Booting PROFINET Smart Control Express (3)

AR Connected and AR Status are enabled.
The AR Connected and AR Status symbols turn green, as shown in the figure below, to indicate the connection with the software PLC is complete.

Figure 12.2.4 Booting PROFINET Smart Control Express (4)

12.2.2 Confirm I/O Board Operations

1) Data transmission from master
TPS-1 ports GPIO8 to GPIO15 are assigned to the lower byte of output settings of PROFINET Smart Control Express. Port status can be confirmed based on whether the corresponding LED (LED1 to LED8) is ON or OFF.

Specify “0x00FF” as the output setting for PROFINET Smart Control Express to turn the LEDs on the I/O board OFF.

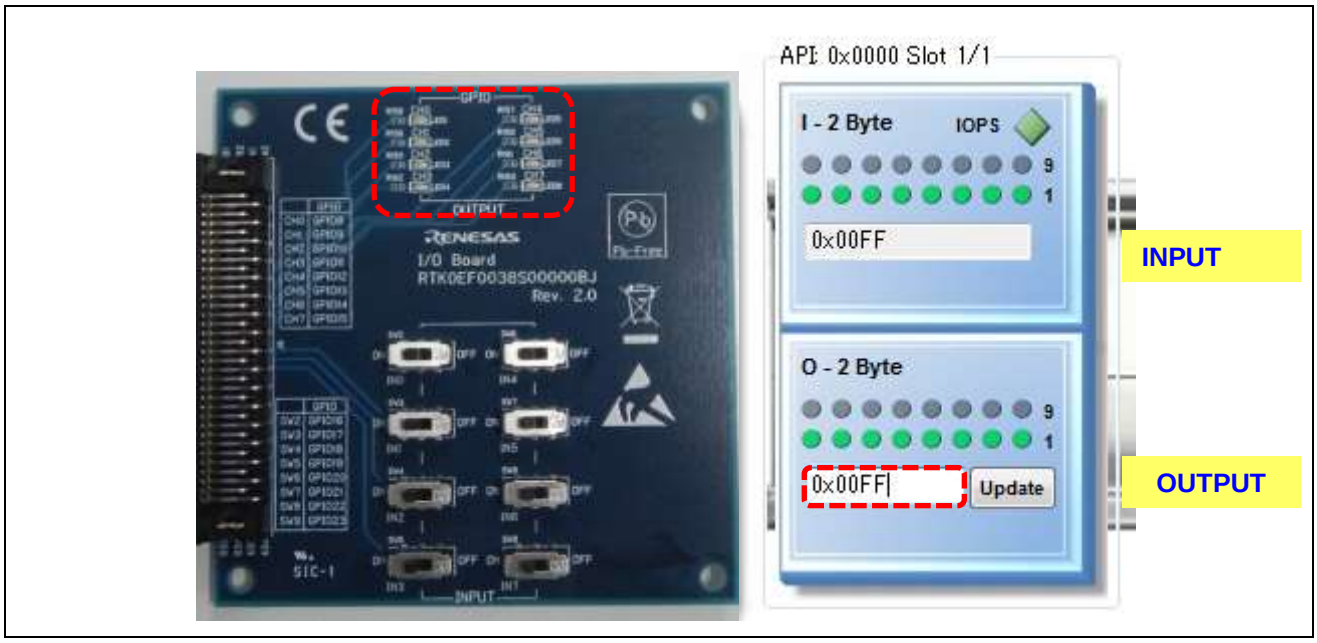


Figure 12-2-2 I/O Board Operation Check (1)

2) Specify “0x0000” as the output setting for PROFINET Smart Control Express to turn the LEDs on the I/O board ON.

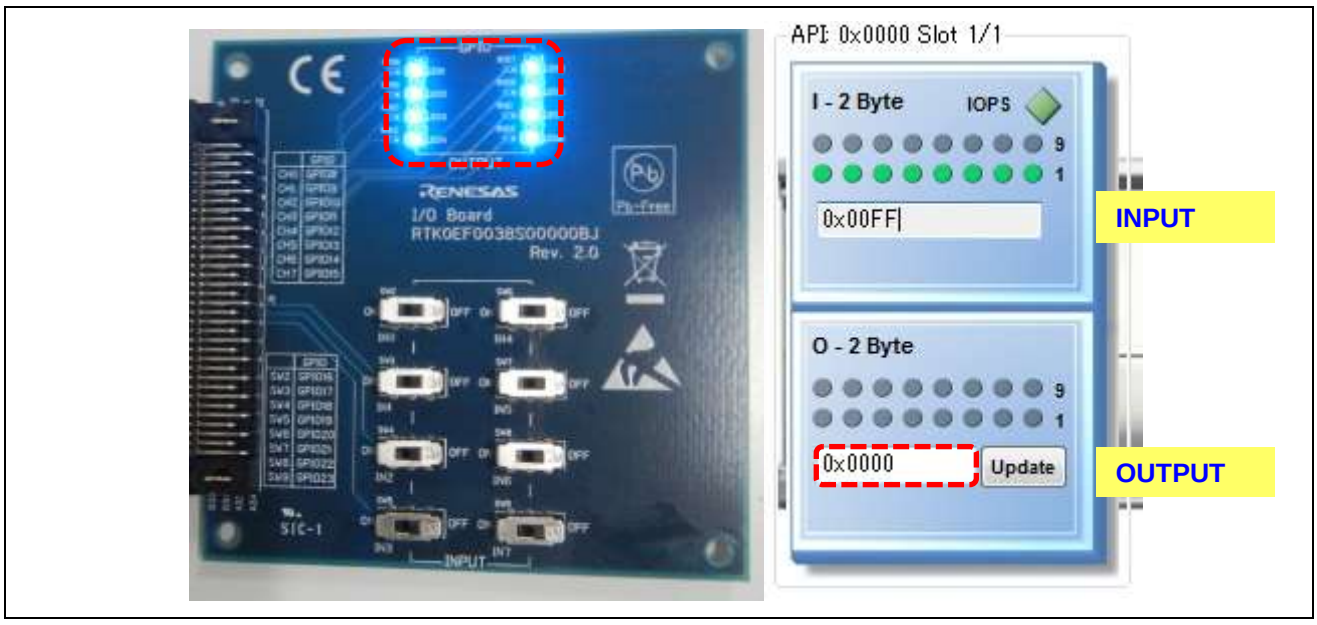


Figure 12-2-2 I/O Board Operation Check (2)

3) TPS-1 ports (GPIO16 to GPIO23) are assigned to the upper byte INPUT settings of PROFINET Smart Control Express.
The virtual LEDs on PROFINET Smart Control Express can be turned ON and OFF by setting the I/O board switches SW2 to SW9.

Set the I/O board switches (SW2 to SW9) to ON to turn on the virtual LEDS on PROFINET Smart Control Express.

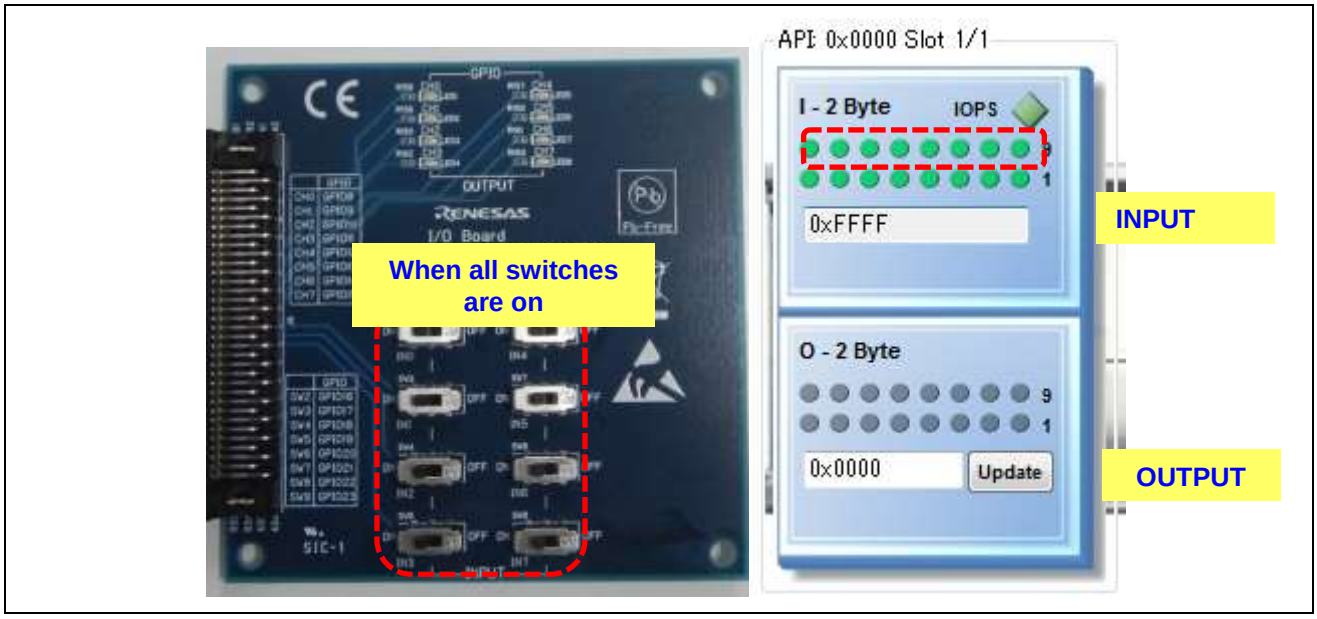


Figure 12-2-3 I/O Board Operation Check (3)

4) Set the I/O board switches (SW2 to SW9) to OFF to turn off the virtual LEDS on PROFINET Smart Control Express.

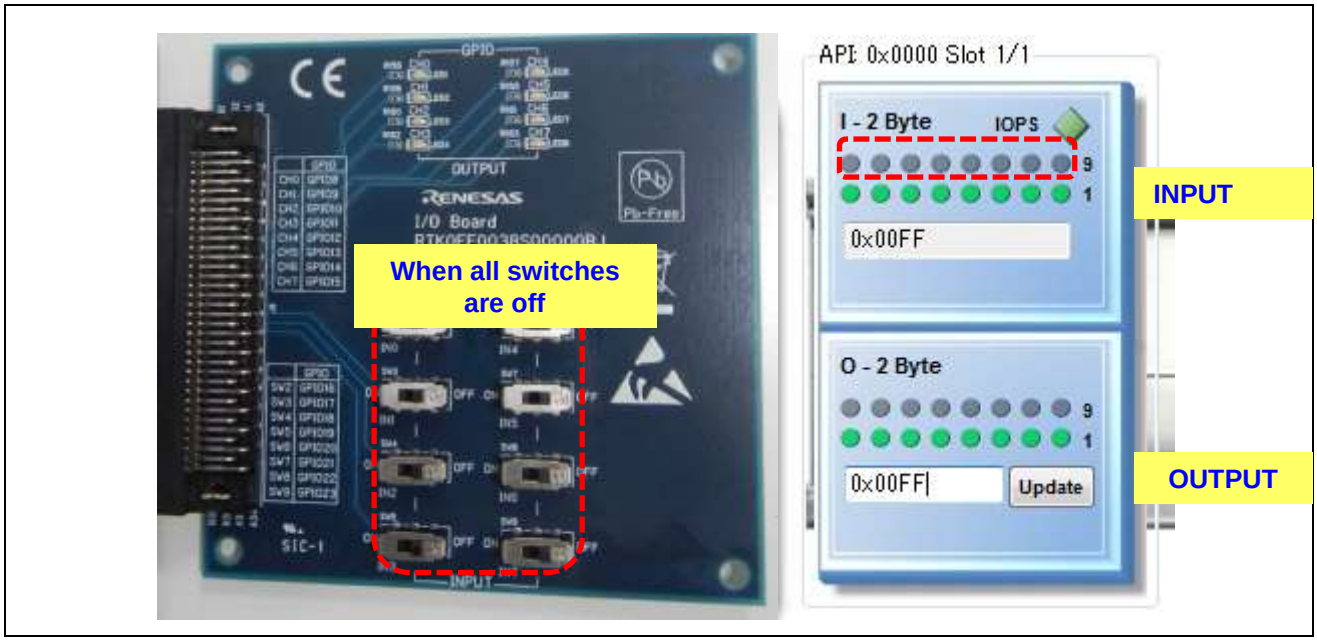


Figure 12-2-4 I/O Board Operation Check (4)

12.2.3 Confirm CPU Board Operations

1) Data transmission from master

CPU RX231ports PC0 to PC3 are assigned to the lower 4 bits of output settings of PROFINET Smart Control Express. Changes in port status can be confirmed based on whether the corresponding LED (LED8 to LED11) is ON or OFF.

Specify “0x00FF” as the output setting for PROFINET Smart Control Express to turn the LEDs on the CPU board OFF.

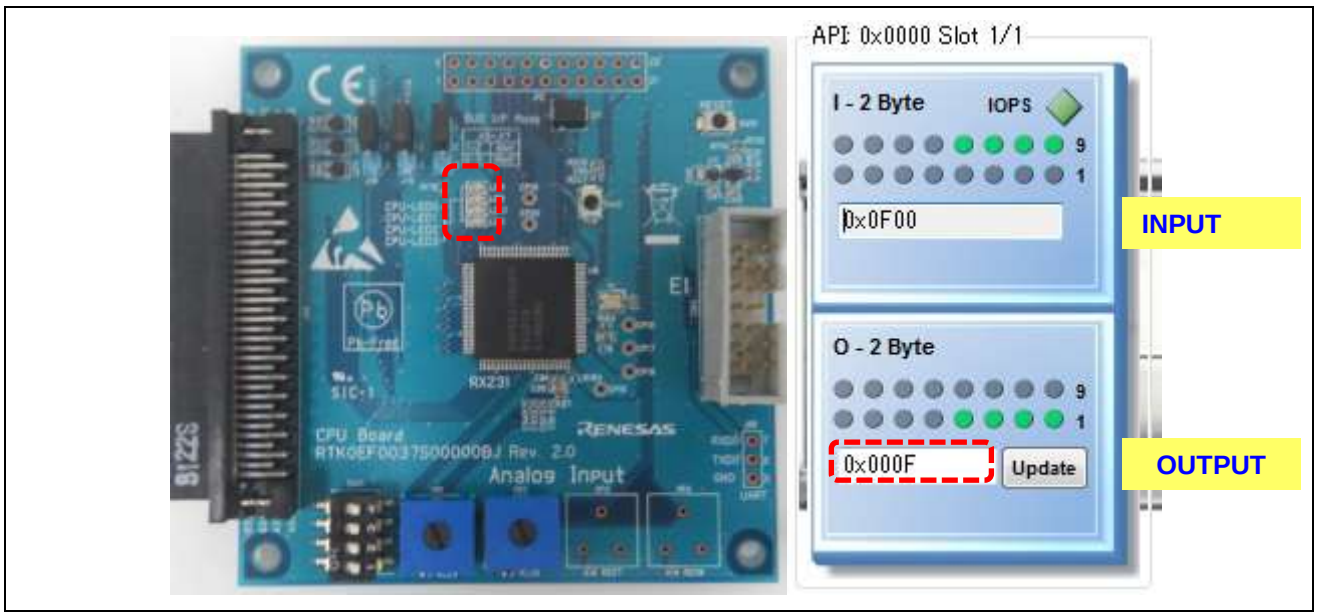


Figure 12-2-5 CPU Board Operation Check (1)

2) Specify “0x0000” as the output setting for PROFINET Smart Control Express to turn the LEDs on the CPU board ON.

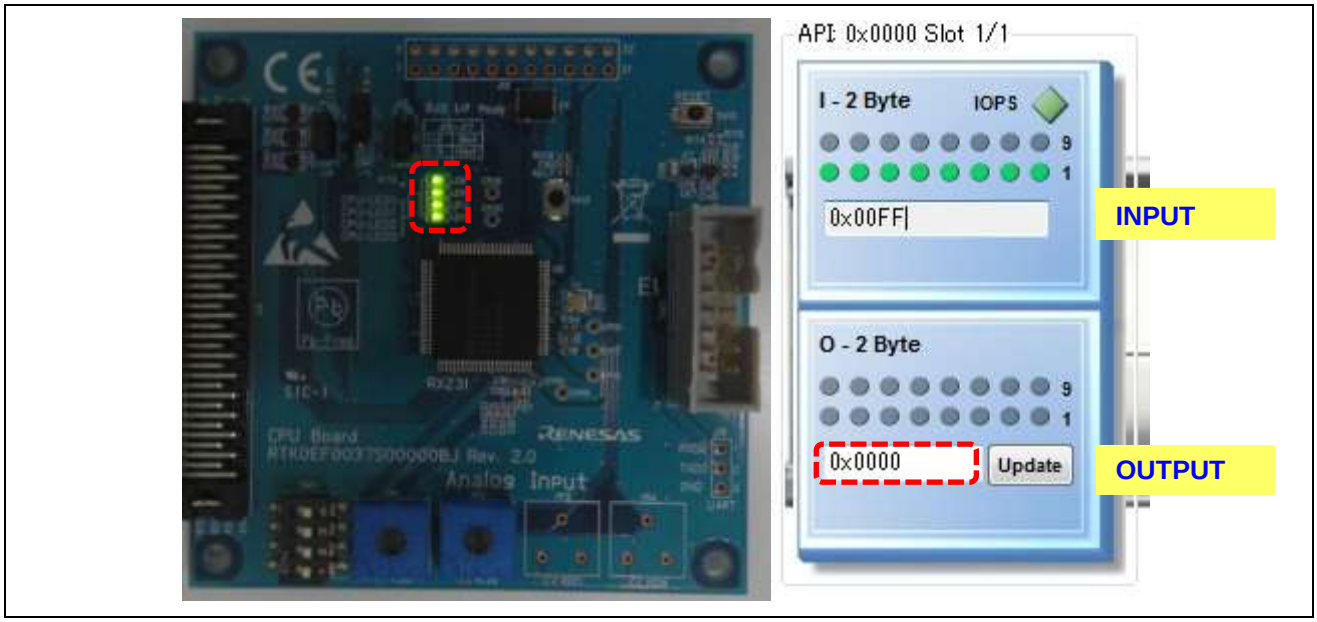


Figure 12-2-6 CPU Board Operation Check (2)

3) CPU RX231 ports (P44 to P47) are assigned to the upper byte INPUT settings of PROFINET Smart Control Express. The virtual LEDs on PROFINET Smart Control Express can be turned ON and OFF by setting the CPU board switch (SW11 pin 1 to pin 4).

Set the CPU board switch (SW11 pin 1 to pin 4) to ON to turn on the virtual LEDS on PROFINET Smart Control Express.

Controlling master-side LEDs with the switches on the CPU board ON:

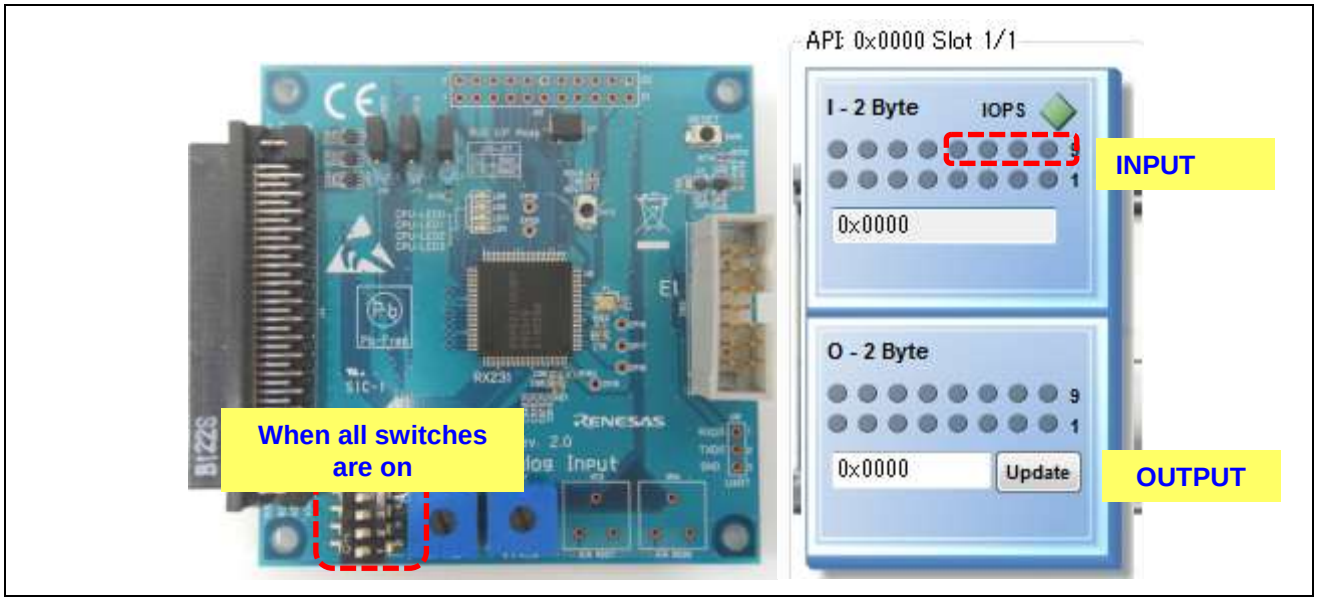


Figure 12-2-7 CPU Board Operation Check (3)

4) Set the CPU board switch (SW11 pin 1 to pin 4) to OFF to turn off the virtual LEDS on PROFINET Smart Control Express.

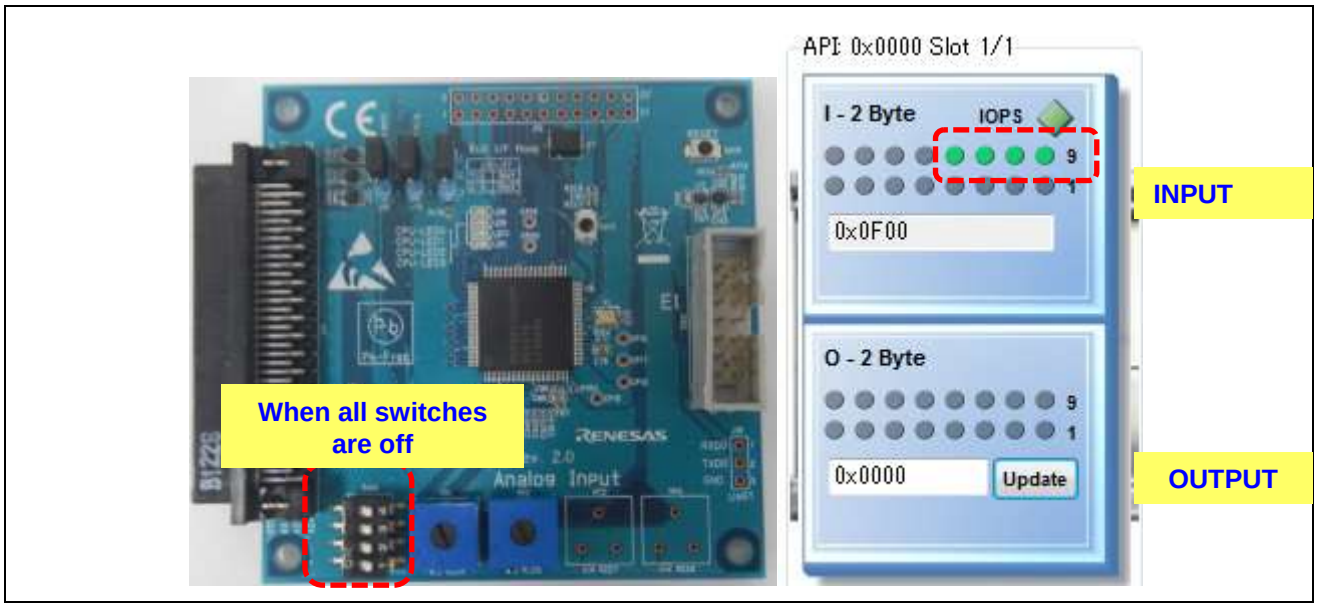


Figure 12-2-8 CPU Board Operation Check (4)

13. Appendix A

13.1 Erasing the Flash Memory from the TPS-1 Main Board

This section explains how to erase the flash memory of the main board.

13.1.1 Flash erase program (TPS_Erase_Flash.s) transfer

1) Set jumper 6 on the TPS-1 main board to 2-3 to set the UART mode.
2) Connect the computer and TPS-1 port with the USB cable.
3) Boot the Terminal Software. Tera Term is used as an example here.
4) Press the Reset switch on the TPS-1 main board.
5) Enter “s” on the Tera Term screen and press the Enter key on the computer.
6) The message shown below is displayed on the Tera Term screen.

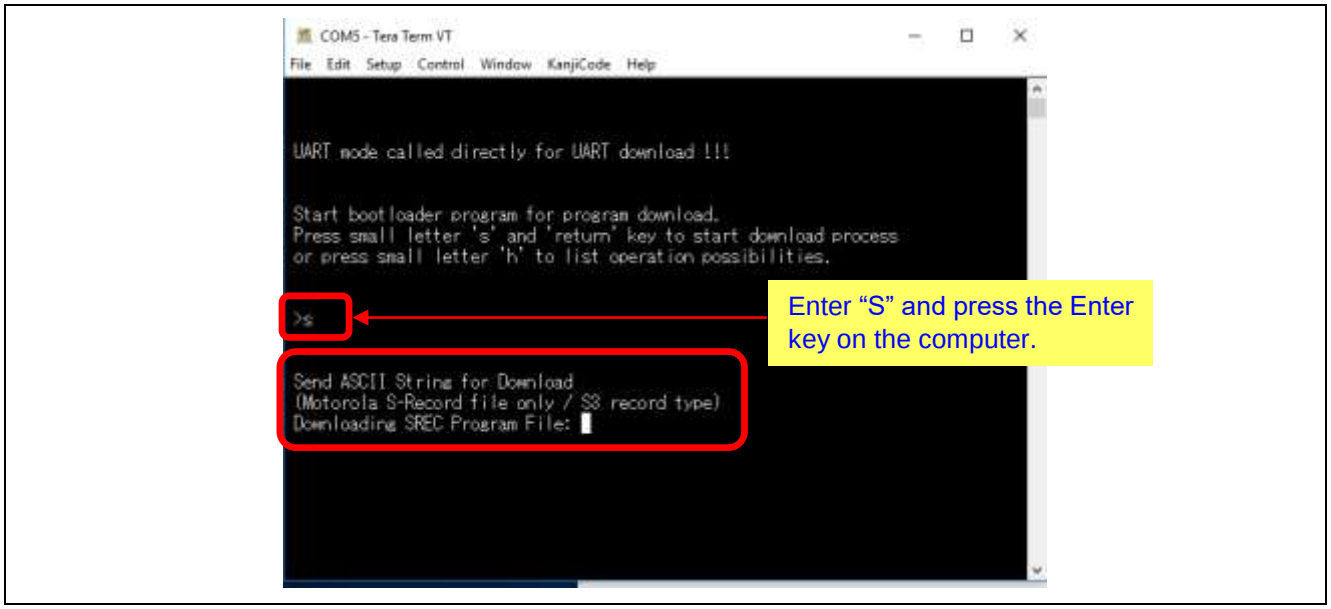


Figure 13-1-1 Flash Erase Procedure (1)

When the above message is displayed, send the file.

Under File, click **Send file.**

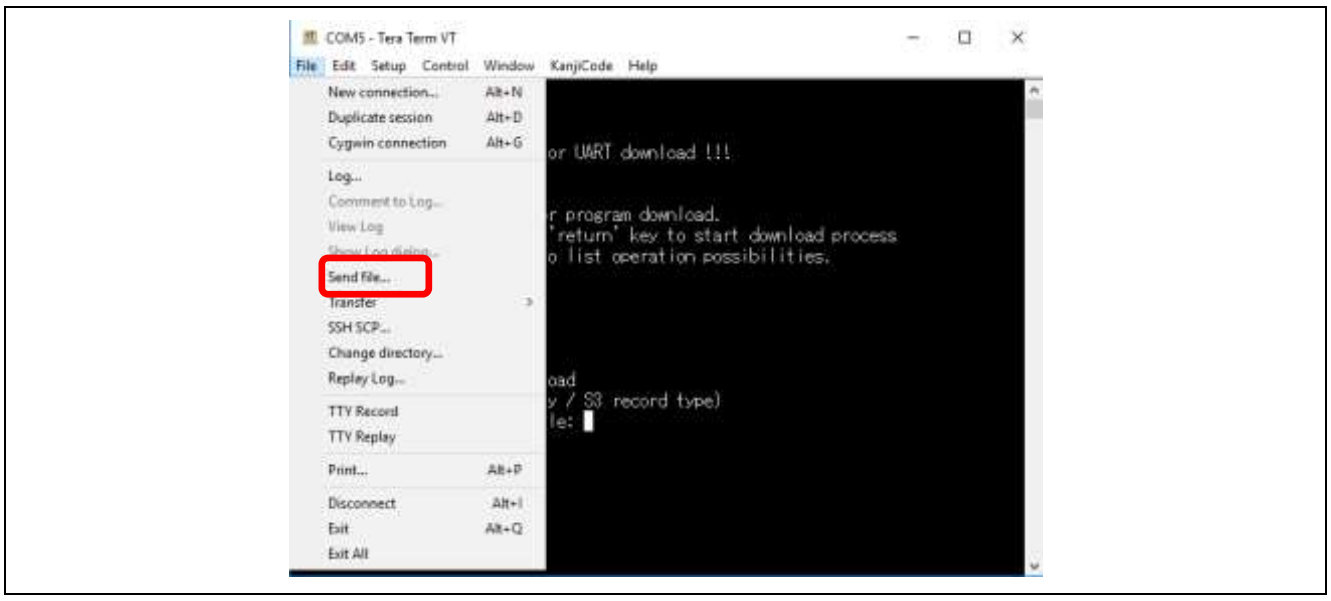


Figure 13-1-2 Flash Erase Procedure (2)

Open the folder called TDT/ TPS Starter and select **TPS_Erase_Flash.s**. Click **O** (open).

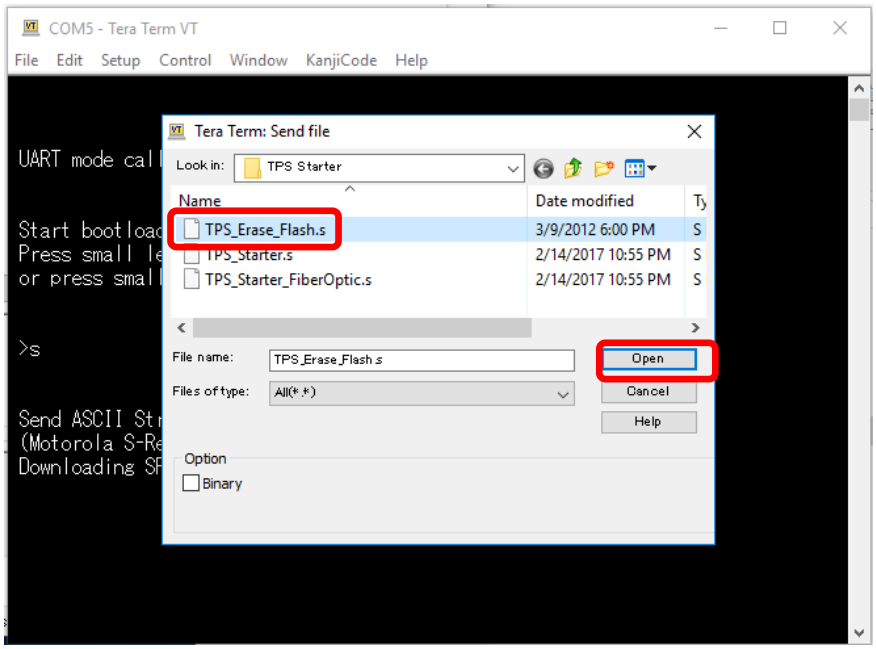


Figure 13-1-3 Flash Erase Procedure (3)

The flash content erase is started.

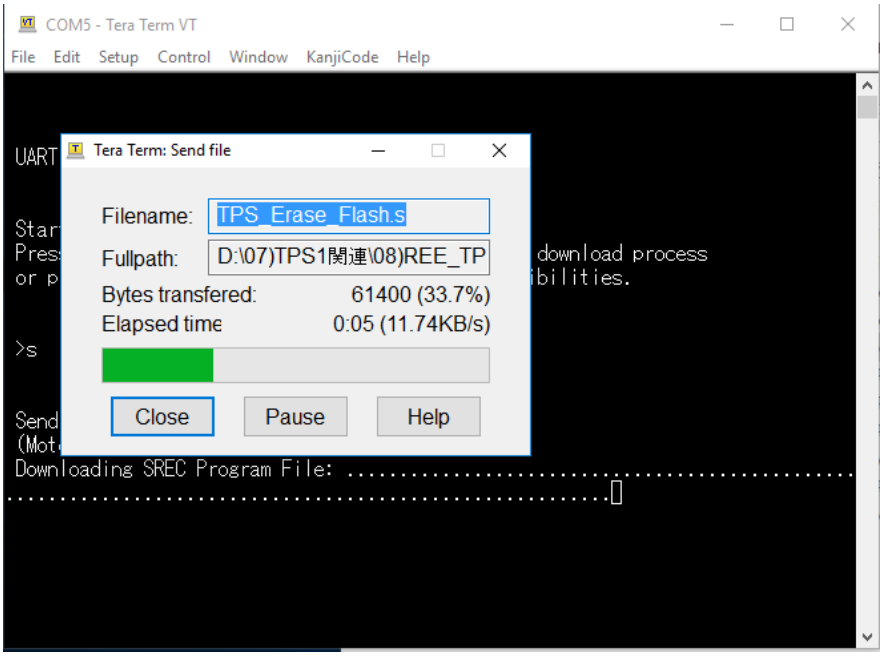


Figure 13-1-4 Flash Erase Procedure (4)

When the flash content has been erased, the following screen is displayed.

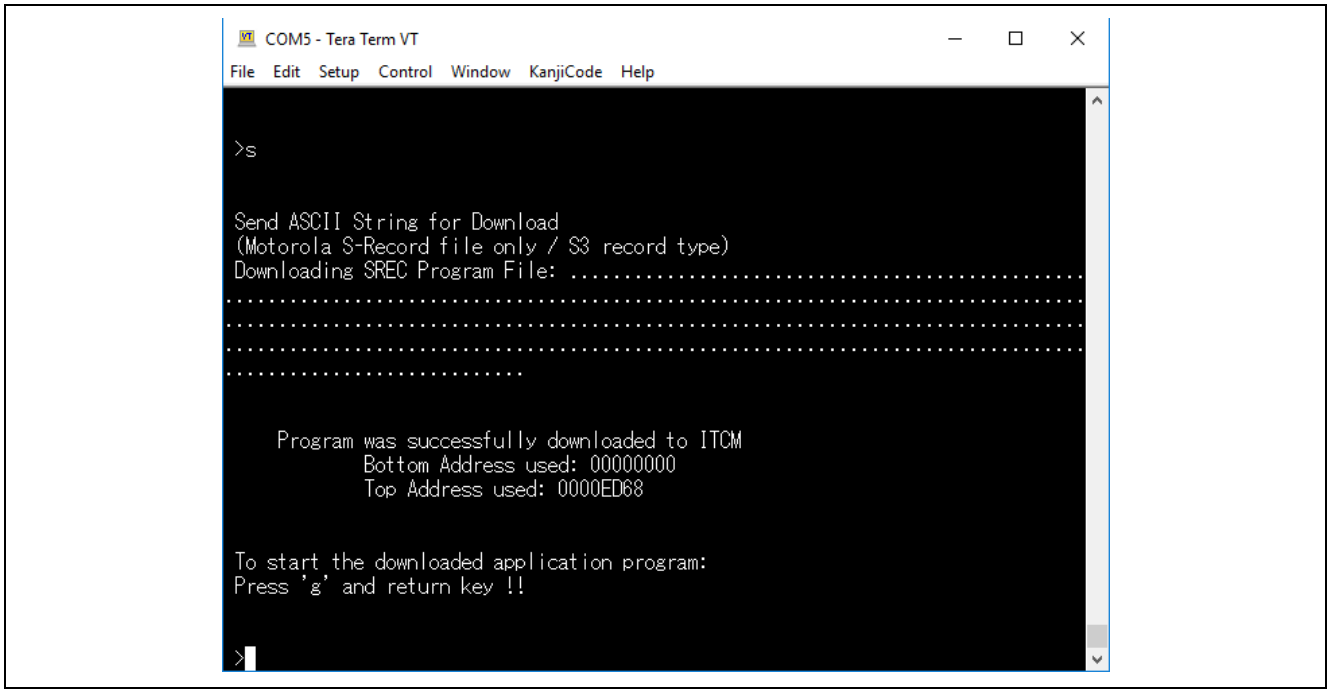


Figure 13-1-4 Flash Erase Procedure (5)

Input “g” and press the Enter key on the computer. This returns the system to the initial state.

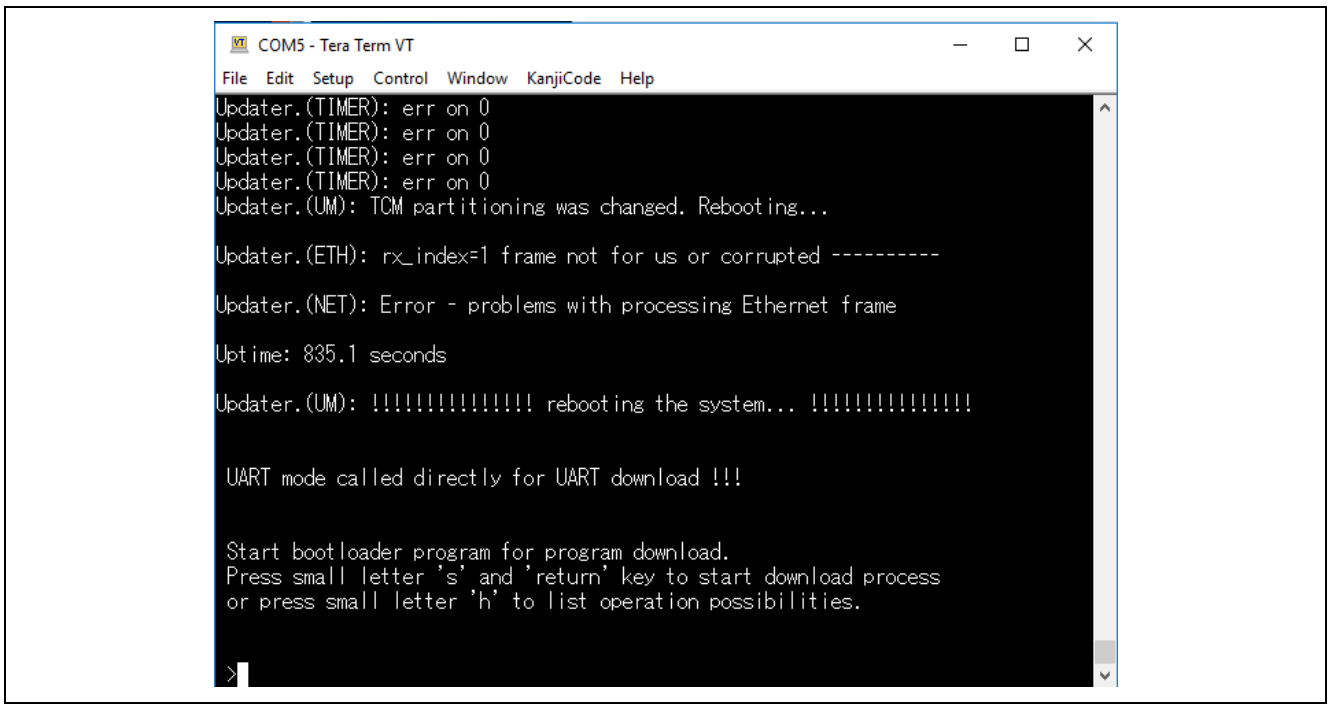


Figure 13-1-5 Flash Erase Procedure (6)

Website and Support <website and support,ws>

Renesas Electronics Website

http://www.renesas.com/

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Revision History

		Description	
Rev.	Date	Page	Summary
1.00	2017/04/25	-	First edition issued

General Precautions in the Handling of MicroprocessingUnit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unitproducts from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   — The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   — When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of Microprocessing unit or Microcontroller unitproducts in the same group but having a different part number may differ in terms of the internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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