User's Manual

M34286T2-CPE

User's Manual

Supported Devices:
720 Series
4286 Group

Renesas Electronics
www.renesas.com

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Preface

The M34286T2-CPE is a compact emulator with the real-time trace functions for the 4286 Group.
This user's manual mainly describes specifications of the M34286T2-CPE and how to set up it. For details on the following products included with the M34286T2-CPE, refer to each product's online manual.

- Emulator debugger: M3T-PD72M
- Assembler: ASM72

All the components of this product are shown in "1.1 Package Components" (page 14). If there is any question or doubt about this product, contact your local distributor.

The related manuals for using this product are listed below. You can download the latest manuals from the Renesas Tools homepage (http://www.renesas.com/tools).

Related manuals

Emulator debugger	M3T-PD72M User's Manual
Assembler	ASM72 User's Manual

Important

Before using this product, be sure to read the user's manual (this manual).
Keep this user's manual, and refer to this when you have questions about this product.

Emulator:

The emulator in this document refers to the following products that are manufactured by Renesas Electronics Corporation:

(1) Compact emulator main unit
(2) Package converter board for connecting the user system

The emulator herein does not include the customer's user system and host machine.

Purpose of use of the emulator:

This emulator is a device to support the development of a system that uses the 720 Series 4286 Group of Renesas 4-bit single-chip MCUs. It provides support for system development in both software and hardware.
Be sure to use this emulator correctly according to said purpose of use. Please avoid using this emulator for other than its intended purpose of use.

For those who use this emulator:

This emulator can only be used by those who have carefully read the user's manual and know how to use it.
Use of this emulator requires the basic knowledge of electric circuits, logical circuits, and MCUs.

When using the emulator:

(1) This product is a development supporting unit for use in your program development and evaluation stages. In mass-producing your program you have finished developing, be sure to make a judgment on your own risk that it can be put to practical use by performing integration test, evaluation, or some experiment else.
(2) In no event shall Renesas Solutions Corp. be liable for any consequence arising from the use of this product.
(3) Renesas Solutions Corp. strives to renovate or provide a workaround for product malfunction at some charge or without charge. However, this does not necessarily mean that Renesas Solutions Corp. guarantees the renovation or the provision under any circumstances.
(4) This product has been developed by assuming its use for program development and evaluation in laboratories. Therefore, it does not fall under the application of Electrical Appliance and Material Safety Law and protection against electromagnetic interference when used in Japan.
(5) Renesas Solutions Corp. cannot predict all possible situations or possible cases of misuse where a potential danger exists. Therefore, the warnings written in this user's manual and the warning labels attached to this emulator do not necessarily cover all of such possible situations or cases. Please be sure to use this emulator correctly and safely on your own responsibility.
(6) This product is not qualified under UL or other safety standards and IEC or other industry standards. This fact must be taken into account when taking this product from Japan to some other country.

When disposing of the emulator:

Penalties may be applicable for incorrect disposal of this waste, in accordance with your national legislation.

Usage restrictions:

This emulator has been developed as a means of supporting system development by users. Therefore, do not use it as a device used for equipment-embedded applications. Also, do not use it for developing the systems or equipment used for the following purposes either:

(1) Transportation and vehicular
(2) Medical (equipment where human life is concerned)
(3) Aerospace
(4) Nuclear power control
(5) Undersea repeater

If you are considering the use of this emulator for one of the above purposes, please be sure to consult your local distributor.

About product changes:

We are constantly making efforts to improve the design and performance of this emulator. Therefore, the specification or design of this emulator or its user's manual may be changed without prior notice.

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About diagrams:

The diagrams in this user's manual may not all represent exactly the actual object.

Precautions for Safety

This chapter describes the precautions which should be taken in order to use this product safely and properly. Be sure to read and understand this chapter before using this product.

Contact us if you have any questions about the precautions described here.

⚠ WARNING **WARNING** indicates a potentially dangerous situation that will cause death or heavy wound unless it is avoided.

⚠ CAUTION **CAUTION** indicates a potentially dangerous situation that will cause a slight injury, a medium-degree injury or a property damage unless it is avoided.

In addition to the two above, the following are also used as appropriate.

△means WARNING or CAUTION.

Example:  CAUTION AGAINST AN ELECTRIC SHOCK

⃠means PROHIBITION.

Example:  DISASSEMBLY PROHIBITED

●means A FORCIBLE ACTION.

Example:  UNPLUG THE POWER CABLE FROM THE RECEPTACLE.

⚠ WARNING

Warnings for AC Power Supply:

- If the attached AC power cable does not fit the receptacle, do not alter the AC power cable and do not plug it forcibly. Failure to comply may cause electric shock and/or fire.
- Use an AC power cable which complies with the safety standard of the country.
- Do not touch the plug of the AC power cable when your hands are wet. This may cause electric shock.
- This product is connected signal ground with frame ground. If your developing product is transformless (not having isolation transformer of AC power), this may cause electric shock. Also, this may give an unrepairable damage to this product and your developing one.
  While developing, connect AC power of the product to commercial power through isolation transformer in order to avoid these dangers.
- If other equipment is connected to the same branch circuit, care should be taken not to overload the circuit.

- When installing this equipment, insure that a reliable ground connection is maintained.

- If you smell a strange odor, hear an unusual sound, or see smoke coming from this product, then disconnect power immediately by unplugging the AC power cable from the outlet.
  Do not use this as it is because of the danger of electric shock and/or fire. In this case, contact your local distributor.
- Before setting up this emulator and connecting it to other devices, turn off power or remove a power cable to prevent injury or product damage.

Warnings to Be Taken for This Product:

- Do not disassemble or modify this product. Personal injury due to electric shock may occur if this product is disassembled and modified. Disassembling and modifying the product will void your warranty.
- Make sure nothing falls into the cooling fan on the top panel, especially liquids, metal objects, or anything combustible.

Warning for Installation:

- Do not set this product in water or areas of high humidity. Make sure that the product does not get wet. Spilling water or some other liquid into the product may cause unrepairable damage.

Warning for Use Environment:

- This equipment is to be used in an environment with a maximum ambient temperature of 35°C. Care should be taken that this temperature is not exceeded.

⚠ CAUTION

Note on Connecting the Power Supply of the Emulator:

- Do not use any power cable other than the one that is included with the product.
- The power cable included with the product has its positive and negative poles color-coded by red and black, respectively.
- Pay attention to the polarities of the power supply. If its positive and negative poles are connected in reverse, the internal circuit may be broken.
- Do not apply any voltages exceeding the product's rated power supply voltage (5.0 V ±5%). Extreme voltages may cause a burn due to abnormal heat or cause the internal circuit to break down.

Cautions to Be Taken for Turning On the Power:

- Turn ON/OFF the power of the emulator and user system as simultaneously as possible.
- Do not leave either the emulator or user system powered on, because of leakage current the internal circuits may be damaged.
- When turning on the power again after shutting off the power, wait about 10 seconds.

Cautions to Be Taken for Handling This Product:

- Use caution when handling the main unit. Be careful not to apply a mechanical shock.
- Do not touch the connector pins of the emulator main unit and the target MCU connector pins directly. Static electricity may damage the internal circuits.
- Do not pull this emulator by the communications interface cable or the flexible cable for connecting the user system. And, excessive flexing or force may break conductors.

Cautions to Be Taken for System Malfunctions:

- If the emulator malfunctions because of interference like external noise, do the following to remedy the trouble.
  (1) Press the RESET button on the emulator upper panel.
  (2) If normal operation is not restored after step (1), shut OFF the emulator once and then reactivate it.

Cautions to Be Taken for Disposal:

Penalties may be applicable for incorrect disposal of this waste, in accordance with your national legislation.

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Contents

User Registration

When you install debugger software, a text file for user registration is created on your PC. Fill it in and email it to your local distributor. If you have replaced an emulator main unit or emulation probe, rewrite an emulator name and serial number in the text file you filled in earlier to register your new hardware products.

Your registered information is used for only after-sale services, and not for any other purposes. Without user registration, you will not be able to receive maintenance services such as a notification of field changes or trouble information. So be sure to carry out the user registration.

For more information about user registration, please contact your local distributor.

Terminology

Some specific words used in this user's manual are defined as follows:

- Emulator M34286T2-CPE
  This means the compact emulator M34286T2-CPE (this product) for the 4286 Group.

- Emulator system
  This means an emulator system built around the M34286T2-CPE emulator. The M34286T2-CPE emulator system is configured with the emulator M34286T2-CPE, emulator debugger M3T-PD72M and host machine.

- Emulator debugger M3T-PD72M
  This means a software tool to control the emulator from the host machine through a USB interface.

- Firmware
  This means a program stored in the flash ROM of the emulator. It analyzes contents of communication with the emulator debugger and controls the emulator. This program is downloadable from the emulator debugger to upgrade firmware.

- Host machine
  This means a personal computer used to control the emulator.

- Target MCU
  This means the microcomputer you are going to debug.

- User system
  This means a user's application system using the microcomputer to be debugged.

- User program
  This means a user's application program to be debugged.

- Evaluation MCU
  This means a microcomputer mounted on the emulator which is operated in the special mode for the emulator.

- #
  In this user's manual, this symbol is used to show low active. (e.g. RESET#)

1. Outline

This chapter describes the package components, the system configuration and the preparation for using this product for the first time.

1.1 Package Components

The M34286T2-CPE package consists of the following items. When unpacking it, check to see if your M34286T2-CPE contains all of these items.

Table 1.1 Package components

Item	Description	Quantity
M34286T2-CPE	Compact emulator	1
20-conductor standard-pitch cable	Cable for connecting user system	1
External trace cable	External trace/trigger signal input cable	1
OSC-2 (4MHz)	Oscillator circuit board	1
OSC-2	Oscillator circuit board (bare board)	1
USB interface cable	Cable for connecting host machine and emulator	1
Power supply cable	Power supply cable for compact emulator	1
M34286T2-CPE User's Manual	This manual	1
M34286T2-CPE User's Manual	Japanese	1
M34286T2-CPE Release Notes	English/Japanese	1/1
CD-ROM	- Emulator debugger M3T-PD72M - Assembler ASM72	1

* Please keep the M34286T2-CPE's packing box and cushion material in your place for reuse at a later time when sending your product for repair or other purposes. Always use these packing box and cushion material when transporting this product.
* If there is any question or doubt about the packaged product, contact your local distributor.

Note:
To our customers,
On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corp., and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this product, it is a valid Renesas Electronics product. We appreciate your understanding.

April 1st, 2010
Renesas Electronics Corporation

1.2 System Configuration

1.2.1 System Configuration

Figure 1.1 shows a configuration of the M34286T2-CPE system.

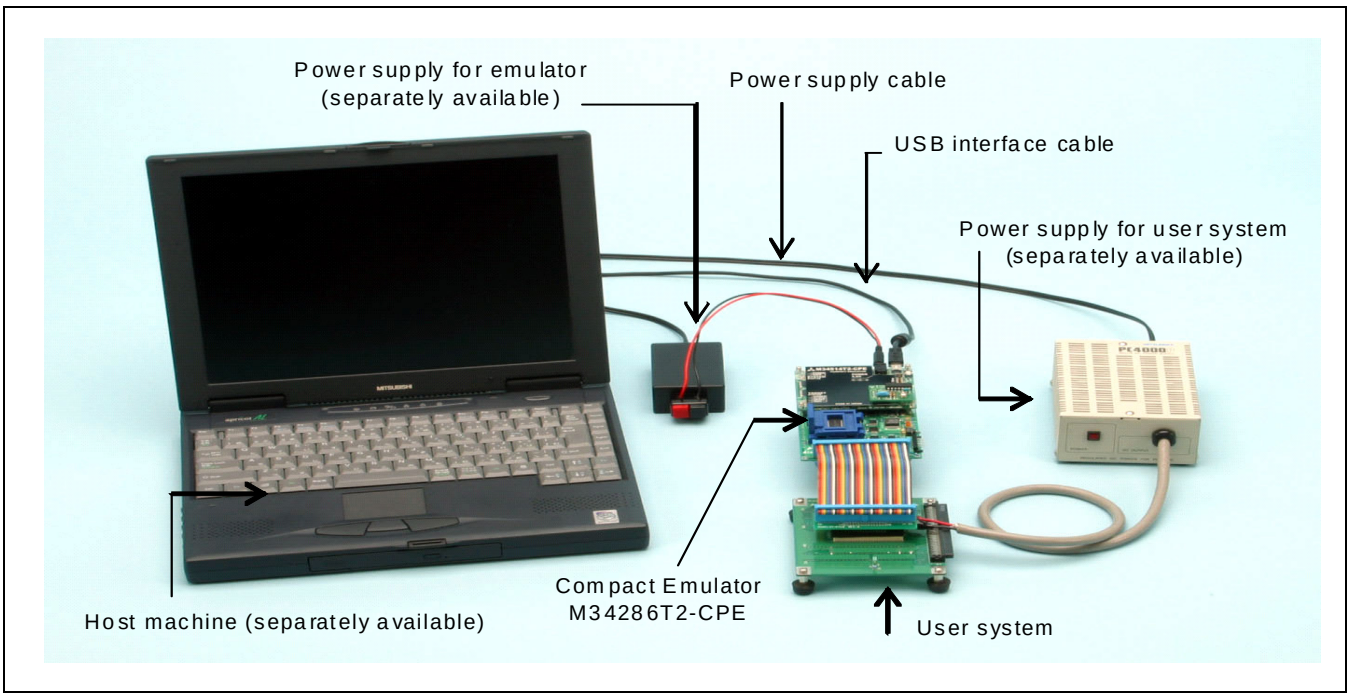


Figure 1.1 System configuration

(1) Compact emulator M34286T2-CPE (this product)

This is a compact emulator for the 4286 Group with the real-time trace functions (hereafter, emulator).

(2) USB interface cable (included)

This is an interface cable for the host machine and the emulator.

(3) Power supply for emulator

This is a power supply for the emulator. Supply 5.0 V ±5% (DC).

Prepare a power supply separately. The power cable is included with this product.

* Be aware that there are some AC adapters whose power supply voltage varies rather widely with its load. You are recommended to use an AC adapter with a switching power supply or a stabilized power supply.

(4) User system

This is your application system. This emulator can be used without the user system.

(5) Power supply for user system

This is a power supply for the user system. As this emulator cannot supply the power to the user system, supply the power to the user system separately from the emulator.

(6) Host machine

This is a personal computer for controlling the emulator.

1.2.2 Names and Functions of the Emulator

Figure 1.2 shows the names of the LEDs on the upper panel of the emulator.

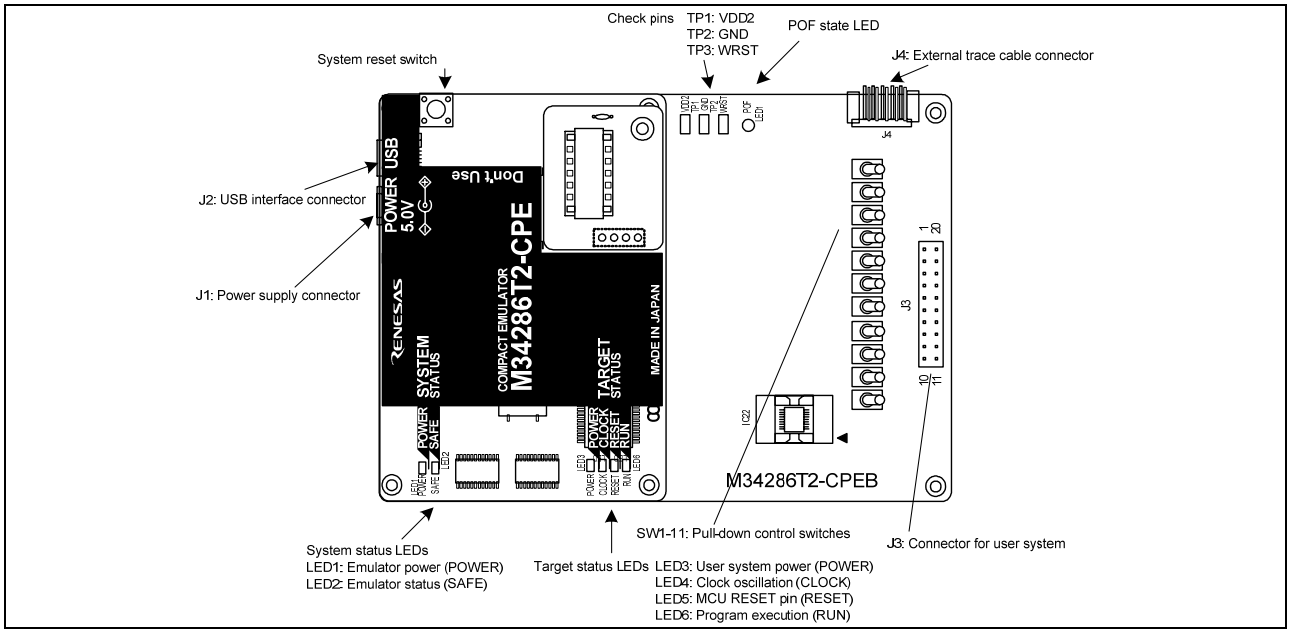


Figure 1.2 Names of the LEDs on the upper panel of the emulator (upper side)

(1) System Status LEDs

The system status LEDs indicate the emulator main unit's operating status etc. Table 1.2 lists the definition of the system status LEDs.

Table 1.2 Definition of the system status LEDs

Name	Number	Color	Status	Meaning
POWER	LED1	Orange	ON	Power is supplied to the emulator.
			OFF	Power is not supplied to the emulator.
SAFE	LED2	Green	ON	Emulator system has started normally.
			OFF	Emulator system has not started normally.

(2) Target Status LEDs

The target status LEDs indicate the target MCU's power supply and operating status. Table 1.3 lists the definition of the target status LEDs.

Table 1.3 Definition of the target status LEDs

Name	Number	Color	Status	Meaning
POWER	LED3	Orange	ON	Power is supplied to the user system.
			OFF	Power is not supplied to the user system.
CLOCK	LED4	Green	ON	Clock is supplied to the target MCU.
			OFF	Clock is not supplied to the target MCU.
RESET	LED5	Red	ON	Target MCU is being reset.
			OFF	Target MCU is not being reset.
RUN	LED6	Green	ON	User program is being executed.
			OFF	User program is not being executed.

(3) POF Status LED

This LED shows whether the MCU is in a state of power down.

Table 1.4 Definitions of the target status LEDs

Name	Color	Status	Meaning
POF	Orange	ON	MCU is in a state of power down.
		OFF	MCU is not in a state of power down, but normal.

(4) System Reset Switch

By pressing the system reset switch, you can initialize the emulator system. Table 1.5 shows the functions of the system reset switch depending on the state of the emulator.

Table 1.5 Definitions of the target status LEDs

State of Emulator	Function
Pressing the system reset switch when the user's program is halted	Initializes the emulator and waits for a command from the emulator debugger.
Pressing the system reset switch when the user's program is executed	Stops the user program, initializes the emulator, and waits for a command from the emulator debugger.

IMPORTANT

Notes on a System Reset:

- After pressing the system reset switch, restart the emulator debugger M3T-PD72M. Otherwise the display of the emulator debugger and the actual value (in the emulator) may not match.
- When the emulator debugger does not start up normally even after rebooting, turn off the emulator and then turn on again.

(5) Power Connector (J1)

This is a connector for connecting the power supply to this product. For details, refer to "2.6 Connecting the Power Supply for Emulator" (page 30).

(6) USB Cable Connector (J2)

This is a USB cable connector for connecting the host machine to this product. For details, "2.7 Connecting the Host Machine" (page 31).

(7) External trace cable connector (J4)

This is an external trace cable connector when using an external trace function. For details, "2.4 Connecting the External Trace/Trigger Cable" (page 26).

(8) Pull-down control switches (JP1-JP11)

These are the switches to connect the pull-down resistor to pins of D0 to D7, G0 to G3 and E0. For details, refer to "2.3.1 Initial setting of the emulator" (page 22).

1.3 Specifications

Table 1.6 lists specifications of the M34286T2-CPE.

Table 1.6 Specifications of the M34286T2-CPE

Item	Description		
Applicable MCUs	4286 Group		
Evaluation MCU	M34286G2GP (mounted in the socket of the emulator)		
Maximum operating frequency	3.0 V	Divided-by 8-mode	4.0 MHz
		Divided-by 4-mode	
		Divided-by 2-mode	
		Through mode	2.0 MHz
Applicable target power supply	3.0 V ±5% Supplied from emulator only. Cannot be supplied from user system.		
Basic debugging functions	- Download - Software break (max. 8 points, break after execution) - Program execution/stop (allows free-run execution supporting software breaks) - Memory reference/setting - Register reference/setting - Disassemble display		
Real-time trace function	Recording cycle	32768 cycles	
	Trace point	- 2 address points (range/pass count can be set) - 1 external trigger point	
	Trace mode	- Before Break mode (Records 32768 cycles before program stops) - Before Trace mode (Records 32768 cycles before event on) - About Trace mode (Records 32768 cycles before/after event on) - After Trace mode (Records 32768 cycles after event on)	
Hardware break function	Hardware break point	- 2 address points (range/pass count can be set) - 1 external trigger point	
	Break mode	- Address break or trigger break - Stack over/under flow - Trace event - Break at end of trace - Timer	
Time measurement	Time measurement point: 2 address point designation (range can be set) Resolution: 100 ns Measurement interval: 8 types Count source: Emulator timer or MCU cycle		
Coverage	C0 coverage		
Connection to the user system (see "2.11 Connecting the User System")	20-pin standard-pitch connector		
Power supply for emulator	DC 5.0 V±5%/2 A externally supplied (prepare a power supply separately)		
Host machine interface	USB *1 (USB 1.1 full-speed, mini-B standard connector used)		

*1: Available to connect the host machine that supports USB 2.0. With the USB interface, not all hardware (such as host machine, USB devices, USB hub) combination will work and guaranteed.

1.4 Operating Environment

Be sure to use thins emulator with the operating environmental of the emulator and host machine listed in Tables 1.7 and 1.8.

Table 1.7 Operating environmental conditions

Item	Description
Operating temperature	5 to 35°C (no dew)
Storage temperature	-10 to 60°C (no dew)

Table 1.8 Operating environment of host machine

Item	Description
Host machine	IBM PC/AT compatibles with USB1.1
OS	Windows XP Windows 2000 *1
CPU	Pentium II 233 MHz or more recommended
Memory	128 MB or more recommended
Pointing device such as mouse	Mouse or any other pointing device usable with the above OS that can be connected to the main body of the host machine.
CD drive	Needed to install the emulator debugger or refer to the user's manual

*1: Windows is either a registered trademark or a trademark of Microsoft Corporation in the United States and other countries.

2. Setup

This chapter describes the preparation for using this product, the procedure for starting up the emulator and how to change settings.

2.1 Starting Up the Emulator

The procedure for starting up the emulator is shown in Figure 2.1. For details, refer to each section hereafter. And, when the emulator does not start up normally, refer to "5. Troubleshooting" (page 61).

Check the package components	Refer to "1.1 Package Components" (page 14).
↓	
User registration	Refer to "User Registration" (page 12).
↓	
Install the emulator debugger M3T-PD72M	Install it from the included CD-ROM.
↓	
Set the pull-down control switches	Select pull-down resistor connection for pins of D0 to D7, G0 to G3 and E0.
↓	
Connect the USB interface cable	Connect the USB interface cable to the USB interface connector (J2) of the emulator and the USB port of the host machine.
↓	
Connect the power supply for emulator.	Connect a power supply to the power connector (J1). Power supply should be 5.0 V ±5%, 2 A.
↓	
Connect the user system.	Connect the user system as occasion demands.
↓	
Turning on the power supply.	Turn on the power to the emulator and the user system as simultaneously as possible.
↓	
Check the LED display of the emulator.	Check that the system status LED, and POWER and CLOCK of target status LED are lighting. When the user system is not connected, the POWER LED does not light up.
↓	
Start up the emulator debugger.	Start up the emulator debugger M3T-PD72M.
↓	
Set the operating environment of the emulator debugger	When the INIT dialog box of the emulator debugger M3T-PD72M is displayed, click OK button. Then the INIT dialog box is displayed again, and select the target MCU and click OK button.
↓	
Debug a program with various functions of the M3T-PD72M	For how to use the M3T-PD72M, refer to the M3T-PD72M online manual.

Figure 2.1 Flowchart of starting up the emulator

2.2 Installing the Emulator Debugger

If the OS used in your host machine is Windows XP or 2000, this installation must be executed by a user with administrator rights.
Be aware that users without administrator rights cannot complete the installation.

2.2.1 Installing the Emulator Debugger M3T-PD72M

From the CD-ROM included with your product, install the emulator debugger M3T-PD72M following the procedure described below.

(1) Launching the installer
From Windows Explorer, etc., start the "setup.exe" program present in the \PD72M\W95E folder of the product disc.

(2) Entering the user information
In the "user information" dialog box, enter the user information (contractor, section, contact address, and host machine). The supplied information will be turned into a format by which technical support will be provided by e-mail.

(3) Selecting components
In the "component selection" dialog box, select the components you want to install. In this dialog box you can change the directory in which to install.

(4) Completing the installation
A dialog box will be displayed indicating that setup has been completed. It means that the installation you made is completed.

2.2.2 Installing the USB Device Driver

Install the USB device driver following the procedure described below.

(1) Connect the host machine and the compact emulator M34286T2-CPE with the USB cable.

(2) Turn on the power to the compact emulator M34286T2-CPE.

(3) USB device will be detected, and the wizard to install the corresponding device driver will start up.

Follow the instructions of the wizard, and a dialog box for specifying the setup information file (inf file) will appear. In this dialog box, specify the musbdrv.inf file present in or below the directory in which you installed the M3T-PD72M (e.g. c:\mtool\pdxx\drivers).

While you are installing, a message may be output indicating that the device driver proper musbdrv.sys cannot be found. Because musbdrv.sys is stored in the same directory as is the musbdrv.inf file, look into the directory and specify it.

2.3 Changing Settings

2.3.1 Initial setting of the emulator

Set the switches on the emulator according to the condition.

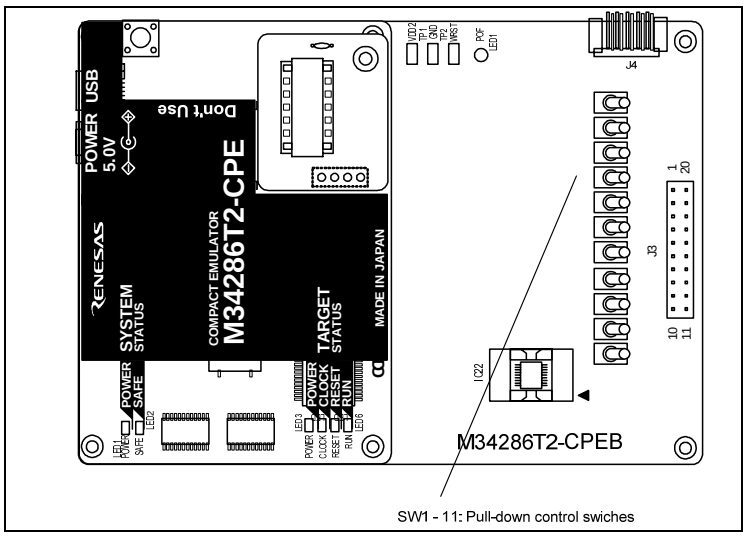


Figure 2.2 Switch positions of the emulator

⚠ CAUTION

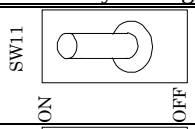
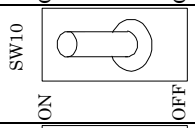
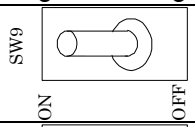
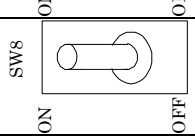
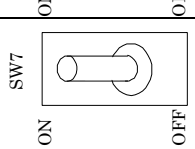
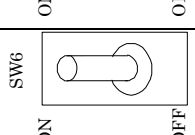
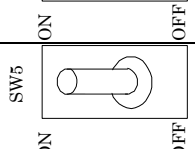
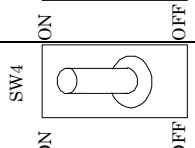
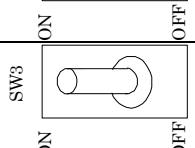
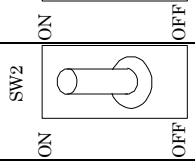
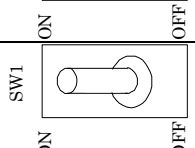
Note on Switch Settings:

- Always shut OFF the emulator before changing switch settings and connecting the cable, etc. Otherwise the internal circuit may cause a break.

(1) Pull-down Control Selecting Switches

With this product, pull-down control of G0-G3, D0-D7 and E0 by the pull-down control resistors (PU0, PU1 and PU2) is not available. Use the pull-down control switches SW1-SW11 to select the function (pull-down control or not).

Table 2.1 Pull-down control switch settings

Switch		Description	
Name	Factory-setting		
SW11		**ON side:** Pulls down the G0/G1 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the G0/G1 port.
SW10		**ON side:** Pulls down the G2/G3 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the G2/G3 port.
SW9		**ON side:** Pulls down the D0 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the D0 port.
SW8		**ON side:** Pulls down the D1 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the D1 port.
SW7		**ON side:** Pulls down the D2 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the D2 port.
SW6		**ON side:** Pulls down the D3 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the D3 port.
SW5		**ON side:** Pulls down the D4 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the D4 port.
SW4		**ON side:** Pulls down the D5 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the D5 port.
SW3		**ON side:** Pulls down the D6 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the D6 port.
SW2		**ON side:** Pulls down the D7 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the D7 port.
SW1		**ON side:** Pulls down the E0 port with a resistance of 150 kΩ.	**OFF side:** Does not pull down the E0 port.

⚠ CAUTION

Note on Switch Settings:

- Always shut OFF the emulator before changing switch settings and connecting the cable, etc. Otherwise the internal circuit may cause a break.

2.3.2 Selecting Clock Supply

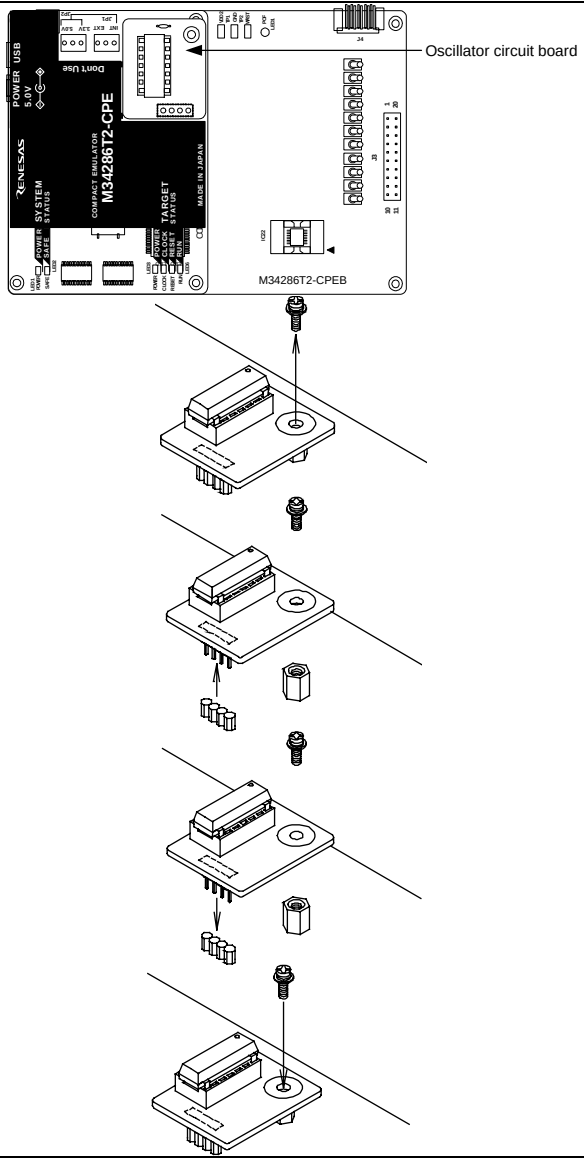
This product always uses the internal oscillator circuit as a clock supply to the evaluation MCU.

(1) Kinds of Oscillator Boards

The M34286T2-CPE comes with an oscillator circuit board OSC-2 (4MHz). And an oscillator circuit bare board OSC-2 is included with this product. A clock supplied to an MCU can be changed by replacing oscillator circuit boards.

(2) Replacing Oscillator Circuit Boards

Figure 2.3 shows how to replace oscillator circuit boards.



The location of the oscillator circuit board is shown left.

Unscrew the screw securing the oscillator circuit board.

Lift off the oscillator circuit board.

Attach another oscillator circuit board to the connector of the emulator.

Secure the new oscillator circuit board with the screw.

Figure 2.3 Replacing oscillator circuit boards

⚠ CAUTION

Note on Replacing the Oscillator Circuit Board:

- When removing the upper cover or replacing the oscillator circuit boards, be sure to shut OFF the power supply. Otherwise the internal circuit may cause a break.

(3) Using the Internal Oscillator Circuit Bare Board

To use this product at a frequency of your setting, build the desired oscillator circuit on the OSC-2 oscillator circuit board. Figure 2.4 shows an external view of the OSC-2 oscillator circuit board (bare board) and where connector pins are located. Figure 2.5 shows the circuitry of the OSC-2 oscillator circuit board (bare board). Use the number of oscillator circuits recommended by the oscillator manufacturer.

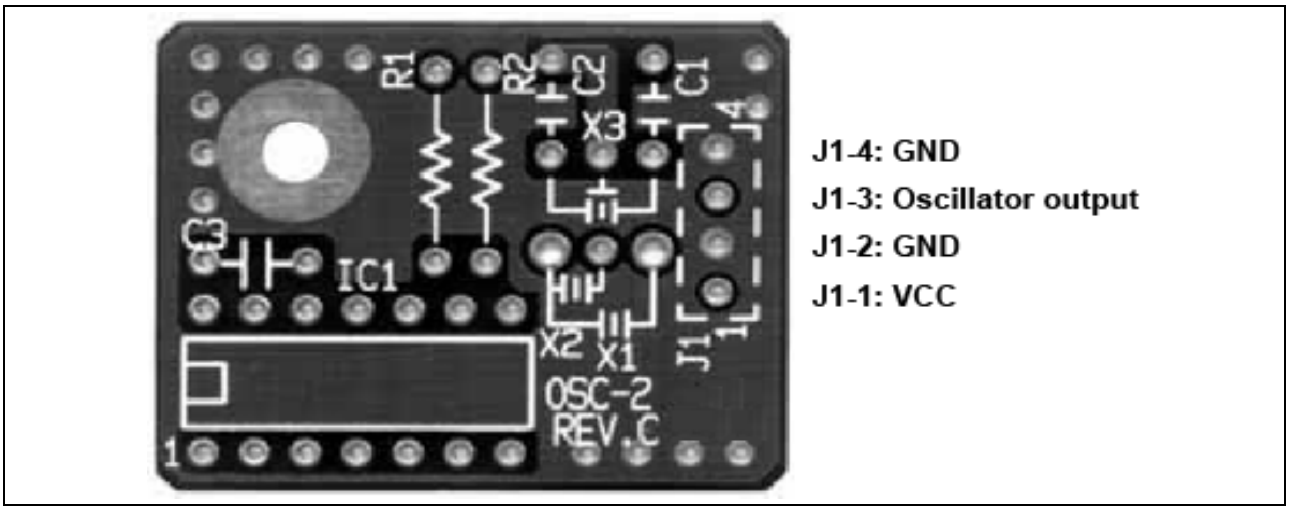


Figure 2.4 External view of the oscillator board (OSC-2) and connector pin assignment

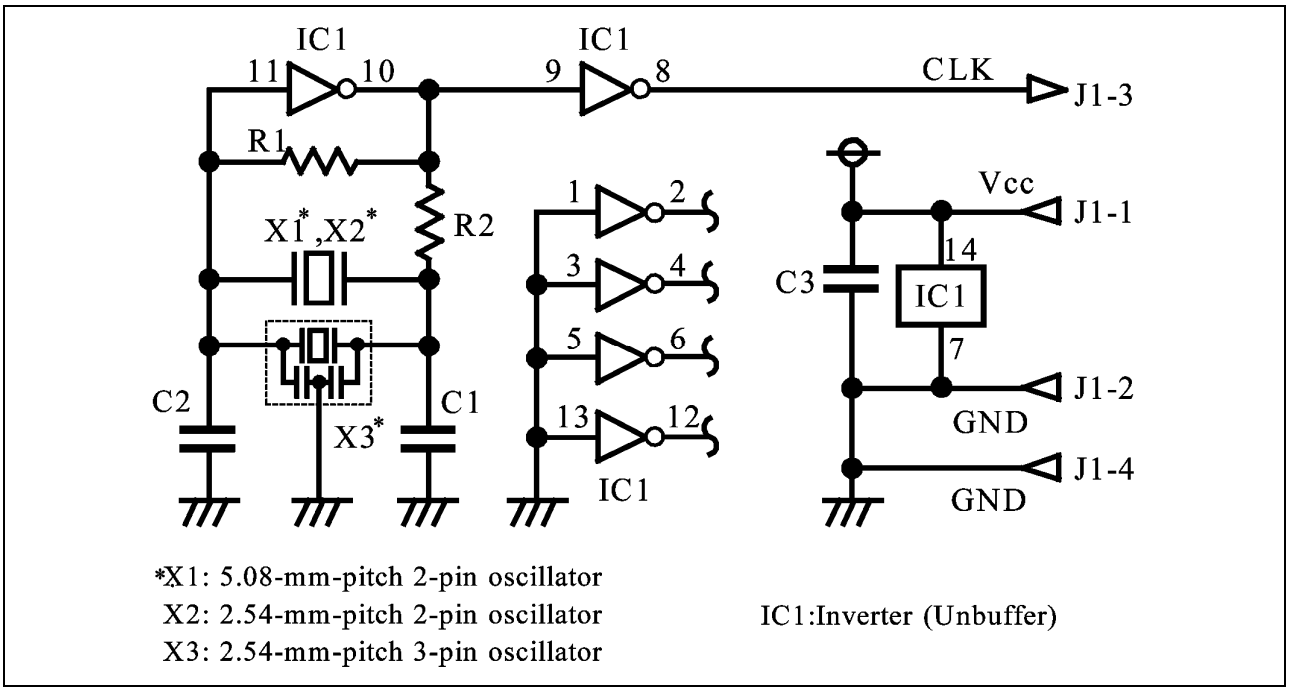


Figure 2.5 Circuit of the oscillator circuit board (OSC-2)

2.4 Connecting the External Trace/Trigger Cable

Using the external trace/trigger cable enables record/reference a hardware break by the external trigger, and changes of an external signal level in the trace window.

(1) Connecting the External Trace/Trigger Cable to the Emulator System

Figure 2.6 shows how to connect the external trace/trigger cable to the connector J4 of the emulator.

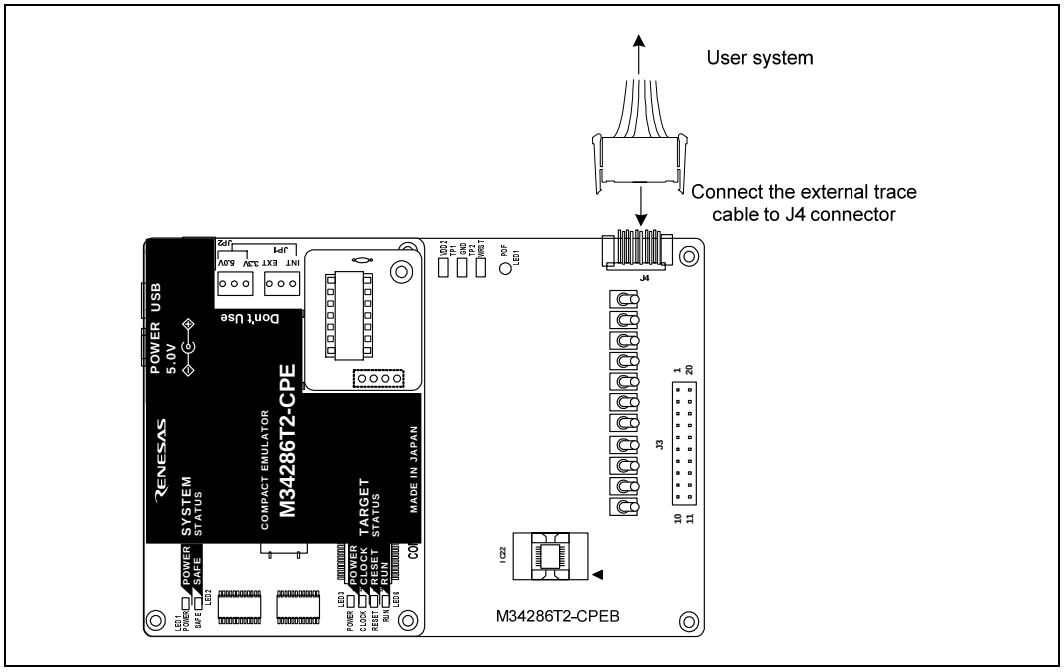
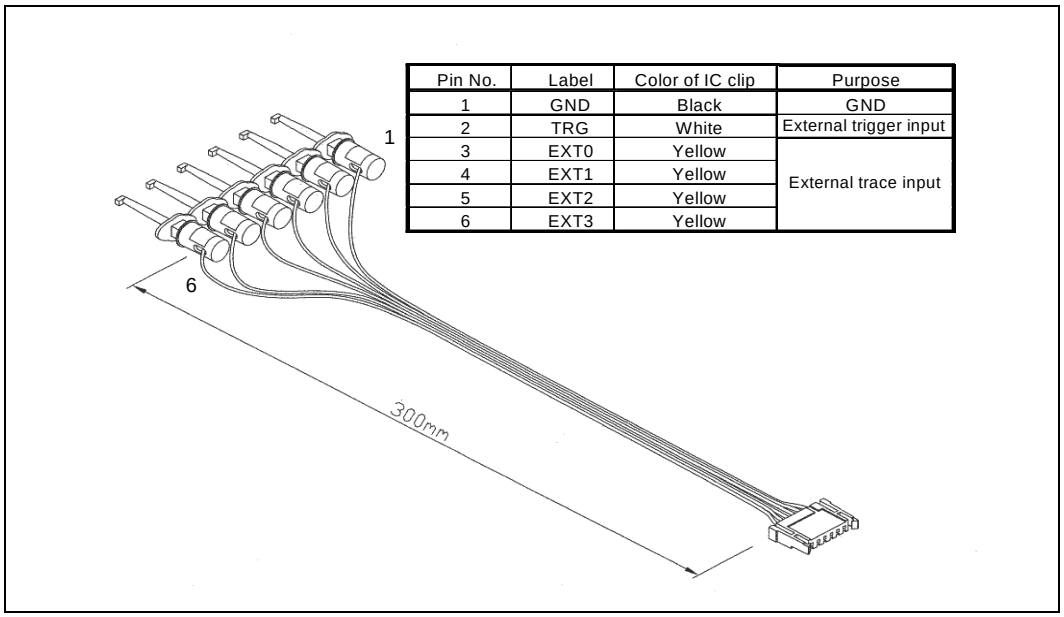


Figure 2.6 Connecting the external trace/trigger cable

(2) Connecting the External Trace/Trigger Cable to the User System

The pin assignments of the external trace cable are shown in Figure 2.7.



Pin No.	Label	Color of IC clip	Purpose
1	GND	Black	GND
2	TRG	White	External trigger input
3	EXT0	Yellow	External trace input
4	EXT1	Yellow	
5	EXT2	Yellow	
6	EXT3	Yellow	

Figure 2.7 Specifications of the external trace cable

(3) Specifications of the External Trace/Trigger Cable

Voltage input characteristics of external trace input and external trigger input are shown in Table 2.2.

The external trace input is latched in the timing shown in Figure 2.8 and the external trigger input is latched in the timing shown in Figure 2.9.

Table 2.2 Voltage input characteristics of external trace input and external trigger input

Item	Symbol	Minimum	Maximum
Input voltage	V_{IN}	0 V	5.5 V
"H" level input voltage	V_{IH}	2.0 V	-
"L" level input voltage	V_{IL}	-	0.8 V

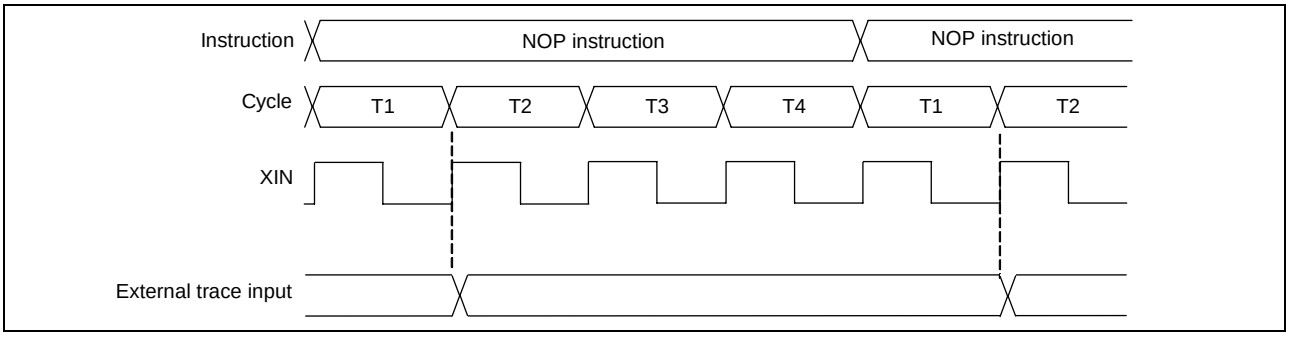


Figure 2.8 External trace input timing

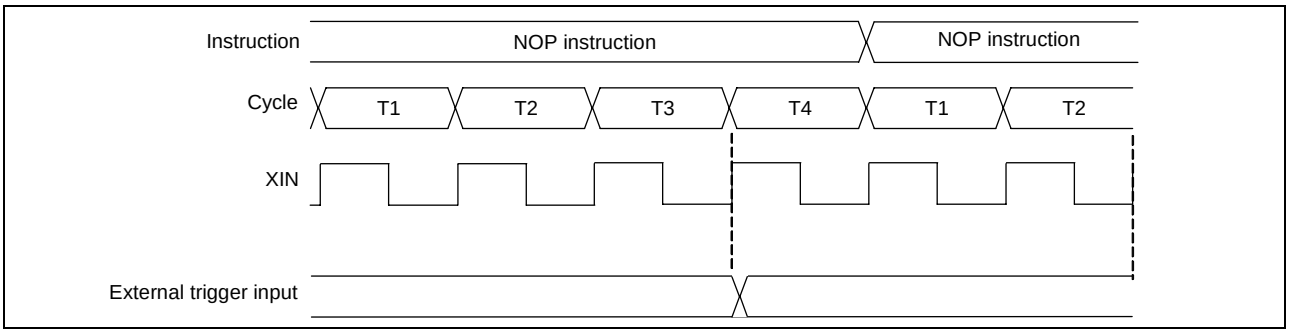


Figure 2.9 External trigger input timing

2.5 Watchdog Timer Initialization Cycle Check Pin

With this product, the watchdog function cannot be debugged.

However, the watchdog timer initialization cycle can be verified by observing the waveform at the check pin (WRST) of the emulator.

(1) Check Pin WRST (TP3) on the Emulator

Figure 2.10 shows the location of the WRST (TP3) and GND (TP2).

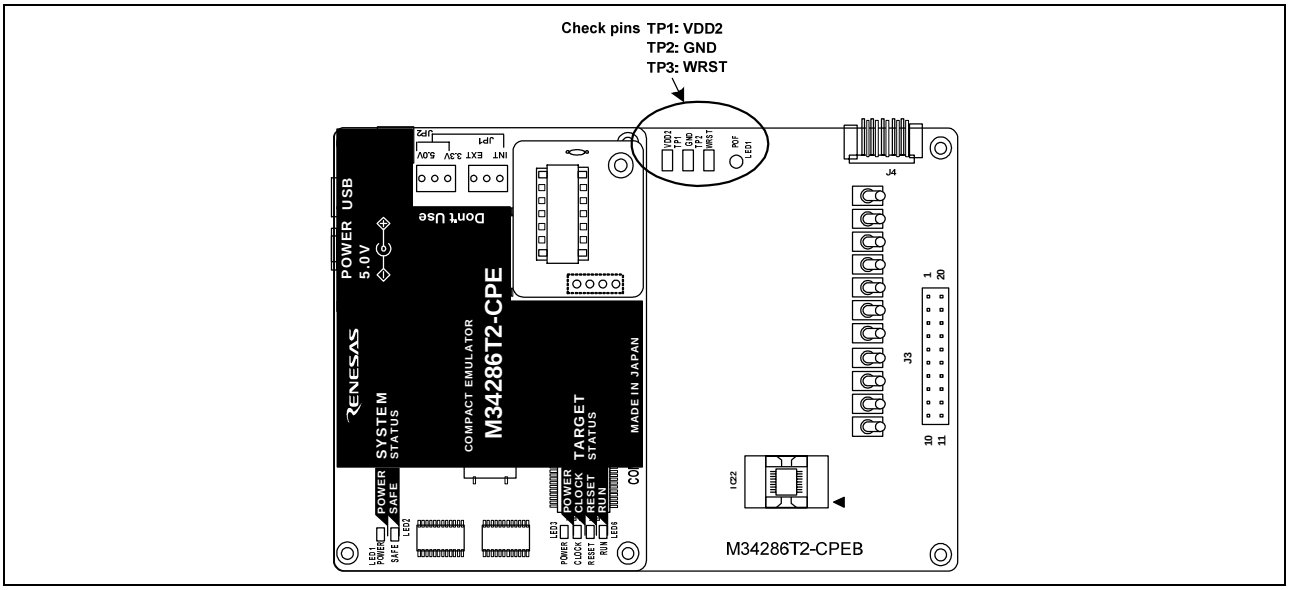


Figure 2.10 Location of the check pin

IMPORTANT

Note on the Watchdog Timer Function:

- With this emulator system, the watchdog timer function cannot be invalidated.
  If an MCU reset occurs by the watchdog timer, the emulator will not operate properly. In this case, perform a reset input from the emulator debugger or reset the emulator system.
  Also, after a reset by the watchdog timer occurs, the problems below may appear in the emulator debugger:
  (1) Only information of address 0000h is displayed in the results of real-time trace.
  (2) When a user program is forcibly stopped, the value of program counter is the same as when started.
  (3) The software break and hardware break do not occur in the program.

  While a user program is stopped, the WRST instruction is always executed in order not to cause a reset by the watchdog timer.

(2) Output Waveform of Check Pin WRST

A waveform similar to the one shown in Figure 2.11 is output when executing the WRST instruction that initializes the watchdog timer. By observing a period in which the check pin (WRST) goes high, you can know when the watchdog timer is initialized.

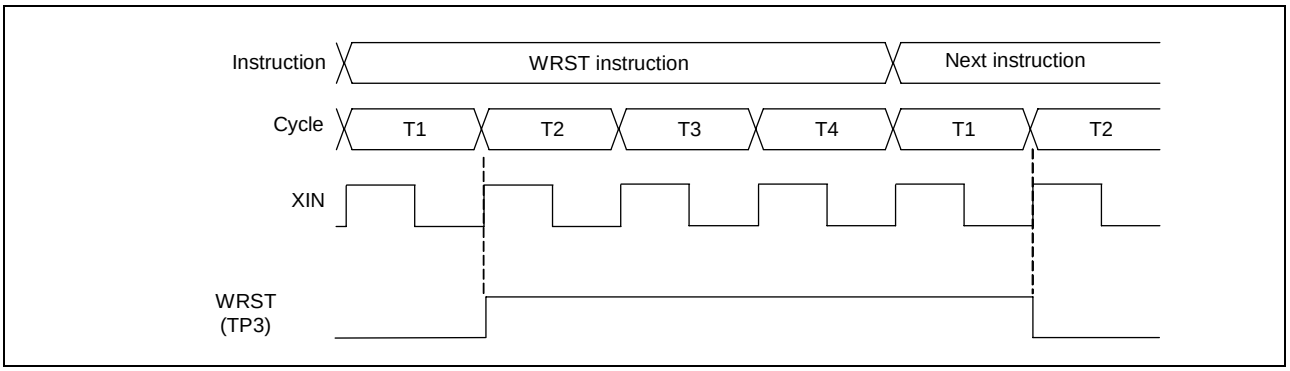


Figure 2.11 Output waveform of check pin WRST

2.6 Connecting the Power Supply for Emulator

Connect the power supply for the emulator to the power connector (J1). The specification of the power supply for the emulator is listed in Table 2.3.

Figures 2.12 and 2.13 show the specifications of the power connector (J1) and an applicable plug, respectively.

Table 2.3 Specification of power supply of the emulator

Power supply voltage	DC 5.0 V±5%/2 A

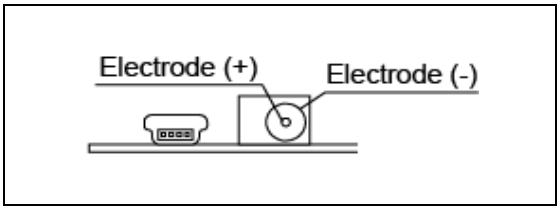


Figure 2.12 Specification of the power connector

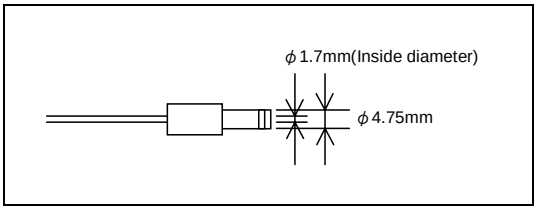


Figure 2.13 Specification of an applicable plug

⚠ CAUTION

Notes on Connecting a Power Supply of the Emulator:

- The power cable included in this product package is colored red (+) and black (-).
- Be careful about the polarity of the power supply. Connecting to the wrong electrode could destroy internal circuits.
- Do not apply a voltage exceeding the specified voltage of the product (5.0 V ±5%), because it may cause burn injuries and the failure of internal circuits.

2.7 Connecting the Host Machine

Connect the emulator and the host machine with the USB interface cable.

Connect the USB interface cable (included) to the USB interface connector (J2) and the USB port of the host machine (see Figure 2.14).

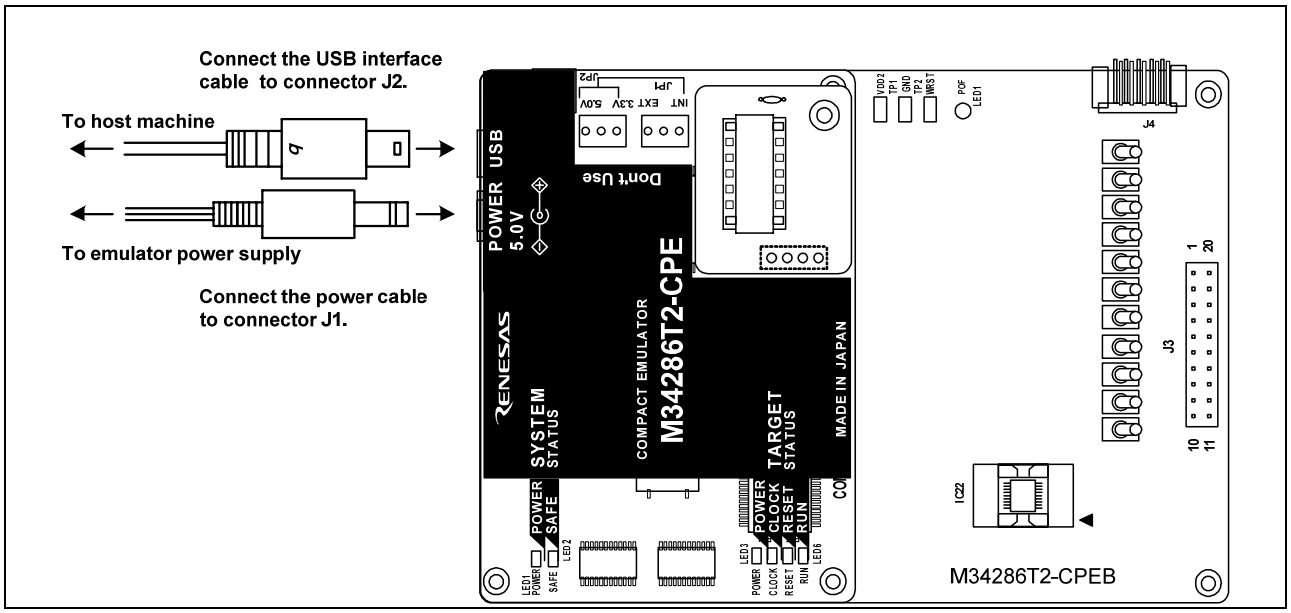


Figure 2.14 Connecting the emulator system

2.8 Turning ON the Power

2.8.1 Checking Connections of the Emulator System

Before turning the power ON, check the connection of the interface cable to the host machine, emulator, and user system.

2.8.2 Turning ON/OFF the Power

Turn ON/OFF the power of the emulator and user system as simultaneously as possible.

Do not leave either the emulator or user system powered on, because of leakage current the internal circuits may be damaged.

When turning ON the power again after shutting OFF the power, wait for about 10 seconds.

2.8.3 Power Supply to the User System

This emulator cannot supply the power to the user system. Therefore design your system so that the user system is powered separately.

The voltage of the user system should be 3.0 V ±5%. Do not change the voltage of the user system after turning on the power.

⚠ CAUTION

Note on Switch Settings:

- Always shut OFF the emulator before changing switch settings and connecting the cable, etc. Otherwise the internal circuit may cause a break.

2.8.4 LED Display When the Emulator Starts Up Normally

After the emulator starts up, check the status of the LEDs to see whether the emulator operation is enabled or not. Figure 2.15 shows the positions of the emulator status LEDs.

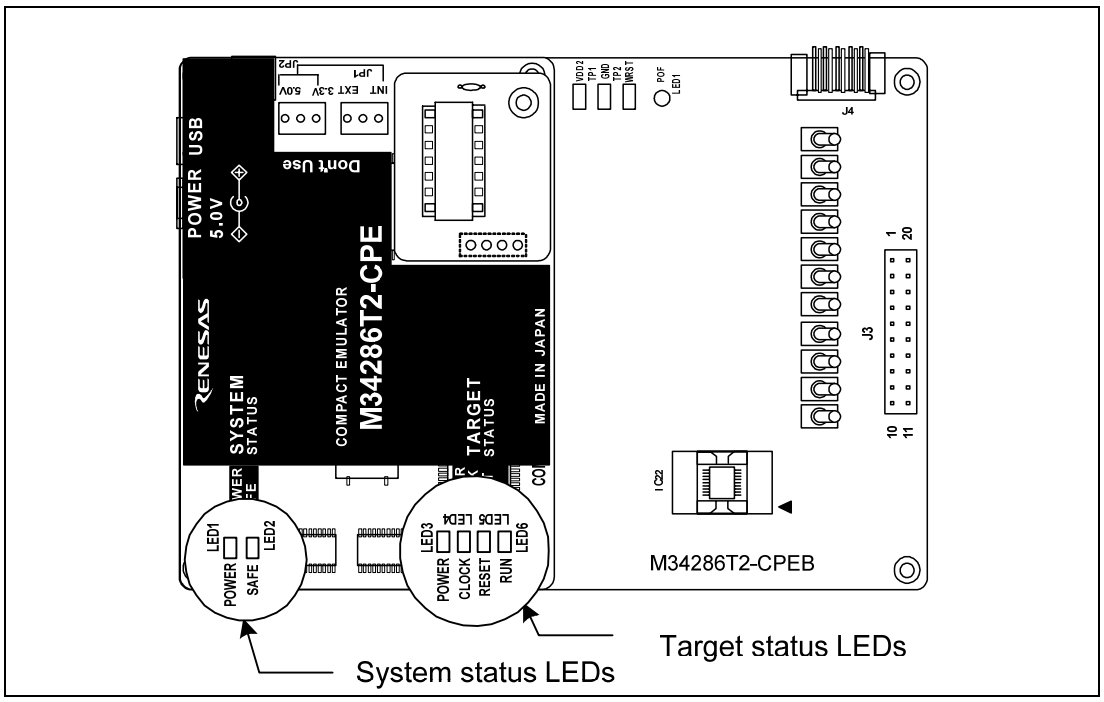


Figure 2.15 Positions of the system status LEDs and target status LEDs

(1) System status LEDs

Check that the LED1 and LED2 of the system status LEDs is lit immediately after the power is activated. If it is not lit, shut off the emulator and check the power supply for the emulator is properly connected.

(2) Target status LEDs

Target status LEDs light as shown in Figure 2.16 when the user system is not connected and as shown in Figure 2.17 when a user system is connected. When the self-check is terminated, SAFE LED (LED2) lights on and the target status LEDs display as shown in Figures 2.16 and 2.17.

When the target status LEDs do not display as shown in Figures 2.16 and 2.17, refer to "Chapter 5. Troubleshooting" (page 61).

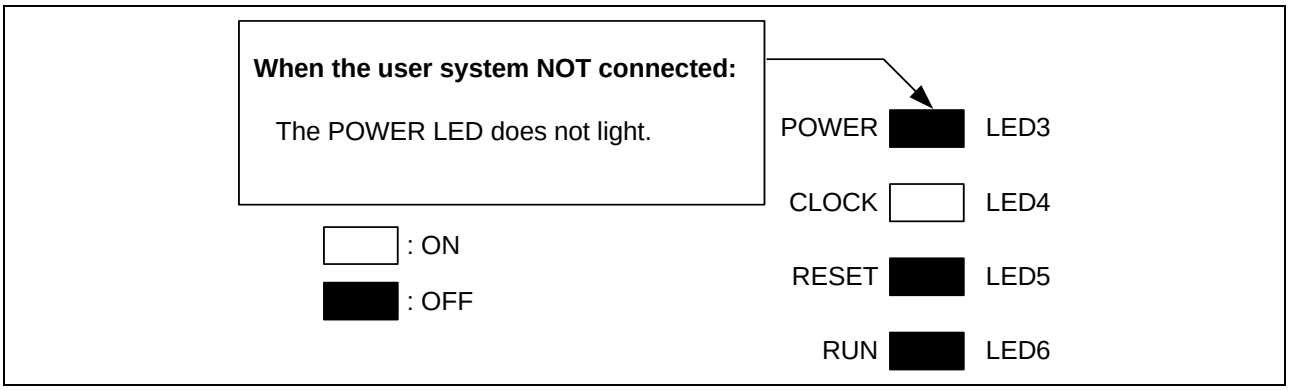


Figure 2.16 LED display when the emulator starts up normally (user system not connected)

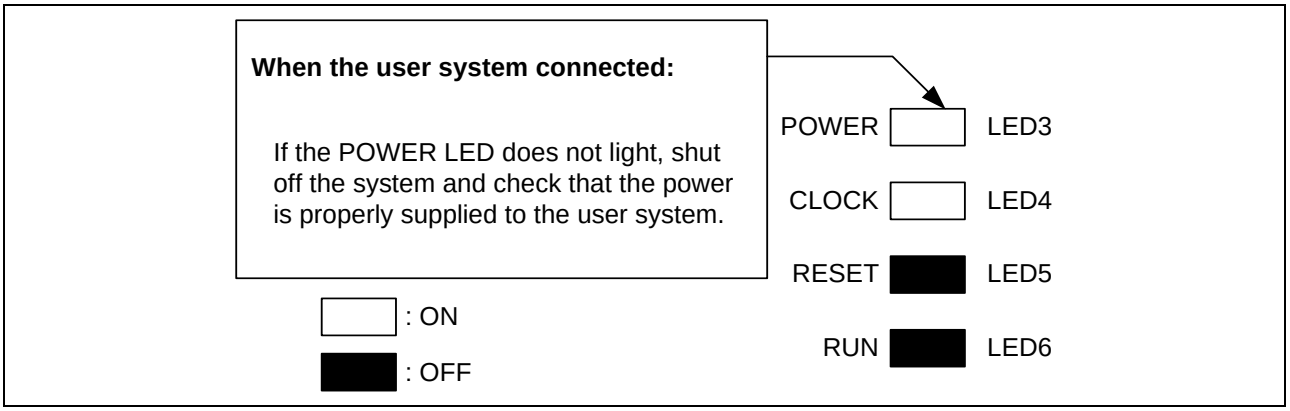


Figure 2.17 LED display when the emulator starts up normally (user system connected)

2.9 Downloading Firmware

2.9.1 When It is Necessary to Download Firmware

It is necessary to download the firmware in the cases listed below.

(1) When the firmware has been upgraded
(2) When M3T-PD72M has been upgraded

If the download is not completed in the cases below, redownload the firmware.
- When the power is unexpectedly shut down during a download from M3T-PD72M
- When a communications interface cable is unexpectedly pulled out

2.9.2 Downloading Firmware in Maintenance Mode

Download the firmware in the maintenance mode as explained here following. **The user system must not be connected when you download the firmware.**

(1) Connect the USB interface cable to the emulator and host machine.
(2) Within 2 seconds of activating power to the emulator, press the system reset switch on the emulator to switch to maintenance mode. When the emulator is switched to maintenance mode, the System Status SAFE LED begins to flash.
(3) Start up the emulator debugger M3T-PD72M. After setting the Init dialog box, the dialog which urges to download the firmware will appear. Download the firmware following messages. Required time for downloading the firmware is about 60 seconds.

IMPORTANT

Note on Downloading Firmware:

- Do not shut OFF power while the firmware is being downloaded. If the power is shut OFF, the emulator will not start up properly. If it happened by mistake, redownload the firmware in the maintenance mode.

2.10 Self-check

2.10.1 Self-check Procedure

To run the self-check of the emulator, do so as explained here below. While the self-check is in progress, the LEDs will change as shown in Figure 2.18.

(1) If the user system is connected, disconnect it.
(2) Within 2 seconds of activating power to the emulator, press the system reset switch on the emulator front panel.
(3) Check the SAFE LED starts flashing and then press the system reset switch again.
(4) The self-check will start. It takes about 15 seconds to complete the self-check.
(5) If the normal result is displayed as shown in Figure 2.18, the self-check terminated normally.

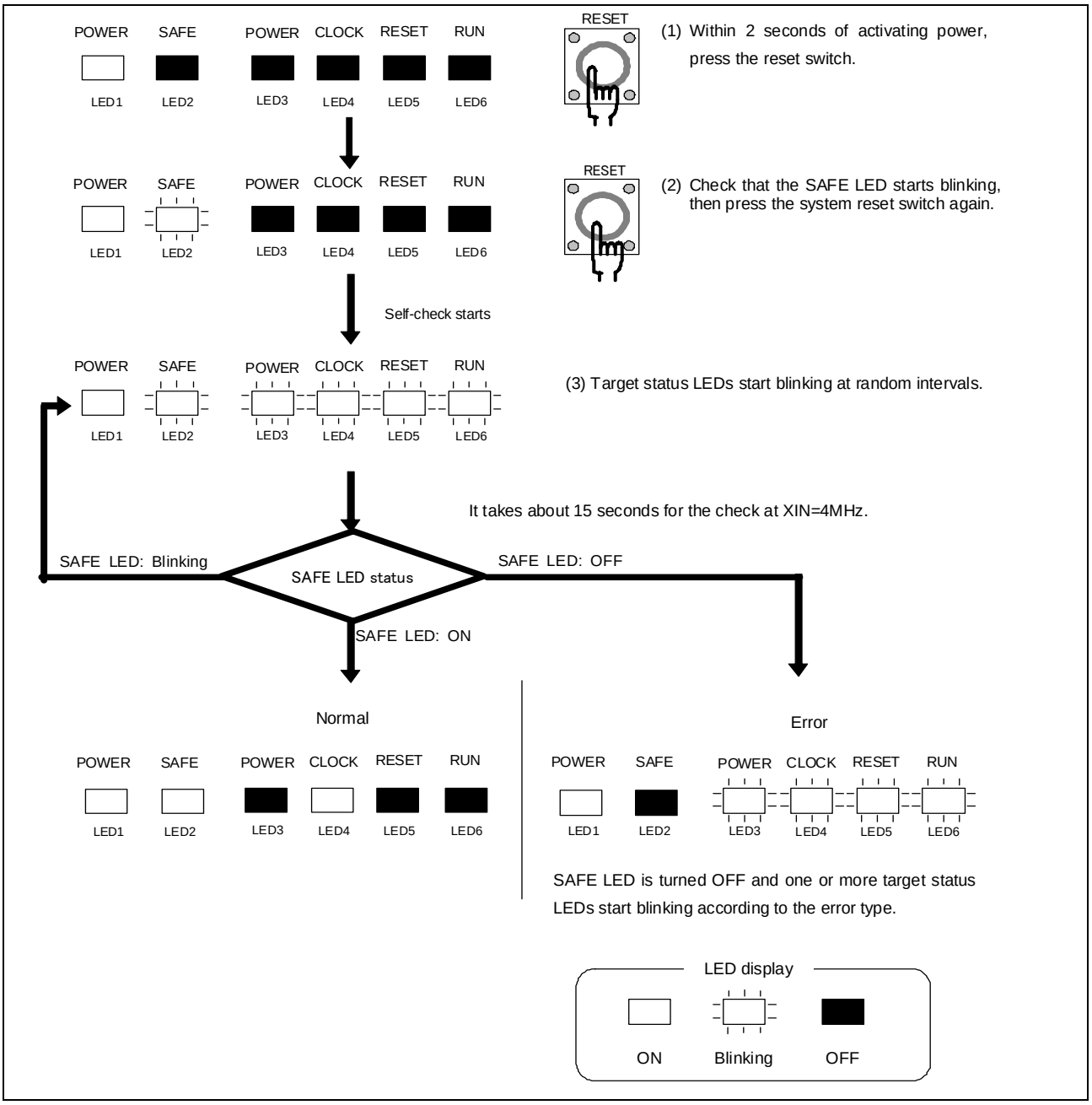


Figure 2.18 LED display while executing the self-check

2.10.2 If an Error is Detected in the Self-check

Table 2.4 lists how to remedy the troubles if the target status LED display is abnormal in the self-check. When an error is detected, shut off the emulator and the user system and follow the steps in the Table 2.4. Then, reactivate the power of the emulator and the user system.

Table 2.4 Error display in the self-check and how to remedy it

LED display Blinking OFF				Problem & Remedy
POWER	CLOCK	RESET	RUN	
■	■	■	■	The emulator system does not work properly. - Check that power is supplied to the emulator. - The emulator may be damaged. Contact your local distributor.
■	■	■	Blinking	
■	■	Blinking	■	
■	Blinking	■	■	A clock is not supplied to the emulator. - Check that the oscillator circuit board (OSC-2) is attached. - Check that the oscillator on the oscillator circuit board (OSC-2) or the oscillation module is oscillating properly.
■	Blinking	Blinking	Blinking	The MCU cannot be controlled. - Check that the MCU is properly attached. - Check that the oscillation frequency of the oscillator circuit board is within the specified range.
Others				The emulator system is not working properly. - The emulator may be damaged. Contact your local distributor.

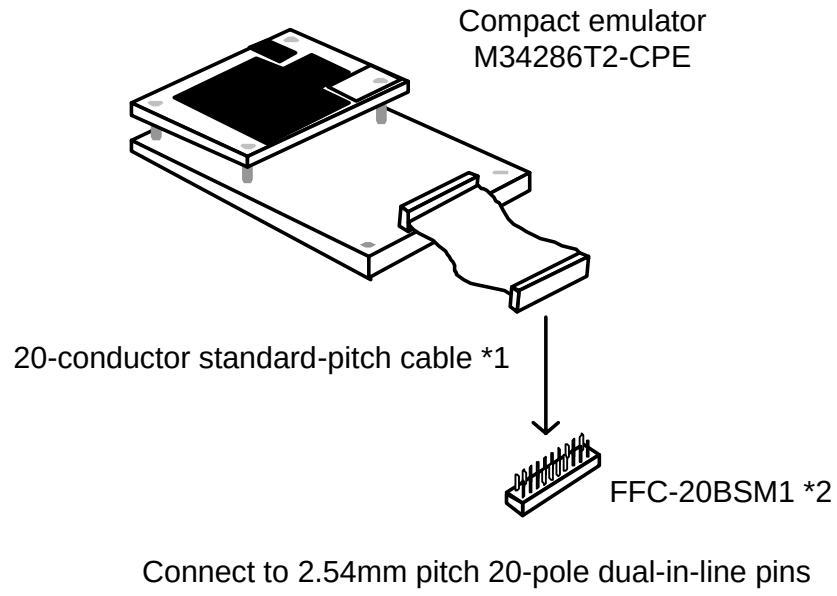
IMPORTANT

Notes on the Self-check:

- **Be sure to disconnect the user system** before executing the self-check.
- Use the preinstalled oscillator circuit board (OSC-2, 4 MHz) to execute the self-check.
- If the self-check does not result normally (excluding target status errors), the emulator may be damaged. Then, contact your local distributor.

2.11 Connecting the User System

Figure 2.19 shows the connection of the M34286T2-CPE and the user system.



*1 This item is included with this product.
*2 Not included. Prepare it separately.
FFC-20BSM1 is made by Honda Tsushin Kogyo.

Figure 2.19 Connection of M34286T2-CPE and user system

⚠ CAUTION

Note on Connecting the User System:

- Take care not to attach the converter board in a wrong direction. It may cause a fatal damage to the emulator.

2.11.1 Connecting to 2.54mm pitch 20-pole Dual-in-line Pins

Connect this product to 20-pole dual-in-line pins using the included 20-conductor standard-pitch cable.

Table 2.5 lists the connector assignments of the 20-conductor standard-pitch cable, and Figure 2.20 shows the pin layout of the 20-conductor standard-pitch cable. Be careful not to connect the cable in a wrong direction, because it may cause a fatal damage to the emulator and user system.

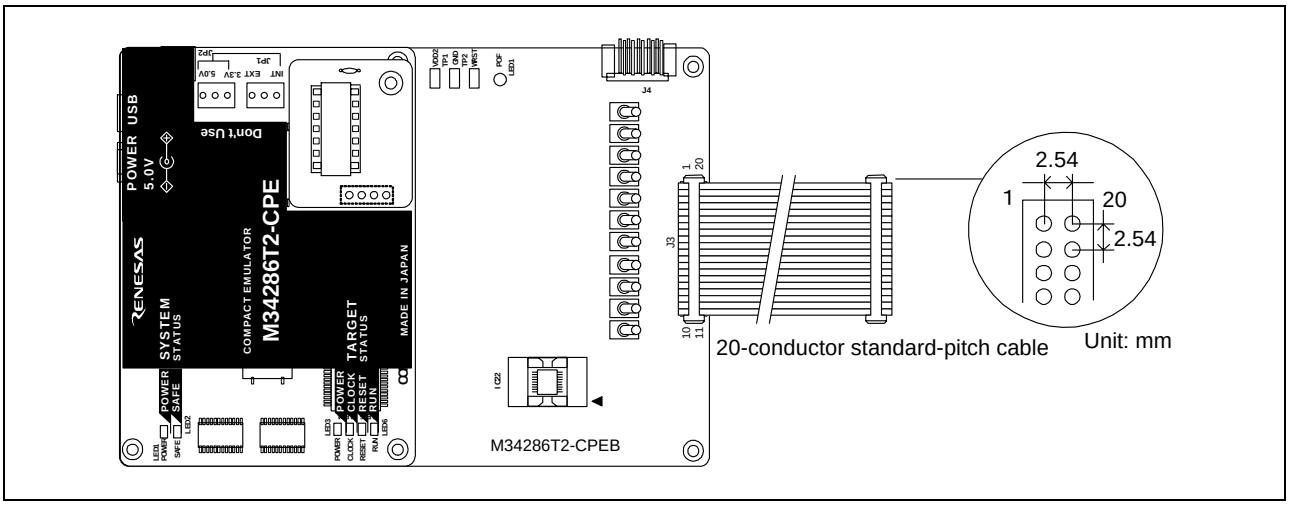


Figure 2.20 Connecting to 2.54mm pitch 20-pole dual-in-line pins

Table 2.5 Connector assignments of the 20-conductor standard-pitch cable

Connector pin No.	MCU pin No.	Signal	Connector pin No.	MCU pin No.	Signal
1	1	VSS	20	20	VDD
2	2	E2	19	19	CARR
3	3	E1	18	18	D0
4	4	XIN	17	17	D1
5	5	XOUT	16	16	D2
6	6	E0	15	15	D3
7	7	G0	14	14	D4
8	8	G1	13	13	D5
9	9	G2	12	12	D6
10	10	G3	11	11	D7

* VDD is connected for the emulator system to monitor power supply of the user system, and the emulator system does not supply power to the user system.

* Pins XIN and XOUT are not connected. XIN is input from the oscillator board OSC-2 on the emulator, and it is not input from an oscillator circuit on the user system. To change a system clock frequency, change the frequency of the oscillator board OSC-2.

⚠ CAUTION

Note on Connecting the User System:

- Take care not to attach the converter board in a wrong direction. It may cause a fatal damage to the emulator.

3. Usage (How to Use the Emulator Debugger)

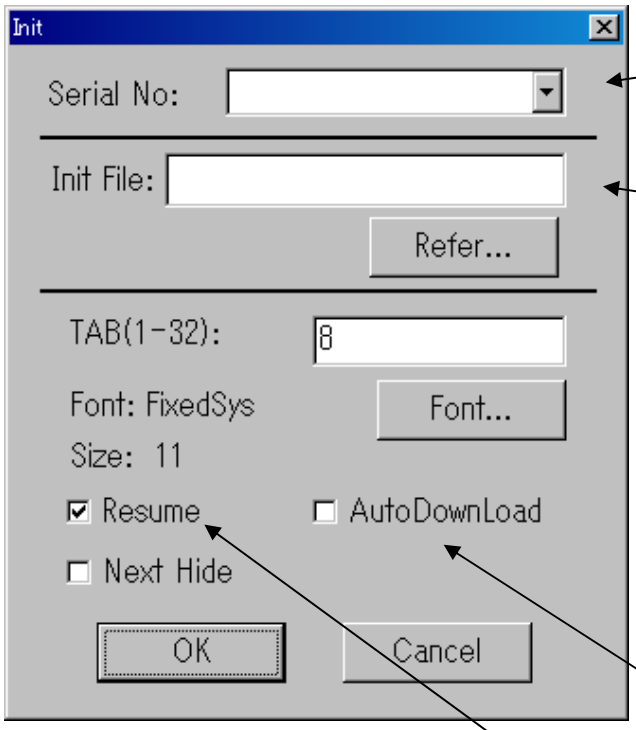
This chapter describes how to start up the emulator debugger and how to use the main windows.

3.1 Starting Up the Emulator Debugger (Init Dialog Box)

To launch the emulator debugger, click the Start menu of Windows and then select Programs >> RENESAS-TOOLS >> PD72M V.xx.xx Release x >> PD72M. When the emulator debugger started up, the Init dialog box appears.

When the emulator debugger started up, the Init dialog box appears.

(1) Setting the Init dialog box (1/2)



Serial No.

Shows the currently connected emulators in list form. Select the serial No. of the emulator you want to be connected.

Automatic execution of script commands

To automatically execute a script command when starting up the debugger, click the "Refer..." button and specify the script file to be executed.

Clicking the "Refer..." button brings up a file selection dialog box. The script file you have selected is displayed in the Init File: section of the dialog box shown here. If you do not want to automatically execute a script command, delete the character string displayed in the Init File: section of the dialog box.

What you specify here is reflected at only startup. If you specify back again in the Init dialog box after startup, whatever you specified has no effect. (Be sure to restart the emulator debugger.)

Redownloading the load module

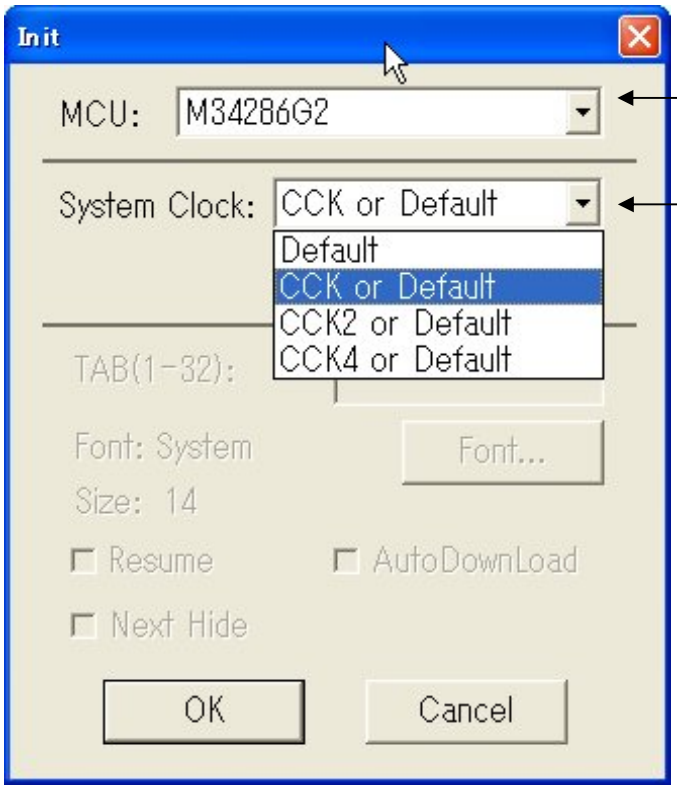
To download the load module (user program) again, select the "AutoDownLoad" check box. (By default, it is unselected)

Restoring the last window state

To restart the state of the window in which it was when it was finished previously (e.g., window position and size), select the "Resume" check box (flagged by a check mark when selected). (By default, it is selected)

(2) Setting the Init dialog box (2/2)

By pressing [OK] after setting the Init dialog box (1/2), the following Init dialog box will be displayed.



Selecting the target MCU

Select the target MCU that you are going to debug.

Selecting the System Clock

Select the system clock that you are going to set within the user program.

Default: System clock is used at f(XIN)/8.

CCK or Default : System clock will be changed from f(XIN)/8 to f(XIN)/1 by the CCK instruction.

CCK2 or Default: System clock will be changed from f(XIN)/8 to f(XIN)/2 by the CCK2 instruction.

CCK4 or Default: System clock will be changed from f(XIN)/8 to f(XIN)/4 by the CCK4 instruction.

IMPORTANT

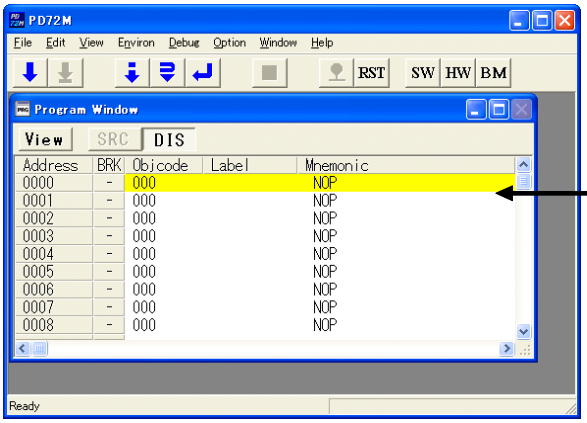
Note on selecting the system clock :

- When selecting System Clock in the INIT dialog, be sure to select the same system clock as those to be specified in the user program.
  If the system clock you select is different from the setting on the user system, the emulator will not work properly. When the emulator does not work properly, quit the emulator debugger. Then, before restarting the emulator debugger, be sure to turn off the power of the emulator and turn it on again.

3.2 Program Window

(1) Downloading a program

1) Initial screen of the program window



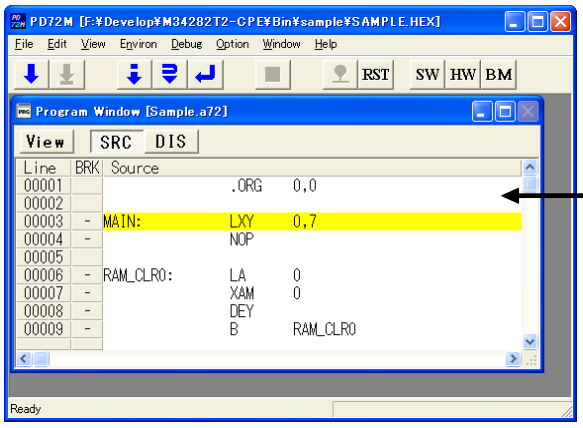
Initial screen of the program window

The program window is a window that always shows the content of the source file corresponding to the current position of the program counter. It automatically opens when the emulator starts up. The program counter position is identified by the yellow background color. Here, you can execute the program up to the cursor position, set or clear software breakpoints, and line-assemble the source file.

The ROM area at the emulator startup time is initialized to '000h' (NOP instruction).

2) Downloading the program

Menu	Menu item	Function
File	Download	Downloads the user program.
	Load Module...	Downloads machine language data and debug information.
	Memory Image...	Downloads only machine language data.
	Symbol...	Downloads only debug information.
	Reload...	Reloads the user program.
	Upload...	Uploads the user program.
	Save Disasm...	Saves the disassembled result.



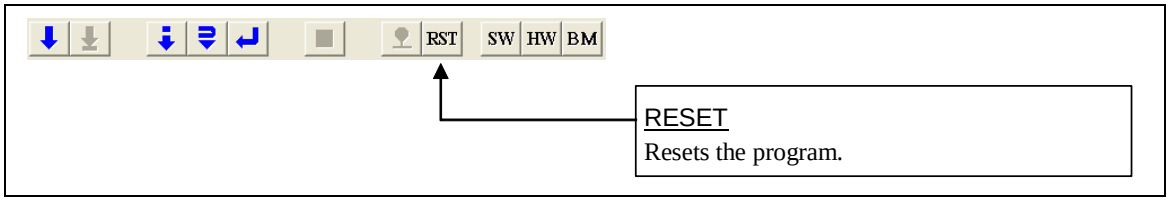
Display after downloading the program

The program window has the following two display modes.

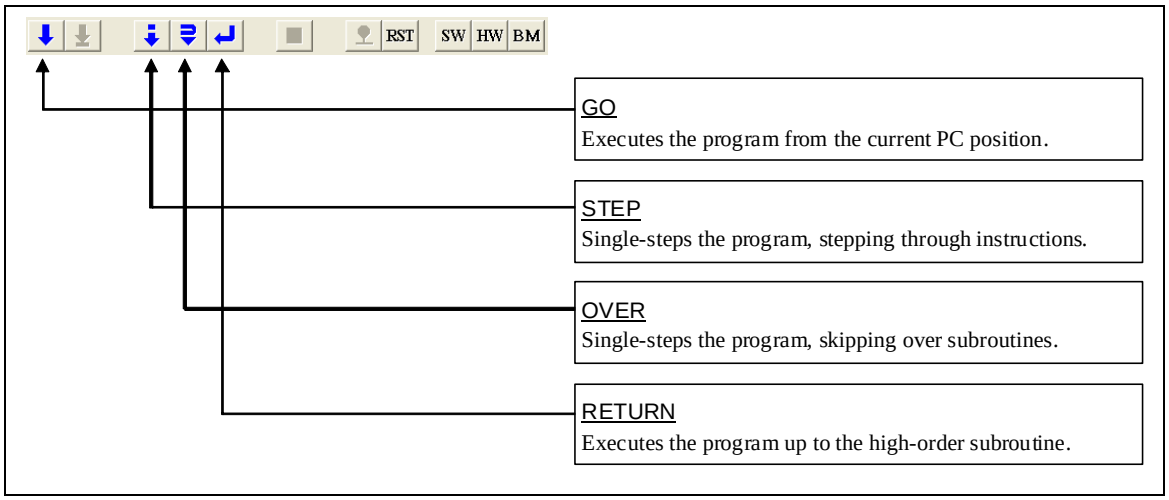
- Source display mode (SRC)
  Shows the source file of the user program.
- Disassemble display mode (DIS)
  Shows the disassembled result of the user program.

(2) Executing the program

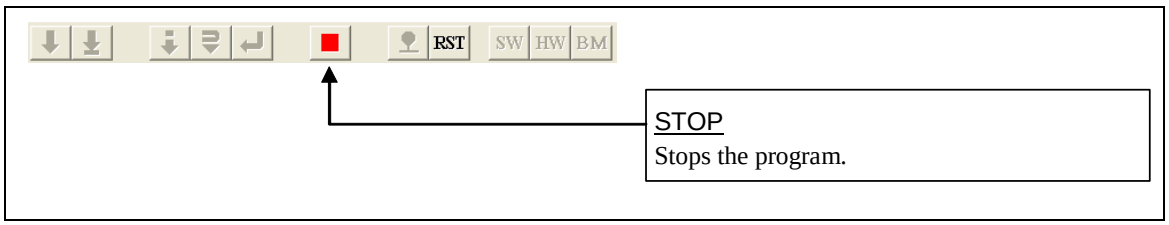
1) Resetting the user program



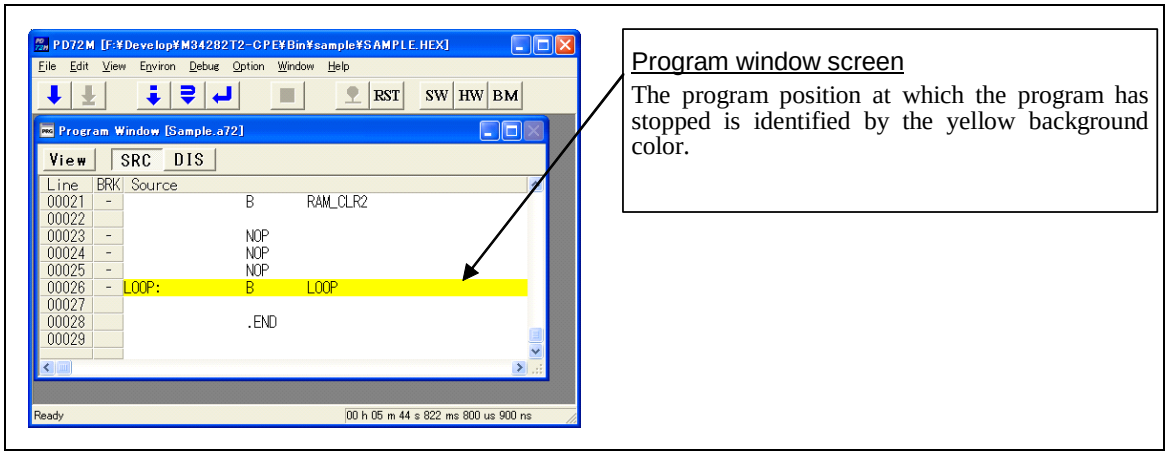
2) Executing the user program



3) Stopping the user program

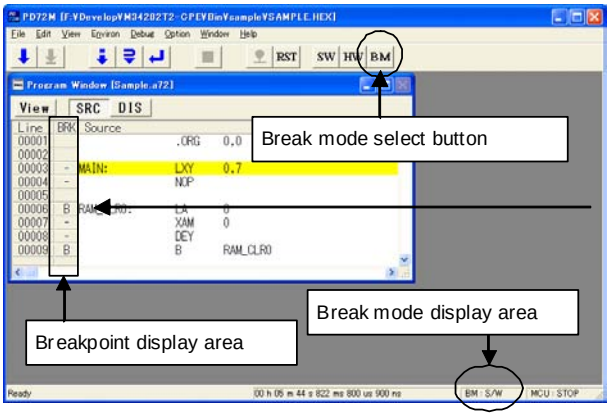


4) Program window screen after the user program has stopped



(3) Setting breakpoints

1) Screen after breakpoint setup



Breakpoint setup screen

There are two types of breakpoints as described below.

Either type of breakpoint needs to be used depending on break mode.

Break modes are switched over by the break mode select button. The current break mode is shown in the break mode display area.

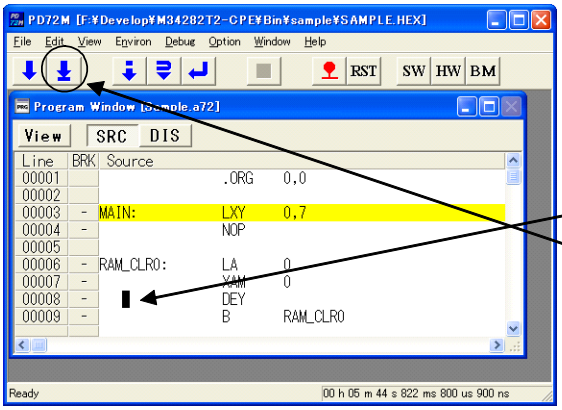
BM: S/W Software break mode
BM: H/W Hardware break mode

- Software breakpoint
  A software breakpoint can be set or cleared by double-clicking the breakpoint display area. If the breakpoint you set is a software breakpoint, the program stops after executing the instruction at the set breakpoint.
  Up to eight software breakpoints can be used in a program.

- Hardware breakpoint
  For hardware breakpoints, you can select break conditions in the hardware breakpoint setup window.
  Up to two hardware breakpoints can be used in a program. The break conditions set can include an address range or an external trigger as the cause of break.

(4) Executing up to the cursor position (Come command)

1) Specifying the Come command



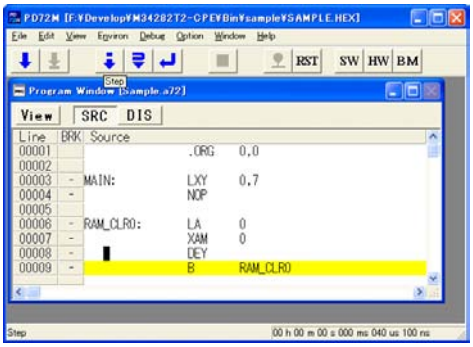
Setup procedure for executing the COME command

The Come command allows you to execute the program up to the cursor position.

The setup procedure is described below.

(1) Click the line in the program display area at which you want the program to break.
(2) Click the Come button.

2) After the Come command has finished



3.3 Hardware Breakpoint Setting Window

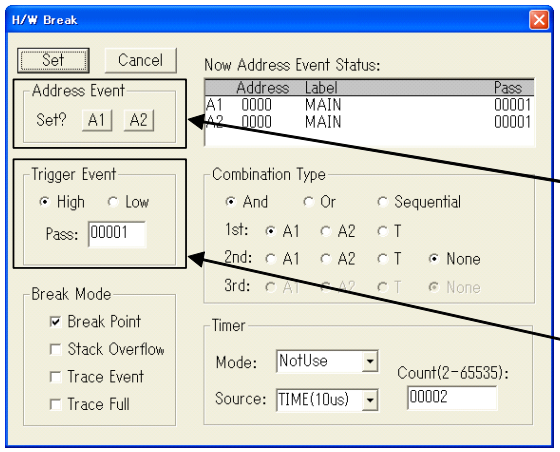
(1) Breakpoint setup dialog box

1) Opening the hardware breakpoint setup dialog box

Hardware Break Point

Clicking this button opens the hardware breakpoint setup dialog box.

2) Hardware Break Point Setting Window in initial state



Hardware breakpoint setup dialog box

You can use a combination of address event (A1 or A2) and T (external trigger event) as a hardware break event.

Setting an address event

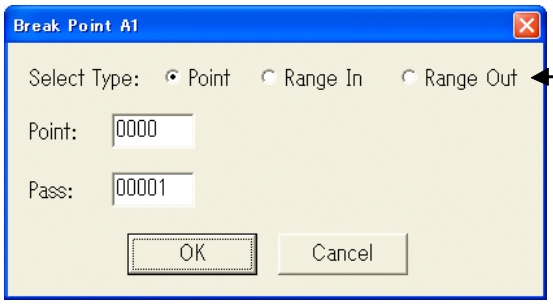
Click A1 or A2 to select the address event you want to set.

Setting an external trigger event

You can set edges or pass counts of external trigger event.

High: Positive edge
Low: Negative edge

3) Address event setting dialog box



Setting an address event

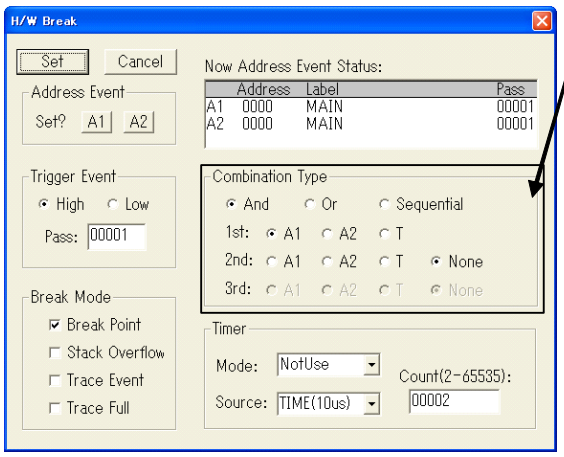
Here, you can select one of three conditions.

Point: At specified address
Range In: In specified address range
Range Out: Outside specified address range

You also can set a pass count.

(2) Setting the combinatorial event condition

1) Window for setting the combinatorial event condition

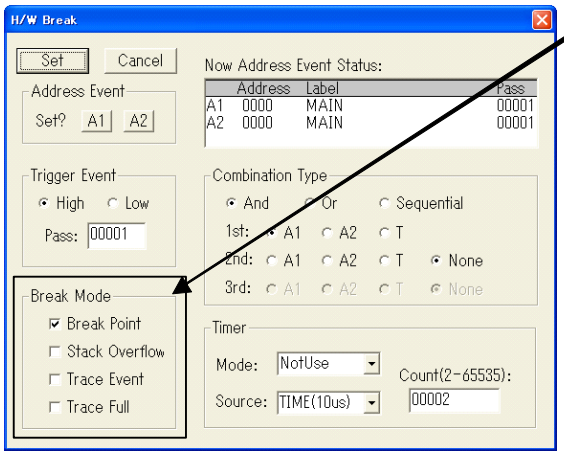


Setting combinatorial conditions

Select a combinatorial condition for A1, A2, and T. One of the following three combinatorial conditions can be selected.

AND:	All of the specified conditions are met.
OR:	One of the specified conditions is met.
Sequential:	The specified conditions are met sequentially in a specified order.

2) Setting a break event

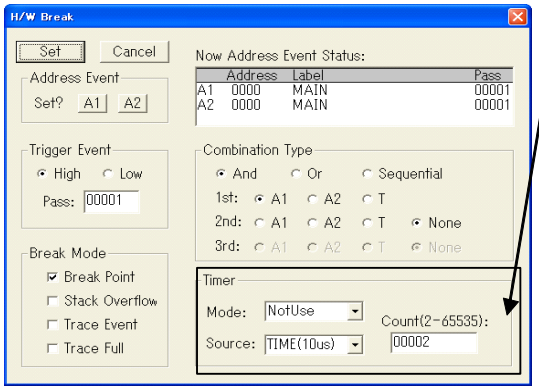


Break condition setup area

The following four break conditions can be set. You can set two or more break conditions at the same time.

Break Point:	The program breaks when a breakpoint is reached.
Stack Overflow:	The program breaks when the stack overflows or underflows.
Trace Event:	The program breaks when a trace event is met.
Trace Full:	The program breaks when it finished writing to the trace memory.

3) Timer setup area



Timer setup area

The following four operation modes of the timer can be specified.

NotUse:	The timer is not used.
TimeOut:	The program that loops at a constant frequency breaks when a breakpoint is not reached within a specified time again. As an operating condition, a breakpoint must be reached at least once.
TimeCount:	The program breaks when a specified time has elapsed after it started running.
DelayCount:	The program breaks when a specified time has elapsed after a breakpoint is reached.

Furthermore, one of the following two can be specified as the count source for the timer.

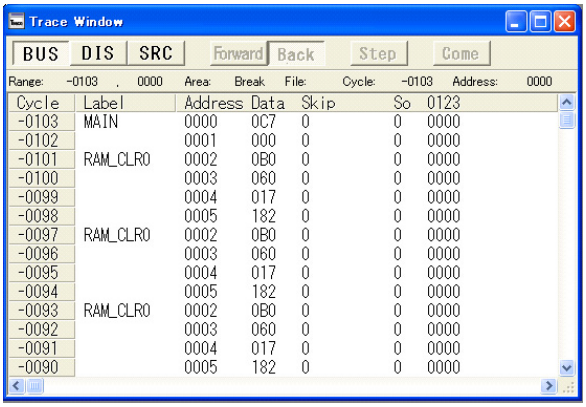
TIME (10us):	The passage of time is counted using the emulator's timer (10 µs fixed).
CYCLE MCU:	The passage of time is counted using machine cycles.

3.4 Trace Window

(1) Trace window

1) Trace window

Menu	Menu item	Function
Window	Trace Window	Opens the trace window.



Trace window

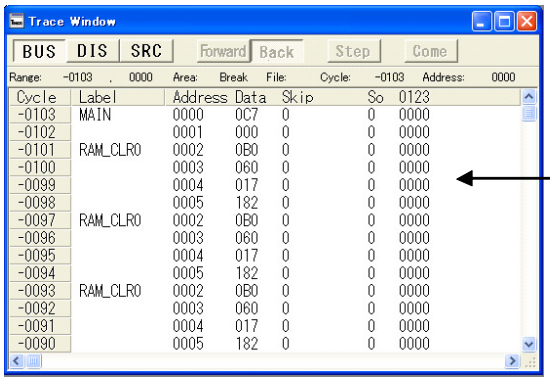
The trace window is used to show the results of real-time trace measurements. It has the following three display modes:

- Bus mode (BUS)
  Bus information per cycle can be inspected. The contents are displayed in order of execution paths.
- Disassemble mode (DIS)
  The execution paths of the executed instructions can be inspected. The contents are displayed in order of execution paths.
- Source mode (SRC)
  The execution paths of the source program can be inspected.

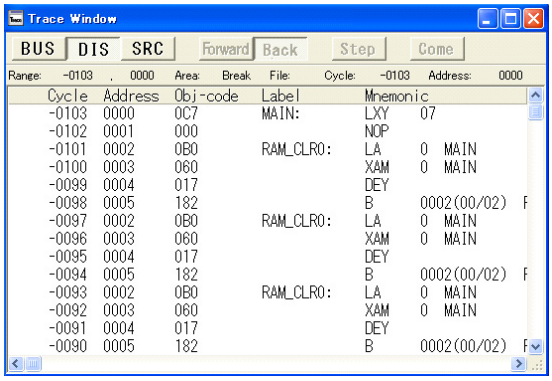
These modes can be switched over using the respective toolbar buttons.
The trace window shows the measurement result when a real-time trace measurement has finished. The trace window remains blank until the real-time trace measurement in progress finishes.

2) Trace window (bus display)

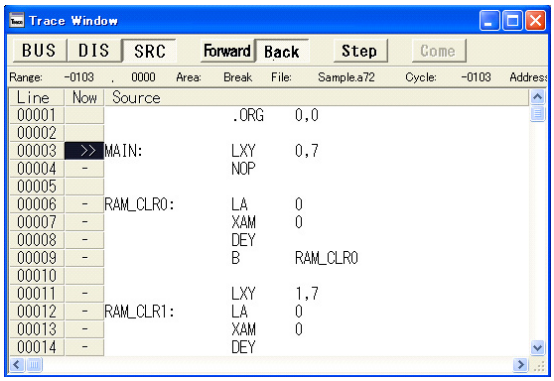
Bus display (BUS)



Disassemble display (DIS)



Source display (SRC)



Explanation of the trace window (bus display)

The following explains the displayed contents, from left to right.

- Address
  Shows the status of the address bus.

- Data
  Shows the status of the data bus.

- Skip
  When marked by 1, it means a skipped instruction.

- So
  When marked by 1, it means that a stack overflow or underflow has occurred.

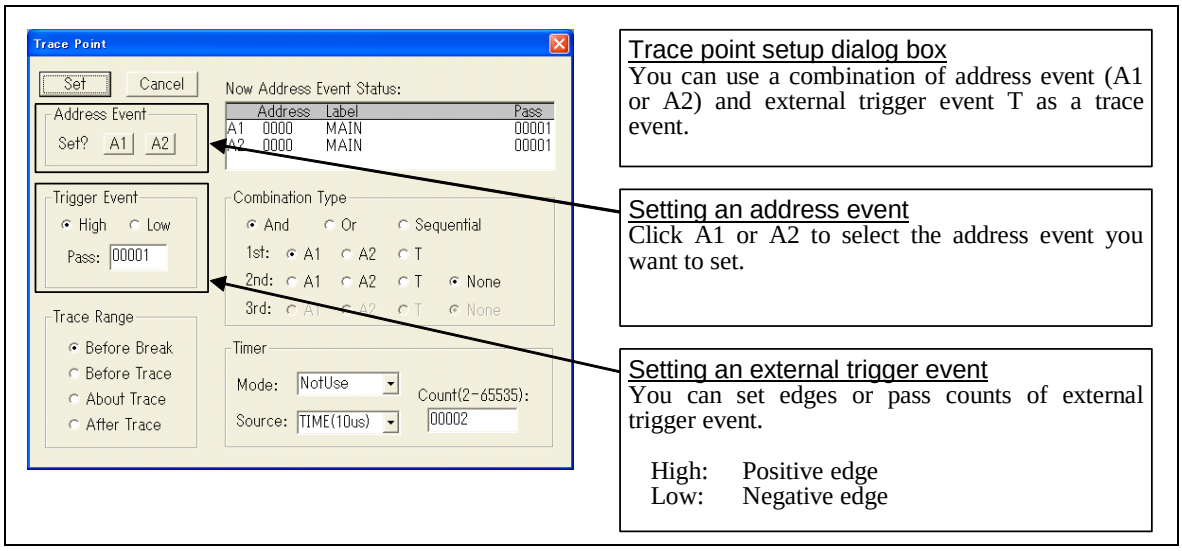
- 0123
  Shows the signal level of external trace cable EXT0-3.

(2) Trace point setup dialog box

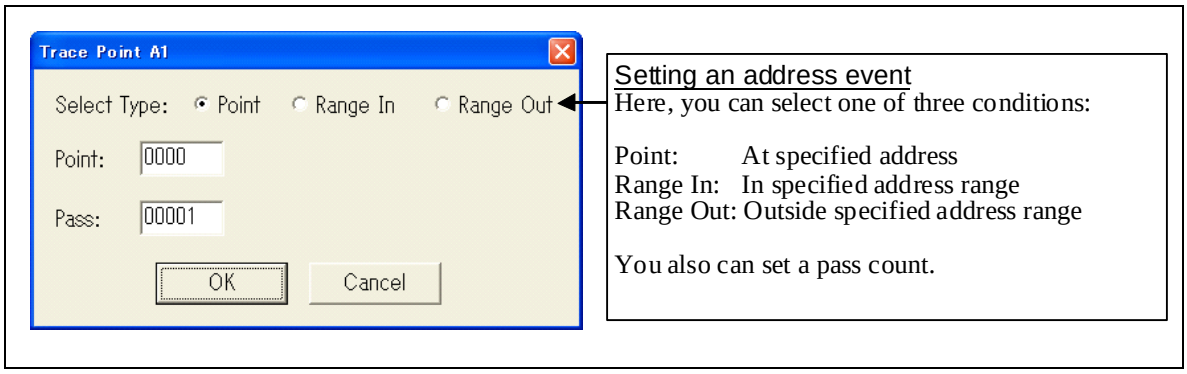
Opening the trace point setup dialog box

Menu	Menu item	Function
Debug	Trace Point	Setting the trace point dialog box

1) Setting the trace point dialog box

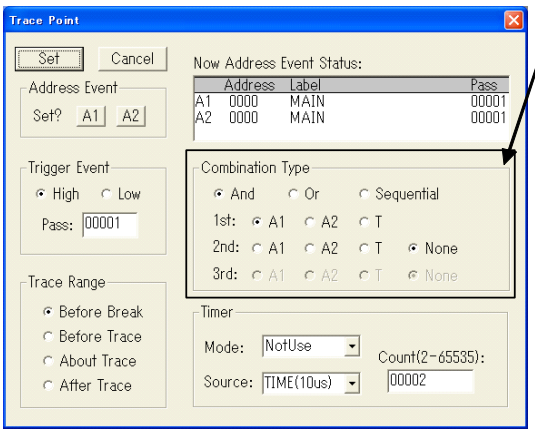


2) Address event setting window in initial state



(3) Setting the combinatorial event condition

1) Window for setting the combinatorial event condition

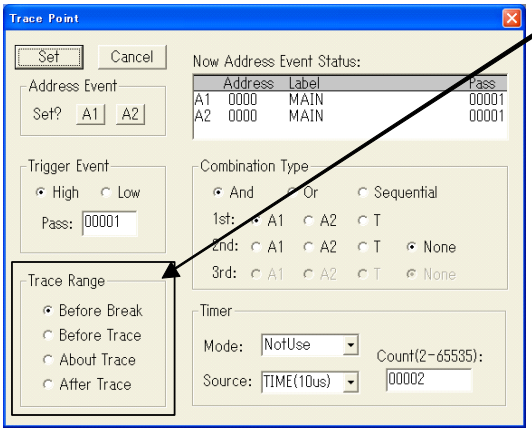


Setting combinatorial conditions

Select a combinatorial condition for A1, A2, and T. One of the following three combinatorial conditions can be selected.

AND:	All of the specified conditions are met.
OR:	One of the specified conditions is met.
Sequential:	The specified conditions are met sequentially in a specified order.

2) Setting a break event

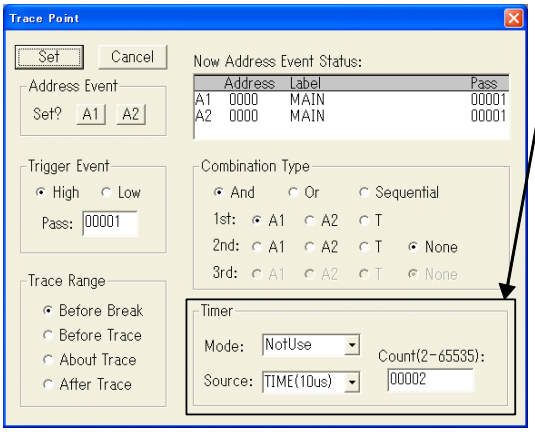


Specifying a trace range

You can specify a trace range for the trace event. Two or more choices can be set at the same time.

Before Break:	32K cycles of instruction execution before the user program stopped is recorded.
Before Trace:	32K cycles of instruction execution before a trace point condition was met is recorded.
About Trace:	32K cycles of instruction execution before and after a trace point condition was met is recorded.
After Trace:	32K cycles of instruction execution after a trace point condition was met is recorded.

3) Timer setup area



Timer setup area

The following four operation modes of the timer can be specified.

NotUse:	The timer is not used.
TimeOut:	The program that loops at a constant frequency breaks when a breakpoint is not reached within a specified time again. As an operating condition, a breakpoint must be reached at least once.
TimeCount:	Recording of the trace finishes when a specified time has elapsed after the program started running.
DelayCount:	Recording of the trace finishes when a specified time has elapsed after a trace point is reached.

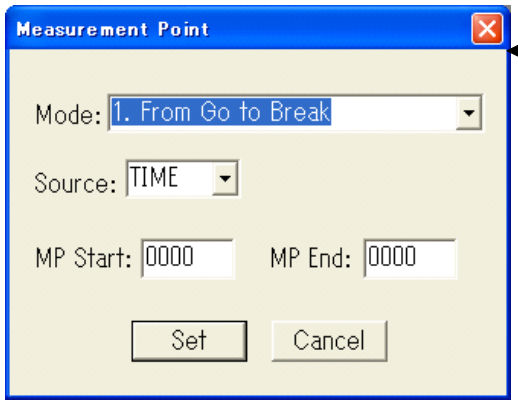
Furthermore, one of the following two can be specified as the count source for the timer.

TIME(10us):	The passage of time is counted using the emulator's timer (10 µs fixed).
CYCLE MCU:	The passage of time is counted using machine cycles.

3.5 Time Measurement

(1) Setting time measurement points

Menu	Menu item	Function
Debug	Measurement Point	Sets up the time measurement points dialog box.



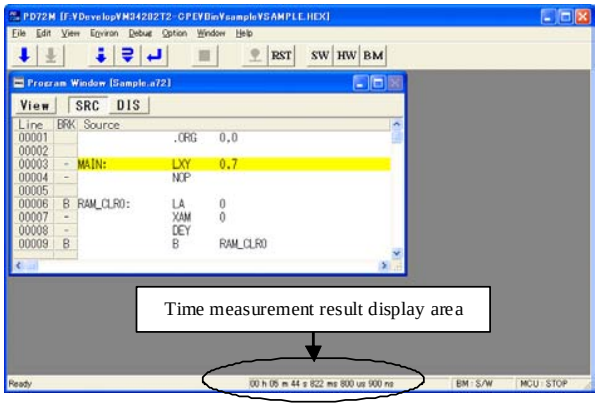
Setting time measurement points

A time measurement range can be specified by selecting one of the following eight time intervals:

1. From Go to Break
   From when the program starts running to when it stops.
2. From Go to MP End
   From when the program starts running to when the end of measurement point passed.
3. From Go to Trace Event
   From when the program starts running to when a trace event is met.
4. From Trace Event to MP End
   From when a trace event is met to when the measurement end point passed.
5. From Trace Event to Break
   From when a trace event is met to when execution of the program finished.
6. From MP Start to MP End
   From when the measurement start point passed to when the measurement end point passed.
7. From MP Start to Trace Event
   From when the measurement start point passed to when a trace event is met.
8. From MP Start to Break
   From when the measurement start point passed to when execution of the program finished.

Furthermore, one of the following two can be specified as the count source for the timer.

TIME(100ns): The passage of time is counted using the emulator's timer (100 ns fixed).
CYCLE MCU: The passage of time is counted using machine cycles.



Display of the time measurement result

The time measurement result is displayed in the status bar at the bottom of the window.

4. Hardware Specifications

This chapter describes specifications of this product.

4.1 Target MCU Specifications

Table 4.1 lists the specifications of target MCUs which can be debugged with this product.

Table 4.1 Specifications of target MCUs for M34286T2-CPE

<table>
<tr><th>Item</th><th colspan="6">Description</th></tr>
<tr><td>Applicable MCU</td><td colspan="6">720 Series 4286 Group</td></tr>
<tr><td>Evaluation MCU</td><td colspan="6">M34286G2GP (mounted in the socket of the emulator)</td></tr>
<tr><td>Power supply voltage of user system</td><td colspan="6">3.0 V±5%
Supplied from emulator only; cannot be supplied from a user system.</td></tr>
<tr><td rowspan="4">Max. operating frequency</td><td colspan="3" rowspan="4">3.0 V</td><td>Divided-by 8-mode</td><td colspan="2" rowspan="3">4.0 MHz</td></tr>
<tr><td>Divided-by 4-mode</td></tr>
<tr><td>Divided-by 2-mode</td></tr>
<tr><td>Through mode</td><td>2.0 MHz</td></tr>
<tr><td>Clock supply</td><td colspan="3">Main clock (X_{IN})</td><td colspan="3">Clock mounted on emulator
(4 MHz: preinstalled, replaceable)</td></tr>
<tr><td rowspan="8">Port emulation</td><td>Pin</td><td>Output type</td><td>Direction</td><td colspan="2">Device</td></tr>
<tr><td>D0-D7</td><td rowspan="4">P-channel open drain
* The pull-down function of D0-D7, G0-G3 and E0 is featured by the external switches.</td><td rowspan="3">I/O</td><td>Input</td><td>74LCX541</td></tr>
<tr><td>G0-G3</td><td rowspan="2">Output</td><td>TD62787</td></tr>
<tr><td>E0</td><td>(P-ch)</td></tr>
<tr><td>E1</td><td>I/O</td><td colspan="2" rowspan="2">Input: 74HC4066
Output: 74HC4066</td></tr>
<tr><td>E2</td><td>-</td><td>Input</td></tr>
<tr><td>CARR</td><td>CMOS</td><td>Output</td><td colspan="2">Output: 74VHC08</td></tr>
<tr><td>Connection to a user system</td><td colspan="6">Connected by 20-pin 2.54mm pitch flat cable</td></tr>
</table>

4.2 Differences between the Actual MCU and Emulator

Differences between the actual MCU and emulator are shown below. When debugging the MCU using this product, be careful about the following precautions.

IMPORTANT

Note on Differences between the Actual MCU and Emulator:

- Operations of the emulator differs from those of actual MCUs as listed below.

(1) Initial values of internal resource data of an MCU at power-on
With the emulator system, the ROM area at power-on is initialized to 000h (NOP instruction).

(2) Voltage drop detection circuit
Because the operating voltage of this product is fixed to 3V or 5V, it cannot evaluate any system using a voltage drop detection circuit.

(3) Power-on reset
You can reset this emulator system by the reset command of the emulator debugger PD72M, however, this emulator system cannot emulate operation at a power-on reset. Therefore, check the operation at a power-on reset using an actual MCU.

(4) Internal pull-down transistor control
Because an emulation circuit exists among ports D0 to D7, G0 to G3 and E0, this emulator system cannot control pull-down transistors by the control resistor of an MCU. To use the internal pull-down transistor, set SW1 to SW11 to the "ON" side. By the settings, each port is pulled down with a 150 kΩ pull-down resistor.

(5) Unconnected pins
Pins below are not connected to the user system
- XIN, XOUT

Notes on Operating Clock:

- The clock generated on the OSC board only is usable as the operating clock, and the clocks listed below cannot be used.
  (1) External input clocks on the user system.

- The clock input to the MCU is supplied from the oscillator circuit board OSC-2 in the emulator, and cannot be supplied from an oscillator circuit in the user system.
  If the system clock frequency needs to be changed, alter the circuit on the oscillator circuit board OCS-2 before use. For details, refer to Section 2.3.2, "Selecting Clock Supply" (page 24).

IMPORTANT

Note on Watchdog Timer:

- With this product, the watchdog timer is running. The watchdog timer initialization cycle can be verified by observing the waveform at the check pin (WRST) of the emulator. For details, refer to "2.5 Watchdog Timer Initialization Cycle Check Pin" (page 28).

- With this emulator system, the watchdog timer function cannot be invalidated.
  If an MCU reset occurs by the watchdog timer, the emulator will not operate properly. In this case, perform a reset input from the emulator debugger or reset the emulator system.
  Also, after a reset by the watchdog timer occurs, the problems below may appear in the emulator debugger:
  (1) Only information of address 0000h is displayed in the results of real-time trace.
  (2) When a user program is forcibly stopped, the value of program counter is the same as when started.
  (3) The software break and hardware break do not occur in the program.

  While a user program is stopped, the WRST instruction is always executed in order not to cause a reset by the watchdog timer.

Notes on Port I/O Timings:

- Port input timings
  Port input timings are the same as with the actual MCUs.

- Port I/O timings
  Port I/O timings are different from those of the actual MCUs for the following ports that are configured with port emulation circuits:
  - D0-D7
  - G0-G3
  - E0

  With the actual MCUs, changes occur at the beginning of the T3 state of an output instruction. With this product, changes occur at the beginning of the T2 state of the next output instruction. Figure 4.1 shows the port I/O timing for this product.
  The output timings excluding the indicated above are the same as with the actual MCUs.

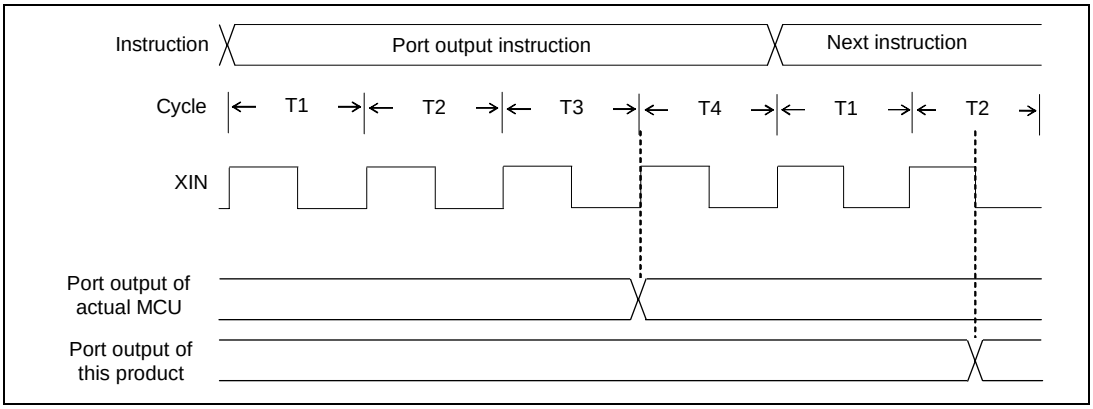


Figure 4.1 Port I/O timings

- As a pitch converter board and other devices are used between the evaluation MCU and the user system, some characteristics are slightly different from those of the actual MCU. Therefore, be sure to evaluate your system with an evaluation MCU.

IMPORTANT

Note on Port Electrical Characteristics:

- Because the following ports are configured with port emulation circuits, electrical characteristics differ from those of the actual MCU.

  - D0-D7
  - E0
  - G0-G3

  For more details, refer to "4.3 Connection Diagram" (page 56).

Note on Register Operation:

- Table below lists the registers that can be operated from the M3T-PD72M. The "Yes" in the table means that the register can be operated; the "No" means that the register can not be operated.

Table 4.2 Registers that can be operated when debugging 4286 Group MCUs

Register	Reference	Modification	Register	Reference	Modification
PC	Yes	Yes	V1	No	Yes
CY	Yes	Yes	V2	No	Yes
A	Yes	Yes	PU0	No	Yes
B	Yes	Yes	PU1	No	Yes
D	No	Yes	PU2	No	Yes
E	Yes	Yes	L0	No	Yes
X	Yes	Yes			
Y	Yes	Yes			
SP	Yes	No			

Note on Final Evaluation:

- Be sure to evaluate your system with an evaluation MCU.

4.3 Connection Diagram

Figure 4.2 shows a part of the connection diagram of the M34286T2-CPE. This connection diagram mainly shows the interface section. The circuits not connected to the user system such as the emulator's control system are omitted. The signals not shown in Figure 4.2 connect the evaluation MCU and the user system directly. Tables 4.2 to 4.5 show IC electric characteristics of this product for reference purposes.

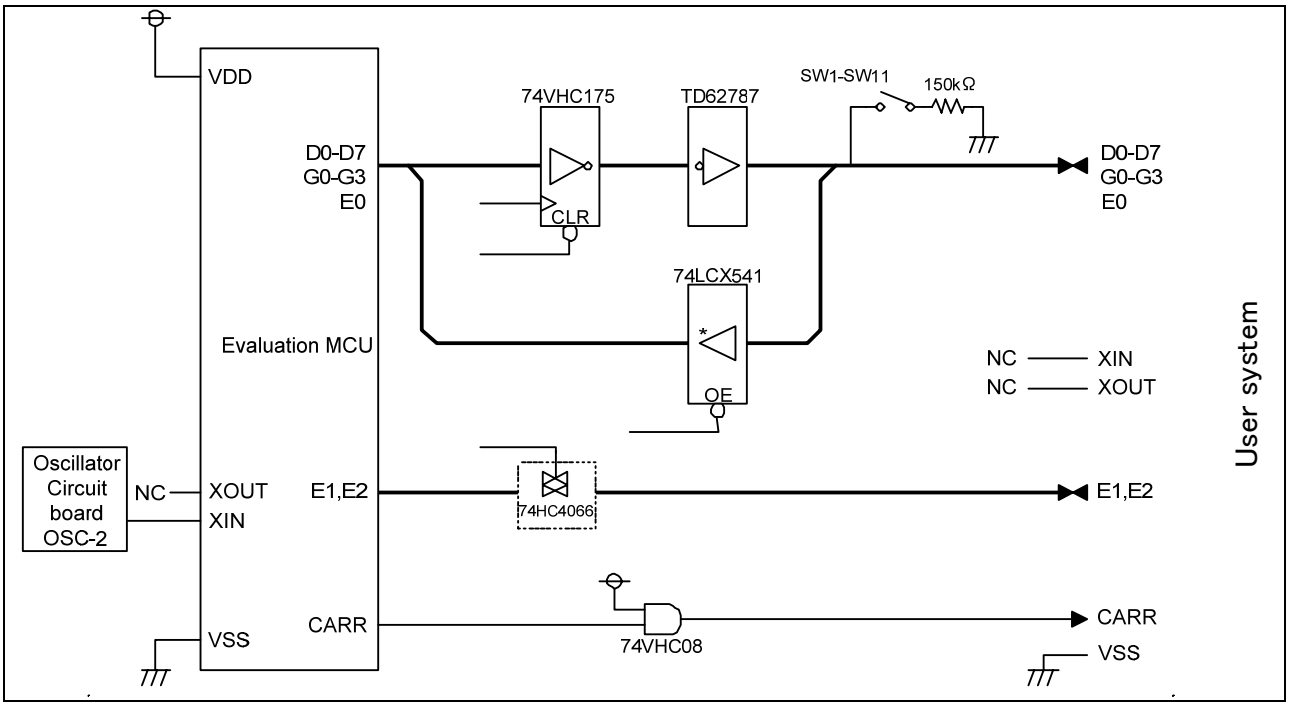


Figure 4.2 Connection diagram of the M34286T2-CPE

Table 4.3 Electrical characteristics of the 74HC4050

Signal	Item	Condition	Standard values		Unit
			Min.	Max.	
V_{IH}	"H" level threshold voltage	Vcc=2.0V	1.50	-	V
		Vcc=4.5V	3.15	-	
		Vcc=6.0V	4.20	-	
V_{IL}	"L" level threshold voltage	Vcc=2.0V	-	0.50	
		Vcc=4.5V	-	1.35	
		Vcc=6.0V	-	1.80	

Table 4.4 Electrical characteristics of the TD62787

Signal	Item	Condition	Standard values			Unit
			Min.	Standard	Max.	
I_{CEX}	Output leakage current	V_{OUT}=-50V	-	-	-100	μ a
$V_{CE(sat)}$	Output saturated voltage	$V_{IN}=V_{IL}$, I_{OUT}=-100mA	-	-	-1.8	A
		$V_{IN}=V_{IL}$, I_{OUT}=-350mA	-	-	-2.0	

Table 4.5 Electrical characteristics of the 74LCX541

Signal	Item	Condition	Standard values			Unit
			Min.	Standard	Max.	
V_{IH}	"H" input voltage	Vcc=2.7-3.6V	2.0	-	-	V
V_{IL}	"L" input voltage	Vcc=2.7-3.6V	-	-	0.8	

Table 4.6 Electrical characteristics of the 74HC4066

Signal	Item	Condition	Standard values			Unit
			Min.	Standard	Max.	
R_{ON}	On resistance	Vcc=4.5V	-	96	170	Ω
ΔR_{ON}	On resistance difference	Vcc=4.5V	-	10	-	
I_{OFF}	Leakage current (when OFF)	Vcc=12.0V	-	-	±100	nA
I_{IZ}	Leakage current (ON, output: OPEN)	Vcc=12.0V	-	-	±100	

Table 4.7 Electrical characteristics of the 74HC08

Signal	Item	Condition	Standard values			Unit
			Min.	Standard	Max.	
V_{OH}	"H" output voltage	Vcc=2.0V, I_{OH}= -50μA	0.90	-	-	V
V_{OL}	"L" output voltage	Vcc=2.0V, I_{OL}= -50μA	-	-	0.10	

4.4 External Dimensions

4.4.1 External Dimensions of the Compact Emulator

Figure 4.3 shows external dimensions of the emulator.

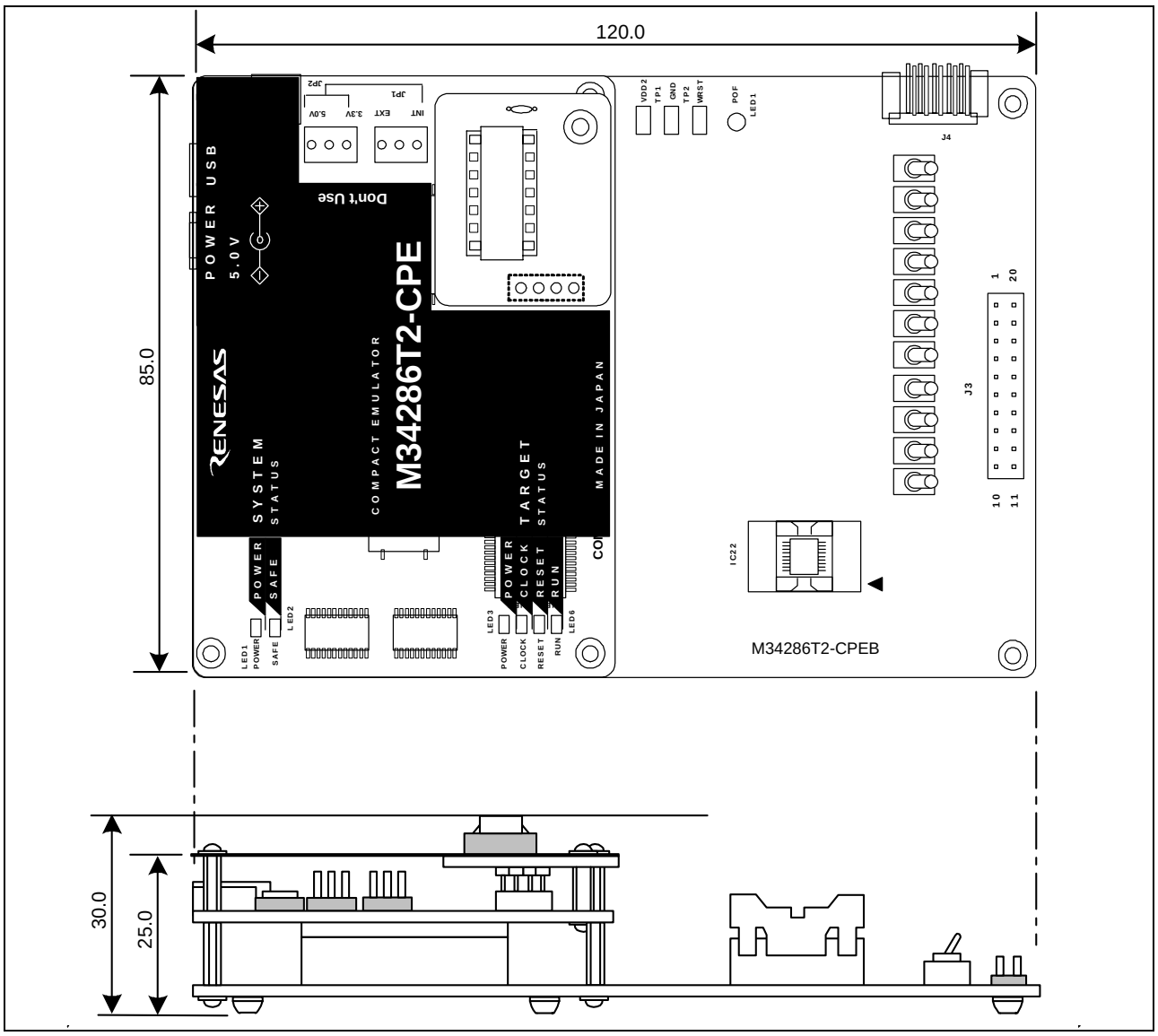


Figure 4.3 Compact emulator external dimensions (Unit: [mm])

4.5 Notes on Using This Product

Notes on using this product are listed below. When debugging the MCU using this product, be careful about the following precautions.

IMPORTANT

Notes on the Self-check:

- If the self-check does not result normally (excluding target status errors), the emulator may be damaged. Then contact your local distributor.
- Run the self-check with the user system not connected.

Note on Quitting the Emulator Debugger:

- To restart the emulator debugger, always shut power to the emulator module off once and then on again.

Notes on the User System (Power Supply, Order of Powering On):

- This emulator cannot supply the power to the user system. Therefore design your system so that the user system is powered separately.
- The voltage of the user system should be as follows.
  3.0 V±5%
- Do not change the voltage of the user system after turning on the power.
- Before powering on your emulator system, check that the host machine, the emulator, the converter board and user system are all connected correctly. Next, turn on the power to each equipment following the procedure below.
  (1) Turn ON/OFF the user system and the emulator as simultaneously as possible.
  (2) When the emulator debugger starts up, check the target status LEDs on the emulator to see if this product is ready to operate.
  Is the power supplied? Check that target status LED (POWER) is ON.*1
  Is the clock supplied? Check that target status LED (CLOCK) is ON.
  *1 When the user system is not connected, the target status LED (POWER) is not lit.

IMPORTANT

Note on the Power Down State:

- Although this emulator allows you to execute a program using POF, execution of such programs is subject to the following limitations:
  (1) The POF instruction cannot be stepped and over-stepped. Therefore, do not attempt to step and step-over the POF instruction.
  (2) No events (hardware breaks and trace points) can be set in execution cycles of the POF instruction. The events set in execution cycles of the POF and POF2 instructions, if any, have no effect.
  (3) During power down state, no commands of the emulator debugger M3T-PD72M except for RESET can be executed. Exit power down state by applying key-on wakeup input before executing the commands.

Note on the MCU Status While the Program is Idle:

- In this emulator, the MCU is operating even while the user program remains idle, as well as when the emulator is executing a command.
  When the user program remains idle, always the WRST instruction is executed.

Note on a Break Operation When Skipping Instructions

- In cases when the next instruction is skipped by a skip instruction, if a break operation (hardware, software or forcible break) in the skipped instruction is attempted, no break occurs. If a skip and a break occur at the same time, the cause of the break is cleared and the program continues running until the next cause of break occurs.

  Example: If a break operation is attempted when executing an instruction at address 0002h, the intended break is canceled and the program continues running.

```
[ADDR] [CODE]
  0000  RC
  0001  SZC
  0002  TABP 1     : Skipped instruction
  0003  TAM
  0004  BL 0004    : The program continues to execute
                      instruction without breaking.
```

Note on a Break Operation in a Train of Successive Instructions:

- The program does not break in a train of successive instructions. If a break operation (hardware, software or forcible break) is attempted in a train of successive instructions, the intended break occurs in an instruction at which the successive instructions ended. An example is shown below.

  Example: If a break operation is attempted while executing the instructions at addresses 0000--0003h, the break occurs at address 0004h.

```
[ADDR] [CODE]
  0000   LA 0   ┐
  0001   LA 1   │
  0002   LA 2   ├ Successive instructions
  0003   LA 3   │
  0004   NOP    ┘ < A break occurs at this address.
```

5. Troubleshooting

This chapter describes how to troubleshoot when this product does not work properly.

5.1 Flowchart to Remedy the Troubles

Figure 5.1 shows the flowchart to remedy the troubles from when power to the emulator is activated until the emulator debugger starts up. Check this while the user system is disconnected. For the latest FAQs visit the Renesas Tools Homepage.

http://www.renesas.com/tools

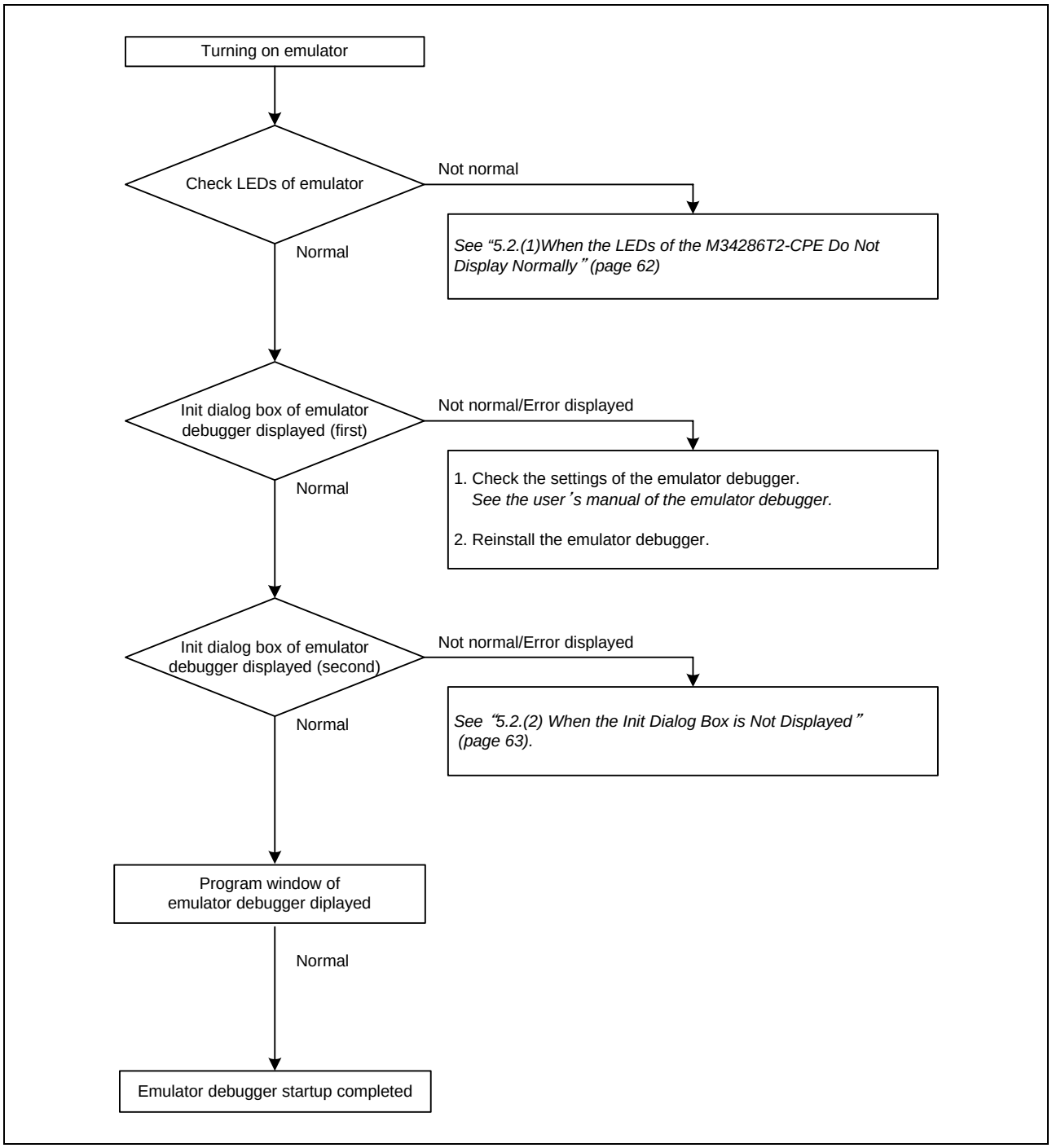


Figure 5.1 Flowchart to remedy the troubles

5.2 When the Emulator Debugger Does Not Start Up Properly

(1) When the LEDs of the M34286T2-CPE Do Not Display Normally

Table 5.1 Errors LEDs show and their checkpoints 1

Error	Connection to the user system	Checkpoint
System Status POWER LED does not light up.	-	Check that the power cable is connected. See "2.6 Connecting the Power Supply for Emulator" (page 30).

Table 5.2 Errors LEDs show and their checkpoints 2

Target Status LED display Blinking OFF POWER	CLOCK	RESET	RUN	Connection to the user system	Problem & Remedy
■				Connected	Check that power (Vcc) is properly supplied to the user system and that the user system is properly grounded.
■				Disconnected	The emulator system is working properly. Target Status POWER LED does not light up when the user system is disconnected
■	■	■	■	-	The emulator system is not working properly. - Check that power is supplied to the emulator. - The emulator may be damaged. Contact your local distributor.
■	■	■	▯	-	
■	■	▯	■	-	
■	▯	■	■	-	A clock is not supplied to the emulator. - Check that the oscillator circuit board (OSC-2) is attached. - Check that the oscillator on the oscillator circuit board (OSC-2) or the oscillation module is oscillating properly. Refer to "2.3.2 Selecting Clock Supply" (page 24)
■	▯	▯	▯	-	The MCU cannot be controlled. - Check that the MCU is properly attached. - Check that the oscillation frequency of the oscillator circuit board (OSC-2) is within the specified range.
Others				-	The emulator system is not working properly. - The emulator may be damaged. Contact your local distributor.

(2) When the Init Dialog Box is Not Displayed

Table 5.3 Errors when starting up the emulator debugger and their checkpoints 1

Error	Checkpoint
Communication error occurred. Data was not sent to the target.	- Check the target status LED display. If the LED is blinking, the emulator did not start up normally. See "2.8.4 LED Display When the Emulator Starts Up Normally" (page 32). - Check that the USB cable is connected properly. See "2.7 Connecting the Host Machine " (page 31). - USB device driver has been installed before the emulator debugger start up? See "2.2.2 Installing the USB Device Driver" (page 21).
Not compact emulator.	Check that an emulator other than the compact emulator (such as PC4701, PC7501) is not connected.

(3) Program Window of the Debugger Does Not Appear

Table 5.4 Errors when starting up the emulator debugger and their checkpoints 2

Error	Checkpoint
The PD72M version and the version of firmware installed in the target do not correspond to each other.	The firmware already installed in the PD72M is older in version than that installed inside the emulator. - Download the latest firmware from the Web and install it securely.

5.3 How to Request for Support

After checking the items in "5 Troubleshooting", fill in the text file which is downloaded from the following URL, then send the information to your local distributor.

http://tool-support.renesas.com/eng/toolnews/registration/support.txt

For prompt response, please specify the following information:

(1) Operating environment
- Operating voltage: _____ [V]
- Operating frequency: _____ [MHz]
- User system: Connected/Disconnected

(2) Product information
- Target MCU: _____
- Emulator: _____

(3) Condition
- The emulator debugger starts up/does not start up
- The error is detected/not detected in the self-check
- Frequency of errors: always/frequency ( )

(4) Problem

6. Maintenance and Guarantee

This chapter describes how to maintenance, repair provisions and how to request for repair.

6.1 User Registration

When you purchase our product, be sure register as a user. For user registration, refer to "User Registration" (page 12) of this user's manual.

6.2 Maintenance

(1) If dust or dirt collects on this product, wipe it off with a dry soft cloth.
Do not use thinner or other solvents because these chemicals can cause the surface coating to separate.

(2) When you do not use this product for a long period, remove the power supply, the host machine and the user system.

6.3 Guarantee

If your product becomes faulty within one year after its purchase while being used under good conditions by observing "IMPORTANT" and "Precautions for Safety" described in this user's manual, we will repair or replace your faulty product free of charge. Note, however, that if your product's fault is raised by any one of the following causes, we will repair it or replace it with new one with extra-charge:

- Misuse, abuse, or use under extraordinary conditions
- Unauthorized repair, remodeling, maintenance, and so on
- Inadequate user's system or misuse of it
- Fires, earthquakes, lightning, storm, flood and other unexpected disasters and damages.

In the above cases, contact your local distributor. If your product is being leased, consult the leasing company or the owner.

6.4 Repair Provisions

Repairs not covered by warranty

The products elapsed more than one year after purchase are not covered by warranty.

Replacement not covered by warranty

If your product's fault falls in any of the following categories, the fault will be corrected by replacing the entire product instead of repair, or you will be advised to purchase new one, depending on the severity of the fault.

- Faulty or broken mechanical portions
- Flaw, separation, or rust in coated or plated portions
- Flaw or cracks in plastic portions
- Faults or breakage caused by improper use or unauthorized repair or modification
- Heavily damaged electric circuits due to overvoltage, overcurrent or shorting of power supply
- Cracks in the printed circuit board or burnt-down patterns
- Wide range of faults that makes replacement less expensive than repair
- Unlocatable or unidentified faults

Expiration of the repair period

When a period of one year elapses after the model was dropped from production, repairing products of the model may become impossible.

Transportation fees at sending your product for repair

Please send your product to us for repair at your expense.

6.5 How to Make Request for Repair

If your product is found faulty, fill in a Repair Request Sheet downloadable from the following URL. And email the sheet and send the product to your local distributor.

http://www.renesas.com/repair

⚠ CAUTION

Note on Transporting the Product:

When sending your product for repair, use the packing box and cushion material supplied with this product when delivered to you and specify handling caution for it to be handled as precision equipment. If packing of your product is not complete, it may be damaged during transportation. When you pack your product in a bag, make sure to use conductive polyvinyl supplied with this product (usually a blue bag). When you use other bags, they may cause a trouble on your product because of static electricity.

M34286T2-CPE User's Manual

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