

M32C/83 Compact Emulator

S30830T-CPE

*Compact Emulator
with Real-time Trace*

User's Manual

 Sunny Giken Inc.

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For inquiries about the contents of the product or this manual, fill in the "Technical Support Application Form" included in the manual and fax it to our dealer, Mitsubishi Electric Corporation's technical support desk. When sending email, write the same items of the "Technical Support Application Form" and send it to Mitsubishi Electric Corporation's support desk (support@apl.maec.co.jp).

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Preface

Thank you for purchasing the S30830T-CPE. The S30830T-CPE is a compact emulator with the real-time trace function for the M32C/81, M32C/82, and M32C/83 Groups.

This User's Manual mainly describes specifications of the S30830T-CPE and how to set up and operate it. For details of the following products, which are used with the S30830T-CPE, refer to each product's online manual.

- Emulator debugger: PD308S
- C compiler: NC308WA Entry Version.
- Integrated development environment: TM

If there is any question or doubt about this product, contact Sunny Giken Inc..

- For the latest information, please access to the below homepage address. The latest information on the S30830T-CPE Emulator hardware and debugger PD308S is available.

<http://www.sunnygiken.co.jp/english/830tcpe-products-e.html>

To use the product properly

Precautions for Safety



- In both this User's Manual and on the product itself, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties.
- The icons' graphic images and meanings are given in "Chapter 1. Precautions for Safety". Be sure to read this chapter before using the product.

Terminology

Some specific words used in this User's Manual are defined as follows:

- **Emulator**

This means the S30830T-CPE (this product).

- **Emulator system**

This means an emulator system built around the S30830T-CPE emulator. The S30830T-CPE emulator system is configured with an emulator, host machine and emulator debugger.

- **Host machine**

This means a personal computer used to control the emulator.

- **Emulator debugger**

This means a software tool, PD308S to control the emulator from the host machine through an communications interface.

- **Evaluation MCU**

This means the microcomputer mounted on the emulator which is operated in the specific mode for tools.

- **Target MCU**

This means the microcomputer you are going to debug.

- **Target system**

This means an Operation application system using the microcomputer to be debugged.

- **'*' after a signal name**

The symbol "*" that is put after a signal name is used to show active LOW.

(e.g.RESET* :Reset signal.)

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MEMO

Chapter 1. Precautions for Safety

This chapter describes precautions for using this product safely and properly. For precautions for the emulator debugger, refer to User's Manual included with your product.

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Chapter 1. Precautions for Safety

In both the User's Manual and on the product itself, several icons are used to insure proper handling of this product and also to prevent injuries to you or other persons, or damage to your properties.

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

1.1 Safety Symbols and Meanings

 WARNING	If the requirements shown in the "WARNING" sentences are ignored, the equipment may cause serious personal injury or death.
 CAUTION	If the requirements shown in the "CAUTION" sentences are ignored, the equipment may cause personal injury or damage to the products.
IMPORTANT	NOTE: Important information on using this product.

In addition to the three above, the following are also used as

	means	WARNING or CAUTION
Example: 		CAUTION AGAINST AN ELECTRIC SHOCK
	means	PROHIBITION
Example: 		DISASSEMBLY PROHIBITED
	means	A FORCIBLE
Example: 		UNPLUG THE POWER CABLE FROM THE RECEPTACLE.

The following pages describe the symbols "WARNING", "CAUTION", and "IMPORTANT".

 WARNING**Warning for Installation:**

- Do not set this product in water or areas of high humidity. Spilling water or some other liquid into the main unit can cause an unrepairable damage.

Warning for Use Environment:

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

 CAUTION**Caution to Be Taken for Modifying This Product:**

- Do not disassemble or modify this product. Disassembling and modifying the product will void your warranty.

Cautions to Be Taken for 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 the compact emulator main unit by the PC cable for connecting to the target system. The cable may cause a break.
- Do not apply a voltage other than the specified voltage of the product, because it may cause burn injuries and the failure of internal circuits.

IMPORTANT**Note on Malfunctions in the System**

- If the emulator malfunctions because of interference like external noise, shut OFF power to the emulator once and then reactivate it.

IMPORTANT

Notes on Differences between the Actual MCU and Emulator:

- Operations of the emulator differs from those of flash memory version MCUs as listed below.

(1)Reset condition

Set the time for starting up (0.2 to 0.8V_{cc}) 1[μs] or less.

(2)Data values of RAM and ROM areas at power-on

When power is turned on, the RAM and ROM areas of the emulator are defaulted to FFh.

(3)Register values when power is turned on

When power is turned on, the emulator's register values are defaulted to 0. However, the program counter and ISP are defaulted to FFFFFFFh and 500h respectively.

(4)Characteristics of ports P15₀ to P15₇

As part of input/output ports (P15) is connected via analog switch circuits to the target system, the electric characteristics etc. differ from those of actual MCU.

(5)A/D conversion

As ports P0 and P2 are input via analog switch circuits to ports P15 of the evaluation MCU, ports P15 cannot be used as input/output ports.

(6)MCU function

Some MCU functions cannot be used in the emulator system. For details, refer to "Note on MCU Functions That Cannot Be Used with This Emulator" (page 10).

- As a package conversion unit is used between the evaluation MCU and the target system, some characteristics are slightly different from those of the actual MCU. Therefore, be sure to evaluate your system with an evaluation MCU. Before starting mask production, evaluate your system and make final confirmation with an CS (Commercial Sample) version MCU.

IMPORTANT

Note on MCU Functions That Cannot Be Used with This Emulator:

- The following MCU features cannot be used with this emulator.

(1) Debugging cannot be done with this emulator in the “micro-processor mode”.

- When using this emulator, always set the processor mode bit in the processor mode register to the "single-chip mode" or “memory expansion mode”.
- When using this emulator, set the CNVSS pin to "L" level.
- Only a separate bus can be used in the “memory expansion mode”. A multiplex bus cannot be used.

(2) Oscillation circuits that use a resonator cannot be used.

Because a package converter board is situated between the evaluation MCU and the target system, oscillation circuits that connect a resonator between the X_{IN} and X_{OUT} pins of the sub-clock oscillation circuit will not oscillate.

(3) Watchdog timers cannot be used.

MCU watchdog timers can only be used during program execution (free running). Disable watchdog timers in all other program operations (break, dump, forced stop, etc.).

Also, if the target system has a watchdog timer in its reset circuit, disable it, too, when using the emulator.

(4) The BRK2 command cannot be used.

The BRK2 command cannot be used. The interrupt is for the emulator exclusive use.

(5) Single step interrupts cannot be used.

Single step interrupts cannot be used. The vector address of a single step interrupt is normally indicated in the emulator work area, but the vector address value cannot be changed.

(6) Software resets cannot be used.

Do not use software resets.

(7) Flash memory and EPROM modes are not emulated.

This emulator does not emulate the flash memory and EPROM modes. Also, the emulator does not emulate the CPU rewrite mode in the flash memory mode.

(8) The DMAC II forward completion interrupt cannot be used.

The DMAC II forward completion interrupt can be used only when a program is being executed (free run).

IMPORTANT

Note on Restrictions in Using the Emulator:

- The following restrictions apply to this emulator.
 - (1) Debug command execution when the BCLK is stopped
 When the BCLK is stopped, debug commands (break, dump, single-step, forced stop, etc.) cannot be executed. The BCLK can stop in the following cases.
 - When the target clock is not oscillating
 - When the target MCU is on hold
 - When the target MCU is in the stop mode
 - (2) MCU status during program hold
 With this emulator, the program can be stopped by putting the MCU on hold. Note that, in this case, peripheral circuits are still operating.
 - (3) Interrupts during single step execution
 Interrupts are disabled during single step execution. Accordingly, interrupt processing is not performed even if an interrupt request is sent.
 - (4) Address matched interrupt
 Do not set software breaks for an address for which an address matched interrupt is set. In step execution, do not execute addresses that generate address matched interrupts.
 - (5) Stop and wait modes
 Do not use a single step for the command that shifts to the stop mode. Operation does not shift to the wait mode when the command that shifts to the wait mode is executed as a single step.
 - (6) Stack area
 With this emulator, user stacks specified by ISP consume 14 bytes. If there isn't enough userstack area, using other areas not designed for use as stacks (SFR area, RAM area that stored data or ROM area) can damage the user program or destabilize emulator control. Therefore, ensure a maximum +14 bytes of the area used by the user program as user stack area.
 - (7) Trace results for addresses that set software breaks
 Software breaks replace the original command with the BRK2 command that generates the BRK2 interrupt. When trace results are viewed in the bus display, "0816" is displayed by fetching (by command) the address that sets the software break, however in the reverse assembly display, the "BRK" command is displayed.
 - (8) Protect register (PRC2)
 When the protect register (PRC2) that enables writing in the port P9 direction register and the menu key registers A3 is changed in the following way, the protect is not cancelled.
 - 1) When the "command that sets PRC2 to '1' is executed (step execution)"
 - 2) When the program is executed with a break point set between the "command that sets PRC2 to '1'" and "when the register to be protected is set"
 - 3) When "PRC2 is set to '1'" in the Dump or Script windows
 - (9) Debug command execution during user program execution
 The real-time aspect of the user program is not guaranteed when debug commands such as dump are executed during user program execution.

IMPORTANT

(10) Debug command execution during Xcin execution

In the emulator system, internal memory (ROM; Flash memory, RAM) is used for the emulation memory. Note that debugging may not be able to continue if debug command is executed in a slow clock cycle in Xcin, such as 32.768kHz, because the PD308S has timeout function.

(11) Ring oscillator

The operation by a ring oscillator, oscillation stop detection, is not available.

(12) Response during user program execution

User programs and data to the emulation memory are to be updated just before user program execution. Therefore, it may take several seconds before the execution if it needs to load a large amount of a user program or to rewrite S/W breakpoints.

IMPORTANT

Note on Controlling MCU Pins:

- Some MCU pins are controlled by the emulator.

(1) RESET* input

The RESET* input from the target system is accepted only while a user program is being executed (only while the RUN Status LED of the emulator is lit.)

(2) NMI* input

The NMI* input from the target system is accepted only while a user program is being executed (only while the RUN Status LED of the emulator is lit).

Memory Expansion Mode:

- When memory expansion mode is needed, pins should be processed in a target system in order to avoid activating RDY and HOLD pins. Otherwise, the emulator will not function correctly.

Notes on the Target System (power supply, order of powering on):

- This emulator connects Vcc pins in order to monitor the power voltage and cannot supply the power to the target system. Therefore design your system so that the target system is powered separately.
- The voltage of the target system should be within the range of 3.3 ($\pm 5\%$) to 5.0V ($\pm 5\%$).
- Before powering on your emulator system, check that the host machine, the emulator, the converter board and target system are all connected correctly. Next, turn on the power to each equipment following the procedure below.

(1) Turn ON/OFF the target 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.

Is the clock supplied? : Check that target Status LED (Clock) is ON. *₁

*₁ When either the internal main clock (X_{IN}) or sub-clock (X_{CIN}) of the emulator is supplied, the target Status LED (Power) is lit. When the sub-clock is supplied from the target system, the Status LED (Clock) will not be lit.

Chapter 2. Usage

This chapter describes how to operate this product.

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Chapter 2. Usage

2.1 Name of Each Part

(1) System Configuration

Figure 2.1 shows the system configuration for this emulator.

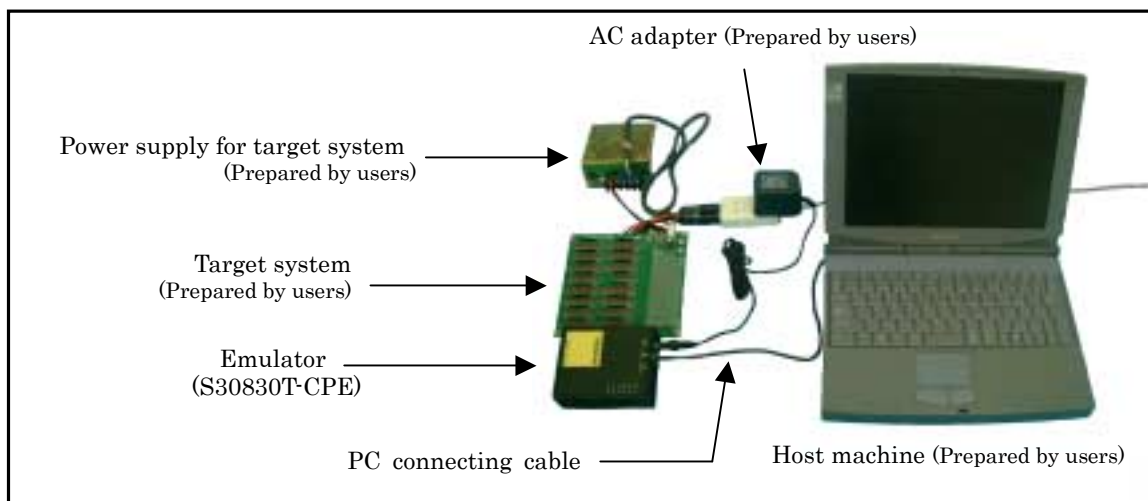


Figure 2.1 System configuration

(a) Emulator S30830T-CPE (included)

This is a compact emulator with the real-time trace function (hereafter, emulator) for the M32C/81, M32C/82, and M32C/83 Groups.

(b) PC connecting cable (included)

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

(c) Power supply for emulator (Prepared by users)

This is a power supply for the emulator. Prepare the power supply separately. The DC cable is included with this product.

(d) Target system (Prepared by users)

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

(e) Power supply for the target system (Prepared by users)

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

(f) Host machine (Prepared by users)

This is a personal computer for controlling the emulator.

Prepare operation environment in which Windows95/98/Me/2000 OS can operate.

(2) Name of Each Part of Emulator

Figure 2.2 shows the name of each part of the emulator.

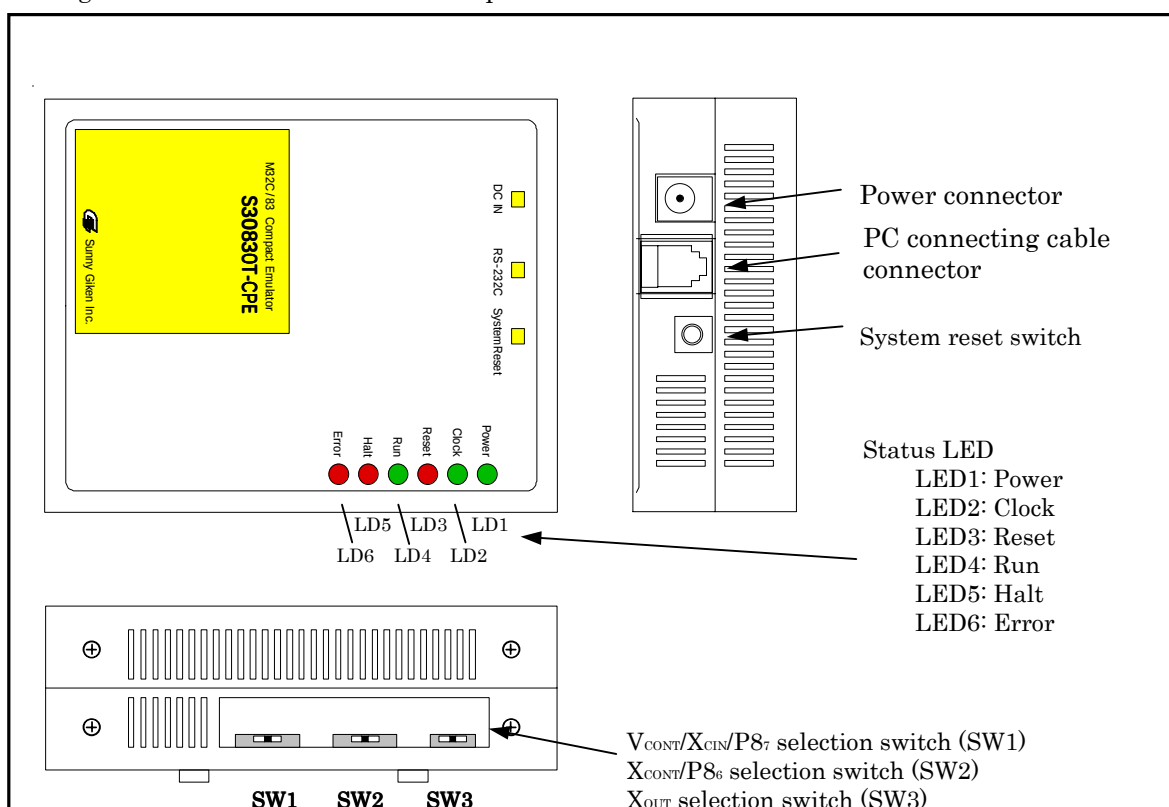


Figure 2.2 Name of each part of emulator (upper side of S30830T-CPE)

(a) Status LED

The Status LEDs indicate the target MCU's power supply and operating status.

Table 2.2 lists the definition of each target Status LED.

Table 2.1 Definition of Status LED

Name	Number	Color	Status	Function
Power	LD1	Green	ON	Power is supplied from the target MCU.
			OFF	Power is not supplied from the target MCU.
Clock	LD2	Green	ON	Clock X _{IN} or X _{CIN} is supplied to the target MCU.
			OFF	Clock is not supplied to the target MCU.
Reset	LD3	Red	ON	Target MCU is reset.
			OFF	Target MCU is not reset.
Run	LD4	Green	ON	User program is being executed.
			OFF	User program has been halted.
Halt	LD5	Red	ON	Target MCU halts operation due to either command or conditions of hardware
			OFF	Target MCU is operating.
Error	LD6	Red	ON	Emulator system has error.
			OFF	Emulator system has no error.

(b)System reset switch

By pressing the system reset switch , you can initialize the emulator system. Table 2.2 shows the functions of the system reset switch depending on the state of emulator.

Table 2.2 Functions of system reset switch

Status of Emulator	Function
When the system reset switch is pressed within 2 seconds of turning on the power.	Changes into a special mode. (All indicators other than Power ON and Clock of the Status LED light up.) Then, when the emulator debugger, PD308S is started, changes into a mode to force downloading of the firmware.
When the system reset switch is pressed during the special mode.	Executes self-check. (All indicators other than Power ON and Clock of the Status LED put shiftlights.)
When the system reset switch is pressed while the user program is being halted.	Initializes the emulator and waits for commands from the emulator debugger.
When the system reset switch is pressed while the user program is being executed.	Stops the user's program, initializes the emulator, and waits for commands from the emulator debugger.

**CAUTION****Note on System Reset Switch:**

- After pressing the system reset switch, reboot the emulator debugger PD308S. Otherwise the display of 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.

2.2 Starting Up the Emulator

The procedure for starting up the emulator is shown in Figure 2.3. For details, refer to each section hereafter. And, when the emulator does not start up normally, refer to "Chapter 5. Troubleshooting" (page 42).

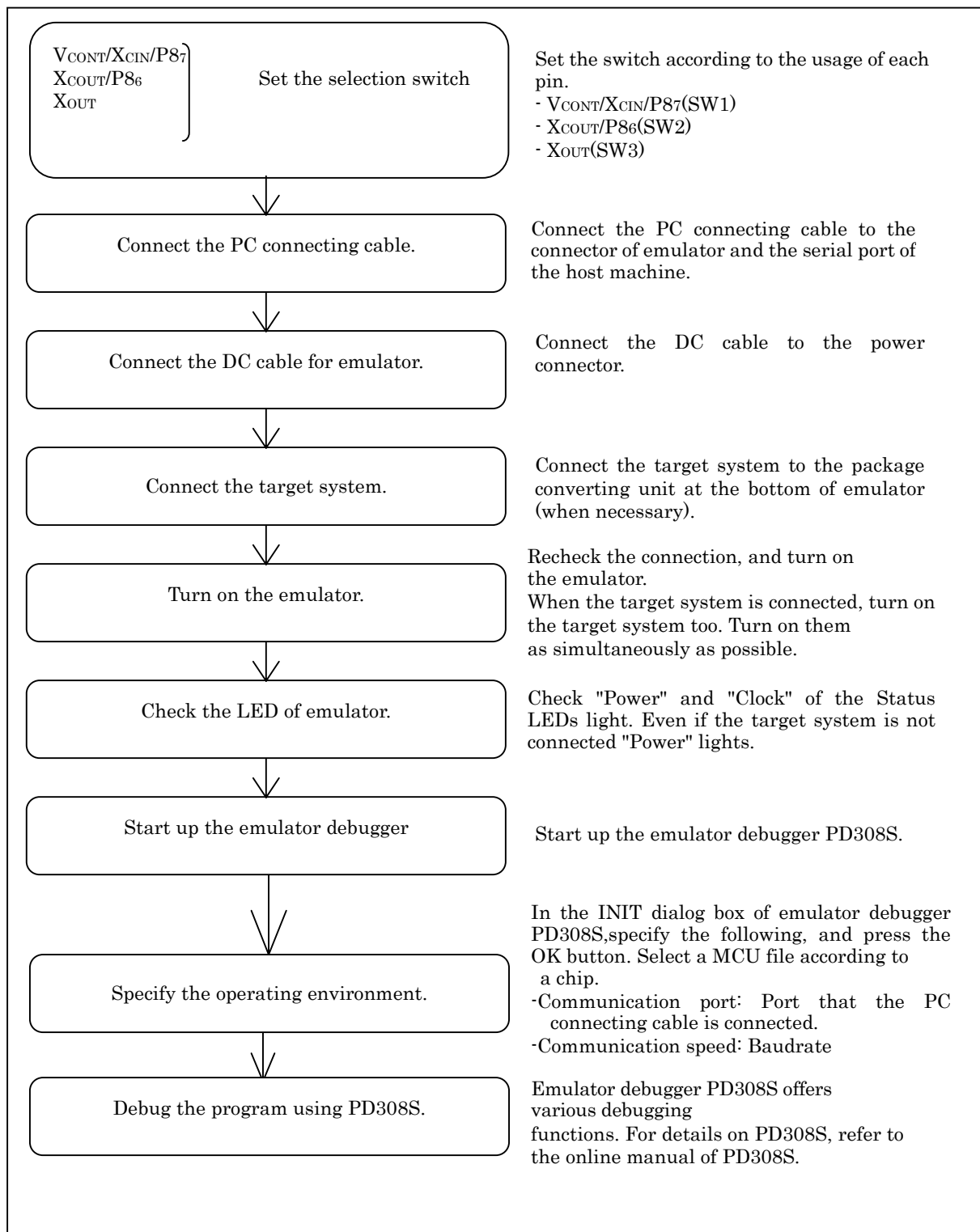


Figure 2.3 Procedure for starting up the emulator

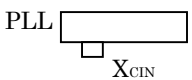
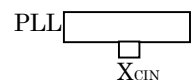
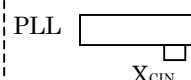
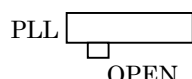
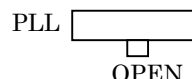
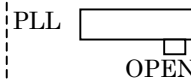
2.3 Emulator Initial Setup

Set the selection switch of the emulator according to conditions of use.

(1) Selection Switch

This is the switch to select the function of $V_{\text{cont}}/X_{\text{CIN}}/P8_7$, $X_{\text{cout}}/P8_6$, X_{out} pins. As shown in Table 2.3 below, set the switch according to the usage of the pins.

Table 2.3 Setting the selection switch

Signal Name	SW No.	Selection Switch Setting		
$V_{\text{CONT}}/X_{\text{CIN}}/P8_7$	SW1	 Using as a synthesizer with PLL frequency	 Using internal emulator sub-clock (32.768kHz)	 Using as a port. (factory -setting)
$X_{\text{COUT}}/P8_6$	SW2	 Using as a synthesizer with PLL frequency (should be connected to VSS)	 Using internal emulator sub-clock (32.768kHz) (should be left open)	 Using as a port. (factory -setting)
X_{OUT}	SW3	 Connecting it to the target system	 Leaving it open	



CAUTION

Note on Setting Switches and Jumper Switches:

- Always shut OFF when changing the setting of the switches and jumper switches, and connecting the cable.
- SW1 and 2 should be used in conjunction with each other.

2.4 Connecting the Emulator System

How to connect the emulator system is shown in Figure 2.4 below.

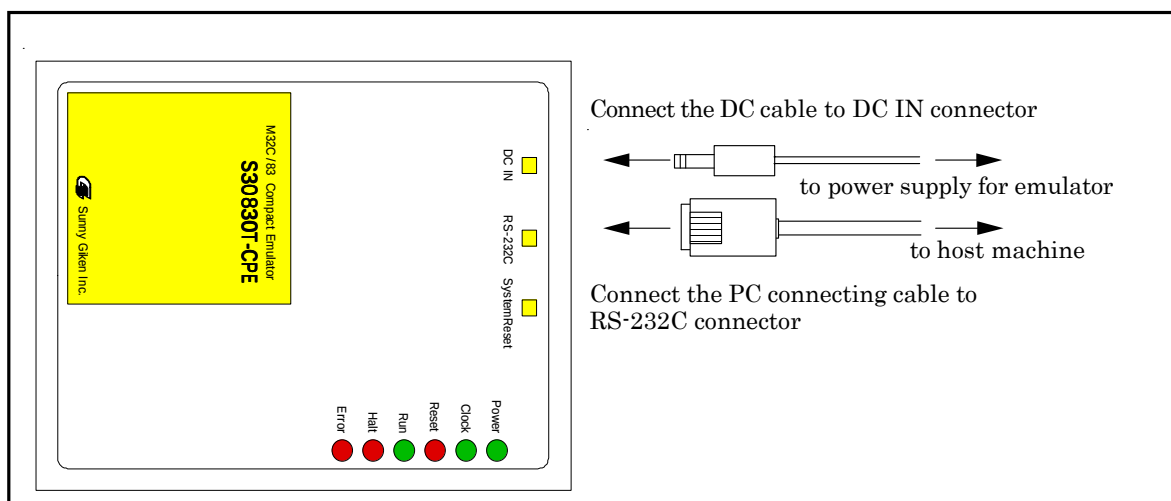


Figure 2.4 Connecting the emulator system

(1) Connecting the PC Connecting Cable

Connect the PC connecting cable (included) to the connector (RS232C) and the serial port of the host machine (see Figure 2.4).

(2) Connecting the DC Cable

Connect the DC cable for the emulator to the DC IN connector. The specifications of the Power supply for the emulator are listed in Table 2.4.

Table 2.4 Specification of power supply of emulator

Power supply voltage	DC12V/0.5 A
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Figures 2.5 and 2.6 show the specifications of the DC cable and the applicable plug, respectively.

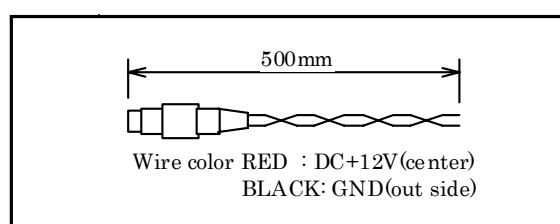


Figure 2.5 Specification of DC cable

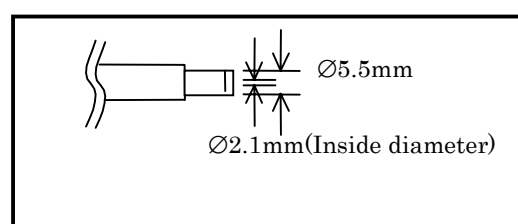


Figure 2.6 Specification of applicable plug

CAUTION

Note on Connecting the Power Supply of Emulator:

- Be careful about the polarity of the power supply. Connecting to the wrong electrode could destroy internal circuits.
- Do not apply a voltage other than the specified voltage of the product (12V 500mA), since it may cause burn injuries and the failure of internal circuits.

2.5 Connecting the Target System (as occasion demands)

There are three ways to connect the emulator and the target board as shown below:

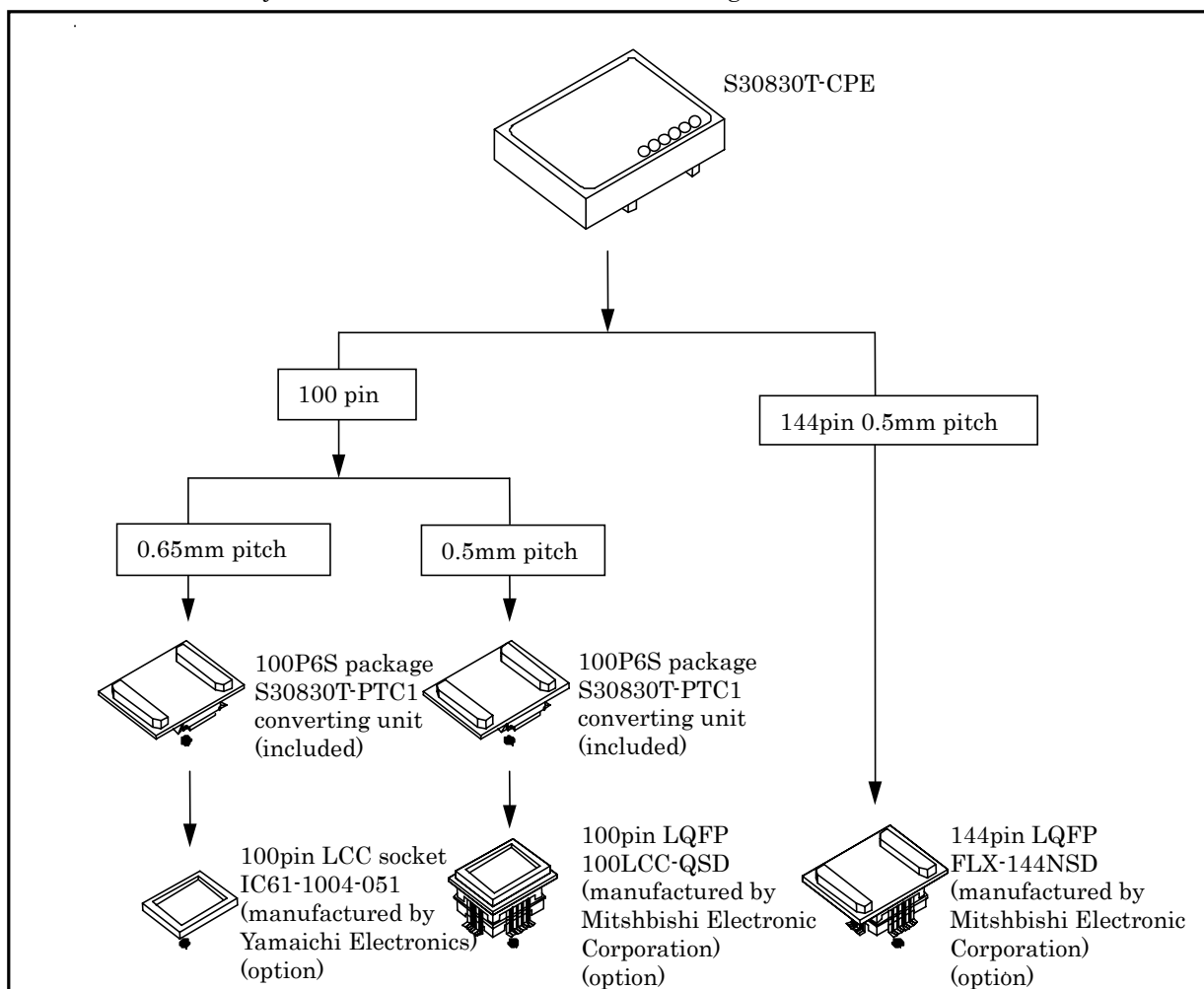


Figure 2.7 Connecting target system

(1)Connecting to the 100 Pin LCC Socket

Connect the package conversion unit on the lower board of the emulator to the LCC socket (option). When connecting it, be sure to check the position of No. 1 pin.

If there is no target board, this connection can be applied.

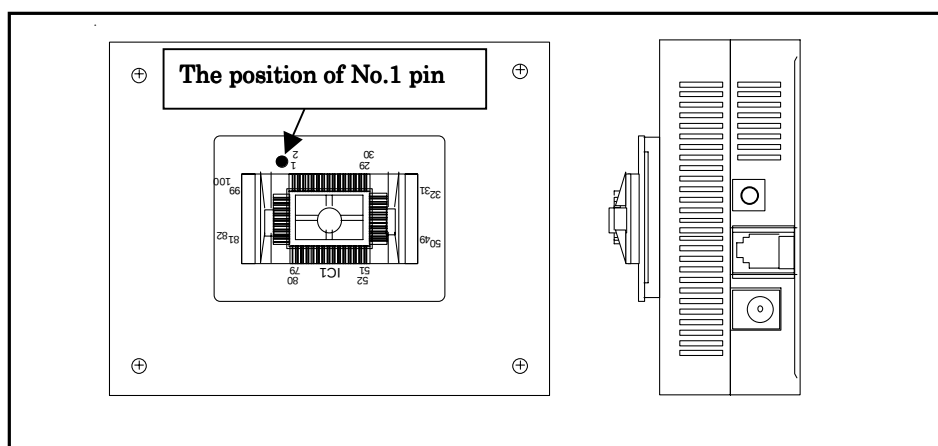


Figure 2.8 Package conversion unit on the lower board of the emulator

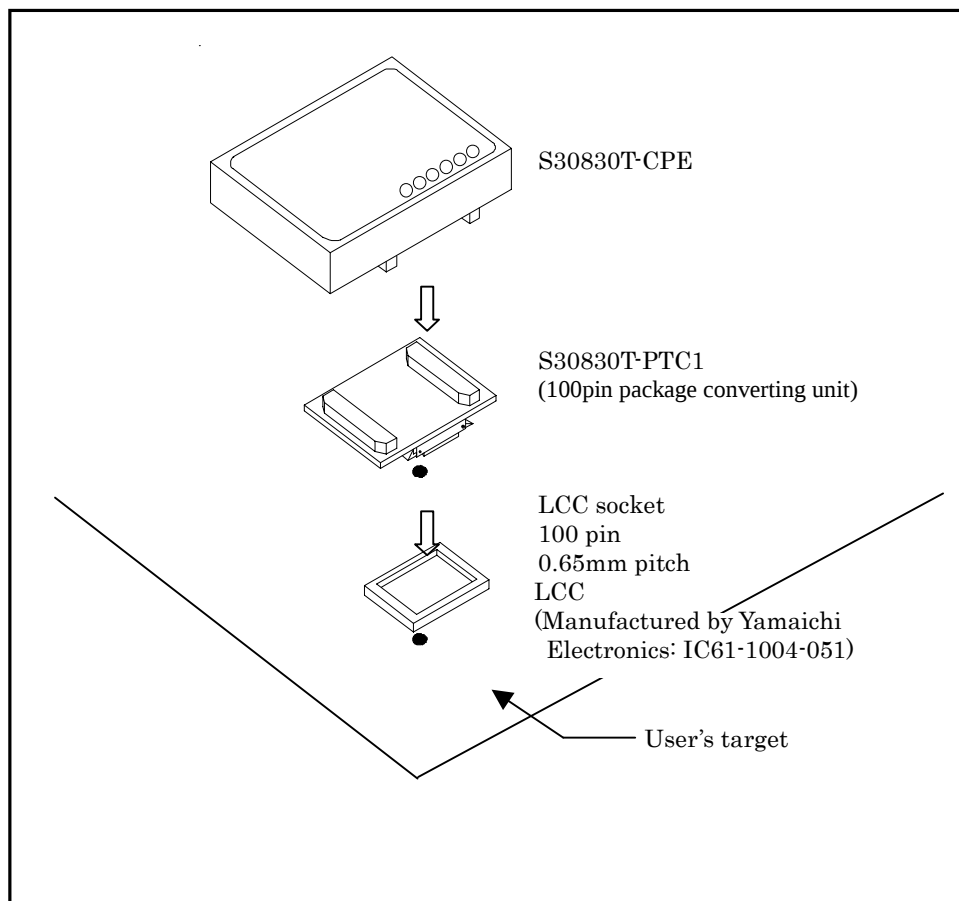


Figure 2.9 Connecting 100-pin LCC socket



CAUTION

Notes on Connecting Target Systems:

- Take care not to attach the converter board in a wrong direction. It may cause a fatal damage to the compact emulator.
- Always shut OFF power of the emulator and the target system when connecting and disconnecting the target system.

2.6 Turning On the Power

(1) Checking the Connection of the Emulator System

Before turning the power ON, check the connection of the host machine and the emulator main unit.

(2) Turning On the Power

Power ON the target system and the emulator main unit as simultaneously as possible.

CAUTION

Notes on Power Supply:

- As this emulator cannot supply power to the target system, provide the target system with a separate power supply from that of the emulator.
- Keep target system power supply voltage within the range of 3.3V (5%) to 5.0V(5%).
- Do not change target system power supply voltage after power has been activated.

2.7 LED Display When the Emulator Starts Up Normally

After the emulator starts up, check the status of the LED to see if the emulator can be operated.

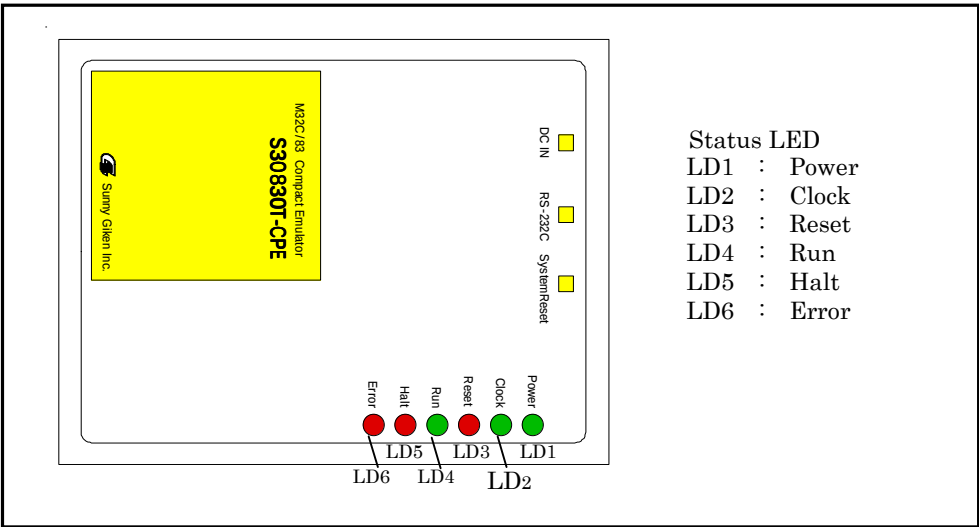


Figure 2.10 Positions of Status LED

Check the POWER of the Status LED is lit immediately after the power is turned on. If it is not lit, shut off the power for the emulator and check if the power supply for the emulator is properly connected.

After the power is turned on, Status LEDs (LD1-6) will light for 4 seconds. Make sure that the display of the Status LEDs become normal after that.

If the Status LEDs do not light as shown in Table 2.5, see "5.1 Troubleshooting Until the Emulator Starts Up" (page 43).

Table 2.5 LED display when the emulator starts up normally

Error	Halt	Run	Reset	Clock	Power
:ON :OFF					

Note: This can be applied when operating with or without connection to a target system.

2.8 Starting Up Emulator Debugger PD308S

After checking the emulator has started up normally, start up emulator debugger PD308S.

For starting up the emulator debugger, follow the steps below.

Windows 95/98/Me/2000.....Click the "START" button and select

Program (P) → [S30830T-CPE] → [PD308S V.1.00 Release 1].



2.9 Setting the Operating Environment of Emulator Debugger PD308S

After starting up PD308S, as the Init dialog box will open, set as shown in Figure 2.11. For details of the Init dialog box, refer to User's Manual of PD308S.

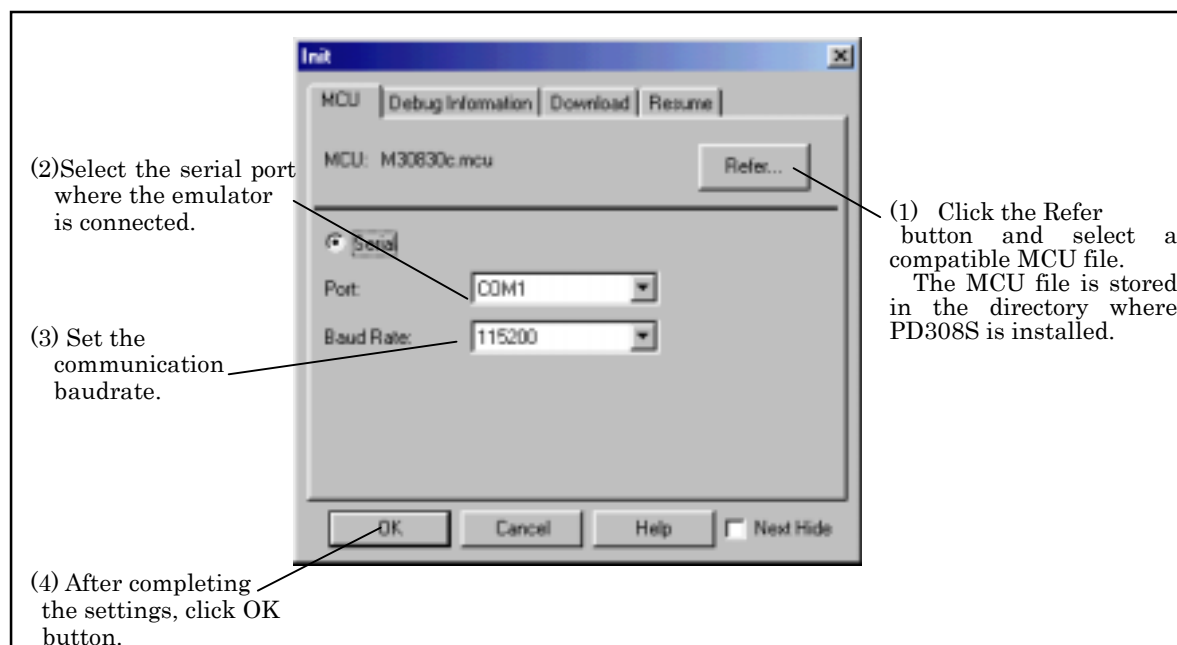


Figure 2.11 Setting Init dialog box

2.10 When Emulator Debugger PD308S Starts Up Normally

Figure 2.12 shows the window display when PD308S starts up normally.

If an error has been detected and PD308S has not started up, refer to "5.1 Troubleshooting Until the Emulator Starts Up" (page 43).

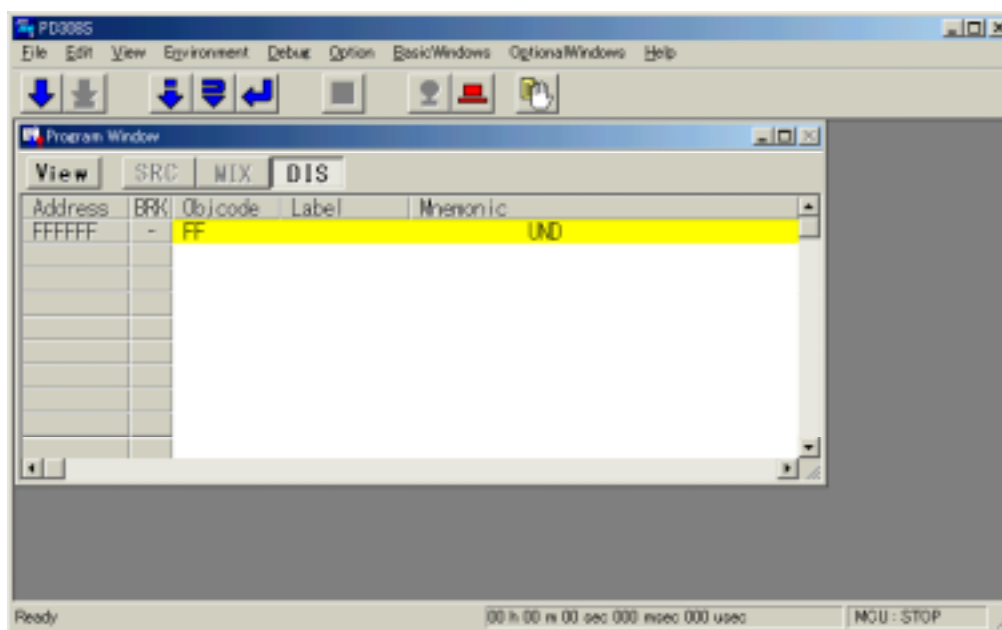


Figure 2.12 Window display of PD308S when it starts up normally

Chapter 3. Changing the Settings

This chapter describes how to change the setting of this product.

3.1 Using the VCONT/P87/XCIN and XCOUT/P86 Pin as a Port	27
3.2 Using the VCONT/P87/XCIN and XCOUT/P86 Pin as Sub-Clock Input	27
3.3 Using the VCONT/P87/XCIN and XCOUT/P86 Pin as PLL Frequency Synthesizer	27
3.4 Changing Clock Supply	28

Chapter 3. Changing the Settings

3.1 Using the V_{CONT}/X_{CIN}/P8₇/ and X_{COUT}/P8₆ Pin as a Port

How to use the emulator when using the V_{CONT}/P8₇/X_{CIN} and X_{COUT}/P8₆ pin as a port is shown below.

- (1) Set the SW1 of the " V_{CONT}/P8₇/X_{CIN} selection switch" to the P8₇ side.
- (2) Set the SW2 of the " X_{COUT}/P8₆ selection switch" to the P8₆ side

3.2 Using the V_{CONT}/X_{CIN}/P8₇/ and X_{COUT}/P8₆ Pin as Sub-Clock Input

How to use the emulator when using the V_{CONT}/P8₇/X_{CIN} and X_{COUT}/P8₆ pin as sub-clock input (32.768kHz) is shown below.

- (1) Set the SW1 of the " V_{CONT}/X_{CIN}/P8₇ selection switch" to the XCIN side.
- (2) Set the SW2 of the " X_{COUT}/P8₆ selection switch" to the OPEN side.

3.3 Using the V_{CONT}/X_{CIN}/P8₇ and X_{COUT}/P8₆ Pin as a PLL Frequency Synthesizer

The emulator has an internal PLL frequency synthesizer stability circuit as illustrated in the figure 3.1. How to use the emulator when using the V_{CONT}/P8₇/X_{CIN} and X_{COUT}/P8₆ pin as a PLL frequency synthesizer is shown below.

- (1) Set the SW1 of the " V_{CONT}/P8₇/X_{CIN} selection switch" to the PLL side.
- (2) Set the SW2 of the " X_{COUT}/P8₆ selection switch" to the PLL side

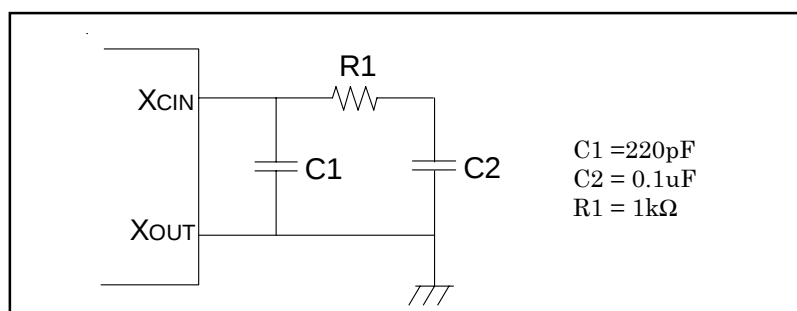


Figure 3.1 PLL Frequency Synthesizer Stable Circuit

3.4 Changing Clock Supply

There are two ways to supply a clock to the MCU, using the oscillator circuit of the emulator or using the oscillator circuit on the target system. Table 3.1 lists the factory-settings of each clock supply.

Table 3.1 Clock supply to the MCU

Clock	Description	Setting
X _{IN} – X _{OUT} (main clock)	Internal oscillator circuit of emulator (30MHz)	Internal oscillator board (S30830T-OSC1) INT side
X _{CIN} – X _{COUT} (sub clock)	Internal oscillator circuit of emulator (32.768kHz)	Selection switch SW1= X _{CIN} side SW2=OPEN side

IMPORTANT

Note on Changing the Clock Supply:

- X_{CIN}-X_{OUT} (main clock) pins can be changed in the oscillator circuit in the emulator. Note that this is not available on the target system.
- For using X_{CIN}-X_{COUT} (sub-clock) pins, it is necessary to change " V_{CONT}/P87/X_{CIN} and X_{COUT}/P86 selection switch " of the emulator. For how to set it, refer to "2.3 (1) P87/X_{CIN} selection switch".(page 19).

(1) Changing the Clock Supply to the Main Clock(X_{IN} = X_{OUT}) of MCU

How to change the clock supply to the main clock of MCU is shown below.

Note that clock supply to the main clock of MCU is not available on the target system.

(a) Remove the cover of the emulator

Remove the cover of the emulator as shown below.

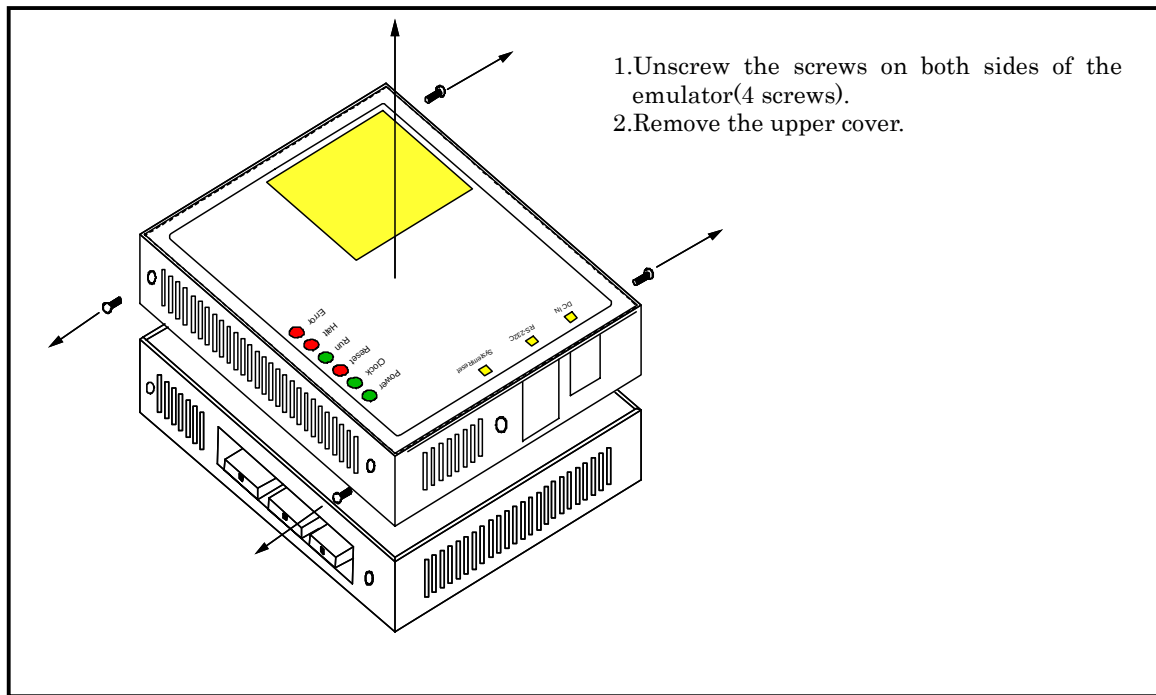


Figure 3.2 Removing the cover of the emulator

**CAUTION****Notes on Removing the Cover of the Emulator:**

- Always shut OFF power of the emulator and the target system when removing the cover of the emulator and changing any switches and supply clocks.

(b) Changing the Internal Oscillator circuit of the Emulator

An oscillator circuit board for 30MHz oscillator is mounted on this product when shipped from factory. The place where the circuit board is mounted is illustrated in Figure 3.3. When using the emulator on an oscillating frequency other than 30MHz, a desired oscillator circuit needs to be constructed and changed. An outer shape of the oscillator circuit board (S30830T-OSC1) and positions of the pins are shown in Figure 3.4. A circuit of the oscillator circuit board is illustrated in Figure 3.5.

For how to replace the oscillator circuit board, refer to “3. How to Replace the Oscillator circuit Board” (page 32)

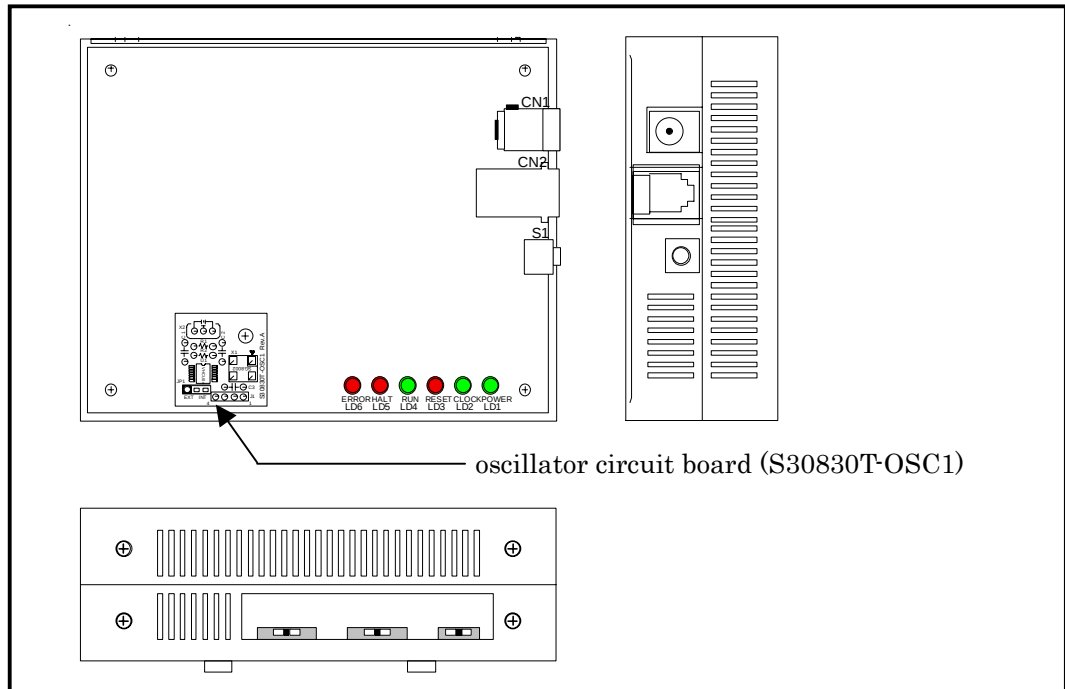


Figure 3.3 Position of the oscillator circuit board

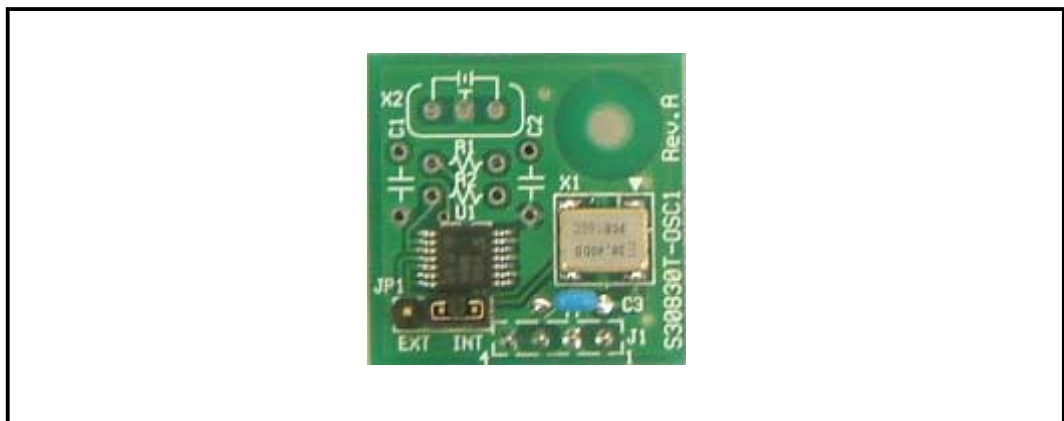


Figure 3.4 Outer shape of the oscillator circuit board (S30830T-OSC1)

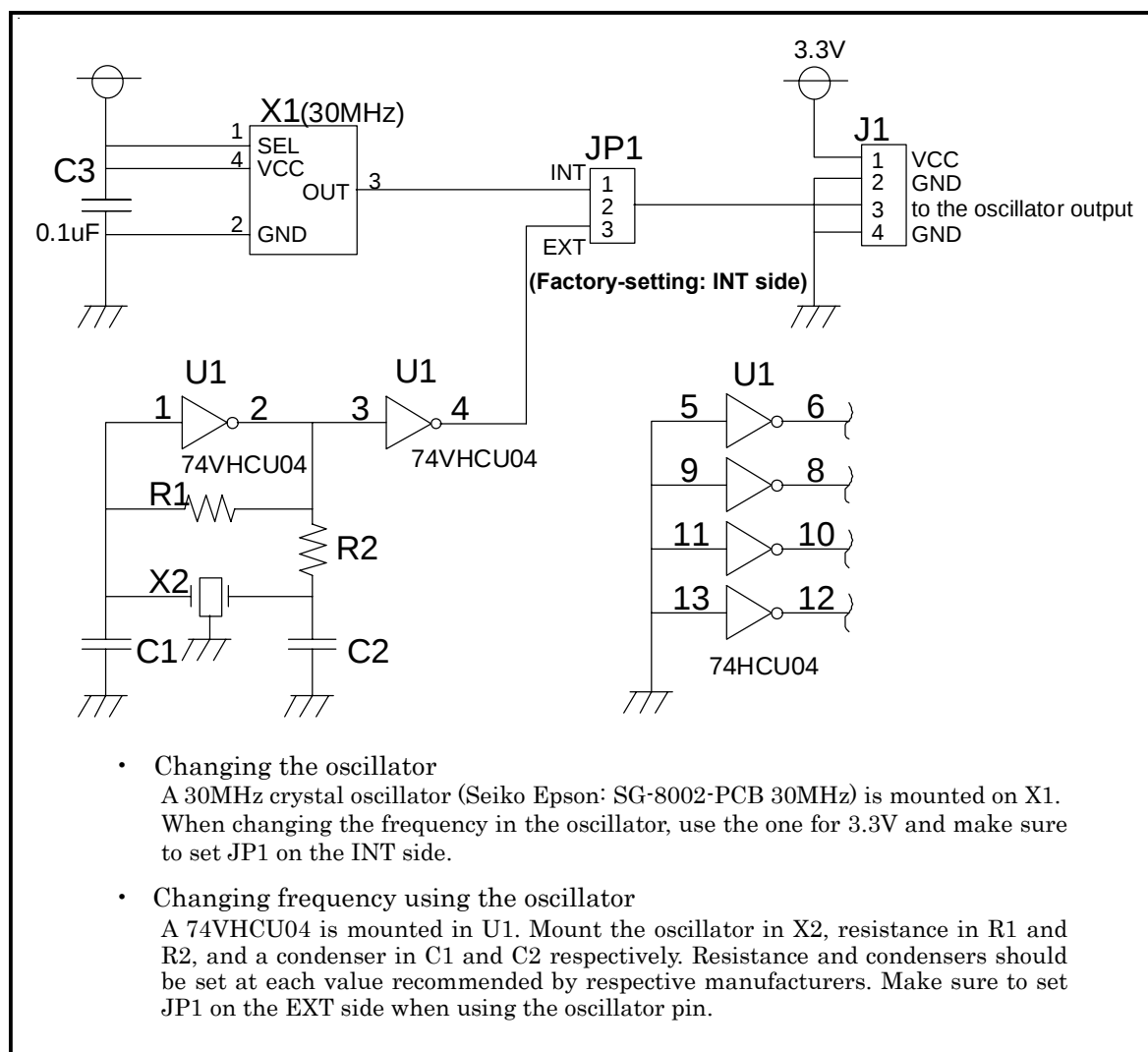


Figure 3.5 Circuit of the oscillator circuit board (S30830T-OSC1)

IMPORTANT

Notes on Replacing Internal Oscillator Circuit of Emulator:

- Soldering is required to replace the emulator's internal oscillation circuit.
- Generally, the oscillator can be replaced only twice (removal and installation count as one time). Replacing it more than twice is not recommended since it will affect board pattern durability.
- Be careful not to damage other devices when replacing the oscillator. Servicing for damage incurred during oscillator replacement can be subject to billing even in the warranty period.

(c) Replacing the Oscillator circuit Board(S30830T-OSC1)

How to replace the oscillator circuit board is shown in Figure 3.6.

For the position to place it, see Figure 3.3 (page 30).

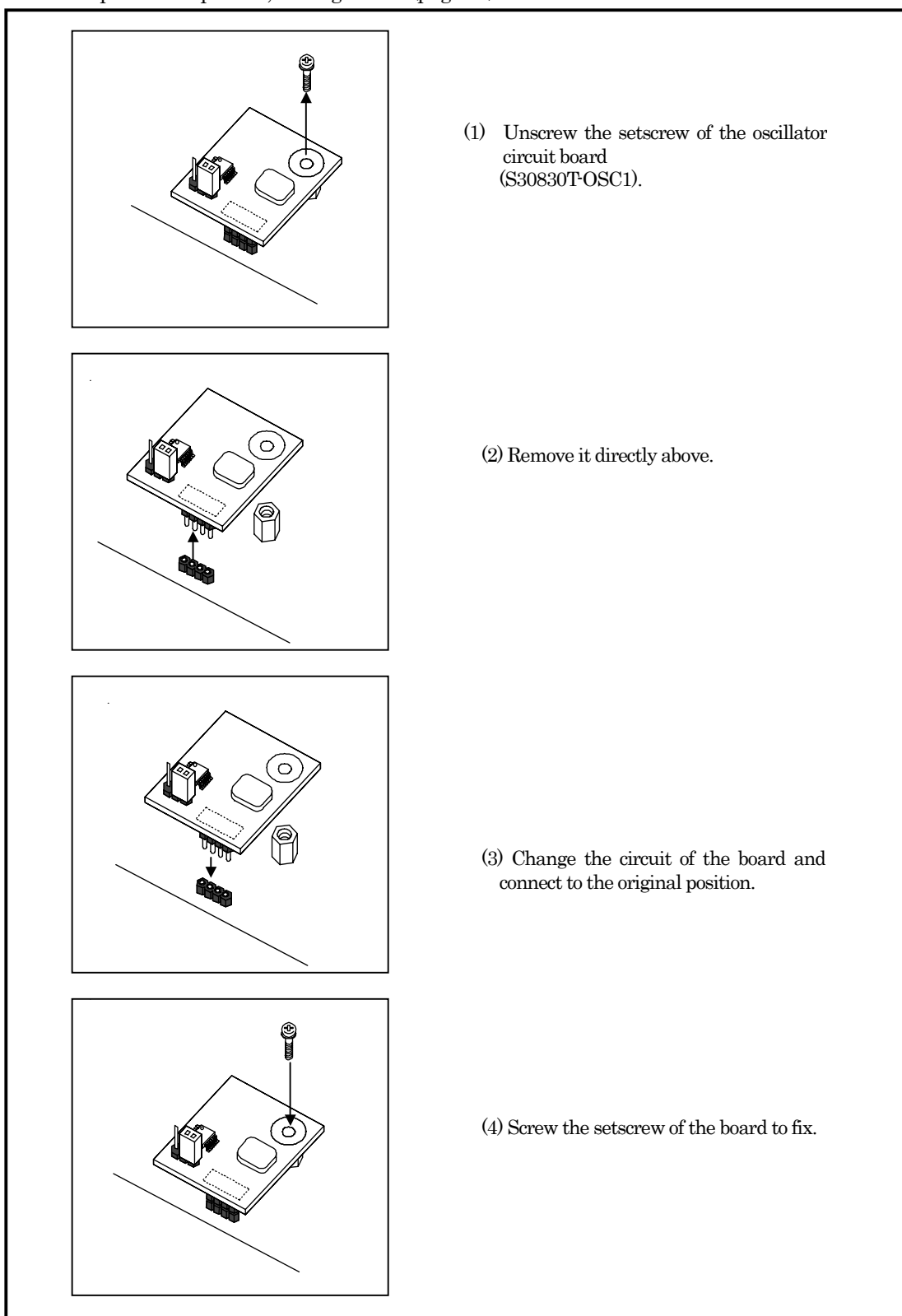


Figure 3.6 Replacing the oscillator circuit board

(2) Changing the Sub-clock Supply ($X_{CIN} = X_{COUT}$) to the Main Clock of MCU

How to change the sub-clock supply is shown below.

When changing only the sub-clock, it is not necessary to remove the cover.

(a) Using the oscillator circuit in the emulator

An oscillator for 32.768KHz is mounted inside the emulator.

The oscillator can be used as a PLL frequency synthesizer. For more details, see “2.3 (1) Selection Switch” (page 19).

(b) Using the oscillator circuit on the target system

When operating the emulator by the oscillator circuit on the target system, construct the circuit as shown in Figure 3.7 in the target system and input the oscillator output at 50% duty (within the operating range of the evaluation MCU) into the X_{CIN} pin. And the X_{OUT} pin should be open.

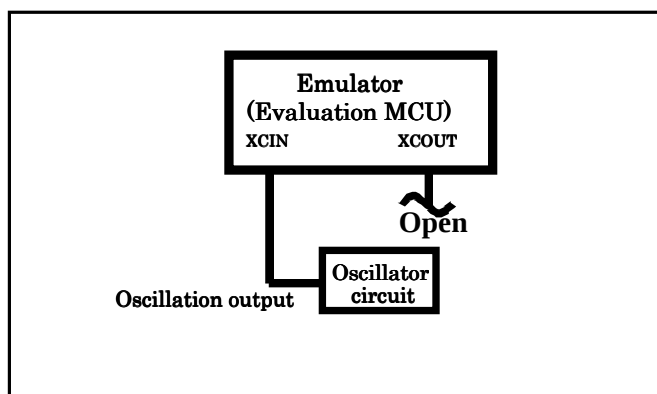


Figure 3.7 External oscillator circuit

Note that in the oscillator circuit shown in Figure 3.8 where a resonator is connected between the X_{IN} and X_{OUT} pins, oscillation does not occur because an emulation circuit is used between the evaluation MCU and the target system.

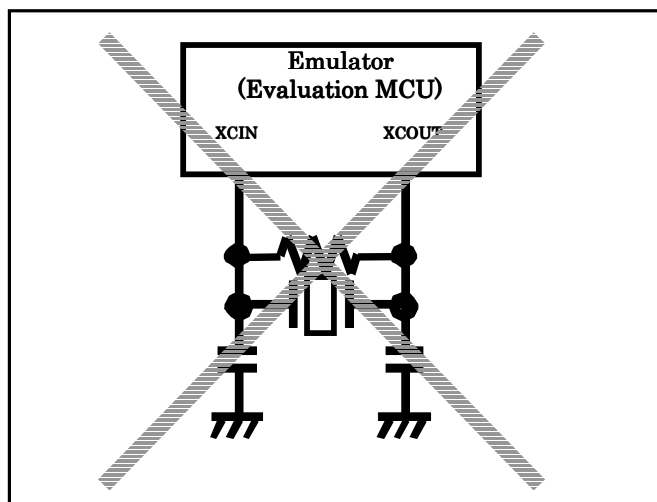


Figure 3.8 Circuit in which oscillation does not occur

Chapter 4. Specifications

This chapter describes specifications of this product.

4.1 Specifications	35
4.2 Memory Map	37
4.3 Connection Diagram	38
4.4 External Dimensions of the Emulator	41

Chapter 4. Specifications

4.1 Specifications

Table 4.1 Specifications of S30830T-CPE

function	specification	
Applicable MCUs	Mitsubishi M16C family M32C/80 series M32C/81, M32C/82, and M32C/83 Groups	
Clock supply (*1)	Main clock (X _{IN})	Clock mounted on emulator (30MHz)
		Internal clock can be changed.
	Sub clock (X _{CIN})	Clock mounted on emulator (32.768kHz)
		Frequency can be changed from the target system.
Maximum operating frequency	30MHz (Power voltage 5.0V, 1 dividing, 0 wait) 20MHz (Power voltage 3.3V, 1 dividing, 0 wait)	
Minimum operating frequency	32.768kHz	
Usable mode	Single-chip mode	
	Memory expansion mode (separate bus)	
Evaluation MCU	M30835FJGP	Emulate chip
	M30624FGMFP	Control MCU
Internal emulation memory	For internal RAM area	Using SRAM inside of emulate chip: 31K bytes
	For internal ROM area	Using flash memory inside flash memory: 512K bytes
Basic debugging functions	Download, S/W break (64 points), Program execution/stop (allows free-run execution supporting S/W breaks), Memory reference/ setting (reference/setting C-variables, run-time execution), Register reference/setting, Disassemble display, C-level debugging, etc.	
Real-time tracing function	• 1K-cycle bus information is recordable (Address: 24 bits, Data: 16 bits, MCU status) • 2 trace modes are supported (Before Break mode/After Go mode)	
Execution time measurement function	Time between program start to stop is measurable.	
Host operating environment	IBM PC/AC compatible / Windows 95/98/Me/NT4.0/2000	
PC interface	RC-232C serial (9600/19200/38400/57600/115200 bps)	
Connection to target system	Connect using package conversion unit (including 100P6S-A compatible as standard equipment) Package conversion units for 100P6Q-A and 144P6Q-A are sold separately.	
Power supply for emulator	DC 12V supplied from external (prepare the power supply separately)	
Power voltage for MCU and power supply	3.3V (±5%), 5.0V (±5%)	
Operating environmental condition	Operating	Temperature 5-35 / Humidity 20-80% (non condensing)
	Storage	Temperature -10-60 / Humidity 0-90% (non condensing)
External dimensions/weight	Approx. 105(W) x 34 (H) x 85 (D) mm (not including lugs) Approx 200g.	

*1 Without using a ring oscillator

4.2 Memory Map

Figure 4.1 shows memory maps when using the emulator. For the memory map of the actual MCU, refer to the User's Manual of your MCU.

Make note of the fact that the memory map of the actual MCU differ from that of emulator. Do not access to the area noted "Do Not Access" in the memory map when using the emulator. Otherwise, the emulator may malfunction.

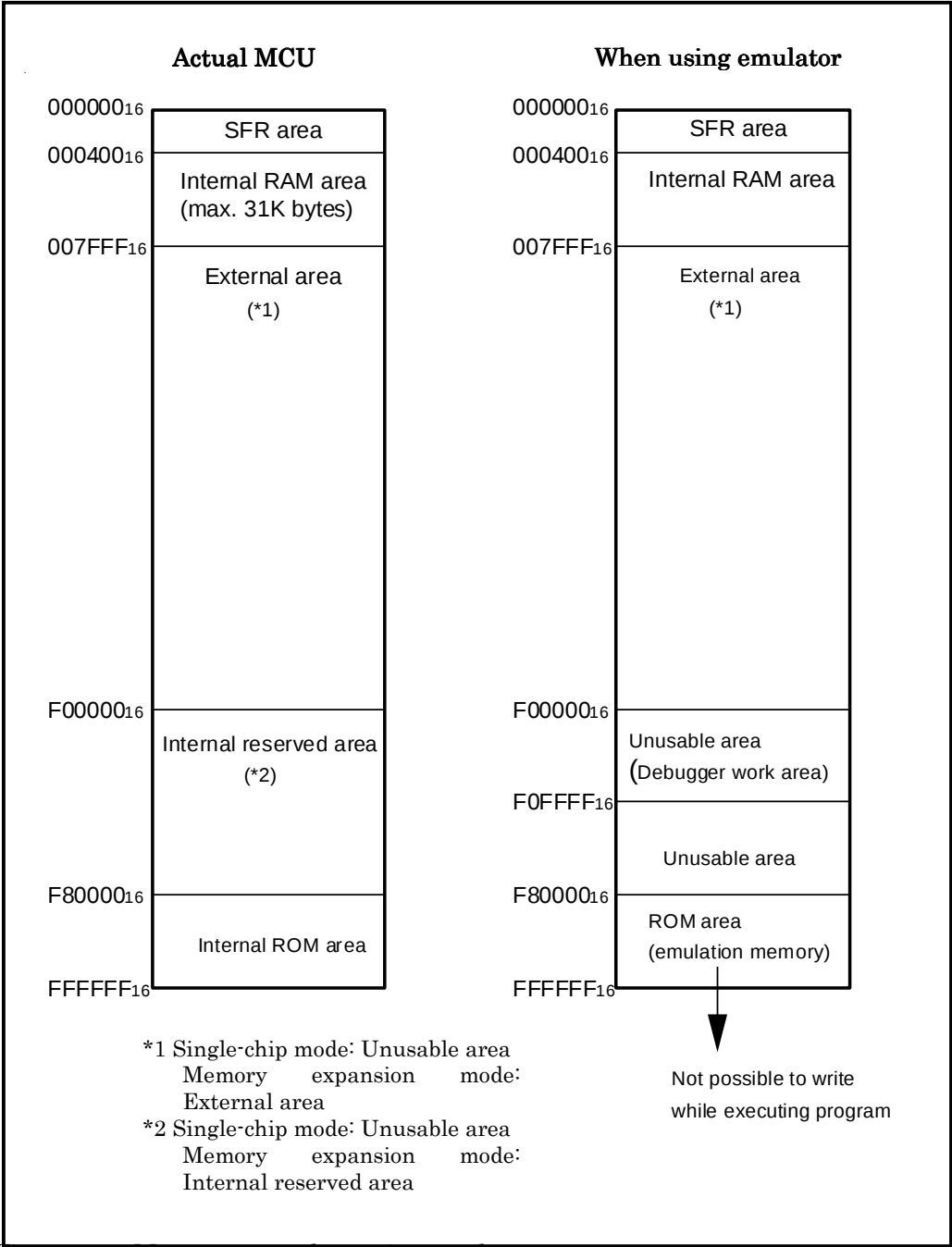


Figure 4.1 Memory map when using emulator

4.3 Connection Diagram

Figure 4.2, 4.3, and 4.4 show the connection diagrams of S30830T-CPE. These connection diagrams mainly show the interface section, and the circuits which are not connected to the target system such as the emulator's control system are omitted.

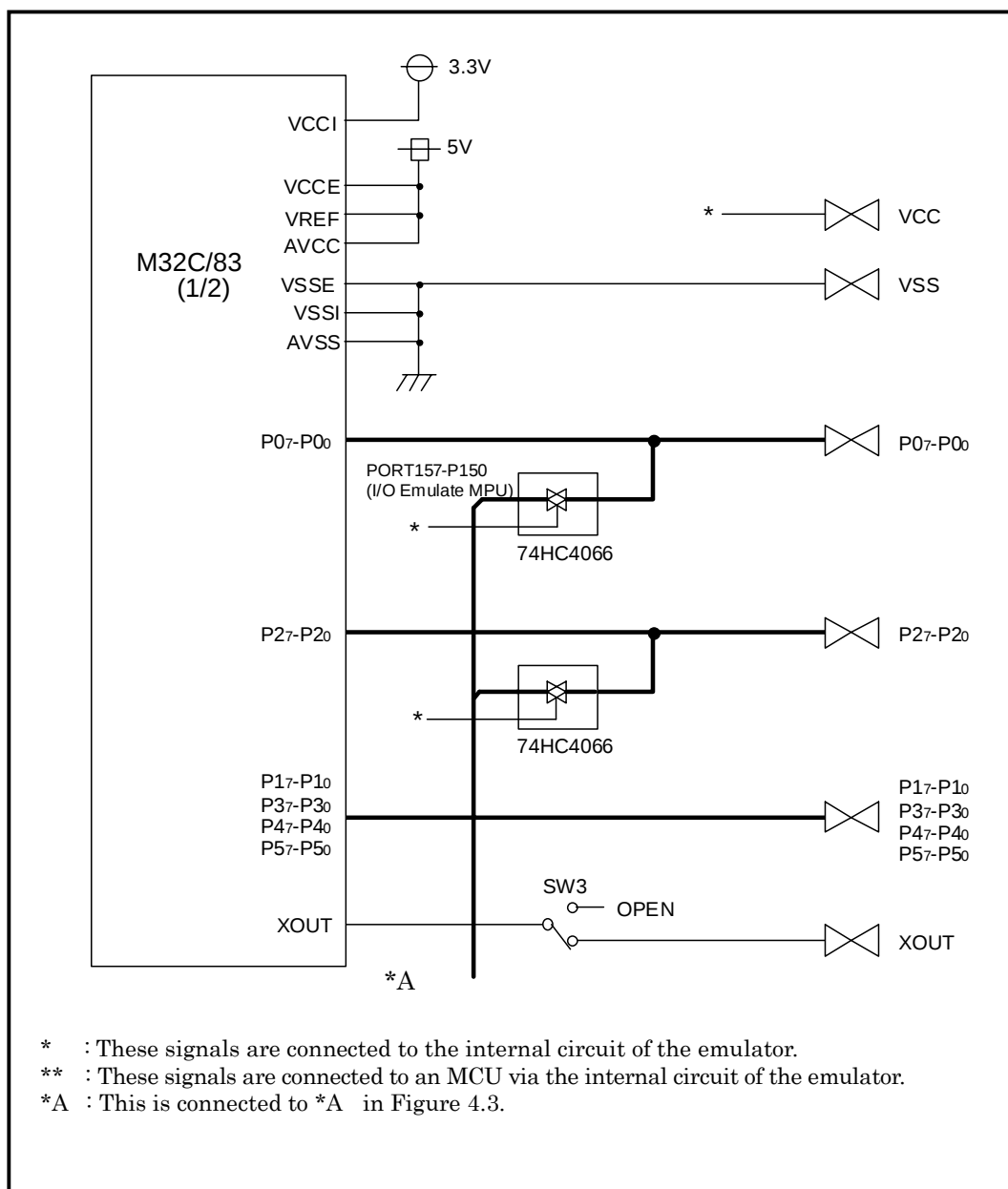


Figure 4.2 Connection diagram1 (CPU Emulate MCU)

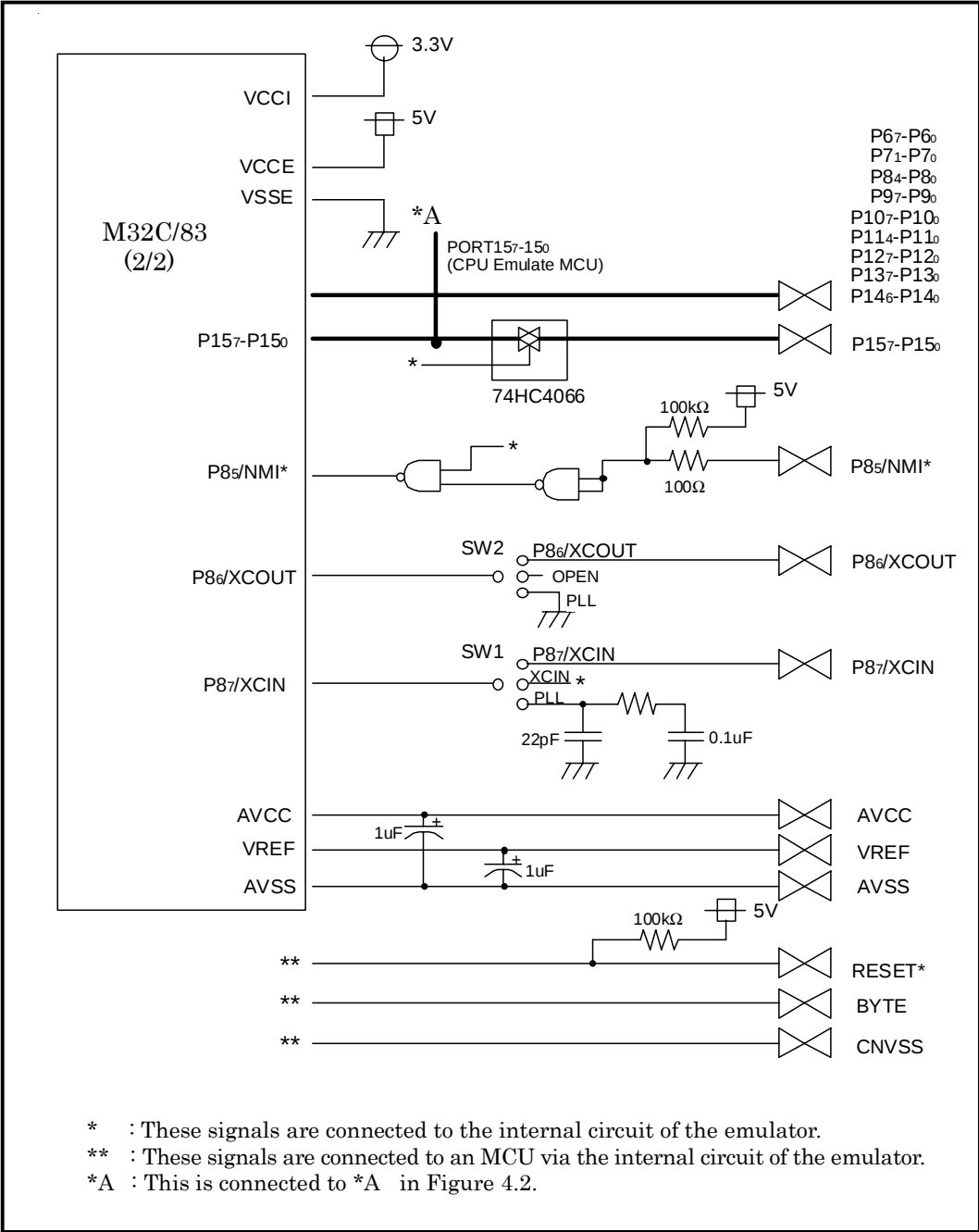


Figure 4.3 Connection diagram2 (I/O Emulate MCU)

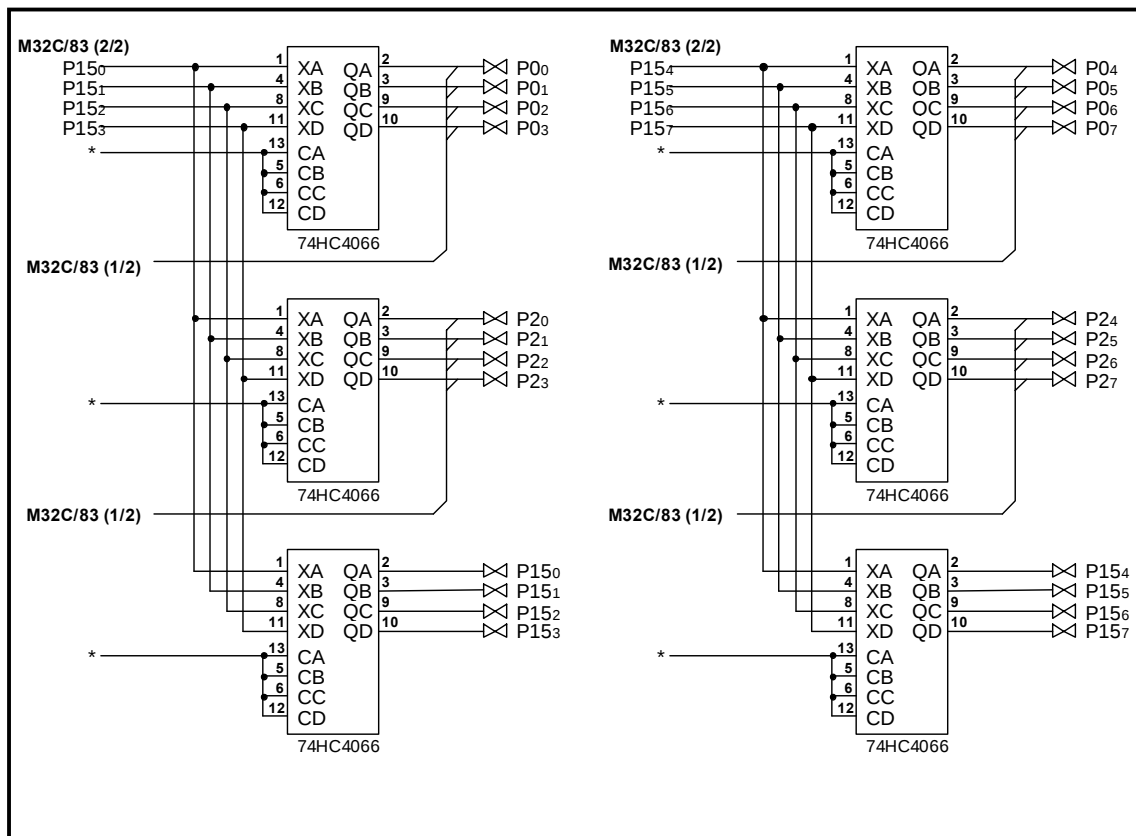


Figure 4.4 Connection diagram3 (detail view of analog switches)

4.4 External Dimensions of the Emulator

External dimensions of the emulator, External dimensions of package conversion unit(100P6S), and External dimensions when connecting to target system are shown in Figure 4.5, 4.6, and 4.7 respectively.

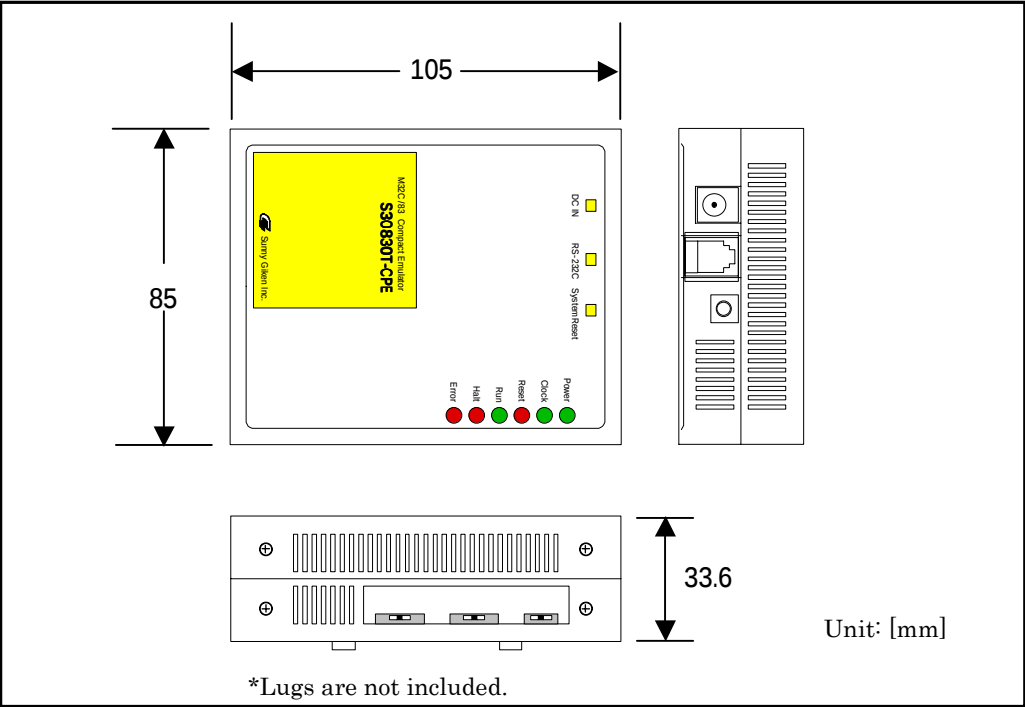


Figure 4.5 External dimensions of emulator

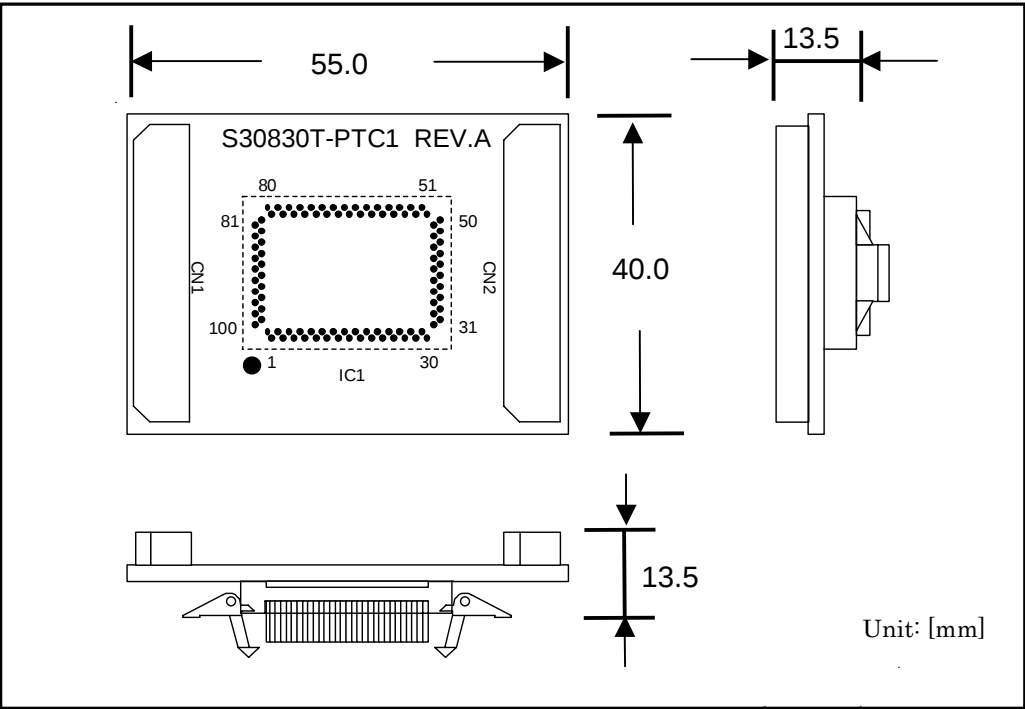


Figure 4.6 External dimensions of package conversion unit (100P6S)

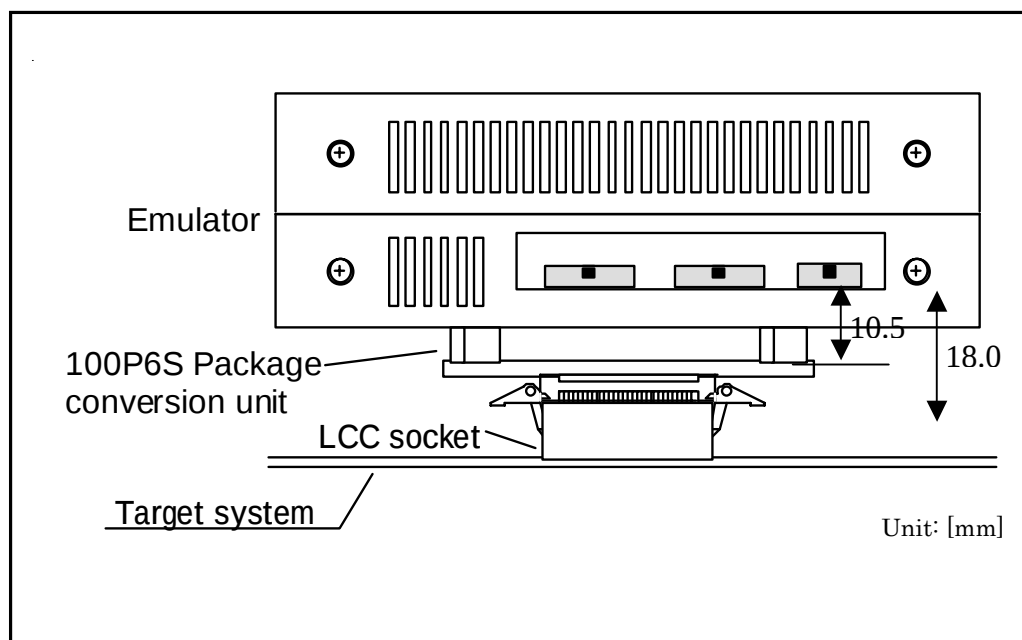


Figure 4.7 External dimensions when connecting to target system

Chapter 5. Troubleshooting

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

5.1 Troubleshooting Until the Emulator Starts Up	44
5.2 Troubleshooting When Using Emulator Debugger PD308S	48
5.3 When the Operation of the Emulator is Abnormal	49

Chapter 5. Troubleshooting

5.1 Troubleshooting Until the Emulator Starts Up

Figure 5.1 shows the flowchart to remedy the troubles from when power to the emulator is activated until the emulator debugger starts up.

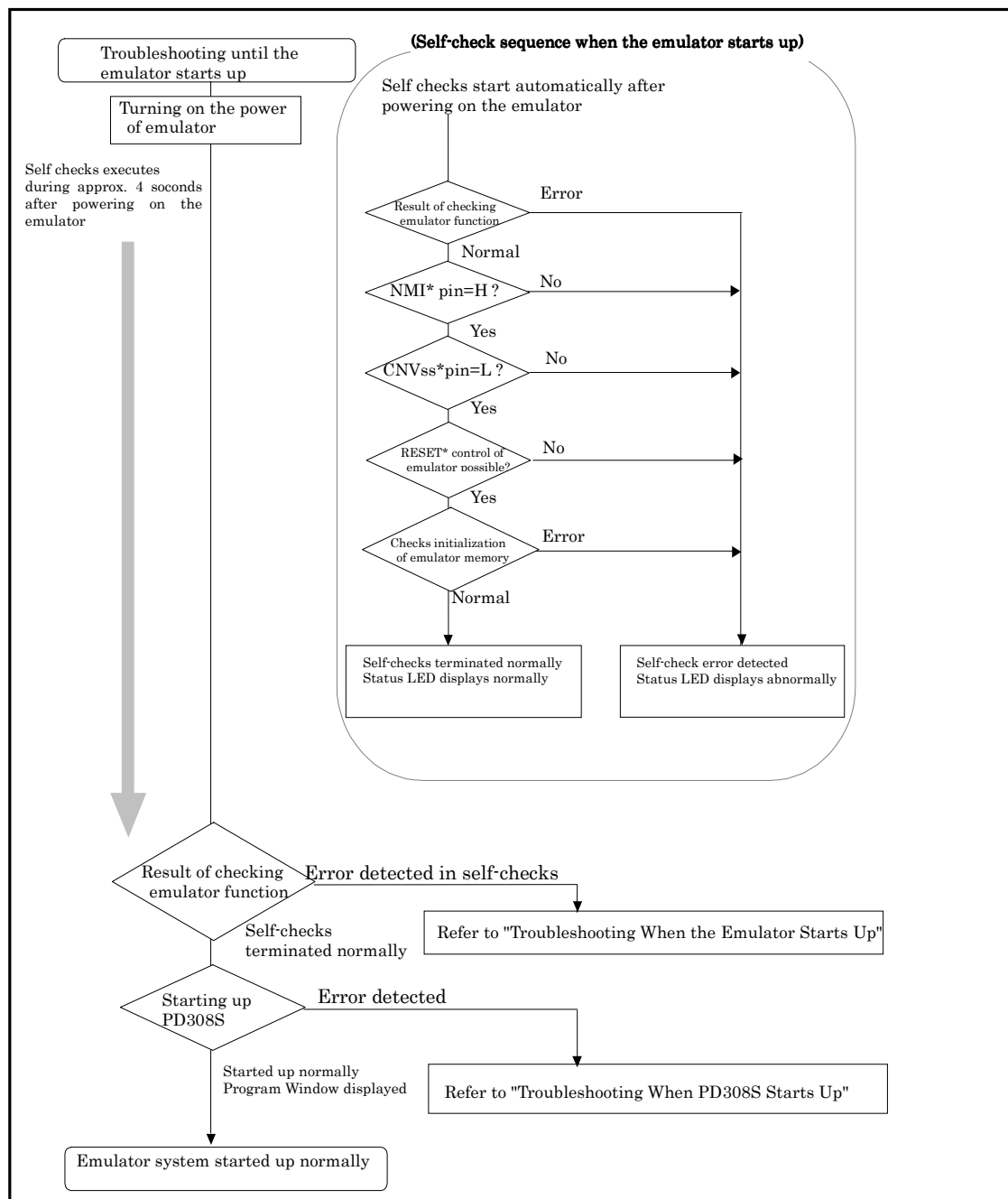


Figure 5.1 Flowchart to remedy the troubles

(1) Troubleshooting When the Emulator Starts Up

Table 5.1 lists how to remedy the troubles when the Status LED of the emulator display is abnormal after powering on the emulator.

When the error is detected, shut off the power of the emulator and the target system and follow the steps in Table 5.1. Then, reactivate the power of the emulator and the target system.

Table 5.1 Error display and how to remedy it when starting up the emulator

Item	LED display	Connection to the target system	Checkpoint
Emulator function check	Error Halt Run Reset Clock Power      	—	Emulator does not work properly. ⇒Check power is being supplied to the emulator. ⇒The emulator may be damaged. Contact us.
	Error Halt Run Reset Clock Power      	—	
	Error Halt Run Reset Clock Power      	—	
Power supply for target system check	Error Halt Run Reset Clock Power      	Connected	Emulator does not work properly because power is not being supplied to the target system. ⇒Check power is being supplied to the target system.
		Not connected	Emulator does not work properly. ⇒Check power is being supplied to the emulator. ⇒The emulator may be damaged. Contact us.
NMI* pin check	Error Halt Run Reset Clock Power      	Connected	Emulator does not work properly because the NMI* pin is "L" level. ⇒Check the NMI pin is "H" level.
		Not connected	Emulator does not work properly. ⇒The emulator may be damaged. Contact us.
CNVss pin check	Error Halt Run Reset Clock Power      	Connected	Emulator does not work properly because the CNVss pin is "H" level. ⇒ Check the CNVss pin is "L" level.
		Not connected	Emulator does not work properly. ⇒The emulator may be damaged. Contact us.
Reset control check	Error Halt Run Reset Clock Power      	—	Emulator does not work properly. ⇒Check power is being supplied to the emulator. ⇒The emulator may be damaged. Contact us.
Emulation memory initialization error	Error Halt Run Reset Clock Power      	—	Emulator does not work properly. ⇒The emulator may be damaged. Contact us.

Explanatory note)  :ON  :Blinking  :OFF

(2) Troubleshooting When Emulator Debugger PD308S Starts Up

Table 5.2 lists error messages and how to remedy them when starting up PD308S.

Table 5.2 Error message and how to remedy it when starting up PD308S

Error	Connection to the target system	Checkpoint
Communication ERROR. Can't accept data.	—	⇒Check the emulator's Status LEDs. If flashing, the emulator is not working properly. Check settings as explained in "(1) Troubleshooting When the Emulator Starts Up". ⇒Check if the connected serial port and the serial port settings in the Init dialog box match. ⇒Try lowering the baud rate in the Init dialog box.
Not Compact Emulator.	—	⇒Check if the connected serial port and the serial port settings in the Init dialog box match. ⇒Check if any equipment other than emulator is not connected.
Target MCU is not given clock.	—	⇒Check if the emulator system's oscillation circuit works properly.
Target MCU is unable to reset.	—	
The version of PD308S and the firmware on the target are not the same.	—	⇒Contact us.
Please download the firmware to the target.	—	

5.2 Troubleshooting When Using Emulator Debugger PD308S

After PD308S has started up normally, errors occurred while using it, remedy the troubles referring Table 5.3.

Table 5.3 Error message and how to remedy it when using PD308S

Error	Connection to the target system	Checkpoint
Target MCU is not given clock.	–	⇒Check if the emulator system's oscillation circuit works properly. Also, if using the sub-clock, see "3.2 Using the V _{CONT} /X _{CIN} /P8 ₇ / and X _{COUT} /P8 ₆ Pin as Sub-Clock Input"(page 27).
Target MCU is unable to reset.	–	⇒Check if the emulator system's oscillation circuit works properly. Also, if using the sub-clock, see "3.2 Using the V _{CONT} /X _{CIN} /P8 ₇ / and X _{COUT} /P8 ₆ Pin as Sub-Clock Input"(page 27).
Target MCU is reset state. Please reset target systems.	Connected	⇒The target MCU has been reset. Cancel the reset.
Target MCU is HOLD state.	–	⇒Check if the emulator system's oscillation circuit works properly. Also, if using the sub-clock, see "3.2 Using the V _{CONT} /X _{CIN} /P8 ₇ / and X _{COUT} /P8 ₆ Pin as Sub-Clock Input" (page 27). ⇒The MCU may be in the stop or wait modes. Either reset the MCU or cancel the mode with an interrupt.
Target MCU is not given power.	Connected	⇒Check the power supply and GND are properly.

5.3 When the Operation of the Emulator is Abnormal

Self-check is a function to check the memory etc. mounted in the emulator. Self-check is executed when the emulator starts up, and detailed check is executed by following the procedure below.

For this self-check, be sure to disconnect the target system.

- (a) Set the dip switch of the emulator as factory setting.
- (b) If the target system is connected, disconnect it.
- (c) Use a main clock mounted as factory setting (30MHz oscillator)

(1) Self-check Procedure in the Self-check Mode

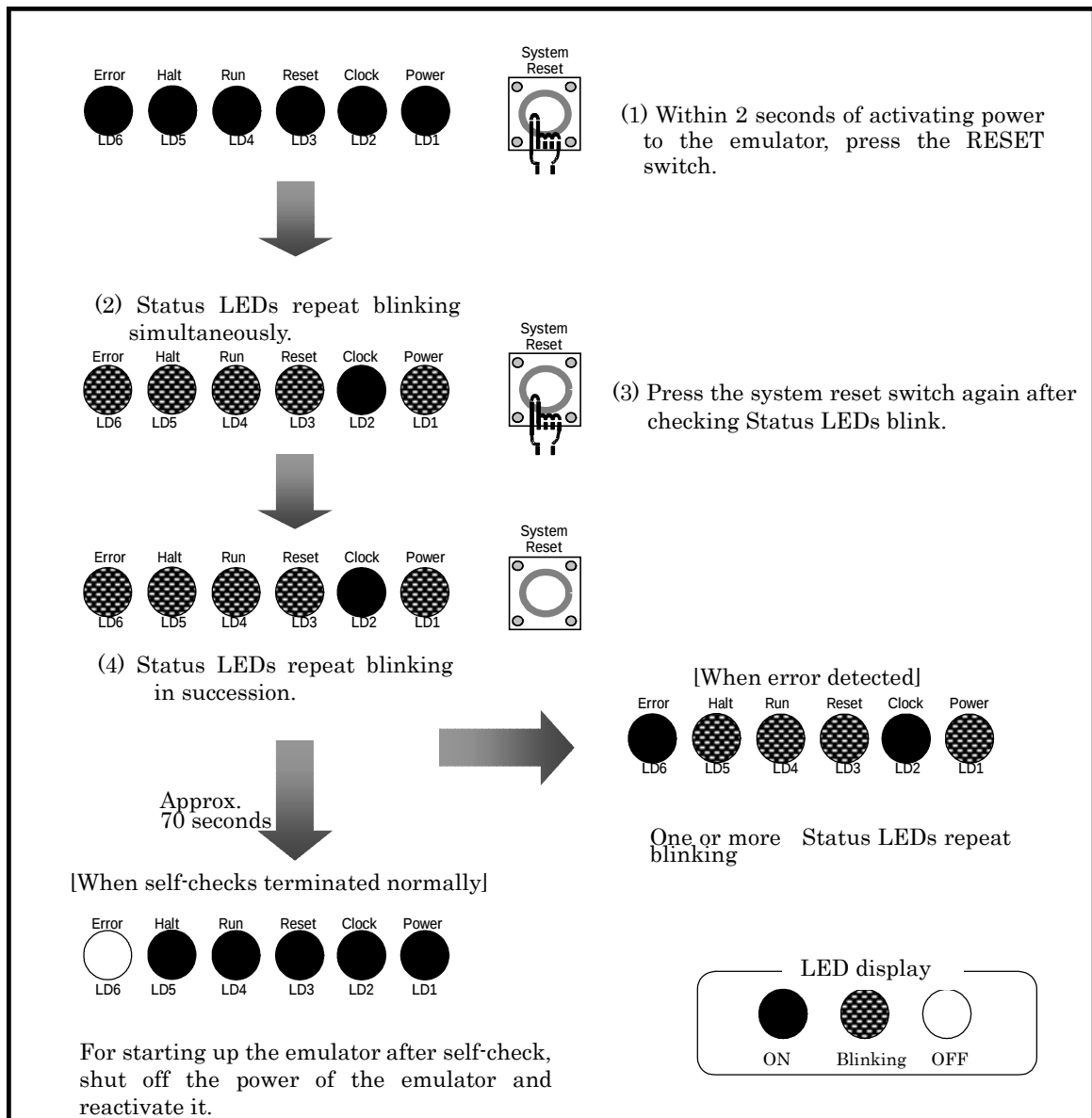


Figure 5.2 Self-check procedure

(2) If an Error is Detected in Self-checks

Table 5.4 lists how to remedy the troubles if the Status LED display is abnormal in self-checks.

When an error is detected, shut off the power of the emulator and the target system and follow the steps in the Table 5.4. Then, reactivate the power of the emulator and the target system.



CAUTION

Notes on Self-checks:

- Be sure to disconnect the target system before executing self-checks.
- If self-checks do not result normally, the emulator may be damaged. Then, contact us.
- When an oscillator installed in the emulator is changed, self-checks may not terminate normally. Use the oscillator of 30MHz when executing self-checks.

Table 5.4 Error display in self-checks and how to remedy it.

LED display	Checkpoint
ErrorHaltRunResetClockPower	Emulator does not work properly. ⇒Check if power is being supplied to the emulator. ⇒If power is being supplied to the emulator, the emulator may be damaged. Report the LED status to us.
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	
ErrorHaltRunResetClockPower	

Explanatory note) :ON, :Blinking, :OFF

MEMO

Chapter 6. Maintenance and Guarantee

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

6.1 Maintenance	53
6.2 Guarantee	53
6.3 Repair Provisions	53
6.4 How to Request for Repair	53

Chapter 6. Maintenance and Guarantee

6.1 Maintenance

If dust or dirt collects on any equipment of your emulation system, wipe it off with a dry soft cloth. Do not use thinner or other solvents because these chemicals can cause the equipment's surface coating to separate.

6.2 Guarantee

The compact emulator presented here has passed Sunny Giken Inc.'s product inspection. If your compact emulator becomes faulty within 12 months after purchase while being used under good conditions by observing the Precautions for Safety described in "Chapter 1. Precautions for Safety", Sunny Giken Inc. will repair the fault free-of-charge. (This provision does not apply to compact emulators leased to you.) When repair is required, contact our dealer, Mitsubishi Electric Corporation.

6.3 Repair Provisions

If a fault in your equipment falls under one of the following categories, the fault will be corrected by replacing the entire equipment instead of repairing, depending on the severity of fault:

- Faulty or broken mechanical section
- Flaw, separation, or rust in coated or plated section
- Flaw or crack in plastic section
- Fault or breakage caused by incorrect use or unauthorized repair or modification
- Heavily damaged electric circuits due to shorting of power supply, overvoltage, or overcurrent
- Crack in printed circuit board or burned-down patterns
- Broad range of fault making replacement less expensive than repairing
- Unlocatable or unidentifiable fault

6.4 How to Request for Repair

If your S30830T-CPE is found faulty, follow the procedure below to send your product for repair.

Customers : Something found faulty

Write down the necessary information in the "S30830T-CPE Repair Request Sheet" attached hereto. Then, send it along with the S30830T-CPE Repair Request Sheet for repair to Mitsubishi Electric Corporation.

Make sure that information in the S30830T-CPE is written in as much detail as possible to facilitate repair.

Mitsubishi Electric Corporation : Contents of fault checked

After checking the contents of fault, Mitsubishi Electric Corporation should please send the faulty S30830T-CPE along with the Repair Request Sheet to Sunny Giken Inc..

Sunny Giken Inc. : Repaired by

When the faulty S30830T-CPE is repaired, it will be returned to the customer by way of our dealer at the earliest convenience.



CAUTION

Note on Transporting the Product:

- When sending your S30830T-CPE for repair, use the packing box and cushion material supplied with the S30830T-CPE 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 the S30830T-CPE (usually a blue bag). When you use other bags, they may cause a trouble on your product because of static electricity.

S30830T-CPE Repair Request Sheet

Date : / /

(Total Pages :)

To Mitsubishi Electric Corporation:

Contact		Product	
Company :		Product name : S30830T-CPE	
Department :		Serial number :	
Responsible person :		Date of purchase :	
Phone :		Target MCU :	
FAX :		Frequency :	MHz
E-mail		Voltage :	V
Address :			
Symptoms :		Occurrence frequency	
Write in detail by itemizing each observed symptom.		• Regularly	
		• Frequency()	
Cause of fault : Write your estimated cause of fault or the sequence of operation when the fault occurred.			
Operating environment :			
Host machine : _____		OS & version: _____ V _____	

Remarks : If you have any special request such as your desired delivery period, write it down here.			

Technical Support Communication Sheet

Date: / /

(Total Pages:)

To Mitsubishi Electric Corporation:

Contact Address	Product Information
Company :	Emulator : S30830T-CPE Serial number :
Department :	Emulator debugger : PD308S
Responsible person :	Version :
Phone :	Host machine :
FAX :	OS & version :
E-mail :	Target MCU :
Address :	
Message :	

Please fill in within heavy-line frame.

Date received : / / /	Date replied :
Person in charge :	
MEMO :	

Consecutive No.

Inquiries (Attach a list of your inquiries, if necessary.)

Overseas Specifications

- Obtaining the CE Mark: (EMI: EN55011 Group1 Class A, EMS: EN61000-6-2)
- FCC Compliance:
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions;
(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

S30830T-CPE User’s Manual

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