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RENESAS

User's Manual

IE-703116-MC-EM1

In-Circuit Emulator Option Board

Target Device
V850E/IA1™

Document No. U14700EJ2V0UM00 (2nd edition)
Date Published August 2001 N CP(K)

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J01.2

INTRODUCTION

Target Readers

This manual is intended for users who design and develop application systems using the V850E/IA1™.

Purpose

The purpose of this manual is to describe the proper operation of the IE-703116-MC-EM1, and its basic specifications.

Organization

This manual is broadly divided into the following parts.

- Overview
- Names and functions of components
- Cautions

How to Read This Manual

It is assumed that the reader of this manual has general knowledge of electrical engineering, logic circuits, and microcontrollers.
The IE-703116-MC-EM1 is used connected to the IE-V850E-MC in-circuit emulator. This manual explains the basic setup procedure and switch settings of the IE-703116-MC-EM1. For the names and functions, and the connection of parts, refer to the **IE-V850E-MC, IE-V850E-MC-A User's Manual (U14487E)**, which is sold separately.

To understand the basic specifications and operation methods broadly
→ Read this manual in the order listed in **CONTENTS**.

To know the operation methods and command functions of the IE-V850E-MC, and IE-703116-MC-EM1-A
→ Read the user's manual of the debugger (sold separately) that is used.

Conventions

Note:	Footnote for item marked with **Note** in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information
Numerical representation:	Binary ··· ×××× or ××××B
	Decimal ··· ××××
	Hexadecimal ··· ××××H
Prefix indicating the power of 2 (address space, memory capacity):	
	K (kilo): $2^{10} = 1024$
	M (mega): $2^{20} = 1024^2$

Terminology

The meanings of terms used in this manual are listed below.

Target device	This is the device to be emulated.
Target system	The system (user-built system) to be debugged. This includes the target program and hardware configured by the user.

Related Documents When using this manual, refer to the following manuals.
The related documents indicated in this publication may include preliminary versions.
However, preliminary versions are not marked as such.

○ **Documents related to development tools (user's manuals)**

Product Name		Document Number
IE-V850E-MC, IE-V850E-MC-A (In-Circuit Emulator)		U14487E
IE-703116-MC-EM1 (In-Circuit Emulator Option Board)		This manual
V800 Series™ Development Tool (Tutorial Guide)		U14218E
CA850 (Ver.2.40 or Later) (C Compiler Package)	Operation	U15024E
	C Language	U15025E
	Project Manager	U15026E
	Assembly Language	U15027E
ID850 (Ver.2.40 or Later) (Integrated Debugger)	Operation Windows Based	U15181E
SM850 (Ver.2.40 or Later) (System Simulator)	Operation Windows Based	U15182E
SM850 (Ver.2.00 or Later) (System Simulator)	External Part User Open Interface Specifications	U14873E
RX850 (Real-Time OS)	Basics	U13430E
	Installation	U13410E
RX850 Pro (Real-Time OS)	Basics	U13773E
	Installation	U13774E
RD850 (Ver. 3.0) (Task Debugger)		U13737E
RD850 Pro (Ver. 3.0) (Task Debugger)		U13916E
AZ850 (System Performance Analyzer)		U14410E

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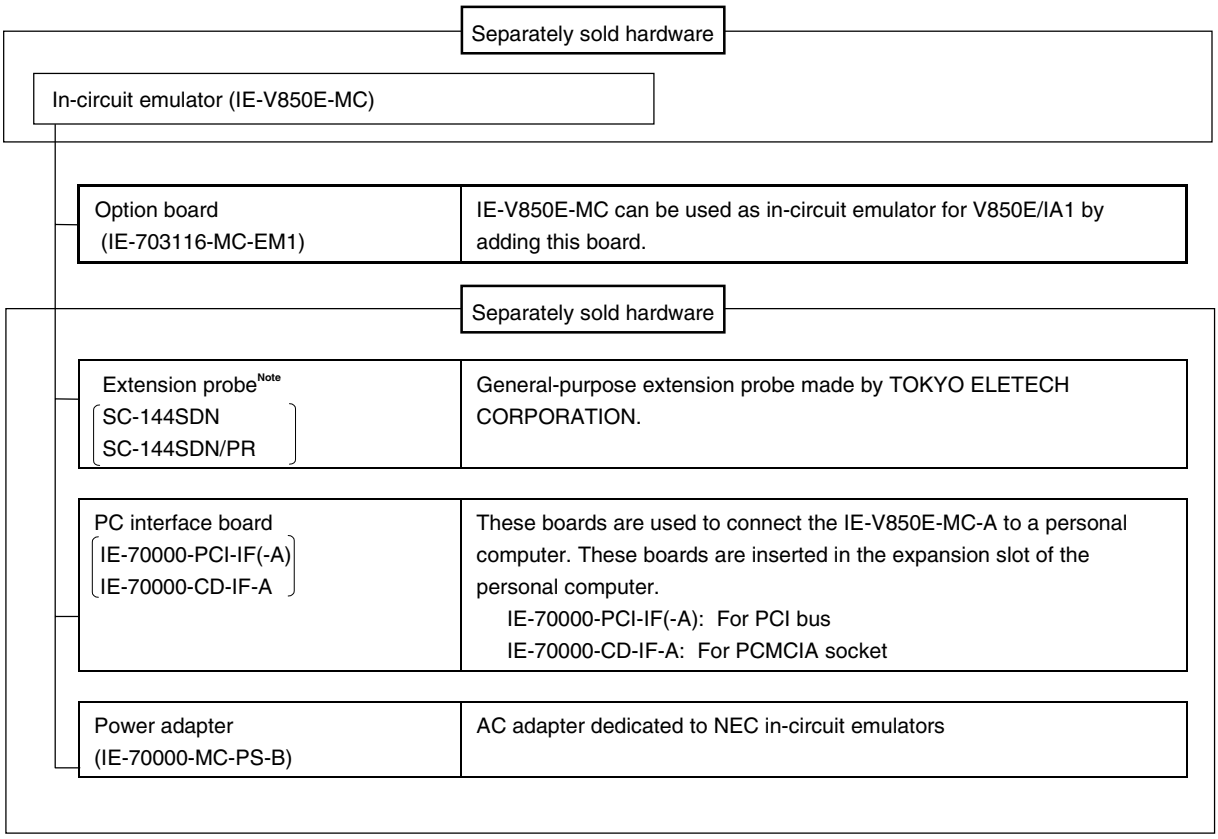
CHAPTER 1 OVERVIEW

The IE-703116-MC-EM1 is an option board for the in-circuit emulator IE-V850E-MC. By connecting the IE-703116-MC-EM1 to the IE-V850E-MC, hardware and software can be debugged efficiently in system development using the V850E/IA1.

In this manual, the basic setup procedures and switch settings of the IE-703116-MC-EM1 when connecting it to the IE-V850E-MC are described. For the names and functions of the parts of the IE-V850E-MC, and for the connection of parts, refer to the **IE-V850E-MC, IE-V850E-MC-A User's Manual (U14487E)** which is a separate volume.

1.1 Hardware Configuration



Note For further information, contact Daimaru Kogyo Co., Ltd.
Tokyo Electronics Department (TEL +81-3-3820-7112)
Osaka Electronics Department (TEL +81-6-6244-6672)

1.2 Features (When Connected to IE-V850E-MC)

- Maximum operation frequency: 50 MHz (V_{DD} = 5 V operation)
- Extremely lightweight and compact
- Higher equivalence with target device can be achieved by omitting buffer between signal cables.
- The following pins can be masked.
  $\overline{\text{RESET}}$, NMI, $\overline{\text{WAIT}}$, $\overline{\text{HLDRQ}}$
- Two methods of connection to target system:
  - Direct connection of the IE-703116-MC-EM1
  - Attach an extension probe (sold separately) to the connection tab of the IE-703116-MC-EM1.
- The dimensions of the IE-703116-MC-EM1 are as follows.

Parameter		Value
Power consumption		0.9 W (at 50 MHz operation frequency)[Note]
External dimensions (Refer to **APPENDIX A DIMENSIONS**)	Height	15 mm
	Length	206 mm
	Width	96 mm
Weight		190 g

Note The power consumption is 9.1 W for IE-V850E-MC + IE-703116-MC-EM1.

1.3 Function Specifications (When Connected to IE-V850E-MC)

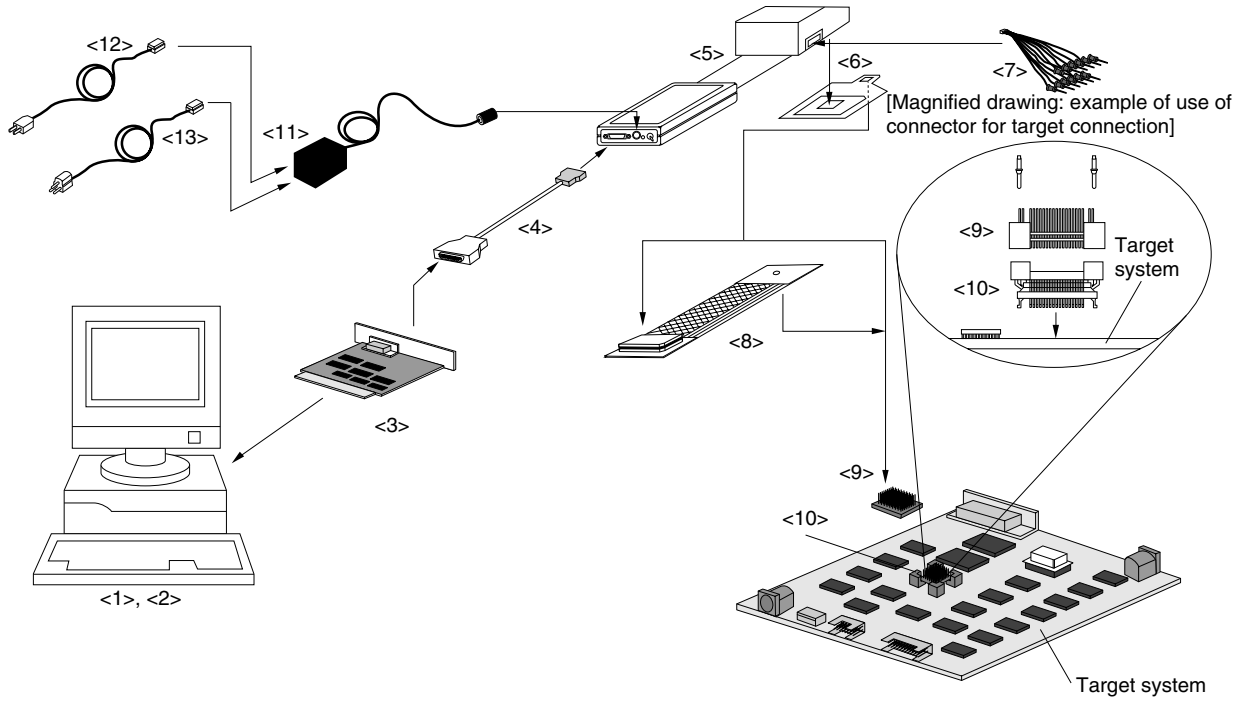
Parameter			Specification
Emulation memory capacity	Internal ROM		256 KB
	External memory		4 MB
Execution/pass detection Coverage memory capacity	Internal ROM		256 KB
	External memory	In ROMless mode	2 MB
		When using iROM	1 MB
Trace memory capacity			168 bits × 32 Kframes
Time measurement function			Can be measured with time tag and timers (3 lines)
External logic probe			8 bits external trace is possible
			Event setting for trace/break is possible
Break function			Event break
			Step execution break
			Forcible break
			Fail-safe break • Illegal access to peripheral I/O • Access to guard space • Writing to ROM space

Caution Some of the functions may not be supported depending on the debugger used.

1.4 System Configuration

The system configuration when connecting the IE-703116-MC-EM1 to the IE-V850E-MC, which is then connected to a personal computer (PC-9800 series, PC/AT or compatibles) is shown below.

Figure 1-1. System Configuration



Remark

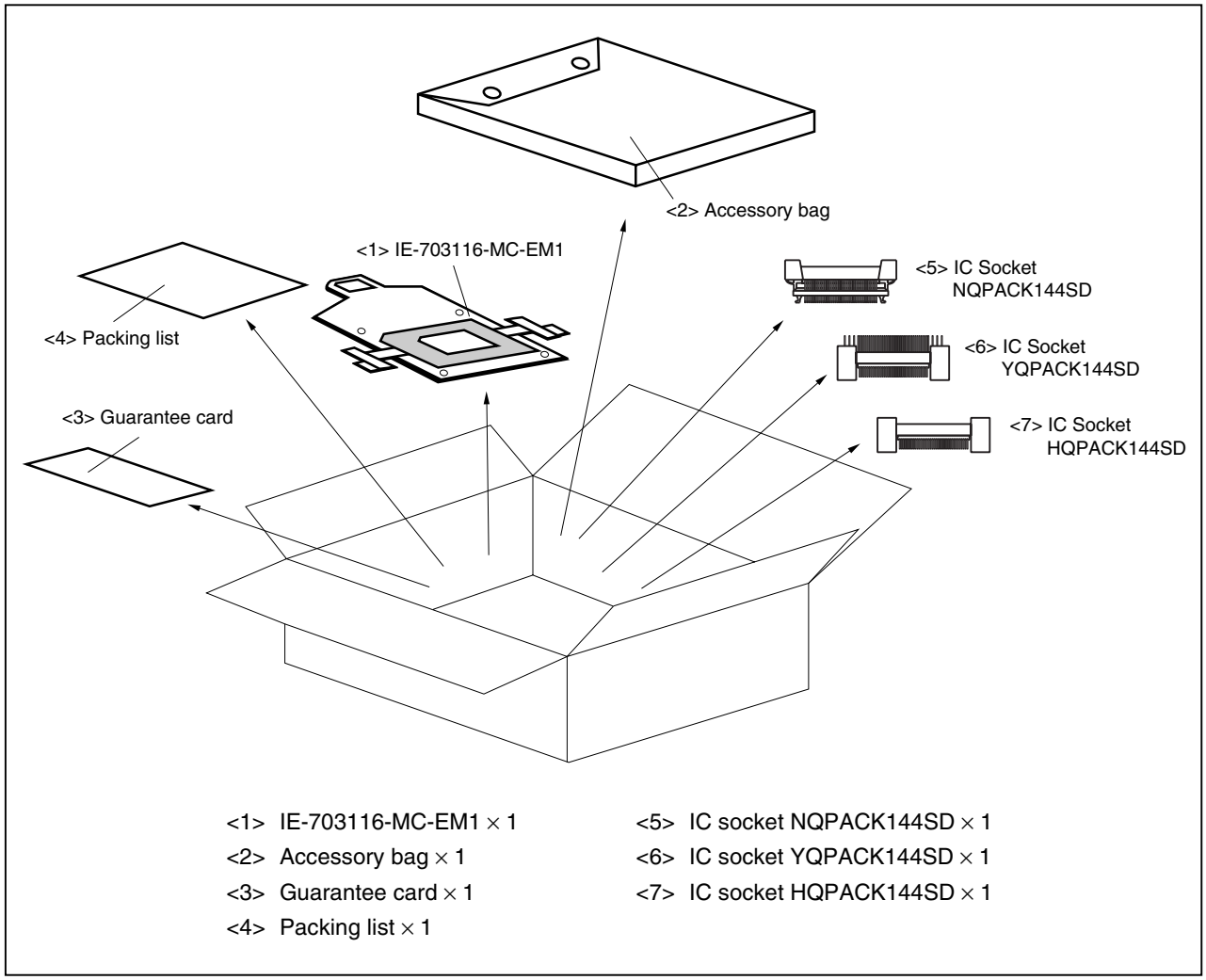
<1> Personal computer (PC-9800 series, PC/AT or compatibles)
<2> Debugger (sold separately), Device file[Note]
<3> PC interface board (IE-70000-PCI-IF(-A), IE-70000-CD-IF-A: sold separately)
<4> PC interface cable (included with IE-V850E-MC)
<5> In-circuit emulator (IE-V850E-MC: sold separately)
<6> In-circuit emulator optional board (IE-703116-MC-EM1)
<7> External logic probe
<8> Extension probe (SC-144SDN, SC-144SDN/PR: sold separately)
<9> Connector for emulator connection (YQPACK144SD: included)
<10> Connector for target connection (NQPACK144SD: included)
<11> Power adapter (IE-70000-MC-PS-B: sold separately)
<12> AC100 V power cable (sold separately: included with IE-70000-MC-PS-B)
<13> AC220 V power cable (sold separately: included with IE-70000-MC-PS-B)

Note Obtain the device file from the web site of NEC Electron Devices (http://www.ic.nec.co.jp/micro/).

1.5 Contents in Carton

The carton of the IE-703116-MC-EM1 contains a main unit, guarantee card, packing list, and accessory bag. Make sure that the accessory bag contains this manual and connector accessories. In case of missing or damaged items, contact an NEC sales representative or distributor.

Figure 1-2. Contents in Carton



Check that the accessory bag contains this manual, a packing list, an external logic probe, and a restriction document.

1.6 Connection Between IE-V850E-MC and IE-703116-MC-EM1

The procedure for connecting the IE-V850E-MC and IE-703116-MC-EM1 is described below.

Caution Connect carefully so as not to break or bend connector pins.

<1> Remove the POD cover (upper and lower) of the IE-V850E-MC.
<2> Set the PGA socket lever of the IE-703116-MC-EM1 to the OPEN position as shown in Figure 1-3 (b).
<3> Connect the IE-703116-MC-EM1 to the PGA socket at the rear of the POD (refer to Figure 1-3 (c)). When connecting, position the IE-V850E-MC and IE-703116-MC-EM1 so that they are horizontal.
Spacers can be connected to fix the POD (refer to **APPENDIX D MOUNTING PLASTIC SPACER**).
<4> Set the PGA socket lever of the IE-703116-MC-EM1 to the CLOSE position as shown in Figure 1-3 (b).
<5> Fix the IE-703116-MC-EM1 between the POD covers (upper and lower) with the nylon rivets supplied with the IE-V850E-MC.
<6> Fix the POD cover (upper) end with nylon rivets.

Figure 1-3. Connection Between IE-V850E-MC and IE-703116-MC-EM1 (1/2)

(a) Overview

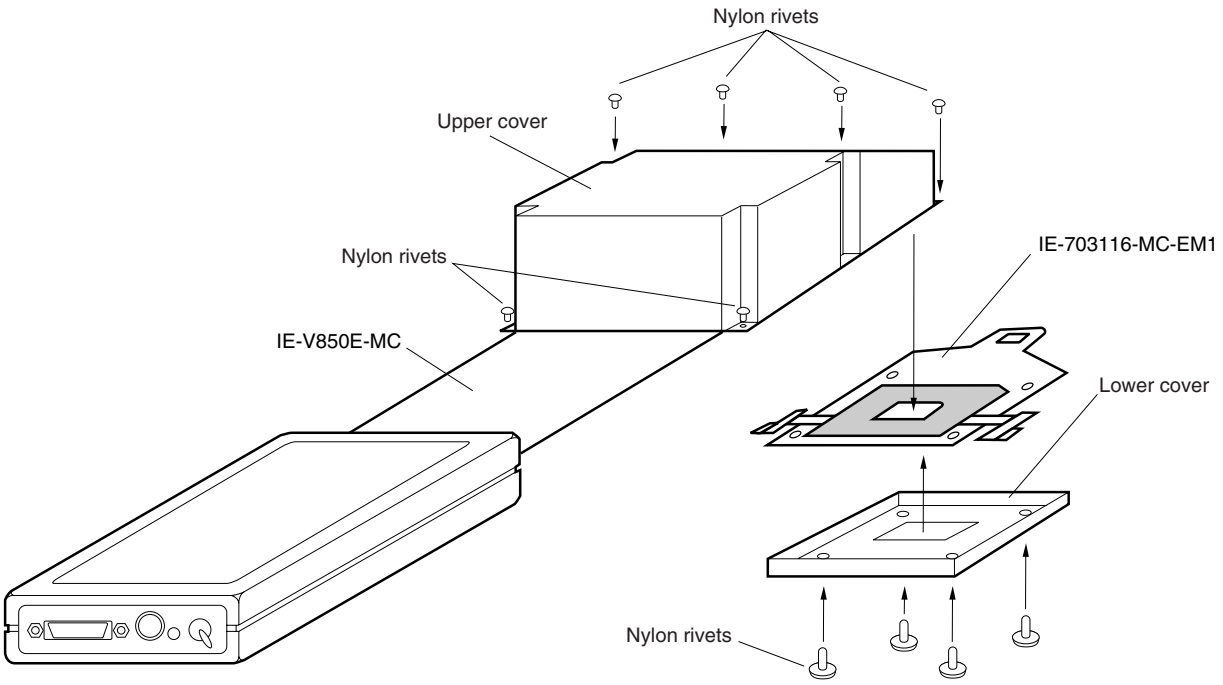
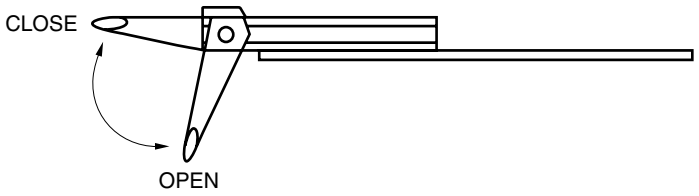
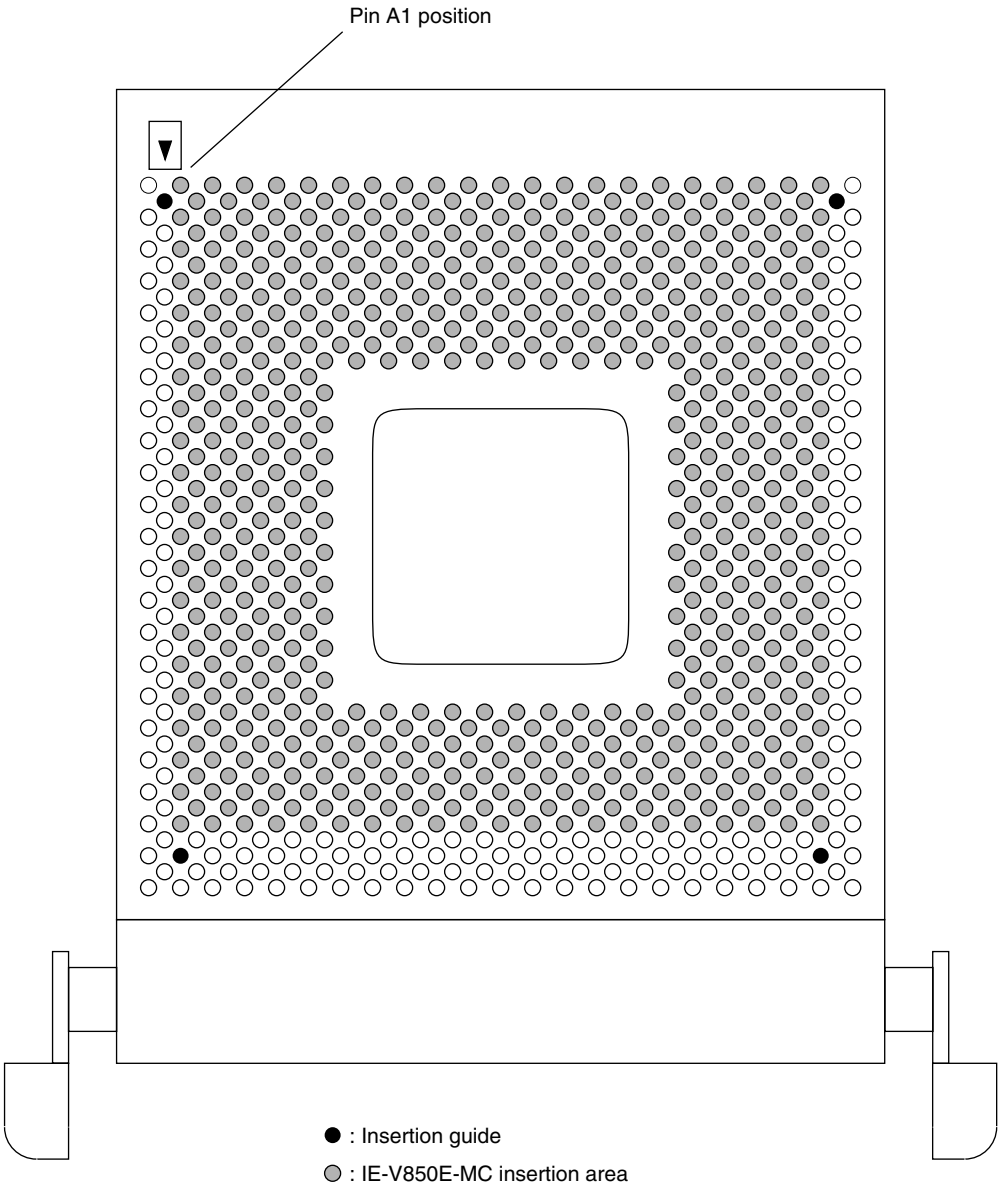


Figure 1-3. Connection Between IE-V850E-MC and IE-703116-MC-EM1 (2/2)

(b) PGA socket lever of IE-703116-MC-EM1



(c) Connecting part (IE-703116-MC-EM1)

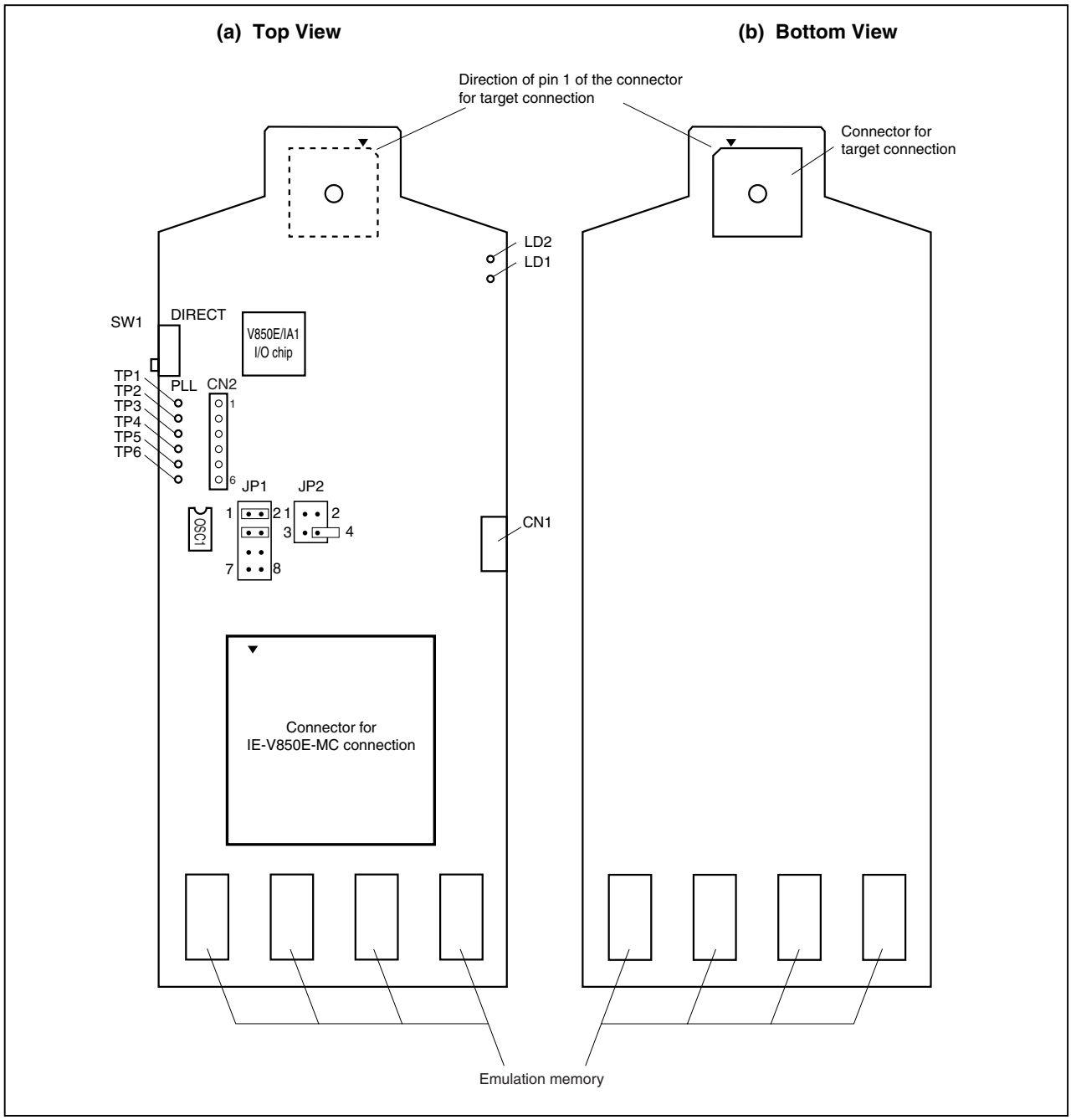


CHAPTER 2 NAMES AND FUNCTIONS OF COMPONENTS

This chapter describes the names, functions, and switch settings of components comprising the IE-703116-MC-EM1. For the details of the POD, jumper, and switch positions, etc., refer to the **IE-V850E-MC**, **IE-V850E-MC-A User's Manual (U14487E)**.

2.1 Component Names and Functions of IE-703116-MC-EM1

Figure 2-1. IE-703116-MC-EM1



(1) Test pin (TP1 to TP6)

To leave the DMA cycle or refresh cycle in the tracer, or break these cycles, connect these pins to the external logic probe.

- TP1: GND
- TP2: Test pin for product shipment inspection
- TP3: DMAAK0
- TP4: DMAAK1
- TP5: DMAAK2
- TP6: DMAAK3

(2) SW1

This is a switch for clock mode switching (for details, refer to **2.2 Clock Settings**).

(3) JP1

This is a jumper for switching the clock supply source (for details, refer to **2.2 Clock Settings**).

(4) JP2

This is a jumper for switching the power supply (for details, refer to **2.4 Power Supply Settings for Option Board**).

(5) CN1

Connects the external logic probe (included).

(6) CN2

This is the socket for connecting a crystal/ceramic resonator (for details, refer to **2.2 Clock Settings**).

(7) LD1 (CKSEL: Green)

LED Status	When Used as Stand-Alone Unit	When Used in Target System Connection
Lit	SW1 = DIRECT	The CKSEL signal from the target system is high
Extinguished	SW1 = PLL	The CKSEL signal from the target system is low

(8) LD2 (RUN: Yellow)

LED Status	
Lit	User program is being executed.
Extinguished	User program is halted.

(9) Connector for IE-V850E-MC connection

This is a connector for connecting the IE-V850E-MC.

(10) Connector for target connection

This is a connector for connecting the target system or the extension probe.

(11) Emulation memory

This is a memory that replaces the memory/memory mapped I/O on the target system (for details, refer to **2.5 Emulation Memory**).

2.2 Clock Settings

2.2.1 Clock settings outline

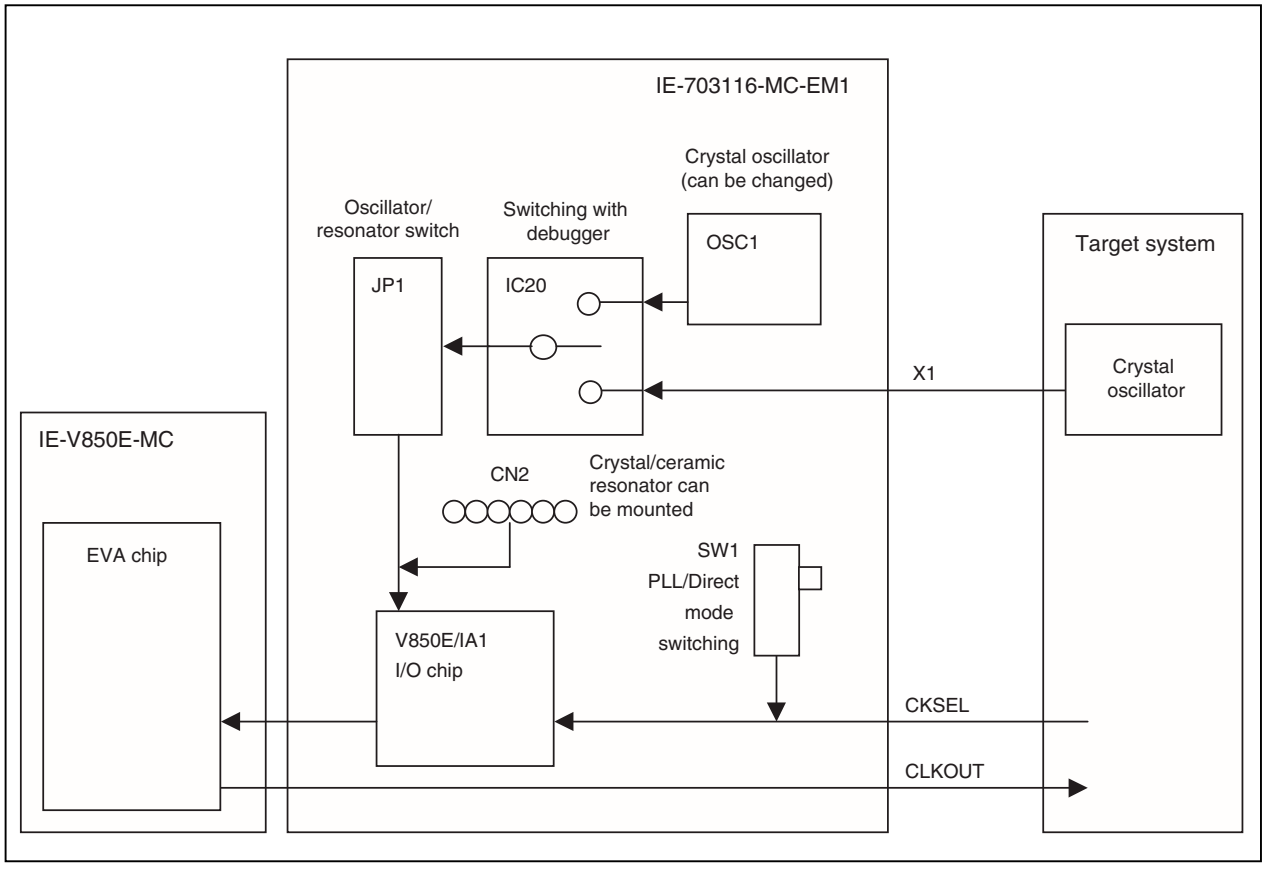
The following 4 clock setting methods are available.

For details, refer to **2.2.2 Clock setting methods**.

(1) Use the crystal oscillator mounted on OSC1 of the IE-703116-MC-EM1 as the internal clock (4.000 MHz).
(2) Change the crystal oscillator mounted on OSC1 of the IE-703116-MC-EM1 and use it as the internal clock (other than 4.000 MHz).
(3) Mount a crystal/ceramic resonator and capacitor on CN2 of the IE-703116-MC-EM1 and use it as the internal clock (other than 4.000 MHz).
(4) Use the crystal oscillator on the target system as the external clock (clock input from target system).

Caution When using an external clock, input the clock generated by the crystal oscillator to the X1 pin. When a clock generated by a crystal/ceramic resonator is used, the emulator does not operate normally.

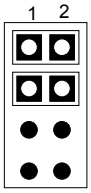
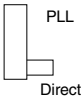
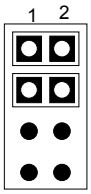
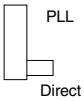
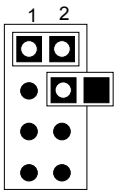
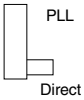
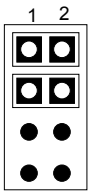
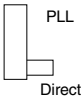
Figure 2-2. Clock Settings Outline



2.2.2 Clock setting methods

A list of the hardware settings when setting the clock is shown below.

Table 2-1. List of Hardware Settings When Setting Clock

Type of Clock Used	Clock Source Selection[Note 1]	OSC1 Crystal Oscillator	CN2 Crystal/ Ceramic Resonator	JP1 Setting	Clock Mode	SW1	CKSEL Pin[Note 2]
(1) Use crystal oscillator (OSC1) mounted on IE-703116-MC-EM1 as internal clock.	Internal	Factory settings (4.000 MHz)	Mounting prohibited		PLL		Low-level input
					Direct		High-level input
(2) Change crystal oscillator (OSC1) mounted on IE-703116-MC-EM1 and use it as the internal clock.	Internal	Change (to other than 4.000 MHz)	Mounting prohibited		PLL		Low-level input
					Direct		High-level input
(3) Mount a crystal/ceramic resonator on IE-703116-MC-EM1 and use it as the internal clock.	Internal	Crystal oscillator can be either mounted or not mounted	Mount		PLL		Low-level input
					Direct		High-level input
(4) Use the crystal oscillator on the target system as an external clock.	External	Crystal oscillator can be either mounted or not mounted	Mounting prohibited		PLL		Low-level input
					Direct		High-level input

Notes 1. Select the clock source in the clock source selection area in the configuration dialog box on the debugger.

2. The input setting to the CKSEL pin is made only when a target system is connected. Leave this pin open when operating the emulator on a standalone basis.

Caution Settings other than those described above are prohibited.

(1) Using the crystal oscillator (OSC1) mounted on the IE-703116-MC-EM1 as the internal clock

<1> If a crystal/ceramic resonator is mounted in the CN2 socket, remove it.

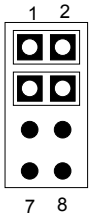
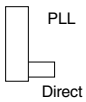
<2> Mount the 4.000 MHz crystal oscillator mounted at factory shipment in the OSC1 socket of the IE-703116-MC-EM1 (with the default settings).

<3> Change JP1 as indicated in Table 2-2 (with the default settings).

<4> Set the SW1 and CKSEL pins according to the clock mode to be used, as shown in Table 2-2.

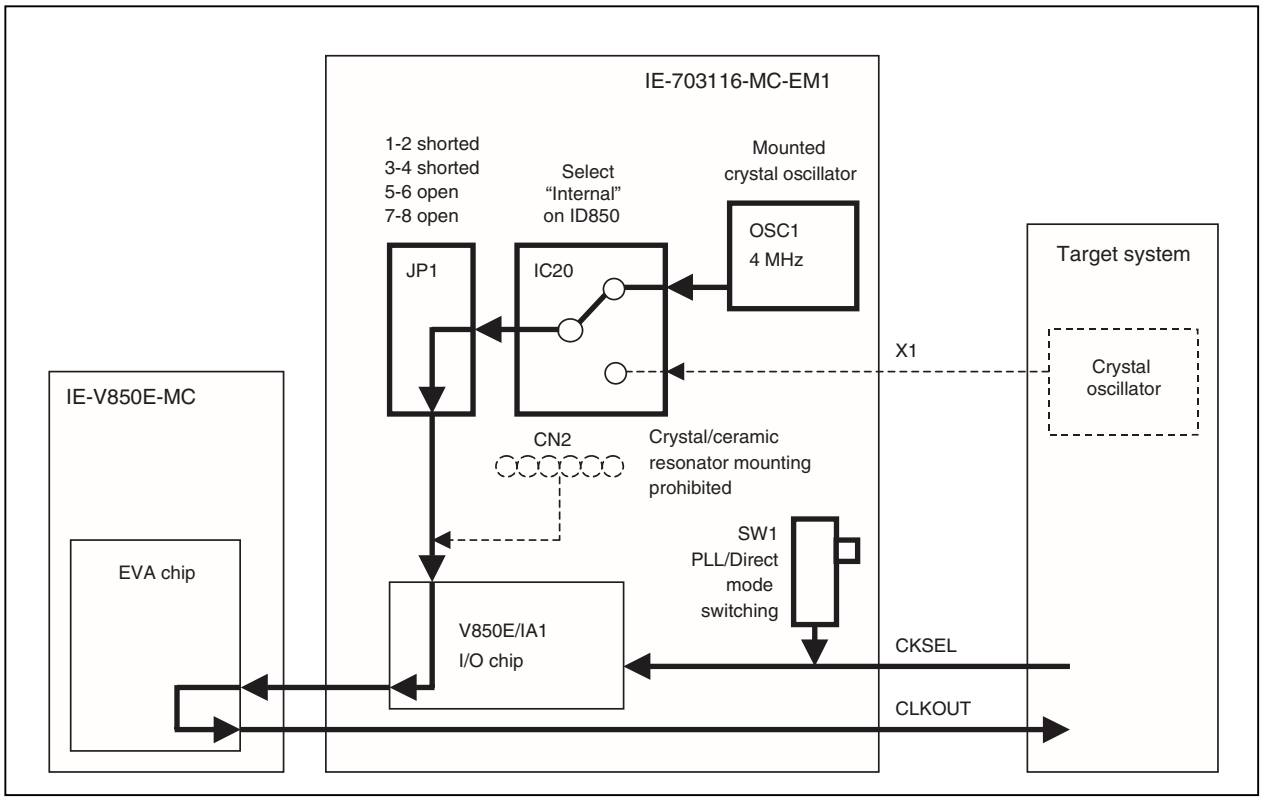
<5> To start up the integrated debugger (ID850), select “Internal” in the clock source selection area in the configuration dialog box (clock selection in emulator).

Table 2-2. Settings When Using Mounted Internal Clock

Type of Clock Used	Clock Source Selection	OSC1 Crystal Oscillator	CN2 Crystal/Ceramic Resonator	JP1 Setting	Clock Mode	SW1	CKSEL Pin[Note]
Use crystal oscillator (OSC1) mounted on IE-703116-MC-EM1 as internal clock.	Internal	Factory setting (4.000 MHz)	Mounting prohibited		PLL		Low-level input
					Direct		High-level input

Note The input setting to the CKSEL pin is made only when a target system is connected. Leave this pin open when operating the emulator on a standalone basis.

Figure 2-3. Outline When Using Mounted Internal Clock



(2) Changing the crystal oscillator (OSC1) mounted on the IE-703116-MC-EM1 and using it as the internal clock

<1> If a crystal/ceramic resonator is mounted in the CN2 socket, remove it.

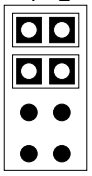
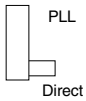
<2> Remove the crystal oscillator (OSC1) that is mounted on the option board and mount the oscillator to be used.

<3> Set JP1 as shown in Table 2-3 (factory settings).

<4> Set the SW1 and CKSEL pins according to the clock mode to be used, as shown in Table 2-3.

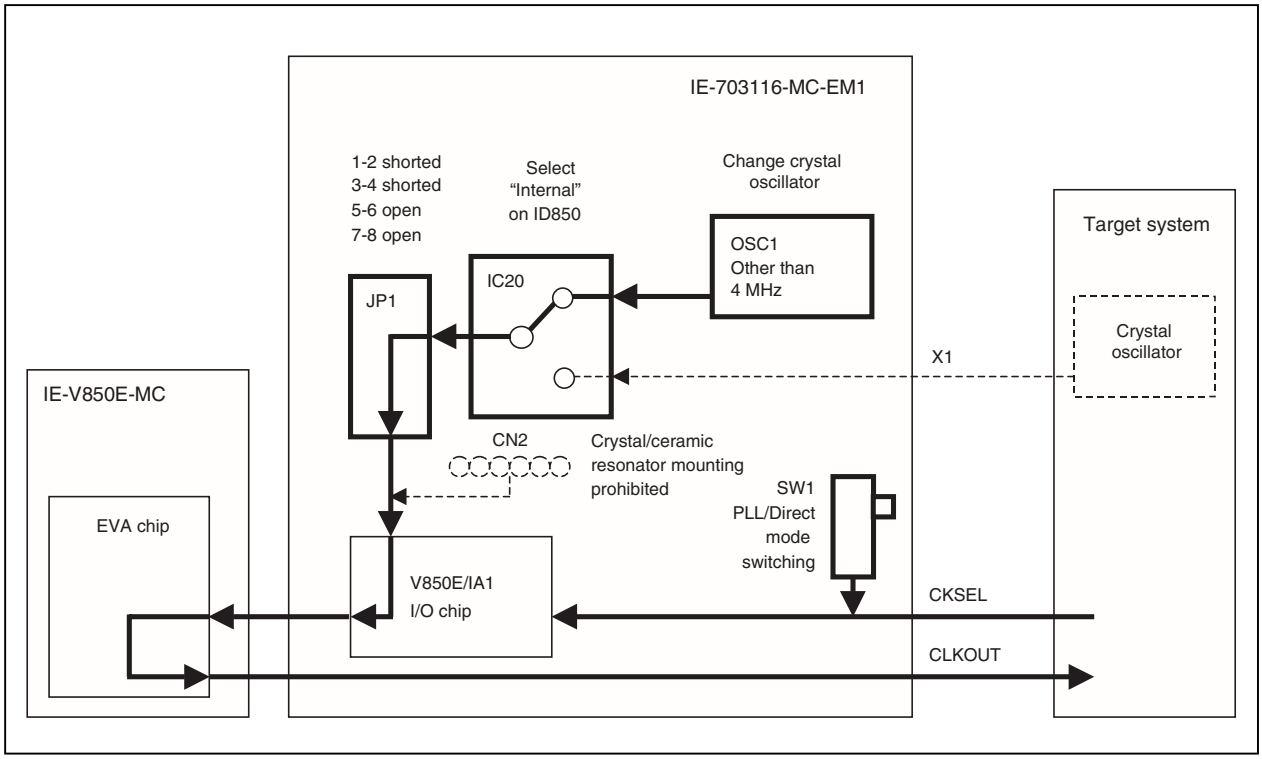
<5> Select “Internal” in the clock source selection area in the configuration dialog box on the integrated debugger (ID850).

Table 2-3. Settings When Changing Mounted Internal Clock

Type of Clock Used	Clock Source Selection	OSC1 Crystal Oscillator	CN2 Crystal/Ceramic Resonator	JP1 Setting	Clock Mode	SW1	CKSEL pin[Note]
Change the crystal oscillator mounted on IE-703116-MC-EM1 and use it as the internal clock.	Internal	Change (to other than 4.000 MHz)	Mounting prohibited	1 2  7 8	PLL		Low-level input
					Direct		High-level input

Note The input setting to the CKSEL pin is made only when a target system is connected. Leave this pin open when operating the emulator on a standalone basis.

Figure 2-4. Outline When Changing Mounted Crystal Oscillator and Using It as Internal Clock



(3) Mounting a crystal/ceramic resonator on the IE-703116-MC-EM1 and using it as the internal clock

<1> Mount the crystal/ceramic resonator and capacitor to be used in the CN2 socket as shown below (when selecting the crystal/ceramic resonator, refer to the V850E/IA1 standards table).

<2> Set JP1 as shown in Table 2-4.

<3> Set the SW1 and CKSEL pins according to the clock mode to be used, as shown in Table 2-4.

<4> Select “Internal” in the clock source selection area in the configuration dialog box on the integrated debugger (ID850).

Figure 2-5. Crystal/Ceramic Resonator Mounting Method and Connection Diagram

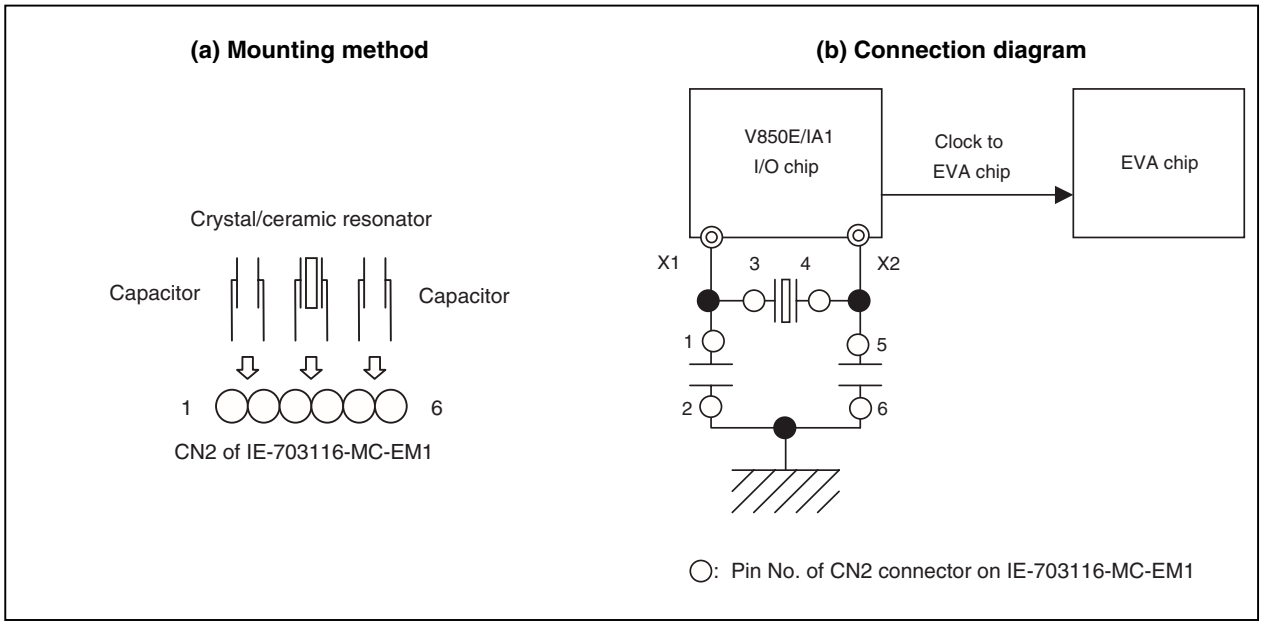
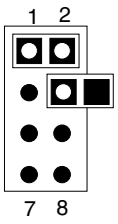
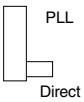


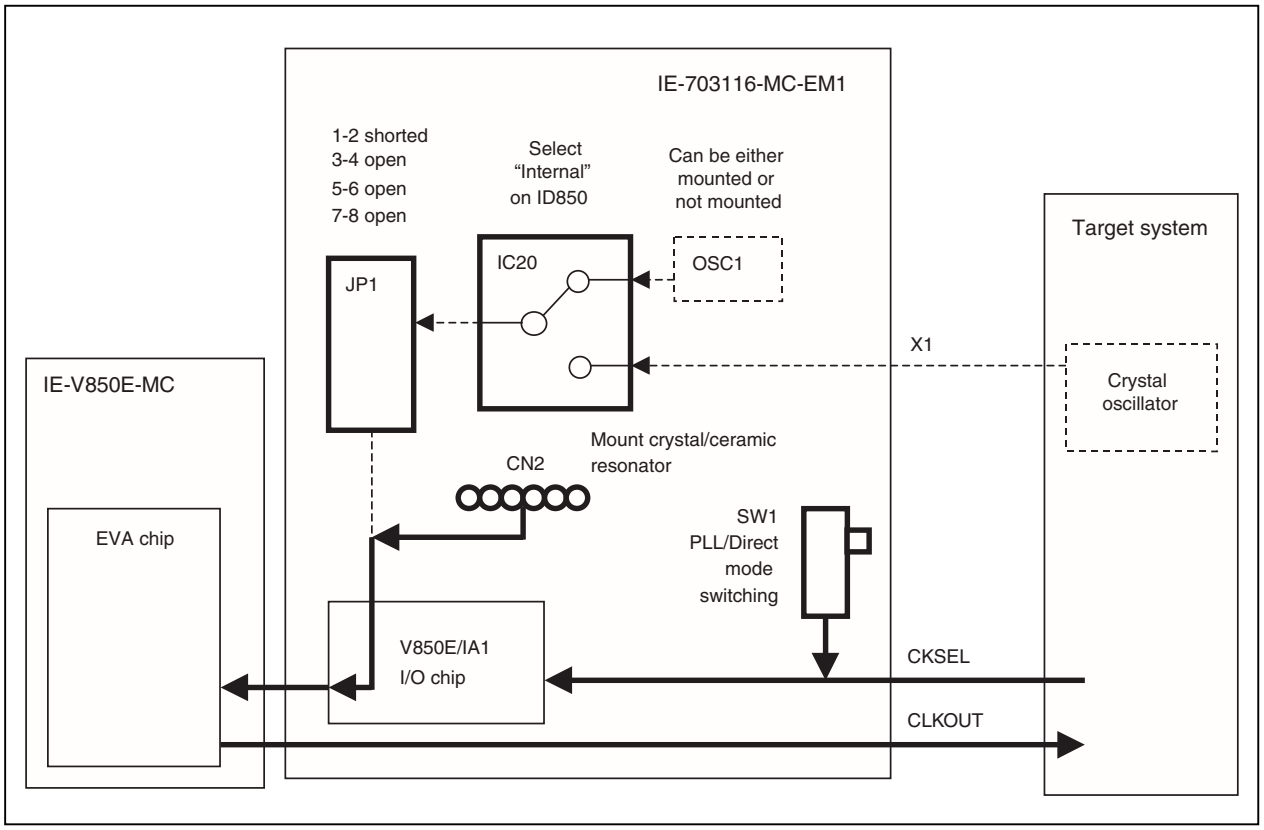
Table 2-4. Settings When Using Crystal/Ceramic Resonator as Internal Clock

Type of Clock Used	Clock Source Selection	OSC1 Crystal Oscillator	CN2 Crystal/Ceramic Resonator	JP1 Setting	Clock Mode	SW1	CKSEL Pin[Note 1]
Mount crystal/ceramic resonator on IE-703116-MC-EM1 and use as internal clock	Internal	Crystal oscillator can be either mounted or not mounted	Mount[Note 2]		PLL		Low-level input
					Direct		High-level input

Notes 1. The input setting to the CKSEL pin is made only when a target system is connected. Leave this pin open when operating the emulator on a standalone basis.

2. When selecting the crystal/ceramic resonator, refer to the V850E/IA1 standards table.

Figure 2-6. Outline When Using Crystal/Ceramic Resonator as Internal Clock



(4) Using the target system crystal oscillator as an external clock

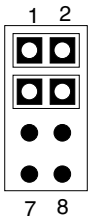
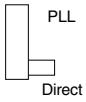
<1> If a crystal/ceramic resonator is mounted in the CN2 socket, remove it.

<2> Set JP1 as shown in Table 2-5 (factory setting).

<3> Set the SW1 and CKSEL pins according to the clock mode to be used, as shown in Table 2-5.

<4> Select “External” in the clock source selection area in the configuration dialog box on the integrated debugger (ID850).

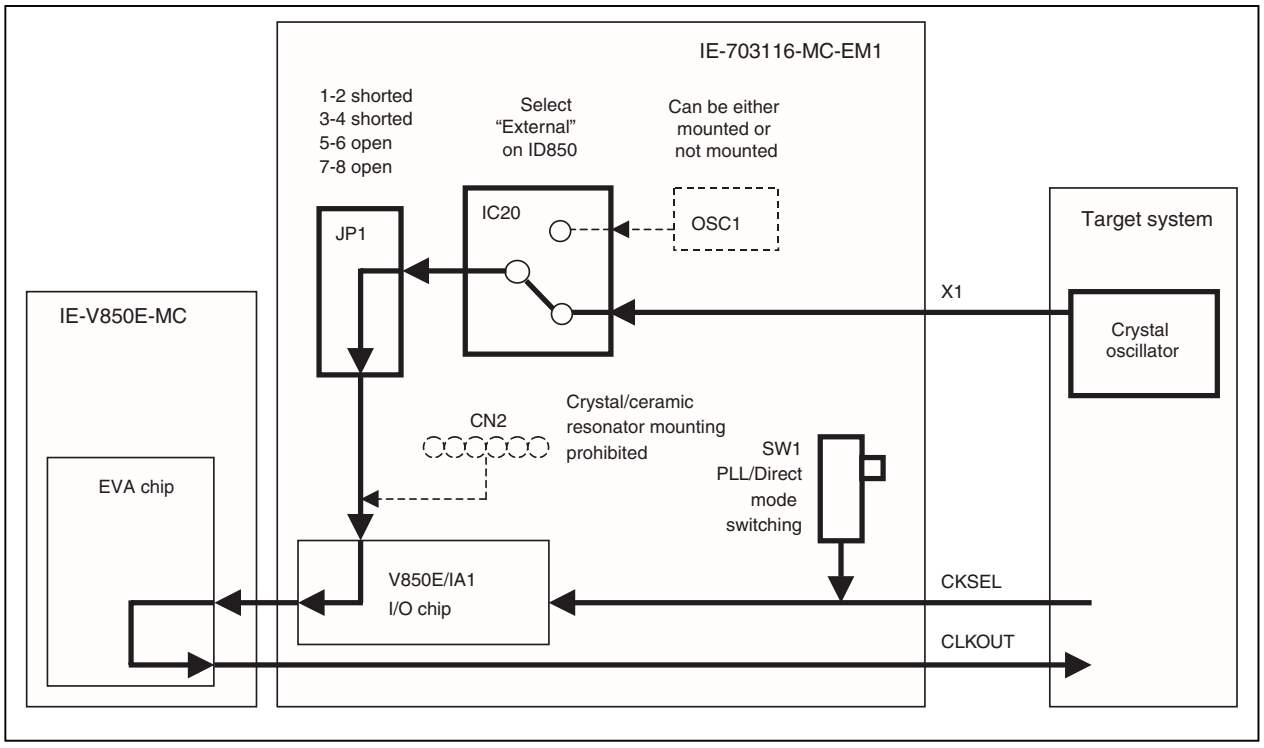
Table 2-5. Settings When Using External Clock

Type of Clock Used	Clock Source Selection	OSC1 Crystal Oscillator	CN2 Crystal Resonator	JP1 Setting	Clock Mode	SW1	CKSEL Pin[Note]
Use crystal oscillator on target system as external clock.	External	Crystal oscillator can be either mounted or not mounted	Mounting prohibited		PLL		Low-level input
					Direct		High-level input

Note The input setting to the CKSEL pin is made only when a target system is connected. Leave this pin open when operating the emulator on a standalone basis.

Caution Be sure to input a clock generated by a crystal oscillator to the X1 pin.
When a clock generated by a crystal/ceramic resonator is used, the emulator does not operate normally.

Figure 2-7. Outline When Using Crystal Oscillator on Target System as External Clock



2.3 Operation Mode

The IE-703116-MC-EM1 supports single-chip mode 0, single-chip mode 1, ROMless mode 0, and ROMless mode 1 similar to the V850E/IA1. Set these as follows.

2.3.1 When emulator is used as stand-alone unit

Only operation in single-chip mode 0 is supported.

When the integrated debugger (ID850) is activated, be sure to select “Mode02” in the configuration dialog box mask setting area.

2.3.2 When emulator is connected to target system

Set as follows in the configuration dialog box mask setting area when the integrated debugger (ID850) is activated in accordance with the operation mode used.

Operation in ROMless mode 0: Select Mode00
Operation in ROMless mode 1: Select Mode01
Operation in single-chip mode 0: Select Mode02
Operation in single-chip mode 1: Select Mode03

Emulation of the MODE pin cannot be performed since the input level to the MODE pin is implemented using the debugger pin mask function in the IE-703116-MC-EM1.

For the settings of the pins on the target system, refer to the **V850E/IA1 Hardware User’s Manual (U14492E).**

2.4 Power Supply Settings for Option Board

Using the JP2 setting, the IE-703116-MC-EM1 can switch between operation using the emulator as a stand-alone unit (using the power of the emulator) and operation using the emulator connected to the target system (using the power of the target system).

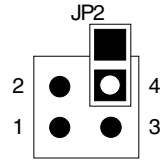
2.4.1 JP2 setting when emulator is used as stand-alone unit

The IE-703116-MC-EM1 operates using the emulator's power supply when the emulator operates as a stand-alone unit and target system power is off.

Figure 2-2 shows the JP2 setting.

Caution If the JP2 setting is incorrect, the emulator may be damaged.

Figure 2-8. Power Supply Settings (When Emulator Is Used as Stand-Alone Unit and Target System Power Is Off)



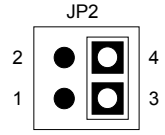
Set both 1 and 2, and 3 and 4 as open

2.4.2 JP2 setting when emulator is connected to target system

The IE-703116-MC-EM1 operates using the target system's power supply when the power of the target system is on. Figure 2-3 shows the JP2 setting.

Caution If the JP2 setting is incorrect, the emulator may be damaged.

Figure 2-9. Power Supply Setting (When Power of Target System Is On)



Set 1 and 2 as open, and 3 and 4 as shorted

2.5 Emulation Memory

This is a substitute memory used to emulate the memory or memory mapped I/O on the target system (capacity: 4 MB).

The emulation memory is mounted on the IE-703116-MC-EM1.

2.5.1 Wait setting for emulation memory

The data wait, address wait, and idle state for the emulation memory are set as follows.

(1) ID850

Select from the following three types on the configuration screen.

Selection	Wait Type	Emulation Memory Access	External Memory Access
WAIT MASK	Data wait	Fixed to 0 waits	Depends on DWC register setting WAIT signal masked
	Address wait	Fixed to 0 waits	Depends on ASC register setting
	Idle state	Fixed to 0 cycles	Depends on BCC register setting
1 WAIT ACCESS	Data wait	Fixed to 1 wait	Depends on DWC register setting and WAIT signal status
	Address wait	Fixed to 0 waits	Depends on ASC register setting
	Idle state	Fixed to 0 cycles	Depends on BCC register setting
TARGET WAIT	Data wait	Depends on DWC register setting However, 1 wait when set to 0 waits	Depends on DWC register setting and WAIT signal status
	Address wait	Fixed to 0 waits	Depends on ASC register setting
	Idle state	Depends on BCC register setting	Depends on BCC register setting

(2) MULTI

Select mask or unmask for WAIT and EMWAIT using the “Pinmask” command.

Selection	Wait Type	Emulation Memory Access	External Memory Access
WAIT: Mask EMWAIT: Mask	Data wait	Fixed to 0 waits	Depends on DWC register setting WAIT signal masked
	Address wait	Fixed to 0 waits	Depends on ASC register setting
	Idle state	Fixed to 0 cycles	Depends on BCC register setting
WAIT: Unmask EMWAIT: Mask	Data wait	Fixed to 1 wait	Depends on DWC register setting and WAIT signal status
	Address wait	Fixed to 0 waits	Depends on ASC register setting
	Idle state	Fixed to 0 cycles	Depends on BCC register setting
WAIT: Unmask EMWAIT: Unmask	Data wait	Depends on DWC register setting However, 1 wait when set to 0 waits	Depends on DWC register setting and WAIT signal status
	Address wait	Fixed to 0 waits	Depends on ASC register setting
	Idle state	Depends on BCC register setting	Depends on BCC register setting

2.5.2 Cautions related to emulation memory

(1) Number of data waits required for emulation memory access

The number of data waits required to be inserted for emulation memory access varies depending on the operating frequency of the emulator.

4 MHz ≤ Operating frequency < 25 MHz	0 waits
25 MHz ≤ Operating frequency ≤ 40 MHz	1 wait
40 MHz < Operating frequency	2 waits

(2) Bus sizing

Make the bus sizing 16 bits (set BSC register BSn0 to 1).

An 8-bit bus cannot be used.

(3) $\overline{\text{WAIT}}$ pin

The number of data waits for the emulation memory is not affected by the $\overline{\text{WAIT}}$ pin.

(4) Address wait

Address waits cannot be inserted in the emulation memory.

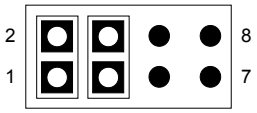
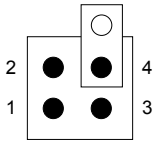
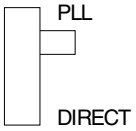
When address waits need to be inserted, set as follows.

Number of data waits for CS space of emulation memory	=	Number of address waits for external memory or external I/O	+	Number of data waits for external memory or external I/O

This setting is effective to make the access speed to the emulation memory equal to that of the external memory or external I/O to measure the performance, etc.

For how to insert waits in the emulation memory, refer to **2.5.1 Wait setting for emulation memory**.

CHAPTER 3 FACTORY SETTINGS

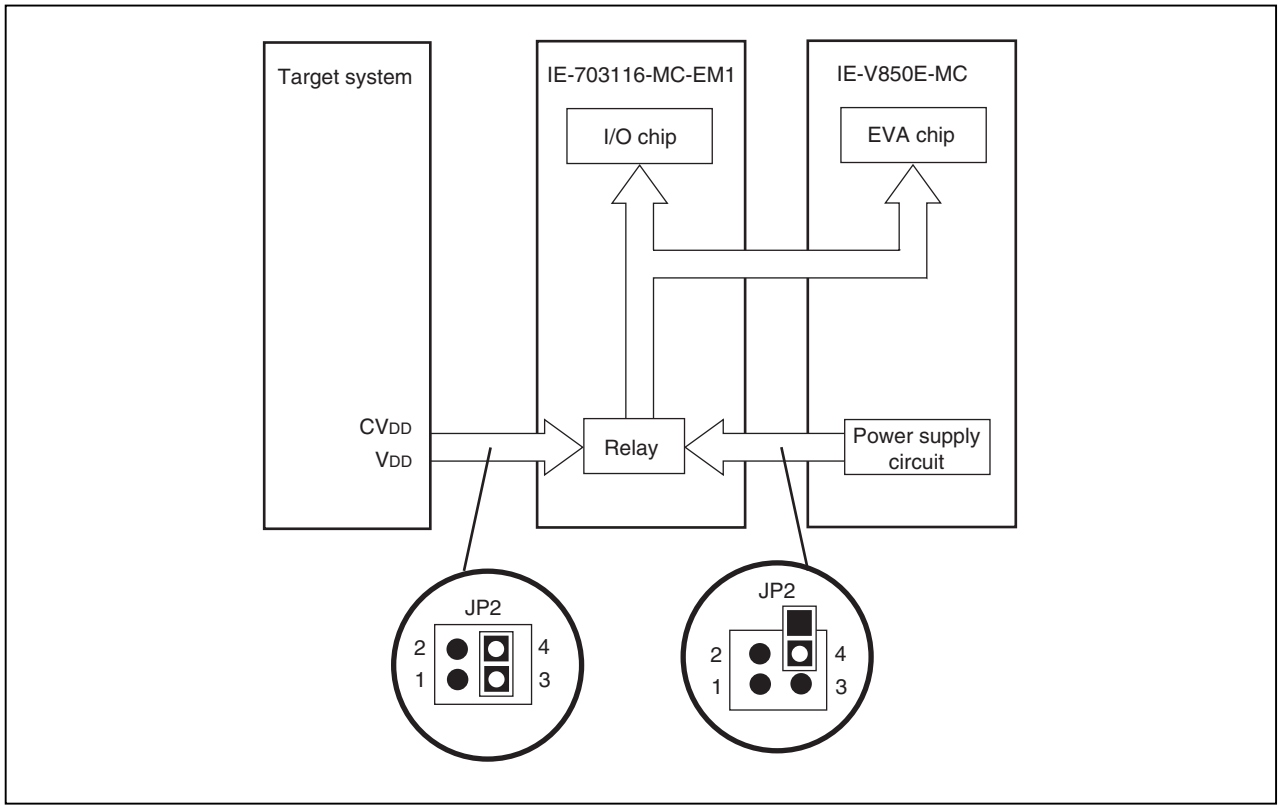
Item	Setting	Remark
JP1		Setting that uses a crystal resonator as an internal/external clock.
JP2		Setting that supplies the IE-703116-MC-EM1 with the power of the emulator (when the emulator operates as a stand-alone unit and target system power is off).
SW1		Set to PLL mode.
OSC1	4.000 MHz crystal oscillator is mounted.	The frequency can be changed by changing the crystal resonator.

CHAPTER 4 CAUTIONS

4.1 V_{DD} of Target System

(1) V_{DD} in the target system is used to operate the circuit in the emulator.
(2) When JP2 is set as “1 and 2 open” and “3 and 4 shorted”, the evaluation chip in the emulator operates on V_{DD} from the target system.
(3) When JP2 is set as “1 and 2 open” and “3 and 4 open”, the emulator recognizes the target system power is off and operates with the 3.3 V power supply.

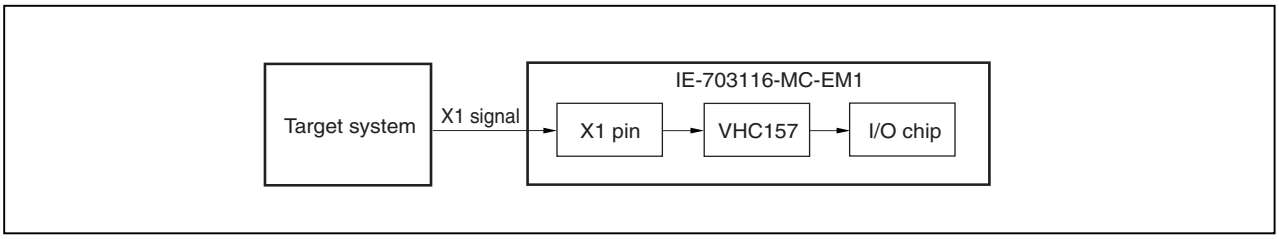
Figure 4-1. Schematic Diagram of Power Supply Flow



4.2 X1 Signal

The input signal (X1 signal) from the target system is delayed (for t_{pLH} = t_{pHL} = 13.2 ns (MAX.)) because it passes through VHC157 before it is input to the I/O chip of the emulator. The input voltage becomes V_{IH} = 2.31 V (MIN.) and V_{IL} = 0.99 V (MAX.). The input current becomes I_{IN} = ±1.0 μA (MAX.).

Figure 4-2. Diagram of X1 Signal Flow



4.3 Pin Termination During Operation of Emulator as Stand-Alone Unit

(1) MODE0 to MODE2 pins

When the emulator operates as a stand-alone unit, the operation mode of the emulator is single-chip mode 0. The MODE0 to MODE2 pins are connected as follows.

- MODE0: Connected to V_{SS} via a resistor (33 kΩ) (pull-down).
- MODE1: Connected to V_{DD} via a resistor (33 kΩ) (pull-up).
- MODE2: Connected to V_{SS} via a resistor (33 kΩ) (pull-down).

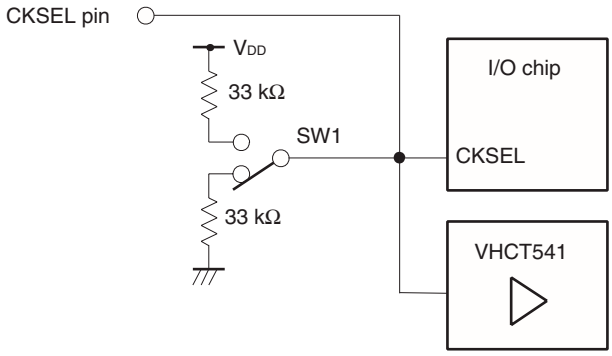
(2) $\overline{\text{RESET}}$ pin

This pin is connected to V_{DD} via a resistor (33 kΩ) (Pull-up).

(3) CKSEL pin

Pull-up/pull-down switching is possible with SW1.

Figure 4-3. Circuit Diagram of CKSEL Pin



4.4 Internal RAM and ROM

Because the internal RAM (iRAM) and internal ROM (iROM) capacities of the emulator are set in steps, the memory capacity is different from that of the target device. If addresses that exceed the target device capacity are accessed, the memory of the emulator is accessed. The memory capacities are as follows.

Table 4-1. Memory Capacity Limitation List

(a) iRAM capacity (Unit: byte)

Target Device	Emulator
1 K to 4 K	4 K
5 K to 12 K (μPD70F3116, μPD703117)	12 K
13 K to 28 K	28 K
29 K to 60 K	60 K

(b) iROM capacity (Unit: byte)

Target Device	Emulator (Emulation Memory)
1 K to 32 K	32 K
33 K to 64 K	64 K
65 K to 128 K (μPD703117)	128 K
129 K to 256 K (μPD70F3116)	256 K
257 K to 512 K	512 K

4.5 Bus Control Pins

There are the following differences between the emulator and the target device in the operation of the pins for bus control.

Table 4-2. Bus Control Pin Operation List (1/2)
(a) During break

Pin Name	Waiting for Emulator Command	Internal Memory					External Memory			
		Internal ROM	Internal RAM		On-Chip Peripheral I/O		Emulation RAM		Target System	
		R	R	W	R	W	R	W	R	W
AD0 to AD15	Hi-Z	Hi-Z					**Note**		**Note**	
A16 to A23	Address accessed last is held	Address accessed last is held					**Note**		**Note**	
$\overline{CS0}$ to $\overline{CS7}$	H	H					H		**Note**	
$\overline{RD}$	H	H					H		**Note**	
$\overline{ASTB}$	H	H					**Note**		**Note**	
$\overline{LWR}$, $\overline{UWR}$	H	H					H		**Note**	
$\overline{WAIT}$	Invalid	Invalid					Maskable		Maskable	
$\overline{HLDRQ}$	Maskable	Maskable					Maskable		Maskable	
$\overline{HLDAK}$	**Note**	**Note**					**Note**		**Note**	

Note Performs the same operation as the cycle that is generated by the target device program execution.

Remarks 1. R: Read
W: Write
2. H: High-level output
Hi-Z: High-impedance

Table 4-2. Bus Control Pin Operation List (2/2)
(b) During user program execution

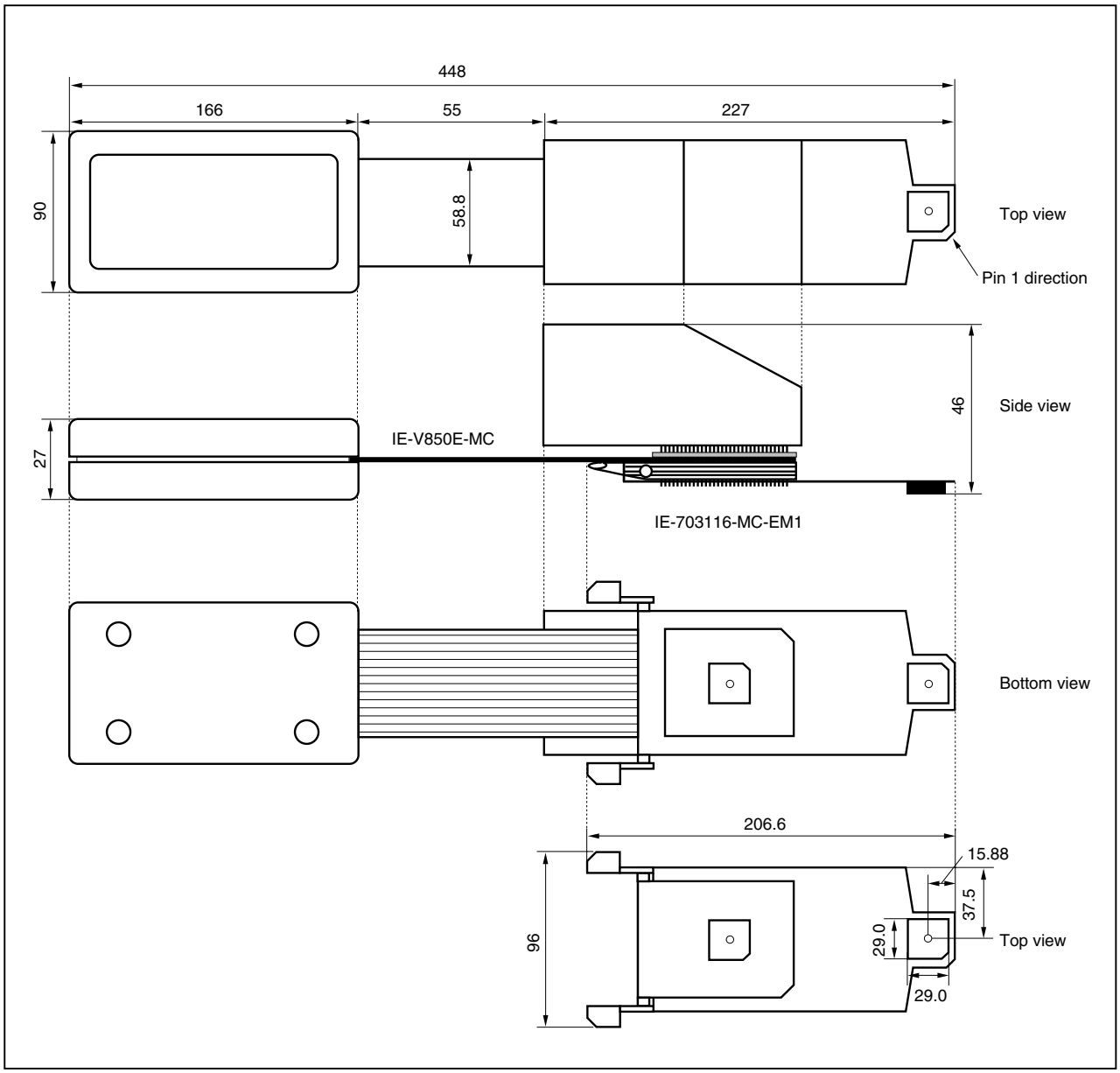
Pin Name	Internal Memory							External Memory					
	Internal ROM		Internal RAM			On-Chip Peripheral I/O		Emulation RAM			Target System		
	F	R	F	R	W	R	W	F	R	W	F	R	W
AD0 to AD15	Hi-Z							**Note**			**Note**		
A16 to A23	Address accessed last is held							**Note**			**Note**		
$\overline{CS0}$ to $\overline{CS7}$	H							H			**Note**		
$\overline{RD}$	H							H			**Note**		
$\overline{ASTB}$	H							**Note**			**Note**		
$\overline{LWR}$, $\overline{UWR}$	H							H			**Note**		
$\overline{WAIT}$	Invalid							Maskable			Maskable		
$\overline{HLDRQ}$	Maskable							Maskable			Maskable		
$\overline{HLDAK}$	**Note**							**Note**			**Note**		

Note Performs the same operation as the cycle that is generated by the target device program execution.

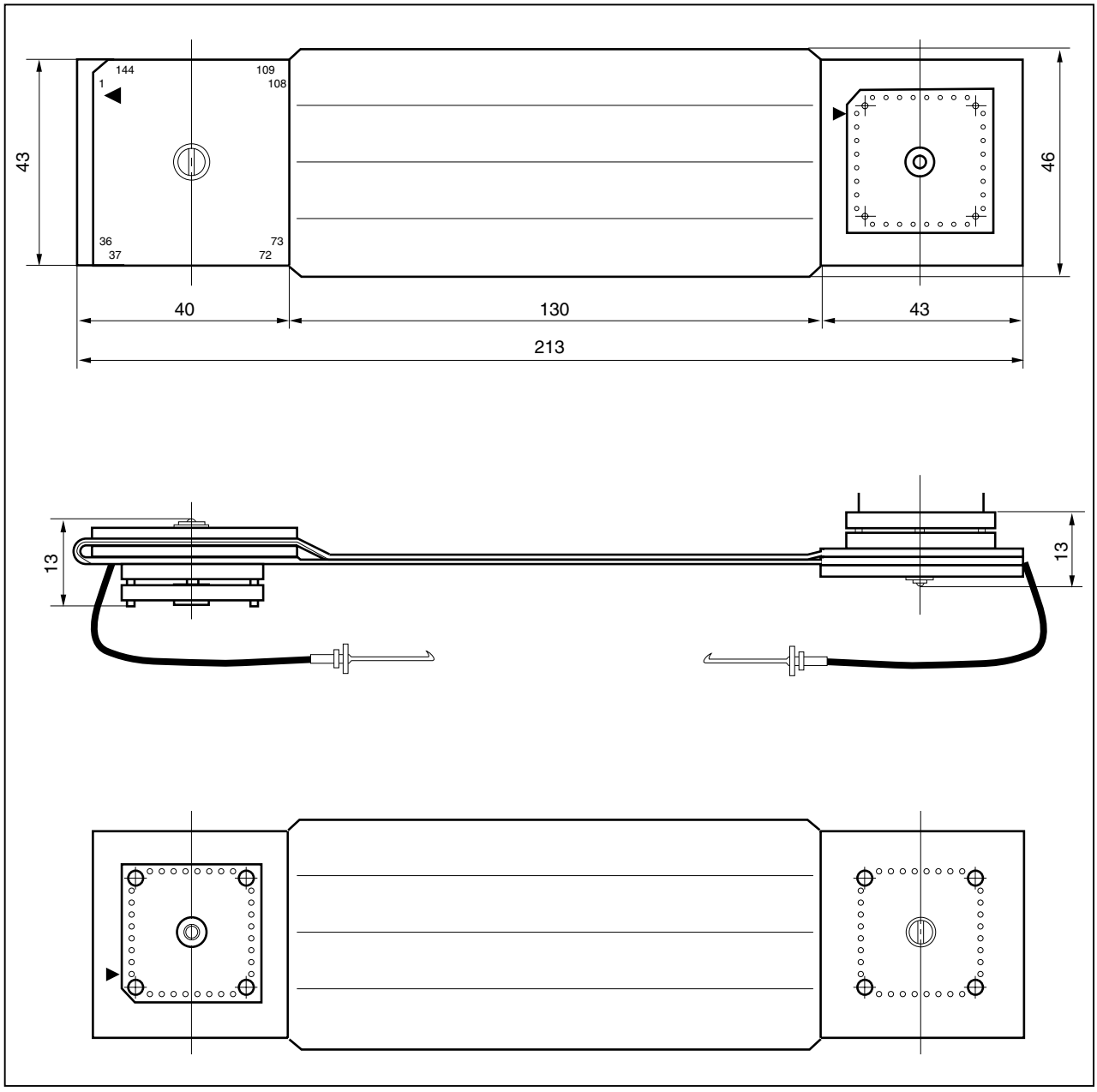
Remarks 1. F: Fetch
R: Read
W: Write
2. H: High-level output
Hi-Z: High-impedance

APPENDIX A DIMENSIONS

(1) IE-V850E-MC + IE-703116-MC-EM1 (Unit: mm)

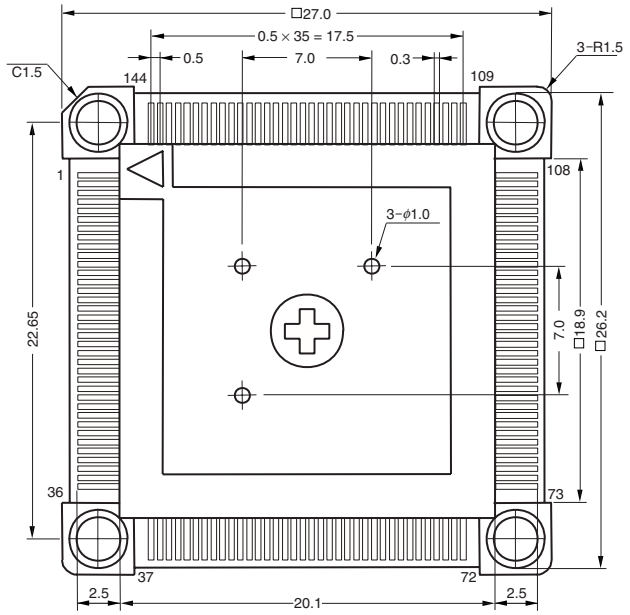


(2) SC-144SD (Unit: mm)

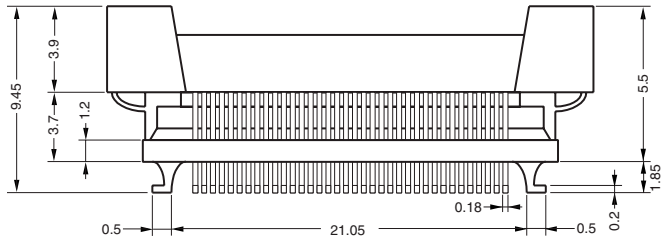


(3) NQPACK144SD (Unit: mm)

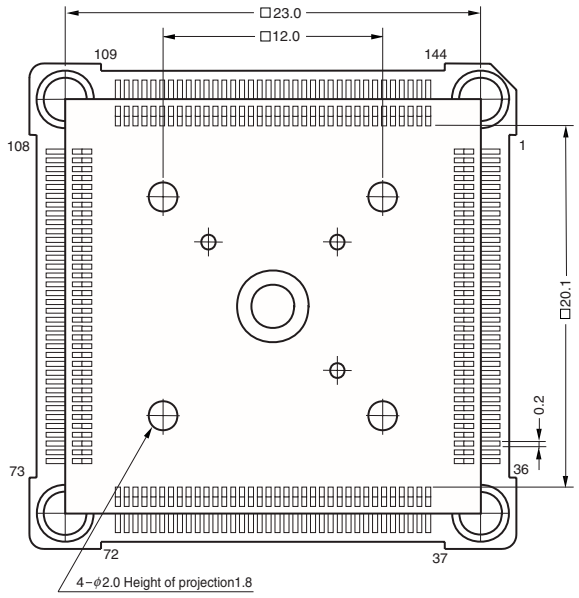
[Top view]



[Side view]

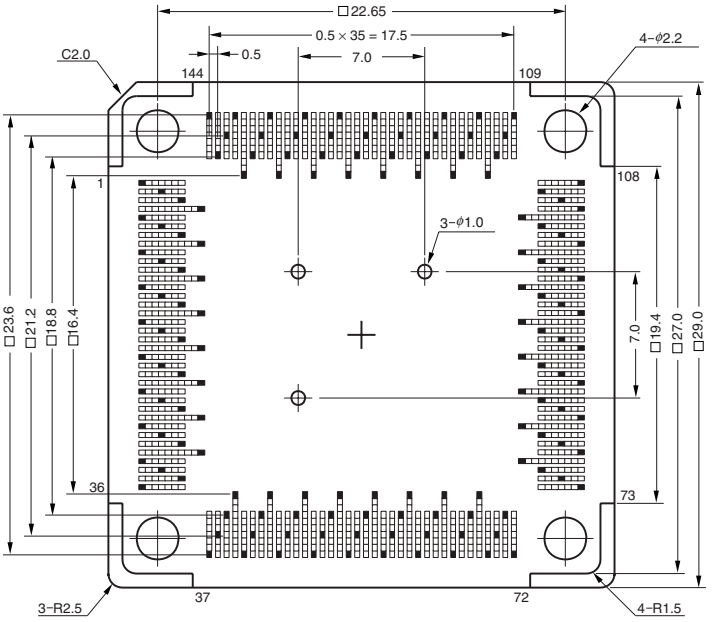


[Bottom view]

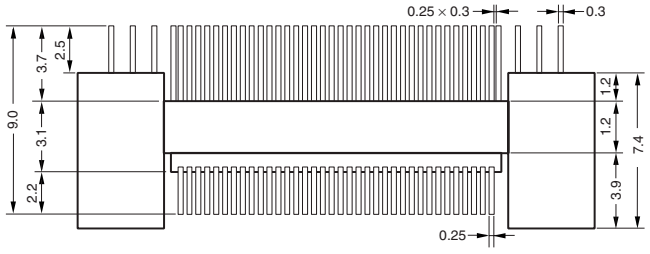


(4) YQPACK144SD (Unit: mm)

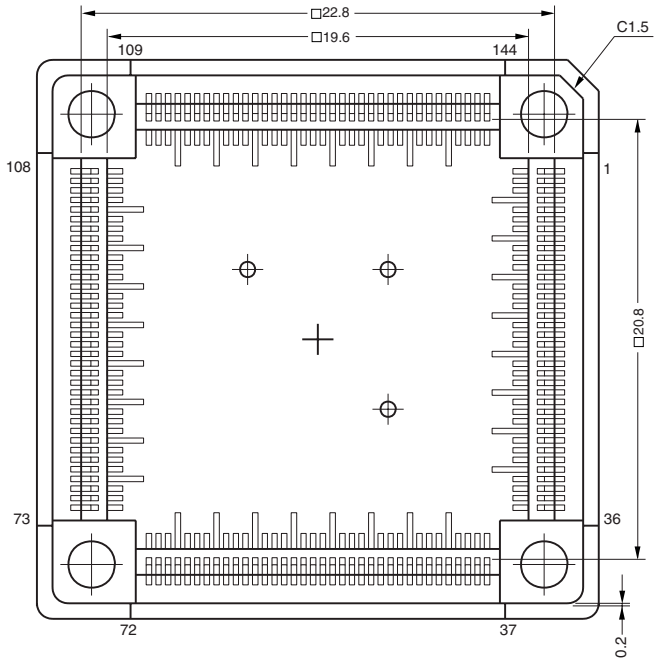
[Top view]



[Side view]

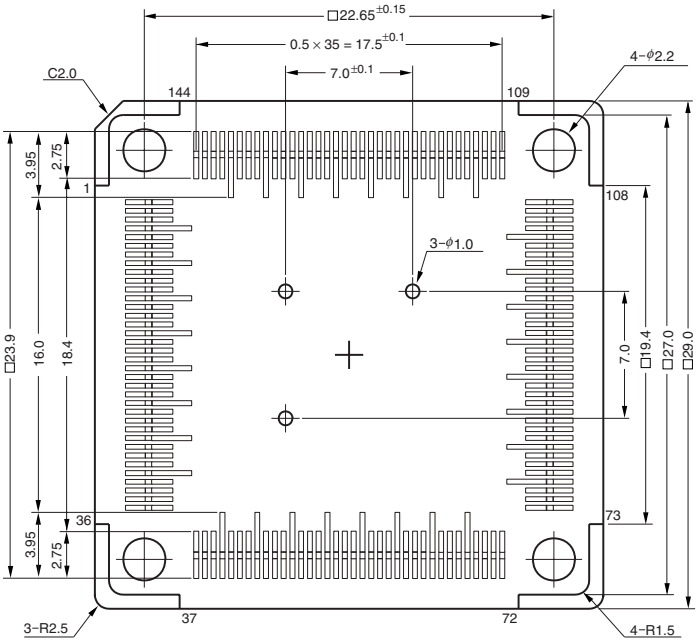


[Bottom view]

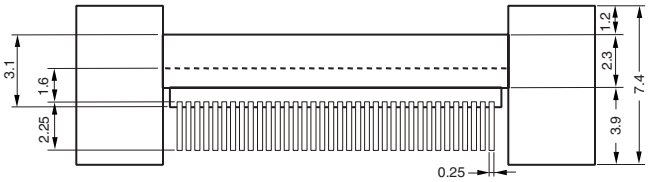


(5) HQPACK144SD (Unit: mm)

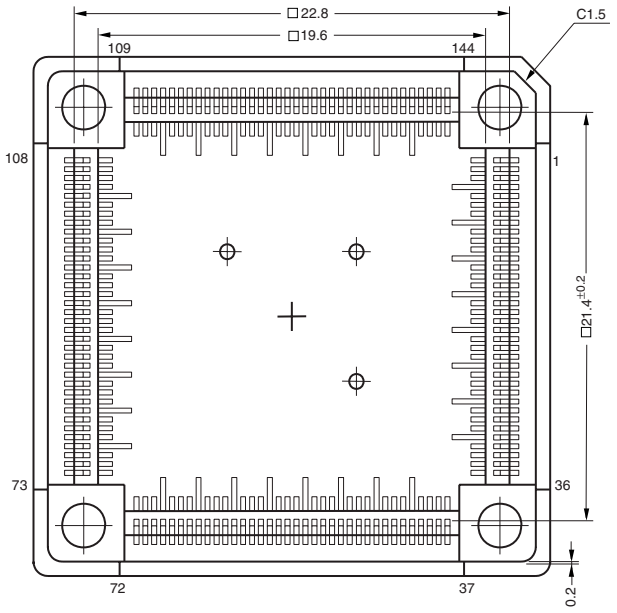
[Top View]



[Side View]

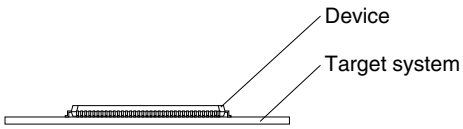


[Bottom View]

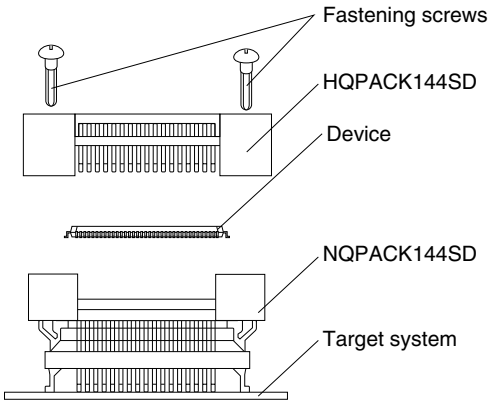


APPENDIX B EXAMPLE OF USE OF CONNECTOR FOR TARGET CONNECTION

(1) When directly connecting device to target system (connector for target connection is not used)

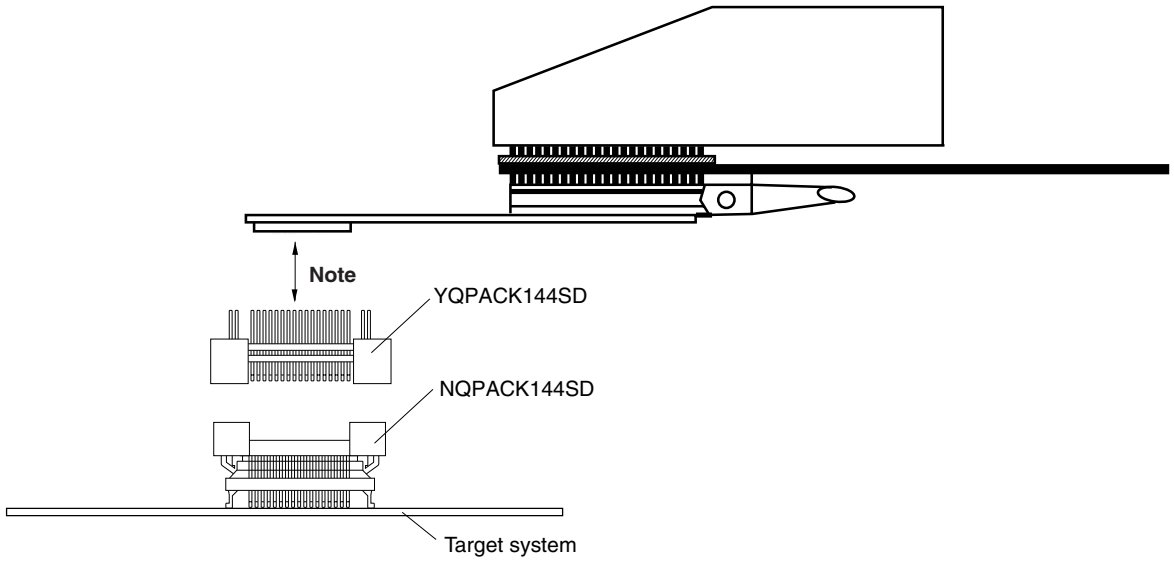


(2) When using device using connector for target connection



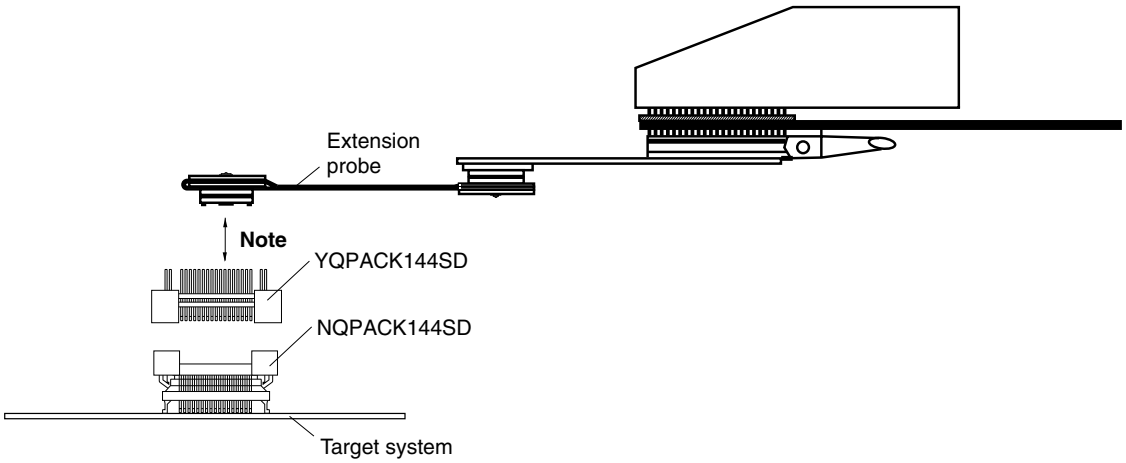
(3) Connection between emulator and target system

(a) When extension probe is not used



Note The connector for emulator connection (YQSOCKET144SDN) can be inserted at this position for height adjustment.

(b) When extension probe is used



Note The connector for emulator connection (YQSOCKET144SDN) can be inserted at this position for height adjustment.

APPENDIX C CONNECTORS FOR TARGET CONNECTION

C.1 Usage

(1) When mounting NQPACK144SD on target system

<1> Coat the tip of the four projections (points) at the bottom of the NQPACK144SD with two-component type epoxy adhesive (cure time longer than 30 min.) and bond the NQPACK144SD to the target system. If not bonded properly, the pad of the printed circuit board may peel off when the emulator is removed from the target system. If the lead of the NQPACK144SD is not aligned with the pad of the target system easily, perform step <2> to adjust the position.

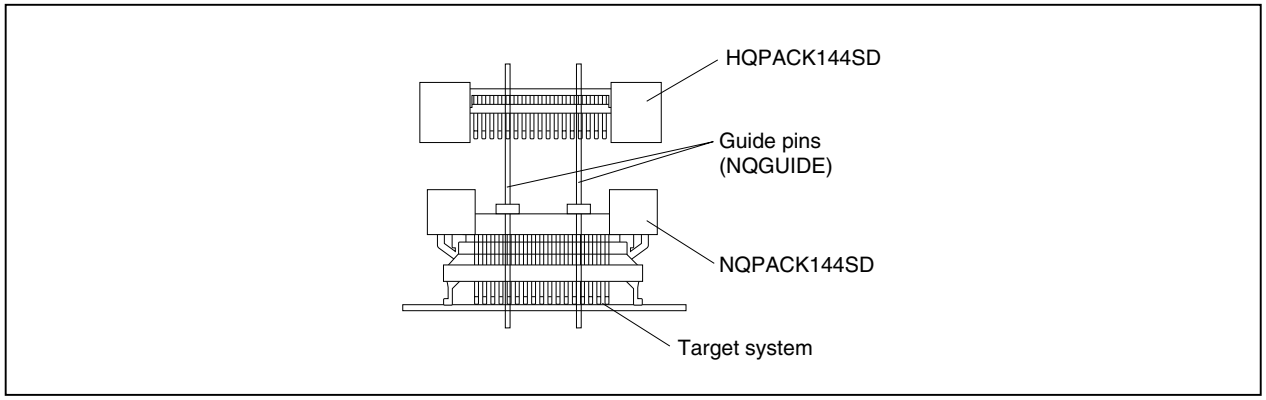
<2> To adjust the position, insert the guide pins for position adjustment (NQGUIDE) provided with NQPACK144SD into the pin holes on the upper side of NQPACK144SD (refer to Figure C-1). The diameter of a hole is ϕ = 1.0 mm. There are three non-through holes (refer to **APPENDIX A DIMENSIONS**).

<3> After setting the HQPACK144SD, solder the NQPACK144SD to the target system. By following this sequence, adherence of flux or solder sputtering to contact pins of the NQPACK144SD can be avoided.

Recommended soldering conditions… Reflow: 240°C, 20 seconds max.
Partial heating: 240°C, 10 seconds max. (per pin row)

<4> Remove the guide pins.

Figure C-1. Mounting NQPACK144SD



Remark NQPACK144SD: Connector for target connection
HQPACK144SD: Cover for device installation

(2) When mounting device

Caution Check for abnormal conditions such as resin burr or bent pins before mounting a device on the NQPACK144SD. Moreover, check that the hold pins of the HQPACK144SD are not broken or bent before mounting the HQPACK144SD. If there are broken or bent pins, fix them with a thin, flat plate such as a blade.

<1> Make sure that the NQPACK144SD is clean and the device pins are parallel (flat) before mounting a device on the NQPACK144SD. Then, after mounting the NQPACK144SD on the target board, fix the device and the HQPACK144SD (refer to Figure C-2).

<2> Using the screws provided with the HQPACK144SD (four locations: M2 × 6 mm), secure the HQPACK144SD, device, and NQPACK144SD.
Tighten the screws in a crisscross pattern with the screwdriver provided or a driver with a torque gauge (avoid tightening only one screw strongly). Tighten the screws with 0.55 kg·f·cm (0.054 N·m) max. torque. Excessive tightening may diminish conductivity.
At this time, each pin is fixed inside the plastic dividers by the contact pin of the NQPACK144SD and the hold pin of the HQPACK144SD (refer to Figure C-3). Thus, pins cannot cause a short with pins of neighboring devices.

Figure C-2. Mounting Device

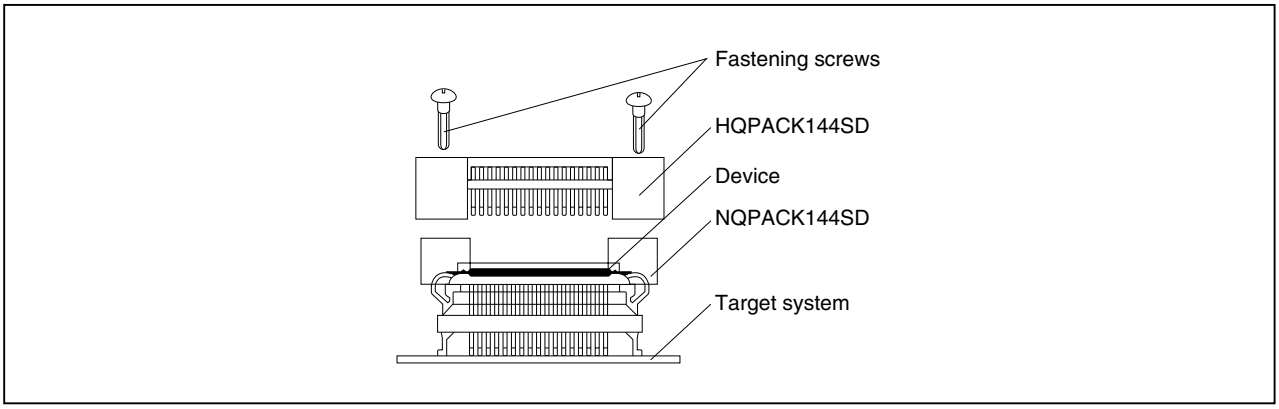
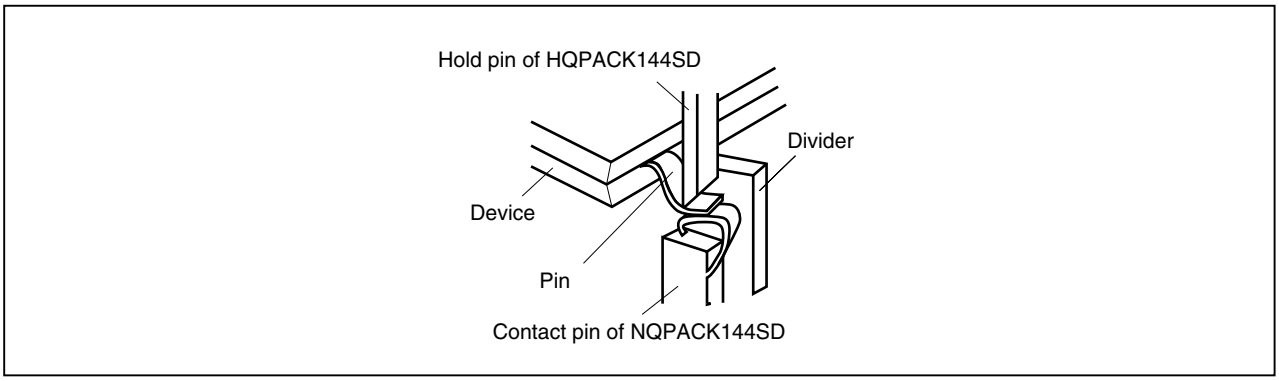


Figure C-3. NQPACK100SD and Device Pin



C.2 Cautions on Handling Connectors

(1) When taking connectors out of the case, remove the sponge while holding the main unit.

(2) When soldering the NQPACK144SD to the target system, cover it with the HQPACK144SD for protection against splashing flux.

Recommended soldering conditions… Reflow: 240°C, 20 seconds max.
Partial heating: 240°C, 10 seconds max. (per pin row)

(3) Check for abnormal conditions such as resin burr or bent pins before mounting a device on the NQPACK144SD. Moreover, when covering with the HQPACK144SD, check that the hold pins of the HQPACK144SD are not broken or bent before mounting the HQPACK144SD. If there are broken or bent pins, fix them with a thin, flat plate such as a blade.

(4) When securing the YQPACK144SD (connector for emulator connection) or HQPACK144SD to the NQPACK144SD with screws, tighten the four screws temporarily with the screwdriver provided or a driver with a torque gauge, then tighten the screws in a crisscross pattern (with 0.054 N·m max. torque).
Excessive tightening of only one screw may diminish conductivity.
If the conductivity is diminished after screw-tightening, stop tightening, remove the screws and make sure the NQPACK144SD is clean and the device pins are parallel (flat).

(5) Device pins do not have high strength. Repeatedly connecting to the NQPACK144SD may cause pins to bend. When mounting a device on NQPACK144SD, check and adjust bent pins.

APPENDIX D MOUNTING PLASTIC SPACER

This chapter describes the mounting method for the plastic spacer supplied with the IE-V850E-MC.

When using the emulator connected to the target system, mount the plastic spacer as shown in Figure D-1 to fix the POD horizontally.

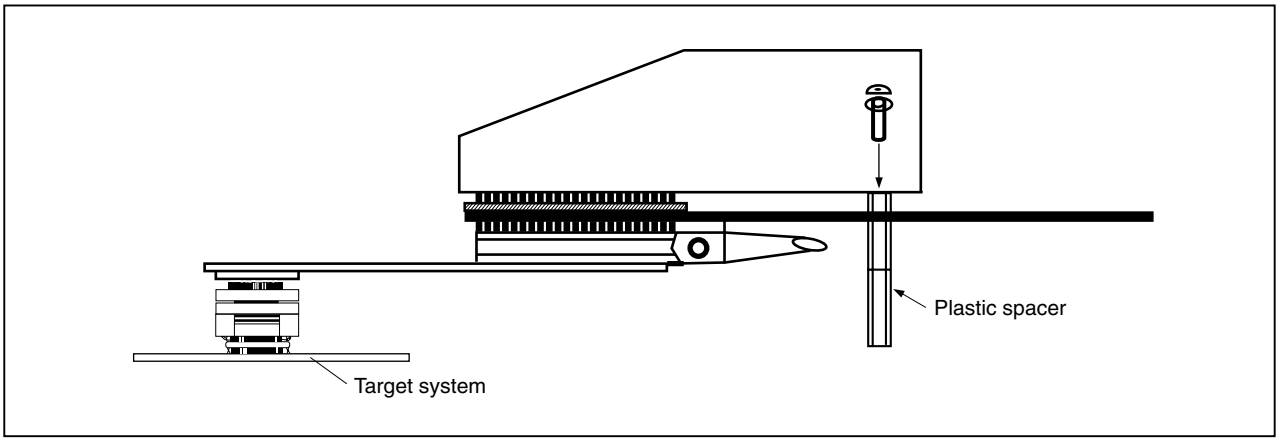
(1) Mounting plastic spacer on IE-V850E-MC

<1> Remove the nylon rivet from the rear part of the POD.

<2> Tighten the plastic spacer with the plastic screw supplied.

<3> To adjust the height, use your own spacer or a stand.

Figure D-1. Mounting Method of Plastic Spacer



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