NEC

Preliminary User's Manual

IE-760018-MC-EM1

In-circuit Emulator Optional Board

Target device
VANStorm

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[MEMO]

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- Ordering information
- Product release schedule
- Availability of related technical literature
- Development environment specifications (for example, specifications for third-party tools and components, host computers, power plugs, AC supply voltages, and so forth)
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INTRODUCTION

Readers

This manual is intended for users who design and develop application systems using the VANStorm.

Purpose

The purpose of this manual is to describe the proper operation of the IE-760018-MC-EM1, and their basic specifications.

Organization

This manual is broadly divided into the following parts.

- Overview
- Name and function 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-760018-MC-EM1 are used connected to the IE-V850E-MC in-circuit emulator. This manual explains the basic setup procedure and switch settings of the IE-760018-MC-EM1. For the names and functions, and the connection of parts, refer to the **IE-V850E-MC User's Manual**, which is a separate volume.

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, IE-760018-MC-EM1.
→ Read the user's manual of the debugger (separate volume) that is used.

Conventions

Note:	Footnote for item marked with **Note** in the text
Caution:	Information requiring particular attention
Remark:	Supplementary information
Numeral representations:	Binary ··· ×××× or ××××B
	Decimal ··· ××××
	Hexadecimal ··· ××××H

Prefixes representing the powers 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	Device that is emulated.
Target system	The system (user-built system) to be debugged. This includes the target program and user-configured hardware.

Product Names Unless otherwise specified, the IE-760018-MC-EM1 is treated as the representative model in this manual

Related Documents The related documents indicated in this publication may include preliminary versions. However, preliminary versions are not marked as such.

○ **Documents related to VANStorm**

Document Name	Document Number
VanStorm User's Manual-Hardware	To be prepared
V850E1 Architecture	U14559EJ1V0UM00
μPD760018 Data Sheet	To be prepared
μPD76F0018 Data Sheet	To be prepared

○ **Documents related to development tools (User's Manual)**

Product Name	Document Number
IE-V850E-MC (In-circuit emulator)	To be prepared
IE-760018-MC-EM1 (In-circuit emulator optional board)	This manual

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LIST OF FIGURES

LIST OF TABLES

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[MEMO]

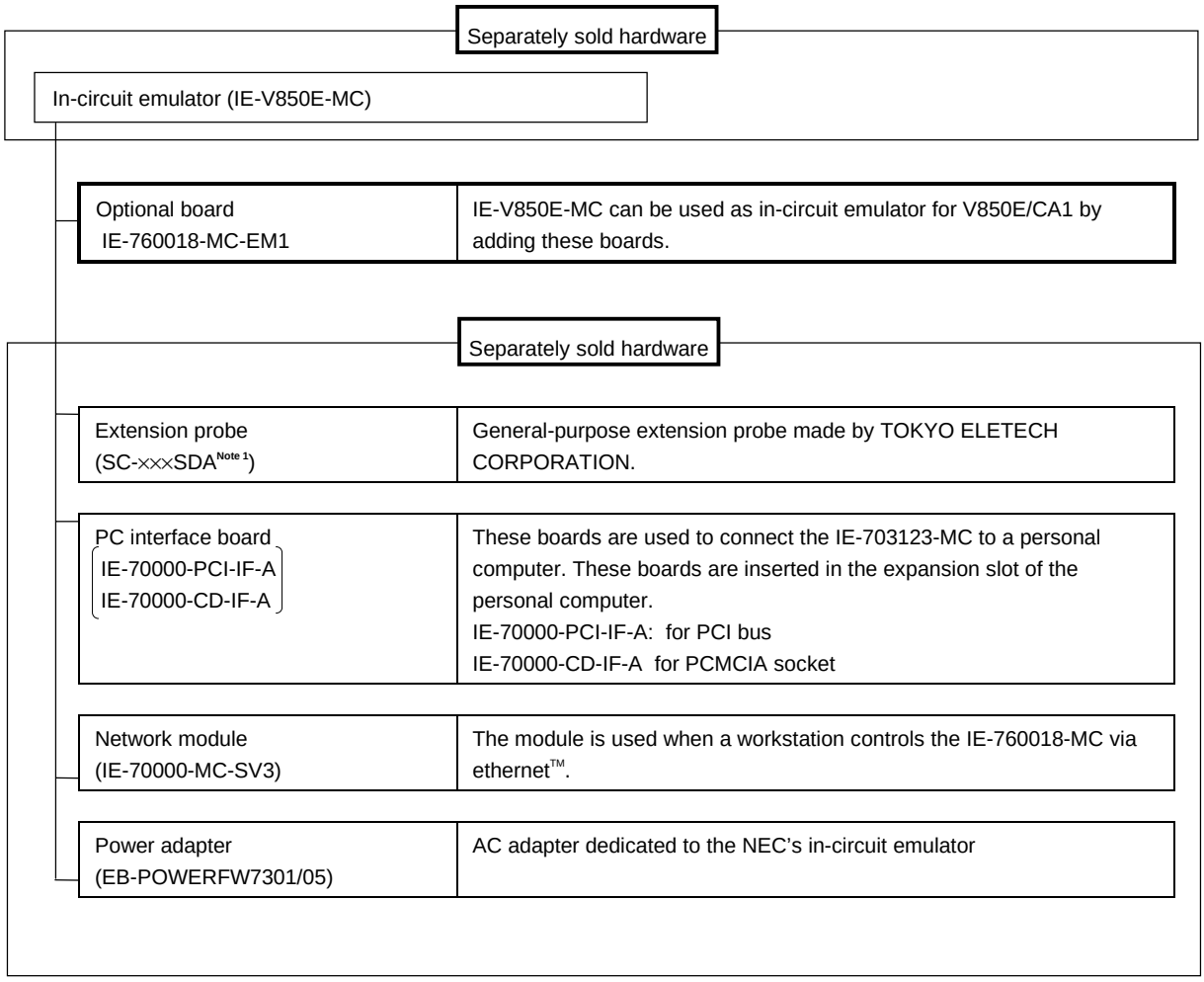
CHAPTER 1 OVERVIEW

The IE-760018-MC-EM1 is an optional board for the in-circuit emulator IE-V850E-MC. By connecting the IE-760018-MC-EM1 to IE-V850E-MC, hardware and software can be debugged efficiently in system development using the VANStorm.

IE-760018-MC-EM1 is an optional board when **HV_{DD} = 5 V**

In this manual, the basic setup sequences and switch settings of the IE-760018-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 elements, refer to the **IE-V850E-MC User's Manual (U14487EJ1V0UM00)** which is a separate volume.

1.1 Hardware Configuration



Notes 1. For further information, contact Daimaru Kogyo Co., Ltd.
Tokyo Electronic Components Division (TEL +81-3-3820-7112)
Osaka Electronic Components Division (TEL +81-6-244-6672)

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

- Maximum operation frequency: 20 MHz (HV_{DD} = 5.0 V operation)
- Extremely lightweight and compact
- Higher equivalence with target device can be achieved by omitting buffer between signal cables.
- Following pins can be masked.
  $\overline{RESET}$, NMI, $\overline{WAIT}$
- Two methods of connection to target system:
  - Direct connection of the IE-760018-MC-EM1
  - Attach an extension probe (sold separetely) to the connection tab of the IE-760018-MC-EM1.
- Dimensions of the IE-760018-MC-EM1 are as follows.

Parameter		Value
Power dissipation		0.6 W (at 16-MHz operation frequency)[Note]
External dimensions (Refer to **APPENDIX A DIMENSIONS**)	Height	41 mm
	Length	246 mm
	Width	101 mm
Weight		240 g

Note The power dissipation is 11.6 W when IE-V850E-MC + IE-760018-MC-EM1.

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

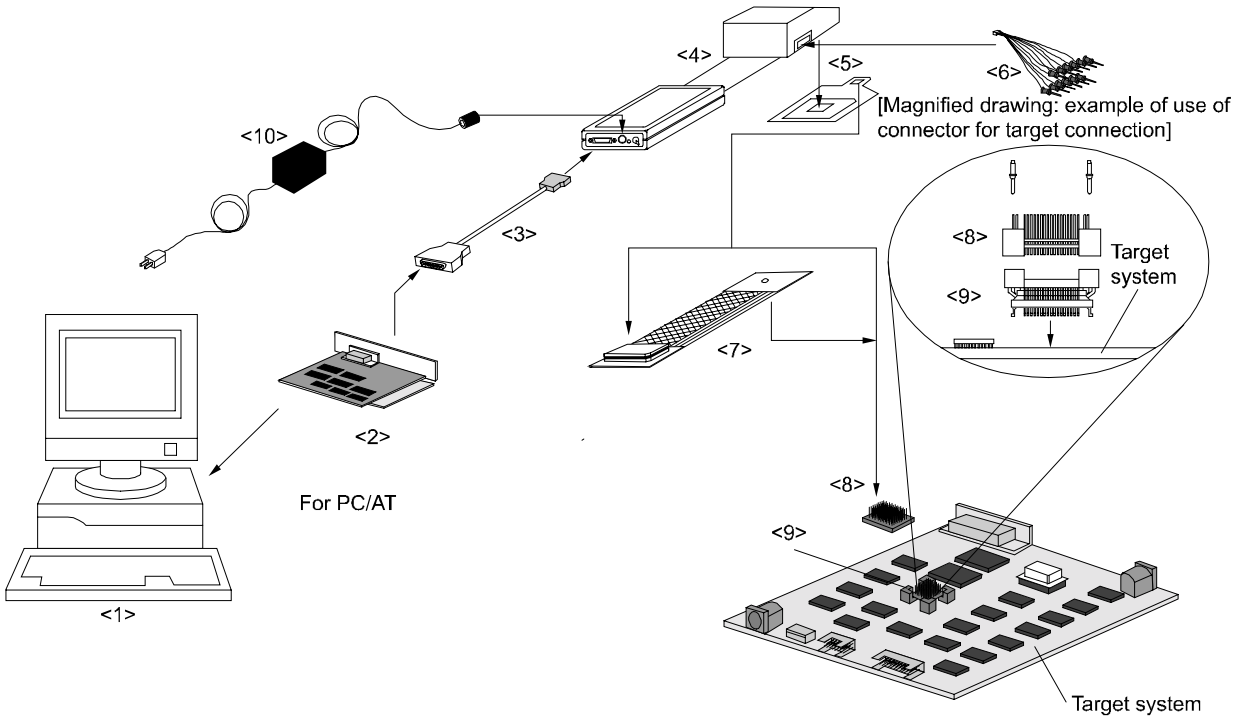
Parameter			Specification
Emulation memory capacity	Internal ROM		1 Mbyte
	External memory		4 Mbytes (mounted on the option board)
Execution/pass detection Coverage memory capacity	Internal ROM		1 Mbyte (standart)
	External memory	In ROM-less mode	2 Mbytes
		When using iROM	1 Mbyte
Memory access detection Coverage memory capacity	External memory		1 Mbyte
Trace memory capacity			168 bits × 32 Kframes
Time measurement function			Can be measured with time tag and timers (3 lines)
External logic probe			8-bit external trace is possible
			Event setting for trace/break is possible
Break function			Event break
			Step execution break
			Forced break
			Fail safe break • Illegal access to peripheral I/O • Access to guard space • Write to the 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-760018-MC-EM1 to the IE-V850E-MC, which is then connected to a personal computer (PC/AT compatible) is shown below.

Figure 1-1. System Configuration



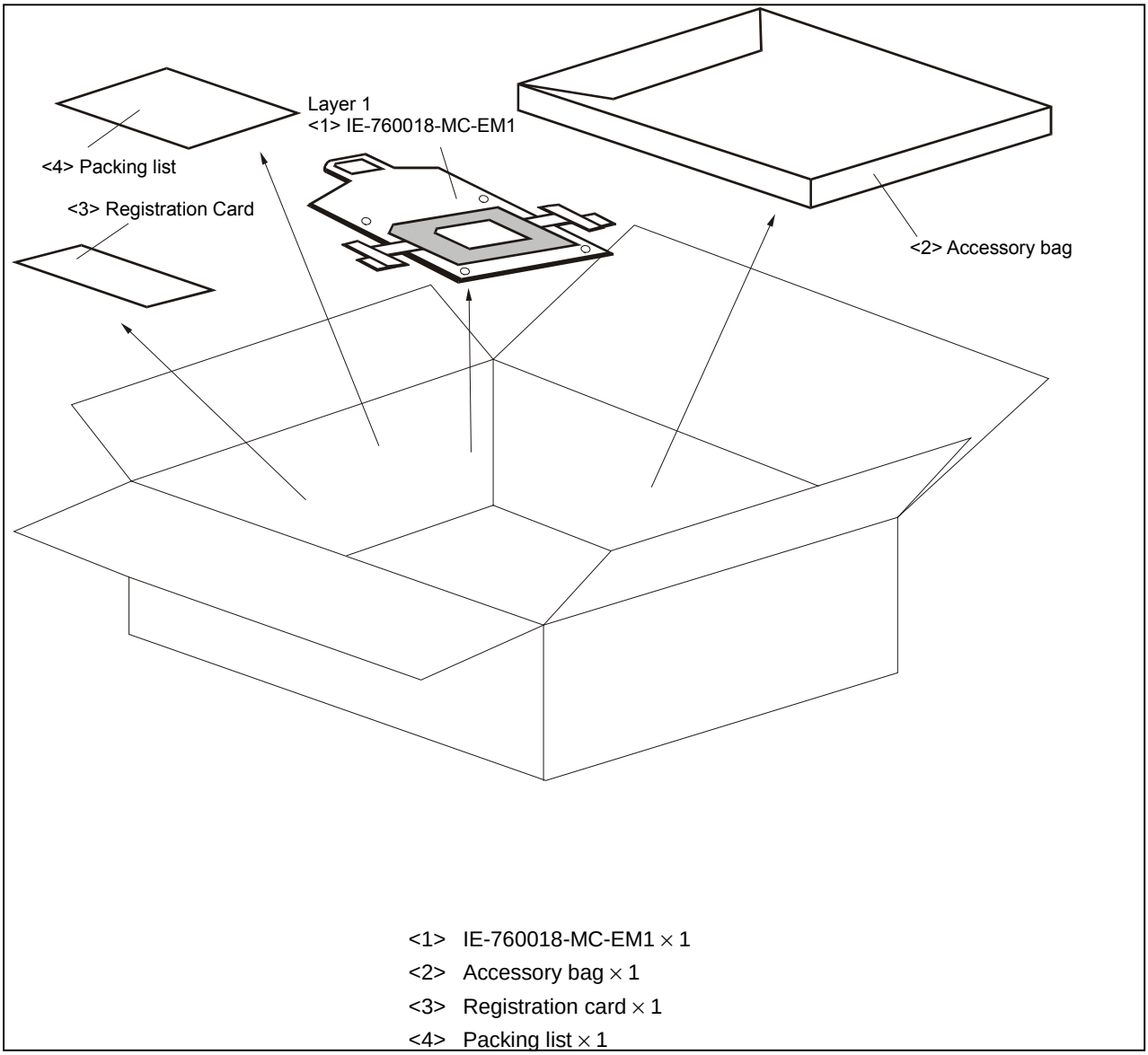
Remark

<1> Personal computer
<2> PC interface board (IE-70000-PCI-IF-A, IE-70000-CD-IF-A: sold separately)
<3> PC interface cable (included with IE-V850E-MC)
<4> In-circuit emulator (IE-V850E-MC: sold separately)
<5> In-circuit emulator option board (IE-760018-MC-EM1)
<6> External logic probe (included with IE-V850E-MC)
<7> Extension probe (SC-144SD: sold separately)
<8> Connector for emulator connection (YQPACK144SD: included)
<9> Connector for target connection (NQPACK144SD: included)
<10> Power adapter (EB-POWERFW7301/05: sold separately)

1.5 Contents in Carton

The carton of the IE-760018-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 contents, contact an NEC sales representative or an NEC distributor.

Figure 1-2. Contents in Carton



<1> IE-760018-MC-EM1 × 1
<2> Accessory bag × 1
<3> Registration card × 1
<4> Packing list × 1

Make sure that the accessory bag contains this manual and an accessory list (1 sheet).

1.6 Connection between IE-V850E-MC and IE-760018-MC-EM1

The procedure for connecting the IE-V850E-MC and IE-76018-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-760018-MC-EM1 to the OPEN position as shown in Figure 1-3 (b).
<3> Connect the IE-760018-MC-EM1 to the PGA socket at the back of the pod (refer to **Figure 1-3 (c)**). When connecting, position the IE-V850E-MC and IE-760018-MC-EM1 so that they are horizontal.
Spacers can be connected to fix the pod. (refer to **APPENDIX D MOUNTING OF PLASTIC SPACER**)
<4> Set the PGA socket lever of the IE-760018-MC-EM1 to the CLOSE position as shown in Figure 1-3 (b).
<5> Fix the IE-760018-MC-EM1 between the pod covers (upper and lower) with nylon rivets.
<6> Secure the pod cover (upper) end with nylon rivets.

Figure 1-3. Connection between IE-V850E-MC and IE-76018-MC-EM1 (1/2)

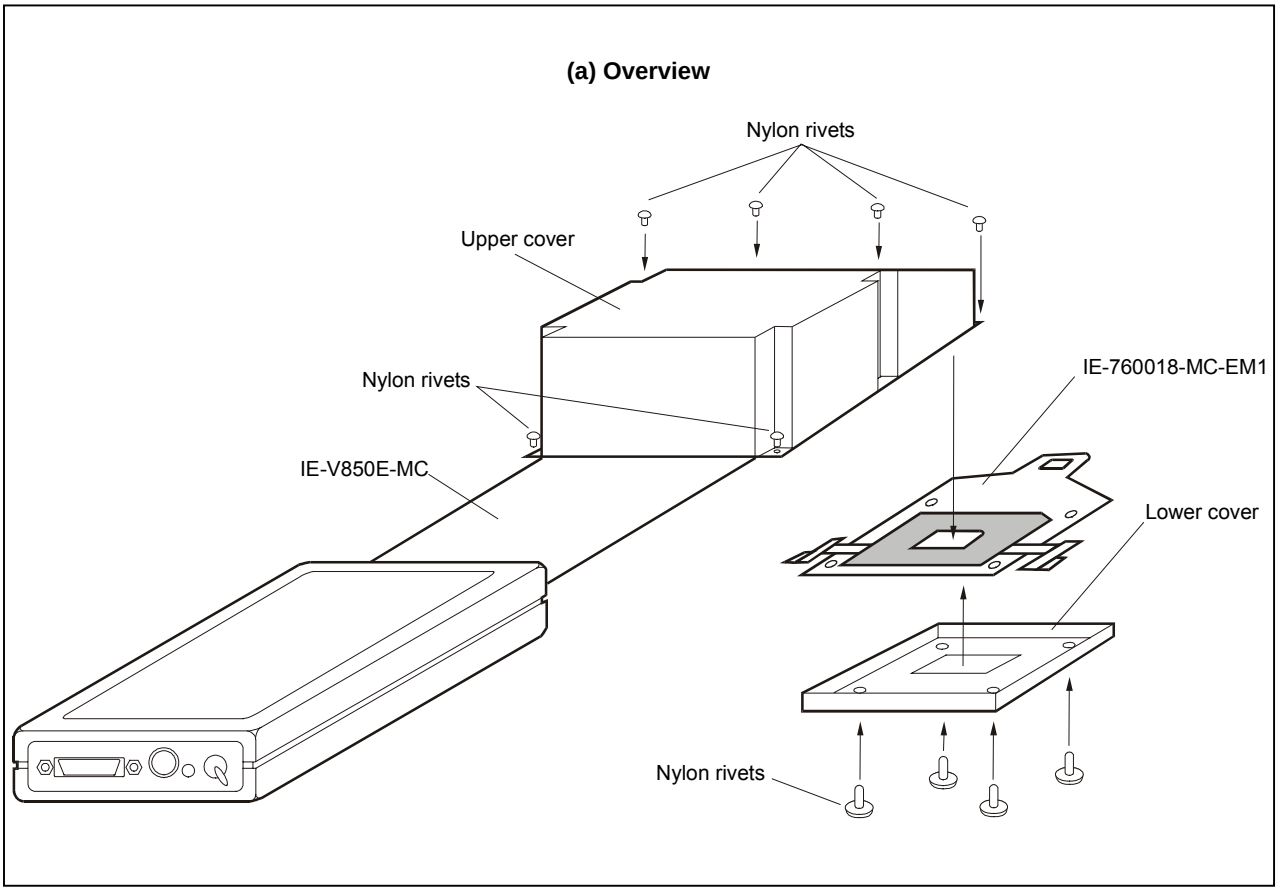
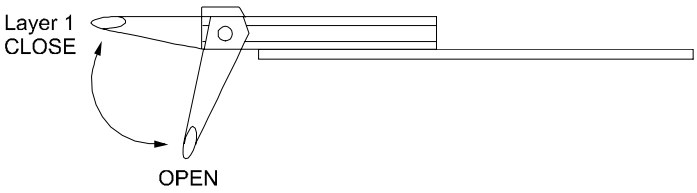
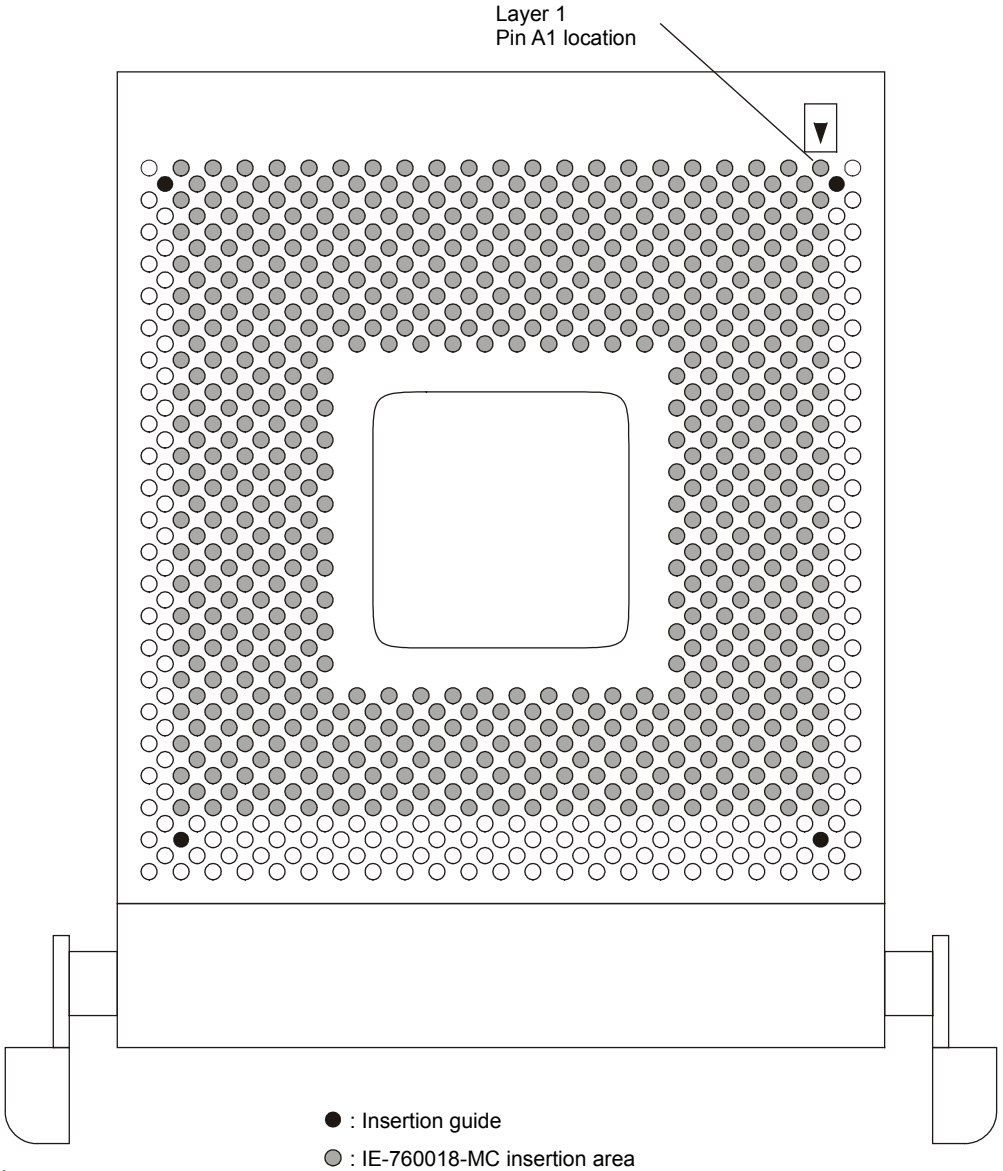


Figure 1-3. Connection between IE-V850E-MC and IE-760018-MC-EM1 (2/2)

(b) PGA Socket Lever of IE-760018-MC-EM1



(c) Connecting part (IE-760018-MC-EM1)

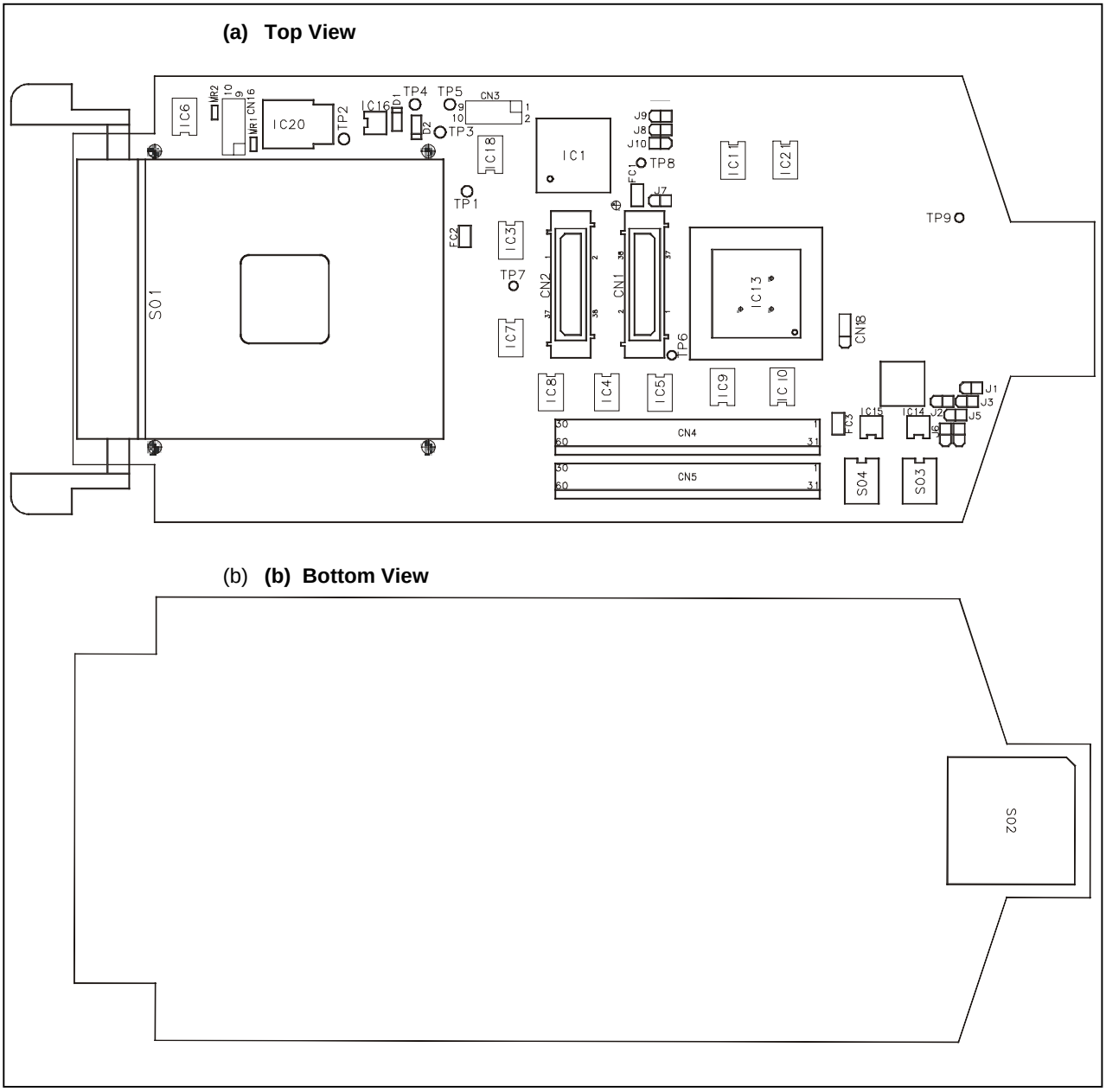


CHAPTER 2 NAME AND FUNCTION OF COMPONENTS

This chapter describes the names, functions, and switch settings of components comprising the IE-760018-MC-EM1. For the details of the pod, jumper, and switch positions, etc., refer to the **IE-V850E-MC User's Manual**.

2.1 Component Name and Function of IE-760018-MC-EM1

Figure 2-1. IE-760018-MC-EM1



Default settings

(1) Test pin (TP1 to TP9)

Test Pins	Function
TP1	V_{CC}
TP2	TV_{DD}
TP3	EMV_{DD}
TP4	(internal use)
TP5	Target Power signal
TP6 – TP9	GND

(3) Connector List (CN1-CN18)

Connector	Function
CN1,CN2	(internal use)
CN3	CPLD(internal use)
CN4	Alternative Memory Bank1
CN5	Alternative Memory Bank2 *
CN16	Ext. Signals xxx **
CN18	(internal use)

* not supported

** Please refer to IE-V850E-MC User's Manual

(4)

Socket	Function
SO3	Quartz for PLL-Mode
SO4	Quartz for Direct Mode

(5) Jumper List

Jumper	Function	Open	Closed
J1	AVDD	Target	Internal 5V
J2	AVSS	Target	Internal GND
J3	AVREF	Target	Internal 5V
J4,J5,J6	(internal use)		
J7	Regulator i/o CVDD	Target	Internal 3,3V (mode REGCUT = H)
J8	Regulator i/o VDD30	Target	Internal 3,3V (mode REGCUT = H)
J9	Regulator i/o VDD31	Target	Internal 3,3V (mode REGCUT = H)

J10	Regulator i/o VDD30/31	Target	Internal 3,3V (mode REGCUT = H)

(6) Connector for IE-V850E-MC connection (SO1)

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

(7) Connector for target connection (SO2)

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

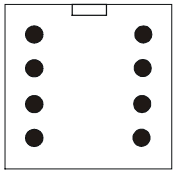
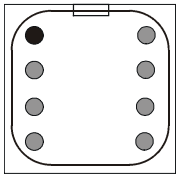
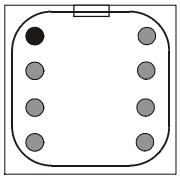
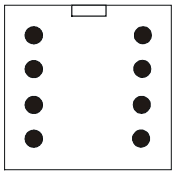
2.2 Clock Setting

The PLL and the Direct mode of the Real chip is supported. No additional settings is required, for using each of this Modi.

- For PLL – Mode (default Mode) the Socket SO3 has to be used .
  Frequency 4 Mhz to 5Mhz. (Main Clock up to 20Mhz)
- For Direct – Mode (default Mode) the Socket SO4 has to be used .
  Frequency up to 40Mhz. (Main Clock up to 20Mhz)

This selection has to be done in accordane to the real chip via the CLKSEL signal on the Target Board.

Table 2-1. Clock Setting (When the Emulator is used as a Stand-Alone Unit or Target System Connection)

Clock Supply Source Setting		Clock Mode Setting	
Clock Supply Method		SO3	SO4
Internal clock	PLL mode		
	Direct mode		

2.3 MODE Pin Setting

The emulator operation mode can be changed with the MODE pin setting.

2.3.1 MODE pin setting when emulator is used as stand-alone unit

When the emulator is used as a stand-alone unit, MODE0 and MODE1 in the emulator are set as follows.
The setting cannot be changed.

Table 2-3. MODE Pin Setting when Emulator is Used as Stand-Alone Unit

Emulator Operation	Settings Inside Emulator	
	MODE0	MODE1
Single-chip mode 0	Not connected to pull up or pull down resistor	

2.3.2 MODE pin setting when emulator is used connected to target system

When the emulator is connected to a target system, set the MODE pins of the target system as follows based on the emulator operations.

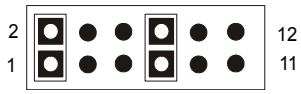
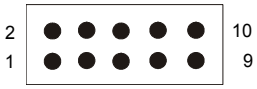
The MODE2 and MODE3 signals in the target system are not used in the emulator.

Table 2-4. MODE Pin Setting when Emulator is Used Connected to Target System

Emulator Operation	Target System Setting	
	MODE0	MODE1
ROM-less mode	Low-level input	Low-level input
Single-chip mode	High-level input	High-level input

[MEMO]

CHAPTER 3 FACTORY SETTINGS

Item	Setting	Remark
JP2		All settings other than those set in the factory are prohibited. (Relationship EVA-chip↔IO-chip)
CN1		Only for internal use.
Jumper EM1-board	Please refer to default settings (chap 2.1(1))	
Crystal oscillator	4.000-MHz crystal oscillator is mounted.	

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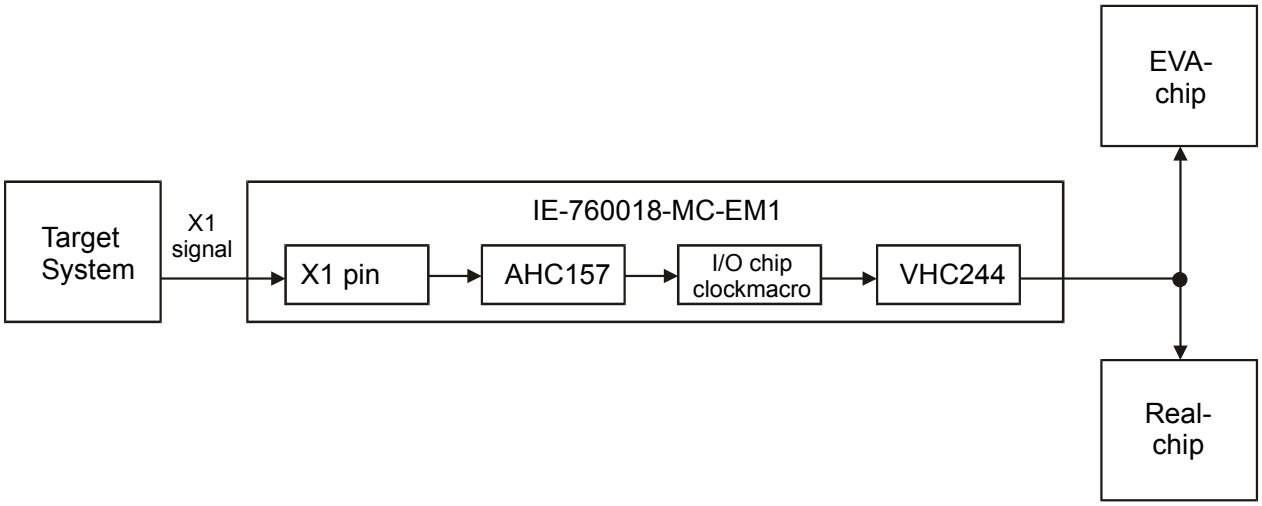
CHAPTER 4 CAUTIONS

4.2 X1 Signal

The input signal (X1 signal) from the target system is delayed because it passes through AHC157 before it is input to th e I/O chip of the emulator.

Figure 4-2. Diagram of X1 Signal Flow



4.3 Pin Termination

(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 target conector (no pull up / pull down)
- MODE1: Connected to target conector (no pull-up / pull down)
- MODE2: Connected to target conector (no pull-up / pull down)

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

This pin is connected to V_{DD} via a resistor (10kΩ). (Pull-up)

(3) CKSEL pin

This pin is connected to V_{SS} via a resistor (10kΩ). (Pull-down)

(4) REGCUT pin

This pin is connected to V_{SS} via a resistor (10kΩ). (Pull-down)

(5) Vpp0 pin, Vpp1

This pin's are connected to V_{SS} via a resistor (10kΩ). (Pull-down)

(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 access is performed to addresses that exceed the target device capacity, the memory of the emulator is accessed. Memory capacities are as follows.

Table 4-1. Memory Capacity Limitation List

(a) iRAM capacity (Unit: byte)

Target Device	Emulator
1 K	1 K
2 K	2 K
3 K	3 K
4 K	4 K
5 K to 6 K	6 K
7 K to 8 K	8 K
9 K to 10 K	10 K
11 K to 12 K	12 K
13 K to 16 K	16 K
17 K to 20 K	20 K
21 K to 24 K	24 K
25 K to 28 K	28 K
29 K to 36 K	36 K
37 K to 44 K	44 K
45 K to 52 K	52 K
53 K to 60 K	60 K

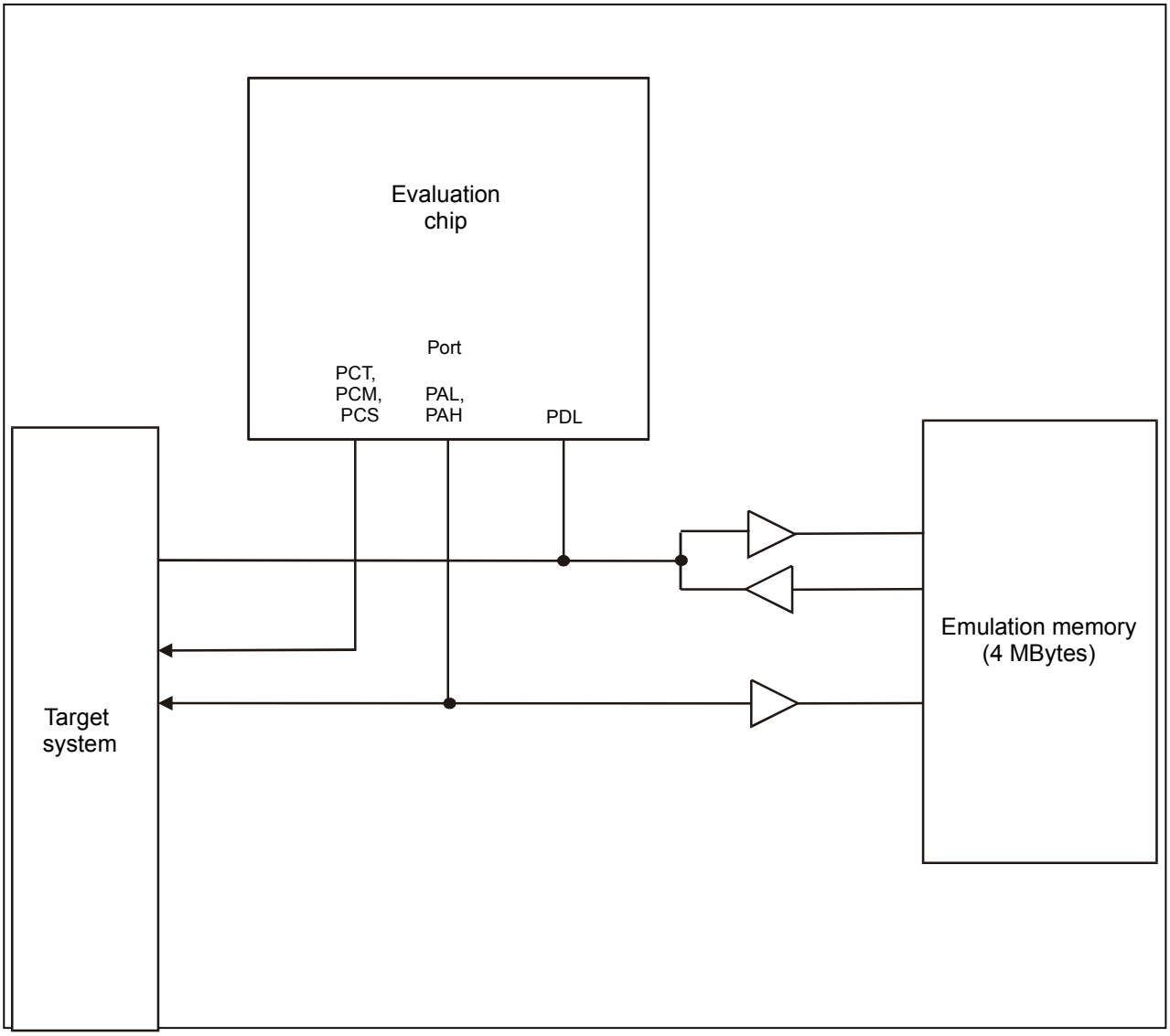
(b) iROM capacity (Unit: byte)

Target Device	Emulator (Emulation Memory)
1 K to 32 K	32 K
33 K to 64 K	64 K
65 K to 128 K	128 K
129 K to 256 K	256 K
257 K to 512 K	512 K[Note]

Note The emulator is mounted iROM emulation memory of 512 Kbytes.

4.5 Port PAL, PHL, PDL, PCT, PCS and PCM

Figure 4-4. Circuit Diagram of Port 4 to 6, A, and B



4.6 Bus Interface Pin

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

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

Pin Name	Waiting for Emulator Command	Internal Memory					External Memory			
		Internal ROM	Internal RAM		Internal Peripheral I/O		Emulation RAM		Target System	
		R	R	W	R	W	R	W	R	W
A0 to A23	**Note**	**Note**					**Note**		**Note**	
D0 to D15	Hi-Z	Hi-Z					**Note**		**Note**	
$\overline{WR0}$ / $\overline{WR1}$	H	H					H		**Note**	
$\overline{RD}$	H	H					H		**Note**	
$\overline{CS2}$ to $\overline{CS4}$	H	H					H		**Note**	
$\overline{WAIT}$	Invalid	**Note**					Maskable			

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 Interface Pin Operation List (2/2)
(b) During user program execution

Pin Name	Internal Memory							External Memory					
	Internal ROM		Internal RAM			Internal Peripheral I/O		Emulation RAM			Target System		
	F	R	F	R	W	R	W	F	R	W	F	R	W
A0 to A23	**Note**							**Note**			**Note**		
D0 to D15	Hi-Z							**Note**			**Note**		
$\overline{WR0}$ / $\overline{WR1}$	H							H			**Note**		
$\overline{RD}$	H							H			**Note**		
$\overline{CS2}$ to $\overline{CS4}$	H							H			**Note**		
$\overline{WAIT}$	**Note**							Maskable					

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

4.7 Emulation Memory Operation Timing Difference

This IE-703123-MC-EM1 Emulator Option Board is a real chip based board. The following table shows the functions, which are not or not complete emulated by the real chip itself. This means it could differ to real chip function.

Table 1 Not in real Chip realised Emulation Functions

Emulation	Function
Special Eval. Chip D703191	External Memory Access
Special Eval. Chip D703191	Alphanumeric Ports
Special Eval. Chip D703191	RESET
Special Eval. Chip D703191	MODE pins

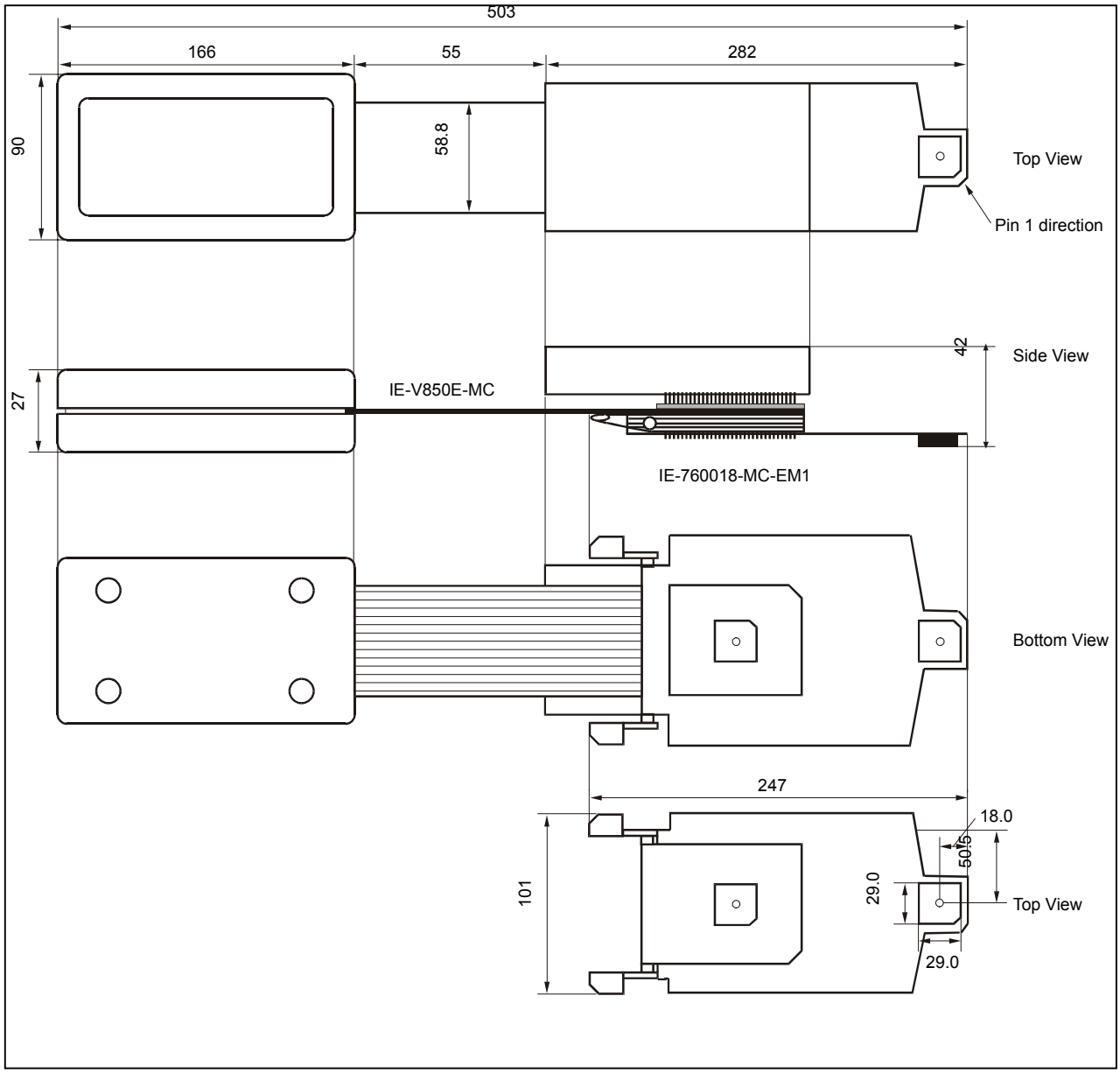
memory access timing that is actually used.

When the area of the page ROM in the target system has been allocated to the emulation memory, the operation timing is the SRAM access timing.
When measuring the performance by using the emulation memory, adjust the setting so that the wait set matches the *Emulation source / Differences to Real chip*

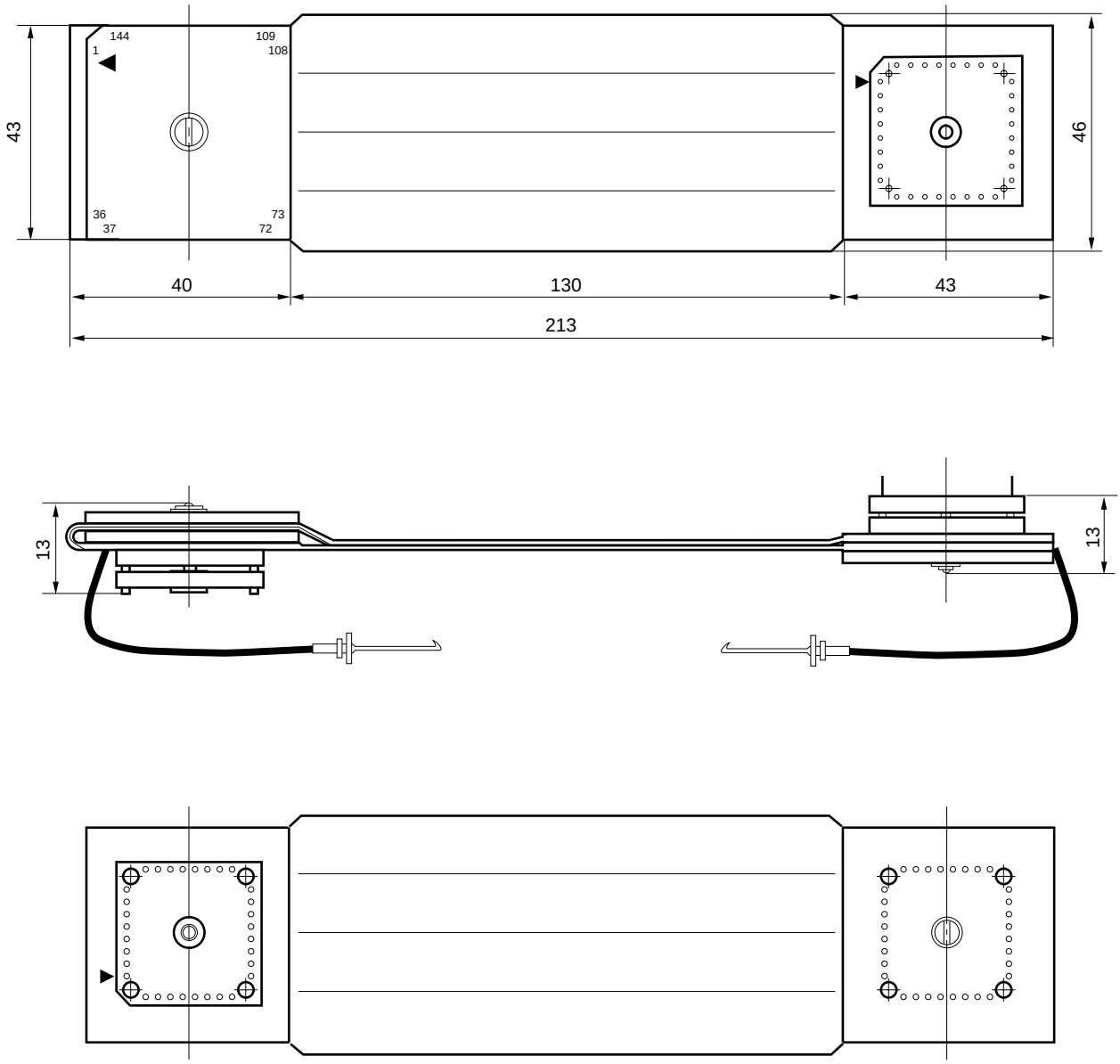
[MEMO]

APPENDIX A DIMENSIONS

(1) IE-V850E-MC + IE-76018-MC-EM1 (Unit: mm)

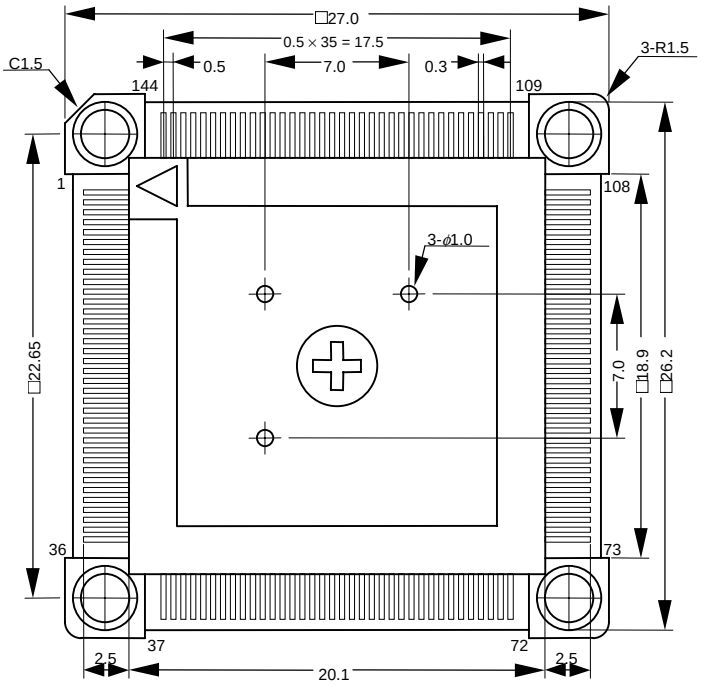


(2) SC-144SD (Unit: mm)

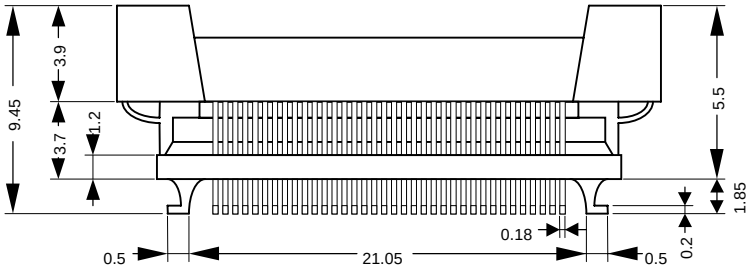


(3) NQPACK144SD (Unit: mm)

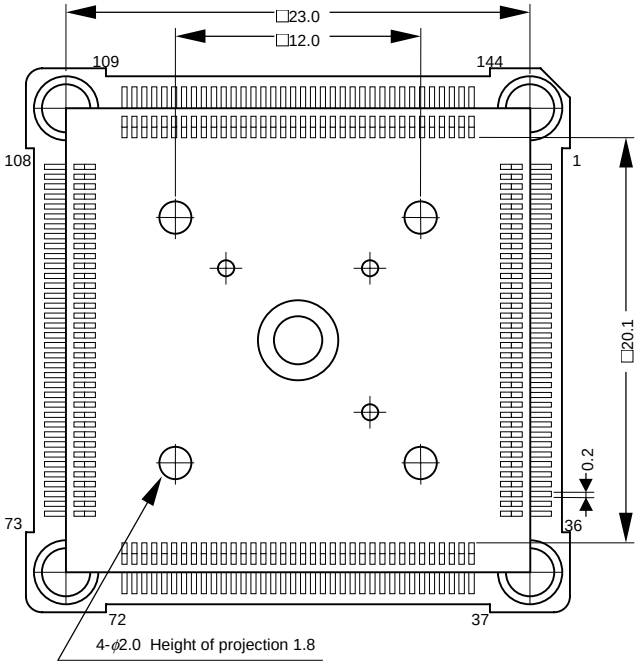
[Top View]



[Side View]

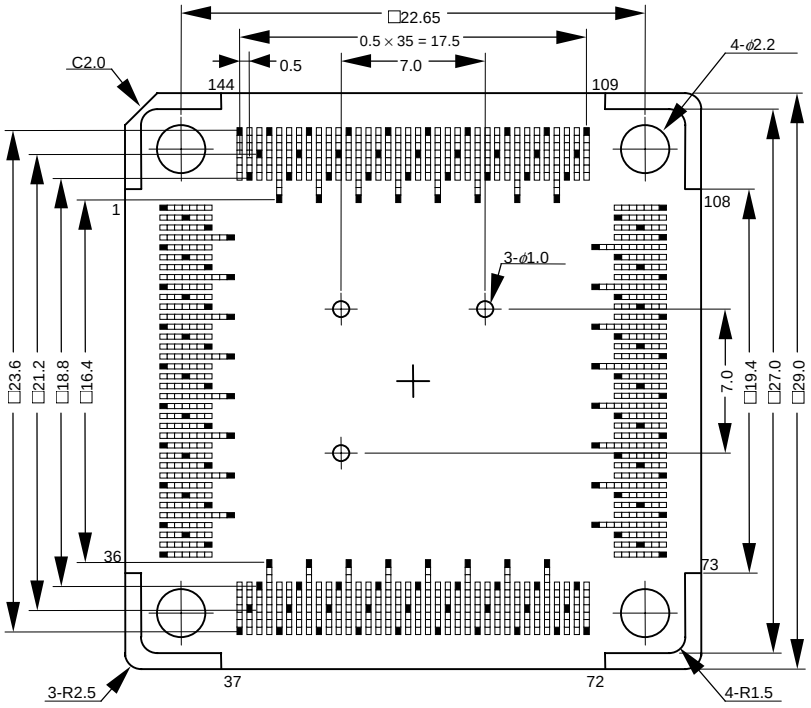


[Bottom View]

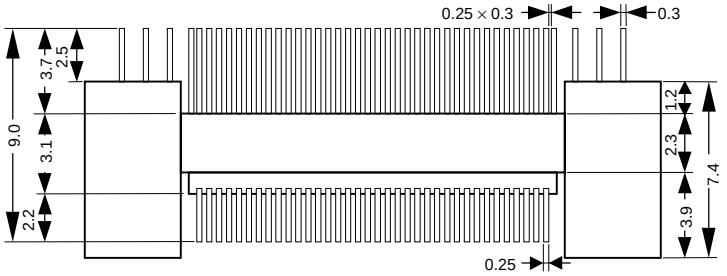


(4) YQPACK144SD (Unit: mm)

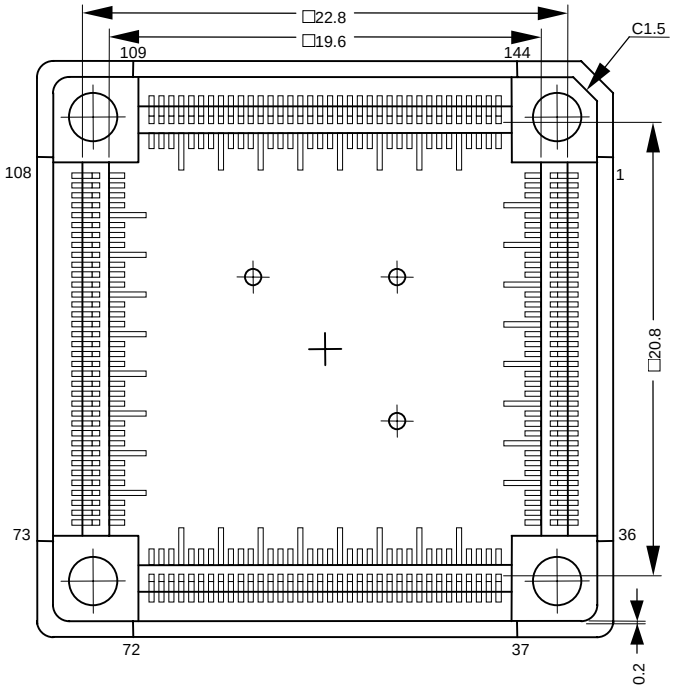
[Top View]



[Side View]

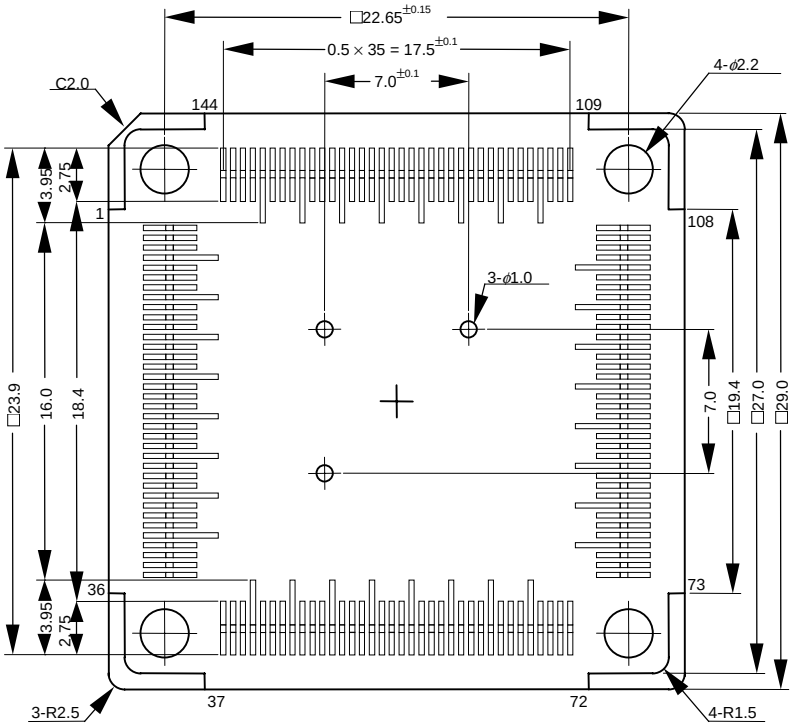


[Bottom View]

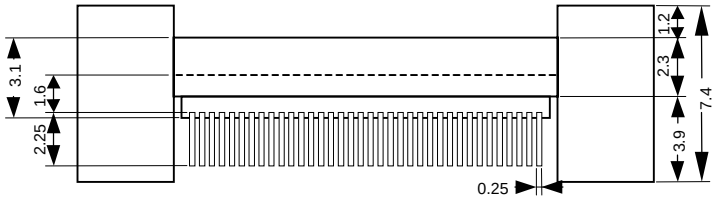


(5) HQPACK144SD (Unit: mm)

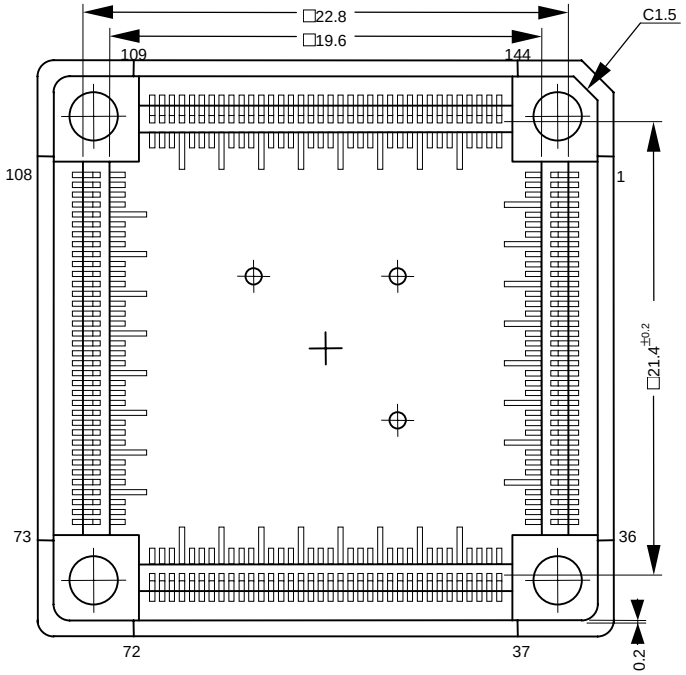
[Top View]



[Side View]



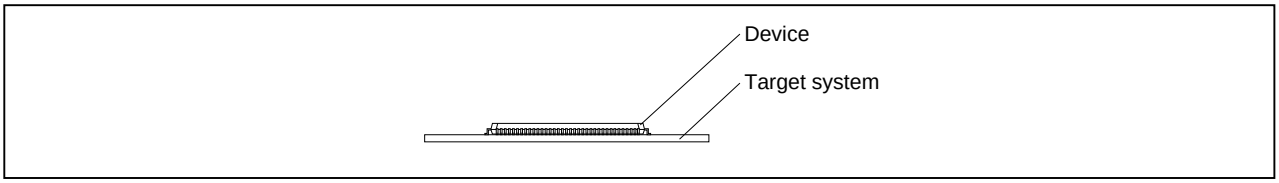
[Bottom View]



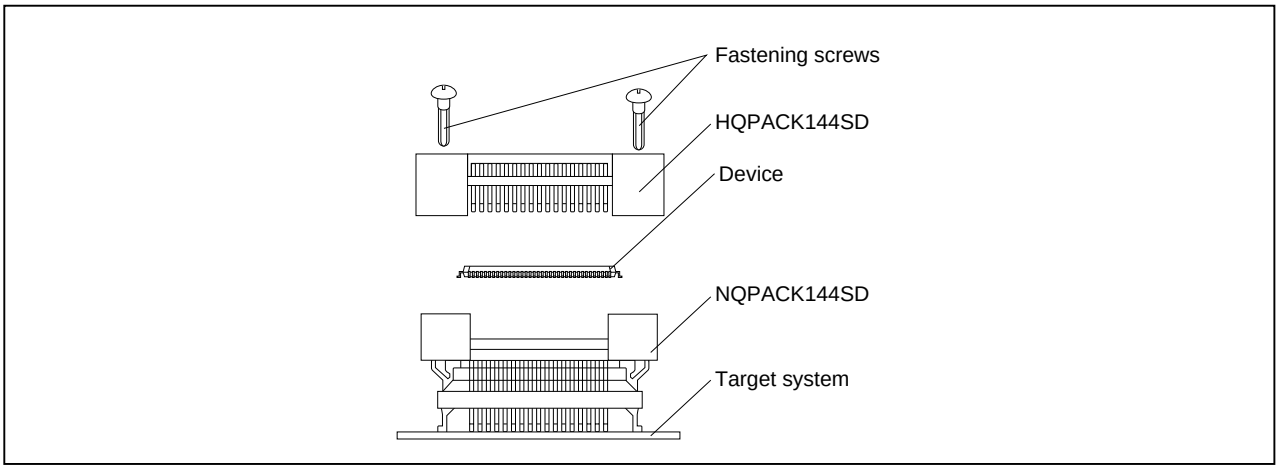
[MEMO]

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)

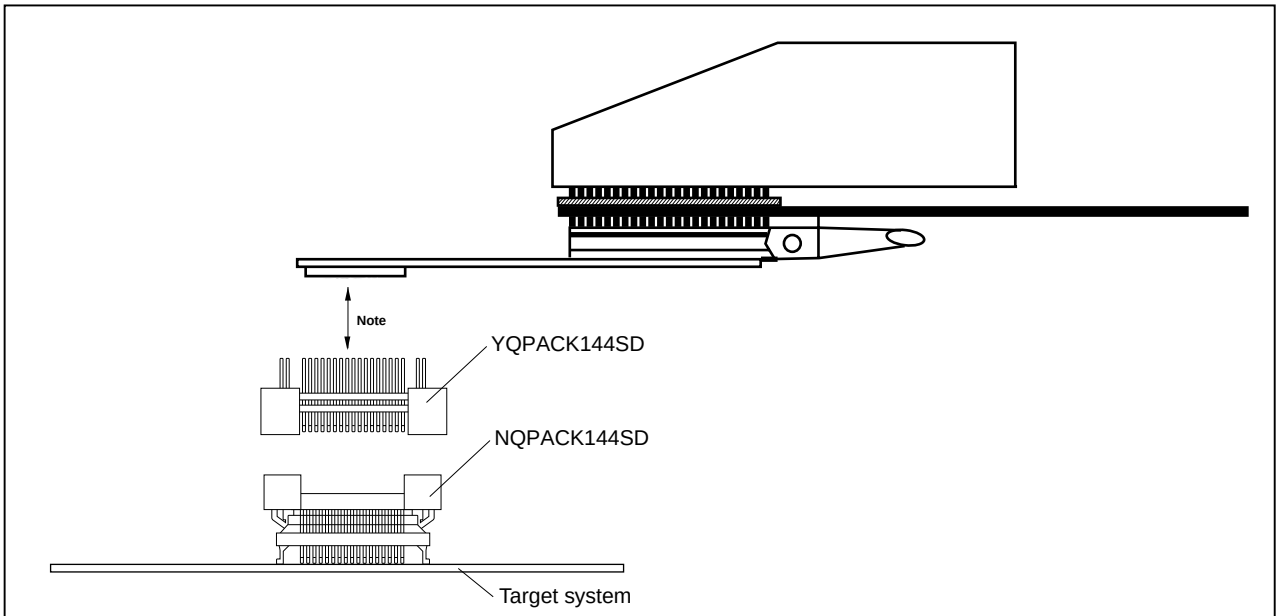


(2) When equipping device by using connector for target connection



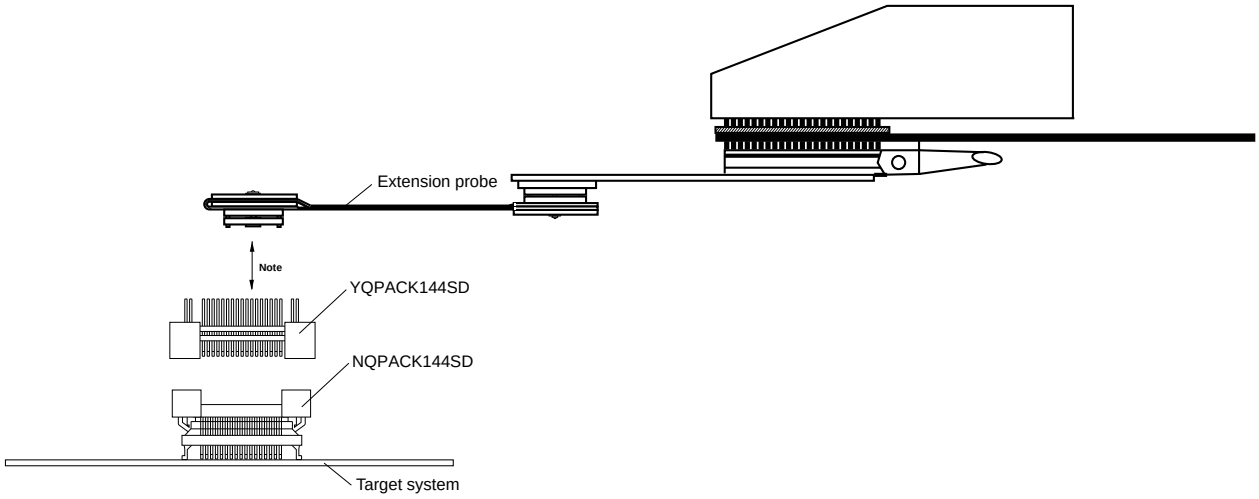
(3) Connection between emulator and target system

(a) When extension probe is not used



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

(b) Example of use of extension probe



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

APPENDIX C CONNECTORS FOR TARGET CONNECTION

C.1 Use

(1) When mounting NQPACK144SD to target system

<1> Coat the tip of 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 does not coincide with the pad of the target system easily, perform step <2> to adjust the position.

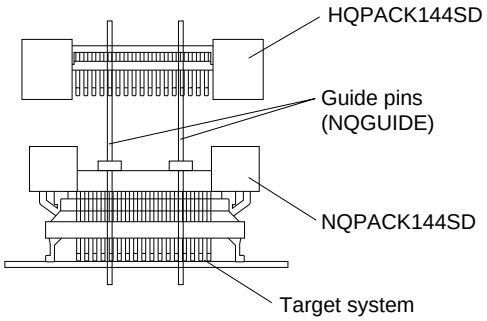
<2> To adjust the position, insert the guide pins for position-adjustment (NQGUIDE) provided with NQPACK144SD into the pin holes at the upper side of NQPACK144SD (refer to **Figure C-1**). The diameter of a hole is ϕ = 1.0 mm. There are three non-through holes (refer to **APPENDIX A DIMENSIONS**).

<3> After setting the HQPACK144SD, solder 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 condition… Reflow : 240°C, 20 sec. max.
Partial heating : 240°C, 10 sec. max. (per pin row)

<4> Remove the guide pins.

Figure C-1. Mounting of NQPACK144SD



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

(2) When setting device

Caution Check for abnormal conditions such as resin burr or bent pins before setting a device to the NQPACK144SD. Moreover, check that the hold pins of the HQPACK144SD are not broken or bent before setting 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 setting a device to the NQPACK144SD. Then, after mounting the NQPACK144SD to the target board, set the device and 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 provided screwdriver or driver with torque gauge (avoid tightening strongly only one screw). 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 wall 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

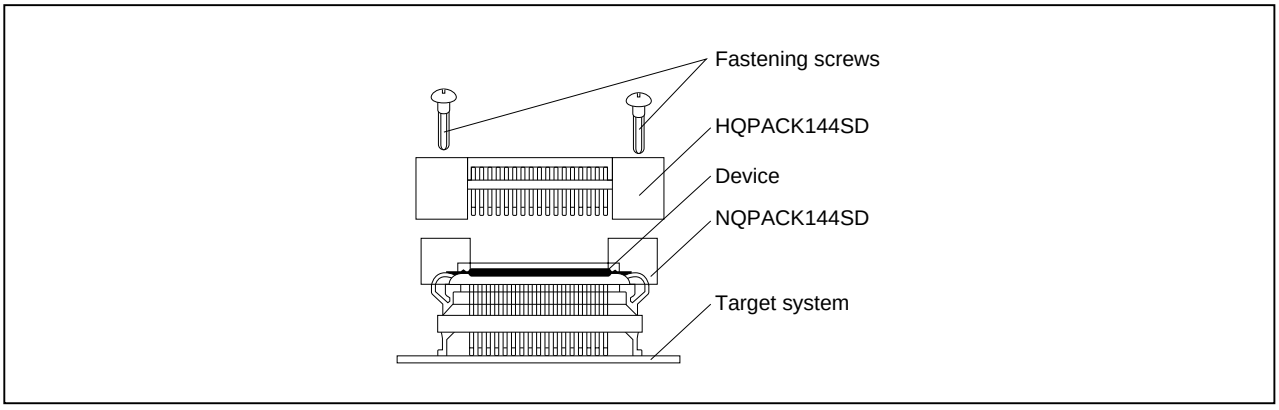
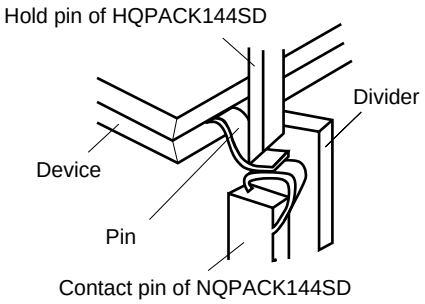


Figure C-3. NQPACK100SD and Device Pin



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 the HQPACK144SD to protect it against splashing flux.

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

(3) Check for abnormal conditions such as resin burr or bent pins before setting a device to the NQPACK144SD. Moreover, check that the hold pins of the HQPACK144SD are not broken or bent before setting 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 provided screwdriver or driver with 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 check whether the NQPACK144SD is stained and make sure the device pins are parallel.

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

[MEMO]

APPENDIX D MOUNTING OF PLASTIC SPACER

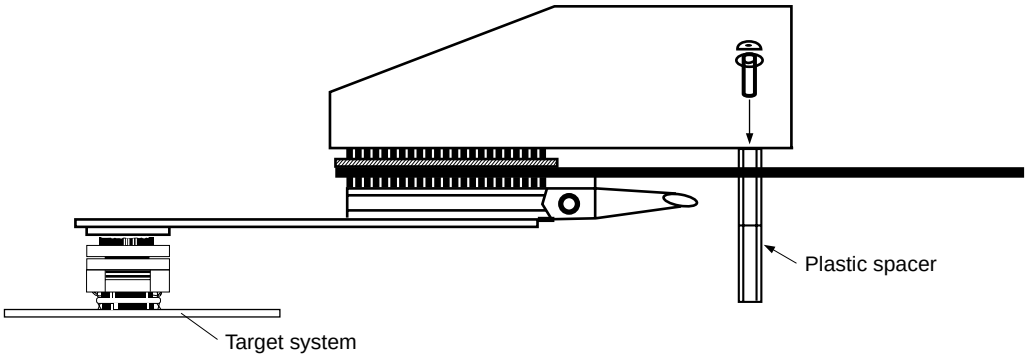
This chapter describes the mounting method for the plastic spacer supplied with the IE-V850E-MC.

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 IE-V850E-MC to plastic spacer

<1> Remove the nylon rivet from the rear part of the pod.
<2> Tighten the plastic spacer with the supplied plastic screw.
<3> To adjust the height, use a user spacer or stand.

Figure D-1. Mounting Method of Plastic Spacer



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