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April 1st, 2010
Renesas Electronics Corporation

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April 1, 2003

User's Manual

SH7729/SH7709A Evaluation Chip Board (HS7729EBH81H/ HS7709AEBH81H) for the E8000 Emulator

User's Manual

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Preface

This manual describes how to connect and operate the EV-chip board. The EV-chip board incorporates an evaluation chip for connection to a user system that uses the SH7729, SH7709A with the E8000 emulator.

Read and understand Sec. 3, “Preparation before Use” of the E8000 Emulator User’s Manual before using this EV-chip board.

CAUTION

The EV-chip board is only for connection to a user system that uses the SH7729, SH7709A with the E8000 emulator. It cannot be used for user systems that target other devices.

The EV-chip board is connected only with the device control board HS7729EDD81H. Read section 2, Configuration, in Part I, E8000 Guide, of the E8000 SH7729/SH7709A Emulator User's Manual.

IMPORTANT INFORMATION

READ FIRST

- **READ this user's manual before using this evaluation chip board (hereafter referred to as the EV-chip board) for Hitachi microcomputer HD6417729 or HD6417709A.**

- **KEEP the user's manual handy for future reference.**

Do not attempt to use the EV-chip board until you fully understand its mechanism.

EV-Chip Board:

Throughout this document, the term "EV-chip board" shall be defined as the following products produced only by Hitachi, Ltd. excluding all subsidiary products.

- EV-chip board
- Device control board

The user system or a host computer is not included in this definition.

Purpose of the EV-Chip Board:

This EV-chip board is a software and hardware development tool for systems employing the Hitachi microcomputer HD6417729 or HD6417709A (hereafter referred to as SH7729/SH7709A). The E8000 emulator and the user system can be connected through the EV-chip board. This EV-chip board must only be used for the above purpose.

Improvement Policy:

Hitachi, Ltd. (including its subsidiaries, hereafter collectively referred to as Hitachi) pursues a policy of continuing improvement in design, performance, and safety of the EV-chip board. Hitachi reserves the right to change, wholly or partially, the specifications, design, user's manual, and other documentation at any time without notice.

Target User of the EV-Chip Board:

This EV-chip board should only be used by those who have carefully read and thoroughly understood the information and restrictions contained in the user's manual. Do not attempt to use the EV-chip board until you fully understand its mechanism.

It is highly recommended that first-time users be instructed by users that are well versed in the operation of the EV-chip board.

LIMITED WARRANTY

Hitachi warrants its EV-chip boards to be manufactured in accordance with published specifications and free from defects in material and/or workmanship. Hitachi, at its option, will repair or replace any EV-chip boards returned intact to the factory, transportation charges prepaid, which Hitachi, upon inspection, determine to be defective in material and/or workmanship. The foregoing shall constitute the sole remedy for any breach of Hitachi's warranty. See the Hitachi warranty booklet for details on the warranty period. This warranty extends only to you, the original Purchaser. It is not transferable to anyone who subsequently purchases the EV-chip board from you. Hitachi is not liable for any claim made by a third party or made by you for a third party.

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Figures:

Some figures in this user's manual may show items different from your actual system.

Limited Anticipation of Danger:

Hitachi cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this user's manual and on the EV-chip board are therefore not all inclusive. Therefore, you must use the EV-chip board safely at your own risk.

SAFETY PAGE

READ FIRST

• READ this user's manual before using this EV-chip board.

• KEEP the user's manual handy for future reference.

Do not attempt to use the EV-chip board until you fully understand its mechanism.

DEFINITION OF SIGNAL WORDS

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER **DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION **CAUTION** used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage.

NOTE emphasizes essential information.

⚠ WARNING

Observe the precautions listed below. Failure to do so will result in a FIRE HAZARD and will damage the user system and the EV-chip board or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.

1. **Always switch OFF the EV-chip board and user system before connecting or disconnecting any CABLES or PARTS.**
2. **Always before connecting, make sure that pin 1 on both sides is correctly aligned.**

Warnings on EV-Chip Board Usage

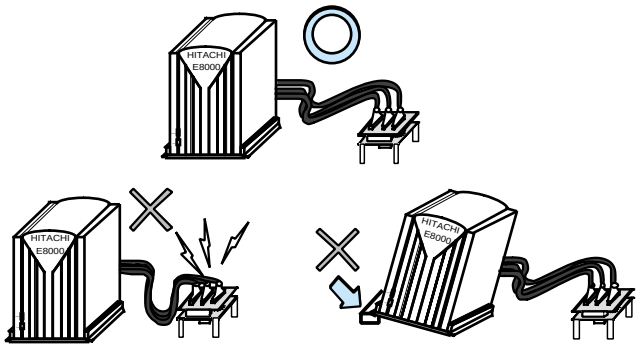
Warnings described below apply as long as you use the EV-chip board. Be sure to read and understand the warnings below before using the EV-chip board. Note that these are the main warnings, not the complete list.

⚠ WARNING

Always switch OFF the EV-chip board and user system before connecting or disconnecting any CABLES or PARTS. Failure to do so will result in a FIRE HAZARD and will damage the user system and the EV-chip board or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.

CAUTION

Place the emulator station and EV-chip board so that the cable is not bent or twisted. A bent or twisted cable will impose stress on the user interface leading to connection or contact failure. Make sure that the emulator station is placed in a secure position so that it does not move during use nor impose stress on the user interface.



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Section 1 Components

1.1 EV-Chip Board Components

Tables 1.1 and 1.2 list the product components of the EV-chip board, respectively (HS7729EBH81H: 208-pin QFP IC socket type, HS7709AEBH81H: 208-pin QFP IC socket type). Check all the components after unpacking. If any components are missing, contact the Hitachi salesperson who sold this EV-chip board.

Table 1.1 EV-chip Board (HS7729EBH81H) Components

Item	Quantity	Remarks
EV-chip board (HS7729EBH81H)	1	Consists of two boards. • HS7410PWB20H (for connecting to the E8000 station) • HS7729PWB30H (IC socket QFP-208)
IC socket	1	NQPACK208SD manufactured by TOKYO ELETECH CORPORATION
IC socket cover	1	HQPACK208SD manufactured by TOKYO ELETECH CORPORATION. For mounting the SH7729.
Screws (for the IC socket)	4	M2 x 6 mm for mounting the MCU
Screws (for the IC socket)	4	M2 x 10 mm for attaching the EV-chip board
Spacers	4	13 mm for attaching the EV-chip board. Four flat washers and four spring washers
Screws (for the spacers)	4	M3 x 6 mm for attaching the EV-chip board. Four flat washers, four spring washers, and four nuts
Guide pins	3	For positioning the IC socket
Specific screwdriver	1	Screwdriver for fixing the IC socket

Table 1.2 EV-chip Board (HS7709AEBH81H) Components

Item	Quantity	Remarks
EV-chip board (HS7709AEBH81H)	1	Consists of two boards. • HS7410PWB20H (for connecting to the E8000 station) • HS7709APWB30H (IC socket QFP-208)
IC socket	1	NQPACK208SD manufactured by TOKYO ELETECH CORPORATION
IC socket cover	1	HQPACK208SD manufactured by TOKYO ELETECH CORPORATION. For mounting the SH7729.
Screws (for the IC socket)	4	M2 x 6 mm for mounting the MCU
Screws (for the IC socket)	4	M2 x 10 mm for attaching the EV-chip board
Spacers	4	13 mm for attaching the EV-chip board. Four flat washers and four spring washers
Screws (for the spacers)	4	M3 x 6 mm for attaching the EV-chip board. Four flat washers, four spring washers, and four nuts
Guide pins	3	For positioning the IC socket
Specific screwdriver	1	Screwdriver for fixing the IC socket

1.2 Component Names

The component names of the EV-chip board are described below.

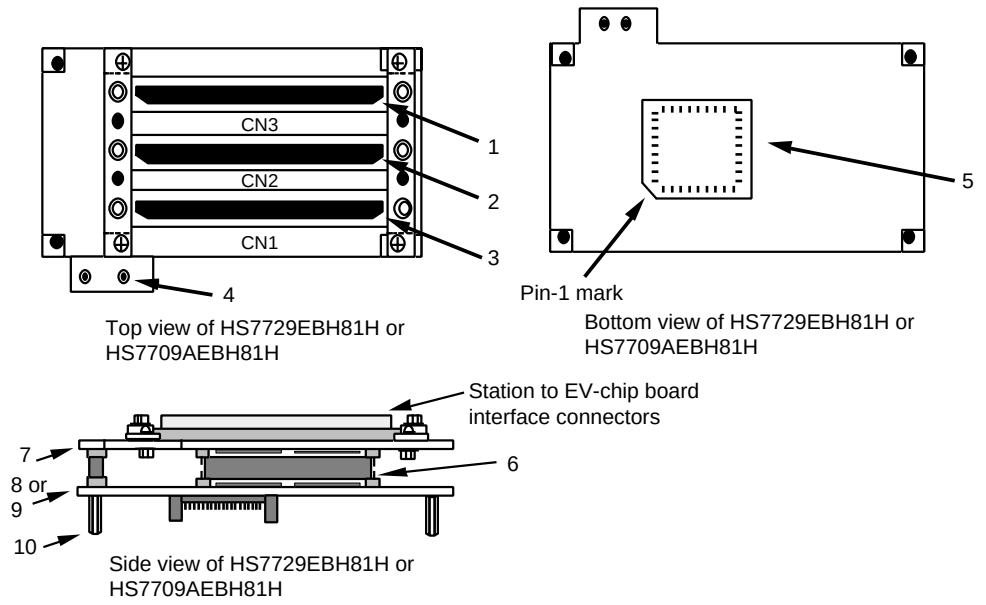


Figure 1.1 EV-Chip Board

1. Station to EV-chip board interface connector CN3: For trace cable 3 which connects the E8000 station to the EV-chip board.
2. Station to EV-chip board interface connector CN2: For trace cable 2 which connects the E8000 station to the EV-chip board.
3. Station to EV-chip board interface connector CN1: For trace cable 1 which connects the E8000 station to the EV-chip board.
4. Crystal oscillator terminals: For installing a crystal oscillator to be used as a clock source for the SH7729/SH7709A.
5. User-system connector: For connecting the user system.
6. Board connector: For connecting HS7410PWB20H and HS7729PWB30H or HS7709APWB30H.

7. HS7410PWB20H:	Includes connectors for interfacing with the E8000 station.
8. HS7729PWB30H[*1]:	Mounts the SH7729 and IC socket for connecting with the user system.
9. HS7709APWB30H[*2]:	Mounts the SH7709A and IC socket for connecting with the user system.
10. Spacer	

Notes: 1. Items 1 through 8 above are called as HS7729EBH81H.
2. Items 1 through 7 and 9 are called as HS7709AEBH81H.

Section 2 Preparation before Use

2.1 Preparing the User System

Table 2.1 lists the user interface pin assignment of the 208-pin QFP IC socket (NQPACK208SD manufactured by TOKYO ELETECH CORPORATION) when the target MCU is the SH7729/SH7709A.

Table 2.1 Pin Assignment of the 208-Pin QFP IC Socket

Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
1	MD1	32	D16/PTA[0]	63	A8
2	MD2	33	VssQ	64	A9
3	Vcc-RTC(1.8V)	34	D15	65	A10
4	XTAL2	35	VccQ	66	A11
5	EXTAL2	36	D14	67	A12
6	Vss-RTC	37	D13	68	A13
7	NMI	38	D12	69	VssQ
8	IRQ0/IRL0/PTH[0]	39	D11	70	A14
9	IRQ1/IRL1/PTH[1]	40	D10	71	VccQ
10	IRQ2/IRL2/PTH[2]	41	D9	72	A15
11	IRQ3/IRL3/PTH[3]	42	D8	73	A16
12	IRQ4/PTH[4]	43	D7	74	A17
13	D31/PTB[7]	44	D6	75	A18
14	D30/PTB[6]	45	VssQ	76	A19
15	D29/PTB[5]	46	D5	77	A20
16	D28/PTB[4]	47	VccQ	78	A21
17	D27/PTB[3]	48	D4	79	Vss
18	D26/PTB[2]	49	D3	80	A22
19	VssQ	50	D2	81	Vcc (1.8V)
20	D25/PTB[1]	51	D1	82	A23
21	VccQ	52	D0	83	VssQ
22	D24/PTB[0]	53	A0	84	A24
23	D23/PTA[7]	54	A1	85	VccQ
24	D22/PTA[6]	55	A2	86	A25
25	D21/PTA[5]	56	A3	87	BS/PTK[4]
26	D20/PTA[4]	57	VssQ	88	RD
27	Vss	58	A4	89	WE0/DQMLL
28	D19/PTA[3]	59	VccQ	90	WE1/DQMLU/WE
29	Vcc (1.8V)	60	A5	91	WE2/DQMUL /ICIORD/PTK[6]
30	D18/PTA[2]	61	A6	92	WE3/DQMUU /ICIOWR/PTK[7]
31	D17/PTA[1]	62	A7	93	RD/WE

Table 2.1 Pin Assignment of the 208-Pin QFP IC Socket (cont)

Pin No.	Pin Name	Pin No.	Pin Name	Pin No.	Pin Name
94	AUDSYNC/PTE[7]	122	BREQ	150	Vcc-PLL2(1.8V)
95	VssQ	123	WAIT	151	AUDCK/PTH[6]
96	CS0/MCS[0]	124	RESETM	152	Vss
97	VccQ	125	ADTRG/PTH[5]	153	Vss
98	CS2/PTK[0]	126	IOIS16/PTG[7]	154	Vcc(1.8V)
99	CS3/PTK[1]	127	ASEMD0/PTG[6]	155	XTAL
100	CS4/PTK[2]	128	ASEBRKAK/PTG[5]	156	EXTAL
101	CS5/CE1A/PTK[3]	129	PTG[4]	157	STATUS0/PTJ[6]
102	CS6/CE1B	130	AUDATA[3]/PTG[3]	158	STATUS1/PTJ[7]
103	CE2A/PTE[4]	131	AUDATA[2]/PTG[2]	159	TCLK/PTH[7]
104	CE2B/PTE[5]	132	Vss	160	IRQOUT
105	CKE/PTK[5]	133	AUDATA[1]/PTG[1]	161	VssQ
106	RAS3L/PTJ[0]	134	Vcc (1.8V)	162	CKIO
107	RAS2L/PTJ[1]	135	AUDATA[0]/PTG[0]	163	VccQ
108	CASLL/CASL/PTJ[2]	136	TRST/PTF[7]/PINT[15]	164	TxD0/SCPT[0]
109	VssQ	137	TMS/PTF[6]/PINT[14]	165	SCK0/SCPT[1]
110	CASLH/CASU/PTJ[3]	138	TDI/PTF[5]/PINT[13]	166	TxD1/SCPT[2]
111	VccQ	139	TCK/PTF[4]/PINT[12]	167	SCK1/SCPT[3]
112	CASHL/PTJ[4]	140	IRLS[3]/PTF[3]/PINT[11]	168	TxD2/SCPT[4]
113	CASHH/PTJ[5]	141	IRLS[2]/PTF[2]/PINT[10]	169	SCK2/SCPT[5]
114	DACK0/PTD[5]	142	IRLS[1]/PTF[1]/PINT[9]	170	RTS2/SCPT[6]
115	DACK1/PTD[7]	143	IRLS[0]/PTF[0]/PINT[8]	171	RxD0/SCPT[0]
116	CAS2L/PTE[6]	144	MD0	172	RxD1/SCPT[2]
117	CAS2H/PTE[3]	145	Vcc-PLL1(1.8V)	173	Vss
118	RAS3U/PTE[2]	146	CAP1	174	RxD2/SCPT[4]
119	RAS2U/PTE[1]	147	Vss-PLL1	175	Vcc(1.8V)
120	TD0/PTE[0]	148	Vss-PLL2		
121	BACK	149	CAP2		

Table 2.1 Pin Assignment of the 208-Pin QFP IC Socket (cont)

Pin No.	Pin Name	Pin No.	Pin Name
176	CTS2/IRQ5/SCP[7]	204	AN[5]/PTL[5]
177	MCS7/PTC[7]/PINT[7]	205	Avcc(3.3V)
178	MCS6/PTC[6]/PINT[6]	206	AN[6]/DA[1]/PTL[6]
179	MCS5/PTC[5]/PINT[5]	207	AN[7]/DA[0]/PTL[7]
180	MCS4/PTC[4]/PINT[4]	208	AVss
181	VssQ		
182	WAKEUP/PTD[3]		
183	VccQ		
184	RESETOUT/PTD[2]		
185	MCS3/PTC[3]/PINT[3]		
186	MCS2/PTC[2]/PINT[2]		
187	MCS1/PTC[1]/PINT[1]		
188	MCS0/PTC[0]/PINT[0]		
189	DRAK0/PTD[1]		
190	DAK1/PTD[0]		
191	DREQ0/PTD[4]		
192	DREQ1/PTD[6]		
193	RESETP		
194	CA		
195	MD3		
196	MD4		
197	MD5		
198	AVss		
199	AN[0]/PTL[0]		
200	AN[1]/PTL[1]		
201	AN[2]/PTL[2]		
202	AN[3]/PTL[3]		
203	AN[4]/PTL[4]		

2.2 Connector Mounting Position of the User System

Figure 2.1 shows the recommended mounting pad (footprint) dimensions and the hole position for installing the EV-chip board for the supplied 208-pin QFP IC socket (NQPACK208SD) manufactured by TOKYO ELETECH CORPORATION.

The screw holes in the EV-chip board for attaching the board are connected to the GND of the board. The ground lines can be enhanced by forming a GND pattern at the screw hole locations of the user system, enabling stable operation during high-speed emulation.

When a hole for EV-chip board is set to fix the EV-chip board and the user system by using a spacer, a crack in the soldered parts on the IC socket (NQPACK208SD) can be prevented from being generated.

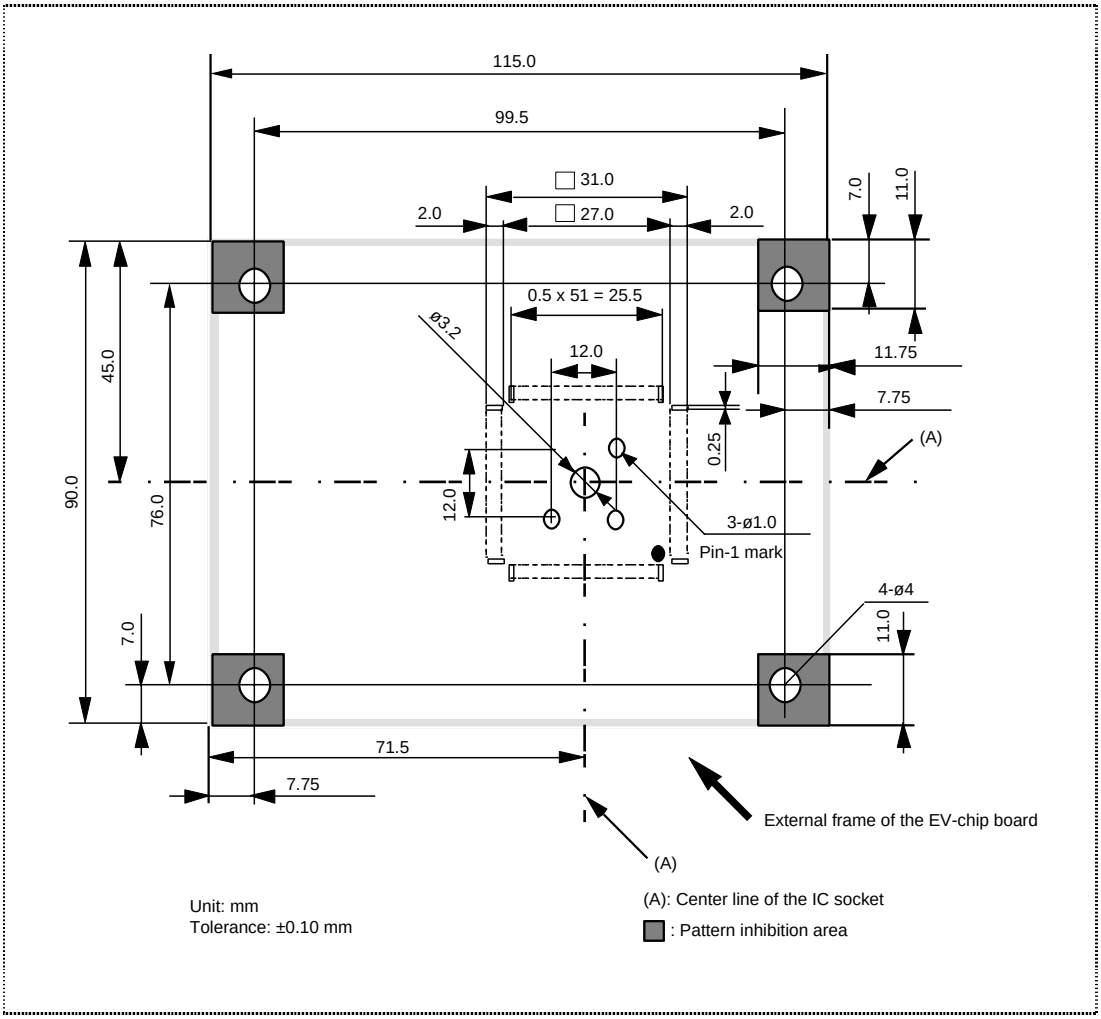


Figure 2.1 Recommended Mounting Pad Dimensions

Comply with the user system component height restriction shown in Figure 2.2 within the external frame of the EV-chip board shown in Figure 2.1.

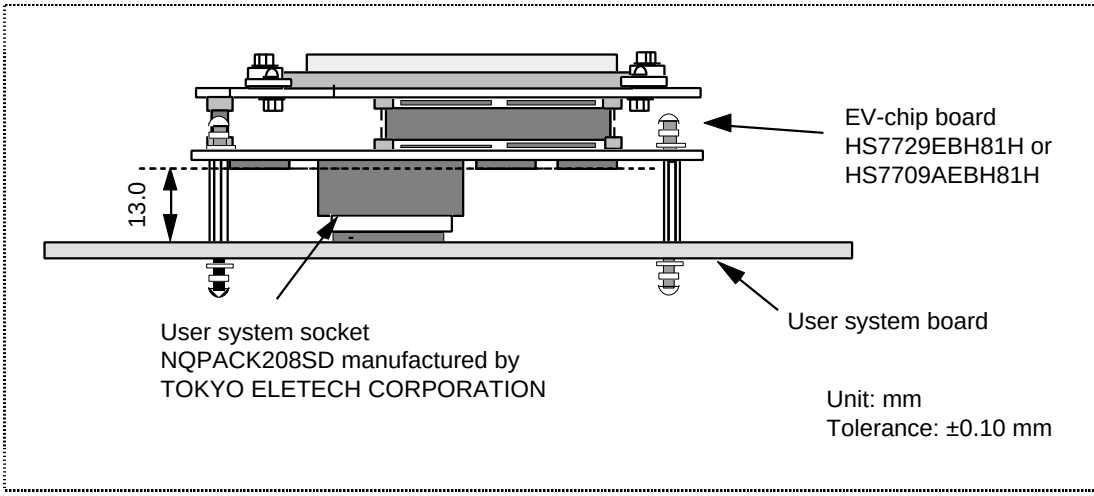
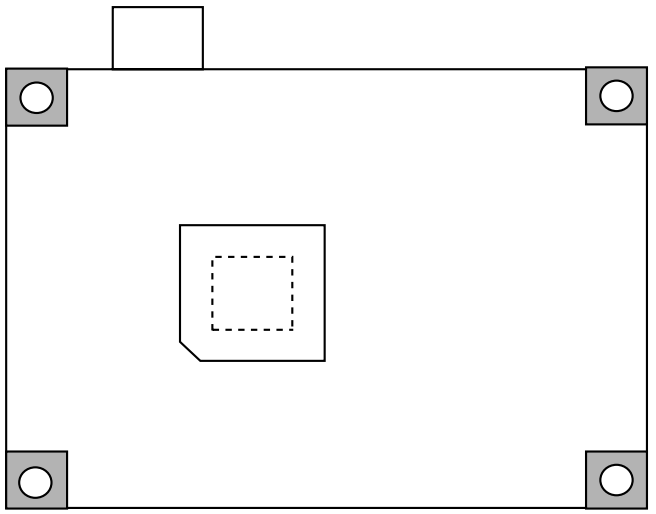


Figure 2.2 Component Height Restriction

⚠ WARNING

The screw holes of the EV-chip board for attaching the board are connected to the GND of the board. Confirm that the spacers, nuts, or washers of the EV-chip board do not make contact with the patterns or components other than the GND on the user system.

Failure to do so will result in a FIRE HAZARD and will damage the user system and emulator or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.



: Ground pattern

Bottom view of the HS7729PWB30H

Section 3 Connecting the EV-Chip Board to the User System

3.1 Connecting the HS7729PWB30H/HS7709APWB30H to the User System

3.1.1 Installing the QFP-208 Package IC Socket

This EV-chip board is designed exclusively for the supplied IC socket (type number: NQPACK208SD) manufactured by TOKYO ELETECH CORPORATION. Therefore, it cannot be used with other IC sockets.

- Positioning the IC socket

  Position the IC socket with the supplied guide pins, as shown in figure 3.1. Apply an epoxy adhesive to the tips of the four protrusions on the bottom surface of the IC socket to bond the IC socket to the user system board.

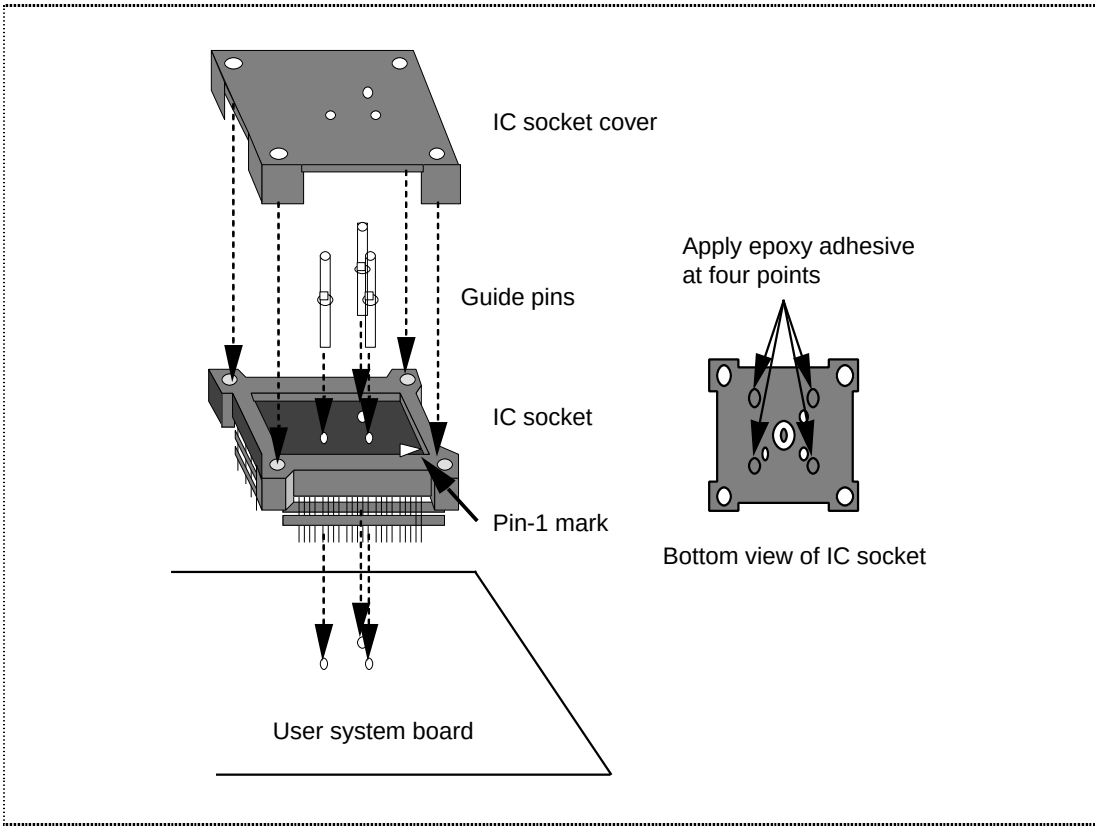


Figure 3.1 Positioning the IC Socket

- Soldering the IC socket

  After the epoxy adhesive has hardened, solder the IC socket. At this time, install the cover on the IC socket to prevent flux or solder from adhering to the guide pins. Use more solder than usual so that a fillet is formed on the lead edge being soldered.

3.1.2 Connecting the HS7729PWB30H/HS7709APWB30H to the User System

1. At shipment, the HS7410PWB20H and HS7729PWB30H are connected to each other (HS7729EBH81H). The HS7410PWB20H and HS7709APWB30H are connected to each other (HS7709AEBH81H). These are referred to as PWB30H. Before connecting the EV-chip board to the user system, separate the HS7410PWB20H from the PWB30H. The HS7410PWB20H is connected to the PWB30H through three connectors as shown in figure 3.2.

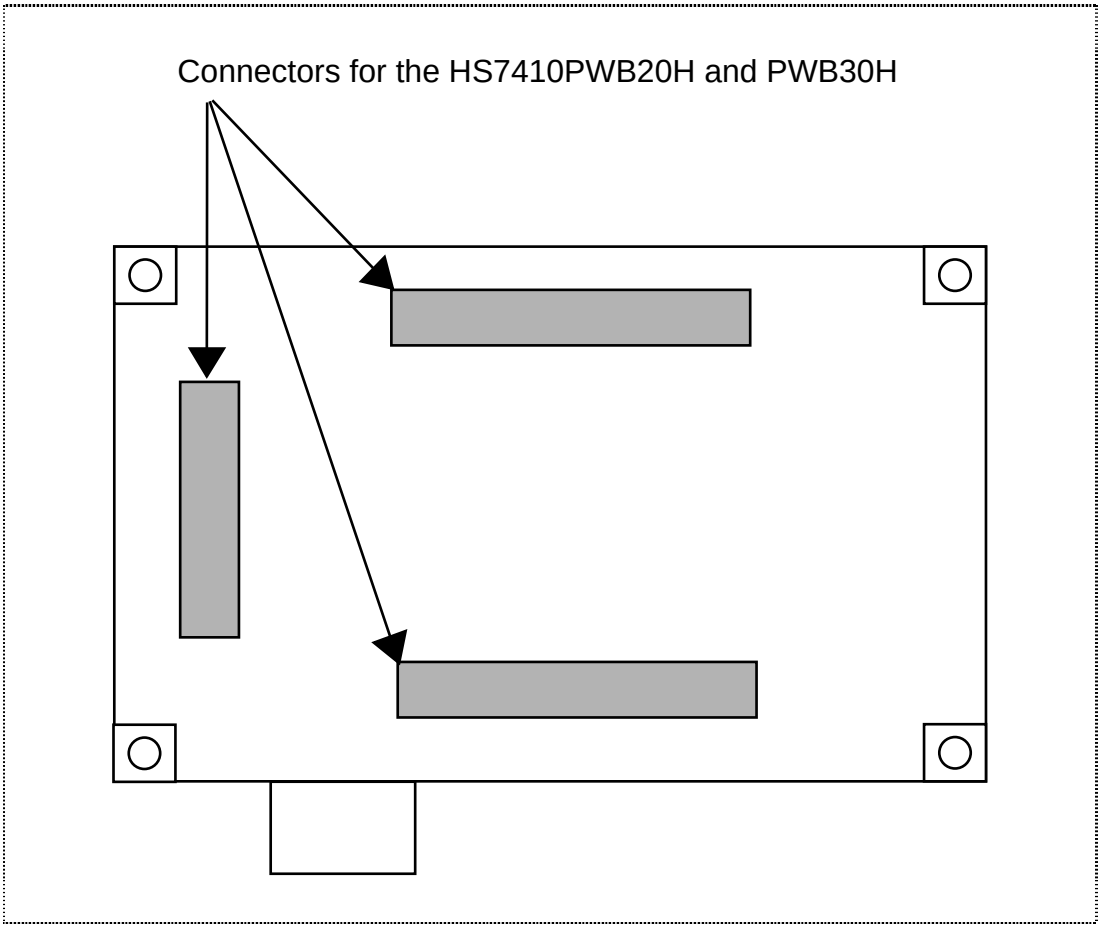


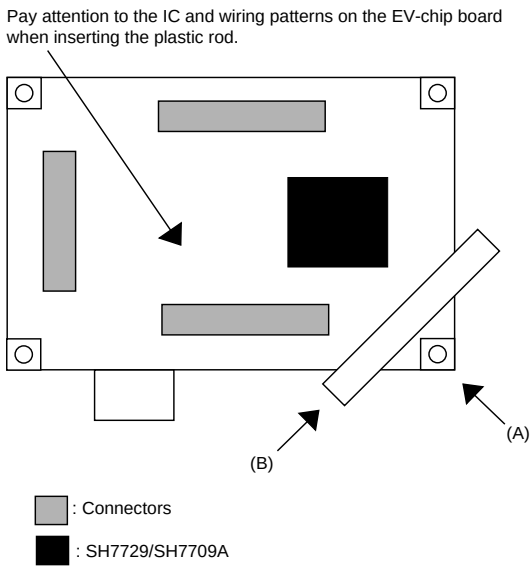
Figure 3.2 Top View of the PWB30H

2. Insert the plastic rod between the HS7410PWB20H and PWB30H, and lever them apart. Alternately between the four corners of the EV-chip board, gradually force the HS7410PWB20H and PWB30H apart.

CAUTION

The following figure shows the position of the SH7729/ SH7709A evaluation chip and connectors between the HS7410PWB20H and PWB30H. Insert the plastic rod in the A direction as shown in the figure. If the plastic rod is inserted in the B direction, wiring patterns and IC leads on the board will be damaged.

Forcefully loosening only one connector applies unusual force to other connectors, thus damaging the connectors and causing contact failures.



3. Attach the spacers on the PWB30H, and install the PWB30H onto the user system after checking the pin-1 location of the IC socket.

4. Attach the HS7420PWB30H to the IC socket on the user system with four screws (M2 x 10 mm). Gradually tighten the screws alternately in a figure-8 pattern (see figure 3.3). Never forcibly tighten only one screw. Otherwise, a contact failure will occur or performance will be degraded. When tightening the screws, hold the IC socket so that it does not twist.

5. Affix the IC socket with screws by using the supplied screwdriver. Stop tightening each screw when the tightening force greatly increases (an approximate target is 0.098 N•m or lower when the torque can be set). If the screw is tightened more forcibly than necessary, the screw threads in the IC socket may be damaged or a contact failure may occur due to a solder crack on the IC socket.

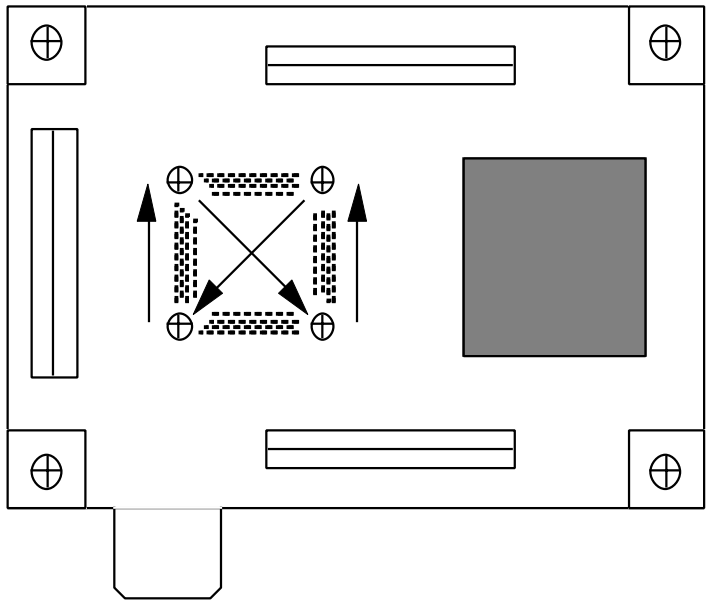


Figure 3.3 Screw-Tightening Sequence (Top View of the PWB30H)

6. Affix the PWB30H to the user system with the appropriate screws and nuts. See figure 3.4. Cracking due to insertion of the trace cable can be prevented in the soldered section of the socket on the user system.

CAUTION

1. **Before connecting the EV-chip board to the user system, check the location of pin 1 on both sides.**
2. **If a malfunction occurs during operation, a crack may have occurred in the soldered section of the IC socket. Check the electric conduction with a tester and resolder the cracked section.**

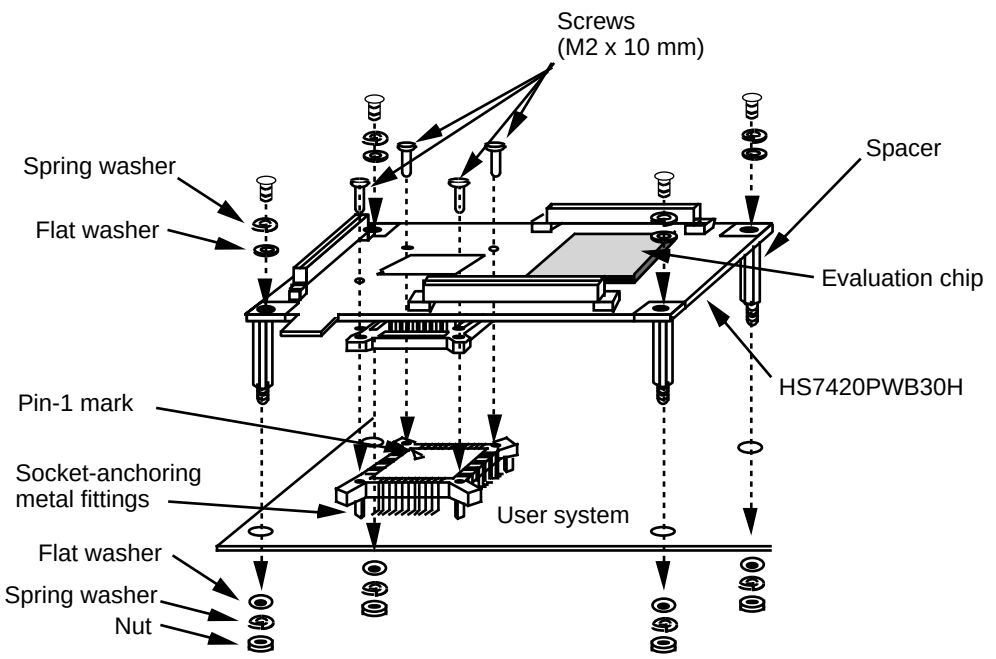


Figure 3.4 Connecting the PWB30H to the User System

3.2 Connecting the Trace Cables

⚠ WARNING

Always switch OFF the emulator and user system before connecting or disconnecting any CABLES or sockets. Failure to do so will result in a FIRE HAZARD and will damage the user system and the emulator or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.

3.2.1 Connecting the Trace Cables to the E8000 Station

Before connecting the trace cables to the HS7410PWB20H, connect the trace cables to the E8000 station.

CAUTION

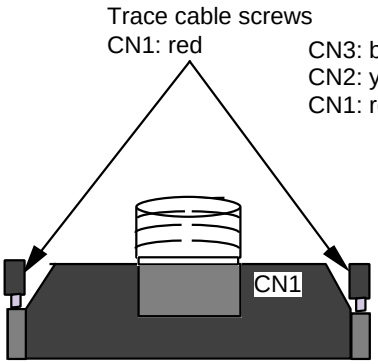
At shipment, trace cables CN2 and CN3 to be connected to the E8000 station are bound into a bundle, and trace cables CN1, CN2, and CN3 to be connected to the EV-chip board are bound into a bundle to prevent an insertion error. For more information on connecting the EV-Chip board to the E8000 station, refer to section 3.2.2, Connecting the EV-Chip Board, in the SH7729/SH7709A E8000 Emulator User's Manual.

3.2.2 Connecting the Trace Cables to the EV-Chip Board

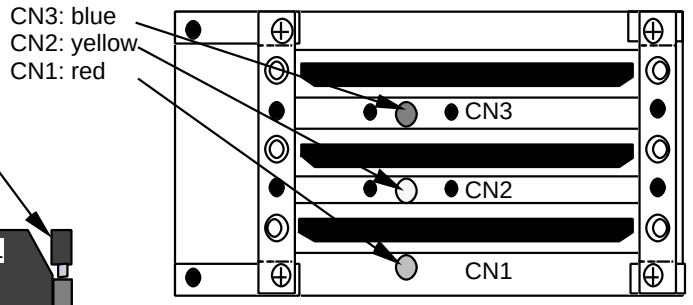
Align the trace cables with the station to EV-chip board interface connectors CN1, CN2, and CN3 on the EV-chip board. Confirm that each trace cable connected to a connector on the E8000 station is also connected to its corresponding station to EV-chip board interface connector on the EV-chip board. For the prevention of insertion errors, colors are specified on the trace cable connectors and the corresponding EV-chip board interface connectors (CN1: red, CN2: yellow, CN3: blue).

CAUTION

For the prevention of insertion errors, colors are specified on the trace cable connectors and the corresponding EV-chip board interface connectors.



Trace cable connector



Top view of the HS7410PWB20H

Tighten the screws to connect the trace cable connectors to the station to EV-chip board interface connectors while holding the HS7410PWB20H securely.

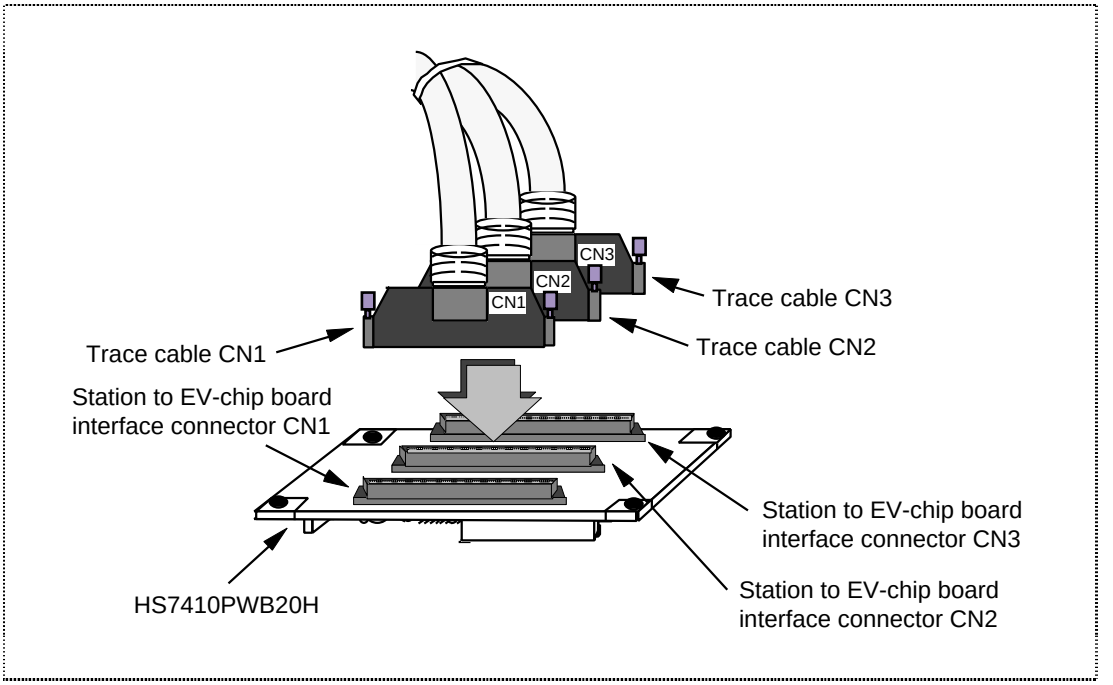


Figure 3.5 Connecting Trace Cables to the EV-Chip Board

⚠ WARNING

Make sure the connector shapes and numbers are correctly matched when connecting the trace cables to the station to EV-chip board interface connectors. Failure to do so will result in a FIRE HAZARD.

3.3 Connecting the HS7410PWB20H and PWB30H

Figure 3.6 shows the connection of the HS7410PWB20H and PWB30H.

Check the location of the connectors that are to be connected on the HS7410PWB20H and PWB30H. Align the connectors on the HS7410PWB20H with those on the PWB30H according to their numbers, and connect them while holding the PWB30H securely. Gradually tighten the screws alternately and repeatedly in a diagonal line on the HS7410PWB20H.

CAUTION

Forcefully tightening only one screw will damage the connectors. Also, this will apply stress to the soldered QFP sockets on the user system and cause cracks in the solder.

⚠ WARNING

The connector and socket structures prevent the connectors from being inserted in the wrong direction. If the connectors cannot be fully inserted or force is required, pin 1 on the connector and pin 1 on the socket may not be aligned correctly. Forcible insertion will apply stress to the soldered sockets on the user system and cause cracks in the solder. Recheck the location of pin 1 on both sides and re-insert the connector.

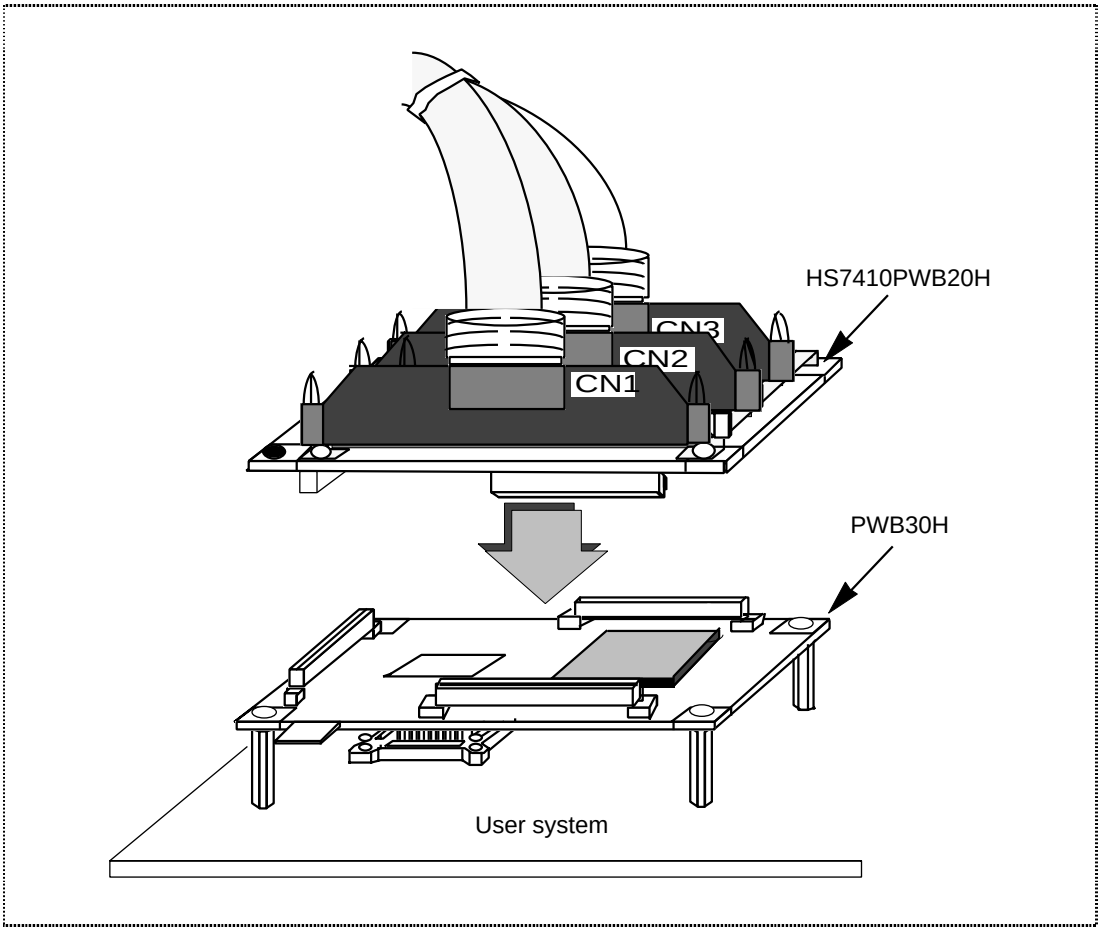


Figure 3.6 Connecting the HS7410PWB20H and PWB30H

Section 4 Mounting the SH7729/SH7709A

4.1 Mounting the SH7729/SH7709A on the User System

When mounting the SH7729/SH7709A on the user system, position the SH7729/SH7709A on the IC socket after checking the direction of pin 1, and tighten the four screws (M2 x 6 mm) on the IC socket cover, as shown in figure 4.1. When tightening the screws, hold the IC socket so that it does not twist.

CAUTION

1. **Before mounting the SH7729/SH7709A on the user system, check the location of pin 1 on both sides.**
2. **Use the supplied screwdriver to tighten the screw.**
3. **Set the tightening torque to 0.98 kgf•cm (0.098 N•m) or lower. If the torque cannot be set, stop tightening the screw as soon as the tightening force greatly increases. If the screw is tightened more forcibly than necessary, the screw threads in the IC socket may be damaged or a contact failure may occur due to a solder crack on the IC socket.**
4. **If an electric conduction error occurs during operation, a crack may have occurred in the soldered section of the IC socket. Check the electric conduction with a tester and resolder the cracked section.**

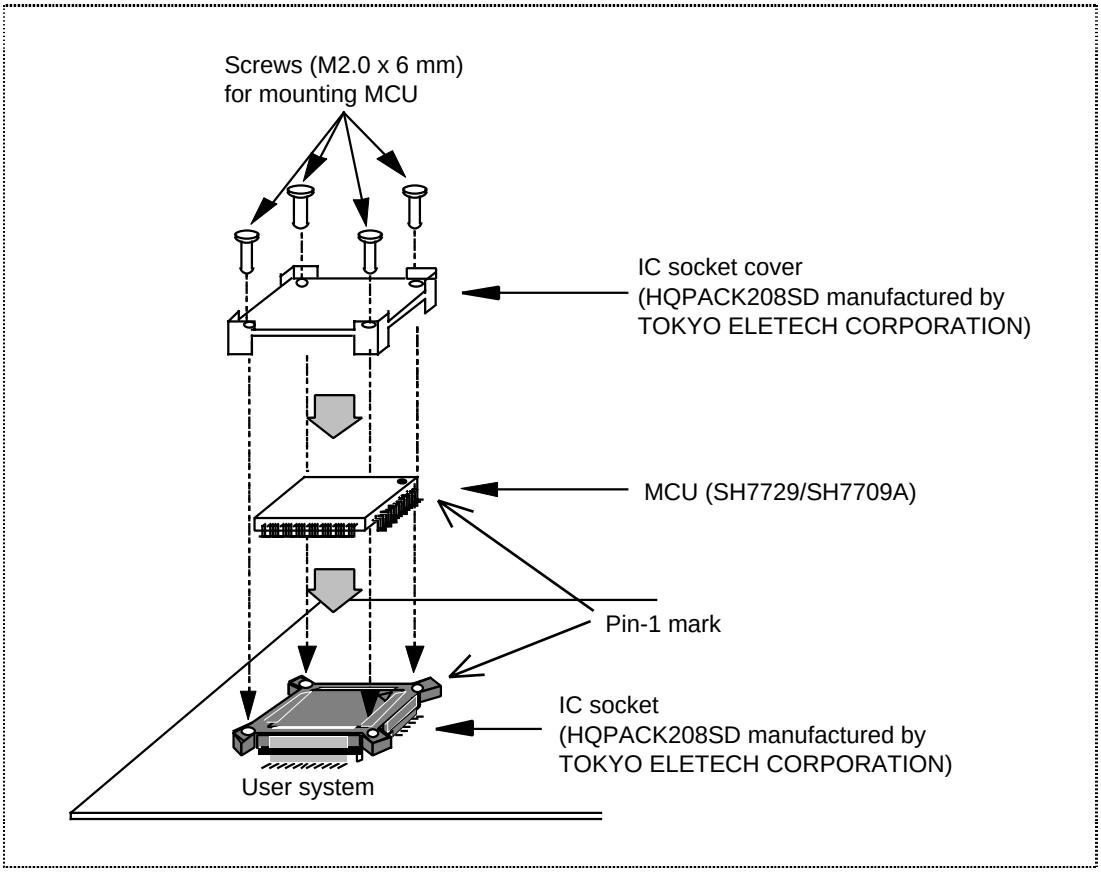


Figure 4.1 Mounting the SH7729/SH7709A