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April 1st, 2010
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H8S/2215 Series BP-112
User System Interface Cable
(HS2215ECB62H) for E6000 Emulator

User's Manual

Renesas Electronics
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Rev.2.0   2002.07

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• READ this user's manual before using this user system interface cable.

• <u>KEEP the user's manual handy for future reference.</u>

Do not attempt to use the user system interface cable until you fully understand its mechanism.

User System Interface Cable:

Throughout this document, the term "user system interface cable" shall be defined as the following product produced only by Hitachi, Ltd. excluding all subsidiary products.

- User system interface cable (HS2215ECB62H)

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

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This user system interface cable is for connecting the emulator station and user system. This user system interface cable must only be used for the above purpose.

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This user system interface cable 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 user system interface cable until you fully understand its mechanism.

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Figures:

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Limited Anticipation of Danger:

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SAFETY PAGE

READ FIRST

• **READ this user's manual before using this user system interface cable.**

• **<u>KEEP the user's manual handy for future reference.</u>**

Do not attempt to use the user system interface cable 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 emulator product or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.

1. Do not repair or remodel the emulator product by yourself for electric shock prevention and quality assurance.

2. Always switch OFF the E6000 emulator and user system before connecting or disconnecting any CABLES or PARTS.

3. Always before connecting any CABLES, make sure that pin 1 on both sides are correctly aligned.

Preface

Thank you for purchasing this user system interface cable (HS2215ECB62H) for the Hitachi's original microcomputer H8S/2215 series.

The HS2215ECB62H is a user system interface cable that connects an H8S/2214 series E6000 emulator (HS2214EPI61H; hereinafter referred to as the emulator) to the IC socket for a BP-112 package for the H8S/2215 series MCU on the user system. HDI HS2214EPI61SR V1.01 or later is necessary.

Contents

Section 1   Configuration

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CAUTION

Use a CSPACK112A1110H02 socket (socket manufactured by Tokyo Eletech Corporation) for the BP-112 package IC socket on the user system.

</div>

Figure 1 shows the configuration of the HS2215ECB62H user system interface cable for the BP-112 package.
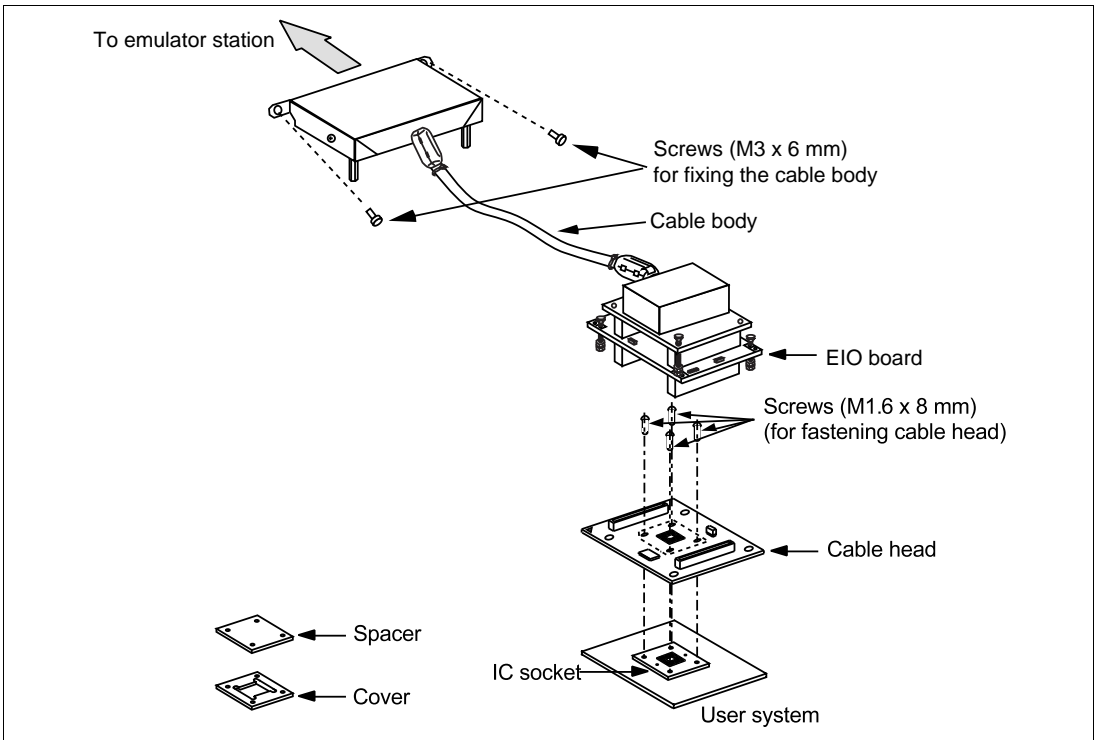

Figure 1   HS2215ECB62H User System Interface Cable

Table 1 lists the HS2215ECB62H components. Please make sure you have all of these components when unpacking.

Table 1   HS2215ECB62H Components

No.	Component	Quantity	Remarks
1	Cable body	1	Includes coaxial cable
2	Cable head	1	Consists of two printed circuit boards
3	IC socket	1	For the BP-112 package
4	Spacer	1	For installing a BP-112 packaged MCU
5	Cover	1	For installing a BP-112 packaged MCU
6	Screws (M1.6 x 8 mm)	4	For fastening cable head and for installing a BP-112 packaged MCU
7	Driver	1	Dedicated screwdriver to fasten the screws.
8	CTS Screws (M3 x 6 mm)	2	For fixing the cable body
9	Documentation	1	User's manual for HS2215ECB62H (this manual)

Section 2   Connection Procedures

2.1   Connecting User System Interface Cable to Emulator Station

```
┌─────────────────────────────────────────────────────────┐
│                    ⚠ WARNING                            │
├─────────────────────────────────────────────────────────┤
│        Observe the precautions listed below.  Failure to do so │
│ will result in a FIRE HAZARD and will damage the user   │
│ system and the emulator product or will result in       │
│ PERSONAL INJURY.  The USER PROGRAM will be               │
│ LOST.                                                    │
│ 1.   Always switch OFF the user system and the emulator │
│      product before the USER SYSTEM INTERFACE CABLE     │
│      is connected to or removed from any part.  Before  │
│      connecting, make sure that pin 1 on both sides are │
│      correctly aligned.                                 │
│ 2. The user system interface cable dedicated to the     │
│      emulator must be used.                             │
└─────────────────────────────────────────────────────────┘
```

To connect the cable body to the emulator station, follow the instructions below.

1. Make sure the user system and emulator station are turned off.

2.   After making sure the direction of the cable body connector is correct, firmly insert the cable body connector into the emulator station socket (figure 2).

3. If the emulator has holes for fastening screws, fasten the cable body to the emulator station by using the provided screws.
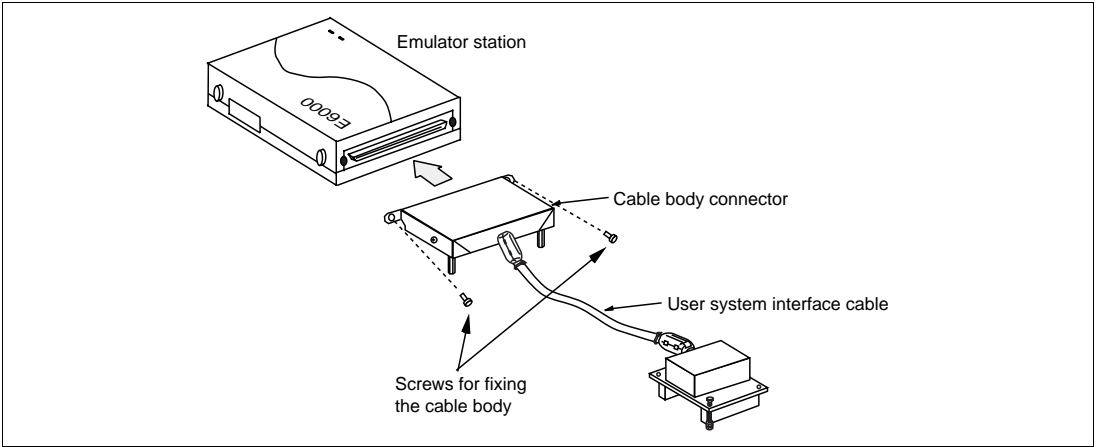
Figure 2   Connecting User System Interface Cable to Emulator Station

2.2   Connecting User System Interface Cable to User System

⚠ WARNING

Always switch OFF the user system and the emulator product before the USER SYSTEM INTERFACE CABLE is connected to or removed from any part. Before connecting, make sure that pin 1 on both sides are correctly aligned. Failure to do so will result in a FIRE HAZARD and will damage the user system and the emulator product or will result in PERSONAL INJURY. The USER PROGRAM will be LOST.

To connect the cable head to the user system, follow the instructions below.

2.2.1   Soldering the IC Socket

Install the socket for BP-112-packaged ICs on the user system.

(1) Gently apply solder to the BGA pads of the user system. Be careful to keep the thickness of the solder within 100 to 150 μm. Too much solder will cause short-circuiting of the pins.

(2) The IC socket is vacuum-packed to avoid oxidization of the surfaces of the solder balls. It is thus recommended that the IC socket be installed on the user system if you do not install the socket immediately after the package it comes in is opened. After the package's seal has been broken, store the socket in a desiccator. Do not touch the solder balls. If they are touched, solder may not adhere to the solder surface.
The IC socket is covered by a protective cover. Socket and cover are fastened together by four screws before the whole is vacuum packed to prevent bending of the IC socket's pins. To avoid the scattering (dispersal) of flux from other components to the IC socket, keep the protective cover on the IC socket until solder reflow has been completed.

(3) Install the provided guide pins into the holes for the guide pins on the user system. Check that the pads are correctly aligned with the IC socket.

(4) Notes on soldering the IC socket

    a. The IC socket is larger than the actual IC package; therefore, refer to figure 8 for the installation of other components.

    b. Do not install components that occupy large volume close to the IC socket. Such components will prevent the convective flow of heat during reflow.

    c. Since the IC socket has a greater volume than the IC package, it is recommended that the temperature profile under the conditions used in installation be measured by attaching a temperature sensor to the back side of the IC socket.

    d. Under the reflow conditions for soldering the IC socket, specify the actual heating to more than 210°C for 30 to 60 seconds.

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Recommended Reflow Conditions

Surface temperature of IC-socket connector
Preheating: 150 to 180°C for 180 seconds
Actual heating: To more than 210°C, for 30 to 60 seconds

</div>

CAUTION

1. **Never dip the IC socket in flux or use wash to clean the IC socket. This is because flux may remain inside the IC socket due to the IC socket's structure. When using the IC socket with other DIP products, never clean the other DIP products with flux because the flux may enter the connector through the guide pins of the IC socket.**

2. **When an IC socket with guide pins is soldered to the user system, about 1.4 mm of the guide pins will stick out (when the user-system board is 1.6 mm thick). When a load is applied to the guide pins from the back of the user-system board, stress will be applied to the soldered part of the IC socket, and this may destroy the connectors. Do not apply any load to the guide pins after the IC socket has been soldered on the user system.**

3. **When an IC socket with no guide pins is soldered to the user system, the soldered part will crack if stress is applied to the IC socket. Therefore, always apply adhesive to the connector and the user system so that there is a firm connection between them.**

4. **When the IC socket has guide pins, it is recommended that epoxy resin adhesive or solder be applied to the guide pins at the back of the user system to make sure that no stress is applied to the soldered part.**

2.2.2   Inserting Cable Head

CAUTION

Check the location of pin 1 before inserting.

Align pin 1 on the IC socket for a BP-112 package on the user system with pin 1 on the user system interface cable head, and insert the user system interface cable head into the IC socket on the user system, as shown in figure 3.
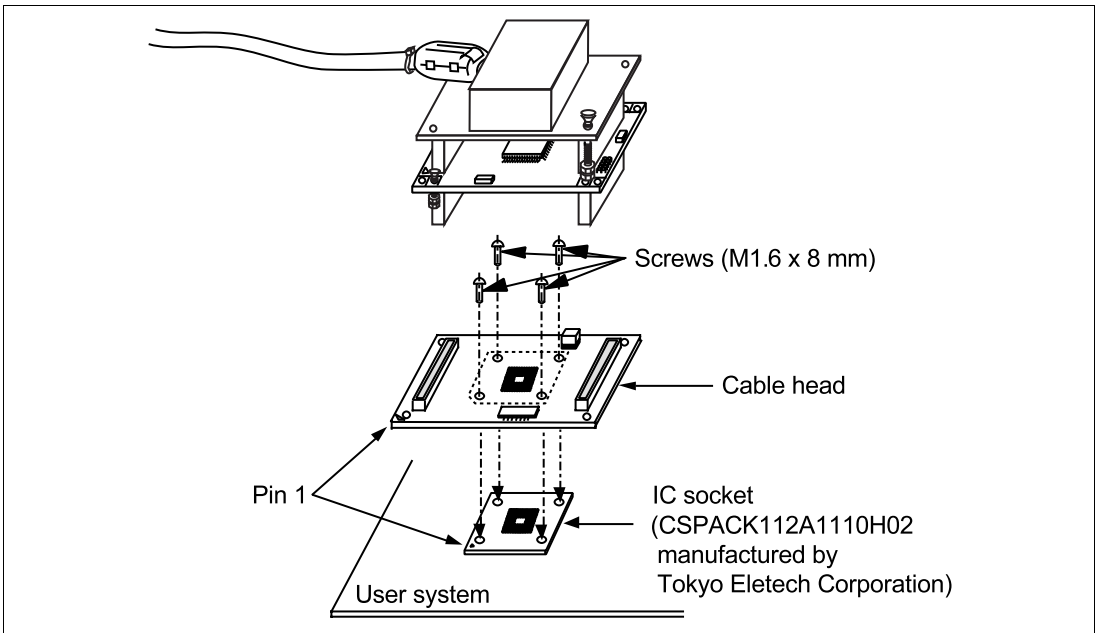

Figure 3   Connecting User System Interface Cable to User System

2.2.3   Fastening Cable Head

CAUTION

1. Use the screwdriver whose head matches the screw head.

2. The tightening torque must be 0.054 N•m or less. If the applied torque cannot be accurately measured, stop tightening when the force required to turn the screw becomes significantly greater than that needed when first tightening. If a screw is tightened too much, the screw head will break or an IC socket contact error will be caused by a crack in the IC socket solder.

3. If the emulator does not operate correctly, cracks might have occurred in the solder.

The user system interface cable (HS2215ECB62H) head and the IC socket for the BP-112 package on the user system have no pin dedicated for alignment. Use the follow procedure to fasten the cable head.

1. Insert two screws (M1.6 x 8 mm) to ① and ③, and screw it a little so that holes at ②-②' and ④-④' match, respectively.
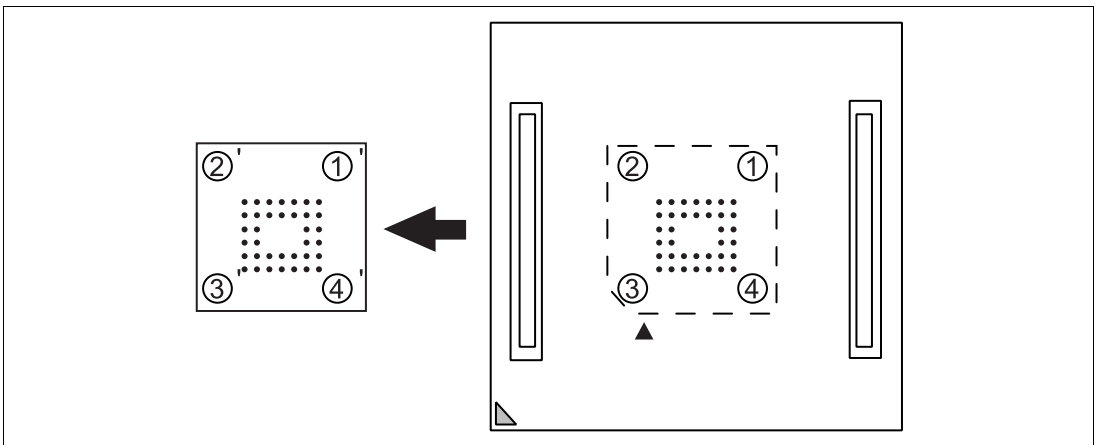
Figure 4   Fastening Cable Head Procedure (1)

2. Next, fasten screws to ② and ④ a little, so that four screw holes are aligned. Then, each screw should be tightened a little at a time, alternating between screws on opposing corners.
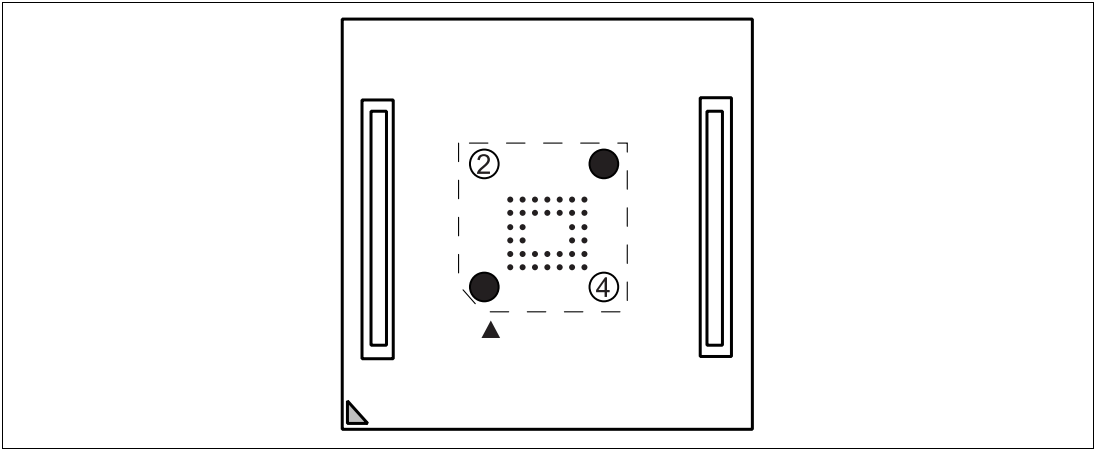

Figure 5   Fastening Cable Head Procedure (2)

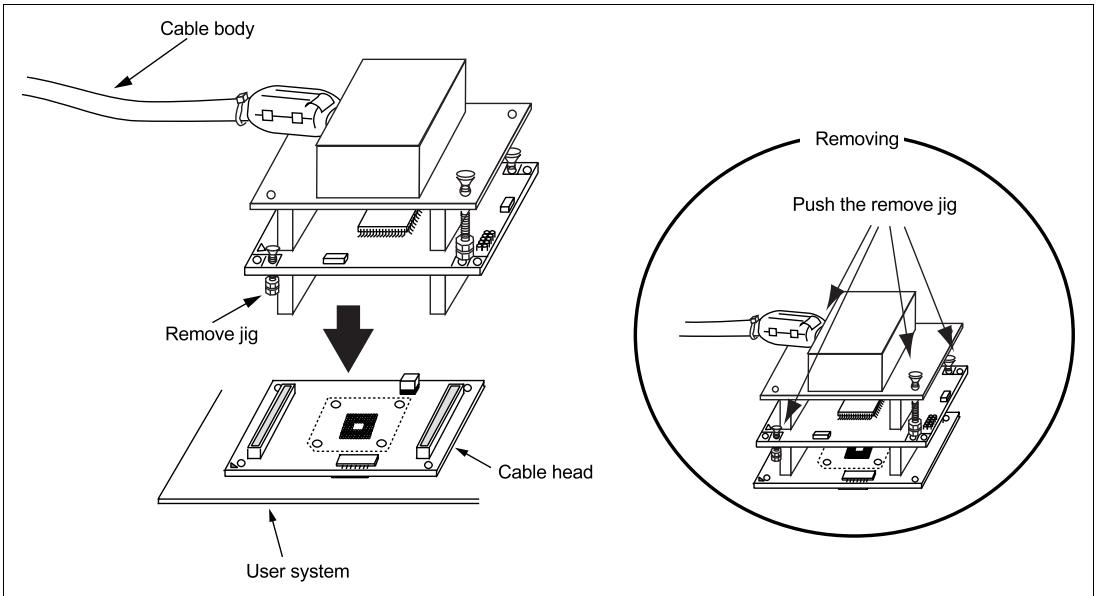### 2.2.4　Fastening Cable Body

Connect the cable body to the cable head.

Figure 6　Fastening Cable Body

To use the single-chip mode (without USB function) for the H8S/2215 operating mode, remove the EIO board and connect the cable body to the cable head as shown in figure 7.
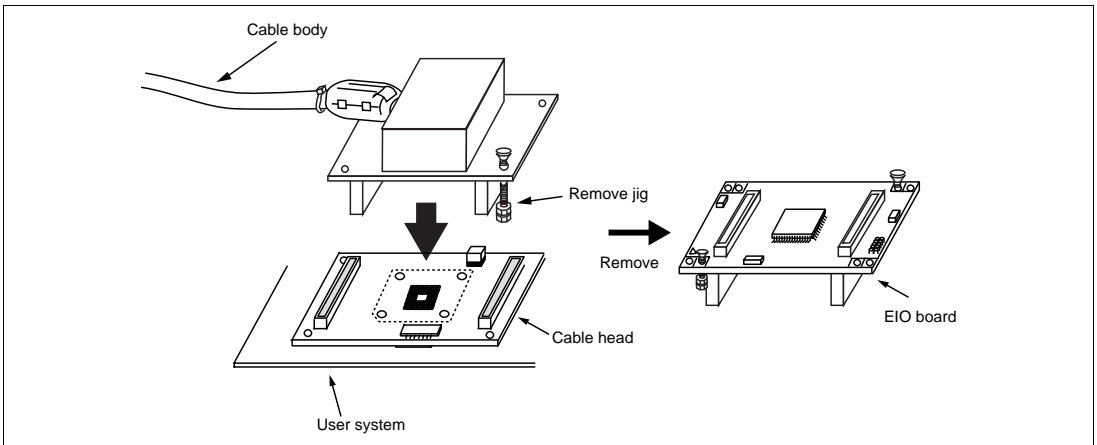
Figure 7　Cable Configuration in Single-Chip Mode

2.3   Recommended Dimensions for User System Mount Pad

Figure 8 shows the recommended dimensions for the mount pad (footprint) for the user system with an IC socket for a BP-112 package (CSPACK112A1110H02: socket (manufactured by Tokyo Eletech Corporation)). Note that the dimensions in figure 8 are somewhat different from those of the actual MCU's mount pad.
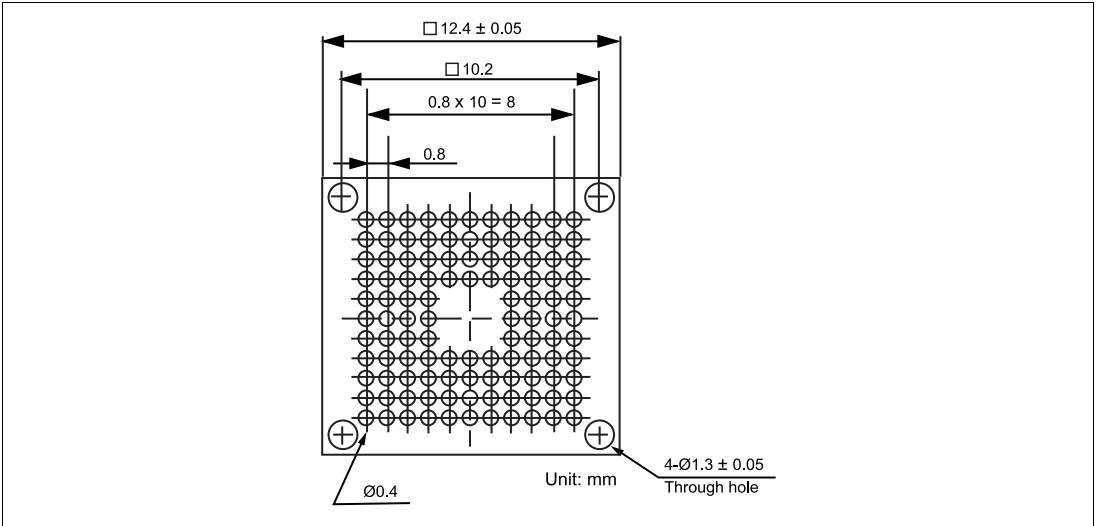

Figure 8   Recommended Dimensions for Mount Pad

2.4　　　Dimensions for User System Interface Cable Head

The dimensions for the user system interface cable head are shown in figure 9.

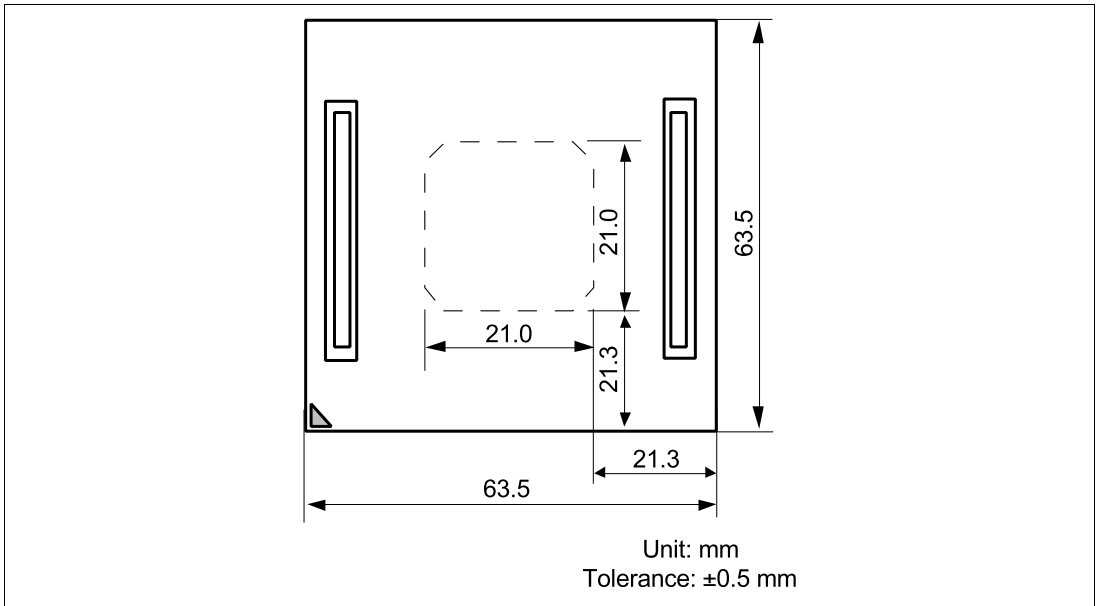

Unit: mm
Tolerance: ±0.5 mm

Figure 9　Dimensions for User System Interface Cable Head

2.5　Resulting Dimensions after Connecting User System Interface Cable

The resulting dimensions, after connecting the user system interface cable head to the user system, are shown in figure 10.
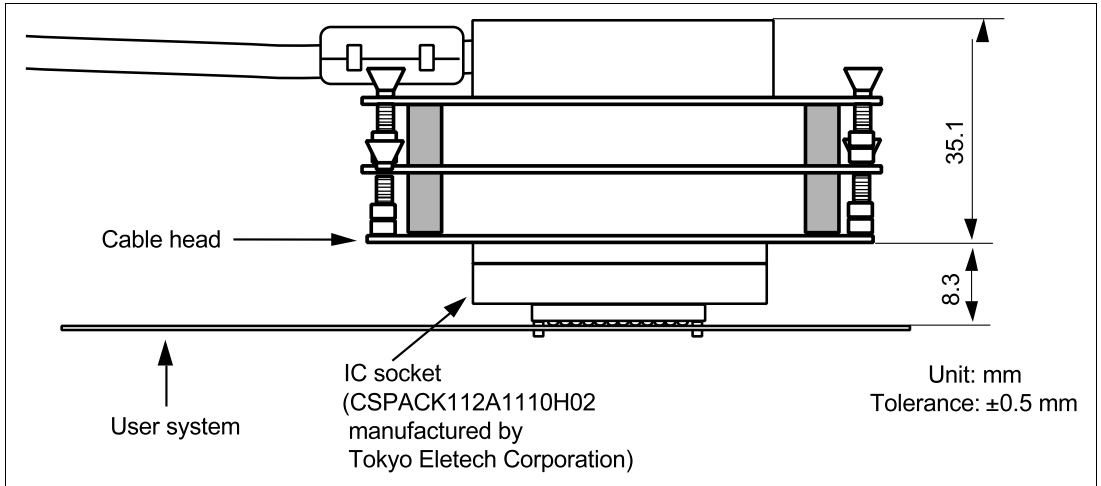

Figure 10　Resulting Dimensions after Connecting User System Interface Cable

Section 3   Installing the MCU to the User System

<div style="border:1px solid black;">

CAUTION

1. **Check the location of pin 1 before inserting.**

2. **Use a provided screwdriver.**

3. **The tightening torque must be 0.054 N•m or less. If the applied torque cannot be accurately measured, stop tightening when the force required to turn the screw becomes significantly greater than that needed when first tightening. If a screw is tightened too much, the screw head will break or an IC socket contact error will be caused by a crack in the IC socket solder.**

4. **If the MCU does not operate correctly, cracks might have occurred in the solder.**

</div>

1. Attach the spacer and cover to the IC socket.
2. Place the spacer on the IC socket. Place the two guide pins of the spacer in the corresponding holes on the IC socket.
3. Place the MCU gently in the opening of the spacer. Be sure to correctly align pin 1 of the MCU with the IC socket. The solder balls of the MCU will then be in the correct locations relative to the connection pins of the IC socket.
4. Put the cover on the spacer. The four holes at the four corners of the spacer and of the cover must be aligned. Use the four screws to fasten the cover to the IC socket. Each screw in turn should be made a little tighter, alternating between screws on opposing corners. Use the screwdriver provided with the package. The torque in tightening must be 0.054 N•m or less.
5. When removing the cover from the IC socket, hold the side of the cover so that no stress is applied to the soldered connections between the IC socket and user system while the screws on the cover are being unscrewed. Use tweezers to remove the MCU from the opening in the spacer.
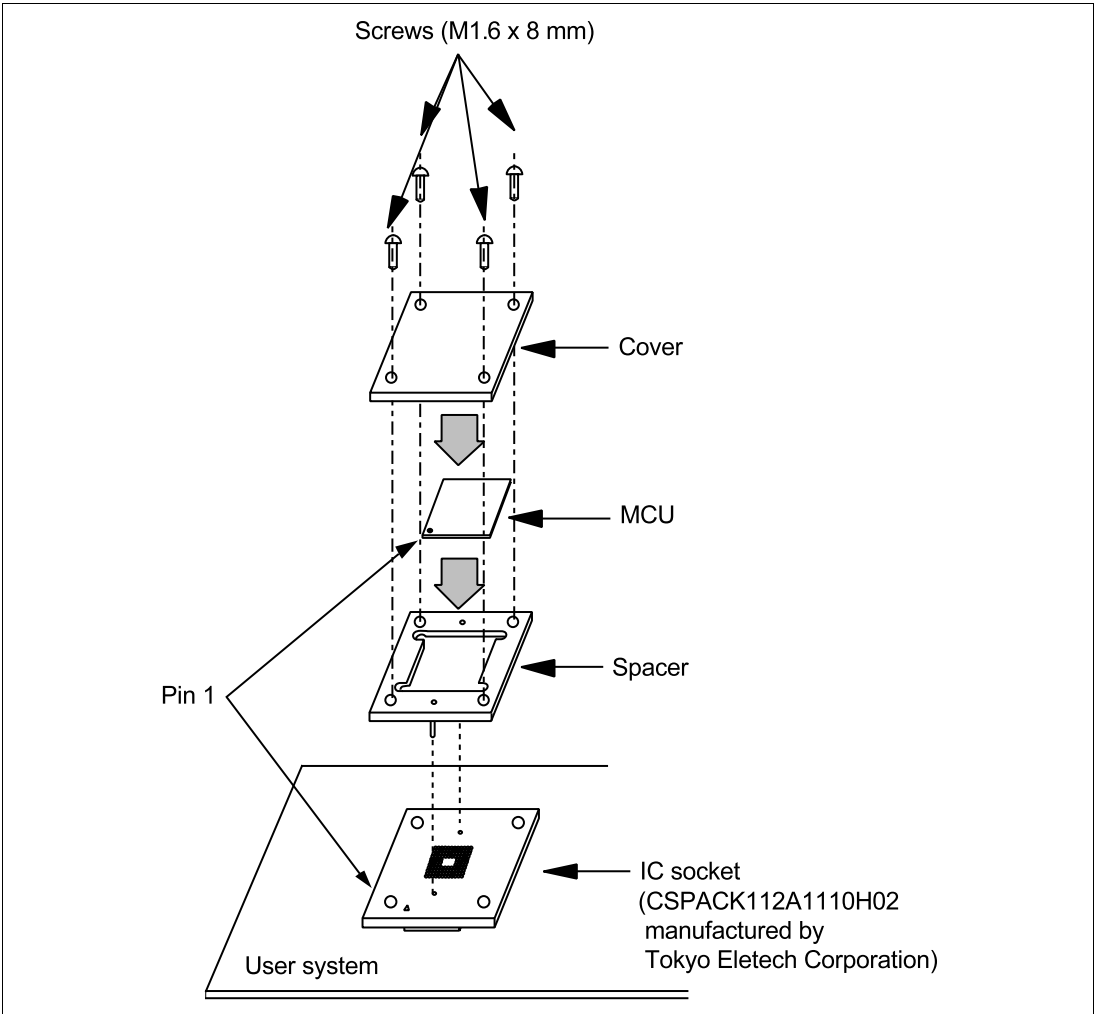
Screws (M1.6 x 8 mm)

Cover

MCU

Spacer

Pin 1

IC socket
(CSPACK112A1110H02
manufactured by
Tokyo Eletech Corporation)

User system

Figure 11   Installing MCU to User System

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Section 4   User Interface Circuit

The user system interface cable includes the H8S/2215 microcomputer to emulate the USB function. The H8S/2215 user interface signal includes an interface circuit as shown in figure 12. Table 2 shows how to select the user interface signals.
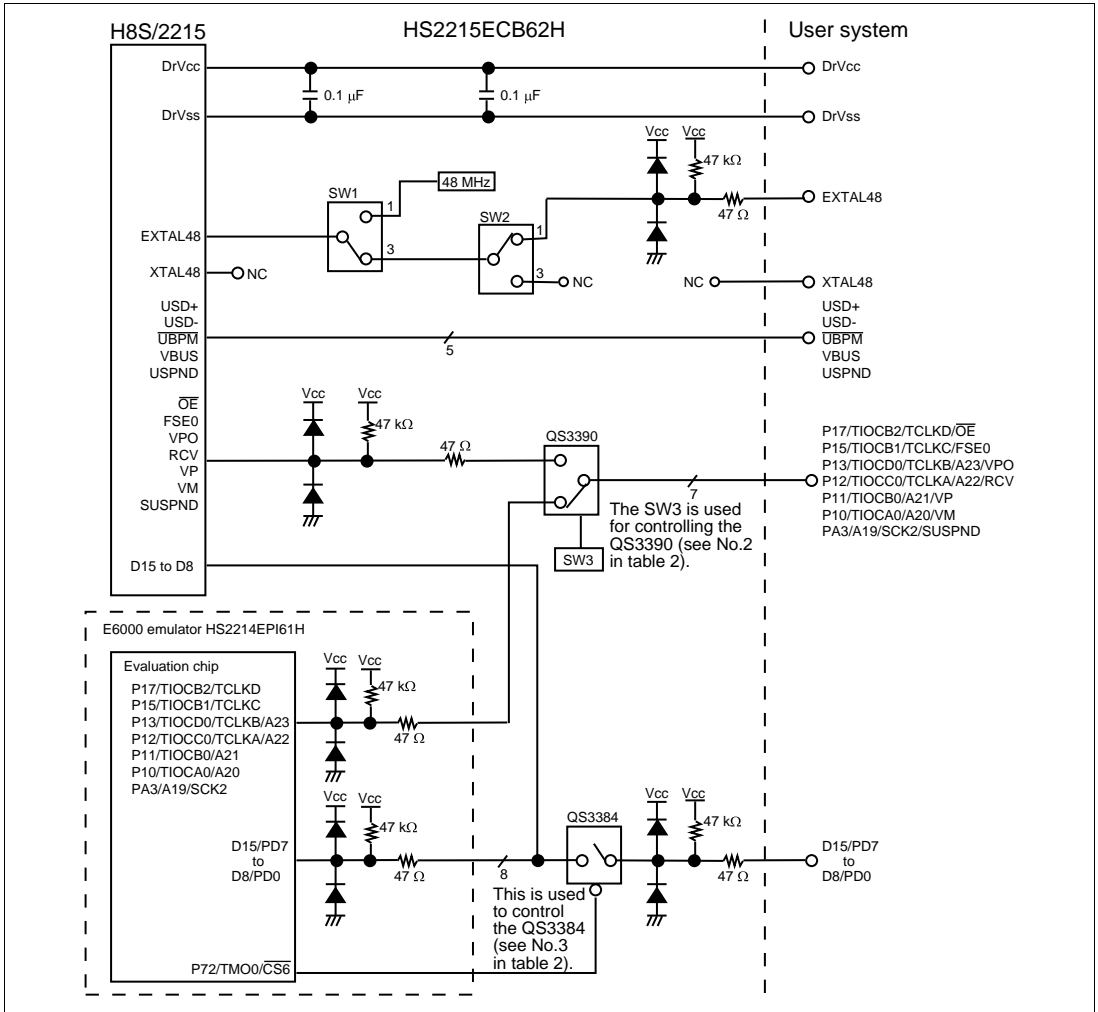

Figure 12   User Interface Signals

Table 2   Selecting User Interface Signals

No.	Function	Switch Setting	Selected Function
1	Selects EXTAL48 input	SW1 = 1	48 MHz emulation clock
		SW1 = 3, SW2 = 1 : Setting at shipment	EXTAL48 TTL clock input
		SW1 = 3, SW2 = 3	—: Cannot be used
2	Selects USB external transceiver connection signal or port function	SW3 = 1 : Setting at shipment	P17/TIOCB2/TCLKD P15/TIOCB1/TCLKC P13/TIOCD0/TCLKB/A23 P12/TIOCC0/TCLKA/A22 P11/TIOCB0/A21 P10/TIOCA0/A20 PA3/A19/SCK2
		SW3 = 3	OE FSE0 VPO RCV VP VM SUSPND
3	Data bus control	—	When CS6 = 'L' , data bus is HighZ (Same as H8S/2215)

SW1 to SW3 are located on the EIO board of the HS2215ECB62H. Figure 13 shows the location of SW1 to SW3.
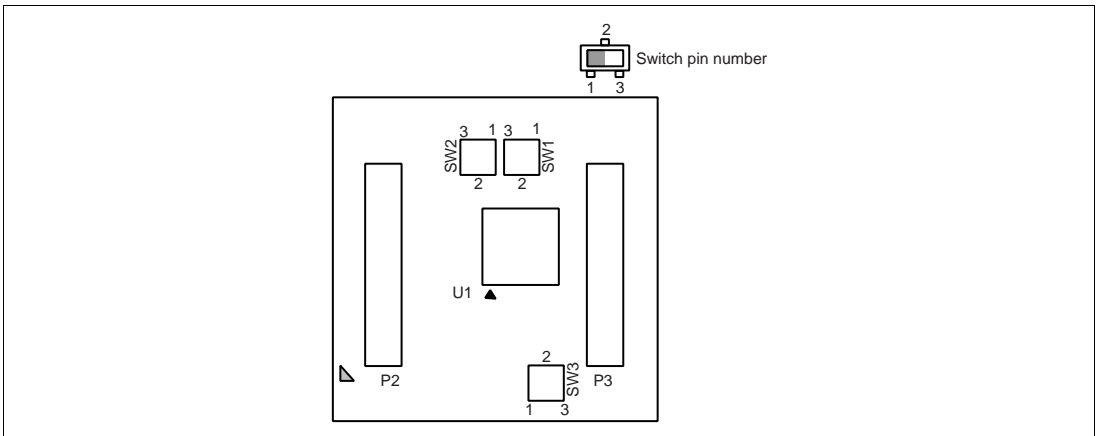

Figure 13   Locations of SW1 to SW3 on the EIO Board

Section 5   Verifying Operation

1. When using the E6000 emulator for the H8S/2215 series, turn on the emulator according to the procedures described in the H8S Series E6000 Emulator User's Manual (HS2000EPI61HE).

2. Verify the user system interface cable connections by accessing the external memory and ports to check the bus states of the pins. If an error is detected, recheck the soldered IC socket and the location of pin 1.

3. The emulator connected to this user system interface cable supports two kinds of clock sources as the MCU clock; an emulator internal clock and an external clock on the user system. For details, refer to the Emulator Supplementary Information (HS2214EPI61HE).

    — To use the emulator internal clock
       Select the clock in the emulator station as the system clock (ϕ), by using the CLOCK command (emulator command).

    — To use the external clock on the user system
       Select external clock t or t2 with the CLOCK command (emulator command). Supply the external clock from the user system to the emulator by inputting the external clock from the EXTAL terminal on the cable head or connecting a crystal oscillator to the EXTAL and XTAL terminals. For details, refer to section 21, Clock Pulse Generator, of the H8S/2215 Series Hardware Manual.
       The user system interface cable has the oscillator circuits shown in figure 14. This circuit is located on the lower board of the HS2215ECB62H.
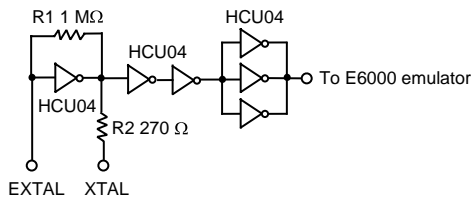

Figure 14   Clock Oscillator

Section 6   Notice

1. Make sure that pin 1 on the user system IC socket is correctly aligned with pin 1 on the cable head before inserting the cable head into the user system IC socket.

2. The dimensions of the recommended mount pad for the user system IC socket are different from those of the MCU.

3. This user system interface cable is specifically designed for the HS2214EPI61H emulator. Do not use this cable with any other emulator station.

4. To prevent breaking of wires in the cable body, do not place heavy or sharp metal objects on the user system interface cable.

5. While the emulator station is connected to the user system with the user system interface cable, force must not be applied to the cable head. Place the emulator station, user system interface cable, and user system as shown in the example in figure 15.

6. The P1 jumper on the lower board is used for testing. Do not remove the jumper that is inserted in the side of pin 1 and pin 2.
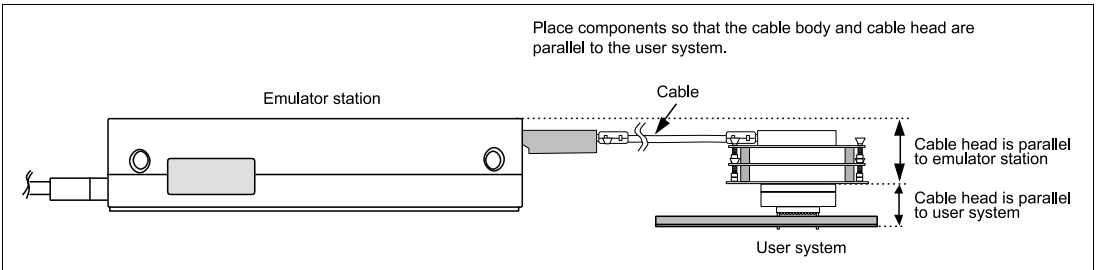
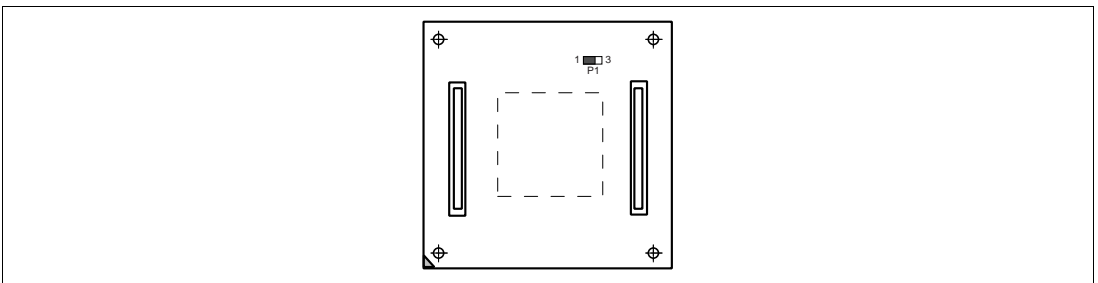**Figure 15   User System Interface Cable Location Example**

Figure 16   Jumper