To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

Send any inquiries to http://www.renesas.com/inquiry.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: "Standard", "High Quality", and "Specific". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as "Specific" without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is "Standard" unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.

   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.

   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.

   "Specific": Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

To all our customers

Regarding the change of names mentioned in the document, such as Hitachi Electric and Hitachi XX, to Renesas Technology Corp.

The semiconductor operations of Mitsubishi Electric and Hitachi were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Hitachi, Hitachi, Ltd., Hitachi Semiconductors, and other Hitachi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Renesas Technology Home Page: http://www.renesas.com

Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

Cautions

Keep safety first in your circuit designs!

1. Renesas Technology Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.
   Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corporation product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corporation or a third party.
2. Renesas Technology Corporation assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corporation or an authorized Renesas Technology Corporation product distributor for the latest product information before purchasing a product listed herein.
   The information described here may contain technical inaccuracies or typographical errors.
   Renesas Technology Corporation assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.
   Please also pay attention to information published by Renesas Technology Corporation by various means, including the Renesas Technology Corporation Semiconductor home page (http://www.renesas.com).
4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corporation assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corporation semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corporation or an authorized Renesas Technology Corporation product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corporation is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
   Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corporation for further details on these materials or the products contained therein.

User's Manual

H8S/2636, H8S/2638, H8S/2639, H8S/2646, H8S/2282 Series E6000 Emulator HS2646EPI61H

Supplementary Information

Renesas Electronics
www.renesas.com

Rev.5.0 2002.05

Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

IMPORTANT INFORMATION
READ FIRST

• READ this user's manual before using this emulator product.
• KEEP the user's manual handy for future reference.

Do not attempt to use the emulator product until you fully understand its mechanism.

Emulator Product:

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

- Emulator station
- User system interface cables
- PC interface boards
- Optional SIMM memory module

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

Purpose of the Emulator Product:

This emulator product is a software and hardware development tool for systems employing the Hitachi microcomputer H8S/2636, H8S/2638, H8S/2639, H8S/2646, and H8S/2282 series (hereafter referred to as the MCU). This emulator product must only be used for the above purpose.

Limited Applications:

This emulator product is not authorized for use in MEDICAL, atomic energy, aeronautical or space technology applications without consent of the appropriate officer of a Hitachi sales company. Such use includes, but is not limited to, use in life support systems. Buyers of this emulator product must notify the relevant Hitachi sales offices before planning to use the product in such applications.

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 emulator product. 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 Emulator Product:

This emulator product 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 emulator product 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 emulator product.

LIMITED WARRANTY

Hitachi warrants its emulator products 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 emulator products 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 emulator product from you. Hitachi is not liable for any claim made by a third party or made by you for a third party.

DISCLAIMER

HITACHI MAKES NO WARRANTIES, EITHER EXPRESS OR IMPLIED, ORAL OR WRITTEN, EXCEPT AS PROVIDED HEREIN, INCLUDING WITHOUT LIMITATION THEREOF, WARRANTIES AS TO MARKETABILITY, MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE OR USE, OR AGAINST INFRINGEMENT OF ANY PATENT. IN NO EVENT SHALL HITACHI BE LIABLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE, OR LOSSES OR EXPENSES RESULTING FROM ANY DEFECTIVE EMULATOR PRODUCT, THE USE OF ANY EMULATOR PRODUCT, OR ITS DOCUMENTATION, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCEPT AS EXPRESSLY STATED OTHERWISE IN THIS WARRANTY, THIS EMULATOR PRODUCT IS SOLD "AS IS ", AND YOU MUST ASSUME ALL RISK FOR THE USE AND RESULTS OBTAINED FROM THE EMULATOR PRODUCT.

State Law:

Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights which may vary from state to state.

The Warranty is Void in the Following Cases:

Hitachi shall have no liability or legal responsibility for any problems caused by misuse, abuse, misapplication, neglect, improper handling, installation, repair or modifications of the emulator product without Hitachi's prior written consent or any problems caused by the user system.

All Rights Reserved:

Other Important Things to Keep in Mind:

1. Circuitry and other examples described herein are meant merely to indicate the characteristics and performance of Hitachi's semiconductor products. Hitachi assumes no responsibility for any intellectual property claims or other problems that may result from applications based on the examples described herein.

2. No license is granted by implication or otherwise under any patents or other rights of any third party or Hitachi.

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 emulator product are therefore not all inclusive. Therefore, you must use the emulator product safely at your own risk.

SAFETY PAGE

READ FIRST

• READ this user's manual before using this emulator product.

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

Do not attempt to use the emulator product 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.**
4. **Supply power according to the power specifications and do not apply an incorrect power voltage. Use only the provided power cable.**

CAUTION

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Preface

Thank you for purchasing the H8S/2636, H8S/2638, H8S/2639, H8S/2646, and H8S/2282 series E6000 emulator.

The H8S/2636, H8S/2638, H8S/2639, H8S/2646, and H8S/2282 series E6000 emulator (hereafter referred to as the E6000) was designed as a software and hardware development tool for systems based on Hitachi's original microcomputers HD64F2636, and HD64F2646.

The E6000 provides a CD-R that contains the Hitachi Debugging Interface (HDI) system program, test program, and the user’s manual.

There are three manuals for the E6000: the H8S series E6000 Emulator User's Manual, this Supplementary Information, and the Hitachi Debugging Interface User's Manual. The E6000 Emulator User's Manual describes E6000 functions common to all H8S series microcomputers. This Supplementary Information describes the functions specialized for each microcomputer supported by the H8S/2636, H8S/2638, H8S/2639, H8S/2646, and H8S/2282 series E6000 emulator. Please read this manual before using the E6000.

To connect the E6000 to the user system, a user system interface cable for each package type is available. For details on the user system interface cable, refer to the User System Interface Cable User's Manual.

The following shows the related manuals:

- H8S Series E6000 Emulator User's Manual (HS2000EPI61HE)
- Hitachi Debugging Interface User's Manual (HS6400DIIW5SE)
- User System Interface Cable User's Manual (HS2646ECH61HE, etc)
- The PC interface board user's manual which will be the following manuals:
  - ISA Bus Interface Board User's Manual (HS6000EII01HE)
  - PCI Bus Interface Board User's Manual (HS6000EIC01HE, HS6000EIC02HE)
  - PCMCIA Interface Card User's Manual (HS6000EIP01HE)
  - LAN Adapter (HS6000ELN01H)
- Option Memory Board User's Manual
  - 1M SIMM Memory Board User's Manual (HS6000EMS11HE)
  - 4M SIMM Memory Board User's Manual (HS6000EMS12HE)

Note: Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and/or in other countries.

Contents

Figures

Tables

Section 1 Overview

The H8S/2636, H8S/2638, H8S/2639, H8S/2646, and H8S/2282 series E6000 emulator (hereafter referred to as the E6000) is an efficient software and hardware development support tool for application systems using Hitachi's original microcomputers H8S/2636, H8S/2638, H8S/2639, H8S/2646, and H8S/2282 series.

1.1 Environment Conditions

Table 1.1 Environment Conditions

Item	Specifications	
Temperature	Operating: +10 to +35°C	
	Storage: –10 to +50°C	
Humidity	Operating: 35 to 80% RH; no condensation	
	Storage: 35 to 80% RH; no condensation	
Ambient gases	No corrosive gases	
AC Power supply voltage	100 V to 240 V AC ±5% 50/60 Hz 0.6 A max.	
AC input cable*	HS2646EPI61H	HS2646EPI61HB
	100 V-120 V (UL)	200 V-240 V (BS)
User system voltage (UVcc)	Depends on the target MCU within the range 4.5 V to 5.5 V	

Note: HS2646EPI61H must be used at AC100 V-120 V input voltage.
HS2646EPI61HB must be used at AC200 V-240 V input voltage.

1.2 Supported MCUs and User System Interface Cables

Tables 1.2 to 1.4 show the correspondence between the MCUs and the user system interface cables supported by the E6000.

Table 1.2 H8S/2636, H8S/2638, H8S/2639 Series MCU and User System Interface Cable

No.	MCU Type Number	Package	E6000 User System Interface Cables
1	HD64F2636	128-pin QFP (FP-128)	HS2636ECH61H
	HD64F2638		
	HD64F2639		

Table 1.3 H8S/2646 Series MCU and User System Interface Cable

No.	MCU Type Number	Package	E6000 User System Interface Cables
1	HD64F2646 HD64F2648R	144-pin QFP (FP-144)	HS2646ECH61H

Table 1.4 H8S/2282 Series MCU and User System Interface Cable

No.	MCU Type Number	Package	E6000 User System Interface Cables
1	HD64F2282	100-pin QFP (FP-100A)	HS2282ECF61H

1.3 Operating Voltage and Frequency Specifications

Table 1.5 shows examples of the MCU operating voltage and frequency specifications supported by the E6000. If the E6000 is used in an environment that exceeds the operating voltage range and operating frequency range guaranteed for the MCU operation, normal emulator operation is not guaranteed.

Table 1.5 Operating Voltage and Frequency Specifications

MCU Types	Operating Voltage (V)	Operating Frequency (ϕ) (MHz)
H8S/2636, H8S/2638, H8S/2639 series	4.5-5.5	4-20
H8S/2646 series	4.5-5.5	4-20
H8S/2282 series	4.5-5.5	4-20

NOTE

For details on the operating voltage and frequency specifications, refer to the MCU hardware manual.

In the E6000, the clock can be selected by using the Configuration window or the Clock command.

Table 1.6 Clock Selections

Clock Command Parameter		Configuration Window Setting		Notes
Main clock	32kHz*	Main clock	Subclock	
10		10MHz internal clock	32 kHz internal clock	Default
20		20 MHz internal clock		
t		Target		
t2		Target/2		

Note: Specify 32kHz even when the subclock (32kHz) is not used.

Section 2 User System Interface

All user system interface signals are directly connected to the MCU in the E6000 with no buffering except for those listed below which are connected to the MCU through control circuits:

- NMI
- RESET
- MD2, MD1, MD0
- XTAL
- EXTAL
- OSC1
- OSC2
- STBY
- WAIT

2.1 Signal Protection

All user system interface signals are protected from over- or under-voltage by use of diode arrays except for the AVcc and Vref.

The Vcc pins (except for the AVcc pin) at the head of the user system interface cable are connected together. The E6000 monitors the voltage level of the Vcc pins and displays the power-supply status in the Status Window.

2.2 User System Interface Circuits

The interface circuit between the MCU in the E6000 emulator and the user system has a signal delay of about 8 ns due to the user system interface cable. And high-impedance signals will be pulled up to the high level by pull-up resistors. When connecting the E6000 emulator to a user system, adjust the user system hardware to compensate for propagation delays.

The following diagrams show the interface signal circuits

Default:

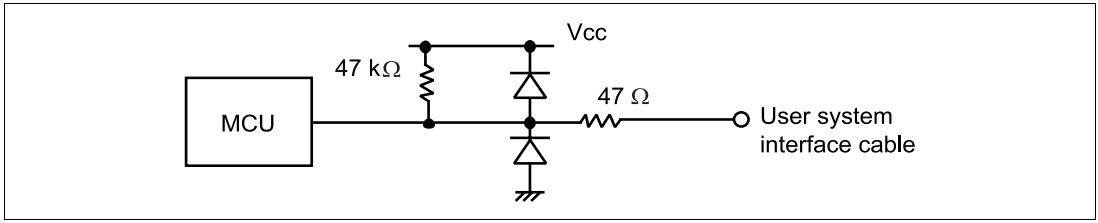

Figure 2.1 Default User System Interface Circuit

Mode Pins (MD2, MD1 and MD0), NMI and WAIT: The NMI signal is input to the MCU through the emulator control circuit. The rising/falling time of the NMI signal must be 8 ns/V or less. The mode pins are only monitored. The CPU mode depends on the HDI Configuration settings.

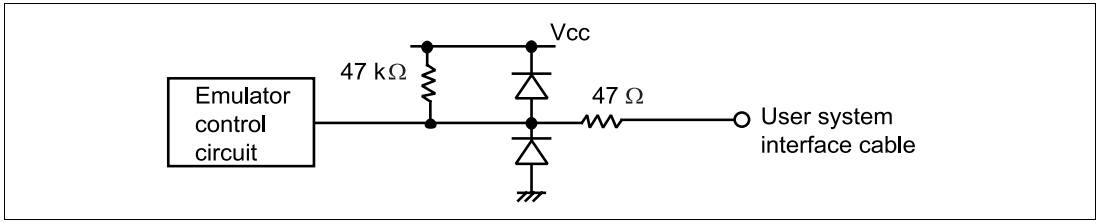

Figure 2.2 User System Interface Circuit for MD2, MD1, MD0, NMI, and WAIT

RESET:

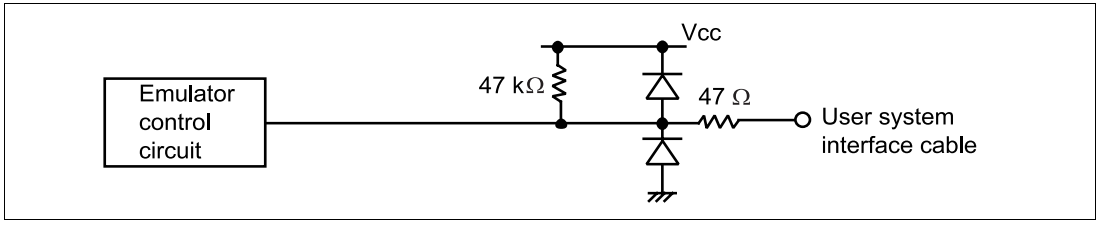

Figure 2.3 User System Interface Circuit for RESET

PWM1A-H, PWM2A-H:

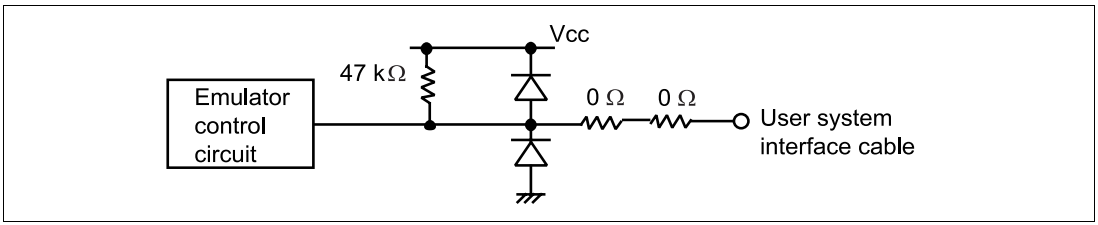

Figure 2.4 User System Interface Circuit for PWM1A-H and PWM2A-H Signals

AN0-AN11, SEG1-SEG24, COM1-COM4, V1-V3, AVcc, AVss and Vref:

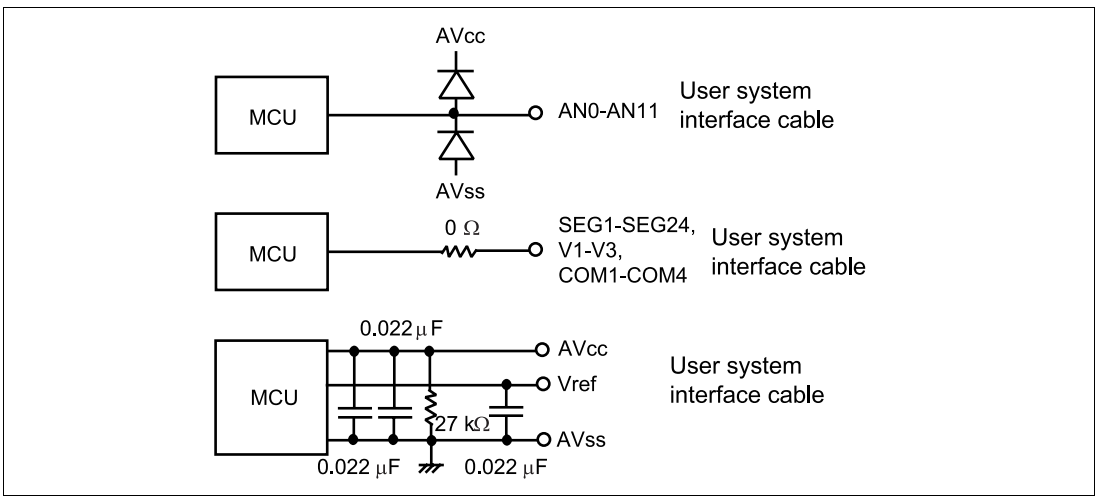

Figure 2.5 User System Interface Circuit for AN0-AN11, SEG1-SEG24, COM1-COM4, V1-V3, AVcc, AVss and Vref Signals

SEG1-SEG24, COM1-COM4:

⚠ WARNING

1. **Always switch OFF the emulator product and user system, before setting the switches. Failure to do so will result in a FIRE HAZARD and will damage the user system and emulator product or will result in PERSONAL INJURY.**
2. **Before closing the cover of the emulator, be sure to check that no foreign objects such as metal fractions are left inside the emulator station.**

In the H8S/2646, H8S/2282 series emulator, pins SEG1-SEG40 and COM1-COM4 are also used for ports. Use the switches on the HS2646PWB61H board (inside the E6000 casing, installed on the top) for setting. Before emulating a program using the H8S/2646, H8S/2282 series emulator, set the switches according to table 2.1 through table 2.3. When using the H8S/2636, H8S/2638, H8S/2639 series E6000 emulator, set all the switches (1 to 46) to pin 1.

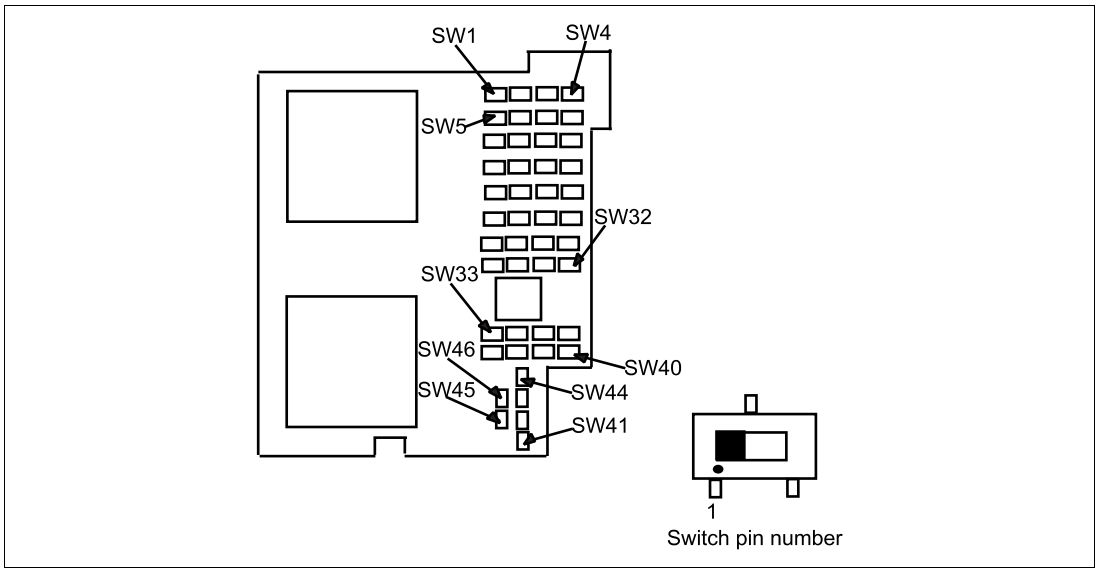

Figure 2.6 Signal Select Switches

Table 2.1 H8S/2646 Signal Select Switch Settings

Switch No.	Setting to Pin 1	Setting to the Other Pin	Notes
SW1	PE0	-*	Default setting: pin 1
SW2	PE1	-*	
SW3	PE2	-*	
SW4	PE3	-*	
SW5	PE4	-*	
SW6	PE5	-*	
SW7	PE6	-*	
SW8	PE7	-*	
SW9	PD0	-*	
SW10	PD1	-*	
SW11	PD2	-*	
SW12	PD3	-*	
SW13	PD4	-*	
SW14	PD5	-*	
SW15	PD6	-*	
SW16	PD7	-*	
SW17	PC0	SEG1	
SW18	PC1	SEG2	
SW19	PC2	SEG3	
SW20	PC3	SEG4	
SW21	PC4	SEG5	
SW22	PC5	SEG6	
SW23	PC6	SEG7	
SW24	PC7	SEG8	
SW25	PB0	SEG9	
SW26	PB1	SEG10	
SW27	PB2	SEG11	
SW28	PB3	SEG12	
SW29	PB4	SEG13	
SW30	PB5	SEG14	

Note: Do not set this pin.

Table 2.1 H8S/2646 Signal Select Switch Settings (cont)

Switch No.	Setting to Pin 1	Setting to the Other Pin	Notes
SW31	PB6	SEG15	Default setting: pin 1
SW32	PB7	SEG16	
SW33	PF2	SEG17	
SW34	PF4	SEG18	
SW35	PF5	SEG19	
SW36	PF6	SEG20	
SW37	PA4	SEG21	
SW38	PA5	SEG22	
SW39	PA6	SEG23	
SW40	PA7	SEG24	
SW41	PA0	COM1	
SW42	PA1	COM2	
SW43	PA2	COM3	
SW44	PA3	COM4	
SW45	P24	-*	
SW46	P26	-*	

Note: Do not set this pin.

Table 2.2 H8S/2648R Signal Select Switch Settings

Switch No.	Setting to Pin 1	Setting to the Other Pin	Notes
SW1	PE0	SEG1	Default setting: pin 1
SW2	PE1	SEG2	
SW3	PE2	SEG3	
SW4	PE3	SEG4	
SW5	PE4	SEG5	
SW6	PE5	SEG6	
SW7	PE6	SEG7	
SW8	PE7	SEG8	
SW9	PD0	SEG9	
SW10	PD1	SEG10	
SW11	PD2	SEG11	
SW12	PD3	SEG12	
SW13	PD4	SEG13	
SW14	PD5	SEG14	
SW15	PD6	SEG15	
SW16	PD7	SEG16	
SW17	PC0	SEG17	
SW18	PC1	SEG18	
SW19	PC2	SEG19	
SW20	PC3	SEG20	
SW21	PC4	SEG21	
SW22	PC5	SEG22	
SW23	PC6	SEG23	
SW24	PC7	SEG24	
SW25	PB0	SEG25	
SW26	PB1	SEG26	
SW27	PB2	SEG27	
SW28	PB3	SEG28	
SW29	PB4	SEG29	
SW30	PB5	SEG30	

Table 2.2 H8S/2648R Signal Select Switch Settings (cont)

Switch No.	Setting to Pin 1	Setting to the Other Pin	Notes
SW31	PB6	SEG31	Default setting: pin 1
SW32	PB7	SEG32	
SW33	PF2	SEG33	
SW34	PF4	SEG34	
SW35	PF5	SEG35	
SW36	PF6	SEG36	
SW37	PA4	SEG37	
SW38	PA5	SEG38	
SW39	PA6	SEG39	
SW40	PA7	SEG40	
SW41	PA0	COM1	
SW42	PA1	COM2	
SW43	PA2	COM3	
SW44	PA3	COM4	
SW45	P24	-*	
SW46	P26	-*	

Note: Do not set this pin.

Table 2.3 H8S/2282 Signal Select Switch Settings

Switch No.	Setting to Pin 1	Setting to the Other Pin	Notes
SW1	PE0	-*	Default setting: pin 1
SW2	PE1	-*	
SW3	PE2	-*	
SW4	PE3	-*	
SW5	PE4	-*	
SW6	PE5	-*	
SW7	PE6	-*	
SW8	PE7	-*	
SW9	PD0	-*	
SW10	PD1	-*	
SW11	PD2	-*	
SW12	PD3	-*	
SW13	PD4	SEG1	
SW14	PD5	SEG2	
SW15	PD6	SEG3	
SW16	PD7	SEG4	
SW17	PC0	SEG5	
SW18	PC1	SEG6	
SW19	PC2	SEG7	
SW20	PC3	SEG8	
SW21	PC4	SEG9	
SW22	PC5	SEG10	
SW23	PC6	SEG11	
SW24	PC7	SEG12	
SW25	PB0	SEG13	
SW26	PB1	SEG14	
SW27	PB2	SEG15	
SW28	PB3	SEG16	
SW29	PB4	SEG17	
SW30	PB5	SEG18	

Note: Do not set this pin.

Table 2.3 H8S/2282 Signal Select Switch Settings (cont)

Switch No.	Setting to Pin 1	Setting to the Other Pin	Notes
SW31	PB6	SEG19	Default setting: pin 1
SW32	PB7	SEG20	
SW33	PF2	SEG21	
SW34	PF4	SEG22	
SW35	PF5	SEG23	
SW36	PF6	SEG24	
SW37	PA4	SEG25	
SW38	PA5	SEG26	
SW39	PA6	SEG27	
SW40	PA7	SEG28	
SW41	PA0	COM1	
SW42	PA1	COM2	
SW43	PA2	COM3	
SW44	PA3	COM4	
SW45	P24	-*	
SW46	P26	-*	

Note: Do not set this pin.

Section 3 Notes on Use

3.1 I/O Register Differences between Actual MCU and E6000

In the E6000, one evaluation chip emulates several types of MCU. Therefore, there are some differences in I/O registers between an actual MCU and the E6000. Note these differences when accessing the I/O registers.

I/O port is in the input state at default. The I/O register contents indicate the emulator port status. When the user system interface cable is not connected, the read value is 1 due to the emulator's pull-up resistors.

In the E6000, accesses to the following registers for controlling the flash memory are invalid.

- RAM emulation register (RAMER: H'FEDB)
- Flash memory control register 1 (FLMCR1: H'FFA8)
- Flash memory control register 2 (FLMCR2: H'FFA9)
- Erase block register 1 (EBR1: H'FFAA)
- Erase block register 2 (EBR2: H'FFAB)

Flash memory power control register (FLPWCR: H'FFAC)

3.2 Access to the Reserved Area

When accessing the reserved area, note the following:

If the reserved area is used, the operation in the actual MCU cannot be guaranteed. If the user program extends to the reserved area during debugging, select the MCU having the largest ROM capacity.

3.3 Use of an Internal RAM Area as External Memory

An internal RAM area can be used as an external address when the RAME bit of the SYSCR is cleared to 0. An emulator (optional memory) cannot be specified for the internal RAM area. Only user memory can be accessed as an external address. Option memory cannot be accessed as an external address. In this case, Memory Mapping must be set to Internal RAM.

3.4 Support of Flash Memory

The E6000 does not emulate the flash memory control operation in the MCU.

3.5 Hardware Standby

When the User Standby enable check box is selected in the Configuration window, the STBY signal of the user system is directly input to the E6000.

When the STBY signal is input, the E6000 hardware is initialized and the E6000 stops emulation. Therefore, the User Standby enable check box should be cleared (not selected) for general emulation.

3.6 Selecting the Emulation Device

WARNING

1. **Always switch OFF the emulator product and user system, before setting the switches. Failure to do so will result in a FIRE HAZARD and will damage the user system and emulator product or will result in PERSONAL INJURY.**
2. **Before closing the cover of the emulator, be sure to check that no foreign objects such as metal fractions are left inside the emulator station.**

Select the emulation device by using the JSW6 switch on the HS2646PWB61H board (inside the E6000 casing, installed on the top).

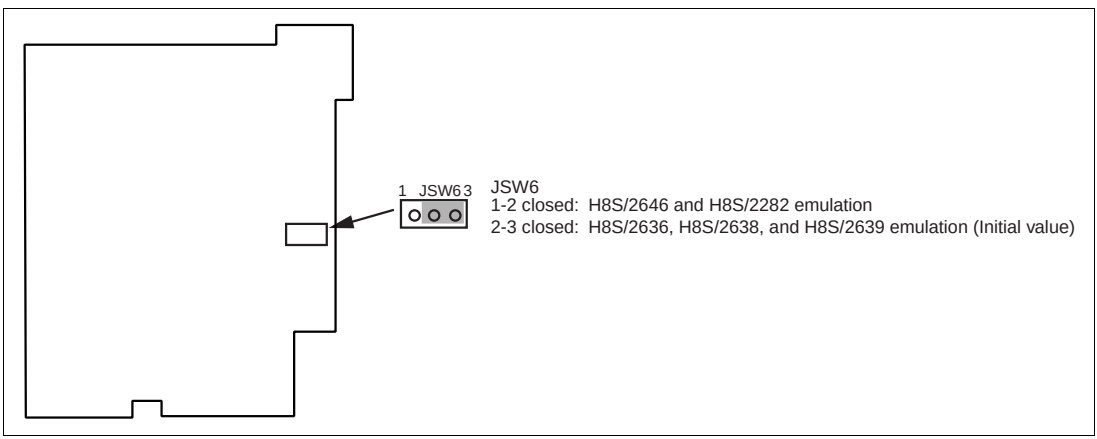

Figure 3.1 JSW6 Setting

3.7 Support of the H8S/2639

To emulate the H8S/2639, select H8S/2638. However, note that the following limitation.
The H8S/2639 incorporates a subclock divider that divides an input clock into 1/128 and generates ϕSUB. However, this emulator does not support the division function. Note that 32.768 kHz is always selected as a subclock.

3.8 Support of the H8S/2282

The H8S/2282 incorporates a subclock divider that divides an input clock into 1/128 and generates ϕSUB. However, this emulator does not support the division function. Note that 32.768 kHz is always selected as a subclock.

Section 4 HDI Parameters

4.1 Address Areas

Table 4.1 lists the parameters for address areas (Area) that can be specified with HDI command line interface or displayed as trace results.

Table 4.1 Address Area Parameters

HDI Parameter (Trace Display)	Address Area	Description
rom	On-chip ROM	MCU's on-chip ROM, which can be read but cannot be written to.
ram	On-chip RAM	MCU's on-chip RAM (except for DTC RAM), which can be read and written to.
IO16 (I/O-16)	Internal I/O registers (16-bit bus)	MCU's internal I/O registers for the 16-bit bus.
IO8 (I/O-8)	Internal I/O registers (8-bit bus)	MCU's internal I/O registers for the 8-bit bus.
IO	Internal I/O registers	MCU's internal I/O registers for the 8-bit bus and 16-bit bus.
ext16 (EXT-16)	External area (16-bit bus)	External area for the 16-bit bus, which can be allocated to the user system memory or the optional SIMM memory module in the E6000.
ext8 (EXT-8)	External area (8-bit bus)	External area for the 8-bit bus, which can be allocated to the user system memory or the optional SIMM memory module in the E6000.
ext	External area	External area for the 8-bit bus and 16-bit bus, which can be allocated to the user system memory or optional SIMM memory module in the E6000.
Dtcram (RAM/DTC)	DTC RAM	MCU's on-chip RAM for DTC.

4.2 Access Status

Table 4.2 lists the parameters for access status (Status) that can be specified with HDI command line interface or displayed as trace results.

Table 4.2 Access Status Parameters

HDI Parameter (Trace Display)	Access Status	Description
dmac	On-chip DMAC	Access by the MCU's DMAC (Cannot be accessed by the EXDMA controller.)
dtc	On-chip DTC	Access by the MCU's DTC
refresh	Refresh	Refresh cycle by the MCU's refresh controller
prefetch (PROG)	CPU prefetch	Instruction prefetch cycle by the CPU
data (DATA)	CPU data access	Data access for instruction execution by the CPU

4.3 I/O Modules

Table 4.3 lists the parameters for I/O module selection in the custom setting of the HDI configuration window.

Table 4.3 I/O Modules

HDI Parameter	I/O Module
PWM14	MCU's 14-bit PWM.
D/A	MCU's D/A.
TMR2-3	MCU's 8-bit timer (TMR2-3).
WDT1	MCU's WDT (WDT1).
IIC1	MCU's I2C bus (IIC1).
IIC0	MCU's I2C bus (IIC0).
IrDA	MCU's IrDA.
DTC	MCU's DTC.
TPU3-5	MCU's 16-bit timer pulse unit (TPU3-5).
MULT	CPU's multiplier.
DMAC	MCU's DMAC.
REFRESH	MCU's refresh controller.
a/d (4 | 8)	A/D converter. Four or eight data registers can be selected.
sci (1 | 2 | 3 | 4)	Serial communication interface. The number of channels can be selected as follows: 1: SCI0, 1 2: SCI0, 1, 2 3: SCI0, 1, 2, 3 4: SCI0, 1, 2, 3, 4

Section 5 Diagnostic Test Procedure

This section describes the diagnostic test procedure using the E6000 test program.

5.1 System Set-Up for Test Program Execution

To execute the test program, use the following hardware; do not connect the user system interface cable and user system.

- E6000 (HS2646EPI61H)
- Host computer
- The E6000 PC interface board which will be one of the following boards or card:
  Select one interface board from the following depending on the PC interface specifications.
  ISA bus interface board (HS6000EII01H)
  PCI bus interface board (HS6000EIC01H or HS6000EIC02H)
  PCMCIA interface card (HS6000EIP01H)

1. Install the E6000 PC interface board in the host computer and connect the supplied PC interface cable to the board.
2. Connect the PC interface cable to the E6000.
3. Connect the supplied AC adapter to the E6000.
4. Initiate the host computer to make it enter DOS prompt command input wait state.
5. Turn on the E6000 switch.

5.2 Diagnostic Test Procedure Using the Test Program

Insert the CD-R (HS2646EPI61SR supplied with the E6000) into the CD-ROM drive of the host computer by pressing the Shift key, move the current directory to <Drive>:\Diag with a command prompt, and enter one of the following commands according to the PC interface board used to initiate the test program:

1. ISA bus interface board (HS6000EII01H)
   > TM2646 –ISA (RET)

2. PCI bus interface board (HS6000EIC01H or HS6000EIC02H)
   > TM2646 –PCI (RET)

3. PCMCIA interface card (HS6000EIP01H)
   > TM2646 –PCCD (RET)

The HDI must be installed before the test program is executed.

Be sure to initiate the test program from <Drive>:\Diag. Do not initiate it from a directory other than <Drive>:\Diag, such as > <Drive>:\Diag\TM2646 –ISA (RET). If the test program is initiated when the current directory is not <Drive>:\Diag, the test program will not operate correctly.

When –S is added to the command line such as > TM2646 –ISA –S (RET), steps 1 to 18 will be repeatedly executed. To stop the execution, enter Q.

Notes: 1. When the CD-R is inserted into the CD-ROM drive without pressing the Shift key, the HDI installation wizard is automatically started.
   In such a case, exit the HDI installation wizard.

2. <Drive> is a drive name for the CD-ROM drive.

3. Do not remove the CD-R from the CD-ROM drive during test program execution.

It will take about 11 minutes to execute the test program when the host computer using Windows®95 runs at 166 MHz and the PCMCIA interface card is used. The following messages are displayed during the test.

Message	Description
`E6000 H8S/2646 EMULATION BOARD Tests Vx.x` `Hitachi Ltd (1999)`	Test program start message. Vx.x shows the version number.
`SIMM module fitted? (1.None 2.1MB 3. 4MB) 1`	Enter 1 because the SIMM memory module is not installed in this example.
`Searching for interface card ........OK, card at H'd0000`	Shows that the PC interface board is correctly installed in the host computer, and displays the address when the ISA bus interface is installed. The displayed address depends on the settings. When the PCI interface board or PCMCIA interface card is installed, the address is not displayed.
`Checking emulator is connected ......OK`	Shows that the E6000 is correctly connected to the host computer.

```
  Emulator Board Information:
     Main Board ID      H'5

     Emulation Board ID H'd

      SUB Board ID      H'4

 SIMM            No SIMM module inserted

Downloading firmware .....

01) Testing Main Board Register :
  IDR0 Register.....................OK
  PAGE Register.....................OK
  TRACE G/A Register................OK
  PERFM G/A Register................OK
  CES GA register ..................OK
  IDR1 Register.....................OK

02) Testing Dual-Port RAM :
  Decode Test ......................OK
  Marching Test ....................OK
```

Shows the ID number of the lower board of the E6000 (always 5).

Shows the ID number of the middle board of the E6000 (always d).

Shows the ID number of the upper board of the E6000 (always 4).

Shows whether the SIMM memory board is installed.

Loading the test program.

Shows the check results for the registers in the E6000 (normal completion).

Shows the results of decoding test and step test for the dual-port RAM in the E6000 (normal completion).

```
  03) Testing Firmware RAM :
    Decode Test. page range H'700 - H'71f ..........OK
```
Shows the results of decoding test for the firmware RAM in the E6000 (normal completion).

```
    Marching Test. page range H'700 - H'71f ........OK
```
Shows the results of step test for the firmware RAM in the E6000 (normal completion).

```
Downloading firmware .....
```
Loading the test program.

```
  04) Testing Trace RAM :
    Decode Test. page range H'000 - H'04f ..........OK
```
Shows the results of decoding test for the trace RAM (first half) in the E6000 (normal completion).

```
    Marching Test. page range H'000 - H'04f ........OK
```
Shows the results of step test for the trace RAM (first half) in the E6000 (normal completion).

```
    Decode Test. page range H'000 - H'04f .........OK
```
Shows the results of decoding test for the trace RAM (last half) in the E6000 (normal completion).

```
    Marching Test. page range H'000 - H'04f ........OK
```
Shows the results of step test for the trace RAM (last half) in the E6000 (normal completion).

```
05) Testing Mapping RAM :
  Decode Test.   page range H'200 - H'27f ........OK
```

Shows the results of decoding test for the mapping RAM in the E6000 (normal completion).

```
  Marching Test. page range H'200 - H'27f ........OK
```

Shows the results of step test for the mapping RAM in the E6000 (normal completion).

```
06) Testing Internal ROM and RAM :
    Setting up, please wait..
    Decode Test   [0×000000 – 0×000fff] .......OK
    Marching Test [0×000000 – 0×000fff] .......OK
    Decode Test   [0×001000 – 0×01ffff] .......OK
    Marching Test [0×001000 – 0×01ffff] .......OK
    Decode Test   [0×ffe000 – 0×ffefbf] .......OK
    Marching Test [0×ffe000 – 0×ffefbf] .......OK
    Decode Test   [0×ffffc0 – 0×ffffff] .......OK
    Marching Test [0×ffffc0 – 0×ffffff] .......OK
```

Shows the results of decoding test and step test for internal ROM and RAM in the E6000 (normal completion).

```
07) Testing Option RAM :
    Setting up, please wait..
    No SIMM fitted - test skipped
```

Shows the check results for the optional SIMM memory module in the E6000 (not installed).

```
08) Testing STEP Operation :
    Setting up, please wait..
    Step Operation ............................OK
```

Shows the check results for the step execution controlling circuits in the E6000 (normal completion).

```
09) Testing Key Break :
    Setting up, please wait..
    Key Break .................................OK
```

Shows the check results for the forced break controlling circuits in the E6000 (normal completion).

```
10) Testing Emulation RAM Hardware Break :
    Setting up, please wait..
    GRD Break ..........................OK
    Setting up, please wait..
    WPT Break ..........................OK
```

Shows the check results for the illegal access break controlling circuits in the E6000 (normal completion).

```
11) Testing Internal ROM Write-Protect :
    Setting up, please wait..
    Write-Protect ....................OK
```

Shows the check results for the internal ROM write-protection controlling circuits in the E6000 (normal completion).

```
12) Testing Hardware Break :
    Setting up, please wait..
    A)Break Point Initialized ............OK
    B)Event Detectors CES channel 1-12 ...OK
    C)Test Sequencing 1 ..................OK
    D)Check Range Break ..................OK
    E)Range Break Test for Data ..........OK
    F)Check Compare Either ...............OK
```

Shows the check results for the hardware break control circuits in the E6000 (normal completion).

```
13) Testing Emulation RAM Trace :
    Setting up, please wait..
    A)Free Trace Test ....................OK
    B)Range Trace Test ...................OK
    C)Point to Point Trace Test ..........OK
    D)Start and Stop Event Trace Test ....OK
    E)Trace memory Overflow Test .........OK
    F)Time STAMP Trace Test ..............OK
      Time STAMP Trace Test 1 ............OK
      Time STAMP Trace Test 2 ............OK
      Time STAMP Trace Test 3 ............OK
```

Shows the check results for the trace controlling circuits in the E6000 (normal completion).

```
14) Testing Runtime counter :
    Setting up, please wait..
    Testing Internal Clock = 20.0 MHz ....OK
    Testing Internal Clock = 10.0 MHz ....OK
```

Shows the check results for the run-time counter in the E6000 (normal completion).

```
15) Testing Emulation Monitor :
    Setting up, please wait..
    A)EMA23-EMA0(MONIT00:D7-D0,MONIT10,E:D7-D0)TEST..OK
    B)ACST2-ACST0(MONIT0E:D2-D0)TEST.................OK
    C)ST3-ST0(MONIT2E:D3-D0)TEST.....................OK
    D)BRKACK(MONIT0E:D7)TEST.........................OK
    E)CNN(MONIT3E:D1)TEST............................OK
    F)NOCLK(MONIT3E:D2)TEST..........................OK
```

Shows the check results for the emulation monitor controlling circuits in the E6000 (normal completion).

```
 16) Testing PERM_GA :
     Setting up, please wait..
     A)Time Measure Test .........................OK
     B)PERM_POINT TO POINT Time Measure Test .....OK
     C)PERM_SUBROUTINE Time Measure Test .........OK
     D)PERM Time Out Bit Test
       Time Out Test 1............................OK
       Time Out Test 2............................OK
```

Shows the check results for the performance analysis controlling circuits in the E6000 (normal completion).

```
 17) Testing Bus Monitor :
     Setting up, please wait..
     A) Register test.............................OK
     B) Parallel RAM test.........................OK
     C) SPRSEL2 test..............................OK
     Setting up, please wait..
     D) RAM monitor test..........................OK
```

Shows the check results for the bus monitor controlling circuits in the E6000 (normal completion).

```
 18) Testing Parallel Access :
     A)IN ROM Parallel Read Access(WORD) .........OK
     B)IN ROM Parallel Write Access(WORD) ........OK
     C)IN ROM Parallel Write Access(High Byte) ...OK
     D)IN ROM Parallel Write Access(Low Byte) ....OK
     E)IN RAM Parallel Read Access(WORD) .........OK
     F)IN RAM Parallel Write Access(WORD) ........OK
     G)IN RAM Parallel Write Access(High Byte) ...OK
     H)IN RAM Parallel Write Access(Low Byte) ....OK
      I)SIMM Parallel Read Access(WORD) ...........SKIP
      J)SIMM Parallel Write Access(WORD) ..........SKIP
      K)SIMM Parallel Write Access(High Byte) .....SKIP
      L)SIMM Parallel Write Access(Low Byte) ......SKIP
```

Shows the check results for the parallel access controlling circuits in the E6000 (normal completion).

```
Tests run for xH:xM:xS
```

Shows the check time.

```
0 total errors
```

Total number of errors.

```
Tests passed, emulator functioning correctly
```

Shows that the E6000 is correctly operating.