H8/3067, H8/3064 Series, H8/3062 Series, H8/3007, H8/3006 E6000 Emulator

HS3067EPI62H

Supplementary Information

HITACHI

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Hitachi, Ltd.

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• 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 board
- 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 H8/3067, H8/3064, H8/3062, H8/3007, H8/3006, series (hereafter referred to as the MCU). This emulator product must only be used for the above purpose.

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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.

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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 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 H8/3067, H8/3064, H8/3062, H8/3007, H8/3006 series E6000 emulator.

The H8/3067, H8/3064, H8/3062, H8/3007, H8/3006 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 HD64F3067, HD64F3064, HD64F3062, HD6413007, HD6413006 series. 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 H8/300H 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 H8/300H series microcomputers. This Supplementary Information describes the functions specialized for each microcomputer supported by the H8/3067, H8/3064, H8/3062, H8/3007, H8/3006 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:

- E6000 H8/300H Series Emulator User's Manual (HS300HEPI61HE)
- Hitachi Debugging Interface User's Manual (HS6400DIIW5SE)
- User System Interface Cable User's Manual (HS3067ECH61HE, 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)
- Description Notes on Using LAN Adapter for E6000/E8000 Emulator (HS6000ELN01H)
- Option Memory Board User's Manual
  1M SIMM Memory Board User's Manual (HS6000EMS11HE)
  4M SIMM Memory Board User's Manual (HS6000EMS12HE)
- Bus Monitor for E6000 Emulator HS6000EBR01H User's Manual

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Tables

Section 1 Overview

The H8/3067, H8/3064, H8/3062 Series, H8/3007, H8/3006 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 H8/3067, H8/3064, H8/3062 series, H8/3007, and H8/3006.

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 50/60 Hz 0.6 A max.
User system voltage (UVcc)	Depends on the target MCU within the range 2.7 V to 5.5 V

1.2 Supported MCUs and User System Interface Cables

Table 1.2 shows the correspondence between the MCUs and the user system interface cables supported by the E6000.

Table 1.2 H8/3067F, H8/3067 Series, H8/3064F, H8/3062F, H8/3062 Series, H8/3007, H8/3006 MCUs and User System Interface Cable

MCU Type Number	Package	E6000 User System Interface Cables
HD64F3067	100-pin QFP/TQFP	HS3067ECH61H
HD6433067	FP-100B/TFP-100B	
HD6433066	100-pin QFP	HS3067ECF61H
HD6433065	FP-100A	
HD64F3064		
HD64F3062		
HD6433062		
HD6433061		
HD6433060		
HD6413007		
HD6413006		

1.3 Operating Voltage and Frequency Specifications

Table 1.3 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 1.3 Operating Voltage and Frequency Specifications

MCU Types	Operating Voltage (V)	Operating Frequency (ϕ) (MHz)
H8/3067F	2.7-5.5	1-10
	3.0-5.5	1-13
	4.5-5.5	1-20
H8/3067 series	2.7-5.5	1-10
	3.0-5.5	1-13
	4.5-5.5	1-20
H8/3064F	2.7-5.5	1-10
	3.0-5.5	1-13
	4.5-5.5	1-25
H8/3062F	2.7-5.5	1-10
	3.0-5.5	1-13
	4.5-5.5	1-25
H8/3062 series	2.7-5.5	1-10
	3.0-5.5	1-13
	4.5-5.5	1-25
H8/3007	2.7-5.5	1-10
	3.0-5.5	1-13
	4.5-5.5	1-20
H8/3006	2.7-5.5	1-10
	3.3-5.5	1-13
	4.5-5.5	1-20

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 1.4 Clock Selections

Clock Command Parameter	Configuration Window Setting	Notes
10	10 MHz internal clock	Default
12.5	12.5 MHz internal clock	
20	20 MHz internal clock	
25	25 MHz internal clock	
t	Target	
t2	Target/2	Not supported by the actual MCU. Use this clock only when the required clock duty cannot be obtained.

NOTE

The system clock (ϕ) frequency is the same clock frequency input to the XTAL and EXTAL when external clock t is specified. For example, when a 25-MHz crystal oscillator is connected to the XTAL and EXTAL of the user system, the system clock (ϕ) frequency is 25 MHz. When external clock t2 is specified, the system clock (ϕ) frequency is 1/2 of the clock frequency input to the XTAL and EXTAL.

The frequency of the E6000 internal clock specified with the HDI CLOCK command is applied to the system clock (ϕ).

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
- /RES
- MD2, MD1, MD0
- /STBY
- XTAL
- EXTAL
- /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.

Pull-up resistors are connected to the port signals except for the analog port signals.

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 System 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 4 ns due to the user system interface cable and it includes pull-up resistors. Therefore, high-impedance signals will be pulled up to the high level. 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:

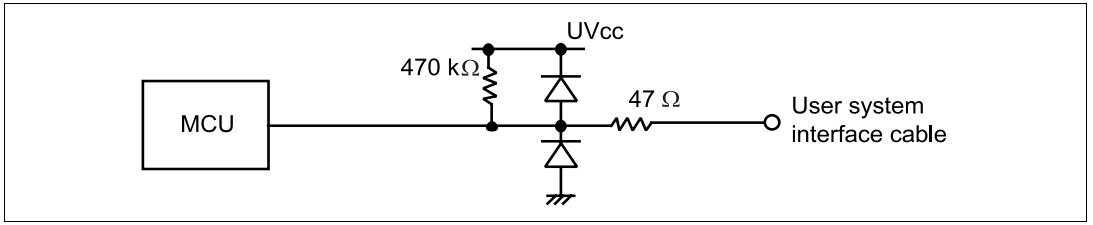

Figure 2.1 Default User System Interface Circuit

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

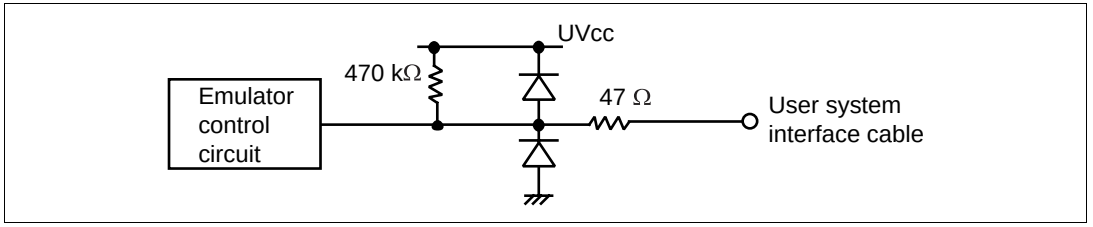

Figure 2.2 User System Interface Circuit for Mode Pins, /STBY, /WAIT, NMI

/RES:

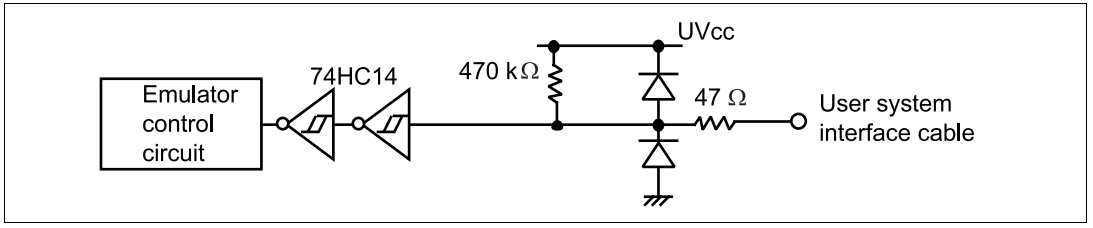

Figure 2.3 User System Interface Circuit for /RES

AN0-AN15, DA0-DA1, AVcc, AVss, Vref:

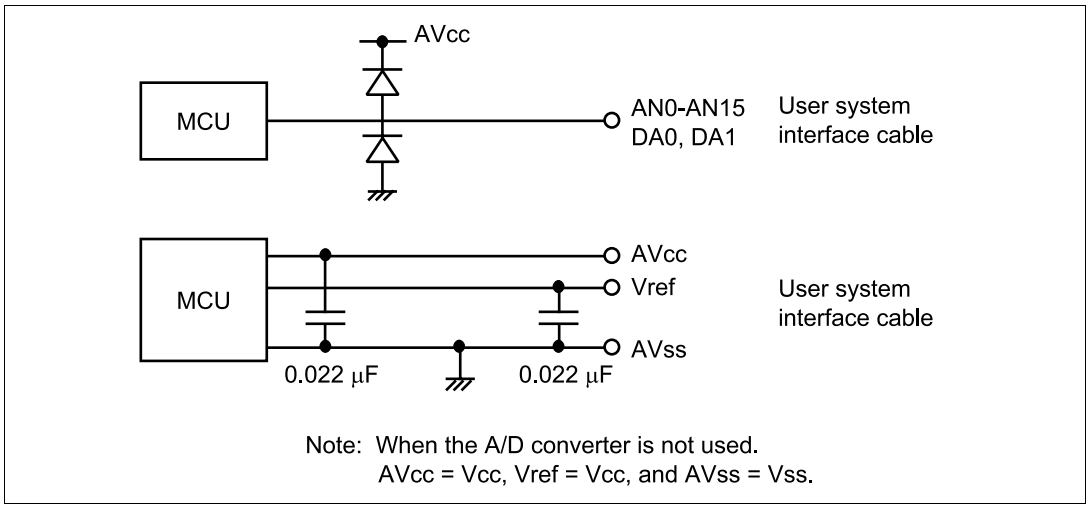

Figure 2.4 User System Interface Circuit for AN0-AN15, DA0-DA1, AVcc, AVss, Vref

/IRQ0–/IRQ7: The /IRQ0 to /IRQ7 signals are input to the MCU and also to the trace acquiring circuit. Therefore, the rising and falling time of these signals must be within 8 ns/V or shorter.

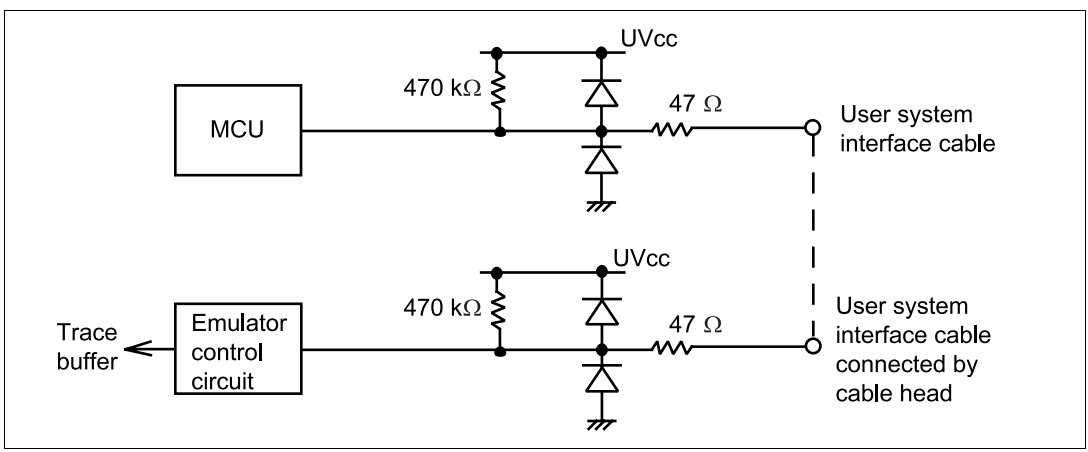

Figure 2.5 User System Interface Circuit for /IRQ0–/IRQ7

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

- RAM control register (RAMCR: H'EE077)
- Flash memory control register (FLMCR: H'EE030)
- Erase block register (EBR: H'EE032)
- Flash memory status register (FLMSR: H’EE07D)

3.2 Differences between Actual MCU and E6000

Table 3.1 shows the differences between actual MCU and E6000 after power supply and command reset.

Table 3.1 Differences between Actual MCU and E6000

Status	Register	E6000 Emulator	MCU
After power-on	PC	Reset vector value	Reset vector value
	ER0 to ER6	Undefined	Undefined
After reset command	ER7 (SP)	H’10	Undefined
	CCR	1 for I mask, others undefined	1 for I mask, others undefined

3.2.1 A/D converter and D/A converter

Since the A/D converter and D/A converter are connected to the user system through the user system interface cable, the precision for those converters are lower than the one described in the MCU's hardware manual.

3.2.2 Support of Flash Memory

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

3.2.3 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 (for example, debug the program for H8/3066 with the H8/3067 memory mapping).

3.3 Hardware Standby

This emulator does not have a hardware standby mode.

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.
ex16n (EXT-16N)	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.
ex16d (EXT-16D)	External DRAM area (16-bit bus)	External DRAM area for the 16-bit bus, which can be allocated to the user system memory or the optional SIMM memory module in the E6000.
ex8n (EXT-8N)	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.
ex8d (EXT-8D)	External DRAM area (8-bit bus)	External DRAM area for the 8-bit bus, which can be allocated to the user system memory or the optional SIMM memory module in the E6000.

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 (DMAC)	On-chip DMAC	Access by the MCU's DMAC
refresh (REFRESH)	Refresh	Refresh cycle by the MCU's refresh controller
cpupre (PROG)	CPU prefetch	Instruction prefetch cycle by the CPU
cpudata (DATA)	CPU data	Instruction data cycle by the CPU

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 (HS3067EPI62H)
- 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, 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 (HS3067EPI62SR supplied with the E6000) into theCD-ROM drive of 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)
   >TM3067 –ISA (RET)

2. PCI bus interface bad (HS6000EIC01H, HS6000EIC02H)
   >TM3067 –PCI (RET)

3. PCMCIA interface card (HS6000EIP01H)
   >TM3067 –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\TM3067 –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 > TM3067 –ISA –S (RET), steps 1 to 16 will be repeatedly executed. To stop the execution, enter Q. When –L filename is added to the command line such as > TM3067 –ISA –L filename (RET), the log name at the execution is saved in filename. When –? is added to the command line such as > TM3067 –ISA –? (RET), online help (option) is displayed.

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. The following execution example shows when the 4-MB SIMM (emulation board) has been mounted.

Message	Description
E6000 H8/3067 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) : 3	Selects a SIMM memory module
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. The displayed address depends on the settings.
Checking emulator is connected .....OK	Shows that the E6000 is correctly connected to the host computer.
Emulator Board Information: Main Board ID H'1	Shows the ID number of the lower board of the E6000 (always 1).
Emulation Board ID H'13	Shows the ID number of the upper board of the E6000 (always 13).

Revision	H'x	Shows the revision number of the upper board of the E6000.
SIMM	4MB	Shows the size of the emulation memory installed in the E6000.

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

01) Testing Register :

C.E.S G/A.....OK
Register Test.....OK
READ ADDRESS = 1F10 READ DATA = 06
READ ADDRESS = 1F11 READ DATA = 02
READ ADDRESS = 1F12 READ DATA = 14
READ ADDRESS = 1F13 READ DATA = 24
READ ADDRESS = 1F14 READ DATA = ED
READ ADDRESS = 1F15 READ DATA = FE
READ ADDRESS = 1FF1 READ DATA = 61
READ ADDRESS = 1FF3 READ DATA = 03
READ ADDRESS = 1FF5 READ DATA = 00

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

02) Testing Dual-Port RAM :

Decode Test .....OK
Marching Test .....OK

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).

04) Testing Trace RAM :

Decode Test. page range H'000 - H'04f .....OK

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

Marching Test. page range H'000 - H'04f .....OK

Shows the results of step test for the trace RAM 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 Option RAM :

Fill Memory Testing 1/4 from 00100000 to 001fffff..OK
Fill Memory Testing 2/4 from 00200000 to 002fffff..OK
Fill Memory Testing 3/4 from 00300000 to 003fffff..OK
Fill Memory Testing 4/4 from 00400000 to 004fffff..OK
Decode/Pause Testing from 00100000 to 004fffff.....OK
Marching Testing from 00100000 to 004fffff.....OK
AllBitReadWrite Testing from 00100000 to 004fffff..OK

Shows the results of decoding test and step test of the SIMM memory module (normal completion). If the SIMM memory module is not installed, these tests are omitted.

07) Testing STEP Operation :

Single Step Operation .....OK
Step Into Operation .....OK

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

08) Testing Internal ROM and RAM :
Decode Test .....OK
Marching Test .....OK

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

09) Testing Key Break :
Key Break .....OK

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

10) Testing Emulation RAM Hardware Break :
GRD Break .....OK
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 :
Write-Protect .....OK

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

12) Testing Hardware Break :
Break Point Intialised .....OK
Event Detectors CES channel 1-12 ...OK
Check Access Either .....OK
Check Access Read .....OK
Check Access Write .....OK
Check Access Count .....OK
Check Access Delay .....OK
Check Compare Either .....OK
Check Range Break .....OK
Check Range Break for Data .....OK
Test Sequencing 1 .....OK
Test Sequencing 2 .....OK
Test Sequencing 3 .....OK

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

13) Testing Memory Mapping :

Guarded Read	(Break ON) .....OK	Shows the check results for the mapping controlling circuits in the E6000 (normal completion).
Guarded Write	(Break ON) .....OK	
Guarded Read	(Break OFF) .....OK	
Guarded Write	(Break OFF) .....OK	
Write-Protect Read	(Break ON) .....OK	
Write-Protect Write	(Break ON) .....OK	
Write-Protect Read	(Break OFF) .....OK	
Write-Protect Write	(Break OFF) .....OK	
ROM Write-Protect Read	(Break ON) .....OK	
ROM Write-Protect Write	(Break ON) .....OK	
ROM Write-Protect Read	(Break OFF) .....OK	
ROM Write-Protect Write	(Break OFF) .....OK	

14) Testing Emulation RAM Trace :

Free Trace Test .....OK	Shows the check results for the trace controlling circuits in the E6000 (normal completion).
Range Trace Test .....OK	
Point to Point Trace Test .....OK	
Start and Stop Event Trace Test .....OK	

15) Testing Runtime counter :

Testing Clock at 25MHz .....OK	Shows the check results for the run-time counter in the E6000 (normal completion).
Testing Clock at 20MHz .....OK	
Testing Clock at 12.5MHz .....OK	
Testing Clock at 10MHz .....OK	

16) Testing Emulation Monitor :

A23 to A0 (MONIT00, MONIT1E, MONIT10) .....OK	Shows the check results for the monitor controlling circuits in the E6000 (normal completion).
ST3 to ST0 (MONIT2E:D7-D4, MONIT0E:D3-D0) .OK	
WINDOW (MONIT20:D1) .....OK	
ASEBRKAK (MONIT0E:D4, MONIT20:D0) .....OK	

0 total errors	Total number of errors.
Tests passed, emulator functioning correctly	Shows that the E6000 is correctly operating.

When this test program detects failures, it stops execution by displaying ERROR. In this case, the emulator hardware will be illegal. Inform the details on the error of Hitachi's sales department.