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April 1st, 2010
Renesas Electronics Corporation

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Customer Support Dept.
April 1, 2003

User's Manual

H8S/2339, H8S/2338, H8S/2329, H8S/2328, H8S/2318, H8S/2319F, H8S/2315F Series E6000 Emulator HS2339EPI61H

Supplementary Information

Renesas Microcomputer Development Environment System

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Rev.1.0 2000.12

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• READ this user's manual before using this emulator product.
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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 H8S/2339, H8S/2338, H8S/2329, H8S/2328, H8S/2318, H8S/2319F and H8S/2315F series (hereafter referred to as the MCU). The emulator product can be used for systems using other microcomputers by exchanging the evaluation chip. This emulator product must only be used for the above purpose.

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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.**

Preface

Thank you for purchasing the H8S/2339, H8S/2338, H8S/2329, H8S/2328, H8S/2318, H8S/2319F, H8S/2315F series E6000 emulator.

The H8S/2339, H8S/2338, H8S/2329, H8S/2328, H8S/2318, H8S/2319F, H8S/2315F 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 HD6432338 and HD6432328 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 H8S series E6000 Emulator User's Manual, the 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. The Supplementary Information describes the functions specialized for each microcomputer supported by the H8S/2339, H8S/2338, H8/2329, H8S/2328, H8S/2318, H8S/2319F and H8S/2315F series E6000 emulator. Please read this manual before using the E6000.

To connect the E6000 to the user system, the 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 (HS2338ECH61HE, 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)

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Tables

Section 1 Overview

The H8S/2339, H8S/2338, H8/2329, H8S/2328, H8S/2318, H8S/2319F and H8S/2315F 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/2339, H8S/2338 series, H8S/2329, H8S/2328 series, H8S/2318 series, H8S/2319F series or H8S/2315F 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*	HS2339EPI61H	HS2339EPI61HB
	100 V-120 V (UL)	200 V-240 V (BS)
User system voltage (UVcc)	Depends on the target MCU within the range 2.7 V to 3.6 V	

Note: HS2339EPI61H must be used at AC100 V-120 V input voltage.
HS2339EPI61HB must be used at AC200 V-240 V input voltage.

1.2 Supported MCUs and User System Interface Cables

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

H8S/2339, H8S/2338 Series:

Table 1.2 H8S/2339, H8S/2338 Series MCUs and User System Interface Cable

No.	MCU Type Number	Package	E6000 User System Interface Cables
1	HD64F2339 HD6432338 HD64F2338 HD6432337 HD6412332	144-pin QFP (FP-144)	HS2338ECH61H

H8S/2329, H8S/2328 Series:

Table 1.3 H8S/2329, H8S/2328 Series MCUs and User System Interface Cables

No.	MCU Type Number	Package	E6000 User System Interface Cables
1	HD64F2329 HD6432328 HD64F2328 HD6332327 HD6412324 HD6432323 HD6412322R HD6412320	128-pin QFP (FP-128)	HS2328ECH61H
2	HD64F2329 HD6432328 HD64F2328 HD6332327 HD6412324 HD6432323 HD6412322R HD6412320	120-pin TQFP (TFP-120)	HS2328ECN61H

H8S/2318 Series:

Table 1.4 H8S/2318 Series MCUs and User System Interface Cables

No.	MCU Type Number	Package	E6000 User System Interface Cables
1	HD6432318 HD64F2318 HD6432317 HD6412312 HD6432311 HD6412310	100-pin TQFP (TFP-100B)	HS2318ECH61H

1.3 Operating Voltage and Frequency Specifications

Table 1.5 shows the MCU operating voltage and frequency specifications supported by the E6000. Note that some MCUs do not operate at neither a low voltage nor a high frequency.

Table 1.5 Operating Voltage and Frequency Specifications

No.	MCU Types	Operating Voltage (V)	Maximum Operating Frequency (ϕ) (MHz)
1	H8S/2339, H8S/2338 series	2.7-3.0	20
		3.0-3.6	25
2	H8S/2329, H8S/2328 series	2.7-3.0	20
		3.0-3.6	25
3	H8S/2318 series	2.7-3.0	20
		3.0-3.6	25

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
8	8 MHz internal clock	
10	10 MHz internal clock	
12	12.5 MHz internal clock	Default
16	16 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 20-MHz crystal oscillator is connected to the XTAL and EXTAL of the user system, the system clock (ϕ) frequency is 20 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
- RESET
- MD2, MD1, MD0
- 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 signals (except for AVcc signals) at the head of the user system interface cable are connected together, which is monitored by the E6000 to detect whether the user system hardware is connected.

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 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 equivalent circuit examples of the interface signals.

Default:

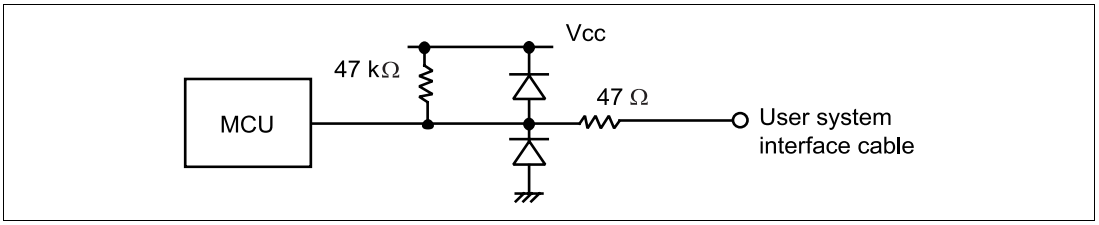

Figure 2.1 Default User System Interface Circuit

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

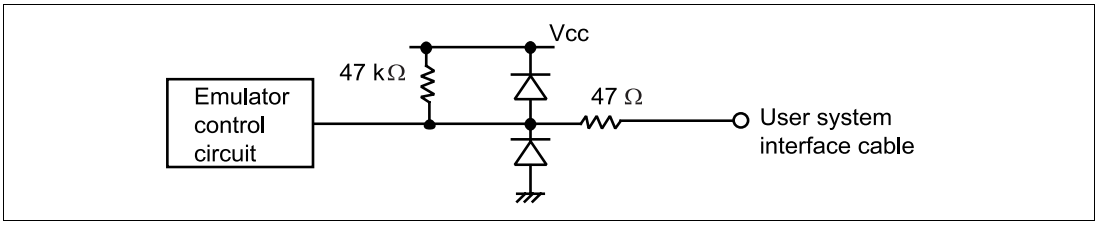

Figure 2.2 User System Interface Circuit for MD2, MD1, MD0, and NMI

RESET:

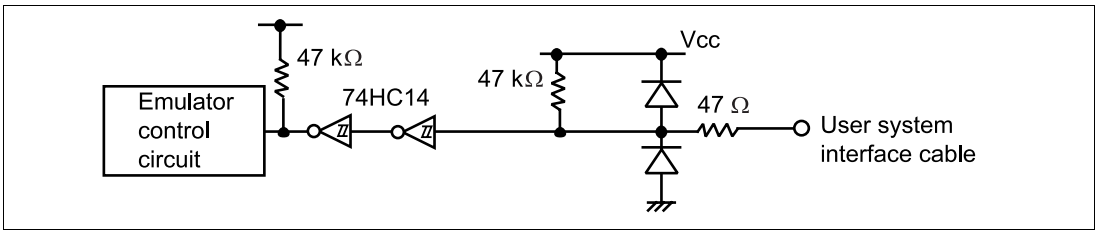

Figure 2.3 User System Interface Circuit for RESET

AN0 to AN7, AN12 to AN15, DA0 to DA3, AVcc, AVss, and Vref:

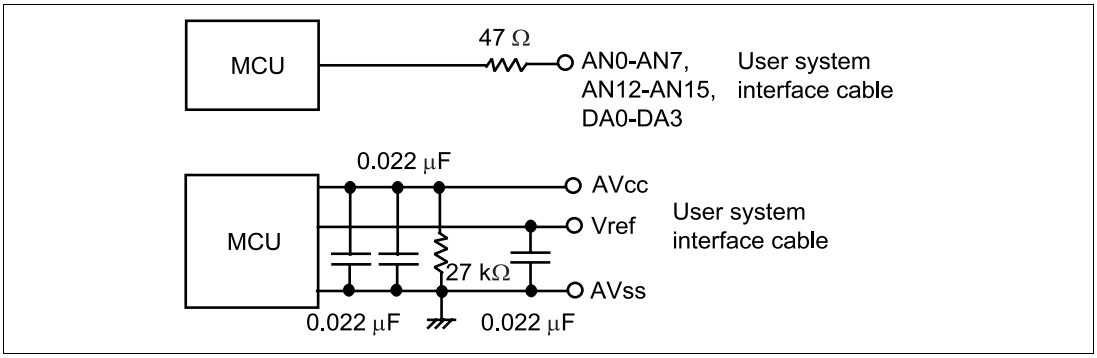

Figure 2.4 User System Interface Circuit for AN0 to AN7, AN12 to AN15, DA0 to DA3, AVcc, AVss, and Vref Signals

IRQ0–IRQ7 and WAIT: The IRQ0 to IRQ7 and WAIT 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.

In the MCU, the terminals for inputting the IRQ4-IRQ7 and WAIT signals can be selected by the register setting. In the E6000, select them by the switch on the user system interface cable (only for the 144-pin version of the H8S/2338 series). For details, refer to the user system interface cable user's manual.

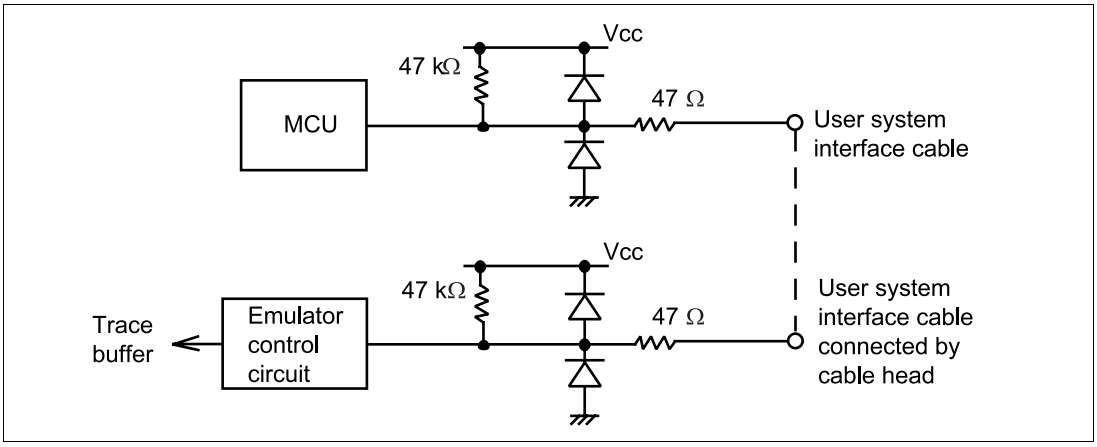

Figure 2.5 IRQ0–IRQ7 and WAIT User System Interface Circuit

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 pull-up resistors.

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

- RAM emulation register (RAMER: H'FEDB)
- System control register 2 (SYSCR2: H'FF42)
- Flash memory control register 1 (FLMCR1: H'FFC8)
- Flash memory control register 2 (FLMCR2: H'FFC9)
- Erase block register 1 (EBR1: H'FFCA)
- Erase block register 2 (EBR2: H'FFCB)

3.2 Access to the Reserved Area

When accessing the reserved area, note the following:

1. In the H8S/2339 series and H8S/2329 series, access (read or write) to the reserved area H’60000 to H’7FFFF is enabled through the following emulator commands. However, access (read or write) to the reserved area H’60000 to H’7FFFF is prohibited when the E6000 is executing a program.
   - File-Load (FL)
   - Memory-Edit (ME)
   - Memory-Fill (MF)
   - Memory-Move (MV)
   - Memory-Test (MT)
2. Part of the reserved area (specified in each MCU’s memory map) can be used as an external address area when the EAE bit of the BCRL is cleared to 0. Target (user memory) or Emulator (optional memory) can be specified for this area with the Configuration settings.

3. If the reserved area other than that described in item 1 above 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 H8S/2332 program in the H8S/2337 mode).
4. Internal RAM (specified in each MCU's memory map) can be used as an external address area when the RAME bit of the SYSCR is cleared to 0. Target (user memory) can be specified for this area with the Configuration settings.

3.3 Support of Flash Memory

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

3.4 Hardware Standby

When the User Standby enable check box is selected in the Configuration window, the STBY signal on 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, we recommend to clear the User Standby enable check box (not selected) for general emulation.

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 (ROM)	On-chip ROM	MCU's on-chip ROM, which can be read but cannot be written to.
ram (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.
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.
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 (DMAC)	On-chip DMAC	Access by the MCU's DMAC
dtc (DTC)	On-chip DTC	Access by the MCU's DTC
refresh (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 Module Selection

Table 4.3 lists the I/O modules that can be selected as Custom settings in the HDI command line interface.

Table 4.3 I/O Modules

HDI Parameter	I/O Module
refresh	MCU's refresh controller (MCR, DRAMCR, RTCNT, and RTCOR).
dmac	MCU's DMAC.
sci2	Serial communication interface 2 (SCI2). SCI0 and SCI1 are always enabled.
mult	Set SCI1 and SCI2 to support the multiprocessor communication/smart card interface. SCI0 is always enabled.
tpu	16-bit timer pulse unit 3 to 5 (TPU3 to TPU5). TPU0 to TPU2 are always enabled.

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

When executing the test program using the following hardware, do not connect the user system interface cable and user system.

- E6000 (HS2339EPI61H)
- 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 Test Program

Insert the CD-R (HS2339EPI61SR 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)
   >TM2339 –ISA (RET)

2. PCI bus interface board (HS6000EIC01H, HS6000EIC02H)
   >TM2339 –PCI (RET)

3. PCMCIA interface card (HS6000EIP01H)
   >TM2339 –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\TM2339 –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 >TM2339 –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 6 minutes to execute the test program when the host computer using Windows®98 runs at 166 MHz and the PCI interface board is used. There are 18 steps in this test. The following messages are displayed during the test.

Message	Description
E6000 H8S/2339 EMULATION BOARD Tests Vx.x Hitachi Ltd (2000)	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 assigned to the board. 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'5	Shows the ID number of the lower board of the E6000 (always 5).
Emulation Board ID H'16	Shows the ID number of the upper board of the E6000 (always H'16).
Revision H'x	Shows the revision number of the upper board of the E6000.
SIMM No SIMM module inserted	Shows whether the SIMM memory board is installed.

```
Downloading firmware .....
```

Loading the test program.

```
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
```

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 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 .........................OK
    Marching Test .......................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..
```

Shows the check results for the illegal access break

```
   GRD Break ..........................OK
   Setting up, please wait..
   WPT Break ..........................OK
```

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 Intialised .............OK
   B)Event Detectors CES channel 1-12 ...OK
   C)Test Sequencing 1 ..................OK
   D)Check Range Break ..................OK
   E)Check Range Break 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
   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 = 16.0 MHz ....OK
   Testing Internal Clock = 12.5 MHz ....OK
   Testing Internal Clock = 10.0 MHz ....OK
   Testing Internal Clock =  8.0 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
```

Shows the check results for the performance analysis controlling circuits in the E6000

```
    C)PERM_SUBROUTINE Time Measure Test .........OK
    D)PERM Time Out Bit Test
      Time Out Test 1............................OK
      Time Out Test 2............................OK

  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

  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

0 total errors

Tests passed, emulator functioning correctly
```

(normal completion).

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

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

Total number of errors.

Shows that the E6000 is correctly operating.

When –S is added to the command line, step 1 will be executed again after step 18.