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April 1st, 2010
Renesas Electronics Corporation

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SH7040 Series E6000

Supplementary Information

HS7040EPI60HE

Renesas Microcomputer
Development Environment
System

Cautions

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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 Renesas Technology Corp. 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.

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



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



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



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 SH7040 series E6000 emulator.

The SH7040 series E6000 emulator (hereafter referred to as the E6000) was designed as a software and hardware development tool for systems based on Renesas's original microcomputers SH7040 series.

The E6000 provides three 3.5-type floppy disks: three stores the HDI system (HS7040EPI60SF disks #1 to #3).

There are three manuals for the E6000: the SH series E6000 Emulator User's Manual, this Supplementary Information, and the HDI User's Manual. The E6000 Emulator User's Manual describes E6000 functions common to all SH series microcomputers. This Supplementary Information describes the functions specialized for each microcomputer supported by the SH7040 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:

- SH Series E6000 Emulator User's Manual (HS7000EPI60HE)
- HDI User's Manual (HS6400DIIW4SE)
- User System Interface Cable User's Manual (HS7042ECH61HE, 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)
- SH7010, SH7040, SH7050 SIMM Memory Module User's Manual (HS6000EMS22HE)

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Section 1 Overview

The SH7040 series E6000 emulator (hereafter referred to as the E6000) is an efficient software and hardware development support tool for application systems using Renesas's original microcomputers SH7040 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 $\pm 5\%$ 50/60 Hz 0.6 A max.
AC input cable*	HS7040EPI60H HS7040EPI60HB 100 V-120 V (UL) 200 V-240 V (BS)
User system voltage (UVcc)	Depends on the target MCU within the range 3.0 V to 5.5 V

Note: HS7040EPI60H must be used at AC100 V-120 V input voltage.
HS7040EPI60HB must be used at AC200 V-240 V input voltage.

1.2 Supported MCUs and User System Interface Cables

Tables 1.2 to 1.3 show the correspondence between the MCUs, the user system interface cables, and the SIMM memory modules supported by the E6000.

SH7040 Series:

Table 1.2 User System Interface Cables for SH7040

MCU Type Number	Package	E6000 User System Interface Cables
HD6477042F28	112-pin QFP (FP-112)	HS7042ECH61H
HD6477042VF16		
HD6477042AF33		
HD6477042AF28		
HD6477042AVF16		
HD64F7044F28		
HD6437040F33		
HD6437040F28		
HD6437040VF16		
HD6437042F28		
HD6437042VF16		
HD6437042AF33		
HD6437042AF28		
HD6437042AVF16		
HD6437044F28		
HD6417014F28		
HD6417014RF28		
HD6477043F28	144-pin QFP (FP-144)	HS7043ECH61H
HD6477043VF16		
HD6477043AF33		
HD6477043AF28		
HD6477043AVF16		
HD64F7045F28		
HD6437041F33		
HD6437041F28		
HD6437041VF16		
HD6437043F28		
HD6437043VF16		
HD6437043AF33		
HD6437043AF28		
HD6437043AVF16		
HD6437045F28		

Table 1.3 SIMM Memory Modules for SH7040, SH7040 and SH7050

SIMM Memory Modules	Memory Size	MCU Type Number
HS6000EMS21H	2.5 Mbytes	HD6477042F28
		HD6477042VF16
		HD6477042AF33
		HD6477042AF28
		HD6477042AVF16
		HD64F7044F28
		HD6437040F33
		HD6437040F28
		HD6437040VF16
		HD6437042F28
		HD6437042VF16
		HD6437042AF33
		HD6437042AF28
		HD6437042AVF16
		HD6437044F28
HD6417014F28		
HS6000EMS22H	6.5 Mbytes	HD6417014RF28
		HD6477043F28
		HD6477043VF16
		HD6477043AF33
		HD6477043AF28
		HD6477043AVF16
		HD64F7045F28
		HD6437041F33
		HD6437041F28
		HD6437041VF16
		HD6437043F28
		HD6437043VF16
		HD6437043AF33
		HD6437043AF28
		HD6437043AVF16
HD6437045F28		

1.3 Operating Voltage and Frequency Specifications

Table 1.4 shows examples of the MCU operating voltage and frequency specifications supported by the E6000. Some MCUs do not guarantee low-power and high-frequency operations.

Table 1.4 Operating Voltage and Frequency Specifications

MCU Types	Operating Voltage (Vcc) (V)	Operating Frequency (ϕ) (MHz)
HD6477042VF16 HD6477042AVF16 HD6477043VF16 HD6477043AVF16 HD6437040VF16 HD6437041VF16 HD6437042VF16 HD6437042AVF16 HD6437043VF16 HD6437043AVF16	3.0-3.6	16.7
HD6477042F28 HD6477042AF28 HD6477043F28 HD6477043AF28 HD64F7044F28 HD64F7045F28 HD6437040F28 HD6437041F28 HD6437042F28 HD6437042AF28 HD6437043F28 HD6437043AF28 HD6437044F28 HD6437045F28 HD6417014F28 HD6417014RF28	4.5-5.5	28.7
HD6477042AF33 HD6477043AF33 HD6437040F33 HD6437041F33 HD6437042AF33 HD6437043AF33	4.75-5.25	33.3

NOTE

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

In the E6000, clock can be selected as shown in table 1.5 by using the Configuration window or the Clock command.

Select the clock from a range between 4 MHz to the maximum operation frequency ϕ (MHz) (see table 1.4). If the input clock and clock divisor is 4 MHz or below, an error will occur.

Table 1.5 Clock Selections for E6000 SH7040 Emulator

Item	Command		Configuration Window Setting		Notes
	Command Name	Parameter	Option name	Parameter	
Input clock	CLOCK	8MHz	Clock Rate	8MHz	Initial value
		8.25MHz		8.25MHz	
		10MHz		10MHz	
		Target		Target	
Clock multiplication	CLOCK_MODE	×1	Clock Mode	PLL × 1	Initial value
		×2		PLL × 2	
		×4		PLL × 4	
		Target*		Target*	
Clock division	CLOCK_DIVISOR	1	Clock Divisor	1	Initial value
		2		2	
		4		4	

Note: *The parameter set for clock multiplication is the same parameter set for mode pins MD3 and MD2 on the user system when Target is selected for the parameter of the clock multiplication.

NOTE

The clock specified by the HDI Clock command or through the Configuration window is divided or multiplied and becomes the system clock (ϕ). Therefore system clock (ϕ) is 10 MHz when Target is selected for clock input, and a 20 MHz crystal oscillator is connected to EXTAL, and division is 2 and multiplication is 1.

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
- MD3, MD2, MD1, MD0
- EXTAL
- WDTOVF

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.

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 this and determines whether the user system is connected.

2.2 User System Interface Circuits

The interface circuit between the MCU in the E6000 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 to a user system, adjust the user system hardware to compensate for propagation delays.

The following diagrams show the interface signal circuits.

Default:

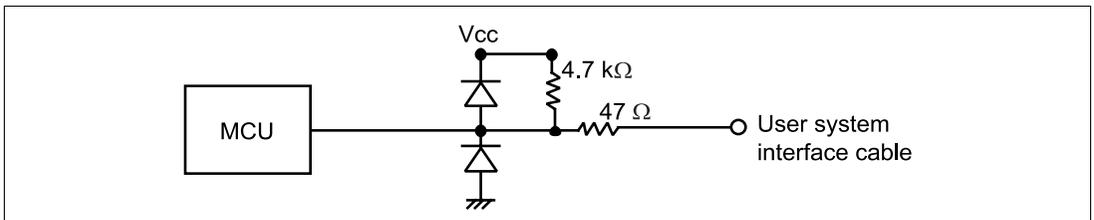


Figure 2.1 Default User System Interface Circuit

Mode Pins (MD3, MD2, MD1 and MD0): The mode pins are only monitored. The operation modes and clock modes depend on the HDI settings.

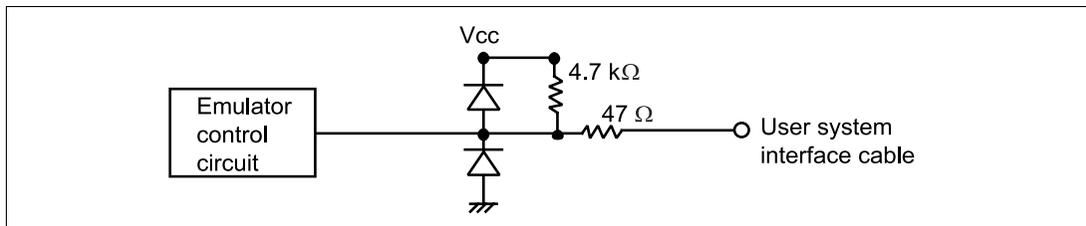


Figure 2.2 User System Interface Circuit for Mode Pins

RES and NMI: The RES and NMI signals are input to the MCU through the emulator control circuit. The rising/falling time of these signals must be 8 ns/V or less.

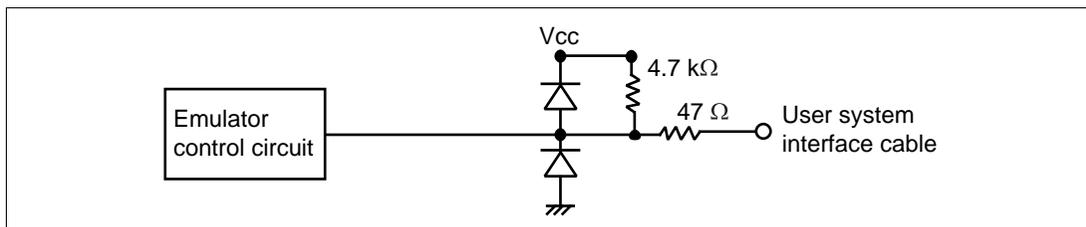


Figure 2.3 User System Interface Circuit for RES and NMI

**PF0/AN0-PF7/AN7, PA0-PA4 (Package: for 144 pin QFP),
PE5/TIOC1B (Package: for 112 pin QFP)**

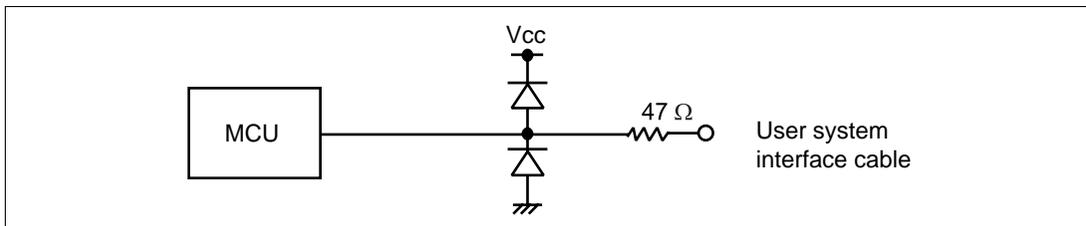


Figure 2.4 User System Interface Circuit for PF0/AN0-PF7/AN7, PA0-PA4, PE5/TIOC1B

IRQ0–IRQ7 and WDTOVF (SH7014: IRQ0–IRQ3, IRQ6–IRQ7) : The IRQ0 to IRQ7 and WDTOVF 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.

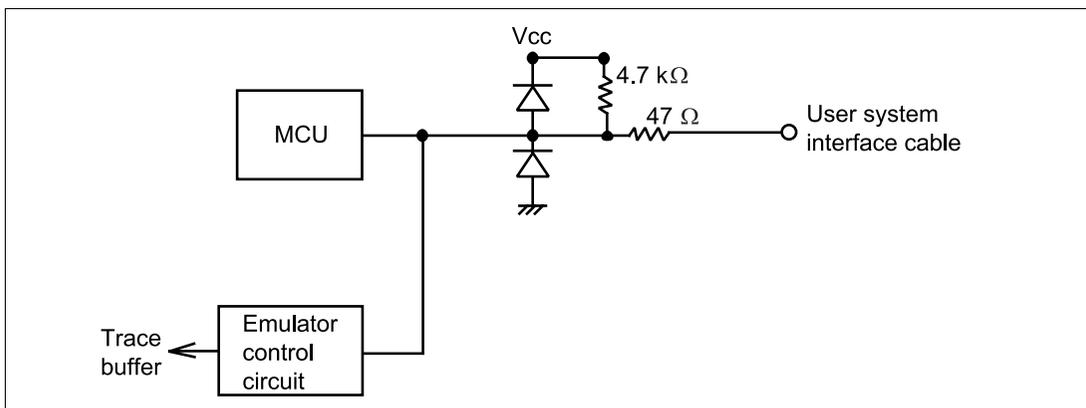


Figure 2.5 User System Interface Circuit for IRQ0–IRQ7 and WDTOVF

AVcc, AVss, and AVref

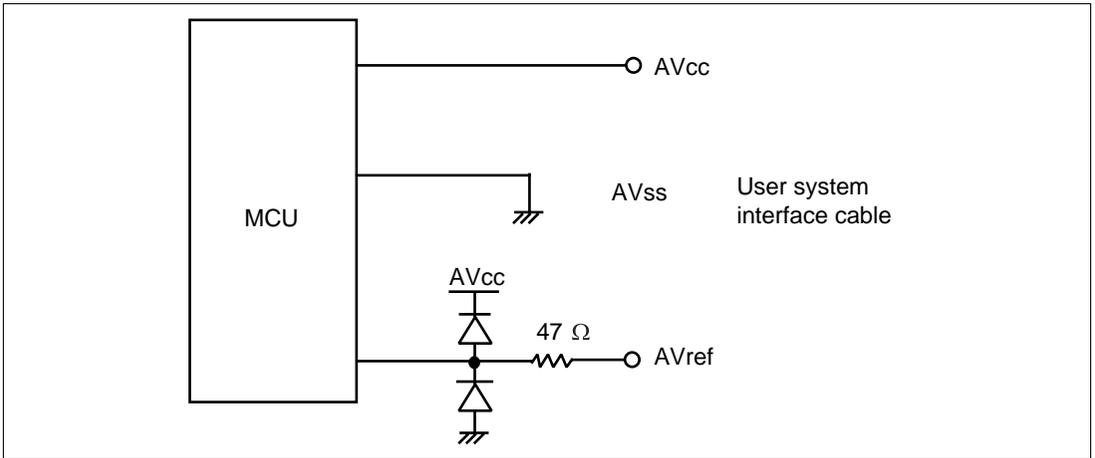


Figure 2.6 User System Interface Circuit for AVcc, AVss, and AVref

XTAL and EXTAL

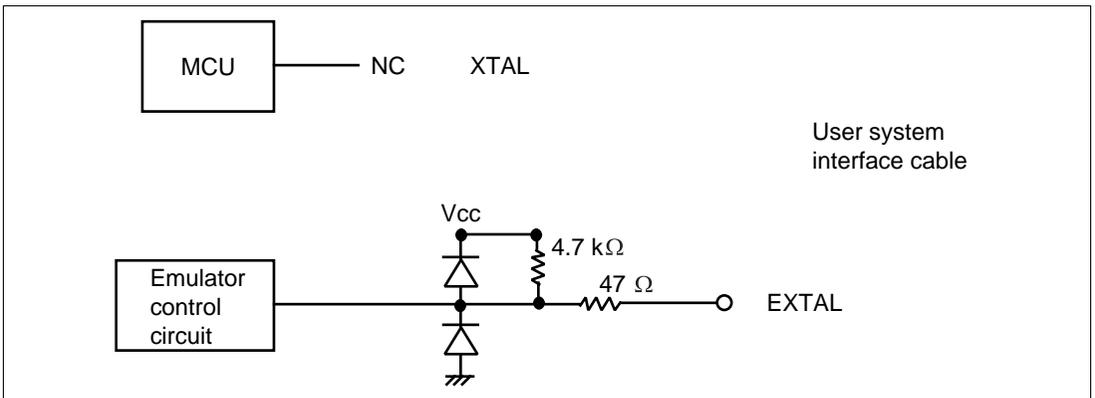


Figure 2.7 User System Interface Circuit for XTAL and EXTAL

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 emulation register (RAMER: H'FFFF8628)
- Flash memory control register 1 (FLMCR1: H'FFFF8580)
- Flash memory control register 2 (FLMCR2: H'FFFF8581)
- Block register 1 (EBR1: H'FFFF8582)

3.2 Access to the Reserved Area

Reserved area cannot be accessed in the actual MCU.

3.3 Use of Internal RAM Area and Internal ROM Area

The internal ROM size of the MCU is 0 kbytes, 64 kbytes, 128 kbytes or 256 kbytes; however, the E6000 has 256 kbytes of ROM. The internal RAM size of the MCU is 3 kbytes or 4 kbytes; however, the E6000 has 6 kbytes of RAM.

3.4 Support of Flash Memory

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

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)	Internal ROM	MCU's internal ROM, which can be read but cannot be written to.
RAM (RAM)	Internal RAM	MCU's internal RAM, which can be read and written to.
IO (I/O)	Internal I/O registers	MCU's internal I/O register area.
CACHE (Cache)	Internal cache	MCU's internal cache area.
TAR8 (Tar8)	User memory (8-bit bus)	8-bit bus user area.
TAR16 (Tar16)	User memory (16-bit bus)	16-bit bus user area.
TAR32 (Tar32)	User memory (32-bit bus)	32-bit bus user area.
EMU8 (Tar8)	Emulation memory (8-bit bus)	8-bit bus emulation memory.
EMU16 (Tar16)	Emulation memory (16-bit bus)	16-bit bus emulation memory.
EMU32 (Emu32)	Emulation memory (32-bit bus)	32-bit bus emulation memory.

4.2 Access Status

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

Table 4.2 Bus Status Parameters

HDI Parameter (Trace Display)	Bus Status	Description
DMAC (DMAC)	On-chip DMAC	Access by the MCU's DMAC
CACHE (Cache)	Cache fill	MCU internal cache fill cycle
DATA (Data)	CPU data access	Data access for instruction execution by the CPU
PROG (Prog)	CPU instruction fetch	Instruction fetch access by the CPU
SLEEP_DMAC (Sleep: DMAC)	Sleep status	DMAC cycle was generated in sleep mode.

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