
R8C/LA8A Group

Timer RH (Real-Time Clock Mode)

R01AN0087EJ0100

Rev.1.00

Oct. 25, 2010

1. Abstract

This document describes a setting method and an application example for a clock operation program using timer RH (real-time clock mode) in the R8C/LA8A Group.

2. Introduction

The application example described in this document applies to the following microcomputer (MCU) and parameters:

- MCU: R8C/LA8A Group
- XIN clock frequency: 20 MHz
- XCIN clock frequency: 32.768 kHz

This application note can be used with other R8C Family MCUs which have the same special function registers (SFRs) as the above group. Check the manual for any modifications to functions. Careful evaluation is recommended before using the program described in this application note.

3. Application Example

3.1 Program Outline

Operate timer RH in real-time clock mode. The count starts from “Thursday, January 1, 2009, 00:00:00” (initial value) with timer RH operating in 24-hour mode. When the count is incremented from “December 31, 2099, 23:59:59”, it becomes “January 1, 2000, 00:00:00”. Use a periodic interrupt triggered every second to obtain the second data (TRHSEC), minute data (TRHMIN), hour data (TRHHR), day-of-the-week data (TRHWK), date data (TRHDY), month data (TRHMON), and year data (TRHYR).

Settings

- Use the 20 MHz XIN clock for the CPU clock.
- Use fC-TRH (32.768 kHz) for the timer RH count source.
- Select 24-hour mode.
- Stop the low-speed on-chip oscillator.
- Use the timer RH interrupt (periodic interrupt triggered every second).

Figure 3.1 shows a Block Diagram. Figure 3.2 shows an Operation Flowchart.

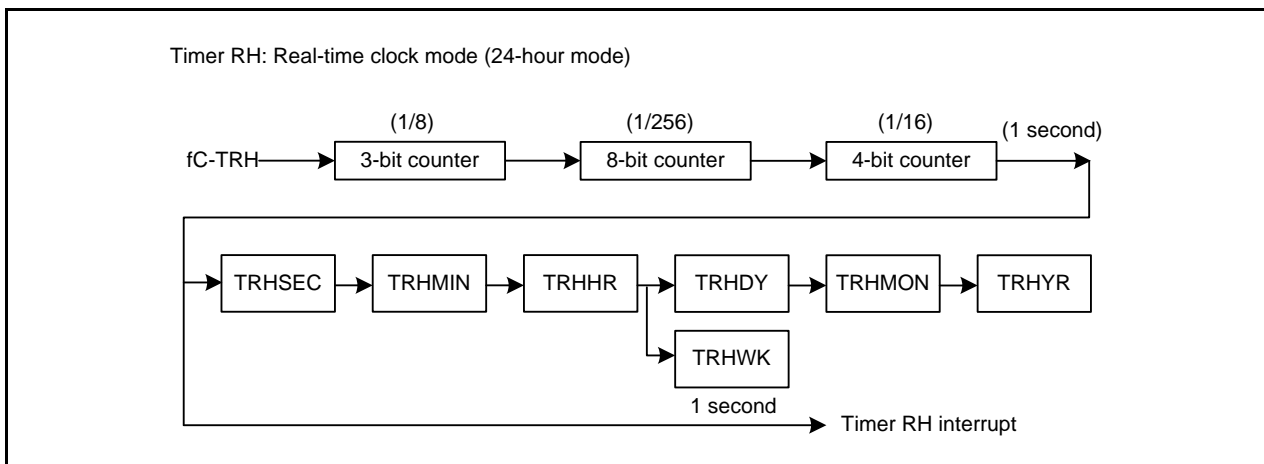


Figure 3.1 Block Diagram

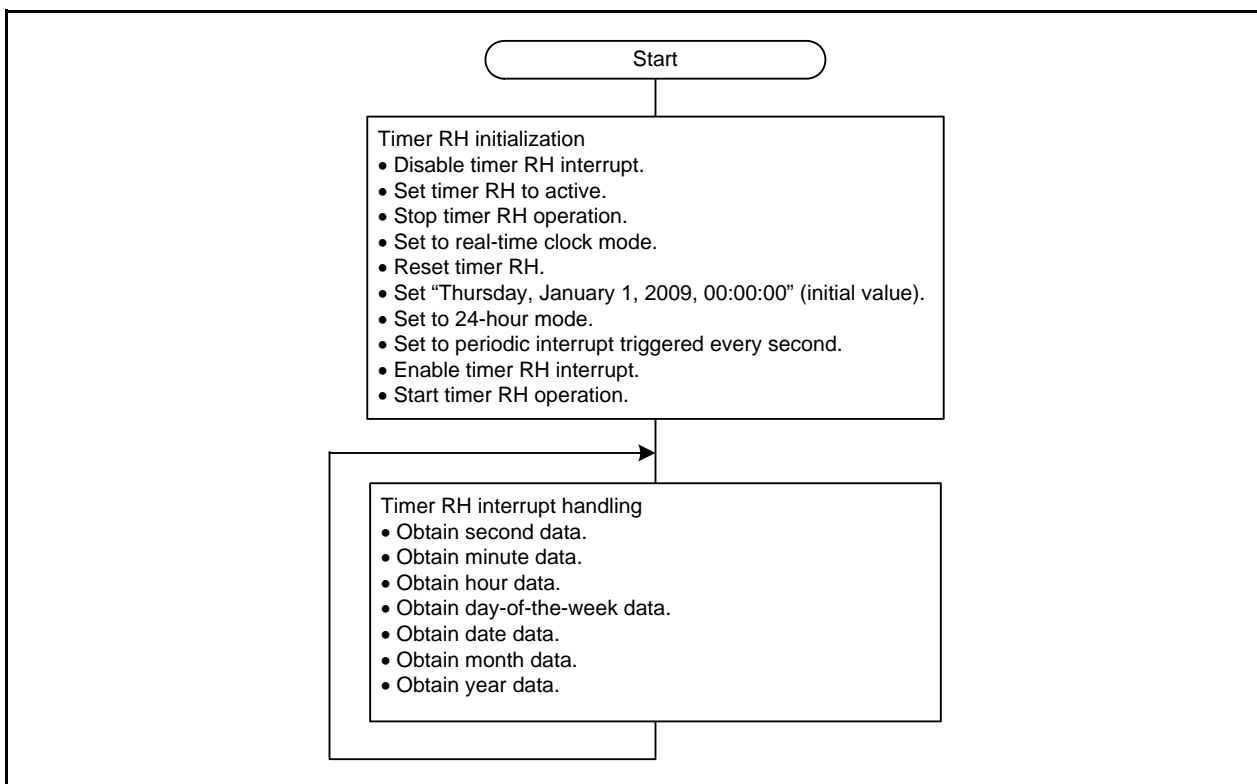


Figure 3.2 Operation Flowchart

3.2 Memory

Table 3.1 Memory

Memory	Size	Remarks
ROM	282 bytes	In the r01an0087_src.c module
RAM	9 bytes	In the r01an0087_src.c module
Maximum user stack	10 bytes	
Maximum interrupt stack	4 bytes	

Memory size varies depending on the C compiler version and compile options.

The above applies to the following conditions:

C compiler: M16C Series, R8C Family C Compiler V.5.45 Release 01

Compile options: -c -finfo -dir "\$(CONFIGDIR)" -R8C

4. Software

This section shows the initial setting procedures and values to set the example described in section 3. **Application Example.** Refer to the latest **R8C/LA8A Group** hardware user's manual for details on individual registers.

The × in the register's setting value represents bits not used in this application, blank spaces represent bits that do not change, and the dash represents reserved bits or bits that have nothing assigned.

4.1 Function Tables

Declaration	void main(void)		
Outline	Main function		
Argument	Argument name		Meaning
	None		—
Variable (global)	Variable name		Contents
	None		—
Returned value	Type	Value	Meaning
	None	—	—
Function	Start the timer RH count after initializing the system clock and timer RH.		

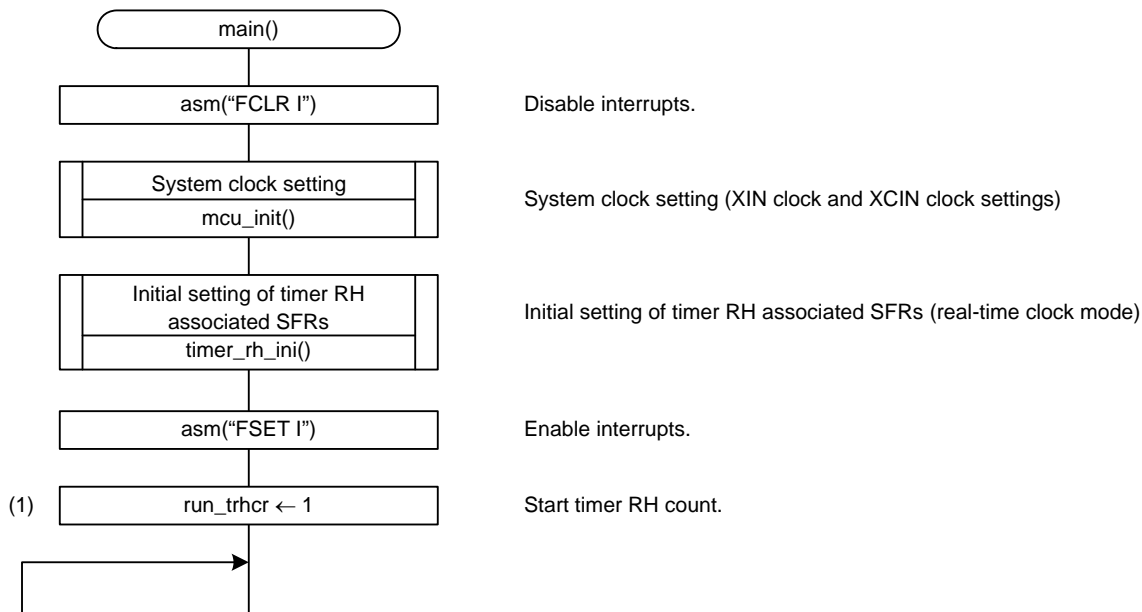
Declaration	void mcu_init(void)		
Outline	System clock setting		
Argument	Argument name		Meaning
	None		—
Variable (global)	Variable name		Contents
	None		—
Returned value	Type	Value	Meaning
	None	—	—
Function	Set the system clock (XIN clock) and XCIN clock.		

Declaration	void timer_rh_init(void)		
Outline	Initial setting of timer RH associated SFRs		
Argument	Argument name		Meaning
	None		—
Variable (global)	Variable name		Contents
	None		—
Returned value	Type	Value	Meaning
	None	—	—
Function	Initialize SFRs to use timer RH in real-time clock mode.		

Declaration	void _timer_rh(void)		
Outline	Timer RH interrupt handling		
Argument	Argument name	Meaning	
	None	—	
Variable (global)	Variable name	Contents	
	unsigned short year	Year data stored	
	unsigned char month	Month data stored	
	unsigned char day	Date data stored	
	enum wk	Day-of-the-week data stored	
	unsigned char hr	Hour data stored	
	unsigned char min	Minute data stored	
	unsigned char sec	Second data stored	
Returned value	Type	Value	Meaning
	None	—	—
Function	Perform timer RH interrupt handling. Obtain the second data, minute data, hour data, day-of-the-week data, date data, month data, and year data.		

4.2 Main Function

- Flowchart



- Register settings

(1) Start the timer RH count.

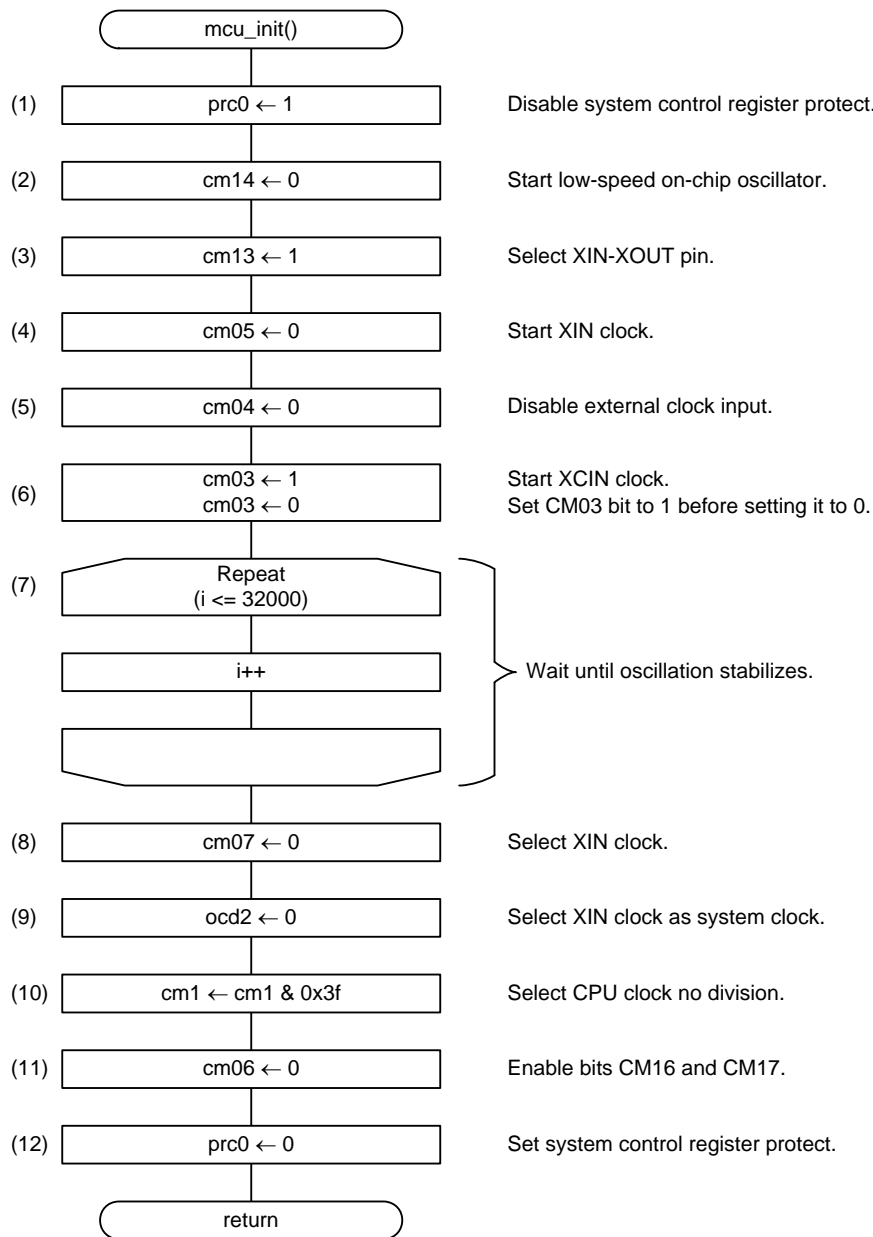
Timer RH Control Register (TRHCR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	1		x				x	

Bit	Symbol	Bit Name	Function	R/W
b7	RUN	Timer RH operation start bit	1: Count starts	R/W

4.3 System Clock Setting

• Flowchart



• Register settings

(1) Enable writing to registers CM0, CM1, CM3, OCD, FRA0, FRC0, FRA2, and FRC1.

Protect Register (PRCR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	—	x	x	x	1

Bit	Symbol	Bit Name	Function	R/W
b0	PRC0	Protect bit 0	Enables writing to registers CM0, CM1, CM3, OCD, FRA0, FRC0, FRA2, and FRC1. 1: Write enabled	R/W

(2) Start the low-speed on-chip oscillator.

System Clock Control Register 1 (CM1)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value			—	0		x	x	x

Bit	Symbol	Bit Name	Function	R/W
b4	CM14	Low-speed on-chip oscillator stop bit	0: Low-speed on-chip oscillator on	R/W

(3) Switch P4_6 and P4_7 to the XIN-XOUT pin.

System Clock Control Register 1 (CM1)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value			—		1	x	x	x

Bit	Symbol	Bit Name	Function	R/W
b3	CM13	Port/XIN-XOUT switch bit	1: XIN-XOUT pin	R/W

(4) Start the XIN clock.

System Clock Control Register 0 (CM0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value			0			x	x	x

Bit	Symbol	Bit Name	Function	R/W
b5	CM05	XIN clock (XIN-XOUT) stop bit	0: XIN clock oscillates	R/W

(5) Disable external clock input.

System Clock Control Register 0 (CM0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value				0		x	x	x

Bit	Symbol	Bit Name	Function	R/W
b4	CM04	XCIN external clock input enable bit	0: External clock input disabled	R/W

(6) Start the XCIN clock.

System Clock Control Register 0 (CM0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value					0	x	x	x

Bit	Symbol	Bit Name	Function	R/W
b3	CM03	XCIN clock stop bit	0: XCIN clock oscillates	R/W

(7) Wait until oscillation stabilizes.

(8) Select the XIN clock.

System Clock Control Register 0 (CM0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	0					x	x	x

Bit	Symbol	Bit Name	Function	R/W
b7	CM07	System clock select bit	0: XIN clock or on-chip oscillator clock	R/W

(9) Select the XIN clock as the system clock.

Oscillation Stop Detection Register (OCD)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	—	x	0	x	x

Bit	Symbol	Bit Name	Function	R/W
b2	OCD2	On-chip oscillator clock select bit	0: XIN clock selected	R/W

(10) Set CPU clock division select bit 1.

System Clock Control Register 1 (CM1)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	0	0	—			x	x	x

Bit	Symbol	Bit Name	Function	R/W
b6	CM16	CPU clock division select bit 1	b7 b6 0 0: No division mode	R/W
b7	CM17			R/W

(11) Set CPU clock division select bit 0.

System Clock Control Register 0 (CM0)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value		0				x	x	x

Bit	Symbol	Bit Name	Function	R/W
b6	CM06	CPU clock division select bit 0	0: Bits CM16 and CM17 in CM1 register enabled	R/W

(12) Disable writing to registers CM0, CM1, CM3, OCD, FRA0, FRC0, FRA2, and FRC1.

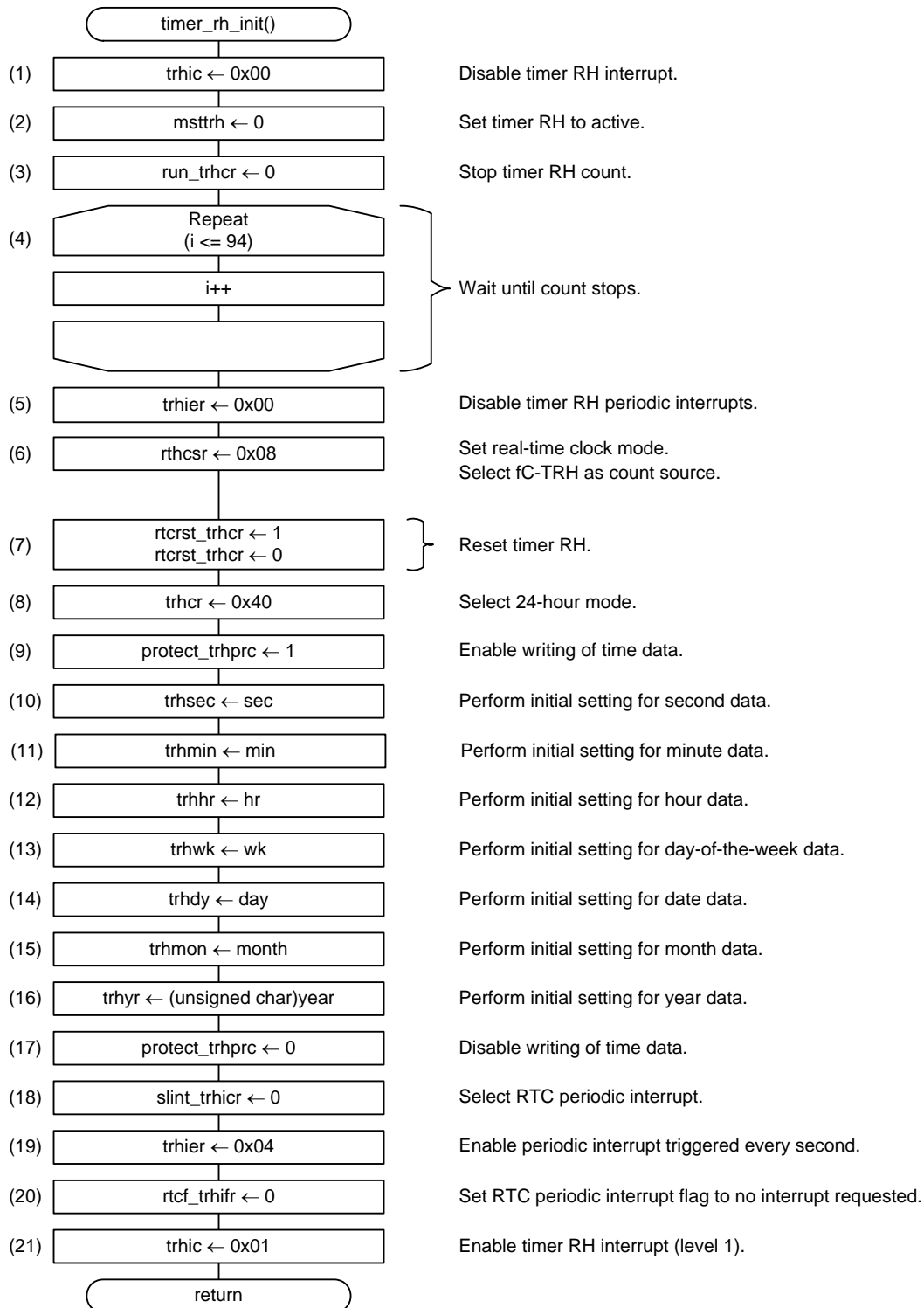
Protect Register (PRCR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	—	x	x	x	0

Bit	Symbol	Bit Name	Function	R/W
b0	PRC0	Protect bit 0	Enables writing to registers CM0, CM1, CM3, OCD, FRA0, FRC0, FRA2, and FRC1. 0: Write disabled	R/W

4.4 Initial Setting of Timer RH Associated SFRs

• Flowchart



• Register settings

(1) Disable the timer RH interrupt.

Interrupt Control Register (TRHIC)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	—		0	0	0

Bit	Symbol	Bit Name	Function	R/W
b0	ILVL0	Interrupt priority level select bit	b2 b1 b0 0 0 0: Level 0 (interrupt disabled)	R/W
b1	ILVL1			R/W
b2	ILVL2			R/W

(2) Set timer RH to active.

Module Standby Control Register 1 (MSTCR1)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	x	x	x	0	x	x

Bit	Symbol	Bit Name	Function	R/W
b2	MSTTRH	Timer RH standby bit	0: Active	R/W

(3) Stop the timer RH count.

Timer RH Control Register (TRHCR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	0		x			x	x	

Bit	Symbol	Bit Name	Function	R/W
b7	RUN	Timer RH operation start bit	0: Count stops	R/W

(4) Wait until the timer RH count stops. Wait for two cycles or more of the count source.

- (5) Disable all periodic interrupts of timer RH.

Timer RH Interrupt Enable Register (TRHIER)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	0	0	0	0	0	0	0	0

Bit	Symbol	Bit Name	Function	R/W
b0	SEIE025	Periodic interrupt triggered every 0.25 seconds enable bit	0: Periodic interrupt triggered every 0.25 seconds disabled	R/W
b1	SEIE05	Periodic interrupt triggered every 0.5 seconds enable bit	0: Periodic interrupt triggered every 0.5 seconds disabled	R/W
b2	SEIE	Periodic interrupt triggered every second enable bit	0: Periodic interrupt triggered every second disabled	R/W
b3	MNIE	Periodic interrupt triggered every minute enable bit	0: Periodic interrupt triggered every minute disabled	R/W
b4	HRIE	Periodic interrupt triggered every hour enable bit	0: Periodic interrupt triggered every hour disabled	R/W
b5	DYIE	Periodic interrupt triggered every day enable bit	0: Periodic interrupt triggered every day disabled	R/W
b6	MOIE	Periodic interrupt triggered every month enable bit	0: Periodic interrupt triggered every month disabled	R/W
b7	YRIE	Periodic interrupt triggered every year enable bit	0: Periodic interrupt triggered every year disabled	R/W

- (6) Set the timer RH count source select register.

Timer RH Count Source Select Register (TRHCSR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	x	x	x	x	1	0	0	0

Bit	Symbol	Bit Name	Function	R/W
b0	CS0	Count source select bit	Set to 1000b (fC-TRH) in real-time clock mode (CS3 bit = 1).	R/W
b1	CS1			R/W
b2	CS2			R/W
b3	CS3			R/W

- (7) Reset timer RH. Set the timer RH reset bit to 0 immediately after setting it to 1.

Timer RH Control Register (TRHCR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value			x	0			x	

Bit	Symbol	Bit Name	Function	R/W
b4	RTCRST	Timer RH reset bit	When this bit is set to 1, the target registers and bits are initialized to the reset values and the timer RH control circuit is initialized.	R/W

(8) Set the timer RH control register.

Timer RH Control Register (TRHCR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value		1	x		0		x	0

Bit	Symbol	Bit Name	Function	R/W
b0	AADJE	Timer RH automatic correction function enable bit	0: Automatic correction function disabled (correction function by software enabled)	R/W
b3	CCLR	Set to 0 in real-time clock mode.		R/W
b6	HR24	Operating mode select bit	1: 24-hour mode	R/W

(9) Enable writing of the time data.

Timer RH Protect Register (TRHPRC)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	1	—	—	—	—	—	—	—

Bit	Symbol	Bit Name	Function	R/W
b7	PROTECT	Protect bit	Write to time data registers enabled/disabled 1: Write enabled	R/W

(10) Perform an initial setting of the second data.

Timer RH Second Data Register (TRHSEC)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value		0	0	0	0	0	0	0

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	SC00	First digit of second count bit	Count 0 to 9 every second. When the digit increments, 1 is added to the second digit of second.	0 to 9 (BCD code)	R/W
b1	SC01				R/W
b2	SC02				R/W
b3	SC03				R/W
b4	SC10	Second digit of second count bit	When counting 0 to 5, 60 seconds are counted.	0 to 5 (BCD code)	R/W
b5	SC11				R/W
b6	SC12				R/W

(11) Perform an initial setting of the minute data.

Timer RH Minute Data Register (TRHMIN)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	0	0	0	0	0	0	0	0

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	MN00	First digit of minute count bit	Count 0 to 9 every minute. When the digit increments, 1 is added to the second digit of minute.	0 to 9 (BCD code)	R/W
b1	MN01				R/W
b2	MN02				R/W
b3	MN03				R/W
b4	MN10	Second digit of minute count bit	When counting 0 to 5, 60 minutes are counted.	0 to 5 (BCD code)	R/W
b5	MN11				R/W
b6	MN12				R/W
b7	MN7	Set to 0 in real-time clock mode.			R/W

(12) Perform an initial setting of the hour data.

Timer RH Hour Data Register (TRHHR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	0	0	0	0	0	0

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	HR00	First digit of hour count bit	Count 0 to 9 every hour. When the digit increments, 1 is added to the second digit of hour.	0 to 9 (BCD code)	R/W
b1	HR01				R/W
b2	HR02				R/W
b3	HR03				R/W
b4	HR10	Second digit of hour count bit	Count 0 to 2.	0 to 2 (BCD code)	R/W
b5	HR11				R/W

(13) Set the day-of-the-week data.

Timer RH Day-of-the-Week Data Register (TRHWK)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	—	—	0	1	0

Bit	Symbol	Bit Name	Function	R/W
b0	WK0	Day-of-the-week count bit	b2 b1 b0 0 1 0: Tuesday	R/W
b1	WK1			R/W
b2	WK2			R/W

(14) Perform an initial setting of the date data.

Timer RH Date Data Register (TRHDY)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	0	0	0	0	0	1

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	DY00	First digit of date count bit	Count 0 to 9 every day. When the digit increments, 1 is added to the second digit of date.	0 to 9 (BCD code)	R/W
b1	DY01				R/W
b2	DY02				R/W
b3	DY03				R/W
b4	DY10	Second digit of date count bit	Count 0 to 3.	0 to 3 (BCD code)	R/W
b5	DY11				R/W

(15) Perform an initial setting of the month data.

Timer RH Month Data Register (TRHMON)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	0	0	0	0	1

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	MO00	First digit of month count bit	Count 0 to 9 every month. When the digit increments, 1 is added to the second digit of month.	0 to 9 (BCD code)	R/W
b1	MO01				R/W
b2	MO02				R/W
b3	MO03				R/W
b4	MO10	Second digit of month count bit	Count 0 to 1.	0 to 1 (BCD code)	R/W

(16) Perform an initial setting of the year data.

Timer RH Year Data Register (TRHYR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	0	0	0	0	1	0	0	1

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	YR00	First digit of year count bit	Count 0 to 9 every year. When the digit increments, 1 is added to the second digit of year.	0 to 9 (BCD code)	R/W
b1	YR01				R/W
b2	YR02				R/W
b3	YR03				R/W
b4	YR10	Second digit of year count bit	Count 0 to 9.	0 to 9 (BCD code)	R/W
b5	YR11				R/W
b6	YR12				R/W
b7	YR13				R/W

(17) Disable writing of the time data.

Timer RH Protect Register (TRHPRC)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	0	—	—	—	—	—	—	—

Bit	Symbol	Bit Name	Function	R/W
b7	PROTECT	Protect bit	Write to time data registers enabled/disabled 0: Write disabled	R/W

(18) Select the RTC periodic interrupt.

Timer RH Second Interrupt Control Register (TRHICR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	x	—	0	x	x	x	x	x

Bit	Symbol	Bit Name	Function	R/W
b5	SLINT	Interrupt select bit	0: RTC periodic interrupt	R/W

(19) Enable the periodic interrupt triggered every second.

Timer RH Interrupt Enable Register (TRHIER)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	0	0	0	0	0	1	0	0

Bit	Symbol	Bit Name	Function	R/W
b2	SEIE	Periodic interrupt triggered every second enable bit	1: Periodic interrupt triggered every second enabled	R/W

(20) Set the RTC periodic interrupt flag to no interrupt requested.

Timer RH Interrupt Flag Register (TRHIFR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	x	x	x	0	x

Bit	Symbol	Bit Name	Function	R/W
b1	RTCF	RTC periodic interrupt flag	0: No interrupt requested	R/W

(21) Enable the timer RH interrupt (level 1).

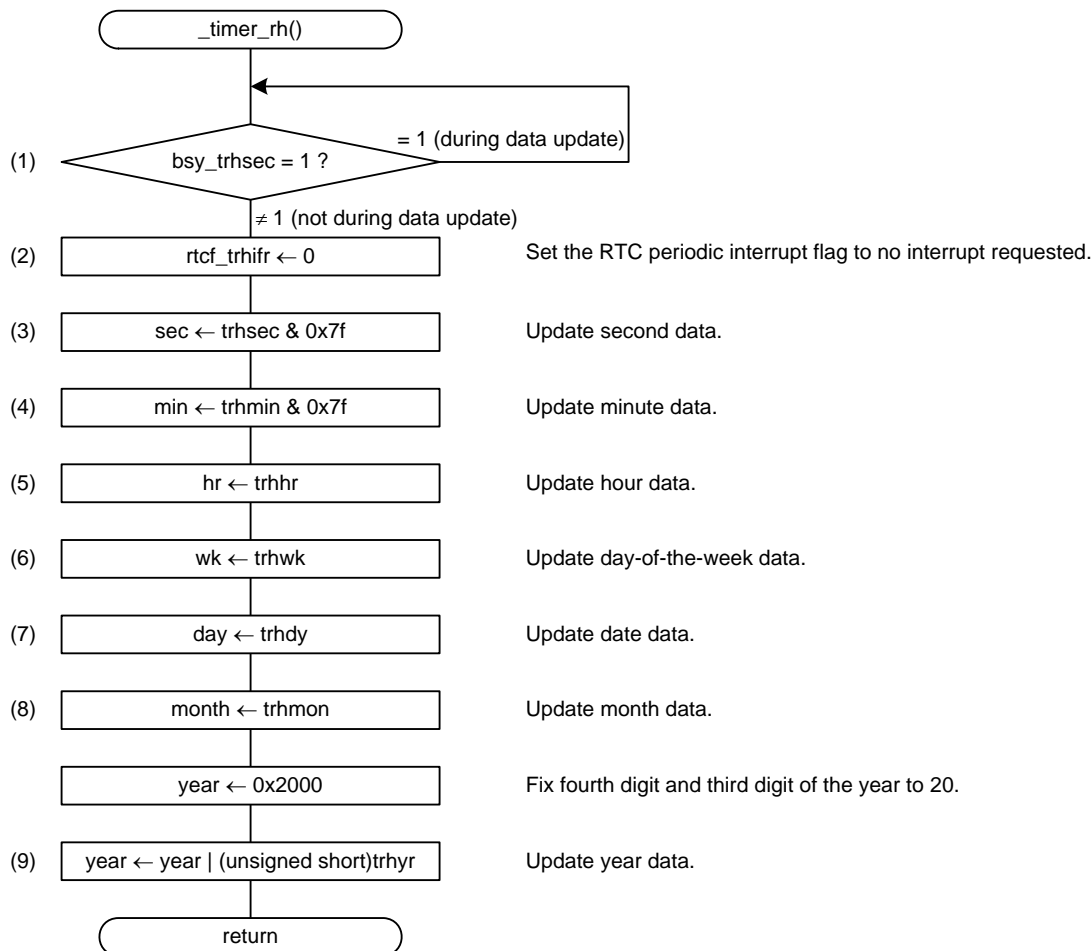
Interrupt Control Register (TRHIC)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	—		0	0	1

Bit	Symbol	Bit Name	Function	R/W
b0	ILVL0	Interrupt priority level select bit	b2 b1 b0 0 0 1: Level 1	R/W
b1	ILVL1			R/W
b2	ILVL2			R/W

4.5 Timer RH Interrupt Handling

• Flowchart



• Register settings

- (1) Wait until the BSY bit in the TRHSEC register becomes 0.

Timer RH Second Data Register (TRHSEC)

Bit	Symbol	Bit Name	Function	R/W
b7	BSY	Timer RH busy flag	This bit is set to 1 while timer RH data registers or the PM bit in the TRHCR register is updated.	R

- (2) Set the RTC periodic interrupt flag to 0.

Timer RH Interrupt Flag Register (TRHIFR)

Bit	b7	b6	b5	b4	b3	b2	b1	b0
Setting Value	—	—	—	x	x	x	0	x

Bit	Symbol	Bit Name	Function	R/W
b1	RTCF	RTC periodic interrupt flag	0: No interrupt requested	R/W

- (3) Read the timer RH second data register to update second data variables

Timer RH Second Data Register (TRHSEC)

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	SC00	First digit of second count bit	Count 0 to 9 every second. When the digit increments, 1 is added to the second digit of second.	0 to 9 (BCD code)	R/W
b1	SC01				R/W
b2	SC02				R/W
b3	SC03				R/W
b4	SC10	Second digit of second count bit	When counting 0 to 5, 60 seconds are counted.	0 to 5 (BCD code)	R/W
b5	SC11				R/W
b6	SC12				R/W

- (4) Read the timer RH minute data register to update minute data variables.

Timer RH Minute Data Register (TRHMIN)

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	MN00	First digit of minute count bit	Count 0 to 9 every minute. When the digit increments, 1 is added to the second digit of minute.	0 to 9 (BCD code)	R/W
b1	MN01				R/W
b2	MN02				R/W
b3	MN03				R/W
b4	MN10	Second digit of minute count bit	When counting 0 to 5, 60 minutes are counted.	0 to 5 (BCD code)	R/W
b5	MN11				R/W
b6	MN12				R/W

- (5) Read the timer RH hour data register to update hour data variables.

Timer RH Hour Data Register (TRHHR)

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	HR00	First digit of hour count bit	Count 0 to 9 every hour. When the digit increments, 1 is added to the second digit of hour.	0 to 9 (BCD code)	R/W
b1	HR01				R/W
b2	HR02				R/W
b3	HR03				R/W
b4	HR10	Second digit of hour count bit	Count 0 to 2.	0 to 2 (BCD code)	R/W
b5	HR11				R/W

- (6) Read the timer RH day-of-the-week data register to update day-of-the-week data variables.

Timer RH Day-of-the-Week Data Register (TRHWK)

Bit	Symbol	Bit Name	Function	R/W
b0	WK0	Day-of-the-week count bit	b2 b1 b0 0 0 0: Sunday 0 0 1: Monday 0 1 0: Tuesday 0 1 1: Wednesday 1 0 0: Thursday 1 0 1: Friday 1 1 0: Saturday 1 1 1: Do not set.	R/W
b1	WK1			R/W
b2	WK2			R/W

- (7) Read the timer RH date data register to update date data variables.

Timer RH Date Data Register (TRHDY)

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	DY00	First digit of date count bit	Count 0 to 9 every day. When the digit increments, 1 is added to the second digit of date.	0 to 9 (BCD code)	R/W
b1	DY01				R/W
b2	DY02				R/W
b3	DY03				R/W
b4	DY10	Second digit of date count bit	Count 0 to 3.	0 to 3 (BCD code)	R/W
b5	DY11				R/W

(8) Read the timer RH month data register to update month data variables.

Timer RH Month Data Register (TRHMON)

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	MO00	First digit of month count bit	Count 0 to 9 every month. When the digit increments, 1 is added to the second digit of month.	0 to 9 (BCD code)	R/W
b1	MO01				R/W
b2	MO02				R/W
b3	MO03				R/W
b4	MO10	Second digit of month count bit	Count 0 to 1.	0 to 1 (BCD code)	R/W

(9) Read the timer RH year data register to update year data variables.

Timer RH Year Data Register (TRHYR)

Bit	Symbol	Bit Name	Function	Setting Range	R/W
b0	YR00	First digit of year count bit	Count 0 to 9 every year. When the digit increments, 1 is added to the second digit of year.	0 to 9 (BCD code)	R/W
b1	YR01				R/W
b2	YR02				R/W
b3	YR03				R/W
b4	YR10	Second digit of year count bit	Count 0 to 9.	0 to 9 (BCD code)	R/W
b5	YR11				R/W
b6	YR12				R/W
b7	YR13				R/W

5. Sample Program

A sample program can be downloaded from the Renesas Electronics website.

To download, click “Application Notes” in the left-hand side menu of the R8C Family page.

6. Reference Documents

R8C/LA8A Group User’s Manual: Hardware Rev.1.01

The latest version can be downloaded from the Renesas Electronics website.

Technical Update/Technical News

The latest information can be downloaded from the Renesas Electronics website.

Website and Support

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Revision History	R8C/LA8A Group Timer RH (Real-Time Clock Mode)
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Rev.	Date	Description	
		Page	Summary
1.00	Oct. 25, 2010	—	First edition issued

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General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this manual, refer to the relevant sections of the manual. If the descriptions under General Precautions in the Handling of MPU/MCU Products and in the body of the manual differ from each other, the description in the body of the manual takes precedence.

1. Handling of Unused Pins

Handle unused pins in accord with the directions given under Handling of Unused Pins in the manual.

- The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

The state of the product is undefined at the moment when power is supplied.

- The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.

In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.

In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

Access to reserved addresses is prohibited.

- The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

- When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products

Before changing from one product to another, i.e. to one with a different part number, confirm that the change will not lead to problems.

- The characteristics of MPU/MCU in the same group but having different part numbers may differ because of the differences in internal memory capacity and layout pattern. When changing to products of different part numbers, implement a system-evaluation test for each of the products.

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