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User's Manual

# Renesas Embedded Application Programming Interface

## Reference manual

Renesas Electronics
www.renesas.com

Rev.1.01 2007.02

REVISION HISTORY

| Rev. | Summary | Date |
|---|---|---|
| 1.00 | | 06.04.07 |
| 1.01 | ・ Additions and corrections made for support of libraries for the H8/36094, H8/36077, H8/36109, and R8C/24 and 25<br>・ Unnecessary periods in Chapter 1, “Instruction,” deleted<br>・ Port P73 of H8 deleted<br>・ Channels A–D written in CreateInputCapture corrected to input captures A–D<br>・ Error in writing “seroal” corrected to “serial”<br>・ Erroneous description of RAPI_70_STATES corrected<br>・ Error in writing of timer channel names corrected<br>・ Error in writing of input capture mode corrected<br>・ Error in writing of output compare mode corrected<br>・ Erroneous description of RAPI_OVERFLOW_BIT15 corrected<br>・ Support for R8C UART1 clock synchronous mode<br>・ RAPI_COUNT_CLEAR added to first arguments for the R8C and H8/300H in __CreateInputCapture and __CreateOutputCompare<br>・ “External signal” deleted from the timer RD count source for the R8C in __CreateInputCapture and __CreateOutputCompare<br>・ Following statements added to the item for timer RD in __SetTimerRegister and __GetTimerRegister<br>・ [15]: Timer RD output master enable register 1<br>・ [16]: Timer RD output master enable register 2<br>・ [17]: Timer RD output control register<br>・ Explanation for clearing H8/300H module added to the description of __Create..., __Open..., and __BasicOpen...<br>・ Explanation for setting H8/300H module for standby added to the description of __Destroy..., __Close..., and BasicClose...<br>・ Return value in __PollingSerialReceiving changed from Boolean to unsigned int, and explanation of return value and example program changed<br>・ Return value in __PollingSerialSending changed from Boolean to unsigned int, and explanation of return value and example program changed<br>・ Remarks regarding use of port B on H8/300H added to __ReadIOPort and __ReadIOPortRegister | 07.02.16 |

| | | |
|---|---|---|
| | ・ Description of third argument in __CreateInputCapture corrected<br>・ Wording “specified” unified to “specified”<br>・ RAPI_BOTH deleted from the description of timer B1 count edges of H8/300H in __CreateEventCounter<br>・ RAPI_FTIOA and RAPI_FTIOB added to __CreatePulsePeriodMeasurementMode and __CreatePulseWidthMeasurementMode<br>・ All occurrences of the word “Tiny” deleted<br>・ Description of second argument added to __GetPulsePeriodMeasurementMode, __GetPulseWidthMeasurementMode, and __GetEventCounter<br>・ Description regarding timer V trigger of H8 in __CreateTimer, __CreateEventCounter, and __CreatePulseWidthMeasurementMode corrected<br>・ Explanation of H8 interrupt settings and interrupt control register settings in __SetSerialInterrupt corrected<br>・ Remarks on timer V of H8/300H in __EnableTimerRegister added<br>・ Specification of timer RA input pins of R8C in __CreatePulsePeriodMeasurementMode and __CreatePulseWidthMeasurementMode as well as RAPI_TIOSEL_P1_7 and RAPI_TIOSEL_P1_5 added<br>・ File name in program example corrected<br>・ Item “Reference” in __BasicSetSerialFormat deleted<br>・ __BasicSetSerialFormat added to “Reference” in __SetSerialFormat and __SetSerialInterrupt<br>・ Error in writing of __CreateInput Capture and __CreateOutputCapture corrected<br>・ Explanation added to Section 2.1, “Overview”<br>・ Causes of clearing of timer W and timer RC counters in __CreateInputCapture deleted<br>・ RAPI_COMPARE_MATCH_A_STOP and RAPI_STOP added to the item for the R8C in __CreateOutputCompare<br>・ Changed to RAPI_INT_LV_0 and RAPI_INT_LV_1 for H8/300H in __SetSerialInterrupt<br>・ Description relating to clock in __CreateTimer corrected<br>・ RAPI_TRC_FILTER and RAPI_TRD_FILTER added to filter specification for H8 in __CreatePulsePeriodMeasurementMode and __CreatePulseWidthMeasurementMode<br>・ RAPI_TIMER_RD2 and RAPI_TIMER_RD3 added to timer RD of H8/36109<br>・ Description relating to timer V trigger input for H8/300H in __CreateTimer deleted<br>・ Description of pulse output function added to the item for R8C in __CreateEventCounter<br>・ Description of timer RE usage added to items data3 and data5 for R8C in __CreateOutputCompare<br>・ Filter function of timer RC and timer RD in __CreatePulsePeriodMeasurementMode, __CreatePulseWidthMeasurementMode, and __CreateInputCapture corrected<br>・ Description that multiple defined values can be set for data1 in __EnableInterrupt added<br>・ Description that RAPI_WITHOUT_SAMPLE_HOLD is specifiable in delay trigger modes 0 and 1 of M16C in __CreateADC corrected<br>・ Description that RAPI_FOCOF is specifiable in repeat mode of R8C in __CreateADC corrected | |

| | | |
|---|---|---|
| | ・ RAPI_AN30, RAPI_AN31, RAPI_AN32, and RAPI_P9_GROUP added to the item for data1 of M16C in __CreateADC<br>・ RAPI_AN30, RAPI_AN31, RAPI_AN32, and RAPI_P9_GROUP added to the item for data1 of M16C in __EnableADC<br>・ Error in writing of H8/300H interrupt set values in __CreateOutputCompare corrected<br>・ Error in writing of timer RD and timer RD symbol name corrected<br>・ Description of gate function of M16C in __CreateEventCounter deleted<br>・ Description of H8/300H noise rejection function in __BasicSetSerialFormat added<br>・ Description of timer W input pins of H8/300H in __CreatePulsePeriodMeasurementMode and __CreatePulseWidthMeasurementMode deleted | |

## Table of Contents

# 1. Introduction

The Renesas Embedded Application Programming Interface (API) is a unified API for the microcomputers made by Renesas Technology Corporation.

# 2. Driver

## 2.1 Overview

The library described herein provides a peripheral facility control program (peripheral driver) for microcomputers. Use of the Renesas API permits the peripheral driver to be built into a user program.

Configuration of Renesas APIs is shown below.

| File name | Description |
|---|---|
| rapi_*xxx_yyy*.lib<br>(*xxx* = family name, *yyy* = series name) | This is the Renesas API library file. To use Renesas APIs, specify this file as input file for the linker. |
| rapi_ad_*xxx_yyy*.h<br>(*xxx* = family name, *yyy* = series name) | This is the header file for A/D converter driver APIs. To use A/D converter driver APIs, be sure to include this file. |
| rapi_io_port_*xxx_yyy*.h<br>(*xxx* = family name, *yyy*= series name) | This is the header file for I/O port driver APIs. To use I/O port driver APIs, be sure to include this file. |
| rapi_sif_*xxx_yyy*.h<br>(*xxx* = family name, *yyy*= series name) | This is the header file for serial I/F driver APIs. To use serial I/F driver APIs, be sure to include this file. |
| rapi_timer_*xxx_yyy*.h<br>(*xxx* = family name, *yyy*= series name) | This is the header file for timer driver APIs. To use timer driver APIs, be sure to include this file. |
| Interrupt_*xxx_yyy*.h<br>(*xxx* = family name, *yyy*= series name) | This is the interrupt function source file for Renesas APIs. To use Renesas APIs that use interrupts, add this file to the user program. |
| rapi_io_*xxx_yyy*.h<br>(*xxx* = family name, *yyy*= series name) | This is the CPU control register definition header file for Renesas APIs. |

## 2.2 Driver Features

The library described herein has the following features available as a peripheral driver.

(1) Serial I/O control feature

It comprises a serial interface driver, which sets or clears the conditions of serial communication, as well as controls and manages the transmission/reception of communication data.

(2) Timer control feature

It comprises a timer driver, which sets or clears the operating conditions of timers, as well as controls the timer operation.

(3) I/O port control feature

It comprises an I/O port driver, which sets or clears the usage conditions of I/O ports, as well as control data read/write operation.

(4) External interrupt control feature

It comprises an external interrupt driver, which sets or clears the usage conditions of external interrupts, as well as controls interrupt operation.

(5) A/D converter control feature

It comprises an A/D converter driver, which sets or clears the usage conditions of A/D converters, as well as controls A/D converter operation.

### 2.3 Serial Interface Driver

The serial interface driver sets serial communication, clears settings, transmit/receives data, and controls the status of serial communication.

There are two kinds of serial interface driver: a single-data transmission/reception API and a multi-data transmission/reception API.

## 2.4 Timer Driver

The timer driver sets the timer, clears timer settings, controls timer operation, and acquires a counter value with respect to the following modes:

- Timer mode
- Event counter mode
- Pulse width modulation mode (PWM mode)
- Pulse period measurement mode
- Pulse width measurement mode
- Input capture mode
- Output compare mode

### 2.4.1 Timer Mode

In this mode, the timer counts the internally generated count source. When an underflow or an overflow interrupt occurs, it calls a preset callback function.

### 2.4.2 Event Counter Mode

In this mode, the timer counts the external signal fed in from an input pin or an overflow or underflow from other timer. When an underflow or an overflow interrupt occurs, it calls a preset callback function.

### 2.4.3 Pulse Width Modulation Mode (PWM Mode)

In this mode, the timer outputs pulses in a given width successively. When an underflow or an overflow interrupt occurs, it calls a preset callback function.

### 2.4.4 Pulse Period Measurement Mode

In this mode, the timer measures the pulse period of an external signal fed in from an input pin. When an underflow or an overflow interrupt occurs, it calls a preset callback function.

### 2.4.5 Pulse Width Measurement Mode

In this mode, the timer measures the pulse width of an external signal fed in from an input pin. When an underflow or an overflow interrupt occurs, it calls a preset callback function.

### 2.4.6 Input Capture Mode

In this mode, the timer latches the timer value upon an active signal edge or clock pulse at an input pin, thereby generating an interrupt request. When an input capture interrupt or an underflow or an overflow interrupt occurs, it calls a preset callback function.

### 2.4.7 Output Compare Mode

In this mode, the timer generates an interrupt request when the timer counter and a comparison value match. When a compare match interrupt or an underflow or an overflow interrupt occurs, it calls a preset callback function.

### 2.5 I/O Port Driver

The I/O port driver sets the I/O port for input or output, writes data to the I/O port, and reads data from the I/O port.

### 2.6 External Interrupt Driver

The external interrupt driver sets external interrupts, controls external interrupts, acquires the status of external interrupt flags, and clears external interrupt flags.

## 2.7 A/D Converter Driver

The A/D converter driver sets the A/D converter, controls the A/D converter, clears settings of the A/D converter, acquires the A/D converter value, acquires the status of the A/D converter, and clears the status of the A/D converter.

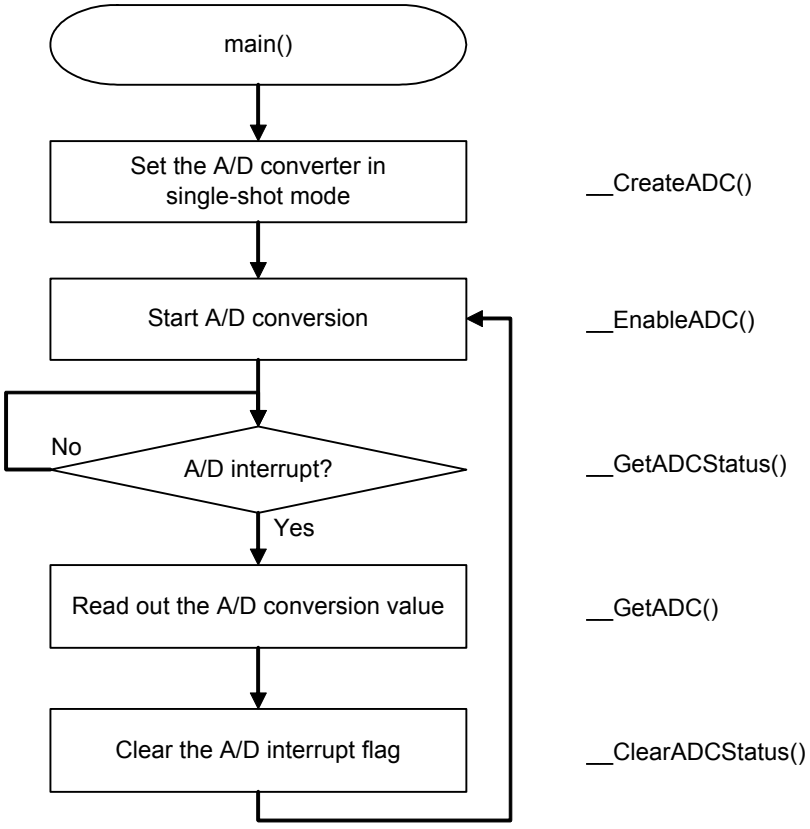
### [A/D converter driver usage example (single-shot mode)]

Here, a program example is shown for the A/D converter operating in single-shot mode under the conditions given below.

| | | |
|---|---|---|
| CPU | : | R8C |
| Operating clock | : | fAD divided by 2 |
| Resolution | : | 10 bits |
| Analog input pin | : | AN0 pin |
| A/D conversion start condition | : | Software trigger |
| Sample-and-hold | : | Enabled |

A program flow and a program example are shown below.

**(Program flow)**



**Program example**

```
#include "rapi_ad_r8c_13.h"

void main( void )
{
   unsigned int  status, data;

   /* Set up A/D converter as one short mode */
   __CreateADC(                    RAPI_ONE_SHOT|RAPI_AN0|RAPI_FAD2|
RAPI_WITH_SAMPLE_HOLD|
               RAPI_AD_OFF|RAPI_10BIT, 1, 0, 0 );

   while( 1 ){
      /* Disable A/D converter */
      __EnableADC( RAPI_AN0| RAPI_AD_ON, 1 );

      /* Check a flag bit of A/D converter interrupt */
      do{
         __GetADCStatus( &status );
      } while( (*status & 0x0001) == 0 )

      /* Get A/D convertered datas of A/D register */
      __GetADC( &data );

      /* Clear status of A/D convertered */
      __ClearADCStatus( 0 );
   }
}
```

## 3. Standard Types

This section describes the standard types defined in the library. For details about the set values, refer to the description of each API.

| Standard type | Description |
|---|---|
| Boolean | The Boolean type represents the enum-type data that indicates whether successful (RAPI_TRUE (= 1)) or failed (RAPI_FALSE (= 0)). |
| VoidFuncNotify | The VoidFuncNotify type represents the type of the notification function to be registered. |

# 4. Library Reference

## 4.1 API List by Peripheral Facility

The table below lists the Renesas Embedded APIs classified by peripheral facility.

| NO | Facility classification | API | API operation |
|---|---|---|---|
| 1 | Single-data serial I/O | R_BasicOpenSerialDriver | Opens serial port |
| 2 | | R_BasicCloseSerialDriver | Closes serial port |
| 3 | | R_BasicSetSerialFormat | Sets serial communication |
| 4 | | R_BasicStartSerialReceiving | Receives 1 data |
| 5 | | R_BasicStartSerialSending | Transmits 1 data |
| 6 | | R_BasicReceivingStatusRead | Reads receive status |
| 7 | | R_BasicSendingStatusRead | Reads transmit status |
| 8 | | R_BasicStopSerialReceiving | Stops reception |
| 9 | | R_BasicStopSerialSending | Stops transmission |
| 10 | Multi-data serial I/O | R_OpenSerialDriver | Opens serial port |
| 11 | | R_CloseSerialDriver | Closes serial port |
| 12 | | R_ConfigSerialDriverNotify | Registers notification function |
| 13 | | R_SetSerialFormat | Sets serial communication |
| 14 | | R_SetSerialInterrupt | Sets transmit/receive interrupt |
| 15 | | R_StartSerialReceiving | Starts reception |
| 16 | | R_StartSerialSending | Starts transmission |
| 17 | | R_StopSerialReceiving | Stops reception |
| 18 | | R_StopSerialSending | Stops transmission |
| 19 | | R_PollingSerialReceiving | Receives by polling |
| 20 | | R_PollingSerialSending | Transmits by polling |
| 21 | Timer | R_CreateTimer | Sets timer mode |
| 22 | | R_EnableTimer | Controls timer mode operation |
| 23 | | R_DestroyTimer | Clears timer mode setting |
| 24 | | R_CreateEventCounter | Sets event counter mode |
| 25 | | R_EnableEventCounter | Controls operation of event counter mode |
| 26 | | R_DestroyEventCounter | Clears setting of event counter mode |
| 27 | | R_GetEventCounter | Gets event counter mode counter value |
| 28 | | R_CreatePulseWidthModulationMode | Sets pulse width modulation mode |
| 29 | | R_EnablePulseWidthModulationMode | Controls operation of pulse width modulation mode |
| 30 | | R_DestroyPulseWidthModulationMode | Clears setting of pulse width modulation mode |
| 31 | | R_CreatePulsePeriodMeasurementMode | Sets pulse period measurement mode |
| 32 | | R_EnablePulsePeriodMeasurementMode | Controls operation of pulse period measurement mode |
| 33 | | R_DestroyPulsePeriodMeasurementMode | Clears setting of pulse width measurement mode |
| 34 | | R_GetPulsePeriodMeasurementMode | Acquires measured value of pulse period measurement mode |

| | | | |
|---|---|---|---|
| 35 | | __CreatePulseWidthMeasurementMode | Sets pulse width measurement mode |
| 36 | | __EnablePulseWidthMeasurementMode | Controls operation of pulse width measurement mode |
| 37 | Timer | __DestroyPulseWidthMeasurementMode | Clears setting of pulse width measurement mode |
| 38 | | __GetPulseWidthMeasurementMode | Acquires measured value of pulse width measurement mode |
| 39 | | __CreateInputCapture | Sets input capture mode |
| 40 | | __EnableInputCapture | Controls operation of input capture mode |
| 41 | | __DestroyInputCapture | Clears setting of input capture mode |
| 42 | | __GetInputCapture | Acquires counter value of input capture mode |
| 43 | | __CreateOutputCompare | Sets output compare mode |
| 44 | | __EnableOutputCompare | Controls operation of output compare mode |
| 45 | | __DestroyOutputCompare | Clears setting of output compare mode |
| 46 | | __SetTimerRegister | Sets timer register |
| 47 | | __EnableTimerRegister | Controls operation of timer register |
| 48 | | __ClearTimerRegister | Clears timer register |
| 49 | | __GetTimerRegister | Gets timer register value |
| 50 | I/O port | __SetIOPort | Sets I/O port |
| 51 | | __ReadIOPort | Reads from I/O port |
| 52 | | __WriteIOPort | Writes to I/O port |
| 53 | | __SetIOPortRegister | Sets I/O port register |
| 54 | | __ReadIOPortRegister | Reads from I/O port register |
| 55 | | __WriteIOPortRegister | Writes to I/O port register |
| 56 | External interrupt | __SetInterrupt | Sets external interrupt |
| 57 | | __EnableInterrupt | Controls external interrupt |
| 58 | | __GetInterruptFlag | Gets flag status of external interrupt |
| 59 | | __ClearInterruptFlag | Clears flag of external interrupt |
| 60 | A/D converter | __CreateADC | Sets A/D converter |
| 61 | | __EnableADC | Controls operation of A/D converter |
| 62 | | __DestroyADC | Discards settings of A/D converter |
| 63 | | __GetADC | Gets A/D conversion value (register specified) |
| 64 | | __GetADCAll | Gets A/D conversion value (all registers) |
| 65 | | __GetADCStatus | Gets status of A/D converter |
| 66 | | __ClearADCStatus | Clears status of A/D converter |

### 4.2 Description of Each API

This section describes each API and explains how to use them, showing a program example for each.

The description of each API is divided into the following items.

- **Synopsis** : Outlines the content of processing performed by the function. It also shows the syntax of the function, followed by a brief explanation of arguments.
- **Description** : Describes the function and how to use it in detail.
- **Return value** : Explains the returned value of the function.
- **Functionality** : Indicates the functional classification of the function.
- **Reference** : Indicates the related functions.
- **Remark** : Describes the precautions to be taken when using the API.
- **Program example** : Presents a program showing how to use the function.

### 4.2.1 Serial I/O
### __BasicOpenSerialDriver

**Synopsis**

<Open a serial port>

**Boolean __BasicOpenSerialDriver(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Opens and initializes a specified serial port.

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

If the serial port specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Serial I/O

**Reference**

__BasicCloseSerialDriver

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- When used for the H8/300H, this API opens and initializes a specified serial port when freeing it from module standby state.

**Program example**

```
#include ”rapi_sif_r8c_13.h”

void func( void )
{
    /* Open serial driver */
    return __BasicOpenSerialDriver( RAPI_COM1 );
}
```

## __BasicCloseSerialDriver

**Synopsis**

<Close a serial port>

**Boolean __BasicCloseSerialDriver(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Closes a specified serial port. For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

If the serial port specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Serial I/O

**Reference**

__BasicOpenSerialDriver

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- When used for the H8/300H, this API places a specified serial port into module standby state after closing it.

**Program example**

```
#include  "rapi_sif_r8c_13.h"

void func( void )
{
    /* Close serial driver */
    return Rapi_BasicCloseSerialDriver( RAPI_COM1 );
}
```

## __BasicSetSerialFormat

**Synopsis**

<Set serial communication>

**Boolean __BasicSetSerialFormat(unsigned long data1, unsigned char data2)**

| | |
|---|---|
| data1 | Setup data 1 |
| data2 | Setup data 2 |

**Description**

Sets serial communication according to specified parameters.

**[data1]**

For data1, the following values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

For serial communication mode, the following values can be set.

(M16C) (UART0, UART1, UART2)

| | |
|---|---|
| RAPI_SM_SYNC | Clock synchronous serial communication mode |
| RAPI_SM_ASYNC | Clock asynchronous serial communication mode |

(M16C)(SI/O3, SI/O4)

| | |
|---|---|
| RAPI_SIO_SM_SYNC | Clock synchronous serial communication mode |

For the data length format of clock asynchronous serial communication, the following values can be set.

If the API is used in clock synchronous serial communication mode, do not set these values.

(M16C) (UART0, UART1, UART2)

| | | | |
|---|---|---|---|
| RAPI_BIT_7 | Transfer data length 7 bits | RAPI_BIT_8 | Transfer data length 8 bits |
| RAPI_BIT_9 | Transfer data length 9 bits | | |

For the clock source of serial communication, the following values can be set.

(M16C) (UART0, UART1, UART2)

| | |
|---|---|
| RAPI_CKDIR_INT | Internal clock is used as the clock source of serial communication. |
| RAPI_CKDIR_EXT | External clock is used as the clock source of serial communication. |

(M16C) (SI/O3, SI/O4)

| | |
|---|---|
| RAPI_SIO_CKDIR_INT | Internal clock is used as the clock source of serial communication. |
| RAPI_SIO_CKDIR_EXT | External clock is used as the clock source of serial communication. |

For the stop bit length of clock asynchronous serial communication, the following values can be set.

If the API is used in clock synchronous serial communication mode, do not set these values.

(M16C) (UART0, UART1, UART2)

| | | | |
|---|---|---|---|
| RAPI_STPB_1 | 1 stop bit | RAPI_STPB_2 | 2 stop bits |

For the parity bit of clock asynchronous serial communication, the following values can be set.

If the API is used in clock synchronous serial communication mode, do not set these values.

(M16C) (UART0, UART1, UART2)

| | | | |
|---|---|---|---|
| RAPI_PARITY_NON | No parity bit | RAPI_PARITY_EVEN | Even parity bit |
| RAPI_PARITY_ODD | Odd parity bit | | |

For the clock polarity of serial communication, the following values can be set.

If the API is used in clock asynchronous serial communication mode, do not set these values.

(M16C) (UART0, UART1, UART2)

| | | | |
|---|---|---|---|
| RAPI_DPOL_NON | Polarity not inverted | RAPI_DPOL_INV | Polarity inverted |

(M16C) (SI/O3, SI/O4)

| | | | |
|---|---|---|---|
| RAPI_SIO_DPOL_NON | Polarity not inverted | RAPI_SIO_DPOL_INV | Polarity inverted |

For the count source of the built-in baud rate generator, the following values can be set.

(M16C) (UART0, UART1, UART2)

| | | | |
|---|---|---|---|
| RAPI_BCSS_F1 | f1SIO | RAPI_BCSS_F2 | f2SIO |
| RAPI_BCSS_F8 | f8SIO | RAPI_BCSS_F32 | f32SIO |

(M16C) (SI/O3, SI/O4)

| | | | |
|---|---|---|---|
| RAPI_SIO_BCSS_F1 | f1SIO | RAPI_SIO_BCSS_F2 | f2SIO |
| RAPI_SIO_BCSS_F8 | f8SIO | RAPI_SIO_BCSS_F32 | f32SIO |

For the _CTS/_RTS function, the following values can be set.

If the internal clock is selected for use in clock synchronous serial communication mode, the _RTS function has no effect.

(M16C) (UART0, UART1, UART2)

| | |
|---|---|
| RAPI_CTSRTS_DIS | _CTS/_RTS functions are not used. |
| RAPI_CTS_SEL | _CTS function is selected. |
| RAPI_RTS_SEL | _RTS function is selected. |

For the transfer format, the following values can be set.

If the data length selected for use in clock asynchronous serial communication mode is 7 or 9 bits long, do not set these values.

(M16C) (UART0, UART1, UART2)

| | | | |
|---|---|---|---|
| RAPI_LSB_SEL | LSB first | RAPI_MSB_SEL | MSB first |

(M16C) (SI/O3, SI/O4)

| | | | |
|---|---|---|---|
| RAPI_SIO_LSB_SEL | LSB first | RAPI_SIO_MSB_SEL | MSB first |

For serial data logic switchover, the following values can be set.

(M16C) (UART2)

| | |
|---|---|
| RAPI_LOGIC_NO_REV | The value written in the transmit buffer register does not have its logic inverted. |
| RAPI_LOGIC_REV | The value written in the transmit buffer register is inverted before being transmitted. |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

For serial communication mode, the following values can be set.

(R8C) (UART0, UART1)

| | |
|---|---|
| RAPI_SM_SYNC | Clock synchronous serial communication mode |
| RAPI_SM_ASYNC | Clock asynchronous serial communication mode |

For the data length format of clock asynchronous serial communication, the following values can be set.

If the API is used in clock synchronous serial communication mode, do not set these values.

(R8C) (UART0, UART1)

| | | | |
|---|---|---|---|
| RAPI_BIT_7 | Transfer data length 7 bits | RAPI_BIT_8 | Transfer data length 8 bits |
| RAPI_BIT_9 | Transfer data length 9 bits | | |

For the clock source of serial communication, the following values can be set.

(R8C) (UART0, UART1)

| | |
|---|---|
| RAPI_CKDIR_INT | Internal clock is used as the clock source of serial communication. |
| RAPI_CKDIR_EXT | External clock is used as the clock source of serial communication. |

For the stop bit length of clock asynchronous serial communication, the following values can be set.

If the API is used in clock synchronous serial communication mode, do not set these values.

(R8C) (UART0, UART1)

| | | | |
|---|---|---|---|
| RAPI_STPB_1 | 1 stop bit | RAPI_STPB_2 | 2 stop bits |

For the parity bit of clock asynchronous serial communication, the following values can be set.

If the API is used in clock synchronous serial communication mode, do not set these values.

(R8C) (UART0, UART1)

| | | | |
|---|---|---|---|
| RAPI_PARITY_NON | No parity bit | RAPI_PARITY_EVEN | Even parity bit |
| RAPI_PARITY_ODD | Odd parity bit | | |

For the clock polarity of serial communication, the following values can be set.

If the API is used in clock asynchronous serial communication mode, do not set these values.

(R8C) (UART0, UART1)

| | | | |
|---|---|---|---|
| RAPI_DPOL_NON | Polarity not inverted | RAPI_DPOL_INV | Polarity inverted |

For the count source of the built-in baud rate generator, the following values can be set.

(R8C) (UART0, UART1)

| | | | |
|---|---|---|---|
| RAPI_BCSS_F1 | f1SIO | RAPI_BCSS_F8 | f8SIO |
| RAPI_BCSS_F32 | f32SIO | | |

For the transfer format, the following values can be set.

If the data length selected for use in clock asynchronous serial communication mode is 7 or 9 bits long, do not set these values.

(R8C) (UART0, UART1)

| | | | |
|---|---|---|---|
| RAPI_LSB_SEL | LSB first | RAPI_MSB_SEL | MSB first |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |

| | |
|---|---|
| RAPI_COM3 | SCI3 channel 3 |

For serial communication mode, the following values can be set.

(H8/300H) (SCI3 channel 1, SCI3 channel 2, SCI3 channel 3)

| | |
|---|---|
| RAPI_SM_SYNC | Clock synchronous serial communication mode |
| RAPI_SM_ASYNC | Clock asynchronous serial communication mode |

For the data length format of clock asynchronous serial communication, the following values can be set.

If the API is used in clock synchronous serial communication mode, do not set these values.

(H8/300H) (SCI3 channel 1, SCI3 channel 2, SCI3 channel 3)

| | | | |
|---|---|---|---|
| RAPI_BIT_7 | Transfer data length 7 bits | RAPI_BIT_8 | Transfer data length 8 bits |

For the clock source of serial communication, the following values can be set.

(H8/300H) (SCI3 channel 1, SCI3 channel 2)

| | |
|---|---|
| RAPI_CKDIR_INT | Internal clock is used as the clock source of serial communication. |
| RAPI_CKDIR_EXT | External clock is used as the clock source of serial communication. |

For the stop bit length of clock asynchronous serial communication, the following values can be set.

If the API is used in clock synchronous serial communication mode, do not set these values.

(H8/300H) (SCI3 channel 1, SCI3 channel 2, SCI3 channel 3)

| | | | |
|---|---|---|---|
| RAPI_STPB_1 | 1 stop bit | RAPI_STPB_2 | 2 stop bits |

For the parity bit of clock asynchronous serial communication, the following values can be set.

If the API is used in clock synchronous serial communication mode, do not set these values.

(H8/300H) (SCI3 channel 1, SCI3 channel 2, SCI3 channel 3)

| | | | |
|---|---|---|---|
| RAPI_PARITY_NON | No parity bit | RAPI_PARITY_EVEN | Even parity bit |
| RAPI_PARITY_ODD | Odd parity bit | | |

For the count source of the built-in baud rate generator, the following values can be set.

(H8/300H) (SCI3 channel 1, SCI3 channel 2 SCI3 channel 3)

| | | | |
|---|---|---|---|
| RAPI_BCSS_F1 | Φ clock | RAPI_BCSS_F4 | φ/4 clock |
| RAPI_BCSS_F16 | φ/16 clock | RAPI_BCSS_F32 | φ/64 clock |

The noise rejection function can be set to be turned on or turned off.

When used in clock synchronous serial communication mode, the noise rejection function has no effect.

(H8/300H) (SCI3 channel 3)

| | |
|---|---|
| RAPI_NOISE_CANCEL_ON | Noise rejection function turned on |
| RAPI_NOISE_CANCEL_OFF | Noise rejection function turned off |

**[data2]**

Sets the divide-by-N value of a communication speed.

**Return value**

If serial communication was successfully set, RAPI_TRUE is returned; if settings failed, RAPI_FALSE is returned.

**Functionality** Serial I/O

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

**Program example**

```
#include  ”rapi_sif_r8c_13.h”

Boolean func( void )
{
   /* Set the data of RAPI_COM1 to serial driver */
   return _BasicSetSerialFormat(RAPI_COM1 | RAPI_SM_SYNC | RAPI_CKDIR_INT
|
                              RAPI_BCSS_F1 | RAPI_DPOL_NON | RAPI_LSB_SEL,
20);
}
```

## __BasicStartSerialReceiving

**Synopsis**

<Receive 1 data>

**Boolean __BasicStartSerialReceiving(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Starts receiving 1 data of serial communication.

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

If data reception in serial communication was successfully started, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__BasicReceivingStatusRead, __BasicStopSerialReceiving

**Remark**

- For the H8/300H, wait for at least a 1-bit period before calling this API after __BasicSetSerialFormat was called.
- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include "rapi_sif_r8c_13.h"

void func( void )
{
    ..........
    __BasicStartSerialReceiving( RAPI_COM1 );
    ..........
}
```

## __BasicStartSerialSending

**Synopsis**

<Transmit 1 data>

**Boolean _BasicStartSerialSending(unsigned long data1, unsigned int data2)**

| | |
|---|---|
| data | Setup data |
| data | Transmit data |

**Description**

Starts sending 1 data of serial communication.

For data1, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SIC3 channel 3 | | |

**Return value**

If data transmission in serial communication was successfully started, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__BasicSendingStatusRead, __BasicStopSerialSending

**Remark**

- For the H8/300H, wait for at least a 1-bit period before calling this API after __BasicSetSerialFormat was called.
- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include  "rapi_sif_r8c_13.h"

Void func( void )
{
    ..........
    __BasicStartSerialSending( RAPI_COM1, 0x00AA );
    ..........
}
```

## __BasicReceivingStatusRead

**Synopsis**

<Read receive status>

**unsigned int __BasicReceivingStatusRead(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Returns the receive status of serial communication.

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

The receive status of serial communication is returned. The returned value is one of the following.

(M16C) (UART0, UART1, UART2)

| | |
|---|---|
| RAPI_RX_INCOMPLETE | Reception not complete yet. |
| Other than above | Reception complete. The value read from the UARTi receive buffer register (i = 0 to 2). |

(M16C) (SI/O3, SI/O4)

| | |
|---|---|
| RAPI_RX_INCOMPLETE | Reception not complete yet. |
| Other than above | Reception complete. Low-order 8 bits: The value read from the SI/Oi transmit/receive register (i = 3, 4). |

(R8C)

| | |
|---|---|
| RAPI_RX_INCOMPLETE | Reception not complete yet. |
| Other than above | Reception complete. The value read from the UARTi receive buffer register (i = 0, 1). |

(H8/300H)

| | |
|---|---|
| RAPI_RX_INCOMPLETE | Reception not complete yet. |
| Other than above | Reception complete.<br>High-order 8 bits: The value read from the serial status register.<br>Low-order 8 bits: The value read from the receive data register.<br>(Not read if an error occurred.) |

**Functionality**

Serial I/O

**Reference**

__BasicStartSerialReceiving, __BasicStopSerialReceiving

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include  ”rapi_sif_r8c_13.h”

void func( void )
{
    unsigned int rcv_data;

    ..........
    rcv_data = __BasicReceivingStatusRead( RAPI_COM1 );
    ..........
}
```

## __BasicSendingStatusRead

**Synopsis**

<Read transmit status>

**Boolean __BasicSendingStatusRead(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Returns the transmit status of serial communication. For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

If no data exists in the transmit buffer, RAPI_TRUE is returned; if data exists, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__BasicStartSerialSending, __BasicStopSerialSending

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include "rapi_sif_r8c_13.h"

void func( void )
{
    ..........
    if (__BasicSendingStatusRead( RAPI_COM1 ) == RAPI_TRUE) {
        /* Transmission completion */
    }
    ..........
}
```

## __BasicStopSerialReceiving

**Synopsis**

<Stop reception>

**Boolean Rapi_BasicStopSerialReceiving(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Stops receiving data in serial communication

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

If data reception in serial communication was successfully stopped, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__BasicStartSerialReceiving

**Remark**

- For the M16C SI/03 and SI/04, this API cannot be used.
- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include  "rapi_sif_r8c_13.h"

void func( void )
{
    ……
    /* Stop receiving data in serial communication */
    __BasicStopSerialReceiving ( RAPI_COM1 );
    ……
}
```

## __BasicStopSerialSending

**Synopsis**

<Stop transmission>

**Boolean __BasicStopSerialSending(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Stops transmitting data in serial communication.

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| SIO3_COM3 | SIO3 channel 3 | | |

**Return value**

If data transmission in serial communication was successfully stopped, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__BasicStartSerialSending

**Remark**

- For the M16C SI/03 and SI/04, this API cannot be used.
- The specifiable serial ports differ with each CPU used.
- When operating in clock synchronous serial communication mode, data reception is stopped at the same time by this API.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include  "rapi_sif_r8c_13.h"

void func( void )
{
    ……
    /* Stop sending data in serial communication */
    __BasicStopSerialSending ( RAPI_COM1 );
    ……
}
```

## __OpenSerialDriver

**Synopsis**

<Open a serial port>

**Boolean __OpenSerialDriver(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Opens and initializes a specified serial port.

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| SIO3_COM3 | SIO3 channel 3 | | |

**Return value**

If the serial port specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Serial I/O

**Reference**

__CloseSerialDriver

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- When used for the H8/300H, this API opens and initializes a specified serial port when freeing it from module standby state.

**Program example**

```
#include  "rapi_sif_r8c_13.h"

void func( void )
{
    ……
    /* Open serial driver */
    return __OpenSerialDriver( RAPI_COM1 );
    ……
}
```

## __CloseSerialDriver

**Synopsis**

<Close a serial port>

**Boolean __CloseSerialDriver(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Closes a specified serial port.

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| SIO3_COM3 | SIO3 channel 3 | | |

**Return value**

If the serial port specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Serial I/O

**Reference**

__OpenSerialDriver

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- When used for the H8/300H, this API places a specified serial port into module standby state after closing it.

**Program example**

```
#include "rapi_sif_r8c_13.h"

void func( void )
{
    ……
    /* Close serial driver */
    return __CloseSerialDriver( RAPI_COM1 );
    ……
}
```

## __ConfigSerialDriverNotify

**Synopsis**

<Register a notification function>

**Boolean __ConfigSerialDriverNotify(unsigned long data, VoidFuncNotify *func)**

| | |
|---|---|
| data | Setup data |
| func | Function pointer to be registered |

**Description**

Registers the notification function necessary to get various transmit/receive information of serial communication.

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**[func]**

The function to be registered in func must be supplied to the serial I/O driver by the user.

The serial I/O driver calls the function registered in func.

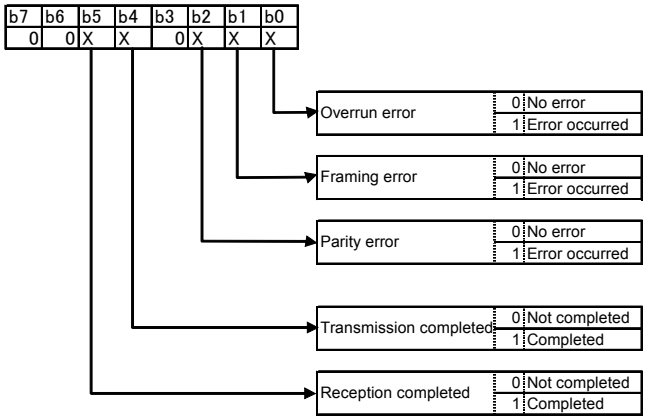
The serial I/O driver notifies the user of the transmit/receive status by an argument.

The type of the function to be registered is shown below.

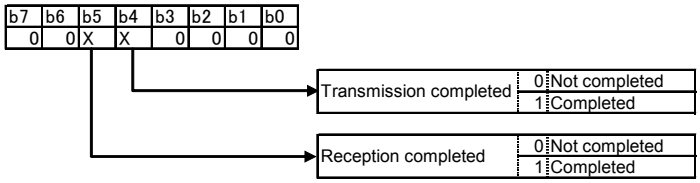
void “any function name” (unsigned char notify);

The argument is detailed below.

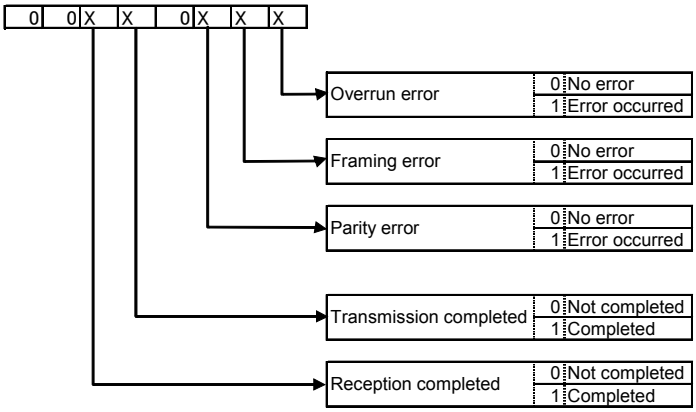
(M16C) (UART0, UART1, UART2)



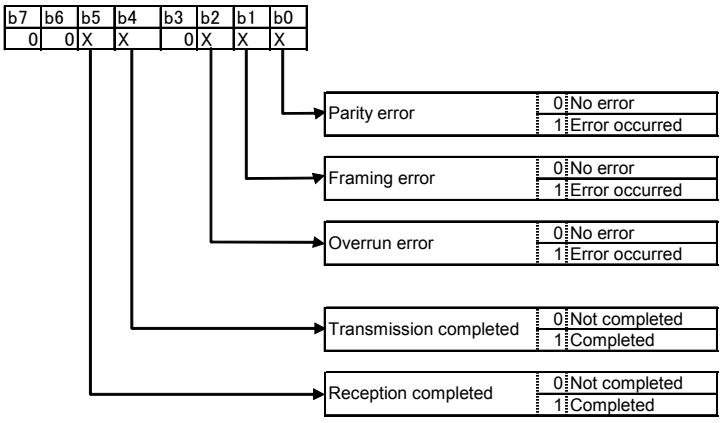

(M16C) (SI/O3,SI/O4)




(R8C)




(H8/300H)




**Return value**

If the serial port specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Serial I/O

**Reference**

__StartSerialReceiving, __StartSerialSending

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

**Program example**

```
#include ”rapi_sif_r8c_13.h”

void Notify(unsigned char result) {
   if ((result&RAPI_OVER_ERR) == RAPI_OVER_ERR) {
      /* Overrun error */
   }
   if ((result&RAPI_FRAMING_ERR) == RAPI_FRAMING_ERR) {
      /* Framing error */
   }
   if ((result&RAPI_PARITY_ERR) == RAPI_PARITY_ERR) {
      /* Parity error */
   }
   if ((result&RAPI_TX_END) == RAPI_TX_END) {
      /* Transmission completion */
   }
   if ((result&RAPI_RX_END) == RAPI_RX_END) {
      /* Reception completion */
   }
}

Boolean func( void )
{
   ……
   /* Set callback functions of RAPI_COM1 to serial driver */
   return __ConfigSerialDriverNotify( RAPI_COM1, Notify );
   ……
}
```

## __SetSerialFormat

**Synopsis**

<Set serial communication>

**Boolean __SetSerialFormat(unsigned long data1, unsigned char data2)**

| | |
|---|---|
| data1 | Setup data 1 |
| data2 | Setup data 2 |

**Description**

Sets serial communication according to specified parameters.

For details about parameters, refer to the description of __BasicSetSerialFormat.

**Return value**

If serial communication was successfully set, RAPI_TRUE is returned; if settings failed, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__BasicSetSerialFormat

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

**Program example**

```
#include  "rapi_sif_r8c_13.h"

Boolean func( void )
{
    ……
    /* Set the data of RAPI_COM1 to serial driver */
    return __SetSerialFormat(RAPI_COM1 | RAPI_SM_SYNC | RAPI_CKDIR_INT |
                          RAPI_BCSS_F1 | RAPI_DPOL_NON | RAPI_LSB_SEL, 20);
    ……
}
```

## __SetSerialInterrupt

**Synopsis**

<Set serial interrupts>

**Boolean __SetSerialInterrupt(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Sets serial interrupts according to specified parameters.

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

For interrupt settings, the following values can set.

(M16C) (UART0, UART1, UART2)

| | |
|---|---|
| RAPI_INT_TX_DIS | Transmit interrupt disabled |
| RAPI_INT_TX_LV_1 | Transmit interrupt priority level 1 |
| RAPI_INT_TX_LV_2 | Transmit interrupt priority level 2 |
| RAPI_INT_TX_LV_3 | Transmit interrupt priority level 3 |
| RAPI_INT_TX_LV_4 | Transmit interrupt priority level 4 |
| RAPI_INT_TX_LV_5 | Transmit interrupt priority level 5 |
| RAPI_INT_TX_LV_6 | Transmit interrupt priority level 6 |
| RAPI_INT_TX_LV_7 | Transmit interrupt priority level 7 |
| RAPI_INT_RX_DIS | Receive interrupt disabled |
| RAPI_INT_RX_LV_1 | Receive interrupt priority level 1 |
| RAPI_INT_RX_LV_2 | Receive interrupt priority level 2 |
| RAPI_INT_RX_LV_3 | Receive interrupt priority level 3 |
| RAPI_INT_RX_LV_4 | Receive interrupt priority level 4 |
| RAPI_INT_RX_LV_5 | Receive interrupt priority level 5 |
| RAPI_INT_RX_LV_6 | Receive interrupt priority level 6 |
| RAPI_INT_RX_LV_7 | Receive interrupt priority level 7 |

(M16C) (SI/O3, SI/O4)

| | |
|---|---|
| RAPI_INT_SIO_DIS | SI/O interrupt disabled |
| RAPI_INT_SIO_LV_1 | SI/O interrupt priority level 1 |
| RAPI_INT_SIO_LV_2 | SI/O interrupt priority level 2 |
| RAPI_INT_SIO_LV_3 | SI/O interrupt priority level 3 |
| RAPI_INT_SIO_LV_4 | SI/O interrupt priority level 4 |
| RAPI_INT_SIO_LV_5 | SI/O interrupt priority level 5 |
| RAPI_INT_SIO_LV_6 | SI/O interrupt priority level 6 |
| RAPI_INT_SIO_LV_7 | SI/O interrupt priority level 7 |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

For interrupt settings, the following values can set.

| | |
|---|---|
| RAPI_INT_TX_DIS | Transmit interrupt disabled |
| RAPI_INT_TX_LV_1 | Transmit interrupt priority level 1 |
| RAPI_INT_TX_LV_2 | Transmit interrupt priority level 2 |
| RAPI_INT_TX_LV_3 | Transmit interrupt priority level 3 |
| RAPI_INT_TX_LV_4 | Transmit interrupt priority level 4 |
| RAPI_INT_TX_LV_5 | Transmit interrupt priority level 5 |
| RAPI_INT_TX_LV_6 | Transmit interrupt priority level 6 |
| RAPI_INT_TX_LV_7 | Transmit interrupt priority level 7 |
| RAPI_INT_RX_DIS | Receive interrupt disabled |
| RAPI_INT_RX_LV_1 | Receive interrupt priority level 1 |
| RAPI_INT_RX_LV_2 | Receive interrupt priority level 2 |
| RAPI_INT_RX_LV_3 | Receive interrupt priority level 3 |
| RAPI_INT_RX_LV_4 | Receive interrupt priority level 4 |
| RAPI_INT_RX_LV_5 | Receive interrupt priority level 5 |
| RAPI_INT_RX_LV_6 | Receive interrupt priority level 6 |
| RAPI_INT_RX_LV_7 | Receive interrupt priority level 7 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

For interrupt settings, the following values can set.

| | | | |
|---|---|---|---|
| RAPI_INT_TX_DIS | Transmit interrupt disabled | RAPI_INT_TX_ENA | Transmit interrupt enabled |
| RAPI_INT_RX_DIS | Receive interrupt disabled | RAPI_INT_RX_ENA | Receive interrupt enabled |

For the CPUs that have an interrupt control register, following values can be set to specify interrupt priority, in addition to ordinary interrupt settings.

| | |
|---|---|
| RAPI_INT_LV_0 | Transmit/Receive interrupt priority level0 |
| RAPI_INT_LV_1 | Transmit/Receive interrupt priority level1 |

**Return value**

If the serial port specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Serial I/O

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include "rapi_sif_r8c_13.h"
```

```
Boolean func( void )
{
    ……
    /* Set interrupt of RAPI_COM1 to serial driver */
    return    __SetSerialInterrupt(    RAPI_COM1    |    RAPI_INT_TX_LV_1    |
RAPI_INT_RX_LV_2 );
    ……
}
```

## __StartSerialReceiving

**Synopsis**

<Start reception>

**Boolean __StartSerialReceiving(unsigned long data, unsigned char wordNum, unsigned int *RcvDtBuf)**

| | |
|---|---|
| data | Setup data |
| wordNum | Number of words received |
| RcvDtBuf | Pointer to the buffer in which received data is stored |

**Description**

Starts reception of serial communication and gets received data by a specified number of words. When acquisition of received data is complete, this API calls a notification function (if a notification function is registered).

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

If reception of serial communication was successfully started, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__ConfigSerialDriverNotify, __StopSerialReceiving

**Remark**

- For the H8/300H, wait for at least a 1-bit period before calling this API after __SetSerialFormat was called.
- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- For the H8/300H, the following values are stored in the receive buffer.
  High-order 8 bits: The value read from the serial status register.
  Low-order 8 bits: The value read from the receive data register.
  (Not read if an error occurred.)

**Program example**

```
#include "rapi_sif_r8c_13.h"
```

```
unsigned int buffer[10];
void func( void )
{
    ……
    /* Get 5 word data received in serial communication */
    __StartSerialReceiving( RAPI_COM1, 5, buffer );
    ……
}
```

## __StartSerialSending

**Synopsis**

<Start transmission>

**Boolean __StartSerialSending(unsigned long data, unsigned char wordNum, unsigned int *SndDtBuf)**

| | |
|---|---|
| data | Setup data |
| wordNum | Number of words transmitted |
| SndDtBuf | Pointer to the transmit data |

**Description**

Starts transmission of serial communication and writes transmit data to the transmit buffer by a specified number of words. When transmission of all transmit data is complete, this API calls a notification function (if a notification function is registered).

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

If transmission of serial communication was successfully started, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__ConfigSerialDriverNotify, __StopSerialSending

**Remark**

- For the H8/300H, wait for at least a 1-bit period before calling this API after __SetSerialFormat was called.
- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

**Program example**

```
#include "rapi_sif_r8c_13.h"
```

```
unsigned int buffer[10];
void func( void )
{
    ……
    /* Set 5 word data to transmit buffer of serial communication */
    __StartSerialSending( RAPI_COM1, 5, buffer );
    ……
}
```

## __StopSerialReceiving

**Synopsis**

<Stop reception>

**Boolean __StopSerialReceiving(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Stops reception of serial communication.

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

If reception of serial communication was successfully stopped, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__StartSerialSending

**Remark**

- For the M16C SI/03 and SI/04, this API cannot be used.
- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include ”rapi_sif_r8c_13.h”

void func( void )
{
    ……
    /* Stop receiving data in serial communication */
    __StopSerialReceiving ( RAPI_COM1 );
    ……
}
```

## __StopSerialSending

**Synopsis**

<Stop transmission>

**Boolean __StopSerialSending(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Stops transmission of serial communication.

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

If transmission of serial communication was successfully stopped, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

Serial I/O

**Reference**

__StartSerialReceiving

**Remark**

- For the M16C SI/03 and SI/04, this API cannot be used.
- The specifiable serial ports differ with each CPU used.
- When operating in clock synchronous serial communication mode, data reception is stopped at the same time by this API.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include  "rapi_sif_r8c_13.h"

void func( void )
{
    ……
    /* Stop sending data in serial communication */
    __StopSerialSending ( RAPI_COM1 );
    ……
}
```

## __PollingSerialReceiving

**Synopsis**

<Polling reception>

**unsigned int __PollingSerialReceiving(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Performs reception of serial communication by polling. This API gets received data by an amount specified by __StartSerialReceiving. When acquisition of received data is complete, it calls a notification function (if a notification function is registered).

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

Out of the receive data counts requested, the number of unreceived data is returned.

**Functionality**

Serial I/O

**Reference**

__ConfigSerialDriverNotify, __SetSerialInterrupt, __StartSerialReceiving

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include  ”rapi_sif_r8c_13.h”

unsigned int buffer[10], count;

void func( void )
{
    ……
    /* Reception interrupt disable */
    __SetSerialInterrupt( RAPI_COM1 | RAPI_INT_TX_DIS | RAPI_INT_RX_DIS );
    /* Start reception */
    __StartSerialReceiving( RAPI_COM1, 5, buffer );
    do{
        count = __PollingSerialReceiving( RAPI_COM1 );
    }while(count)
    ……
}
```

## __PollingSerialSending

**Synopsis**

<Polling transmission>

**Unsigned __PollingSerialSending(unsigned long data)**

| | |
|---|---|
| data | Setup data |

**Description**

Performs transmission of serial communication by polling. This API sends transmit data by an amount specified by __StartSerialSending from the transmit data buffer specified by __StartSerialSending. When transmission of all transmit data is complete, it calls a notification function (if a notification function is registered).

**[data]**

For data, the following values can be set.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |
| RAPI_COM3 | UART2 | RAPI_COM4 | SI/O3 |
| RAPI_COM5 | SI/O4 | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_COM1 | UART0 | RAPI_COM2 | UART1 |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_COM1 | SCI3 channel 1 | RAPI_COM2 | SCI3 channel 2 |
| RAPI_COM3 | SCI3 channel 3 | | |

**Return value**

Out of the transmit data counts requested, the number of untransmitted data is returned.

**Functionality**

Serial I/O

**Reference**

__ConfigSerialDriverNotify, __SetSerialInterrupt, __StartSerialReceiving

**Remark**

- The specifiable serial ports differ with each CPU used.
- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

**Program example**

```
#include  "rapi_sif_r8c_13.h"
```

```
unsigned int buffer[10],count;
void func( void )
{
    ……
    /* Transmission interrupt disable */
    __SetSerialInterrupt( RAPI_COM1 | RAPI_INT_TX_DIS | RAPI_INT_RX_DIS );
    /* Start transmission */
    __StartSerialSending( RAPI_COM1, 5, buffer );
    do{
       count = __PollingSerialSending( RAPI_COM1 );
    }while(count)
    ……
}
```

### 4.2.2 Timer
### __CreateTimer

**Synopsis**

<Set timer mode>

**Boolean __CreateTimer(unsigned long data1, unsigned int data2, unsigned int data3, unsigned int data4, void* func)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |
| data3 | Setup data 3 (content differs with MCU type) |
| data4 | Setup data 4 (content differs with MCU type) |
| func | Callback function pointer<br>(Specify 0 if no callback functions are set.) |

**Description**

Sets a specified timer to timer mode.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Uses timer A channel 0. |
| RAPI_TIMER_A1 | Uses timer A channel 1. |
| RAPI_TIMER_A2 | Uses timer A channel 2. |
| RAPI_TIMER_A3 | Uses timer A channel 3. |
| RAPI_TIMER_A4 | Uses timer A channel 4. |
| RAPI_TIMER_B0 | Uses timer B channel 0. |
| RAPI_TIMER_B1 | Uses timer B channel 1. |
| RAPI_TIMER_B2 | Uses timer B channel 2. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_F8 | Selects $f_8$ for the count source. |
| RAPI_F32 | Selects $f_{32}$ for the count source. |
| RAPI_FC32 | Selects $f_{c32}$ for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateTimer. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateTimer. |
| RAPI_GATE_L | Selects a gate facility that counts a period during which input at $TA_{iIN}$ pin remains low. |
| RAPI_GATE_H | Selects a gate facility that counts a period during which input at $TA_{iIN}$ pin remains high. |
| RAPI_PULSE_ON | Selects that pulses are output from $TA_{iIN}$ pin. |
| RAPI_PULSE_OFF | Selects that no pulses are output from $TA_{iIN}$ pin. |

**• Specifiable definition values when timer A is used (RAPI_TIMER_A0 to RAPI_TIMER_A4 specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_F32, RAPI_FC32 }. The default value is RAPI_F2.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Pulse output state) Specify one from { RAPI_PULSE_ON, RAPI_PULSE_OFF }. The default value is RAPI_PULSE_OFF.

(Gate facility) Specify one from { RAPI_GATE_L, RAPI_GATE_H }. If omitted, “No gate facility” is set.

**・ Specifiable definition values when timer B is used (RAPI_TIMER_B0 to RAPI_TIMER_B2 specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_F32, RAPI_FC32 }. The default value is RAPI_F2.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Uses timer X. |
| RAPI_TIMER_Y | Uses timer Y. |
| RAPI_TIMER_Z | Uses timer Z. |
| RAPI_TIMER_RA | Uses timer RA. |
| RAPI_TIMER_RB | Uses timer RB. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_F8 | Selects $f_8$ for the count source. |
| RAPI_F32 | Selects $f_{32}$ for the count source. |
| RAPI_FRING | Selects $f_{RING}$ for the count source. |
| RAPI_FOCO | Selects foco for the count source. |
| RAPI_FC32 | Selects fC32 for the count source. |
| RAPI_TIMER_Y_ UNDERFLOW | Selects the underflow of timer Y for the count source. |
| RAPI_TIMER_RA_UN DERFLOW | Selects the underflow of timer RA for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateTimer. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateTimer. |
| RAPI_WRITE_ RELOAD_ONLY | Selects operation mode in which writing to the primary register and prescaler causes the set data to be written to only the reload register. |
| RAPI_WRITE_ RELOAD_BOTH | Selects operation mode in which writing to the primary register and prescaler causes the set data to be written to both the reload register and the counter, respectively. |

**• Specifiable definition values when timer X is used (RAPI_TIMER_X specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_F32 }. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

**• Specifiable definition values when timer Y is used (RAPI_TIMER_Y specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F8, RAPI_FRING }. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Write control) Specify one from { RAPI_WRITE_RELOAD_ONLY, RAPI_WRITE_RELOAD_BOTH }. The default value is RAPI_WRITE_RELOAD_BOTH.

**• Specifiable definition values when timer Z is used (RAPI_TIMER_Z specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_TIMER_Y_UNDERFLOW}. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Write control) Specify one from {RAPI_WRITE_RELOAD_ONLY, RAPI_WRITE_RELOAD_BOTH}. The default value is RAPI_WRITE_RELOAD_BOTH.

**• Specifiable definition values when timer RA is used (RAPI_TIMER_RA specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_FOCO, RAPI_FC32}. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

**• Specifiable definition values when timer RB is used (RAPI_TIMER_RB specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_TIMER_RA_UNDERFLOW}. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Write control) Specify one from {RAPI_WRITE_RELOAD_ONLY, RAPI_WRITE_RELOAD_BOTH}. The default value is RAPI_WRITE_RELOAD_BOTH.

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_A | Uses timer A. |
| RAPI_TIMER_B1 | Uses timer B1. |
| RAPI_TIMER_V | Uses timer V |
| RAPI_TA_F8 | Supplies φ/8 clock to timer A. |
| RAPI_TA_F32 | Supplies φ/32 clock to timer A. |
| RAPI_TA_F128 | Supplies φ/128 clock to timer A. |
| RAPI_TA_F256 | Supplies φ/256 clock to timer A. |
| RAPI_TA_F512 | Supplies φ/512 clock to timer A. |
| RAPI_TA_F2048 | Supplies φ/2048 clock to timer A. |
| RAPI_TA_F4096 | Supplies φ/4096 clock to timer A. |
| RAPI_TA_F8192 | Supplies φ/8192 clock to timer A. |
| RAPI_TB1_F4 | Timer B1 counts with internal clock φ/4. |
| RAPI_TB1_F16 | Timer B1 counts with internal clock φ/16. |
| RAPI_TB1_F64 | Timer B1 counts with internal clock φ/64. |

| | |
|---|---|
| RAPI_TB1_F256 | Timer B1 counts with internal clock φ/256. |
| RAPI_TB1_F512 | Timer B1 counts with internal clock φ/512. |
| RAPI_TB1_F2048 | Timer B1 counts with internal clock φ/2048. |
| RAPI_TB1_F8192 | Timer B1 counts with internal clock φ/8192. |
| RAPI_TV_F4 | Timer V counts on falling edges of internal clock φ/4. |
| RAPI_TV_F8 | Timer V counts on falling edges of internal clock φ/8. |
| RAPI_TV_F16 | Timer V counts on falling edges of internal clock φ/16. |
| RAPI_TV_F32 | Timer V counts on falling edges of internal clock φ/32. |
| RAPI_TV_F64 | Timer V counts on falling edges of internal clock φ/64. |
| RAPI_TV_F128 | Timer V counts on falling edges of internal clock φ/128. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateTimer. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateTimer. |
| RAPI_OVERFLOW | Enables overflow interrupt. |
| RAPI_OUT_F4 | Outputs φ/4 clock. |
| RAPI_OUT_F8 | Outputs φ/8 clock. |
| RAPI_OUT_F16 | Outputs φ/16 clock. |
| RAPI_OUT_F32 | Outputs φ/32 clock. |
| RAPI_OUT_8192 | Outputs φW/4 clock. |
| RAPI_OUT_4096 | Outputs φW/8 clock. |
| RAPI_OUT_2048 | Outputs φW/16 clock. |
| RAPI_OUT_1024 | Outputs φW/32 clock. |
| RAPI_AUTO_RELOAD | Uses auto reload facility. |

**• Specifiable definition values when timer A is used (RAPI_TIMER_A specified)**

(Clock) Specify one from { RAPI_TA_F8, RAPI_TA_F32, RAPI_TA_F128, RAPI_TA_F256, RAPI_TA_F512, RAPI_TA_F2048, RAPI_TA_F4096, RAPI_TA_F8192 }. The default value is RAPI_TA_F8192.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, “No interrupt request” is set.

(Output) Specify one from { RAPI_OUT_F4, RAPI_OUT_F8, RAPI_OUT_F16, RAPI_OUT_F32, RAPI_OUT_8192, RAPI_OUT_4096, RAPI_OUT_2048, RAPI_OUT_1024 }. If this specification is omitted, “Clock output” is set.

**• Specifiable definition values when timer B1 is used (RAPI_TIMER_B1 specified)**

(Clock) Specify one from { RAPI_TB1_F4, RAPI_TB1_F16, RAPI_TB1_F64, RAPI_TB1_F256, RAPI_TB1_F512, RAPI_TB1_F2048, RAPI_TB1_F8192 }. The default value is RAPI_TB1_F8192.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, “No interrupt request” is set.

(Reload) To select the auto reload facility, specify RAPI_AUTO_RELOAD. If RAPI_AUTO_RELOAD is not specified, “Select interval facility” is set.

**• Specifiable definition values when timer V is used (RAPI_TIMER_V specified)**

(Clock) Specify one from { RAPI_TV_F4, RAPI_TV_F8, RAPI_TV_F16, RAPI_TV_F32, RAPI_TV_F64, RAPI_TV_F128}. If this specification is omitted, “Disable clock input” is set.

| | |
|---|---|
| (Interrupt) | If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, “No interrupt request” is set. |
| (Operating states set) | Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF. |

**[data2]**

(M16C) (R8C)

Specify the interrupt priority level (0-7) to be set in the interrupt control register.

(H8/300H)

Specify the interrupt priority level (0–1) to be set in the interrupt control register. For the CPUs that do not have an interrupt control register, specify 0.

**[data3]**

(M16C)

Specify the value to be set in the timer register in 16 bits.

(R8C)

When using timer X, specify the set value for the timer register; when using timer Y or timer Z, specify the set value for the primary register in 8 bits.

(H8/300H)

Specify the set value for the timer reload register in 8 bits. This setting is effective only when timer B1 is used. If any timer other than B1 is used, specify 0.

**[data4]**

(M16C) (H8/300H)

Specify 0.

(R8C)

Specify the set value for the prescaler register in 8 bits.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (timer mode)

**Reference**

R_RAPI_EnableTimer, R_RAPI_DestroyTimer

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API specify when freeing it from module stanby.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void TimerIntFunc( void ){}
```

```
void func( void )
{
   /* Set up timer X as timer mode */
   __CreateTimer(  RAPI_TIMER_X|RAPI_TIMER_ON|RAPI_F8,  5,  0x80,  0x80,
TimerIntFunc );
}
```

## __EnableTimer

**Synopsis**

<Control operation of timer mode>

**Boolean __EnableTimer(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Controls operation of the timer that is set to specified timer mode by starting or stopping it.

**[data]**

For data, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |
| RAPI_TIMER_ON | Sets the timer that is set to timer mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to timer mode to stop operating. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_Z | Selects timer Z. |
| RAPI_TIMER_RA | Selects timer RA. |
| RAPI_TIMER_RB | Selects timer RB. |
| RAPI_TIMER_ON | Sets the timer that is set to timer mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to timer mode to stop operating. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_V | Selects timer V. |
| RAPI_TIMER_ON | Sets the timer that is set to timer mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to timer mode to stop operating. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (timer mode)

**Reference**

__CreateTimer, __DestroyTimer

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
   /* Disable timer Y as timer mode */
   __EnableTimer( RAPI_TIMER_Y| RAPI_TIMER_OFF );
}
```

## __DestroyTimer

**Synopsis**

<Discard settings of timer mode>

**Boolean __DestroyTimer(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Discards settings of the timer that is set to specified timer mode.

**[data]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2 |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_Z | Selects timer Z. |
| RAPI_TIMER_RA | Selects timer RA. |
| RAPI_TIMER_RB | Selects timer RB. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_A | Selects timer A. |
| RAPI_TIMER_B1 | Selects timer B1. |
| RAPI_TIMER_V | Selects timer V. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (timer mode)

**Reference**

__CreateTimer, __EnableTimer

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API places a specified timer into module stanby state after discarding it.

**Program example**

```
#include "rapi_timer_r8c_13.h"
```

```
void func( void )
{
   /* Destroy the setting of timer Z as timer mode */
   __DestroyTimer( RAPI_TIMER_Z );
}
```

## __CreateEventCounter

**Synopsis**

<Set event counter mode>

**Boolean __CreateEventCounter(unsigned long data1, unsigned int data2, unsigned int data3, unsigned int data4, void* func)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |
| data3 | Setup data 3 (content differs with MCU type) |
| data4 | Setup data 4 (content differs with MCU type) |
| func | Callback function pointer<br>(Specify 0 if no callback functions are set.) |

**Description**

Sets a specified timer to event counter mode.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Uses timer A channel 0. |
| RAPI_TIMER_A1 | Uses timer A channel 1. |
| RAPI_TIMER_A2 | Uses timer A channel 2 |
| RAPI_TIMER_A3 | Uses timer A channel 3. |
| RAPI_TIMER_A4 | Uses timer A channel 4. |
| RAPI_TIMER_B0 | Uses timer B channel 0. |
| RAPI_TIMER_B1 | Uses timer B channel 1. |
| RAPI_TIMER_B2 | Uses timer B channel 2. |
| RAPI_EV_EXTERNAL | Selects the external signal input to $TA_{iIN}$ pin (when using timer Ai) or $TB_{iIN}$ pin (when using timer Bi) for the count source. |
| RAPI_EV_TIMER_AJ | Selects overflow or underflow of timer Aj (j = i – 1, however j = 4 if i = 0) for the count source. |
| RAPI_EV_TIMER_AK | Selects overflow or underflow of timer Ak (k = i – 1, however k = 0 if i = 4) for the count source. |
| RAPI_EV_TIMER_B2 | Selects overflow or underflow of timer B2 for the count source. |
| RAPI_EV_TIMER_BJ | Selects overflow or underflow of timer Bj (j = i – 1, however j = 2 if i = 0) for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateEventCounter. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateEventCounter. |
| RAPI_PULSE_ON | Selects that pulses are output from $TA_{iIN}$ pin. |
| RAPI_PULSE_OFF | Selects that no pulses are output from $TA_{iIN}$ pin. |
| RAPI_AUTO_RELOAD | Selects reload type for the count type. |
| RAPI_FREE_RUN | Selects free-run type for the count type. |
| RAPI_UP_COUNT | Selects up-count for the count operation. |
| RAPI_DOWN_COUNT | Selects down-count for the count operation. |

| | |
|---|---|
| RAPI_UDF_REGISTER | Selects the UDF register for the cause of up/down switching. |
| RAPI_TAIOUT | Selects the input signal at $TA_{iOUT}$ pin for the cause of up/down switching. |
| RAPI_RISING | Selects the rising edge of count source as active edge. |
| RAPI_FALLING | Selects the falling edge of count source as active edge. |
| RAPI_BOTH | Selects both rising and falling edges of count source as active edges. |

**• Specifiable definition values when timer A is used (RAPI_TIMER_A0 to RAPI_TIMER_A4 specified)**

(Count source) Specify one from { RAPI_EV_EXTERNAL, RAPI_EV_TIMER_AJ, RAPI_EV_TIMER_AK, RAPI_EV_TIMER_B2 }. The default value is RAPI_EV_EXTERNAL.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Pulse output facility) Specify one from { RAPI_PULSE_ON, RAPI_PULSE_OFF }. The default value is RAPI_PULSE_OFF.

(Gate facility) Specify one from { RAPI_GATE_L, RAPI_GATE_H }. If omitted, “No gate facility” is set.

(Count type) Specify one from { RAPI_AUTO_RELOAD, RAPI_FREE_RUN }. The default value is RAPI_AUTO_RELOAD.

(Count direction) Specify one from { RAPI_UP_COUNT, RAPI_DOWN_COUNT }. The default value is RAPI_DOWN_COUNT. The count direction can only be set when the UDF register is used.

(Count direction switching) Specify one from { RAPI_UDF_REGISTER, RAPI_TAIOUT }. The default value is RAPI_UDF_REGISTER.

(Count edge) Specify one from { RAPI_RISING, RAPI_FALLING }. The default value is RAPI_FALLING.

**• Specifiable definition values when timer B is used (RAPI_TIMER_B0 to RAPI_TIMER_B2 specified)**

(Count source) Specify one from { RAPI_EV_EXTERNAL, RAPI_EV_TIMER_BJ }. The default value is RAPI_EV_EXTERNAL.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Count edge) Specify one from { RAPI_RISING, RAPI_FALLING, RAPI_BOTH }. The default value is RAPI_FALLING.

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Uses timer X. |
| RAPI_TIMER_Y | Uses timer Y. |
| RAPI_TIMER_RA | Uses timer RA. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateEventCounter. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateEventCounter. |
| RAPI_WRITE_ RELOAD_ ONLY | Selects operation mode in which writing to the primary register and prescaler causes the set data to be written to only the reload register. |

| | |
|---|---|
| RAPI_WRITE_ RELOAD_ BOTH | Selects operation mode in which writing to the primary register and prescaler causes the set data to be written to both the reload register and the counter, respectively. |
| RAPI_RISING | Selects the rising edge of count source as active edge. |
| RAPI_FALLING | Selects the falling edge of count source as active edge. |
| RAPI_FILTER_F1 | Use sampling frequency f1 for digital filter function |
| RAPI_FILTER_F8 | Use sampling frequency f8 for digital filter function |
| RAPI_FILTER_F32 | Use sampling frequency f32 for digital filter function |
| RAPI_TIOSEL_P1_7 | Sets count source input pin to P1_7. |
| RAPI_TIOSEL_P1_5 | Sets count source input pin to P1_5. |
| RAPI_PULSE_ON | Selects that pulses are output from TRA0 pin. |
| RAPI_PULSE_OFF | Selects that no pulses are output from TRA0 pin. |

**• Specifiable definition values when timer X is used (RAPI_TIMER_X specified)**

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Count edge) Specify one from { RAPI_RISING, RAPI_FALLING }. The default value is RAPI_FALLING.

**• Specifiable definition values when timer Y is used (RAPI_TIMER_Y specified)**

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Write control) Specify one from { RAPI_WRITE_RELOAD_ONLY, RAPI_WRITE_RELOAD_BOTH }. The default value is RAPI_WRITE_RELOAD_BOTH.

(INT2/CNTR1 input) Specify one from { RAPI_RISING, RAPI_FALLING }. The default value is RAPI_FALLING.

**• Specifiable definition values when timer RA is used (RAPI_TIMER_RA specified)**

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Count edge) Specify one from { RAPI_RISING, RAPI_FALLING }. The default value is RAPI_FALLING.

(Filter) Specify one from { RAPI_FILTER_F1, RAPI_FILTER_F8, RAPI_FILTER_F32}. The default value is no filter.

(Input pin) Specify one from { RAPI_TIOSEL_P1_7, RAPI_TIOSEL_P1_5 }. The default value is RAPI_TIOSEL_P1_7.

(Pulse output function) Specify one from { RAPI_PULSE_ON, RAPI_PULSE_OFF }. The default value is RAPI_PULSE_OFF.

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_B1 | Uses timer B1. |
| RAPI_TIMER_V | Uses timer V. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateEventCounter. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateEventCounter. |
| RAPI_OVERFLOW | Enables overflow interrupt. |
| RAPI_AUTO_RELOAD | Uses auto reload facility. |

| | |
|---|---|
| RAPI_RISING | Selects the rising edge of count source as active edge. |
| RAPI_FALLING | Selects the falling edge of count source as active edge. |
| RAPI_BOTH | Selects both rising and falling edges of count source as active edges. |
| RAPI_TRGV_RISING | Selects the rising edge of TRGV pin input signal as active edge. |
| RAPI_ TRGV_FALLING | Selects the falling edge of TRGV pin input signal as active edge. |
| RAPI_ TRGV_BOTH | Selects both rising and falling edges of TRGV pin input signal as active edges. |
| RAPI_TRGV_PROHIBITED | Selects that trigger input from TRGV pin is disabled. |

**• Specifiable definition values when timer B1 is used (RAPI_TIMER_B1 specified)**

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If RAPI_OVERFLOW is not specified, “No overflow interrupt request” is set.

(Reload) To select the auto reload facility, specify RAPI_AUTO_RELOAD. If no interrupts are specified, “No interrupt request” is set.

(Count edge) Specify one from { RAPI_RISING, RAPI_FALLING }. The default value is RAPI_FALLING.

**• Specifiable definition values when timer V is used (RAPI_TIMER_V specified)**

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, “No interrupt request” is set.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Count edge) Specify one from { RAPI_RISING, RAPI_FALLING, RAPI_BOTH }. The default value is RAPI_FALLING.

(TRGV pin input) Specify one from { RAPI_TRGV_RISING, RAPI_ TRGV_FALLING, RAPI_ TRGV_BOTH, RAPI_TRGV_PROHIBIT }. The default value is RAPI_TRGV_PROHIBIT.

**[data2]**

(M16C) (R8C)

Specify the interrupt priority level (0‑7) to be set in the interrupt control register.

(H8/300H)

Specify the interrupt priority level (0–1) to be set in the interrupt control register. For the CPUs that do not have an interrupt control register, specify 0.

**[data3]**

(M16C)

Specify the value to be set in the timer register in 16 bits.

(R8C)

When using timer X, specify the set value for the timer register; when using timer Y, specify the set value for the primary register in 8 bits.

(H8/300H)

Specify the set value for the timer reload register in 8 bits. This setting is effective only when timer B1 is used. If any timer other than B1 is used, specify 0.

**[data4]**

(M16C) (H8/300H)

Specify 0.

(R8C)

Specify the set value for the prescaler register in 8 bits.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (event counter mode)

**Reference**

__EnableEventCounter, __DestroyEventCounter, __GetEventCounter

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API specify when freeing it from module stanby state.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void TimerIntFunc( void ){}

void func( void )
{
    /* Set up timer Y as event counter mode */
    __CreateEventCounter( RAPI_TIMER_Y|RAPI_TIMER_ON|RAPI_FALLING, 5,
                        0x80, 0x80, TimerIntFunc );
}
```

## __EnableEventCounter

**Synopsis**

<Control operation of event counter mode>

**Boolean __EnableEventCounter(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Controls operation of the timer that is set to specified timer mode by starting or stopping it.

**[data]**

For data, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |
| RAPI_TIMER_ON | Sets the timer that is set to event counter mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to event counter mode to stop operating. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_RA | Selects timer RA. |
| RAPI_TIMER_ON | Sets the timer that is set to event counter mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to event counter mode to stop operating. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_V | Selects timer V. |
| RAPI_TIMER_ON | Sets the timer that is set to event counter mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to event counter mode to stop operating. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality** Timer (event counter mode)

**Reference** __CreateEventCounter, __DestroyEventCounter, __GetEventCounter

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c.h"

void func( void )
{
    /* Disable timer Y as event counter mode */
    __EnableEventCounter( RAPI_TIMER_Y|RAPI_TIMER_OFF );
}
```

## __DestroyEventCounter

**Synopsis**

<Discard settings of event counter mode>

**Boolean __DestroyEventCounter(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Discards settings of the timer that is set to specified timer mode.

**[data]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_RA | Selects timer RA. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_B1 | Selects timer B1. |
| RAPI_TIMER_V | Selects timer V. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (event counter mode)

**Reference**

__CreateEventCounter, __EnableEventCounter, __GetEventCounter

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API places a specified timer into module stanby state after discarding it.

**Program example**

```
#include "rapi_timer_r8c.h"
```

```
void func( void )
{
    /* Destroy the setting of timer Y as event counter mode */
    __DestroyEventCounter( RAPI_TIMER_Y );
}
```

## __GetEventCounter

**Synopsis**

<Get event counter mode counter value>

**Boolean __GetEventCounter(unsigned long data1, unsigned int *data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Pointer to the buffer in which counter value is stored |

**Description**

Gets the counter value of the timer that is set to specified event counter mode.

**[data1]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_RA | Selects timer RA. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_B1 | Selects timer B1. |
| RAPI_TIMER_V | Selects timer V. |

**[data2]**

Specify a pointer to the array in which the acquired counter value is stored.

(M16C)

• When using timer A (RAPI_TIMER_A0 to RAPI_TIMER_A4 specified)

[0]: The value of timer Ai register (i = 0–4) is stored.

• When using timer B (RAPI_TIMER_B0 to RAPI_TIMER_B2 specified)

[0]: The value of timer Bi register (i = 0–2) is stored.

(R8C)

• When using timer X (RAPI_TIMER_X specified)

[0]: The value of prescaler X register is stored.

[1]: The value of timer X register is stored.

• When using timer Y (RAPI_TIMER_Y specified)

[0]: The value of prescaler Y is stored.

[1]: The value of timer Y primary register is stored.

• When using timer RA (RAPI_TIMER_RA specified)

[0]: The value of timer RA prescaler register is stored.

[1]: The value of timer RA register is stored.
(H8/300H)
• When using timer B1 (RAPI_TIMER_B1 specified)
[0]: The value of timer counter B1 is stored.
• When using timer V (RAPI_TIMER_V specified)
[0]: The value of timer counter V is stored.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (event counter mode)

**Reference**

__CreateEventCounter, __EnableEventCounter, __DestroyEventCounter

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    unsigned int data[2];

    /* Get the counter of timer Y as event counter mode */
    __GetEventCounter(RAPI_TIMER_Y, data );
}
```

## __CreatePulseWidthModulationMode

**Synopsis**

<Set pulse width modulation mode>

**Boolean __CreatePulseWidthModulationMode(unsigned long data1, unsigned int data2, unsigned int* data3, void* data4)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |
| data3 | Setup data 3 (content differs with MCU type) |
| func | Callback function pointer<br>(Specify 0 if no callback functions are set.) |

**Description**

Sets a specified timer to pulse width modulation mode.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Uses timer A channel 0. |
| RAPI_TIMER_A1 | Uses timer A channel 1. |
| RAPI_TIMER_A2 | Uses timer A channel 2. |
| RAPI_TIMER_A3 | Uses timer A channel 3. |
| RAPI_TIMER_A4 | Uses timer A channel 4. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_F8 | Selects $f_8$ for the count source. |
| RAPI_F32 | Selects $f_{32}$ for the count source. |
| RAPI_FC32 | Selects $f_{C32}$ for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreatePulseWidthModulationMode. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreatePulseWidthModulationMode. |
| RAPI_TG_TAIIN | Selects external trigger input from $TA_{iIN}$ pin for the count start condition. |
| RAPI_EV_ TIMER_AJ | Selects overflow or underflow of timer Aj (j = i – 1, however j = 4 if i = 0) as the trigger for the timer to start counting. |
| RAPI_EV_TIMER_ AK | Selects overflow or underflow of timer Ak (k = i + 1, however k = 0 if i = 4) as the trigger for the timer to start counting. |
| RAPI_EV_TIMER_ B2 | Selects overflow or underflow of timer B2 as the trigger for the timer to start counting. |
| RAPI_TG_TAIS | Only writing 1 to the $TA_iS$ bit of the TABSR register causes the timer to start counting. |
| RAPI_PULSE_ON | Selects that pulses are output from $TA_{iIN}$ pin. Selectable only when timer Ai is used. |
| RAPI_PULSE_OFF | Selects that no pulses are output from $TA_{iIN}$ pin. Selectable only when timer Ai is used. |
| RAPI_PWM_16 | Selects operation as a 16-bit pulse width modulator. |
| RAPI_PWM_8 | Selects operation as an 8-bit pulse width modulator. |

| | |
|---|---|
| RAPI_RISING | Selects the rising edge of $TA_{iIN}$ pin input signal as active edge. |
| RAPI_FALLING | Selects the falling edge of $TA_{iIN}$ pin input signal as active edge. |

**• Specifiable definition values when timer A is used (RAPI_TIMER_A0 to RAPI_TIMER_A4 specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F32, RAPI_FC32 }. The default value is RAPI_F2.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Count start condition) Specify one from { RAPI_TG_TAIS, RAPI_TG_TAIIN, RAPI_EV_TIMER_AJ, RAPI_EV_TIMER_AK, RAPI_EV_TIMER_B2 }. The default value is RAPI_TG_TAIIN.

(Pulse output facility) Specify one from { RAPI_PULSE_ON, RAPI_PULSE_OFF }. The default value is RAPI_PULSE_OFF.

(Modulator) Specify one from { RAPI_PWM_16, RAPI_PWM_8 }. The default value is RAPI_PWM_16.

($TA_{iIN}$ pin input) Specify one from { RAPI_RISING, RAPI_FALLING }. The default value is RAPI_FALLING. The active edge of $TA_{iIN}$ pin input can only be set when RAPI_TG_TAIIN is selected.

(R8C)

| | |
|---|---|
| RAPI_TIMER_Y | Uses timer Y. |
| RAPI_TIMER_Z | Uses timer Z. |
| RAPI_TIMER_RB | Uses timer RB. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_F8 | Selects $f_8$ for the count source. |
| RAPI_FRING | Selects $f_{RING}$ for the count source. |
| RAPI_TIMER_Y_ UNDERFLOW | Selects underflow of timer Y for the count source. |
| RAPI_TIMER_RA_ UNDERFLOW | Selects underflow of timer RA for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreatePulseWidthModulationMode. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreatePulseWidthModulationMode. |
| RAPI_H_L_L | Sets to output a high during the primary period, a low during the secondary period, and a low when the timer is idle. |
| RAPI_L_H_H | Sets to output a low during the primary period, a high during the secondary period, and a high when the timer is idle. |

**• Specifiable definition values when timer Y is used (RAPI_TIMER_Y specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F8, RAPI_FRING }. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Output) Specify one from { RAPI_H_L_L, RAPI_L_H_H }. The default value is RAPI_H_L_L.

**• Specifiable definition values when timer Z is used (RAPI_TIMER_Z specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_TIMER_Y_UNDERFLOW}. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Output) Specify one from { RAPI_H_L_L, RAPI_L_H_H }. The default value is RAPI_H_L_L.

**• Specifiable definition values when timer RB is used (RAPI_TIMER_RB specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_TIMER_RA_UNDERFLOW}. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Output) Specify one from { RAPI_H_L_L, RAPI_L_H_H }. The default value is RAPI_H_L_L.

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_V | Uses timer V. |
| RAPI_TV_F4 | Timer V counts on falling edges of internal clock φ/4. |
| RAPI_TV_F8 | Timer V counts on falling edges of internal clock φ/8. |
| RAPI_TV_F16 | Timer V counts on falling edges of internal clock φ/16. |
| RAPI_TV_F32 | Timer V counts on falling edges of internal clock φ/32. |
| RAPI_TV_F64 | Timer V counts on falling edges of internal clock φ/64. |
| RAPI_TV_F128 | Timer V counts on falling edges of internal clock φ/128. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreatePulseWidthModulationMode. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreatePulseWidthModulationMode. |
| RAPI_COMPARE_MATCH_A | Enables compare match A interrupt. |
| RAPI_COMPARE_MATCH_B | Enables compare match B interrupt. |
| RAPI_OUT_H_L | Sets to output a high the during primary period and a low during the secondary period. |
| RAPI_OUT_L_H | Sets to output a low the during primary period and a high during the secondary period. |
| RAPI_RISING | Selects the rising edge of TRGV pin input signal as active edge. |
| RAPI_FALLING | Selects the falling edge of TRGV pin input signal as active edge. |
| RAPI_BOTH | Selects both rising and falling edges of TRGV pin input signal as active edge. |
| RAPI_TRGV_RISING | Selects the rising edge of TRGV pin input signal as active edge. |
| RAPI_ TRGV_FALLING | Selects the falling edge of TRGV pin input signal as active edge. |
| RAPI_ TRGV_BOTH | Selects both rising and falling edges of TRGV pin input signal as active edges. |
| RAPI_TRGV_ PROHIBITED | Selects that trigger input from TRGV pin is disabled. |

**• Specifiable definition values when timer V is used (RAPI_TIMER_V specified)**

| | |
|---|---|
| (Clock) | Specify one from { RAPI_TV_F4, RAPI_TV_F8, RAPI_TV_F16, RAPI_TV_F32, RAPI_TV_F64, RAPI_TV_F128 }. If clock specification is omitted, specify “Disable clock input.” |
| (Interrupt) | If compare match A interrupt requests are enabled, specify RAPI_COMPARE_MATCH_A. If compare match B interrupt requests are enabled, specify RAPI_COMPARE_MATCH_B. If no interrupts are specified, “No interrupt request” is set. |
| (Operating states set) | Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF. |
| (Output) | Specify one from { RAPI_OUT_H_L, RAPI_OUT_L_H }. Always be sure to specify this output. |
| (TRGV pin input) | Specify one from { RAPI_TRGV_RISING, RAPI_ TRGV_FALLING, RAPI_ TRGV_BOTH, RAPI_TRGV_PROHIBITED }. The default value is RAPI_TRGV_PROHIBITED. |

**[data2]**

(M16C) (R8C)

Specify the interrupt priority level (0-7) to be set in the interrupt control register.

(H8/300H)

Specify the interrupt priority level (0–1) to be set in the interrupt control register. For the CPUs that do not have an interrupt control register, specify 0.

**[data3]**

(M16C)

Specify a pointer to the 16-bit variable in which the set value for the timer register is stored.

For 16-bit PWM, specify the value of ‘n’ in “high-level width $n/f_j$, period $65535/f_j$” in 16 bits.

For 8-bit PWM, specify the values of ‘n’ and ‘m’ in “high-level width $n (m + 1)/f$, period $255 (m + 1)/f_j$” in the 8 high-order bits and the 8 low-order bits, respectively.

(R8C)

Specify a pointer to the array in which the set value is stored.

[0]: Specify the set value for the primary register in 8 bits.

[1]: Specify the set value for the secondary register in 8 bits.

[2]: Specify the set value for the prescaler in 8 bits.

(H8/300H)

Specify a pointer to the array in which the set value is stored.

[0]: Specify the comparison value A in 8 bits.

[1]: Specify the comparison value B in 8 bits.

**Return value** If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality** Timer (pulse width modulation mode (PWM mode))

**Reference**

__EnablePulseWidthModulationMode, __DestroyPulseWidthModulationMode

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- For the H8/300H, make sure that comparison value A < comparison value B.
- When used for the H8/300H, this API specify when freeing it from module stanby state.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void TimerIntFunc( void ){}

void func( void )
{
    unsigned int p_tim[] =  {0xAA, 0xBB, 0xCC};

    /* Set up timer Z as pulse width modulation mode */

__CreatePulseWidthModulationMode( RAPI_TIMER_Z|RAPI_TIMER_ON|RAPI_F8,
                                  5, p_tim, TimerIntFunc);
}
```

## __EnablePulseWidthModulationMode

**Synopsis**

<Control operation of pulse width modulation mode>

**Boolean __EnablePulseWidthModulationMode(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Controls operation of the timer that is set to specified pulse width modulation mode by starting or stopping it.

**[data]**

For data, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_ON | Sets the timer that is set to pulse width modulation mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to pulse width modulation mode to stop operating. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_Z | Selects timer Z. |
| RAPI_TIMER_RB | Selects timer RB. |
| RAPI_TIMER_ON | Sets the timer that is set to pulse width modulation mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to pulse width modulation mode to stop operating. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_V | Selects timer V. |
| RAPI_TIMER_ON | Sets the timer that is set to pulse width modulation mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to pulse width modulation mode to stop operating. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse width modulation mode (PWM mode))

**Reference**

__CreatePulseWidthModulationMode, __DestroyPulseWidthModulationMode

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    /* Enable timer Y as pulse width modulation mode */
    __EnablePulseWidthModulationMode( RAPI_TIMER_Y|RAPI_TIMER_ON );
}
```

## __DestroyPulseWidthModulationMode

**Synopsis**

<Discard settings of pulse width modulation mode>

**Boolean __DestroyPulseWidthModulationMode(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Discards settings of the timer that is set to specified pulse width modulation mode.

**[data]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_Z | Selects timer Z. |
| RAPI_TIMER_RB | Selects timer RB. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_V | Selects timer V. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse width modulation mode (PWM mode))

**Reference**

__CreatePulseWidthModulationMode, __EnablePulseWidthModulationMode

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API places a specified timer into module stanby state after discarding it.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    /* Destroy the setting of timer Z as pulse width modulation mode */
    __DestroyPulseWidthModulationMode( RAPI_TIMER_Z );
}
```

## __CreatePulsePeriodMeasurementMode

**Synopsis**

<Set pulse period measurement mode>

**Boolean __CreatePulsePeriodMeasurementMode(unsigned long data1, unsigned int data2, unsigned int data3, unsigned int data4, void* func)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |
| data3 | Setup data 3 (content differs with MCU type) |
| data4 | Setup data 4 (content differs with MCU type) |
| func | Callback function pointer<br>(Specify 0 if no callback functions are set.) |

**Description**

Sets a specified timer to pulse period measurement mode.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_B0 | Uses timer B channel 0. |
| RAPI_TIMER_B1 | Uses timer B channel 1. |
| RAPI_TIMER_B2 | Uses timer B channel 2. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_F8 | Selects $f_8$ for the count source. |
| RAPI_F32 | Selects $f_{32}$ for the count source. |
| RAPI_FC32 | Selects $f_{C32}$ for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_RISING_ RISING | Selects measurement of an interval from the rise to the next rise of a measurement pulse. |
| RAPI_FALLING_ FALLING | Selects measurement of an interval from the fall to the next fall of a measurement pulse. |

**• Specifiable definition values when timer B is used (RAPI_TIMER_B0 to RAPI_TIMER_B2 specified)**

| | |
|---|---|
| (Count source) | Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_F32, RAPI_FC32 }. The default value is RAPI_F2. |
| (Operating states set) | Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF. |
| (Measurement pulse) | Specify one from { RAPI_RISING_RISING, RAPI_FALLING_FALLING }. The default value is RAPI_FALLING_FALLING. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Uses timer X. |

| | |
|---|---|
| RAPI_TIMER_RA | Uses timer RA. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_F8 | Selects $f_8$ for the count source. |
| RAPI_F32 | Selects $f_{32}$ for the count source. |
| RAPI_FC32 | Selects $f_{C32}$ for the count source. |
| RAPI_FOCO | Selects fOCO for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_RISING_ RISING | Selects measurement of an interval from the rise to the next rise of a measurement pulse. |
| RAPI_FALLING_ FALLING | Selects measurement of an interval from the fall to the next fall of a measurement pulse. |
| RAPI_FILTER_F1 | Use sampling frequency f1 for digital filter function |
| RAPI_FILTER_F8 | Use sampling frequency f8 for digital filter function |
| RAPI_FILTER_F32 | Use sampling frequency f32 for digital filter function |
| RAPI_TIOSEL_P1_7 | Sets count source input pin to P1_7. |
| RAPI_TIOSEL_P1_5 | Sets count source input pin to P1_5. |

**• Specifiable definition values when timer X is used (RAPI_TIMER_X specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_F32 }. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Measurement pulse) Specify one from { RAPI_RISING_RISING, RAPI_FALLING_FALLING }. The default value is RAPI_FALLING_FALLING.

**• Specifiable definition values when timer RA is used (RAPI_TIMER_RA specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_F32, RAPI_FOCO }. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Measure pulse) Specify one from { RAPI_RISING_RISING, RAPI_FALLING_FALLING }. The default value is RAPI_FALLING_FALLING.

(Filter) Specify one from { RAPI_FILTER_F1, RAPI_FILTER_F8, RAPI_FILTER_F32}. The default value is no filter.

(Input pin) Specify one from { RAPI_TIOSEL_P1_7, RAPI_TIOSEL_P1_5 }. The default value is RAPI_TIOSEL_P1_7.

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Uses timer W. |
| RAPI_TIMER_Z0 | Uses timer Z channel 0. |
| RAPI_TIMER_Z1 | Uses timer Z channel 1. |
| RAPI_TIMER_RC | Uses timer RC. |
| RAPI_TIMER_RD0 | Uses timer RD0 channel 0. |
| RAPI_TIMER_RD1 | Uses timer RD0 channel 1. |
| RAPI_TIMER_RD2 | Uses timer RD0 channel 2. |

| | |
|---|---|
| RAPI_TIMER_RD3 | Uses timer RD0 channel 3. |
| RAPI_TW_F1 | Timer W counts with internal clock φ. |
| RAPI_TW_F2 | Timer W counts with internal clock φ/2. |
| RAPI_TW_F4 | Timer W counts with internal clockφ/4. |
| RAPI_TW_F8 | Timer W counts with internal clock φ/8. |
| RAPI_TZ_F1 | Timer Z counts with internal clock φ. |
| RAPI_TZ_F2 | Timer Z counts with internal clock φ/2. |
| RAPI_TZ_F4 | Timer Z counts with internal clock φ/4. |
| RAPI_TZ_F8 | Timer Z counts with internal clock φ/8. |
| RAPI_TRC_F1 | Timer RC counts with internal clock φ. |
| RAPI_TRC_F2 | Timer RC counts with internal clock φ/2. |
| RAPI_TRC_F4 | Timer RC counts with internal clockφ/4. |
| RAPI_TRC_F8 | Timer RC counts with internal clock φ/8. |
| RAPI_TRC_F32 | Timer RC counts with internal clock φ/8. |
| RAPI_TRC_F40M | Timer RC counts with internal clock φ40M. |
| RAPI_TRD_F1 | Timer RD counts with internal clock φ. |
| RAPI_TRD_F2 | Timer RD counts with internal clock φ/2. |
| RAPI_TRD_F4 | Timer RD counts with internal clockφ/4. |
| RAPI_TRD_F8 | Timer RD counts with internal clock φ/8. |
| RAPI_TRD_F32 | Timer RD counts with internal clock φ/32. |
| RAPI_TRD_F40M | Timer RD counts with internal clock φ40M. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_OVERFLOW | Enables overflow interrupt. |
| RAPI_RISING_ RISING | Selects measurement of an interval from the rise to the next rise of a measurement pulse. |
| RAPI_FALLING_ FALLING | Selects measurement of an interval from the fall to the next fall of a measurement pulse. |
| RAPI_TRC_FILTER_F 1 | Use sampling frequency f1 for timer RC digital filter function |
| RAPI_TRC_FILTER_F 8 | Use sampling frequency f8 for timer RC digital filter function |
| RAPI_TRC_FILTER_F 32 | Use sampling frequency f32 for timer RC digital filter function |
| RAPI_TRD_FILTER_F | Use sampling frequency f for timer RC digital filter function |
| RAPI_TRD_FILTER_F 1 | Use sampling frequency f1 for timer RD digital filter function |
| RAPI_TRD_FILTER_F 8 | Use sampling frequency f8 for timer RD digital filter function |
| RAPI_TRD_FILTER_F 32 | Use sampling frequency f32 for timer RD digital filter function |
| RAPI_TRD_FILTER_F | Use sampling frequency f for timer RD digital filter function |
| RAPI_FTIOA | Use FTIOA pin as input pin. |

| | |
|---|---|
| RAPI_FTIOB | Use FTIOB pin as input pin. |

**• Specifiable definition values when timer W is used (RAPI_TIMER_W specified)**

| | |
|---|---|
| (Count source) | Specify one from { RAPI_TW_F1, RAPI_TW_F2, RAPI_TW_F4, RAPI_TW_F8 }. The default value is RAPI_TW_F1. |
| (Operating states set) | Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF. |
| (Measurement pulse) | Specify one from { RAPI_RISING_RISING, RAPI_FALLING_FALLING }. The default value is RAPI_RISING_RISING. |
| (Interrupt) | If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, “No interrupt request” is set. |

**• Specifiable definition values when timer Z is used (RAPI_TIMER_Z0 to RAPI_TIMER_Z1 specified)**

| | |
|---|---|
| (Count source) | Specify one from { RAPI_TZ_F1, RAPI_TZ_F2, RAPI_TZ_F4, RAPI_TZ_F8 }. The default value is RAPI_TZ_F1. |
| (Operating states set) | Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF. |
| (Measurement pulse) | Specify one from { RAPI_RISING_RISING, RAPI_FALLING_FALLING }. The default value is RAPI_RISING_RISING. |
| (Interrupt) | If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, “No interrupt request” is set. |
| (Input pin) | Specify one from { RAPI_FTIOA, RAPI_FTIOB }. The default value is RAPI_FTIOA. |

**• Specifiable definition values when timer RC is used (RAPI_TIMER_RC specified)**

| | |
|---|---|
| (Count source) | Specify one from { RAPI_TRC_F1, RAPI_TRC_F2, RAPI_TRC_F4, RAPI_TRC_F8, RAPI_TRC_F32 }. The default value is RAPI_RC_F1. |
| (Operating states set) | Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF. |
| (Measurement pulse) | Specify one from { RAPI_RISING_RISING, RAPI_FALLING_FALLING }. The default value is RAPI_RISING_RISING. |
| (Interrupt) | If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, “No interrupt request” is set. |
| (Input pin) | Specify one from { RAPI_FTIOA, RAPI_FTIOB }. The default value is RAPI_FTIOA. |
| (Clock for digital filter) | Specify one from { RAPI_TRC_FILTER_F1, RAPI_TRC_FILTER_F8, RAPI_TRC_FILTER_F32, RAPI_TRC_FILTER_F }. The default value is RAPI_TRC_FILTER_F32. |

**• Specifiable definition values when timer RD is used (RAPI_TIMER_RD specified)**

| | |
|---|---|
| (Count source) | Specify one from { RAPI_TRD_F1, RAPI_TRD_F2, RAPI_TRD_F4, RAPI_TRD_F8, RAPI_TRD_F32, RAPI_TRD_F40M }. The default value is RAPI_RC_F1. |
| (Operating states set) | Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF. |
| (Measurement pulse) | Specify one from { RAPI_RISING_RISING, RAPI_FALLING_FALLING }. The default value is RAPI_RISING_RISING. |

| | |
|---|---|
| (Interrupt) | If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, “No interrupt request” is set. |
| (Input pin) | Specify one from { RAPI_FTIOA, RAPI_FTIOB }. The default value is RAPI_FTIOA. |
| (Clock for digital filter) | Specify one from { RAPI_TRC_FILTER_F1, RAPI_TRC_FILTER_F8, RAPI_TRC_FILTER_F32, RAPI_TRC_FILTER_F }. The default value is RAPI_TRC_FILTER_F32. |

**[data2]**

(M16C) (R8C)

Specify the interrupt priority level (0-7) to be set in the interrupt control register.

(H8/300H)

Specify the interrupt priority level (0–1) to be set in the interrupt control register. For the CPUs that do not have an interrupt control register, specify 0.

**[data3]**

(M16C) (H8/300H)

Specify 0.

(R8C)

When using timer X, specify the set value for the timer register.

**[data4]**

(M16C) (H8/300H)

Specify 0.

(R8C)

Specify the set value for the prescaler register.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse period measurement mode)

**Reference**

__EnablePulsePeriodMeasurementMode, __DestroyPulsePeriodMeasurementMode, __GetPulsePeriodMeasurementMode

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API specify when freeing it from module stanby state.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void TimerIntFunc( void ){}

void func( void )
{
    /* Set up timer X as pulse period measurement mode */
    __CreatePulsePeriodMeasurementMode(
        RAPI_TIMER_X|RAPI_TIMER_ON|RAPI_FALLING_FALLING|RAPI_F8,
        5, 0x80, 0x80, TimerIntFunc);
}
```

## __EnablePulsePeriodMeasurementMode

**Synopsis**

<Control operation of pulse period measurement mode>

**Boolean __EnablePulsePeriodMeasurementMode(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Controls operation of the timer that is set to specified pulse period measurement mode by starting or stopping it.

**[data]**

For data, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |
| RAPI_TIMER_ON | Sets the timer that is set to pulse period measurement mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to pulse period measurement mode to stop operating. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_RA | Selects timer RA. |
| RAPI_TIMER_ON | Sets the timer that is set to pulse period measurement mode to start operating. |
| RAPI_TIMER_ OFF | Sets the timer that is set to pulse period measurement mode to stop operating. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD 0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD 1 | Selects timer RD channel 1. |
| RAPI_TIMER_RD 2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD 3 | Selects timer RD channel 3. |
| RAPI_TIMER_ON | Sets the timer that is set to pulse period measurement mode to start operating. |

| | |
|---|---|
| RAPI_TIMER_OFF | Sets the timer that is set to pulse period measurement mode to stop operating. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse period measurement mode)

**Reference**

__CreatePulsePeriodMeasurementMode, __DestroyPulsePeriodMeasurementMode, __GetPulsePeriodMeasurementMode

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    /* Enable timer X as pulse period measurement mode */
    __EnablePulsePeriodMeasurementMode( RAPI_TIMER_X|RAPI_TIMER_ON );
}
```

## __DestroyPulsePeriodMeasurementMode

**Synopsis**

<Discard settings of pulse period measurement mode>

**Boolean __DestroyPulsePeriodMeasurementMode(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Discards settings of the timer that is set to specified pulse period measurement mode.

**[data]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_RA | Selects timer RA. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD 0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD 1 | Selects timer RD channel 1. |
| RAPI_TIMER_RD 2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD 3 | Selects timer RD channel 3. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse period measurement mode)

**Reference**

__CreatePulsePeriodMeasurementMode, __EnablePulsePeriodMeasurementMode, __GetPulsePeriodMeasurementMode

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

- When used for the H8/300H, this API places a specified timer into module stanby state after discarding it.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    /* Destroy the setting of timer X as pulse period measurement mode */
    __DestroyPulsePeriodMeasurementMode( RAPI_TIMER_X );
}
```

## __GetPulsePeriodMeasurementMode

**Synopsis**

<Get measured value in pulse period measurement mode>

**Boolean __GetPulsePeriodMeasurementMode(unsigned long data1, unsigned int *data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Pointer to the buffer in which counter value is stored |

**Description**

Gets the counter value of the timer that is set to specified pulse period measurement mode.

**[data1]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_RA | Selects timer RA. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD 0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD 1 | Selects timer RD channel 1. |
| RAPI_TIMER_RD 2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD 3 | Selects timer RD channel 3. |

**[data2]**

Specify a pointer to the array in which the acquired counter value is stored.

(M16C)

• When using timer B (RAPI_TIMER_B0 to RAPI_TIMER_B2 specified)

[0]: The value of timer Bi register (i = 0–2) is stored.

(R8C)

• When using timer X (RAPI_TIMER_X specified)

[0]: The value of prescaler X register is stored.

[1]: The value of timer X register is stored.

• When using timer RA (RAPI_TIMER_RA specified)

[0]: The value of timer RA prescaler register is stored.
[1]: The value of timer RA register is stored.
(H8/300H)
• When using timer W (RAPI_TIMER_W specified)
[0]: (The value of general register A) – (The value of general register C) is stored.
[1]: (The value of general register B) – (The value of general register D) is stored.
• When using timer Z (RAPI_TIMER_Z0 - RAPI_TIMER_Z1 specified)
[0]: (The value of general register Ai(i=0,1)) – (The value of general register C i(i=0,1)) is stored.
[1]: (The value of general register B i(i=0,1)) – (The value of general register D i(i=0,1)) is stored.
• When using timer RC (RAPI_TIMER_RC specified)
[0]: (The value of general register A) – (The value of general register C) is stored.
[1]: (The value of general register B) – (The value of general register D) is stored.
• When using timer RD (RAPI_TIMER_RD specified)
[0]: (The value of general register A) – (The value of general register C) is stored.
[1]: (The value of general register B) – (The value of general register D) is stored.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse period measurement mode)

**Reference**

__CreatePulsePeriodMeasurementMode, __EnablePulsePeriodMeasurementMode, __DestroyPulsePeriodMeasurementMode

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    unsigned int data[2];

    /* Get the measured value of timer X as pulse period measurement mode
*/
    __GetPulsePeriodMeasurementMode( RAPI_TIMER_X, data );
}
```

## __CreatePulseWidthMeasurementMode

**Synopsis**

<Set pulse width measurement mode>

**Boolean __CreatePulseWidthMeasurementMode(unsigned long data1, unsigned int data2, unsigned int data3, unsigned int data4, void* func)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |
| data3 | Setup data 3 (content differs with MCU type) |
| data4 | Setup data 4 (content differs with MCU type) |
| func | Callback function pointer<br>(Specify 0 if no callback functions are set.) |

**Description**

Sets a specified timer to pulse with measurement mode.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_B0 | Uses timer B channel 0. |
| RAPI_TIMER_B1 | Uses timer B channel 1. |
| RAPI_TIMER_B2 | Uses timer B channel 2. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_F8 | Selects $f_8$ for the count source. |
| RAPI_F32 | Selects $f_{32}$ for the count source. |
| RAPI_FC32 | Selects $f_{C32}$ for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreatePulseWidthMeasurementMode. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreatePulseWidthMeasurementMode. |

**• Specifiable definition values when timer B is used (RAPI_TIMER_B0 to RAPI_TIMER_B2 specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_F32, RAPI_FC32 }. The default value is RAPI_F2.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Uses timer X. |
| RAPI_TIMER_RA | Uses timer RA. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_F8 | Selects $f_8$ for the count source. |
| RAPI_F32 | Selects $f_{32}$ for the count source. |
| RAPI_FC32 | Selects $f_{C32}$ for the count source. |

| | |
|---|---|
| RAPI_FOCO | Selects fOCO for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_RISING_ RISING | Selects measurement of an interval from the rise to the next rise of a measurement pulse. |
| RAPI_FALLING_ FALLING | Selects measurement of an interval from the fall to the next fall of a measurement pulse. |
| RAPI_FILTER_F1 | Use sampling frequency f1 for digital filter function |
| RAPI_FILTER_F8 | Use sampling frequency f8 for digital filter function |
| RAPI_FILTER_F32 | Use sampling frequency f32 for digital filter function |
| RAPI_TIOSEL_P1 _7 | Sets count source input pin to P1_7. |
| RAPI_TIOSEL_P1 _5 | Sets count source input pin to P1_5. |

**• Specifiable definition values when timer X is used (RAPI_TIMER_X specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_F32 }. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Measurement pulse) Specify one from { RAPI_FALLING_RISING, RAPI_RISING_FALLING }. The default value is RAPI_FALLING_RISING.

**• Specifiable definition values when timer RA is used (RAPI_TIMER_RA specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2, RAPI_F8, RAPI_F32, RAPI_FOCO }. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Measure pulse) Specify one from { RAPI_RISING_RISING, RAPI_FALLING_FALLING }. The default value is RAPI_FALLING_FALLING.

(Filter) Specify one from { RAPI_FILTER_F1, RAPI_FILTER_F8, RAPI_FILTER_F32}. The default value is no filter.

(Input pin) Specify one from { RAPI_TIOSEL_P1_7, RAPI_TIOSEL_P1_5 }. The default value is RAPI_TIOSEL_P1_7.

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Uses timer W. |
| RAPI_TIMER_Z0 | Uses timer Z channel 0. |
| RAPI_TIMER_Z1 | Uses timer Z channel 1. |
| RAPI_TIMER_RC | Uses timer RC. |
| RAPI_TIMER_RD0 | Uses timer RD0 channel 0. |
| RAPI_TIMER_RD1 | Uses timer RD0 channel 1. |
| RAPI_TIMER_RD2 | Uses timer RD0 channel 2. |
| RAPI_TIMER_RD3 | Uses timer RD0 channel 3. |
| RAPI_TW_F1 | Timer W counts with internal clock φ. |
| RAPI_TW_F2 | Timer W counts with internal clock φ/2. |
| RAPI_TW_F4 | Timer W counts with internal clock φ/4. |

| | |
|---|---|
| RAPI_TW_F8 | Timer W counts with internal clock φ/8. |
| RAPI_TZ_F1 | Timer Z counts with internal clock φ. |
| RAPI_TZ_F2 | Timer Z counts with internal clock φ/2. |
| RAPI_TZ_F4 | Timer Z counts with internal clock φ/4. |
| RAPI_TZ_F8 | Timer Z counts with internal clock φ/8. |
| RAPI_TRC_F1 | Timer RC counts with internal clock φ. |
| RAPI_TRC_F2 | Timer RC counts with internal clock φ/2. |
| RAPI_TRC_F4 | Timer RC counts with internal clockφ/4. |
| RAPI_TRC_F8 | Timer RC counts with internal clock φ/8. |
| RAPI_TRC_F32 | Timer RC counts with internal clock φ/8. |
| RAPI_TRC_F40M | Timer RC counts with internal clock φ40M. |
| RAPI_TRD_F1 | Timer RD counts with internal clock φ. |
| RAPI_TRD_F2 | Timer RD counts with internal clock φ/2. |
| RAPI_TRD_F4 | Timer RD counts with internal clockφ/4. |
| RAPI_TRD_F8 | Timer RD counts with internal clock φ/8. |
| RAPI_TRD_F32 | Timer RD counts with internal clock φ/32. |
| RAPI_TRD_F40M | Timer RD counts with internal clock φ40M. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreatePulsePeriodMeasurementMode. |
| RAPI_OVERFLOW | Enables overflow interrupt. |
| RAPI_RISING_ RISING | Selects measurement of an interval from the rise to the next rise of a measurement pulse. |
| RAPI_FALLING_ FALLING | Selects measurement of an interval from the fall to the next fall of a measurement pulse. |
| RAPI_TRC_FILTER_F1 | Use sampling frequency f1 for timer RC digital filter function |
| RAPI_TRC_FILTER_F8 | Use sampling frequency f8 for timer RC digital filter function |
| RAPI_TRC_FILTER_F32 | Use sampling frequency f32 for timer RC digital filter function |
| RAPI_TRD_FILTER_F | Use sampling frequency f for timer RC digital filter function |
| RAPI_TRD_FILTER_F1 | Use sampling frequency f1 for timer RD digital filter function |
| RAPI_TRD_FILTER_F8 | Use sampling frequency f8 for timer RD digital filter function |
| RAPI_TRD_FILTER_F32 | Use sampling frequency f32 for timer RD digital filter function |
| RAPI_TRD_FILTER_F | Use sampling frequency f for timer RD digital filter function |
| RAPI_FTIOA | Use FTIOA pin as input pin. |
| RAPI_FTIOB | Use FTIOB pin as input pin. |

**• Specifiable definition values when timer W is used (RAPI_TIMER_W specified)**

(Count source) Specify one from { RAPI_TW_F1, RAPI_TW_F2, RAPI_TW_F4, RAPI_TW_F8 }. The default value is RAPI_TW_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, "No interrupt request" is set.

**• Specifiable definition values when timer Z is used (RAPI_TIMER_Z0 to RAPI_TIMER_Z1 specified)**

(Count source) Specify one from { RAPI_TZ_F1, RAPI_TZ_F2, RAPI_TZ_F4, RAPI_TZ_F8 }. The default value is RAPI_TZ_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, "No interrupt request" is set.

(Input pin) Specify one from { RAPI_FTIOA, RAPI_FTIOB }. The default value is RAPI_FTIOA.

**• Specifiable definition values when timer RC is used (RAPI_TIMER_RC specified)**

(Count source) Specify one from { RAPI_TRC_F1, RAPI_TRC_F2, RAPI_TRC_F4, RAPI_TRC_F8, RAPI_TRC_F32, RAPI_TRC_F40M }. The default value is RAPI_RC_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, "No interrupt request" is set.

(Input pin) Specify one from { RAPI_FTIOA, RAPI_FTIOB }. The default value is RAPI_FTIOA.

(Clock for digital filter) Specify one from { RAPI_TRC_FILTER_F1, RAPI_TRC_FILTER_F8, RAPI_TRC_FILTER_F32, RAPI_TRC_FILTER_F }. The default value is RAPI_TRC_FILTER_F32.

**• Specifiable definition values when timer RD is used (RAPI_TIMER_RD specified)**

(Count source) Specify one from { RAPI_TRD_F1, RAPI_TRD_F2, RAPI_TRD_F4, RAPI_TRD_F8, RAPI_TRD_F32, RAPI_TRD_F40M }. The default value is RAPI_RC_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If no interrupts are specified, "No interrupt request" is set.

(Input pin) Specify one from { RAPI_FTIOA, RAPI_FTIOB }. The default value is RAPI_FTIOA.

(Clock for digital filter) Specify one from { RAPI_TRC_FILTER_F1, RAPI_TRC_FILTER_F8, RAPI_TRC_FILTER_F32, RAPI_TRC_FILTER_F }. The default value is RAPI_TRC_FILTER_F32.

**[data2]**

(M16C) (R8C)

Specify the interrupt priority level (0-7) to be set in the interrupt control register.

(H8/300H)

Specify the interrupt priority level (0–1) to be set in the interrupt control register. For the CPUs that do not have an interrupt control register, specify 0.

**[data3]**

(M16C)(H8/300H)

Specify 0.

(R8C)

When using timer X, specify the set value for the timer register.

**[data4]**

(M16C) (H8/300H)

Specify 0.

(R8C)

Specify the set value for the prescaler register.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse width measurement mode)

**Reference**

__EnablePulseWidthMeasurementMode, __DestroyPulseWidthMeasurementMode, __GetPulseWidthMeasurementMode

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API specify when freeing it from module stanby state.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void TimerIntFunc( void ){}

void func( void )
{
   /* Set up timer X as pulse width measurement mode */
   __CreatePulseWidthMeasurementMode(
      RAPI_TIMER_X|RAPI_TIMER_ON|RAPI_RISING_FALLING|RAPI_F8,
      5, 0x80, 0x80, TimerIntFunc);
}
```

## __EnablePulseWidthMeasurementMode

**Synopsis**

<Control operation of pulse width measurement mode>

**Boolean __EnablePulseWidthMeasurementMode(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Controls operation of the timer that is set to specified pulse width measurement mode.

**[data]**

For data, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |
| RAPI_TIMER_ON | Sets the timer that is set to pulse width measurement mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to pulse width measurement mode to stop operating. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_RA | Selects timer RA. |
| RAPI_TIMER_ON | Sets the timer that is set to pulse width measurement mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to pulse width measurement mode to stop operating. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD 0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD 1 | Selects timer RD channel 1. |
| RAPI_TIMER_RD 2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD 3 | Selects timer RD channel 3. |
| RAPI_TIMER_ON | Sets the timer that is set to pulse width measurement mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to pulse width measurement mode to stop operating. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse width measurement mode)

**Reference**

__CreatePulseWidthMeasurementMode, __DestroyPulseWidthMeasurementMode, __GetPulseWidthMeasurementMode

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    /* Disable timer X as pulse width measurement mode */
    __EnablePulseWidthMeasurementMode( RAPI_TIMER_X|RAPI_TIMER_OFF );
}
```

## __DestroyPulseWidthMeasurementMode

**Synopsis**

<Discard settings of pulse width measurement mode>

**Boolean __DestroyPulseWidthMeasurementMode(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Discards settings of the timer that is set to specified pulse width measurement mode.

**[data]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD 0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD 1 | Selects timer RD channel 1. |
| RAPI_TIMER_RD 2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD 3 | Selects timer RD channel 3. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse width measurement mode)

**Reference**

__CreatePulseWidthMeasurementMode, __EnablePulseWidthMeasurementMode, __GetPulseWidthMeasurementMode

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API places a specified timer into module stanby state after discarding it.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    /* Destroy the setting of timer X as pulse width measurement mode */
    __DestroyPulseWidthMeasurementMode( RAPI_TIMER_X );
}
```

## __GetPulseWidthMeasurementMode

**Synopsis**

<Get measured value in pulse width measurement mode>

**Boolean __GetPulseWidthMeasurementMode(unsigned long data1, unsigned int *data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Pointer to the buffer in which counter value is stored |

**Description**

Gets the counter value of the timer that is set to specified pulse width measurement mode.

**[data1]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_RA | Selects timer RA. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD 0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD 1 | Selects timer RD channel 1. |
| RAPI_TIMER_RD 2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD 3 | Selects timer RD channel 3. |

**[data2]**

Specify a pointer to the array in which the acquired counter value is stored.

(M16C)

• When using timer B (RAPI_TIMER_B0 to RAPI_TIMER_B2 specified)

[0]: The value of timer Bi register (i = 0–2) is stored.

(R8C)

• When using timer X (RAPI_TIMER_X specified)

[0]: The value of prescaler X register is stored.

[1]: The value of timer X register is stored.

• When using timer RA (RAPI_TIMER_RA specified)

[0]: The value of timer RA prescaler register is stored.
[1]: The value of timer RA register is stored.
(H8/300H)
• When using timer W (RAPI_TIMER_W specified)
[0]: (The value of general register A) – (The value of general register C) is stored.
[1]: (The value of general register B) – (The value of general register D) is stored.
• When using timer Z (RAPI_TIMER_Z0 - RAPI_TIMER_Z1 specified)
[0]: (The value of general register Ai(i=0,1)) – (The value of general register C i(i=0,1)) is stored.
[1]: (The value of general register B i(i=0,1)) – (The value of general register D i(i=0,1)) is stored.
• When using timer RC (RAPI_TIMER_RC specified)
[0]: (The value of general register A) – (The value of general register C) is stored.
[1]: (The value of general register B) – (The value of general register D) is stored.
• When using timer RD (RAPI_TIMER_RD specified)
[0]: (The value of general register A) – (The value of general register C) is stored.
[1]: (The value of general register B) – (The value of general register D) is stored.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (pulse width measurement mode)

**Reference**

__CreatePulseWidthMeasurementMode, __EnablePulseWidthMeasurementMode, __DestroyPulseWidthMeasurementMode

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    unsigned int data[2];

    /* Get the measured value of timer X as pulse width measurement mode
*/
    __GetPulseWidthMeasurementMode( RAPI_TIMER_X, data );
}
```

## __CreateInputCapture

**Synopsis**

<Set input capture mode>

**Boolean __CreateInputCapture(unsigned long data1, unsigned int* data2, unsigned int* data3, unsigned int* data4, void** data5)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |
| data3 | Setup data 3 (content differs with MCU type) |
| data4 | Setup data 4 (content differs with MCU type) |
| data5 | Setup data 5 (content differs with MCU type) |

**Description**

Sets a specified timer to input capture mode.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_S | Uses timer S. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateInputCapture. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateInputCapture. |
| RAPI_OVERFLOW_BIT14 | Selects overflow of bit 14 for the base timer interrupt. |
| RAPI_OVERFLOW_BIT15 | Selects overflow of bit 15 for the base timer interrupt. |

**• Specifiable definition values when timer S is used (RAPI_TIMER_S specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2 }. The default value is RAPI_F2.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Base timer) Specify one from { RAPI_OVERFLOW_BIT14, RAPI_OVERFLOW_BIT15 }. The default value is RAPI_OVERFLOW_BIT15.

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Uses timer C. |
| RAPI_TIMER_RD0 | Uses timer RD channel 0. |
| RAPI_TIMER_RD1 | Uses timer RD channel 1. |
| RAPI_TRD_F1 | Selects $f_1$ for the timer RD count source. |
| RAPI_TRD_F2 | Selects $f_2$ for the timer RD count source. |
| RAPI_TRD_F8 | Selects $f_8$ for the timer RD count source. |
| RAPI_TRD_F32 | Selects $f_{32}$ for the timer RD count source. |
| RAPI_TRD_F40M | Selects fOCO40M for the timer RD count source. |
| RAPI_FRING_FAST | Selects $f_{RING\text{-}fast}$ for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateInputCapture. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateInputCapture. |
| RAPI_RISING | Selects the rising edge of measurement pulse as active edge. |

| | |
|---|---|
| RAPI_FALLING | Selects the falling edge of measurement pulse as active edge. |
| RAPI_BOTH | Selects both rising and falling edges of measurement pulse as active edge. |
| RAPI_FILTER_F1 | Uses the digital filter facility that has a sampling frequency $f_1$. |
| RAPI_FILTER_F8 | Uses the digital filter facility that has a sampling frequency $f_8$. |
| RAPI_FILTER_F32 | Uses the digital filter facility that has a sampling frequency $f_{32}$. |
| RAPI_INT3_TRIGGER | Selects the trigger facility of $TC_{IN}$ input. |
| RAPI_FRING128 | Selects the trigger facility of $f_{RING128}$ input. |
| RAPI_OVERFLOW | Enable overflow interrupt. |
| RAPI_INPUT_CAPTURE_A | Enable GRA input capture interrupt. |
| RAPI_INPUT_CAPTURE_B | Enable GRB input capture interrupt. |
| RAPI_INPUT_CAPTURE_C | Enable GRC input capture interrupt. |
| RAPI_INPUT_CAPTURE_D | Enable GRD input capture interrupt. |
| RAPI_COUNT_CLEAR_A | Selects GRA input capture to counter clear factor |
| RAPI_COUNT_CLEAR_B | Selects GRB input capture to counter clear factor |
| RAPI_COUNT_CLEAR_C | Selects GRC input capture to counter clear factor |
| RAPI_COUNT_CLEAR_D | Selects GRD input capture to counter clear factor |
| RAPI_COUNT_CLEAR_SYNC | Clear counter in sync with the synchronized other timer counter |
| RAPI_TIMER_SYNC | Synchronize timer on channels A and B. |
| RAPI_TRD_FILTER_F1 | Use sampling frequency f1 for digital filter function |
| RAPI_TRD_FILTER_F8 | Use sampling frequency f8 for digital filter function |
| RAPI_TRD_FILTER_F32 | Use sampling frequency f32 for digital filter function |
| RAPI_TRD_FILTER_F | Use sampling frequency f for digital filter function |

**• Specifiable definition values when timer C is used (RAPI_TIMER_C specified)**

(Count source) Specify one from [RAPI_TRD_F1, RAPI_TRD_F2, RAPI_TRD_F4, RAPI_TRD_F8, RAPI_TRD_F32, RAPI_TRD_F40M]. The default is RAPI_TRD_F1.

(Operating states set) Specify one from [RAPI_TIMER_ON, RAPI_TIMER_OFF]. The default is RAPI_TIMER_OFF

| | |
|---|---|
| (Interrupt) | If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If input capture A, input capture B, input capture C, or input capture D interrupt requests are enabled, specify RAPI_INPUT_CAPURE_A, RAPI_INPUT_CAPURE_B, RAPI_INPUT_CAPURE_C, or RAPI_INPUT_CAPURE_D, respectively. When not specifying interrupts, select “No interrupt requests.” |
| (Counter clear) | To specify GRA, GRB, GRC, or GRD input capture for the cause for which the counter is cleared, select RAPI_COUNT_CLEAR_A, RAPI_COUNT_CLEAR_B, RAPI_COUNT_CLEAR_C, or RAPI_COUNT_CLEAR_D, respectively. If cleared at the same time a synchronously operating counter on another channel is cleared, select RAPI_COUNT_CLEAR_SYNC. |
| (Synchronization) | If timers on channels 0 and 1 are to be synchronized, select RAPI_TIMER_SYNC. When not specifying synchronization, select “Channels 0 and 1 operate independently.” |
| (Clock for digital filter) | Specify one from [RAPI_TRD_FILTER_F1, RAPI_TRD_FILTER_F8, RAPI_TRD_FILTER_F32, RAPI_TRD_FILTER_F]. The default is RAPI_TRD_FILTER_F32. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Uses timer W. |
| RAPI_TIMER_Z0 | Uses timer Z channel 0. |
| RAPI_TIMER_Z1 | Uses timer Z channel 1. |
| RAPI_TIMER_RC | Uses timer RC. |
| RAPI_TIMER_RD0 | Uses timer RD0 channel 0. |
| RAPI_TIMER_RD1 | Uses timer RD0 channel 1. |
| RAPI_TIMER_RD2 | Uses timer RD0 channel 2. |
| RAPI_TIMER_RD3 | Uses timer RD0 channel 3. |
| RAPI_TW_F1 | Timer W counts with internal clock φ. |
| RAPI_TW_F2 | Timer W counts with internal clock φ/2. |
| RAPI_TW_F4 | Timer W counts with internal clock φ/4. |
| RAPI_TW_F8 | Timer W counts with internal clock φ/8. |
| RAPI_TZ_F1 | Timer Z counts with internal clock φ. |
| RAPI_TZ_F2 | Timer Z counts with internal clock φ/2. |
| RAPI_TZ_F4 | Timer Z counts with internal clock φ/4. |
| RAPI_TZ_F8 | Timer Z counts with internal clock φ/8. |
| RAPI_TRC_F1 | Timer RC counts with internal clock φ. |
| RAPI_TRC_F2 | Timer RC counts with internal clock φ/2. |
| RAPI_TRC_F4 | Timer RC counts with internal clockφ/4. |
| RAPI_TRC_F8 | Timer RC counts with internal clock φ/8. |
| RAPI_TRC_F32 | Timer RC counts with internal clock φ/8. |
| RAPI_TRC_F40M | Timer RC counts with internal clock φ40M. |
| RAPI_TRD_F1 | Timer RD counts with internal clock φ. |
| RAPI_TRD_F2 | Timer RD counts with internal clock φ/2. |

| | |
|---|---|
| RAPI_TRD_F4 | Timer RD counts with internal clockφ/4. |
| RAPI_TRD_F8 | Timer RD counts with internal clock φ/8. |
| RAPI_TRD_F32 | Timer RD counts with internal clock φ/32. |
| RAPI_TRD_F40M | Timer RD counts with internal clock φ40M. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateInputCapture. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateInputCapture. |
| RAPI_OVERFLOW | Enables overflow interrupt. |
| RAPI_INPUT_ CAPTURE_A | Enables GRA input capture interrupt. |
| RAPI_INPUT_ CAPTURE_B | Enables GRB input capture interrupt. |
| RAPI_INPUT_ CAPTURE_C | Enables GRC input capture interrupt. |
| RAPI_INPUT_ CAPTURE_D | Enables GRD input capture interrupt. |
| RAPI_COUNT_CLEAR_A | Specifies GRA input capture for the cause of counter clear. |
| RAPI_COUNT_CLEAR_B | Specifies GRB input capture for the cause of counter clear. |
| RAPI_COUNT_CLEAR_C | Specifies GRC input capture for the cause of counter clear. |
| RAPI_COUNT_CLEAR_D | Specifies GRD input capture for the cause of counter clear. |
| RAPI_COUNT_CLEAR_S YNC | Clear counter in sync with the synchronized other timer counter |
| RAPI_TIMER_SYNC | Synchronizes timer on channels 0 and 1. |
| RAPI_TRC_FILTER_F1 | Use sampling frequency f1 for timer RC digital filter function |
| RAPI_TRC_FILTER_F8 | Use sampling frequency f8 for timer RC digital filter function |
| RAPI_TRC_FILTER_F32 | Use sampling frequency f32 for timer RC digital filter function |
| RAPI_TRC_FILTER_F | Use sampling frequency f for timer RD digital filter function |
| RAPI_TRD_FILTER_F1 | Use sampling frequency f1 for timer RD digital filter function |
| RAPI_TRD_FILTER_F8 | Use sampling frequency f8 for timer RD digital filter function |
| RAPI_TRD_FILTER_F32 | Use sampling frequency f32 for timer RD digital filter function |
| RAPI_TRD_FILTER_F | Use sampling frequency f for timer RD digital filter function |

**• Specifiable definition values when timer W is used (RAPI_TIMER_W specified)**

(Count source) Specify one from { RAPI_TW_F1, RAPI_TW_F2, RAPI_TW_F4, RAPI_TW_F8 }. The default value is RAPI_TW_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. Similarly, if input capture A, input capture B, input capture C, or input capture D interrupt requests are enabled, specify RAPI_INPUT_CAPTURE_A, RAPI_INPUT_CAPTURE_B, RAPI_INPUT_CAPTURE_C, or RAPI_INPUT_CAPTURE_D, respectively. If no interrupts are specified, “No interrupt request” is set.

(Counter clear) To specify GRA, GRB, GRC, or GRD input capture for the cause for which the counter is cleared, select RAPI_COUNT_CLEAR_A, RAPI_COUNT_CLEAR_B, RAPI_COUNT_CLEAR_C, or RAPI_COUNT_CLEAR_D, respectively. If cleared at the same time a synchronously operating counter on another channel is cleared, select RAPI_COUNT_CLEAR_SYNC.

**• Specifiable definition values when timer Z is used (RAPI_TIMER_Z0 to RAPI_TIMER_Z1 specified)**

(Count source) Specify one from { RAPI_TZ_F1, RAPI_TZ_F2, RAPI_TZ_F4, RAPI_TZ_F8 }. The default value is RAPI_TZ_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. Similarly, if input capture A, input capture B, input capture C, or input capture D interrupt requests are enabled, specify RAPI_INPUT_CAPTURE_A, RAPI_INPUT_CAPTURE_B, RAPI_INPUT_CAPTURE_C, or RAPI_INPUT_CAPTURE_D, respectively. If no interrupts are specified, “No interrupt request” is set.

(Counter clear) To specify GRA, GRB, GRC, or GRD input capture for the cause of counter clear, specify RAPI_COUNT_CLEAR_A, RAPI_COUNT_CLEAR_B, RAPI_COUNT_CLEAR_C, or RAPI_COUNT_CLEAR_D, respectively.

(Synchronization) If the timer is synchronized on channels 0 and 1, specify RAPI_TIMER_SYNC. If synchronization is not specified, “Channels 0 and 1 operate independently” is set.

**• Specifiable definition values when timer RC is used (RAPI_TIMER_RC specified)**

(Count source) Specify one from [RAPI_TRD_F1, RAPI_TRD_F2, RAPI_TRD_F4, RAPI_TRD_F8, RAPI_TRD_F32, RAPI_TRD_F40M]. The default is RAPI_TRD_F1.

(Operating states set) Specify one from [RAPI_TIMER_ON, RAPI_TIMER_OFF]. The default is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If input capture A, input capture B, input capture C, or input capture D interrupt requests are enabled, specify RAPI_INPUT_CAPURE_A, RAPI_INPUT_CAPURE_B, RAPI_INPUT_CAPURE_C, or RAPI_INPUT_CAPURE_D, respectively. When not specifying interrupts, select “No interrupt requests.”

(Clock for digital filter) Specify one from [RAPI_TRD_FILTER_F1, RAPI_TRD_FILTER_F8, RAPI_TRD_FILTER_F32, RAPI_TRD_FILTER_F]. The default is RAPI_TRD_FILTER_F32.

**• Specifiable definition values when timer RD is used (RAPI_TIMER_RD specified)**

(Count source) Specify one from [RAPI_TRD_F1, RAPI_TRD_F2, RAPI_TRD_F4, RAPI_TRD_F8, RAPI_TRD_F32, RAPI_TRD_F40M]. The default is RAPI_TRD_F1.

| | |
|---|---|
| (Operating states set) | Specify one from [RAPI_TIMER_ON, RAPI_TIMER_OFF]. The default is RAPI_TIMER_OFF. |
| (Interrupt) | If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If input capture A, input capture B, input capture C, or input capture D interrupt requests are enabled, specify RAPI_INPUT_CAPURE_A, RAPI_INPUT_CAPURE_B, RAPI_INPUT_CAPURE_C, or RAPI_INPUT_CAPURE_D, respectively. When not specifying interrupts, select “No interrupt requests.” |
| (Counter clear) | To specify GRA, GRB, GRC, or GRD input capture for the cause for which the counter is cleared, select RAPI_COUNT_CLEAR_A, RAPI_COUNT_CLEAR_B, RAPI_COUNT_CLEAR_C, or RAPI_COUNT_CLEAR_D, respectively. If cleared at the same time a synchronously operating counter on another channel is cleared, select RAPI_COUNT_CLEAR_SYNC. |
| (Synchronization) | If timers on channels 0 and 1 are to be synchronized, select RAPI_TIMER_SYNC. When not specifying synchronization, select “Channels 0 and 1 operate independently.” |
| (Clock for digital filter) | Specify one from [RAPI_TRD_FILTER_F1, RAPI_TRD_FILTER_F8, RAPI_TRD_FILTER_F32, RAPI_TRD_FILTER_F]. The default is RAPI_TRD_FILTER_F32. |

**[data2]**

(M16C)

Specify a pointer to the array in which the interrupt priority level is stored.

[0]: Specify the IC/OC base timer interrupt priority level (0-7).

[1]: Specify the IC/OC interrupt 0 priority level (0-7).

[2]: Specify the IC/OC interrupt 1 priority level (0-7).

(R8C)

When timer RD is used (RAPI_TIMER_RD0 or RAPI_TIMERRD1 specified), specify a pointer to the variable that contains the interrupt priority level (0-7) to be set in the interrupt control register. When timer RD is not used, specify a pointer to the following array that contains the interrupt priority level

[0]: Specify the timer C interrupt priority level (0-7).

[1]: Specify the compare match 0 interrupt priority level (0-7).

[2]: Specify the compare match 1 interrupt priority level (0-7).

(H8/300H)

Specify the interrupt priority level (0–1) to be set in the interrupt control register. For the CPUs that do not have an interrupt control register, specify 0.

**[data3]**

(M16C)

Specify a pointer to the array in which the set value for the time measurement control register is stored.

[0]: Specify the set value for time measurement control register 0.

[1]: Specify the set value for time measurement control register 1.

[2]: Specify the set value for time measurement control register 2.
[3]: Specify the set value for time measurement control register 3.
[4]: Specify the set value for time measurement control register 4.
[5]: Specify the set value for time measurement control register 5.
[6]: Specify the set value for time measurement control register 6.
[7]: Specify the set value for time measurement control register 7.

For each element of the array, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

| | |
|---|---|
| RAPI_IC_RISING | Selects the rising edge of measurement pulse as active edge. |
| RAPI_IC_FALLING | Selects the falling edge of measurement pulse as active edge. |
| RAPI_IC_BOTH | Selects both rising and falling edges of measurement pulse as active edge. |
| RAPI_FILTER_F1_F2 | Uses the digital filter facility that has a sampling frequency $f_1$ or $f_2$. |
| RAPI_FILTER_FBT1 | Uses the digital filter facility that has a sampling frequency $f_{BT1}$. |
| RAPI_GATE | Uses a gate facility. |
| RAPI_GATE_CLEAR | Clears the gate facility upon a match of base timer and G1POk register. |
| RAPI_PRESCALER | Uses a prescaler facility. |

**• Specifiable definition values for time measurement registers 0-7**

(Measurement pulse) Specify one from { RAPI_IC_RISING, RAPI_IC_FALLING, RAPI_IC_BOTH }. If no measurement pulses are specified, the time measurement register is set to "No time measurement performed."

(Filter) Specify one from { RAPI_FILTER_F1, RAPI_FILTER_FBT1 }. If no filters are specified, "No digital filter" is set.

**• Specifiable definition values for time measurement registers 6-7**

(Gate) To use the gate facility, specify RAPI_GATE. If RAPI_GATE is not specified, "No facility unused" is set. Make sure RAPI_GATE_CLEAR is specified at the same time RAPI_GATE is specified.

(Prescaler) To use the prescaler facility, specify RAPI_PRESCALER. If RAPI_PRESCALER is not specified, "No prescaler facility" is set.

(R8C)

When using timer RD (RAPI_TIMER_RD0 to RAPI_TIMER_RD1 specified), set one of the following values. Otherwise, specify 0.

Specify a pointer to the array in which each active edge setting is stored.

[0]: Specify the active edge of TRDIOAi (i=0,1) pin.
[1]: Specify the active edge of TRDIOBi (i=0,1) pin.
[2]: Specify the active edge of TRDIOCi (i=0,1) pin.
[3]: Specify the active edge of TRDIODi (i=0,1) pin.

For each element of the array, one of [RAPI_TRD_RISING, RAPI_TRD_FALLING, RAPI_TRD_BOTH] can be set as the active edge of measured pulses.

Furthermore, if the digital filter function is enabled, select RAPI_FILTER_ON.

To set the f0C0128 signal for the TRDI0A0 pin on channel 0, specify RAPI_F0C0128. For the elements corresponding to unused channels, set 0.

| | |
|---|---|
| RAPI_TRD_RISING | Selects the rising edge of measurement pulse as active edge. |
| RAPI_TRD_FALLING | Selects the falling edge of measurement pulse as active edge. |
| RAPI_TRD_BOTH | Selects both rising and falling edges of measurement pulse as active edge. |
| RAPI_FILTER_ON | Selects digital filter on. If not select “RAPI_FILTER_ON”, “No digital filter” is set. |
| RAPI_FOCO128 | Selects fOCO128 as TRDIOA0 pin input. Specifiable only active edge of channel0 TRDIOA0 pin. |

(H8/300H)

Specify a pointer to the array in which each active edge setting is stored.

[0]: Specify the active edge of TRDIOA pin.

[1]: Specify the active edge of TRDIOB pin.

[2]: Specify the active edge of TRDIOC pin.

[3]: Specify the active edge of TRDIOD pin.

For each element of the array, one of the following definition values { RAPI_RISING, RAPI_FALLING, RAPI_BOTH } can be set.

For the array elements corresponding to unused channels, set 0.

| | |
|---|---|
| RAPI_RISING | Selects the rising edge of measurement pulse as active edge. |
| RAPI_FALLING | Selects the falling edge of measurement pulse as active edge. |
| RAPI_BOTH | Selects both rising and falling edges of measurement pulse as active edge. |
| RAPI_FILTER_ON | Selects digital filter on. If not select “RAPI_FILTER_ON”, “No digital filter” is set. |

**[data4]**

(M16C)

Specify a pointer to the array in which the set value for each register or timer S is stored.

[0]: Specify the set value for the facility select and facility enable registers.
Specify the channel for which the time measurement facility is enabled.

[1]: Specify the set value for interrupt enable register 0.
Specify the channel for which IO/CO interrupt 0 request is enabled.

[2]: Specify the set value for interrupt enable register 1.
Specify the channel for which IO/CO interrupt 1 request is enabled.

[3]: Specify the set value for the count source divide-by-N register.
Specify the value of ‘n’ in the formula “count source divided by (n ÷ 1)” in 8 bits.

[4]: Specify the set value for time measurement prescaler register 6.
Specify the value of ‘n’ in the prescaler period “n ÷ 1” in 8 bits.

[5]: Specify the set value for time measurement prescaler register 7.
Specify the value of ‘n’ in the prescaler period “n ÷ 1” in 8 bits.

For the channels to be specified in each array element, use the following definition values. To specify multiple definition values at the same time, use the symbol “|” to separate each specified value. If 0 is specified, the value 0 is set in the corresponding register.

| | |
|---|---|
| RAPI_CHANNEL0 | Selects channel 0. |

| | |
|---|---|
| RAPI_CHANNEL1 | Selects channel 1. |
| RAPI_CHANNEL2 | Selects channel 2. |
| RAPI_CHANNEL3 | Selects channel 3. |
| RAPI_CHANNEL4 | Selects channel 4. |
| RAPI_CHANNEL5 | Selects channel 5. |
| RAPI_CHANNEL6 | Selects channel 6. |
| RAPI_CHANNEL7 | Selects channel 7. |

(R8C) (H8/300H)

Specify 0.

**[data5]**

(M16C)

Specify a pointer to the array in which the callback function is stored.

[0]: Specify a pointer to the callback function for IC/OC base timer interrupt. If this pointer is not specified, 0 is set.

[1]: Specify a pointer to the callback function for IC/OC interrupt 0. If this pointer is not specified, 0 is set.

[2]: Specify a pointer to the callback function for IC/OC interrupt 1. If this pointer is not specified, 0 is set.

(R8C) (H8/300H)

Specify a pointer to the array in which the callback function is stored. If this pointer is not specified, RAPI_NULL is set.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (input capture mode)

**Reference**

R_EnableInputCapture, R_DestroyInputCapture, R_GetInputCapture

**Remark**

- If an undefined value is specified in the first, third and fourth arguments, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When use CPU which has no digital filter function, cannot specify digital filter setting.
- When used for the H8/300H, this API specify when freeing it from module stanby state.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void TimerIntFunc( void ){}
```

```
void func( void )
{
    /* Set up timer C as imput capture mode */
    __CreateInputCapture(
        RAPI_TIMER_C|RAPI_TIMER_ON|RAPI_BOTH|RAPI_F32| RAPI_FRING128,
        5, TimerIntFunc);
}
```

## __EnableInputCapture

**Synopsis**

<Control operation of input capture mode>

**Boolean __EnableInputCapture(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Controls operation of the timer that is set to specified input capture mode by starting or stopping it.

**[data]**

For data, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_S | Selects timer S. |
| RAPI_TIMER_ON | Sets the timer that is set to input capture mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to input capture mode to stop operating. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Selects timer C. |
| RAPI_TIMER_RD0 | Selects timer RD0 channe 0. |
| RAPI_TIMER_RD1 | Selects timer RD0 channe 1. |
| RAPI_TIMER_ON | Sets the timer that is set to input capture mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to input capture mode to stop operating. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RD0. |
| RAPI_TIMER_RD0 | Selects timer RD0 channe 0. |
| RAPI_TIMER_RD1 | Selects timer RD0 channe 1. |
| RAPI_TIMER_RD2 | Selects timer RD0 channe 2. |
| RAPI_TIMER_RD3 | Selects timer RD0 channe 3. |
| RAPI_TIMER_ON | Sets the timer that is set to input capture mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to input capture mode to stop operating. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (input capture mode)

**Reference**

CreateInputCapture, DestroyInputCapture, GetInputCapture

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.

- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    /* Enable timer C as input capture mode */
    __EnableInputCapture( RAPI_TIMER_C|RAPI_TIMER_ON );
}
```

## __DestroyInputCapture

**Synopsis**

<Discard settings of input capture mode>

**Boolean __DestroyInputCapture(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Discards settings of the timer that is set to specified input capture mode.

**[data]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_S | Selects timer S. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Selects timer C. |
| RAPI_TIMER_RD0 | Selects timer RD0 channe 0. |
| RAPI_TIMER_RD1 | Selects timer RD0 channe 1. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RD0. |
| RAPI_TIMER_RD0 | Selects timer RD0 channe 0. |
| RAPI_TIMER_RD1 | Selects timer RD0 channe 1. |
| RAPI_TIMER_RD2 | Selects timer RD0 channe 2. |
| RAPI_TIMER_RD3 | Selects timer RD0 channe 3. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (input capture mode)

**Reference**

__CreateInputCapture, __EnableInputCapture, __GetInputCapture

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API places a specified timer into module stanby state after discarding it.

**Program example**

```
#include "rapi_timer_r8c_13.h"
```

```
void func( void )
{
    /* Destroy the setting of timer C as input capture mode */
    __DestroyInputCapture( RAPI_TIMER_C );
}
```

## __GetInputCapture

**Synopsis**

<Get input capture mode counter value>

**Boolean __GetInputCapture(unsigned long data1, unsigned int *data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |

**Description**

Gets the counter value of the timer that is set to specified input capture mode.

**[data1]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_S | Selects timer S. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Selects timer C. |
| RAPI_TIMER_RD0 | Selects timer RD0 channe 0. |
| RAPI_TIMER_RD1 | Selects timer RD0 channe 1. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RD0. |
| RAPI_TIMER_RD0 | Selects timer RD0 channe 0. |
| RAPI_TIMER_RD1 | Selects timer RD0 channe 1. |
| RAPI_TIMER_RD2 | Selects timer RD0 channe 2. |
| RAPI_TIMER_RD3 | Selects timer RD0 channe 3. |

**[data2]**

(M16C)

Specify a pointer to the array in which the acquired counter value is stored.

[0]: Stores the value of base timer register 0.

[1]: Stores the value of time measurement register 0.

[2]: Stores the value of time measurement register 1.

[3]: Stores the value of time measurement register 2.

[4]: Stores the value of time measurement register 3.

[5]: Stores the value of time measurement register 4.

[6]: Stores the value of time measurement register 5.

[7]: Stores the value of time measurement register 6.

[8]: Stores the value of time measurement register 7.

(R8C)

Specify a pointer to the array in which the acquired counter value is stored.

**• When timer C is used (RAPI_TIMER_C specified)**

[0]: Stores the value of timer C counter.

[1]: Stores the value of capture & compare 0 register.

**• When timer RD is used (RAPI_TIMER_RD0- RAPI_TIMER_RD1 specified)**

[0]: Stores the value of timer counter.

[1]: Stores the value of general register A.

[2]: Stores the value of general register B.

[3]: Stores the value of general register C.

[4]: Stores the value of general register D.

(H8/300H)

[0]: Stores the value of the timer counter.

[1]: Stores the value of general register A.

[2]: Stores the value of general register B.

[3]: Stores the value of general register C.

[4]: Stores the value of general register D.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (input capture mode)

**Reference**

__CreateInputCapture, __EnableInputCapture, __DestroyInputCapture

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    unsigned int data[2];

    /* Get the counter of timer C as input capture mode */
    __GetInputCapture( RAPI_TIMER_C, data );
}
```

## __CreateOutputCompare

**Synopsis**

<Set output compare mode>

**Boolean __CreateOutputCompare(unsigned long data1, unsigned int* data2, unsigned int* data3, unsigned int* data4, void** data5)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |
| data3 | Setup data 3 (content differs with MCU type) |
| data4 | Setup data 4 (content differs with MCU type) |
| data5 | Setup data 5 (content differs with MCU type) |

**Description**

Sets a specified timer to output compare mode.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_S | Uses timer S. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F2 | Selects $f_2$ for the count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateOutputCompare. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateOutputCompare. |
| RAPI_OVERFLOW_BIT14 | Selects overflow of bit 14 for the base timer interrupt. |
| RAPI_OVERFLOW_BIT15 | Selects overflow of bit 15 for the base timer interrupt. |

**• Specifiable definition values when timer S is used (RAPI_TIMER_S specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F2 }. The default value is RAPI_F2.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Base timer) Specify one from { RAPI_OVERFLOW_BIT14, RAPI_OVERFLOW_BIT15 }. The default value is RAPI_OVERFLOW_BIT15.

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Uses timer C. |
| RAPI_TIMER_RD0 | Uses timer RD0 channe 0. |
| RAPI_TIMER_RD1 | Uses timer RD0 channe 1. |
| RAPI_TIMER_RE | Uses timer C. |
| RAPI_F1 | Selects $f_1$ for the count source. |
| RAPI_F8 | Selects $f_8$ for the count source. |
| RAPI_F32 | Selects $f_{32}$ for the count source. |
| RAPI_FRING_FAST | Selects $f_{RING-fast}$ for the count source. |
| RAPI_TRD_F1 | Selects $f_1$ for the timer RD count source. |
| RAPI_TRD_F2 | Selects $f_2$ for the timer RD count source. |
| RAPI_TRD_F4 | Selects $f_4$ for the timer RD count source. |
| RAPI_TRD_F8 | Selects $f_8$ for the timer RD count source. |

| | |
|---|---|
| RAPI_TRD_F32 | Selects $f_{32}$ for the timer RD count source. |
| RAPI_TRD_F40M | Selects fOCO40M for the timer RD count source. |
| RAPI_TRE_F4 | Selects $f_4$ for the timer RE count source. |
| RAPI_TRE_F8 | Selects $f_8$ for the timer RE count source. |
| RAPI_TRE_F32 | Selects $f_{32}$ for the timer RE count source. |
| RAPI_TRE_FC4 | Selects fC4 for the timer RE count source. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateOutputCompare. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateOutputCompare. |
| RAPI_TIMER_OVERFLOW | Enables the overflow interrupt. |
| RAPI_COMPARE_MATCH | Enables the comparematch interrupt. |
| RAPI_COMPARE_MATCH_A | Enables the GRA compare match interrupt. |
| RAPI_COMPARE_MATCH_B | Enables the GRB compare match interrupt. |
| RAPI_COMPARE_MATCH_C | Enables the GRC compare match interrupt. |
| RAPI_COMPARE_MATCH_D | Enables the GRD compare match interrupt. |
| RAPI_COUNT_CLEAR_A | Specifies GRA compare match for the cause of counter clear. |
| RAPI_COUNT_CLEAR_B | Specifies GRB compare match for the cause of counter clear. |
| RAPI_COUNT_CLEAR_C | Specifies GRC compare match for the cause of counter clear. |
| RAPI_COUNT_CLEAR_D | Specifies GRD compare match for the cause of counter clear. |
| RAPI_COUNT_CLEAR_SYNC | Clear counter in sync with the synchronized other timer counter |
| RAPI_TIMER_SYNC | Synchronize timer on channels 0 and 1. |
| RAPI_CMP00_DISABLE | Disables CMP output from $CMP0_0$. |
| RAPI_CMP01_DISABLE | Disables CMP output from $CMP0_1$. |
| RAPI_CMP02_DISABLE | Disables CMP output from $CMP0_2$. |
| RAPI_CMP10_DISABLE | Disables CMP output from $CMP1_0$. |
| RAPI_CMP11_DISABLE | Disables CMP output from $CMP1_1$. |
| RAPI_CMP12_DISABLE | Disables CMP output from $CMP1_2$. |
| RAPI_CMP00_ENABLE | Enables CMP output from $CMP0_0$. |
| RAPI_CMP01_ENABLE | Enables CMP output from $CMP0_1$. |
| RAPI_CMP02_ENABLE | Enables CMP output from $CMP0_2$. |
| RAPI_CMP10_ENABLE | Enables CMP output from $CMP1_0$. |
| RAPI_CMP11_ENABLE | Enables CMP output from $CMP1_1$. |
| RAPI_CMP12_ENABLE | Enables CMP output from $CMP1_2$. |
| RAPI_OUTPUT_REVERSE_0 | Inverts CMP output from $CMP0_0$ through $CMP0_2$. |
| RAPI_OUTPUT_REVERSE_1 | Inverts CMP output from $CMP1_0$ through $CMP1_2$. |
| RAPI_RELOAD | Sets TC register to “0x0000” when compare 1 matches. |

| | |
|---|---|
| RAPI_UNCHANGE_0 | Leaves CMP0 output unchanged even when matched in compare 0. |
| RAPI_REVERSE_0 | Inverts CMP0 output upon compare 0 match signal. |
| RAPI_L_0 | Forces CMP0 output low upon compare 0 match signal. |
| RAPI_H_0 | Forces CMP0 output high upon compare 0 match signal. |
| RAPI_UNCHANGE_1 | Leaves CMP1 output unchanged even when matched in compare 1. |
| RAPI_REVERSE_1 | Inverts CMP1 output upon compare 1 match signal. |
| RAPI_L_1 | Forces CMP1 output low upon compare 1 match signal. |
| RAPI_H_1 | Forces CMP1 output high upon compare 1 match signal. |
| RAPI_OUTPUT_DISABLE | Disable output. |
| RAPI_OUTPUT_F2 | Specifies f2 output for output function. |
| RAPI_OUTPUT_F4 | Specifies f4 output for output function. |
| RAPI_OUTPUT_F8 | Specifies f8 output for output function. |
| RAPI_OUTPUT_COMPARE | Specifies compare output for output function. |
| RAPI_4BIT_COUNTER | Uses 4 bit counter. |
| RAPI_COMPARE_MATCH_A_STOP | Stop count when GRA compare match occur |
| RAPI_STOP | Stop count when clear TSTART bit. |

**• Specifiable definition values when timer C is used (RAPI_TIMER_C specified)**

(Count source) Specify one from { RAPI_F1, RAPI_F8, RAPI_F32, RAPI_FRING_FAST }. The default value is RAPI_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

($CMP0_0$ output) Specify one from { RAPI_CMP00_DISABLE, RAPI_CMP00_ENABLE }. The default value is RAPI_CMP00_DISABLE.

($CMP0_1$ output) Specify one from { RAPI_CMP01_DISABLE, RAPI_CMP01_ENABLE }. The default value is RAPI_CMP01_DISABLE.

($CMP0_2$ output) Specify one from { RAPI_CMP02_DISABLE, RAPI_CMP02_ENABLE }. The default value is RAPI_CMP02_DISABLE.

($CMP1_0$ output) Specify one from { RAPI_CMP10_DISABLE, RAPI_CMP10_ENABLE }. The default value is RAPI_CMP10_DISABLE.

($CMP1_1$ output) Specify one from { RAPI_CMP11_DISABLE, RAPI_CMP11_ENABLE }. The default value is RAPI_CMP11_DISABLE.

($CMP1_2$ output) Specify one from { RAPI_CMP12_DISABLE, RAPI_CMP12_ENABLE }. The default value is RAPI_CMP12_DISABLE.

(CMP0 output inversion) To invert CMP0 output, specify RAPI_OUTPUT_REVERSE_0. If RAPI_OUTPUT_REVERSE_0 is not specified, “CMP0 output not inverted” is set.

(CMP1 output inversion) To invert CMP1 output, specify RAPI_OUTPUT_REVERSE_1. If RAPI_OUTPUT_REVERSE_1 is not specified, “CMP1 output not inverted” is set.

| | |
|---|---|
| (TC reload) | To reload TC register, specify RAPID_RELOAD. If RAPID_RELOAD is not specified, “No reload” is set. |
| (CMP0 output mode) | Specify one from { RAPI_UNCHANGE_0, RAPI_REVERSE_0, RAPI_L_0, RAPI_H_0 }. The default value is RAPI_UNCHANGE_0. |
| (CMP1 output mode) | Specify one from { RAPI_UNCHANGE_1, RAPI_REVERSE_1, RAPI_L_1, RAPI_H_1 }. The default value is RAPI_UNCHANGE_1. |

**• Specifiable definition values when timer RD is used (RAPI_TIMER_RD specified)**

| | |
|---|---|
| (Count source) | Specify one from [RAPI_TRD_F1, RAPI_TRD_F2, RAPI_TRD_F4, RAPI_TRD_F8, RAPI_TRD_F32, RAPI_TRD_F40M]. The default is RAPI_TRD_F1. |
| (Operating states set) | Specify one from [RAPI_TIMER_ON, RAPI_TIMER_OFF]. The default is RAPI_TIMER_OFF |
| (Interrupt) | If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If input capture A, input capture B, input capture C, or input capture D interrupt requests are enabled, specify RAPI_INPUT_CAPURE_A, RAPI_INPUT_CAPURE_B, RAPI_INPUT_CAPURE_C, or RAPI_INPUT_CAPURE_D, respectively. When not specifying interrupts, select “No interrupt requests.” |
| (Counter clear) | To specify GRA, GRB, GRC, or GRD input capture for the cause for which the counter is cleared, select RAPI_COUNT_CLEAR_A, RAPI_COUNT_CLEAR_B, RAPI_COUNT_CLEAR_C, or RAPI_COUNT_CLEAR_D, respectively. If cleared at the same time a synchronously operating counter on another channel is cleared, select RAPI_COUNT_CLEAR_SYNC. |
| (Synchronization) | If timers on channels 0 and 1 are to be synchronized, select RAPI_TIMER_SYNC. When not specifying synchronization, select “Channels 0 and 1 operate independently.” |
| (count stop) | Specify one from [RAPI_COMPARE_MATCH_A_STOP, RAPI_STOP]. The default is RAPI_STOP. |

**• Specifiable definition values when timer RE is used (RAPI_TIMER_RE specified)**

| | |
|---|---|
| (Count source) | Specify one from [RAPI_TRE_F4, RAPI_TRE_F8, RAPI_TRE_F32, RAPI_TRD_FC4]. The default is RAPI_TRD_F1. |
| (Operating states set) | Specify one from [RAPI_TIMER_ON, RAPI_TIMER_OFF]. The default is RAPI_TIMER_OFF |
| (Interrupt) | If compare match interrupt requests are enabled, specify RAPI_COMPARE_MATCH. When not specifying interrupts, select “No interrupt requests.” |
| (Output function) | Specify one from [RAPI_OUTPUT_DISABLE, RAPI_OUTPUT_F2, RAPI_OUTPUT_F4, RAPI_OUTPUT_F8, RAPI_OUTPUT_COMPARE]. The default is RAPI_OUTPUT_COMPARE. |
| (Counter) | If use 4 bit counter, spcify RAPI_4BIT_COUNTER. The default is 8 bit counter . |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Uses timer W. |
| RAPI_TIMER_Z0 | Uses timer Z channel 0. |
| RAPI_TIMER_Z1 | Uses timer Z channel 1. |
| RAPI_TIMER_RC | Uses timer RC. |
| RAPI_TIMER_RD0 | Uses timer RD0 channel 0. |
| RAPI_TIMER_RD1 | Uses timer RD0 channel 1. |
| RAPI_TIMER_RD2 | Uses timer RD0 channel 2. |
| RAPI_TIMER_RD3 | Uses timer RD0 channel 3. |
| RAPI_TW_F1 | Timer W counts with internal clock φ. |
| RAPI_TW_F2 | Timer W counts with internal clock φ/2. |
| RAPI_TW_F4 | Timer W counts with internal clock φ/4. |
| RAPI_TW_F8 | Timer W counts with internal clock φ/8. |
| RAPI_TZ_F1 | Timer Z counts with internal clock φ. |
| RAPI_TZ_F2 | Timer Z counts with internal clock φ/2. |
| RAPI_TZ_F4 | Timer Z counts with internal clock φ/4. |
| RAPI_TZ_F8 | Timer Z counts with internal clock φ/8. |
| RAPI_TRC_F1 | Timer RC counts with internal clock φ. |
| RAPI_TRC_F2 | Timer RC counts with internal clock φ/2. |
| RAPI_TRC_F4 | Timer RC counts with internal clockφ/4. |
| RAPI_TRC_F8 | Timer RC counts with internal clock φ/8. |
| RAPI_TRC_F32 | Timer RC counts with internal clock φ/8. |
| RAPI_TRC_F40M | Timer RC counts with internal clock φ40M. |
| RAPI_TRD_F1 | Timer RD counts with internal clock φ. |
| RAPI_TRD_F2 | Timer RD counts with internal clock φ/2. |
| RAPI_TRD_F4 | Timer RD counts with internal clockφ/4. |
| RAPI_TRD_F8 | Timer RD counts with internal clock φ/8. |
| RAPI_TRD_F32 | Timer RD counts with internal clock φ/32. |
| RAPI_TRD_F40M | Timer RD counts with internal clock φ40M. |
| RAPI_TIMER_ON | Sets the timer to start operating in __CreateOutputCompare. |
| RAPI_TIMER_OFF | Sets the timer to stop operating in __CreateOutputCompare. |
| RAPI_OVERFLOW | Enables overflow interrupt. |
| RAPI_COMPARE_ MATCH_A | Enables GRA compare match interrupt. |
| RAPI_COMPARE_ MATCH_B | Enables GRB compare match interrupt. |
| RAPI_COMPARE_ MATCH_C | Enables GRC compare match interrupt. |
| RAPI_COMPARE_ MATCH_D | Enables GRD compare match interrupt. |
| RAPI_COUNT_CLEAR_A | Specifies GRA compare match for the cause of counter clear. |
| RAPI_COUNT_CLEAR_B | Specifies GRB compare match for the cause of counter clear. |
| RAPI_COUNT_CLEAR_C | Specifies GRC compare match for the cause of counter clear. |
| RAPI_COUNT_CLEAR_D | Specifies GRD compare match for the cause of counter clear. |

| | |
|---|---|
| RAPI_COUNT_CLEAR_SYNC | Clear counter in sync with the synchronized other timer counter |
| RAPI_TIMER_SYNC | Synchronizes timer on channels 0 and 1. |

**• Specifiable definition values when timer W is used (RAPI_TIMER_W specified)**

(Count source) Specify one from { RAPI_TW_F1, RAPI_TW_F2, RAPI_TW_F4, RAPI_TW_F8 }. The default value is RAPI_TW_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. Similarly, if compare match A, compare match B, compare match C, or compare match D interrupt requests are enabled, specify RAPI_COMPARE_ATCH_A, RAPI_COMPARE_ATCH_B, RAPI_COMPARE_ATCH_C, or RAPI_COMPARE_ATCH_D, respectively. If no interrupts are specified, “No interrupt request” is set.

(Counter clear) To specify GRA compare match for the cause of counter clear, specify RAPI_COUNT_CLEAR_A.

**• Specifiable definition values when timer Z is used (RAPI_TIMER_Z0 to RAPI_TIMER_Z1 specified)**

(Count source) Specify one from { RAPI_TZ_F1, RAPI_TZ_F2, RAPI_TZ_F4, RAPI_TZ_F8 }. The default value is RAPI_TZ_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. Similarly, if compare match A, compare match B, compare match C, or compare match D interrupt requests are enabled, specify RAPI_COMPARE_ATCH_A, RAPI_COMPARE_ATCH_B, RAPI_COMPARE_ATCH_C, or RAPI_COMPARE_ATCH_D, respectively. If no interrupts are specified, “No interrupt request” is set.

(Counter clear) To specify GRA, GRB, GRC, or GRD compare match for the cause of counter clear, specify RAPI_COUNT_CLEAR_A, RAPI_COUNT_CLEAR_B, RAPI_COUNT_CLEAR_C, or RAPI_COUNT_CLEAR_D, respectively.

(Synchronization) If the timer is synchronized on channels 0 and 1, specify RAPI_TIMER_SYNC. If synchronization is not specified, “Channels 0 and 1 operate independently” is set.

**• Specifiable definition values when timer RC is used (RAPI_TIMER_RC specified)**

(Count source) Specify one from [RAPI_TRD_F1, RAPI_TRD_F2, RAPI_TRD_F4, RAPI_TRD_F8, RAPI_TRD_F32, RAPI_TRD_F40M]. The default is RAPI_TRD_F1.

(Operating states set) Specify one from [RAPI_TIMER_ON, RAPI_TIMER_OFF]. The default is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. If compare match A, compare match B, compare match C, or compare match D interrupt requests are enabled, specify RAPI_COMPARE_MATCH_A, RAPI_COMPARE_MATCH_B, RAPI_COMPARE_MATCH_C, or RAPI_COMPARE_MATCH_D, respectively. When not specifying interrupts, select “No interrupt requests.”

(Counter clear) To specify GRA compare match for the cause of counter clear, specify RAPI_COUNT_CLEAR_A.

**• Specifiable definition values when timer RD is used (RAPI_TIMER_RD0 to RAPI_TIMER_RD4 specified)**

(Count source) Specify one from [RAPI_TRD_F1, RAPI_TRD_F2, RAPI_TRD_F4, RAPI_TRD_F8, RAPI_TRD_F32, RAPI_TRD_F40M]. The default is RAPI_TRD_F1.

(Operating states set) Specify one from { RAPI_TIMER_ON, RAPI_TIMER_OFF }. The default value is RAPI_TIMER_OFF.

(Interrupt) If overflow interrupt requests are enabled, specify RAPI_OVERFLOW. Similarly, if compare match A, compare match B, compare match C, or compare match D interrupt requests are enabled, specify RAPI_COMPARE_MATCH_A, RAPI_COMPARE_MATCH_B, RAPI_COMPARE_MATCH_C, or RAPI_COMPARE_MATCH_D, respectively. If no interrupts are specified, “No interrupt request” is set.

(Counter clear) To specify GRA, GRB, GRC, or GRD compare match for the cause of counter clear, specify RAPI_COUNT_CLEAR_A, RAPI_COUNT_CLEAR_B, RAPI_COUNT_CLEAR_C, or RAPI_COUNT_CLEAR_D, respectively.

(Synchronization) If the timer is synchronized on channels 0 and 1, specify RAPI_TIMER_SYNC. If synchronization is not specified, “Channels 0 and 1 operate independently” is set.

**[data2]**

(M16C)

Specify a pointer to the array in which the interrupt priority level is stored.

[0]: Specify the IC/OC base timer interrupt priority level (0-7).

[1]: Specify the IC/OC interrupt 0 priority level (0-7).

[2]: Specify the IC/OC interrupt 1 priority level (0-7).

(R8C)

Specify a pointer to the array in which the interrupt priority level is stored.

[0]: Specify the timer C interrupt priority level (0-7).

[1]: Specify the compare match 0 interrupt priority level (0-7).

[2]: Specify the compare match 1 interrupt priority level (0-7).

(H8/300H)

Specify 0.

**[data3]**

(M16C)

Specify a pointer to the array in which the set value for the waveform generation control register or waveform generation register is stored.

[0]: Specify the set value for waveform generation control register 0.

[1]: Specify the set value for waveform generation control register 1.

[2]: Specify the set value for waveform generation control register 2.

[3]: Specify the set value for waveform generation control register 3.

[4]: Specify the set value for waveform generation control register 4.

[5]: Specify the set value for waveform generation control register 5.

[6]: Specify the set value for waveform generation control register 6.

[7]: Specify the set value for waveform generation control register 7.

[8]: Specify the set value for waveform generation register 0 in 16 bits.
Specify the comparison value of channel 0 in 16 bits.

[9]: Specify the set value for waveform generation register 1 in 16 bits.
Specify the comparison value of channel 1 in 16 bits.

[10]: Specify the set value for waveform generation register 2 in 16 bits.
Specify the comparison value of channel 2 in 16 bits.

[11]: Specify the set value for waveform generation register 3 in 16 bits.
Specify the comparison value of channel 3 in 16 bits.

[12]: Specify the set value for waveform generation register 4 in 16 bits.
Specify the comparison value of channel 4 in 16 bits.

[13]: Specify the set value for waveform generation register 5 in 16 bits.
Specify the comparison value of channel 5 in 16 bits.

[14]: Specify the set value for waveform generation register 6 in 16 bits.
Specify the comparison value of channel 6 in 16 bits.

[15]: Specify the set value for waveform generation register 7 in 16 bits.
Specify the comparison value of channel 7 in 16 bits.

To specify the set value for each waveform generation control register that is an array element, the following definition values can be set. To specify multiple definition values at the same time, use the symbol "|" to separate each specified value.

| | |
|---|---|
| RAPI_SINGLE | Selects single-phase waveform output mode. |
| RAPI_SR | Selects SR waveform output mode. |
| RAPI_PHASE_DELAYED | Selects inverted waveform output mode. |
| RAPI_OUT_INIT_0 | Outputs a 0 as the initial output value. |
| RAPI_OUT_INIT_1 | Outputs a 1 as the initial output value. |
| RAPI_OUTPUT_ REVERSED | Uses an output inversion facility. |
| RAPI_RELOAD_WITH_ RESET | Selects a reset of the base timer as the timing with which the G1P0J register value is reloaded. |
| RAPI_RELOAD_WITH_ WRITE | Selects a write to the base timer as the timing with which the G1P0J register value is reloaded. |

**• Specifiable definition values for waveform generation control registers 0-7**

(Output mode) Specify one from { RAPI_SINGLE, RAPI_SR, RAPI_PHASE_DELAYED }. The default value is RAPI_SINGLE.

(Initial output value) Specify one from { RAPI_OUT_INIT_0, RAPI_OUT_INIT_1 }. The default value is RAPI_OUT_INIT_0.

(Output inversion) To invert the output, specify RAPI_OUTPUT_REVERSED. If output inversion is not specified, “Output not inverted” is set.

(Reload) Specify one from { RAPI_RELOAD_WITH_RESET, RAPI_RELOAD_WITH_WRITE }.
The default value is RAPI_RELOAD_WITH_WRITE.

(R8C)

**• When timer C is used (RAPI_TIMER_C specified)**

Specify a pointer to the array in which the comparison value is stored.

[0]: Specify comparison value 0 in 16 bits.

[1]: Specify comparison value 1 in 16 bits.

**• When timer RD is used (RAPI_TIMER_RD0 to RAPI_TIMER_RD4 specified)**

Specify a pointer to the array in which the comparison value is stored.

[0]: Specify the output operation of TRDIOAi (i=0,1).

[1]: Specify the output operation of TRDIOBi (i=0,1).

[2]: Specify the output operation of TRDIOCi (i=0,1).

[3]: Specify the output operation of TRDIODi (i=0,1).

[4]: Specify the comparison value of general register A in 16 bits.

[5]: Specify the comparison value of general register B in 16 bits.

[6]: Specify the comparison value of general register C in 16 bits.

[7]: Specify the comparison value of general register D in 16 bits.

To specify output operation for each output compare of array elements, the following definition values can be used. To specify multiple definition values at the same time, use the symbol “|” to separate each specified value. For elements of output operation corresponding to unused channels, set 0.

| | |
|---|---|
| RAPI_OUT_0 | Selects 0 output for the output waveform. |
| RAPI_OUT_1 | Selects 1 output for the output waveform. |
| RAPI_OUT_TOGGLE | Selects toggle output for the output waveform. |
| RAPI_OUT_INIT_0 | Selects 0 output for the initial output. |
| RAPI_OUT_INIT_1 | Selects 1 output for the initial output. |

**• When timer RE is used (RAPI_TIMER_RE specified)**

Specify a pointer to the array in which the comparison value is stored.

Specify comparison value of timer RE compare data register in 8 bits.

(H8/300H)

Specify a pointer to the array in which the comparison value is stored.

[0]: Specify the output operation of FTIOA pin.

[1]: Specify the output operation of FTIOB pin.

[2]: Specify the output operation of FTIOC pin.

[3]: Specify the output operation of FTIOD pin.

[4]: Specify the comparison value of general register A in 16 bits.

[5]: Specify the comparison value of general register B in 16 bits.

[6]: Specify the comparison value of general register C in 16 bits.

[7]: Specify the comparison value of general register D in 16 bits.

To specify output operation for each output compare of array elements, the following definition values can be used. To specify multiple definition values at the same time, use the symbol "|" to separate each specified value. For elements of output operation corresponding to unused channels, set 0.

| | |
|---|---|
| RAPI_OUT_0 | Selects 0 output for the output waveform. |
| RAPI_OUT_1 | Selects 1 output for the output waveform. |
| RAPI_OUT_TOGGLE | Selects toggle output for the output waveform. |
| RAPI_OUT_INIT_0 | Selects 0 output for the initial output. |
| RAPI_OUT_INIT_1 | Selects 1 output for the initial output. |

**[data4]**

(M16C)

Specify a pointer to the array in which the set value for each register of timer S is stored.

[0]: Specify the set value for the facility select and facility enable register.
Specify the channel for which the waveform generation facility is enabled.

[1]: Specify the set value for interrupt enable register 0.
Specify the channel for which IO/CO interrupt 0 request is enabled.

[2]: Specify the set value for interrupt enable register 1.
Specify the channel for which IO/CO interrupt 1 request is enabled.

[3]: Specify the set value for the count source divide-by-n register. Specify the value of 'n' in the formula "count source divided by (n + 1)" in 8 bits.

For the channels to be specified in each array element, use the following definition values. To specify multiple definition values at the same time, use the symbol "|" to separate each specified value. If 0 is specified, the value 0 is set in the corresponding register.

| | |
|---|---|
| RAPI_CHANNEL0 | Selects channel 0. |
| RAPI_CHANNEL1 | Selects channel 1. |
| RAPI_CHANNEL2 | Selects channel 2. |
| RAPI_CHANNEL3 | Selects channel 3. |
| RAPI_CHANNEL4 | Selects channel 4. |
| RAPI_CHANNEL5 | Selects channel 5. |
| RAPI_CHANNEL6 | Selects channel 6. |
| RAPI_CHANNEL7 | Selects channel 7. |

(R8C) (H8/300H)

Specify 0.

**[data5]**

(M16C)

Specify a pointer to the array in which the callback function is stored.

[0]: Specify a pointer to the callback function for IC/OC base timer interrupt.
If this pointer is not specified, 0 is set.

[1]: Specify a pointer to the callback function for IC/OC interrupt 0.
If this pointer is not specified, 0 is set.
[2]: Specify a pointer to the callback function for IC/OC interrupt 1.
If this pointer is not specified, 0 is set.

(R8C)

**• When timer C is used (RAPI_TIMER_C specified)**

Specify a pointer to the array in which the callback function is stored.
[0]: Specify a pointer to the callback function for timer C interrupt.
If this pointer is not specified, 0 is set.
[1]: Specify a pointer to the callback function for compare match interrupt 0.
If this pointer is not specified, 0 is set.
[2]: Specify a pointer to the callback function for compare match interrupt 1.
If this pointer is not specified, 0 is set.

**• When timer RD is used (RAPI_TIMER_RD0 to RAPI_TIMER_RD4 specified)**

Specify a pointer to the array in which the callback function is stored.
If this pointer is not specified, RAPI_NULL is set.

**• When timer RE is used (RAPI_TIMER_RE specified)**

Specify a pointer to the array in which the callback function is stored.
If this pointer is not specified, RAPI_NULL is set.

(H8/300H)

Specify a pointer to the variable in which the callback function is stored. If this pointer is not specified, RAPI_NULL is set.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (output compare mode)

**Reference**

__EnableOutputCompare, __DestroyOutputCompare

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- If when using the H8/300H an undefined value is specified in the second argument, program operation cannot be guaranteed.
- If when using the M16C an undefined value is specified for any waveform generation control register in the third argument, operation of the API cannot be guaranteed.
- If when using the H8/300H an undefined value is specified for the output operation of any channel in the third argument, operation of the API cannot be guaranteed.
- If when using the M16C or the H8/300H an undefined value is specified in the fourth argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void TimerIntFunc0( void ){}
void TimerIntFunc1( void ){}
void TimerIntFunc2( void ){}

void func( void )
{
   unsigned int *p_func[] =  {(void*) TimerIntFunc0,(void*) TimerIntFunc1,
                           (void*) TimerIntFunc2};
   unsigned char p_ic[] =  {1,2,3};
   unsigned int p_cmp[] =  {0x1234, 0x9876};

   /* Set up timer C as output compare mode */
   __CreateOutputCompare(

RAPI_TIMER_C|RAPI_TIMER_ON|RAPI_RELOAD|RAPI_L_1|RAPI_L_0|RAPI_F32|
      RAPI_CMP02_ENABLE|RAPI_CMP12_ENABLE, p_cmp, p_ic, p_func );
}
```

## __EnableOutputCompare

**Synopsis**

<Control operation of output compare mode>

**Boolean __EnableOutputCompare(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Controls operation of the timer that is set to specified output compare mode by starting or stopping it.

**[data]**

For data, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_S | Selects timer S. |
| RAPI_TIMER_ON | Sets the timer that is set to output compare mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to output compare mode to stop operating. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Selects timer C. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |
| RAPI_TIMER_RE | Selects timer RE. |
| RAPI_TIMER_ON | Sets the timer that is set to output compare mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to output compare mode to stop operating. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RD0. |
| RAPI_TIMER_RD0 | Selects timer RD0 channe 0. |
| RAPI_TIMER_RD1 | Selects timer RD0 channe 1. |
| RAPI_TIMER_RD2 | Selects timer RD0 channe 2. |
| RAPI_TIMER_RD3 | Selects timer RD0 channe 3. |
| RAPI_TIMER_ON | Sets the timer that is set to output compare mode to start operating. |
| RAPI_TIMER_OFF | Sets the timer that is set to output compare mode to stop operating. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (output compare mode)

**Reference**

__CreateOutputCompare, __DestroyOutputCompare

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be

guaranteed.

- The specifiable timers differ with each CPU used.

**Program example**

```
#include "rapi_timer_r8c_13.h"

void func( void )
{
    /* Enable timer C as output compare mode */
    __EnableOutputCompare( RAPI_TIMER_C|RAPI_TIMER_ON );
}
```

## __DestroyOutputCompare

**Synopsis**

<Discard settings of output compare mode>

**Boolean __DestroyOutputCompare(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Discards settings of the timer that is set to specified output compare mode.

[data]

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_S | Selects timer S. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Selects timer C. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |
| RAPI_TIMER_RE | Selects timer RE. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RD0. |
| RAPI_TIMER_RD0 | Selects timer RD0 channe 0. |
| RAPI_TIMER_RD1 | Selects timer RD0 channe 1. |
| RAPI_TIMER_RD2 | Selects timer RD0 channe 2. |
| RAPI_TIMER_RD3 | Selects timer RD0 channe 3. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (output compare mode)

**Reference**

__CreateOutputCompare, __EnableOutputCompare

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- When used for the H8/300H, this API places a specified timer into module stanby state after discarding it.

**Program example**

```
#include "rapi_timer_r8c_13.h"
```

```
void func( void )
{
    /* Destroy the setting of timer C as output compare mode */
    __DestroyOutputCompare( RAPI_TIMER_C );
}
```

## __SetTimerRegister

**Synopsis**

<Set timer register>

**Boolean __SetTimerRegister(unsigned long data1, unsigned int *data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Pointer to the buffer in which register value is stored |

**Description**

Sets the registers of a specified timer.

**[data1]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |
| RAPI_TIMER_S | Selects timer S. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Selects timer C. |
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_Z | Selects timer Z. |
| RAPI_TIMER_RA | Selects timer RA. |
| RAPI_TIMER_RB | Selects timer RB. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |
| RAPI_TIMER_RE | Selects timer RE. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_A | Selects timer A. |
| RAPI_TIMER_B1 | Selects timer B1. |
| RAPI_TIMER_V | Selects timer V. |
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |
| RAPI_TIMER_RD2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD3 | Selects timer RD channel 3. |

**[data2]**

The content of a pointer to the buffer in which the register value is stored must be specified as described below. The value is set in each register in order of buffer pointer elements.

(M16C)

**• When using timer A (RAPI_TIMER_A0 to RAPI_TIMER_A4 specified)**

[0]: Specify the set value for the timer Ai mode register (i = 0–4).

[1]: Specify the set value for the timer Ai register (i = 0–4).

[2]: Specify the set value for the up/down flag register.

[3]: Specify the set value for the one-shot start flag register.

[4]: Specify the set value for the trigger select register.

[5]: Specify the set value for the time-clock prescaler reset register.

[6]: Specify the set value for the count start flag register.

**• When using timer B (RAPI_TIMER_B0 to RAPI_TIMER_B2)**

[0]: Specify the set value for the timer Bi mode register (i = 0–2).

[1]: Specify the set value for the timer Bi register (i = 0–2).

[3]: Specify the set value for the time-clock prescaler reset register.

[4]: Specify the set value for the count start flag register.

**• When using timer S (RAPI_TIMER_S specified)**

[0]: Specify the set value for the base timer register.

[1]: Specify the set value for the base timer reset register.

[2]: Specify the set value for base timer control register 0.

[3]: Specify the set value for base timer control register 1.

[4]: Specify the set value for the count source divide-by-n register.

[5]: Specify the set value for time measurement control register 0.

[6]: Specify the set value for time measurement control register 1.

[7]: Specify the set value for time measurement control register 2.

[8]: Specify the set value for time measurement control register 3.

[9]: Specify the set value for time measurement control register 4.

[10]: Specify the set value for time measurement control register 5.

[11]: Specify the set value for time measurement control register 6.

[12]: Specify the set value for time measurement control register 7.

[13]: Specify the set value for time measurement prescaler register 6.

[14]: Specify the set value for time measurement prescaler register 7.

[15]: Specify the set value for waveform generation control register 0.

[16]: Specify the set value for waveform generation control register 1.

[17]: Specify the set value for waveform generation control register 2.

[18]: Specify the set value for waveform generation control register 3.

[19]: Specify the set value for waveform generation control register 4.

[20]: Specify the set value for waveform generation control register 5.

[21]: Specify the set value for waveform generation control register 6.

[22]: Specify the set value for waveform generation control register 7.

[23]: Specify the set value for waveform generation register 0.

[24]: Specify the set value for waveform generation register 1.

[25]: Specify the set value for waveform generation register 2.

[26]: Specify the set value for waveform generation register 3.

[27]: Specify the set value for waveform generation register 4.

[28]: Specify the set value for waveform generation register 5.

[29]: Specify the set value for waveform generation register 6.

[30]: Specify the set value for waveform generation register 7.

[31]: Specify the set value for the facility select register.

[32]: Specify the set value for the facility enable register.

[33]: Specify the set value for the interrupt request register.

[34]: Specify the set value for interrupt enable register 0.

[35]: Specify the set value for interrupt enable register 1.

(R8C)

**• When using timer C (RAPI_TIMER_C specified)**

[0]: Specify the set value for the timer C output control register.

[1]: Specify the set value for timer C control register 0.

[2]: Specify the set value for timer C control register 1.

[3]: Specify the set value for the capture & compare 0 register.

[4]: Specify the set value for the compare 1 register.

**• When using timer X (RAPI_TIMER_X specified)**

[0]: Specify the set value for the timer count source setup register.

[1]: Specify the set value for the prescaler X register.

[2]: Specify the set value for the timer X register.

[3]: Specify the set value for the timer X mode register.

**• When using timer Y (RAPI_TIMER_Y specified)**

[0]: Specify the set value for the timer count source setup register.

[1]: Specify the set value for the prescaler Y register.

[2]: Specify the set value for the timer Y primary register.

[3]: Specify the set value for the timer Y secondary register.

[4]: Specify the set value for the timer Y & Z waveform output control register.

[5]: Specify the set value for the timer Y & Z output control register.

[6]: Specify the set value for the timer Y & Z mode register.

**• When using timer Z (RAPI_TIMER_Z specified)**

[0]: Specify the set value for the timer count source setup register.

[1]: Specify the set value for the prescaler Z register.

[2]: Specify the set value for the timer Z primary register.

[3]: Specify the set value for the timer Z secondary register.

[4]: Specify the set value for the timer Y & Z waveform output control register.

[5]: Specify the set value for the timer Y & Z output control register.

[6]: Specify the set value for the timer Y & Z mode register.

**• When using timer RA (RAPI_TIMER_RA specified)**

[0]: Specify the set value for the timer RA I/O control register.

[1]: Specify the set value for the timer RA prescaler register.

[2]: Specify the set value for the timer RA register.

[3]: Specify the set value for the timer RA mode register.

[4]: Specify the set value for the timer RA control register.

**• When using timer RB (RAPI_TIMER_RB specified)**

[0]: Specify the set value for the timer RB one shot control register.

[1]: Specify the set value for the timer RB I/O control register.

[2]: Specify the set value for the timer RB prescaler register.

[3]: Specify the set value for the timer RB primary register.

[4]: Specify the set value for the timer RB secondary register.

[5]: Specify the set value for the timer RB mode register.

[6]: Specify the set value for the timer RB control register.

**• When using timer RD (RAPI_TIMER_RD0 to RAPI_TIMER_RD1)**

[0]: Specify the set value for the timer RD mode register.

[1]: Specify the set value for the timer RD PWM mode register.

[2]: Specify the set value for the timer RD function control register.

[3]: Specify the set value for the timer RD general register Ai (i=0,1).

[4]: Specify the set value for the timer RD general register Bi (i=0,1).

[5]: Specify the set value for the timer RD general register Ci (i=0,1).

[6]: Specify the set value for the timer RD general register Di (i=0,1).

[7]: Specify the set value for the timer RD digital filter function select register i(i=0,1).

[8]: Specify the set value for the timer RD control register i(i=0,1).

[9]: Specify the set value for the timer RD I/O control register Ai(i=0,1).

[10]: Specify the set value for the timer RD I/O control register Ci(i=0,1).

[11]: Specify the set value for the timer RD status register i(i=0,1).

[12]: Specify the set value for the timer RD interrupt enable register i(i=0,1).

[13]: Specify the set value for the timer RD counter i(i=0,1).

[14]: Specify the set value for the timer RD start register.

[15]: Specify the set value for the timer RD output master enable register 1.

[16]: Specify the set value for the timer RD output master enable register 2.

[17]: Specify the set value for the timer RD output control register.

**• When using timer RE (RAPI_TIMER_RE)**

[0]: Specify the set value for the timer RE second data register.

[1]: Specify the set value for the timer RE minute data register.

[2]: Specify the set value for the timer RE hour data register.

[3]: Specify the set value for the timer RE day of week data register.

[4]: Specify the set value for the timer RE control register 2.

[5]: Specify the set value for the timer RE count source select register.

[6]: Specify the set value for the timer RE control register 1.

(H8/300H)

**• When using timer A (RAPI_TIMER_A specified)**

[0]: Specify the set value for timer mode register A.

[1]: Specify the set value for timer counter A.

**• When using timer B1 (RAPI_TIMER_B1 specified)**

[0]: Specify the set value for timer mode register B1.

[1]: Specify the set value for timer load register B1.

**• When using timer V (RAPI_TIMER_V specified)**

[0]: Specify the set value for timer counter V.

[1]: Specify the set value for time constant register A.

[2]: Specify the set value for time constant register B.

[3]: Specify the set value for timer control register V0.
[4]: Specify the set value for timer control register V1.
[5]: Specify the set value for timer control/status register V.

**• When using timer W (RAPI_TIMER_W specified)**

[0]: Specify the set value for timer control register W.
[1]: Specify the set value for timer interrupt enable register W.
[2]: Specify the set value for timer status register W.
[3]: Specify the set value for timer I/O control register 0.
[4]: Specify the set value for timer I/O control register 1.
[5]: Specify the set value for the timer counter.
[6]: Specify the set value for general register A.
[7]: Specify the set value for general register B.
[8]: Specify the set value for general register C.
[9]: Specify the set value for general register D.
[10]: Specify the set value for the timer mode register W.

**• When using timer Z (RAPI_TIMER_Z0 to RAPI_TIMER_Z1 specified)**

[0]: Specify the set value for the timer mode register.
[1]: Specify the set value for the timer PWM mode register.
[2]: Specify the set value for the timer function control register.
[3]: Specify the set value for the timer output master enable register.
[4]: Specify the set value for the timer output control register.
[5]: Specify the set value for the timer counter.
[6]: Specify the set value for general register A i(i=0,1).
[7]: Specify the set value for general register B i(i=0,1).
[8]: Specify the set value for general register C i(i=0,1).
[9]: Specify the set value for general register D i(i=0,1).
[10]: Specify the set value for timer control register_i (i = 0, 1).
[11]: Specify the set value for timer I/O control register A_i (i = 0, 1).
[12]: Specify the set value for timer I/O control register C_i (i = 0, 1).
[13]: Specify the set value for timer status register_i (i = 0, 1).
[14]: Specify the set value for timer interrupt enable register_i (i = 0, 1).
[15]: Specify the set value for PWM mode output level control register_i (i = 0, 1).
[16]: Specify the set value for the timer start register.

**• When using timer RC (RAPI_TIMER_RC)**

[0]: Specify the set value for timer RC control register 1.
[1]: Specify the set value for timer RC control register 2.
[2]: Specify the set value for timer RC interrupt enable register.
[3]: Specify the set value for timer RC status register.
[4]: Specify the set value for timer RC I/O control register 0.
[5]: Specify the set value for timer RC I/O control register 1.
[6]: Specify the set value for timer RC output enable register.
[7]: Specify the set value for timer RC digital filter function select register.
[8]: Specify the set value for timer RC counter.
[9]: Specify the set value for general register A.
[10]: Specify the set value for general register B.

[11]: Specify the set value for general register C.
[12]: Specify the set value for general register D.
[13]: Specify the set value for timer RC mode register.

**• When using timer RD (RAPI_TIMER_RD0 to RAPI_TIMER_RD3 specified)**

[0]: Specify the set value for the timer RD mode register.
[1]: Specify the set value for the timer RD PWM mode register.
[2]: Specify the set value for the timer RD function control register.
[3]: Specify the set value for the timer RD output master enable register 1.
[4]: Specify the set value for the timer RD output master enable register 2.
[5]: Specify the set value for the timer RD output control register.
[6]: Specify the set value for the timer RD counter i(i=0,1).
[7]: Specify the set value for general register A_i(i=0,1).
[8]: Specify the set value for general register B_i(i=0,1).
[9]: Specify the set value for general register C_i(i=0,1).
[10]: Specify the set value for general register D_i(i=0,1).
[11]: Specify the set value for timer RD control register_i (i = 0, 1).
[12]: Specify the set value for timer RD I/O control register A_i (i = 0, 1).
[13]: Specify the set value for timer RD I/O control register C_i (i = 0, 1).
[14]: Specify the set value for timer RD status register_i (i = 0, 1).
[15]: Specify the set value for timer RD interrupt enable register_i (i = 0, 1).
[16]: Specify the set value for PWM mode output level control register_i (i = 0, 1).
[17]: Specify the set value for the timer RD digital filter function select register i(i = 0, 1).
[18]: Specify the set value for the timer RD start register.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (register manipulation)

**Reference**

__EnableTimerRegister, __ClearTimerRegister, __GetTimerRegister

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include " rapi_timer_r8c_13.h"

void func( void )
{
    unsigned char data[] =  {0,0,0,0,0,0,0};

    /* Set up timer Z register */
    __SetTimerRegister( RAPI_TIMER_Z, data );
}
```

## __EnableTimerRegister

**Synopsis**

<Control operation of timer register>

**Boolean __EnableTimerRegister(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Controls operation of a specified timer by starting or stopping it.

**[data]**

For data, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |
| RAPI_TIMER_S | Selects timer S. |
| RAPI_TIMER_ON | Sets the selected timer to start operating. |
| RAPI_TIMER_OFF | Sets the selected timer to stop operating. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Selects timer C. |
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_Z | Selects timer Z. |
| RAPI_TIMER_RA | Selects timer RA. |
| RAPI_TIMER_RB | Selects timer RB. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |
| RAPI_TIMER_RE | Selects timer RE. |
| RAPI_TIMER_ON | Sets the selected timer to start operating. |
| RAPI_TIMER_OFF | Sets the selected timer to stop operating. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_V | Selects timer V. |
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |

| | |
|---|---|
| RAPI_TIMER_RD2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD3 | Selects timer RD channel 3. |
| RAPI_TIMER_ON | Sets the selected timer to start operating. |
| RAPI_TIMER_OFF | Sets the selected timer to stop operating. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (register manipulation)

**Reference**

__SetTimerRegister, __ClearTimerRegister, __GetTimerRegister

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.
- To specify commencement of timer operation when using timer V of the H8/300H, set the clock and count condition to be supplied to TCNTV that are specified in __SetTimerRegister immediately preceding this API.

**Program example**

```
#include " rapi_timer_r8c_13.h"

void func( void )
{
    /* Activate timer C */
    __EnableTimerRegister( RAPI_TIMER_C|RAPI_TIMER_ON );
}
```

## __ClearTimerRegister

**Synopsis**

<Clear timer register>

**Boolean __ClearTimerRegister(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Sets the timer register of a specified timer to its initial value after reset.

**[data]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |
| RAPI_TIMER_S | Selects timer S. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Selects timer C. |
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_Z | Selects timer Z. |
| RAPI_TIMER_RA | Selects timer RA. |
| RAPI_TIMER_RB | Selects timer RB. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |
| RAPI_TIMER_RE | Selects timer RE. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_A | Selects timer A. |
| RAPI_TIMER_B1 | Selects timer B1. |
| RAPI_TIMER_V | Selects timer V. |
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |
| RAPI_TIMER_RD2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD3 | Selects timer RD channel 3. |

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (register manipulation)

**Reference**

__SetTimerRegister, __EnableTimerRegister, __GetTimerRegister

**Remark**

- If an undefined value is specified in the argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include " rapi_timer_r8c_13.h"

void func( void )
{
    /* Clear the setting of timer C */
    __ClearTimerRegister( RAPI_TIMER_C );
}
```

## __GetTimerRegister

**Synopsis**

<Get timer register value>

**Boolean __GetTimerRegister(unsigned long data1, unsigned int *data2)**

| | |
|---|---|
| data1 | Setup data (content differs with MCU type) |
| data2 | Pointer to the buffer in which register value is stored |

**Description**

Gets the counter value of a specified timer.

**[data]**

For data, the following definition values can be set.

(M16C)

| | |
|---|---|
| RAPI_TIMER_A0 | Selects timer A channel 0. |
| RAPI_TIMER_A1 | Selects timer A channel 1. |
| RAPI_TIMER_A2 | Selects timer A channel 2. |
| RAPI_TIMER_A3 | Selects timer A channel 3. |
| RAPI_TIMER_A4 | Selects timer A channel 4. |
| RAPI_TIMER_B0 | Selects timer B channel 0. |
| RAPI_TIMER_B1 | Selects timer B channel 1. |
| RAPI_TIMER_B2 | Selects timer B channel 2. |
| RAPI_TIMER_S | Selects timer S. |

(R8C)

| | |
|---|---|
| RAPI_TIMER_C | Selects timer C. |
| RAPI_TIMER_X | Selects timer X. |
| RAPI_TIMER_Y | Selects timer Y. |
| RAPI_TIMER_Z | Selects timer Z. |
| RAPI_TIMER_RA | Selects timer RA. |
| RAPI_TIMER_RB | Selects timer RB. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |
| RAPI_TIMER_RE | Selects timer RE. |

(H8/300H)

| | |
|---|---|
| RAPI_TIMER_A | Selects timer A. |
| RAPI_TIMER_B1 | Selects timer B1. |
| RAPI_TIMER_V | Selects timer V. |
| RAPI_TIMER_W | Selects timer W. |
| RAPI_TIMER_Z0 | Selects timer Z channel 0. |
| RAPI_TIMER_Z1 | Selects timer Z channel 1. |
| RAPI_TIMER_RC | Selects timer RC. |
| RAPI_TIMER_RD0 | Selects timer RD channel 0. |
| RAPI_TIMER_RD1 | Selects timer RD channel 1. |
| RAPI_TIMER_RD2 | Selects timer RD channel 2. |
| RAPI_TIMER_RD3 | Selects timer RD channel 3. |

**[data2]**

Specify a pointer to the array in which the acquired register value is stored.
The content of the array is described below.
(M16C)

**• When using timer A (RAPI_TIMER_A0 to RAPI_TIMER_A4 specified)**

[0]: Store the value of timer Ai mode register (i = 0–4).

[1]: Store the value of timer Ai register (i = 0–4).

[2]: Store the value of the up/down flag register.

[3]: Store the value of the one-shot start flag register.

[4]: Store the value of the trigger select register.

[5]: Store the value of the time-clock prescaler reset flag register.

[6]: Store the value of the count start flag register.

**• When using timer B (RAPI_TIMER_B0 to RAPI_TIMER_B2 specified)**

[0]: Store the value of timer Bi mode register (i = 0–2).

[1]: Store the value of timer Bi register (i = 0–2).

[2]: Store the value of the time-clock prescaler reset flag register.

[3]: Store the value of the count start flag register.

**• When using timer S (RAPI_TIMER_S specified)**

[0]: Store the value of the base timer register.

[1]: Store the value of the base timer reset register.

[2]: Store the value of base timer control register 0.

[3]: Store the value of base timer control register 1.

[4]: Store the value of the count source divide-by-n register.

[5]: Store the value of time measurement control register 0.

[6]: Store the value of time measurement control register 1.

[7]: Store the value of time measurement control register 2.

[8]: Store the value of time measurement control register 3.

[9]: Store the value of time measurement control register 4.

[10]: Store the value of time measurement control register 5.

[11]: Store the value of time measurement control register 6.

[12]: Store the value of time measurement control register 7.

[13]: Store the value of time measurement prescaler register 6.

[14]: Store the value of time measurement prescaler register 7.

[15]: Store the value of waveform generation control register 0.

[16]: Store the value of waveform generation control register 1.

[17]: Store the value of waveform generation control register 2.

[18]: Store the value of waveform generation control register 3.

[19]: Store the value of waveform generation control register 4.

[20]: Store the value of waveform generation control register 5.

[21]: Store the value of waveform generation control register 6.

[22]: Store the value of waveform generation control register 7.

[23]: Store the value of time measurement register 0.

[24]: Store the value of time measurement register 1/waveform generation register 1.

[25]: Store the value of time measurement register 2/waveform generation register 2.

[26]: Store the value of time measurement register 3/waveform generation register 3.

[27]: Store the value of time measurement register 4/waveform generation register 4.

[28]: Store the value of time measurement register 5/waveform generation register 5.

[29]: Store the value of time measurement register 6/waveform generation register 6.

[30]: Store the value of time measurement register 7/waveform generation register 7.

[31]: Store the value of the facility select register.

[32]: Store the value of the facility enable register.

[33]: Store the value of the interrupt request register.

[34]: Store the value of interrupt enable register 0.

[35]: Store the value of interrupt enable register 1.

(R8C)

**• When using timer C (RAPI_TIMER_C specified)**

[0]: Store the value of the timer C register.

[1]: Store the value of the capture & compare 0 register.

[2]: Store the value of the compare 1 register.

[3]: Store the value of the timer C output control register.

[4]: Store the value of timer C control register 1.

[5]: Store the value of timer C control register 0.

**• When using timer X (RAPI_TIMER_X specified)**

[0]: Store the value of the timer count source setup register.

[1]: Store the value of the prescaler X register.

[2]: Store the value of the timer X register.

[3]: Store the value of the timer X mode register.

**• When using timer Y (RAPI_TIMER_Y specified)**

[0]: Store the value of the timer count source setup register.

[1]: Store the value of the prescaler Y register.

[2]: Store the value of the timer Y primary register.

[3]: Store the value of the timer Y secondary register.

[4]: Store the value of the timer Y & Z waveform output control register.

[5]: Store the value of the timer Y & Z output control register.

[6]: Store the value of the timer Y & Z mode register.

**• When using timer Z (RAPI_TIMER_Z specified)**

[0]: Store the value of the timer count source setup register.

[1]: Store the value of the prescaler Z register.

[2]: Store the value of the timer Z primary register.

[3]: Store the value of the timer Z secondary register.

[4]: Store the value of the timer Y & Z waveform output control register.

[5]: Store the value of the timer Y & Z output control register.

[6]: Store the value of the timer Y & Z mode register.

**• When using timer RA (RAPI_TIMER_RA specified)**

[0]: Specify the set value for the timer RA I/O control register.

[1]: Specify the set value for the timer RA prescaler register.

[2]: Specify the set value for the timer RA register.

[3]: Specify the set value for the timer RA mode register.

[4]: Specify the set value for the timer RA control register.

**• When using timer RB (RAPI_TIMER_RB specified)**

[0]: Specify the set value for the timer RB one shot control register.

[1]: Specify the set value for the timer RB I/O control register.

[2]: Specify the set value for the timer RB prescaler register.

[3]: Specify the set value for the timer RB primary register.

[4]: Specify the set value for the timer RB secondary register.

[5]: Specify the set value for the timer RB mode register.

[6]: Specify the set value for the timer RB control register.

**• When using timer RD (RAPI_TIMER_RD0 to RAPI_TIMER_RD1)**

[0]: Specify the set value for the timer RD mode register.

[1]: Specify the set value for the timer RD PWM mode register.

[2]: Specify the set value for the timer RD function control register.

[3]: Specify the set value for the timer RD general register Ai (i=0,1).

[4]: Specify the set value for the timer RD general register Bi (i=0,1).

[5]: Specify the set value for the timer RD general register Ci (i=0,1).

[6]: Specify the set value for the timer RD general register Di (i=0,1).

[7]: Specify the set value for the timer RD digital filter function select register i(i=0,1).

[8]: Specify the set value for the timer RD control register i(i=0,1).

[9]: Specify the set value for the timer RD I/O control register Ai(i=0,1).

[10]: Specify the set value for the timer RD I/O control register Ci(i=0,1).

[11]: Specify the set value for the timer RD status register i(i=0,1).

[12]: Specify the set value for the timer RD interrupt enable register i(i=0,1).

[13]: Specify the set value for the timer RD counter i(i=0,1).

[14]: Specify the set value for the timer RD start register.

[15]: Specify the set value for the timer RD output master enable register 1.

[16]: Specify the set value for the timer RD output master enable register 2.

[17]: Specify the set value for the timer RD output control register.

**• When using timer RE (RAPI_TIMER_RE)**

[0]: Specify the set value for the timer RE second data register.

[1]: Specify the set value for the timer RE minute data register.

[2]: Specify the set value for the timer RE hour data register.

[3]: Specify the set value for the timer RE day of week data register.

[4]: Specify the set value for the timer RE control register 2.

[5]: Specify the set value for the timer RE count source select register.

[6]: Specify the set value for the timer RE control register 1.

(H8/300H)

**• When using timer A (RAPI_TIMER_A specified)**

[0]: Store the value of timer mode register A.

[1]: Store the value of timer counter A.

**• When using timer B1 (RAPI_TIMER_B1 specified)**

[0]: Store the value of timer mode register B1.

[1]: Store the value of timer counter B1.

**• When using timer V (RAPI_TIMER_V specified)**

[0]: Store the value of timer counter V.

[1]: Store the value of time constant register A.

[2]: Store the value of time constant register B.

[3]: Store the value of timer control register V0.

[4]: Store the value of timer control register V1.

[5]: Store the value of timer control/status register V.

- **When using timer W (RAPI_TIMER_W specified)**

[0]: Store the value of timer mode register W.

[1]: Store the value of timer control register W.

[2]: Store the value of timer interrupt master enable register W.

[3]: Store the value of timer status register W.

[4]: Store the value of timer I/O control register 0.

[5]: Store the value of timer I/O control register 1.

[6]: Store the value of the timer counter.

[7]: Store the value of general register A.

[8]: Store the value of general register B.

[9]: Store the value of general register C.

[10]: Store the value of general register D.

- **When using timer Z (RAPI_TIMER_Z specified)**

[0]: Store the value of the timer start register.

[1]: Store the value of the timer mode register.

[2]: Store the value of the timer PWM mode register.

[3]: Store the value of the timer function control register.

[4]: Store the value of the timer output master enable register.

[5]: Store the value of the timer output control register.

[6]: Store the value of timer counter_i (i = 0, 1).

[7]: Store the value of general register A_i (i = 0, 1).

[8]: Store the value of general register B_i (i=0, 1).

[9]: Store the value of general register C_i (i=0, 1).

[10]: Store the value of general register D_i (i=0, 1).

[11]: Store the value of timer control register_i (i = 0, 1).

[12]: Store the value of timer I/O control register A_i (i = 0, 1).

[13]: Store the value of timer I/O control register B_i (i = 0, 1).

[14]: Store the value of timer status register_i (i = 0, 1).

[15]: Store the value of timer interrupt enable register_i (i = 0, 1).

[16]: Store the value of PWM mode output level control register_i (i = 0, 1).

- **When using timer RC (RAPI_TIMER_RC)**

[0]: Specify the set value for timer RC control register 1.

[1]: Specify the set value for timer RC control register 2.

[2]: Specify the set value for timer RC interrupt enable register.

[3]: Specify the set value for timer RC status register.

[4]: Specify the set value for timer RC I/O control register 0.

[5]: Specify the set value for timer RC I/O control register 1.

[6]: Specify the set value for timer RC output enable register.

[7]: Specify the set value for timer RC digital filter function select register.

[8]: Specify the set value for timer RC counter.

[9]: Specify the set value for general register A.
[10]: Specify the set value for general register B.
[11]: Specify the set value for general register C.
[12]: Specify the set value for general register D.
[13]: Specify the set value for timer RC mode register.

**• When using timer RD (RAPI_TIMER_RD0 to RAPI_TIMER_RD3 specified)**

[0]: Specify the set value for the timer RD mode register.
[1]: Specify the set value for the timer RD PWM mode register.
[2]: Specify the set value for the timer RD function control register.
[3]: Specify the set value for the timer RD output master enable register 1.
[4]: Specify the set value for the timer RD output master enable register 2.
[5]: Specify the set value for the timer RD output control register.
[6]: Specify the set value for the timer RD counter i(i=0,1).
[7]: Specify the set value for general register A_i(i=0,1).
[8]: Specify the set value for general register B_i(i=0,1).
[9]: Specify the set value for general register C_i(i=0,1).
[10]: Specify the set value for general register D_i(i=0,1).
[11]: Specify the set value for timer RD control register_i (i = 0, 1).
[12]: Specify the set value for timer RD I/O control register A_i (i = 0, 1).
[13]: Specify the set value for timer RD I/O control register C_i (i = 0, 1).
[14]: Specify the set value for timer RD status register_i (i = 0, 1).
[15]: Specify the set value for timer RD interrupt enable register_i (i = 0, 1).
[16]: Specify the set value for PWM mode output level control register_i (i = 0, 1).
[17]: Specify the set value for the timer RD digital filter function select register i(i = 0, 1).
[18]: Specify the set value for the timer RD start register.

**Return value**

If the timer specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

Timer (register manipulation)

**Reference**

__SetTimerRegister, __EnableTimerRegister, __ClearTimerRegister

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable timers differ with each CPU used.

**Program example**

```
#include " rapi_timer_r8c_13.h"

void func( void )
{
   unsigned int data[7];

   /* Get the value of timer Z registers */
    __GetTimerRegister( RAPI_TIMER_Z, data );
}
```

### 4.2.3 I/O Port
### __SetIOPort

**Synopsis**

<Set I/O port>

**Boolean __SetIOPort(unsigned long data1, unsigned int data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |

**Description**

Sets the operating conditions of a specified I/O port.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value. Note, however, that multiple ports cannot be specified at the same time.

(M16C)

The definition values corresponding to each I/O port are listed below.

| | | | |
|---|---|---|---|
| RAPI_PORT_0_0 | Port $P0_0$ | RAPI_PORT_0_1 | Port $P0_1$ |
| RAPI_PORT_0_2 | Port $P0_2$ | RAPI_PORT_0_3 | Port $P0_3$ |
| RAPI_PORT_0_4 | Port $P0_4$ | RAPI_PORT_0_5 | Port $P0_5$ |
| RAPI_PORT_0_6 | Port $P0_6$ | RAPI_PORT_0_7 | Port $P0_7$ |
| RAPI_PORT_1_0 | Port $P1_0$ | RAPI_PORT_1_1 | Port $P1_1$ |
| RAPI_PORT_1_2 | Port $P1_2$ | RAPI_PORT_1_3 | Port $P1_3$ |
| RAPI_PORT_1_4 | Port $P1_4$ | RAPI_PORT_1_5 | Port $P1_5$ |
| RAPI_PORT_1_6 | Port $P1_6$ | RAPI_PORT_1_7 | Port $P1_7$ |
| RAPI_PORT_2_0 | Port $P2_0$ | RAPI_PORT_2_1 | Port $P2_1$ |
| RAPI_PORT_2_2 | Port $P2_2$ | RAPI_PORT_2_3 | Port $P2_3$ |
| RAPI_PORT_2_4 | Port $P2_4$ | RAPI_PORT_2_5 | Port $P2_5$ |
| RAPI_PORT_2_6 | Port $P2_6$ | RAPI_PORT_2_7 | Port $P2_7$ |
| RAPI_PORT_3_0 | Port $P3_0$ | RAPI_PORT_3_1 | Port $P3_1$ |
| RAPI_PORT_3_2 | Port $P3_2$ | RAPI_PORT_3_3 | Port $P3_3$ |
| RAPI_PORT_3_4 | Port $P3_4$ | RAPI_PORT_3_5 | Port $P3_5$ |
| RAPI_PORT_3_6 | Port $P3_6$ | RAPI_PORT_3_7 | Port $P3_7$ |
| RAPI_PORT_6_0 | Port $P6_0$ | RAPI_PORT_6_1 | Port $P6_1$ |
| RAPI_PORT_6_2 | Port $P6_2$ | RAPI_PORT_6_3 | Port $P6_3$ |
| RAPI_PORT_6_4 | Port $P6_4$ | RAPI_PORT_6_5 | Port $P6_5$ |
| RAPI_PORT_6_6 | Port $P6_6$ | RAPI_PORT_6_7 | Port $P6_7$ |
| RAPI_PORT_7_0 | Port $P7_0$ | RAPI_PORT_7_1 | Port $P7_1$ |
| RAPI_PORT_7_2 | Port $P7_2$ | RAPI_PORT_7_3 | Port $P7_3$ |
| RAPI_PORT_7_4 | Port $P7_4$ | RAPI_PORT_7_5 | Port $P7_5$ |
| RAPI_PORT_7_6 | Port $P7_6$ | RAPI_PORT_7_7 | Port $P7_7$ |
| RAPI_PORT_8_0 | Port $P8_0$ | RAPI_PORT_8_1 | Port $P8_1$ |
| RAPI_PORT_8_2 | Port $P8_2$ | RAPI_PORT_8_3 | Port $P8_3$ |
| RAPI_PORT_8_4 | Port $P8_4$ | RAPI_PORT_8_5 | Port $P8_5$ |
| RAPI_PORT_8_6 | Port $P8_6$ | RAPI_PORT_8_7 | Port $P8_7$ |

| | | | |
|---|---|---|---|
| RAPI_PORT_9_0 | Port $P9_0$ | RAPI_PORT_9_1 | Port $P9_1$ |
| RAPI_PORT_9_2 | Port $P9_2$ | RAPI_PORT_9_3 | Port $P9_3$ |
| RAPI_PORT_9_5 | Port $P9_5$ | RAPI_PORT_9_6 | Port $P9_6$ |
| RAPI_PORT_9_7 | Port $P9_7$ | RAPI_PORT_10_0 | Port $P10_0$ |
| RAPI_PORT_10_1 | Port $P10_1$ | RAPI_PORT_10_2 | Port $P10_2$ |
| RAPI_PORT_10_3 | Port $P10_3$ | RAPI_PORT_10_4 | Port $P10_4$ |
| RAPI_PORT_10_5 | Port $P10_5$ | RAPI_PORT_10_6 | Port $P10_6$ |
| RAPI_PORT_10_7 | Port $P10_7$ | | |

The definition values related to port settings are described below.

| | |
|---|---|
| RAPI_PORT_INPUT | Sets a selected port for input. |
| RAPI_PORT_OUTPUT | Sets a selected port for output. |
| RAPI_PULLED_HIGH | Sets a selected port to be pulled high. |
| RAPI_NOT_PULLED _HIGH | Sets a selected port not to be pulled high. |
| RAPI_LATCH | Sets a selected port to read the port latch regardless of whether it is set for input or output. Specifiable only when port P1 is used. |

(R8C)

The definition values corresponding to each I/O port are listed below.

| | | | |
|---|---|---|---|
| RAPI_PORT_0_0 | Port $P0_0$ | RAPI_PORT_0_1 | Port $P0_1$ |
| RAPI_PORT_0_2 | Port $P0_2$ | RAPI_PORT_0_3 | Port $P0_3$ |
| RAPI_PORT_0_4 | Port $P0_4$ | RAPI_PORT_0_5 | Port $P0_5$ |
| RAPI_PORT_0_6 | Port $P0_6$ | RAPI_PORT_0_7 | Port $P0_7$ |
| RAPI_PORT_1_0 | Port $P1_0$ | RAPI_PORT_1_1 | Port $P1_1$ |
| RAPI_PORT_1_2 | Port $P1_2$ | RAPI_PORT_1_3 | Port $P1_3$ |
| RAPI_PORT_1_4 | Port $P1_4$ | RAPI_PORT_1_5 | Port $P1_5$ |
| RAPI_PORT_1_6 | Port $P1_6$ | RAPI_PORT_1_7 | Port $P1_7$ |
| RAPI_PORT_2_0 | Port $P2_0$ | RAPI_PORT_2_1 | Port $P2_1$ |
| RAPI_PORT_2_2 | Port $P2_2$ | RAPI_PORT_2_3 | Port $P2_3$ |
| RAPI_PORT_2_4 | Port $P2_4$ | RAPI_PORT_2_5 | Port $P2_5$ |
| RAPI_PORT_2_6 | Port $P2_6$ | RAPI_PORT_2_7 | Port $P2_7$ |
| RAPI_PORT_3_0 | Port $P3_0$ | RAPI_PORT_3_1 | Port $P3_1$ |
| RAPI_PORT_3_2 | Port $P3_2$ | RAPI_PORT_3_3 | Port $P3_3$ |
| RAPI_PORT_3_4 | Port $P3_4$ | RAPI_PORT_3_5 | Port $P3_5$ |
| RAPI_PORT_3_7 | Port $P3_7$ | RAPI_PORT_4_3 | Port $P4_3$ |
| RAPI_PORT_4_4 | Port $P4_4$ | RAPI_PORT_4_5 | Port $P4_5$ |
| RAPI_PORT_6_0 | Port $P6_0$ | RAPI_PORT_6_1 | Port $P6_1$ |
| RAPI_PORT_6_2 | Port $P6_2$ | RAPI_PORT_6_3 | Port $P6_3$ |
| RAPI_PORT_6_4 | Port $P6_4$ | RAPI_PORT_6_5 | Port $P6_5$ |
| RAPI_PORT_6_6 | Port $P6_6$ | RAPI_PORT_6_7 | Port $P6_7$ |

The definition values corresponding to each I/O port are listed below.

| | |
|---|---|
| RAPI_PORT_INPUT | Sets a selected port for input. |
| RAPI_PORT_OUTPUT | Sets a selected port for output. |
| RAPI_PULLED_HIGH | Sets a selected port to be pulled high. |

| | |
|---|---|
| RAPI_NOT_PULLED_HIGH | Sets a selected port not to be pulled high. |
| RAPI_DRIVE_CAPACITY_H | Sets the N-channel output transistor drive capacity of a selected port to High. Specifiable only when port P1 is used. |
| RAPI_DRIVE_CAPACITY_L | Sets the N-channel output transistor drive capacity of a selected port to Low. Specifiable only when port P1 is used. |

(H8/300H)

The definition values corresponding to each I/O port are listed below.

| | | | |
|---|---|---|---|
| RAPI_PORT_1_0 | Port P10 | RAPI_PORT_1_1 | Port P11 |
| RAPI_PORT_1_2 | Port P12 | RAPI_PORT_1_4 | Port P14 |
| RAPI_PORT_1_5 | Port P15 | RAPI_PORT_1_6 | Port P16 |
| RAPI_PORT_1_7 | Port P17 | RAPI_PORT_2_0 | Port P20 |
| RAPI_PORT_2_1 | Port P21 | RAPI_PORT_2_2 | Port P22 |
| RAPI_PORT_2_3 | Port P23 | RAPI_PORT_2_4 | Port P24 |
| RAPI_PORT_2_5 | Port P25 | RAPI_PORT_2_6 | Port P26 |
| RAPI_PORT_2_7 | Port P27 | RAPI_PORT_3_0 | Port P30 |
| RAPI_PORT_3_1 | Port P31 | RAPI_PORT_3_2 | Port P32 |
| RAPI_PORT_3_3 | Port P33 | RAPI_PORT_3_4 | Port P34 |
| RAPI_PORT_3_5 | Port P35 | RAPI_PORT_3_6 | Port P36 |
| RAPI_PORT_3_7 | Port P37 | RAPI_PORT_5_0 | Port P50 |
| RAPI_PORT_5_1 | Port P51 | RAPI_PORT_5_2 | Port P52 |
| RAPI_PORT_5_3 | Port P53 | RAPI_PORT_5_4 | Port P54 |
| RAPI_PORT_5_5 | Port P55 | RAPI_PORT_5_6 | Port P56 |
| RAPI_PORT_5_7 | Port P57 | RAPI_PORT_6_0 | Port P60 |
| RAPI_PORT_6_1 | Port P61 | RAPI_PORT_6_2 | Port P62 |
| RAPI_PORT_6_3 | Port P63 | RAPI_PORT_6_4 | Port P64 |
| RAPI_PORT_6_5 | Port P65 | RAPI_PORT_6_6 | Port P66 |
| RAPI_PORT_6_7 | Port P67 | RAPI_PORT_7_0 | Port P70 |
| RAPI_PORT_7_1 | Port P71 | RAPI_PORT_7_2 | Port P72 |
| RAPI_PORT_7_4 | Port P74 | RAPI_PORT_7_5 | Port P75 |
| RAPI_PORT_7_6 | Port P76 | RAPI_PORT_7_7 | Port P77 |
| RAPI_PORT_8_0 | Port P80 | RAPI_PORT_8_1 | Port P81 |
| RAPI_PORT_8_2 | Port P82 | RAPI_PORT_8_3 | Port P83 |
| RAPI_PORT_8_4 | Port P84 | RAPI_PORT_8_5 | Port P85 |
| RAPI_PORT_8_6 | Port P86 | RAPI_PORT_8_7 | Port P87 |
| RAPI_PORT_9_0 | Port P90 | RAPI_PORT_9_1 | Port P91 |
| RAPI_PORT_9_2 | Port P92 | RAPI_PORT_9_3 | Port P93 |
| RAPI_PORT_9_4 | Port P94 | RAPI_PORT_9_5 | Port P95 |
| RAPI_PORT_9_6 | Port P96 | RAPI_PORT_9_7 | Port P97 |
| RAPI_PORT_C_0 | Port PC0 | RAPI_PORT_C_1 | Port PC1 |
| RAPI_PORT_C_2 | PortPC2 | RAPI_PORT_C_3 | PortPC3 |
| RAPI_PORT_D_0 | PortPD0 | RAPI_PORT_D_1 | PortPD1 |
| RAPI_PORT_D_2 | PortPD2 | RAPI_PORT_D_3 | PortPD3 |
| RAPI_PORT_D_4 | PortPD4 | RAPI_PORT_D_5 | PortPD5 |

| | | | |
|---|---|---|---|
| RAPI_PORT_D_6 | PortPD6 | RAPI_PORT_D_7 | PortPD7 |
| RAPI_PORT_E_0 | PortPE0 | RAPI_PORT_E_1 | PortPE1 |
| RAPI_PORT_E_2 | PortPE2 | RAPI_PORT_E_3 | PortPE3 |
| RAPI_PORT_E_4 | PortPE4 | RAPI_PORT_E_5 | PortPE5 |
| RAPI_PORT_E_6 | PortPE6 | RAPI_PORT_E_7 | PortPE7 |
| RAPI_PORT_F_0 | PortPF0 | RAPI_PORT_G_0 | PortPG0 |
| RAPI_PORT_G_1 | PortPG1 | RAPI_PORT_G_2 | PortPG2 |
| RAPI_PORT_G_3 | PortPG3 | RAPI_PORT_G_4 | PortPG4 |
| RAPI_PORT_G_5 | PortPG5 | RAPI_PORT_G_6 | PortPG6 |
| RAPI_PORT_G_7 | PortPG7 | RAPI_PORT_H_0 | PortPH0 |
| RAPI_PORT_H_1 | PortPH1 | RAPI_PORT_H_2 | PortPH2 |
| RAPI_PORT_H_3 | PortPH3 | RAPI_PORT_H_4 | PortPH4 |
| RAPI_PORT_H_5 | PortPH5 | RAPI_PORT_H_6 | PortPH6 |
| RAPI_PORT_H_7 | PortPH7 | RAPI_PORT_J_0 | PortPJ0 |
| RAPI_PORT_J_1 | PortPJ1 | | |

The definition values related to port settings are described below.

| | |
|---|---|
| RAPI_PORT_INPUT | Sets a selected port for input. |
| RAPI_PORT_OUTPUT | Sets a selected port for output. |
| RAPI_PULLED_HIGH | Sets a selected port to be pulled high. |
| RAPI_NOT_PULLED_HIGH | Sets a selected port not to be pulled high. |

**[data2]**

(M16C)

Specify the digital filter width of the digital debounce facility assigned to _NMI/_SD. Specifiable only when port P85 is used.

Specify the digital filter width of the digital debounce facility assigned to INPC17/_INT5. Specifiable only when port P17 is used.

When using any other port, set 0 for this data.

(R8C) (H8/300H)

Specify 0.

**Return value**

If the I/O port specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

I/O port

**Reference**

__ReadIOPort, __WriteIOPort, __SetIOPortRegister, __ReadIOPortRegister, __WriteIOPortRegister

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable I/O ports differ with each CPU used.
- The API cannot set function that the specified I/O port dont have.

**Program example**

```
#include " rapi_io_port_r8c_13.h

void func( void )
{
   /* Set up port P03 as input port */
   __SetIOPort(RAPI_PORT_0_3| RAPI_PORT_INPUT| RAPI_PULLED_HIGH, 0, 0 );
}
```

## __ReadIOPort

**Synopsis**

<Read from I/O port>

**Boolean __ReadIOPort(unsigned long data1, unsigned int *data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Pointer to the variable in which the value read from I/O port is stored. |

**Description**

Gets the value of a specified I/O port.

**[data1]**

Specify an I/O port from which data is read. The definition values corresponding to each I/O port are listed below.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_PORT_0_0 | Port $P0_0$ | RAPI_PORT_0_1 | Port $P0_1$ |
| RAPI_PORT_0_2 | Port $P0_2$ | RAPI_PORT_0_3 | Port $P0_3$ |
| RAPI_PORT_0_4 | Port $P0_4$ | RAPI_PORT_0_5 | Port $P0_5$ |
| RAPI_PORT_0_6 | Port $P0_6$ | RAPI_PORT_0_7 | Port $P0_7$ |
| RAPI_PORT_1_0 | Port $P1_0$ | RAPI_PORT_1_1 | Port $P1_1$ |
| RAPI_PORT_1_2 | Port $P1_2$ | RAPI_PORT_1_3 | Port $P1_3$ |
| RAPI_PORT_1_4 | Port $P1_4$ | RAPI_PORT_1_5 | Port $P1_5$ |
| RAPI_PORT_1_6 | Port $P1_6$ | RAPI_PORT_1_7 | Port $P1_7$ |
| RAPI_PORT_2_0 | Port $P2_0$ | RAPI_PORT_2_1 | Port $P2_1$ |
| RAPI_PORT_2_2 | Port $P2_2$ | RAPI_PORT_2_3 | Port $P2_3$ |
| RAPI_PORT_2_4 | Port $P2_4$ | RAPI_PORT_2_5 | Port $P2_5$ |
| RAPI_PORT_2_6 | Port $P2_6$ | RAPI_PORT_2_7 | Port $P2_7$ |
| RAPI_PORT_3_0 | Port $P3_0$ | RAPI_PORT_3_1 | Port $P3_1$ |
| RAPI_PORT_3_2 | Port $P3_2$ | RAPI_PORT_3_3 | Port $P3_3$ |
| RAPI_PORT_3_4 | Port $P3_4$ | RAPI_PORT_3_5 | Port $P3_5$ |
| RAPI_PORT_3_6 | Port $P3_6$ | RAPI_PORT_3_7 | Port $P3_7$ |
| RAPI_PORT_6_0 | Port $P6_0$ | RAPI_PORT_6_1 | Port $P6_1$ |
| RAPI_PORT_6_2 | Port $P6_2$ | RAPI_PORT_6_3 | Port $P6_3$ |
| RAPI_PORT_6_4 | Port $P6_4$ | RAPI_PORT_6_5 | Port $P6_5$ |
| RAPI_PORT_6_6 | Port $P6_6$ | RAPI_PORT_6_7 | Port $P6_7$ |
| RAPI_PORT_7_0 | Port $P7_0$ | RAPI_PORT_7_1 | Port $P7_1$ |
| RAPI_PORT_7_2 | Port $P7_2$ | RAPI_PORT_7_3 | Port $P7_3$ |
| RAPI_PORT_7_4 | Port $P7_4$ | RAPI_PORT_7_5 | Port $P7_5$ |
| RAPI_PORT_7_6 | Port $P7_6$ | RAPI_PORT_7_7 | Port $P7_7$ |
| RAPI_PORT_8_0 | Port $P8_0$ | RAPI_PORT_8_1 | Port $P8_1$ |
| RAPI_PORT_8_2 | Port $P8_2$ | RAPI_PORT_8_3 | Port $P8_3$ |
| RAPI_PORT_8_4 | Port $P8_4$ | RAPI_PORT_8_5 | Port $P8_5$ |
| RAPI_PORT_8_6 | Port $P8_6$ | RAPI_PORT_8_7 | Port $P8_7$ |
| RAPI_PORT_9_0 | Port $P9_0$ | RAPI_PORT_9_1 | Port $P9_1$ |
| RAPI_PORT_9_2 | Port $P9_2$ | RAPI_PORT_9_3 | Port $P9_3$ |

| | | | |
|---|---|---|---|
| RAPI_PORT_9_5 | Port $P9_5$ | RAPI_PORT_9_6 | Port $P9_6$ |
| RAPI_PORT_9_7 | Port $P9_7$ | RAPI_PORT_10_0 | Port $P10_0$ |
| RAPI_PORT_10_1 | Port $P10_1$ | RAPI_PORT_10_2 | Port $P10_2$ |
| RAPI_PORT_10_3 | Port $P10_3$ | RAPI_PORT_10_4 | Port $P10_4$ |
| RAPI_PORT_10_5 | Port $P10_5$ | RAPI_PORT_10_6 | Port $P10_6$ |
| RAPI_PORT_10_7 | Port $P10_7$ | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_PORT_0_0 | Port $P0_0$ | RAPI_PORT_0_1 | Port $P0_1$ |
| RAPI_PORT_0_2 | Port $P0_2$ | RAPI_PORT_0_3 | Port $P0_3$ |
| RAPI_PORT_0_4 | Port $P0_4$ | RAPI_PORT_0_5 | Port $P0_5$ |
| RAPI_PORT_0_6 | Port $P0_6$ | RAPI_PORT_0_7 | Port $P0_7$ |
| RAPI_PORT_1_0 | Port $P1_0$ | RAPI_PORT_1_1 | Port $P1_1$ |
| RAPI_PORT_1_2 | Port $P1_2$ | RAPI_PORT_1_3 | Port $P1_3$ |
| RAPI_PORT_1_4 | Port $P1_4$ | RAPI_PORT_1_5 | Port $P1_5$ |
| RAPI_PORT_1_6 | Port $P1_6$ | RAPI_PORT_1_7 | Port $P1_7$ |
| RAPI_PORT_2_0 | Port $P2_0$ | RAPI_PORT_2_1 | Port $P2_1$ |
| RAPI_PORT_2_2 | Port $P2_2$ | RAPI_PORT_2_3 | Port $P2_3$ |
| RAPI_PORT_2_4 | Port $P2_4$ | RAPI_PORT_2_5 | Port $P2_5$ |
| RAPI_PORT_2_6 | Port $P2_6$ | RAPI_PORT_2_7 | Port $P2_7$ |
| RAPI_PORT_3_0 | Port $P3_0$ | RAPI_PORT_3_1 | Port $P3_1$ |
| RAPI_PORT_3_2 | Port $P3_2$ | RAPI_PORT_3_3 | Port $P3_3$ |
| RAPI_PORT_3_4 | Port $P3_4$ | RAPI_PORT_3_5 | Port $P3_5$ |
| RAPI_PORT_3_7 | Port $P3_7$ | RAPI_PORT_4_2 | Port $P4_2$ |
| RAPI_PORT_4_3 | Port $P4_3$ | RAPI_PORT_4_4 | Port $P4_4$ |
| RAPI_PORT_4_5 | Port $P4_5$ | RAPI_PORT_4_6 | Port $P4_6$ |
| RAPI_PORT_4_7 | Port $P4_7$ | RAPI_PORT_6_0 | Port $P6_0$ |
| RAPI_PORT_6_1 | Port $P6_1$ | RAPI_PORT_6_2 | Port $P6_2$ |
| RAPI_PORT_6_3 | Port $P6_3$ | RAPI_PORT_6_4 | Port $P6_4$ |
| RAPI_PORT_6_5 | Port $P6_5$ | RAPI_PORT_6_6 | Port $P6_6$ |
| RAPI_PORT_6_7 | Port $P6_7$ | | |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_PORT_1_0 | Port P10 | RAPI_PORT_1_1 | Port P11 |
| RAPI_PORT_1_2 | Port P12 | RAPI_PORT_1_4 | Port P14 |
| RAPI_PORT_1_5 | Port P15 | RAPI_PORT_1_6 | Port P16 |
| RAPI_PORT_1_7 | Port P17 | RAPI_PORT_2_0 | Port P20 |
| RAPI_PORT_2_1 | Port P21 | RAPI_PORT_2_2 | Port P22 |
| RAPI_PORT_2_3 | Port P23 | RAPI_PORT_2_4 | Port P24 |
| RAPI_PORT_2_5 | PortP25 | RAPI_PORT_2_6 | PortP26 |
| RAPI_PORT_2_7 | PortP27 | RAPI_PORT_3_0 | PortP30 |
| RAPI_PORT_3_1 | PortP31 | RAPI_PORT_3_2 | PortP32 |
| RAPI_PORT_3_3 | PortP33 | RAPI_PORT_3_4 | PortP34 |
| RAPI_PORT_3_5 | PortP35 | RAPI_PORT_3_6 | PortP36 |
| RAPI_PORT_3_7 | PortP37 | RAPI_PORT_5_0 | PortP50 |

| | | | |
|---|---|---|---|
| RAPI_PORT_5_1 | PortP51 | RAPI_PORT_5_2 | PortP52 |
| RAPI_PORT_5_3 | PortP53 | RAPI_PORT_5_4 | PortP54 |
| RAPI_PORT_5_5 | PortP55 | RAPI_PORT_5_6 | PortP56 |
| RAPI_PORT_5_7 | PortP57 | RAPI_PORT_6_0 | PortP60 |
| RAPI_PORT_6_1 | PortP61 | RAPI_PORT_6_2 | PortP62 |
| RAPI_PORT_6_3 | PortP63 | RAPI_PORT_6_4 | PortP64 |
| RAPI_PORT_6_5 | PortP65 | RAPI_PORT_6_6 | PortP66 |
| RAPI_PORT_6_7 | PortP67 | RAPI_PORT_7_0 | PortP70 |
| RAPI_PORT_7_1 | PortP71 | RAPI_PORT_7_2 | PortP72 |
| RAPI_PORT_7_4 | PortP74 | RAPI_PORT_7_5 | PortP75 |
| RAPI_PORT_7_6 | PortP76 | RAPI_PORT_7_7 | PortP77 |
| RAPI_PORT_8_0 | PortP80 | RAPI_PORT_8_1 | PortP81 |
| RAPI_PORT_8_2 | PortP82 | RAPI_PORT_8_3 | PortP83 |
| RAPI_PORT_8_4 | PortP84 | RAPI_PORT_8_5 | PortP85 |
| RAPI_PORT_8_6 | PortP86 | RAPI_PORT_8_7 | PortP87 |
| RAPI_PORT_9_0 | PortP90 | RAPI_PORT_9_1 | PortP91 |
| RAPI_PORT_9_2 | PortP92 | RAPI_PORT_9_3 | PortP93 |
| RAPI_PORT_9_4 | PortP94 | RAPI_PORT_9_5 | PortP95 |
| RAPI_PORT_9_6 | PortP96 | RAPI_PORT_9_7 | PortP97 |
| RAPI_PORT_B_0 | PortPB0 | RAPI_PORT_B_1 | PortPB1 |
| RAPI_PORT_B_2 | PortPB2 | RAPI_PORT_B_3 | PortPB3 |
| RAPI_PORT_B_4 | PortPB4 | RAPI_PORT_B_5 | PortPB5 |
| RAPI_PORT_B_6 | PortPB6 | RAPI_PORT_B_7 | PortPB7 |
| RAPI_PORT_C_0 | PortPC0 | RAPI_PORT_C_1 | PortPC1 |
| RAPI_PORT_C_2 | PortPC2 | RAPI_PORT_C_3 | PortPC3 |
| RAPI_PORT_D_0 | PortPD0 | RAPI_PORT_D_1 | PortPD1 |
| RAPI_PORT_D_2 | PortPD2 | RAPI_PORT_D_3 | PortPD3 |
| RAPI_PORT_D_4 | PortPD4 | RAPI_PORT_D_5 | PortPD5 |
| RAPI_PORT_D_6 | PortPD6 | RAPI_PORT_D_7 | PortPD7 |
| RAPI_PORT_E_0 | PortPE0 | RAPI_PORT_E_1 | PortPE1 |
| RAPI_PORT_E_2 | PortPE2 | RAPI_PORT_E_3 | PortPE3 |
| RAPI_PORT_E_4 | PortPE4 | RAPI_PORT_E_5 | PortPE5 |
| RAPI_PORT_E_6 | PortPE6 | RAPI_PORT_E_7 | PortPE7 |
| RAPI_PORT_F_0 | PortPF0 | RAPI_PORT_F_1 | PortPF1 |
| RAPI_PORT_F_2 | PortPF2 | RAPI_PORT_F_3 | PortPF3 |
| RAPI_PORT_F_4 | PortPF4 | RAPI_PORT_F_5 | PortPF5 |
| RAPI_PORT_F_6 | PortPF6 | RAPI_PORT_F_7 | PortPF7 |
| RAPI_PORT_G_0 | PortPG0 | RAPI_PORT_G_1 | PortPG1 |
| RAPI_PORT_G_2 | PortPG2 | RAPI_PORT_G_3 | PortPG3 |
| RAPI_PORT_G_4 | PortPG4 | RAPI_PORT_G_5 | PortPG5 |
| RAPI_PORT_G_6 | PortPG6 | RAPI_PORT_G_7 | PortPG7 |
| RAPI_PORT_H_0 | PortPH0 | RAPI_PORT_H_1 | PortPH1 |
| RAPI_PORT_H_2 | PortPH2 | RAPI_PORT_H_3 | PortPH3 |

| | | | |
|---|---|---|---|
| RAPI_PORT_H_4 | PortPH4 | RAPI_PORT_H_5 | PortPH5 |
| RAPI_PORT_H_6 | PortPH6 | RAPI_PORT_H_7 | PortPH7 |
| RAPI_PORT_J_0 | PortPJ0 | RAPI_PORT_J_1 | PortPJ1 |

**Return value**

If the I/O port specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

I/O port

**Reference**

__SetIOPort, __WriteIOPort, __SetIOPortRegister, __ReadIOPortRegister, __WriteIOPortRegister

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable I/O ports differ with each CPU used.
- Ports in port B of the H8/300H that are used as analog input pins cannot be used as input ports.

**Program example**

```
#include " rapi_io_port_r8c_13.h"

void func( void )
{
    /* Get the value of port P12 */
    __ReadIOPort(RAPI_PORT_1_2, &data );
}
```

## __WriteIOPort

**Synopsis**

<Write to I/O port>

**Boolean __WriteIOPort(unsigned long data1, unsigned int data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Data to be written to I/O port |

**Description**

Writes data to a specified I/O port.

**[data1]**

Specify an I/O port to which data is written. The definition values corresponding to each I/O port are listed below.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_PORT_0_0 | Port $P0_0$ | RAPI_PORT_0_1 | Port $P0_1$ |
| RAPI_PORT_0_2 | Port $P0_2$ | RAPI_PORT_0_3 | Port $P0_3$ |
| RAPI_PORT_0_4 | Port $P0_4$ | RAPI_PORT_0_5 | Port $P0_5$ |
| RAPI_PORT_0_6 | Port $P0_6$ | RAPI_PORT_0_7 | Port $P0_7$ |
| RAPI_PORT_1_0 | Port $P1_0$ | RAPI_PORT_1_1 | Port $P1_1$ |
| RAPI_PORT_1_2 | Port $P1_2$ | RAPI_PORT_1_3 | Port $P1_3$ |
| RAPI_PORT_1_4 | Port $P1_4$ | RAPI_PORT_1_5 | Port $P1_5$ |
| RAPI_PORT_1_6 | Port $P1_6$ | RAPI_PORT_1_7 | Port $P1_7$ |
| RAPI_PORT_2_0 | Port $P2_0$ | RAPI_PORT_2_1 | Port $P2_1$ |
| RAPI_PORT_2_2 | Port $P2_2$ | RAPI_PORT_2_3 | Port $P2_3$ |
| RAPI_PORT_2_4 | Port $P2_4$ | RAPI_PORT_2_5 | Port $P2_5$ |
| RAPI_PORT_2_6 | Port $P2_6$ | RAPI_PORT_2_7 | Port $P2_7$ |
| RAPI_PORT_3_0 | Port $P3_0$ | RAPI_PORT_3_1 | Port $P3_1$ |
| RAPI_PORT_3_2 | Port $P3_2$ | RAPI_PORT_3_3 | Port $P3_3$ |
| RAPI_PORT_3_4 | Port $P3_4$ | RAPI_PORT_3_5 | Port $P3_5$ |
| RAPI_PORT_3_6 | Port $P3_6$ | RAPI_PORT_3_7 | Port $P3_7$ |
| RAPI_PORT_6_0 | Port $P6_0$ | RAPI_PORT_6_1 | Port $P6_1$ |
| RAPI_PORT_6_2 | Port $P6_2$ | RAPI_PORT_6_3 | Port $P6_3$ |
| RAPI_PORT_6_4 | Port $P6_4$ | RAPI_PORT_6_5 | Port $P6_5$ |
| RAPI_PORT_6_6 | Port $P6_6$ | RAPI_PORT_6_7 | Port $P6_7$ |
| RAPI_PORT_7_0 | Port $P7_0$ | RAPI_PORT_7_1 | Port $P7_1$ |
| RAPI_PORT_7_2 | Port $P7_2$ | RAPI_PORT_7_3 | Port $P7_3$ |
| RAPI_PORT_7_4 | Port $P7_4$ | RAPI_PORT_7_5 | Port $P7_5$ |
| RAPI_PORT_7_6 | Port $P7_6$ | RAPI_PORT_7_7 | Port $P7_7$ |
| RAPI_PORT_8_0 | Port $P8_0$ | RAPI_PORT_8_1 | Port $P8_1$ |
| RAPI_PORT_8_2 | Port $P8_2$ | RAPI_PORT_8_3 | Port $P8_3$ |
| RAPI_PORT_8_4 | Port $P8_4$ | RAPI_PORT_8_5 | Port $P8_5$ |
| RAPI_PORT_8_6 | Port $P8_6$ | RAPI_PORT_8_7 | Port $P8_7$ |
| RAPI_PORT_9_0 | Port $P9_0$ | RAPI_PORT_9_1 | Port $P9_1$ |
| RAPI_PORT_9_2 | Port $P9_2$ | RAPI_PORT_9_3 | Port $P9_3$ |

| | | | |
|---|---|---|---|
| RAPI_PORT_9_5 | Port $P9_5$ | RAPI_PORT_9_6 | Port $P9_6$ |
| RAPI_PORT_9_7 | Port $P9_7$ | RAPI_PORT_10_0 | Port $P10_0$ |
| RAPI_PORT_10_1 | Port $P10_1$ | RAPI_PORT_10_2 | Port $P10_2$ |
| RAPI_PORT_10_3 | Port $P10_3$ | RAPI_PORT_10_4 | Port $P10_4$ |
| RAPI_PORT_10_5 | Port $P10_5$ | RAPI_PORT_10_6 | Port $P10_6$ |
| RAPI_PORT_10_7 | Port $P10_7$ | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_PORT_0_0 | Port $P0_0$ | RAPI_PORT_0_1 | Port $P0_1$ |
| RAPI_PORT_0_2 | Port $P0_2$ | RAPI_PORT_0_3 | Port $P0_3$ |
| RAPI_PORT_0_4 | Port $P0_4$ | RAPI_PORT_0_5 | Port $P0_5$ |
| RAPI_PORT_0_6 | Port $P0_6$ | RAPI_PORT_0_7 | Port $P0_7$ |
| RAPI_PORT_1_0 | Port $P1_0$ | RAPI_PORT_1_1 | Port $P1_1$ |
| RAPI_PORT_1_2 | Port $P1_2$ | RAPI_PORT_1_3 | Port $P1_3$ |
| RAPI_PORT_1_4 | Port $P1_4$ | RAPI_PORT_1_5 | Port $P1_5$ |
| RAPI_PORT_1_6 | Port $P1_6$ | RAPI_PORT_1_7 | Port $P1_7$ |
| RAPI_PORT_2_0 | Port $P2_0$ | RAPI_PORT_2_1 | Port $P2_1$ |
| RAPI_PORT_2_2 | Port $P2_2$ | RAPI_PORT_2_3 | Port $P2_3$ |
| RAPI_PORT_2_4 | Port $P2_4$ | RAPI_PORT_2_5 | Port $P2_5$ |
| RAPI_PORT_2_6 | Port $P2_6$ | RAPI_PORT_2_7 | Port $P2_7$ |
| RAPI_PORT_3_0 | Port $P3_0$ | RAPI_PORT_3_1 | Port $P3_1$ |
| RAPI_PORT_3_2 | Port $P3_2$ | RAPI_PORT_3_3 | Port $P3_3$ |
| RAPI_PORT_3_4 | Port $P3_4$ | RAPI_PORT_3_5 | Port $P3_5$ |
| RAPI_PORT_3_7 | Port $P3_7$ | RAPI_PORT_4_3 | Port $P4_3$ |
| RAPI_PORT_4_4 | Port $P4_4$ | RAPI_PORT_4_5 | Port $P4_5$ |
| RAPI_PORT_6_0 | Port $P6_0$ | RAPI_PORT_6_1 | Port $P6_1$ |
| RAPI_PORT_6_2 | Port $P6_2$ | RAPI_PORT_6_3 | Port $P6_3$ |
| RAPI_PORT_6_4 | Port $P6_4$ | RAPI_PORT_6_5 | Port $P6_5$ |
| RAPI_PORT_6_6 | Port $P6_6$ | RAPI_PORT_6_7 | Port $P6_7$ |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_PORT_1_0 | Port P10 | RAPI_PORT_1_1 | Port P11 |
| RAPI_PORT_1_2 | Port P12 | RAPI_PORT_1_4 | Port P14 |
| RAPI_PORT_1_5 | Port P15 | RAPI_PORT_1_6 | Port P16 |
| RAPI_PORT_1_7 | Port P17 | RAPI_PORT_2_0 | Port P20 |
| RAPI_PORT_2_1 | Port P21 | RAPI_PORT_2_2 | Port P22 |
| RAPI_PORT_2_3 | Port P23 | RAPI_PORT_2_4 | Port P24 |
| RAPI_PORT_2_5 | PortP25 | RAPI_PORT_2_6 | PortP26 |
| RAPI_PORT_2_7 | PortP27 | RAPI_PORT_3_0 | PortP30 |
| RAPI_PORT_3_1 | PortP31 | RAPI_PORT_3_2 | PortP32 |
| RAPI_PORT_3_3 | PortP33 | RAPI_PORT_3_4 | PortP34 |
| RAPI_PORT_3_5 | PortP35 | RAPI_PORT_3_6 | PortP36 |
| RAPI_PORT_3_7 | PortP37 | RAPI_PORT_5_0 | PortP50 |
| RAPI_PORT_5_1 | PortP51 | RAPI_PORT_5_2 | PortP52 |
| RAPI_PORT_5_3 | PortP53 | RAPI_PORT_5_4 | PortP54 |

| | | | |
|---|---|---|---|
| RAPI_PORT_5_5 | PortP55 | RAPI_PORT_5_6 | PortP56 |
| RAPI_PORT_5_7 | PortP57 | RAPI_PORT_6_0 | PortP60 |
| RAPI_PORT_6_1 | PortP61 | RAPI_PORT_6_2 | PortP62 |
| RAPI_PORT_6_3 | PortP63 | RAPI_PORT_6_4 | PortP64 |
| RAPI_PORT_6_5 | PortP65 | RAPI_PORT_6_6 | PortP66 |
| RAPI_PORT_6_7 | PortP67 | RAPI_PORT_7_0 | PortP70 |
| RAPI_PORT_7_1 | PortP71 | RAPI_PORT_7_2 | PortP72 |
| RAPI_PORT_7_4 | PortP74 | RAPI_PORT_7_5 | PortP75 |
| RAPI_PORT_7_6 | PortP76 | RAPI_PORT_7_7 | PortP77 |
| RAPI_PORT_8_0 | PortP80 | RAPI_PORT_8_1 | PortP81 |
| RAPI_PORT_8_2 | PortP82 | RAPI_PORT_8_3 | PortP83 |
| RAPI_PORT_8_4 | PortP84 | RAPI_PORT_8_5 | PortP85 |
| RAPI_PORT_8_6 | PortP86 | RAPI_PORT_8_7 | PortP87 |
| RAPI_PORT_9_0 | PortP90 | RAPI_PORT_9_1 | PortP91 |
| RAPI_PORT_9_2 | PortP92 | RAPI_PORT_9_3 | PortP93 |
| RAPI_PORT_9_4 | PortP94 | RAPI_PORT_9_5 | PortP95 |
| RAPI_PORT_9_6 | PortP96 | RAPI_PORT_9_7 | PortP97 |
| RAPI_PORT_C_0 | PortPC0 | RAPI_PORT_C_1 | PortPC1 |
| RAPI_PORT_C_2 | PortPC2 | RAPI_PORT_C_3 | PortPC3 |
| RAPI_PORT_D_0 | PortPD0 | RAPI_PORT_D_1 | PortPD1 |
| RAPI_PORT_D_2 | PortPD2 | RAPI_PORT_D_3 | PortPD3 |
| RAPI_PORT_D_4 | PortPD4 | RAPI_PORT_D_5 | PortPD5 |
| RAPI_PORT_D_6 | PortPD6 | RAPI_PORT_D_7 | PortPD7 |
| RAPI_PORT_E_0 | PortPE0 | RAPI_PORT_E_1 | PortPE1 |
| RAPI_PORT_E_2 | PortPE2 | RAPI_PORT_E_3 | PortPE3 |
| RAPI_PORT_E_4 | PortPE4 | RAPI_PORT_E_5 | PortPE5 |
| RAPI_PORT_E_6 | PortPE6 | RAPI_PORT_E_7 | PortPE7 |
| RAPI_PORT_G_0 | PortPG0 | RAPI_PORT_G_1 | PortPG1 |
| RAPI_PORT_G_2 | PortPG2 | RAPI_PORT_G_3 | PortPG3 |
| RAPI_PORT_G_4 | PortPG4 | RAPI_PORT_G_5 | PortPG5 |
| RAPI_PORT_G_6 | PortPG6 | RAPI_PORT_G_7 | PortPG7 |
| RAPI_PORT_H_0 | PortPH0 | RAPI_PORT_H_1 | PortPH1 |
| RAPI_PORT_H_2 | PortPH2 | RAPI_PORT_H_3 | PortPH3 |
| RAPI_PORT_H_4 | PortPH4 | RAPI_PORT_H_5 | PortPH5 |
| RAPI_PORT_H_6 | PortPH6 | RAPI_PORT_H_7 | PortPH7 |
| RAPI_PORT_J_0 | PortPJ0 | RAPI_PORT_J_1 | PortPJ1 |

**Return value**

If the I/O port specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

I/O port

**Reference**

SetIOPort, ReadIOPort, SetIOPortRegister, ReadIOPortRegister,

__WriteIOPortRegister

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable I/O ports differ with each CPU used.

**Program example**

```
#include " rapi_io_port_r8c_13.h"

void func( void )
{
    unsigned int data;

    /* Set the data to port P05 */
    __WriteIOPort( RAPI_PORT_0_5, 0 );
}
```

## __SetIOPortRegister

**Synopsis**

<Set I/O port register>

**Boolean __SetIOPortRegister(unsigned long data1, unsigned int data2, unsigned int data3, unsigned int data4)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |
| data3 | Setup data 3 (content differs with MCU type) |
| data4 | Setup data 4 (content differs with MCU type) |

**Description**

**[data1]**

Set the operating condition of a specified I/O port in each relevant register.

(M16C)

The definition values corresponding to each I/O port register are listed below.

| | | | |
|---|---|---|---|
| RAPI_PORT_0 | Port P0 register | RAPI_PORT_1 | Port P1 register |
| RAPI_PORT_2 | Port P2 register | RAPI_PORT_3 | Port P3 register |
| RAPI_PORT_6 | Port P6 register | RAPI_PORT_7 | Port P7 register |
| RAPI_PORT_8 | Port P8 register | RAPI_PORT_9 | Port P9 register |
| RAPI_PORT_10 | Port P10 register | | |

The definition values related to port settings are described below.

| | |
|---|---|
| RAPI_LATCH | Set to read the port latch regardless of whether the port is set for input or output. Specifiable only when port P1 is used. |

(R8C)

The definition values corresponding to each I/O port register are listed below.

| | | | |
|---|---|---|---|
| RAPI_PORT_0 | Port P0 register | RAPI_PORT_1 | Port P1 register |
| RAPI_PORT_2 | Port P2 register | RAPI_PORT_3 | Port P3 register |
| RAPI_PORT_4 | Port P4 register | RAPI_PORT_6 | Port P6 register |

(H8/300H)

The definition values corresponding to each I/O port register are listed below.

| | | | |
|---|---|---|---|
| RAPI_PORT_1 | Port P1 register | RAPI_PORT_2 | Port P2 register |
| RAPI_PORT_3 | Port P3 register | RAPI_PORT_5 | Port P5 register |
| RAPI_PORT_6 | Port P6 register | RAPI_PORT_7 | Port P7 register |
| RAPI_PORT_8 | Port P8 register | RAPI_PORT_9 | Port P9 register |
| RAPI_PORT_C | Port PC register | RAPI_PORT_D | Port PD register |
| RAPI_PORT_E | Port PE register | RAPI_PORT_F | Port PF register |
| RAPI_PORT_G | Port PG register | RAPI_PORT_H | Port PH register |
| RAPI_PORT_J | Port PJ register | | |

**[data2]**

(M16C) (R8C)

Specify the set value for the port direction register corresponding to a selected port.

(H8/300H)

Specify the set value for the port control register corresponding to a selected port.

**[data3]**

(M16C) (R8C)

Specify the set value for the pullup control register corresponding to a selected port.

(H8/300H)

Specify the set value for the pullup control register corresponding to a selected port.

**[data4]**

(M16C)

Specify the digital filter width of the digital debounce facility assigned to _NMI/_SD. Specifiable only when port P8 is used.

Specify the digital filter width of the digital debounce facility assigned to INPC17/_INT5. Specifiable only when port P1 is used.

When using any other port, set 0 for this data.

(R8C)

Specify the set value for the port P1 drive capacity register. Specifiable only when port P1 is used.

When using any other port, set 0 for this data.

(H8/300H)

Specify 0.

**Return value**

If the I/O port register specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

I/O port

**Reference**

__SetIOPort, __ReadIOPort, __WriteIOPort, __ReadIOPortRegister, __WriteIOPortRegister

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable I/O port registers differ with each CPU used.

**Program example**

```
#include " rapi_io_port_r8c_13.h"

void func( void )
{
    /* Set inputs/outputs of port P1 register */
    __SetIOPortRegister(RAPI_PORT_1, 0xAA, 0, 0 );
}
```

## __ReadIOPortRegister

**Synopsis**

<Read from I/O port register>

**Boolean __ReadIOPortRegister(unsigned long data1, unsigned int *data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Pointer to the variable in which the value read from I/O port register is stored. |

**Description**

Gets the value of a specified I/O port from each relevant register.

**[data1]**

Specify an I/O port register from which data is read. The definition values corresponding to each I/O port register are listed below.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_PORT_0 | Port P0 register | RAPI_PORT_1 | Port P1 register |
| RAPI_PORT_2 | Port P2 register | RAPI_PORT_3 | Port P3 register |
| RAPI_PORT_6 | Port P6 register | RAPI_PORT_7 | Port P7 register |
| RAPI_PORT_8 | Port P8 register | RAPI_PORT_9 | Port P9 register |
| RAPI_PORT_10 | Port P10 register | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_PORT_0 | Port P0 register | RAPI_PORT_1 | Port P1 register |
| RAPI_PORT_2 | Port P2 register | RAPI_PORT_3 | Port P3 register |
| RAPI_PORT_4 | Port P4 register | RAPI_PORT_6 | Port P6 register |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_PORT_1 | Port P1 register | RAPI_PORT_2 | Port P2 register |
| RAPI_PORT_3 | Port P3 register | RAPI_PORT_5 | Port P5 register |
| RAPI_PORT_6 | Port P6 register | RAPI_PORT_7 | Port P7 register |
| RAPI_PORT_8 | Port P8 register | RAPI_PORT_9 | Port P9 register |
| RAPI_PORT_B | Port PB register | RAPI_PORT_C | Port PC register |
| RAPI_PORT_D | Port PD register | RAPI_PORT_E | Port PE register |
| RAPI_PORT_F | Port PF register | RAPI_PORT_G | Port PG register |
| RAPI_PORT_H | Port PH register | RAPI_PORT_J | Port PJ register |

**Return value**

If the I/O port register specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

I/O port

**Reference**

__SetIOPort, __ReadIOPort, __WriteIOPort, __SetIOPortRegister, __WriteIOPortRegister

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable I/O port registers differ with each CPU used.

- Ports in port B of the H8/300H that are used as analog input pins cannot be used as input ports.

**Program example**

```
#include " rapi_io_port_r8c_13.h"

void func( void )
{
    unsigned int data;

    /* Get the value of port P1 register */
    __ReadIOPortRegister( RAPI_PORT_1, &data );
}
```

## __WriteIOPortRegister

**Synopsis**

<Write to I/O port register>

**Boolean __WriteIOPortRegister(unsigned long data1, unsigned int data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Data to be written to I/O port register |

**Description**

Writes the value for a specified I/O port to each relevant register.

**[data1]**

Specify an I/O port register to which data is written. The definition values corresponding to each I/O port register are listed below.

(M16C)

| | | | |
|---|---|---|---|
| RAPI_PORT_0 | Port P0 register | RAPI_PORT_1 | Port P1 register |
| RAPI_PORT_2 | Port P2 register | RAPI_PORT_3 | Port P3 register |
| RAPI_PORT_6 | Port P6 register | RAPI_PORT_7 | Port P7 register |
| RAPI_PORT_8 | Port P8 register | RAPI_PORT_9 | Port P9 register |
| RAPI_PORT_10 | Port P10 register | | |

(R8C)

| | | | |
|---|---|---|---|
| RAPI_PORT_0 | Port P0 register | RAPI_PORT_1 | Port P1 register |
| RAPI_PORT_2 | Port P2 register | RAPI_PORT_3 | Port P3 register |
| RAPI_PORT_4 | Port P4 register | RAPI_PORT_6 | Port P6 register |

(H8/300H)

| | | | |
|---|---|---|---|
| RAPI_PORT_1 | Port P1 register | RAPI_PORT_2 | Port P2 register |
| RAPI_PORT_3 | Port P3 register | RAPI_PORT_5 | Port P5 register |
| RAPI_PORT_6 | Port P6 register | RAPI_PORT_7 | Port P7 register |
| RAPI_PORT_8 | Port P8 register | RAPI_PORT_9 | Port P9 register |
| RAPI_PORT_B | Port PB register | RAPI_PORT_C | Port PC register |
| RAPI_PORT_D | Port PD register | RAPI_PORT_E | Port PE register |
| RAPI_PORT_F | Port PF register | RAPI_PORT_G | Port PG register |
| RAPI_PORT_H | Port PH register | RAPI_PORT_J | Port PJ register |

**Return value**

If the I/O port register specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

I/O port

**Reference**

__SetIOPort, __ReadIOPort, __WriteIOPort, __SetIOPortRegister, __ReadIOPortRegister

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable I/O port registers differ with each CPU used.

**Program example**

```
#include " rapi_io_port_r8c_13.h"

void func( void )
{
    /* Set the data to port P1 register */
    __WriteIOPortRegister( RAPI_PORT_1, 0xFF );
}
```

### 4.2.4 External interrupt
### __SetInterrupt

**Synopsis**

<Set external interrupt>

**Boolean __SetInterrupt(unsigned long data1, unsigned int data2, void* func)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |
| func | Callback function pointer<br>(Specify 0 if no callback functions are set.) |

**Description**

Sets a specified external interrupt.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value. Note, however, that multiple external interrupts cannot be specified at the same time.

(M16C)

| | |
|---|---|
| RAPI_INT0 | Uses _INT0 interrupt. |
| RAPI_INT1 | Uses _INT1 interrupt. |
| RAPI_INT2 | Uses _INT2 interrupt. |
| RAPI_INT3 | Uses _INT3 interrupt. |
| RAPI_INT4 | Uses _INT4 interrupt. |
| RAPI_INT5 | Uses _INT5 interrupt. |
| RAPI_KEY | Uses key input interrupt. |
| RAPI_INT_RISING | Specifies a rising edge for the active edge of a selected external interrupt. |
| RAPI_INT_FALLING | Specifies a falling edge for the active edge of a selected external interrupt. |
| RAPI_INT_BOTH | Specifies both edges for the active edge of a selected external interrupt. |
| RAPI_KI0_ENABLE | Uses _KI0 pin input. |
| RAPI_KI1_ENABLE | Uses _KI1 pin input. |
| RAPI_KI2_ENABLE | Uses _KI2 pin input. |
| RAPI_KI3_ENABLE | Uses _KI3 pin input. |

**• Specifiable definition values when _INT0-5 interrupts are used (RAPI_INT0 to RAPI_INT5 specified)**

(Polarity) Specify one from { RAPI_INT_RISING, RAPI_INT_FALLING, RAPI_INT_BOTH }. The default value is RAPI_INT_FALLING.

**• Specifiable definition values when key input interrupt is used (RAPI_KEY specified)**

(Input pin) To use _KI0, _KI1, _KI2, or _KI3 pin input, specify RAPI_KI0_ENABLE, RAPI_KI1_ENABLE, RAPI_KI2_ENABLE, or RAPI_KI3_ENABLE, respectively. The default value is RAPI_INT_FALLING.

(R8C)

| | |
|---|---|
| RAPI_INT0 | Uses _INT0 interrupt. |
| RAPI_INT1 | Uses _INT1 interrupt. |

| | |
|---|---|
| RAPI_INT2 | Uses _INT2 interrupt. |
| RAPI_INT3 | Uses _INT3 interrupt. |
| RAPI_KEY | Uses key input interrupt. |
| RAPI_INT_RISING | Specifies a rising edge for the active edge of a selected external interrupt. |
| RAPI_INT_FALLING | Specifies a falling edge for the active edge of a selected external interrupt. |
| RAPI_INT_BOTH | Specifies both edges for the active edge of a selected external interrupt. |
| RAPI_FILTER_F1 | Uses the digital filter facility that has a sampling frequency $f_1$. |
| RAPI_FILTER_F8 | Uses the digital filter facility that has a sampling frequency $f_8$. |
| RAPI_FILTER_F32 | Uses the digital filter facility that has a sampling frequency $f_{32}$. |
| RAPI_KI0_FALLING | Enables _KI0 pin input whose falling edge is the active edge. |
| RAPI_KI0_RISING | Enables _KI0 pin input whose rising edge is the active edge. |
| RAPI_KI1_FALLING | Enables _KI1 pin input whose falling edge is the active edge. |
| RAPI_KI1_RISING | Enables _KI1 pin input whose rising edge is the active edge. |
| RAPI_KI2_FALLING | Enables _KI2 pin input whose falling edge is the active edge. |
| RAPI_KI2_RISING | Enables _KI2 pin input whose rising edge is the active edge. |
| RAPI_KI3_FALLING | Enables _KI3 pin input whose falling edge is the active edge. |
| RAPI_KI3_RISING | Enables _KI3 pin input whose rising edge is the active edge. |

**• Specifiable definition values when _INT0 to _INT3 interrupt is used (RAPI_INT0 to RAPI_INT3 specified)**

(Polarity) Specify one from { RAPI_INT_RISING, RAPI_INT_FALLING, RAPI_INT_BOTH }. The default value is RAPI_INT_FALLING.

(Filter) Specify one from { RAPI_FILTER_F1, RAPI_FILTER_F8, RAPI_FILTER_F32 }. If no filters are specified, “No filter” is set.

**• Specifiable definition values when key input interrupt is used (RAPI_KEY specified)**

(_KI0 pin input) Specify one from { RAPI_KI0_FALLING, RAPI_KI0_RISING }. If _KI0 pin input is not specified, “_KI0 pin input disabled” is set.

(_KI1 pin input) Specify one from { RAPI_KI1_FALLING, RAPI_KI1_RISING }. If _KI1 pin input is not specified, “_KI1 pin input disabled” is set.

(_KI2 pin input) Specify one from { RAPI_KI2_FALLING, RAPI_KI2_RISING }. If _KI2 pin input is not specified, “_KI2 pin input disabled” is set.

(_KI3 pin input) Specify one from { RAPI_KI3_FALLING, RAPI_KI3_RISING }. If _KI3 pin input is not specified, “_KI3 pin input disabled” is set.

(H8/300H)

| | |
|---|---|
| RAPI_IRQ0 | Uses IRQ0 interrupt. |
| RAPI_IRQ1 | Uses IRQ1 interrupt. |
| RAPI_IRQ2 | Uses IRQ2 interrupt. |
| RAPI_IRQ3 | Uses IRQ3 interrupt. |
| RAPI_WKP | Uses WKP interrupt. |
| RAPI_NOT_INT_ REQUEST | Does not request assertion of interrupt for a selected external interrupt. |
| RAPI_INT_REQUEST | Requests assertion of interrupt for a selected external interrupt. |

| | |
|---|---|
| RAPI_INT_RISING | Specifies a rising edge for the active edge of a selected external interrupt. |
| RAPI_INT_FALLING | Specifies a falling edge for the active edge of a selected external interrupt. |
| RAPI_WKP0_FALLING | Enables _WKP0 pin input whose falling edge is the active edge. |
| RAPI_WKP0_RISING | Enables _WKP0 pin input whose rising edge is the active edge. |
| RAPI_WKP1_FALLING | Enables _WKP1 pin input whose falling edge is the active edge. |
| RAPI_WKP1_RISING | Enables _WKP1 pin input whose rising edge is the active edge. |
| RAPI_WKP2_FALLING | Enables _WKP2 pin input whose falling edge is the active edge. |
| RAPI_WKP2_RISING | Enables _WKP2 pin input whose rising edge is the active edge. |
| RAPI_WKP3_FALLING | Enables _WKP3 pin input whose falling edge is the active edge. |
| RAPI_WKP3_RISING | Enables _WKP3 pin input whose rising edge is the active edge. |
| RAPI_WKP4_FALLING | Enables _WKP4 pin input whose falling edge is the active edge. |
| RAPI_WKP4_RISING | Enables _WKP4 pin input whose rising edge is the active edge. |
| RAPI_WKP5_FALLING | Enables _WKP5 pin input whose falling edge is the active edge. |
| RAPI_WKP5_RISING | Enables _WKP5 pin input whose rising edge is the active edge. |

**• Specifiable definition values when _IRQ0–3 interrupts are used (RAPI_IRQ0 to RAPI_IRQ3 specified)**

(Polarity) Specify one from { RAPI_INT_RISING, RAPI_INT_FALLING }. The default value is RAPI_INT_FALLING.

(Interrupt request) Specify one from { RAPI_NOT_INT_REQUEST, RAPI_INT_REQUEST }. The default value is RAPI_NOT_INT_REQUEST.

**• Specifiable definition values when WKP interrupt is used (RAPI_WKP specified)**

(_WKP0 pin input) Specify one from { RAPI_WKP0_FALLING, RAPI_WKP0_RISING }. If _WKP0 pin input is not specified, "_WKP0 pin input disabled" is set.

(_WKP1 pin input) Specify one from { RAPI_WKP1_FALLING, RAPI_WKP1_RISING }. If _WKP1 pin input is not specified, "_WKP1 pin input disabled" is set.

(_WKP pin input) Specify one from { RAPI_WKP2_FALLING, RAPI_WKP2_RISING }. If _WKP2 pin input is not specified, "_WKP2 pin input disabled" is set.

(_WKP3 pin input) Specify one from { RAPI_WKP3_FALLING, RAPI_WKP3_RISING }. If _WKP3 pin input is not specified, "_WKP3 pin input disabled" is set.

(_WKP4 pin input) Specify one from { RAPI_WKP4_FALLING, RAPI_WKP4_RISING }. If _WKP4 pin input is not specified, "_WKP4 pin input disabled" is set.

(_WKP5 pin input) Specify one from { RAPI_WKP5_FALLING, RAPI_WKP5_RISING }. If _WKP5 pin input is not specified, "_WKP5 pin input disabled" is set.

**[data2]**

(M16C) (R8C)

Specify the interrupt priority level (0-7) to be set in the interrupt control register.

(H8/300H)

Specify the interrupt priority level (0–1) to be set in the interrupt control register. For the CPUs that do not have an interrupt control register, specify 0.

**Return value** If the external interrupt specification is incorrect, RAPI_FALSE is returned; otherwise,

RAPI_TRUE is returned.

**Functionality**

External interrupt

**Reference**

__EnableInterrupt, __GetInterruptFlag, __ClearInterruptFlag

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable external interrupts differ with each CPU used.
- For the R8C, if its CPU type is the one that does not accept specification of “both edges” for interrupts to INT2 and INT3, RAPI_INT_BOTH cannot be specified for INT2 and INT3.

**Program example**

```
#include " rapi_interrupt_r8c_13.h"

void IntFunc( void ){}

void func( void )
{
    /* Set up _INT0 interrupt */
    __SetInterrupt( RAPI_INT0|RAPI_INT_FALLING, 0, IntFunc );
}
```

## __EnableInterrupt

**Synopsis**

<Control external interrupt>

**Boolean __EnableInterrupt(unsigned long data1, unsigned int data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Setup data 2 (content differs with MCU type) |

**Description**

Changes the operating condition of a specified external interrupt.

**[data1]**

The following definition values can be set for data1. To specify multiple definition values at the same time, use the symbol "|" to separate each specified value. Note, however, that multiple external interrupts cannot be specified at the same time.

(M16C)

| | |
|---|---|
| RAPI_INT0 | Uses _INT0 interrupt. |
| RAPI_INT1 | Uses _INT1 interrupt. |
| RAPI_INT2 | Uses _INT2 interrupt. |
| RAPI_INT3 | Uses _INT3 interrupt. |
| RAPI_INT4 | Uses _INT4 interrupt. |
| RAPI_INT5 | Uses _INT5 interrupt. |
| RAPI_KEY | Uses key input interrupt. |

(R8C)

| | |
|---|---|
| RAPI_INT0 | Uses _INT0 interrupt. |
| RAPI_INT1 | Uses _INT1 interrupt. |
| RAPI_INT2 | Uses _INT2 interrupt. |
| RAPI_INT3 | Uses _INT3 interrupt. |
| RAPI_KEY | Uses key input interrupt. |

(H8/300H)

| | |
|---|---|
| RAPI_IRQ0 | Uses IRQ0 interrupt. |
| RAPI_IRQ1 | Uses IRQ1 interrupt. |
| RAPI_IRQ2 | Uses IRQ2 interrupt. |
| RAPI_IRQ3 | Uses IRQ3 interrupt. |
| RAPI_WKP | Uses WKP interrupt. |
| RAPI_NOT_INT_ REQUEST | Does not request assertion of interrupt for a selected external interrupt. (Default) |
| RAPI_INT_REQUEST | Requests assertion of interrupt for a selected external interrupt. |

**[data2]**

(M16C) (R8C)

Specify the interrupt priority level (0-7) to be set in the interrupt control register.

(H8/300H)

Specify the interrupt priority level (0–1) to be set in the interrupt control register. For the CPUs that do not have an interrupt control register, specify 0.

**Return value**

If the external interrupt specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

External interrupt

**Reference**

__SetInterrupt, __GetInterruptFlag, __ClearInterruptFlag

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable external interrupts differ with each CPU used.

**Program example**

```
#include " rapi_interrupt_r8c_13.h"

void func( void )
{
    /* Activate _INT1 interrupt ( interrupt priority level 5 ) */
    __EnableInterrupt(RAPI_INT1, 5 );
}
```

## __GetInterruptFlag

**Synopsis**

<Get the status of external interrupt flag>

**Boolean __GetInterruptFlag(unsigned long data1, unsigned int *data2))**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Pointer to the buffer in which the acquired flag data is stored |

**Description**

Gets the value of interrupt request flag of a specified external interrupt.

**[data1]**

(M16C)

| | |
|---|---|
| RAPI_INT0 | Uses _INT0 interrupt. |
| RAPI_INT1 | Uses _INT1 interrupt. |
| RAPI_INT2 | Uses _INT2 interrupt. |
| RAPI_INT3 | Uses _INT3 interrupt. |
| RAPI_INT4 | Uses _INT4 interrupt. |
| RAPI_INT5 | Uses _INT5 interrupt. |
| RAPI_KEY | Uses key input interrupt. |

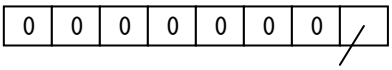
(R8C)

| | |
|---|---|
| RAPI_INT0 | Uses _INT0 interrupt. |
| RAPI_INT1 | Uses _INT1 interrupt. |
| RAPI_INT2 | Uses _INT2 interrupt. |
| RAPI_INT3 | Uses _INT3 interrupt. |
| RAPI_KEY | Uses key input interrupt. |

(H8/300H)

| | |
|---|---|
| RAPI_IRQ0 | Uses IRQ0 interrupt. |
| RAPI_IRQ1 | Uses IRQ1 interrupt. |
| RAPI_IRQ2 | Uses IRQ2 interrupt. |
| RAPI_IRQ3 | Uses IRQ3 interrupt. |
| RAPI_WKP0 | Uses WKP0 interrupt. |
| RAPI_WKP1 | Uses WKP1 interrupt. |
| RAPI_WKP2 | Uses WKP2 interrupt. |
| RAPI_WKP3 | Uses WKP3 interrupt. |
| RAPI_WKP4 | Uses WKP4 interrupt. |
| RAPI_WKP5 | Uses WKP5 interrupt. |

**[data2]**




Value of interrupt request flag (0: Interrupt not requested; 1: Interrupt requested)

**Return value**

If the external interrupt specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality** External interrupt

**Reference** __SetInterrupt, __EnableInterrupt, __ClearInterruptFlag

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable external interrupts differ with each CPU used.

**Program example**

```
#include " rapi_interrupt_r8c_13.h"

void func( void )
{
    unsigned char data;

    /* Get flag of _INT2 interrupt */
    __GetInterruptFlag( IS_INT2, &data );
}
```

## __ClearInterruptFlag

**Synopsis**

<Clear external interrupt flag>

**Boolean __ClearInterruptFlag(unsigned long data)**

| | |
|---|---|
| data | Setup data (content differs with MCU type) |

**Description**

Clears the interrupt request flag of a specified external interrupt.

**[data]**

(M16C)

| | |
|---|---|
| RAPI_INT0 | Uses _INT0 interrupt. |
| RAPI_INT1 | Uses _INT1 interrupt. |
| RAPI_INT2 | Uses _INT2 interrupt. |
| RAPI_INT3 | Uses _INT3 interrupt. |
| RAPI_INT4 | Uses _INT4 interrupt. |
| RAPI_INT5 | Uses _INT5 interrupt. |
| RAPI_KEY | Uses key input interrupt. |

(R8C)

| | |
|---|---|
| RAPI_INT0 | Uses _INT0 interrupt. |
| RAPI_INT1 | Uses _INT1 interrupt. |
| RAPI_INT2 | Uses _INT2 interrupt. |
| RAPI_INT3 | Uses _INT3 interrupt. |
| RAPI_KEY | Uses key input interrupt. |

(H8/300H)

| | |
|---|---|
| RAPI_IRQ0 | Uses IRQ0 interrupt. |
| RAPI_IRQ1 | Uses IRQ1 interrupt. |
| RAPI_IRQ2 | Uses IRQ2 interrupt. |
| RAPI_IRQ3 | Uses IRQ3 interrupt. |
| RAPI_WKP0 | Uses WKP0 interrupt. |
| RAPI_WKP1 | Uses WKP1 interrupt. |
| RAPI_WKP2 | Uses WKP2 interrupt. |
| RAPI_WKP3 | Uses WKP3 interrupt. |
| RAPI_WKP4 | Uses WKP4 interrupt. |
| RAPI_WKP5 | Uses WKP5 interrupt. |

**Return value**

If the external interrupt specification is incorrect, RAPI_FALSE is returned; otherwise, RAPI_TRUE is returned.

**Functionality**

External interrupt

**Reference**

__SetInterrupt, __EnableInterrupt, __GetInterruptFlag

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot

be guaranteed.

- The specifiable external interrupts differ with each CPU used.

**Program example**

```
#include " rapi_interrupt_r8c_13.h"

void func( void )
{
    /* Clear status of _INT0 interrupt */
    __ClearInterruptFlag( RAPI_INT0 );
}
```

### 4.2.5 A/D converter
### __CreateADC

**Synopsis**

<Set A/D converter>

**Boolean __CreateADC(unsigned long data1, unsigned int data2, unsigned int data3, void* func)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Number of analog input pins used by A/D converter (differs with MCU type) |
| data3 | Setup data 3 (content differs with MCU type) |
| func | Callback function pointer<br>(Specify 0 if no callback functions are set.) |

**Description**

Sets the A/D converter to specified mode and operating condition.

**[data1]**

For data1, the following definition values can be set. To set multiple definition values at the same time, use the symbol "|" to separate each specified value. Note, however, that multiple analog input pin symbols cannot be specified at the same time.

(M16C)

| | |
|---|---|
| RAPI_ONE_SHOT | Selects one-shot mode. |
| RAPI_REPEAT | Selects repeat mode. |
| RAPI_SINGLE_SWEEP | Selects single sweep mode. |
| RAPI_REPEAT_SWEEP0 | Selects repeat sweep mode 0. |
| RAPI_REPEAT_SWEEP1 | Selects repeat sweep mode 1. |
| RAPI_SIMULTANEOUS_<br>SAMPLE_SWEEP | Selects simultaneous sampling sweep mode. |
| RAPI_DELAYED_TRIGGER0 | Selects delayed trigger mode 0. |
| RAPI_DELAYED_TRIGGER1 | Selects delayed trigger mode 1. |
| RAPI_AN0 | Uses $AN_0$ pin for the analog input pin. |
| RAPI_AN1 | Uses $AN_1$ pin for the analog input pin. |
| RAPI_AN2 | Uses $AN_2$ pin for the analog input pin. |
| RAPI_AN3 | Uses $AN_3$ pin for the analog input pin. |
| RAPI_AN4 | Uses $AN_4$ pin for the analog input pin. |
| RAPI_AN5 | Uses $AN_5$ pin for the analog input pin. |
| RAPI_AN6 | Uses $AN_6$ pin for the analog input pin. |
| RAPI_AN7 | Uses $AN_7$ pin for the analog input pin. |
| RAPI_AN00 | Uses $AN_{00}$ pin for the analog input pin. |
| RAPI_AN01 | Uses $AN_{01}$ pin for the analog input pin. |
| RAPI_AN02 | Uses $AN_{02}$ pin for the analog input pin. |
| RAPI_AN03 | Uses $AN_{03}$ pin for the analog input pin. |
| RAPI_AN04 | Uses $AN_{04}$ pin for the analog input pin. |
| RAPI_AN05 | Uses $AN_{05}$ pin for the analog input pin. |
| RAPI_AN06 | Uses $AN_{06}$ pin for the analog input pin. |
| RAPI_AN07 | Uses $AN_{07}$ pin for the analog input pin. |
| RAPI_AN20 | Uses $AN_{20}$ pin for the analog input pin. |
| RAPI_AN21 | Uses $AN_{21}$ pin for the analog input pin. |

| | |
|---|---|
| RAPI_AN22 | Uses $AN_{22}$ pin for the analog input pin. |
| RAPI_AN23 | Uses $AN_{23}$ pin for the analog input pin. |
| RAPI_AN24 | Uses $AN_{24}$ pin for the analog input pin. |
| RAPI_AN25 | Uses $AN_{25}$ pin for the analog input pin. |
| RAPI_AN26 | Uses $AN_{26}$ pin for the analog input pin. |
| RAPI_AN27 | Uses $AN_{27}$ pin for the analog input pin. |
| RAPI_AN30 | Uses $AN_{30}$ pin for the analog input pin. |
| RAPI_AN31 | Uses $AN_{31}$ pin for the analog input pin. |
| RAPI_AN32 | Uses $AN_{32}$ pin for the analog input pin. |
| RAPI_P0_GROUP | Uses port $P_0$ group for the analog input pin. |
| RAPI_P10_GROUP | Uses port $P_{10}$ group for the analog input pin. |
| RAPI_P1P9_GROUP | Uses port $P_1$/$P_9$ group for the analog input pin. |
| RAPI_P9_GROUP | Uses port $P_9$ group for the analog input pin. |
| RAPI_FAD | Sets the AD converter's operating frequency to $f_{AD}$. |
| RAPI_FAD2 | Sets the AD converter's operating frequency to $f_{AD}$ divided by 2. |
| RAPI_FAD3 | Sets the AD converter's operating frequency to $f_{AD}$ divided by 3. |
| RAPI_FAD4 | Sets the AD converter's operating frequency to $f_{AD}$ divided by 4. |
| RAPI_FAD6 | Sets the AD converter's operating frequency to $f_{AD}$ divided by 6. |
| RAPI_FAD12 | Sets the AD converter's operating frequency to $f_{AD}$ divided by 12. |
| RAPI_10BIT | Sets the AD converter's resolution to 10 bits. |
| RAPI_8BIT | Sets the AD converter's resolution to 8 bits. |
| RAPI_AD_ON | Sets the AD converter to start operating. |
| RAPI_AD_OFF | Sets the AD converter to stop operating. |
| RAPI_WITH_SAMPLE_HOLD | Specifies that sample-and-hold action is applied. |
| RAPI_WITHOUT_SAMPLE_HOLD | Specifies that sample-and-hold action is not applied. |
| RAPI_SOFTWARE_TRIGGER | Selects software trigger. |
| RAPI_EXTERNAL_TRIGGER | Selects external trigger. |
| RAPI_TIMER_B0_TRIGGER | Selects underflow of timer B0 as trigger. |
| RAPI_TIMER_B2_TRIGGER | Selects underflow of timer B2 as trigger. |
| RAPI_ICTB2_TRIGGER | Selects underflow of timer B2 interrupt generation frequency set counter as trigger. |

**• Specifiable definition values when one-shot mode is used (RAPI_ONE_SHOT specified)**

(Input pin) Specify one from { RAPI_AN0, RAPI_AN1, RAPI_AN2, RAPI_AN3, RAPI_AN4, RAPI_AN5, RAPI_AN6, RAPI_AN7, RAPI_AN00, RAPI_AN01, RAPI_AN02, RAPI_AN03, RAPI_AN04, RAPI_AN05, RAPI_AN06, RAPI_AN07, RAPI_AN20, RAPI_AN21, RAPI_AN22, RAPI_AN23, RAPI_AN24, RAPI_AN25, RAPI_AN26, RAPI_AN27, RAPI_AN30, RAPI_AN31, RAPI_AN32 }. The default is RAPI_AN0.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD3, RAPI_FAD4, RAPI_FAD6, RAPI_FAD12 }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Conversion method) Specify one from { RAPI_WITH_SAMPLE_HOLD, RAPI_WITHOUT_SAMPLE_HOLD }. The default value is RAPI_WITHOUT_SAMPLE_HOLD.

(Trigger) Specify one from { RAPI_SOFTWARE_TRIGGER, RAPI_EXTERNAL_TRIGGER }. The default value is RAPI_SOFTWARE_TRIGGER.

**• Specifiable definition values when repeat mode is used (RAPI_REPEAT specified)**

(Input pin) Specify one from { RAPI_AN0, RAPI_AN1, RAPI_AN2, RAPI_AN3, RAPI_AN4, RAPI_AN5, RAPI_AN6, RAPI_AN7, RAPI_AN00, RAPI_AN01, RAPI_AN02, RAPI_AN03, RAPI_AN04, RAPI_AN05, RAPI_AN06, RAPI_AN07, RAPI_AN20, RAPI_AN21, RAPI_AN22, RAPI_AN23, RAPI_AN24, RAPI_AN25, RAPI_AN26, RAPI_AN27, RAPI_AN30, RAPI_AN31, RAPI_AN32 }. The default is RAPI_AN0.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD3, RAPI_FAD4, RAPI_FAD6, RAPI_FAD12 }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Conversion method) Specify one from { RAPI_WITH_SAMPLE_HOLD, RAPI_WITHOUT_SAMPLE_HOLD }. The default value is RAPI_WITHOUT_SAMPLE_HOLD.

(Trigger) Specify one from { RAPI_SOFTWARE_TRIGGER, RAPI_EXTERNAL_TRIGGER }. The default value is RAPI_SOFTWARE_TRIGGER.

**• Specifiable definition values when single sweep mode is used (RAPI_SINGLE_SWEEP specified)**

(Input pin) Specify one from { RAPI_P0_GROUP, RAPI_P10_GROUP, RAPI_P1P9_GROUP, RAPI_P9_GROUP }. The default value is RAPI_P10_GROUP.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD3, RAPI_FAD4, RAPI_FAD6, RAPI_FAD12 }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Conversion method) Specify one from { RAPI_WITH_SAMPLE_HOLD, RAPI_WITHOUT_SAMPLE_HOLD }. The default value is RAPI_WITHOUT_SAMPLE_HOLD.

(Trigger) Specify one from { RAPI_SOFTWARE_TRIGGER, RAPI_EXTERNAL_TRIGGER }. The default value is RAPI_SOFTWARE_TRIGGER.

**• Specifiable definition values when repeat sweep mode 0 is used (RAPI_REPEAT_SWEEP0 specified)**

(Input pin) Specify one from { RAPI_P0_GROUP, RAPI_P10_GROUP, RAPI_P1P9_GROUP, RAPI_P9_GROUP }. The default value is RAPI_P10_GROUP.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD3, RAPI_FAD4, RAPI_FAD6, RAPI_FAD12 }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Conversion method) Specify one from { RAPI_WITH_SAMPLE_HOLD, RAPI_WITHOUT_SAMPLE_HOLD }. The default value is RAPI_WITHOUT_SAMPLE_HOLD.

(Trigger) Specify one from { RAPI_SOFTWARE_TRIGGER, RAPI_EXTERNAL_TRIGGER }. The default value is RAPI_SOFTWARE_TRIGGER.

**• Specifiable definition values when repeat sweep mode 1 is used (RAPI_REPEAT_SWEEP1 specified)**

(Input pin) Specify one from { RAPI_P0_GROUP, RAPI_P10_GROUP, RAPI_P1P9_GROUP, RAPI_P9_GROUP }. The default value is RAPI_P10_GROUP.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD3, RAPI_FAD4, RAPI_FAD6, RAPI_FAD12 }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Conversion method) Specify one from { RAPI_WITH_SAMPLE_HOLD, RAPI_WITHOUT_SAMPLE_HOLD }. The default value is RAPI_WITHOUT_SAMPLE_HOLD.

(Trigger) Specify one from { RAPI_SOFTWARE_TRIGGER, RAPI_EXTERNAL_TRIGGER }. The default value is RAPI_SOFTWARE_TRIGGER.

**• Specifiable definition values when simultaneous sampling sweep mode is used (RAPI_SIMULTANEOUS_SAMPLE_SWEEP specified)**

(Input pin) Specify one from { RAPI_P0_GROUP, RAPI_P10_GROUP, RAPI_P1P9_GROUP, RAPI_P9_GROUP }. The default value is RAPI_P10_GROUP.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD3, RAPI_FAD4, RAPI_FAD6, RAPI_FAD12 }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Trigger) Specify one from { RAPI_SOFTWARE_TRIGGER, RAPI_EXTERNAL_TRIGGER, RAPI_TIMER_B0_TRIGGER, RAPI_TIMER_B2_TRIGGER, RAPI_ICTB2_TRIGGER }. The default value is RAPI_SOFTWARE_TRIGGER.

**• Specifiable definition values when delayed trigger mode 0 is used (RAPI_DELAYED_TRIGGER0 specified)**

(Input pin) Specify one from { RAPI_P0_GROUP, RAPI_P10_GROUP, RAPI_P1P9_GROUP, RAPI_P9_GROUP }. The default value is RAPI_P10_GROUP.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD3, RAPI_FAD4, RAPI_FAD6, RAPI_FAD12 }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Conversion method) Specify RAPI_WITH_SAMPLE_HOLD.

**• Specifiable definition values when delayed trigger mode 1 is used (RAPI_DELAYED_TRIGGER1 specified)**

(Input pin) Specify one from { RAPI_P0_GROUP, RAPI_P10_GROUP, RAPI_P1P9_GROUP, RAPI_P9_GROUP }. The default value is RAPI_P10_GROUP.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD3, RAPI_FAD4, RAPI_FAD6, RAPI_FAD12 }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Conversion method) Specify RAPI_WITH_SAMPLE_HOLD.

(R8C)

| | |
|---|---|
| RAPI_ONE_SHOT | Selects one-shot mode. |
| RAPI_REPEAT | Selects repeat mode. |
| RAPI_AN0 | Uses AN0 pin for the analog input pin. |
| RAPI_AN1 | Uses AN1 pin for the analog input pin. |
| RAPI_AN2 | Uses AN2 pin for the analog input pin. |
| RAPI_AN3 | Uses AN3 pin for the analog input pin. |
| RAPI_AN4 | Uses AN4 pin for the analog input pin. |
| RAPI_AN5 | Uses AN5 pin for the analog input pin. |
| RAPI_AN6 | Uses AN6 pin for the analog input pin. |
| RAPI_AN7 | Uses AN7 pin for the analog input pin. |
| RAPI_AN8 | Uses AN8 pin for the analog input pin. |
| RAPI_AN9 | Uses AN9 pin for the analog input pin. |
| RAPI_AN10 | Uses AN10 pin for the analog input pin. |
| RAPI_AN11 | Uses AN11 pin for the analog input pin. |
| RAPI_FAD | Sets the AD converter's operating frequency to $f_{AD}$. |
| RAPI_FAD2 | Sets the AD converter's operating frequency to $f_{AD}$ divided by 2. |
| RAPI_FAD4 | Sets the AD converter's operating frequency to $f_{AD}$ divided by 4. |
| RAPI_FOCOF | Sets the AD converter's operating frequency to fOCO-F. |
| RAPI_10BIT | Sets the AD converter's resolution to 10 bits. |
| RAPI_8BIT | Sets the AD converter's resolution to 8 bits. |
| RAPI_AD_ON | Sets the AD converter to start operating in __CreateAD. |
| RAPI_AD_OFF | Sets the AD converter to stop operating in __CreateAD |
| RAPI_WITH_SAMPLE_HOLD | Specifies that sample-and-hold action is applied. |
| RAPI_WITHOUT_SAMPLE_HOLD | Specifies that sample-and-hold action is not applied. |

| | |
|---|---|
| RAPI_SOFTWARE_TRIGGER | Selects software trigger. |
| RAPI_TIMER_RD_TRIGGER | Selects timer RD as trigger. |

**• Specifiable definition values when one-shot mode is used (RAPI_ONE_SHOT specified)**

(Input pin) Specify one from { RAPI_AN0, RAPI_AN1, RAPI_AN2, RAPI_AN3, RAPI_AN4, RAPI_AN5, RAPI_AN6, RAPI_AN7, RAPI_AN8, RAPI_AN9, RAPI_AN10, RAPI_AN11 }. Always be sure to specify an input pin.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD4, RAPI_FOCOF }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Conversion method) Specify one from { RAPI_WITH_SAMPLE_HOLD, RAPI_WITHOUT_SAMPLE_HOLD }. The default value is RAPI_WITHOUT_SAMPLE_HOLD.

(Trigger) Specify one from { RAPI_SOFTWARE_TRIGGER, RAPI_TIMER_RD_TRIGGER }. The default value is RAPI_SOFTWARE_TRIGGER.

**• Specifiable definition values when repeat mode is used (RAPI_REPEAT specified)**

(Input pin) Specify one from { RAPI_AN0, RAPI_AN1, RAPI_AN2, RAPI_AN3, RAPI_AN4, RAPI_AN5, RAPI_AN6, RAPI_AN7, RAPI_AN8, RAPI_AN9, RAPI_AN10, RAPI_AN11}. Always be sure to specify an input pin.

(Operating frequency) Specify one from { RAPI_FAD, RAPI_FAD2, RAPI_FAD4 }. The default value is RAPI_FAD4.

(Resolution) Specify one from { RAPI_10BIT, RAPI_8BIT }. The default value is RAPI_8BIT.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Conversion method) Specify one from { RAPI_WITH_SAMPLE_HOLD, RAPI_WITHOUT_SAMPLE_HOLD }. The default value is RAPI_WITHOUT_SAMPLE_HOLD.

(Trigger) Specify one from { RAPI_SOFTWARE_TRIGGER, RAPI_TIMER_RD_TRIGGER }. The default value is RAPI_SOFTWARE_TRIGGER.

(H8/300H)

| | |
|---|---|
| RAPI_ONE_SHOT | Selects one-shot mode. |
| RAPI_REPEAT | Selects repeat mode. |
| RAPI_SINGLE_SWEEP | Selects single sweep mode. |
| RAPI_REPEAT_SWEEP0 | Selects repeat sweep mode 0. |
| RAPI_AN0 | Uses AN0 pin for the analog input pin. |
| RAPI_AN1 | Uses AN1 pin for the analog input pin. |
| RAPI_AN2 | Uses AN2 pin for the analog input pin. |
| RAPI_AN3 | Uses AN3 pin for the analog input pin. |

| | |
|---|---|
| RAPI_AN4 | Uses AN4 pin for the analog input pin. |
| RAPI_AN5 | Uses AN5 pin for the analog input pin. |
| RAPI_AN6 | Uses AN6 pin for the analog input pin. |
| RAPI_AN7 | Uses AN7 pin for the analog input pin. |
| RAPI_AN8 | Uses AN8 pin for the analog input pin. |
| RAPI_AN9 | Uses AN9 pin for the analog input pin. |
| RAPI_AN10 | Uses AN10 pin for the analog input pin. |
| RAPI_AN11 | Uses AN11 pin for the analog input pin. |
| RAPI_AN12 | Uses AN12 pin for the analog input pin. |
| RAPI_AN13 | Uses AN13 pin for the analog input pin. |
| RAPI_AN14 | Uses AN14 pin for the analog input pin. |
| RAPI_AN15 | Uses AN15 pin for the analog input pin. |
| RAPI_AN0_GROUP | Uses AN0-AN3 group for the analog input pin. |
| RAPI_AN4_GROUP | Uses AN4-AN7 group for the analog input pin. |
| RAPI_AN8_GROUP | Uses AN8-AN11 group for the analog input pin. |
| RAPI_AN12_GROUP | Uses AN12-AN15 group for the analog input pin. |
| RAPI_134_STATES | Conversion time = 134 states |
| RAPI_70_STATES | Conversion time = 70 states |
| RAPI_AD_ON | Sets the AD converter to start operating in __CreateAD. |
| RAPI_AD_OFF | Sets the AD converter to stop operating in __CreateAD. |
| RAPI_RISING_TRIGGER | Includes a rising-edge external trigger in the A/D conversion start condition. |
| RAPI_FALLING_TRIGGER | Includes a falling-edge external trigger in the A/D conversion start condition. |
| RAPI_AD_INT_REQUEST | Requests assertion of interrupt for A/D conversion interrupt. |
| RAPI_NOT_AD_INT_ REQUEST | Does not request assertion of interrupt for A/D conversion interrupt. |

**• Specifiable definition values when one-shot mode is used (RAPI_ONE_SHOT specified)**

(Input pin) Specify one from { RAPI_AN0, RAPI_AN1, RAPI_AN2, RAPI_AN3, RAPI_AN4, RAPI_AN5, RAPI_AN6, RAPI_AN7, RAPI_AN8, RAPI_AN9, RAPI_AN10, RAPI_AN11, RAPI_AN12, RAPI_AN13, RAPI_AN14, RAPI_AN15 }. The default value is RAPI_AN0.

(Conversion time) Specify one from { RAPI_134_STATES, RAPI_70_STATES }. The default value is RAPI_134_STATES.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Trigger) Specify one from { RAPI_RISING_TRIGGER, RAPI_FALLING_TRIGGER }. If no triggers are specified, “Trigger input disabled” is set.

(Interrupt request) Specify one from { RAPI_AD_INT_REQUEST, RAPI_NOT_AD_INT_REQUEST }. The default value is RAPI_NOT_AD_INT_REQUEST.

**• Specifiable definition values when repeat mode is used (RAPI_REPEAT specified)**

(Input pin) Specify one from { RAPI_AN0, RAPI_AN1, RAPI_AN2, RAPI_AN3, RAPI_AN4, RAPI_AN5, RAPI_AN6, RAPI_AN7, RAPI_AN8, RAPI_AN9, RAPI_AN10, RAPI_AN11, RAPI_AN12, RAPI_AN13, RAPI_AN14, RAPI_AN15 } The default value is RAPI_AN0.

(Conversion time) Specify one from { RAPI_134_STATES, RAPI_70_STATES }. The default value is RAPI_134_STATES.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Trigger) Specify one from { RAPI_RISING_TRIGGER, RAPI_FALLING_TRIGGER }. If no triggers are specified, “Trigger input disabled” is set.

**• Specifiable definition values when single sweep mode is used (RAPI_SINGLE_SWEEP specified)**

(Input pin) Specify one from { RAPI_AN0_GROUP, RAPI_AN4_GROUP, RAPI_AN8_GROUP, RAPI_AN12_GROUP }. The default value is RAPI_AN0_GROUP.

(Conversion time) Specify one from { RAPI_134_STATES, RAPI_70_STATES }. The default value is RAPI_134_STATES.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Trigger) Specify one from { RAPI_RISING_TRIGGER, RAPI_FALLING_TRIGGER }. If no triggers are specified, “Trigger input disabled” is set.

(Interrupt request) Specify one from { RAPI_AD_INT_REQUEST, RAPI_NOT_AD_INT_REQUEST }. The default value is RAPI_NOT_AD_INT_REQUEST.

**• Specifiable definition values when repeat sweep mode 0 is used (RAPI_REPEAT_SWEEP0 specified)**

(Input pin) Specify one from { RAPI_AN0_GROUP, RAPI_AN4_GROUP, RAPI_AN8_GROUP, RAPI_AN12_GROUP }. The default value is RAPI_AN0_GROUP.

(Conversion time) Specify one from { RAPI_134_STATES, RAPI_70_STATES }. The default value is RAPI_134_STATES.

(Operating states set) Specify one from { RAPI_AD_ON, RAPI_AD_OFF }. The default value is RAPI_AD_OFF.

(Trigger) Specify one from { RAPI_RISING_TRIGGER, RAPI_FALLING_TRIGGER }. If no triggers are specified, “Trigger input disabled” is set.

**[data2]**

(M16C)

The set value differs with the A/D conversion mode used.

| | |
|---|---|
| One-shot mode<br>Repeat mode | Specify 1. |
| Single sweep mode<br>Repeat sweep mode 0<br>Simultaneous sampling mode<br>Delayed trigger mode 0 | Specify 2, 4, 6, or 8. |

| | |
|---|---|
| Delayed trigger mode 1 | |
| Repeat sweep mode | Specify 1, 2, 3, or 4. |

(R8C)

Specify 1.

(H8/300H)

| | |
|---|---|
| One-shot mode<br>Repeat mode | Specify 1. |
| Single sweep mode<br>Repeat sweep mode 0 | Specify 1, 2, 3, or 4. |

**[data3]**

(M16C) (R8C)

Specify the interrupt priority level (0-7) to be set in the interrupt control register.

(H8/300H)

Specify the interrupt priority level (0–1) to be set in the interrupt control register. For the CPUs that do not have an interrupt control register, specify 0.

**Return value**

If A/D converter was successfully set, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

A/D converter

**Reference**

__EnableADC, __DestroyADC, __GetADC, __GetADCAll

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable analog input pins differ with each CPU used.
- If you use an R8C MCU which does not support fOCO-F for its operating frequency, you cannot specify RAPI_FOCOF.
- If you use an R8C MCU which does not support timer RD as a trigger, you cannot specify RAPI_TIMER_RD_TRIGGER as a trigger.
- When used for the H8/300H, this API specify when freeing it from module stanby.

**Program example**

```
#include " rapi_ad_r8c_13.h"

void AdIntFunc( void ){}

void func( void )
{
    /* Set up A/D converter as one short mode */
    __CreateADC( RAPI_ONE_SHOT|RAPI_AN2|RAPI_FAD2| RAPI_WITH_SAMPLE_HOLD
|
                RAPI_EXTERNAL_TRIGGER   |RAPI_AD_ON|RAPI_10BIT,   1,   5,
AdIntFunc );
}
```

## __EnableADC

**Synopsis**

<Control operation of A/D converter>

**Boolean __EnableADC (unsigned long data1, unsigned int data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Number of analog input pins used by A/D converter (differs with MCU type) |

**Description**

Controls operation of the A/D converter by starting or stopping it.

**[data1]**

(M16C)

| | |
|---|---|
| RAPI_AN0 | Uses $AN_0$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN1 | Uses $AN_1$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN2 | Uses $AN_2$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN3 | Uses $AN_3$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN4 | Uses $AN_4$pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN5 | Uses $AN_5$pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN6 | Uses $AN_6$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN7 | Uses $AN_7$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN00 | Uses $AN_{00}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN01 | Uses $AN_{01}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN02 | Uses $AN_{02}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN03 | Uses $AN_{03}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN04 | Uses $AN_{04}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN05 | Uses $AN_{05}$pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN06 | Uses $AN_{06}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN07 | Uses $AN_{07}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN20 | Uses $AN_{20}$ pin for the analog input pin. |

| | |
|---|---|
| | Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN21 | Uses $AN_{21}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN22 | Uses $AN_{22}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN23 | Uses $AN_{23}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN24 | Uses $AN_{24}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN25 | Uses $AN_{25}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN26 | Uses $AN_{26}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN27 | Uses $AN_{27}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN30 | Uses $AN_{30}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN31 | Uses $AN_{31}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN32 | Uses $AN_{32}$ pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_P0_GROUP | Uses port $P_0$ group for the analog input pin. Selectable only when sweep mode, repeat sweep mode 0, simultaneous sampling sweep mode, delayed trigger mode 0, delayed trigger mode 1, or repeat sweep mode 1 is used. |
| RAPI_P10_GROUP | Uses port $P_{10}$ group for the analog input pin. Selectable only when sweep mode, repeat sweep mode 0, simultaneous sampling sweep mode, delayed trigger mode 0, delayed trigger mode 1, or repeat sweep mode 1 is used. |
| RAPI_P1P9_GROUP | Uses port $P_1$ /$P_9$ group for the analog input pin. Selectable only when sweep mode, repeat sweep mode 0, simultaneous sampling sweep mode, delayed trigger mode 0, delayed trigger mode 1, or repeat sweep mode 1 is used. |
| RAPI_P9_GROUP | Uses port $P_9$ group for the analog input pin. Selectable only when sweep mode, repeat sweep mode 0, simultaneous sampling sweep mode, delayed trigger mode 0, delayed trigger mode 1, or repeat sweep mode 1 is used. |
| RAPI_AD_ON | Sets the A/D converter to start operating. |
| RAPI_AD_OFF | Sets the A/D converter to stop operating. |

(R8C)

| | |
|---|---|
| RAPI_AN0 | Uses $AN_0$ pin for the analog input pin. |
| RAPI_AN1 | Uses $AN_1$ pin for the analog input pin. |
| RAPI_AN2 | Uses $AN_2$ pin for the analog input pin. |
| RAPI_AN3 | Uses $AN_3$ pin for the analog input pin. |

| | |
|---|---|
| RAPI_AN4 | Uses $AN_4$ pin for the analog input pin. |
| RAPI_AN5 | Uses $AN_5$ pin for the analog input pin. |
| RAPI_AN6 | Uses $AN_6$ pin for the analog input pin. |
| RAPI_AN7 | Uses $AN_7$ pin for the analog input pin. |
| RAPI_AN8 | Uses $AN_8$ pin for the analog input pin. |
| RAPI_AN9 | Uses $AN_9$ pin for the analog input pin. |
| RAPI_AN10 | Uses $AN_{10}$ pin for the analog input pin. |
| RAPI_AN11 | Uses $AN_{11}$ pin for the analog input pin. |
| RAPI_AD_ON | Sets the A/D converter to start operating. |
| RAPI_AD_OFF | Sets the A/D converter to stop operating. |

(H8/300H)

| | |
|---|---|
| RAPI_AN0 | Uses AN0 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN1 | Uses AN1 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN2 | Uses AN2 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN3 | Uses AN3 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN4 | Uses AN4 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN5 | Uses AN5 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN6 | Uses AN6 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN7 | Uses AN7 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN8 | Uses AN8 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN9 | Uses AN9 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN10 | Uses AN10 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN11 | Uses AN11 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN12 | Uses AN12 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN13 | Uses AN13 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN14 | Uses AN14 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN15 | Uses AN15 pin for the analog input pin.<br>Selectable only when one-shot mode or repeat mode is used. |
| RAPI_AN0_GROUP | Uses AN0-AN3 pins group for the analog input pin. |

| | |
|---|---|
| | Selectable only when sweep mode or repeat sweep mode 0 is used. |
| RAPI_AN4_GROUP | Uses AN4-AN7 pins group for the analog input pin.<br>Selectable only when sweep mode or repeat sweep mode 0 is used. |
| RAPI_AN8_GROUP | Uses AN8-AN11 pins group for the analog input pin.<br>Selectable only when sweep mode or repeat sweep mode 0 is used. |
| RAPI_AN12_GROUP | Uses AN12-AN15 pins group for the analog input pin.<br>Selectable only when sweep mode or repeat sweep mode 0 is used. |
| RAPI_AD_ON | Sets the A/D converter to start operating. |
| RAPI_AD_OFF | Sets the A/D converter to stop operating. |

**[data2]**

(M16C)

The set value differs with the A/D conversion mode used.

| | |
|---|---|
| One-shot mode<br>Repeat mode | Specify 1. |
| Single sweep mode<br>Repeat sweep mode 0<br>Simultaneous sampling mode<br>Delayed trigger mode 0<br>Delayed trigger mode 1 | Specify 2, 4, 6, or 8. |
| Repeat sweep mode 1 | Specify 1, 2, 3, or 4. |

(R8C)

Specify 1.

(H8/300H)

| | |
|---|---|
| One-shot mode<br>Repeat mode | Specify 1. |
| Single sweep mode<br>Repeat sweep mode 0 | Specify 1, 2, 3, or 4. |

**Return value**

If A/D converter was successfully controlled, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

A/D converter

**Reference**

__CreateADC, __DestroyADC, __GetADC, __GetADCAll

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.
- The specifiable analog input pins differ with each CPU used.

**Program example**

```
#include "rapi_ad_r8c_13.h"
```

```
void func( void )
{
    /* Disable A/D converter */
    __EnableADC( RAPI_AN0|RAPI_AD_OFF, 1 );
}
```

## __DestroyADC

**Synopsis**

<Discard settings of A/D converter>

**Boolean __DestroyADC(void)**

**Description**

Discards settings of a specified A/D converter.

**Return value**

If converter setting was successfully discarded, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

A/D converter

**Reference**

__CreateADC, __EnableADC, __GetADC, __GetADCAll

**Remark**

- When used for the H8/300H, this API places a specified timer into module stanby state after discarding it.

**Program example**

```
#include "rapi_ad_r8c_13.h"

void func( void )
{
    /* Destroy A/D converter */
    __DestroyADC();
}
```

## __GetADC

**Synopsis**

<Get A/D converted value (register specified)>

**Boolean __GetADC(unsigned long data1, unsigned int *data2)**

| | |
|---|---|
| data1 | Setup data 1 (content differs with MCU type) |
| data2 | Pointer to the buffer in which A/D converted value is stored. |

**Description**

Gets the A/D converted value from a specified A/D register.

For data1, the following values can be set.

(M16C)

| | |
|---|---|
| RAPI_AD0 | Selects A/D register 0. |
| RAPI_AD1 | Selects A/D register 1. |
| RAPI_AD2 | Selects A/D register 2. |
| RAPI_AD3 | Selects A/D register 3. |
| RAPI_AD4 | Selects A/D register 4. |
| RAPI_AD5 | Selects A/D register 5. |
| RAPI_AD6 | Selects A/D register 6. |
| RAPI_AD7 | Selects A/D register 7. |

(R8C)

Specify 0.

(H8/300H)

| | |
|---|---|
| RAPI_ADDRA | Selects A/D data register A. |
| RAPI_ADDRB | Selects A/D data register B. |
| RAPI_ADDRC | Selects A/D data register C. |
| RAPI_ADDRD | Selects A/D data register D. |

**Return value**

If A/D converted value was successfully acquired, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

A/D converter

**Reference**

__CreateADC, __EnableADC, __DestroyADC, __GetADCAll

**Remark**

- If an undefined value is specified in the first argument, operation of the API cannot be guaranteed.

**Program example**

```
#include "rapi_ad_r8c_13.h"

void func( void )
{
    unsigned int data;

    /* Get an A/D convertered data of A/D register 0 */
    __GetADC( RAPI_AD0, &data );
}
```

## __GetADCAll

**Synopsis**

<Get A/D converted value (all registers)>

**Boolean __GetADCAll(unsigned int *data)**

| | |
|---|---|
| data | Pointer to the buffer in which A/D converted value is stored. |

**Description**

Gets the A/D converted value from all A/D registers.

The A/D registers from which A/D converted values are acquired are listed below.

| | | |
|---|---|---|
| [M16C] (16 bytes) | : | [0] A/D register 0<br>[1] A/D register 1<br>[2] A/D register 2<br>[3] A/D register 3<br>[4] A/D register 4<br>[5] A/D register 5<br>[6] A/D register 6<br>[7] A/D register 7 |
| [R8C] (2 bytes) | : | A/D register |
| [H8/300H] (8 bytes) | : | [0] A/D register A<br>[1] A/D register B<br>[2] A/D register C<br>[3] A/D register D |

**Return value**

If A/D converted values were successfully acquired, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

A/D converter

**Reference**

__CreateADC, __EnableADC, __DestroyADC, __GetADC

**Program example**

```
#include "rapi_ad_r8c_13.h"

void func( void )
{
    unsigned int data[8];

    /* Get A/D convertered datas of A/D register */
    __GetADCAll( data );
}
```

## __GetADCStatus

**Synopsis**

<Get the status of A/D converter>

**Boolean __GetADCStatus(unsigned int *status)**

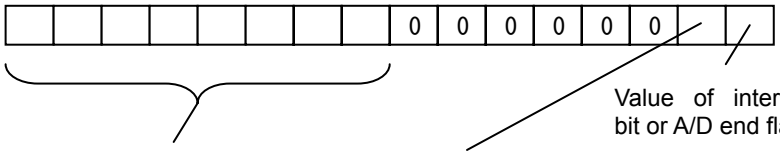
| | |
|---|---|
| **status** | Pointer to the buffer in which the register content indicating A/D converter status is stored. |

**Description**

Gets the status of a specified A/D converter.

The status of interrupt bit (when using the M16C or R8C) or the value of A/D end flag (when using the H8/300H) is stored in the first low-order bit of *status. Furthermore, the status of A/D conversion start flag is stored in the second low-order bit of *status. When used in the M16C, the value of A/D conversion status register 0 is stored in the 8 high-order bits of *status.

[Configuration of *status]




Value of interrupt bit or A/D end flag

Value of A/D conversion status register 0 (for only the M16C; 0 for the R8C and H8/300H)

Value of A/D conversion start flag (for only the R8C; 0 for the M16C and H8/300H)

**Return value**

If A/D converter status was successfully acquired, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

A/D converter

**Reference**

__ClearADCStatus

**Program example**

```
#include " rapi_ad_r8c_13.h"

void func( void )
{
    unsigned int status;

    /* Get status of A/D convertered */
    __GetADCStatus( &status );
}
```

## __ClearADCStatus

**Synopsis**

<Clear the status of A/D converter>

**Boolean __ClearADCStatus(unsigned int status)**

| | |
|---|---|
| status | Status of A/D converter |

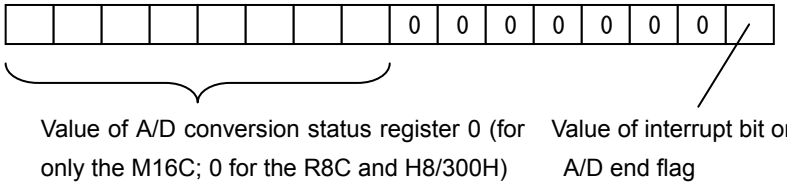
**Description**

Clears the status flag of a specified A/D converter.

Specify the status of interrupt bit (when using the M16C or R8C) or the value of A/D end flag (when using the H8/300H) in the first low-order bit of status.

When used in the M16C, specify the value of A/D conversion status register 0 in the 8 high-order bits of status. Write 0 to the bits to be cleared and 1 to the bits that do not need to be cleared.

[Configuration of status]




**Return value**

If A/D converter status flag was successfully cleared, RAPI_TRUE is returned; if failed, RAPI_FALSE is returned.

**Functionality**

A/D converter

**Reference**

__GetADCStatus

**Program example**

```
#include "rapi_ad_r8c_13.h"

void func( void )
{
    /* Clear status of A/D convertered */
    __ClearADCStatus( 0 );
}
```

Renesas Embedded
Application Programming Interface
Reference Manual

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# Renesas Embedded Application Programming Interface
# Reference manual

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