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Renesas Electronics Corporation

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R8C/25 Group

Timer RA in Pulse Width Measurement Mode

1. Abstract

This document describes a program for timer RF in pulse width measurement mode.

2. Introduction

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

- MCU : R8C/25 Group

This program can be used with other R8C/Tiny Series MCUs which have the same special function registers (SFRs) as the R8C/25 Group. Check the manual for any additions and modifications to functions. Careful evaluation is recommended before using this application note.

3. Application Example Description

In pulse width measurement mode, the pulse width of an external signal input from the $\overline{\text{INT1}}/\text{TRAIO}$ pin is measured.

The setting conditions of this program are as follows:

- Count source : f1
- Measurement period : "H" level width of the TRAIO input is measured
- Input pin : $\overline{\text{INT1}}/\text{TRAIO}$ (P1_7)
- TRAIO input filter : No filter

Figure 3.1 shows the Operating Example in Pulse Width Measurement Mode.

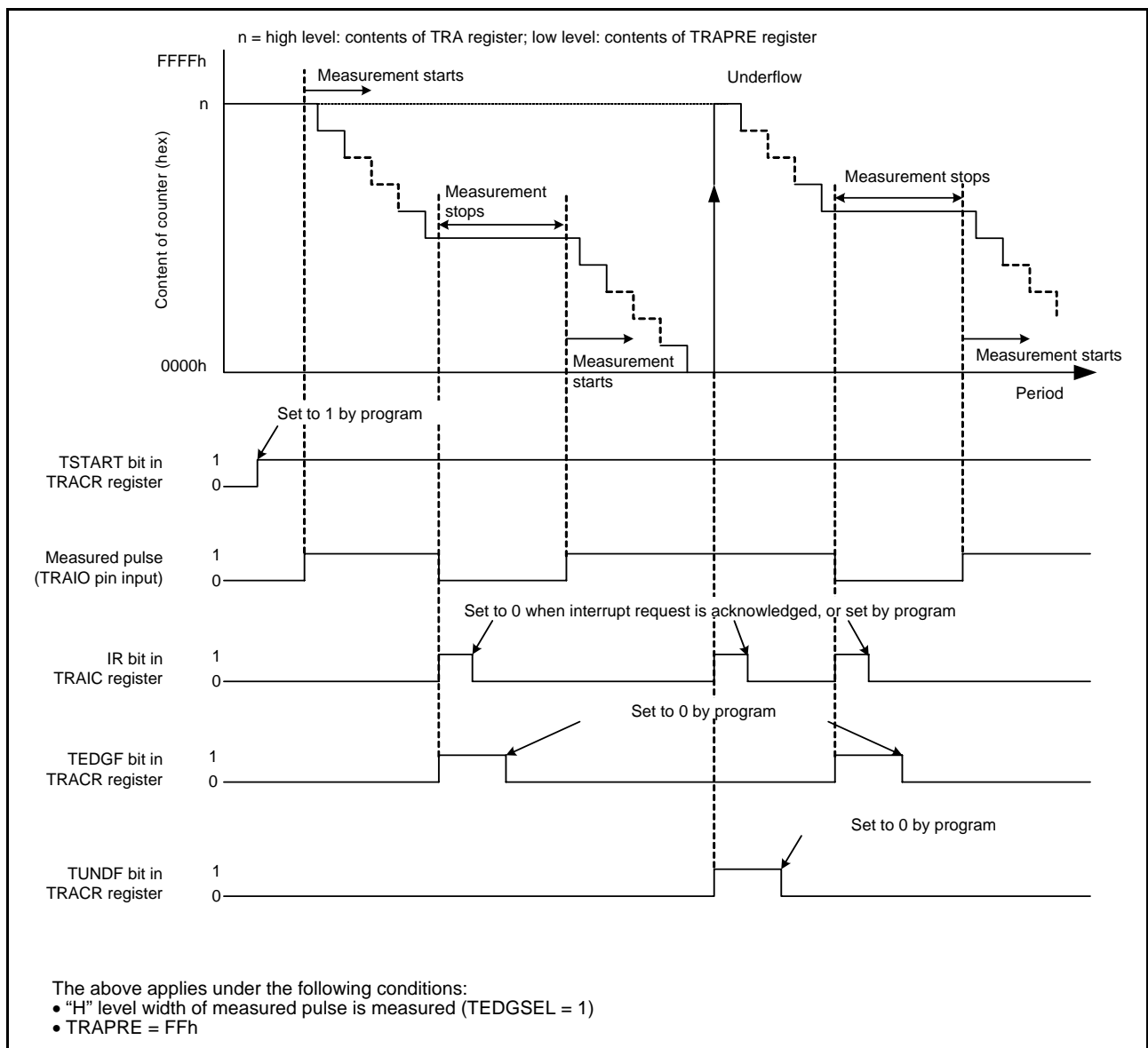


Figure 3.1 Operating Example in Pulse Width Measurement Mode

This sample program may include operations of unused bit functions for the SFR bit layout. Set these values according to the operating conditions of the user system.

3.1 Pin Usage

Table 3.1 Pin Usage and Function

Pin Name	I/O	Function
P1_7/TRAI0/ $\overline{\text{INT1}}$	Input	Measured pulse input

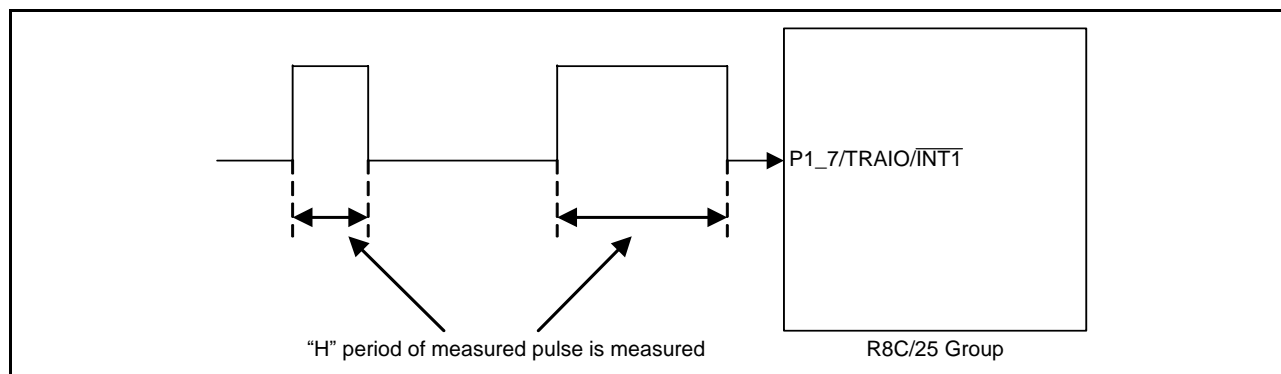


Figure 3.2 Pin Usage

3.2 Memory Usage

Table 3.2 Memory Usage

Memory Usage	Size	Remark
ROM	262 bytes	In main.c module
RAM	5 bytes	In main.c module
Maximum user stack usage	10 bytes	main function: 7 bytes timer_ra_init function: 3 bytes
Maximum interrupt stack usage	18 bytes	TRA_init function: 18 bytes

Memory usage varies depending on the C compiler version and the compile option.

The above applies under the following conditions:

- C compiler: M16C/60, 30, 20, 10, Tiny, R8C/Tiny Series Compiler V.5.40 Release 00
- Compile option: -c -finfo; NOTE: -dir "\$(CONFIGDIR)" -R8C

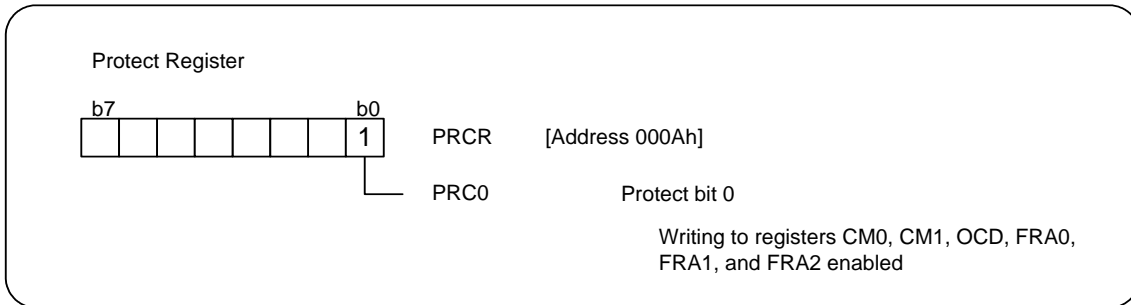
NOTE: Unavailable in the R8C/Tiny-exclusive free version.

4. Setup

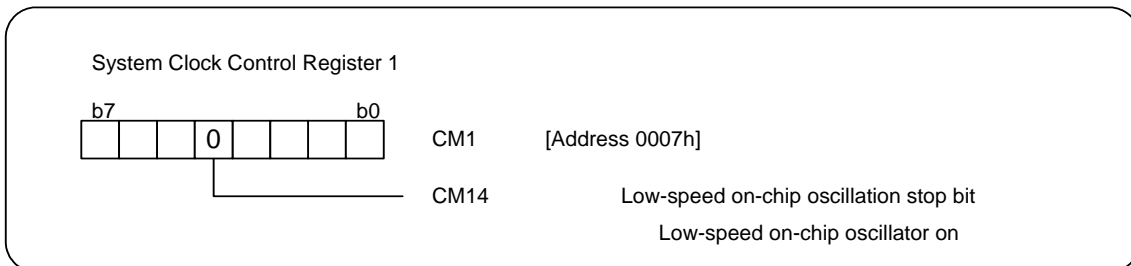
This section shows the initial setting procedures and values to perform the example described in **3. Application Example Description**. Refer to the **R8C/25 Group Hardware Manual** for details on individual registers.

4.1 Setting System Clock

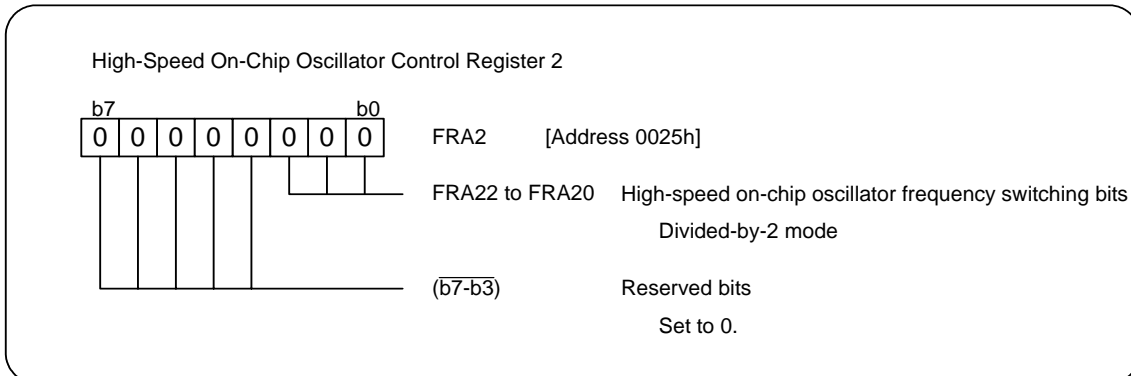
- (1) Enable writing to registers CM0, CM1, OCD, FRA0, FRA1, and FRA2.



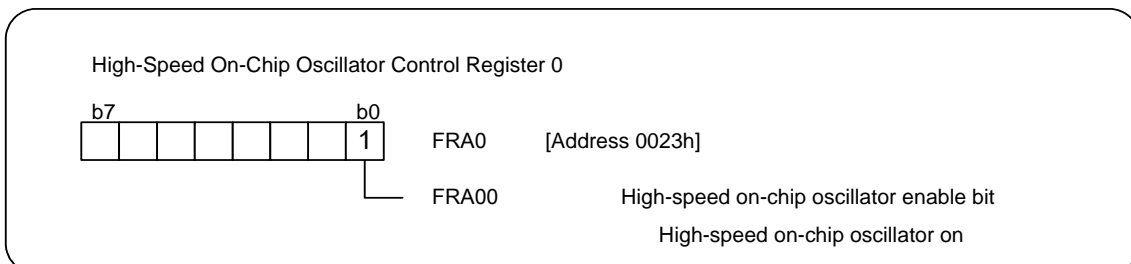
- (2) Start the low-speed on-chip oscillator.



- (3) Set the division of the high-speed on-chip oscillator clock.

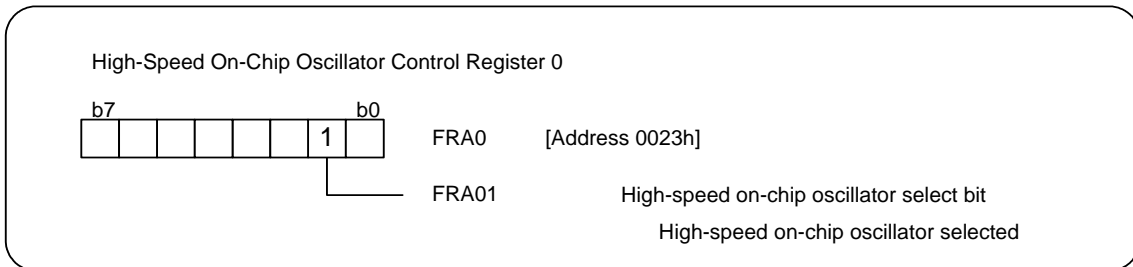


- (4) Start the high-speed on-chip oscillator clock.

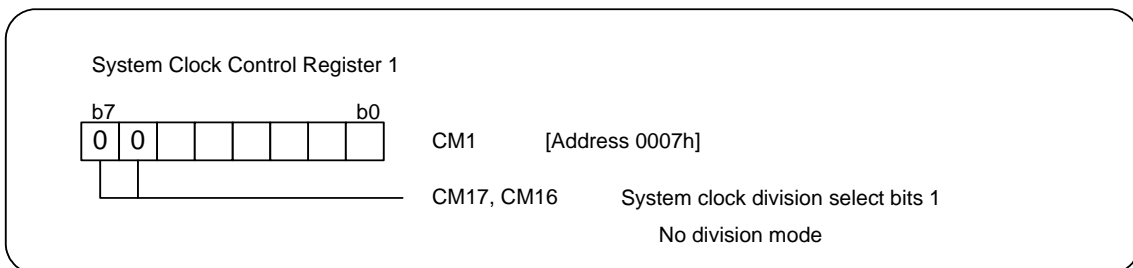


(5) Wait until oscillation stabilizes.

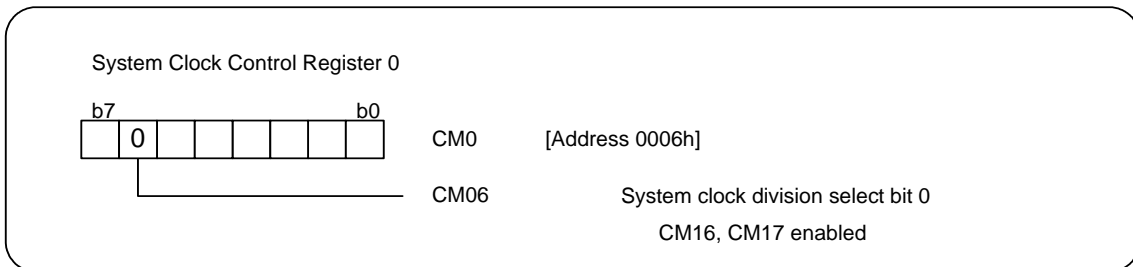
(6) Select the high-speed on-chip oscillator.



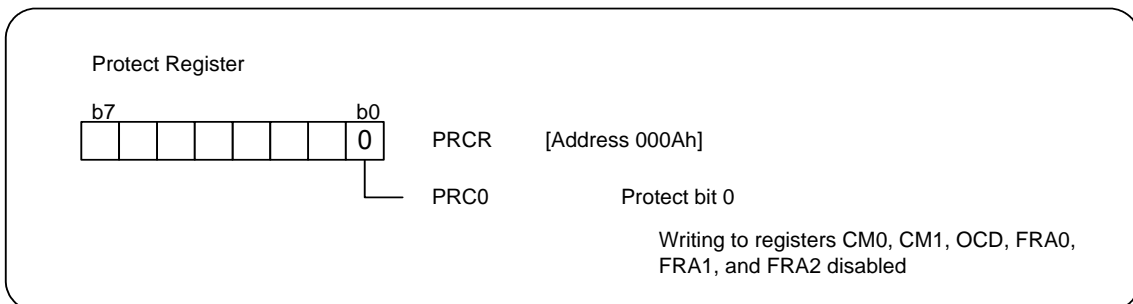
(7) Set system clock division select bits 1.



(8) Set system clock division select bit 0.

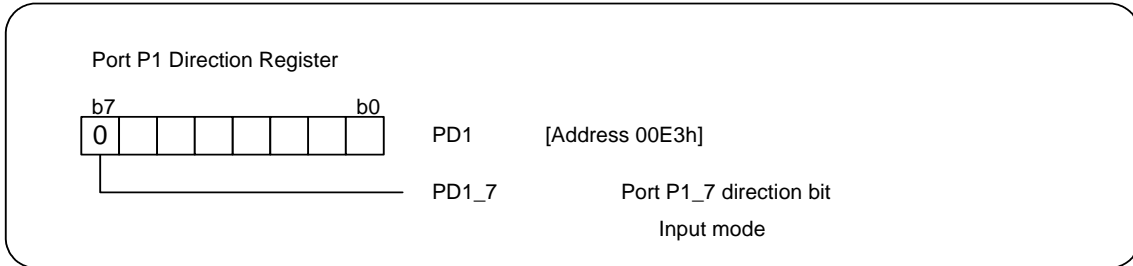


(9) Disable writing to registers CM0, CM1, OCD, FRA0, FRA1, and FRA2.

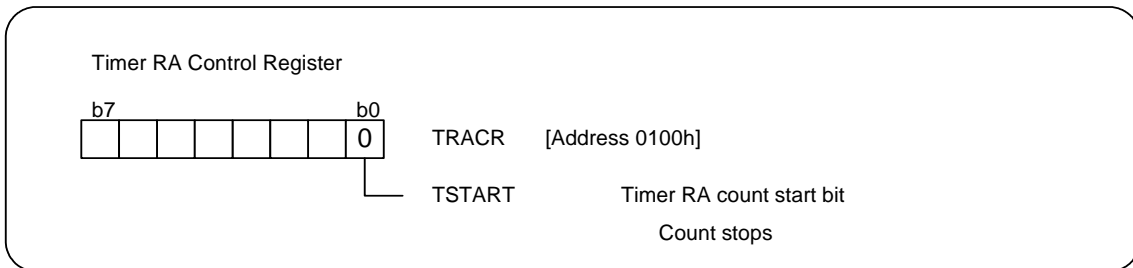


4.2 Setting Pulse Width Measurement Mode

- (1) Set the port P1 direction register.

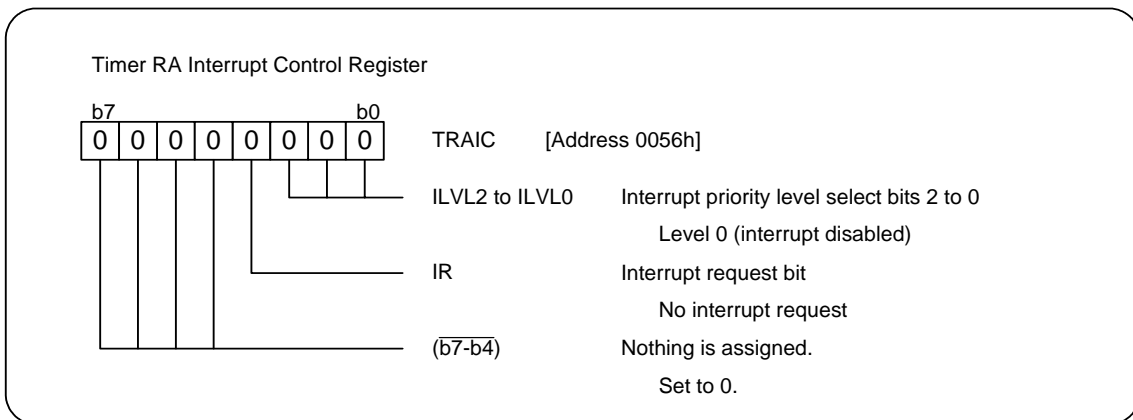


- (2) Stop timer RA counting.

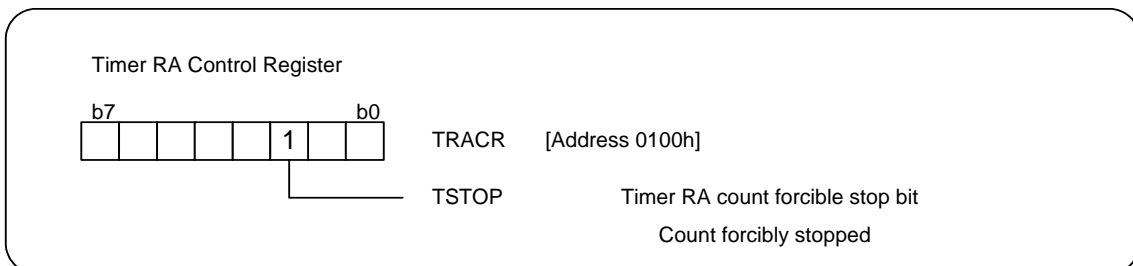


- (3) Wait until the TCSTF bit in the TRACR register is set to 0.

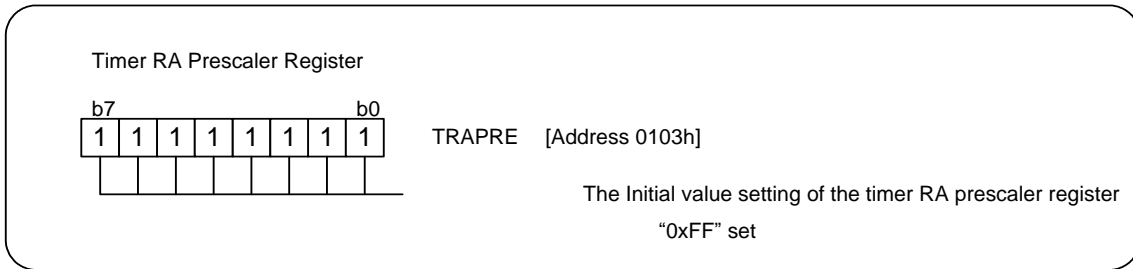
- (4) Set the timer RA interrupt control register (timer RA interrupt disabled).



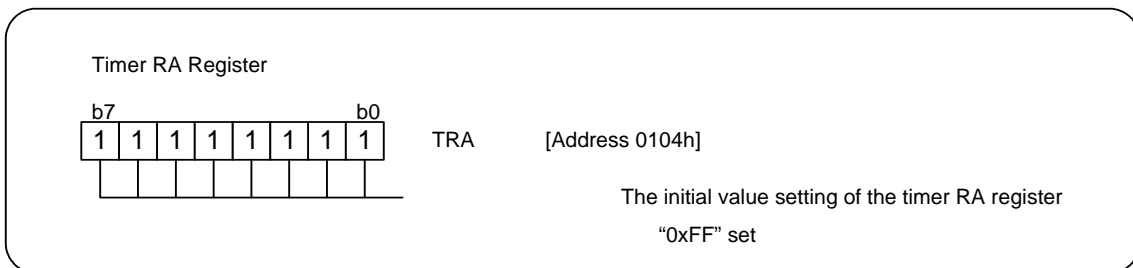
- (5) Stop timer RA counting forcibly.



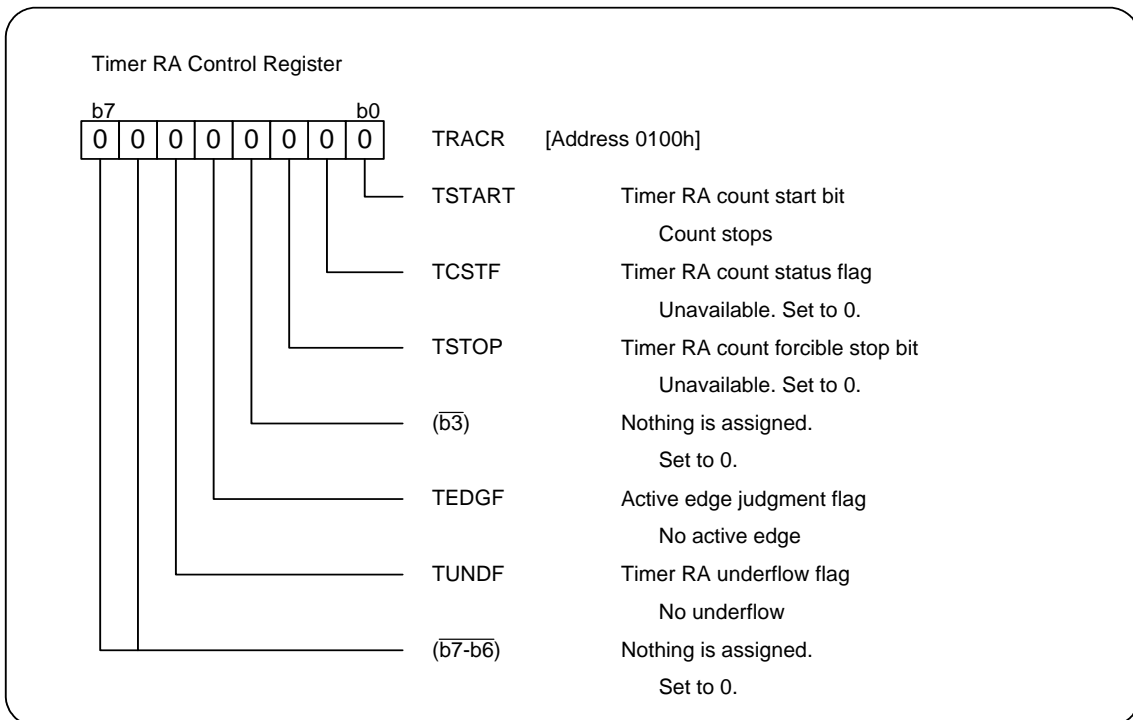
(6) Set the timer RA prescaler register.



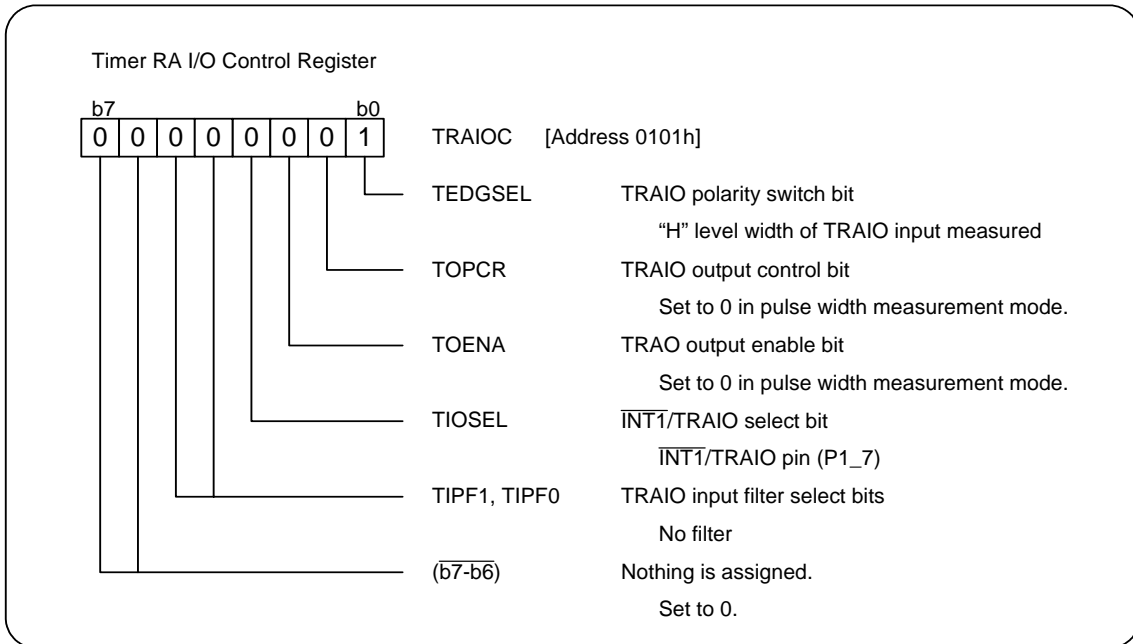
(7) Set the timer RA register.



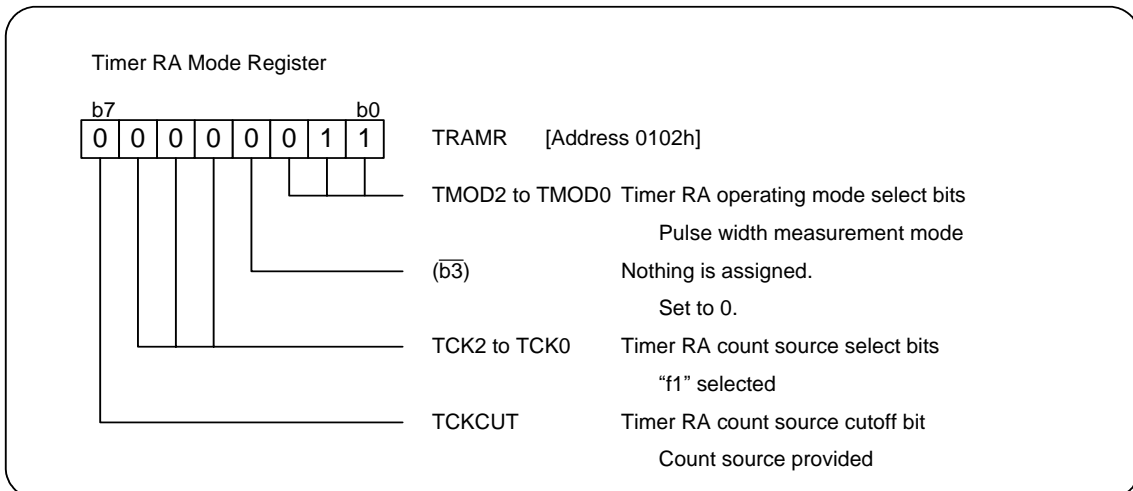
(8) Set the timer RA control register.



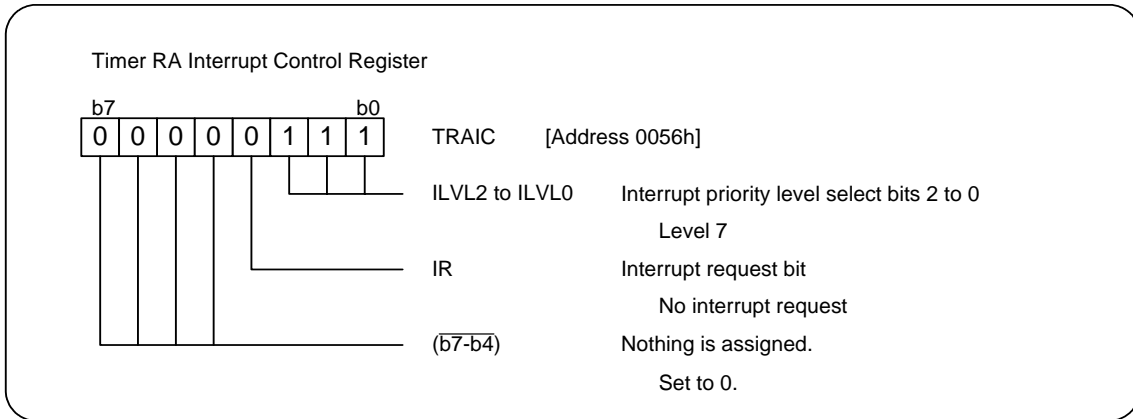
(9) Set the timer RA I/O control register.



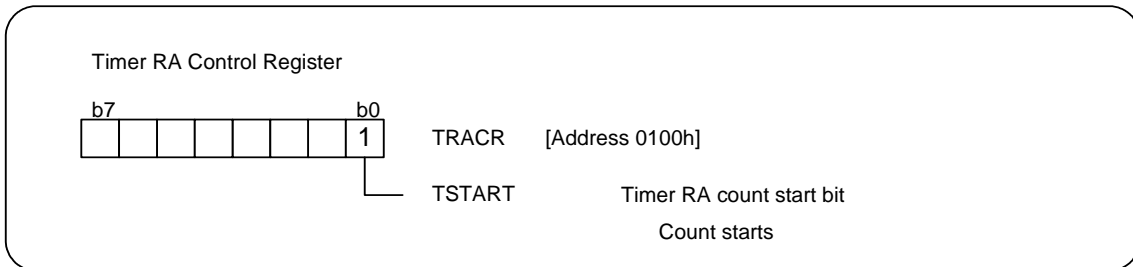
(10) Set the timer RA mode register.



(11) Set the timer RA interrupt control register.



(12) Start timer RA counting.

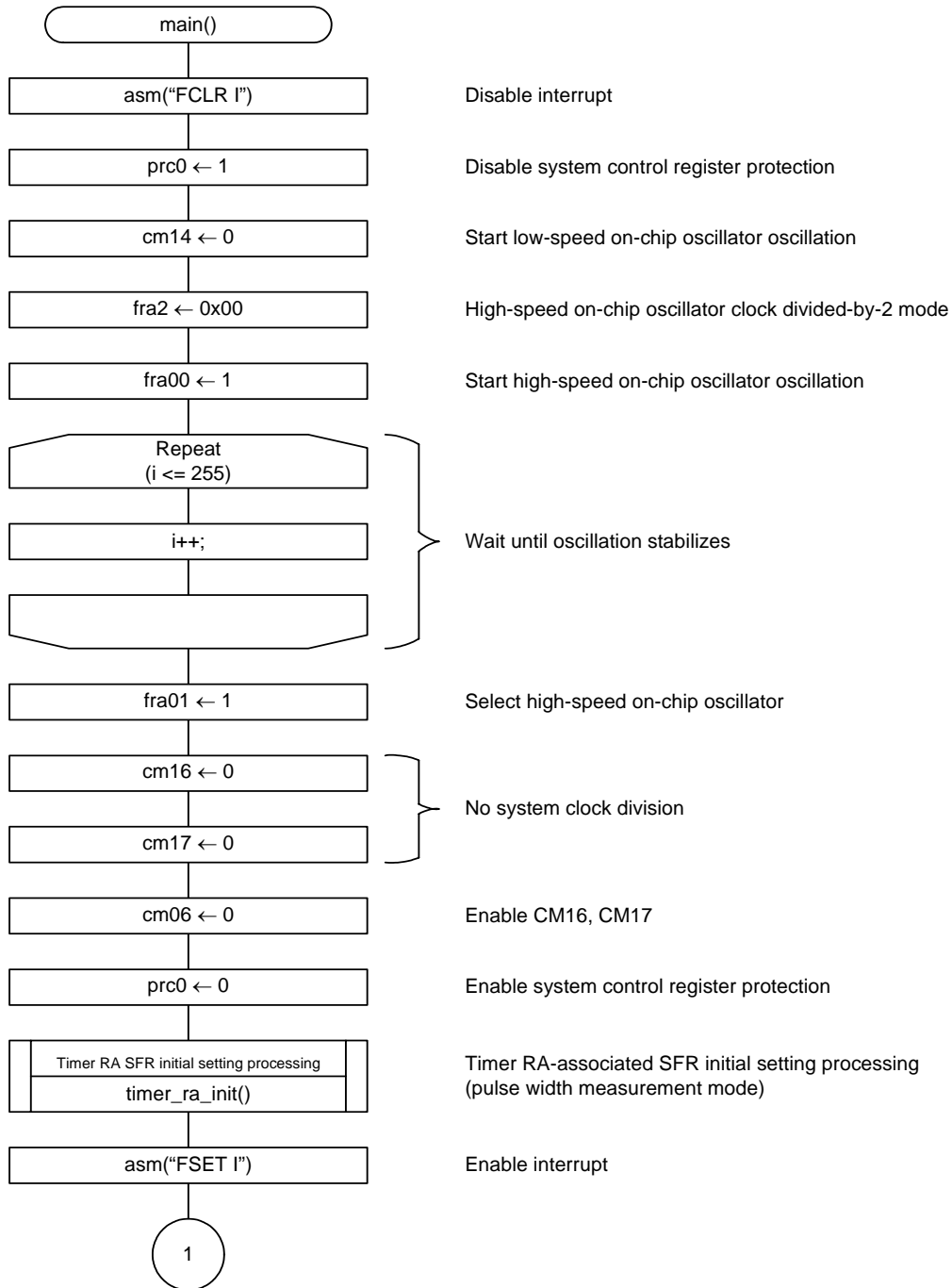


(13) Wait until the TCSTF bit in the TRACR register is set to 1.

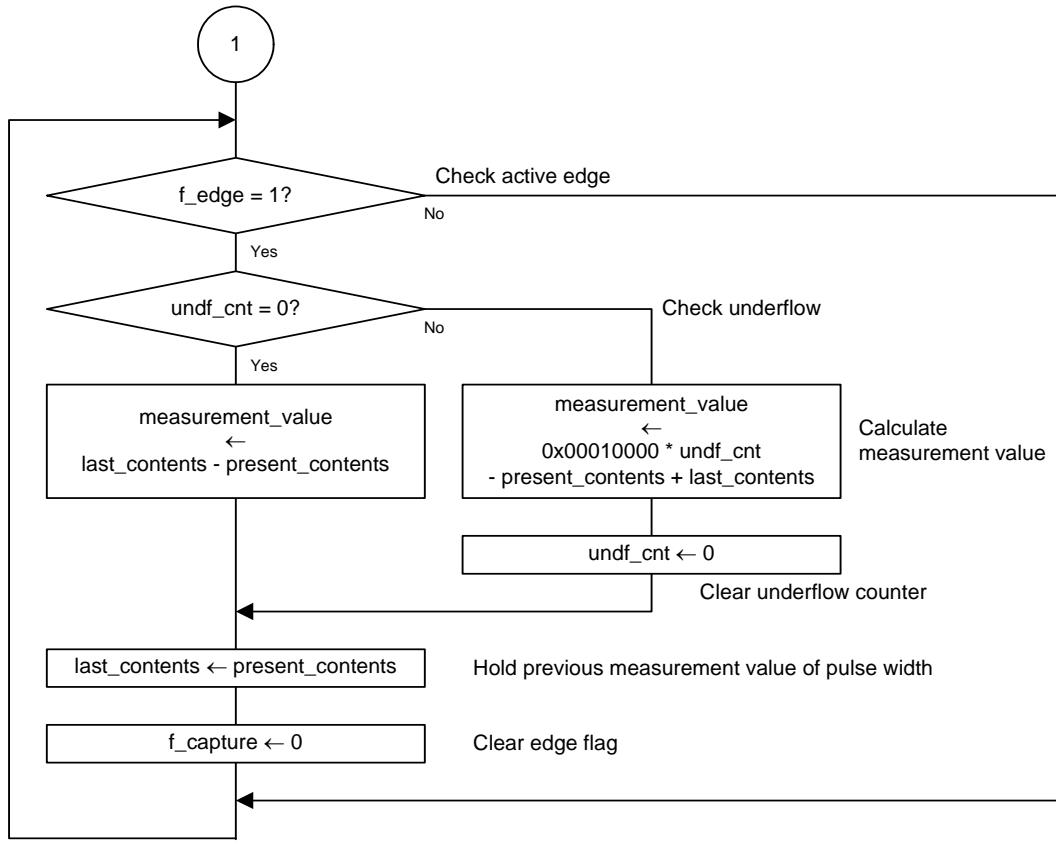
5. Flowchart

5.1 Main Function

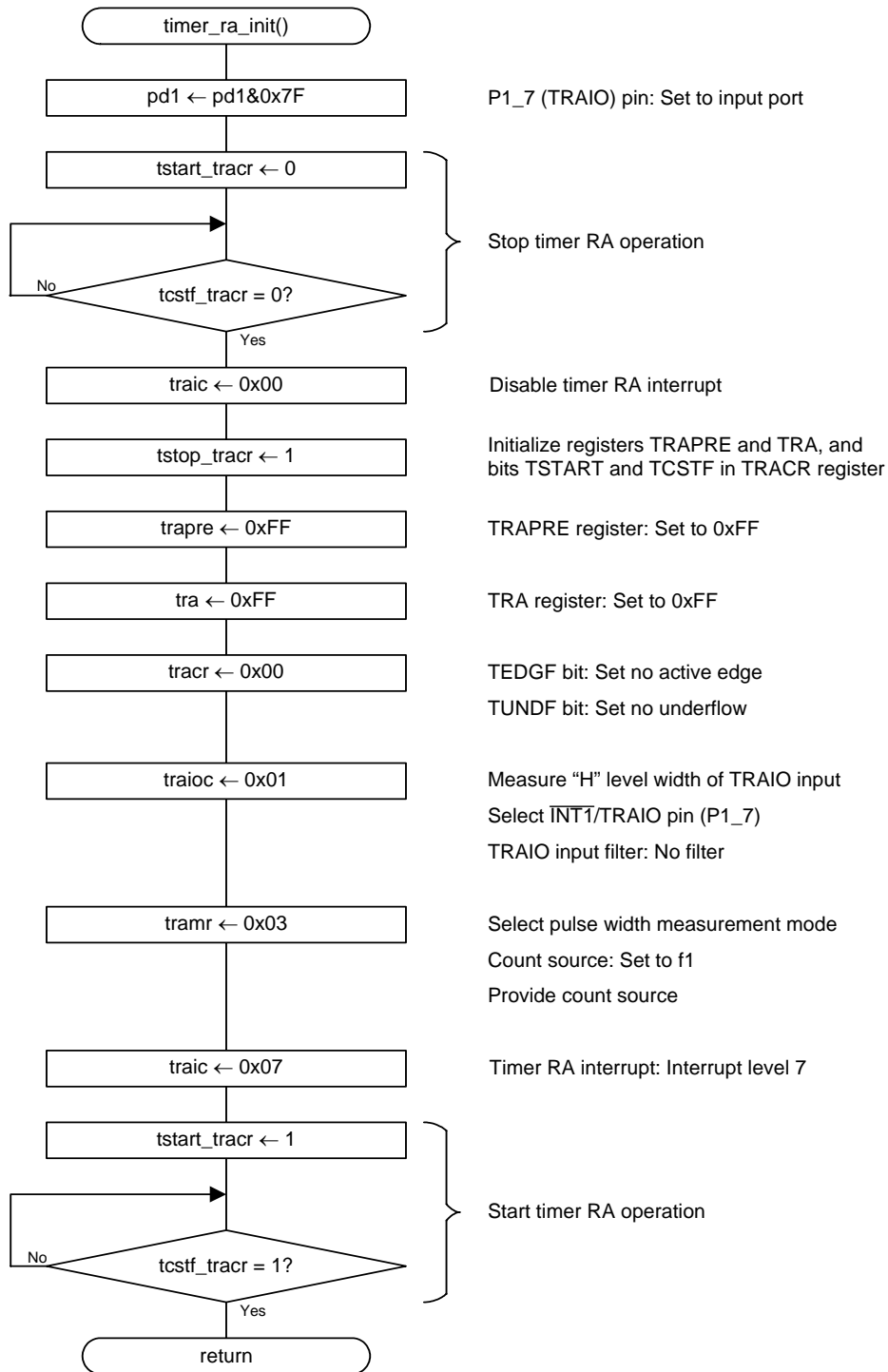
5.1.1 Main Function 1



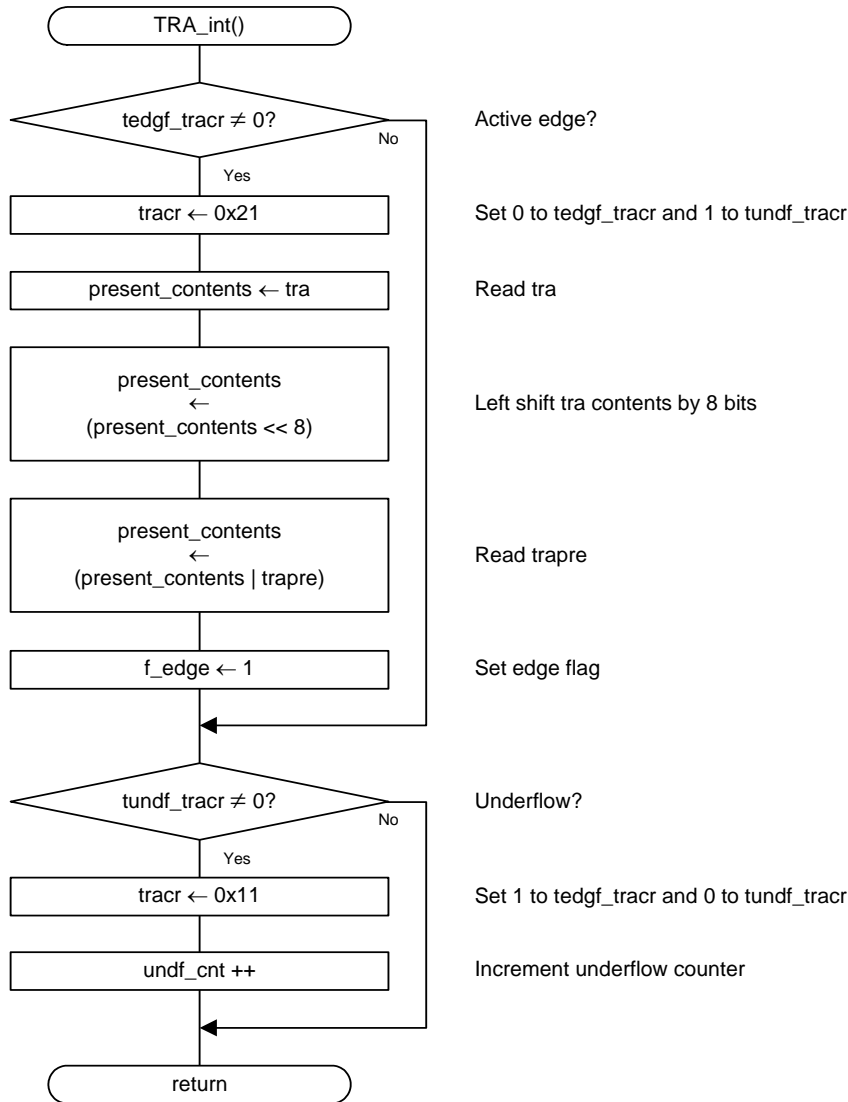
5.1.2 Main Function 2



5.2 Timer RA-Associated SFR Initial Setting Processing



5.3 Timer RA Interrupt Handling



6. Sample Programming Code

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

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

7. Reference Documents

Hardware Manual

R8C/25 Group Hardware Manual

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

Technical Update/Technical News

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REVISION HISTORY	R8C/25 Group Timer RA in Pulse Width Measurement Mode
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		Page	Summary
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