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April 1st, 2010
Renesas Electronics Corporation

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M32C/84, 85, 86, 87, 88 Group

Long-Period Timers

1. Abstract

Two timer A's are connected to make a 16-bit timer with a 16-bit prescaler.
Use the peripheral functions listed below.

- Timer A0 in timer mode
- Timer A1 in event counter mode

2. Introduction

The application example described in this document is applied to the following MCUs and parameter(s):

MCUs: M32C/84 Group
M32C/85 Group
M32C/86 Group
M32C/87 Group
M32C/88 Group

This program can be used with other M16C Family MCUs which have the same special function registers (SFRs) as the above MCUs. Check the manual for any additions and modifications to functions. Careful evaluation is recommended before using this application note.

3. Example Description

3.1 Specifications

(1) Set timer A0 to timer mode, and timer A1 to event counter mode.
(2) Timer A0 counts the count source f1 and generates a 1 ms period.
Timer A1 counts timer A0 underflows and generates a 1s period.
(3) Connect a 32 MHz oscillator to Xin.

3.2 Operation

(1) Setting bits TA0S and TA1S in the TABSR register to 1 (count started) causes the counter to start counting.
The timer A0 counter counts the count source f1.
(2) If the timer A0 counter underflows, the counter reloads the content of the reload register and continues counting. At this time, the IR bit in the TA0IC register is set to 1 (interrupt requested).
Also, the timer A1 counter decrements its value.
(3) If the timer A1 counter underflows, the counter reloads the content of the reload register and continues counting. At this time, the IR bit in the TA1IC register is set to 1 (interrupt requested).
(4) Setting the TA0S bit to 0 (count stopped) causes the counter to hold its value and to stop.

Figure 1 shows the Operation Timing and Figure 2 shows the Timer Connection Diagram.

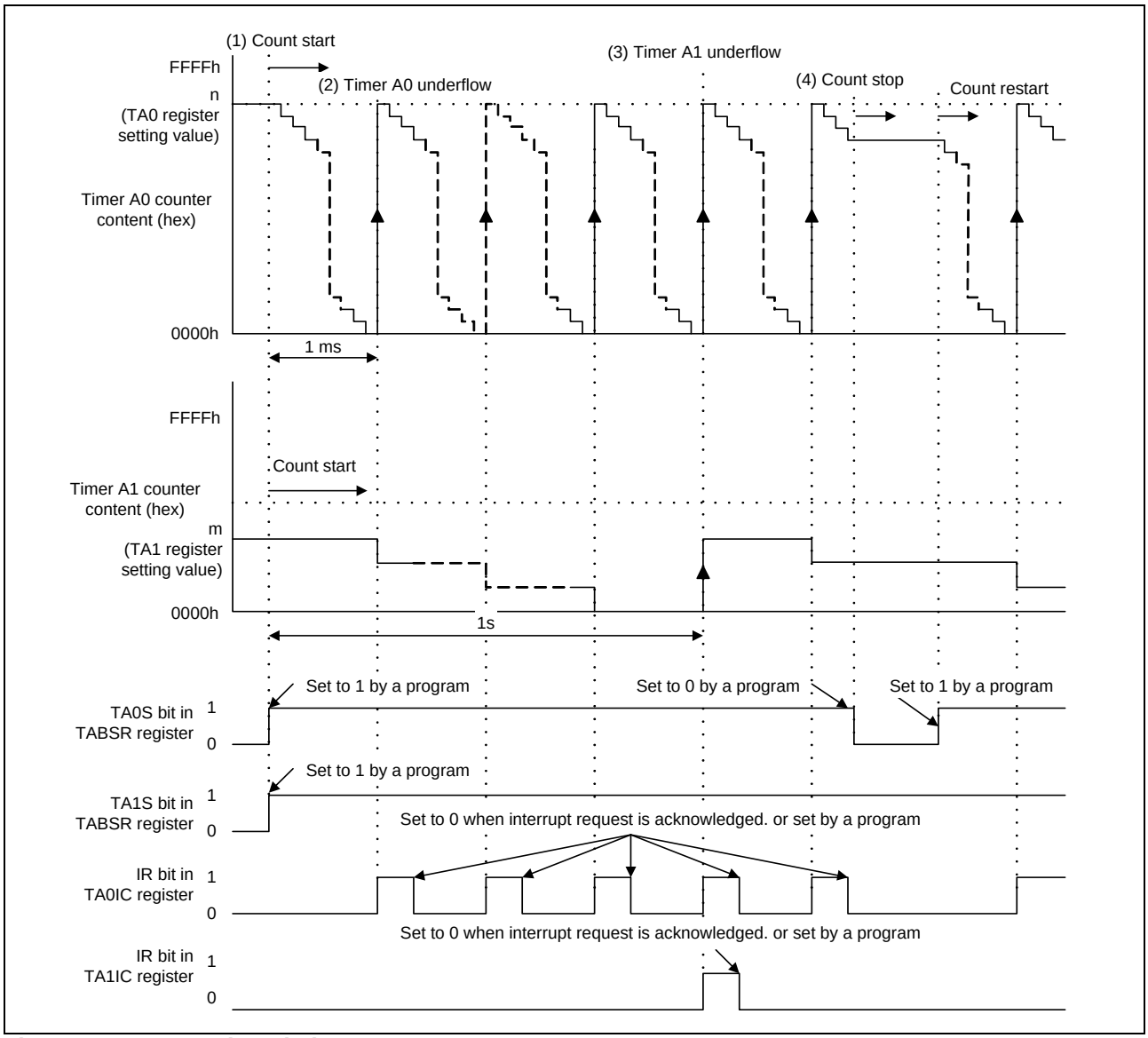


Figure 1 Operation Timing

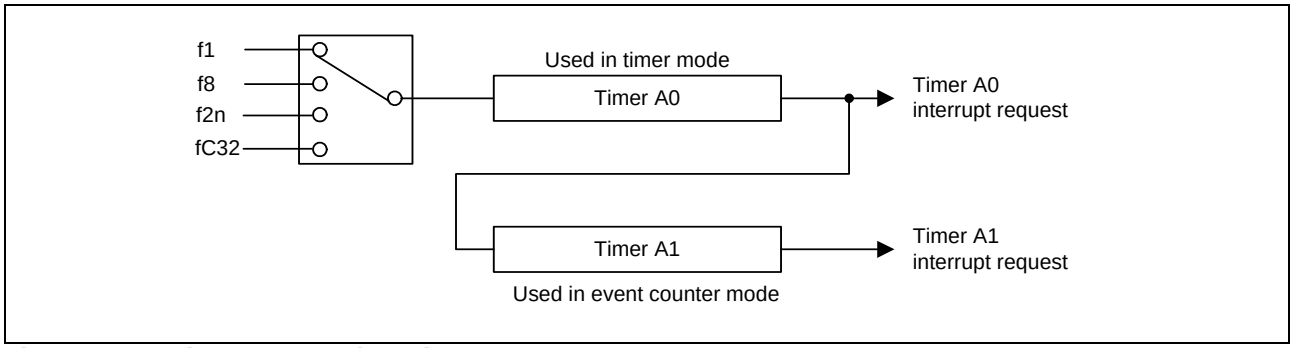
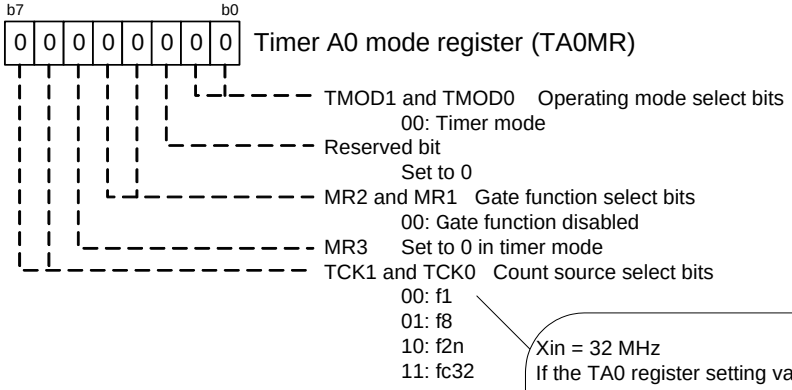


Figure 2 Timer Connection Diagram

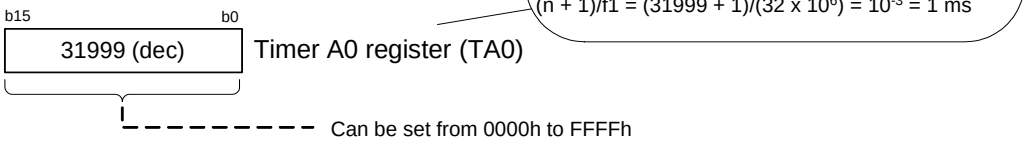
3.3 Setup

This section shows the setting steps and values to perform the application example described in **3. Example Description**.
Refer to the each MCUs Hardware Manual for details of individual registers.

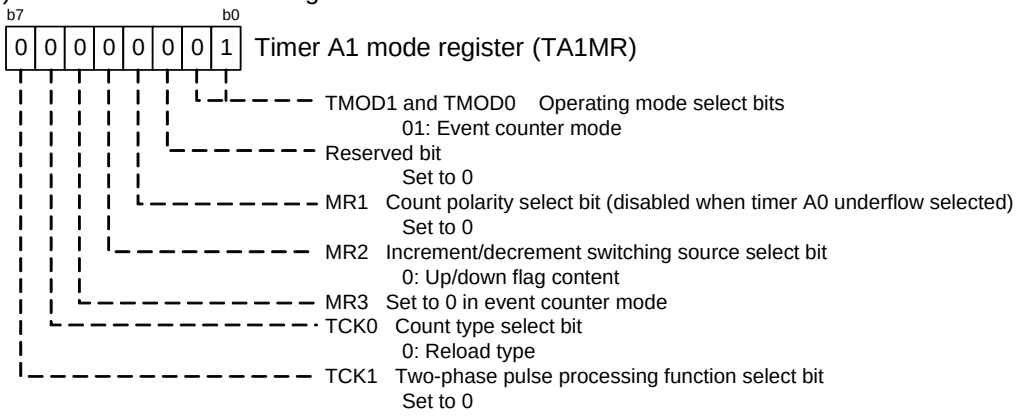
(1) Set the timer A0 mode register



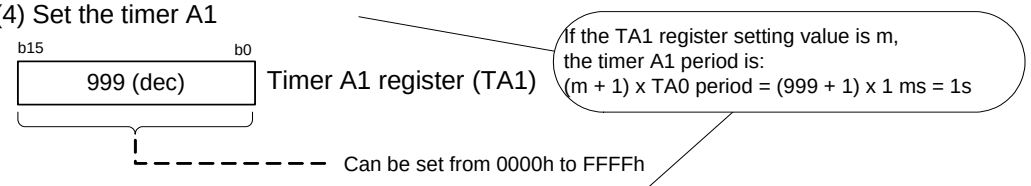
(2) Set the timer A0 register



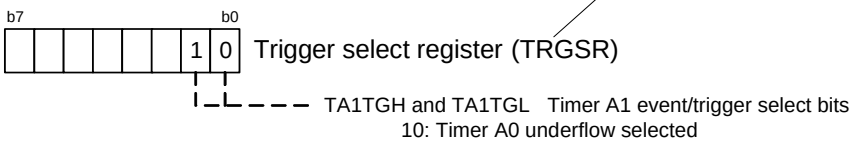
(3) Set the timer A1 mode register



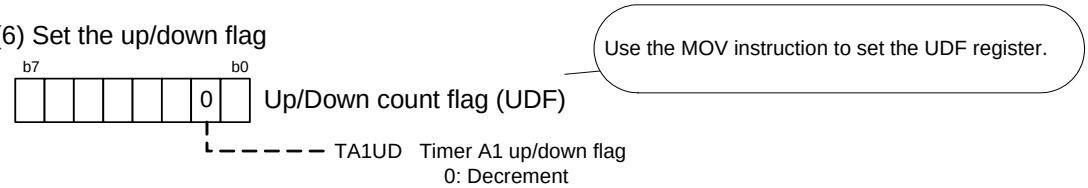
(4) Set the timer A1



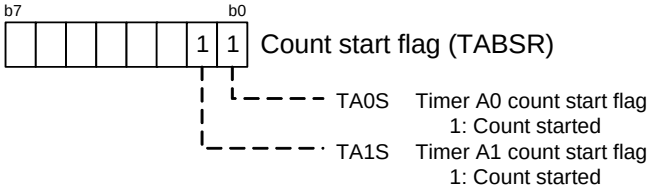
(5) Set the trigger select register



(6) Set the up/down flag



(7) Set the count start flag



4. Sample Programming Code

A sample program can be downloaded from the Renesas Technology website.
For download, click “Application Notes” in the left-hand side menu of the M16C Family page.

5. Reference Documents

Hardware Manuals
M32C/84 Group Hardware Manual
M32C/85 Group Hardware Manual
M32C/86 Group Hardware Manual
M32C/87 Group Hardware Manual
M32C/88 Group Hardware Manual
The latest version can be downloaded from the Renesas Technology website.

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REVISION HISTORY	M32C/84, 85, 86, 87, 88 Group Long-Period Timers

Rev.	Date	Description	
		Page	Summary
1.00	Sep.10, 2006	–	First Edition issued

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