

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

Send any inquiries to <http://www.renesas.com/inquiry>.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
 - “Standard”: Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.
 - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
 - “Specific”: Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

32176 Group

Combination of two Timers

1. Overview

The reference sample program combined noise processing input mode of timer TIO5 and measure input function of timer TML0 for 32176 group appears on this document.

2. Introduction

The sample task described in this document uses the following microcomputers, under the respective conditions.

- Microcomputer: 32176 Group (M32176FnVFP, M32176FnTFP)
- Operating Frequency: 20 to 40 MHz (The sample program is compiled assuming a frequency of 40 MHz.)
- Operating Board: Starter kit for 32176 Group

3. Sample program for Combination of two timers

3.1 Outline of Sample program

In this sample program, Time after Noise processing input is measured by combining noise processing input mode of timer TIO5 and measure input function of timer TML0.

TIO5 is operated by noise processing mode, with count clock bus 0 as count source. Input external signal is inputted from TIN3 to timer TIO5 through input event bus 3, if "H" level of the signal is more than setting time on the program, it goes interrupt processing. Also when output from TIO5 is inputted to TML0 through input event bus 0, that counter value of TML0 is captured in TML0 measure 0 register.

In this sample program P11DATA is incremented for confirming interrupt.

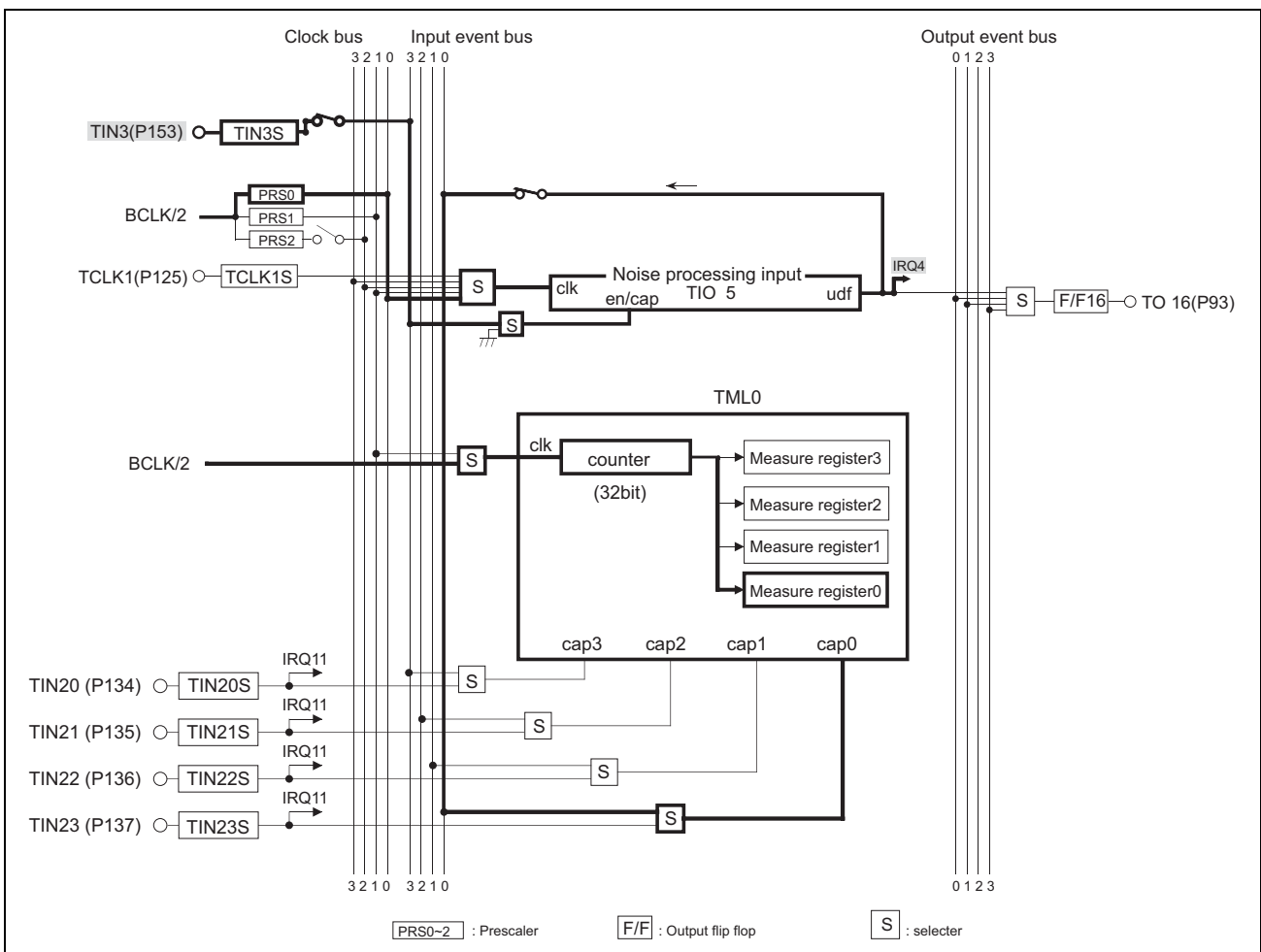


Figure 3.1.1 Configuration of Sample for Combination of the plural timer

3.2 Description of a reference program

Note: The registers used are indicated as (register name: bit name).

3.2.1 Various initialization functions (init_func())

(1) Call the port initialization function

3.2.2 Port initialization functions (port_init())

(1) Initial setting of output port

- Set Port Input Permit bit of Port Input Special Function Control Register as permit inputting (PICNT: PIEN0)
- Initialize P11 Data Register (P11DATA)
- Set P11 Direction Register as output mode. (P11DIR)
- Set P11 Operation Mode Register as input/output port. (P11MOD)

Note: If a Direction Register is set as output before setting up a Data Register, an unfixed value is outputted until writing will be performed to a Data Register.

3.2.3 TIO5 Noise Processing Input mode initial setting Function (TIO5_noise_init())

(1) Set prescaler divided by value

- Set “prescaler divided by value -1” in prescaler register 0. (PRS0)
(10us@10MHz)

(2) Set Input Event Bus (CKIEBCR: IEB3S, IEB0S)

- Select TIN3 when inputs in input event bus3.
- Select TIO5 when inputs in input event bus0.

(3) Initial setting TIO5

- Set Noise Processing Input Mode (TIO5CR: TIO5M)
- Set Clock Bus0 to Clock sources (TIO5CR: TIO5CKS)
- Set Input Event Bus3 to Measurement Input Sources (TIO5CR: TIO5ENS)
- Set noise judgment time in reload register 0.(TIO5RL0)

(4) Initial setting Input terminal

- Set TIN3 as "H" level is valid. (TINCR0: TIN3S)
- Set P153 Operation Mode bit to TIN3 (P15MOD: P153MOD)

(5) Set Interrupt

- Set TIO5 Interrupt Request as prohibition (TIOIR1: TIOIM5)
- Set interrupt prior level as “1”. (IMJTOCR4)
- Set TIN3 Interrupt Request as permission (TINIR0: TINIM3)

(6) Start counting TIO5

- Set Enable protect bit as permit rewriting (TIOPRO: TIO5PRO) (Note 1)
- Start counting (TIOCEN: TIO5CEN)

Note 1. Set enable only for bit used, set disable for other bit.

3.2.4 TML0 measure input processing initialize Function (TML0_Cap_init())

- (1) Initialize TML0 (TML0CR: TML0SS0, TML0CKS)
- Set the trigger of TML0 measure to input event bus0.
 - Set TML0 clock source select bit to BCLK/2.

3.2.5 Main Function (main())

- (1) Call the interrupt prohibitive function
- (2) Call the various initialization functions
- (3) Call the TML0 measure input processing initial function
- (4) Call the TIO5 Noise Processing Input Mode Initial setting Function
- (5) Call the interrupt permit function
- (6) Infinite loop waiting for Interrupt

3.2.6 TIO Interrupt handler function (TIO4_7_Int())

- (1) TIO5 Interrupt Request Status Check
- When there is TIO5 interrupt request, go those processing below.
- 1) Call the interrupt prohibitive function
 - 2) Clear TIO5 Interrupt Request Status (TIOIR1: TIOIS5)
 - 3) Call the interrupt permit function
 - 4) Call TIO5 Noise Processing Input interrupt processing function

3.2.7 TIO5 Noise Processing Input Interrupt Processing Function (TIO5_noiseInt())

- (1) TIO5 Interrupt Processing
- Call the interrupt prohibitive function.
 - As TIO5 is stopped, TIO5 is restart counting. (TIOPRO: TIOCEN)
 - Call the interrupt permit function
- (2) Increment of P11DATA
- When TIO5 interrupt occurs, increment P11DATA.
- (3) Read out TML0 counter
- Read out the value of TML0 measure0 register (TML0MR0).

3.2.8 Startup routine (startup.ms)

- (1) Set interrupt
- Set Interrupt sources of ICU Vector Table, which is MJT input interrupt4 (H'0000 00B4), as the head address of interrupt processing function (TIO4_7_Int())

3.3 Sample Program

The sample program for combination of two timers is shown below.

Note that the sample program below requires the SFR definition file. The latest SFR definition file can be downloaded from Renesas Technology website. When using the SFR definitions file, adjust the path setting to match the operating computer environment.

3.3.1 noise_cap.c

```

1  /* FILE COMMENT      *****
2  *      M32R C Programming      Rev. 1.01
3  *      < Sample Program for 32176 >
4  *      < TIO5 noise processing input & TML0 Capture >
5  *
6  *      Copyright (c) 2004 Renesas Technology Corporation
7  *      All Rights Reserved
8  *      *****/
9
10 *****/
11 /*      Include file      */
12 *****/
13
14 #include      "..\inc\sfr32176_pragma.h"
15
16 *****/
17 /*      Function prototype declaration      */
18 *****/
19
20      void      main(void);      /* Main function */
21      void      init_func(void);      /* Initial setup function */
22      void      port_init(void);      /* Initialize port */
23      void      TIO5_noise_init( void );      /* Initialize TIO5 noise processing
input mode */
24      void      TML0_Cap_init( void );      /* Initialize TML0 capture input */
25      void      TIO5_noiseInt( void );      /* Process TIO5 noise processing
input interrupt (user processing) */
26      void      TIO4_7_Int(void);      /* Process TIO4-7 output interrupt */
27
28 *****/
29 /*      Definition of external reference      */
30 *****/
31
32 extern void      DisInt( void );      /* Interrupt disable function */
33 extern void      EnInt( void );      /* Interrupt enable function */
34
35 *****/
36 /*      Define macro      */
37 *****/
38
39 /*** Noise processing input (TIO5) ***/
40
41      /* 0123 4567
*/
42 #define IEB03_MASK      0xc4u      /* 1100 0100B   Clock bus & input event bus
control register */
43 #define IEB03_INIT      0x04u      /* 0000 0100B
*/
44      /* ||   +----- Input event bus 0 :Select
TIO5 (TIO5 output) for output */
45      /* +------ Input event bus 3 :TIN3
*/
46
47      /* 0123 4567 89AB CDEF
*/
48 #define TIN3_MASK      0x0700u      /* 0000 0111 0000 0000B
*/
49 #define TIN3_HLevel      0x0600u      /* 0000 0110 0000 0000B
*/
50      /*   +++----- Set high on TIN3 to
be the active level      */
51
52      /* 0123 4567
*/

```

```

53 #define TIO5_Noise      0x9eu          /* 1001 1110B
*/
54                               /* |||| |+++--- Set TIO5 noise processing
input mode                      */
55                               /* |||+----- Measurement input source :
*/
56                               /* |||                               Input event bus 3
selected                          */
57                               /* +++----- Select clock bus 0
*/
58
59 #define TIO5_NoiseTime  100 - 1      /* Count value for noise judgment time
*/
60
61 /*** Capture(TML0) ***/
62
63                               /* 0123 4567
*/
64 #define TML0SS0_MASK    0x81u        /* 1000 0001B   TML0 control register
*/
65 #define TML0SS0_IEB0    0x80u        /* 1000 0000B
*/
66                               /* |           +--- Select 1/2 internal
peripheral clock                 */
67                               /* +----- Input event bus 0 selected
*/
68
69 /*****
70 /*                               Global variable                               */
71 /*****
72
73     ULONG    capture_time;           /* Measurement count value */
74
75 /*****FUNC COMMENT*****/
76 * Function name: init_func()
77 *-----
78 * Description   : Initialize ICU
79 *-----
80 * Argument      : -
81 *-----
82 * Returns       : -
83 *-----
84 * Notes         :
85 *""FUNC COMMENT END""*****/
86 void init_func(void)
87 {
88     port_init();                     /* Initialize those related to port
*/
89 }
90
91 /*****FUNC COMMENT*****/
92 * Function name :port_init()
93 *-----
94 * Description   : Initialize port
95 *-----
96 * Argument      : -
97 *-----
98 * Returns       : -
99 *-----
100 * Notes         :
101 *""FUNC COMMENT END""*****/
102 void port_init(void)
103 {
104     PICNT = PIEN0;                   /* Enable port input */
105
106     P11DATA = 0x00;                  /* Output data (must be set prior to
mode) */
107     P11DIR = 0xff;                   /* P110-P117 : Output mode */
108     P11MOD = 0x00;                   /* P110-P117 : Input/output port */
109 }
110
111 /*****FUNC COMMENT*****/
112 * Function name : TIO5_noise_init()
113 *-----
114 * Description   : Initialize TIO5 noise processing input mode
115 *               : - TIO5 is used in noise processing input mode to detect
116 *               :   high on TIN3 via input event bus 3

```



```

117 *           : - Output TIO5 underflow to input event bus 0 (to TML0_Cap0)
118 *           : - Use clock bus 0 as a count source
119 *-----
120 * Argument   : -
121 *-----
122 * Returns    : -
123 *-----
124 * Notes      : Set prescaler, clock bus, etc. separately
125 *           : Set functions of ICU's interrupt control related registers separately
126 *           : Port input function must be enabled
127 *           : For M32R/E#1,2,3, PnMOD cannot be accessed for R/M/W
128 *           : The function must be executed while interrupt is disabled
129 *"FUNC COMMENT END"*****
130 void TIO5_noise_init( void )
131 {
132     UCHAR temp;
133     USHORT temp16;
134
135     PRS0 = ( 100 - 1); /* Set prescaler(10us@10MHz)
*/
136
137 /**/ Setting input event bus 0,3 ***/
138
139     temp = CKIEBCR;
140     CKIEBCR = ( temp & ~IEB03_MASK) | IEB03_INIT; /* Select input event bus 0,3
for input */
141
142 /**/ Setting noise processing input mode (TIO5) ***/
143
144     TIO5CR = TIO5_Noise; /* Set TIO5 noise processing
input mode */
145     TIO5RL0 = TIO5_NoiseTime; /* Set TIO5 noise judgment
time */
146
147 /**/ Setting P153 (TIN3) high level active ***/
148
149     temp16 = TINCR0;
150     TINCR0 = ( temp16 & ~TIN3_MASK) | TIN3_HLevel; /* Set high on TIN3 to be the
active level */
151     P15MOD |= 0x10u; /* Select P153 for TIN */
152
153 /**/ Setting interrupt (TIO5) ***/
154
155     temp = TIOIR1;
156     temp |= ( TIOIS7 | TIOIS6 | TIOIS4);
157     temp &= ~( TIOIS5 | TIOIM5); /* Enable TIO5 interrupt */
158     TIOIR1 = temp;
159     IMJTOCR4 = 0x01; /* TIO4-7 ILEVEL=1 */
160
161 /**/ Setting interrupt (TIN3) ***/
162
163     TINIR1 |= TINIM3; /* Disable TIN3 interrupt */
164
165 /**/ Starting count ***/
166
167     TIOPRO = (~TIO5PRO) & 0xFFFFu; /* Enable TIO5 enable protect
rewrite */
168     TIOCEN = 0xffff; /* Starting count TIO5 */
169 }
170
171 /"FUNC COMMENT"*****
172 * Function name : TML0_Cap_init()
173 *-----
174 * Description   : Initialize TML0 capture input
175 *           : - Capture upon input event bus 0 (TIO5 underflow)
176 *-----
177 * Argument     : -
178 *-----
179 * Returns      : -
180 *-----
181 * Notes        : TML0 counter is not initialized
182 *           : Counter start counting upon reset
183 *           : The function must be executed while interrupt is disabled
184 *"FUNC COMMENT END"*****
185 void TML0_Cap_init( void )
186 {
187     UCHAR temp;

```

```

188  /** Setting measure timer (TML0) */
189
190      temp = TML0CR;
191      TML0CR = ( temp & ~TML0SS0_MASK) | TML0SS0_IEB0;          /* TML0 measure 0 -> input
event bus 0 (TIO5 underflow) */
192  }
193
194  /*"FUNC COMMENT"*****
195  * Function name: main()
196  *-----
197  * Description   : - Interrupt processing is executed when TIO5 is operated
198  *               :   in noise processing input mode and high-level duration
199  *               :   on TIN3 is lms or more (source clock frequency: 10 MHz)
200  *               :   LED (PORT11) is incremented when an interrupt occurred
201  *-----
202  * Argument     : -
203  *-----
204  * Returns      : -
205  *-----
206  * Notes        : -
207  *"FUNC COMMENT END"*****/
208  void main(void)
209  {
210      DisInt();          /* Disable interrupt */
211
212      init_func();
213
214      TML0_Cap_init();   /* Set TML0 capture */
215      TIO5_noise_init(); /* Start TIO5 count */
216
217      EnInt();          /* Enable interrupt */
218
219      while(1){
220          ;
221      }
222  }
223
224  /*"FUNC COMMENT"*****
225  * Function name : TIO4_7_Int()
226  *-----
227  * Description   : - Process TIO4-7 output interrupt
228  *               :   Clear request if the interrupt is TIO5 interrupt and
229  *               :   TIO5 interrupt processing will be executed
230  *-----
231  * Argument     : -
232  *-----
233  * Returns      : -
234  *-----
235  * Notes        : TIO4,6,7 output interrupt not considered
236  *"FUNC COMMENT END"*****/
237  void TIO4_7_Int(void)
238  {
239      UCHAR   temp;
240
241      /** Interrupt judgment(TIO5) */
242
243      if(( TIOIR1 & TIOIS5) != 0u) {
244          DisInt();          /* Disable interrupt */
245          temp = TIOIR1;
246          temp |= ( TIOIS4 | TIOIS6 | TIOIS7);
247          temp &= ~TIOIS5;   /* Clear TIN0 interrupt
request */
248          TIOIR1 = temp;
249          EnInt();          /* Enable interrupt */
250
251          TIO5_noiseInt();  /* Process TIO5 interrupt */
252      }
253  }
254  /*"FUNC COMMENT"*****
255  * Function name: TIO5_noiseInt()
256  *-----
257  * Description   : Process TIO5 interrupt
258  *-----
259  * Argument     : -
260  *-----
261  * Returns      : -
262  *-----

```

```

263 * Notes      : In the noise processing mode, the counter is stopped upon
264 *            : an underflow and count must be started over again to
265 *            : restart processing. The interrupt processing time until
266 *            : recount is not considered
267 *""FUNC COMMENT END""******/
268 void      TIO5_noiseInt( void )
269 {
270     DisInt();                /* Disable interrupt */
271     TIOPRO = (~TIO5PRO) & 0xFFFFu; /* TIO5 Enable TIO5 enable
protect rewrite */
272     TIOCEN = 0xffff;        /* TIO5 Starting count TIO5
*/
273     EnInt();                /* Enable interrupt */
274
275     (P11DATA)++;           /* Increment the port when an
interrupt occurred */
276     capture_time = TML0MRO; /* Copy the TML0 measure 0
register value to the RAM */
277
278 }

```

3.3.2 startup.ms

(abbreviation)

```

69 ;*****
70 ; ICU Vector Table
71 ;*****
72 ;
73     .SECTION      ICUVECT, DATA, ALIGN=4
74 ;
75     .IMPORT      $TIO4_7_Int
76 ;
77 vectbl:
78     .DATA.W      EIT_reset      ; H'0000 0094  MJT Input Interrupt 4:TIN3-
TIN6
79     .DATA.W      EIT_reset      ; H'0000 0098  MJT Input Interrupt 3:TIN20-
TIN23
80     .DATA.W      EIT_reset      ; H'0000 009C  MJT Input Interrupt 2:TIN12-
TIN19
81     .DATA.W      EIT_reset      ; H'0000 00A0  MJT Input Interrupt 1:TIN0-
TIN2
82     .DATA.W      EIT_reset      ; H'0000 00A4  MJT Input Interrupt 0:TIN7-
TIN11
83     .DATA.W      EIT_reset      ; H'0000 00A8  MJT Output Interrupt
7:TMS0,TMS1
84     .DATA.W      EIT_reset      ; H'0000 00AC  MJT Output Interrupt
6:TOP8,TOP9
85     .DATA.W      EIT_reset      ; H'0000 00B0  MJT Output Interrupt 5:TOP10
86     .DATA.W      $TIO4_7_Int    ; H'0000 00B4  MJT Output Interrupt 4:TIO4-
TIO7
87     .DATA.W      EIT_reset      ; H'0000 00B8  MJT Output Interrupt
3:TIO8,TIO9
88     .DATA.W      EIT_reset      ; H'0000 00BC  MJT Output Interrupt 2:TOP0-
TOP5
89     .DATA.W      EIT_reset      ; H'0000 00C0  MJT Output Interrupt
1:TOP6,TOP7
90     .DATA.W      EIT_reset      ; H'0000 00C4  MJT Output Interrupt 0:TIO0-
TIO3
91     .DATA.W      EIT_reset      ; H'0000 00C8  DMAC0-4 Interrupt:DMA0-DMA4
92     .DATA.W      EIT_reset      ; H'0000 00CC  SIO1 Receive Interrupt
93     .DATA.W      EIT_reset      ; H'0000 00D0  SIO1 Transmit Interrupt
94     .DATA.W      EIT_reset      ; H'0000 00D4  SIO0 Receive Interrupt
95     .DATA.W      EIT_reset      ; H'0000 00D8  SIO0 Transmit Interrupt
96     .DATA.W      EIT_reset      ; H'0000 00DC  A-D0 Conversion Interrupt
97     .DATA.W      EIT_reset      ; H'0000 00E0  TID0 Output Interrupt
98     .DATA.W      EIT_reset      ; H'0000 00E4  TOD0 Output Interrupt
99     .DATA.W      EIT_reset      ; H'0000 00E8  DMAC5-9 Interrupt:DMA5-DMA9
100    .DATA.W      EIT_reset      ; H'0000 00EC  SIO2,3 Transmit/Receive
Interrupt
101    .DATA.W      EIT_reset      ; H'0000 00F0  RTD Interrupt
102    .DATA.W      EIT_reset      ; H'0000 00F4  TID1 Output Interrupt
103    .DATA.W      EIT_reset      ; H'0000 00F8  TOD1,TOM0 Output Interrupt
104    .DATA.W      EIT_reset      ; H'0000 00FC  SIO4,5 Transmit/Receive
Interrupt
105    .DATA.W      EIT_reset      ; H'0000 0100  A-D1 Conversion Interrupt
106    .DATA.W      EIT_reset      ; H'0000 0104  TID2 Output Interrupt
107    .DATA.W      EIT_reset      ; H'0000 0108  TML1 Input Interrupt
108    .DATA.W      EIT_reset      ; H'0000 010C  CAN0 Transmit/Receive & Error
Interrupt
109    .DATA.W      EIT_reset      ; H'0000 0110  CAN1 Transmit/Receive & Error
Interrupt
110 ;

```

(abbreviation)

3.4 Timing of operation

Timing of operation in this reference program is shown below.
 In this program if "H" level time, as noise processing is less than 1ms it is invalid.
 (In the program, it is considering as $n = (100-1)$)

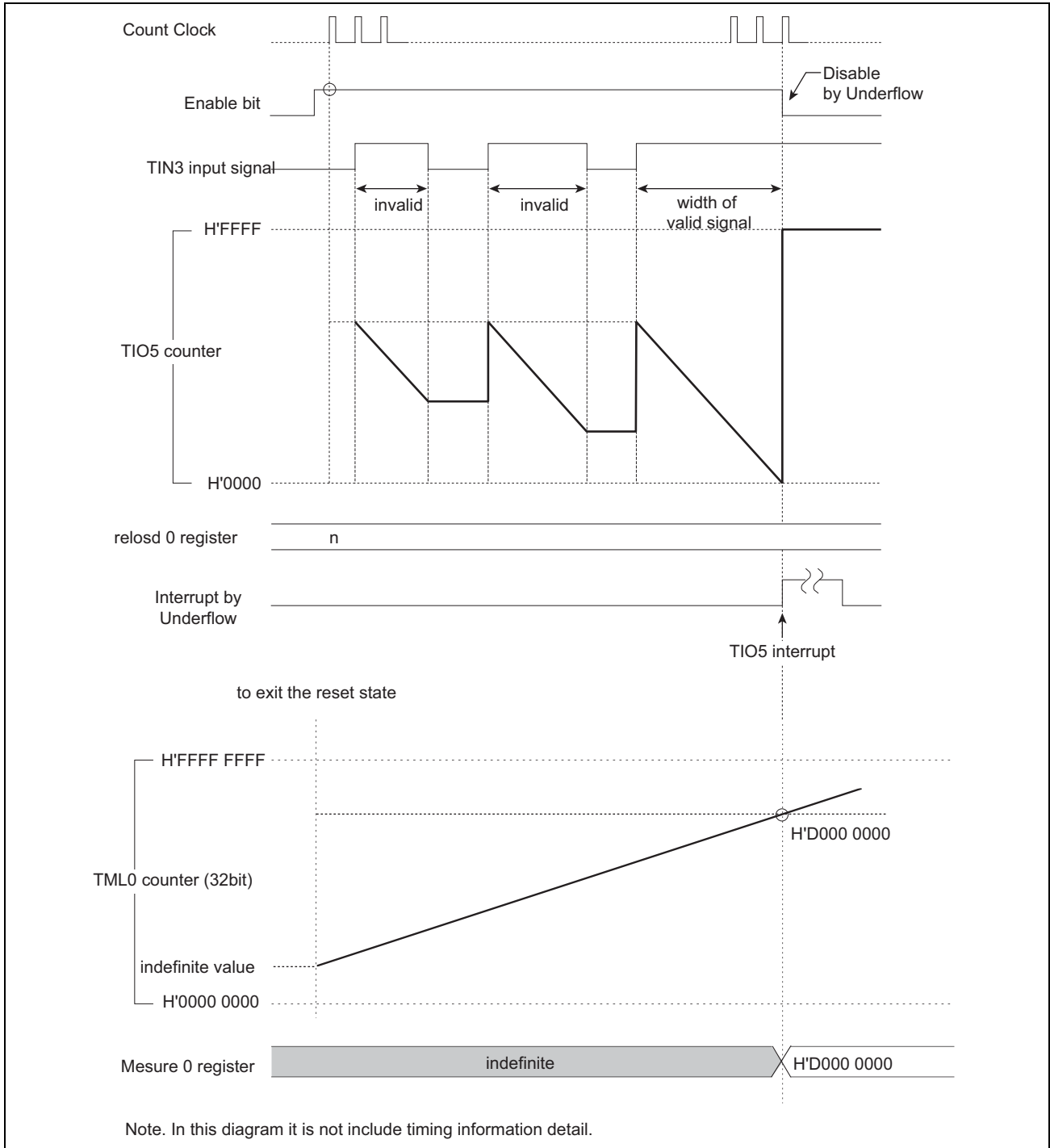


Figure3.4.1 Timing Diagram for TIO Noise Processing Input

4. Reference Documents

- 32176 Group User's Manual (Rev.1.01)
- M32R Family Software Manual (Rev.1.20)
- M3T-CC32R V.4.30 User's Manual (Compiler)
- M3T-CC32R V.4.30 User's Manual (Assembler)

(Please get the latest one from Renesas Technology Corp. website.)

5. Website and Support Center

- Renesas Technology Corp. website
<http://www.renesas.com/>
- Inquires for all Renesas products and technical inquiries for the M32R Family products:
Customer Support Center: csc@renesas.com

Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	Dec.09.05	—	First edition issued

Keep safety first in your circuit designs!

1. Renesas Technology Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corporation product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corporation or a third party.
2. Renesas Technology Corporation assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corporation or an authorized Renesas Technology Corporation product distributor for the latest product information before purchasing a product listed herein.
The information described here may contain technical inaccuracies or typographical errors. Renesas Technology Corporation assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.
Please also pay attention to information published by Renesas Technology Corporation by various means, including the Renesas Technology Corporation Semiconductor home page (<http://www.renesas.com>).
4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corporation assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corporation semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corporation or an authorized Renesas Technology Corporation product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corporation is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corporation for further details on these materials or the products contained therein.