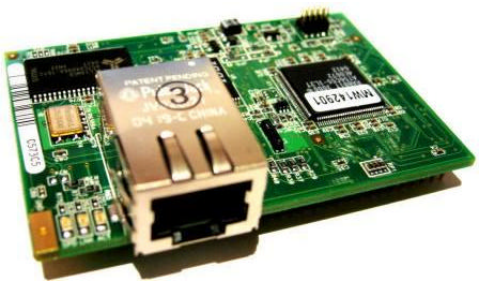
TN001

RABBIT micro controller

Extension of system timer clock to ms resolution
Technical note



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File:
Attachments: no attachments
Current versions available on: www.burger-web.com

Table of versions

Version	Date	Remarks
1.0	6.1.2005	First version
		Please check internet for updates www.burger-web.com

1 Overview

This document outlines how to modify the ZWorld library vdriver.lib to implement a system timer clock with ms-resolution. The description starts with a short problem description, shows an easy example and outlines the necessary modification step by step.

2 Introduction

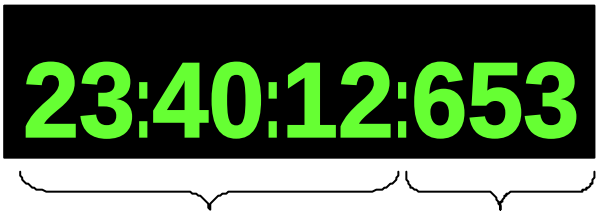
Some times it can be useful in a project to have an exact clock e.g. for capturing data with a time stamp. Having the Rabbit Micro Controller, a RTC with a resolution of 1 second is provided. Beyond that some timer variables as ms_timer, s_timer etc. are available with the Z-World libraries but what happens if an exact time stamp is needed. **The modification can be done in around 30 Minutes.**

2.1.1 The goal

The goal of this patch is to extend the system timer by a variable **MS_TIMER_CLOCK** for getting a clock with a resolution of 1ms. The MS_TIMER_CLOCK variable runs from 0 to 999 and is synchronized with the **SEC_TIMER** variable. The variable MS_TIMER_CLOCK has the type **unsigned int**.

2.1.2 Example

The example shows how to read the clock system clock variable having a time stamp with ms-resolution. The picture below shows the extension of the clock by the new timer value MS_TIMER_CLOCK.



Calculated by RTC or by SEC_TIMER **MS_TIMER_CLOCK**

The value can easily be read by the same way as the SEC_TIMER value. MS_TIMER_CLOCK is synchronized wit the SEC_TIMER value. A small example that shows the current SEC_TIMER value and MS_TIMER_CLOCK value is shown below.

Example program how to use the MS_TIMER_CLOCK variable

```
// Example program of modified vdriver.lib
// this program shows how to use the modified library vdriver.lib with the MS_TIMER_CLOCK value
// Author: Gerhard Burger
// Date: 6. November 2005
// Feedback: please over: www.burger-web.com
// Updates: www.burger-web.com
//
// program description
// first step: SEC_TIMRER value is inited by the Real time clock value (it is assumed that
// the RTC is inited with the right time value
// second step: program prints out the current second value (holding the time and date in
// a resolution of 1 second and print out the milliseconds
void main(void)
{
      SEC_TIMER = read_rtc();         // initialize SEC_TIMER to new RTC
      printf("System time is %d seconds and %d2 milliseconds \r\n",SEC_TIMER,MS_TIMER_CLOCK);
}
```

2.1.3 The Modification

Having a system timer clock with ms resolution the library vdriver.lib has to be modified. Changes have to be made on 5 positions in the vdriver.lib and around 30 minutes are needed.
All positions in the file are indicated with the label “@Modification, so that you can find them very easy.
Attached a small description of the five Modification steps

2.2 Modification step 1

Define an external shared unsigned int variable MS_TIMER_CLOCK. This variable can be accessed by the application.

Modification 1

```
extern char __TICK_COUNTER;
extern char __MS_COUNTER;
extern int __SEC_COUNTER;
extern unsigned int __MCOS_COUNTER;
extern unsigned int __MCOS_CNT_VAL;
extern shared unsigned long MS_TIMER;
extern shared unsigned long TICK_TIMER;
extern shared unsigned long SEC_TIMER;

// @MODIFICATION------------------------------  22. November 2004 ------------------------------additional code for 1000 Hz counter
// Extension to the system clock to MS-TIMERS
// Modification 1 to 5
extern shared unsigned int MS_TIMER_CLOCK;

extern char  bios_intnesting;
extern char  bios_swpend;

/*** EndHeader */

char  bios_intnesting;
char  bios_swpend;
unsigned int __MCOS_COUNTER;
char  __TICK_COUNTER;
char __MS_COUNTER;
int __SEC_COUNTER;
shared unsigned long SEC_TIMER;
shared unsigned long MS_TIMER;
shared unsigned long TICK_TIMER;
unsigned int __MCOS_CNT_VAL;


// @MODIFICATION---------------------------------  22. November 2004 ----------------------------------------------
additional code for 1000 Hz counter
// Extension to system Clock to MS-TIMERS
// Modification 2 of  5
shared unsigned int MS_TIMER_CLOCK;

char pisr_inuse;

#if __SEPARATE_INST_DATA__
// This overwrites the periodic interrupt relay
#rcodorg periodic_intvec apply
#asm
    jp periodic_isr
#endasm
#rcodorg rootcode resume
#endif

#asm xmem nodebug
;
```

Figure 1: Modification step 1 (indicated in blue color)

2.3 Modification step 2

Define a shared unsigned int variable MS_TIMER_CLOCK. This variable holds the milliseconds for the system clock.

Modification 1

```
extern char __TICK_COUNTER;
extern char __MS_COUNTER;
extern int __SEC_COUNTER;
extern unsigned int __MCOS_COUNTER;
extern unsigned int __MCOS_CNT_VAL;
extern shared unsigned long MS_TIMER;
extern shared unsigned long TICK_TIMER;
extern shared unsigned long SEC_TIMER;

// @MODIFICATION---------- 22. November 2004 ----------additional code for 1000 Hz counter
// Extension to the system clock to MS-TIMERS
// Modification 1 to 5
extern shared unsigned int MS_TIMER_CLOCK;

extern char  bios_intnesting;
extern char  bios_swpend;

/*** EndHeader */

char  bios_intnesting;
char  bios_swpend;
unsigned int __MCOS_COUNTER;
char  __TICK_COUNTER;
char __MS_COUNTER;
int __SEC_COUNTER;
shared unsigned long SEC_TIMER;
shared unsigned long MS_TIMER;
shared unsigned long TICK_TIMER;
unsigned int __MCOS_CNT_VAL;


// @MODIFICATION---------- 22. November 2004 ----------additional code for 1000 Hz counter
// Extension to system Clock to MS-TIMERS
// Modification 2 of 5
shared unsigned int MS_TIMER_CLOCK;

char pisr_inuse;

#if __SEPARATE_INST_DATA__
// This overwrites the periodic interrupt relay
#rcodorg periodic_intvec apply
#asm
     jp periodic_isr
#endasm
#rcodorg rootcode resume
#endif

#asm xmem nodebug
;
```

Figure 2: Modification step 2

2.4 Modification step 3

Jump to calculation of MS_TIMER_CLOCK

Modification 3

```
  inc   (hl)              ; 8
  jr    nz,.DoneTICK      ; 5
  inc   hl                ; 2   this runs every 16384 s.
  inc   (hl)              ; 8
.DoneTICK:

  ld    a,(__MS_COUNTER)  ; 9   this runs every 1/1024th s.
  add   a,250             ; 4
  ld    (__MS_COUNTER),a  ; 10

// @MODIFICATION---------- 22. November 2004 ----------additional code for 1000 Hz counter
;// Extension to system Clock to MS-TIMERS
; Modification 3 of 5

; früher  jr    nc, .Done_MS      ; 5   skip 6 times per 256 entries because  ;      (250/256)*1024 = 1000
  jr    nc,  .Done_MS_TIMER_CLOCK   ;  5  skip  6  times  per  256  entries  because  ;
(250/256)*1024 = 1000

  ld    hl,  MS_TIMER     ; 6   this runs 1000 time per s.
  inc   (hl)              ; 8
  jr    nz,.Done_MS       ; 5
  inc   hl                ; 2   this runs ~ every 32/125 s.
  inc   (hl)              ; 8
  jr    nz,.Done_MS       ; 5
  inc   hl                ; 2   this runs ~ every 8192/125 s.
  inc   (hl)              ; 8
  jr    nz,.Done_MS       ; 5
  inc   hl                ; 2   this runs ~ every 2097152/125 s.
  inc   (hl)              ; 8
.Done_MS:


;@MODIFICATION----------  22. November 2004 ----------additional code for 1000 Hz counter
;Extension to system Clock to MS-TIMERS
; Modification 4 of 5
;
  ld    hl,  MS_TIMER_CLOCK  ; 6   this runs 1000 time per s. // load address of MS_Timer_CLOCK
  inc   (hl)              ; 8                    // icnrement ms
  jr    nz,.Done_MS_TIMER_CLOCK   ; 5  Check overflow
  inc   hl                ; 2   this runs ~ every 32/125 s.  if overflow
  inc   (hl)              ; 8
.Done_MS_TIMER_CLOCK:
;----------additional  code  for  1000  Hz
counter

  ld    hl,TICK_TIMER+1   ; 6
  ld    h,(hl)            ; 5
```

Figure 3: Modification step 3

2.5 Modification step 4

Increment the MS_TIMER_CLOCK variable and set to zero on overflow

Modification 4

```
  inc   (hl)              ; 8
  jr    nz,.DoneTICK      ; 5
  inc   hl                ; 2   this runs every 16384 s.
  inc   (hl)              ; 8
.DoneTICK:

  ld    a,(__MS_COUNTER)  ; 9   this runs every 1/1024th s.
  add   a,250             ; 4
  ld    (__MS_COUNTER),a  ; 10

// @MODIFICATION---------- 22. November 2004 ----------additional code for 1000 Hz counter
;// Extension to system Clock to MS-TIMERS
; Modification 3 of 5

; früher  jr    nc, .Done_MS      ; 5   skip 6 times per 256 entries because ;      (250/256)*1024 = 1000
  jr    nc,  .Done_MS_TIMER_CLOCK   ;  5  skip  6  times  per  256  entries  because  ;
(250/256)*1024 = 1000

  ld    hl,  MS_TIMER     ; 6   this runs 1000 time per s.
  inc   (hl)              ; 8
  jr    nz,.Done_MS       ; 5
  inc   hl                ; 2   this runs ~ every 32/125 s.
  inc   (hl)              ; 8
  jr    nz,.Done_MS       ; 5
  inc   hl                ; 2   this runs ~ every 8192/125 s.
  inc   (hl)              ; 8
  jr    nz,.Done_MS       ; 5
  inc   hl                ; 2   this runs ~ every 2097152/125 s.
  inc   (hl)              ; 8
.Done_MS:


;@MODIFICATION----------  22. November 2004 ----------additional code for 1000 Hz counter
;Extension to system Clock to MS-TIMERS
; Modification 4 of 5
;
  ld    hl,  MS_TIMER_CLOCK  ; 6   this runs 1000 time per s. // load address of MS_Timer_CLOCK
  inc   (hl)              ; 8                    // icnrement ms
  jr    nz,.Done_MS_TIMER_CLOCK   ; 5  Check overflow
  inc   hl                ; 2   this runs ~ every 32/125 s.  if overflow
  inc   (hl)              ; 8
.Done_MS_TIMER_CLOCK:
;-------------------------------------------------------------------------------------------additional  code  for  1000  Hz
counter

  ld    hl,TICK_TIMER+1   ; 6
  ld    h,(hl)            ; 5
```

Figure 4: Modification step 4

2.6 Modification step 5

Set variable MS_TIMER_CLOCK to 0 if 999ms have been reached.

Modification 5

```
  jr    z,.DoneTimers       ; 5

  ld    hl,__SEC_COUNTER    ; 6
  xor   a,(hl)              ; 6
  ld    (hl),a              ; 6

;@MODIFICATION----------  22. November 2004 ----------additional code for 1000 Hz counter
; Extension to system Clock to MS-TIMERS
; Modification 5 to 5
;
   xor   a                  ; clear a
   ld    (MS_TIMER_CLOCK),a
   ld    (MS_TIMER_CLOCK+1),a
;-------------------------------------------------------------------------------additional code for 1000 Hz counter

   ld    hl,SEC_TIMER        ; 6
   inc   (hl)                ; 8   this runs ~ every 1 s.
   jr    nz,.DoneTimers      ; 5
   inc   hl                  ; 2
   inc   (hl)                ; 8   this runs ~ every 256 s.
   jr    nz,.DoneTimers      ; 5
```

Figure 5: Modification step 5

3 Compatibility and side effects

I tested the modification on the libraries of the compiler versions:

- Dynamic C 8.01
- Dynamic C8.61 and
- Dynamic C9.02

On all of them it works very fine, also in more complex projects. I have not detected any side effects.

4 Download

The modified library vdriver.lib of version 8.61 as described above can be downloaded on:
http://www.burger-web.de/www.burger-web.com/downlods

5 Installation

1. Move to directory of Dynamic C compiler /Lib
2. Create a copy of vdriver.lib e.g. vdriver.lib_original
3. Either do modification of vdriver lib as described or use the modified vdriver.lib that can be downloaded on www.burger-web.com
4. run the sample program for test

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