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Renesas Electronics Corporation

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R8C/Tiny Series

General-purpose Program for Variable Vector Table

1. Abstract

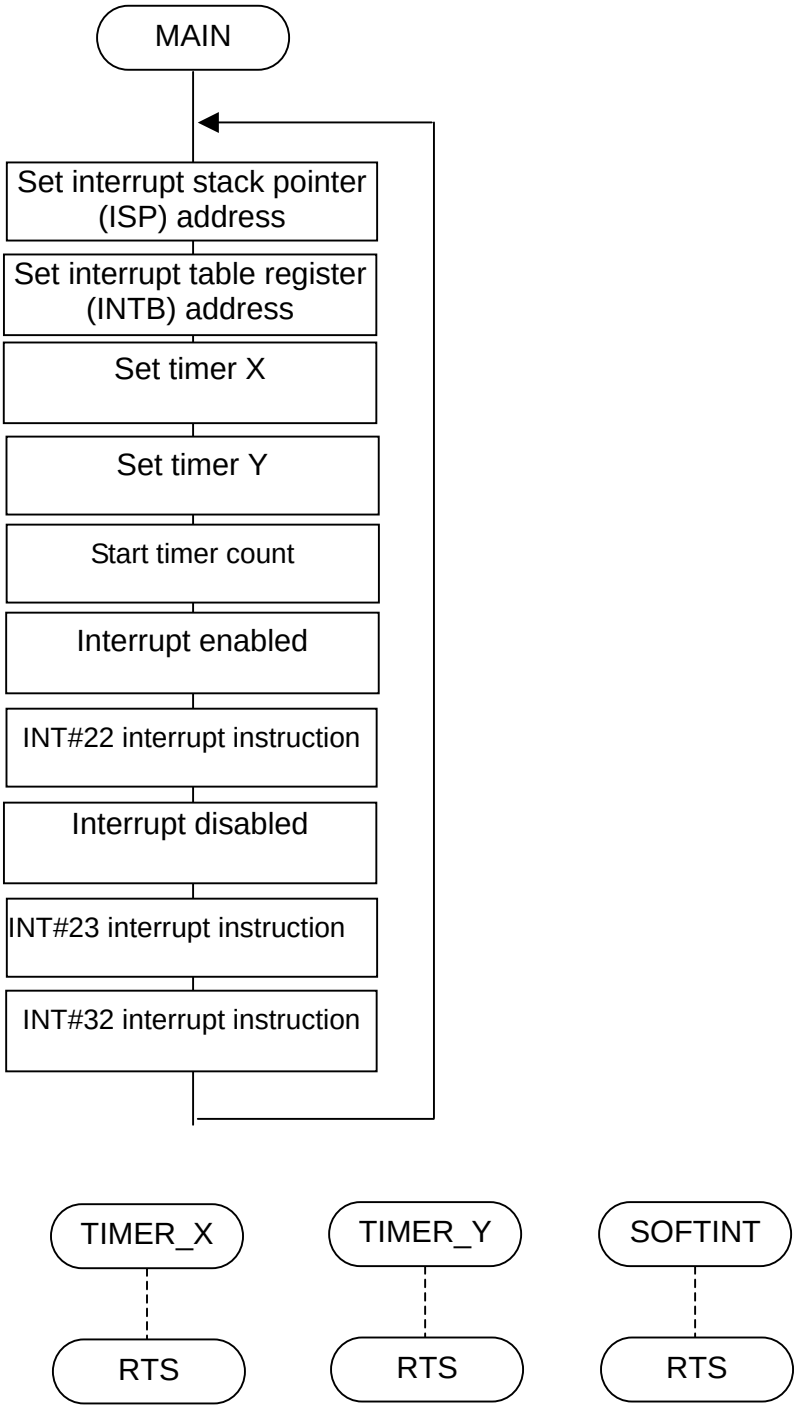
This program shows an example for setting variable vector tables and an example for using software interrupts.

2. Introduction

This program is an example using R8C/10 group microcomputers.
A variable vector table is a 256-byte interrupt vector table whose start address (IntBase) is indicated by the content of the interrupt table register (INTB). The variable vector table in this program has its start address at 0D000H. The variable vector table has individual vector tables each comprised of 4 bytes, and each vector table contains the start address of an interrupt routine.
There are software interrupt numbers (0 to 63) available for each vector table. The INT instruction uses these software interrupt numbers. No labels can be used in place of the software interrupt numbers. Peripheral I/O interrupts are assigned software interrupt numbers 0 to 31. In this program, software interrupt number 22 is used for timer X and software interrupt number 23 is used for timer Y. Software interrupt numbers 32 to 63 are used for software interrupts. This type of interrupt is generated by the INT instruction. Therefore, software interrupts are used in the same way as a subroutine by using the INT instruction. The INT instruction is executed even when interrupts are disabled. After interrupts are disabled (FCLR I) in this program, INT#23 and INT#32 are executed regardless of whether or not the interrupt enable flag (I) is set.

This program can also be used when operating other microcomputers within the R8C /10 group, provided they have the same vector table as the R8C microcomputers. However, some functions may have been modified. Refer to the User's Manual for details. Use functions covered in this Application Note only after careful evaluation.

3. Flowchart


MAIN
Set interrupt stack pointer (ISP) address
Set interrupt table register (INTB) address
Set timer X
Set timer Y
Start timer count
Interrupt enabled
INT#22 interrupt instruction
Interrupt disabled
INT#23 interrupt instruction
INT#32 interrupt instruction
TIMER_X
RTS
TIMER_Y
RTS
SOFTINT
RTS

4. The example of a reference program

```
                .include   sfr_r811.inc                    ; special page include file
;******************************************************************************
;                                                                             *
;    R8C Program Collection No. 33                                           *
;    CPU            : R8C/Tiny                                                *
;                                                                             *
;******************************************************************************
VromTOP          .EQU          00D100H                        ; Declares start address of ROM
VIstack          .EQU          000660h                    ; Interrupt stack pointer
Vintbase .EQU          00D000h                    ; Declares interrupt vector table address
FIX_VECTOR.EQU          00FFDCh                        ; Declares fixed interrupt vector address
;                                                          ;
;============================================================================
;     Title: Variable vector table
;     Outline: Description example of variable vector table and software interrupt
;============================================================================
                .SECTION     PROGRAM,CODE              ;
                .ORG         VromTOP                       ; ROM area
MAIN:                                                      ;
     LDC        #VIstack,ISP                    ; Sets interrupt stack pointer
     LDINTB     #Vintbase                           ; Sets interrupt table register
;                                                          ;
     mov.B      #00000000b,tcss                     ; Timer Source select register
     MOV.B      #00000000B,txmr                     ; Timers X mode Register
     mov.B      #00000000b,tyzmr                ; TimerY/Z mode Register
;                                                          ;
     MOV.W      #100-1,prex                         ; Sets timer X counter
     MOV.B      #00000001B,txic                     ; Sets interrupt level 1 for timer A0
     MOV.W      #0E7h,prey                          ; Sets timer Y counter
     MOV.B      #3h,typr                        ; Sets timer Y counter
     MOV.B      #0,tysc                             ; Sets timer Y counter
     MOV.B      #00000010B,tyic                     ; Sets interrupt level 2 for timer A1
;                                                          ;
     BSET       txs                                 ; Timers X start counting
     BSET       tys                                 ; Timers Y start counting
;                                                          ;
     FSET       I                                   ; Enables interrupts
;                                                          ;
     INT        #22                                 ; Performs timer X interrupt processing
;                                                          ; (TIMER_A0 is executed)
;                                                          ;
     FCLR       I                                   ; Disables interrupts
;                                                          ;
     INT        #23                                 ; Performs timer Y interrupt processing
;                                                          ; (TIMER_A1 is executed)
;                                                          ;
     INT        #32                                 ; Performs SOFTINT label interrupt processing
```

```
;               (Here is your program.)
      jmp  MAIN

TIMER_X:                                        ;

;               (Here is your program.)

      REIT                                      ;
TIMER_Y:                                        ;

;               (Here is your program.)

      REIT                                      ;
SOFTINT:                                        ;

;               (Here is your program.)

      REIT                                      ;
NOTUSE:                                             ;

;               (Here is your program.)

      REIT                                      ;
;                                               ;
              .SECTION    SPECIAL,ROMDATA               ;
              .ORG        Vintbase            ; Variable vector table area
;------------------------------------------------------;
;     Peripheral I/O interrupt vector table             ;
;------------------------------------------------------;
              .lword          NOTUSE                ; BRK instruction       (vector 0)
              .org        (Vintbase+52)
              .lword          NOTUSE                ; Key input interrupt   (vector 13)
              .lword          NOTUSE                ; A-D                   (vector 14)
              .org        (Vintbase+68)
              .lword          NOTUSE                ; UART0 transmit        (vector 17)
              .lword          NOTUSE                ; UART0 receive             (vector 18)
              .lword          NOTUSE                ; UART1 transmit        (vector 19)
              .lword          NOTUSE                ; UART1 receive             (vector 20)
              .lword          NOTUSE                ; INT2                      (vector 21)
              .lword          TIMER_X                   ; Timer X               (vector 22)
              .lword          TIMER_Y                   ; Timer Y               (vector 23)
              .lword          NOTUSE                ; Timer Z               (vector 24)
              .lword          NOTUSE                ; INT1                      (vector 25)
              .lword          NOTUSE                ; INT3                      (vector 26)
              .lword          NOTUSE                ; Timer C               (vector 27)
              .org        (Vintbase+116)
              .lword          NOTUSE                ; INT0                      (vector 29)
              .org        (Vintbase+128)
              .lword          SOFTINT                   ; vector 32 (for user or MR30)
              .lword          NOTUSE                ; vector 33 (for user or MR30)
```

```
                .lword      NOTUSE                  ; vector 34 (for user or MR30)
                .lword      NOTUSE                  ; vector 35 (for user or MR30)
                .lword      NOTUSE                  ; vector 36 (for user or MR30)
                .lword      NOTUSE                  ; vector 37 (for user or MR30)
                .lword      NOTUSE                  ; vector 38 (for user or MR30)
                .lword      NOTUSE                  ; vector 39 (for user or MR30)
                .lword      NOTUSE                  ; vector 40 (for user or MR30)
                .lword      NOTUSE                  ; vector 41 (for user or MR30)
                .lword      NOTUSE                  ; vector 42 (for user or MR30)
                .lword      NOTUSE                  ; vector 43 (for user or MR30)
                .lword    NOTUSE                  ; vector 44 (for user or MR30)
                .lword      NOTUSE                  ; vector 45 (for user or MR30)
                .lword      NOTUSE                  ; vector 46 (for user or MR30)
                .lword      NOTUSE                      ; vector 47 (for user or MR30)
                .LWORD      NOTUSE                  ; Software interrupt number 0
                .LWORD      NOTUSE                  ; Software interrupt number 1
;                                                   ;
                .SECTION    INTER,ROMDATA           ; Declares FOMDATA attribute section of section name "INTER"
                .ORG        FIX_VECTOR              ; Sets location to FFFDCH
                .LWORD      NOTUSE                  ; FFFDC to F  Undefined instruction
                .LWORD      NOTUSE                  ; FFFE0 to 3   Overflow
                .LWORD      NOTUSE                  ; FFFE4 to 7   BRK instruction
                .LWORD      NOTUSE                  ; FFFE8 to B   Address coincidence
                .LWORD      NOTUSE                  ; FFFEC to F  Single stepping
                .LWORD      NOTUSE                  ; FFFF0 to 3   Watchdog timer
                .LWORD      NOTUSE                  ; FFFF4 to 7   Debugger
                .LWORD      NOTUSE                  ; FFFF8 to B   NMI
                .LWORD      MAIN                    ; FFFFC to F  Reset
;                                                   ;
                .END                                ;
```

5. Reference

HARDWARE MANUAL
R8C/10 group HARDWARE MANUAL
(Acquire the most current version from Renesas web-site)

6. Web-site and contact for support

Renesas Web-site

http://www.renesas.com

Contact for M16C family microcomputer technical support

Mail to : support_apl@renesas.com

REVISION HISTORY

Rev.	Date	Description	
		Page	Summary
1.00	Dec 29, 2003	-	First edition issued

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