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R8C/Tiny Series

General-purpose Program for Example for Initial Setting Assembler

1. Abstract

This program is an example of initial settings accomplished by using the directive commands of the assembler.

2. Introduction

The program shown here consists of the following:

(1) Map file information output
(2) Global symbol name specification
(3) Numeric symbol definition
(4) RAM area allocation
(5) Bit symbol definition
(6) Initial setup program
- Interrupt stack pointer setting
- FB register setting
- SB register setting
- INTB register setting
- RAM clear

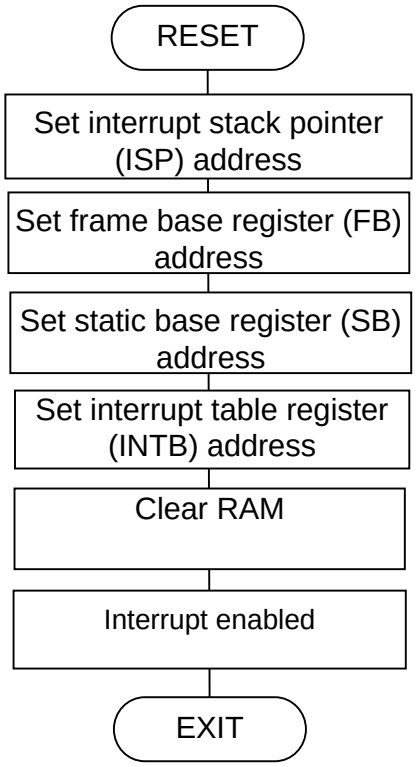
(7) Peripheral I/O interrupt vector table
(8) Nonmaskable interrupt fixed vector table

The following shows the range of the FB and SB relative addresses in this program.

FB	380H to 47FH -128 ↑ -400H ↓ + 127
SB	480H to 57FH 480H ↓ + 255

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


RESET
Set interrupt stack pointer (ISP) address
Set frame base register (FB) address
Set static base register (SB) address
Set interrupt table register (INTB) address
Clear RAM
Interrupt enabled
EXIT

4. The example of a reference program

```
;***************************************************************************************
;                                                                                      *
;     R8C Program Collection No. 30                                                   *
;    CPU            : R8C/Tiny                                                       *
;                                                                                      *
;***************************************************************************************
;=======================================================================================
;     Title: Initial settings using assembler's directive commands
;     Outline:
;           (1) Assemble control
;           (2) Address control
;           (3) Link control
;           (4) List control
;           (5) Branch instruction optimization control
;     Notes:
;=======================================================================================
;-------------------------------------------------------;
;     Map file information output                       ;
;-------------------------------------------------------;
                .VER        'Ver1.02'           ; 'Ver1.02' is output when generating map file
;                               ;
;-------------------------------------------------------;
;     Global symbol name specification                  ;
;-------------------------------------------------------;
;                                                       ; [Global symbol specification]
                .GLB        RUTINE              ; Externlly referenced symbol
                .GLB        MAIN                ; Public symbol
;                                                       ;
;                                                       ; [Global bit symbol specification]
                .BTGLB      P3_0                ; Externally referenced symbol
                .BTGLB      P0_7                ; Public symbol
;                                                       ;
;-------------------------------------------------------;
;     Numeric symbol definition                         ;
;-------------------------------------------------------;
VramTOP         .EQU        000400H                 ; Declares start address of RAM
VramEND         .EQU        0006FFH                 ; Declares last address of RAM
VIstack     .EQU        000600H             ; Interrupt stack pointer
VproTOP     .EQU        00D000H             ; Declares start address of program
VECTOR_ADR  .EQU        00FE00h                 ; Declares start address of variable vector table
FIX_VECTOR.EQU          00FFDCh                 ; Declares fixed interrupt vector address
;                                               ;
CNT125ms    .EQU        125                 ; Sets 125 in CNT125ms
;                                               ;
AUTOchar    .EQU        -8                  ; Sets -8 in AUTOchar
;                                               ;
                .FORM       45,160              ; [List output control instruction]
;                                               ; Specifies 45 lines, 160 columns per page of list file
```

```
                .LIST       ON                      ; [List output control]
;                                                   ; Outputs assembler list
                .PAGE       'RAM'                   ; [List page break and title specification]
                .SECTION    MEMORY,DATA                 ; [Section name specification]
;                                                   ; Declares DATA attribute section of section name "MEMORY"
                .ORG        VramTOP                     ; [Absolute address setting]
;                                                   ; Sets location to 400H
;------------------------------------------------------;
;     RAM area allocation                               ;
;------------------------------------------------------;
;                                                   ; [RAM area 1-byte allocation]
CHAR:       .BLKB       10                          ; Allocates 10-byte area
;                                                   ;
;                                                   ; [RAM area 2-byte allocation]
SHORT:      .BLKW       10                          ; Allocates 20-byte area
;                                                   ;
;                                                   ; [RAM area 3-byte allocation]
ADDR:       .BLKA       10                          ; Allocates 30-byte area
;                                                   ;
;                                                   ; [RAM area 4-byte allocation]
LONG:       .BLKL       10                          ; Allocates 40-byte area
;                                                   ;
;                                                   ; [Single-precision, floating-point RAM area allocation]
SFLOAT:     .BLKF       10                          ; Allocates 40-byte area
;                                                   ;
;                                                   ; [Double-precision, floating-point RAM area allocation]
DFLOAT:     .BLKD       10                          ; Allocates 80-byte area
;                                                   ;
CHECK:      .BLKW       10                          ;
;                                                   ;
;------------------------------------------------------;
;     Bit symbol definition                           ;
;------------------------------------------------------;
BIT4        .BTEQU      4,CHAR                  ; Sets bit 4 of displacement CHAR to BIT4
MSB             .BTEQU      15,SHORT                    ; Sets bit 15 of displacement SHORT to MSB
P0_7        .BTEQU      7,3E0H                  ; Sets bit 7 at address 3E0 to P0_7
;                                                   ;
                .SECTION    PROG,CODE               ; Declares CODE attribute section of section name "PROG"
                .ORG        VproTOP                 ; Sets location to F0000H
                .OPTJ       OFF                     ; [Branch instruction optimize specification]
;                                                   ; Does not optimize branch instruction after this line
                .FB     VramTOP                         ; [Assumption of FB register value]
;                                                   ; Assumes 400H for FB register value
                .SB     VramTOP+80H                     ; [Assumption of SB register value]
;                                                   ; Assumes 480H for SB register value
                .FBSYM      SHORT                   ;
                .SBSYM      CHECK                   ;
;======================================================;
;     Program start                                   ;
;======================================================;
```

```
RESET:                                                  ;
        LDC     #VIstack,ISP                    ; Sets interrupt stack pointer
;                                                       ;
        LDC     #VramTOP,FB                     ; Sets frame base register
        LDC     #VramTOP+80H,SB                         ; Sets static base register
        LDINTB  #VECTOR_ADR                             ; Sets interrupt table register
;                                                       ;
        MOV.W   #0,R0                           ; Sets store data (0)
        MOV.W   #((VramEND+1)-VramTOP)/2,R3     ; Sets number of transfers performed
        MOV.W   #VramTOP,A1                     ; Sets address where to start storing
        SSTR.W                                  ; Executes clearing of RAM
;                                                       ;
        FSET    I                               ; Enables interrupt
;                                                       ;
;=======================================================;
;       Main program                                    ;
;=======================================================;
MAIN:                                                   ;
        MOV.W   #1234H,SHORT                            ;
;                                                       ;
;                                                       ;
        MOV.W   #5678H,CHECK                            ;
;                                                       ;
;                                                       ;
        JSR     ROUTINE                                         ;
        BSET    P0_7                                    ;

;               (Here is your program.)

ROUTINE:                                                ;

;               (Here is your program.)

        RTS                                             ;

NOTUSE:

;               (Here is your program.)

        RTS                                             ;

                .PAGE           'VECTOR'                ;
                .SECTION        UINTER,ROMDATA                  ; Declares FOMDATA attribute section of section name "UINTER"
                .org            VECTOR_ADR
;-------------------------------------------------------;
;       Peripheral I/O interrupt vector table           ;
;-------------------------------------------------------;
                .lword          NOTUSE                  ; BRK instruction       (vector 0)
                .org            (VECTOR_ADR+52)
                .lword          NOTUSE                  ; Key input interrupt   (vector 13)
```

```
                .lword      NOTUSE                  ; A-D                   (vector 14)
                .org        (VECTOR_ADR+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      NOTUSE                  ; Timer X               (vector 22)
                .lword      NOTUSE                  ; 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        (VECTOR_ADR+116)
                .lword      NOTUSE                  ; INT0                  (vector 29)
                .org        (VECTOR_ADR+128)
                .lword      NOTUSE                  ; 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)

                .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      RESET                   ; FFFFC to F   Reset
;-------------------------------------------------------;
;       End of assemble direction                       ;
;-------------------------------------------------------;
                .END                                ;
```

5. Reference

SOFTWARE MANUAL
R8C/Tiny Series SOFTWARE MANUAL
(Acquire the most current version from Renesas web-site)

6. Web-site and contact for support

Renesas Web-site

http://www.renesas.com/jpn

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REVISION HISTORY

Rev.	Date	Description	
		Page	Summary
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