

```

1
2 ;*****
3 ;* THIS TINY PROGRAM DEMONSTRATES HOW YOU CAN USE SOFT-TIMERS IN YOUR
4 ;* PROGRAMS TO PRODUCE LONG INTERVAL EVENTS WITH LOWEST OVERHEAD.
5 ;*
6 ;* DEVICE:ATMEGA8
7 ;* ASSEMBLER&IDE:AVR STODIO4.12 AVR ASM2
8 ;* CPU FREQUENCY:8 MHz
9 ;* SOFT-TIMER'S TIME-BASE: 1mS WITH THIS TIME-BASE AND A 16BIT STIMER
10 ;* YOU CAN MAKE STIMER OVERFLOW FOR MAXIMUM 65 SECONDS.
11 ;*
12 ;* AUTHOR:OMID KOMPANI
13 ;* IRAN-TEHRAN
14 ;* 2006 - 1384
15 ;*
16 ;* PDF FORMAT OF THIS DOCUMENT IS EDITED IN NOTEPAD++ IDE.A VERY QUICK AND
17 ;* USEFULL TEXT EDITOR! YOU CAN DOWNLOAD IT FROM
18 ;* http://notepad-plus.sourceforge.net/
19 ;*
20 ;*****
21
22 DEF.H
23
24 .DEF STIMER_PVL =R14
25 .DEF STIMER_PVH =R15
26
27
28 .DEF TEMP =R16
29 .DEF STIMER_OV_FLAGS =R20 ;FLAGS FOR EVENTS OF STIMERS
30 .EQU _STIMER1_OV =0
31 .EQU _STIMER2_OV =1
32 .EQU _STIMER3_OV =2
33 .EQU _STIMER4_OV =3
34 .EQU _STIMER5_OV =4
35 .EQU _STIMER6_OV =5
36 .EQU _STIMER7_OV =6
37 .EQU _STIMER8_OV =7
38
39 .DEF STIMER_CVL =R24 ;CURRENT VALUE OF EACH STIMER
40 .DEF STIMER_CVH =R25
41
42
43 MAIN.ASM
44
45
46 .NOLIST
47 .INCLUDE "M8DEF.INC" ;ORIGINAL DEFINITIONS FOR ATMEGA8
48 .LIST
49
50 .INCLUDE "DEF.H" ;VARIABLES & CONSTANTS ARE DEFINED HERE
51 .INCLUDE "SRAM.H" ;RAM DEFINITIONS (STIMERS)
52 .INCLUDE "MACRO.H"
53
54 .CSEG
55 .INCLUDE "ISR.ASM" ;INTERRUPT SERVICE ROUTINES
56 .INCLUDE "STIMER.ASM"
57
58
59 ;*****
60 ;* MAIN CONTROL LOOP OF PROGRAM
61 ;*****

```

```

62
63
64 MAIN:
65
66     SBRC     STIMER_OV_FLAGS, _STIMER1_OV
67     RCALL    ON_STIMER1
68
69     SBRC     STIMER_OV_FLAGS, _STIMER2_OV
70     RCALL    ON_STIMER2
71
72     SBRC     STIMER_OV_FLAGS, _STIMER3_OV
73     RCALL    ON_STIMER3
74
75     SBRC     STIMER_OV_FLAGS, _STIMER4_OV
76     RCALL    ON_STIMER4
77
78     SBRC     STIMER_OV_FLAGS, _STIMER5_OV
79     RCALL    ON_STIMER5
80
81     SBRC     STIMER_OV_FLAGS, _STIMER6_OV
82     RCALL    ON_STIMER6
83
84     SBRC     STIMER_OV_FLAGS, _STIMER7_OV
85     RCALL    ON_STIMER7
86
87     SBRC     STIMER_OV_FLAGS, _STIMER8_OV
88     RCALL    ON_STIMER8
89
90     RJMP     MAIN
91
92
93     ISR.ASM
94
95     .ORG     $00
96     RJMP     INIT
97     .ORG     $09
98     RJMP     ISR_TOV0
99
100
101 INIT:
102     _INIT_STACK      ;SETS THE STACK POINTER AT TOP OF SRAM (.:MACRO.H)
103
104     ;** CLEAR R0-R25
105     CLR        R0
106     CLR        R29
107     LDI        R28, 1
108     LDI        R25, 24
109 CLEAR_REGISTERS:
110     ST         Y+, R0
111     DEC        R25
112     BRNE       CLEAR_REGISTERS
113     CLR        R28
114
115     ;** SETS CURRENT VALUE OF TIMERS
116     LDI        YH, HIGH(RAM_STIMER1_CVL)
117     LDI        YL, LOW(RAM_STIMER1_CVL)
118 CLR_STIMER_CV:
119     ST         Y+, TEMP
120     CPI        YL, LOW(RAM_STIMER8_CVH)
121     BRNE       CLR_STIMER_CV
122

```

```

123 ;** SETTINGS OF TIMER0
124     LDI     TEMP,0B00000011      ;LOADS TIMER0 CLK/64
PRESCALER
125     OUT     TCCR0,TEMP
126     LDI     TEMP,130             ;FOR 1 mS INTERRUPT (1/8000000*64*125=1mS)
127     OUT     TCNT0,TEMP
128
129     LDI     TEMP,(1<<TOIE0)      ;ENABLES TIMER0 OV INT.
130     OUT     TIMSK,TEMP
131
132 ;** SETTINGS OF SOFT TIMERS
133     CLR     STIMER_OV_FLAGS      ;CLEARS ALL SOFT-TIMER OV FLAGS
134
135 ;** LOAD SOFT-TIMER1 PRESET VALUE FOR 4SECONDS OVERFLOW
136     LDI     R16,LOW(4000-1)      ;BECAUSE COUNTING STARTS FROM 0
137     LDI     R17,HIGH(4000-1)     ;SUBTRACT 1 FROM YOUR NUMBER
138
139 ;   _STORE_16BIT_RAM    (16BIT RAM DESTINATION , HBYTE , LBYTE)
140     _STORE_16BIT_RAM    RAM_STIMER1_PV,R17,R16
141
142 ;** ENABLES SOFT-TIMER1
143     CLR     TEMP
144     SBR     TEMP,(1<<_STIMER1_EN) ;ENABLES SOFT TIMER1
145     _STORE_8BIT_RAM     RAM_STIMER_ENABLE_FLAGS,TEMP
146
147
148     SEI                      ;ENABLES GLOBAL INTERRUPT FLAG
149
150     RJMP    MAIN
151
152
153 ;*****
154 ;   INTERRUPT SERVICE ROUTINE FOR TIMER#0 OVERFLOW EACH 1mS
155 ;*****
156 ISR_TOV0:
157     PUSH    TEMP
158     LDI     TEMP,130
159     OUT     TCNT0,TEMP
160     PUSH    R1
161     IN      R1,SREG            ;STORES SREG
162     PUSH    YH
163     PUSH    YL
164     PUSH    STIMER_CVH
165     PUSH    STIMER_CVL
166
167 ;   _LOAD_8BIT_RAM      (8BIT RAM VALUE , DESTINATION REGISTER)
168     _LOAD_8BIT_RAM     RAM_STIMER_ENABLE_FLAGS,TEMP
169
170
171 ;***** 16BIT SOFT TIMER#1 *****
172 CHECK_STIMER1:
173     SBRS    TEMP,_STIMER1_EN      ;IS SOFT-TIMER#1 ENABLE?
174     RJMP    CHECK_STIMER2        ;IF NOT CHECK SOFT-TIMER#2
175     _LOAD_16BIT_RAM     RAM_STIMER1_CV,STIMER_CVH,STIMER_CVL
176     _LOAD_16BIT_RAM     RAM_STIMER1_PV,STIMER_PVH,STIMER_PVL
177     CP      STIMER_CVL,STIMER_PVL ;COMPARES CURRENT VALUE AND PRESET VALUE OF
178     CPC      STIMER_CVH,STIMER_PVH ;16BIT STIMER1.IF STIMER1 REACHES TO PRESET
179     BRLO    INCREASE_STIMER1      ;VALUE SETS THE OV FLAG IF NOT INCRESSES THE
180     EOR      STIMER_CVL,STIMER_CVL ;STIMER1
181     EOR      STIMER_CVH,STIMER_CVH
182     SBR      STIMER_OV_FLAGS,(1<<_STIMER1_OV)

```

```

183         RJMP SAVE_STIMER1
184
185 INCREASE_STIMER1:
186 ;=====
187     ADIW STIMER_CVH:STIMER_CVL,1
188 SAVE_STIMER1:
189 ;=====
190     _STORE_16BIT_RAM    RAM_STIMER1_CV,STIMER_CVH,STIMER_CVL
191
192 ;***** 16BIT SOFT TIMER#2 *****
193 CHECK_STIMER2:
194
195
196     OUT     SREG,R1      ;LOADS SREG
197     POP     STIMER_CVL
198     POP     STIMER_CVH
199     POP     YL
200     POP     YH
201     POP     R1
202     POP     TEMP
203     RETI
204
205
206 STIMER.ASM
207
208
209 .CSEG
210
211 ;*****
212 ;*  RESPONSIBLE ROUTINES FOR SOFT TIMER EVENTS
213 ;*****
214
215 ON_STIMER1:
216     SBI     PORTE,1
217     CBR     STIMER_OV_FLAGS,(1<<_STIMER1_OV)
218     RET
219
220 ON_STIMER2:
221
222     CBR     STIMER_OV_FLAGS,(1<<_STIMER2_OV)
223     RET
224
225 ON_STIMER3:
226
227     CBR     STIMER_OV_FLAGS,(1<<_STIMER3_OV)
228     RET
229
230 ON_STIMER4:
231
232     CBR     STIMER_OV_FLAGS,(1<<_STIMER4_OV)
233     RET
234
235 ON_STIMER5:
236
237     CBR     STIMER_OV_FLAGS,(1<<_STIMER5_OV)
238     RET
239
240 ON_STIMER6:
241
242     CBR     STIMER_OV_FLAGS,(1<<_STIMER6_OV)
243     RET

```

```

244
245 ON_STIMER7:
246
247     CBR     STIMER_OV_FLAGS, (1<<_STIMER7_OV)
248     RET
249
250 ON_STIMER8:
251
252     CBR     STIMER_OV_FLAGS, (1<<_STIMER8_OV)
253     RET
254
255
256     MACRO.H
257
258
259     .NOLIST
260     .CSEG
261
262     ;*****
263     ;   INITIALIZING THE STACK POINTER AT THE TOP OF SRAM
264     ;*****
265     .MACRO     _INIT_STACK
266         LDI     ZH, HIGH (RAMEND)
267         OUT     SPH, ZH
268         LDI     ZL, LOW (RAMEND)
269         OUT     SPL, ZL
270     .ENDMACRO
271
272     ;*****
273     ;*   _LOAD_8BIT_RAM
274     ;*****
275     .MACRO     _LOAD_8BIT_RAM
276         LDS     @1, @0
277     .ENDMACRO
278
279     ;*****
280     ;*   _STORE_8BIT_RAM
281     ;*****
282     .MACRO     _STORE_8BIT_RAM
283         LDI     YL, LOW (@0)
284         LDI     YH, HIGH (@0)
285         STS     @0, @1
286     .ENDMACRO
287
288
289     ;*****
290     ;*   _LOAD_16BIT_RAM
291     ;*****
292     .MACRO     _LOAD_16BIT_RAM
293         LDI     YL, LOW (@0)
294         LDI     YH, HIGH (@0)
295         LD      @1, Y
296         LD      @2, -Y
297     .ENDMACRO
298
299     ;*****
300     ;*   _STORE_16BIT_RAM
301     ;*****
302     .MACRO     _STORE_16BIT_RAM
303         LDI     YL, LOW (@0)
304         LDI     YH, HIGH (@0)

```

```

305         ST      Y,@1
306         ST      -Y,@2
307     .ENDMACRO
308
309     .LIST
310
311
312     SRAM.H
313
314
315     .NOLIST
316     .DSEG
317
318
319     .EQU RAM_STIMER_ENABLE_FLAGS=$60
320     .EQU _STIMER1_EN           =0
321     .EQU _STIMER2_EN           =1
322     .EQU _STIMER3_EN           =2
323     .EQU _STIMER4_EN           =3
324     .EQU _STIMER5_EN           =4
325     .EQU _STIMER6_EN           =5
326     .EQU _STIMER7_EN           =6
327     .EQU _STIMER8_EN           =7
328
329     .EQU RAM_STIMER1_CV=$62
330     .EQU     RAM_STIMER1_CVL=$61
331     .EQU     RAM_STIMER1_CVH=$62
332     .EQU RAM_STIMER2_CV=$64
333     .EQU     RAM_STIMER2_CVL=$63
334     .EQU     RAM_STIMER2_CVH=$64
335     .EQU RAM_STIMER3_CV=$66
336     .EQU     RAM_STIMER3_CVL=$65
337     .EQU     RAM_STIMER3_CVH=$66
338     .EQU RAM_STIMER4_CV=$68
339     .EQU     RAM_STIMER4_CVL=$67
340     .EQU     RAM_STIMER4_CVH=$68
341     .EQU RAM_STIMER5_CV=$6A
342     .EQU     RAM_STIMER5_CVL=$69
343     .EQU     RAM_STIMER5_CVH=$6A
344     .EQU RAM_STIMER6_CV=$6C
345     .EQU     RAM_STIMER6_CVL=$6B
346     .EQU     RAM_STIMER6_CVH=$6C
347     .EQU RAM_STIMER7_CV=$6E
348     .EQU     RAM_STIMER7_CVL=$6D
349     .EQU     RAM_STIMER7_CVH=$6E
350     .EQU RAM_STIMER8_CV=$70
351     .EQU     RAM_STIMER8_CVL=$6F
352     .EQU     RAM_STIMER8_CVH=$70
353
354     .EQU RAM_STIMER1_PV=$72
355     .EQU     RAM_STIMER1_PVL=$71
356     .EQU     RAM_STIMER1_PVH=$72
357     .EQU RAM_STIMER2_PV=$74
358     .EQU     RAM_STIMER2_PVL=$73
359     .EQU     RAM_STIMER2_PVH=$74
360     .EQU RAM_STIMER3_PV=$76
361     .EQU     RAM_STIMER3_PVL=$75
362     .EQU     RAM_STIMER3_PVH=$76
363     .EQU RAM_STIMER4_PV=$78
364     .EQU     RAM_STIMER4_PVL=$77
365     .EQU     RAM_STIMER4_PVH=$78

```

```
366 .EQU RAM_STIMER5_PV=$7A
367 .EQU     RAM_STIMER5_PVL=$79
368 .EQU     RAM_STIMER5_PVH=$7A
369 .EQU RAM_STIMER6_PV=$7C
370 .EQU     RAM_STIMER6_PVL=$7B
371 .EQU     RAM_STIMER6_PVH=$7C
372 .EQU RAM_STIMER7_PV=$7E
373 .EQU     RAM_STIMER7_PVL=$7D
374 .EQU     RAM_STIMER7_PVH=$7E
375 .EQU RAM_STIMER8_PV=$80
376 .EQU     RAM_STIMER8_PVL=$7F
377 .EQU     RAM_STIMER8_PVH=$80
378
379
380 .LIST
381
382     END!
383
```