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1 ; BCD counter © Valerio Cocco
2
3     device 16f84
4
5 ; \***** labels *****\
6
7 ; status regsiter
8 status equ 3 ; adress of the status register
9 rp0 equ 5 ; bank select
10 carry equ 0 ; carry flag - Indicates when an arithmetic carry or borrow has been generated out of the
   ↳ most significant ALU bit position.
11 zero equ 2 ; zero flag - Indicates that the result of an operation was zero.
12
13 ; port a
14 porta equ 5
15 clock equ 0 ; clock signal in RA0
16 reset equ 1 ; reset in RA1
17 inhibit equ 2 ; inhibit in RA2
18 carryOut equ 3 ; carry out RA3
19 mask equ 1 ; 00000001 ; mask for the clock signal on RA0
20
21 portb equ 6
22 ; TRIS (TRISate regsiter) Used to define the direction (in/out) of port or pin.
23 trisa equ 5 ; for port a
24 trisb equ 6 ; for port b
25
26 bcdOverfVal0 equ 10 ; 0000 1010
27 bcdOverfVal1 equ 0A0h ; 1010 0000
28 bcdMask equ 0Fh ; 0000 1111, mask for the first bcd digit
29
30 ; variables
31 counter equ 10h ; 0c first aviable adress
32 currentValue equ 12h
33 oldValue equ 13h
34 edge equ 14h
35
36 ; \***** labels *****\
37
38     org 0 ; program start at adress 0
39
40 cold
41     ; initialize ports
42     bsf status,rp0 ; select bank 1
43     bcf trisa,carryOut ; set carry on port a to out
44     clrf trisb ; set port all to out
45
46     bcf status,rp0 ; select bank 0
47
48     ; read first value
49     movf porta,w ; read port a in w
50     andlw mask ; mask clock signal
51     movwf oldValue ; write w regsiter to oldValue: first comparison value
52
53 resetCNT
54     clrf counter ; init
55     bcf porta,carryOut ; reset carry
56
57     clrf portb
58     bcf porta,carryOut ; output carry 0
59
60 mainloop
61     ; output BCD
62     movf counter,w
63     movwf portb
64
65     btfsc porta,reset ; reset in = 1?

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66     goto resetCNT ; yes → reset
67
68     btfsc porta,inhibit ; inhibit = 1?
69     goto mainloop ; yes → pause
70
71     call checkEdge ; edge? no → w = 0,
72     xorlw 2 ; w = 2 (rising redge)? set zero flag if w = 2
73     btfss status,zero ; w = 2?
74     goto mainloop ; no
75
76     bcf porta,carryOut ; output carry 0
77
78     ; increment BCD
79     incf counter ; first digit
80     movf counter,w
81     andlw bcdMask ; mask first digit
82     xorlw bcdOverfVal0 ; overflow on first digit?
83     btfss status,zero
84     goto mainloop ; no
85     ; yes
86     movf counter,w
87     xorlw bcdOverfVal0 ; set first nibble to 0
88     addlw 10h ; increment second nibble
89     movwf counter
90
91     xorlw bcdOverfVal1 ; overflow on second digit?
92     btfss status,zero
93     goto mainloop ; no
94     ; yes
95     clrf counter
96     bsf porta,carryOut
97
98     goto mainloop
99
100 checkEdge
101     ; read current value
102     movf porta,w
103     andlw mask ; mask clock signal on RA0
104     movwf currentValue
105     xorwf oldValue,w ; compare with oldValue
106     movwf edge
107
108     ; oldValue := currentValue
109     movf currentValue,w
110     movwf oldValue
111
112     ; edge = 0 if currentValue = oldValue
113     movf edge ; set zero-flag if edge = 0
114     btfsc status,zero ; edge 0?
115     retlw 0 ; no → no new edge
116
117     movf currentValue ; set zero-flag if currentValue = 0
118     btfss status,zero ; currentValue = 0? or zero = 1?
119     retlw 2 ; no → rising edge
120     retlw 1 ; yes → falling edge

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```

1 ; BCD to seven segment display © Valerio Cocco
2
3     device 16f84
4
5 ; \***** labels *****\
6     pcl equ 2 ; program counter
7
8     status equ 3 ; status register
9     rp0 equ 5 ; bank select

```

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10 carry equ 0 ; carry flag - Indicates when an arithmetic carry or borrow has been generated out of the
   ↳ most significant ALU bit position.
11 zero equ 2 ; zero flag - Indicates that the result of an operation was zero.
12
13 ; input: port A input
14 porta equ 5
15 trisa equ 5
16 ra6 equ 6
17 bcdmask equ 0Fh ; 00001111
18
19 ; output: port B
20 portb equ 6
21 trisb equ 6
22
23 ; variables
24 bcdin equ 10h
25 ; \***** labels *****\
26
27     org 0
28
29 cold
30     ; init
31     bsf status,rp0 ; select bank 1
32     clrf trisb ; set port b to output, RB0 is LSB
33     bcf trisa,ra6 ; set RA6 to output: digit 0 select
34     bcf status,rp0 ; select bank 0
35
36     bsf porta,ra6
37
38 mainloop
39     movf porta,w
40     andlw bcdmask
41     movwf bcdin
42     call bcdToSsd
43     movwf portb
44     bcf porta,ra6 ; output portb to digit 0
45     bsf porta,ra6 ; lock output from portb to digit
46     goto mainloop
47
48 bcdToSsd ; Seven Segment Display
49     movf bcdin,w
50
51     addwf pcl ; unsave: undefined behavior if bcdin > 9
52     retlw 3Fh ; 0
53     retlw 06h ; 1
54     retlw 5Bh ; 2
55     retlw 4Fh ; 3
56     retlw 66h ; 4
57     retlw 6Dh ; 5
58     retlw 7Dh ; 6
59     retlw 07h ; 7
60     retlw 7Fh ; 8
61     retlw 6Fh ; 9
62     ; retlw 0 ; A
63     ; retlw 0 ; B
64     ; ...

```

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1 ; frequency divider @ Valerio Cocco
2
3     device 16f84
4
5 ; \***** labels *****\
6 status equ 3 ; status register
7 rp0 equ 5 ; bank select

```

```

8  carry equ 0 ; carry flag - Indicates when an arithmetic carry or borrow has been generated out of the
   ↳ most significant ALU bit position.
9  zero equ 2 ; zero flag - Indicates that the result of an operation was zero.
10
11  porta equ 5
12  output equ 1 ; out an ra1
13  trisa equ 5
14
15  currentValue equ 10h
16  oldValue equ 11h
17  edge equ 12h
18
19  mask equ 00000001b
20  ; \***** labels *****\
21
22  cold
23      bsf status,rp0 ; select bank 1
24      bcf trisa,output
25      bcf status,rp0 ; select bank 0
26
27      ; read initial value
28      movf porta,w
29      andlw mask
30      movwf oldValue
31
32  mainloop
33      call checkEdge
34      xorlw 2 ; rising edge?
35      btfss status,zero
36      goto mainloop ; no
37      ; yes
38      movlw 10b
39      xorwf porta
40      goto mainloop
41
42  checkEdge
43      movf porta,w
44      andlw mask
45      movwf currentValue
46      xorwf oldValue,w
47      movwf edge
48
49      ; oldValue := currentValue
50      movf currentValue,w
51      movwf oldValue
52
53      ; edge = 0 if currentValue = oldValue
54      movf edge ; set zero-flag if edge = 0
55      btfsc status,zero ; edge 0?
56      retlw 0 ; no → no new edge
57
58      movf currentValue ; set zero-flag if currentValue = 0
59      btfss status,zero ; currentValue = 0? / zero = 1?
60      retlw 2 ; no → rising edge
61      retlw 1 ; ja → falling edge

```

```

1  ; km counter
2
3      device 16f84
4
5  ; \***** labels *****\
6  pcl equ 2 ; program counter
7
8  status equ 3 ; status register
9  rp0 equ 5 ; bank select

```

```

10 carry equ 0 ; carry flag - Indicates when an arithmetic carry or borrow has been generated out of the
   ↳ most significant ALU bit position.
11 zero equ 2 ; zero flag - Indicates that the result of an operation was zero.
12
13 fsr equ 4 ; Indirect data memory address pointer 0.
14
15 indf equ 0; Uses contents of FSR to address data memory (not a physical register).
16
17 ; input: port A input
18 porta equ 5
19 trisa equ 5
20 ra0 equ 0
21 ra1 equ 1
22 ra2 equ 2
23 ra3 equ 3
24
25 ; literals
26 bcdMask equ 0Fh ; 00001111
27 sigMask equ 00001000b ;
28
29 ; output: port B
30 portb equ 6
31 trisb equ 6
32
33
34 ; variables
35 bcdin 9h
36 signalCounter 10h
37 currentVal 11h
38 oldVal 12h
39 kmCounter equ 13h
40
41 ; \***** labels *****\
42
43     org 0
44
45 cold
46     ; init ports
47     bsf status,rp0 ; select bank 1
48     clrf trisb ; set port b to output, RB0 is LSB
49     bcf trisa,ra0 ; set RA0 to output: digit 0 select
50     bcf trisa,ra1 ; digit 1 select
51     bcf trisa,ra2 ; digit 2 select
52     bcf status,rp0 ; select bank 0
53
54     bsf porta,ra3 ; sig in
55
56     ; init variables
57     clrf signalCounter
58     clrf kmCounter ; dm at 13h
59     clrf 14h ; m
60     clrf 15h ; 1xx m
61     clrf 16h ; km
62     clrf 17h ; 1x km
63
64     ; read first value
65     movf porta,w ; read port a in w
66     andlw sigMask
67     movwf oldValue
68
69 mainloop
70     ; output todo
71
72     call checkEdge ; edge? no → w = 0,
73     xorlw 2 ; w = 2 (rising redge)? set zero flag if w = 2
74     btfss status,zero ; w = 2?

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75     goto mainloop ; no
76     incf signalCounter
77     movf signalCounter,w
78     xorlw 8 ; counted 8 signals?
79     btfss status,zero
80     goto mainloop
81
82     clrf signalCounter
83     ; increment km counter todo
84     movwf kmCounter
85     movwf fsr
86 bcdinc
87     incf indf
88     movf indf,w
89     xorlw 10 ; bcd overflow?
90     btfss status,zero
91     goto mainloop ; no
92     ; yes
93     clrf indf ; clear overflown bcd digit
94     ; increment next digit
95     movf fsr,w
96     xorlw 17h ; out of bounds?
97     btfsc status,zero
98     goto mainloop ; yes
99     ; no
100    incf fsr
101    goto bcdinc
102
103 checkEdge
104     ; read current value
105     movf porta,w
106     andlw mask ; mask clock signal on RA0
107     movwf currentValue
108     xorwf oldValue,w ; compare with oldValue
109     movwf edge
110
111     ; oldValue := currentValue
112     movf currentValue,w
113     movwf oldValue
114
115     ; edge = 0 if currentValue = oldValue
116     movf edge ; set zero-flag if edge = 0
117     btfsc status,zero ; edge 0?
118     retlw 0 ; no → no new edge
119
120     movf currentValue ; set zero-flag if currentValue = 0
121     btfss status,zero ; currentValue = 0? or zero = 1?
122     retlw 2 ; no → rising edge
123     retlw 1 ; yes → falling edge
124
125 bcdToSsd ; Sevent Segment Display
126     movf bcdin,w
127
128     addwf pcl ; unsave: undefined behavior if bcdin > 9
129     retlw 3Fh ; 0
130     retlw 06h ; 1
131     retlw 5Bh ; 2
132     retlw 4Fh ; 3
133     retlw 66h ; 4
134     retlw 6Dh ; 5
135     retlw 7Dh ; 6
136     retlw 07h ; 7
137     retlw 7Fh ; 8
138     retlw 6Fh ; 9
139     ; retlw 0 ; A
140     ; retlw 0 ; B

```

