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;-----
; Title      :   SPI_DOGM163_5_0V
;
; Functions  :   SPI with 256 kHz
;              :   64 kHz at PB1 (Pin 15)
;              :   Display of 64 different Contrast Settings
;              :   For temporary Stop: PC0 (Pin 23) = Low
;-----

; CPU        :   ATMEGA8A-PU
; Frequency   :   4.096 MHz
; Language    :   Assembler Studio 4
; Date        :   06.06.2015
; Version     :   1.0
; Author      :   Klaus
;-----

        .include    "m8def.inc"
;-----

; Reset and Interrupt Vector          Description

Begin:  rjmp      Main                ; 1 POWER ON RESET
        reti      ; 2 Int0-Interrupt
        reti      ; 3 Int1-Interrupt
        reti      ; 4 TC2 Compare Match
        reti      ; 5 TC2 Overflow
        reti      ; 6 TC1 Capture
        reti      ; 7 TC1 Compare Match A
        reti      ; 8 TC1 Compare Match B
        reti      ; 9 TC1 Overflow
        reti      ; 10 TC0 Overflow
        reti      ; 11 SPI, STC Serial Transfer Complete
        reti      ; 12 UART Rx complete
        reti      ; 13 UART Data Register Empty
        reti      ; 14 UART Tx complete
        reti      ; 15 ADC Conversion Complete
        reti      ; 16 EEPROM Ready
        reti      ; 17 Analog Comparator
        reti      ; 18 TWI (I²C) Serial Interface
        reti      ; 19 Store Program Memory Redy

;-----

; Start, Power ON, Reset, Stackpointer, Ports, Power Up Waiting Time

Main:
        ldi       R16      ,   LOW (RAMEND)    ; Stackpointer Initialization
        out       SPL      ,   R16             ;
        ldi       R16      ,   HIGH(RAMEND)    ;
        out       SPH      ,   R16             ;

        ldi       R16      ,   0b00111111      ; PORTB Bits 1 until 5 = Output
        out       DDRB     ,   R16             ; PORTB Bits 6 and 7 = Quartz
        ldi       R16      ,   0b00000000      ; PORTB Bits 0 until 7 = 0
        out       PORTB    ,   R16             ;

        ldi       R16      ,   0b00000000      ; PORTC Bits 0 until 7 = Input
        out       DDRC     ,   R16             ;
        ldi       R16      ,   0b00111111      ; PORTC Bits 0 until 5 = 1 (Pullup)
        out       PORTC    ,   R16             ;

        ldi       R16      ,   0b11111111      ; PORTD Bits 0 until 7 = Output
        out       DDRD     ,   R16             ;
        ldi       R16      ,   0b00000000      ; PORTD Bits 0 until 7 = 0
        out       PORTD    ,   R16             ;

        ldi       R16      ,   5                ; 50 ms Power Up Waiting Time
        rcall     Wait

;-----

; Timer/Counter1: 64 kHz at PB1 Pin 15

        ldi       R18      ,   (1<<COM1A0)
        out       TCCR1A    ,   R18            ; COM1A0 = Toggle PB1 (Pin15)

        ldi       R18      ,   (0<<CS10) | (1<<CS11) | (1<<WGM12)
        out       TCCR1B    ,   R18            ; CS10 = 0 Prescaling 8

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; CS11 = 1
; WGM12 = CTC (Clear Timer on Compare Match)

ldi R19 , 0b00000000
ldi R18 , 0b00000011 ; 3 + 1 = 4
out OCR1AH , R19
out OCR1AL , R18 ; 4096 / (8 * 4) = 128 kHz (PB0 = 64 kHz)

ldi R18 , (1<<OCIE1A) ; OCIE1A = Output Compare A Match Interrupt
out TIMSK , R18 ; Enable

sei ; Global Interrupts Enabled

;-----
; Master Initialization and CGRAM Initialization

rcall SPI_Init
ldi R16 , 1 ; 10 ms
rcall Wait
ldi R20 , 118
ldi R21 , 81
rcall LCD_init
rcall CGRAM_Init
rcall Start
rjmp Loop1

;-----
; Initialization of the LCD DOGM163-A 5V with 64 different Settings of the Contrast

Start:
rcall LCD_line1
ldi R16 , 1 ; 0.01 Second
rcall Wait
ldi R16 , 'A'
rcall LCD_data
ldi R16 , 'f'
rcall LCD_data
ldi R16 , 't'
rcall LCD_data
ldi R16 , 'e'
rcall LCD_data
ldi R16 , 'r'
rcall LCD_data
ldi R16 , ' '
rcall LCD_data
ldi R16 , 't'
rcall LCD_data
ldi R16 , 'h'
rcall LCD_data
ldi R16 , 'i'
rcall LCD_data
ldi R16 , 's'
rcall LCD_data
ldi R16 , ':'
rcall LCD_data
ldi R16 , ' '
rcall LCD_data
ldi R16 , 'p'
rcall LCD_data
ldi R16 , 'l'
rcall LCD_data
ldi R16 , 's'
rcall LCD_data
ldi R16 , '.'
rcall LCD_data

rcall LCD_line2
ldi R16 , 1 ; 0.01 Second
rcall Wait
ldi R16 , ' '
rcall LCD_data
ldi R16 , 'w'
rcall LCD_data
ldi R16 , 'a'

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rcall LCD_data
ldi R16 , 'i'
rcall LCD_data
ldi R16 , 't'
rcall LCD_data
ldi R16 , ' '
rcall LCD_data
ldi R16 , 'p'
rcall LCD_data
ldi R16 , 'a'
rcall LCD_data
ldi R16 , 't'
rcall LCD_data
ldi R16 , 'i'
rcall LCD_data
ldi R16 , 'e'
rcall LCD_data
ldi R16 , 'n'
rcall LCD_data
ldi R16 , 't'
rcall LCD_data
ldi R16 , 'l'
rcall LCD_data
ldi R16 , 'y'
rcall LCD_data
ldi R16 , ' '
rcall LCD_data

ldi R16 , 250 ; 2.50 Seconds
rcall Wait

ret

;-----
; Counting up the Contrast Values C5 C4 C3 C2 C1 C0

Loop1:
ldi R20 , 112 ; C3 C2 C1 C0 | R20 = 112...127
; | R20 = 0b01110000...0b01111111
ldi R21 , 80 ; C5 C4 | R21 = 80... 83
; | R21 = 0b01010000...0b01010011
; | Ion: Icon Display Off
; | Bon: Booster Circuit Off
; | Bon: Charge Pump (3.3V -> 5V)

Loop2:
sbis PINC , 0 ; Stop Button
rjmp Loop2
rcall LCD_Init
ldi R16 , 1 ; 10 ms
rcall Wait
rcall LCD_Text
ldi R16 , 50 ; 500 ms
rcall Wait
inc R20 ; R20 = R20 + 1
cpi R20 , 128 ; R20 = 128 ?
breq Loop3 ; if R20 = 128
rjmp Loop2 ; if R20 <= 127

Loop3:
inc R21 ; R21 = R21 + 1
cpi R21 , 84 ; R21 = 84 ? (possible only if R20 = 128
; and R21 = 84
breq Loop1 ; if R20 = 128 and R21 = 84
ldi R20 , 112 ; R20 = 112
rjmp Loop2 ; if R21 <= 83

;-----
; Subroutine for the creation of Text

LCD_Text:
ldi ZL , LOW(Text00*2) ; " CONTRAST 543210"
ldi ZH , HIGH(Text00*2)
rcall TextOut10
ldi ZL , LOW(Text10*2) ; "SETTING C "
ldi ZH , HIGH(Text10*2)

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        rcall    TextOut20

        cpi      R21      ,    80
        breq     T11
        cpi      R21      ,    81
        breq     T12
        cpi      R21      ,    82
        breq     T13
        cpi      R21      ,    83
        breq     T14

T11:    ldi      ZL        ,    LOW(Text11*2) ; "00    "
        ldi      ZH        ,    HIGH(Text11*2)
        rcall    TextOut30
        rjmp     LCD_Text01

T12:    ldi      ZL        ,    LOW(Text12*2) ; "01    "
        ldi      ZH        ,    HIGH(Text12*2)
        rcall    TextOut30
        rjmp     LCD_Text01

T13:    ldi      ZL        ,    LOW(Text13*2) ; "10    "
        ldi      ZH        ,    HIGH(Text13*2)
        rcall    TextOut30
        rjmp     LCD_Text01

T14:    ldi      ZL        ,    LOW(Text14*2) ; "11    "
        ldi      ZH        ,    HIGH(Text14*2)
        rcall    TextOut30
        rjmp     LCD_Text01

LCD_Text01:
        cpi      R20      ,    112
        breq     T21
        cpi      R20      ,    113
        breq     T22
        cpi      R20      ,    114
        breq     T23
        cpi      R20      ,    115
        breq     T24
        cpi      R20      ,    116
        breq     T25
        cpi      R20      ,    117
        breq     T26
        cpi      R20      ,    118
        breq     T27
        cpi      R20      ,    119
        breq     T28
        cpi      R20      ,    120
        breq     T29
        cpi      R20      ,    121
        breq     T30
        cpi      R20      ,    122
        breq     T31
        cpi      R20      ,    123
        breq     T32
        cpi      R20      ,    124
        breq     T33
        cpi      R20      ,    125
        breq     T34
        cpi      R20      ,    126
        breq     T35
        cpi      R20      ,    127
        breq     T36

T21:    rjmp     LCD_Text21
T22:    rjmp     LCD_Text22
T23:    rjmp     LCD_Text23
T24:    rjmp     LCD_Text24
T25:    rjmp     LCD_Text25
T26:    rjmp     LCD_Text26
T27:    rjmp     LCD_Text27
T28:    rjmp     LCD_Text28
T29:    rjmp     LCD_Text29

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T30:    rjmp    LCD_Text30
T31:    rjmp    LCD_Text31
T32:    rjmp    LCD_Text32
T33:    rjmp    LCD_Text33
T34:    rjmp    LCD_Text34
T35:    rjmp    LCD_Text35
T36:    rjmp    LCD_Text36

LCD_Text21:
    ldi        ZL        ,    LOW(Text21*2)    ; "0000"
    ldi        ZH        ,    HIGH(Text21*2)
    rcall      TextOut40
    ldi        R22       ,    1
    rcall      LCD_Text50
    rjmp       LCD_Text40
LCD_Text22:
    ldi        ZL        ,    LOW(Text22*2)    ; "0001"
    ldi        ZH        ,    HIGH(Text22*2)
    rcall      TextOut40
    ldi        R22       ,    2
    rcall      LCD_Text50
    rjmp       LCD_Text40
LCD_Text23:
    ldi        ZL        ,    LOW(Text23*2)    ; "0010"
    ldi        ZH        ,    HIGH(Text23*2)
    rcall      TextOut40
    ldi        R22       ,    3
    rcall      LCD_Text50
    rjmp       LCD_Text40
LCD_Text24:
    ldi        ZL        ,    LOW(Text24*2)    ; "0011"
    ldi        ZH        ,    HIGH(Text24*2)
    rcall      TextOut40
    ldi        R22       ,    4
    rcall      LCD_Text50
    rjmp       LCD_Text40
LCD_Text25:
    ldi        ZL        ,    LOW(Text25*2)    ; "0100"
    ldi        ZH        ,    HIGH(Text25*2)
    rcall      TextOut40
    ldi        R22       ,    5
    rcall      LCD_Text50
    rjmp       LCD_Text40
LCD_Text26:
    ldi        ZL        ,    LOW(Text26*2)    ; "0101"
    ldi        ZH        ,    HIGH(Text26*2)
    rcall      TextOut40
    ldi        R22       ,    6
    rcall      LCD_Text50
    rjmp       LCD_Text40
LCD_Text27:
    ldi        ZL        ,    LOW(Text27*2)    ; "0110"
    ldi        ZH        ,    HIGH(Text27*2)
    rcall      TextOut40
    ldi        R22       ,    7
    rcall      LCD_Text50
    rjmp       LCD_Text40
LCD_Text28:
    ldi        ZL        ,    LOW(Text28*2)    ; "0111"
    ldi        ZH        ,    HIGH(Text28*2)
    rcall      TextOut40
    ldi        R22       ,    8
    rcall      LCD_Text50
    rjmp       LCD_Text40
LCD_Text29:
    ldi        ZL        ,    LOW(Text29*2)    ; "1000"
    ldi        ZH        ,    HIGH(Text29*2)
    rcall      TextOut40
    ldi        R22       ,    9
    rcall      LCD_Text50
    rjmp       LCD_Text40
LCD_Text30:
    ldi        ZL        ,    LOW(Text30*2)    ; "1001"
    ldi        ZH        ,    HIGH(Text30*2)

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        rcall    TextOut40
        ldi      R22      ,    10
        rcall    LCD_Text50
        rjmp     LCD_Text40
LCD_Text31:
        ldi      ZL      ,    LOW(Text31*2)    ; "1010"
        ldi      ZH      ,    HIGH(Text31*2)
        rcall    TextOut40
        ldi      R22      ,    11
        rcall    LCD_Text50
        rjmp     LCD_Text40
LCD_Text32:
        ldi      ZL      ,    LOW(Text32*2)    ; "1011"
        ldi      ZH      ,    HIGH(Text32*2)
        rcall    TextOut40
        ldi      R22      ,    12
        rcall    LCD_Text50
        rjmp     LCD_Text40
LCD_Text33:
        ldi      ZL      ,    LOW(Text33*2)    ; "1100"
        ldi      ZH      ,    HIGH(Text33*2)
        rcall    TextOut40
        ldi      R22      ,    13
        rcall    LCD_Text50
        rjmp     LCD_Text40
LCD_Text34:
        ldi      ZL      ,    LOW(Text34*2)    ; "1101"
        ldi      ZH      ,    HIGH(Text34*2)
        rcall    TextOut40
        ldi      R22      ,    14
        rcall    LCD_Text50
        rjmp     LCD_Text40
LCD_Text35:
        ldi      ZL      ,    LOW(Text35*2)    ; "1110"
        ldi      ZH      ,    HIGH(Text35*2)
        rcall    TextOut40
        ldi      R22      ,    15
        rcall    LCD_Text50
        rjmp     LCD_Text40
LCD_Text36:
        ldi      ZL      ,    LOW(Text36*2)    ; "1111"
        ldi      ZH      ,    HIGH(Text36*2)
        rcall    TextOut40
        ldi      R22      ,    16
        rcall    LCD_Text50
        rjmp     LCD_Text40
LCD_Text40:
        ret

LCD_Text50:
                                ; Bar Graph in LCD_line3
        ldi      R16      ,    32
        rcall    LCD_goto
LCD_Text51:
        ldi      R16      ,    5
        rcall    LCD_data
        dec      R22
        breq     LCD_Text52
        rjmp     LCD_Text51
LCD_Text52:
        ret

;-----
; Subroutines for the Output of Text to the LCD

TextOut10:
        push     R16
        rcall    LCD_line1
TextOut11:
        lpm      R16      ,    Z+
        cpi      R16      ,    255
        breq     TextOut12
        rcall    LCD_data
        rjmp     TextOut11
TextOut12:

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        pop    R16
        ret

TextOut20:
        push   R16
        rcall  LCD_line2
TextOut21:
        lpm    R16, Z+
        cpi    R16, 255
        breq   TextOut22
        rcall  LCD_data
        rjmp   TextOut21
TextOut22:
        pop    R16
        ret

TextOut30:
        push   R16
        ldi    R16, 26
        rcall  LCD_goto
TextOut31:
        lpm    R16, Z+
        cpi    R16, 255
        breq   TextOut32
        rcall  LCD_data
        rjmp   TextOut31
TextOut32:
        pop    R16
        ret

TextOut40:
        push   R16
        ldi    R16, 28
        rcall  LCD_goto
TextOut41:
        lpm    R16, Z+
        cpi    R16, 255
        breq   TextOut42
        rcall  LCD_data
        rjmp   TextOut41
TextOut42:
        pop    R16
        ret

;-----
; SPI Initialization

SPI_Init:                                ; Master Initialization
        ldi    R16, 0b00101111
        out    DDRB, R16                ; Configure /SS, MOSI and SCK as Output Pins
                                           ; Set Bits SPE and MSTR of the SPCR Register
                                           ; PB0 = RS (H = Data, L = Command) = 1 (or)
                                           ; PB1 = 64 kHz for Charge Pump = 1 (ye)
                                           ; PB2 = CBS (Chip Select) = 1 (gn)
                                           ; PB3 = MOSI (Master Out, Slave In) = 1 (bl)
                                           ; PB4 = MISO (Master In, Slave Out) = 0
                                           ; PB5 = SCK (SPI Clock, 64 kHz) = 1 (ws)

        ldi    R16, (1<<SPE) | (1<<MSTR) | (1<<SPR0)
        out    SPCR, R16                ; SPCR = SPI Control Register
                                           ; SPE = SPI Enable = 1
                                           ; MSTR = Master/Slave Select = 1
                                           ; SPR0 = 1/16 CPU Frequenz, = 1
                                           ; 4096/64 = 256 kHz

        ret

; *****
; Begin Initializaton of LCD DOGM163 / 5 V
; *****

LCD_Init:
;-----
; RS des LCD: 0 = Command, L = Data

        cbi    PORTB, 2                ; LCD CBS = 0 (Chip Select)

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        cbi    PORTB    ,    0                ; LCD RS  = 0 (Command)

;-----
; Function Set (Instruction Code) (CGRAM not available)

        ldi    R16      ,    0b00111001      ; 8 Bit, 2 Lines, Instruction Table 1
        rcall  LCD_cmd

        ldi    R16      ,    1
        rcall  Wait

;-----
; Bias Set, 2 Lines (Instruction Table 1)

        ldi    R16      ,    0b00011101      ; BS: 1/4, 3 Lines
        rcall  LCD_cmd

        ldi    R16      ,    1
        rcall  Wait

;-----
; Icon Control, Power Control, Contrast Set (Instruction Table 1)

; Contrast according to the datasheet of the DOGM163 5V
;        ldi    R16      ,    0b01010010      ; Icon Display Off, Charge Pump Off,
;        rcall  LCD_cmd                        ; C5=1 C4=0

; Contrast Setting by Program
        mov     R16      ,    R21              ; Contrast: Content of R21
        rcall  LCD_cmd

        ldi    R16      ,    1
        rcall  Wait

;-----
; Follower Control (Instruction Table 1)

        ldi    R16      ,    0b01101010      ; Follower Circuit On
        rcall  LCD_cmd                        ; Follower Amplified Ratio:
                                           ; Rab2=0, Rab1=1, Rab0=0

; Remarks: Fon=0: No Contrast, Fon must be set to 1
;          Rab2=0 Rab1=0 Rab0=0 Contrast: None
;          Rab2=1 Rab1=1 Rab0=1 Contrast: Very High

        ldi    R16      ,    1
        rcall  Wait

;-----
; Contrast Set (Instruction Table 1)

; Contrast according to the datasheet of the DOGM163 5V
;        ldi    R16      ,    0b01111100      ; Contrast C3=1 C2=1 C1=0 C0=0
;        rcall  LCD_cmd                        ; C3=0 C2=1 C1=0 C0=0

; Contrast Setting by Program
        mov     R16      ,    R20              ; Contrast: Content of R20
        rcall  LCD_cmd

        ldi    R16      ,    1
        rcall  Wait

;-----
; Function Set (Instruction Code) (CGRAM available)

        ldi    R16      ,    0b00111000      ; 8 Bit, 2 Lines,
        rcall  LCD_cmd                        ; Instruction Table 0)

        ldi    R16      ,    1
        rcall  Wait

;-----
; Display On/Off (Instruction Code)

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```

        ldi    R16    ,    0b00001100    ; Display On, Cursor Off, Cursor Blinking Off
        rcall  LCD_cmd

        ldi    R16    ,    1
        rcall  Wait

;-----
; Clear Display (Instruction Code)

        ldi    R16    ,    0b00000001    ; Clear Display, DDRAM Address = 0
        rcall  LCD_cmd

        ldi    R16    ,    1
        rcall  Wait

;-----
; Entry Mode Set (Instruction Code)

        ldi    R16    ,    0b00000110    ; Cursor Shift Right
        rcall  LCD_cmd

        ldi    R16    ,    1
        rcall  Wait

        ret

; *****
; End Initialization of LCD DOGM163 / 5 V
; *****

;-----
; CGRAM Initialisation

CGRAM_Init:
        ldi    R16    ,    0b01000000    ; Set CGRAM address in DDRAM
        rcall  LCD_cmd                    ; Instruction Table 1
CGRAM_Init1:
        ldi    ZL     ,    LOW(Symbols*2)
        ldi    ZH     ,    HIGH(Symbols*2)
CGRAM_Init2:
        lpm    R16    ,    Z+
        cpi    R16    ,    255
        breq   CGRAM_Init3
        rcall  LCD_data
        rjmp   CGRAM_Init2
CGRAM_Init3:
        ret

;-----
; Data for the display in the LCD, sends 1 Byte

LCD_data:
        push   R16
        sbi    PORTB ,    0                ; RS = 1, Data
        out    SPDR  ,    R16
LCD_data1:
        sbis   SPSR  ,    SPIF
        rjmp   LCD_data1
        pop    R16
        ret

;-----
; Command to the LCD, like LCD_data but RS = 0

LCD_cmd:
        push   R16
        cbi    PORTB ,    0                ; RS = 0, Command
        out    SPDR  ,    R16
LCD_cmd1:
        sbis   SPSR  ,    SPIF
        rjmp   LCD_cmd1
        pop    R16
        ret

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;-----
LCD_clear:
    push    R16
    ldi     R16,    0b00000001    ; Display Clear
    rcall   LCD_cmd
    pop     R16
    ret

;-----
LCD_home:
    push    R16
    ldi     R16,    0b00000010    ; Display Cursor HOME
    rcall   LCD_cmd
    pop     R16
    ret

;-----
LCD_off:
    push    R16
    ldi     R16,    0b00001000    ; LCD OFF
    rcall   LCD_cmd
    pop     R16
    ret

;-----
LCD_on:
    push    R16
    ldi     R16,    0b00001100    ; LCD On, Cursor Off, Blink Off
    rcall   LCD_cmd
    pop     R16
    ret

;-----
LCD_CurOn:
    push    R16
    ldi     R16,    0b00001110    ; LCD On, Cursor On, Blink Off
    rcall   LCD_cmd
    pop     R16
    ret

;-----
LCD_BlkJOn:
    push    R16
    ldi     R16,    0b00001101    ; LCD On, Cursor Off, Blink On
    rcall   LCD_cmd
    pop     R16
    ret

;-----
LCD_CurBlkJOn:
    push    R16
    ldi     R16,    0b00001111    ; LCD On, Cursor On, Blink On
    rcall   LCD_cmd
    pop     R16
    ret

;-----
; LCD_line1: 0
; LCD_line2: 16
; LCD_line3: 32

LCD_line1:
    push    R16
    ldi     R16,    0b10000000    ; DDRAM Address 0x00
    rcall   LCD_cmd
    pop     R16
    ret

;-----
LCD_line2:
    push    R16
    ldi     R16,    0b10010000    ; DDRAM Address 0x10
    rcall   LCD_cmd
    pop     R16

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```

ret

;-----
LCD_line3:
    push    R16
    ldi     R16, 0b10100000 ; DDRAM Address 0x20
    rcall   LCD_cmd
    pop     R16
    ret

;-----
; Goto R16 = Addresses in LCD_line1: 0 ... 15
;           LCD_line2: 16 ... 31
;           LCD_line3: 32 ... 47

LCD_goto:
    push    R16
    ori     R16, 0b10000000 ; Goto DDRAM Address R16
    rcall   LCD_cmd
    pop     R16
    ret

;-----
LCD_CUL:
    push    R16
    ldi     R16, 0b00010000 ; Cursor one position left
    rcall   LCD_cmd
    pop     R16
    ret

;-----
LCD_CUR:
    push    R16
    ldi     R16, 0b00010100 ; Cursor one position right
    rcall   LCD_cmd
    pop     R16
    ret

;-----
; Waiting Time: R16 = 1 ==> 0.01 s, R16 = 255 ==> 2.55 s at 3.686 MHz

Wait:
    push    R16
    push    R17
    push    R18

    cpi     R16, 0
    breq    WLoop0
WLoop1:
    ldi     R17, 0b01101110
WLoop2:
    ldi     R18, 0b01101110
WLoop3:
    dec     R18
    brne    WLoop3
    nop
    nop
    dec     R17
    brne    WLoop2
    dec     R16
    brne    WLoop1
WLoop0:
    pop     R18
    pop     R17
    pop     R16
    ret

;-----
; Text

Text00: .db " CONTRAST 543210",255,0

Text10: .db "Setting C ",255,0

```

```
Text11: .db      "00      ",255,0
Text12: .db      "01      ",255,0
Text13: .db      "10      ",255,0
Text14: .db      "11      ",255,0
```

```
Text21: .db      "0000",255,0
Text22: .db      "0001",255,0
Text23: .db      "0010",255,0
Text24: .db      "0011",255,0
Text25: .db      "0100",255,0
Text26: .db      "0101",255,0
Text27: .db      "0110",255,0
Text28: .db      "0111",255,0
Text29: .db      "1000",255,0
Text30: .db      "1001",255,0
Text31: .db      "1010",255,0
Text32: .db      "1011",255,0
Text33: .db      "1100",255,0
Text34: .db      "1101",255,0
Text35: .db      "1110",255,0
Text36: .db      "1111",255,0
```

```
;-----
; Symbols for the CGRAM
```

Symbols:

```
.db      0,0,0,0,0,0,0,0
.db      0,0,0,16,16,16,0,0
.db      0,0,0,16,16,16,0,0
.db      0,0,0,20,20,20,0,0
.db      0,0,0,20,20,20,0,0
.db      0,0,0,21,21,21,0,0,255,0
```

```
;-----
```