```
'***** pwm in out test  20081113
'ATmega168
'RC 8M ver auto changer test
'******** syokika settei **************

    $Clock=8   'RC 8MHz
    $Device=m168
    $Stack = 32
    $Source= On
    $Lcd    = PORTC.0, RS=PORTD.0, EN=PORTD.1 , 16, 2
    $LeadChar=" ",Format (3,0)

'***** dim value ******
    Dim A As Word
    Dim Av As Word
    Dim Avf As Byte
    Dim Avf2 As Byte
    Dim Avf3 As Byte
    Dim Auto As Byte

    Dim Diag As Bit

    Dim Tq As Word
    Dim Tq00 As Word
    Dim Tqx As Word
    Dim Tqmax As Byte
    Dim Tqoff As Word
    Dim Tqont As Word
    Dim Tqofft As  Byte
    Dim Tqon As Bit
    Dim Tqtlim As Byte
    Dim Tqeg As Bit
    Dim Tudisp As Bit

    Dim T As Word
    Dim T2 As Word
    Dim Tt2 As Word
    Dim Tc As Byte
    Dim Tc1 As Byte
    Dim Tc2 As Byte

    Dim Mq As Word
    Dim Mqx As Word
    Dim Mqmax As Byte
    Dim Mqcal As Bit

    Dim V As Word
    Dim Q As Word

    Dim C1 As Byte
    Dim C2 As Byte
'   Dim C3 As Byte
    Dim C4 As Byte
    Dim C6 As Byte
    Dim I As  Byte
    Dim N As  Byte
    Dim L As  Byte
    Dim Kdc As  Byte
'   Dim kpt As Byte
'   Dim kpt2 As Byte

    Dim Sc As Bit
    Dim Sh As Byte

    Declare Sub Cap2()
    Declare Sub Bardisp()
    Declare Sub Tud()
    Declare Interrupt Icp1()
    Declare Sub Avfcal()

'**** port *****************
    'Config Portc = Input
    'Config Portb = Input
    'Config PORTD = Output
    'mod_plus_output OC2B PD3(5pin)
    'plus input Icp1 PB0(14pin)
```

```basic
'***** SW  input port ******
    ' SW1 PB1(15pin) active high
    ' Sw2 PB2(16pin) active high
    ' Sw3 PB3(17pin) active high
'***ADC***

    'Config Adc = Single , Prescaler = 8
    'Start Adc
    ADMUX=5
'   ADCSRA=128+64+3
    ADCSRA=195

    '=195
    'aden[bit7]=128
    'adps1[bit1]=2
    'adps0[bit0]=1
    ADCSRB=0

'*** VR analog voltage input port

    'PC5[ADC5]=28pin  0-5V  EXT Vol
    'PC4[ADC4]=27pin  0-5V diag osc volume
    'Config PINC.4 = Input
    'Config PINC.5 = Input
'***** LED output *****
'PC0(23p) active high
'DDRC.0=1
'**** LCD *****

    '***for LCD pin set output port ***
    ' 2 = 0V       /  1  = 5V
    ' 4 = RS PD0 /  3 = Vo[0-5V_VR]
    ' 6 = E PD1   /  5  = R/W [to GND]
    ' 8 = D1 nc   /  7  =D0 nc
    '10 = D3 nc  / 9  = D2 nc
    '12 = D5 PC1 / 11 = D4 PC0
    '14 = D7 PD3 / 13  = D6 PC2
    'Config Lcd = 16 * 2
    'Config Lcdmode = Port
    'Config Lcdpin = Pin , Db4 = PORTC.0 , Db5 = PORTC.1 , Db6 = PORTC.2 , Db7 = PORTC.3 ,
    InitLcd()
    Cursor Off
    DefLcdChar 1 , 32 , 32 , 32 , 32 , 32 , 32 , 31 , 31
    DefLcdChar 2 , 32 , 32 , 32 , 31 , 31 , 32 , 32 , 32
    DefLcdChar 3 , 32 , 32 , 32 , 31 , 31 , 32 , 31 , 31


'**** debug(Diag) flag set ***

    Diag = 0
    '0=normal[pwm0b nothing]
    '1=pwm0b output
    If PINB.3 = 1 Then Diag = 1

'*** PWM [timer2] setting PD3(5pin)***

    TCCR2B = 10
    TCCR2A = 161
    PORTD.3 = 0
    DDRD.3 = 1

'*** PWM [timer0] diag osc setting ***

    '** normal=off **
    TCCR0A = 0
    TCCR0B = 0
    PORTD.5 = 0
    DDRD.5 = 0

    If Diag = 1 Then
    'when diag is pwmb0=on
        TCCR0B = 10
        TCCR0A = 161
        PORTD.5 = 0
        DDRD.5 = 1
    End If
```

```
'*** capture1 [timer1 TQ input width count] setting ***

    TCCR1A = 0
    'wgm11=1(bit1)=0 wgm10=0 com1a1=1(bit7)=0 com1a0=0(bit6)
    'com1b1=1(bit5)=0 com1b0=0(bit4)
    'Tccr1b .1 = 1
    'Tccr1b .0 = 0
    TCCR1B = 0
    'Fall = 2 '130
    'Rise = 66 '194
    'wgm13=0(bit4=16) wgm12=0  cs11(bit1=2)
    'ices1(bit6=64)(input Capture1 Edge Select) rise=1 fall=0
    'icnc1(bit7=128)(Input Capture1 Noise Canceler) on=1

    'Timsk1 =
    'icie1(bit5=32)(Timer/Counter1 Input Capture Interrupt Enable

    '********* Pwm output width set **********
    If Diag=1 Then
        '128+32
        OCR0A = 64
        '=64[RC 8MHz]
        OCR0B = 7
        '=4[RC 8MHz]

        'for diag input PWM OSC freq width=125us

    End If

    OCR2A=64
    '=64[RC 8MHz]
    'for output PWM OSC freq width=125us

    OCR2B=4
    '=4[RC 8MHz]
    'output PWM Duty width

    If Diag=1 Then
        Cls
        Lcd "D"
'   Else
'       Lcd "Normal"
    End If

    Wait 1

'***** warikomi set *****

    Enable Interrupts

'*** TQ init value setup ***
    Tqmax = 126
    '126[8M]

    'TQ input
    Cap2()
    'TQ=8-126[8M:TCCR1B=66]
    'TQ=67-1010[8M:TCCR1B=65]

    'Tq00 is offset about 7(pwm=12us)
    Tq00 = Tq
    'Tq00=13
    Q=Tq
    Mqmax = Tqmax - Tq00
    '6000=(64-4)*100
    T2=6000/Mqmax
    T = Tqmax - Tq00
    T=T*10
    T = T / 16
    Locate 2,1
    Lcd "TQ=" ; Tq00
    Wait 1
    Cls

'** mode init value**
```

```
'    c1=40
'    C2=40
'    C3=100
'    C4=10

     Tqtlim=120
     Tqont=0
     Tqon=0
     L=0
     Q=0
     Tc=0
     Tqx=0
     Tc1=0
     Tc2=0
'    V2=4
     Avf=0
     Kdc=0
     Tqofft=180
     Tqoff=0
     Sc=0
'    kpt=0
'    kpt2=0
'    kpt3=0
'***** main loop start *****
Main:
If L mod 5=0 Then
  '*** TQ sensor input ***

     Cap2()
     'TQ=8-126[8M:TCCR1B=66]

     If Tq > Tqmax Then Tq = Tqmax

     '*** Tq cal setting ***
     If Tq > Tq00 Then
          Tq = Tq - Tq00
     Else
          Tq = 0
     End If
     'If Tq2+10<tq Then Tq=Tq2

     'Tq2=Tq
     Tqx=Tqx+Tq
     N=N+1
  '*** Tq input end ***
End If
If L=0 Then
     '***A/D vin & scale only DIAG***

     'ch4=PC4[27p]
     If Diag = 1 Then

          ADMUX=4
          ADCSRA=195 '&B11000011
          V=Adc(4)
          ADCSRA=0
          '*** [8Mh]***
          V = V / 17
          V = V + 4
          If V>63 Then V=63
          OCR0B = V
          'V= 4-64[8M]
          ' Diag Duty size 10-100%

     End If

     '*** EXT VOLUME control ***
     '[Real amp gain cont]
     ADMUX=5
     ADCSRA=195 '&B11000011
     V = Adc(5)
     'ch5=PC5[28p]
     ADCSRA=0

     V = V / 16
```

```
'**** PB1(normal mode x1.0 ) SW input set LED on/off****
'    If PINB.1=0 Then
'        V=20
'        PORTC.0=0 'LED off
'    Else
'        If c6>3 Then
'            PORTC.0=0 'LED on
'        Else
'            PORTC.0=1
'        End If
'    End If
'********0=normal 1=strong ******************

    If V>30 Then v=31
    '*** auto mode set and reset***
    Auto=0
'    auto=1
    If V<30 Then Auto=1
    If V=0 Then Auto=2
    If Auto<>1 Then Avf=0
'    V=15
    'V=0 turbo
    'V=1-29 auto
    'V=30 normal
    'V=31 off
    C1=20+v 'auto asist change start level
    C2=10+v
     'C2=asist cal start offset level
    C4 = V 'asist level

    '*** KPT counter ***
'    If kpt<50 Then kpt=kpt+1


End If
'*** If L mod 10 =0 start ***

If L mod 10 = 0 Then


    Tq=Tqx/N
    Tqx = Tq*10 / T
    'Tqx=0-16

    '**tq start up timing load**

    If Tqont>Tqtlim Then
        Tqont=0
        Tqon=0
        Kdc=0
        Sc=0
    End If

    If Tq>5 Then

        If  Tqoff=0 Then
            Tqon=1
            Tqont=0
        End If
        Tqoff=Tqofft

    End If



    '**tq Peak to peak sample hold **
    '**rising edge**
    If Tqeg=0 Then


        If Tqon=1 Then
            If Kdc>0 Or Sc=1 Then Tqont=Tqont+1
        End If
```

```vb
            If Tq>Tc Then Tc=Tq

            If Tq+2<Tc Then
'           If tc2-tc1>10 Then
'                   kpt2=kpt2+kpt
'                   kpt2=kpt2/2
'                   kpt=0
'           End If


                If Av>30 Then
                    Sh=40
                Else
                    Sh=Av*2
                    Sh=100-Sh
                End If
                If Tqon=1 Then Sh=20
                Tt2=Tq*Sh/100

'               If L=0 Then kpt=0
                Tudisp=1
                Tc2=Tc
                Tqeg=1
                Avf2=0
'               tud()

                    '*** High kpt asist up ***
'                   If kpt2<30 Then
'                       If kpt2<10 Then kpt3=10
'                       kpt3=30-kpt2
'                       kpt3=kpt3/2
'                   Else
'                       kpt3=0
'                   End If

                If Tqon=1 Then Kdc=Kdc+1


            End If
            If Tq < Tc Then Tq=Tc
        End If

    '**Falling edge**
    If  Tqeg=1 Then

        If Tq<Tc Then Tc=Tq
        If Tq>Tc+2 Then
            Tqeg=0
'           If kpt4=1 And L=0 Then kpt4=0
            Tc1=Tc
        End If

    End If

    If Tqeg=1 Then

        If Tq > Tt2 And Auto=1 Then Tq=Tc2

        If Avf>0 And Avf2=0 Then
            avf=avf-1
            If Avf>0 Then Avf=Avf-1
            Avf2=1
            Avf3=0
        End If

    End If


'*** Mq cal setting ***

    '**** auto mode cal ****
    If Auto=1 And Tqeg=0 Then

        If Tq>C1 And Avf3=0 Then
        'c1=25+V(1-19) normal=44-26
            'Av=40-C4+Avf
```

```vb
            avfcal()
            If Av<43 Then
                Avf=5+Avf
                Avf3=1
            End If
        End If

    End If

'   Av=30-C4+Avf+kpt3
'   Av=40-C4+Avf
    avfcal()

'   If av>50 Then AV=50
    '**** auto timer *************

    If Tqoff>0 Then Tqoff=Tqoff-1
    If Tqoff=0 Then
'       kpt2=50
'       kpt=50
        Avf=0
        Avf2=0
        Avf3=0
        Tc2=0
        Tud()
        Tqon=0

    End If
    Mqcal=0
    Mq = Tq
    A=V/10+1

    '** tq start  power save **

    If  Auto=1 Then

        If Tq >= A Or Tqon=1 Then
            '** tq start  power save **

            If Tqon=1 Then

                AV=AV*Tqont/Tqtlim
                If Av<10 Then AV=10
                A=0

                If Sc=0 And Tq>C2 Then
                    Sc=1
                    'avf=C4+10
                    If tq>c1 Then avf=c4+15
                    'avfcal()
                    'If av>35 Then av=35
                    Tqont=120
                End If

            End If
            Mqcal=1
        End If

    End If

    If  Mqcal=1 Then

        Mq = Tq - A
        Mq = Mq * Av
        Mq = Mq / 10
        Mq = Mq + A

    End If


    'max limit set
    If Mq > Mqmax Then    Mq = Mqmax

'** Mq disp cal ***
    If C4=31 Then q=0
    Mqx = Q*10/ T
```

```
        If Auto=2 Then Mqx=16

 '*** LCD Display ***
        Bardisp()

'** If L mod 10 =0 End**
End If

'*** auto decay ***
'    If auto=2 Or Mq>c3 Then
'        uplim=1
'    Else
'        uplim=0
'    End If

    If Auto=2 Or Mq>100  Then
        Mq=Mqmax-L+15
        If C6=9 Then
            Mq=Tq00
            Tq=Tq00
            Mqx=0
        End If

        If C6=5 Then
            Locate 1,1
            Lcd "    "
        End If

    Else
        C6=0
    End If

    If Mq<100 Then
        If Q>Mq+1 Then Q=Q-1
        If Q<Mq Then
            'If q+2<mq Then
            '    Q=Q+2
            'Else
                Q=Q+1
            'End If
        End If
    Else
        Q=Mq
    End If


    '*** PWM2B output ***
        'Tq=8-126 118 [8M]
        'ocr2b=4-64 60
        A = Q*T2/100+4 '[8M]
        If A>63 Then A=63
        If C4=31 Then A=4
        OCR2B=A

    '*** L= sw scan interrupt timer ***

    L = L + 1
    If L = 31 Then

        L = 0
        If Auto=2 Or Mq>100 Then
            C6=C6+1
            If C6=10 Then C6=0
        End If
    End If


GoTo Main
'***** main end *****
'*** av keisan ***
Sub avfcal()
    Av=40-C4+Avf
End Sub

'*** [warikomi sub] enable cap1-sub control ***
```

```
Sub Cap2()

Cap3:

    ICR1H=0
    ICR1L=0
    TIMSK1 = 32
    WaitUs 2
    TCCR1B = 66
    If ICR1L=0 Then Tq=0
    WaitUs 64
    TIMSK1 = 0
    WaitUs 2

    If Tq<>Tcnt1l Then
        Tq=Tcnt1l
        GoTo Cap3
    End If

End Sub

'*** [warikomi sub] capture1 ***
Interrupt Icp1(),Save 3

    If TCCR1B = 66 Then
        TCCR1B = 2
        TCNT1H=0
        TCNT1L=0
    Else
        TCCR1B=0
    End If

End Interrupt


'*** sub bar disp ***
Sub Bardisp()

    '**** multi LCD disp  ****
    For N = 1 To 16

        Locate 2 , N
        I = 0

        If Tqx >= N Then I = I + 2
        If Mqx >= N Then I = I + 1

        If I > 0 Then
            Lcd Chr(I)
        Else
            Lcd " "
        End If

    Next N
    N=0
    Tqx=0
    Format(2,0)
'    Locate 1,6
'    Lcd tqoff/15
'    Locate 1 , 9
'    Lcd q
'        Locate 2 , 15
'        Lcd v2
    If Tudisp=1 Then Tud()

    Locate 1 , 1
    Format(1,1)

    If Auto=2 Then
        Lcd "-MAX-"
    Else
        If C4<31 Then

            If Avf>0 Then
                Lcd "A";Av;" "
            Else
```

```
                    If Tqon=0 Then
                        Lcd "x";Av;" "
                    Else
                        Lcd "S";Av;" "
                    End If
                End If
            Else
                Lcd "=OFF="
            End If
        End If

End Sub

Sub Tud()


        Format(2,0)
'       Locate 1,9
'       Lcd kpt2

        Tudisp=0
'       Format(2,0)

        Locate 1,15
        Lcd Tc2
'       Locate 2 , 15
'       Lcd V2
End Sub

End
```