

LAMPIRAN A

PROGRAM

```
#include <mega16.h>
#include <delay.h>
#include <stdio.h>

// Fungsi LCD Module Alphanumeric
#asm
    .equ __lcd_port=0x15 ;PORTC
#endasm
#include <lcd.h>

// Variabel
char text[32];
int
volume,i,j,k,off,sisa,sisas,tone,tempo,function,beat,tap,rhythm,bc,vol,tape,waktu,v
olt,total,dtone,tambah;
void sound();

// Timer 0 overflow interrupt service routine
interrupt [TIM0_OVF] void timer0_ovf_isr(void)
{
// Reinitialize Timer 0 value
TCNT0=0x6C;
// Coding
PORTD.7=0;
//-----volume-----
if(PIND.3==0)
{delay_ms(50);
if(PIND.3==0) {vol=1;}}
```

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}

if(vol==1)
{

PORTD.0=1;
    if(PIND.5==0) //naik
    {
        delay_ms(50);
        if(PIND.5==0) //naik
        {
            if(volume >=10)volume=1;
            else volume++;
            lcd_clear();
            lcd_gotoxy (0,0);
            sprintf(text,"  VOLUME");
            lcd_puts(text);
            lcd_gotoxy (0,1);
            sprintf(text," CURRENT = %d",volume);
            lcd_puts(text);
        }
    }
    if(PIND.6==0) //turun
    {
        delay_ms(50);
        if(PIND.6==0) //turun
        {
            if(volume >1)volume--;
            else volume=10;
            lcd_clear();
            lcd_gotoxy (0,0);

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        sprintf(text,"  VOLUME");
        lcd_puts(text);
        lcd_gotoxy (0,1);
        sprintf(text," CURRENT = %d",volume);
        lcd_puts(text);
    }
}
if(PIND.3==0)
{delay_ms(50);
if(PIND.3==0) {vol=0;PORTD.0=0;}
}
}
//-----function-----
if(PIND.4==0)
{
    delay_ms(50);
    if(PIND.4==0)
    {
        if(function >=2)function=0;
        else function++;
        if(function ==0) //beat
        {
            lcd_clear();
            lcd_gotoxy (0,0);
            sprintf(text,"  BEAT");
            lcd_puts(text);
            lcd_gotoxy (0,1);
            sprintf(text," CURRENT = %d",beat);
            lcd_puts(text);
        }
        else if(function ==1)

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        {
        lcd_clear();
        lcd_gotoxy (0,0);
        sprintf(text,"  TEMPO");
        lcd_puts(text);
        lcd_gotoxy (0,1);
        sprintf(text," CURRENT = %d",tempo);
        lcd_puts(text);
        }
    else if( function ==2)
    {
    lcd_clear();
    lcd_gotoxy (0,0);
    sprintf(text,"  TAP");
    lcd_puts(text);
    lcd_gotoxy (0,1);
    sprintf(text," CURRENT = %d",tap);
    lcd_puts(text);
    }
    delay_ms(1000);
    }
}

//-----setiap function-----

if(PIND.5==0 && vol==0 && tap==0) //naik
{
    delay_ms(50);
    if(PIND.5==0 && vol==0 && tap==0) //naik
    {
        if(function ==0)

```

```

{
    if(beat >=7)beat=0;
    else beat++;
    lcd_clear();
    lcd_gotoxy (0,0);
    sprintf(text,"  BEAT");
    lcd_puts(text);
    lcd_gotoxy (0,1);
    sprintf(text," CURRENT = %d",beat);
    lcd_puts(text);

}
if(function ==1)
{
    if(tempo >=208)tempo=40;
    else tempo++;
    lcd_clear();
    lcd_gotoxy (0,0);
    sprintf(text,"  TEMPO");
    lcd_puts(text);
    lcd_gotoxy (0,1);
    sprintf(text," CURRENT = %d",tempo);
    lcd_puts(text);

}
if(function ==2)
{
    if(tap ==0) tap=1;
    else tap=0;
    lcd_clear();
    lcd_gotoxy (0,0);

```



```

        sprintf(text,"  TEMPO");
        lcd_puts(text);
        lcd_gotoxy (0,1);
        sprintf(text," CURRENT = %d",tempo);
        lcd_puts(text);
    }
    if(function ==2)
    {
    }
    if(function ==3)
    {
        if(rhythm >0)rhythm--;
        else rhythm=4;
        lcd_clear();
        lcd_gotoxy (0,0);
        sprintf(text,"  RHYTHM");
        lcd_puts(text);
        lcd_gotoxy (0,1);
        sprintf(text," CURRENT = %d",rhythm);
        lcd_puts(text);
    }
}
}

PORTD.7=0;
}

void main(void)
{

```

```

// Inisialisasi Port Input/Output
// Inisialisasi Port A
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTA=0x00;
DDRA=0x00;

// Inisialisasi Port B
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTB=0x00;
DDRB=0x00;

// Inisialisasi Port C
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTC=0x00;
DDRC=0x00;

// Inisialisasi Port D
// Func7=Out Func6=In Func5=In Func4=In Func3=In Func2=In Func1=Out
Func0=Out
// State7=1 State6=P State5=P State4=P State3=P State2=P State1=1 State0=1
PORTD=0xFC;
DDRD=0x83;

// Inisialisasi Timer/Counter 0
// Clock source: System Clock

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```

// Clock value: 10,800 kHz
// Mode: Normal top=FFh
// OC0 output: Disconnected
TCCR0=0x05;
TCNT0=0x6C;
OCR0=0x00;

// Inisialisasi Timer/Counter 1
// Clock source: System Clock
// Clock value: Timer 1 Stopped
// Mode: Normal top=FFFFh
// OC1A output: Discon.
// OC1B output: Discon.
// Noise Canceler: Off
// Input Capture on Falling Edge
// Timer 1 Overflow Interrupt: Off
// Input Capture Interrupt: Off
// Compare A Match Interrupt: Off
// Compare B Match Interrupt: Off
TCCR1A=0x00;
TCCR1B=0x00;
TCNT1H=0x00;
TCNT1L=0x00;
ICR1H=0x00;
ICR1L=0x00;
OCR1AH=0x00;
OCR1AL=0x00;
OCR1BH=0x00;
OCR1BL=0x00;

//Inisialisasi Timer/Counter 2

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// Clock source: System Clock
// Clock value: Timer 2 Stopped
// Mode: Normal top=FFh
// OC2 output: Disconnected
ASSR=0x00;
TCCR2=0x00;
TCNT2=0x00;
OCR2=0x00;

// Inisialisasi External Interrupt(s)
// INT0: Off
// INT1: Off
// INT2: Off
MCUCR=0x00;
MCUCSR=0x00;

// Inisialisasi Timer(s)/Counter(s) Interrupt(s)
TIMSK=0x01;

// Inisialisasi Analog Comparator
// Analog Comparator: Off
// Analog Comparator Input Capture by Timer/Counter 1: Off
ACSR=0x80;
SFIOCR=0x00;

// Global enable interrupts
#asm("sei")

// Inisialisasi LCD module
lcd_init(16);
lcd_clear();

```

```

lcd_gotoxy(0,1);
lcd_putsf(" METRONOME");
lcd_gotoxy(0,0);
lcd_putsf(" GEBY");
volume=5;
vol=0;
tone=0;
tempo=40;
function=0;
beat=0;
tap=0;
rhythm=tone;
PORTD.7=0;
bc=0;
tape=0;
waktu=0;
delay_ms(1000);

while (1)
{

//-----main idea-----
if(tap==0)
{
lcd_clear();
lcd_gotoxy (0,0);
sprintf(text,"VOL=%3d TEMP=%3d",volume,tempo);
lcd_puts(text);
lcd_gotoxy (0,1);

```

```

sprintf(text,"BEAT=%d",beat);
lcd_puts(text);
//-----beat-----
    if(beat== 0) {tone =0;sound();}
    if(beat== 1) {tone =5;sound();}
    else if(beat>1){
        if(bc>=beat) bc=0;
        bc++;
        if(bc<=(beat-1))tone=0;
        if(bc==beat)tone=8;
        sound();
    }
}

//-----
else if(tap==1)
{

if(PIND.4==0 || PIND.3==0 ) tap=0; //balikin ke kondisi tap =0;
waktu++;
tape=209-waktu;
delay_us(3300); //

    if (PIND.5==0)
    {
        delay_ms(50);
        if(PIND.5==0)
        {
            tone=7;

            //-----sound on-----
            if(volume==1) volt= 80;

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if(volume==2) volt= 84;
if(volume==3) volt= 86;
if(volume==4) volt= 88;
if(volume==5) volt= 90;
if(volume==6) volt= 92;
if(volume==7) volt= 94;
if(volume==8) volt= 96;
if(volume==9) volt= 98;
if(volume==10) volt= 100;
PORTD.0=1;
for(j=0;j<=200;j++)
{
PORTD.0=1;
PORTD.7= 1; //volume
for(i=0;i<=(volt);i++)
{
delay_us(2);
}

PORTD.7=0;
delay_us(10);

```

```

PORTD.1=1;
if(tone == 0) delay_us(1);
if(tone == 1) delay_us(20);
if(tone == 2) delay_us(40);
if(tone == 3) delay_us(60);
if(tone == 4) delay_us(80);
if(tone == 5) delay_us(100);
if(tone == 6) delay_us(120);

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if(tone == 7) delay_us(140);
if(tone == 8) delay_us(160);
if(tone == 9) delay_us(180);

PORTD.1=0;
sisas=(100-((volt)+(tone*10)));
for(sisa=0;sisa<=sisas;sisa++)
{
delay_us(2);
}
}
PORTD.0=0;
//-----end sound on-----

```

```

if(tape<=40)
{
lcd_clear();
lcd_gotoxy (0,0);
sprintf(text,"TAP CALCULATION");
lcd_puts(text);
lcd_gotoxy (0,1);
sprintf(text,"TEMP= LOW");
lcd_puts(text);
}
else if(tape>=208)
{
lcd_clear();
lcd_gotoxy (0,0);
sprintf(text,"TAP CALCULATION");
lcd_puts(text);
}

```

```

        lcd_gotoxy (0,1);
        sprintf(text,"TEMP= HIGH");
        lcd_puts(text);
    }
    else
    {
        lcd_clear();
        lcd_gotoxy (0,0);
        sprintf(text,"TAP CALCULATION");
        lcd_puts(text);
        lcd_gotoxy (0,1);
        sprintf(text,"TEMP= %d",tape);
        lcd_puts(text);
    }

    tape=0;
    waktu=0;
}

};

}

```

```

void sound(void)
{
    //-----off.....
    PORTD.0=0;
    //caluculation time
    if(tone == 0) dtone=1;
}

```

```

if(tone == 1) dtone=20;
if(tone == 2) dtone=40;
if(tone == 3) dtone=60;
if(tone == 4) dtone=80;
if(tone == 5) dtone=100;
if(tone == 6) dtone=120;
if(tone == 7) dtone=140;
if(tone == 8) dtone=160;
if(tone == 9) dtone=180;
sisas=(100-((volt)+(tone*10)));
total=(((volt*2)+10+dtone+(sisas*2))*200);//total wkt untuk on suara
sekali, dlm mikro second
if(tempo>=40)tambah = 560;
if(tempo>=50)tambah = 480;
if(tempo>=60)tambah= 420;
if(tempo>=70) tambah=380;
if(tempo>=80) tambah=345;
if(tempo>=90) tambah= 320;
if(tempo>=100) tambah =300;
if(tempo>=110)tambah = 280;
if(tempo>=120)tambah = 260;
if(tempo>=150) tambah=240;
if(tempo>=160) tambah= 220;
if(tempo>=170) tambah =200;
if(tempo>=180) tambah =180;
if(tempo>=190)tambah = 160;
if(tempo>=200)tambah = 140;
if(tempo>=210) tambah=140;
total=(total/1000)+tambah;//total wkt untuk on suara semua,dlm 0,1 mili
second
off=(60000/tempo)-total;

```



```

        for(k=0;k<=off;k++) delay_ms(1);
//delay_ms(160);

//-----on-----
for(j=0;j<=200;j++)
{
if(volume==1) volt= 80;
if(volume==2) volt= 84;
if(volume==3) volt= 86;
if(volume==4) volt= 88;
if(volume==5) volt= 90;
if(volume==6) volt= 92;
if(volume==7) volt= 94;
if(volume==8) volt= 96;
if(volume==9) volt= 98;
if(volume==10) volt= 100;
PORTD.0=1;
        PORTD.7= 1; //volume
        for(i=0;i<=(volt);i++)
        {
                delay_us(2);
        }

        PORTD.7=0;
        delay_us(10);

        PORTD.1=1;
if(tone == 0) delay_us(1);
if(tone == 1) delay_us(20);
if(tone == 2) delay_us(40);
if(tone == 3) delay_us(60);

```

```
if(tone == 4) delay_us(80);
if(tone == 5) delay_us(100);
if(tone == 6) delay_us(120);
if(tone == 7) delay_us(140);
if(tone == 8) delay_us(160);
if(tone == 9) delay_us(180);

PORTD.1=0;
sisas=(100-((volt)+(tone*10)));
for(sisa=0;sisas<=sisas;sisas++)
{
delay_us(2);
}
}
}
```