LAMPIRAN

Lampiran -1 Listing Program

```
#include <LiquidCrystal_I2C.h>
#include <DHT.h>
#include <Wire.h>
#include <BH1750.h>

#define DS3231_ADDRESS 0x68
byte zero = 0x00; //workaround for issue #527
void(* resetFunc) (void) = 0;

#define dht1 2
#define dht2 3
#define dht3 4
#define dht4 5

DHT dht[] = {
  {dht1, DHT22},{dht2, DHT22},
  {dht3, DHT22},{dht4, DHT22},
};

LiquidCrystal_I2C lcd(0x27, 20, 4);
BH1750 lightMeter;

#define  Lampu A2 //relay Lampu aktif LOW
#define  Kipas A1
#define  Heater A0
#define  btnUpDown 9 //btnUpDown aktif LOW (untuk pilih Hari)
#define  btnSet 8  //btnSet aktif LOW (untuk Setting)
#define  Buzzer 11     //Buzzer aktif HIGH
#define  LED 13        //aktif HIGH

float Sr, Kr, S[4], K[4];
float SrX=0.0, KrX=0.0;
float lux;
//================================================================
================================

//================================  Deklarasi Variabel
====================================
byte detRTC, mntRTC, jamRTC, hriRTC, tglRTC, blnRTC, thnRTC;
byte ht, SetA, SetB, waktu, waktuX, dataRTC;
int nRTC, count=1500;
int nML = 1080;  //jam 18*60 menit
```

```
int OFF1= 1140; //OFF1 = jam 19.00 (1 jam ) atau 19*60=1140
int OFF2= 120;  //OFF2 = jam 02.00 (8 jam ) atau 2*60=120
int OFF3= 1380; //OFF3 = jam 23.00 (5 jam ) atau 1380
int OFF4= 1320; //OFF4 = jam 22.00 (4 jam ) atau 1320
int OFF5= 1200; //OFF5 = jam 20.00 (2 jam) atau 1200
byte Hari=1, Lama, detJedah;
byte countA=0, countB=0, countLCD=0;

bool lcdState = true;
bool staLampu, staKipas, staHeater;
//========================== Akhir Deklarasi Variabel
====================

// ============================== Awal void setup ()
======================
void setup() {
    Wire.begin();
    lightMeter.begin();
    Serial.begin(9600);
    for (auto& sensor : dht) { sensor.begin();}
    lcd.init(); lcd.backlight();
    lcd.home ();         lcd.print(F("  SISTEM OTOMATIS   "));
    lcd.setCursor(0,1); lcd.print(F("  KANDANG TERTUTUP  "));
    delay(1000);
    pinMode(Kipas,OUTPUT);
    pinMode(Heater,OUTPUT);
    pinMode(Lampu,OUTPUT);
    digitalWrite(Lampu,HIGH);  //relay aktif LOW
    digitalWrite(Kipas,HIGH);
    digitalWrite(Heater,HIGH);
    pinMode(btnUpDown,INPUT_PULLUP);
    pinMode(LED,OUTPUT);  //LED aktif HIGH
    pinMode(btnSet,INPUT_PULLUP);
    pinMode(Buzzer,OUTPUT); //Buzzer aktif HIGH

    delay(2000);
    byte countSet=0;
    while (!digitalRead(btnSet) && lcdState && countSet<30)
          { countSet++; delay(100); }
    if(countSet>=30 && lcdState)
      { beepSet(); Setting_A();}
    lcd.clear();
}
// ======================== Akhir void setup ()
======================

void loop() {
```

```
   for (int i = 0; i < 4; i++) {
     S[i] = dht[i].readTemperature();
     K[i] = dht[i].readHumidity();
   }
   Kr= (K[0]+K[1]+K[2]+K[3])/4;
   Sr= (S[0]+S[1]+S[2]+S[3])/4;

   Sr=Sr-4.00;
   if(SrX!=Sr || KrX!=Kr) {
     lcd.setCursor(0,1); lcd.print("Kr:    %   Sr:     C");
     lcd.setCursor(3,1); lcd.print(Kr,0);
     lcd.setCursor(14,1); lcd.print(Sr,0);
     lcd.setCursor(18,1); lcd.print((char)223);
     SrX=Sr;  KrX=Kr;
   }

   lux = lightMeter.readLightLevel();
   if(countLCD==20) {
      countLCD=0;
      lcd.setCursor(0,2); lcd.print("L :    lx ");
      lcd.setCursor(3,2);
      if(lux<10) lcd.setCursor(5,2);
      if(lux>9 && lux<100) lcd.setCursor(4,2);
      lcd.print(lux,0);
   }
   //countLCD++;
   bacaRTC();
   tampilkan_ke_LCD();

   //================= Masuk menu Setting Variabel Control
===========
   byte countSet=0;
   while (!digitalRead(btnSet) && lcdState && countSet<30) {
      countSet++; delay(100); }
   if(countSet>=30 && lcdState)  { beepSet(); Setting_A(); }

   //========================== Status LCD
==========================
  // if(!digitalRead(btnSet) && !lcdState) {count=1500;
lcdState=1;}
  // if(lcdState) tampilkan_ke_LCD();
  //delay(100); count--;

   if(Hari >= 1 && Hari <= 7) KHari_1();
   if(Hari >= 8 && Hari <14) KHari_2();
   if(Hari >=15 && Hari <=21) KHari_3();
   if(Hari >=22 && Hari <=28) KHari_4();
```

```
   if(Hari >=29 && Hari <=35) KHari_5();
   lcd.setCursor(0,3);
     //lcd.print("nML:"+String(nML)); lcd.print("  ");
     //lcd.print("nRTC:"+String(nRTC));
    if(staLampu) lcd.print("L: ON  "); else lcd.print("L:OFF
");
    if(staKipas) lcd.print("K: ON  "); else lcd.print("K:OFF
");
    if(staHeater)lcd.print("H: ON");   else
lcd.print("H:OFF");
}
// ======================  Akhir void loop()
========================

void bacaRTC() {
     Wire.beginTransmission(DS3231_ADDRESS);
     byte zero = 0x00;
     Wire.write(zero);
     Wire.endTransmission();
     Wire.requestFrom(DS3231_ADDRESS, 7);
     detRTC= bcdToDec(Wire.read());
     mntRTC = bcdToDec(Wire.read());
     jamRTC= bcdToDec(Wire.read() & 0x3F); //24 hour time
     hriRTC = bcdToDec(Wire.read()); //1-7 -> sunday -
Saturday
     tglRTC = bcdToDec(Wire.read());
     blnRTC = bcdToDec(Wire.read());
     thnRTC = bcdToDec(Wire.read());
     if(blnRTC==1) Hari=tglRTC;
     else if(blnRTC==2) Hari=tglRTC+31;
     nRTC = jamRTC*60 + mntRTC; //mengubah ke nilai menit nRTC
    // if(Hari>40) setReg(4,1); //Reset Hari ke Satu
}
void tampilkan_ke_LCD(){
     /*
     lcd.setCursor(0,0); lcd.print("T");
     if(tglRTC<10) { lcd.print('0');}
     lcd.print(tglRTC); lcd.print('/');
     if(blnRTC<10) { lcd.print('0');}
     lcd.print(blnRTC); lcd.print('/');
     lcd.print(thnRTC);
     */

     lcd.setCursor(0,0); lcd.print("Hari Ke:");
     if(Hari<10) lcd.print(0); lcd.print(Hari);

     lcd.setCursor(10,0); lcd.print(" J");
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```
     if(jamRTC<10) { lcd.print('0');}
     lcd.print(jamRTC); lcd.print(':');
     if(mntRTC<10) { lcd.print('0');}
     lcd.print(mntRTC); lcd.print(':');
     if(detRTC<10) { lcd.print('0');}
     lcd.print(detRTC);
  /*
     if(count==0) {
        lcdState=0;
        lcd.noDisplay();
        lcd.noBacklight();
      }
    */
}

void KHari_1() { //Hari 1-7, Suhu 32-33 derajat, Lampu OFF 1
jam
     if(Sr<31.6) { Heater_ON(); }
     if(Sr>33.5) { Kipas_ON(); }
     if(Sr>=31.6 && Sr<=33.5) { Heater_OFF(); Kipas_OFF(); }
     if(nRTC >= nML && nRTC < OFF1)  LampuPadam();
     else  LampuNyala();
}
void KHari_2() { //Hari 8-14,Suhu 30-31 derajat, Lampu OFF 8
jam
     if(Sr<29.6) { Heater_ON();  }
     if(Sr>31.5) { Kipas_ON(); }
     if(Sr>=29.6 && Sr<=31.5) { Heater_OFF(); Kipas_OFF(); }
     if(nRTC >= nML || nRTC<OFF2) LampuPadam();
     else LampuNyala();
}
void KHari_3() {  //Hari 15-21, Suhu 28-29 derajat, Lampu OFF
5 jam
     if(Sr<27.6) { Heater_ON(); }
     if(Sr>29.5) { Kipas_ON(); }
     if(Sr>=27.6 && Sr<=29.5){ Heater_OFF(); Kipas_OFF(); }
     if(nRTC >= nML && nRTC < OFF3) LampuPadam();
     else LampuNyala();
}
void KHari_4() { //Hari 22-28, Suhu 26-27 derajat, Lampu OFF 4
jam
     if(Sr<25.6) { Heater_ON();  }
     if(Sr>27.5) { Kipas_ON(); }
     if(Sr>=25.6 && Sr<=27.5) { Heater_OFF(); Kipas_OFF(); }
     if(nRTC >= nML && nRTC < OFF4) LampuPadam();
     else LampuNyala();
}
```

```
void KHari_5() { //Hari 29-35, Suhu 24-25 derajat, Lampu OFF 2
jam
     if(Sr<23.6) { Heater_ON();  }
     if(Sr>25.5) { Kipas_ON(); }
     if(Sr>=23.6 && Sr<=25.5) { Heater_OFF(); Kipas_OFF(); }
     if(nRTC >= nML || nRTC < OFF5) LampuPadam();
     else LampuNyala();
}

//=================   Awal Listing Kontrol Modul
=====================
void High(int pin) { digitalWrite(pin,HIGH); }
void Low(int pin) { digitalWrite(pin,LOW); }
void Heater_ON()  { Low(Heater); staHeater=1; Kipas_OFF();}
void Heater_OFF() { High(Heater); staHeater=0;}
void Kipas_ON()   { Low(Kipas); staKipas=1; Heater_OFF();}
void Kipas_OFF()  { High(Kipas); staKipas=0;}
void Lampu_ON()   { Low(Lampu); staLampu=1; }
void Lampu_OFF()  { High(Lampu); staLampu=0;  }
void buzzer_ON()  { High(Buzzer); }
void buzzer_OFF() { Low(Buzzer); }
void led_ON()     { digitalWrite(LED,HIGH); }
void led_OFF()    { digitalWrite(LED,LOW); }

void LampuPadam() {
     Lampu_OFF();
     lcd.setCursor(10,2); lcd.print("          ");
}
void LampuNyala() {
     Lampu_ON();
     lcd.setCursor(10,2);
     if(staLampu) {
        if(lux>90.0) lcd.print("  Lampu OK");
        else { lcd.print("Cek Lampu!");
                if(countB==20) {countB=0; beep(10,100); }
             }
     }
     countB++;
}
void beep(byte kali, int tunda) {
  for(byte i=1; i<=kali; i++) {
      buzzer_ON(); delay(tunda);
      buzzer_OFF();  delay(tunda);
   }
}

void kedip(byte on) {
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     countA++;
     if(countA<=on) led_ON();
     else led_OFF();
     if(countA==2*on) countA=0;
}
void beepSet() { buzzer_ON(); delay(500); buzzer_OFF(); }
void beepChange() { buzzer_ON(); delay(100); buzzer_OFF(); }

     //reg=0 --> detRTC, reg=1 --> mntRTC
     //reg=2 --> jamRTC, reg=3 --> hariRTC
     //reg=4 --> tglRTC, reg=5 --> blnRTC
     //reg=6 --> thnRTC

byte bacaReg(byte reg) {
     Wire.beginTransmission(DS3231_ADDRESS);
     // set DS3231 register pointer to (reg)h :
     Wire.write(reg);
     Wire.endTransmission();
     //request 1 bytes data and starting from (reg)h
     Wire.requestFrom(DS3231_ADDRESS, 1);
     //format Jam 00-23 :
     if(reg==2) dataRTC = bcdToDec(Wire.read() & 0x3F);
     else dataRTC = bcdToDec(Wire.read());
     return dataRTC;
}

void setReg(byte reg, byte tulisRTC) {
  Wire.beginTransmission(DS3231_ADDRESS);
  //set next input to start at the seconds register :
  Wire.write(reg);
  Wire.write(decToBcd(tulisRTC));
  Wire.endTransmission();
}

//Convert BCD normal DECIMAL numbers :
byte bcdToDec(byte val) {return ((val/16*10) + (val%16));}
//Convert DECIMAL numbers to BCD :
byte decToBcd(byte val) {return ((val/10*16) + (val%10));}


void Setting_A() {
  if(SetA==0) {
     lcd.clear();
     lcd.setCursor(0,0); lcd.print(F("  Masuk Menu    "));
     lcd.setCursor(0,1); lcd.print(F("  Setting ... ! "));
     delay(2000); lcd.clear();
     SetA=250;
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  }
  while(SetA==250) {
    beepSet(); SetA=1; bacaRTC();  waktu=bacaReg(0);
    lcd.setCursor(0,0); lcd.print(F(" SET DETIK ... ?"));
    lcd.setCursor(0,1); lcd.print(F(" Detik =   "));
    lcd.setCursor(10,1); if(waktu<10) { lcd.print(F("0"));}
    lcd.print(waktu);
  }

  //========== Untuk men-SET RTC, Regiter 0 s/d 6
=============
  //variabel setX (kursor, teksA, teksB, teksC, teksD )
  while(SetA==1) {setX(10, 1, 2, 3, 4);} //SET DETIK ... ?
  while(SetA==2) {setX(10, 5, 6, 7, 2);} //SET MENIT ... ?
  while(SetA==3) {setX(10, 9,10,11, 6);} //SET JAM ... ?
  while(SetA==4) {setX(10,13,14,15,10);} //SET HARI ... ?
}

void Setting_B() {
  //============ Setting RTC, Regiter 0 s/d 6
================
  // void setY  (byte kursor, byte valmin, byte valmax )
  while(SetB==1) {setY(10,0,59);} //Setting Detik (min=0,
max=59)
  while(SetB==2) {setY(10,0,59);} //Setting Menit (min=0,
max=59)
  while(SetB==3) {setY(10,0,23);} //Setting Jam (min=0,
max=23)
  while(SetB==4) {setY(10,1,35);} //Setting Tanggal (min=1,
max=35)
}

void setX (byte kursor, byte teksA, byte teksB, byte teksC,
byte teksD ) {
   if(SetA>0 && !digitalRead(btnUpDown)) selesaiSetting();
   byte countSet=0;
   while(!digitalRead(btnSet) && countSet<12){ countSet++;
delay(100); }
   if(countSet>0 && countSet<12){
      beepSet();
      lcd.clear();
      lcd.setCursor(0,0); cetak(teksA);
      if(SetA==1) waktu=bacaReg(1);
      if(SetA==2) waktu=bacaReg(2);
      if(SetA==3) waktu=bacaReg(4);
      lcd.setCursor(0,1); cetak(teksB);
```

```
      SetA++;
      lcd.setCursor(kursor,1);

      if(SetA==4) { waktuX=bacaReg(5);
                    if(waktuX==2) waktu=waktu+31;
                  }
      if(waktu<10) lcd.print(F("0")); lcd.print(waktu);
      if(SetA>4) selesaiSetting();
   }

   if(countSet>=12)  {
      if(SetA==1) waktu=bacaReg(0);
      if(SetA==2) waktu=bacaReg(1);
      if(SetA==3) waktu=bacaReg(2);
      if(SetA==4) { if(bacaReg(5)==1) waktu=bacaReg(4);
                    if(bacaReg(5)==2) waktu=bacaReg(4)+31;
                  }
      beep(3,100);
      lcd.setCursor(0,0); cetak(teksC);
      lcd.setCursor(0,1); cetak(teksD);
      SetB=SetA; Setting_B();
   }
}

void setY (byte kursor, byte valmin, byte valmax ) {
   byte countSet=0;
   while(!digitalRead(btnSet) && countSet<12){ countSet++;
delay(100); }
   if(countSet>=12) {
      if(SetB==1) setReg(0,waktu);
      if(SetB==2) setReg(1,waktu);
      if(SetB==3) setReg(2,waktu);
      if(SetB==4) { if(waktu<=31) {
                       setReg(4,waktu); setReg(5,1); }
                    else {waktu=waktu-31;
                          setReg(4,waktu); setReg(5,2); }
                   }
      lcd.setCursor(0,0);  lcd.print(F("SUDAH DI UBAH ! "));
      lcd.setCursor(0,1);  lcd.print(F("                "));
      beepSet(); delay(1000); beep(3,100);
      Settin0g_A(); //SetB=0;
   }

   if(countSet>0 && countSet<12) { countSet=0; beepChange();
      if(digitalRead(btnUpDown)) {

         waktu++; if(waktu>valmax) waktu=valmin;
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```
      } else {
         waktu--;
         if(waktu<valmin || waktu>valmax) waktu=valmax;
      }
   }

   lcd.setCursor(kursor,1);
   if(waktu<10) lcd.print(F("0"));
   if(SetB<5) lcd.print(waktu);
}

void selesaiSetting() {
      lcd.setCursor(0,0); cetak(25);
      lcd.setCursor(0,1); cetak(26);
      beep(3,100); delay(2000); lcd.clear();
      if(SetB>4) resetFunc();
      else { SetA=0; SetB=0; }
}

void cetak(byte tx) {
   if(tx== 1) lcd.print(F(" SET MENIT ... ?"));
   if(tx== 2) lcd.print(F(" Menit =        "));
   if(tx== 3) lcd.print(F("Setting DETIK..."));
   if(tx== 4) lcd.print(F(" Detik =        "));
   if(tx== 5) lcd.print(F(" SET JAM ... ?  "));
   if(tx== 6) lcd.print(F(" Jam   =        "));
   if(tx== 7) lcd.print(F("Setting MENIT..."));
   if(tx== 9) lcd.print(F(" SET HARI ... ? "));
   if(tx==10) lcd.print(F(" Hari  =        "));
   if(tx==11) lcd.print(F("Setting JAM ... "));
   if(tx==15) lcd.print(F("Setting HARI ..."));
   if(tx==25) lcd.print(F(" == SETTING ==  "));
   if(tx==26) lcd.print(F(" == SELESAI ==  "));
}
```