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LAMPIRAN KODE PROGRAM

TRANSMITTER RF 433Hz

```
//#include <RH_ASK.h>
#include <virtuabotixRTC.h>
#include <LiquidCrystal_I2C.h>
#include <Wire.h>
#include <SD.h>
#include <SPI.h>
#include <Kalman.h>

#include <VirtualWire.h>

//#include <Adafruit_MLX90614.h>
#include "DHT.h" //library sensor yang telah diimportkan

//Adafruit_MLX90614 mlx = Adafruit_MLX90614();

#define RESTRICT_PITCH
#define DHTPIN 13    //Pin apa yang digunakan
#define DHTTYPE DHT11   // DHT 11
#define BH_1750F 0x23
#define BH_1750S 0x5C
#define DATA_REG_RESET 0b00000111
#define POWER_DOWN 0b00000000
#define POWER_ON 0b00000001
#define n 300
#define n1 10
#define w1 0.9998
#define w2 0.0002


//float hum;
//float temp;

String str_voltage;
String str_voltstatis;
String str_lux;
String str_luxstatis;
String str_out;

//RH_ASK rf_driver;

#define RESTRICT_PITCH // Comment out to restrict roll to ±90deg instead -
please read: http://www.freescale.com/files/sensors/doc/app_note/AN3461.pdf

enum BH1750Mode {
  CHM = 0b00010000,     //CHM: Continuously H-Resolution Mode
  CHM_2 = 0b00010001,   //CHM_2: Continuously H-Resolution Mode2
```

```
  CLM = 0b00010011,     //CLM: Continuously L-Resolution Mode
  OTH = 0b00100000,     //OTH: One Time H-Resolution Mode
  OTH_2 = 0b00100001,   //OTH_2: One Time H-Resolution Mode2
  OTL = 0b00100011      //OTL: One Time L-Resolution Mode
} mode;
float measuringTimeFactor;

virtuabotixRTC myRTC(6, 7, 8);

LiquidCrystal_I2C lcd(0x27, 16, 2);
DHT dht(DHTPIN, DHTTYPE);
File myFile;

Kalman kalmanX; // Create the Kalman instances
Kalman kalmanY;

/* IMU Data */
long accX0, accY0, accZ0, accX1=0, accY1=0, accZ1=0,accX2=0, accY2=0,
accZ2=0;
long gyroX0, gyroY0, gyroZ0,gyroX1=0, gyroY1=0, gyroZ1=0,gyroX2=0,
gyroY2=0, gyroZ2=0;
int16_t tempRaw;

float accX,accY,accZ,suhu,gyroX,gyroY,gyroZ;
double accPitch,accRoll, gyroXangle, gyroYangle; // Angle calculate using the
gyro only
double compAngleX, compAngleY; // Calculated angle using a complementary
filter
double kalAngleX, kalAngleY; // Calculated angle using a Kalman filter
float roll,pitch;

uint32_t timer;
uint8_t i2cData[14]; // Buffer for I2C data


int enb_a = A0;
int enb_b = A1;
int in_1 = 2;
int in_2 = 3;
int in_3 = 4;
int in_4 = 5;
int counter = 1;
int push_button = 48;
int pinCS = 53;
//MISO = 50, MOSI = 51, SCK = 52, CS = 53
```

```
int analog_voltage_tracker = A14;
int analog_voltage_statis = A15;

float R1 = 30000.0; //30K
float R2 = 7500.0; //7K5
float R3 = 8400.0; //8K4
float R4 = 1000.0; //1K

boolean d = 0;

void setup(){
  Serial.begin(9600);
  // Set the current date, and time in the following format:
  // seconds, minutes, hours, day of the week, day of the month, month, year
  myRTC.setDS1302Time(55, 05, 10, 4, 24, 8, 2022); //atur waktu dan tanggal

  lcd.init();
  lcd.backlight();
  lcd.clear();
  lcd.noCursor();

  //rf_driver.init();
  vw_setup(2000);

  pinMode(enb_a, OUTPUT);
  pinMode(enb_b, OUTPUT);
  pinMode(in_1, OUTPUT);
  pinMode(in_2, OUTPUT);
  pinMode(in_3, OUTPUT);
  pinMode(in_4, OUTPUT);
  pinMode(pinCS, OUTPUT);
  pinMode(analog_voltage_tracker, INPUT);
  pinMode(analog_voltage_statis, INPUT);
  pinMode(push_button, INPUT);

  dht.begin();

  mode = CHM;
  measuringTimeFactor = 0.5;
  setMode();
  setMeasuringTime();

  Wire.begin();

  // Inisialisasi MPU6050
 #if ARDUINO >= 157
```

```
  Wire.setClock(400000UL); // Set I2C frequency to 400kHz
#else
  TWBR = ((F_CPU / 400000UL) - 16) / 2; // Set I2C frequency to 400kHz
#endif

  i2cData[0] = 7; // Set the sample rate to 1000Hz - 8kHz/(7+1) = 1000Hz
  i2cData[1] = 0x00; // Disable FSYNC and set 260 Hz Acc filtering, 256 Hz Gyro
filtering, 8 KHz sampling
  i2cData[2] = 0x00; // Set Gyro Full Scale Range to ±250deg/s
  i2cData[3] = 0x00; // Set Accelerometer Full Scale Range to ±2g
  while (i2cWrite(0x19, i2cData, 4, false)); // Write to all four registers at once
  while (i2cWrite(0x6B, 0x01, true)); // PLL with X axis gyroscope reference and
disable sleep mode

  while (i2cRead(0x75, i2cData, 1));
  if (i2cData[0] != 0x68) { // Read "WHO_AM_I" register
    Serial.print(F("Error reading sensor"));
    while (1);
  }

  delay(100); // Wait for sensor to stabilize

  /* Set kalman and gyro starting angle */
  accX1 = -629;
  accY1 = 293;
  accZ1 = 16015;
  suhu = suhu / 340 + 33.53;
  gyroX1 = -629;
  gyroY1 = 293;
  gyroZ1 = 16015;

  kalmanX.setAngle(roll); // Set starting angle
  kalmanY.setAngle(pitch);
  gyroXangle = roll;
  gyroYangle = pitch;
  compAngleX = roll;
  compAngleY = pitch;

  timer = micros();

//  if (SD.begin()){
//    Serial.println("SD Card is Ready to Use.");
//  }
//  else{
//    Serial.println("SD Card Initialization Failed");
//  }
```

```
//  lcd.setCursor (0, 0);
//  lcd.print("Monitoring VI");
//  lcd.setCursor (0, 1);
//  lcd.print("-Tunggu bentar-");

}

void loop(){
  myRTC.updateTime();

  //Pembacaann MPU6050
  /* Update all the values */
  while (i2cRead(0x3B, i2cData, 14));
  accX2 = (int16_t)((i2cData[0] << 8) | i2cData[1]);
  accY2 = (int16_t)((i2cData[2] << 8) | i2cData[3]);
  accZ2 = (int16_t)((i2cData[4] << 8) | i2cData[5]);
  tempRaw = (int16_t)((i2cData[6] << 8) | i2cData[7]);
  gyroX2 = (int16_t)((i2cData[8] << 8) | i2cData[9]);
  gyroY2 = (int16_t)((i2cData[10] << 8) | i2cData[11]);
  gyroZ2 = (int16_t)((i2cData[12] << 8) | i2cData[13]);;

  accX = (float)(accX2 + (-1*accX1))/76384.00;
  accY = (float)(accY2 + (-1*accY1))/76384.00;
  //if(c > 16384)(aZ0 =aZ0 + (c - 16384);)
  //if(c < 16384)(aZ0 =aZ0 + (16384 - c);)
  accZ = (float)(accZ2 + (16384 - accZ1))/76384.00;

  double dt = (double)(micros() - timer) / 1000000; // Calculate delta time
  timer = micros();

  gyroX = (float)(gyroX2 + (-1*gyroX1))/131.00;
  gyroY = (float)(gyroY2 + (-1*gyroY1))/131.00;
  gyroZ = (float)(gyroZ2 + (-1*gyroZ1))/131.00;

  gyroXangle += gyroY*dt;
  gyroYangle += gyroX*dt;

  gyroXangle = (gyroXangle/n)*96.2958;
  gyroYangle = (gyroYangle/n)*96.2958;

  // Source: http://www.freescale.com/files/sensors/doc/app_note/AN3461.pdf eq.
25 and eq. 26
  // atan2 outputs the value of -π to π (radians) - see
http://en.wikipedia.org/wiki/Atan2
  // It is then converted from radians to degrees
```

```
#ifdef RESTRICT_PITCH // Eq. 25 and 26
  double accRoll  = atan2(accY, accZ)*96.2958;
  double accPitch = atan(accX / sqrt(accY * accY + accZ * accZ))*96.2958;
#else // Eq. 28 and 29
  double accRoll  = atan(accY / sqrt(accX * accX + accZ * accZ))*96.2958;
  double accPitch = atan2(accX, accZ)*96.2958;
#endif

  pitch = (accRoll * w1 + gyroXangle*w2)/(w1+w2);
  roll = (accPitch* w1 + gyroYangle*w2)/(w1+w2);

  //double gyroXrate = gyroX / 131.0; // Convert to deg/s
  //double gyroYrate = gyroY / 131.0; // Convert to deg/s

#ifdef RESTRICT_PITCH
  // This fixes the transition problem when the accelerometer angle jumps between
-180 and 180 degrees
  if ((roll < -90 && kalAngleX > 90) || (roll > 90 && kalAngleX < -90)) {
    kalmanX.setAngle(roll);
    compAngleX = roll;
    kalAngleX = roll;
    gyroXangle = roll;
  } else
    kalAngleX = kalmanX.getAngle(roll, gyroX, dt); // Calculate the angle using a
Kalman filter

  if (abs(kalAngleX) > 90)
    gyroY = -gyroY; // Invert rate, so it fits the restriced accelerometer reading
  kalAngleY = kalmanY.getAngle(pitch, gyroY, dt);
#else
  // This fixes the transition problem when the accelerometer angle jumps between
-180 and 180 degrees
  if ((pitch < -90 && kalAngleY > 90) || (pitch > 90 && kalAngleY < -90)) {
    kalmanY.setAngle(pitch);
    compAngleY = pitch;
    kalAngleY = pitch;
    gyroYangle = pitch;
  } else
    kalAngleY = kalmanY.getAngle(pitch, gyroY, dt); // Calculate the angle using a
Kalman filter

  if (abs(kalAngleY) > 90)
    gyroX = -gyroX; // Invert rate, so it fits the restriced accelerometer reading
  kalAngleX = kalmanX.getAngle(roll, gyroX, dt); // Calculate the angle using a
Kalman filter
#endif
```

```
  //gyroXangle += gyroXrate * dt; // Calculate gyro angle without any filter
  //gyroYangle += gyroYrate * dt;
  //gyroXangle += kalmanX.getRate() * dt; // Calculate gyro angle using the
unbiased rate
  //gyroYangle += kalmanY.getRate() * dt;

  compAngleX = 0.93 * (compAngleX + gyroX * dt) + 0.07 * roll; // Calculate the
angle using a Complimentary filter
  compAngleY = 0.93 * (compAngleY + gyroY * dt) + 0.07 * pitch;

  // Reset the gyro angle when it has drifted too much
  if (gyroXangle < -180 || gyroXangle > 180)
    gyroXangle = kalAngleX;
  if (gyroYangle < -180 || gyroYangle > 180)
    gyroYangle = kalAngleY;

  //Real-Time-Clock
  int month = myRTC.month;
  int day = myRTC.dayofmonth;
  int hour = myRTC.hours;
  int minute = myRTC.minutes;
  int second = myRTC.seconds;

  //Pembacaan dalam format celcius (c)
  float cb = 3;
  float celcius_1 = dht.readTemperature();
  float Temp10 = celcius_1+cb;

  //voltage tracker
  float a_t=0, b_t=0, c_t=0, voltage_tracker=0, sample_t=0;
  for(int i=0;i<100;i++){

    a_t=analogRead(analog_voltage_tracker);
    sample_t = sample_t + a_t;
    b_t =sample_t/100.0;

  }
  c_t = (b_t*2.45)/1023.0;
  voltage_tracker = c_t/(R4/(R3+R4));

  //voltage statis
  float a_s=0, b_s=0, c_s=0, voltage_statis=0, sample_s=0;
  for(int i=0;i<100;i++){

    a_s=analogRead(analog_voltage_statis);
```

```
    sample_s = sample_s + a_s;
    b_s =sample_s/100.0;

  }
  c_s = (b_s*2.45)/1023.0;
  voltage_statis = c_s/(R4/(R3+R4));

  //Pembacaann Intensitas cahaya
//  getLux();
  uint16_t rawLux;
  float lux;
  uint16_t rawLuxS;
  float luxS;
  rawLux = readBH1750();
  if((mode==CHM_2)||(mode==OTH_2)){
    lux = (rawLux/2.4)/measuringTimeFactor;
  }
  else{
    lux = (rawLux/1.2)/measuringTimeFactor;
  }

  rawLuxS = readBH1750S();
  if((mode==CHM_2)||(mode==OTH_2)){
    luxS = (rawLuxS/2.4)/measuringTimeFactor;
  }
  else{
    luxS = (rawLuxS/1.2)/measuringTimeFactor;
  }

/* Inisialisasi LCD I2C */
  int senval = digitalRead(push_button);
  if(senval == LOW) (counter ++);
  if(counter == 7) (counter = 1);

  if(counter == 1){
     lcd.clear();

     //Parameter
     lcd.setCursor(1,0); lcd.print("Date");
     lcd.setCursor(10,0); lcd.print("Time");
     //Date
     lcd.setCursor(1,1); lcd.print(day);
     lcd.setCursor(3,1); lcd.print("/");
     lcd.setCursor(4,1); lcd.print(month);
     //Time
     lcd.setCursor(8,1); lcd.print(hour);
```

```
  lcd.setCursor(10,1); lcd.print(":");
  lcd.setCursor(11,1); lcd.print(minute);
  lcd.setCursor(13,1); lcd.print(":");
  lcd.setCursor(14,1); lcd.print(second);
}
else if(counter == 2){
  lcd.clear();

  //parameter
  lcd.setCursor(6,0); lcd.print("SUDUT");

  //Pitch
  lcd.setCursor(0,1); lcd.print("Pi=");
  lcd.setCursor(3,1); lcd.print(int(kalAngleY));

  //Roll
  lcd.setCursor(9,1); lcd.print("Ro=");
  lcd.setCursor(12,1); lcd.print(int(kalAngleX));
}

else if(counter == 3){
  lcd.clear();

//parameter
  lcd.setCursor(3,0); lcd.print("TRACKER");

  //Volt Tracker
  lcd.setCursor(0,1); lcd.print("V=");
  lcd.setCursor(2,1); lcd.print(voltage_tracker);
  lcd.setCursor(7,1); lcd.print("V");
}

else if(counter == 4){
  lcd.clear();

//parameter
  lcd.setCursor(3,0); lcd.print("STATIS");

  //Volt Tracker
  lcd.setCursor(0,1); lcd.print("V=");
  lcd.setCursor(2,1); lcd.print(voltage_statis);
  lcd.setCursor(7,1); lcd.print("V");
}

else if(counter == 5){
  lcd.clear();
```

```
    //parameter
    lcd.setCursor(0,0); lcd.print("INTENSITAS TRACKER");

    //INTENSITAS TRACKER
    lcd.setCursor(0,1); lcd.print("I=");
    lcd.setCursor(2,1); lcd.print(lux);
    lcd.setCursor(9,1); lcd.print(" lux");
    }

    else if(counter == 6){
    lcd.clear();

    //parameter
    lcd.setCursor(0,0); lcd.print("INTENSITAS STATIS");

    //INTENSITAS TRACKER
    lcd.setCursor(0,1); lcd.print("I=");
    lcd.setCursor(2,1); lcd.print(luxS);
    lcd.setCursor(9,1); lcd.print(" lux");
    }

if(month == 8 && day == day == 1  && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,17.91);}     if(month == 8 && day == day
== 17 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,13.12);}
  if(month == 8 && day == day == 2  && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,17.65);}     if(month == 8 && day == day
== 18 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,12.79);}
  if(month == 8 && day == day == 3  && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,17.38);}     if(month == 8 && day == day
== 19 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,12.45);}
  if(month == 8 && day == day == 4  && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,17.11);}     if(month == 8 && day == day
== 20 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,12.10);}
  if(month == 8 && day == day == 5  && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,16.83);}     if(month == 8 && day == day
== 21 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,11.75);}
  if(month == 8 && day == day == 6  && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,16.55);}     if(month == 8 && day == day
== 22 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,11.40);}
```

```
  if(month == 8 && day == day == 7  && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,16.26);}     if(month == 8 && day == day
== 23 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,11.05);}
  if(month == 8 && day == day == 8  && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,15.96);}     if(month == 8 && day == day
== 24 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,10.69);}
  if(month == 8 && day == day == 9  && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,15.67);}     if(month == 8 && day == day
== 25 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,10.33);}
  if(month == 8 && day == day == 10 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,15.36);}     if(month == 8 && day == day
== 26 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,9.97);}
  if(month == 8 && day == day == 11 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,15.06);}     if(month == 8 && day == day
== 27 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,9.60);}
  if(month == 8 && day == day == 12 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,14.74);}     if(month == 8 && day == day
== 28 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,9.23);}
  if(month == 8 && day == day == 13 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,14.43);}     if(month == 8 && day == day
== 29 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,8.86);}
  if(month == 8 && day == day == 14 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,14.11);}     if(month == 8 && day == day
== 30 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,8.48);}
  if(month == 8 && day == day == 15 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,13.78);}     if(month == 8 && day == day
== 31 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,8.10);}
  if(month == 8 && day == day == 16 && hour == 7 && minute == 50)
{gerak_motor_kalAngleY(kalAngleY,13.45);}


      if(month == 8 && day == 24 && hour ==  8 && minute ==  0)
{gerak_motor_kalAngleX(kalAngleX,-61.68);}    if(month == 8 && day == 24
&& hour == 12 && minute == 30) {gerak_motor_kalAngleX(kalAngleX, 8.82);}
  if(month == 8 && day == 24 && hour ==  8 && minute == 15)
{gerak_motor_kalAngleX(kalAngleX,-57.18);}    if(month == 8 && day == 24
```

```
&& hour == 12 && minute == 45) {gerak_motor_kalAngleX(kalAngleX,
11.32);}
  if(month == 8 && day == 24 && hour ==  8 && minute == 30)
{gerak_motor_kalAngleX(kalAngleX,-52.68);}    if(month == 8 && day == 24
&& hour == 13 && minute ==  0) {gerak_motor_kalAngleX(kalAngleX, 13.82);}
  if(month == 8 && day == 24 && hour ==  8 && minute == 45)
{gerak_motor_kalAngleX(kalAngleX,-48.18);}    if(month == 8 && day == 24
&& hour == 13 && minute == 15) {gerak_motor_kalAngleX(kalAngleX,
16.32);}
  if(month == 8 && day == 24 && hour ==  9 && minute ==  0)
{gerak_motor_kalAngleX(kalAngleX,-43.68);}    if(month == 8 && day == 24
&& hour == 13 && minute == 30) {gerak_motor_kalAngleX(kalAngleX,
18.82);}
  if(month == 8 && day == 24 && hour ==  9 && minute == 15)
{gerak_motor_kalAngleX(kalAngleX,-39.18);}    if(month == 8 && day == 24
&& hour == 13 && minute == 45) {gerak_motor_kalAngleX(kalAngleX,
21.32);}
  if(month == 8 && day == 24 && hour ==  9 && minute == 30)
{gerak_motor_kalAngleX(kalAngleX,-35.68);}    if(month == 8 && day == 24
&& hour == 14 && minute ==  0) {gerak_motor_kalAngleX(kalAngleX, 23.82);}
  if(month == 8 && day == 24 && hour ==  9 && minute == 45)
{gerak_motor_kalAngleX(kalAngleX,-31.18);}    if(month == 8 && day == 24
&& hour == 14 && minute == 15) {gerak_motor_kalAngleX(kalAngleX,
26.32);}
  if(month == 8 && day == 24 && hour == 10 && minute ==  0)
{gerak_motor_kalAngleX(kalAngleX,-27.68);}    if(month == 8 && day == 24
&& hour == 14 && minute == 30) {gerak_motor_kalAngleX(kalAngleX,
28.82);}
  if(month == 8 && day == 24 && hour == 10 && minute == 15)
{gerak_motor_kalAngleX(kalAngleX,-23.18);}    if(month == 8 && day == 24
&& hour == 14 && minute == 45) {gerak_motor_kalAngleX(kalAngleX,
31.32);}
  if(month == 8 && day == 24 && hour == 10 && minute == 30)
{gerak_motor_kalAngleX(kalAngleX,-19.68);}    if(month == 8 && day == 24
&& hour == 15 && minute ==  0) {gerak_motor_kalAngleX(kalAngleX, 33.82);}
  if(month == 8 && day == 24 && hour == 10 && minute == 45)
{gerak_motor_kalAngleX(kalAngleX,-15.18);}    if(month == 8 && day == 24
&& hour == 15 && minute == 15) {gerak_motor_kalAngleX(kalAngleX,
36.32);}
  if(month == 8 && day == 24 && hour == 11 && minute ==  0)
{gerak_motor_kalAngleX(kalAngleX,-11.68);}    if(month == 8 && day == 24
&& hour == 15 && minute == 30) {gerak_motor_kalAngleX(kalAngleX,
38.82);}
  if(month == 8 && day == 24 && hour == 11 && minute == 15)
{gerak_motor_kalAngleX(kalAngleX,-4.18);}    if(month == 8 && day == 24
```

```
&& hour == 15 && minute == 45) {gerak_motor_kalAngleX(kalAngleX,
41.32);}
  if(month == 8 && day == 24 && hour == 11 && minute == 30)
{gerak_motor_kalAngleX(kalAngleX,-0.68);}    if(month == 8 && day == 24
&& hour == 16 && minute ==  0) {gerak_motor_kalAngleX(kalAngleX, 43.82);}
  if(month == 8 && day == 24 && hour == 11 && minute == 45)
{gerak_motor_kalAngleX(kalAngleX,1.18);}    if(month == 8 && day == 24 &&
hour == 16 && minute == 15) {gerak_motor_kalAngleX(kalAngleX, 47.32);}
  if(month == 8 && day == 24 && hour == 12 && minute ==  0)
{gerak_motor_kalAngleX(kalAngleX,3.68);}    if(month == 8 && day == 24 &&
hour == 16 && minute == 30) {gerak_motor_kalAngleX(kalAngleX, 49.82);}
  if(month == 8 && day == 24 && hour == 12 && minute == 15)
{gerak_motor_kalAngleX(kalAngleX,5.18);}    if(month == 8 && day == 24 &&
hour == 16 && minute == 45) {gerak_motor_kalAngleX(kalAngleX, 52.32);}

     /* Print Data */
//#if 0 // Set to 1 to activate
//  Serial.print(accX); Serial.print("\t");
//  Serial.print(accY); Serial.print("\t");
//  Serial.print(accZ); Serial.print("\t");
//
//  Serial.print(gyroX); Serial.print("\t");
//  Serial.print(gyroY); Serial.print("\t");
//  Serial.print(gyroZ); Serial.print("\t");
//
//  Serial.print("\t");
//#endif

    //str_voltage = String (voltage_tracker);
    //str_voltstatis = String (voltage_statis);
   // str_lux = String (lux);
   // str_luxstatis = String (luxS);
   // str_out = str_voltage + "," + str_voltstatis + "," + str_lux + "," + str_luxstatis;

   // static char *msg = str_out.c_str();

    //rf_driver.send((uint8_t *)msg, strlen(msg));
   // rf_driver.waitPacketSent();

    float values[] = {voltage_tracker, voltage_statis, lux, luxS};
    vw_send((uint8_t *)values, sizeof(values));
    vw_wait_tx();

  /* Print Data */
  Serial.print(voltage_tracker);
  Serial.print(";");
```

```
  Serial.print(voltage_statis);
  Serial.print(";");
 // Serial.print(Temp10);
  //Serial.print(";");
  Serial.print(lux);
  Serial.print(";");
  Serial.print(luxS);
  Serial.print(";");
  Serial.print(kalAngleX);
  Serial.print("\n");
 // Serial.print(roll);
 // Serial.print(";");
 // Serial.print(pitch);
//  Serial.print(";");
 // Serial.print(kalAngleY);
 // Serial.print("\n");

//#if 0 // Set to 1 to print the temperature
//  Serial.print("\t");
//
//  double temperature = (double)tempRaw / 340.0 + 36.53;
//  Serial.print(temperature); Serial.print("\t");
//#endif
  delay(1000);
}

void gerak_motor_kalAngleY(float kalAngleY, float angle_kalAngleY){
  float tolerance = 1;
  while(kalAngleY > angle_kalAngleY - tolerance && kalAngleY >
angle_kalAngleY + tolerance){
    //Serial.println("P NYALA ULUR");
    digitalWrite(in_3, HIGH);
    digitalWrite(in_4, LOW);
    analogWrite(enb_b, 200);
    break;
  }
  while(kalAngleY < angle_kalAngleY - tolerance && kalAngleY <
angle_kalAngleY + tolerance){
    //Serial.println("P NYALA TARIK");
    digitalWrite(in_3, LOW);
    digitalWrite(in_4, HIGH);
    analogWrite(enb_b, 200);
    break;
  }
  while(kalAngleY > angle_kalAngleY - tolerance && kalAngleY <
angle_kalAngleY + tolerance){
```

```
    //Serial.println("PITCH MATI");
    digitalWrite(in_3, LOW);
    digitalWrite(in_4, LOW);
    break;
  }
}

void gerak_motor_kalAngleX(float kalAngleX, float angle_kalAngleX){
  float tolerance = 1;
  while(kalAngleX > angle_kalAngleX - tolerance && kalAngleX >
angle_kalAngleX + tolerance){
    //Serial.println("/t");
    //Serial.println("R NYALA TARIK");
    digitalWrite(in_1, HIGH);
    digitalWrite(in_2, LOW);
    analogWrite(enb_a, 200);
    break;
  }
  while(kalAngleX < angle_kalAngleX - tolerance && kalAngleX <
angle_kalAngleX + tolerance){
    //Serial.println("/t");
    //Serial.println("R NYALA ULUR");
    digitalWrite(in_1, LOW);
    digitalWrite(in_2, HIGH);
    analogWrite(enb_a, 200);
    break;
  }
  while(kalAngleX >= angle_kalAngleX - tolerance && kalAngleX <=
angle_kalAngleX + tolerance){
    //Serial.println("/t");
    //Serial.println("ROLL MATI");
    digitalWrite(in_1, LOW);
    digitalWrite(in_2, LOW);
    break;
  }
}
void getLux(){
  uint16_t rawLux;
  float lux;
  uint16_t rawLuxS;
  float luxS;
  rawLux = readBH1750();
  if((mode==CHM_2)||(mode==OTH_2)){
    lux = (rawLux/2.4)/measuringTimeFactor;
  }
  else{
```

```
    lux = (rawLux/1.2)/measuringTimeFactor;
  }
  rawLuxS = readBH1750S();
  if((mode==CHM_2)||(mode==OTH_2)){
    luxS = (rawLuxS/2.4)/measuringTimeFactor;
  }
  else{
    luxS = (rawLuxS/1.2)/measuringTimeFactor;
  }

}
void powerDown(){
  writeBH1750(POWER_DOWN);
  writeBH1750S(POWER_DOWN);
}
void powerOn(){
  writeBH1750(POWER_ON);
  writeBH1750S(POWER_ON);
  setMode();
}
void dataRegReset(){
  writeBH1750(DATA_REG_RESET);
  writeBH1750S(DATA_REG_RESET);
}
void setMode(){
  writeBH1750(mode);
  writeBH1750S(mode);
}
void setMeasuringTime(){
  byte mt = round(measuringTimeFactor*69);
  byte highByteMT = ((mt>>5) | 0b01000000);
  byte lowByteMT = (mt & 0b01111111);
  lowByteMT |= 0b01100000;
  writeBH1750(highByteMT);
  writeBH1750(lowByteMT);
  writeBH1750S(highByteMT);
  writeBH1750S(lowByteMT);
}
uint16_t readBH1750(){
  uint8_t MSbyte, LSbyte;
  Wire.requestFrom(BH_1750F, 2);
  if(Wire.available()){
    MSbyte=Wire.read();
    LSbyte=Wire.read();
  }
  return ((MSbyte<<8) + LSbyte);
```

```
}
void writeBH1750(byte val){
  Wire.beginTransmission(BH_1750F);
  Wire.write(val);
  Wire.endTransmission();
}
uint16_t readBH1750S(){
  uint8_t MSbyte, LSbyte;
  Wire.requestFrom(BH_1750S, 2);
  if(Wire.available()){
    MSbyte=Wire.read();
    LSbyte=Wire.read();
  }
  return ((MSbyte<<8) + LSbyte);
}
void writeBH1750S(byte val){
  Wire.beginTransmission(BH_1750S);
  Wire.write(val);
  Wire.endTransmission();
}
```

LAMPIRAN KODE PROGRAM RECEIVER RF 433Hz

```
#include <VirtualWire.h>

float voltage_tracker;
float voltage_statis;
float lux;
float luxS;

void setup() {
  Serial.begin(9600);  // Inisialisasi komunikasi serial
  vw_setup(2000);  // Kecepatan transmisi RF (dalam baud)
  vw_rx_start();   // Mulai menerima data

  // Inisialisasi pin sensor
  pinMode(2, OUTPUT); // Contoh penggunaan pin 2 sebagai output
}

void loop() {
  uint8_t buf[VW_MAX_MESSAGE_LEN];
  uint8_t buflen = VW_MAX_MESSAGE_LEN;

  if (vw_get_message(buf, &buflen)) {
    if (buflen == sizeof(float) * 4) { // Pastikan panjang pesan sesuai dengan 4
integer
```

```
      float *values = (float *)buf;
      voltage_tracker = values[0];
      voltage_statis = values[1];
      lux = values[2];
      luxS = values[3];

      // Lakukan sesuatu dengan nilai sensor yang diterima
      // Contoh: Mengendalikan perangkat berdasarkan nilai sensor
     // digitalWrite(2, voltage_tracker > 512 ? HIGH : LOW); // Contoh:
Menggunakan nilai sensor1 untuk mengendalikan perangkat di pin 2
     // Serial.print("Received sensor values: ");
     // Serial.print("Sensor1: ");
      Serial.print(voltage_tracker);
      Serial.print(";");
      Serial.print(voltage_statis);
      Serial.print(";");
      Serial.print(lux);
      Serial.print(";");
      Serial.print(luxS);
      Serial.print("\n");
    }
  }
}
```

LAMPIRAN KODE PROGRAM VISUAL BASIC

```
Imports ZedGraph
Imports System.Data.OleDb
Imports System.IO
Public Class Form1

    Dim flag_masuk As Integer
    Dim flag_masuk30 As Integer
    Dim flag_first As Integer
    Dim hitung_masuk As Integer


    Dim time_last As Integer
    Dim time_temp As Integer
    Dim time_interval As Integer
    Dim time_now As Integer
    Dim time_set As Integer


    Dim currentgraph As GraphPane
    Dim listcurrent As RollingPointPairList
    Dim currentgraph_line As LineItem

    Dim currentgraph2 As GraphPane
    Dim listcurrent2 As RollingPointPairList
    Dim currentgraph_line2 As LineItem

    Dim currentgraph3 As GraphPane
    Dim listcurrent3 As RollingPointPairList
    Dim currentgraph_line3 As LineItem

    Dim currentgraph4 As GraphPane
    Dim listcurrent4 As RollingPointPairList
    Dim currentgraph_line4 As LineItem

    Dim currentgraph5 As GraphPane
    Dim listcurrent5 As RollingPointPairList
    Dim currentgraph_line5 As LineItem

    Dim currentgraph6 As GraphPane
    Dim listcurrent6 As RollingPointPairList
    Dim currentgraph_line6 As LineItem

    Dim starting_time As Double = 0 '100
    Dim nilai As Single
    Dim nilai2 As Single
    Dim nilai3 As Single
    Dim nilai4 As Single
    Dim nilai5 As Single
    Dim nilai6 As Single
    Dim nilai7 As Single
    Dim nilai8 As Single
    Dim nilai9 As Single

    Dim Folder As String = Environment.CurrentDirectory + "\\Backup\\"

    Sub TimerZedgraph()
        Dim xScale As Scale
```

```
        Dim kurvaTeganganTracker As LineItem =
GrafikTeganganTracker.GraphPane.CurveList(0)
        'Dim xRange As Double = currentgraph.XAxis.Scale.Max -
currentgraph.XAxis.Scale.Min
        Dim list As IPointListEdit
        Dim waktu As Double = (Environment.TickCount - starting_time) /
1000.0

        'Label6.Text = Environment

        'starting_time = starting_time + 1
        'Dim waktu As Double = starting_time
        list = kurvaTeganganTracker.Points

        list.Add(waktu, nilai)

        xScale = GrafikTeganganTracker.GraphPane.XAxis.Scale

        If (waktu > xScale.Max - xScale.MajorStep) Then
            xScale.Max = waktu + xScale.MajorStep
            xScale.Min = xScale.Max - 10
        End If
        ' Pastikan Y axis di scale ulang untuk mengakomodir data aktual

        GrafikTeganganTracker.AxisChange()
        ' Redraw paksa
        GrafikTeganganTracker.Invalidate()

    End Sub


    Sub TimerZedgraph1()
        Dim xScale As Scale
        Dim kurvaTeganganFixed As LineItem =
GrafikTeganganFixed.GraphPane.CurveList(0)
        'Dim xRange As Double = currentgraph.XAxis.Scale.Max -
currentgraph.XAxis.Scale.Min
        Dim list As IPointListEdit
        Dim waktu As Double = (Environment.TickCount - starting_time) /
1000.0

        'Label6.Text = Environment

        'starting_time = starting_time + 1
        'Dim waktu As Double = starting_time
        list = kurvaTeganganFixed.Points

        list.Add(waktu, nilai2)

        xScale = GrafikTeganganFixed.GraphPane.XAxis.Scale

        If (waktu > xScale.Max - xScale.MajorStep) Then
            xScale.Max = waktu + xScale.MajorStep
            xScale.Min = xScale.Max - 10
        End If
        ' Pastikan Y axis di scale ulang untuk mengakomodir data aktual
```

```
        GrafikTeganganFixed.AxisChange()
        ' Redraw paksa
        GrafikTeganganFixed.Invalidate()

    End Sub

    Sub TimerZedgraph2()
        Dim xScale As Scale
        Dim kurvaIntensitastracker As LineItem =
GrafikIntensitasTracker.GraphPane.CurveList(0)
        Dim list As IPointListEdit
        Dim waktu As Double = (Environment.TickCount - starting_time) /
1000.0

        'Label6.Text = Environment

        'starting_time = starting_time + 1
        'Dim waktu As Double = starting_time
        list = kurvaIntensitastracker.Points

        list.Add(waktu, nilai3)

        xScale = GrafikIntensitasTracker.GraphPane.XAxis.Scale
        If (waktu > xScale.Max - xScale.MajorStep) Then
            xScale.Max = waktu + xScale.MajorStep
            xScale.Min = xScale.Max - 10
        End If
        ' Pastikan Y axis di scale ulang untuk mengakomodir data aktual
        GrafikIntensitasTracker.AxisChange()
        ' Redraw paksa
        GrafikIntensitasTracker.Invalidate()
    End Sub

    Sub TimerZedgraph3()
        Dim xScale As Scale
        Dim kurvaIntensitasFixed As LineItem =
GrafikIntensitasFixed.GraphPane.CurveList(0)
        Dim list As IPointListEdit
        Dim waktu As Double = (Environment.TickCount - starting_time) /
1000.0

        'Label6.Text = Environment

        'starting_time = starting_time + 1
        'Dim waktu As Double = starting_time
        list = kurvaIntensitasFixed.Points

        list.Add(waktu, nilai4)

        xScale = GrafikIntensitasFixed.GraphPane.XAxis.Scale
        If (waktu > xScale.Max - xScale.MajorStep) Then
            xScale.Max = waktu + xScale.MajorStep
            xScale.Min = xScale.Max - 10
        End If
        ' Pastikan Y axis di scale ulang untuk mengakomodir data aktual
        GrafikIntensitasFixed.AxisChange()
        ' Redraw paksa
```

```
        GrafikIntensitasFixed.Invalidate()
    End Sub


    Private Sub port_avalible()
        cmbComPort.Items.Clear()
        For Each port_name As String In IO.Ports.SerialPort.GetPortNames
            Dim myPort As New IO.Ports.SerialPort(port_name)
            cmbComPort.Items.Add(port_name)

            cmbComPort.Text = port_name

        Next
    End Sub

Dim autosaveTimer As New Timer()

    Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load
        Label10.Text = String.Format("{0} {1}.csv",
DateTime.Now.ToString("dd MMMM yyy HHmmss"), TextBox1.Text)
        Folder = Folder + Label10.Text

        ' Atur interval timer ke 1 jam (3600000 milidetik)
        autosaveTimer.Interval = 3600000

        ' Menambahkan event handler untuk Timer.Tick
        AddHandler autosaveTimer.Tick, AddressOf AutosaveTimer_Tick

        ' Mulai Timer
        autosaveTimer.Start()

        ComboBox_time.Text = "1"
        ComboBox_detik.Text = "Detik"
        sep = ","

        If Val(Label_now.Text) < 0 Then
            Label_now.Text = "00"
        End If


        Label18.Text = Val(Label_now.Text) + 30
        If Val(Label18.Text) > 60 Then
            Label18.Text = Val(Label_now.Text) - 30
        End If

        time_set = 0

        flag_terima = 0
        flag_first = 0
        flag_masuk = 0


        'starting_time = Environment.TickCount
        currentgraph = GrafikTeganganTracker.GraphPane
        'Dim xRange As Double = currentgraph.XAxis.Scale.Max -
currentgraph.XAxis.Scale.Min
```

```
        'currentgraph.XAxis.Scale.Max = New XDate(DateTime.Now)
        'currentgraph.XAxis.Scale.Min = currentgraph.XAxis.Scale.Max -
xRange
        currentgraph.Title.Text = "Tegangan Solar Tracker"
        currentgraph.XAxis.Title.Text = "Time(S)"
        currentgraph.YAxis.Title.Text = "Tegangan (V)"
        'currentgraph.YAxis.Scale.Min = 0
        'currentgraph.YAxis.Scale.Max = 10
        listcurrent = New RollingPointPairList(6000)
        currentgraph_line = currentgraph.AddCurve("V", listcurrent,
Color.Blue, SymbolType.None)
        currentgraph_line.Line.Width = 3
        currentgraph_line.Line.IsSmooth = True
        'currentgraph.XAxis.Type = AxisType.Date
        'currentgraph.XAxis.Scale.FontSpec.Angle = 65
        'currentgraph.XAxis.Scale.MajorStep = 1
        'currentgraph.XAxis.Scale.MajorUnit = DateUnit.Minute
        'currentgraph.XAxis.Scale.MinorUnit = DateUnit.Second
        'currentgraph.XAxis.Scale.Format = DateTime.Now.ToString("HH.mm.ss")
        GrafikTeganganTracker.AxisChange()


        'starting_time = Environment.TickCount
        currentgraph2 = GrafikTeganganFixed.GraphPane
        currentgraph2.Title.Text = "Tegangan Solar Statis"
        currentgraph2.XAxis.Title.Text = "Time(S)"
        currentgraph2.YAxis.Title.Text = "Tegangan (V)"
        listcurrent2 = New RollingPointPairList(6000)
        currentgraph_line2 = currentgraph2.AddCurve("V", listcurrent2,
Color.Green, SymbolType.None)
        currentgraph_line2.Line.Width = 3
        currentgraph_line2.Line.IsSmooth = True
        'curve.Line.IsSmooth = True
        'currentgraph4.XAxis.Type = AxisType.Date
        'currentgraph4.XAxis.Scale.FontSpec.Angle = 65
        'currentgraph4.XAxis.Scale.MajorStep = 1
        'currentgraph4.XAxis.Scale.MajorUnit = DateUnit.Minute
        'currentgraph4.XAxis.Scale.MinorUnit = DateUnit.Second
        'currentgraph4.XAxis.Scale.Format =
DateTime.Now.ToString("HH.mm.ss")
        GrafikTeganganFixed.AxisChange()

        'starting_time = Environment.TickCount
        currentgraph3 = GrafikIntensitasTracker.GraphPane
        'Dim xRange As Double = currentgraph.XAxis.Scale.Max -
currentgraph.XAxis.Scale.Min
        'currentgraph.XAxis.Scale.Max = New XDate(DateTime.Now)
        'currentgraph.XAxis.Scale.Min = currentgraph.XAxis.Scale.Max -
xRange
        currentgraph3.Title.Text = "Intensitas Cahaya Matahari Solar Statis"
        currentgraph3.XAxis.Title.Text = "Time(S)"
        currentgraph3.YAxis.Title.Text = "Intensitas Cahaya Matahari (Lux)"
        'currentgraph.YAxis.Scale.Min = 0
        'currentgraph.YAxis.Scale.Max = 10
        listcurrent3 = New RollingPointPairList(6000)
        currentgraph_line3 = currentgraph3.AddCurve("Lux", listcurrent3,
Color.Red, SymbolType.None)
```

```
        currentgraph_line3.Line.Width = 3
        currentgraph_line3.Line.IsSmooth = True
        'currentgraph.XAxis.Type = AxisType.Date
        'currentgraph.XAxis.Scale.FontSpec.Angle = 65
        'currentgraph.XAxis.Scale.MajorStep = 1
        'currentgraph.XAxis.Scale.MajorUnit = DateUnit.Minute
        'currentgraph.XAxis.Scale.MinorUnit = DateUnit.Second
        'currentgraph.XAxis.Scale.Format = DateTime.Now.ToString("HH.mm.ss")
        GrafikIntensitasTracker.AxisChange()

        'starting_time = Environment.TickCount
        currentgraph4 = GrafikIntensitasFixed.GraphPane
        currentgraph4.Title.Text = "Intensitas Cahaya Matahari Solar
Tracker"
        currentgraph4.XAxis.Title.Text = "Time(S)"
        currentgraph4.YAxis.Title.Text = "Intensitas Cahaya Matahari (Lux)"
        listcurrent3 = New RollingPointPairList(6000)
        currentgraph_line4 = currentgraph4.AddCurve("lux", listcurrent4,
Color.Yellow, SymbolType.None)
        currentgraph_line4.Line.Width = 3
        currentgraph_line4.Line.IsSmooth = True
        'curve.Line.IsSmooth = True
        'currentgraph4.XAxis.Type = AxisType.Date
        'currentgraph4.XAxis.Scale.FontSpec.Angle = 65
        'currentgraph4.XAxis.Scale.MajorStep = 1
        'currentgraph4.XAxis.Scale.MajorUnit = DateUnit.Minute
        'currentgraph4.XAxis.Scale.MinorUnit = DateUnit.Second
        'currentgraph4.XAxis.Scale.Format =
DateTime.Now.ToString("HH.mm.ss")
        GrafikIntensitasFixed.AxisChange()

        Try
            TabControl1.Appearance = TabAppearance.FlatButtons
            TabControl1.ItemSize = New Size(0, 1)
            TabControl1.SizeMode = TabSizeMode.Fixed

        Catch ex As Exception

        End Try

        'ListView1.View = View.Details
        ''ListView1.Columns.Add("Tanggal Jam", 130)
        ''ListView1.Columns.Add("Tegangan Tracker (V)", 130)
        ''ListView1.Columns.Add("Tegangan Fixed (V)", 130)
        ''ListView1.Columns.Add("Temp ('C)", 70)
        ''ListView1.Columns.Add("Tegangan Tracker (V)", 130)
        ''ListView1.Columns.Add("Intensitas Fixed (Lux)", 130)
        ''ListView1.Columns.Add("Sudut (o)", 70)
        'ListView1.GridLines = True
        'Dim conn As New
OleDbConnection("Provider=Microsoft.ACE.OLEDB.12.0;Data
source=D:\cobaexcel.xlsx;Extended Properties=Excel 8.0")
        'conn.Open()
        'Dim cmd As New OleDbCommand("Select * from [Sheet1$]", conn)
        'Dim da As OleDbDataReader = cmd.ExecuteReader
        'Do While da.Read = True
        '    Dim list1 = ListView1.Items.Add(da(0))
```

```
        '    list1.subitems.Add(da(1))
        '    list1.subitems.Add(da(2))
        '    list1.subitems.Add(da(3))
        '    list1.subitems.Add(da(4))
        '    list1.subitems.Add(da(5))
        '    list1.subitems.Add(da(6))
        'Loop
        ' conn.Close()

    End Sub

    Private Sub Timer_jam_Tick(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Timer_jam.Tick
        Label12.Text = DateTime.Now.ToString("dd MMM yyy HH:mm:ss")

        If ComboBox_time.Text = "60" Then
            If ComboBox_detik.Text = "Menit" Then
                Label_now.Text = Val(TimeOfDay.ToString("HH"))
            Else
                Label_now.Text = Val(TimeOfDay.ToString("mm"))
            End If
        Else
            If ComboBox_detik.Text = "Menit" Then
                Label_now.Text = Val(TimeOfDay.ToString("mm"))
            Else
                Label_now.Text = Val(TimeOfDay.ToString("ss"))
            End If
        End If



        If flag_masuk = 1 Then
            If flag_terima = 1 Then
                flag_terima = 0
                Label7.Text = nilai_tegangantracker.ToString("0.0")
                Label8.Text = nilai_IntensitasFixed.ToString("0.0")
                Label14.Text = nilai_teganganfixed.ToString("0.0")
                Label22.Text = nilai_Intensitastracker.ToString("0.0")


                nilai = nilai_tegangantracker
                nilai2 = nilai_teganganfixed
                nilai3 = nilai_Intensitastracker
                nilai4 = nilai_IntensitasFixed
                'nilai6 = nilai_sudut
                'nilai7 = nilai_KalRoll
                'nilai8 = nilai_Pitch
                'nilai9 = nilai_KalPitch

                If flag_first = 0 Then 'UNTUK HEADER
                    flag_first = 1
                    RichTextBox1.AppendText("Tangal Jam" + sep + "Tegangan
Tracker (V)" + sep + "Tegangan Fixed (V)" + sep + "Intensitas tracker (Lux)"
+ sep + "Intensitas Fixed (Lux)" + vbNewLine)

                End If
```

```
                Call isi_list_view()
                Call isi_rich_text()
                Call TimerZedgraph()
                Call TimerZedgraph1()
                Call TimerZedgraph2()
                Call TimerZedgraph3()

                RichTextBox1.SaveFile(Folder,
RichTextBoxStreamType.PlainText)

            End If

            If time_set = 0 Then
                time_set = 1
                time_temp = time_last + time_interval '19=17+2
                If time_temp >= 60 Then
                    time_temp = time_temp - 60
                End If
            End If

            Label_temp.Text = time_temp '19
            Label_start.Text = time_last '19


            time_now = Val(Label_now.Text)
            If time_now = time_temp Then
                Try
                    time_last = time_temp
                    SerialPort_data.Write("c")
                    time_set = 0

                Catch
                    'MessageBox.Show("Error")
                    CheckBox1.Checked = False
                    flag_masuk = 0
                    If SerialPort_data.IsOpen Then
                        SerialPort_data.Close()
                    End If
                End Try
            End If
        End If

    End Sub


    Private Sub Button2_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button2.Click
        SaveFileDialog1.Filter = "csv files (*.csv)|*.csv"

        SaveFileDialog1.FileName = String.Format("{0} {1}.csv",
DateTime.Now.ToString("dd MMMM yyy HHmmss"), TextBox1.Text)

        If SaveFileDialog1.ShowDialog() =
System.Windows.Forms.DialogResult.OK And SaveFileDialog1.FileName.Length > 0
Then
            RichTextBox1.SaveFile(SaveFileDialog1.FileName,
RichTextBoxStreamType.PlainText)
```

```
        End If


    End Sub

    Sub isi_list_view()
        Dim lvi As New ListViewItem(DateTime.Now.ToString("dd MMM yyy
HH.mm.ss"))
        lvi.SubItems.Add(nilai_tegangantracker)
        lvi.SubItems.Add(nilai_teganganfixed)
        lvi.SubItems.Add(nilai_IntensitasFixed)
        lvi.SubItems.Add(nilai_Intensitastracker)
        ListView1.Items.Add(lvi)
        ' lvi.SubItems.Add(nilai_temp)

        'lvi.SubItems.Add(nilai_sudut)
        'lvi.SubItems.Add(nilai_KalRoll)
        'lvi.SubItems.Add(nilai_Pitch)
        'lvi.SubItems.Add(nilai_KalPitch)


        lvi.Selected = True
        lvi.EnsureVisible()
        lvi = Nothing
    End Sub

    Dim sep As String
    Sub isi_rich_text()
        RichTextBox1.AppendText(DateTime.Now.ToString("dd MMM yyy HH.mm.ss")
+ sep + nilai_tegangantracker.ToString() + sep +
nilai_teganganfixed.ToString() + sep + nilai_Intensitastracker.ToString() +
sep + nilai_IntensitasFixed.ToString() + vbNewLine)
        RichTextBox1.ScrollToCaret()
    End Sub

    Dim state_buzzer As Integer
    Dim state_fan As Integer
    Dim state_lampu As Integer

    Dim nilai_tegangantracker As Double
    Dim nilai_teganganfixed As Double
    Dim nilai_temp As Double
    Dim nilai_Intensitastracker As Double
    Dim nilai_IntensitasFixed As Double
    Dim nilai_sudut As Double
    Dim nilai_KalRoll As Double
    Dim nilai_Pitch As Double
    Dim nilai_KalPitch As Double

    Dim temp_atas_bayi As Double
    Dim temp_bawah_bayi As Double
    Dim temp_atas_ruang As Double
    Dim temp_bawah_ruang As Double

    Dim s As String
    Dim sp() As String
```

```
    Dim flag_terima As Integer
    Dim flag_terima_first As Integer

    Private Sub SerialPort_data_DataReceived(ByVal sender As System.Object,
ByVal e As System.IO.Ports.SerialDataReceivedEventArgs) Handles
SerialPort_data.DataReceived
        Dim str As String
        str = SerialPort_data.ReadLine()
        s = str 'this text box contains value (08:00-17:41)
        sp = s.Split(";")
        nilai_tegangantracker = Val(sp(0))
        nilai_teganganfixed = Val(sp(1))
        nilai_IntensitasFixed = Val(sp(2))
        nilai_Intensitastracker = Val(sp(3))
        'nilai_sudut = Val(sp(5))
        'nilai_KalRoll = Val(sp(6))
        'nilai_Pitch = Val(sp(7))
        'nilai_KalPitch = Val(sp(8))

        ' TANDA ADA DATA DITERIMA
        flag_terima = 1

    End Sub


    Private Sub Button1_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button1.Click
        Dim result As Integer = MessageBox.Show("Aplikasi akan ditutup?",
"Caution", MessageBoxButtons.YesNo)

        If result = DialogResult.No Then
            Activate()
        ElseIf result = DialogResult.Yes Then
            If SerialPort_data.IsOpen Then
                SerialPort_data.Close()
            End If
            Application.Exit()
        End If
    End Sub

    Private Sub CheckBox1_CheckedChanged(ByVal sender As Object, ByVal e As
EventArgs) Handles CheckBox1.CheckedChanged
        If CheckBox1.Checked = True Then
            Try
                ComboBox_detik.Enabled = False
                ComboBox_time.Enabled = False
                cmbComPort.Enabled = False
                SerialPort_data.PortName = cmbComPort.Text
                SerialPort_data.Open()
                SerialPort_data.Write("c")


                flag_masuk = 1
                time_set = 0
                time_last = Val(Label_now.Text)
                If ComboBox_time.Text = "60" Then
```

```
                    time_interval = 1
                Else
                    time_interval = Val(ComboBox_time.Text)
                End If
                Label_start.Text = time_last

            Catch
                MessageBox.Show("Error")
                CheckBox1.Checked = False
            End Try
        Else
            ComboBox_detik.Enabled = True
            ComboBox_time.Enabled = True
            cmbComPort.Enabled = True

            flag_masuk = 0
            If SerialPort_data.IsOpen Then
                SerialPort_data.Close()
            End If
        End If
    End Sub


    Private Sub cmbComPort_Click(ByVal sender As Object, ByVal e As
EventArgs) Handles cmbComPort.Click
        port_avalible()
    End Sub


    Private Sub NewRecordToolStripMenuItem_Click(ByVal sender As
System.Object, ByVal e As System.EventArgs) Handles
NewRecordToolStripMenuItem.Click
        Dim result As Integer = MessageBox.Show("Data akan hilang?",
"Caution", MessageBoxButtons.YesNo)

        If result = DialogResult.No Then
            Activate()
        ElseIf result = DialogResult.Yes Then
            If SerialPort_data.IsOpen Then
                SerialPort_data.Close()
            End If
            Application.Restart()
        End If

    End Sub

    Private Sub ExitToolStripMenuItem_Click(ByVal sender As System.Object,
ByVal e As System.EventArgs) Handles ExitToolStripMenuItem.Click
        Dim result As Integer = MessageBox.Show("Aplikasi akan ditutup?",
"Caution", MessageBoxButtons.YesNo)

        If result = DialogResult.No Then
            Activate()
        ElseIf result = DialogResult.Yes Then
            If SerialPort_data.IsOpen Then
                SerialPort_data.Close()
            End If
```

```
            Application.Exit()
        End If
    End Sub

    Private Sub Button4_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles Button4.Click
        Process.Start(Environment.CurrentDirectory + "\\Backup\\")
    End Sub

    Private Sub btnDashboard_Click(ByVal sender As Object, ByVal e As
EventArgs) Handles btnDashboard.Click, btnArus.Click, btn3.Click
        Try
            Dim Mybutton = DirectCast(sender, Button)

            Select Case Mybutton.Name
                Case "btnDashboard"
                    TabControl1.SelectedTab = TabPage1
                Case "btnArus"
                    TabControl1.SelectedTab = TabPage2
                Case "btn3"
                    TabControl1.SelectedTab = TabPage3
            End Select
        Catch ex As Exception

        End Try
    End Sub

    Private Sub btn_simpangrafik_Click(ByVal sender As System.Object, ByVal
e As System.EventArgs) Handles btn_simpangrafik.Click
        'create Bitmap recipient
        Dim bm As Bitmap
        bm = New Bitmap(1, 1)
        'measure the chart to size the bitmap
        Dim G As Graphics
        G = Graphics.FromImage(bm)
        Me.GrafikTeganganTracker.GraphPane.AxisChange(G)
        'save the file of the chart on disk (PNG format)

Me.GrafikTeganganTracker.GraphPane.GetImage().Save("D://Skripsi//Database
PanelSurya mysql//grafik tegangan tracker.png",
System.Drawing.Imaging.ImageFormat.Png)

        Dim bm2 As Bitmap
        bm2 = New Bitmap(1, 1)
        'measure the chart to size the bitmap
        Dim G2 As Graphics
        G2 = Graphics.FromImage(bm)
        Me.GrafikIntensitasTracker.GraphPane.AxisChange(G)
        'save the file of the chart on disk (PNG format)

Me.GrafikIntensitasTracker.GraphPane.GetImage().Save("D://Skripsi//Database
PanelSurya mysql//grafik Intensitas Fixed.png",
System.Drawing.Imaging.ImageFormat.Png)

    End Sub
```

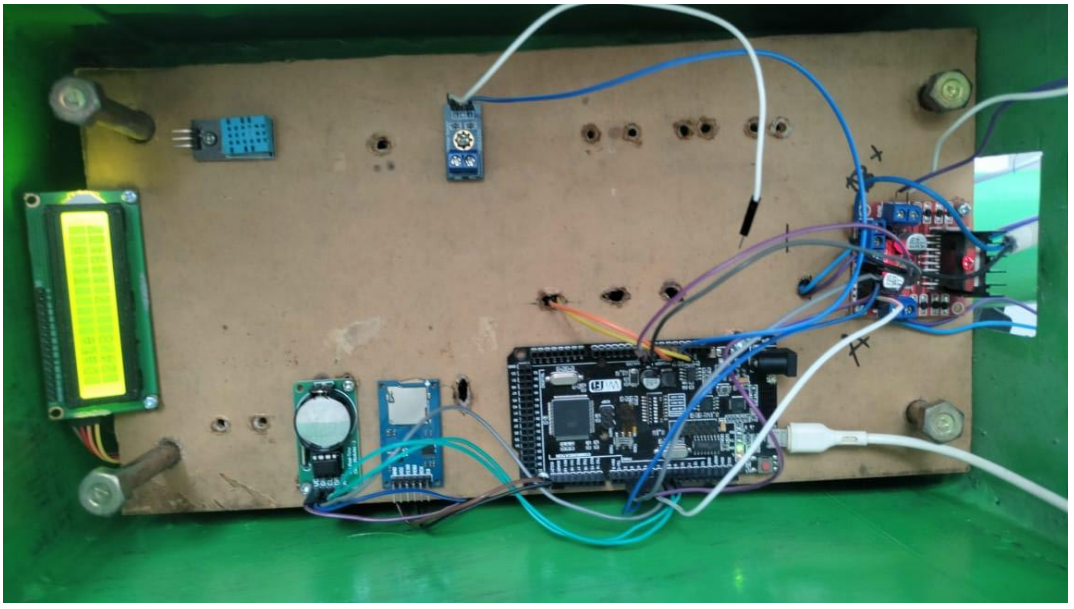
```
    Private Sub TabPage2_Click(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles TabPage2.Click

    End Sub

   ' Fungsi untuk melakukan autosave data
    Private Sub AutosaveData()
            ' Di sini Anda dapat menulis kode untuk menyimpan data ke file
            ' Contoh sederhana: menyimpan data ke file teks
            Dim fileName As String = "autosave_data.txt"

            Try
                ' Menulis data ke file
                Using sw As StreamWriter = File.AppendText(fileName)
                    sw.WriteLine(DateTime.Now.ToString("dd MMM yyy
HH:mm:ss") + sep + nilai_tegangantracker.ToString() + sep +
nilai_teganganfixed.ToString() + sep + nilai_Intensitastracker.ToString() +
sep + nilai_IntensitasFixed.ToString())
                End Using

                ' Tampilkan pesan sukses (opsional)
                MessageBox.Show("Data berhasil di-autosave!", "Sukses",
MessageBoxButtons.OK, MessageBoxIcon.Information)
            Catch ex As Exception
                ' Tampilkan pesan kesalahan jika ada masalah saat menyimpan
                MessageBox.Show("Terjadi kesalahan saat menyimpan data: " &
ex.Message, "Kesalahan", MessageBoxButtons.OK, MessageBoxIcon.Error)
            End Try
        End Sub

        Private Sub AutosaveTimer_Tick(sender As Object, e As EventArgs)
            ' Panggil fungsi untuk melakukan autosave
            AutosaveData()
        End Sub

End Class
```

LAMPIRAN FOTO ALAT DAN PROSES MONITORING

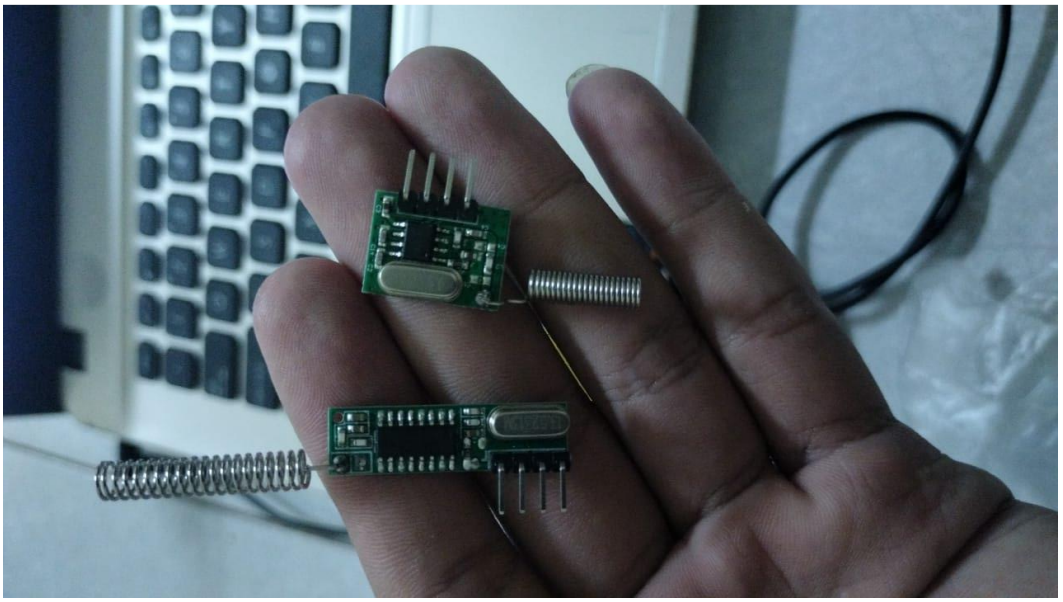

DC POWER SUPPLY
LW

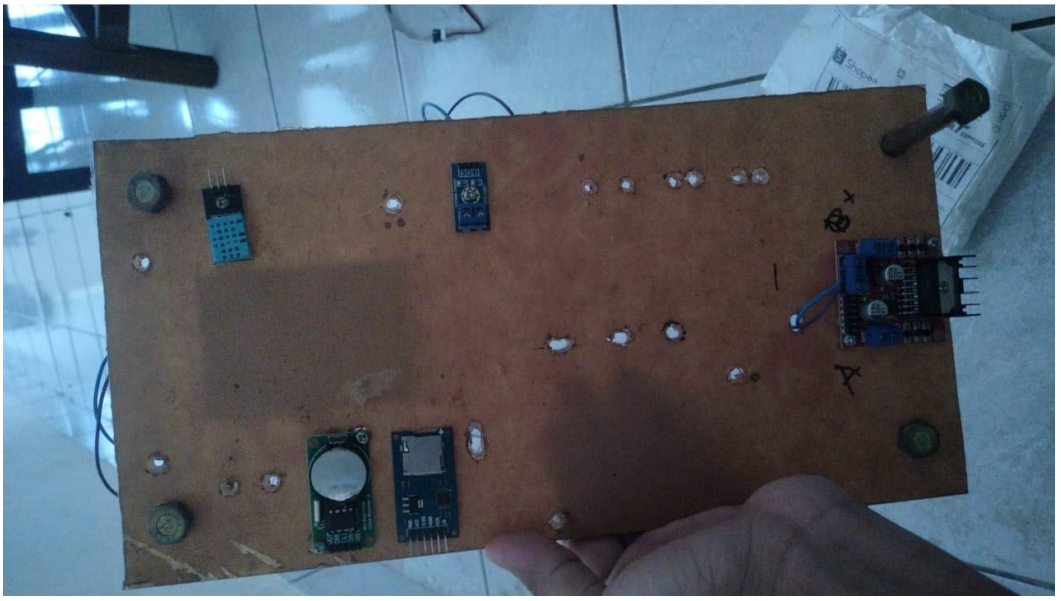

DC POWER SUPP
LW
SMT-POWER
SMT12120

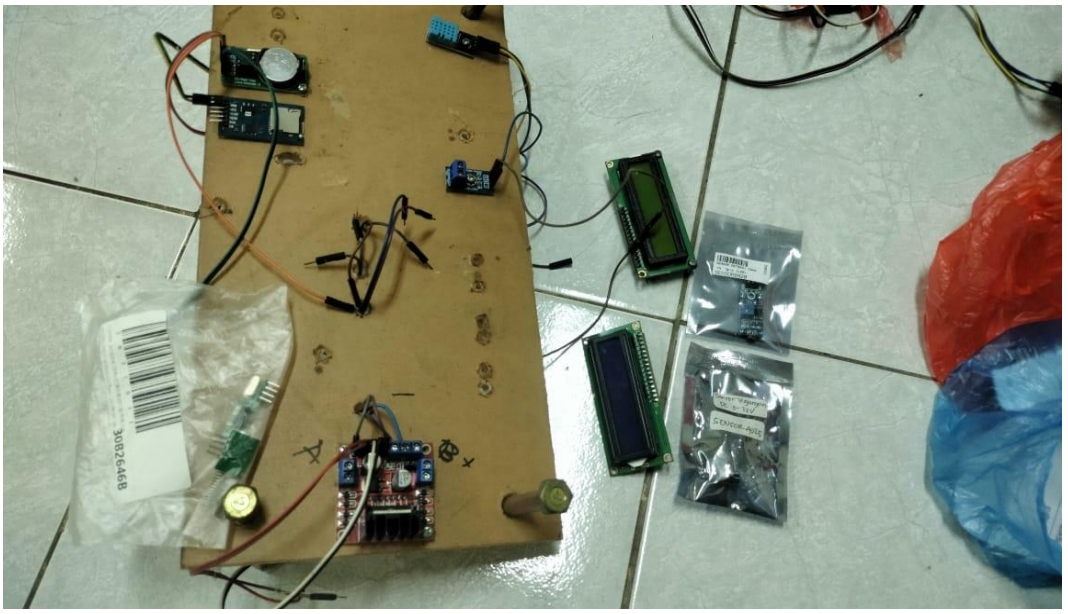

GS

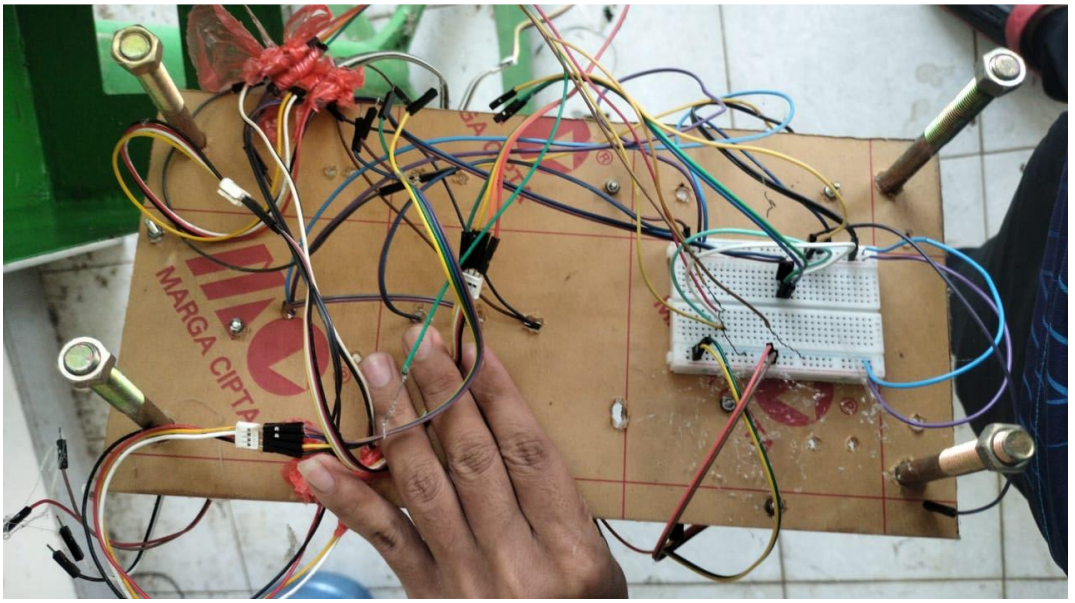


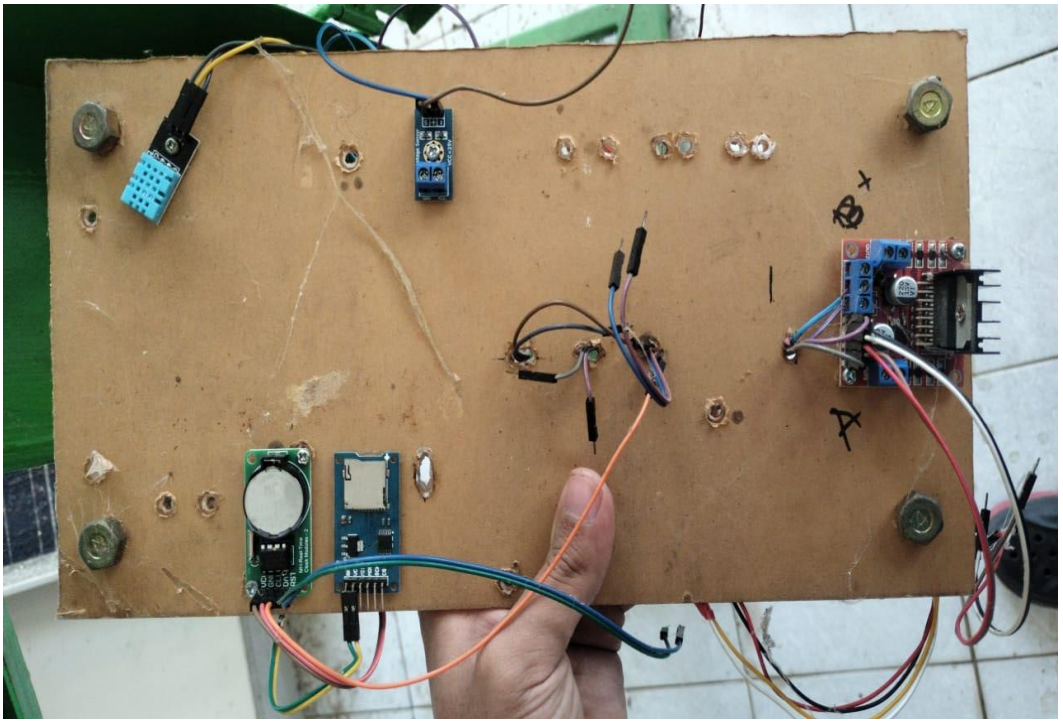

UP





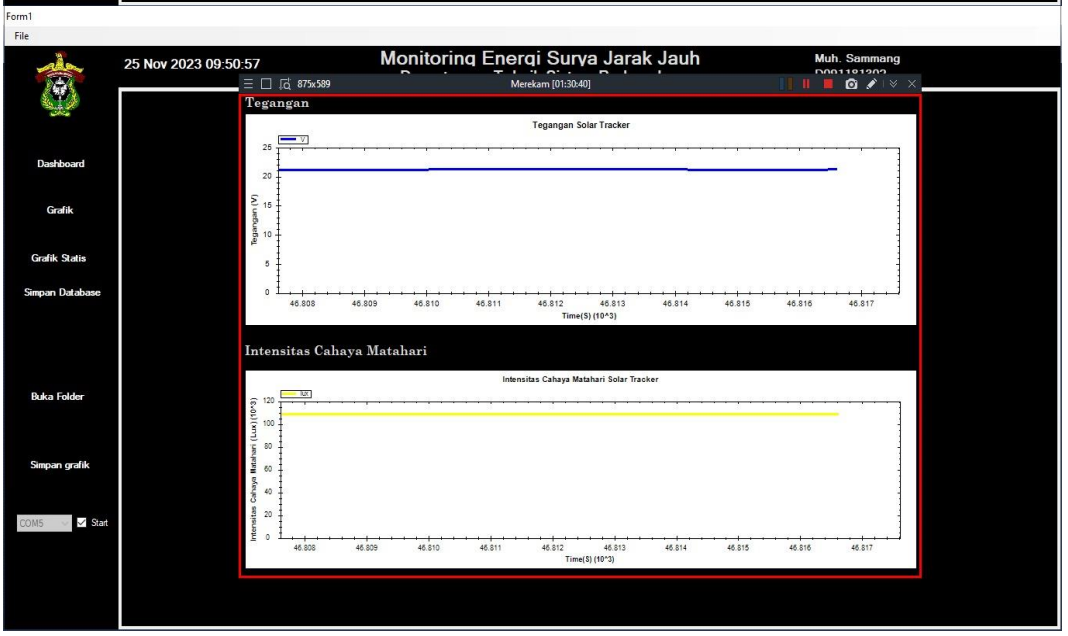


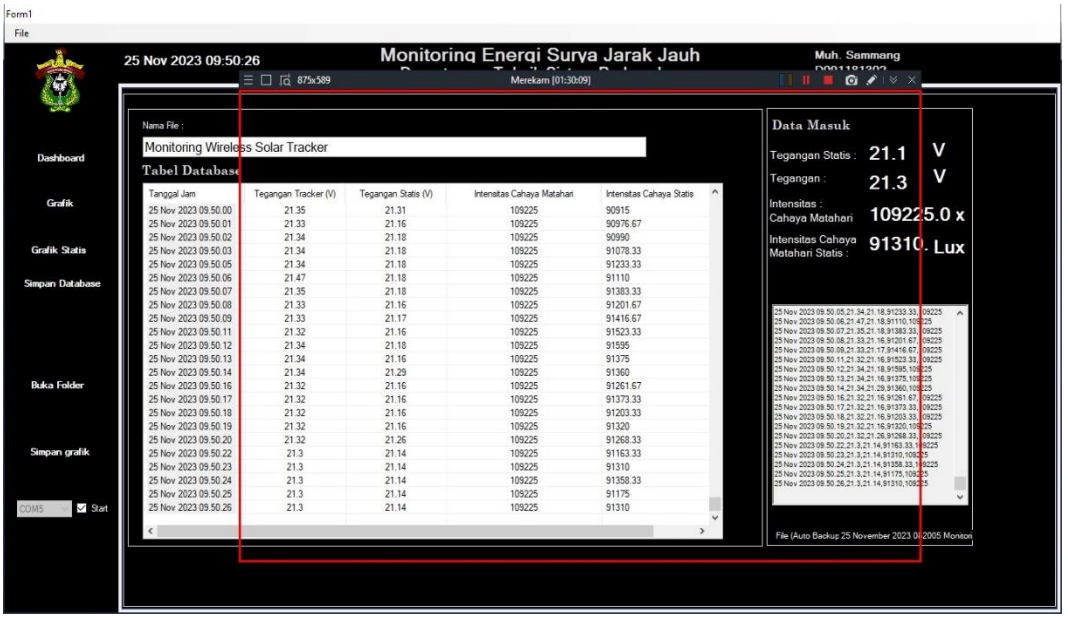





Sensor Tegangan
DC 0-25V
SENSOR 4025


Form1
File
25 Nov 2023 09:51:02
Monitoring Energi Surya Jarak Jauh
Muh. Sammang
875x589
Merekam [01:30:44]
Dashboard
Grafik
Grafik Statis
Simpan Database
Buka Folder
Simpan grafik
COM5
Start
Tegangan Statis
Tegangan Solar Statis
Tegangan (V)
Time(S) (10^3)
Intensitas Cahaya Matahari Statis
Intensitas Cahaya Matahari Solar Statis
Intensitas Cahaya Matahari (Lux) (10^3)


Form1
File
25 Nov 2023 09:50:57
Monitoring Energi Surya Jarak Jauh
Muh. Sammang
875x589
Merekam [01:30:40]
Dashboard
Grafik
Grafik Statis
Simpan Database
Buka Folder
Simpan grafik
COM5
Start
Tegangan
Tegangan Solar Tracker
Tegangan (V)
Time(S) (10^3)
Intensitas Cahaya Matahari
Intensitas Cahaya Matahari Solar Tracker
Intensitas Cahaya Matahari (Lux) (10^3)


Form1
File
25 Nov 2023 09:50:26
Monitoring Energi Surya Jarak Jauh
Muh. Sammang
875x589
Merekam [01:30:09]
Dashboard
Grafik
Grafik Statis
Simpan Database
Buka Folder
Simpan grafik
COM5
Start
Nama File :
Monitoring Wireless Solar Tracker
Tabel Database
Tanggal Jam
Tegangan Tracker (V)
Tegangan Statis (V)
Intensitas Cahaya Matahari
Intensitas Cahaya Statis
25 Nov 2023 09.50.00 21.35 21.31 109225 90915
25 Nov 2023 09.50.01 21.33 21.16 109225 90976.67
25 Nov 2023 09.50.02 21.34 21.18 109225 90990
25 Nov 2023 09.50.03 21.34 21.18 109225 91078.33
25 Nov 2023 09.50.05 21.34 21.18 109225 91233.33
25 Nov 2023 09.50.06 21.47 21.18 109225 91110
25 Nov 2023 09.50.07 21.35 21.18 109225 91383.33
25 Nov 2023 09.50.08 21.33 21.16 109225 91201.67
25 Nov 2023 09.50.09 21.33 21.17 109225 91416.67
25 Nov 2023 09.50.11 21.32 21.16 109225 91523.33
25 Nov 2023 09.50.12 21.34 21.18 109225 91595
25 Nov 2023 09.50.13 21.34 21.16 109225 91375
25 Nov 2023 09.50.14 21.34 21.29 109225 91360
25 Nov 2023 09.50.16 21.32 21.16 109225 91261.67
25 Nov 2023 09.50.17 21.32 21.16 109225 91373.33
25 Nov 2023 09.50.18 21.32 21.16 109225 91203.33
25 Nov 2023 09.50.19 21.32 21.16 109225 91320
25 Nov 2023 09.50.20 21.32 21.26 109225 91268.33
25 Nov 2023 09.50.22 21.3 21.14 109225 91163.33
25 Nov 2023 09.50.23 21.3 21.14 109225 91310
25 Nov 2023 09.50.24 21.3 21.14 109225 91358.33
25 Nov 2023 09.50.25 21.3 21.14 109225 91175
25 Nov 2023 09.50.26 21.3 21.14 109225 91310
Data Masuk
Tegangan Statis : 21.1 V
Tegangan : 21.3 V
Intensitas Cahaya Matahari : 109225.0 x
Intensitas Cahaya Matahari Statis : 91310. Lux

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET, DAN TEKNOLOGI
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SURAT PENUGASAN

No. 22507/UN4.7.1/TD.06/2022

Dari : Dekan Fakultas Teknik Universitas Hasanuddin

Kepada :
1. **Dr.Eng. Faisal Mahmuddin, S.T., M.Inf.Tech., M.Eng.** **Pemb. I**
2. **Haryanti Rivai, S.T., M.T..Ph.D.** **Pemb. II**

Isi :

1. Bahwa berdasarkan peraturan Akademik Universitas Hasanuddin Tahun 2018 Pasal 16 (SK. Rektor Unhas nomor : 2784/UN4.1/KEP/2018), dengan ini menugaskan Saudara sebagai PEMBIMBING MAHASISWA, maka dengan ini kami menugaskan untuk membimbing penulisan Skripsi/Tugas Akhir mahasiswa Teknik Sistem Perkapalan Fakultas Teknik Universitas Hasanuddin di bawah ini :

   Nama : **Muh. Sammang**
   No. Stambuk : **D091181302**

   Judul Skripsi/Tugas Akhir :
   SISTEM MONITORING ENERGI SURYA JARAK JAUH (WIRELESS PHOTOVOLTAIK MONITORING SYSTEM)

2. Surat penugasan pembimbing ini mulai berlaku sejak tanggal ditetapkannya dan berakhir sampai selesainya penulisan Skripsi/Tugas Akhir Mahasiswa tersebut.

3. Agar surat penugasan ini dilaksanakan sebaik - baiknya dengan penuh rasa tanggung jawab.

Ditetapkan di Gowa,
Pada tanggal, 15 September 2022
a.n Dekan,
Wakil Dekan Bidang Akademik dan
Kemahasiswaan Fakultas Teknik UH

Dr. Amil Ahmad Ilham, S.T., M.IT.
Nip. 19731010 199802 1 001

Tembusan :
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2. Ketua Departemen Teknik Sistem Perkapalan FT-UH.
3. Mahasiswa yang bersangkutan

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Laman: www.unhas.ac.id

SURAT IZIN UJIAN SKRIPSI

Nomor 02198/UN4.1.1.1/PK.03.02/2024

Berdasarkan Peraturan Rektor Universitas Hasanuddin tentang Penyelenggaraan Program Sarjana Nomor 2781/UN4.1/KEP/2018 tanggal 16 Juli 2018, dengan ini menerangkan bahwa:

Nama	:	MUH.SAMMANG
NIM	:	D091181302
Tempat/Tanggal Lahir	:	SABE/28 NOVEMBER 1999
Fakultas	:	TEKNIK
Program Studi	:	TEK. SISTEM PERKAPALAN

Telah memenuhi syarat untuk Ujian Skripsi Strata I (S1). Demikian Surat Persetujuan ini dibuat untuk digunakan dalam proses pelaksanaan ujian skripsi, dengan ketentuan dapat mengikuti wisuda jika **persyaratan kelulusan/wisuda telah dipenuhi**. Terima Kasih.

Makassar, 16 Januari 2024
a.n. Direktur Pendidikan
Kepala Subdirektorat Administrasi
Pendidikan,

Susy Asteria Irafany, S.T., M.Si.
NIP 197403132009102001

Keterangan online wisuda:

User	:	D091181302
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Alamat Web	:	http://wisuda.unhas.ac.id

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET, DAN TEKNOLOGI
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Telp/Fax:+62-411- 588400, Email:marine.eng@unhas.ac.id

SURAT PENUGASAN

No. 1828/UN4.7.1/TD.06/2024

Dari : Dekan Fakultas Teknik Universitas Hasanuddin
Kepada : Mereka yang tercantum namanya dibawah ini.

Isi :

1. Bahwa Berdasarkan Peraturan Rektor Universitas Hasanuddin Nomor 29/UN4.1/2023 tentang Penyelenggaraan Program Sarjana Universitas Hasanuddin dengan ini menugaskan Saudara sebagai PANITIA UJIAN SARJANA Program Strata Satu (S1) Teknik Sistem Perkapalan Fakultas Teknik Universitas Hasanuddin dengan susunan sebagai berikut :

   Ketua : Dr.Eng. Faisal Mahmuddin, S.T., M.Inf.Tech., M.Eng.
   Sekretaris : Haryanti Rivai, S.T., M.T..Ph.D.
   Anggota : 1. Rahimuddin, S.T., M.T., Ph.D.
   2. M. Rusydi Alwi, S.T., M.T.

   Untuk menguji bagi mahasiswa tersebut dibawah ini :

   Nama/Nim : Muh. Sammang / D091181302
   Departemen : Teknik Sistem Perkapalan

   Judul Thesis/Skripsi :
   Sistem Monitoring Energi Surya Jarak Jauh (Wireless Photovoltaik Monitoring System)

2. Waktu ujian ditetapkan oleh Panitia Ujian Akhir Program Strata Satu (S1).
3. Agar surat penugasan ini dilaksanakan sebaik-baiknya dengan penuh rasa tanggung jawab.
4. Surat penugasan ini berlaku sejak tanggal ditetapkan sampai dengan berakhirnya Ujian Sarjana tersebut, dengan ketentuan bahwa segala sesuatunya akan ditinjau dan diperbaiki sebagaimana mestinya apabila dikemudian hari ternyata terdapat kekeliruan dalam keputusan ini.

Ditetapkan di Gowa,
Pada tanggal , 23 Januari 2024
a.n Dekan,
Wakil Dekan Bidang Akademik dan Kemahasiswaan,

Dr. Amil Ahmad Ilham, S.T., M.IT.
Nip.19731010 199802 1 001

Tembusan :
1. Dekan FT-UH.
2. Ketua Departemen Teknik Sistem Perkapalan FT-UH.
3. Kasubag Umum dan Perlengkapan FT-UH

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DEPARTEMEN TEKNIK SISTEM PERKAPALAN
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Telp Fax:+62-411- 588400, Email marine.eng@unhas.ac.id

BERITA ACARA UJIAN SARJANA

Terhadap Mahasiswa

N a m a	:	Muh. Sammang
Stambuk	:	D091181302
Judul	:	***Sistem Monitoring Energi Surya Jarak Jauh (Wireless Photovoltaik Monitoring System)***
Hari/Tanggal	:	Rabu, 24 Januari 2024
Waktu	:	11.00 Wita- Selesai
Tempat	:	Ruang Sidang Teknik Sistem Perkapalan
Keputusan Sidang / Catatan	:	88,25 Perbaiki sesuai dengan koreksi penguji

PANITIA UJIAN

No.	Susunan Panitia	N a m a	Tanda Tangan
1	Ketua/Anggota	Dr.Eng. Faisal Mahmuddin, S.T., M.Inf.Tech., M.Eng.	1.....
2	Sekretaris/Anggota	Haryanti Rivai, S.T., M.T..Ph.D.	2.....
3	Anggota	Rahimuddin, S.T., M.T., Ph.D.	3.....
4	Anggota	M. Rusydi Alwi, S.T., M.T.	4.....

Gowa , 2023

Ketua Sidang,

Dr.Eng. Faisal Mahmuddin, S.T., M.Inf.Tech., M.Eng
Nip 19810211 200501 1 003

Sekretaris Sidang,

Haryanti Rivai, S.T., M.T..Ph.D.
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