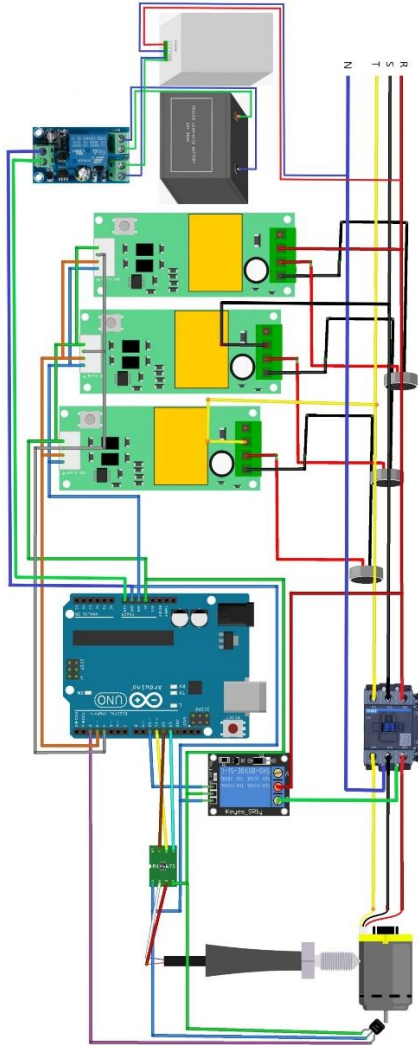


LAMPIRAN A

Rangkaian Keseluruhan Sistem



LAMPIRAN B

Perancangan Program Arduino

String textForSMS;

```
//PZEM=====
#include <PZEM004Tv30.h>
//Pin 11 Rx (Connects to the Tx pin on the PZEM)
//Pin 12 Tx (Connects to the Rx pin on the PZEM)
PZEM004Tv30 pzem1(3, 4, 0x02); //rx tx address
PZEM004Tv30 pzem2(3, 4, 0x03); //rx tx address
PZEM004Tv30 pzem3(3, 4, 0x04); //rx tx address
float powertotal = 0;
float volt3phase = 0;
float voltphase = 0;
float currenttotal = 0;
float voltmaxA = 0;
float voltmaxB = 0;
float voltave = 0;
float voltunbalance = 0;
unsigned long waktusebelum = 0;

//TEMPERATUR=====
#include <max6675.h>

int thermoDO = 11;
int thermoCS = 12;
int thermoCLK = 13;
float tempdata = 0;
float kontaktor = 0;
MAX6675 thermocouple(thermoCLK, thermoCS, thermoDO);

//RPM=====
volatile unsigned int count = 0;
unsigned long next = 1000;
unsigned int temp = 0;
unsigned int rpm = 0;
unsigned int rpm1 = 0;
//RELAY=====
```

```

char f;
int relaykontaktor = 10;
int relaysirine = 9;
int pencacah = 0;
int pencacahkontaktor = 0;

//LCD=====
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 20, 4);

void setup() {
Serial.begin(115200);
attachInterrupt(digitalPinToInterrupt(2), magnet_detect, RISING);
pinMode (relaykontaktor,OUTPUT);
pinMode (relaysirine,OUTPUT);
digitalWrite (relaykontaktor, HIGH);
digitalWrite (relaysirine, HIGH);
lcd.begin();
}

void loop() {
unsigned long waktusekarang=millis();
if(waktusekarang-waktusebelum>=500){
    waktusebelum = waktusekarang;

float voltage1 = pzem1.voltage();
float current1 = pzem1.current();
if (!isnan (voltage1)) {
}
else {
    voltage1 = 0;
    current1 = 0;
}

float voltage2 = pzem2.voltage();
float current2 = pzem2.current();
if (!isnan (voltage2)) {
}
else {

```

```

voltage2 = 0;
current2 = 0;
}

float voltage3 = pzem3.voltage();
float current3 = pzem3.current();
if (!isnan (voltage3)) {
}
else {
voltage3 = 0;
current3 = 0;
}

//Power total=====
voltphase= (pow(voltage1,2) + pow(voltage2,2) + pow(voltage3,2));
volt3phase = sqrt(voltphase);
currenttotal =(current1+current2+current3)/3;
powertotal = volt3phase*currenttotal*0.79*1.73;

//Unbalance Voltage=====
voltmaxA = max(voltage1,voltage2);
voltmaxB = max(voltmaxA,voltage3);
voltave = (voltage1 + voltage2 + voltage3)/3;
voltunbalance = 100*((voltmaxB-voltave)/voltave);

//TEMPERATURE=====
tempdata = thermocouple.readCelsius();

//KONTAKTOR=====
kontaktor = digitalRead(relaykontaktor);

//RPM=====
if (millis() > next) {
temp = count;
rpm = temp*38;
count -= temp;
next += 1000;
}

```

```

//LCD=====
lcd.setCursor (0,0);
lcd.print (tempdata,2);
lcd.setCursor (5,0);
lcd.print ("C");
lcd.setCursor (7,0);
lcd.print (rpm);
lcd.setCursor (11,0);
lcd.print ("RPM");
lcd.setCursor (14,0);
lcd.print (" ");
//R
lcd.setCursor (0,1);
lcd.print ("R");
lcd.setCursor (1,1);
lcd.print ("=");
lcd.setCursor (2,1);
lcd.print (voltage1);
lcd.setCursor (7,1);
lcd.print ("V");
lcd.setCursor (9,1);
lcd.print (current1);
lcd.setCursor (13,1);
lcd.print ("A");
lcd.setCursor (14,1);
lcd.print (" ");
//S
lcd.setCursor (0,2);
lcd.print ("S");
lcd.setCursor (1,2);
lcd.print ("=");
lcd.setCursor (2,2);
lcd.print (voltage2);
lcd.setCursor (7,2);
lcd.print ("V");
lcd.setCursor (9,2);
lcd.print (current2);
lcd.setCursor (13,2);
lcd.print ("A");

```

```

lcd.setCursor (15,2);
lcd.print (powertotal);
lcd.setCursor (19,2);
lcd.print ("W");
//T
lcd.setCursor (0,3);
lcd.print ("T");
lcd.setCursor (1,3);
lcd.print ("=");
lcd.setCursor (2,3);
lcd.print (voltage3);
lcd.setCursor (7,3);
lcd.print ("V");
lcd.setCursor (9,3);
lcd.print (current3);
lcd.setCursor (13,3);
lcd.print ("A");
lcd.setCursor (14,3);
lcd.print (" ");

//SMS=====
textForSMS = textForSMS + tempdata + "," + rpm + "," + voltage1 + ","
+ current1 + "," + voltage2 + "," + current2 + "," + voltage3 + "," +
current3 + "," + powertotal + "," + kontaktor + ",";
Serial.println(textForSMS);
textForSMS = "";
}
//SMS=====
if (Serial.available(>0){
  f=Serial.read();
  if(f==48){
    digitalWrite (relaykontaktor,LOW);
    pencacahkontaktor = 0;
    Serial.flush();
    delay (2000);
  }

  if(f==49){
    digitalWrite (relaykontaktor,HIGH);

```

```

pencacah = 0;
Serial.flush();
delay (2000);
}

if(f==50){
  pencacah++;
  pencacahkontaktor++;
  Serial.flush ();
}

if (f==51) {
  pencacah = 0;
  pencacahkontaktor = 0;
  Serial.flush ();
}

if (f==52) {
  pencacahkontaktor = 0;
  Serial.flush ();
}

if (pencacah >= 2){
  digitalWrite (relaysirine,LOW);
}
else {
  digitalWrite (relaysirine,HIGH);
}

if (pencacahkontaktor >= 5){
  digitalWrite (relaykontaktor,HIGH);
}
}

void magnet_detect()
{
  count++;
}

```


LAMPIRAN C

Perancangan Program Microsoft *Visual Studio*

```
Imports System
Imports System.IO
Imports System.IO.Ports
Imports System.Math

Public Class Form1
    Dim comPort As String
    Dim value1 As Integer
    Dim VR, VS, VT, Vaverage, Vunbalance, Vunbalancehasil, Vmax1,
    Vmax2, V3phase1, V3phase2, powertotal, IR, IampS, IT, Iaverage As
    Decimal

    Private Sub Form1_Load(sender As Object, e As EventArgs) Handles
    MyBase.Load
        lblketerangan1.Text = ""
        lblketerangan2.Text = ""
        Labelkondisitemp.Text = ""
        LabelkondisiRPM.Text = ""
        lblketeranganvolt.Text = ""
        lblketeranganvolt2.Text = ""
        lblketeranganuv.Text = ""
        Timer1.Enabled = False
        comPort = ""
        For Each sp As String In My.Computer.Ports.SerialPortNames
            ComboBox1.Items.Add(sp)
        Next
    End Sub

    Private Sub Button1_Click(sender As Object, e As EventArgs) Handles
    Button1.Click
        If (Button1.Text = "Connect") Then
            If (comPort <> "") Then
                SerialPort1.Close()
                SerialPort1.PortName = comPort
                SerialPort1.BaudRate = 115200
            End If
        End If
    End Sub
End Class
```

```

        SerialPort1.DataBits = 8
        SerialPort1.Parity = Parity.None
        SerialPort1.StopBits = StopBits.One
        SerialPort1.Handshake = Handshake.None
        SerialPort1.Encoding = System.Text.Encoding.Default
        SerialPort1.ReadTimeout = 1000
        SerialPort1.Open()
        Button1.Text = "Disconnect"
        lblketerangan1.Text = "AKTIF"
        Timer1.Start()
    Else
        MsgBox("Pilih Port yang Akan Anda Gunakan")
    End If

Else
    SerialPort1.Close()
    Button1.Text = "Connect"
    lblketerangan1.Text = "TIDAK AKTIF"
    Timer1.Enabled = False
    lblketerangan2.Text = ""
    Labelkondisitemp.Text = ""
    LabelkondisiRPM.Text = ""
    lblketeranganvolt.Text = ""
    lblketeranganvolt2.Text = ""
    lblketeranganuv.Text = ""
End If
End Sub

Private Sub Timer2_Tick(sender As Object, e As EventArgs) Handles
Timer2.Tick
    Label15.Text = Format(Today, "dddd,dd MMMM yyyy")
    Label16.Text = Format(Now, "HH:mm:ss")
End Sub

Private Sub ComboBox1_SelectedIndexChanged(sender As Object, e
As EventArgs) Handles ComboBox1.SelectedIndexChanged
    If (ComboBox1.SelectedItem <> "") Then
        comPort = ComboBox1.SelectedItem
    End If

```

End Sub

```
Private Sub DataReceived(ByVal sender As Object, ByVal e As  
SerialDataReceivedEventArgs) Handles SerialPort1.DataReceived
```

```
    Dim incoming As String  
    Try  
        incoming = SerialPort1.ReadExisting()  
        If TextBoxAll.InvokeRequired Then  
            TextBoxAll.Invoke(DirectCast(Sub() TextBoxAll.Text &=  
incoming, MethodInvoker))  
        Else  
            TextBoxAll.Text &= incoming  
        End If  
    Catch ex As Exception  
        MessageBox.Show(ex.Message)  
    End Try  
End Sub
```

```
Private Sub Timer1_Tick(ByVal sender As System.Object, ByVal e As  
System.EventArgs) Handles Timer1.Tick
```

```
    Dim sp() As String  
    Dim str As String  
    str = TextBoxAll.Text + "," + "," + "," + "," + "," + "," + "," + "," + "," +  
"," + "," + "," + "  
    sp = str.Split(",")  
    TextBoxTemp.Text = Val(sp(0))  
    TextBoxRPM.Text = Val(sp(1))  
    TextBoxVoltR.Text = Val(sp(2))  
    TextBoxAmpereR.Text = Val(sp(3))  
    TextBoxVoltS.Text = Val(sp(4))  
    TextBoxAmpereS.Text = Val(sp(5))  
    TextBoxVoltT.Text = Val(sp(6))  
    TextBoxAmpereT.Text = Val(sp(7))  
    TextBoxpowertotal.Text = Val(sp(8))  
    TextBoxkontaktor.Text = Val(sp(9))  
    TextBoxAll.Text = ""  
End Sub
```

```

Private Sub ButtonStart_Click(ByVal sender As Object, ByVal e As
EventArgs) Handles ButtonStart.Click
    If (lblketerangan1.Text = "AKTIF") Then
        SerialPort1.Write("0/")
        lblketerangan2.Text = "MOTOR ON"
    End If
End Sub

```

```

Private Sub ButtonStop_Click(sender As Object, e As EventArgs)
Handles ButtonStop.Click
    If (lblketerangan1.Text = "AKTIF") Then
        SerialPort1.Write("1/")
        lblketerangan2.Text = "MOTOR OFF"
    End If
End Sub

```

```

Private Sub TextBoxTemp_TextChanged(ByVal sender As
System.Object, ByVal e As System.EventArgs) Handles
TextBoxTemp.TextChanged
    If Val(TextBoxTemp.Text) > 34.99 Then
        Labelkondisitemp.Text = "Motor Terlalu Panas"
        If (lblketerangan2.Text) = "MOTOR ON" Then
            If (TextBoxkontaktor.Text = "0") Then
                SerialPort1.Write("2/")
                If MessageBox.Show("MOTOR TERLALU PANAS,
matikan?", "Overheat", MessageBoxButtons.YesNoCancel,
MessageBoxIcon.Question) = vbYes Then
                    SerialPort1.Write("1/")
                    lblketerangan2.Text = "MOTOR OFF"
                    TextBoxkontaktor.Text = "1"
                ElseIf MessageBox.Show("MOTOR TERLALU PANAS,
matikan?", "Overheat", MessageBoxButtons.YesNoCancel,
MessageBoxIcon.Question) = vbNo Then
                    SerialPort1.Write("4/")
                End If
            End If
        End If
    Else
        Labelkondisitemp.Text = "NORMAL"
    End If
End Sub

```

```

End If
End Sub

Private Sub TextBoxRPM_TextChanged(sender As Object, e As
EventArgs) Handles TextBoxRPM.TextChanged
    If Val(TextBoxRPM.Text) < 2500 Then
        Labelkondisitemp.Text = "Motor Terlalu Lambat"
        If (lblketerangan2.Text) = "MOTOR ON" Then
            If (TextBoxkontaktor.Text = "0") Then
                SerialPort1.Write("2/")
                If MessageBox.Show("MOTOR TERLALU LAMBAT,
matikan?", "Underspeed", MessageBoxButtons.YesNoCancel,
MessageBoxIcon.Question) = vbYes Then
                    SerialPort1.Write("1/")
                    lblketerangan2.Text = "MOTOR OFF"
                    TextBoxkontaktor.Text = "1"
                ElseIf MessageBox.Show("MOTOR TERLALU LAMBAT,
matikan?", "Underspeed", MessageBoxButtons.YesNoCancel,
MessageBoxIcon.Question) = vbNo Then
                    SerialPort1.Write("4/")
                End If
            End If
        End If
    Else
        Labelkondisitemp.Text = "NORMAL"
    End If
End Sub

Private Sub TextBoxkontaktor_TextChanged(ByVal sender As
System.Object, ByVal e As System.EventArgs)
    If TextBoxkontaktor.Text = "1" Then
        lblketerangan2.Text = "MOTOR OFF"
    End If
End Sub

Private Sub TextBoxVoltR_TextChanged(ByVal sender As
System.Object, ByVal e As System.EventArgs) Handles
TextBoxVoltR.TextChanged
    VR = Val(TextBoxVoltR.Text)
    VS = Val(TextBoxVoltS.Text)

```

```

VT = Val(TextBoxVoltT.Text)
IR = Val(TextBoxAmpereR.Text)
IampS = Val(TextBoxAmpereS.Text)
IT = Val(TextBoxAmpereT.Text)
Vaverage = (VR + VS + VT) / 3
If Vaverage = 0 Then
    Vaverage = 0.1
End If
If VR > VS Then
    Vmax1 = VR
Elseif VR < VS Then
    Vmax1 = VS
End If

If Vmax1 > VT Then
    Vmax2 = Vmax1
Elseif Vmax1 < VT Then
    Vmax2 = VT
End If

If Vmax2 > Vaverage Then
    Vunbalance = (100 * ((Vmax2 - Vaverage) / Vaverage))
    Dim Vunbalancehasil = Round(Vunbalance, 3)
    lblketeranganuv.Text = Val(Vunbalancehasil)
Elseif Vmax2 = Vaverage Then
    Vunbalance = 0
End If

If Vunbalance > 5 Then
    lblketeranganvolt.Text = "Tegangan Tidak Seimbang"
    If (lblketerangan2.Text) = "MOTOR ON" Then
        If (TextBoxkontaktor.Text = "0") Then
            SerialPort1.Write("/2/")
            If MessageBox.Show("TEGANGAN TIDAK SEIMBANG,
matikan?", "Unbalance Voltage", MessageBoxButtons.YesNoCancel,
MessageBoxIcon.Question) = vbYes Then
                SerialPort1.Write("/1/")
                lblketerangan2.Text = "MOTOR OFF"
                TextBoxkontaktor.Text = "1"
            End If
        End If
    End If
End If

```

```

ElseIf    MessageBox.Show("TEGANGAN    TIDAK
SEIMBANG,    matikan?",    "Unbalance    Voltage",
MessageBoxButtons.YesNoCancel, MessageBoxIcon.Question) = vbNo
Then
    SerialPort1.Write("4/")
    End If
    End If
    End If
ElseIf Vunbalance < 5 Then
    lblketeranganvolt.Text = "NORMAL"
    SerialPort1.Write("3/")
    End If
End Sub

```

```

Private Sub TextBoxVoltS_TextChanged(ByVal sender As
System.Object, ByVal e As System.EventArgs) Handles
TextBoxVoltS.TextChanged

```

```

    If VR > 225 Then
        lblketeranganvolt2.Text = "Overvoltage"
    Else
        lblketeranganvolt2.Text = ""
    End If
    If VS > 225 Then
        lblketeranganvolt2.Text = "Overvoltage"
    Else
        lblketeranganvolt2.Text = ""
    End If
    If VT > 225 Then
        lblketeranganvolt2.Text = "Overvoltage"
    Else
        lblketeranganvolt2.Text = ""
    End If
    If VR < 215 Then
        lblketeranganvolt2.Text = "Undervoltage"
    Else
        lblketeranganvolt2.Text = ""
    End If
    If VS < 215 Then
        lblketeranganvolt2.Text = "Undervoltage"

```

```
Else
    lblketeranganvolt2.Text = ""
End If
If VT < 215 Then
    lblketeranganvolt2.Text = "Undervoltage"
Else
    lblketeranganvolt2.Text = ""
End If
End Sub
End Class
```