

# LAMPIRAN

## Lampiran 1 Surat Kesediaan Pembimbing I

### SURAT KESEDIAAN MEMBIMBING TA

Yang bertanda tangan di bawah ini:

Nama : Safar Dwi Kurniawan, M.Kom  
NIDN : 0624089101  
NIPY : 03.021.487  
Jabatan Struktural : Lektor  
Jabatan Fungsional : Dosen Tetap

Dengan ini menyatakan bersedia untuk menjadi pembimbing I pada Tugas Akhir mahasiswa berikut:

Nama : Ikhlasul Amal  
NIM : 21040148  
Program Studi : DIII Teknik Komputer

Judul TA : **RANCANG BANGUN PEMBUAT KOPI BERBASIS  
ARDUINO UNO**

Demikian pernyataan ini dibuat agar dapat dilaksanakan sebagaimana mestinya.

Tegal, 2024

Mengetahui,  
Kepala Program Studi DIII Teknik Komputer,



Ida Afriliana.ST.M.Kom  
NIPY. 12.013.168

Dosen Pembimbing I,

Safar Dwi Kurniawan, M.Kom  
NIPY. 03.021.487

## Lampiran 2 Surat Kesediaan Pembimbing II

### SURAT KESEDIAAN MEMBIMBING TA

Yang bertanda tangan di bawah ini:

Nama : Yerry Febrian Sabanise, M.Kom.  
NIDN : 0613028602  
NIPY : 03.012.110  
Jabatan Struktural : Lektor  
Jabatan Fungsional : Dosen Tetap

Dengan ini menyatakan bersedia untuk menjadi pembimbing II pada Tugas Akhir mahasiswa berikut:

Nama : Ikhlasul Amal  
NIM : 21040148  
Program Studi : DIII Teknik Komputer

Judul TA : : **RANCANG BANGUN PEMBUAT KOPI BERBASIS  
ARDUINO UNO**

Demikian pernyataan ini dibuat agar dapat dilaksanakan sebagaimana mestinya.

Tegal, 2024

Mengetahui,

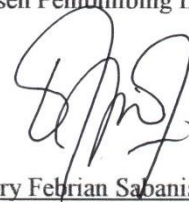
Kepala Program Studi DIII Teknik Komputer,



Ida Afrihana, ST, M.Kom

NIPY. 12.013.168


Dosen Pembimbing II,



Yerry Febrian Sabanise, M.Kom.

NIPY. 03.012.110

### Lampiran 3 Surat Observasi

 **POLITEKNIK HARAPAN BERSAMA**  
D-3 Teknik Komputer

No. : 017.03/KMP.PHB/VI/2024  
Lampiran : -  
Perihal : Permohonan Izin Observasi Tugas Akhir (TA)


Kepada Yth.  
Pimpinan Badjoeri cafe  
Jl. Pemuda No.89, Mulyoharjo, Kec. Pemalang, Kabupaten Pemalang, Jawa Tengah 52313

Dengan Hormat,  
Schubungan dengan tugas mata kuliah Tugas Akhir (TA) yang akan diselenggarakan di semester VI (Genap) Program Studi D III Teknik Komputer Politeknik Harapan Bersama Tegal, Maka dengan ini kami mengajukan izin observasi pengambilan data di Badjoeri cafe yang Bapak / Ibu Pimpin, untuk kepentingan dalam pembuatan produk Tugas Akhir, dengan Mahasiswa sebagai berikut:

No.	NIM	Nama	No. HP
1	21040148	IKHLASUL AMAL	089520185114
2	21040120	SYAHMI IZAAN	082325409748

Demikian surat permohonan ini kami sampaikan atas izin dan kerjasamanya kami sampaikan terima kasih.

Tegal, 25 Juni 2024  
Ka. Prodi DIII Teknik Komputer  
Politeknik Harapan Bersama Tegal

  
Ida Adhikha, ST, M.Kom  
NIPY. 12.013.168

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komputer@pohbtegal.ac.id  
pohbtegal.ac.id

CS Dipindai dengan CamScanner

## Lampiran 4 Surat Keterangan Observasi

### BADJOERI CAFFE

Alamat: Jl. Pemuda No.89, Kec Pemalang, Kab Pemalang, Jawa Tengah 52313

Nomor : 001/BC/IX/2024

Lampiran : -

Perihal : Surat Keterangan Observasi

Dengan Hormat,

Menindaklanjuti surat permohonan ijin observasi Tugas Akhir (TA) dengan Nomor: 017.03/KMP.PHB/VI/2024. Yang bertanda tangan dibawah ini pemilik Badjoeri Caffe menerangkan dengan sesungguhnya bahwa:

No	Nama	Nim	Program Studi
1	Iklashul Amal	21040148	DIII Teknik Komputer
2	Syahmi Izaan	21040120	DIII Teknik Komputer

Yang bersangkutan telah melaksanakan observasi di Badjoeri Caffe sejak 25 Juni 2024. Demikian surat keterangan ini dibuat dengan sebenarnya untuk dapat dipergunakan sebagaimana mestinya.

Pemalang, 20 Agustus 2024



Kukuh Pratama

Lampiran 5 Dokumentasi Observasi



## Lampiran 6 Source Code Arduino IDE

```
#include <max6675.h>
#include <LiquidCrystal_I2C.h>
#include <Wire.h>
#include <OneWire.h>
#include <DallasTemperature.h>
#include <SoftwareSerial.h>
#include <EEPROM.h>

int thermoDO = 6;
int thermoCS = 5;
int thermoCLK = 4;
MAX6675 thermocouple(thermoCLK, thermoCS, thermoDO);

LiquidCrystal_I2C lcd(0x27, 16, 2);
uint8_t degree[8] = {140,146,146,140,128,128,128,128};

SoftwareSerial nodemcu(2, 3); // RX, TX

#define pin_ir A0

#define rl_pompa A1
#define rl_heat A3
#define tombol A2
#define buzz 13

// Motor Pompa Gula Kopi
const int enA = 9;
const int in1 = 7;
const int in2 = 8;
const int enB = 10;
const int in3 = 11;
const int in4 = 12;

String data_diterima = "";
bool pecah = false;

byte addr_lama_buka_1 = 0;
byte addr_lama_buka_2 = 1;
byte addr_lama_aduk = 2;
byte addr_batas_min_suhu = 3;
byte addr_tb_kopi_1 = 4;
byte addr_tb_kopi_2 = 5;
```

```

byte addr_tb_emergency = 6;
byte addr_tb_sync      = 7;
byte addr_status_mesin = 8;
byte addr_lama_on_pompa = 9;
byte addr_tb_heater    = 30;
byte addr_kec_gula_kopi = 33;

byte baca_lama_buka_1 = 0;
byte baca_lama_buka_2 = 0;
byte baca_lama_aduk    = 0;
byte baca_batas_min_suhu = 0;
byte baca_tb_kopi_1    = 0;
byte baca_tb_kopi_2    = 0;
byte baca_tb_emergency = 0;
byte baca_tb_sync      = 0;
byte baca_status_mesin = 0;
byte baca_lama_on_pompa = 0;
byte baca_tb_heater    = 0;
byte baca_kec_gula_kopi = 0;

float suhuCThermo = 0.0;
float last_suhuCThermo = 0.0;
int relay_heat     = HIGH;

int tb_heater_int = 0;

unsigned long t_kirim_status = millis();
unsigned long t_baca_suhu    = millis();
unsigned long t_debug_serial = millis();

void setup() {
  Serial.begin(9600);
  nodemcu.begin(9600);

  lcd.begin();
  lcd.backlight();
  lcd.clear();

  lcd.createChar(0, degree);

  pinMode(pin_ir, INPUT);

  pinMode(tombol, INPUT);
  pinMode(buzz, OUTPUT);
  pinMode(rl_pompa, OUTPUT);

```



```

pinMode(rl_heat, OUTPUT);

digitalWrite(buzz, LOW);
digitalWrite(rl_pompa, HIGH);
digitalWrite(rl_heat, HIGH);
digitalWrite(tombol, LOW);

pinMode(enA, OUTPUT);
pinMode(in1, OUTPUT);
pinMode(in2, OUTPUT);
pinMode(enB, OUTPUT);
pinMode(in3, OUTPUT);
pinMode(in4, OUTPUT);

// EEPROM.write(addr_tb_kopi_1, 0);
// EEPROM.write(addr_tb_kopi_2, 0);
// EEPROM.write(addr_tb_emergency, 0);
// EEPROM.write(addr_tb_sync, 0);
// EEPROM.write(addr_status_mesin, 3);

stopMotors();

update_baca_eeprom();
tampilan_awal_lcd();
}

void loop() {
awal_program :
update_baca_eeprom();
unsigned long currentMillis = millis();

if(currentMillis - t_baca_suhu >= 1000) {
suhuCThermo = thermocouple.readCelsius();
if(suhuCThermo != last_suhuCThermo) {
last_suhuCThermo = suhuCThermo;
if(baca_tb_heater == 1) {
if((int)last_suhuCThermo >= (int) Baca_batas_min_suhu)
{
relay_heat = HIGH;
} else if ((int)last_suhuCThermo <=
(int) Baca_batas_min_suhu - 5) {
relay_heat = LOW;
}
digitalWrite(rl_heat, relay_heat);
} else {

```

```

        digitalWrite(rl_heat, HIGH);
    }
}
t_baca_suhu = currentMillis;
}

if(nodemcu.available()){
    char data = (char)nodemcu.read();
    data_diterima += data;
    if(data == '\n') pecah = true;
}

if(pecah) {
    //Serial.print(data_diterima);

    if(data_diterima.startsWith("$")) {
        sync_data_mesin_dengan_web(data_diterima);
    }

    data_diterima = "";
    pecah = false;
}

update_baca_eeprom();
if(EEPROM.read(addr_tb_kopi_1) == 1) {
    digitalWrite(buzz, HIGH);
    delay(350);
    digitalWrite(buzz, LOW);

    lcd.clear();
    digitalWrite(rl_heat, HIGH);
    delay(200);
    lcd.setCursor(0, 0);
    lcd.print("Proses Penyajian");
    lcd.setCursor(2,1);
    lcd.print("Kopi Jenis 1");
    digitalWrite(rl_heat, HIGH);
    int data_sensor = analogRead(pin_ir);
    //Serial.println(data_sensor);

    if(data_sensor >= 512) { // Tidak ada gelas
        nodemcu.print("~"); // Pengenal tanda gelas tidak
ditemukan
        nodemcu.println("~");
        delay(2000);
    }
}

```

```

lcd.clear();
while(1) {
  //debug_serial();
  lcd.setCursor(3, 0);
  lcd.print("Error !!!");
  lcd.setCursor(0,1);
  lcd.print("Gelas Belum Siap");
  digitalWrite(buzz,      LOW);
  delay(200);
  digitalWrite(buzz,      HIGH);
  delay(200);
  digitalWrite(rl_pompa, HIGH);
  digitalWrite(rl_heat,  HIGH);
  //kendali_tb_emergency_dan_tb_sync();
  if(analogRead(pin_ir) < 512) {
    lcd.clear();
    delay(500);
    lcd.setCursor(0, 0);
    lcd.print("Proses Penyajian");
    lcd.setCursor(2,1);
    lcd.print("Kopi Jenis 1");
    break; // Gelas tersedia
  }
}
}else{
  stopMotors();
  delay(500);
  while(1) {
    digitalWrite(buzz,      LOW);
    nodemcu.print("@"); // Pengenal tanda kopi 1 aktif
    nodemcu.println("0");
    delay(500);

    setMotorSpeed(map(baca_kec_gula_kopi, 10, 100, 90,
255), 1);
    delay((int) baca_lama_buka_1 * 1000);
    setMotorSpeed(0, 1);
    delay(500);

    digitalWrite(rl_pompa, LOW);
    delay((int) baca_lama_on_pompa * 1000);
    digitalWrite(rl_pompa, HIGH);
    delay(500);

    lcd.clear();

```

```

delay(500);

nodemcu.print("@"); // Pengenal tanda kopi 1 selesai
nodemcu.println("1");

lcd.setCursor(2, 0);
lcd.print("Kopi Jenis 1");
lcd.setCursor(1,1);
lcd.print("Siap Disajikan");
EEPROM.write(addr_tb_kopi_1,      0);
EEPROM.write(addr_tb_kopi_2,      0);
EEPROM.write(addr_tb_emergency,   0);
EEPROM.write(addr_tb_sync,        0);
EEPROM.write(addr_status_mesin,   10);
update_baca_eeprom();
baca_tb_kopi_1 = 0;
delay(2000);

lcd.clear();
tampilan_awal_lcd();
Serial.flush();
break;
goto awal_program;
}
}
}

update_baca_eeprom();
if(EEPROM.read(addr_tb_kopi_2) == 1) {
  digitalWrite(buzz,    HIGH);
  delay(350);
  digitalWrite(buzz,    LOW);

  lcd.clear();
  digitalWrite(rl_heat,  HIGH);
  delay(200);
  lcd.setCursor(0, 0);
  lcd.print("Proses Penyajian");
  lcd.setCursor(2,1);
  lcd.print("Kopi Jenis 2");
  digitalWrite(rl_heat,  HIGH);
  int data_sensor = analogRead(pin_ir);
  //Serial.println(data_sensor);

  if(data_sensor >= 512) { // Tidak ada gelas

```

```

        nodemcu.print("~"); // Pengenal tanda gelas tidak
ditemukan
        nodemcu.println("~");
        delay(2000);
        lcd.clear();
        while(1) {
            //debug_serial();
            lcd.setCursor(3, 0);
            lcd.print("Error !!!");
            lcd.setCursor(0,1);
            lcd.print("Gelas Belum Siap");
            digitalWrite(buzz,      LOW);
            delay(200);
            digitalWrite(buzz,      HIGH);
            delay(200);
            digitalWrite(rl_pompa, HIGH);
            digitalWrite(rl_heat,  HIGH);
            //kendali_tb_emergency_dan_tb_sync();
            if(analogRead(pin_ir) < 512) {
                lcd.clear();
                delay(500);
                lcd.setCursor(0, 0);
                lcd.print("Proses Penyajian");
                lcd.setCursor(2,1);
                lcd.print("Kopi Jenis 1");
                break; // Gelas tersedia
            }
        }
    }else{
        stopMotors();
        delay(500);
        while(1) {
            digitalWrite(buzz,      LOW);
            nodemcu.print("^"); // Pengenal tanda kopi 1 aktif
            nodemcu.println("0");
            delay(500);

            setMotorSpeed(map(baca_kec_gula_kopi, 10, 100, 90,
255), 2);
            delay((int) Baca_lama_buka_2 * 1000);
            setMotorSpeed(0, 2);
            delay(500);

            digitalWrite(rl_pompa, LOW);
            delay((int) Baca_lama_on_pompa * 1000);

```

```

digitalWrite(rl_pompa, HIGH);
delay(500);

lcd.clear();
delay(500);

nodemcu.print("^"); // Pengenal tanda kopi 2 selesai
nodemcu.println("1");

lcd.setCursor(2, 0);
lcd.print("Kopi Jenis 2");
lcd.setCursor(1,1);
lcd.print("Siap Disajikan");
EEPROM.write(addr_tb_kopi_1,      0);
EEPROM.write(addr_tb_kopi_2,      0);
EEPROM.write(addr_tb_emergency,   0);
EEPROM.write(addr_tb_sync,        0);
EEPROM.write(addr_status_mesin,   10);
update_baca_eeprom();
baca_tb_kopi_2 = 0;
delay(2000);

lcd.clear();
tampilan_awal_lcd();
Serial.flush();
break;
goto awal_program;
}
}
}

kendali_tb_emergency_dan_tb_sync();

if(currentMillis - t_kirim_status >= 1000) {
  update_baca_eeprom();
  nodemcu.print("#"); // Pengenal data berkelanjutan
  nodemcu.print(baca_status_mesin);
  nodemcu.print(",");
  nodemcu.print(suhuCThermo);
  nodemcu.print(",");
  nodemcu.print(digitalRead(rl_pompa));
  nodemcu.print(",");
  nodemcu.println(digitalRead(rl_heat));
  t_kirim_status = currentMillis;
}

```

```

    if(currentMillis - t_debug_serial >= 1000) {
        debug_serial();
        t_debug_serial = currentMillis;
    }
}

void update_baca_eeprom() {
    baca_lama_buka_1    = EEPROM.read(addr_lama_buka_1);
    baca_lama_buka_2    = EEPROM.read(addr_lama_buka_2);
    baca_lama_aduk      = EEPROM.read(addr_lama_aduk);
    baca_batas_min_suhu = EEPROM.read(addr_batas_min_suhu);
    baca_lama_on_pompa  = EEPROM.read(addr_lama_on_pompa);

    baca_tb_kopi_1      = EEPROM.read(addr_tb_kopi_1);
    baca_tb_kopi_2      = EEPROM.read(addr_tb_kopi_2);
    baca_tb_emergency   = EEPROM.read(addr_tb_emergency);
    baca_tb_sync        = EEPROM.read(addr_tb_sync);

    baca_status_mesin   = EEPROM.read(addr_status_mesin);
    baca_tb_heater      = EEPROM.read(addr_tb_heater);
    baca_kec_gula_kopi  = EEPROM.read(addr_kec_gula_kopi);
}

void stopMotors() {
    digitalWrite(in1, LOW);
    digitalWrite(in2, LOW);
    digitalWrite(in3, LOW);
    digitalWrite(in4, LOW);
    analogWrite(enA, 0);
    analogWrite(enB, 0);
}

void setMotorSpeed(int speed, int pompa) {
    switch(pompa) {
        case 1:
            digitalWrite(in1, HIGH);
            digitalWrite(in2, LOW);
            analogWrite(enA, speed);
            break;

        case 2:
            digitalWrite(in3, LOW);
            digitalWrite(in4, HIGH);
            analogWrite(enB, speed);
    }
}

```

```

        break;
    }
}

void kendali_tb_emergency_dan_tb_sync() {
    if((digitalRead(tombol) == HIGH) || (baca_tb_emergency ==
1)) {
//      EEPROM.write(addr_tb_emergency, 1);
        stopMotors();
        digitalWrite(buzz, HIGH);
        lcd.clear();

        while(1) {
            lcd.setCursor(2, 0);
            lcd.print("EMERGENCY !");
            lcd.setCursor(3,1);
            lcd.print("Menunggu..");
            nodemcu.print("!"); // Pengenal data tanda emergency
            nodemcu.println("0");
            delay(500);

            stopMotors();
            delay(2000);
            digitalWrite(buzz, LOW);
            digitalWrite(rl_pompa, HIGH);
            digitalWrite(rl_heat, HIGH);
            delay(500);

            nodemcu.print("!"); // Pengenal data tanda emergency
            nodemcu.println("1");
            EEPROM.write(addr_tb_kopi_1, 0);
            EEPROM.write(addr_tb_kopi_2, 0);
            EEPROM.write(addr_tb_emergency, 0);
            EEPROM.write(addr_tb_sync, 0);
            EEPROM.write(addr_status_mesin, 10);
            update_baca_eeeprom();
            delay(500);

            lcd.clear();
            tampilan_awal_lcd();
            break;
        }
    }

//  if(baca_tb_sync == 1) {

```



```

/////      EEPROM.write(addr_tb_sync,    1);
//      digitalWrite(buzz,    HIGH);
//      delay(250);
//      digitalWrite(buzz,    LOW);
//      delay(250);
//      digitalWrite(buzz,    HIGH);
//      delay(250);
//      digitalWrite(buzz,    LOW);
//      lcd.clear();
//
//      while(1) {
//          lcd.setCursor(0, 0);
//          lcd.print("Sync Data .....");
//          lcd.setCursor(3,1);
//          lcd.print("Menunggu..");
//          nodemcu.print("*"); // Pengenal data tanda sync
//          nodemcu.println("0");
//
//          sync_data_mesin_dengan_web(data_diterima);
//          delay(2000);
//
//          nodemcu.print("*"); // Pengenal data tanda sync
//          nodemcu.println("1");
//          EEPROM.write(addr_tb_kopi_1,    0);
//          EEPROM.write(addr_tb_kopi_2,    0);
//          EEPROM.write(addr_tb_emergency,  0);
//          EEPROM.write(addr_tb_sync,    0);
//          EEPROM.write(addr_status_mesin,  10);
//          update_baca_eeprom();
//          delay(500);
//
//          lcd.clear();
//          tampilan_awal_lcd();
//          break;
//      }
//  }
}

void sync_data_mesin_dengan_web(String data_diterima) {
    int commaIndex1 = data_diterima.indexOf(',');
    int commaIndex2 = data_diterima.indexOf(',', commaIndex1 +
1);
    int commaIndex3 = data_diterima.indexOf(',', commaIndex2 +
1);
}

```

```

    int commaIndex4 = data_diterima.indexOf(',', commaIndex3 +
1);
    int commaIndex5 = data_diterima.indexOf(',', commaIndex4 +
1);
    int commaIndex6 = data_diterima.indexOf(',', commaIndex5 +
1);
    int commaIndex7 = data_diterima.indexOf(',', commaIndex6 +
1);
    int commaIndex8 = data_diterima.indexOf(',', commaIndex7 +
1);
    int commaIndex9 = data_diterima.indexOf(',', commaIndex8 +
1);
    int commaIndex10 = data_diterima.indexOf(',', commaIndex9 +
1);
    int commaIndex11 = data_diterima.indexOf(',', commaIndex10 +
1);

    String data_1 = data_diterima.substring(1, commaIndex1);
    String data_2 = data_diterima.substring(commaIndex1 + 1,
commaIndex2);
    String data_3 = data_diterima.substring(commaIndex2 + 1,
commaIndex3);
    String data_4 = data_diterima.substring(commaIndex3 + 1,
commaIndex4);
    String data_5 = data_diterima.substring(commaIndex4 + 1,
commaIndex5);
    String data_6 = data_diterima.substring(commaIndex5 + 1,
commaIndex6);
    String data_7 = data_diterima.substring(commaIndex6 + 1,
commaIndex7);
    String data_8 = data_diterima.substring(commaIndex7 + 1,
commaIndex8);
    String data_9 = data_diterima.substring(commaIndex8 + 1,
commaIndex9);
    String data_10 = data_diterima.substring(commaIndex9 + 1,
commaIndex10);
    String data_11 = data_diterima.substring(commaIndex10 + 1,
commaIndex11);
    String data_12 = data_diterima.substring(commaIndex11 + 1);

    int lama_buka_1_int = data_8.toInt();
    int lama_buka_2_int = data_9.toInt();
    int lama_aduk_int = data_6.toInt();
    int min_suhu_int = data_7.toInt();

```

```

int lama_pompa_int    = data_10.toInt();

if(data_11.equals("ON")) {
    tb_heater_int = 1;
}else{
    tb_heater_int = 0;
}

int tb_kopi_1_int    = 0;
if(data_4 == "ON") {
    tb_kopi_1_int = 1;
}else if(data_4 == "OFF") {
    tb_kopi_1_int = 2;
}else{
    tb_kopi_1_int = 3;
}

int tb_kopi_2_int    = 0;
if(data_5 == "ON") {
    tb_kopi_2_int = 1;
}else if(data_5 == "OFF") {
    tb_kopi_2_int = 2;
}else{
    tb_kopi_2_int = 3;
}

int tb_emergency_int    = 0;
if(data_2 == "ON") {
    tb_emergency_int = 1;
}else if(data_2 == "OFF") {
    tb_emergency_int = 2;
}else{
    tb_emergency_int = 3;
}

int tb_sync_int    = 0;
if(data_3 == "ON") {
    tb_sync_int = 1;
}else if(data_3 == "OFF") {
    tb_sync_int = 2;
}else{
    tb_sync_int = 3;
}

int status_mesin_int;

```

```

if(data_1 == "k1") {
    status_mesin_int = 1;
}else if(data_1 == "k2") {
    status_mesin_int = 2;
}else if(data_1 == "1") {
    status_mesin_int = 3;
}else if(data_1 == "2") {
    status_mesin_int = 4;
}else if(data_1 == "3") {
    status_mesin_int = 5;
}else if(data_1 == "4") {
    status_mesin_int = 6;
}else if(data_1 == "5") {
    status_mesin_int = 7;
}

int kec_gula_kopi_int = data_12.toInt();

byte lama_buka_1_byte = (byte)lama_buka_1_int;
byte lama_buka_2_byte = (byte)lama_buka_2_int;
byte lama_aduk_byte = (byte)lama_aduk_int;
byte min_suhu_byte = (byte)min_suhu_int;
byte tb_kopi_1_byte = (byte)tb_kopi_1_int;
byte tb_kopi_2_byte = (byte)tb_kopi_2_int;
byte tb_emergency_byte = (byte)tb_emergency_int;
byte tb_sync_byte = (byte)tb_sync_int;
byte status_mesin_byte = (byte)status_mesin_int;
byte lama_pompa_byte = (byte)lama_pompa_int;
byte tb_heater_byte = (byte)tb_heater_int;
byte kec_gula_kopi_byte= (byte)kec_gula_kopi_int;

if(lama_buka_1_byte > 0)
EEPROM.write(addr_lama_buka_1, lama_buka_1_byte);
if(lama_buka_2_byte > 0)
EEPROM.write(addr_lama_buka_2, lama_buka_2_byte);
if(lama_aduk_byte >
0) EEPROM.write(addr_lama_aduk, lama_aduk_byte);
if(min_suhu_byte > 0) EEPROM.write(addr_batas_min_suhu,
min_suhu_byte);
if(lama_pompa_byte >
0) EEPROM.write(addr_lama_on_pompa, lama_pompa_byte);

EEPROM.write(addr_tb_kopi_1, tb_kopi_1_byte);
EEPROM.write(addr_tb_kopi_2, tb_kopi_2_byte);
EEPROM.write(addr_tb_emergency, tb_emergency_byte);

```

```

EEPROM.write(addr_tb_sync,      tb_sync_byte);
EEPROM.write(addr_status_mesin, status_mesin_byte);
EEPROM.write(addr_tb_heater,    tb_heater_byte);
EEPROM.write(addr_kec_gula_kopi, kec_gula_kopi_byte);
// Serial.println(tb_heater_int);
// Serial.println(EEPROM.read(addr_tb_heater));

update_baca_eeprom();
}

void tampilan_awal_lcd() {
  lcd.setCursor(0, 0);
  lcd.print("Mesin Saji Kopi");
  lcd.setCursor(0,1);
  lcd.print("Monggo Dipilih");
}

void debug_serial() {
  Serial.println("Data Baca EEPROM");
  Serial.print("Lama Buka Servo Kopi 1: ");
  Serial.print(baca_lama_buka_1);
  Serial.println(" Detik");
  Serial.print("Lama Buka Servo Kopi 2: ");
  Serial.print(baca_lama_buka_2);
  Serial.println(" Detik");
  Serial.print("Lama Putar Pengaduk   : ");
  Serial.print(baca_lama_aduk);
  Serial.println(" Detik");
  Serial.print("Lama ON Pompa         : ");
  Serial.print(baca_lama_on_pompa);
  Serial.println(" Detik");
  Serial.print("Batas Min Suhu Heater : ");
  Serial.print(baca_batas_min_suhu);
  Serial.println(" C");
  Serial.print("Baca Tombol Kopi 1     : ");
  Serial.println(baca_tb_kopi_1);
  Serial.print("Baca Tombol Kopi 2     : ");
  Serial.println(baca_tb_kopi_2);
  Serial.print("Baca Tombol Emergency : ");
  Serial.println(baca_tb_emergency);
  Serial.print("Baca Tombol Sync       : ");
  Serial.println(baca_tb_sync);
  Serial.print("Baca Status Mesin     : ");
  Serial.println(baca_status_mesin);
  Serial.print("Baca Kecepatan Pompa  : ");

```

```
Serial.println(baca_kec_gula_kopi);

Serial.println();

Serial.println("Data Fisik");
Serial.print("Suhu Air Thermcouple : ");
Serial.print(suhuCThermo);
Serial.println(" C");
Serial.print("Status Pompa : ");
Serial.println(digitalRead(rl_pompa));

Serial.print("Status Heater : ");
Serial.print(digitalRead(rl_heat));
Serial.print(" Tombol : ");
Serial.println(baca_tb_heater);

Serial.println();
}
```