LAMPIRAN

LIST PROGRAM RECEIVER

```
#include <Servo.h>

Servo sKelingkingKiri;
Servo sKelingkingKanan;
Servo sManisKiri;
Servo sManisKanan;
Servo sTengahKiri;
Servo sTengahKanan;
Servo sTelunjukKiri;
Servo sTelunjukKanan;
Servo sJempolKiri;
Servo sJempolKanan;
Servo sBahuKiri;
Servo sBahuKanan;

#define pinsKelingkingKiri 2
#define pinsKelingkingKanan 3
#define pinsManisKiri 4
#define pinsManisKanan 5
#define pinsTengahKiri 6
#define pinsTengahKanan 7
#define pinsTelunjukKiri 23
#define pinsTelunjukKanan 22
#define pinsJempolKiri 10
#define pinsJempolKanan 11
#define pinsBahuKiri 24
#define pinsBahuKanan 8
#define motorlengankanan1 30
#define motorlengankanan2 31
#define motorlengankanan3 32
#define motorlengankanan4 33
#define motorbahukanan1   34
#define motorbahukanan2   35
```

```
#define motorlengankiri1 38
#define motorlengankiri2 39
#define motorlengankiri3 40
#define motorlengankiri4 41
#define motorbahukiri1  42
#define motorbahukiri2  43

#define lslengankanan1 47 //maju
#define lslengankanan2 46 //mundur
#define lslengankanan3 49 //maju
#define lslengankanan4 48 //mundur
#define lsbahukanan1  50 //maju
#define lsbahukanan2  51 //mundur
#define lslengankiri1 52
#define lslengankiri2 53
#define lslengankiri3 44
#define lslengankiri4 45
#define lsbahukiri1  29
#define lsbahukiri2  28

int posisi_sudut_saat_lengan_kananA = 0;
int posisi_sudut_saat_lengan_kananB = 0;
int posisi_sudut_saat_bahu_kanan = 0;
int posisi_sudut_saat_lengan_kiriA = 0;
int posisi_sudut_saat_lengan_kiriB = 0;
int posisi_sudut_saat_bahu_kiri = 0;
String inputString = "";        // a string to hold incoming data
boolean stringComplete = false;  // whether the string is complete

int nilai_dc1 = 0;
int nilai_dc2 = 0;
int nilai_dc3 = 0;
int nilai_dc4 = 0;
int nilai_dc5 = 0;
```

```
int nilai_dc6 = 0;
int nilai_servo1 = 0;
int nilai_servo2 = 0;
int nilai_flex0 = 0;
int nilai_flex1 = 0;
int nilai_flex2 = 0;
int nilai_flex3 = 0;
int nilai_flex4 = 0;
int nilai_flex5 = 0;
int nilai_flex6 = 0;
int nilai_flex7 = 0;
int nilai_flex8 = 0;
int nilai_flex9 = 0;

long rata1 = 0;
long rata2 = 0;
long rata3 = 0;
long rata4 = 0;
long rata5 = 0;
long rata6 = 0;
long rata7 = 0;
long rata8 = 0;
long rata9 = 0;
long rata10 = 0;
long rata11 = 0;
long rata12 = 0;
long rata13 = 0;
long rata14 = 0;
long rata15 = 0;
long rata16 = 0;
long rata17 = 0;
long rata18 = 0;
```

```cpp
bool status_bahu_kanan = 0 ; //0 maju 1 mundur
bool status_lengan_kanan1 = 0 ;
bool status_lengan_kanan2 = 0 ;

bool status_bahu_kiri = 0 ; //0 maju 1 mundur
bool status_lengan_kiri1 = 0 ;
bool status_lengan_kiri2 = 0 ;

void setup() {
  Serial1.begin(38400);
  Serial.begin(9600);
  sKelingkingKiri.attach(pinsKelingkingKiri);
  sKelingkingKanan.attach(pinsKelingkingKanan);
  sManisKiri.attach(pinsManisKiri);
  sManisKanan.attach(pinsManisKanan);
  sTengahKiri.attach(pinsTengahKiri);
  sTengahKanan.attach(pinsTengahKanan);
  sTelunjukKiri.attach(pinsTelunjukKiri);
  sTelunjukKanan.attach(pinsTelunjukKanan);
  sJempolKiri.attach(pinsJempolKiri);
  sJempolKanan.attach(pinsJempolKanan);
  sBahuKiri.attach(pinsBahuKiri);
  sBahuKanan.attach(pinsBahuKanan);
  // put your setup code here, to run once:
  inputString.reserve(200);
  pinMode(motorlengankanan1, OUTPUT);
  pinMode(motorlengankanan2, OUTPUT);
  pinMode(motorlengankanan3, OUTPUT);
  pinMode(motorlengankanan4, OUTPUT);
  pinMode(motorbahukanan1, OUTPUT);
  pinMode(motorbahukanan2, OUTPUT);
  pinMode(motorlengankiri1, OUTPUT);
  pinMode(motorlengankiri2, OUTPUT);
  pinMode(motorlengankiri3, OUTPUT);
```

```
    pinMode(motorlengankiri4, OUTPUT);
    pinMode(motorbahukiri1, OUTPUT);
    pinMode(motorbahukiri2, OUTPUT);

    pinMode(lslengankanan1,INPUT_PULLUP);
    pinMode(lslengankanan2,INPUT_PULLUP);
    pinMode(lslengankanan3,INPUT_PULLUP);
    pinMode(lslengankanan4,INPUT_PULLUP);
    pinMode(lsbahukanan1,INPUT_PULLUP);
    pinMode(lsbahukanan2,INPUT_PULLUP);

    pinMode(lslengankiri1,INPUT_PULLUP);
    pinMode(lslengankiri2,INPUT_PULLUP);
    pinMode(lslengankiri3,INPUT_PULLUP);
    pinMode(lslengankiri4,INPUT_PULLUP);
    pinMode(lsbahukiri1,INPUT_PULLUP);
    pinMode(lsbahukiri2,INPUT_PULLUP);

}

void motor_maju1() {
  status_bahu_kanan = 0;
  if (digitalRead(lsbahukanan1)==0){
    digitalWrite(motorbahukanan1, HIGH);
    digitalWrite(motorbahukanan2, HIGH);

  }else{
    digitalWrite(motorbahukanan1, HIGH);
    digitalWrite(motorbahukanan2, LOW);

  }
}

void motor_maju2() {
```

```
    status_lengan_kanan1 = 0;
   if (digitalRead(lslengankanan1)==0){
     digitalWrite(motorlengankanan1, HIGH);
     digitalWrite(motorlengankanan2, HIGH);

   }else{
   digitalWrite(motorlengankanan1, HIGH);
   digitalWrite(motorlengankanan2, LOW);
   }
}
void motor_maju3() {
   status_lengan_kanan2 = 0;
   if (digitalRead(lslengankanan3)==0){
     digitalWrite(motorlengankanan3, HIGH);
     digitalWrite(motorlengankanan4, HIGH);

   }else{
   digitalWrite(motorlengankanan3, HIGH);
   digitalWrite(motorlengankanan4, LOW);
   }
}

//belum ganti pin
void motor_maju4() {
   status_bahu_kiri = 0;
   if (digitalRead(lsbahukiri1)==0){
     digitalWrite(motorbahukiri1, HIGH);
     digitalWrite(motorbahukiri2, HIGH);

   }else{
     digitalWrite(motorbahukiri1, HIGH);
     digitalWrite(motorbahukiri2, LOW);

   }
```

```
}

void motor_maju5() {
  status_lengan_kiri1 = 0;
  if (digitalRead(lslengankiri1)==0){
    digitalWrite(motorlengankiri1, HIGH);
    digitalWrite(motorlengankiri2, HIGH);

  }else{
  digitalWrite(motorlengankiri1, HIGH);
  digitalWrite(motorlengankiri2, LOW);
  }
}
void motor_maju6() {
  status_lengan_kiri2 = 0;
  if (digitalRead(lslengankiri3)==0){
    digitalWrite(motorlengankiri3, HIGH);
    digitalWrite(motorlengankiri4, HIGH);

  }else{
  digitalWrite(motorlengankiri3, HIGH);
  digitalWrite(motorlengankiri4, LOW);
  }
}



void motor_mundur1() {
  status_bahu_kanan = 1;
  if (digitalRead(lsbahukanan2)==0){
    digitalWrite(motorbahukanan1, HIGH);
    digitalWrite(motorbahukanan2, HIGH);

  }else{
```

```
   digitalWrite(motorbahukanan1, LOW);
   digitalWrite(motorbahukanan2, HIGH);


 }
}

void motor_mundur2() {
  status_lengan_kanan1 = 1;

  if (digitalRead(lslengankanan2)==0){
  digitalWrite(motorlengankanan1, HIGH);
  digitalWrite(motorlengankanan2, HIGH);

  }else{
  digitalWrite(motorlengankanan1, LOW);
  digitalWrite(motorlengankanan2, HIGH);

  }

}

void motor_mundur3() {
  status_lengan_kanan2 = 1;
 if (digitalRead(lslengankanan4)==0){
  digitalWrite(motorlengankanan3, HIGH);
  digitalWrite(motorlengankanan4, HIGH);

  }else{
  digitalWrite(motorlengankanan3, LOW);
  digitalWrite(motorlengankanan4, HIGH);

  }
}
```

```
//belom ganti piin
void motor_mundur4() {
  status_bahu_kiri = 1;
  if (digitalRead(lsbahukiri2)==0){
    digitalWrite(motorbahukiri1, HIGH);
    digitalWrite(motorbahukiri2, HIGH);

  }else{
    digitalWrite(motorbahukiri1, LOW);
    digitalWrite(motorbahukiri2, HIGH);

  }
}

void motor_mundur5() {
  status_lengan_kiri1 = 1;

  if (digitalRead(lslengankiri2)==0){
  digitalWrite(motorlengankiri1, HIGH);
  digitalWrite(motorlengankiri2, HIGH);

  }else{
  digitalWrite(motorlengankiri1, LOW);
  digitalWrite(motorlengankiri2, HIGH);

  }

}

void motor_mundur6() {
  status_lengan_kiri2 = 1;
 if (digitalRead(lslengankiri4)==0){
  digitalWrite(motorlengankiri3, HIGH);
```

```
    digitalWrite(motorlengankiri4, HIGH);


  }else{
  digitalWrite(motorlengankiri3, LOW);
  digitalWrite(motorlengankiri4, HIGH);


  }
}




void motor_stop1() {
  digitalWrite(motorbahukanan1, HIGH);
  digitalWrite(motorbahukanan2, HIGH);
}

void motor_stop2() {
  digitalWrite(motorlengankanan1, HIGH);
  digitalWrite(motorlengankanan2, HIGH);
}

void motor_stop3() {
  digitalWrite(motorlengankanan3, HIGH);
  digitalWrite(motorlengankanan4, HIGH);
}


//belom ganti pin

void motor_stop4() {
  digitalWrite(motorbahukiri1, HIGH);
  digitalWrite(motorbahukiri2, HIGH);
}
```

```cpp
void motor_stop5() {
  digitalWrite(motorlengankiri1, HIGH);
  digitalWrite(motorlengankiri2, HIGH);
}

void motor_stop6() {
  digitalWrite(motorlengankiri3, HIGH);
  digitalWrite(motorlengankiri4, HIGH);
}

int counter1 = 0;
int counter2 = 0;
int counter3 = 0;
int counter4 = 0;
int counter5 = 0;
int counter6 = 0;
int counter7 = 0;
int counter8 = 0;
int counter9 = 0;
int counter10 = 0;
int counter11 = 0;
int counter12 = 0;
int counter13 = 0;
int counter14 = 0;
int counter15 = 0;
int counter16 = 0;
int counter17 = 0;
int counter18 = 0;

int waktu1 = 5;
int waktu2 = 5;
int waktu3 = 5;
int waktu4 = 5;
```

```
int waktu5 = 5;
int waktu6 = 5;
int waktu7 = 5;
int waktu8 = 5;
int waktu9 = 5;
int waktu10 = 5;
int waktu11 = 5;
int waktu12 = 5;
int waktu13 = 5;
int waktu14 = 5;
int waktu15 = 5;
int waktu16 = 5;
int waktu17 = 5;
int waktu18 = 5;

long waktu_delay1 = 0;
long waktu_delay2 = 0;
long waktu_delay3 = 0;
long waktu_delay4 = 0;
long waktu_delay5 = 0;
long waktu_delay6 = 0;
long waktu_delay7 = 0;
long waktu_delay8 = 0;
long waktu_delay9 = 0;
long waktu_delay10 = 0;
long waktu_delay11 = 0;
long waktu_delay12 = 0;
long waktu_delay13 = 0;
long waktu_delay14 = 0;
long waktu_delay15 = 0;
long waktu_delay16 = 0;
long waktu_delay17 = 0;
long waktu_delay18 = 0;
```

```
long waktu_mulai1 = 0;
long waktu_mulai2 = 0;
long waktu_mulai3 = 0;
long waktu_mulai4 = 0;
long waktu_mulai5 = 0;
long waktu_mulai6 = 0;
long waktu_mulai7 = 0;
long waktu_mulai8 = 0;
long waktu_mulai9 = 0;
long waktu_mulai10 = 0;
long waktu_mulai11 = 0;
long waktu_mulai12 = 0;
long waktu_mulai13 = 0;
long waktu_mulai14 = 0;
long waktu_mulai15 = 0;
long waktu_mulai16 = 0;
long waktu_mulai17 = 0;
long waktu_mulai18 = 0;




void loop() {
//buka komen ini kalau nak cek limit switch
//  while(1){
//    Serial.print(digitalRead(lsbahukiri1));
//    Serial.print(" ");
//    Serial.println(digitalRead(lsbahukiri2));
//
//  }
  // put your main code here, to run repeatedly:
  masuk_data(); //call the function
  // print the string when a newline arrives:
  if (stringComplete) {
    Serial.println(inputString);
```

```
//nilai_dc1 = inputString.toInt();
//nilai_servo1 = inputString.toInt();
nilai_dc1 = getValue(inputString, ',', 0).toInt();
Serial.print("  ");
Serial.print(nilai_dc1);
nilai_dc2 = getValue(inputString, ',', 1).toInt();
Serial.print("  ");
Serial.print(nilai_dc2);
nilai_dc3 = getValue(inputString, ',', 2).toInt();
Serial.print("  ");
Serial.print(nilai_dc3);
nilai_dc4 = getValue(inputString, ',', 3).toInt();
Serial.print("  ");
Serial.print(nilai_dc4);
nilai_dc5 = getValue(inputString, ',', 4).toInt();
Serial.print("  ");
Serial.print(nilai_dc5);
nilai_dc6 = getValue(inputString, ',', 5).toInt();
Serial.print("  ");
Serial.print(nilai_dc6);
nilai_servo1 = getValue(inputString, ',', 6).toInt();
Serial.print("  ");
Serial.print(nilai_servo1);
nilai_servo2 = getValue(inputString, ',', 7).toInt();
Serial.print("  ");
Serial.println(nilai_servo2);

nilai_flex0 = getValue(inputString, ',', 8).toInt();
Serial.print("  ");
Serial.print(nilai_flex0);
nilai_flex1 = getValue(inputString, ',', 9).toInt();
Serial.print("  ");
Serial.print(nilai_flex1);
nilai_flex2 = getValue(inputString, ',', 10).toInt();
```

```
    Serial.print("  ");
    Serial.print(nilai_flex2);
    nilai_flex3 = getValue(inputString, ',', 11).toInt();
    Serial.print("  ");
    Serial.print(nilai_flex3);
    nilai_flex4 = getValue(inputString, ',', 12).toInt();
    Serial.print("  ");
    Serial.println(nilai_flex4);


    nilai_flex5 = getValue(inputString, ',', 13).toInt();
    Serial.print("  ");
    Serial.print(nilai_flex5);
    nilai_flex6 = getValue(inputString, ',', 14).toInt();
    Serial.print("  ");
    Serial.print(nilai_flex6);
    nilai_flex7 = getValue(inputString, ',', 15).toInt();
    Serial.print("  ");
    Serial.print(nilai_flex7);
    nilai_flex8 = getValue(inputString, ',', 16).toInt();
    Serial.print("  ");
    Serial.print(nilai_flex8);
    nilai_flex9 = getValue(inputString, ',', 17).toInt();
    Serial.print("  ");
    Serial.println(nilai_flex9);

    dc_bahu_kanan();
    dc_bahu_kiri();
    dc_kananA();
    dc_kananB();
    dc_kiriA();
    dc_kiriB();
  servoBahuKanan();
  servoBahuKiri();
```

```
//PROGRAM MOTOR SERVO PADA JARI
if (nilai_flex0 < 550)nilai_flex0 = 550;
if (nilai_flex0 > 820)nilai_flex0 = 820;
  Serial.print(nilai_flex0);
  nilai_flex0 = map(nilai_flex0, 550, 820, 50, 125);
  sJempolKiri.write(nilai_flex0);

if (nilai_flex1 < 742)nilai_flex1 = 742;
if (nilai_flex1 > 875)nilai_flex1 = 875;
  Serial.print(nilai_flex1);
  nilai_flex1 = map(nilai_flex1, 742, 875, 50, 125);
  sTelunjukKiri.write(nilai_flex1);

if (nilai_flex2 < 550)nilai_flex2 = 550;
if (nilai_flex2 > 800)nilai_flex2 = 800;
//
if (nilai_flex2 >= 550 && nilai_flex2 <= 800) {
  Serial.print(nilai_flex2);
  nilai_flex2 = map(nilai_flex2, 550, 800, 110, 179);
  sTengahKiri.write(nilai_flex2);
}

if (nilai_flex3 < 700)nilai_flex3 = 700;
if (nilai_flex3 > 850)nilai_flex3 = 850;
if (nilai_flex3 >= 700&& nilai_flex3 <= 850) {
  Serial.print(nilai_flex3);
  nilai_flex3 = map(nilai_flex3, 700, 850, 110, 179);
  sManisKiri.write(nilai_flex3);
}

if (nilai_flex4 < 600)nilai_flex4 = 600;
if (nilai_flex4 > 850)nilai_flex4 = 850;
  Serial.print(nilai_flex4);
```

```
    nilai_flex4 = map(nilai_flex4, 600, 850, 110, 179);
    sKelingkingKiri.write(nilai_flex4);



    if (nilai_flex5 < 555)nilai_flex5 = 555;
    if (nilai_flex5 > 770)nilai_flex5 = 770;

    if (nilai_flex5 >= 555 && nilai_flex5 <= 770) {
      Serial.print(nilai_flex5);
      nilai_flex5 = map(nilai_flex5, 555, 770, 110, 179);
      sJempolKanan.write(nilai_flex5);
    }

    if (nilai_flex6 < 540)nilai_flex6 = 540;
    if (nilai_flex6 > 800)nilai_flex6 = 800;
    if (nilai_flex6 >= 550 && nilai_flex6 <= 800) {
      Serial.print(nilai_flex6);
      nilai_flex6 = map(nilai_flex6, 540, 800, 110, 179);
      sTelunjukKanan.write(nilai_flex6);
    }

    if (nilai_flex7 < 500)nilai_flex7 = 500;
    if (nilai_flex7 > 750)nilai_flex7 = 750;
    if (nilai_flex7 >= 500 && nilai_flex7 <= 750) {
      Serial.print(nilai_flex7);
      nilai_flex7 = map(nilai_flex7, 500, 750, 110, 179);
      sTengahKanan.write(nilai_flex7);
    }

    if (nilai_flex8 < 500)nilai_flex8 = 500;
    if (nilai_flex8 > 800)nilai_flex8 = 800;

    if (nilai_flex8 >= 500 && nilai_flex8 <= 800) {
      Serial.print(nilai_flex8);
```

```
    nilai_flex8 = map(nilai_flex8, 500, 800, 110, 179);
    sManisKanan.write(nilai_flex8);
  }


  if (nilai_flex9 < 550)nilai_flex9 = 550;
  if (nilai_flex9 > 750)nilai_flex9 = 750;


  if (nilai_flex9 >= 550 && nilai_flex9 <= 750) {
    Serial.print(nilai_flex9);
    nilai_flex9 = map(nilai_flex9, 550, 750, 110, 179);
    sKelingkingKanan.write(nilai_flex9);
  }




    //   //PROGRAM MOTOR DC PADA BAHU KIRI BERGERAK KEATAS DAN
KEBAWAH
    inputString = "";
    stringComplete = false;
  }
 if (status_bahu_kanan == 0 && digitalRead(lsbahukanan1) == 0){
   motor_stop1();
 }
 if (status_bahu_kanan == 1 && digitalRead(lsbahukanan2) == 0){
   motor_stop1();
```

```
}
if (status_lengan_kanan1 == 0 && digitalRead(lslengankanan1) == 0){
  motor_stop2();
}
if (status_lengan_kanan1 == 1 && digitalRead(lslengankanan2) == 0){
  motor_stop2();
}
if (status_lengan_kanan2 == 0 && digitalRead(lslengankanan3) == 0){
  motor_stop3();
}
if (status_lengan_kanan2 == 1 && digitalRead(lslengankanan4) == 0){
  motor_stop3();
}


if (status_bahu_kiri == 0 && digitalRead(lsbahukiri1) == 0){
  motor_stop4();
}
if (status_bahu_kiri == 1 && digitalRead(lsbahukiri2) == 0){
  motor_stop4();
}
if (status_lengan_kiri1 == 0 && digitalRead(lslengankiri1) == 0){
  motor_stop5();
}
if (status_lengan_kiri1 == 1 && digitalRead(lslengankiri2) == 0){
  motor_stop5();
}
if (status_lengan_kiri2 == 0 && digitalRead(lslengankiri3) == 0){
  motor_stop6();
}
if (status_lengan_kiri2 == 1 && digitalRead(lslengankiri4) == 0){
  motor_stop6();
}
```

```
}


void masuk_data() {

  while (Serial1.available()) {
    // get the new byte:
    char inChar = (char)Serial1.read();
    // add it to the inputString:
    // if the incoming character is a newline, set a flag
    // so the main loop can do something about it:
    if (inChar == '\n') {
      stringComplete = true;
    } else if (inChar == '\r') {

    } else {
      inputString += inChar;
    }

  }
}



String getValue(String data, char separator, int index)
{
  int found = 0;
  int strIndex[] = {0, -1};
  int maxIndex = data.length() - 1;

  for (int i = 0; i <= maxIndex && found <= index; i++) {
```

```
    if (data.charAt(i) == separator || i == maxIndex) {
      found++;
      strIndex[0] = strIndex[1] + 1;
      strIndex[1] = (i == maxIndex) ? i + 1 : i;
    }
  }

  return found > index ? data.substring(strIndex[0], strIndex[1]) : "";
}



void dc_bahu_kanan() {
  //PROGRAM MOTOR DC PADA BAHU KANAN
  if (rata1 == 0 ) rata1 = nilai_dc1;
  else {
    rata1 += nilai_dc1;
  }
  counter1 ++;
  if (counter1 == 9) {
    counter1 = 0;
    rata1 /= 10;
    nilai_dc1 = rata1;
    Serial.println(posisi_sudut_saat_bahu_kanan);
    Serial.print("  ");
    Serial.print(nilai_dc1);
    Serial.println(" ");
    if (posisi_sudut_saat_bahu_kanan == 0)posisi_sudut_saat_bahu_kanan = nilai_dc1;
    int selisih = abs(posisi_sudut_saat_bahu_kanan - nilai_dc1);
    //Serial.println(selisih);
    if (selisih > 2 ) {
      waktu_mulai1 = millis();
      waktu_delay1 = (selisih * waktu1);

      if (posisi_sudut_saat_bahu_kanan > nilai_dc1) {
```

```
      motor_maju1();
    } else {


      motor_mundur1();
    }
    posisi_sudut_saat_bahu_kanan = nilai_dc1;
  }


  }

  if (waktu_mulai1 + abs(waktu_delay1) < millis() and waktu_delay1 != 0) {
    motor_stop1();
    waktu_delay1 = 0;
  }
}


void dc_kananA() {
  //PROGRAM MOTOR DC PADA BAHU KANAN
  if (rata2 == 0 ) rata2 = nilai_dc2;
  else {
    rata2 += nilai_dc2;
  }
  counter2 ++;
  if (counter2 == 9) {
    counter2 = 0;
    rata2 /= 10;
    nilai_dc2 = rata2;
    Serial.println(posisi_sudut_saat_lengan_kananA);
    Serial.println(nilai_dc2);
    Serial.println(" ");
    if (posisi_sudut_saat_lengan_kananA == 0)posisi_sudut_saat_lengan_kananA = nilai_dc2;
    int selisih = abs(posisi_sudut_saat_lengan_kananA - nilai_dc2);
    //Serial.println(selisih);
```

```
    if (selisih > 2 ) {
      waktu_mulai2 = millis();
      waktu_delay2 = (selisih * waktu2);

      if (posisi_sudut_saat_lengan_kananA > nilai_dc2) {
        motor_maju2();
      } else {

        motor_mundur2();
      }
      posisi_sudut_saat_lengan_kananA = nilai_dc2;
    }

  }

  if (waktu_mulai2 + abs(waktu_delay2) < millis() and waktu_delay2 != 0) {
    motor_stop2();
    waktu_delay2 = 0;
  }
}

void dc_kananB() {
  //PROGRAM MOTOR DC PADA BAHU KANAN
  if (rata3 == 0 ) rata3 = nilai_dc3;
  else {
    rata3 += nilai_dc3;
  }
  counter3 ++;
  if (counter3 == 9) {
    counter3 = 0;
    rata3 /= 10;
    nilai_dc3 = rata3;
    Serial.println(" ");
    Serial.println(nilai_dc3);
```

```
    Serial.println(" ");
    if (posisi_sudut_saat_lengan_kananB == 0)posisi_sudut_saat_lengan_kananB = nilai_dc3;
    int selisih = abs(posisi_sudut_saat_lengan_kananB - nilai_dc3);
    //Serial.println(selisih);
    if (selisih > 2 ) {
      waktu_mulai3 = millis();
      waktu_delay3 = (selisih * waktu3);


      if (posisi_sudut_saat_lengan_kananB > nilai_dc3) {
        motor_maju3();
      } else {


        motor_mundur3();
      }
      posisi_sudut_saat_lengan_kananB = nilai_dc3;
    }


  }

  if (waktu_mulai3 + abs(waktu_delay3) < millis() and waktu_delay3 != 0) {
    motor_stop3();
    waktu_delay3 = 0;
  }
}



void dc_bahu_kiri() {
  //PROGRAM MOTOR DC PADA BAHU KANAN
  if (rata4 == 0 ) rata4 = nilai_dc4;
  else {
    rata4 += nilai_dc4;
  }
  counter4 ++;
  if (counter4 == 3) {
```

```
    counter4 = 0;
    rata4 /= 4;
    nilai_dc4 = rata4;
    Serial.println();
    Serial.println(nilai_dc4);
    Serial.print(" ");
    if (posisi_sudut_saat_bahu_kiri == 0)posisi_sudut_saat_bahu_kiri = nilai_dc4;
    int selisih = abs(posisi_sudut_saat_bahu_kiri - nilai_dc4);
    //Serial.println(selisih);
    if (selisih > 2 ) {
      waktu_mulai4 = millis();
      waktu_delay4 = (selisih * waktu4);

      if (posisi_sudut_saat_bahu_kiri > nilai_dc4) {
        motor_maju4();
      } else {

        motor_mundur4();
      }
      posisi_sudut_saat_bahu_kiri = nilai_dc4;
    }

  }

  if (waktu_mulai4 + abs(waktu_delay4) < millis() and waktu_delay4 != 0) {
    motor_stop4();
    waktu_delay4 = 0;
  }
}




void dc_kiriA() {
  //PROGRAM MOTOR DC PADA BAHU KANAN
```

```
if (rata5 == 0 ) rata5 = nilai_dc5;
else {
  rata5 += nilai_dc5;
}
counter5 ++;
if (counter5 == 3) {
  counter5 = 0;
  rata5 /= 4;
  nilai_dc5 = rata5;
  Serial.print(nilai_dc5);
  Serial.print(" ");
  if (posisi_sudut_saat_lengan_kiriA == 0)posisi_sudut_saat_lengan_kiriA = nilai_dc5;
  int selisih = abs(posisi_sudut_saat_lengan_kiriA - nilai_dc5);
  //Serial.println(selisih);
  if (selisih > 2 ) {
    waktu_mulai5 = millis();
    waktu_delay5 = (selisih * waktu5);

    if (posisi_sudut_saat_lengan_kiriA > nilai_dc5) {
      motor_maju5();
    } else {

      motor_mundur5();
    }
    posisi_sudut_saat_lengan_kiriA = nilai_dc5;
  }

}

if (waktu_mulai5 + abs(waktu_delay5) < millis() and waktu_delay5 != 0) {
  motor_stop5();
  waktu_delay5 = 0;
}
}
```

```
void dc_kiriB() {
  //PROGRAM MOTOR DC PADA BAHU kiri
  if (rata6 == 0 ) rata6 = nilai_dc6;
  else {
    rata6 += nilai_dc6;
  }
  counter6 ++;
  if (counter6 == 3) {
    counter6 = 0;
    rata6 /= 4;
    nilai_dc6 = rata6;
    Serial.print(nilai_dc6);
    Serial.print(" ");
    if (posisi_sudut_saat_lengan_kiriB == 0)posisi_sudut_saat_lengan_kiriB = nilai_dc6;
    int selisih = abs(posisi_sudut_saat_lengan_kiriB - nilai_dc6);
    //Serial.println(selisih);
    if (selisih > 2 ) {
      waktu_mulai6 = millis();
      waktu_delay6 = (selisih * waktu6);

      if (posisi_sudut_saat_lengan_kiriB > nilai_dc6) {
        motor_maju6();
      } else {

        motor_mundur6();
      }
      posisi_sudut_saat_lengan_kiriB = nilai_dc6;
    }

  }

  if (waktu_mulai6 + abs(waktu_delay6) < millis() and waktu_delay6 != 0) {
    motor_stop6();
```

```
    waktu_delay6 = 0;
  }
}

void servoBahuKiri() {
  //Servo bahu Kiri
  if (nilai_servo1 > 50 ) nilai_servo1 = 50;
  nilai_servo1 -= 50;
  nilai_servo1 = abs(nilai_servo1);
  nilai_servo1 *= 10;
  if (rata7 == 0) rata7 = nilai_servo1;
  else {
    rata7 += nilai_servo1;
  }
  counter7++;
  if (counter7 == 2) {
    counter7 = 0;
    rata7 /= 3;
    if (rata7 > 130) rata7 = 130;
    Serial.println();
    Serial.println();
    Serial.println(150 - rata7);
    Serial.println();
    Serial.println();

    sBahuKiri.write(150 - rata7);
    rata7 = 0;
  }

}

void servoBahuKanan() {
// Servo bahu kanan
  if (nilai_servo2 > 950 ) nilai_servo2 = 950;
```

```
    nilai_servo2 -= 50;
    nilai_servo2 = abs(nilai_servo2);
    nilai_servo2 *= 5;
    if (rata8 == 0) rata8 = nilai_servo2;
    else {
      rata8 += nilai_servo2;
    }
    counter8++;
    if (counter8 == 2) {
      counter8 = 0;
      rata8 /= 3;
      if (rata8 > 130) rata8 = 130;
      Serial.println();
      Serial.println();
      Serial.println(150 - rata8);
      Serial.println();
      Serial.println();

      sBahuKanan.write(150 - rata8);
      rata8 = 0;
    }
}
```

LIST PROGRAM TRANSMITTER

```
#define potensio A0
#define potensio1 A1
#define potensio2 A2
#define potensio3 A4
#define potensio4 A5
#define potensio5 A6
#define potensio6 A7
#define potensio7 A8
//#include <Servo.h>

//Servo servo1;

int nilai_potensio = 0;
int nilai_potensio1 = 0;
int nilai_potensio2 = 0;
int nilai_potensio3 = 0;
int nilai_potensio4 = 0;
int nilai_potensio5 = 0;
int nilai_potensio6 = 0;
int nilai_potensio7 = 0;
int nilai_flex = 0;
int nilai_flex0 = 0;
int nilai_flex1 = 0;
int nilai_flex2 = 0;
int nilai_flex3 = 0;
int nilai_flex4 = 0;
int nilai_flex5 = 0;
int nilai_flex6 = 0;
int nilai_flex7 = 0;
int nilai_flex8 = 0;
int nilai_flex9 = 0;
byte controlPins[] = {B00000000,
            B10000000,
```

```
            B01000000,
            B11000000,
            B00100000,
            B10100000,
            B01100000,
            B11100000,
            B00010000,
            B10010000,
            B01010000,
            B11010000,
            B00110000,
            B10110000,
            B01110000,
            B11110000 };

// holds incoming values from 74HC4067
int muxValues[] = {0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0};

void setup() {
  Serial.begin(9600);
  Serial1.begin(38400);
  pinMode(potensio,INPUT);
  pinMode(potensio1,INPUT);
  pinMode(potensio2,INPUT);
  pinMode(potensio3,INPUT);
  pinMode(potensio4,INPUT);
  pinMode(potensio5,INPUT);
  pinMode(potensio6,INPUT);
  pinMode(potensio7,INPUT);
  Serial.begin(9600);
  DDRC = B11111111; // set PORTD (digital 7~0) to outputs
}

void setPin(int outputPin)
```

```
// function to select pin on 74HC4067
{
  PORTC = controlPins[outputPin];
}

void displayData()
// dumps captured data from array to serial monitor
{
  Serial.println();
  Serial.println("Values from multiplexer:");
  Serial.println("=======================");
  for (int i = 0; i < 16; i++)
  {
    Serial.print("input I");
    Serial.print(i);
    Serial.print(" = ");
    Serial.println(muxValues[i]);


  }
  Serial.println("=======================");
//  delay(100);
}

void loop() {
nilai_potensio = analogRead(potensio);
  Serial.print("data potensio =");
  Serial.println(nilai_potensio);
  Serial1.print(nilai_potensio);
  Serial1.print(",");

nilai_potensio1 = analogRead(potensio1);
  Serial.print("data potensio =");
  Serial.println(nilai_potensio1);
  Serial1.print(nilai_potensio1);
```

```
  Serial1.print(",");

nilai_potensio2 = analogRead(potensio2);
  Serial.print("data potensio =");
  Serial.println(nilai_potensio2);
  Serial1.print(nilai_potensio2);
  Serial1.print(",");

nilai_potensio3 = analogRead(potensio3);
  Serial.print("data potensio =");
  Serial.println(nilai_potensio3);
  Serial1.print(nilai_potensio3);
  Serial1.print(",");

nilai_potensio4 = analogRead(potensio4);
  Serial.print("data potensio =");
  Serial.println(nilai_potensio4);
  Serial1.print(nilai_potensio4);
  Serial1.print(",");

nilai_potensio5 = analogRead(potensio5);
  Serial.print("data potensio =");
  Serial.println(nilai_potensio5);
  Serial1.print(nilai_potensio5);
  Serial1.print(",");

nilai_potensio6 = analogRead(potensio6);
  Serial.print("data potensio =");
  Serial.println(nilai_potensio6);
  Serial1.print(nilai_potensio6);
  Serial1.print(",");

nilai_potensio7 = analogRead(potensio7);
  Serial.print("data potensio =");
```

```
    Serial.println(nilai_potensio7);
    Serial1.print(nilai_potensio7);
    Serial1.print(",");


  for (int i = 0; i < 16; i++)
  {
    setPin(i); // choose an input pin on the 74HC4067
    muxValues[i]=analogRead(A3); // read the vlaue on that pin and store in array

  }
nilai_flex0 = muxValues[0];
  Serial1.print(nilai_flex0);
  Serial1.print(",");
nilai_flex1 = muxValues[1];
  Serial1.print(nilai_flex1);
  Serial1.print(",");
nilai_flex2 = muxValues[2];
  Serial1.print(nilai_flex2);
  Serial1.print(",");
nilai_flex3 = muxValues[3];
  Serial1.print(nilai_flex3);
  Serial1.print(",");
nilai_flex4 = muxValues[4];
  Serial1.print(nilai_flex4);
  Serial1.print(",");
nilai_flex5 = muxValues[5];
  Serial1.print(nilai_flex5);
  Serial1.print(",");
nilai_flex6 = muxValues[6];
  Serial1.print(nilai_flex6);
  Serial1.print(",");
nilai_flex7 = muxValues[15];
  Serial1.print(nilai_flex7);
```

```
    Serial1.print(",");
nilai_flex8 = muxValues[8];
    Serial1.print(nilai_flex8);

    Serial1.print(",");
nilai_flex9 = muxValues[9];
    Serial1.println(nilai_flex9);

    // display captured data
    displayData();

}
```