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APPENDIX

Lampiran 1. Rencana Kerja

SCHEDULE PROGRESS PROJECT

No.	Description		Week1	Week2	Week3	Week4	Week5	Week6	Week7	Week8	Week9	Week10	Week11	Week12	Week13	Week14	Week15	Week16
1	Introduction Course	Plan	■															
		Actual	√															
2	Menentukan Tema	Plan		■	■													
		Actual		√	√													
3	Membuat Porposal	Plan				■	■											
		Actual				√	√											
4	Membuat Projek	Plan				■	■	■	■	■	■	■	■					
		Actual				√	√	√	√	√	√	√	√					
5	Uji Coba Alat Project	Plan												■	■			
		Actual												√	√			
6	Membuat Laporan Akhir	Plan														■	■	
		Actual														√	√	
7	Presentasi Akhir	Plan																■
		Actual																√

Lampiran 2. Datasheet Sensor LDR

RS Data Sheet

Light dependent resistors

NORP12 RS stock number 651-507
NSL19-M51 RS stock number 596-141

Two cadmium sulphide (cdS) photoconductive cells with spectral responses similar to that of the human eye. The cell resistance falls with increasing light intensity. Applications include smoke detection, automatic lighting control, batch counting and burglar alarm systems.

Guide to source illuminations

Light source	Illumination (Lux)
Moonlight	0.1
60W bulb at 1m	50
1W MES bulb at 0.1m	100
Fluorescent lighting	500
Bright sunlight	30,000

Circuit symbol

Light memory characteristics

Light dependent resistors have a particular property in that they remember the lighting conditions in which they have been stored. This memory effect can be minimised by storing the LDRs in light prior to use. Light storage reduces equilibrium time to reach steady resistance values.

NORP12 (RS stock no. 651-507)

Absolute maximum ratings

Voltage, ac or dc peak	320V
Current	75mA
Power dissipation at 30°C	250mW
Operating temperature range	-60°C to +75°C

Electrical characteristics

T_A = 25°C. 2854°K tungsten light source

Parameter	Conditions	Min.	Typ.	Max.	Units
Cell resistance	1000 lux 10 lux	- -	400 9	- -	Ω kΩ
Dark resistance	-	1.0	-	-	MΩ
Dark capacitance	-	-	3.5	-	pF
Rise time 1	1000 lux 10 lux	- -	2.8 18	- -	ms ms
Fall time 2	1000 lux 10 lux	- -	48 120	- -	ms ms

1. Dark to 110% R_L
2. To 10 × R_L
R_L = photocell resistance under given illumination.

Features

- Wide spectral response
- Low cost
- Wide ambient temperature range.

Dimensions

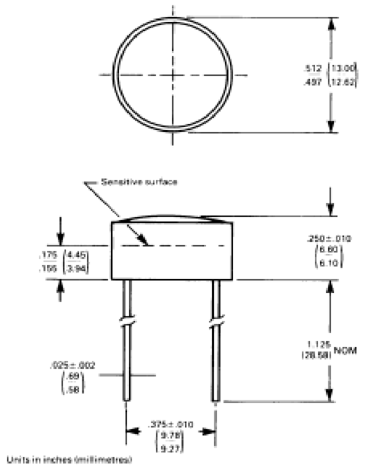


Figure 1 **Power dissipation derating**

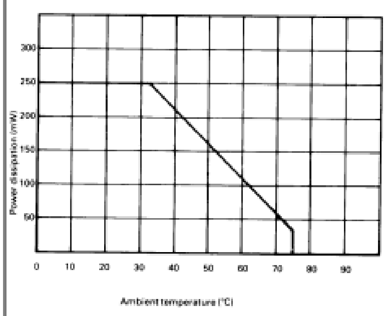
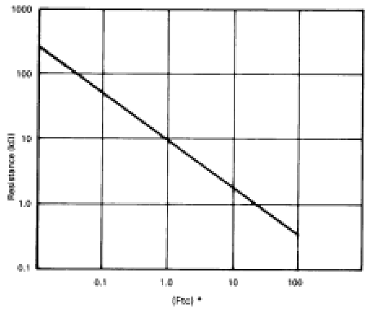
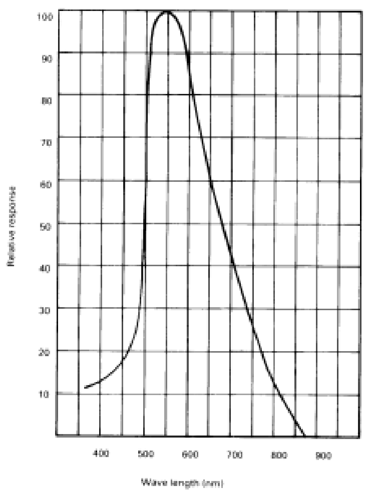


Figure 3 **Resistance as a function of illumination**



*1Ftc=10.764 lumens

Figure 2 **Spectral response**



Absolute maximum ratings

Voltage, ac or dc peak ________________________ 100V
Current _________________________________ 5mA
Power dissipation at 25°C ___________________ 50mW*
Operating temperature range __________ -25°C +75°C

***Derate linearly from 50mW at 25°C to 0W at 75°C.**

Electrical characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Cell resistance	10 lux 100 lux	20 -	- 5	100 -	kΩ kΩ
Dark resistance	10 lux after 10 sec	20	-	-	MΩ
Spectral response	-	-	550	-	nm
Rise time	10ftc	-	45	-	ms
Fall time	10ftc	-	55	-	ms

Dimensions

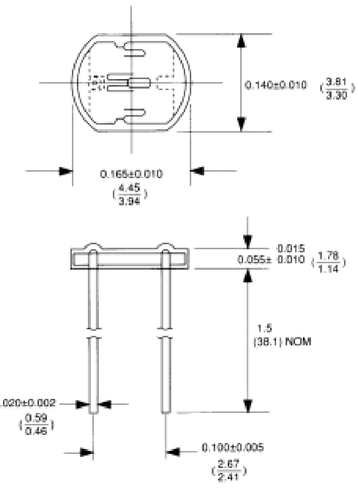


Figure 4 **Resistance as a function illumination**

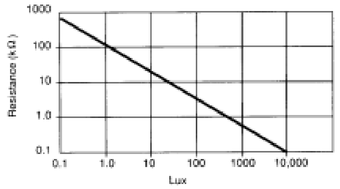
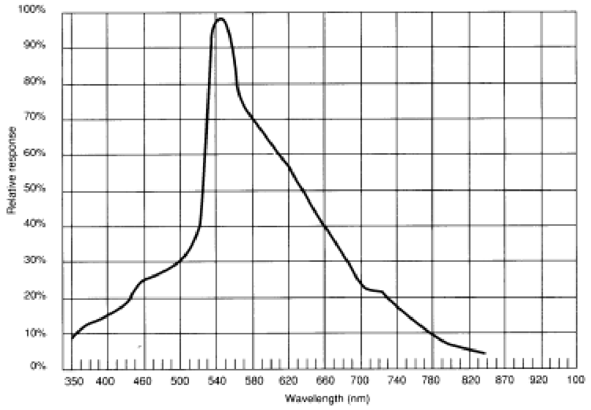
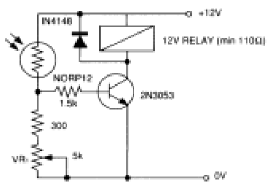


Figure 5 **Spectral response**



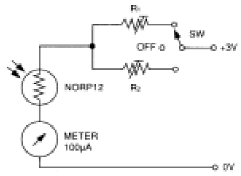
Typical application circuits

Figure 6 **Sensitive light operated relay**



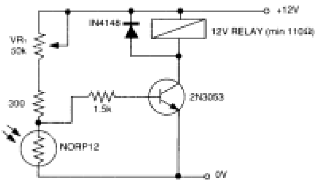
Relay energised when light level increases above the level set by VR_1

Figure 9 **Logarithmic law photographic light meter**



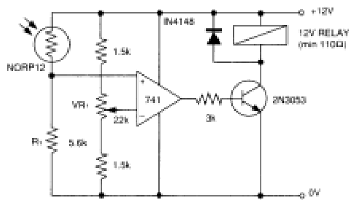
Typical value $R^1 = 100k\Omega$
$R^2 = 200k\Omega$ preset to give two overlapping ranges.
(Calibration should be made against an accurate meter.)

Figure 7 **Light interruption detector**



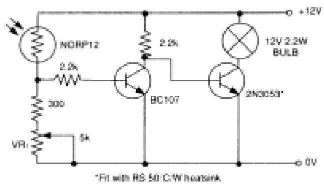
As Figure 6 relay energised when light level drops below the level set by VR_1

Figure 10 **Extremely sensitive light operated relay**



(Relay energised when light exceeds preset level.)
Incorporates a balancing bridge and op-amp. R_1 and NORP12 may be interchanged for the reverse function.

Figure 8 **Automatic light circuit**



Adjust turn-on point with VR_1

RS Components, PO Box 99, Corby, Northants, NN17 9RS
An Electrocomponents Company
Telephone: 01536 201234

Lampiran 3. Datasheet Raindrop Sensor

VAISALA www.vaisala.com

Yl-83 Rain Detector

Vaisala YL-83 Rain Detector

Rain and snow are quickly and accurately detected with the YL-83 Rain Detector. The YL-83 operates via droplet detection rather than by signal level threshold.

A special delay circuitry allows about two-minute interval between raindrops before assuming an OFF (no rain) position. This enables the sensor to accurately distinguish between rain cessation and light rain.

The YL-83 also features an analog Rain Signal for estimating rain intensity. Since this signal is proportional to the percentage of moist or wet area on the sensor plate, rain intensity has a direct impact on the amplitude and variation of this analog signal.

The YL-83 sensor is positioned at a 30° angle. This design, together with the internal heating element, ensures that the surface dries quickly, an essential factor in calculating intensity. The same heating element also protects the surface from fog and condensed moisture, and is activated at low temperatures in order to melt snow, thus allowing snow detection. Sensor performance is not affected by reasonable amounts of dirt and dust due to droplet detection.

It is intended to be used in areas with only rain or wet/moist snow precipitation.

Features/Benefits

- Fast and accurate precipitation detection (ON/OFF)
- Rain intensity measurement with processing unit
- Maintenance free
- Heating element for keeping sensor free of snow and condensed moisture, and for quick drying

Technical Data

Sensor

Capacitive principle, thick layer sensor
RainCap™ with a thin glass shield. Integrated heater element.

Sensitivity of Rain Detection

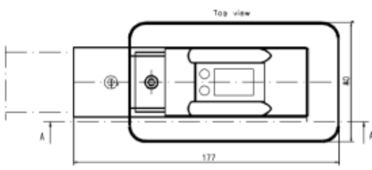
Minimum wet area	0.05 cm²
OFF-delay (active)	< 5 min

Physical

Sensor plate	
Sensing area	7.2 cm²
Angle	30°
Housing material	Polypropylene
Windshield and support bracket	Aluminum
Moisture shield	Polyurethane
Dimensions	(h × w × l)
With wind shield	110 × 80 × 175 mm
Without wind shield	90 × 46 × 157 mm
Weight	500 g
Cable length	4 m

Electrical

Supply voltage	12 VDC ± 10 %
Supply current	
Typical less than	150 mA
Maximum	260 mA
Heater OFF	25 mA
Sensor plate	
Heating power	0.5 ... 2.3 W



Output

Rain ON/OFF	
Open collector, active low signal corresponds to rain	
Maximum voltage	15 V
Maximum current	50 mA
Analog output	1...3 V (wet...dry)
Frequency output	1500...6000 Hz, non-calibrated

Input

Control to switch heater OFF	
Open circuit input enables the heater.	
Connection to GND disables the heater.	
Contact rating min.	15 V, 2 mA

Ground Wiring

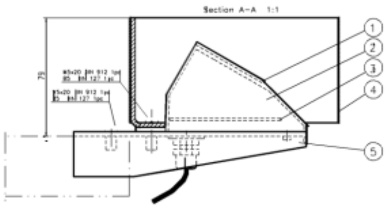
Separate ground wires for signal and heater

Temperature Range

Operating	-15...+55 °C (+5...+131 °F)
Storage	-40...+65 °C (-40...+149 °F)

Mounting

By one screw (M5 x 20 mm) to sensor arm



1. *Sensor, RainCap™*
2. *Polyurethane moisture shield*
3. *Component assembly*
4. *Wind shield*
5. *Mounting plate*

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CE

Lampiran 4. Harga Bahan Pembuatan Alat

No	Nama Barang	jumlah	Harga
1	Motor Driver ULN2003	1 Pcs	Rp 25,000
2	Arduino Nano + Kabel USB	1 Pcs	Rp 95,000
3	Lampu LED	1 Pcs	Rp 5,000
4	Stepper Motor 28BYJ-48	1 Pcs	Rp 20,000
5	Rain Drop Sensor	1 Pcs	Rp 15,000
6	Sensor LDR	1 Pcs	Rp 10,000
7	Kabel Male-Female	1 Set	Rp 26,000
8	Saklar Kecil	1 Pcs	Rp 4,000
9	Akrilik fullset	1 Set	Rp 85,000
10	Pulley + Hidler Pulley GT2	1 Set	Rp 70,000
11	Bahan Support (Timah dan Lem)	1 Lot	Rp 20,000
12	Baterai 6V	1 Pcs	Rp 81,000
13	Modul Bluetooth	1 Pcs	Rp 35,000
Jumlah			Rp 491,000

Lampiran 5. Program Coding

```
#include <SoftwareSerial.h>
SoftwareSerial BTSerial(3, 2);
#include <AccelStepper.h>
#define motorPin1 8
#define motorPin2 9
#define motorPin3 10
#define motorPin4 11
#define MotorInterfaceType 8
#define Home 4

int int_cahaya = A7;
int air = A6;
int stopper2 = A5;
int stopper1 = A4;
//String inval;

AccelStepper stepper = AccelStepper(MotorInterfaceType, motorPin1, motorPin3,
motorPin2, motorPin4);
const int bawah = 0;
const int atas = 1024;

void setup() {
  int val = 0;
  pinMode(int_cahaya, INPUT);
  pinMode(air, INPUT);
  pinMode(stopper1, INPUT_PULLUP);
  pinMode(stopper2, INPUT);
  pinMode(Home, OUTPUT);
  stepper.setMaxSpeed(900);
```

```
stepper.setAcceleration(800);
//  BTSerial.setTimeout(10);
BTSerial.begin(9600);
Serial.begin(115200);
digitalWrite(Home, LOW);
//  digitalWrite(Home, HIGH);
val = analogRead(stopper1);
delay(1);
val = analogRead(stopper1);
delay(1);
val = analogRead(stopper1);
delay(1);
Serial.print("val = ");
Serial.println(val);
if (val > 45) {
  int count = 0;
  //Serial.print("val = ");
  //Serial.println(val);
  //    //Serial.println("Homing !!");
  while (val > 615) {
    count++;
    if (count >= 10000) {
      count = 0;
    } // //Serial.print("H val = ");  //Serial.println(val);}
    //      //Serial.println("Homing !!");
    val = analogRead(stopper1);
    stepper.setSpeed(900);
    stepper.runSpeed();
  }
  Serial.print("val = ");
  Serial.println(val  );
```

```
    stepper.setCurrentPosition(0);
  }

  digitalWrite(Home, HIGH);
  //  Serial.print("HOMING DONE val = ");
  //  Serial.println(val);
}

void loop() {

  int sensor_air = analogRead(air);
  int sensor_cahaya = analogRead(int_cahaya);
  String inval;

  if (BTSerial.available()) {
    inval = BTSerial.read();
    //    Serial.println(inval);
    //  Serial.write(BTSerial.read());
    if ( inval == "254") { //Hujan
      //      Serial.println(inval);
      //      Serial.println("Pos 0 (Hujan)");
      stepper.runToNewPosition(0);
    }
    else if (inval == "238") { //cerah
      //      Serial.println(inval);
      //      Serial.println("Pos 1 (Cerah)");
      stepper.runToNewPosition(-24000);
    }
  }
  else {
    //    Serial.print("Hujan :");
```

```
    //    Serial.print(sensor_air);
    //    Serial.print("\tCerah :");
    //    Serial.println(sensor_cahaya);
    if (sensor_air <= 800) {
      //      Serial.println("Pos 0 (Hujan)");
      stepper.runToNewPosition(0);
    }
    else if ((sensor_air >= 800) && (sensor_cahaya <= 800)) { //cerah
      //      Serial.println("Pos 1 (Cerah)");
      stepper.runToNewPosition(-24000);
    }
    delay(1000);
  }
}
```