

Tabel 1. Karakteristik Potensiometer Putaran Kedua

No	Sudut (derajat)	Teori (K <sup>o</sup> )	Praktik (K <sup>o</sup> )	Error (%)
0	0	45,00	45,50	1,10
1	10	44,86	45,30	0,97
2	20	44,72	45,10	0,84
3	30	44,58	45,00	0,93
4	40	44,44	44,90	1,02
5	50	44,30	44,80	1,12
6	60	44,16	44,70	1,21
7	70	44,02	44,60	1,30
8	80	43,88	44,50	1,39
9	90	43,74	44,40	1,49
10	100	43,60	44,20	1,36
11	110	43,46	44,10	1,45
12	120	43,32	44,00	1,55
13	130	43,18	43,90	1,64
14	140	43,04	43,80	1,74
15	150	42,90	43,70	1,83
16	160	42,76	43,50	1,70
17	170	42,62	43,30	1,57
18	180	42,48	43,00	1,21
19	190	42,34	42,90	1,31
20	200	42,20	42,80	1,40
21	210	42,06	42,60	1,27
22	220	41,92	42,40	1,13
23	230	41,78	42,30	1,23
24	240	41,64	42,20	1,33
25	250	41,50	42,00	1,19
26	260	41,36	41,90	1,29
27	270	41,22	41,80	1,39
28	280	41,08	41,60	1,25
29	290	40,94	41,50	1,35
30	300	40,80	41,30	1,21
31	310	40,66	41,20	1,31
32	320	40,52	41,10	1,41
33	330	40,38	41,00	1,51
34	340	40,24	39,80	1,11
35	350	40,10	39,70	1,01
36	360	40,00	39,50	1,27

Tabel 2. Karakteristik Potensiometer Putaran Ketiga

No	Sudut (derajat)	Teori (K )	Praktik (K )	Error (%)
0	0	40,00	39,50	1,27
1	10	39,86	39,30	1,42
2	20	39,72	39,10	1,59
3	30	39,58	39,00	1,49
4	40	39,44	38,90	1,39
5	50	39,30	38,80	1,29
6	60	39,16	38,70	1,19
7	70	39,02	38,60	1,09
8	80	38,88	38,50	0,99
9	90	38,74	38,40	0,89
10	100	38,60	38,30	0,78
11	110	38,46	38,20	0,68
12	120	38,32	38,00	0,84
13	130	38,18	37,90	0,74
14	140	38,04	37,70	0,90
15	150	37,90	37,60	0,80
16	160	37,76	37,50	0,69
17	170	37,62	37,30	0,86
18	180	37,48	37,00	1,30
19	190	37,34	36,90	1,19
20	200	37,20	36,70	1,36
21	210	37,06	36,50	1,53
22	220	36,92	36,40	1,43
23	230	36,78	36,30	1,32
24	240	36,64	36,20	1,22
25	250	36,50	36,00	1,39
26	260	36,36	35,90	1,28
27	270	36,22	35,80	1,17
28	280	36,08	35,70	1,06
29	290	35,94	35,50	1,24
30	300	35,80	35,30	1,42
31	310	35,66	35,10	1,60
32	320	35,52	35,00	1,49
33	330	35,38	34,90	1,38
34	340	35,24	34,80	1,26
35	350	35,10	34,70	1,15
36	360	35,00	34,50	1,45

Tabel 3. Karakteristik Potensiometer Putaran keempat

No	Sudut (derajat)	Teori (K $\Omega$ )	Praktik (K $\Omega$ )	Error (%)
0	0	35,00	34,50	1,45
1	10	34,86	34,30	1,63
2	20	34,72	34,20	1,52
3	30	34,58	34,10	1,41
4	40	34,44	34,00	1,29
5	50	34,30	33,90	1,18
6	60	34,16	33,80	1,07
7	70	34,02	33,60	1,25
8	80	33,88	33,50	1,13
9	90	33,74	33,40	1,02
10	100	33,60	33,30	0,90
11	110	33,46	33,10	1,09
12	120	33,32	33,00	0,97
13	130	33,18	32,90	0,85
14	140	33,04	33,70	1,96
15	150	32,90	33,60	2,08
16	160	32,76	33,40	1,92
17	170	32,62	33,30	2,04
18	180	32,48	33,10	1,87
19	190	32,34	32,90	1,70
20	200	32,20	32,80	1,83
21	210	32,06	32,70	1,96
22	220	31,92	32,50	1,78
23	230	31,78	32,40	1,91
24	240	31,64	32,30	2,04
25	250	31,50	32,00	1,56
26	260	31,36	31,80	1,38
27	270	31,22	31,70	1,51
28	280	31,08	31,60	1,65
29	290	30,94	31,40	1,46
30	300	30,80	31,20	1,28
31	310	30,66	31,10	1,41
32	320	30,52	31,00	1,55
33	330	30,38	29,80	1,95
34	340	30,24	29,70	1,82
35	350	30,10	29,50	2,03
36	360	30,00	29,40	2,04

Tabel 4. Karakteristik Potensiometer Putaran Kelima

No	Sudut (derajat)	Teori (K )	Praktik (K )	Error (%)
0	0	30,00	29,40	2,04
1	10	29,86	29,20	2,26
2	20	29,72	29,10	2,13
3	30	29,58	29,00	2,00
4	40	29,44	28,90	1,87
5	50	29,30	28,80	1,74
6	60	29,16	28,70	1,60
7	70	29,02	28,50	1,82
8	80	28,88	28,40	1,69
9	90	28,74	28,20	1,91
10	100	28,60	28,10	1,78
11	110	28,46	28,00	1,64
12	120	28,32	27,90	1,51
13	130	28,18	27,80	1,37
14	140	28,04	27,70	1,23
15	150	27,90	27,60	1,09
16	160	27,76	27,50	0,95
17	170	27,62	27,30	1,17
18	180	27,48	27,10	1,40
19	190	27,34	27,00	1,26
20	200	27,20	26,90	1,12
21	210	27,06	26,70	1,35
22	220	26,92	26,60	1,20
23	230	26,78	26,40	1,44
24	240	26,64	26,30	1,29
25	250	26,50	26,20	1,15
26	260	26,36	26,10	1,00
27	270	26,22	26,00	0,85
28	280	26,08	25,80	1,09
29	290	25,94	25,70	0,93
30	300	25,80	25,60	0,78
31	310	25,66	25,50	0,63
32	320	25,52	25,30	0,87
33	330	25,38	25,20	0,71
34	340	25,24	25,10	0,56
35	350	25,10	25,00	0,40
36	360	25,00	24,80	0,81

Tabel 5. Karakteristik Potensiometer Putaran Keenam

No	Sudut (derajat)	Teori (K $\Omega$ )	Praktik (K $\Omega$ )	Error (%)
0	0	25,00	24,80	0,81
1	10	24,86	24,70	0,65
2	20	24,72	24,50	0,90
3	30	24,58	24,30	1,15
4	40	24,44	24,10	1,41
5	50	24,30	24,00	1,25
6	60	24,16	23,90	1,09
7	70	24,02	23,80	0,92
8	80	23,88	23,70	0,76
9	90	23,74	23,60	0,59
10	100	23,60	23,50	0,43
11	110	23,46	23,40	0,26
12	120	23,32	23,30	0,09
13	130	23,18	23,20	0,09
14	140	23,04	23,10	0,26
15	150	22,90	23,00	0,43
16	160	22,76	22,90	0,61
17	170	22,62	22,80	0,79
18	180	22,48	22,70	0,97
19	190	22,34	22,60	1,15
20	200	22,20	22,40	0,89
21	210	22,06	22,30	1,08
22	220	21,92	22,10	0,81
23	230	21,78	22,00	1,00
24	240	21,64	21,80	0,73
25	250	21,50	21,70	0,92
26	260	21,36	21,60	1,11
27	270	21,22	21,50	1,30
28	280	21,08	21,40	1,50
29	290	20,94	21,20	1,23
30	300	20,80	21,10	1,42
31	310	20,66	21,00	1,62
32	320	20,52	20,80	1,35
33	330	20,38	20,70	1,55
34	340	20,24	20,60	1,75
35	350	20,10	20,50	1,95
36	360	20,00	20,40	1,96

Tabel 6. Karakteristik Potensiometer Putaran Ketujuh

No	Sudut (derajat)	Teori (K )	Praktik (K )	Error (%)
0	0	20,00	20,40	1,96
1	10	19,86	20,30	2,17
2	20	19,72	20,20	2,38
3	30	19,58	20,00	2,10
4	40	19,44	19,80	1,82
5	50	19,30	19,70	2,03
6	60	19,16	19,60	2,24
7	70	19,02	19,50	2,46
8	80	18,88	19,40	2,68
9	90	18,74	19,30	2,90
10	100	18,60	19,20	3,12
11	110	18,46	19,10	3,35
12	120	18,32	19,00	3,58
13	130	18,18	18,90	3,81
14	140	18,04	18,70	3,53
15	150	17,90	18,60	3,76
16	160	17,76	18,50	4,00
17	170	17,62	18,40	4,24
18	180	17,48	18,30	4,48
19	190	17,34	18,20	4,73
20	200	17,20	18,10	4,97
21	210	17,06	18,00	5,22
22	220	16,92	17,90	5,47
23	230	16,78	17,80	5,73
24	240	16,64	17,70	5,99
25	250	16,50	17,60	6,25
26	260	16,36	17,40	5,98
27	270	16,22	17,30	6,24
28	280	16,08	17,00	5,41
29	290	15,94	16,90	5,68
30	300	15,80	16,70	5,39
31	310	15,66	16,60	5,66
32	320	15,52	16,50	5,94
33	330	15,38	16,30	5,64
34	340	15,24	16,10	5,34
35	350	15,10	16,00	5,63
36	360	15,00	15,90	5,66

Tabel 7. Karakteristik Potensiometer Putaran Kedelapan

No	Sudut (derajat)	Teori (K )	Praktik (K )	Error (%)
0	0	15,00	15,90	5,66
1	10	14,86	15,70	5,35
2	20	14,72	15,60	5,64
3	30	14,58	15,40	5,32
4	40	14,44	15,30	5,62
5	50	14,30	15,20	5,92
6	60	14,16	15,00	5,60
7	70	14,02	14,90	5,91
8	80	13,88	14,70	5,58
9	90	13,74	14,60	5,89
10	100	13,60	14,40	5,56
11	110	13,46	14,20	5,21
12	120	13,32	14,10	5,53
13	130	13,18	14,00	5,86
14	140	13,04	13,80	5,51
15	150	12,90	13,70	5,84
16	160	12,76	13,50	5,48
17	170	12,62	13,40	5,82
18	180	12,48	13,30	6,17
19	190	12,34	13,20	6,52
20	200	12,20	13,10	6,87
21	210	12,06	12,90	6,51
22	220	11,92	12,80	6,88
23	230	11,78	12,60	6,51
24	240	11,64	12,50	6,88
25	250	11,50	12,40	7,26
26	260	11,36	12,20	6,89
27	270	11,22	12,10	7,27
28	280	11,08	12,00	7,67
29	290	10,94	11,90	8,07
30	300	10,80	11,70	7,69
31	310	10,66	11,60	8,10
32	320	10,52	11,50	8,52
33	330	10,38	11,40	8,95
34	340	10,24	11,30	9,38
35	350	10,10	11,10	9,01
36	360	10,00	11,00	9,09

Tbel 8. Karakteristik Potensiometer Putaran Kesembilan

No	Sudut (derajat)	Teori (K )	Praktik (K )	Error (%)
0	0	10,00	11,00	9,09
1	10	9,86	10,80	8,70
2	20	9,72	10,60	8,30
3	30	9,58	10,40	7,88
4	40	9,44	10,10	6,53
5	50	9,30	10,00	7,00
6	60	9,16	9,80	6,53
7	70	9,02	9,50	5,05
8	80	8,88	9,40	5,53
9	90	8,74	9,20	5,00
10	100	8,60	9,00	4,44
11	110	8,46	8,70	2,76
12	120	8,32	8,60	3,26
13	130	8,18	8,50	3,76
14	140	8,04	8,40	4,29
15	150	7,90	8,10	2,47
16	160	7,76	8,00	3,00
17	170	7,62	7,80	2,31
18	180	7,48	7,50	0,27
19	190	7,34	7,30	0,55
20	200	7,20	7,20	0,00
21	210	7,06	7,10	0,56
22	220	6,92	7,00	1,14
23	230	6,78	6,70	1,19
24	240	6,64	6,60	0,61
25	250	6,50	6,50	0,00
26	260	6,36	6,30	0,95
27	270	6,22	6,10	1,97
28	280	6,08	6,00	1,33
29	290	5,94	5,90	0,68
30	300	5,80	5,70	1,75
31	310	5,66	5,60	1,07
32	320	5,52	5,50	0,36
33	330	5,38	5,40	0,37
34	340	5,24	5,30	1,13
35	350	5,10	5,20	1,92
36	360	5,00	5,10	1,96



Tabel 9. Karakteristik Potensiometer Putaran Kesepuluh

No	Sudut (derajat)	Teori (K <sup>2</sup> )	Praktik (K <sup>2</sup> )	Error (%)
0	0	5,00	5,10	1,96
1	10	4,86	5,00	2,80
2	20	4,72	4,80	1,67
3	30	4,58	4,60	0,43
4	40	4,44	4,50	1,33
5	50	4,30	4,40	2,27
6	60	4,16	4,20	0,95
7	70	4,02	4,10	1,95
8	80	3,88	4,00	3,00
9	90	3,74	3,90	4,10
10	100	3,60	3,70	2,70
11	110	3,46	3,60	3,89
12	120	3,32	3,50	5,14
13	130	3,18	3,40	6,47
14	140	3,04	3,30	7,88
15	150	2,90	3,20	9,38
16	160	2,76	3,10	10,97
17	170	2,62	3,00	12,67
18	180	2,48	2,90	14,48
19	190	2,34	2,80	16,43
20	200	2,20	2,70	18,52
21	210	2,06	2,60	20,77
22	220	1,92	2,50	23,20
23	230	1,78	2,40	25,83
24	240	1,64	2,30	28,70
25	250	1,50	2,20	31,82
26	260	1,36	1,00	36,00
27	270	1,22	0,90	35,56
28	280	1,08	0,80	35,00
29	290	0,94	0,70	34,29
30	300	0,80	0,60	33,33
31	310	0,66	0,50	32,00
32	320	0,52	0,40	30,00
33	330	0,38	0,30	26,67
34	340	0,24	0,20	20,00
35	350	0,10	0,10	0,00
36	360	0,00	0,00	0,00

```

#include <mega32.h>
#include <ff.h>
#include <sdcard.h>
#include <delay.h>
#include <alcd.h>
#include <stdlib.h>
#include <stdio.h>

// I2C Bus functions
#asm
    .equ __i2c_port=0x15 ;PORTC
    .equ __sda_bit=1
    .equ __scl_bit=0
#endasm
#include <i2c.h>
#include <ds1307.h>

// Declare your global variables here
//=====
/* Timer1 overflow interrupt frequency [Hz] */
#define T1_OVF_FREQ 100
/* Timer1 clock prescaler value */
#define T1_PRESC 1024L
/* Timer1 initialization value after overflow */
#define T1_INIT (0x10000L-
(_MCU_CLOCK_FREQUENCY_/((T1_PRESC*T1_OVF_FREQ)))
// ADC VREF VCC
#define ADC_VREF_TYPE 0x40

/* FAT function result */
FRESULT res;
/* number of bytes written/read to the file */
unsigned int nbytes;
/* will hold the information for logical drive 0: */
FATFS fat;
/* will hold the file information */
FIL file;
/* will hold file attributes, time stamp information */
FILINFO finfo;

char buffer[100];
char filename[30];

unsigned char buf[16];
unsigned char hour[3];
unsigned char minute[3];
unsigned char second[3];
unsigned char date[3];

```

```

unsigned char month[3];
unsigned char year[3];

unsigned char status_tulis,status_create,h, m, s, d, mo, y;
unsigned int panjangdatammc,x,z;
float data_jarak;

int data1,data2,data3;

#define hp "085767077599"

//=====
unsigned int read_adc(unsigned char adc_input)
{
  ADMUX=adc_input | (ADC_VREF_TYPE & 0xff);
  ADCSRA|=0x40;
  while ((ADCSRA & 0x10)==0);
  ADCSRA|=0x10;
  return ADCW;
}

interrupt [TIM1_OVF] void timer_comp_isr(void)
{
  TCNT1H=T1_INIT>>8;
  TCNT1L=T1_INIT&0xFF;
  disk_timerproc();
}

void timer_mmc()
{
  //TIMER
  TCCR1A=0x00;
  TCCR1B=(1<<CS12)|(1<<CS10);
  TCNT1H=T1_INIT>>8;
  TCNT1L=T1_INIT&0xFF;
  TIMSK=1<<TOIE1;
}

void stop_timer_mmc()
{
  //TIMER
  TCCR1A=0x00;
  TCCR1B=0;
  TCNT1H=T1_INIT>>8;
  TCNT1L=T1_INIT&0xFF;
  TIMSK&=~(1<<TOIE1);
}

```

```

void error(FRESULT res)
{
    if ((res>=FR_DISK_ERR) && (res<=FR_TIMEOUT))
    {
        //poutput=USART1;
        //printf("ERROR: %p\r\n",error_msg[res]);
    }
}

void display_status(char *file_name)
{
    if ((res=f_stat(file_name,&finfo))==FR_OK)
    {
    }
}
//=====
void inisialisasi_fat(void)
{
    timer_mmc();
    for(;;)
    {
        if ((res=f_mount(0,&fat))==FR_OK)
        {
            break;
        }
        else
        {
            error(res);
        }
    }
    stop_timer_mmc();
}

void reset_filename(void)
{
    unsigned char i_reset;
    for(i_reset=0;i_reset<30;i_reset++)
    {
        filename[i_reset]=0;
    }
}
//=====
===
void file_data_ukur(void)
{
    filename[0]='0';
}

```

```
filename[1]=':';  
filename[2]='D';  
filename[3]='a';  
filename[4]='t';  
filename[5]='a';  
filename[6]=':';  
filename[7]='t';  
filename[8]='x';  
filename[9]='t';  
}
```

```
void file_baru(void)  
{  
    unsigned char ulang;  
    status_create=0;  
    for(ulang=0;ulang<10;ulang++)  
    {  
        reset_filename();  
        file_data_ukur();  
        timer_mmc();  
  
        if  
((res=f_open(&file,filename,FA_CREATE_NEW))==FR_OK)status_create=1;  
        else status_create=0;  
  
        if(status_create==1)  
        {  
            if ((res=f_close(&file))==FR_OK)status_create=1;  
            else status_create=0;  
        }  
  
        if(status_create==1)break;  
  
    }  
    stop_timer_mmc();  
}
```

```
void isi_file(void)  
{  
    unsigned ulang;  
    status_tulis=0;  
  
    reset_filename();  
    file_data_ukur();  
    display_status(filename);
```

```

for(ulang=0;ulang<10;ulang++)
{
    timer_mmc();
    if ((res=f_open(&file,filename,FA_WRITE))==FR_OK)status_tulis=1;
    else status_tulis=0;

    if(status_tulis==1)
    {
        if ((res=f_lseek(&file,finfo.fsize))==FR_OK)status_tulis=1;
        else status_tulis=0;
    }

    if(status_tulis==1)
    {
        if
((res=f_write(&file,buffer,panjangdatammc+1,&nbytes))==FR_OK)status_tulis=1
;
        else status_tulis=0;
    }

    if(status_tulis==1)
    {
        if ((res=f_close(&file))==FR_OK)status_tulis=1;
        else status_tulis=0;
    }

    if(status_tulis==1)break;
    delay_ms(500);
}
stop_timer_mmc();
}

void header1()
{
    panjangdatammc=0;
    buffer[panjangdatammc]=' ';
    panjangdatammc++;
    buffer[panjangdatammc]=' ';
    panjangdatammc++;
    buffer[panjangdatammc]='W';
    panjangdatammc++;
    buffer[panjangdatammc]='A';
    panjangdatammc++;
    buffer[panjangdatammc]='K';
    panjangdatammc++;
    buffer[panjangdatammc]='T';
    panjangdatammc++;
    buffer[panjangdatammc]='U';
}

```

```
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;
```

```
buffer[panjangdatammc]='T';  
panjangdatammc++;  
buffer[panjangdatammc]='A';  
panjangdatammc++;  
buffer[panjangdatammc]='N';  
panjangdatammc++;  
buffer[panjangdatammc]='G';  
panjangdatammc++;  
buffer[panjangdatammc]='G';  
panjangdatammc++;  
buffer[panjangdatammc]='A';  
panjangdatammc++;  
buffer[panjangdatammc]='L';  
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;
```

```
buffer[panjangdatammc]=' '  
panjangdatammc++;  
buffer[panjangdatammc]=' '  
panjangdatammc++;  
buffer[panjangdatammc]='J';  
panjangdatammc++;  
buffer[panjangdatammc]='A';  
panjangdatammc++;  
buffer[panjangdatammc]='R';  
panjangdatammc++;  
buffer[panjangdatammc]='A';  
panjangdatammc++;  
buffer[panjangdatammc]='K';  
panjangdatammc++;
```

```

    buffer[panjangdatammc]=' ';
    panjangdatammc++;
    buffer[panjangdatammc]='R';
    panjangdatammc++;
    buffer[panjangdatammc]='E';
    panjangdatammc++;
    buffer[panjangdatammc]='L';
    panjangdatammc++;
    buffer[panjangdatammc]=' ';
    panjangdatammc++;
    buffer[panjangdatammc]='(';
    panjangdatammc++;
    buffer[panjangdatammc]='m';
    panjangdatammc++;
    buffer[panjangdatammc]='m';
    panjangdatammc++;
    buffer[panjangdatammc]=')';
    panjangdatammc++;

    buffer[panjangdatammc]=13;
    panjangdatammc++;
    buffer[panjangdatammc]=10;
}

```

```

void header2()
{
    panjangdatammc=0;
    buffer[panjangdatammc]='=';
    panjangdatammc++;
    buffer[panjangdatammc]='=';
    panjangdatammc++;
    buffer[panjangdatammc]='=';
    panjangdatammc++;
    buffer[panjangdatammc]='=';
    panjangdatammc++;
    buffer[panjangdatammc]='=';
    panjangdatammc++;
    buffer[panjangdatammc]='=';
    panjangdatammc++;
    buffer[panjangdatammc]='=';
    panjangdatammc++;
    buffer[panjangdatammc]='=';
    panjangdatammc++;

    buffer[panjangdatammc]='=';
    panjangdatammc++;

    buffer[panjangdatammc]='=';

```







```
buffer[panjangdatammc]=date[0];
panjangdatammc++;
buffer[panjangdatammc]=date[1];
panjangdatammc++;
buffer[panjangdatammc]='/';
panjangdatammc++;
buffer[panjangdatammc]=month[0];
panjangdatammc++;
buffer[panjangdatammc]=month[1];
panjangdatammc++;
buffer[panjangdatammc]='/';
panjangdatammc++;
buffer[panjangdatammc]=year[0];
panjangdatammc++;
buffer[panjangdatammc]=year[1];
panjangdatammc++;
```

```
buffer[panjangdatammc]=' ';
panjangdatammc++;
buffer[panjangdatammc]=' ';
panjangdatammc++;
buffer[panjangdatammc]=' ';
panjangdatammc++;
buffer[panjangdatammc]=' ';
panjangdatammc++;
buffer[panjangdatammc]=' ';
panjangdatammc++;
buffer[panjangdatammc]=' ';
panjangdatammc++;
buffer[panjangdatammc]=' ';
panjangdatammc++;
buffer[panjangdatammc]=' ';
```

```
buffer[panjangdatammc]=buf[0];
panjangdatammc++;
buffer[panjangdatammc]=buf[1];
panjangdatammc++;
buffer[panjangdatammc]=buf[2];
panjangdatammc++;
buffer[panjangdatammc]=buf[3];
panjangdatammc++;
buffer[panjangdatammc]=buf[4];
panjangdatammc++;
buffer[panjangdatammc]=buf[5];
panjangdatammc++;
buffer[panjangdatammc]=buf[6];
panjangdatammc++;
```

```
    buffer[panjangdatammc]=13;
    panjangdatammc++;
    buffer[panjangdatammc]=10;
}
```

### **Program untuk LCD**

```
void sukses()
{
PORTC.7=0;
delay_ms(100);
PORTC.7=1;
}

void welcome()
{
lcd_gotoxy(0,0);
lcd_putsf(" Tugas Akhir");
delay_ms(2000);
lcd_clear();

lcd_gotoxy(0,0);
lcd_putsf(" YULIANA");
lcd_gotoxy(0,1);
lcd_putsf(" SETIARINI");
delay_ms(3000);
lcd_clear();

lcd_gotoxy(0,0);
lcd_putsf("NPM : 0817041063");
lcd_gotoxy(0,1);
lcd_putsf(" FAKULTAS MIPA");
delay_ms(3000);
lcd_clear();

lcd_gotoxy(0,0);
lcd_putsf(" JURUSAN FISIKA");
lcd_gotoxy(0,1);
lcd_putsf(" UNIV. LAMPUNG");
delay_ms(3000);
lcd_clear();
}
```

### Program untuk SMS Gateway

```

void send_sms()
{
//lcd_clear();
//lcd_gotoxy(0,0);
//lcd_putsf("Mengirim SMS");
printf("AT+CMGS=");
putchar("");
printf(hp);
putchar("");
putchar(',');
putchar(13);
putchar(10);
printf("%d:%d:%d %d/%d/%d %0.2f mm",h,m,s,d,mo,y,data_jarak);
putchar(26);
delay_ms(1000);
}

void main(void)
{
DDRC=0b11000000;
PORTC=0b11000000;

i2c_init();
rtc_init(0,0,0);

UCSRA=0x00;
UCSRB=0x18;
UCSRC=0x06;
UBRRH=0x00;
UBRRL=0x4D;

TCCR1A=0x00;
TCCR1B=(1<<CS12)|(1<<CS10);
TCNT1H=T1_INIT>>8;
TCNT1L=T1_INIT&0xFF;
TIMSK=1<<TOIE1;
ADMUX=ADC_VREF_TYPE & 0xff;
ADCSRA=0x84;
SFIOR&=0xEF;
#asm("sei")

lcd_init(16);
lcd_gotoxy(0,0);
lcd_putsf("Inisialisasi...");
delay_ms(3000);

```

```

inisialisasi_fat();
file_baru();
delay_ms(1000);

header2();
isi_file();
header1();
isi_file();
header2();
isi_file();
delay_ms(1000);
sukses();

lcd_clear();
welcome();

while (1)
{
    x++;
    z++;

    data1=read_adc(0);
    data2=read_adc(1);
    data3=data1-data2;

    data_jarak =(data3*0.5)+1060;
    sprintf(buf,"%0.2f ",data_jarak);

    rtc_get_time(&h,&m,&s); // mengakses jam
    rtc_get_date(&d,&mo,&y); //mengakses tanggal
    sprintf(hour,"%d",h);
    sprintf(minute,"%d",m);
    sprintf(second,"%d",s);
    sprintf(date,"%d",d);
    sprintf(month,"%d",mo);
    sprintf(year,"%d",y);

    lcd_gotoxy(0,0);
    lcd_putsf("JARAK REL KERETA");
    lcd_gotoxy(3,1);
    lcd_puts(buf);
    lcd_gotoxy(11,1);
    lcd_putsf("mm");

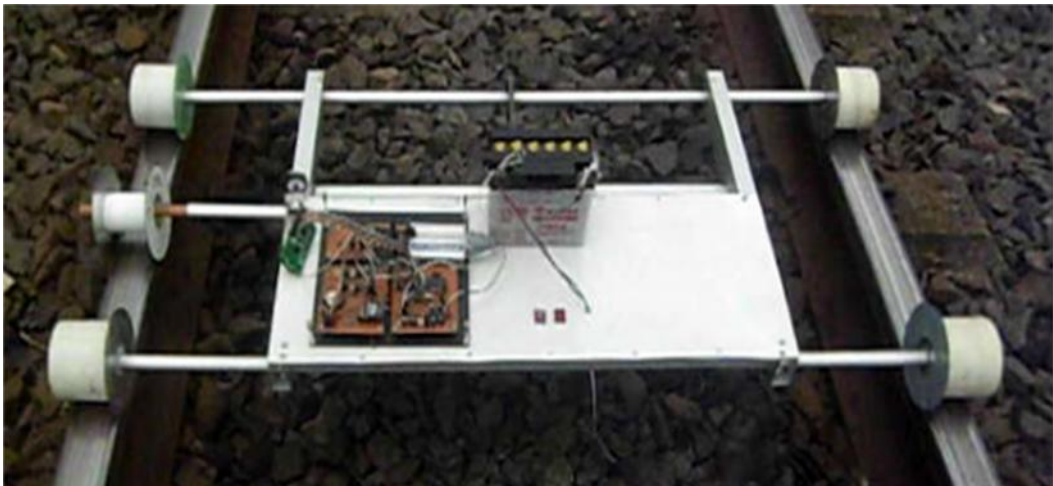
    if(x>=500) // Tulis ke microSD
    {
        x=0;
    }
}

```

```
data();
isi_file();
delay_ms(1000);
sukses();
}

if(z>=2000) // Kirim SMS
{
z=0;
send_sms();
delay_ms(1000);
sukses();
delay_ms(500);
sukses();
}

delay_ms(10);
}
}
```



Gambar 1. Alat pendeteksi pergeseran rel keseluruhan

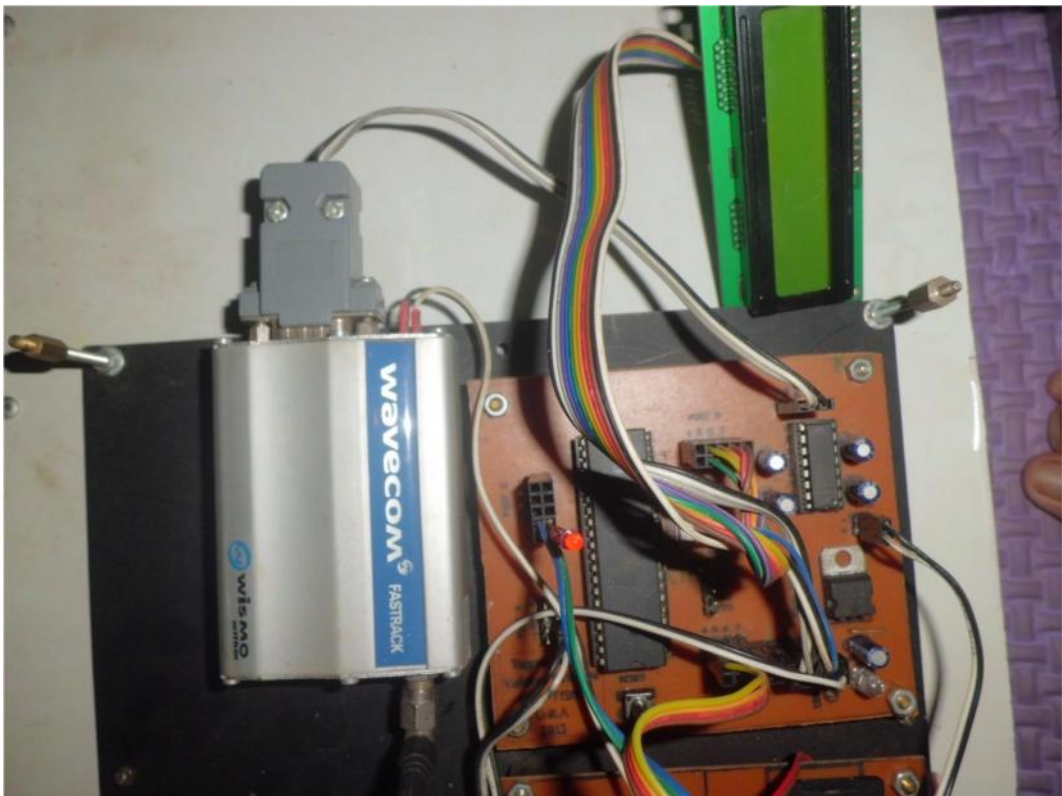


Gambar 2. Rangkaian elektronika keseluruhan





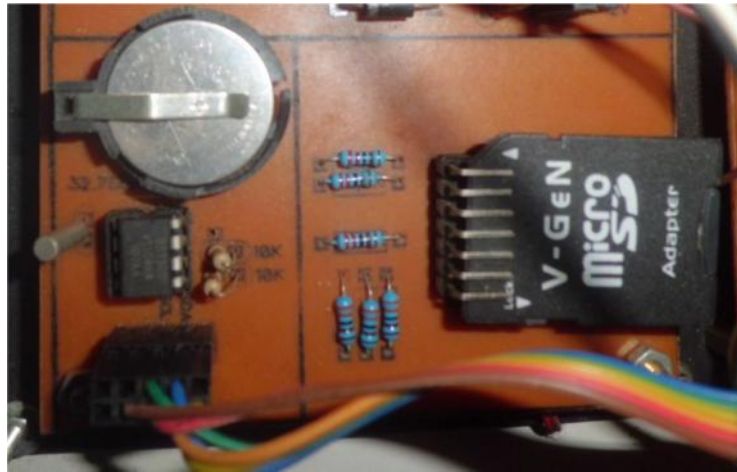
Gambar 3. Rangkaian Pengkondisi Sinyal



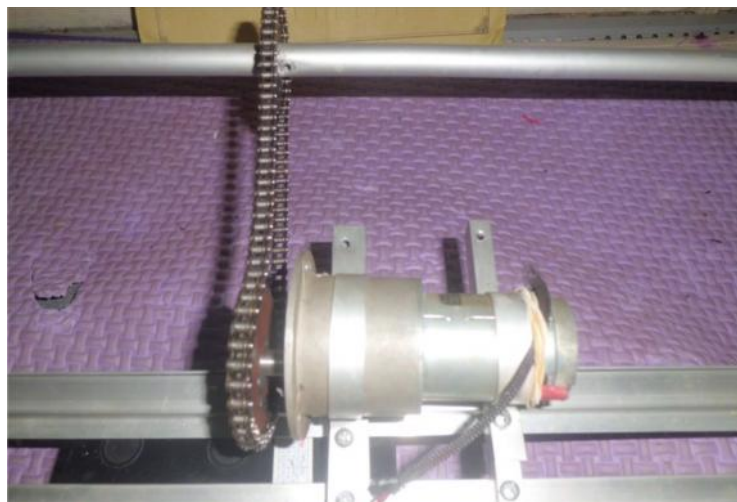
Gambar 4. Rangkaian modem Wavecom dan RS232



Gambar 5. Rangkaian Catu Daya



Gambar 6. Rangkaian Micro SD dan RTC



Gambar 7. Mekanik untuk motor DC

