

LAMPIRAN

1. Listing Program

```
/*
ic : ATmega8
*/

#include <mega8.h>
#include <stdio.h>
#include <delay.h>

// Alphanumeric LCD functions
#include <alcd.h>

#define ADC_VREF_TYPE 0x40

#define relay      PORTB.0
#define dtout     PORTB.1
#define dtin      PINB.2
#define button    PINC.5
#define signal    PORTB.3

char buffer[33];

int peka0=800;
int peka1=800;
int peka2=800;

// Read the AD conversion result
unsigned int read_adc(unsigned char adc_input)
{
ADMUX=adc_input | (ADC_VREF_TYPE & 0xff);
// Delay needed for the stabilization of the ADC input voltage
delay_us(10);
// Start the AD conversion
ADCSRA|=0x40;
// Wait for the AD conversion to complete
while ((ADCSRA & 0x10)==0);
ADCSRA|=0x10;
return ADCW;
}

// Declare your global variables here

void uji_sensor(){
```

```

lcd_clear();
lcd_gotoxy(0,0);
sprintf(buffer,"%d",read_adc(0));
lcd_puts(buffer);
lcd_gotoxy(8,0);
sprintf(buffer,"%d",read_adc(1));
lcd_puts(buffer);
lcd_gotoxy(0,1);
sprintf(buffer,"%d",read_adc(2));
lcd_puts(buffer);
lcd_gotoxy(8,1);
sprintf(buffer,"%d %d %d",dtin,dtout,button);
lcd_puts(buffer);
dtout=button;

delay_ms(100);
}

void go_program(){
int time=0;
int adc1,adc2,adc3;
// start awal
while(1){
lcd_clear();
lcd_gotoxy(0,0);
lcd_putsf("Tekan SEND");
lcd_gotoxy(0,1);
lcd_putsf("Untuk Mengirim");

// mulai mengirim karir
if( button == 0 ) {
break;
}

// jika dapat perintah menerima
if(dtin == 0) time++;
else time = 0;
if(dtin == 0 && time >= 30) goto terima;

delay_ms(100);
}

// monitor pengiriman karir
dtout=0; // kirim perintah mengaktifkan vacum ke kontroller
penerima
lcd_clear();
while(1){

```

```

adc1=read_adc(0);
adc2=read_adc(1);
adc3=read_adc(2);

lcd_gotoxy(0,0);
lcd_putsf("Pengirim: ");
lcd_gotoxy(10,0);
if( adc1 < peka0 ) lcd_putsf(">");
lcd_gotoxy(11,0);
if( adc2 < peka1 ) lcd_putsf(">");
lcd_gotoxy(12,0);
if( adc3 < peka2 ) lcd_putsf(">");
lcd_gotoxy(0,1);
lcd_putsf("Status: ");

// terima kode
if(dtin == 0) {

dtout=1; // stop perintah
lcd_putsf("Diterima");
while(1)
{
signal = 1;
delay_ms(1000);
signal = 0; // led / buzer on
delay_ms(500);
}; // stop
}
else {
lcd_gotoxy(8,1);
lcd_putsf("Mengirim");

}

}

terima:
// menerima karir
relay = 1; // vacum on
signal = 1;
delay_ms(1000);
signal = 0; // led / buzer on
lcd_clear();
while(1){
adc1=read_adc(0);
adc2=read_adc(1);
adc3=read_adc(2);

```

```

if( button == 0 ) signal = 0; // led / buzzer off

lcd_gotoxy(0,0);
lcd_putsf("Penerima: ");
lcd_gotoxy(10,0);
if( adc1 < peka0 ) lcd_putsf("<");
lcd_gotoxy(11,0);
if( adc2 < peka1 ) lcd_putsf("<");
lcd_gotoxy(12,0);
if( adc3 < peka2 ) lcd_putsf("<");
lcd_gotoxy(0,1);
lcd_putsf("Status: ");

if( adc1 < peka0 ) {
lcd_gotoxy(8,1);
lcd_putsf("Datang ");
dtout = 0; // kirim kode bahwa karir dah di terima
relay = 0; // vacum off
signal = 1; // led / buzzer on
delay_ms(1000);
dtout = 1;
while(1);
signal = 1;
delay_ms (100);
signal = 0; //led / buzzer on
delay_ms(100);
} // stop

else {
lcd_gotoxy(8,1);
lcd_putsf("Menunggu");
}

}

void main(void)
{
// Declare your local variables here

// Input/Output Ports initialization
// Port B initialization
// Func7=In Func6=In Func5=In Func4=In Func3=Out Func2=In
Func1=Out Func0=Out

```

```
// State7=T State6=T State5=T State4=T State3=0 State2=P State1=0
State0=0

PORTB=0x04;
DDRB=0x0B;

// Port C initialization
// Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In Func0=In
// State6=T State5=P State4=T State3=T State2=T State1=T State0=T
PORTC=0x20;
DDRC=0x00;

// Port D initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In
Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T
State0=T
PORTD=0x00;
DDRD=0x00;

// Timer/Counter 0 initialization
// Clock source: System Clock
// Clock value: Timer 0 Stopped
TCCR0=0x00;
TCNT0=0x00;

// Timer/Counter 1 initialization
// Clock source: System Clock
// Clock value: Timer1 Stopped
// Mode: Normal top=0xFFFF
// OC1A output: Discon.
// OC1B output: Discon.
// Noise Canceler: Off
// Input Capture on Falling Edge
// Timer1 Overflow Interrupt: Off
// Input Capture Interrupt: Off
// Compare A Match Interrupt: Off
// Compare B Match Interrupt: Off
TCCR1A=0x00;
TCCR1B=0x00;
TCNT1H=0x00;
TCNT1L=0x00;
ICR1H=0x00;
ICR1L=0x00;
OCR1AH=0x00;
OCR1AL=0x00;
```

```
OCR1BH=0x00;
OCR1BL=0x00;

// Timer/Counter 2 initialization
// Clock source: System Clock
// Clock value: Timer2 Stopped
// Mode: Normal top=0xFF
// OC2 output: Disconnected
ASSR=0x00;
TCCR2=0x00;
TCNT2=0x00;
OCR2=0x00;

// External Interrupt(s) initialization
// INT0: Off
// INT1: Off
MCUCR=0x00;

// Timer(s)/Counter(s) Interrupt(s) initialization
TIMSK=0x00;

// USART initialization
// USART disabled
UCSRB=0x00;

// Analog Comparator initialization
// Analog Comparator: Off
// Analog Comparator Input Capture by Timer/Counter 1: Off
ACSR=0x80;
SFIOR=0x00;

// ADC initialization
// ADC Clock frequency: 1000,000 kHz
// ADC Voltage Reference: AVCC pin
ADMUX=ADC_VREF_TYPE & 0xff;
ADCSRA=0x84;

// SPI initialization
// SPI disabled
SPCR=0x00;

// TWI initialization
// TWI disabled
TWCR=0x00;

// Alphanumeric LCD initialization
// Connections are specified in the
```

```

// Project|Configure|C Compiler|Libraries|Alphanumeric LCD menu:
// RS - PORTD Bit 0
// RD - PORTD Bit 7
// EN - PORTD Bit 1
// D4 - PORTD Bit 2
// D5 - PORTD Bit 3
// D6 - PORTD Bit 4
// D7 - PORTD Bit 5
// Characters/line: 16
lcd_init(16);
dtout=1;
lcd_clear();
lcd_gotoxy(0,0);
lcd_putsf("By Padma");
lcd_gotoxy(0,1);
lcd_putsf("Start Go...");

delay_ms(1000);

while (1)
{
    // Place your code here

    go_program();

    //uji_sensor();

}
}

```

2. Hasil Pengukuran

a. Darah 5 ml

Pengukuran ke- (n)	Hasil Pengukuran (detik)
1	01,68
2	01,90
3	01,81
4	01,63
5	01,89
6	01,73
7	01,94
8	01,87
9	01,92
10	01,91
11	01,71

12	01,81
13	01,86
14	01,85
15	01,84
16	01,82
17	01,87
18	01,96
19	01,72
20	01,88
Jumlah	36,66
Rata- rata	1,833

a) Jumlah.

$$01.68+ 01.90+ 01.81+ 01.63+ 01.89+ 01.73+ 01.94+ 01.87+ 01.92+ 01.91+ 01.77+ 01.81+ 01.86+ 01.85+ 01.84+ 01.82+ 01.87+ 01.96+ 01.72+ 01.88= 36,66$$

b) Rata – Rata (\bar{X}) = $\frac{\sum Xi}{n}$

$$= 36,66/ 20$$

$$= 1,833$$

c) Kecepatan (v) = s/ t

$$= 5m/ 1,833s$$

$$= 2,72 \text{ m/s}$$

b. Darah 10 ml

Pengukuran ke- (n)	Hasil Pengukuran (detik)
1	02,04
2	01,78
3	01,96
4	01,94
5	02,18
6	01,98
7	02,04
8	02,15
9	01,90
10	02,21
11	01,82
12	01,95
13	02,32
14	02,05
15	02,42

16	01,82
17	01,86
18	02,01
19	01,99
20	02,12
Jumlah	40,54
Rata- rata	2,027

a) Jumlah.

$$02.04+ 01.78+ 01.96+ 01.94+ 02.18+ 01.98+ 02.04+ 02.15+ 01.90+ 02.21+ 01.82+ 01.95+ 02.32+ 02.05+ 02.42+ 01.82+ 01.86+ 02.01+ 01.99+ 02.12=40,54$$

b) Rata – Rata (\bar{X}) = $\frac{\sum Xi}{n}$

$$= 40,54/ 20$$

$$= 2,027$$

c) Kecepatan (v) = s/ t

$$= 5m/ 2,027s$$

$$= 2,46 \text{ m/s}$$

c. Urine 20 ml

Pengukuran ke- (n)	Hasil Pengukuran (detik)
1	02,14
2	02,27
3	02,26
4	02,06
5	02,29
6	02,20
7	02,26
8	01,99
9	02,03
10	02,18
11	02,30
12	02,15
13	02,17
14	02,04
15	01,84
16	02,55
17	02,21
18	02,21
19	02,34

20	02,26
Jumlah	43,75
Rata- rata	2,1875

a) Jumlah.

$$02.14+ 02.27+ 02.26+ 02.06+ 02.99+ 02.20+ 02.26+ 01.99+ 02.03+ 02.18+ 02.30+ 02.15+ 02.17+ 02.04+ 01.84+ 02.55+ 02.21+ 02.21+ 02.34+ 02.26= 43,75$$

b) Rata – Rata (\bar{X}) = $\frac{\Sigma Xi}{n}$

$$= 43,75/ 20$$

$$= 2,1875$$

c) Kecepatan (v) = s/ t

$$= 5m/ 2,187s$$

$$= 2,28 \text{ m/s}$$

d. Urine 30 ml

Pengukuran ke- (n)	Hasil Pengukuran (detik)
1	02,26
2	02,59
3	02,22
4	02,54
5	02,40
6	02,12
7	02,10
8	02,06
9	02,15
10	02,09
11	02,12
12	02,24
13	02,08
14	02,10
15	02,20
16	02,17
17	02,16
18	02,23
19	02,10
20	02,31
Jumlah	44,24
Rata- rata	2,212

a) Jumlah.

$$02.26+ 02.59+ 02.22+ 02.54+ 02.40+ 02.12+ 02.10+ 02.06+ 02.15+ 02.09+ 02.12+ 02.24+ 02.08+ 02.10+ 02.20+ 02.17+ 02.16+ 02.23+ 02.10+ 02.31= 44,24$$

b) Rata – Rata (\bar{X}) = $\frac{\Sigma Xi}{n}$

$$= 44,24/ 20$$
$$= 2,212$$

c) Kecepatan (v) = s/ t

$$= 5m/ 2,212s$$
$$= 2,26 \text{ m/s}$$

e. Urine 40 ml

Pengukuran ke- (n)	Hasil Pengukuran (detik)
1	02,16
2	02,25
3	02,69
4	02,39
5	02,70
6	02,53
7	02,22
8	02,49
9	02,38
10	02,45
11	02,27
12	02,47
13	02,29
14	02,37
15	02,27
16	02,23
17	02,40
18	02,32
19	02,41
20	02,49
Jumlah	47,78
Rata- rata	2,389

a) Jumlah.

$$02.16+ 02.25+ 02.69+ 02.39+ 02.70+ 02.53+ 02.22+ 02.49+ 02.38+ 02.45+ 02.27+ 02.47+ 02.29+ 02.37+ 02.27+ 02.23+ 02.40+ 02.32+ 02.41+ 02.49= 47,78$$

b) **Rata – Rata** (\bar{X}) = $\frac{\Sigma Xi}{n}$

$$= 47,78/ 20$$

$$= 2,389$$

c) **Kecepatan (v)** = s/ t

$$= 5m/ 2,389s$$

$$= 2,09m/s$$

f. Urine 50 ml

Pengukuran ke- (n)	Hasil Pengukuran (detik)
1	02,84
2	02,80
3	02,54
4	02,98
5	02,59
6	02,52
7	02,82
8	02,45
9	02,63
10	02,11
11	02,72
12	02,47
13	03,12
14	02,64
15	02,64
16	02,57
17	02,52
18	02,56
19	02,59
20	02,61
Jumlah	50,08
Rata- rata	2,504

a) Jumlah.

$$02.84+ 02.80+ 02.54+ 02.98+ 02.59+ 02.52+ 02.82+ 02.45+ 02.63+ 02.11+ 02.72+ 02.47+ 03.12+ 02.64+ 02.64+ 02.57+ 02.52+ 02.56+ 02.59+ 02.61= 50,08$$

b) Rata – Rata (\bar{X}) = $\frac{\Sigma Xi}{n}$

$$= 50,08 / 20$$
$$= 2,504$$

c) Kecepatan (v) = s / t

$$= 5\text{m} / 2,504\text{s}$$
$$= 1,99 \text{ m/s}$$

3. Gambar Alat



Tampilan LCD di ruang pengirim ketika *carrier* sudah sampai di ruang penerima.



Tampilan LCD di ruang penerima ketika *carrier* datang.



Proses Pengambilan Data



Gambar Alat Simulasi *Pneumatic Tube* Sebagai Alat Pengirim Sampel Berbasis *Atmega8*



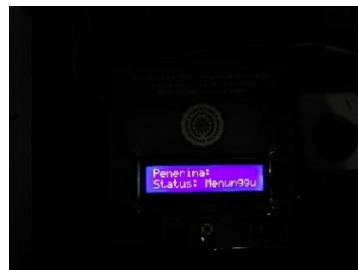
Proses Penimbangan Sampel



Proses Penimbangan Sampel



Tampilan di LCD apabila akan mengirim *carrier*.



Tampilan di ruang penerima apabila *carrier* sedang berjalan.