

LAMPIRAN

Tabel time per beat atau percobaan pertama

Tempo	time/beat	output osiloskop	Tempo	time/beat	output osiloskop
40	1500	1516	125	480	486
41	1463	1482	126	476	476
42	1429	1448	127	472	472
43	1395	1408	128	469	469
44	1364	1380	129	465	465
45	1333	1344	130	462	469
46	1304	1320	131	458	458
47	1277	1298	132	455	455
48	1250	1270	133	451	451
49	1224	1238	134	448	448
50	1200	1216	135	444	449
51	1176	1194	136	441	441
52	1154	1166	137	438	438
53	1132	1146	138	435	435
54	1111	1122	139	432	432
55	1091	1102	140	429	437
56	1071	1082	141	426	426
57	1053	1064	142	423	423
58	1034	1048	143	420	420
59	1017	1028	144	417	417
60	1000	1012	145	414	421
61	984	998	146	411	411
62	968	980	147	408	408
63	952	966	148	405	405
64	938	952	149	403	403
65	923	934	150	400	408
66	909	918	151	397	397
67	896	906	152	395	395
68	882	896	153	392	392
69	870	884	154	390	390
70	857	870	155	387	392
71	845	856	156	385	385
72	833	844	157	382	382
73	822	833	158	380	380
74	811	822	159	377	377
75	800	811	160	375	381
76	789	800	161	373	373
77	779	790	162	370	370
78	769	780	163	368	368
79	759	769	164	366	366
80	750	764	165	364	369
81	741	752	166	361	361

82	732	742
83	723	734
84	714	726
85	706	718
86	698	708
87	690	700
88	682	692
89	674	684
90	667	677
91	659	669
92	652	662
93	645	654
94	638	647
95	632	641
96	625	634
97	619	627
98	612	620
99	606	613
100	600	609
101	594	602
102	588	597
103	583	590
104	577	587
105	571	579
106	566	574
107	561	570
108	556	565
109	550	557
110	545	554
111	541	550
112	536	547
113	531	539
114	526	534
115	522	530
116	517	526
117	513	521
118	508	518
119	504	513
120	500	508
121	496	496
122	492	492
123	488	488
124	484	484

167	359	359
168	357	357
169	355	355
170	353	359
171	351	351
172	349	349
173	347	347
174	345	345
175	343	349
176	341	341
177	339	339
178	337	337
179	335	335
180	333	335
181	331	331
182	330	330
183	328	328
184	326	326
185	324	327
186	323	323
187	321	321
188	319	319
189	317	317
190	316	319
191	314	314
192	313	313
193	311	311
194	309	313
195	308	312
196	306	311
197	305	309
198	303	307
199	302	306
200	300	302
201	299	304
202	297	301
203	296	300
204	294	297
205	293	296
206	291	294
207	290	293
208	288	291

Tabel Pemanipulasian Data

Tempo	Time/beat (ms)	Input Percobaan Kedua (ms)	Hasil Output Osiloskop (ms)	Selisih I/O
40	1500	1484	1500	16
41	1463	1444	1463	19
42	1429	1410	1429	19
43	1395	1382	1395	13
44	1364	1348	1364	16
45	1333	1322	1333	11
46	1304	1288	1304	16
47	1277	1256	1277	21
48	1250	1230	1250	20
49	1224	1210	1224	14
50	1200	1184	1200	16
51	1176	1158	1176	18
52	1154	1142	1154	12
53	1132	1118	1132	14
54	1111	1100	1111	11
55	1091	1080	1091	11
56	1071	1060	1071	11
57	1053	1042	1053	11
58	1034	1020	1034	14
59	1017	1006	1017	11
60	1000	988	1000	12
61	984	970	984	14
62	968	956	968	12
63	952	938	952	14
64	938	924	938	14
65	923	912	923	11
66	909	900	909	9
67	896	886	896	10
68	882	868	882	14
69	870	856	870	14
70	857	844	857	13
71	845	834	845	11
72	833	822	833	11
73	822	811	822	11
74	811	800	811	11
75	800	789	800	11
76	789	778	789	11
77	779	768	779	11
78	769	758	769	11
79	759	749	759	10
80	750	736	750	14
81	741	730	741	11
82	732	722	732	10

83	723	712	723	11
84	714	702	714	12
85	706	694	706	12
86	698	688	698	10
87	690	680	690	10
88	682	672	682	10
89	674	664	674	10
90	667	657	667	10
91	659	649	659	10
92	652	642	652	10
93	645	636	645	9
94	638	629	638	9
95	632	623	632	9
96	625	616	625	9
97	619	611	619	8
98	612	604	612	8
99	606	599	606	7
100	600	591	600	9
101	594	586	594	8
102	588	579	588	9
103	583	576	583	7
104	577	567	577	10
105	571	563	571	8
106	566	558	566	8
107	561	552	561	9
108	556	547	556	9
109	550	543	550	7
110	545	536	545	9
111	541	532	541	9
112	536	525	536	11
113	531	523	531	8
114	526	518	526	8
115	522	514	522	8
116	517	508	517	9
117	513	505	513	8
118	508	498	508	10
119	504	495	504	9
120	500	492	500	8
121	496	489	496	7
122	492	485	492	7
123	488	480	488	8
124	484	477	484	7
125	480	474	480	6
126	476	470	476	6
127	472	465	472	7
128	469	463	469	6
129	465	459	465	6
130	462	455	462	7

131	458	451	458	7
132	455	448	455	7
133	451	445	451	6
134	448	442	448	6
135	444	439	444	5
136	441	436	441	5
137	438	432	438	6
138	435	430	435	5
139	432	427	432	5
140	429	421	429	8
141	426	418	426	8
142	423	416	423	7
143	420	412	420	8
144	417	410	417	7
145	414	407	414	7
146	411	404	411	7
147	408	401	408	7
148	405	398	405	7
149	403	396	403	7
150	400	392	400	8
151	397	390	397	7
152	395	388	395	7
153	392	385	392	7
154	390	383	390	7
155	387	382	387	5
156	385	380	385	5
157	382	376	382	6
158	380	376	380	4
159	377	371	377	6
160	375	369	375	6
161	373	367	373	6
162	370	364	370	6
163	368	362	368	6
164	366	360	366	6
165	364	359	364	5
166	361	355	361	6
167	359	353	359	6
168	357	351	357	6
169	355	349	355	6
170	353	347	353	6
171	351	345	351	6
172	349	343	349	6
173	347	341	347	6
174	345	339	345	6
175	343	337	343	6
176	341	336	341	5
177	339	334	339	5
178	337	333	337	4

179	335	331	335	4
180	333	331	333	2
181	331	328	331	3
182	330	327	330	3
183	328	325	328	3
184	326	323	326	3
185	324	321	324	3
186	323	320	323	3
187	321	318	321	3
188	319	316	319	3
189	317	314	317	3
190	316	313	316	3
191	314	311	314	3
192	313	310	313	3
193	311	308	311	3
194	309	305	309	4
195	308	304	308	4
196	306	301	306	5
197	305	301	305	4
198	303	299	303	4
199	302	298	302	4
200	300	298	300	2
201	299	294	299	5
202	297	293	297	4
203	296	292	296	4
204	294	291	294	3
205	293	290	293	3
206	291	288	291	3
207	290	287	290	3
208	288	285	288	3

Source Code

```
.*****  
,  
;costanta lcd  
;*****  
display_clear equ 01h  
funcset       equ 28h  
entrymodset   equ 06h  
dispon        equ 0ch  
cursor        equ 0eh  
blink         equ 0fh  
  
data_lcd      equ 30h  
ram_lcd       equ 31h  
t_rat         equ 32h  
t_pul         equ 33h  
t_sat         equ 34h  
count_t       equ 35h  
count_b       equ 36h  
tlowl         equ 37h  
tlowh         equ 38h  
ct            equ 39h  
  
fsw3          bit 20h.0  
  
org 0000h  
jmp start  
  
org 0003h  
jmp int_ex0  
  
org 0030h  
  
int_ex0:  
    setb fsw3  
    reti  
  
init_lcd:  
    mov a,#funcset  
    call controlout  
    mov a,#dispon  
    call controlout  
    mov a,#display_clear  
    call controlout  
    call dlylcd2
```

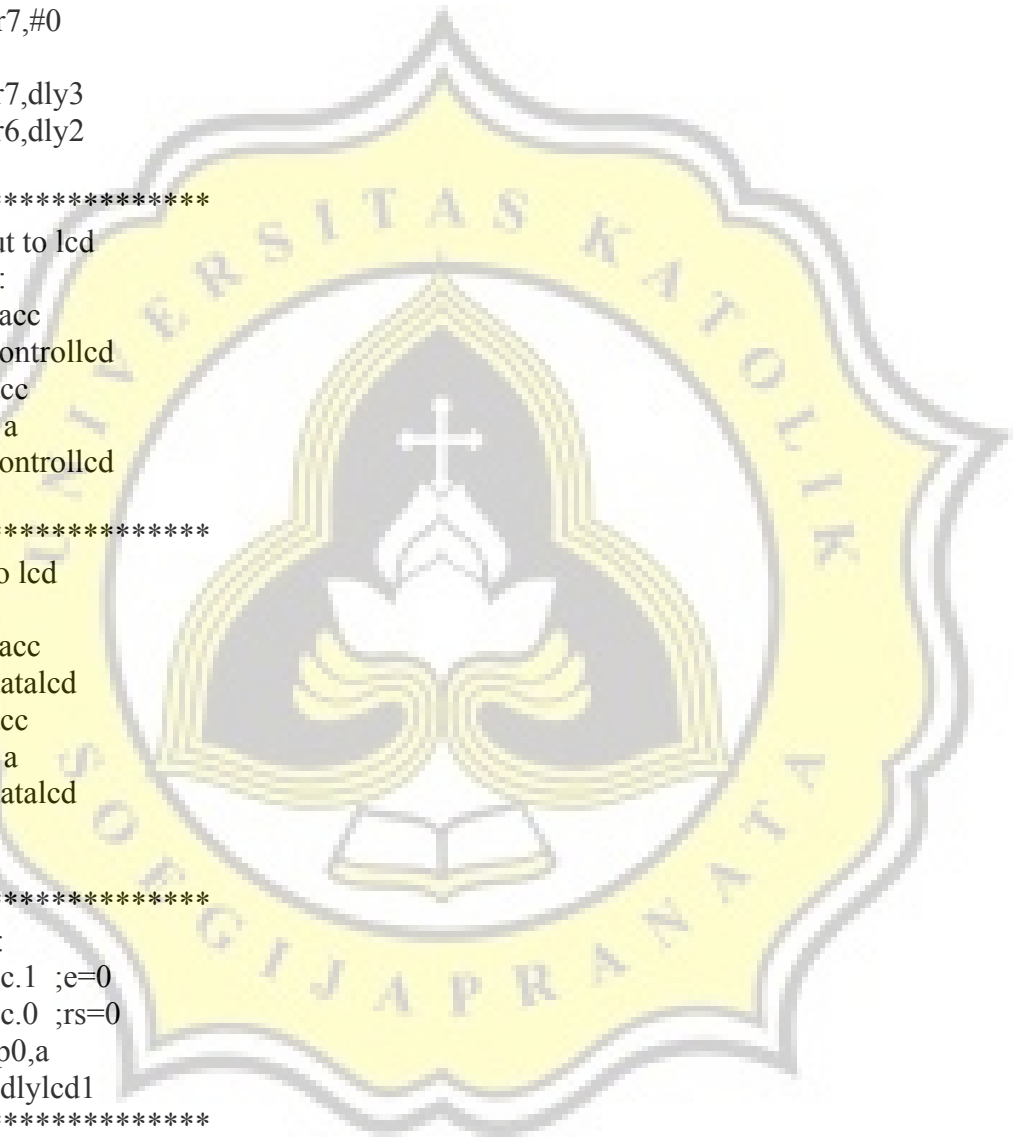
```

mov a,#entrymodset
call controlout
ret

;*****
dlylcd2:
mov r6,#40h
dly2:
mov r7,#0
dly3:
djnz r7,dly3
djnz r6,dly2
ret
;*****
;control out to lcd
controlout:
push acc
call controlled
pop acc
swap a
call controlled
ret
;*****
;data out to lcd
dataout:
push acc
call datalcd
pop acc
swap a
call datalcd
ret
;*****
controlled:
clr acc.1 ;e=0
clr acc.0 ;rs=0
mov p0,a
sjmp dlylcd1
;*****
datalcd:
clr acc.1 ;e=0
setb acc.0 ;rs=1
mov p0,a

dlylcd1:
setb p0.1 ;e=1

```




```

    mov r7,#250
    djnz r7,$
    clr p0.1 ;e=0
    ret
;*****
;line lcd
line2:
    mov a,#0c0h
    sjmp lineout
line1:
    mov a,#80h
lineout:
    call controlout
    ret
;*****
;tampilan karakter
tampilline2:
    call line2
    sjmp outchar
tampilline1:
    call line1
    sjmp outchar
tampilcharloop:
    call dataout
    inc dptr
outchar:
    clr a
    movc a,@a+dptr
    jnz tampilcharloop
    ret

tampilinram:
    clr a
    movc a,@a+dptr
    jz finish_send
    mov data_lcd,a
    call send_lcd
    inc dptr
    inc ram_lcd
    sjmp tampilinram
finish_send:
    ret

;*****
;set up lcd
setuplcd:

```

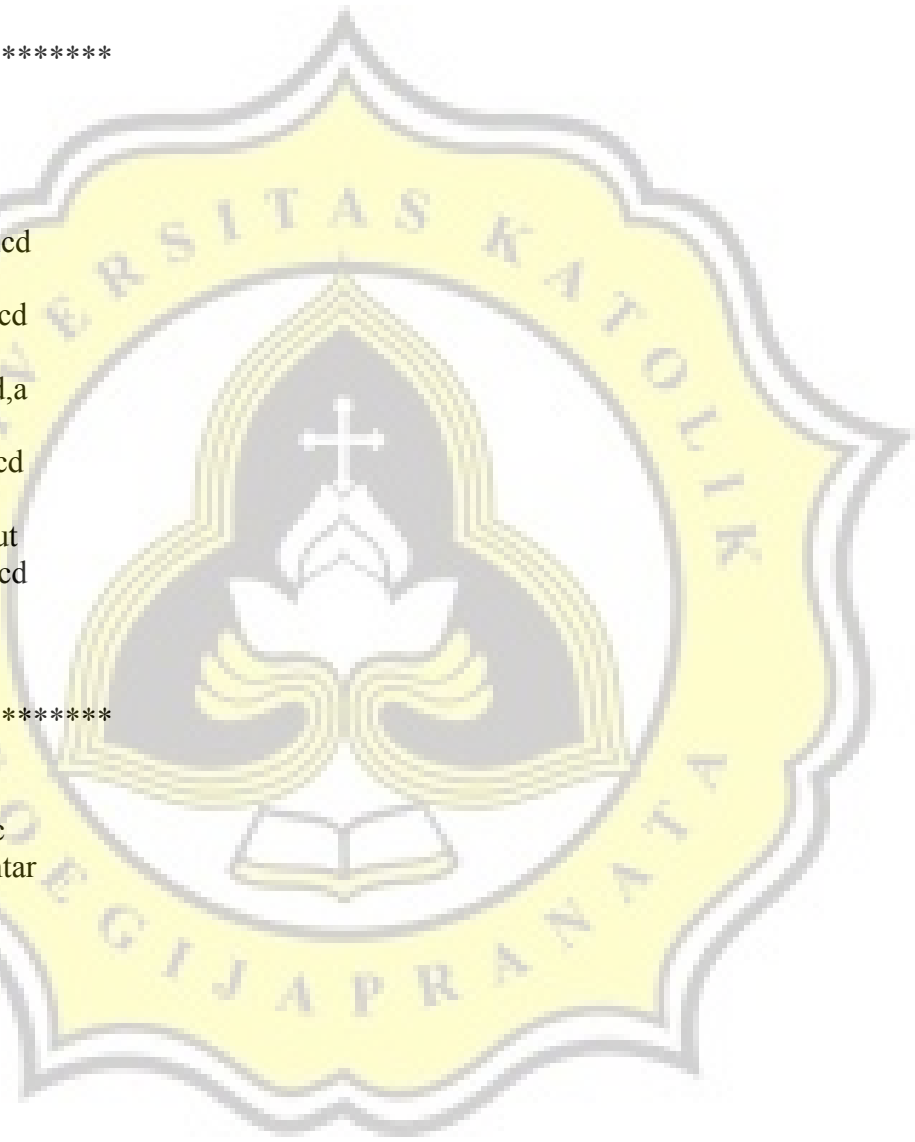


```

mov a,#03h
call controlout
mov r5,#2
call sebentar
mov a,#02h
call controlout
mov r5,#1
call sebentar
ret
;
;*****
;send to add lcd
send_lcd:
mov a,#9
clr c
subb a,data_lcd
jc sendtoram
mov a,data_lcd
orl a,#30h
mov data_lcd,a
sendtoram:
mov a,ram_lcd
orl a,#80h
call controlout
mov a,data_lcd
call dataout
ret
;
;*****
;delay time
sebentar:
call dlybounc
djnz r5,sebentar
ret
dlybounc:
mov r6,#100
loopb2:
mov r7,#250
loopb1:
nop
nop
nop
djnz r7,loopb1
djnz r6,loopb2
ret

```

sw3 equ p3.2



```

sw2 equ p3.3
sw1 equ p3.4

text_main1:
    db 'Setting:1.Tempo',0
text_main2:
    db '2.Beat 3.Start',0

text_set:
    db '1.(+)2.(-)3.Exit',0
text_set_beat:
    db 'Set Beat: ',0
text_set_tempo:
    db 'Set Tempo: ',0

disp_tempo:
    mov a,count_t
    mov b,#100
    div ab
    mov t_rat,a
    mov a,b
    mov b,#10
    div ab
    mov t_pul,a
    mov t_sat,b
    mov dptr,#text_set_tempo
    call tampilline2
    mov a,t_rat
    cjne a,#0,nbt1
    mov data_lcd,#' '
    call send_lcd
    mov a,t_pul
    cjne a,#0,nbt2
    mov data_lcd,#' '
    inc ram_lcd
    call send_lcd
    jmp nbt3
nbt1:
    mov data_lcd,t_rat
    call send_lcd
nbt2:
    mov data_lcd,t_pul
    inc ram_lcd
    call send_lcd
nbt3:
    mov data_lcd,t_sat

```



```
inc ram_lcd  
call send_lcd  
ret
```

```
disp_beat:  
mov a,count_b  
mov b,#100  
div ab  
mov t_rat,a  
mov a,b  
mov b,#10  
div ab  
mov t_pul,a  
mov t_sat,b  
mov dptr,#text_set_beat  
call tampilline2  
mov a,t_rat  
cjne a,#0,nbb1  
mov data_lcd,#'  
call send_lcd  
mov a,t_pul  
cjne a,#0,nbb2  
mov data_lcd,#'  
inc ram_lcd  
call send_lcd  
jmp nbt3
```

```
nbb1:  
mov data_lcd,t_rat  
call send_lcd
```

```
nbb2:  
mov data_lcd,t_pul  
inc ram_lcd  
call send_lcd
```

```
nbb3:  
mov data_lcd,t_sat  
inc ram_lcd  
call send_lcd  
ret
```

```
out_key:  
mov r5,#2  
call sebentar  
mov a,p3  
anl a,#00011100b  
cjne a,#00011100b,out_key  
mov r5,#3
```



```
call sebentar  
ret
```

```
set_tempo:  
call init_lcd  
mov dptr,#text_set  
call tampilline1
```

```
update:  
mov ram_lcd,#4bh  
call disp_tempo
```

```
cek_sw1t:  
jb sw1,cek_sw2t  
call out_key  
inc count_t  
mov a,count_t  
cjne a,#209,update  
mov count_t,#40  
jmp update
```

```
cek_sw2t:  
jb sw2,cek_sw3t  
call out_key  
dec count_t  
mov a,count_t  
cjne a,#39,update  
mov count_t,#208  
jmp update
```

```
cek_sw3t:  
jb sw3,cek_sw1t  
call out_key  
ret
```

```
set_beat:  
call init_lcd  
mov dptr,#text_set  
call tampilline1
```

```
updateb:  
mov ram_lcd,#4bh  
call disp_beat
```

```
cek_sw1b:  
jb sw1,cek_sw2b  
call out_key
```

```

inc count_b
mov a,count_b
cjne a,#7,updateb
mov count_b,#2
jmp updateb

```

```

cek_sw2b:
jb sw2,cek_sw3b
call out_key
dec count_b
mov a,count_b
cjne a,#0,updateb
mov count_b,#6
jmp updateb

```

```

cek_sw3b:
jb sw3,cek_sw1b
call out_key
ret

```

```

text_run1:
db 'Tempo :',0
text_run2:
db 'Beat :',0

```

```

disp_run:
call init_lcd
mov dptr,#text_run1
call tampilline1
mov ram_lcd,#08h
call disp_tempo
mov dptr,#text_run2
call tampilline2
mov ram_lcd,#48h
call disp_beat
ret

```

```

;-----menu program-----

```

```

main_menu:
call init_lcd
mov dptr,#text_main1
call tampilline1
mov dptr,#text_main2
call tampilline2

```

```

cek_sw1:

```



```

    jb sw1,cek_sw2
    call out_key
    call set_tempo
    jmp main_menu
cek_sw2:
    jb sw2,cek_sw3
    call out_key
    call set_beat
    jmp main_menu

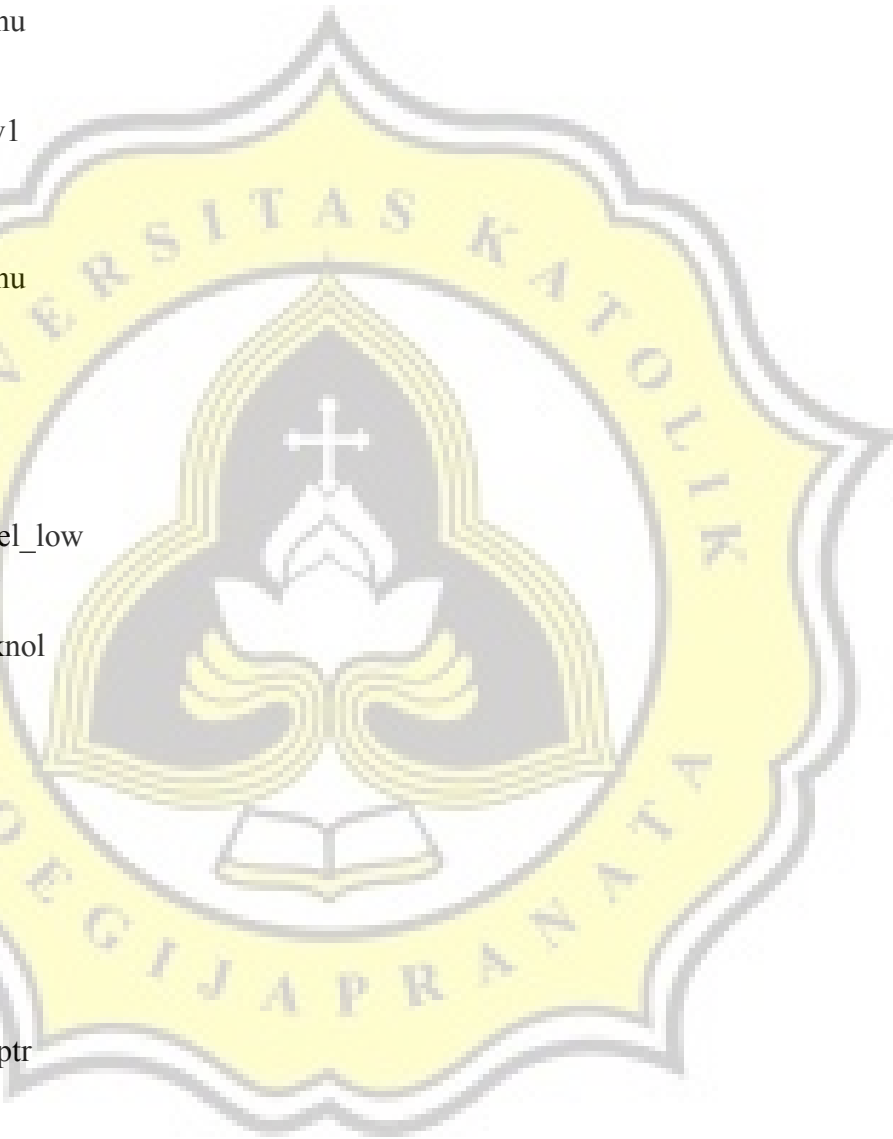
cek_sw3:
    jb sw3,cek_sw1
    call out_key
    call disp_run
    call run_tone
    jmp main_menu

count1 equ -1000
count2 equ -1000
count3 equ -500

run_tone:
    mov dptr,#tabel_low
    mov a,count_t
    subb a,#40
    cjne a,#0,tidaknol
    jmp gotab

tidaknol:
    mov r0,a
updptr:
    inc dptr
    inc dptr
    djnz r0,updptr
gotab:
    mov a,#0
    movc a,@a+dptr
    mov tlowh,a
    inc dptr
    mov a,#0
    movc a,@a+dptr
    mov tlowl,a
    mov tmod,#01h
    clr fsw3
    mov ct,#0

```



```

awal:
    mov dptr,#0
    jnb fsw3,inv
    clr p3.0
    setb p3.1
    jmp testb
inv:
    clr p3.1
    setb p3.0

testb:
    inc ct
    mov a,ct
    cjne a,count_b,ulang2
    mov ct,#0
ulang2b:
    mov th0,#high count3
    mov tl0,#low count3
    setb tr0

tunggu1b:
    jb sw3,tunggu1xb
    jmp out_tone
tunggu1xb:
    jnb tf0,tunggu1b

    clr tr0
    clr tf0
    cpl p1.0
    inc dptr
    mov a,dph
    cjne a,#0,ulang2b
    mov a,dpl
    cjne a,#110,ulang2b
    jmp ccx

ulang2:
    mov th0,#high count1
    mov tl0,#low count1
    setb tr0

tunggu1:
    jb sw3,tunggu1x
    jmp out_tone
tunggu1x:

```



```

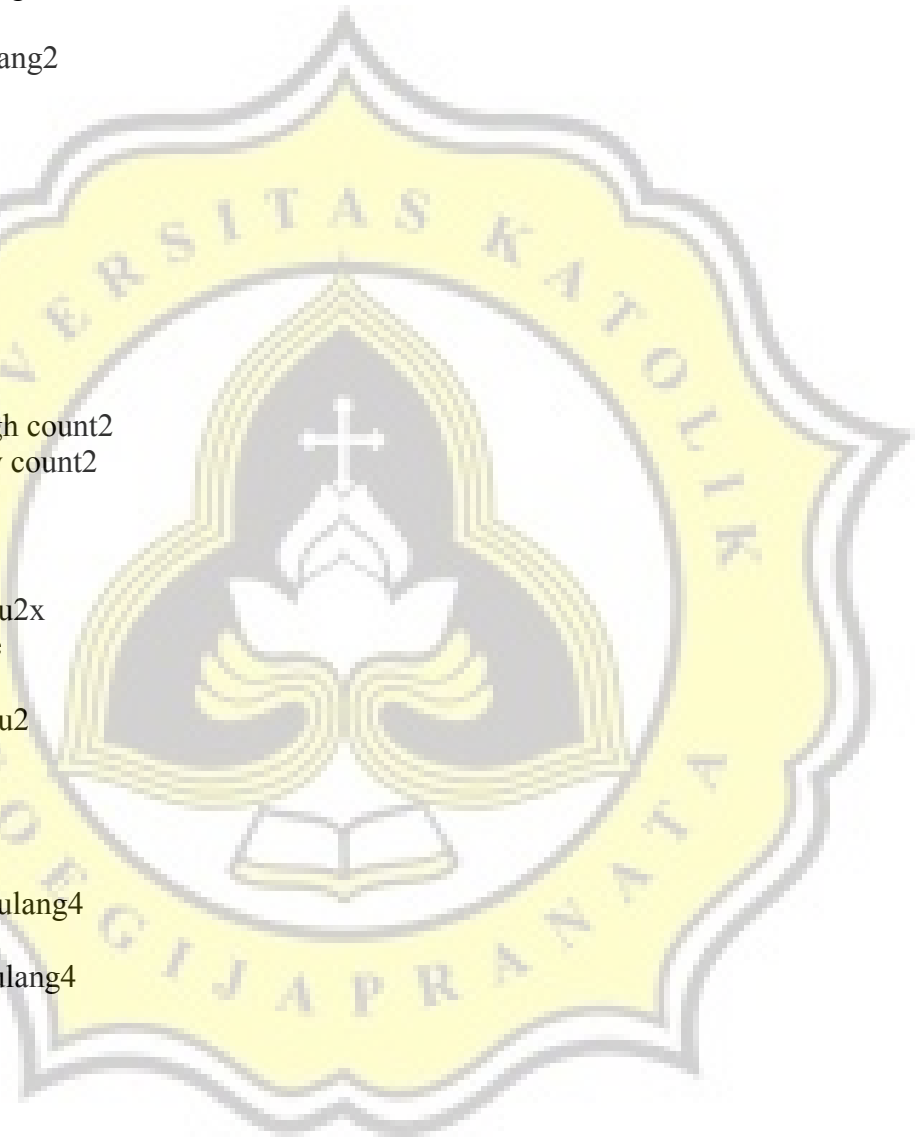
jnb tf0,tunggu1

clr tr0
clr tf0
cpl p1.0
inc dptr
mov a,dph
cjne a,#0,ulang2
mov a,dpl
cjne a,#55,ulang2
ccx:
cpl fsw3
setb p2.0
setb p3.0
setb p3.1
setb p1.0
clr p2.0
mov dptr,#0
ulang4:
mov th0,#high count2
mov tl0,#low count2
setb tr0

tunggu2:
jb sw3,tunggu2x
jmp out_tone
tunggu2x:
jnb tf0,tunggu2
clr tr0
clr tf0
inc dptr
mov a,dph
cjne a,tlowh,ulang4
mov a,dpl
cjne a,tlowl,ulang4
setb p2.0
jmp awal
out_tone:
call out_key
setb p1.0
setb p3.0
setb p3.1
setb p2.0
ret

;-----main program-----

```



start:

```
setb sw1  
setb sw2  
setb sw3  
mov count_t,#40  
mov count_b,#2  
call setuplcd  
call init_lcd  
call main_menu
```

tabel_low:

```
dw 1429  
dw 1389  
dw 1355  
dw 1327  
dw 1293  
dw 1267  
dw 1233  
dw 1201  
dw 1175  
dw 1155  
dw 1129  
dw 1103  
dw 1087  
dw 1063  
dw 1045  
dw 1025  
dw 1005  
dw 987  
dw 965  
dw 951  
dw 933  
dw 915  
dw 901  
dw 883  
dw 869  
dw 857  
dw 845  
dw 831  
dw 813  
dw 801  
dw 789  
dw 779  
dw 767  
dw 756
```



dw 745
dw 734
dw 723
dw 713
dw 703
dw 694
dw 681
dw 675
dw 667
dw 657
dw 647
dw 639
dw 633
dw 625
dw 617
dw 609
dw 602
dw 594
dw 587
dw 581
dw 574
dw 568
dw 561
dw 556
dw 549
dw 544
dw 536
dw 531
dw 524
dw 521
dw 512
dw 508
dw 503
dw 497
dw 492
dw 488
dw 481
dw 477
dw 470
dw 468
dw 463
dw 459
dw 453
dw 450
dw 443
dw 440



dw 437
dw 434
dw 430
dw 425
dw 422
dw 419
dw 415
dw 410
dw 408
dw 404
dw 400
dw 396
dw 393
dw 390
dw 387
dw 384
dw 381
dw 377
dw 375
dw 372
dw 366
dw 363
dw 361
dw 357
dw 355
dw 352
dw 349
dw 346
dw 343
dw 341
dw 337
dw 335
dw 333
dw 330
dw 328
dw 327
dw 325
dw 321
dw 321
dw 316
dw 314
dw 312
dw 309
dw 307
dw 305
dw 304



dw 300
dw 298
dw 296
dw 294
dw 292
dw 290
dw 288
dw 286
dw 284
dw 282
dw 281
dw 279
dw 278
dw 276
dw 276
dw 273
dw 272
dw 270
dw 268
dw 266
dw 265
dw 263
dw 261
dw 259
dw 258
dw 256
dw 255
dw 253
dw 250
dw 249
dw 246
dw 246
dw 244
dw 243
dw 243
dw 239
dw 238
dw 237
dw 236
dw 235
dw 233
dw 232
dw 230

jmp \$
end



Hasil pengukuran melalui osiloskop



Tempo 40



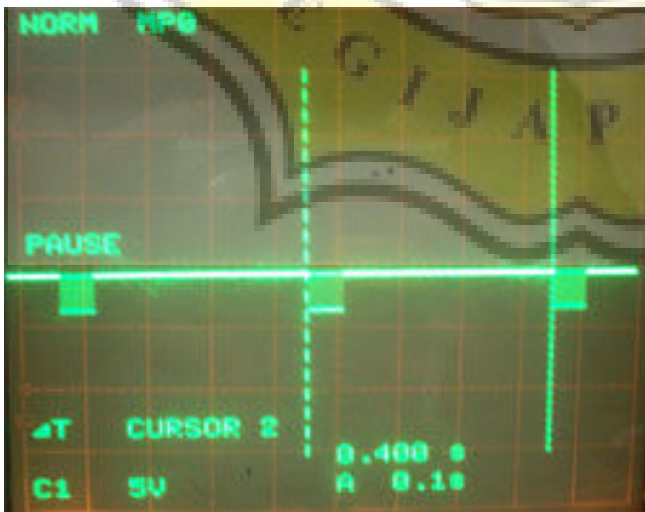
Tempo 60



Tempo 90



Tempo 120



Tempo 150



Tempo 180



Tempo 200