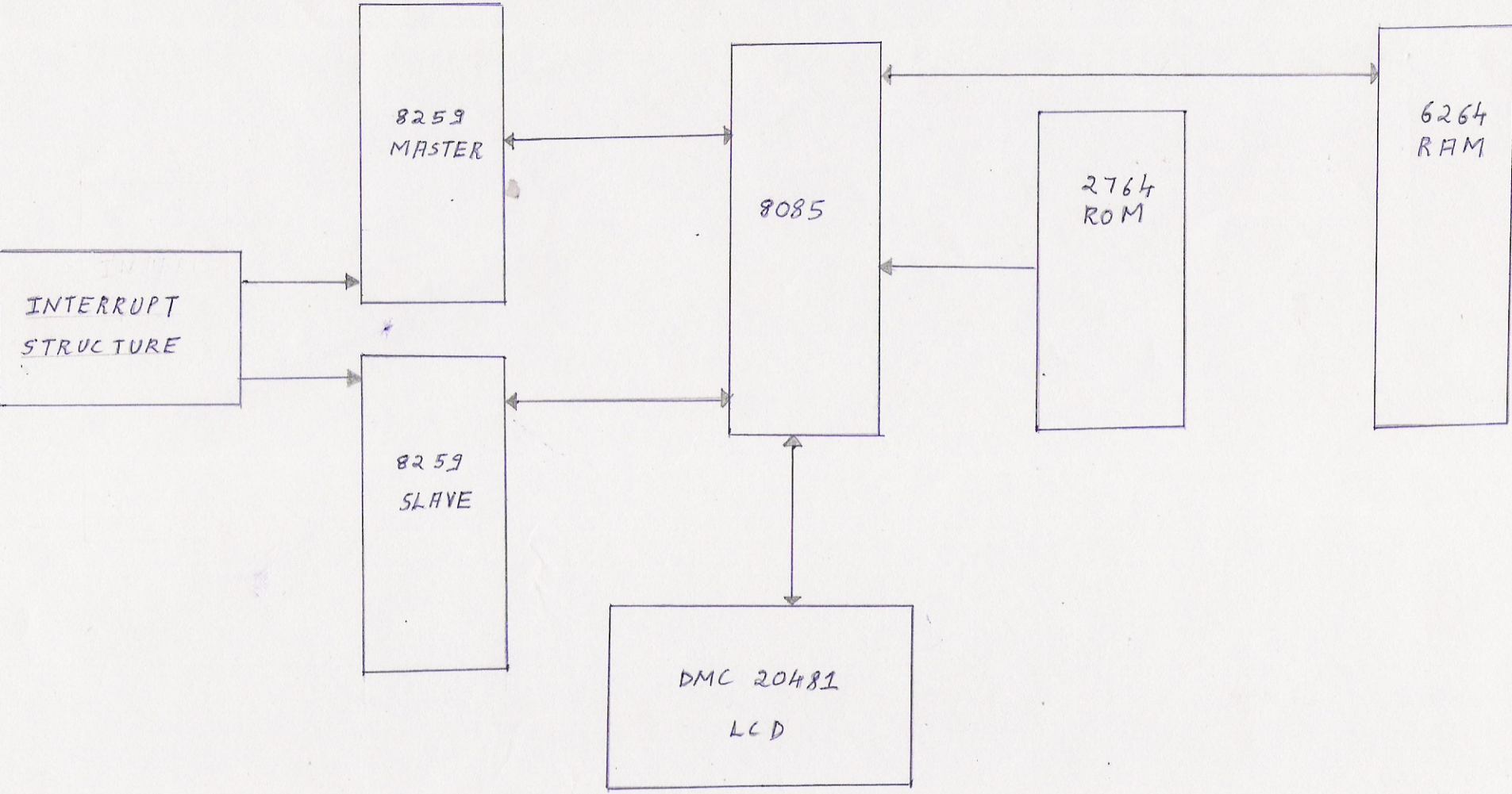
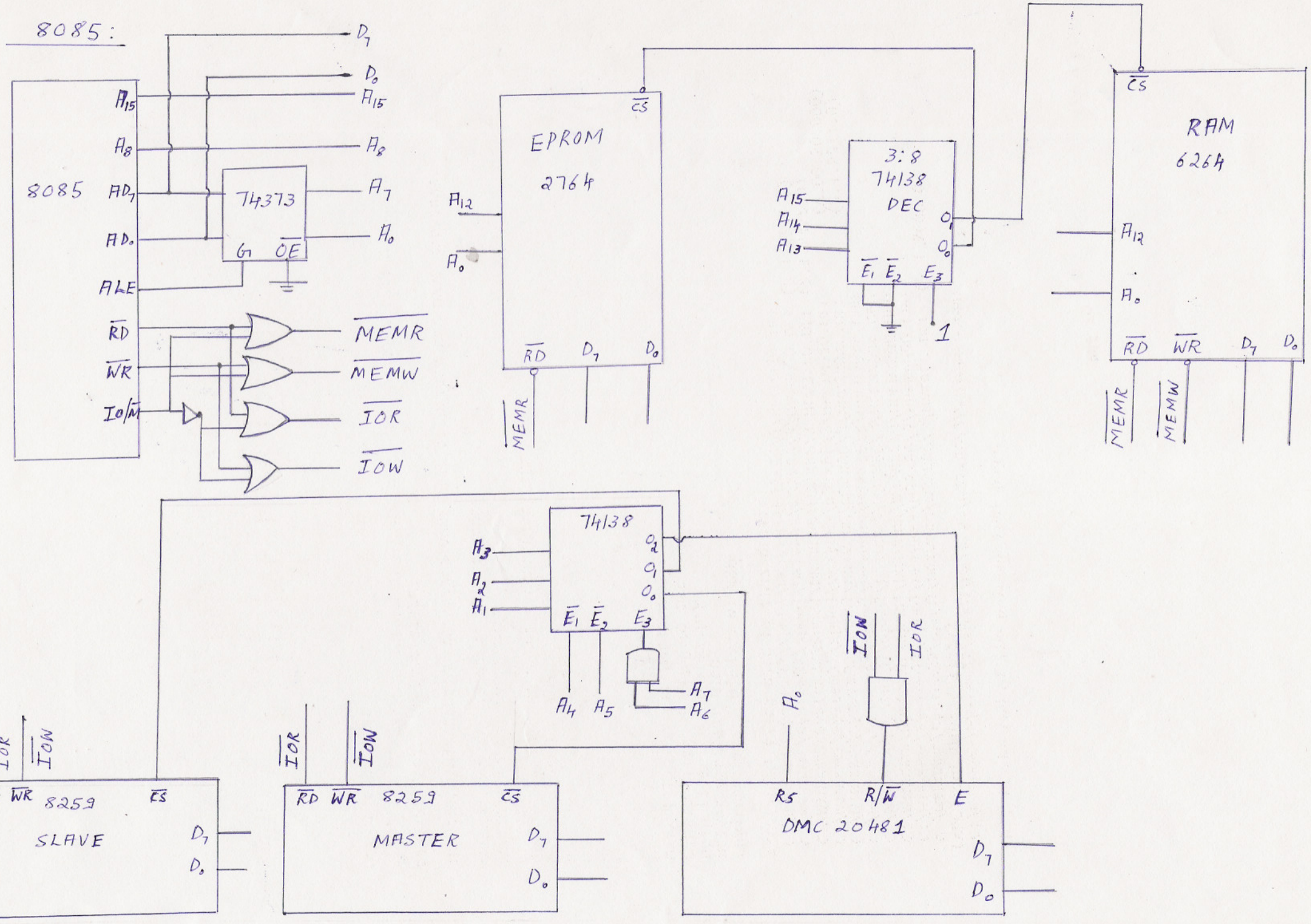
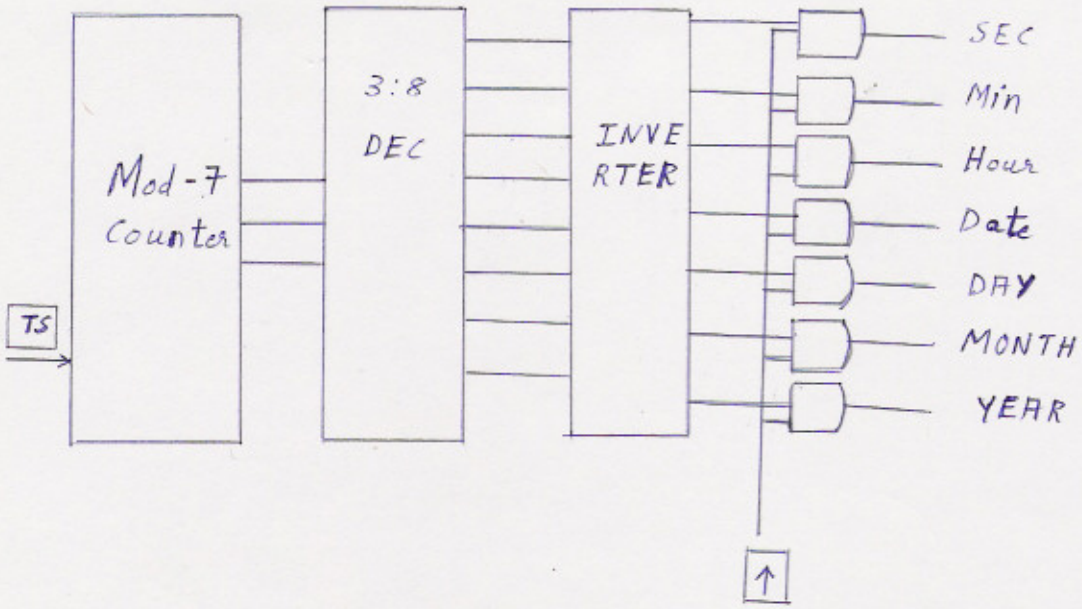
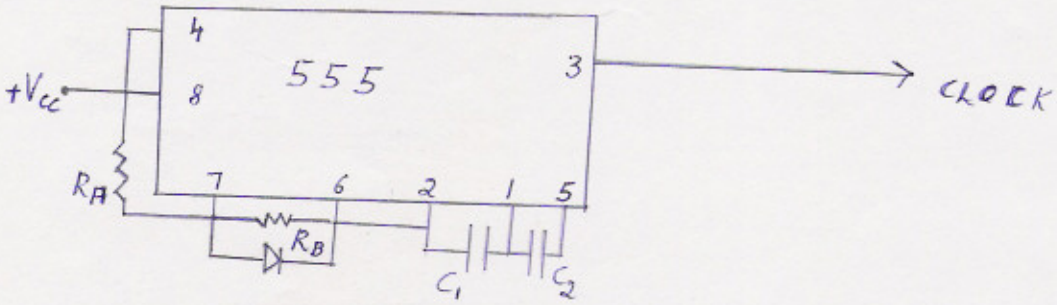
BLOCK DIAGRAM:



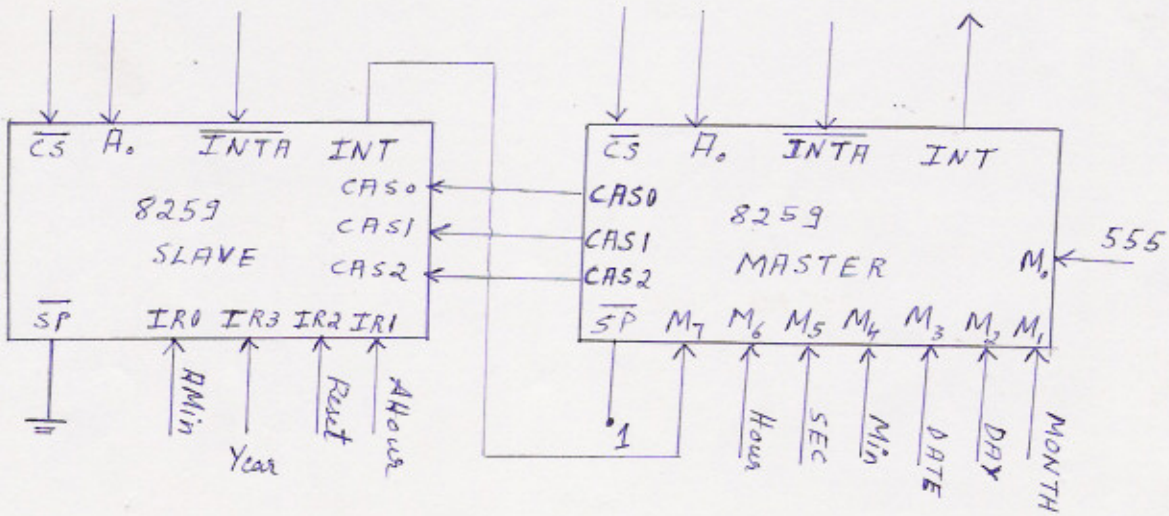

8085:
8085
74373
EPROM
2764
3:8
74138
DEC
RAM
6264
74138
SLAVE
8259
MASTER
8259
DMC 20481
MEMR
MEMW
IOR
IOW

INTERRUPT STRUCTURE:





PIC STRUCTURE:



SWITCHES Used:

1.) Reset Switch
2.) Time Select Switch
3.) Increment Switch
4.) Alarm Hour Switch
5.) Alarm Minute Switch

Time Select Switch Operation:

Pulse Number	Quantity Selected
1	Second
2	Minute
3	Hour
4	Date
5	Day
6	Month
7	Year

ADDRESSES:

EPROM 2764 (8K) :0000H - 1FFFH
RAM 6264 (8K) : 2000H - 3FFFH
LCD : C4/C5H
8259 MASTER: C0/C1H
8259 SLAVE : C2/C3H

QUANTITY ADDRESSES:

SECOND : 2000H
MINUTE : 2001H
HOUR : 2002H
DATE : 2003H
DAY : 21 Locations from 2400H pointed by (BC)
MONTH : 2004H
YEAR : 2005H & 2006H
ALARM HOUR: 2007H
ALARM MINUTE : 2008H
Thought for the day : RAM location starts from 2500H.

555Timer :

Ra = 16 ohm
Rb = 144 ohm
C1 = 80micro Farad
C2 = 0.01micro Farad

20*4 LCD DMC 20481 Module :

LINE1: 00 01 02 . . . . . 12 13
LINE2: 40 41 42 . . . . . 52 53
LINE3: 14 15 16 . . . . . 26 27
LINE4: 54 55 56 . . . . . 66 67

Displayed Quantity	Addresses
Second	51,52h
Minute	22,21h
Hour	18,19h
Date	54,55h
Day	5a,5b,5ch
Month	65,66h
Year	40,41,42,43h
AlarmHour	48,49h
Hyphen	4ah
AlarmMinute	4b,4ch
Thought For The Day	00 - 13h

MAIN PROGRAM:

Master:

ICW1 :14H
ICW2 : 00H
ICW3 : 80H

Slave :

ICW1: 34H
ICW2 :00H
ICW3 :07H
OCW1 :F0H

Starting Vector Locations:

Master:

IR0:555 ISR-0000h
IR1:Month ISR-0004h
IR2:Day ISR-0008h
IR3:Date ISR-000ch
IR4:Hour ISR-0010h
IR5:Min ISR-0014h
IR6:Sec ISR-0018h

Slave:

IR0:AMin ISR-0020h
IR1:AHour ISR-0024h
IR2:Reset ISR-0028h
IR3:Year ISR-002ch

Program:

```
lxi sp,stack
di
mvi a,14h
out c0h
xra a
out c1h
mvi a,80h
out c1h
mvi a,34h
out c2h
xra a
out c3h
mvi a,07h
out c3h
mvi a,f0h
out c3h
lxi d,6432h
xra a
```

```
lxi h.1000h
mov m,a
inx h
mov m,a
inx h
mov m,a
adi 01h
inx h
mov m,a
inx h
mov m,a
inx h
mvi m,00h
inx h
mvi m,20h
lxi b,140fh
lxi h,02f3h
call 20mic
mvi a,30h
out c4h
lxi h,00d2h
call 20mic
mvi a,30h
out c4h
lxi h,0007h
call 20mic
mvi a,30h
out c4h
lxi h,multiplier
call 20mic
mvi a,38h
out c4h
call check
mvi a,08h
out c4h
call check
mvi a,01h
out c4h
call check
mvi a,07h
out c4h
call check
mvi a,0ch
out c4h
call check
ei
display:lxi h,1000h
mov a,m
call ascii
call second
inx h
inx h
mov a,m
call ascii
call hour
dcx h
mov a,m
```

```
call ascii
call hour
inx h
inx h
mov a,m
call ascii
call date
call daydisplay
inx h
mov a,m
call ascii
call month
inx h
inx h
mov a,m
call ascii
call year
dcx h
mov a,m
call ascii
call year
inx h
inx h
mov a,m
call ascii
call Ahour
inx h
mov a,m
call ascii
call Ahour
call thoughtdisplay
jmp display
```

Associated Subroutines:

1.) 20mic:

Function: to introduce 20 micro sec delay
Input: (HL) with multiplier
Output: None
Registers Modified: A,H,L

```
start:mvi a,04h
loop:dcr a
jnz loop
dcx h
mov a,l
ora h
jnz start
ret
```

2.) Check:

Function:To check the status of the LCD.

```
loop:in c4h
ani 80h
jnz loop
ret
```

3.) Ascii:

Function:Stores the ASCII codes of the 2 nibbles of the accumulator at the Memory locations 2600h and 2601h
Input : A
Output:None

```
push h
push psw
lxi h,2601h
ani 0fh
adi 30h
mov m,a
pop psw
ani f0h
rrc
rrc
rrc
rrc
adi 30h
dcx h
mov m,a
pop h
ret
```

4.) Second:

Function:Displays the second digits on the LCD.

```
mvi a,d1h
out c4h
lda 2600h
out c5h
lda 2601h
out c5h
ret
```

5.) Hour:

Function:Displays the digits of the Hour and Minute on the LCD.

```
lda 2700
push psw
cpi ffh
jz loop
mvi a,98h
out c4h
loop:lda 2600h
out c5h
lda 2601h
out c5h
```

```
pop psw
cma
sta 2700
rz
mvi a,4ah
out c5h
ret
```

6.) Date:

Function:Displays the two digits of the date on the LCD

```
mvi a,d4h
out c4h
lda 2600h
out c5h
lda 2601h
out c5h
ret
```

7.) Daydisplay:

Function:Displays the 3 characters pointed by the BC register pair.

```
push b
mvi  a,dah
out c4h
ldax b
out c5h
inx b
ldax b
out c5h
inx b
ldax b
out c5h
pop b
ret
```

8.) Month:

Function:Displays the month number on the LCD.

```
mvi a,e5h
out c4h
lda 2600h
out c5h
lda 2601h
out c5h
ret
```

9.) Year:

Function: Displays the four digits of the year on the LCD.

```
lda 2701h
push psw
cpi ffh
```

```
jz loop
mvi a,c0h
out c4h
loop:lda 2600h
out c5h
lda 2601h
out c5h
pop psw
cma
sta 2701h
ret
```

10.) ThoughtDisplay:

Function: Displays the characters on the LCD.

```
lxi h,2500
mvi a,80h
out c4h
loop:mov a,m
cpi 0dh
rz
out c5h
inx h
jmp loop
```

CLOCK Interrupt Service Routine:

Function: The processor is interrupted every 0.01 sec.For 100 times interruption , 1 sec is counted.

```
dcr d
jnz loop
di
mvi d,64h
lxi h,2000h
mov a,m
adi 01h
daa
mov m,a
cpi 60
jnz loop
di
xra a
mov m,a
inx h
mov a,m
adi 01h
daa
mov m,a
call alarm
cpi 60
jnz loop
di
xra a
mov m,a
inx h
mov a,m
adi 01h
daa
mov m,a
cpi 24
jnz loop
di
xra a
mov m,a
inx h
mov a,m
adi 01h
daa
mov m,a
call loadthought
call day
cmp e
jnz loop
di
mvi m,01h
inx h
mov a,m
adi 01h
daa
mov m,a
call 31
```

```
push psw
lda 2700
ani 01h
pop psw
jnz loop1
call 30
push psw
lda 2700
ani 01h
pop psw
jnz loop1
call leapyear
loop1:cpi 13
jnz loop
di
mvi m,01h
inx h
mov a,m
adi 01h
daa
mov m,a
inx h
mov a,m
aci 00h
daa
mov m,a
loop:mvi a,60h
out c0h
ei
ret
```

ASSOCIATED Subroutines:

1.) Alarm:

Function:Compares the alarm time with instantneous time.

```
push psw
push d
push b
mov b,a
xra a
xchg
lxi h,2008h
cmp m
mov a,b
jnz loop
cpi 60
jnz loop1
inx d
ldax d
adi 01h
daa
dcx h
cmp m
jnz loop1
```

```
jz yes
loop:cmp m
jnz loop1
inx d
ldax d
dcx h
cmp m
jnz loop1
yes:mvi a,dbh
out port
loop1:pop b
pop h
pop psw
ret
```

2.) Load Thought :

Function: Transfers the characters from ROM to RAM.

```
push psw
push d
push h
lxi h,2600h
mov e,m
inx h
mov d,m
lxi h,2500h
loop:ldax d
mov m,a
cpi 0dh
inx d
inx h
jnz loop
lxi h,2600h
mov m,e
inx h
mov m,d
pop h
pop d
pop psw
ret
```

3.) 31:

Function: Compares the month for 31 days
Input : (HL)
Output:(E) with 32

```
push psw
cpi 01h
jz loop
cpi 03h
jz loop
cpi 05h
jz loop
cpi 07h
```

```
jz loop
cpi 08h
jz loop
cpi 10
jz loop
cpi 12
jz loop
cpi 13
jz loop
xra a
jmp loop1
loop:mvi e,32
mvi a,01h
loop1:sta 2700h
pop psw
ret
```

4.) 30:

Function : Compares the month for 30 days
Input: (A) with month
Output:(A) with month and (E) with 31

```
push psw
cpi 04h
jz loop
cpi 06h
jz loop
cpi 09h
jz loop
cpi 11
jz loop
xra a
jmp loop1
loop:mvi e,31
mvi a,01h
loop1:sta 2700h
pop psw
ret
```

5.)LeapYear:

Function: checks whether the year is a leap year or not.

```
push b
push psw
inx h
mov a,m
mov b,a
ani 03h
mov a,b
jz loop1
ani 09h
jz loop2
loop3:mvi e,29h
dcx h
```

```
pop psw
pop b
ret
loop1:ani 10
jnz loop3
loop4:mvi e,30h
dcx h
pop psw
pop b
ret
loop2:mov a,b
ani 10h
jz loop3
jmp loop4
```

6.) Day :

Function: Points (BC) to the next day location

```
push psw
mov a,c
cpi 12
jnz loop
mvi c,00h
pop psw
ret
loop:inx b
inx b
inx b
pop psw
ret
```

INTERRUPT SERVICE ROUTINES:

1.) Reset ISR:

Function:Clears the SEC, Min and hour locations.

```
push h
lxi h,2000h
mvi m,00h
inx h
mvi m,00h
inx h
mvi m,00h
pop h
mvi a,67h
out c0h
mvi a,62h
out c2h
ei
ret
```

2.) Second ISR:

Function: The second ML is incremented.

```
push psw
lda 2000h
adi 01h
daa
cpi 60
jnz loop
xra a
loop:sta 2000h
mvi a,66h
out c0h
ei
pop psw
ret
```

3.) Minute ISR:

Function: The minute ML is incremented.

```
push psw
lda 2001h
adi 01h
daa
cpi 60
jnz loop
xra a
loop:sta 2001h
mvi a,65h
out c0h
ei
pop psw
ret
```

4.) Hour ISR:

Function: The Hour ML is incremented.

```
push psw
lda 2002h
adi 01h
daa
cpi 24
jnz loop
xra a
loop:sta 2002h
mvi a,64h
out c0h
ei
pop psw
ret
```

5.) Date ISR:

Function: The Date ML is incremented

```
push psw
lda 2003h
adi 01h
daa
cpi 32
jnz loop
mvi a,01h
loop:sta 2003h
mvi a,63h
out c0h
ei
pop psw
ret
```

6.) Day ISR:

Function: The Day ML is incremented

```
push psw
mov a,c
cpi 12
jnz loop
lxi b,2400h
mvi a,62h
out c0h
ei
pop psw
ret
loop:inx b
inx b
inx b
mvi a,62h
out c0h
ei
```

```
pop psw
ret
```

7.) Month ISR:

Function: The Month ML is incremented.

```
push psw
lda 2004h
adi 01h
daa
cpi 13
jnz loop
mvi a,00h
loop:sta 2004h
mvi a,61h
out c0h
ei
pop psw
ret
```

8.)Year ISR:

Function: The Year ML's are incremented

```
push psw
lda 2005h
adi 01h
daa
sta 2005h
lda 2006h
aci 00h
daa
sta 2006h
mvi a,67h
out c0h
mvi a,63h
out c2h
ei
pop psw
ret
```

9.) AHour:

Function:The AHour ML is incremented.

```
push psw
lda 2007h
adi 01h
daa
cpi 24
jnz loop
xra a
loop:sta 2007h
mvi a,67h
out c0h
mvi a,61h
```

```
out c2h
ei
pop psw
ret
```

10.) AMin :

Function: The AMin is incremented.

```
push psw
lda 2008h
adi 01h
daa
cpi 60
jnz loop
xra a
loop:sta 2008h
mvi a,67h
out c0h
mvi a,60h
out c2h
ei
pop psw
ret
```