PROJECT:
BUILDING CONTROL SYSTEM
AGUILAR, SEAN KARL TYRESE G.
ALOTAYA, ISAAC JADON R.
CAÑOS, BEA BELLE THERESE B.

PROCED1 SEGMENT 'CODE' ISR1 PROC FAR
ASSUME CS:PROCED1, DS:DATA
ORG 00000H
PUSHF
PUSH AX
PUSH DX
MOV AL, 00H
OUT PORTJ, AL
MOV FAN1_FLAG, 0
MOV FAN2_FLAG, 0
MOV ROOM1_WARNING_FLAG, 0 POP DX
POP AX
POPF
IRET
ISR1 ENDP
PROCED1 ENDS
PROCED2 SEGMENT 'CODE' ISR2 PROC FAR
ASSUME CS:PROCED2, DS:DATA
ORG 00100H
PUSHF
PUSH AX
PUSH DX
MOV AL, 00H
OUT PORTL, AL MOV FAN3_FLAG, 0
MOV FAN4_FLAG, 0
MOV ROOM2_WARNING_FLAG, 0
POP DX
POP AX
POPF
IRET
ISR2 ENDP
PROCED2 ENDS
PROCED3 SEGMENT 'CODE'

ASSUME CS:PROCED3, DS:DATA

```
ORG 00200H
    PUSHF
    PUSH AX
    PUSH DX
    MOV AL, 00H
    OUT PORTN, AL
    MOV FAN5 FLAG, 0
   MOV FAN6_FLAG, 0
    MOV ROOM3_WARNING_FLAG, 0
    POP DX
    POP AX
    POPF
    IRET
ISR3 ENDP
PROCED3 ENDS
PROCED4 SEGMENT 'CODE'
ISR4 PROC FAR
ASSUME CS:PROCED4, DS:DATA
ORG 00300H
    PUSHF
    PUSH AX
    PUSH DX
    CMP ROOM1_SCHED_ON_FLAG, 1
    JE ROOM1_ON_FANS
    CMP ROOM1 SCHED OFF FLAG, 1
    JE ROOM1 OFF FANS
    JMP EXIT_ISR4
    ROOM1 ON FANS:
    MOV AL, 03H
    OUT PORTJ, AL
    MOV AL, 01H
    OUT PORTK, AL
    MOV FAN1 FLAG, 1
    MOV FAN2_FLAG, 1
    JMP EXIT_ISR4
```

```
ROOM1 OFF FANS:
    MOV AL, 00H
    OUT PORTJ, AL
    MOV AL, 00H
    OUT PORTK, AL
    MOV FAN1_FLAG, 0
    MOV FAN2 FLAG, 0
    JMP EXIT ISR4
    EXIT ISR4:
    POP DX
    POP AX
    POPF
    IRET
ISR4 ENDP
PROCED4 ENDS
PROCED5 SEGMENT 'CODE'
ISR5 PROC FAR
ASSUME CS:PROCED5, DS:DATA
ORG 00400H
    PUSHF
    PUSH AX
    PUSH DX
    CMP ROOM2_SCHED_ON_FLAG, 1
    JE ROOM2_ON_FANS
    CMP ROOM2_SCHED_OFF_FLAG, 1
    JE ROOM2 OFF FANS
    JMP EXIT ISR5
    ROOM2_ON_FANS:
    MOV AL, 03H
    OUT PORTL, AL
    MOV AL, 01H
    OUT PORTM, AL
    MOV FAN3_FLAG, 1
    MOV FAN4 FLAG, 1
    JMP EXIT_ISR5
    ROOM2_OFF_FANS:
```

MOV. AL. GOLL	MOV FAME FLAC
MOV AL, 00H	MOV FAN5_FLAG, 0
OUT PORTL, AL	MOV FAN6_FLAG, 0
MOV AL, 00H	JMP EXIT_ISR6
OUT PORTM, AL	
MOV FAN3_FLAG, 0	EXIT_ISR6:
MOV FAN4_FLAG, 0	POP DX
JMP EXIT_ISR5	POP AX
	POPF
EXIT ISR5:	IRET
POP DX	ISR6 ENDP
POP AX	PROCED6 ENDS
POPF	
IRET	DATA SEGMENT
ISR5 ENDP	ORG 03000H
PROCED5 ENDS	; LCD & Keypad PPI
NOCEDS ENDS	PORTA EQU ØDØH
PROCED6 SEGMENT 'CODE'	PORTB EQU ØD2H
ISR6 PROC FAR	PORTC EQU ØD4H
	COM_REG1_EQU_0D6H
ASSUME CS:PROCED6, DS:DATA	COM_KEGI EQU WDOH
ORG 00500H	. ADC C Intermed DDI
PUSHF	; ADC & Interrupt PPI
PUSH AX	PORTD EQU ØD8H
PUSH DX	PORTE EQU ØDAH
	PORTF EQU ØDCH
CMP ROOM3_SCHED_ON_FLAG, 1	COM_REG2 EQU ØDEH
JE ROOM3_ON_FANS	
CMP ROOM3_SCHED_OFF_FLAG, 1	; Timer & Buzzer PPI
JE ROOM3_OFF_FANS	PORTG EQU 0E0H
JMP EXIT_ISR6	PORTH EQU 0E2H
	PORTI EQU 0E4H
ROOM3_ON_FANS:	COM_REG3 EQU 0E6H
MOV AL, 03H	
OUT PORTN, AL	; Fans PPI
MOV AL, 01H	PORTJ EQU 0F0H
OUT PORTO, AL	PORTK EQU 0F2H
MOV FAN5_FLAG, 1	PORTL EQU 0F4H
MOV FAN6_FLAG, 1	COM_REG4 EQU 0F6H
JMP EXIT_ISR6	PORTM EQU 0F8H
-	PORTN EQU ØFAH
ROOM3_OFF_FANS:	PORTO EQU ØFCH
MOV AL, 00H	COM_REG5 EQU ØFEH
OUT PORTN, AL	
MOV AL, 00H	: 8259 PIC
OUT PORTO, AL	PIC1 EQU 0C8H

```
PIC2 EQU 0CAH
   ICW1 EQU 013H
   ICW2 EQU 080H
   ICW4 EQU 003H
   OCW1 EQU 0C0H
                      ;1100 0000 = C0
; 8253 Timer
   PORT_T EQU 0C0H
   COM_REGT EQU 0C6H
; Strings to be displayed on LCD
   MENU1_STR DB "Room 1 [1]", "$"
   MENU2_STR DB "Room 2 [2]", "$"
   MENU3_STR DB "Room 3 [3]", "$"
   MENU4_STR DB "Schedule [4]", "$"
   ROOM1_STR DB "Room 1 ", "$"
   ROOM2_STR DB "Room 2 ", "$"
   ROOM3_STR DB "Room 3 ", "$"
   ROOM1_FAN1_STR DB "Fan 1: ", "$"
   ROOM1_FAN2_STR DB "Fan 2: ",
   ROOM2_FAN1_STR DB "Fan 1: ", "$"
ROOM2_FAN2_STR DB "Fan 2: ", "$"
   ROOM3_FAN1_STR DB "Fan 1: ", "$"
   ROOM3_FAN2_STR DB "Fan 2: ", "$"
   TURN_ON_STR DB "Turn ON: [1]", "$"
   TURN_OFF_STR DB "Turn OFF: [2]", "$"
   SCHED_STR DB "Schedule Room", "$"
   FAN_ON_STR DB "[ON] ", "$"
   FAN_OFF_STR DB "[OFF]", "$"
   TEMP_STR DB "Temperature: ", "$"
   WARNING_STR DB "Temperature Warning!", "$"
   SCHED_TIME_STR DB "Time: ", "$"
   CLEAR_BOTTOM DB " ", "$"
; Data Variables
   HR ONES DIGIT DB 30H
    HR TENS DIGIT DB 31H
    MIN_ONES_DIGIT DB 30H
   MIN TENS DIGIT DB 30H
   AT ROOM FLAG DB 0
    AT ROOM1 FLAG DB 0
    AT_ROOM2_FLAG DB 0
   AT_ROOM3_FLAG DB 0
```

AT_SCHED_FLAG DB 0	T24 DB "24", "\$"	
AT_SCHED_ROOM1_FLAG DB 0	T25 DB "25", "\$"	; configure 8283 Timer
AT_SCHED_ROOM2_FLAG DB 0	T26 DB "26", "\$"	MOV AL, 00111000B
AT_SCHED_ROOM3_FLAG DB 0	T27 DB "27", "\$"	OUT COM_REGT, AL
	T28 DB "28", "\$"	OUT COM_REUT, AL
ADC_CURR_DB_0		0250 DIC
FAN1_FLAG DB 0	T29 DB "29", "\$"	; configure 8259 PIC
FAN2_FLAG DB 0	T30 DB "30", "\$"	MOV AL, ICW1
FAN3_FLAG DB 0	DATA ENDS	OUT PIC1, AL
FAN4_FLAG DB 0		MOV AL, ICW2
FAN5_FLAG DB 0		OUT PIC2, AL
FAN6 FLAG DB 0	STK SEGMENT STACK	MOV AL, ICW4
ROOM1_FANS_STATE DB 00H	BOS DW 64d DUP (?)	OUT PIC2, AL
ROOM2_FANS_STATE_DB_00H	TOS LABEL WORD	MOV AL, OCW1
ROOM3_FANS_STATE DB 00H	STK ENDS	OUT PIC2, AL
	STR ENDS	
ROOM1_WARNING_FLAG_DB_0		STI
ROOM2_WARNING_FLAG DB 0		
ROOM3_WARNING_FLAG DB 0	CODE SEGMENT PUBLIC 'CODE'	; Storing interrupt vector to interrupt vector
HELPER DB 9AH	ASSUME CS:CODE, DS:DATA, SS:STK	table in memory
ROOM1_SCHED_HR_TENS DB ?	ORG 08000H	MOV AX, OFFSET ISR1
ROOM1_SCHED_HR_ONES DB ?		MOV [ES:200H], AX
ROOM1_SCHED_MIN_TENS_DB ?	START:	MOV AX, SEG ISR1
ROOM1 SCHED MIN ONES DB ?	MOV AX, DATA	MOV [ES:202H], AX
ROOM2_SCHED_HR_TENS_DB_?	MOV DS, AX ; set the Data Segment	MOV AX, OFFSET ISR2
ROOM2_SCHED_HR_ONES_DB_?	address	MOV [ES:204H], AX
ROOM2_SCHED_MIN_TENS_DB ?	MOV AX, STK	MOV AX, SEG ISR2
ROOM2_SCHED_MIN_ONES_DB_?	MOV SS, AX ; set the Stack Segment	MOV [ES:206H], AX
ROOM3_SCHED_HR_TENS_DB_?	address	MOV AX, OFFSET ISR3
ROOM3_SCHED_HR_ONES_DB_?	LEA SP, TOS ; set SP as Top of Stack	MOV [ES:208H], AX
ROOM3_SCHED_MIN_TENS DB ?	CLI	MOV AX, SEG ISR3
ROOM3_SCHED_MIN_ONES DB ?		MOV [ES:20AH], AX
ROOM1_SCHED_ON_FLAG DB 0	; configure 8255 PPIs	MOV AX, OFFSET ISR4
ROOM1_SCHED_OFF_FLAG DB 0	MOV DX, COM_REG1	MOV [ES:20CH], AX
ROOM2_SCHED_ON_FLAG DB 0	MOV AL, 10001001B	MOV AX, SEG ISR4
ROOM2_SCHED_OFF_FLAG DB 0	OUT DX, AL	MOV [ES:20EH], AX
ROOM3_SCHED_ON_FLAG DB 0	MOV DX, COM_REG3	MOV AX, OFFSET ISR5
ROOM3_SCHED_OFF_FLAG_DB 0	MOV AL, 10000010B	MOV [ES:210H], AX
T16 DB "16", "\$"	OUT DX, AL	MOV AX, SEG ISR5
, ,	MOV AL, 10000000B	MOV [ES:212H], AX
T18 DB "18", "\$"	MOV DX, COM_REG2	MOV AX, OFFSET ISR6
T19 DB "19", "\$"	OUT DX, AL	MOV [ES:214H], AX
T20 DB "20", "\$"	MOV DX, COM_REG4	MOV AX, SEG ISR6
T21 DB "21", "\$"	OUT DX, AL	MOV [ES:216H], AX
T22 DB "22", "\$"	MOV DX, COM_REG5	
T23 DB "23", "\$"	OUT DX, AL	HERE:

CALL INIT_LCD CALL SHOW_MENU CALL MENU_CHECK_DAVBL	CALL DELAY_1MS JMP MENU_CHECK_DAVBL	MOV DX, PORTC IN AL, DX; read PORTC TEST AL, 10H; check if DAVBL is high
JMP HERE	; MODULE: Check DAVBL for rooms	JZ SCHEDULE_CHECK_DAVBL ; if low then check
JPII TIERE	ROOM_CHECK_DAVBL:	again
	CALL CLOCK_TIME	IN AL, DX ; read 4-bit keypad data
; MODULE: display menu	CALL CHECK_SCHEDULE	AND AL, OFH ; mask upper nibble
SHOW_MENU:	CMP ROOM1_WARNING_FLAG, 1	CMP AL, 00H; check if key pressed is 1 (00H)
MOV AL, 080H ; set cursor position	JE ROOM1_WARNING	JE SCHED_ROOM1
LEA SI, MENU1_STR ; move strng to display	CMP ROOM2_WARNING_FLAG, 1	CMP AL, 01H; check if key pressed is 2 (01H)
CALL DISPLAY_STR ; instruct LCD and display	JE ROOM2_WARNING	JE SCHED_ROOM2
string from SI	CMP ROOM3_WARNING_FLAG, 1	CMP AL, 02H; check if key pressed is 3 (02H)
	JE ROOM3_WARNING	JE SCHED_ROOM3
MOV AL, ØCØH	CMP AT_ROOM_FLAG, 1	CMP AL, 0EH; check if key pressed is # (0EH)
LEA SI, MENU2_STR	JNE CONT_ROOM_CHECK_DAVBL	JE BACK; go back to menu
CALL DISPLAY_STR	CALL READ_ADC	JMP SCHEDULE_CHECK_DAVBL
MOV AL AOVII	CALL ADC_DATA_CONVERTER	CHECK DAVEL.
MOV AL, 094H LEA SI, MENU3_STR	MOV AL, 0E1H CALL DISPLAY_STR	CHECK_DAVBL: CMP HELPER, 9CH
CALL DISPLAY_STR	CALL DISPLAT_STR	JE DISP_COLON
CALL DISPLAT_STR	CONT_ROOM_CHECK_DAVBL:	CMP HELPER, 9FH
MOV AL, 0D4H	MOV DX, PORTC	JE CONIRM_SCHEDULE
LEA SI, MENU4_STR	IN AL, DX; read PORTC	CALL CLOCK_TIME
CALL DISPLAY_STR	TEST AL, 10H; check if DAVBL is high	MOV DX, PORTC
RET	JZ ROOM_CHECK_DAVBL ;if low then check	IN AL, DX
	again	AND AL, OFH
; MODULE: Check DAVBL for menu	IN AL, DX ; read 4-bit keypad data	CMP AL, 0CH ; check if key pressed
MENU_CHECK_DAVBL:	AND AL, 0FH ; mask upper nibble	is *
CALL CLOCK_TIME	CMP AL, 08H ; check if key pressed is 7	JE KEY_BACKSPACE
CALL CHECK_SCHEDULE	(08H)	CMP AL, 0EH ; check if key pressed
MOV DX, PORTC	JE FIRST_FAN ; go to FIRST_FAN module	is #
IN AL, DX; read PORTC	CMP AL, OAH; check if key pressed is 9	JE BACK
TEST AL, 10H; check if DAVBL is high	(OAH)	CMP AL, 0DH ; check if key pressed
JZ MENU_CHECK_DAVBL ; if low then check again	JE SECOND_FAN ; go to SECOND_FAN module	is 0
IN AL, DX; read 4-bit keypad data	CMP AL, 0EH; check if key pressed is # (0EH)	JE KEY_D0
AND AL, 0FH ;mask upper nibble CMP AL, 00H ;check if key pressed is 1 (00H)	JE BACK ; go back to menu	CMP AL, 00H ; check if key pressed is 1
JE ROOM1 ;go to room 1 menu	JE BACK , go back to menu	JE KEY_D1
CMP AL, 01H ;check if key pressed is 2 (01H)	CALL DELAY_1MS	CMP AL, 01H ; check if key pressed
JE ROOM2; go to room 2 menu	JMP ROOM_CHECK_DAVBL	is 2
CMP AL, 02H ;check if key pressed is 3 (02H)		JE KEY_D2
JE ROOM3 ; go to room 3 menu	; MODULE: Check davbl for scheduling	CMP AL, 02H ; check if key pressed
CMP AL, 04H ;check if key pressed is 4 (02H)	SCHEDULE_CHECK_DAVBL:	is 3
JE SCHEDULE ; go to room all menu	CALL CLOCK_TIME	JE KEY_D3

	CMP AL, 04H	; check if key pressed	DEC HELPER	MOV AL, HELPER
is 4	,	, , , , , , , , , , , , , , , , , , , ,	CONT3:	CALL INST_CTRL
	JE KEY_D4		MOV AL, HELPER	MOV AL, '7'
	CMP AL, 05H	; check if key pressed	CALL INST_CTRL	JMP CONT2
is 5	,	, , , , , ,	MOV AL, '-'	KEY_D8:
	JE KEY_D5		CALL DATA_CTRL	MOV AL, HELPER
	CMP AL, 06H	; check if key pressed	CALL DELAY_500MS	CALL INST_CTRL
is 6	·		JMP CHECK_DAVBL	MOV AL, '8'
	JE KEY_D6		KEY_D0:	JMP CONT2
	CMP AL, 08H	; check if key pressed	MOV AL, HELPER	KEY_D9:
is 7	·		CALL INST_CTRL	MOV AL, HELPER
	JE KEY_D7		MOV AL, '0'	CALL INST_CTRL
	CMP AL, 09H	; check if key pressed	JMP CONT2	MOV AL, '9'
is 8	•		KEY_D1:	JMP CONT2
	JE KEY_D8		MOV AL, HELPER	DISP_COLON:
	CMP AL, ØAH	; check if key pressed	CALL INST_CTRL	MOV AL, HELPER
is 9			MOV AL, '1'	CALL INST_CTRL
	JE KEY_D9		JMP CONT2	MOV AL, 3AH
	JMP CHECK_DAVBL		KEY_D2:	JMP CONT2
			MOV AL, HELPER	CONT2:
FI	NAL_CHECK_DAVBL:		CALL INST_CTRL	CALL DATA_CTRL
	CALL CLOCK_TIME		MOV AL, '2'	CMP HELPER, 9AH
	MOV DX, PORTC		JMP CONT2	JE STORE_SCHED_HR_TENS
	IN AL, DX		KEY_D3:	CMP HELPER, 9BH
	AND AL, 0FH		MOV AL, HELPER	JE STORE_SCHED_HR_ONES
	CMP AL, ØEH	; check if key pressed	CALL INST_CTRL	CMP HELPER, 9DH
is #			MOV AL, '3'	JE STORE_SCHED_MIN_TENS
	JE BACK		JMP CONT2	CMP HELPER, 9EH
	CMP AL, 00H	; check if key pressed	KEY_D4:	JE STORE_SCHED_MIN_ONES
is 1	JE TUDN ON		MOV AL, HELPER	CONT/.
	JE TURN_ON	. abaak if kay maaaad	CALL INST_CTRL	CONT4:
i	CMP AL, 01H	; check if key pressed	MOV AL, '4' JMP CONT2	INC HELPER
is 2	JE TUDN OEE			CALL DELAY_500MS
	JE TURN_OFF JMP FINAL_CHECK_DAVBL		KEY_D5: MOV AL, HELPER	JMP CHECK_DAVBL
	SMF TINAL_CHECK_DAVBE		CALL INST_CTRL	STORE_SCHED_HR_TENS:
•	helpers		MOV AL, '5'	CMP AT_SCHED_ROOM1_FLAG, 1
,	KEY_BACKSPACE:		JMP CONT2	JE STORE_ROOM11
	CMP HELPER, 9DH		KEY_D6:	CMP AT_SCHED_ROOM2_FLAG, 1
	JE DOUBLE_BACKSPACE		MOV AL, HELPER	JE STORE_ROOM21
	DEC HELPER		CALL INST_CTRL	CMP AT_SCHED_ROOM3_FLAG, 1
	JMP CONT3		MOV AL, '6'	JE STORE_ROOM31
	DOUBLE_BACKSPACE:		JMP CONT2	-
	DEC HELPER		KEY_D7:	STORE_ROOM11:
		'		

MOV ROOM1 SCHED HR TENS, AL JMP CONT4 JMP CONT4 STORE_ROOM33: STORE ROOM21: MOV ROOM3_SCHED_MIN_TENS, AL MOV ROOM2 SCHED HR TENS, AL JMP CONT4 JMP CONT4 STORE_SCHED_MIN_ONES: STORE_ROOM31: CMP AT_SCHED_ROOM1_FLAG, 1 JE STORE ROOM14 MOV ROOM3_SCHED_HR_TENS, AL JMP CONT4 CMP AT SCHED ROOM2 FLAG, 1 JE STORE ROOM24 STORE_SCHED_HR_ONES: CMP AT_SCHED_ROOM3_FLAG, 1 CMP AT_SCHED_ROOM1_FLAG, 1 JE STORE ROOM34 JE STORE ROOM12 CMP AT SCHED ROOM2 FLAG, 1 STORE ROOM14: JE STORE_ROOM22 MOV ROOM1_SCHED_MIN_ONES, AL CMP AT SCHED ROOM3 FLAG, 1 JMP CONT4 JE STORE ROOM32 STORE ROOM24: STORE ROOM12: MOV ROOM2 SCHED MIN ONES, AL MOV ROOM1_SCHED_HR_ONES, AL JMP CONT4 JMP CONT4 STORE ROOM34: STORE ROOM22: MOV ROOM3 SCHED MIN ONES, AL MOV ROOM2_SCHED_HR_ONES, AL JMP CONT4 JMP CONT4 ; MODULE: Displays a 24-hour clock CLOCK TIME: STORE ROOM32: MOV ROOM3_SCHED_HR_ONES, AL CALL DISPLAY HOUR TENS JMP CONT4 CALL DISPLAY_HOUR_ONES CALL DISPLAY COLON CALL DISPLAY MIN TENS STORE SCHED MIN TENS: CMP AT SCHED ROOM1 FLAG, 1 CALL DISPLAY MIN ONES JE STORE_ROOM13 CALL UPDATE_TIME CMP AT_SCHED_ROOM2_FLAG, 1 RET JE STORE ROOM23 ; MODULE: Update the time CMP AT SCHED ROOM3 FLAG, 1 UPDATE TIME: JE STORE ROOM33 ; 32 33 35 39 CMP MIN_ONES_DIGIT, 3AH STORE ROOM13: JE RESET MIN ONES MOV ROOM1 SCHED MIN TENS, AL CMP MIN TENS DIGIT, 36H JMP CONT4 JE RESET MIN TENS STORE ROOM23: CMP HR_ONES_DIGIT, 3AH MOV ROOM2_SCHED_MIN_TENS, AL JE RESET_HR_ONES

CMP HR TENS DIGIT, 33H JE RESET HR TENS CMP HR_ONES_DIGIT, 34H JE CHECK_IF_PM CONT UPDATE TIME: INC MIN_ONES_DIGIT CALL DELAY_500MS RET **RESET MIN ONES:** MOV MIN_ONES_DIGIT, 30H CALL DISPLAY MIN ONES INC MIN TENS DIGIT RET **RESET MIN TENS:** MOV MIN TENS DIGIT, 30H CALL DISPLAY MIN TENS INC HR ONES DIGIT RET **RESET HR ONES:** MOV HR ONES DIGIT, 30H CALL DISPLAY_HOUR_ONES INC HR_TENS_DIGIT RET **RESET HR TENS:** MOV HR_TENS_DIGIT, 30H CALL DISPLAY HOUR TENS RET CHECK_IF_PM: CMP HR_TENS_DIGIT, 32H JE RESET TO AM JNE CONT UPDATE TIME RET RESET TO AM: MOV HR ONES DIGIT, 30H

CALL DISPLAY HOUR ONES

MOV HR_TENS_DIGIT, 30H

CALL DISPLAY HOUR TENS

RET THE	SCHEDULE_ROOM1:	CALL DISPLAY_STR
JMP_UPDATE_TIME	MOV AL, 08H OUT PORTF, AL	CONT_FAN2:
; MODULE: Checks if time sync with schedule time	MOV AL, 00H	MOV AL, 094H ; displays "Fan 2: "
CHECK_SCHEDULE:	OUT PORTF, AL	LEA SI, ROOM1_FAN2_STR
MOV AL, HR_TENS_DIGIT	RET	CALL DISPLAY_STR
CMP AL, ROOM1_SCHED_HR_TENS	KET	CMP FAN2_FLAG, 1
JE CHECK_HR_ONES	SCHEDULE_ROOM2:	JE FAN2_ON
CMP AL, ROOM2_SCHED_HR_TENS	MOV AL, 10H	MOV AL, 09BH ; displays "[OFF]"
JE CHECK_HR_ONES	OUT PORTF, AL	LEA SI, FAN_OFF_STR
CMP AL, ROOM3_SCHED_HR_TENS	MOV AL, 00H	CALL DISPLAY_STR
JE CHECK_HR_ONES	OUT PORTF, AL	CALL DISTERNI_STA
RET	RET	CONT_ROOM1:
		JMP CONT
CHECK_HR_ONES:	SCHEDULE_ROOM3:	
MOV AL, HR_ONES_DIGIT	MOV AL, 20H	FAN1_ON:
CMP AL, ROOM1_SCHED_HR_ONES	OUT PORTF, AL	
JE CHECK_MIN_TENS	MOV AL, 00H	LEA SI, FAN_ON_STR
CMP AL, ROOM2_SCHED_HR_ONES	OUT PORTF, AL	CALL DÍSPLAY_STR
JE CHECK_MIN_TENS	RET	JMP CONT_FAN2
CMP AL, ROOM3_SCHED_HR_ONES		-
JE CHECK_MIN_TENS		FAN2_ON:
RET	; MODULE: Menu, Rooms, Fans, Emergency, Scheduling	MOV AL, 09BH ; displays "[ON] "
	controls	LEA SI, FAN_ON_STR
CHECK_MIN_TENS:	ROOM1:	CALL DISPLAY_STR
MOV AL, MIN_TENS_DIGIT	MOV AT_ROOM_FLAG, 1	JMP CONT_ROOM1
CMP AL, ROOM1_SCHED_MIN_TENS	MOV AT_ROOM1_FLAG, 1	
JE CHECK_MIN_ONES	MOV AT_ROOM2_FLAG, 0	ROOM2:
CMP AL, ROOM2_SCHED_MIN_TENS	MOV AT_ROOM3_FLAG, 0	MOV AT_ROOM_FLAG, 1
JE CHECK_MIN_ONES	MOV AT_SCHED_FLAG, 0	MOV AT_ROOM1_FLAG, 0
CMP AL, ROOM3_SCHED_MIN_TENS	MOV DX, PORTE	MOV AT_ROOM2_FLAG, 1
JE CHECK_MIN_ONES	MOV AL, 01H	MOV AT_ROOM3_FLAG, 0
RET	OUT DX, AL	MOV AT_SCHED_FLAG, 0
	CALL INIT_LCD	MOV DX, PORTE
CHECK_MIN_ONES:	MOV AL, 080H ; displays "Room 1"	MOV AL, 02H
MOV AL, MIN_ONES_DIGIT	LEA SI, ROOM1_STR	OUT DX, AL
CMP AL, ROOM1_SCHED_MIN_ONES	CALL DISPLAY_STR	CALL INIT_LCD
JE SCHEDULE_ROOM1	MOV AL, 0C0H ; displays "Fan 1: "	MOV AL, 080H ; displays "Room 2"
CMP AL, ROOM2_SCHED_MIN_ONES	LEA SI, ROOM1_FAN1_STR	LEA SI, ROOM2_STR
JE SCHEDULE_ROOM2	CALL DISPLAY_STR	CALL DISPLAY_STR
CMP AL, ROOM3_SCHED_MIN_ONES	CMP FAN1_FLAG, 1	MOV AL, 0C0H ; displays "Fan 1: "
JE SCHEDULE_ROOM3	JE FAN1_ON	LEA SI, ROOM2_FAN1_STR
RET	MOV AL, 0C7H ; displays "[0FF]"	CALL DISPLAY_STR
	LEA SI, FAN_OFF_STR	CMP FAN3_FLAG, 1

JE FAN3_ON MOV AL, 0C7H ; displays "[0FF]" LEA SI, FAN_OFF_STR CALL DISPLAY_STR	LEA SI, ROOM3_FAN1_STR CALL DISPLAY_STR CMP FAN5_FLAG, 1 JE FAN5_ON MOV AL, 0C7H; displays "[0FF]"	LEA SI, MENU1_STR CALL DISPLAY_STR MOV AL, 094H LEA SI, MENU2_STR CALL DISPLAY_STR
CONT_FAN4: MOV AL, 094H ; displays "Fan 2: " LEA SI, ROOM2_FAN2_STR	LEA SI, FAN_OFF_STR CALL DISPLAY_STR	MOV AL, 0D4H LEA SI, MENU3_STR CALL DISPLAY_STR
CALL DISPLAY_STR CMP FAN4_FLAG, 1 JE FAN4_ON	CONT_FAN6: MOV AL, 094H ; displays "Fan 2: " LEA SI, ROOM3_FAN2_STR	CALL DELAY_1MS JMP SCHEDULE_CHECK_DAVBL
MOV AL, 09BH ; displays "[OFF]" LEA SI, FAN_OFF_STR CALL DISPLAY_STR	CALL DISPLAY_STR CMP FAN6_FLAG, 1 JE FAN6_ON MOV AL, 09BH ; displays "[0FF]"	BACK: MOV AT_ROOM_FLAG, 0 MOV AT_ROOM1_FLAG, 0 MOV AT_ROOM2_FLAG, 0
CONT_ROOM2: JMP CONT	LEA SI, FAN_OFF_STR CALL DISPLAY_STR	MOV AT_ROOM3_FLAG, 0 MOV AT_SCHED_FLAG, 0 MOV AL, 00H
FAN3_ON: MOV AL, 0C7H ; displays "[ON] " LEA SI, FAN_ON_STR CALL DISPLAY_STR	CONT_ROOM3: JMP CONT FAN5_ON:	OUT PORTE, AL OUT PORTG, AL JMP HERE
JMP CONT_FAN4 FAN4_ON:	MOV AL, ØC7H ; displays "[ON] " LEA SI, FAN_ON_STR CALL DISPLAY_STR	SCHED_ROOM1: MOV AT_SCHED_ROOM1_FLAG, 1 MOV AL, 0C0H
MOV AL, 09BH ; displays "[ON] " LEA SI, FAN_ON_STR CALL DISPLAY_STR	JMP CONT_FANG FAN6_ON:	CALL INST_CTRL LEA SI, CLEAR_TOP CALL DISPLAY_STR
JMP CONT_ROOM2 ROOM3:	MOV AL, 09BH ; displays "[ON] " LEA SI, FAN_ON_STR CALL DISPLAY_STR	MOV AL, 094H CALL INST_CTRL LEA SI, SCHED_TIME_STR
MOV AT_ROOM_FLAG, 1 MOV AT_ROOM1_FLAG, 0 MOV AT_ROOM2_FLAG, 0 MOV AT_ROOM3_FLAG, 1	JMP CONT_ROOM3 SCHEDULE: MOV AT_ROOM_FLAG, 0	CALL DISPLAY_STR MOV AL, 09AH CALL INST_CTRL LEA SI, CLEAR_TOP
MOV AT_SCHED_FLAG, 0 MOV DX, PORTE MOV AL, 03H	MOV AT_SCHED_FLAG, 1 MOV AT_ROOM1_FLAG, 0 MOV AT_ROOM2_FLAG, 0	CALL DISPLAY_STR MOV AL, 0D4H CALL INST_CTRL
OUT DX, AL CALL INIT_LCD MOV AL, 080H ; displays "Room 3"	MOV AT_ROOM3_FLAG, 0 CALL INIT_LCD MOV AL, 080H	LEA SI, CLEAR_TOP CALL DISPLAY_STR MOV AL, 9CH
LEA SI, ROOM3_STR CALL DISPLAY_STR MOV AL, 0C0H ; displays "Fan 1: "	LEA SI, SCHED_STR CALL DISPLAY_STR MOV AL, 0C0H	CALL INST_CTRL MOV AL, 3AH CALL DATA_CTRL

CALL DELAY 1MS LEA SI, CLEAR TOP MOV HELPER, 9AH JMP CHECK DAVBL CALL DISPLAY STR JMP BACK MOV AL, 9CH SCHED ROOM2: CALL INST CTRL TURN OFF: MOV AT SCHED ROOM2 FLAG, 1 MOV AL, 3AH CMP AT_SCHED_ROOM1_FLAG, 1 MOV AL, 0C0H CALL DATA CTRL JE CONFIRM ROOM1 OFF SCHED CALL INST_CTRL CALL DELAY_1MS CMP AT_SCHED_ROOM2_FLAG, 1 JMP CHECK DAVBL LEA SI, CLEAR_TOP JE CONFIRM ROOM2 OFF SCHED CMP AT SCHED ROOM3 FLAG, 1 CALL DISPLAY_STR MOV AL, 094H CONIRM SCHEDULE: JE CONFIRM ROOM3 OFF SCHED CALL INST CTRL JMP BACK MOV AL, 0C0H LEA SI, SCHED_TIME_STR CALL INST CTRL CALL DISPLAY STR LEA SI, TURN ON STR CONFIRM ROOM1 OFF SCHED: MOV AL, 09AH CALL DISPLAY STR MOV ROOM1 SCHED ON FLAG, 0 CALL INST CTRL MOV AL, 094H MOV ROOM1 SCHED OFF FLAG, 1 LEA SI, CLEAR_TOP CALL INST CTRL MOV HELPER, 9AH CALL DISPLAY STR LEA SI, TURN OFF STR JMP BACK CALL DISPLAY STR MOV AL, 0D4H CALL INST CTRL JMP FINAL CHECK DAVBL CONFIRM ROOM2 OFF SCHED: LEA SI, CLEAR TOP MOV ROOM2 SCHED ON FLAG, 0 CALL DISPLAY_STR TURN_ON: MOV ROOM2_SCHED_OFF_FLAG, 1 MOV AL, 9CH CMP AT_SCHED_ROOM1_FLAG, 1 MOV HELPER, 9AH CALL INST CTRL JE CONFIRM ROOM1 ON SCHED JMP BACK MOV AL, 3AH CMP AT SCHED ROOM2 FLAG, 1 CALL DATA_CTRL JE CONFIRM_ROOM2_ON_SCHED CONFIRM_ROOM3_OFF_SCHED: CALL DELAY_1MS CMP AT SCHED ROOM3 FLAG, 1 MOV ROOM3_SCHED_ON_FLAG, 0 JMP CHECK DAVBL JE CONFIRM ROOM3 ON SCHED MOV ROOM3 SCHED OFF FLAG, 1 JMP BACK MOV HELPER, 9AH JMP BACK SCHED ROOM3: MOV AT_SCHED_ROOM3_FLAG, 1 CONFIRM ROOM1 ON SCHED: MOV AL, 0C0H MOV ROOM1 SCHED ON FLAG, 1 FIRST FAN: CALL INST CTRL MOV ROOM1 SCHED OFF FLAG. 0 CMP AT ROOM1 FLAG, 1 LEA SI, CLEAR TOP MOV HELPER, 9AH JE AT ROOM1 1 CALL DISPLAY STR JMP BACK CMP AT ROOM2 FLAG, 1 MOV AL, 094H JE AT ROOM2 1 CMP AT ROOM3 FLAG, 1 CALL INST CTRL CONFIRM ROOM2 ON SCHED: LEA SI, SCHED TIME STR MOV ROOM2 SCHED ON FLAG, 1 JE AT ROOM3 1 CALL DISPLAY STR MOV ROOM2 SCHED OFF FLAG, 0 CMP AT SCHED FLAG, 1 MOV AL, 09AH MOV HELPER, 9AH JE AT ROOMS JMP CONT CALL INST CTRL JMP BACK LEA SI, CLEAR TOP CALL DISPLAY STR CONFIRM ROOM3 ON SCHED: AT ROOM1 1: MOV AL, 0D4H MOV ROOM3 SCHED ON FLAG. 1 CMP FAN1_FLAG, 1 MOV ROOM3 SCHED_OFF_FLAG, 0 CALL INST CTRL JE RESET FAN1 FLAG

CMP FAN2_FLAG, 1				OUT PORTL, AL	
JE FANS_ROOM1_1		AT_R00M2_1:			
MOV FAN1_FLAG, 1		CMP FAN3_FLAG, 1		CONT_AT_ROOM2_1:	
MOV AL, 01H		JE RESET_FAN3_FLAG		JMP CONT	
OUT PORTJ, AL		CMP FAN4_FLAG, 1			
MOV AL, 0C7H	; Update LCD to	JE FANS_ROOM2_1		AT_ROOM3_1:	
display "[ON] "		MOV FAN3_FLAG, 1		CMP FAN5_FLAG, 1	
LEA SI, FAN_ON_STR		MOV AL, 01H		JE RESET_FAN5_FLAG	
CALL DISPLAY_STR		OUT PORTL, AL		CMP FAN6_FLAG, 1	
JMP CONT_AT_ROOM1_1		MOV AL, 0C7H	; Update LCD to	JE FANS_ROOM3_1	
		display "[ON] "		MOV FAN5_FLAG, 1	
FANS_ROOM1_1:		LEA SI, FAN_ON_STR		MOV AL, 01H	
MOV FAN1 FLAG, 1		CALL DISPLAY_STR		OUT PORTN, AL	
MOV FAN2_FLAG, 1		JMP CONT_AT_ROOM2_1		MOV AL, ØC7H	; Update LCD to
MOV AL, 03H				display "[ON] "	•
OUT PORTJ, AL		FANS_ROOM2_1:		LEA SI, FAN_ON_STR	
MOV AL, 0C7H	; Update LCD to	MOV FAN3 FLAG, 1		CALL DISPLAY STR	
display "[ON] "	, .	MOV FAN4_FLAG, 1		JMP CONT_AT_ROOM3_1	
LEA SI, FAN_ON_STR		MOV AL, Ø3H			
CALL DÍSPLAY_STR		OUT PORTL, AL		FANS ROOM3 1:	
MOV AL, 09BH	; Update LCD to	MOV AL, 0C7H	; Update LCD to	MOV FAN5_FLAG, 1	
display "[ON] "	, ,	display "[ON] "	, .	MOV FAN6_FLAG, 1	
LEA SI, FAN_ON_STR		LEA SI, FAN_ON_STR		MOV AL, Ø3H	
CALL DÍSPLAY STR		CALL DISPLAY STR		OUT PORTN, AL	
JMP CONT_AT_ROOM1_1		MOV AL, 09BH	; Update LCD to	MOV AL, ØC7H	; Update LCD to
		display "[ON] "	, .,	display "[ON] "	, .,
RESET FAN1 FLAG:		LEA SI, FAN_ON_STR		LEA SI, FAN_ON_STR	
MOV FAN1_FLAG, 0		CALL DISPLAY_STR		CALL DISPLAY_STR	
MOV AL, 00H		JMP CONT_AT_ROOM2_1		MOV AL, 09BH	; Update LCD to
OUT PORTJ, AL				display "[ON] "	
MOV AL, 0C7H	; Update LCD to	RESET FAN3 FLAG:		LEA SI, FAN_ON_STR	
display "[OFF]"	, .	MOV FAN3_FLAG, 0		CALL DISPLAY_STR	
LEA SI, FAN_OFF_STR		MOV AL, 00H		JMP CONT AT ROOM3 1	
CALL DÍSPLAY_STR		OUT PORTL, AL			
CMP FAN2_FLAG, 1		MOV AL, 0C7H	; Update LCD to	RESET_FAN5_FLAG:	
JE OFF_FAN1_ONLY		display "[OFF]"	, .	MOV FAN5 FLAG, 0	
JMP CONT_AT_ROOM1_1		LEA SI, FAN_OFF_STR		MOV AL, 00H	
		CALL DISPLAY_STR		OUT PORTN, AL	
OFF_FAN1_ONLY:		CMP FAN4_FLAG, 1		MOV AL, ØC7H	; Update
MOV AL, 02H		JE OFF_FAN3_ONLY		LCD to display "[OFF]"	, ,
OUT PORTJ, AL		JMP CONT_AT_ROOM2_1		LEA SI, FAN_OFF_STR	
•				CALL DISPLAY_STR	
<pre>CONT_AT_ROOM1_1:</pre>		OFF_FAN3_ONLY:		CMP FAN6_FLAG, 1	
JMP CONT		MOV AL, 02H		JE OFF_FAN5_ONLY	
		,		,	

JMP CONT_AT_ROOM3_1				LEA SI, FAN_OFF_STR	
		SECOND_FAN:		CALL DISPLAY_STR	
OFF_FAN5_ONLY:		CMP AT_ROOM1_FLAG, 1		CMP FAN1_FLAG, 1	
MOV AL, 02H		JE AT_ROOM1_2		JE OFF_FAN2_ONLY	
OUT PORTN, AL		CMP AT_ROOM2_FLAG, 1		JMP CONT_AT_ROOM1_2	
,		JE AT ROOM2 2			
CONT_AT_ROOM3_1:		CMP AT_ROOM3_FLAG, 1		OFF_FAN2_ONLY:	
JMP CONT		JE AT_ROOM3_2		MOV AL, 01H	
o oo		02 /// _/// _//		OUT PORTJ, AL	
AT ROOMS:		AT_ROOM1_2:			
MOV DX, PORTJ		CMP FAN2_FLAG, 1		CONT_AT_ROOM1_2:	
MOV AL, Ø3H		JE RESET FAN2 FLAG		JMP CONT	
OUT DX, AL		CMP FAN1 FLAG, 1		3111 20111	
MOV AL, 0C7H	; Update LCD	JE FANS_ROOM1_2		AT_ROOM2_2:	
to display "[ON] "	, opaate Leb	MOV FAN2 FLAG, 1		CMP FAN4 FLAG, 1	
LEA SI, FAN_ON_STR		MOV AL, 02H		JE RESET FAN4 FLAG	
		OUT PORTJ, AL		CMP FAN3_FLAG, 1	
CALL DISPLAY_STR	· Undata LCD	·	· Undata LCD	_ :	
MOV AL, 09BH	; Update LCD	MOV AL, 09BH	; Update LCD	JE FANS_ROOM2_2	
to display "[ON] "		to display "[ON] "		MOV FAN4_FLAG, 1	
LEA SI, FAN_ON_STR		LEA SI, FAN_ON_STR		MOV DX, PORTL	
CALL DISPLAY_STR		CALL DISPLAY_STR		MOV AL, 02H	
MOV DX, PORTL		JMP CONT_AT_ROOM1_2		OUT DX, AL	
MOV AL, 03H				MOV AL, 09BH	; Update LCD
OUT DX, AL		FANS_ROOM1_2:		to display "[ON] "	
MOV_AL, 0C7H	; Update LCD	MOV FAN1_FLAG, 1		LEA SI, FAN_ON_STR	
to display "[ON] "		MOV FAN2_FLAG, 1		CALL DISPLAY_STR	
LEA SI, FAN_ON_STR		MOV AL, 03H		JMP CONT_AT_ROOM2_2	
CALL DISPLAY_STR		OUT PORTJ, AL			
MOV AL, 09BH	; Update LCD	MOV AL, 0C7H	; Update	FANS_ROOM2_2:	
to display "[ON] "		LCD to display "[ON] "		MOV FAN3_FLAG, 1	
LEA SI, FAN_ON_STR		LEA SI, FAN_ON_STR		MOV FAN4_FLAG, 1	
CALL DISPLAY_STR		CALL DISPLAY_STR		MOV AL, 03H	
MOV DX, PORTN		MOV AL, 09BH	; Update	OUT PORTL, AL	
MOV AL, 03H		LCD to display "[ON] "		MOV AL, 0C7H	; Update
OUT DX, AL		LEA SI, FAN_ON_STR		LCD to display "[ON] "	
MOV AL, 0C7H	; Update LCD	CALL DISPLAY_STR		LEA SI, FAN_ON_STR	
to display "[ON] "	•	JMP CONT_AT_ROOM1_2		CALL DISPLAY_STR	
LEA SI, FAN_ON_STR				MOV AL, 09BH	; Update
CALL DÍSPLAY_STR		RESET_FAN2_FLAG:		LCD to display "[ON] "	, ,
MOV AL, 09BH	; Update LCD	MOV FAN2_FLAG, 0		LEA SI, FAN_ON_STR	
to display "[ON] "	, ,	MOV AL, 00H		CALL DISPLAY STR	
LEA SI, FAN_ON_STR		OUT PORTJ, AL		JMP CONT_AT_ROOM2_2	
CALL DISPLAY_STR		MOV AL, 09BH	; Update	5 55	
JMP CONT		LCD to display "[OFF]"	, 0,000	RESET_FAN4_FLAG:	
				1	

MOV FAN4_FLAG, 0 MOV DX, PORTL MOV AL, 00H		LEA SI, FAN_ON_STR CALL DISPLAY_STR JMP CONT_AT_ROOM3_2		JMP ROOM_CHECK_DAVBL
OUT DX, AL MOV AL, 09BH LCD to display "[OFF]" LEA SI, FAN_OFF_STR CALL DISPLAY_STR CMP FAN3_FLAG, 1 JE OFF_FAN4_ONLY JMP CONT_AT_ROOM2_2 OFF_FAN4_ONLY: MOV AL, 01H	; Update	RESET_FAN6_FLAG: MOV FAN6_FLAG, 0 MOV AL, 00H OUT PORTN, AL MOV AL, 09BH LCD to display "[OFF]" LEA SI, FAN_OFF_STR CALL DISPLAY_STR CMP FAN5_FLAG, 1 JE OFF_FAN6_ONLY	; Update	<pre>; MODULE: fetch data from temperature sensor using ADC ; ADDC ADDB ADDA ; 0 0 0 = TEMPSEN_1 ; 0 0 1 = TEMPSEN_2 ; 0 1 0 = TEMPSEN_3 READ_ADC: MOV DX, PORTD IN AL, DX</pre>
OUT PORTL, AL CONT_AT_ROOM2_2: JMP CONT		JMP CONT_AT_ROOM3_2 OFF_FAN6_ONLY: MOV AL, 01H		; MODULE: Endless loop ENDLESS: JMP ENDLESS
AT_ROOM3_2: CMP FAN6_FLAG, 1 JE RESET_FAN6_FLAG CMP FAN5_FLAG, 1 JE FANS_ROOM3_2		OUT PORTN, AL CONT_AT_ROOM3_2: JMP CONT ROOM1_WARNING:		INST_CTRL: PUSH AX; preserve value of AL MOV DX, PORTA; set port of LCD data bus (PORTA) OUT DX, AL; write data in AL to PORTA
MOV FAN6_FLAG, 1 MOV AL, 02H OUT PORTN, AL MOV AL, 09BH	; Update LCD	MOV AL, 01H OUT PORTF, AL MOV AL, 00H OUT PORTF, AL		MOV DX, PORTB; set port of LCD control lines (PORTB) MOV AL, 02H; E=1, RS=0 (access instruction reg)
to display "[ON] " LEA SI, FAN_ON_STR CALL DISPLAY_STR JMP CONT_AT_ROOM3_2		JMP CONT ROOM2_WARNING: MOV AL, 02H OUT PORTF, AL MOV AL, 00H		OUT DX, AL; write data in AL to PORTB CALL DELAY_1MS; delay for 1 ms MOV DX, PORTB; set port of LCD control lines (PORTB) MOV AL, 00H; E=0, RS=0
FANS_ROOM3_2: MOV FAN5_FLAG, 1 MOV FAN6_FLAG, 1 MOV AL, 03H		OUT PORTF, AL JMP CONT ROOM3_WARNING: MOV AL, 04H		OUT DX, AL; write data in AL to PORTB POP AX; restore value of AL RET
OUT PORTN, AL MOV AL, 0C7H LCD to display "[ON] " LEA SI, FAN_ON_STR CALL DISPLAY_STR	; Update	OUT PORTF, AL MOV AL, 00H OUT PORTF, AL JMP CONT		DATA_CTRL: PUSH AX; preserve value of AL MOV DX, PORTA; set port of LCD data bus (PORTA) OUT DX, AL; write data in AL to PORTA
MOV AL, 09BH LCD to display "[ON] "	; Update	CONT: CALL DELAY_1MS		MOV DX, PORTB; set port of LCD control lines (PORTB)

MOV AL, 03H ; E=1, RS=1 (access data register)	MOV AL, ØD4H	; displays	CMP FAN2_FLAG, 1	
OUT DX, AL ; write data in AL to PORTB	"Temperature: "		JE BUZZER_ON1	
CALL DELAY_1MS ; delay for 1 ms	LEA SI, TEMP_STR		CMP FAN3_FLAG, 1	
MOV DX, PORTB ; set port of LCD control lines	CALL DISPLAY_STR		JE BUZZER_ON2	
(PORTB)	MOV AL, ØE3H		CMP FAN4_FLAG, 1	
MOV AL, 01H ; E=0, RS=1	LEA SI, CLEAR BOTTOM		JE BUZZER ON2	
OUT DX, AL ; write data in AL to PORTB	CALL DÍSPLAY_STR		CMP FAN5_FLAG, 1	
POP AX; restore value of AL	_		JE BUZZER_ON3	
RET	MOV AL, ADC_CURR		CMP FAN6 FLAG, 1	
	CMP AL, 01BH		JE BUZZER_ON3	
INIT LCD:	JE TEMP_16		RET	
MOV AL, 38H ; 8-bit interface, dual-line	CMP AL, 01DH		BUZZER_ON1:	
display	JE TEMP 17		MOV AL, 0D4H	
CALL INST_CTRL ; write instruction to LCD	CMP AL, 01FH		LEA SI, WARNING_STR	
MOV AL, 08H ; display off, cursor off, blink	JE TEMP_18		CALL DISPLAY_STR	
off	CMP AL, 021H		MOV CX, Ø3H	
CALL INST_CTRL ; write instruction to LCD	JE TEMP_19		CALL TIMER CTRL	
MOV AL, 01H ; clear display	CMP AL, 022H		MOV ROOM1_WARNING_FLAG,	1
CALL INST_CTRL ; write instruction to LCD	JE TEMP_20		MOV AL, 02H	
MOV AL, 06H ; increment cursor, display shift	CMP AL, 024H		OUT PORTG, AL	
off	JE TEMP_21		MOV AL, 0C7H	; displays
CALL INST_CTRL ; write instruction to LCD	CMP AL, 026H		"[OFF]"	,,.
MOV AL, OCH; display on, cursor off, blink	JE TEMP_22		LEA SI, FAN_OFF_STR	
off	CMP AL, 027H		CALL DISPLAY_STR	
CALL INST_CTRL ; write instruction to LCD	JE TEMP_23		MOV AL, 09BH	; displays
RET	CMP AL, 029H		"[OFF]"	,
	JE TEMP_24		LEA SI, FAN_OFF_STR	
; MODULE: Convert the digital data from ADC to a	CMP AL, 02BH		CALL DISPLAY STR	
string format and convert to a certain speed	JE TEMP_25		RET	
; 16 21 26	CMP AL, 02CH		BUZZER_ON2:	
; 17 22 27	JE TEMP_26		MOV AL, 0D4H	
; 18 Speed 3 23 Speed 2 28 Speed 1	CMP AL, 02EH		LEA SI, WARNING_STR	
; 19 24 29	JE TEMP_27		CALL DISPLAY_STR	
; 20 25 30	CMP AL, 030H		MOV CX, 03H	
ADC_DATA_CONVERTER:	JE TEMP_28		CALL TIMER_CTRL	
MOV AL, ADC_CURR	CMP AL, 032H		MOV ROOM2_WARNING_FLAG,	1
CMP AL, 01BH	JE TEMP 29		MOV AL, 02H	
JL BUZZER	CMP AL, 033H		OUT PORTG, AL	
CMP AL, 033H	JE TEMP_30			displays "[OFF]"
JG BUZZER	RET		LEA SI, FAN_OFF_STR	
MOV AL, 00H			CALL DISPLAY_STR	
OUT PORTG, AL	BUZZER:			displays "[OFF]"
	CMP FAN1_FLAG, 1		LEA SI, FAN_OFF_STR	
	JE BUZZER_ON1		CALL DISPLAY_STR	

BUZZER_ONS:	RI	ET			RET
LEA SI, WARNING_STR CALL DISPLAY_STR MOV CX, 03H CACLL TIMER_CTRL MOV ROONS, WARNING_FLAG, 1 OUT PORTG, AL MOV AL, 03H OUT PORTG, AL MOV AL, 03H OUT PORTG, AL LEA SI, FAN_OFF_STR CALL DISPLAY_STR CALL DISPLAY_STR CALL DISPLAY_STR CALL DISPLAY_STR LEA SI, FAN_OFF_STR CALL DISPLAY_STR CALL HANDLE_ROOM MOV AL, 03H MOV AL, 03H CEA SI, 718 RET TEMP_15: CALL HANDLE_ROOM MOV AL, 03H CAMP AT_ROOMS_FLAG, 1 JE ROOMS CAMP AT_SCHED_FLAG, 1 JE ROOMS CALL HANDLE_ROOM MOV AL, 03H CALL HANDLE_ROOM MOV AL, 03H MOV AL,	BI	UZZER_ON3:		; Getting Temperature sensor value ready to	TEMP_23:
LEA SI, WARNING_STR CALL DISPLAY_STR MOV CX, 03H CACLL TIMER_CTRL MOV ROOWS, WARNING_FLAG, 1 OUT PORTG, AL MOV AL, 03H OUT PORTG, AL MOV AL, 03H OUT PORTG, AL MOV AL, 03H OUT PORTG, AL LEA SI, 716 RET CALL HANDLE_ROOM MOV AL, 03H MOV AL, 03H LEA SI, 716 RET TEMP_74: CALL HANDLE_ROOM MOV AL, 03H LEA SI, 717 RET CALL DISPLAY_STR CALL DISPLAY_STR CALL DISPLAY_STR CALL DISPLAY_STR RET TEMP_15: CALL HANDLE_ROOM MOV AL, 03H LEA SI, 718 RET HANDLE_ROOM: CMP AT_ROOMS_FLAG, 1 JE ROOM01 CMP AT_ROOMS_FLAG, 1 JE ROOM02 CMP AT_ROOMS_FLAG, 1 JE ROOM02 CMP AT_SCHED_FLAG, 1 JE ROOM03 CMP AT_SCHED_FLAG, 1 JE ROOM03 CMP AT_SCHED_FLAG, 1 JE ROOM01 RET TEMP_20: CALL HANDLE_ROOM MOV AL, 03H MOV AL, 03H MOV AL, 03H LEA SI, 719 RET TEMP_77: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 726 RET TEMP_77: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 726 RET TEMP_27: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 726 RET TEMP_27: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 727 RET TEMP_28: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 727 RET TEMP_28: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 727 RET TEMP_28: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 727 RET TEMP_28: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 727 RET TEMP_28: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 727 RET TEMP_28: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 728 RET TEMP_29: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 728 RET TEMP_29: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 728 RET TEMP_29: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 729 CONT1: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 729 CONT1: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 729 CONT1: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 729 CONT1: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 729 CONT1: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 729 CONT1: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 729 CONT1: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 729 CONT1: CALL HANDLE_ROOM MOV AL, 03H CLEA SI, 729 CONT1: CALL HANDLE_ROOM MOV AL, 03H CLEA SI,		MOV AL, 0D4H		display	CALL HANDLE_ROOM
CALL DISPLAY_STR				TEMP 16:	MOV AL, 02H
MOV CX, 03H					
CALL TIMER_CTRL OUT DX, AL RET MOV AL, 02H OUT DX, AL CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL CALL DISPLAY_STR CALL HANDLE_ROOM MOV AL, 02H CALL DISPLAY_STR CALL DISPLAY		-			
MOV ROOM3 WARRING FLAG, 1					
MOV AL, 92H OUT PORTIG AL MOV AL, 9C7H ; displays TEMP_17:		-			
OUT PORTG, AL MOV AL, 92H OUT DX, AL LEA SI, 724					_
MOV AL, 9C7H					_
CFF CALL DISPLAY_STR		· · · · · · · · · · · · · · · · · · ·	· displays		
LEA SI, FAN OFF STR CALL DISPLAY_STR MOV AL, 09BH ; displays RET TEMP_25: CALL HANDLE_ROOM MOV AL, 02H MOV AL, 09BH MOV AL, 02H MOV AL,	"[OEE]"	MOV AL, 00/11	, displays		
CALL DISPLAY_STR CALL DISPLAY_STR MOV AL, 09BH ; displays RET TEMP_18:	[011]	IEA ST EAN OEE STD			
MOV AL, 09BH ; displays				, ,	
"[OFF]" LEA SI, FAN OFF STR CALL DISPLAY_STR RET RET HANDLE_ROOM: CMP AT_ROOM1_FLAG, 1 JER OOM02 CMP AT_SCOM2_FLAG, 1 JER OOM03 CMP AT_SCOM2_FLAG, 1 JER OOM04 CMP AT_SCOM2_FLAG, 1 JER OOM05 CMP AT_SCOM2_FLAG, 1 JER OOM05 CMP AT_SCOM2_FLAG, 1 JER OOM06 CMP AT_SCOM2_FLAG, 1 JER OOM07 CMP AT_SCOM2_FLAG, 1 JER OOM08 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T20 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T27 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T20 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T20 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T20 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T20 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T28 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T21 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 03H OUT DX, AL CALL HANDLE_ROOM MOV AL, 03H			. dienlave		
LEA SI, FAN_OFF_STR CALL HANDLE_ROOM LEA SI, 725	"[סככ]"	MUV AL, 09BH	; uisplays		<u> </u>
CALL DISPLAY_STR MOV AL, 03H CLA SI, 725 RET	[OFF]	LEA CT. FAN OFF CTD			
RET HANDLE_ROOM: CMP AT_ROOM1_FLAG, 1 JE ROOM01 CMP AT_ROOM2_FLAG, 1 JE ROOM02 CMP AT_ROOM3_FLAG, 1 JE ROOM03 CMP AT_ROOM3_FLAG, 1 JE ROOM03 CMP AT_SCHED_FLAG, 1 JE ROOM03 CMP AT_SCHED_FLAG, 1 JE ROOM05 CMP AT_SCHED_FLAG, 1 JMP CONT1 ROOM01: RET ROOM01: RET ROOM01: RET ROOM02: MOV DX, PORTK JMP CONT1 ROOM02: MOV DX, PORTK JMP CONT1 ROOM02: MOV DX, PORTM MOV AL, 02H OUT DX, AL LEA SI, T27 RET CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T28 RET CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T28 RET CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T21 RET CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29 CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29					
HANDLE_ROOM: RET CALL HANDLE_ROOM MOV AL, 01H					
HANDLE ROOM: CMP AT_ROOM1_FLAG, 1	RI	El			
CMP AT_ROOM1_FLAG, 1 TEMP_19:					<u> </u>
JE ROOM01	H	_			-
CMP AT_ROOM2_FLAG, 1 JE ROOM02 CMP AT_ROOM3_FLAG, 1 JE ROOM03_FLAG, 1 JE ROOM03_FLAG, 1 JE ROOM03_FLAG, 1 JE ROOM03 CMP AT_SCHED_FLAG, 1 JE ROOMS JE ROOMS CALL HANDLE_ROOM CMP AT_SCHED_FLAG, 1 JE ROOMS JMP CONT1 ROOM01: MOV DX, PORTK JMP CONT1 ROOM02: MOV DX, PORTK JMP CONT1 ROOM03: MOV DX, PORTM JMP CONT1 ROOM05: MOV DX, PORTO JMP CONT1 RET CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL LEA SI, T29 CONT1: RET CALL HANDLE_ROOM MOV AL, 02H DUT DX, AL LEA SI, T29 RET					
JE ROOM02 CMP AT_ROOM3_FLAG, 1 JE ROOM03 CMP AT_SCHED_FLAG, 1 JE ROOMS CALL HANDLE_ROOM CALL HANDLE_ROO					
CMP AT_ROOM3_FLAG, 1 LEA SI, T19 TEMP_27:					
RET					
CMP AT_SCHED_FLAG, 1 TEMP_20: MOV AL, 01H JE ROOMS CALL HANDLE_ROOM OUT DX, AL JMP CONT1 MOV AL, 03H LEA SI, T27 ROOM01: LEA SI, T20 RET MOV DX, PORTK RET CALL HANDLE_ROOM JMP CONT1 TEMP_21: MOV AL, 01H ROOM02: CALL HANDLE_ROOM OUT DX, AL JMP CONT1 MOV AL, 02H LEA SI, T28 ROOM03: LEA SI, T21 TEMP_29: MOV DX, PORTO RET CALL HANDLE_ROOM JMP CONT1 CALL HANDLE_ROOM MOV AL, 01H ROOMS: CALL HANDLE_ROOM OUT DX, AL LEA SI, T29 LEA SI, T29					
JE ROOMS CALL HANDLE_ROOM NOV AL, 03H LEA SI, T27 ROOM01:					_
MOV AL, 03H LEA SI, T27					
OUT DX, AL RET TEMP_28: MOV DX, PORTK RET CALL HANDLE_ROOM MOV DX, PORTK TEMP_21: MOV AL, Ø1H OUT DX, AL MOV DX, PORTM GALL HANDLE_ROOM OUT DX, AL LEA SI, T28 MOV DX, PORTM LEA SI, T28 MOV DX, PORTO RET CALL HANDLE_ROOM OUT DX, AL RET CALL HANDLE_ROOM OUT DX, AL CALL HANDLE_ROOM CONTINUE CALL HANDLE_ROOM OUT DX, AL CALL HANDLE_ROOM CONTINUE CALL HANDLE_ROOM OUT DX, AL CALL HANDLE_ROOM CONTINUE CALL HANDLE_ROOM OUT DX, AL CALL HANDLE_R		JE ROOMS			
ROOM01:		JMP CONT1		MOV AL, 03H	
MOV DX, PORTK RET CALL HANDLE_ROOM JMP CONT1 TEMP_21: MOV AL, 01H ROOM02: CALL HANDLE_ROOM OUT DX, AL MOV DX, PORTM MOV AL, 02H LEA SI, T28 JMP CONT1 OUT DX, AL RET ROOM03: LEA SI, T21 TEMP_29: MOV DX, PORTO RET CALL HANDLE_ROOM JMP CONT1 TEMP_22: MOV AL, 01H ROOMS: CALL HANDLE_ROOM OUT DX, AL LEA SI, T29 LEA SI, T29 CONT1: OUT DX, AL RET				OUT DX, AL	RET
JMP CONT1		ROOM01:		LEA SI, T20	TEMP_28:
ROOM02: CALL HANDLE_ROOM OUT DX, AL MOV DX, PORTM MOV AL, 02H LEA SI, T28 JMP CONT1 OUT DX, AL RET ROOM03: LEA SI, T21 TEMP_29: MOV DX, PORTO RET CALL HANDLE_ROOM JMP CONT1 TEMP_22: MOV AL, 01H ROOMS: CALL HANDLE_ROOM OUT DX, AL MOV AL, 02H LEA SI, T29 CONT1: OUT DX, AL RET		MOV DX, PORTK		RET	CALL HANDLE_ROOM
MOV DX, PORTM MOV AL, 02H LEA SI, T28 JMP CONT1 OUT DX, AL RET ROOM03: LEA SI, T21 TEMP_29: MOV DX, PORTO RET CALL HANDLE_ROOM JMP CONT1 TEMP_22: MOV AL, 01H ROOMS: CALL HANDLE_ROOM OUT DX, AL LEA SI, T29 LEA SI, T29 CONT1: OUT DX, AL RET		JMP CONT1		TEMP_21:	MOV AL, 01H
JMP CONT1		ROOM02:		CALL HANDLE_ROOM	OUT DX, AL
ROOM03: MOV DX, PORTO JMP CONT1 RET CALL HANDLE_ROOM TEMP_22: CALL HANDLE_ROOM OUT DX, AL MOV AL, 02H OUT DX, AL CONT1: TEMP_29: CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL RET TEMP_29: CALL HANDLE_ROOM MOV AL, 02H OUT DX, AL RET		MOV DX, PORTM		MOV AL, 02H	LEA SI, T28
MOV DX, PORTO JMP CONT1 ROOMS: CALL HANDLE_ROOM TEMP_22: CALL HANDLE_ROOM OUT DX, AL LEA SI, T29 CONT1: CALL HANDLE_ROOM OUT DX, AL RET CALL HANDLE_ROOM OUT DX, AL RET CALL HANDLE_ROOM OUT DX, AL RET		JMP CONT1		OUT DX, AL	RET
JMP CONT1 ROOMS: CALL HANDLE_ROOM MOV AL, 01H OUT DX, AL MOV AL, 02H CONT1: OUT DX, AL RET		ROOM03:		LEA SI, T21	TEMP_29:
ROOMS: CALL HANDLE_ROOM OUT DX, AL MOV AL, 02H LEA SI, T29 CONT1: RET		MOV DX, PORTO		RET	CALL HANDLE_ROOM
MOV AL, 02H LEA SI, T29 CONT1: OUT DX, AL RET		JMP CONT1		TEMP_22:	MOV AL, 01H
CONT1: OUT DX, AL RET		ROOMS:		CALL HANDLE_ROOM	OUT DX, AL
CONT1: OUT DX, AL RET				MOV AL, 02H	LEA SI, T29
RET LEA SI, T22 TEMP_30:	C	ONT1:		OUT DX, AL	RET
	RI	ET		LEA SI, T22	TEMP_30:

CALL HANDLE_ROOM MOV AL, 01H OUT DX, AL LEA SI, T30 RET
; MODULE: Displays a string from SI DISPLAY_STR: CALL INST_CTRL
DISP: MOV AL, [SI] CMP AL, '\$' JE EXIT CALL DATA_CTRL INC SI JMP DISP RET
DISPLAY_HOUR_TENS: MOV AL, 08FH CALL INST_CTRL MOV AL, HR_TENS_DIGIT CALL DATA_CTRL RET
DISPLAY_HOUR_ONES: MOV AL, 090H CALL INST_CTRL MOV AL, HR_ONES_DIGIT CALL DATA_CTRL RET
DISPLAY_COLON: MOV AL, 091H CALL INST_CTRL MOV AL, 3AH CALL DATA_CTRL RET
DISPLAY_MIN_TENS: MOV AL, 092H CALL INST_CTRL MOV AL, MIN_TENS_DIGIT

```
CALL DATA_CTRL
    RET
   DISPLAY_MIN_ONES:
       MOV AL, 093H
        CALL INST_CTRL
       MOV AL, MIN_ONES_DIGIT
        CALL DATA_CTRL
    RET
    ; MODULE: Timer Control
   TIMER_CTRL:
        CALL DELAY_1S
        DEC CX
        CMP CX, 00H
        JNZ TIMER_CTRL
    RET
   DELAY 1S:
       MOV DX, PORT_T
                       ; access 8253 timer
       MOV AL, 0A0H
       OUT DX, AL
       MOV AL, 0FH
        OUT DX, AL
       LOCK_INPUT:
           MOV DX, PORTH
           IN AX, DX
           XOR AH, AH
           AND AL, 01H
           CMP AL, 00H ; checks if remaining time
is 0
           JNE LOCK_INPUT
    RET
   DELAY_500MS: MOV CX, 25
    L2:
        CALL DELAY_1MS
       LOOP L2
        RET
   DELAY_1MS: MOV BX, 02CAH
    L1:
        DEC BX
        NOP
```

JNZ L1
RET
RET

EXIT:
RET
CODE ENDS
END START