

## **Microprocessor Based Night Lamp with Morning Alarm**

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### **Abstract**

In the present paper the author has designed and developed a system to glow the night lamp in the evening and gives an alarm in the morning automatically using the most popular Microprocessor 8085. Assembly language programming was developed to display the current time in the address and data field of the Microprocessor kit in 24 Hrs mode. After the execution of the program with current time and other data are stored in the memory locations specified for the purpose and the electronic circuit so developed is connected to the kit, gives required result very accurately.

### **INTRODUCTION**

With the advent integrated circuits latest and modern microprocessors are available which works with a very high clock speed. But the 8085A Microprocessor is still a most popular microprocessor and widely used in higher education. It has simple architecture and adequate instruction set and works with clock speed of 5 MHz. The beauty of this microprocessor is its logical and simple assembly language programming. In the present paper the author designed and developed a system that will automatically switch ON the night lamp at the pre-set time (say in the evening at 19.00 hrs.) and gives a morning alarm (say at 6.00 hrs) for some time and switch off the night bulb using 8085A microprocessor. The electronic circuit for glowing of night lamp and ringing the alarm at proper time was designed and interfaced with the 8085A microprocessor through a programmable peripheral Interface (PPI) 8255. The software for the same was prepared in the assembly language of the Microprocessor 8085 which was checked on the M/S SCIEN TECH kit (M85-01) and found to work satisfactorily. The simple logic of assembly language programming is very easy to understand rather it is self explanatory. The current time is stored in the memory locations say 2050H to 2055 H as given in the

program. The assembly language program was developed to show the current time in 24 Hrs. mode (i.e. after 12:59:59 it will show 13:00:00 and after 23:59:59 it will show 00:00:00 and so on). Such project may be designed by the B. Tech./M. Tech. students of the Electrical or Electronics Engineering.

### Set-up:

The circuit diagram for switching ON the lamp and alarm using IC 8255-I PPI (Programmable Peripheral Interface), attached with the Microprocessor in the Kit is shown in figure 1. The night lamp is connected through a 9-volt relay. The base of the transistor BC 107 is connected to PA<sub>0</sub> pin of 8255 through 10 K $\Omega$  resistance. The night bulb is connected to the A.C. mains through the N/O pins of the relay. When a high signal was received through the software to a PA<sub>0</sub> (D<sub>0</sub> bit of port A) of 8255-I, the transistor goes into saturation. The relay is energized.

The N/O terminals of the relay get connected and night bulb becomes ON. When PA<sub>0</sub> pin is low (through programming) night lamp becomes off.

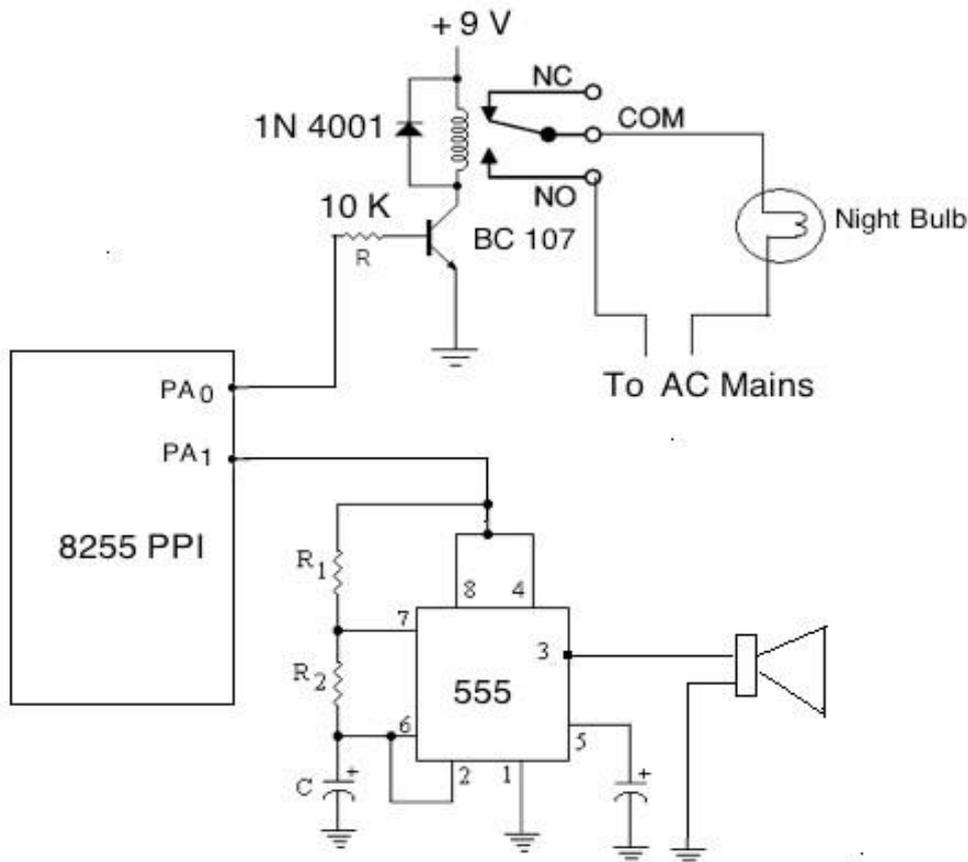


Fig. 1

PA<sub>1</sub> pin of 8255-I is connected to a timer IC 555. This IC is wired in Astable multivibrator mode as shown in figure 1. The frequency of this multivibrator is given by the equation 1. The values of resistances R<sub>1</sub>, R<sub>2</sub> and Capacitor C may be chosen as per the frequency of the alarm

$$f = \frac{1}{0.69(R_1 + 2R_2)C} = \frac{1.44}{(R_1 + 2R_2)C} \dots\dots\dots (1)$$

When PA<sub>1</sub> pin of 8255-I is high Astable Multivibrator works and gives an audio signal to the speaker giving the Alarm sound.

#### ASSEMBLY LANGUAGE PROGRAM:

The assembly language program to switch ON the night bulb and ringing the alarm is given below:

Address	Op code	Label	Mnemonics	Comments
20F6	31 FF 27		LXI SP, 27FF H	: Initialize stack pointer
20F9	3E 80		MVI A, 80 H	: Initialize 8255-I, all ports as output port
20FB	DE 03		OUT 03 H	: Control word for 8255-I
20FD	CD 47 03		CALL 0347 H	: Clears the display
2100	AF	START	XRA A	: Make Acc. = 0
2101	47		MOV B, A	: Make B= 0
2102	21 50 20		LXI H, 2050 H	: stores the Address of MSD of current time in HL register pair
2105	CD D0 05		CALL 05D0 H	: Calls subroutine to display MSD and LSD of current time in address field

2108	3E 01		MVI A, 01 H	
210A	06 00		MVI B, 00 H	
210C	21 54 20		LXI H, 2054 H	
210F	CD D0 05		CALL 05 D0 H	: Program to display Seconds in data field
2112	CD 08 25		CALL 2508 H	: Program to check if time for night lamp
2115	CD 08 25		CALL 251E H	: Program to check if Alarm time
2118	21 55 20		LXI H, 2055 H	
211B	7E		MOV A, M	: Stores LSD of current sec in Acc.
211C	C6 01		ADI 01 H	: Add 1 to it
211E	FE 0A		CPI 0A H	: Compare with 0A H
2120	CA 33 21		JZ RR	: If it is > 9 jump to RR
2123	77		MOV M, A	: stores LSD of current time to location
2124	06 02	DD	MVI B, 02 H	
2126	11 00 FA	YY	LXI D, FA 00 H	
2129	CD 00 25		CALL 2500 H	: 1 sec delay program
212C	05		DCR B	
212D	C2 26 21		JNZ YY	
2130	C3 00 21		JMP START	: Go to START
2133	3E 00	RR	MVI A, 00 H	: For more than 9 make it 00
2135	77		MOV M, A	: Store it to LSD of Sec location
2136	2B		DCX H	
2137	7E		MOV A, M	: Stores the MSD of Sec to Acc
2138	C6 01		ADI 01 H	: Add 1 to it
213A	FE 06		CPI 06 H	: Compare with 06 H
213C	CA 43 21		JZ UU	: if it is 6 jump to UU
213F	77		MOV M, A	: Else store to its memory location
2140	C3 24 21		JMP DD	: Jump to DD for 1 Sec delay and repeat

2143	3E 00	UU	MVI A, 00H	: MSD of Sec is 6 makes it 00
2145	77		MOV M, A	: Store its memory location
2146	2B		DCX H	
2147	7E		MOV A, M	: Stores LSD of Minutes to Acc.
2148	C6 01		ADI 01 H	: Add 1 to it
214A	FE 0A		CPI 0A H	: Compare it with 0A H
214C	CA 53 21		JZ VV	: If it is > 9 Jump to VV
214F	77		MOV M, A	: Store its memory location
2150	C3 24 21		JMP DD	: Jump to DD for 1 sec Delay and repeat
2153	3E 00	VV	MVI A, 00H	: For more than 9 make it 00
2155	77		MOV M, A	: Stores it to LSD of Min location
2156	2B		DCX H	
2157	7E		MOV A, M	: Loads ACC with MSD of Min location
2158	C6 01		ADI 01 H	: Adds 1 to it
215A	FE 06		CPI 06 H	: Compare it with 06
215C	CA 63 21		JZ SS	: If it is 06 then JUMP to SS
215F	77		MOV M, A	: Else store it MSD of Min location
2160	C3 24 21		JMP DD	: Jump to DD for 1 Sec delay and repeat
2163	3E 00	SS	MVI A, 00H	: If is 06 make it to 00
2165	77		MOV M, A	: Stores it to MSD of Min location
2166	2B		DCX H	
2167	7E		MOV A, M	: Loads ACC with LSD of HRS
2168	C6 01		ADI 01 H	: Adds 1 to it
216A	FE 05		CPI 05 H	: Compare if it is 05 ( for 24)
216C	CA 79 21		JZ FF	: If it is 05 then JUMP to FF
216F	77		MOV M, A	: Else store it LSD of HRS location
2170	FE 0A		CPI 0A H	: Compare with 0A
2172	CA 97 21		JZ EE	: if it is more than 9 Jump to EE
2175	77		MOV M, A	: Else store it to LSD of HRS location
2176	C3 24 21		JMP DD	: Jump to DD for 1 sec delay and repeat
2179	2B	FF	DCX H	
217A	7E		MOV A, M	: Move MSD of HRS to ACC
2158	C6 01		ADI 01 H	: Add 01 to it
217B	FE 02		CPI 02 H	: Compare it 02 (for 24)
217D	CA 8D 21		JZ GG	: If it is 02 Jump to GG
2180	23		INX H	
2181	7E		MOV A, M	: Else load LSD of HRS to ACC
2182	C6 01		ADI 01 H	: Add 01 to it
2184	FE 0A		CPI 0A H	: Compare it with 0A
2186	CA 97 21		JZ EE	: If is more than 9 jump to EE
2189	77		MOV M, A	: Stores to its memory location
218A	C3 24 21		JMP DD	: Jump to DD for 1 Sec delay and repeat
218D	3E 00	GG	MVI A, 00 H	: If HRS is 24 make 00
218F	77		MOV M, A	
2190	23		INX H	
2191	3E 00		MVI A, 00H	
2193	77		MOV M, A	

2194	C3 24 21		JMP DD	: Jump to DD for 1 Sec delay and repeat
2197	3E 00	EE	MVI A, 00 H	: LSD of HRS MORE than 9 make it 00
2199	77		MOV M, A	: Store to its memory location
219A	2B		DCX H	
219B	7E		MVI A, M	: Stores MSD of HRS to ACC
219C	C6 01		ADi 01 H	: Add 01 to it
219E	77		MOV M, A	: Store to its memory locations
219F	C3 24 21		JMP DD	: Jump to DD for 1 Sec delay and repeat

**1 Sec DELAY SUBROUTINE**

2500	IB	NEXT	DCX D
2501	7A		MOV A, D
2502	B3		ORA E
2503	C2 00 25		JNZ NEXT
2506	C9		RET

**SUBROUTINE PROGRAM FOR CHECKING IF CURRENT TIME IS GLOWING OF NIGHT LAMP AND/ OR MORNING ALARM TIME**

2508	21 53 20		LXI H, 2055 H	: LSD of current Sec.
250B	11 5C 20		LXI D, 205C H	: LSD of Night lamp time
250E	06 06		MVI B, 06H	: B as Counter 6 (for checking of LSD of Sec to MSD of HRS)
2510	1A	AGAIN	LDAX D	: M <sub>D-E</sub> to ACC
2511	BE		CMP M	: Compares it with M <sub>H-L</sub>
2512	C0		RNZ	: Return if not equal
2513	2B		DCX H	: Decrement M <sub>H-L</sub>
2514	1B		DCX D	: Decrement M <sub>D-L</sub>
2515	05		DCR B	: Decrement B
2516	C2 10 25		JNZ AGAIN	: Jump AGAIN
2519	3E 01		MVI A, 01H	: Initialize PA <sub>0</sub> to 1
251B	DE 00		OUT 00H	: Glows the Night Lamp
251D	C9		RET	: Return back
251E	21 55 20		LXI H, 2055H	} : Similar program for checking of : Morning Alarm time
2521	11 62 20		LXI D, 2062H	
2524	06 06		MVI B, 06H	
2526	1A	AGAIN1	LDAX D	
2527	BE		CMP M	
2528	C0		RNZ	
2529	2B		DCX H	
252A	1B		DCX D	
252B	05		DCR B	
252C	C2 26 25		JNZ AGAIN1	
252F	3E 01		MVI A, 02H	: Initialize Port A as 02
2531	DE 00		OUT 00H	: Night lamp off and Alarm rings
2533	21 55 20		LXI H, 2055 H	
2536	7E		MOV A, M	: LSD of Current time to ACC
2537	C6 01		ADI 01 H	: Add 1 to it

2539	77	XXX	MOV M, A	: Stores to its memory location
253A	06 02		MVI B, 02 H	}
253C	11 00 FA	XYZ	LXI D, FA00H	
253E	CD 00 25		CALL 2500 H	: 1 sec delay program
2541	05		DCR B	}
2542	C2 3C 25		JNZ XYZ	
2545	AF		XRA A	}
2546	47		MOV B, A	
2547	21 50 20		LXI H, 2050 H	}
254A	CD D0 05		CALL 05D0 H	
254D	3E 01		MVA A, 01 H	: Displays current time
254F	06 00		MVI B, 00 H	: in Address & data field
2551	21 54 20		LXI H 2054 H	}
2553	CD D0 05		CALL 05D0 H	
2556	21 55 20		LXI H, 2055 H	}
2559	7E		MOV A, M	
255A	C6 01		ADI 01 H	: Move Current Sec. to ACC.
255C	FE 06		CPI 08 H	: Add 1 to it
255E	C2 39 25		JNZ XXX	: Compare with 08
2561	3E 00		MVI A, 00 H	: If it is < 08 Jump to XXX
2563	D3 00		OUT 00 H	: Initialize Port A as 00
2565	C9		RET	: Alarm also OFF after 8 sec
				: Return to main program

**DATA**

2050	MSD OF HOURS	}	: Current time
2051	LSD OF HOURS		
2052	MSD OF MINUTES		
2053	LSD OF MINUTES		
2054	MSD OF SECONDS		
2055	LSD OF SECONDS	}	: Time for Night Lamp
2056	01		
2057	MSD OF 01	}	: Time for Morning Alarm
2058	LSD OF 09		
2059	MSD OF 00		
205A	LSD OF 00		
205B	MSD OF 00		
205C	LSD OF 00	}	
205D	MSD OF 00		
205E	LSD OF 06		
205F	MSD OF 00		
2060	LSD OF 00		
2061	MSD OF 00	}	
2062	LSD OF 00		

**WORKING**

This program written in assembly language is self-explanatory. As shown above the current time is stored in the memory locations from 2050 H to 2055 H. Time for night lamp is stored in the memory locations from 2057 H to 205C H and the time for morning alarm is stored in the memory locations 205D H to 2062 H.

When the program is executed, the current time is displayed in the address and data fields of the microprocessor kit in 24 Hrs mode. The current time is updated after every second by the software. Assembly language is such that the night lamp will automatically switched ON in the evening at 19:00:00 hrs and it is switched OFF in the morning at 6:00:00 hrs and simultaneously alarm becomes ON for 8

Secs. It was found to work very accurate. Time to switch ON the night bulb and Alarm time in the morning be stored as per your requirement.

**ACKNOWLEDGEMENT**

Thanks are due to the authorities of SVS University, Meerut for providing the necessary facilities for the research.

**BIBLIOGRAPHY**

- [1] R. S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5<sup>th</sup> ed., Prentice Hall, 2002.
- [2] B. Ram, "Fundamentals of Microprocessor and Microcomputers" Dhanpat Rai Publications, New Delhi.
- [3] D. K. Kaushik, "An Introduction to Microprocessor 8085", Dhanpat Rai publishing Co., New Delhi.
- [4] Deepak Kumar and Divanshu Kaushik, "A Review Paper on 8085 Microprocessor", IJIRT, Vol. 1, No.6, pp. 501-503.
- [5] O P Garg and D K Kaushik, "Use of microprocessor in LED Dial Clock" IJIEC, Vol.6, No.1 (2014), pp.7-13.