

Processor Hardware/Software Interface

EECS 113

Assignment 3: Motor Revolution Counter

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The screenshot displays the Proteus simulator interface for an 8051 microcontroller project. The top section shows the hardware configuration, including the 8051 microcontroller with its registers (R0-R7, B, ACC, PSW, IP, IE, PCON, DPH, DPL, SP) and memory (Data Memory, PC, PSW). The system clock is set to 12.0 MHz. The assembly code is shown in the center, with comments indicating the purpose of each instruction. The bottom section shows the peripheral components, including a keypad, a motor, and a display (LCD or 7-segment).

System Clock (MHz): 12.0
SBUF: 0x00, 0x00, 0xD9, 0x15
RXD TXD: 1, 0, TMOD: 0x51, SCON: 0x00, TCON: 0x5A
pins bits: 0xF9, 0xF9, P3, 0x00, 0x00, 0xFF, 0xFF, P2, 0x30, 0x30, P1, 0xFF, 0xFF, P0, 0x00A4, PC: 8051, PSW: 0, 0, 0, 0, 0, 0, 0, 1
Data Memory: 00 45 3F 00 00 00 00 00 00 00 00 00 84 00 93 00 93 00 10 00 00 00 00 00 00 00 00 00 00 00 00 00 20 00 00 00 00 00 00 00 00 00 00 00 00 00 30 00 00 00 00 00 00 00 00 00 00 00 00 00 40 31 35 36 30 30 00 00 00 00 00 00 00 00 00 00 50 00 00 00 00 00 00 00 00 00 00 00 00 00 60 00 00 00 00 00 00 00 00 00 00 00 00 00 70 00 00 00 00 00 00 00 00 00 00 00 00 00

Assembly Code:
;---LCD Send LCD Command
0088 CLR RS
008A MOV P1, A
008C ACALL PULSE
008E RET
;---Pulse---
PULSE:
008F SETB E
0091 ACALL DELAY
0093 CLR E
;---Delays---
DELAY: ;LCD delay
0095 MOV R7, #50
0097 DJNZ R7, \$
0099 RET
DELAY10: ;10ms delay correspond
;65536-10000=55536, 55536=D8F0H
009A MOV TH0, #0D8H
009D MOV TL0, #0F0H
00A0 SETB TR0
00A2 SETB TR1
00A4 JNB TF0, \$

Peripheral Components:
- Keypad: 12x3 matrix, 12 keys.
- Motor: 24V, 1.5A, 1500 RPM.
- Display: 4-digit 7-segment display showing 15500.
- ADC: 8-bit, 0.0V input, 11111111 output.
- UART: 8-bit, 4800 Baud, No Parity.

System Clock (MHz) 12.0

100 Update Freq.

SBUF

R/O	W/O	TH0	TL0	R7	0x00	B	0x06
0x00	0x00	0xD9	0xCF	R6	0x00	ACC	0x80
RXD	TXD	TMOD	0x51	R5	0x00	PSW	0x01
1	0	0x51	0x5A	R4	0x00	IP	0x00
SCON	0x00	TCON	0x5A	R3	0x00	IE	0x00
				R2	0x00	PCON	0x00
pins	bits	TH1	TL1	R1	0x3F	DPH	0x00
0xF9	0xF9	P3	0x00	0x0E	0x45	DPL	0x00
0xFF	0xFF	P2				SP	0x09
0x30	0x30	P1					
0xFF	0xFF	P0					

PC 8051

0x00A4

PSW 00000001

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	45	3F	00	00	00	00	00	00	00	00	84	00	93	00	93	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	36	32	33	30	30	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Time: 24ms 436us - Instructions: 12300

Send LCD command

```

CMD:
0088 CLR RS
008A MOV P1, A
008C ACALL PULSE
008E RET

;---Pulse---
PULSE:
008F SETB E
0091 ACALL DELAY
0093 CLR E

;---Delays---
DELAY: ;LCD delay
0095 MOV R7, #50
0097 DJNZ R7, $
0099 RET

DELAY10: ;10ms delay correspond
;65536-10000=55536, 55536=D8F0
009A MOV TH0, #0D8H
009D MOV TL0, #0F0H
00A0 SETB TR0
00A2 SETB TR1
00A4 JNB TF0, $

```

P0.7	1	Display-select Decoder CS DAC WR
P0.6	1	Keypad Column 2
P0.5	1	Keypad Column 1
P0.4	1	Keypad Column 0
P0.3	1	Keypad Row 3
P0.2	1	Keypad Row 2
P0.1	1	Keypad Row 1
P0.0	1	Keypad Row 0
P1.7	0	LED 7 Seg. dp DAC DB7 LCD DB7
P1.6	0	LED 6 Seg. g DAC DB6 LCD DB6
P1.5	1	LED 5 Seg. f DAC DB5 LCD DB5
P1.4	1	LED 4 Seg. e DAC DB4 LCD DB4
P1.3	0	LED 3 Seg. d DAC DB3 LCD DB3
P1.2	0	LED 2 Seg. c DAC DB2 LCD DB2
P1.1	0	LED 1 Seg. b DAC DB1 LCD DB1
P1.0	0	LED 0 Seg. a DAC DB0 LCD DB0
P2.7	1	SW 7 ADC DB7
P2.6	1	SW 6 ADC DB6
P2.5	1	SW 5 ADC DB5
P2.4	1	SW 4 ADC DB4
P2.3	1	SW 3 ADC DB3
P2.2	1	SW 2 ADC DB2
P2.1	1	SW 1 ADC DB1
P2.0	1	SW 0 ADC DB0
P3.7	1	ADC RD Comparator Output
P3.6	1	ADC WR
P3.5	1	Motor Sensor
P3.4	1	Display-select Input 1
P3.3	1	AND G..put Displ..t 0 LCD RS
P3.2	0	LCD E ADC INTR
P3.1	0	Motor Control Bit 1 Ext. UART Rx
P3.0	1	Motor Control Bit 0 Ext. UART Tx

DI LD

7 6 5 4 3 2 1 0

0.0 V output

Scope DAC

1 2 3 AND Gate Disabled

4 5 6 Key Bounce Disabled

7 8 9 Standard

* 0 #

U No Parity 8-bit UART @ 4800 Baud

Rx Rx Reset

Tx Tx Send

0.0 V input

11111111

ADC

MAX

MIN

Motor Enabled

BF 0 AC 0x05 IR 0x80 DR 0x30

8.8.8.8

System Clock (MHz) 12.0

100 Update Freq.

SBUF

R/O	W/O	TH0	TL0	R7	0x00	B	0x01
0x00	0x00	0xDA	0xD3	R6	0x00	ACC	0x80
RXD	TXD	TMOD	0x51	R5	0x00	PSW	0x01
1	0	0x51	0x5A	R4	0x00	IP	0x00
SCON	0x00	TCON	0x5A	R3	0x00	IE	0x00
				R2	0x00	PCON	0x00
pins	bits	TH1	TL1	R1	0x3F	DPH	0x00
0xF9	0xF9	P3	0x00	0x05	0x45	DPL	0x00
0xFF	0xFF	P2				SP	0x09
0x30	0x30	P1					
0xFF	0xFF	P0					

PC 8051

0x00A4

PSW 00000001

Data Memory

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
00	45	3F	00	00	00	00	00	00	00	00	84	00	93	00	93	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	31	31	36	30	30	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Remove All Breakpoints

RST Step Run New Load Save Copy Paste

Time: 36ms 759us - Instructions: 18500

Send LCD command

```

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008A MOV P1, A
008C ACALL PULSE
008E RET

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P0.1	1	Keypad Row 1
P0.0	1	Keypad Row 0
P1.7	0	LED 7 Seg. dp DAC DB7 LCD DB7
P1.6	0	LED 6 Seg. g DAC DB6 LCD DB6
P1.5	1	LED 5 Seg. f DAC DB5 LCD DB5
P1.4	1	LED 4 Seg. e DAC DB4 LCD DB4
P1.3	0	LED 3 Seg. d DAC DB3 LCD DB3
P1.2	0	LED 2 Seg. c DAC DB2 LCD DB2
P1.1	0	LED 1 Seg. b DAC DB1 LCD DB1
P1.0	0	LED 0 Seg. a DAC DB0 LCD DB0
P2.7	1	SW 7 ADC DB7
P2.6	1	SW 6 ADC DB6
P2.5	1	SW 5 ADC DB5
P2.4	1	SW 4 ADC DB4
P2.3	1	SW 3 ADC DB3
P2.2	1	SW 2 ADC DB2
P2.1	1	SW 1 ADC DB1
P2.0	1	SW 0 ADC DB0
P3.7	1	ADC RD Comparator Output
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0.0 V output

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Motor Enabled

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