

# Some Programs for the COSMAC ELF

A few simple programs to exercise the COSMAC ELF.

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## Q Toggle (Blink)

Description: Toggle the Q Bit and so blink the Q LED.  
 Author: Joe Weisbecker (from the Popular Electronics September 1976 ELF article)

Addr	Mem	Label	Instr	Comment
----	---	-----	-----	-----
00	7A		REQ	Q off
01	F8	Delay	LDI 16	Delay will be 256*num
02	10			
03	B1		PHI 1	Load delay into high bits of R1
04	21	DlyLp	DEC 1	R(1)--
05	91		GHI 1	R(1).1 -> D
06	3A		BNZ DlyLp	Loop until 0
07	04			
08	31		BQ 0	If Q is on go turn it off.
09	00			
10	7B		SEQ	Turn Q on.
11	30		BR Delay	Goto Delay.
12	01			

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## Addr to Data

Description: Set the data in each memory location equal to its address.

Author: IBM

Addr	Mem	Label	Instr	Comment
00	90		GHI 0	Register 0 has 0001.
01	AF		PLO 15	Set RF = 0000.
02	BF		PHI 15	
03	EF	Loop	SEX 15	
04	8F		GLO 15	This is the address value.
05	73		STXD	Set Data = Address.
06	30		BR Loop	Repeat until done.
07	03			

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## Blinky Mem

Description: Scans through memory, displaying each byte with a delay for visibility.  
Author: Brent Hilpert

Addr	Mem	Label	Instr		Comment
----	---	-----	-----	-----	-----
00	E2	Start	SEX	2	X refs R2
01	F8		LDI	0	0 -> R2
02	00				
03	A2		PLO	2	
04	B2		PHI	2	
05	82	Loop	GLO	2	Check low bits of pointer
06	CE		LSZ		for 0.
07	7A		REQ		and display Q appropriately.
08	38		SKP		
09	7B		SEQ		
0A	64		OUT	4	Display mem, increment pointer.
0B	F8	Delay	LDI	8	Delay is 256*num.
0C	08				
0D	B1		PHI	1	Load delay into high bits.
0E	21	DlyLp	DEC	1	Count down
0F	91		GHI	1	
10	3A		BNZ	DlyLp	until 0
11	0E				
12	30		BR	Loop	Loop for next mem location.
13	05				

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## Walking Bit

Description: A simple program to rotate a bit around the 8 display LEDs.  
Author: Brent Hilpert

Addr	Mem	Label	Instr	Comment
----	---	-----	-----	-----
00	E2	Start	SEX 2	X refs R2
01	F8		LDI BitPtrn	R2 refs BitPtrn
02	17			
03	A2		PLO 2	
04	F8		LDI 0	
05	00			
06	B2		PHI 2	
07	FD		SDI 0	Set DF to 1 to start bit pattern.
08	00			
09	52	WalkLp	STR 2	Save bit pattern.
0A	64		OUT 4	Display bit pattern
0B	22		DEC 2	and undo increment from OUT.
0C	F8	Delay	LDI 8	Delay is 256*num.
0D	08			
0E	B1		PHI 1	Load Delay into high bits.
0F	21	DlyLp	DEC 1	Count down.
10	91		GHI 1	
11	3A		BNZ DlyLp	Loop until 0.
12	0F			
13	02		LDN 2	Rotate BitPtrn
14	76		RSHR	to right.
15	30		BR WalkLp	Loop to display.
16	09			
17		BitPtrn		Data: the bit pattern

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## Tone Generator

Description: Toggles Q at a rate determined by the data switches. So, with Q connected appropriately to a speaker, tones of different frequencies will be generated.

Author: Brent Hilpert

Addr	Mem	Label	Instr	Comment
----	---	-----	-----	-----
00	E2	Start	SEX 2	X refs R2.
01	F8		LDI 0	Initialize R2 to point to Dummy.
02	00			
03	B2		PHI 2	
04	F8		LDI InData	IN needs memory location to load into.
05	12			
06	A2		PLO 2	
07	7A	Qoff	REQ	Turn Q off.
08	6C	Delay	IN 4	Get delay count from switches.
09	FF	DlyLp	SMI 1	Count down
0A	01			
0B	3A		BNZ DlyLp	until 0.
0C	09			
0D	31		BQ Qoff	If Q is on go turn it off.
0E	07			
0F	7B		SEQ	Turn Q on.
10	30		BR Delay	Go delay.
11	08			
12		InData		Data: Load location for IN.