

LC-3 ISA Overview

Compiled by Y. Malaiya based on materials by Lee, Patt, Patel

Registers: 8 16-bit registers, **R7** holds return address, **R0** used for In./Out., others may be assigned by convention.

Memory: $2^{16} \times 16$

x0000 x00FF	Trap Vector table
X0100 x01FF	Interrupt Vector table
X0200 x2FFF	OS and Supervisor Stack
X3000 xFDFF	For User Programs
xFE00 xFFFF	Device Register Addresses

Instruction set:

Mnemonic	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
*ADD	0	0	0	1	DR			SR1			0	0	0	SR2		
*ADD	0	0	0	1	DR			SR1			1	imm5				
*AND	0	1	0	1	DR			SR1			0	0	0	SR2		
*AND	0	1	0	1	DR			SR1			1	imm5				
BR	0	0	0	0	n	z	p	PCoffset9								
JMP	1	1	0	0	0	0	0	BaseR			0	0	0	0	0	0
JSR	0	1	0	0	1	PCoffset11										
JSRR	0	1	0	0	0	0	0	BaseR			0	0	0	0	0	0
*LD	0	0	1	0	DR			PCoffset9								
*LDI	1	0	1	0	DR			PCoffset9								
*LDR	0	1	1	0	DR			BaseR			offset6					
*LEA	1	1	1	0	DR			PCoffset9								
*NOT	1	0	0	1	DR			SR			1	1	1	1	1	1
reserved	1	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-
RTI	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ST	0	0	1	1	SR			PCoffset9								
STI	1	0	1	1	SR			PCoffset9								
STR	0	1	1	1	SR			BaseR			offset6					
*TRAP	1	1	1	1	0	0	0	0	trapvect8							

* modifies condition codes NZP

Operand comes from: Source Register, **Immediate:** from instruction, **LD:** location relative to PC, **LDR:** location addressed by BaseR + offset, **LDI:** from location with address at location relative to PC.

Traps: TRAP x20 or GETC

x20 **GETC** = Get character (R0 = character) x23 **IN** = Request keyboard input (R0 = character)
 x21 **OUT** = Output ch. to monitor (R0 = ch.) x25 **HALT** = Halt the program
 x22 **PUTS** = Output string to monitor (R0 => string)

Assembler directives: .ORIG x3000 .FILL x4000 BLKW 1 .STRINGZ "Hello!" .END

ASCII Code Table: '1' is x31

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI
1	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
2	SP	!	"	#	\$	%	&	'	()	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	DEL