

LARC CHARACTER CODES

CONSOLE DECIMAL DISPLAY	NUMERIC ONE DIGIT	ALPHA TWO DIGIT	CONSOLE KEYBOARD
0	11100	15	\
0	00100	16	^
-	00010	17	-
0	10000	20	0
1	00001	21	1
2	10011	22	2
3	00111	23	3
4	10110	24	4
5	01000	25	5
6	11001	26	6
7	01011	27	7
8	11111	28	8
9	01110	29	9
8	11010	37	.
+	10101	80	+
	01101	Illegal	

INSTRUCTION WORD FORMAT

T	I	I	A	A	B	B	M	M	M	M
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- T:** 1-9 = TRACING MODE
 . = NO TRACING MODE
 i = INDIRECT ADDRESSING MODE
I: INSTRUCTION DIGITS
A: ARITHMETIC REGISTER ADDRESS
B: INDEX REGISTER ADDRESS
M: STORAGE ADDRESS

Univac[®]

LARC

INSTRUCTION
CARDS

COMPUTING UNIT INSTRUCTIONS

00	SKP	Skip
01	AX	$(M) + (A) \longrightarrow A$
02	A	$(M) \oplus (A) \longrightarrow A$
03	AM	$ (M) \oplus (A) \longrightarrow A$
04	AU	$(M) \oplus (A) \longrightarrow A + 1$
05	AAX	$(M') + (A') \longrightarrow A'$
06	AA	$(M') \oplus (A') \longrightarrow A'$
09	FV	Lock Yes: (5DD) $\longrightarrow A$, Reset Lock & Connect Set? No : M $\longrightarrow C$
11	NX	$-(M) + (A) \longrightarrow A$
12	N	$-(M) \oplus (A) \longrightarrow A$
14	NU	$-(M) \oplus (A) \longrightarrow A + 1$
15	NNX	$-(M') + (A') \longrightarrow A'$
16	NN	$-(M') \oplus (A') \longrightarrow A'$
19	FVK	Lock Yes: (12DD) $\longrightarrow A$, Reset Lock & Connect Set? No : M $\longrightarrow C$
20	MXR	$(M) \times (A)Rdd \longrightarrow A$
21	MXE	$(M) \times (A) \longrightarrow A'$
22	MR	$(M) \otimes (A)Rdd \longrightarrow A$
23	M	$(M) \otimes (A) \longrightarrow A$
24	MU	$(M) \otimes (A) \longrightarrow A + 1$
25	ME	$(M) \otimes (A) \longrightarrow A'$
26	MMX	$(M') \times (A') \longrightarrow A'$
27	MM	$(M') \otimes (A') \longrightarrow A'$
29	SV	Lock Yes: M $\longrightarrow C$ Set? No : (A) $\longrightarrow 5DD$
30	DX	$(A) \div (M) \longrightarrow A$
31	DXE	$(A) \div (M) \longrightarrow A, A + 1$ [Remainder]
32	DR	$(A) \oplus (M)Rdd \longrightarrow A$
34	DUR	$(A) \oplus (M)Rdd \longrightarrow A + 1$
35	DDX	$(A') \div (M') \longrightarrow A'$
36	DD	$(A') \oplus (M') \longrightarrow A'$
37	DSE	$(A') \oplus (M) \longrightarrow A'$
39	SVK	Lock Yes: M $\longrightarrow C$ Set? No : (A) $\longrightarrow 12DD$
40	S	$(A) \longrightarrow M$
41	SN	$-(A) \longrightarrow M$
42	SM	$ (A) \longrightarrow M$
43	F	$(M) \longrightarrow A$
45	SS	$(A') \longrightarrow M'$
46	SSN	$-(A') \longrightarrow M'$
47	SSM	$ (A') \longrightarrow M'$
48	FF	$(M') \longrightarrow A'$
50	CX	FL $\longrightarrow FX, M = \text{scale}$

51	C	FX $\longrightarrow FL, M = \text{scale}$
52	PR	$(A)10^{-M} \longrightarrow A, M \text{ places}$
53	PL	$(A)10^M \longrightarrow A, M \text{ places}$
55	CCX	FL' $\longrightarrow FX', M = \text{scale}$
56	CC	FX' $\longrightarrow FL', M = \text{scale}$
57	PPR	$(A')10^{-M} \longrightarrow A', M \text{ places}$
58	PPL	$(A')10^M \longrightarrow A', M \text{ places}$
59	PPC	Left circular shift $M \text{ places}$
60	EOP	$(M_i) \longrightarrow A_i$
61	EA	$(M_A) \longrightarrow A_A$
62	EB	$(M_B) \longrightarrow A_B$
63	EAB	$(M_{AB}) \longrightarrow A_{AB}$
64	EM	$(M_M) \longrightarrow A_M$
65	EL	Ext. into A from A - 1 according to M
66	EU	Ext. into A from A + 1 according to M
70	TE	(A) = Yes: M $\longrightarrow C$ (A + 1) No : (C) + 1 $\longrightarrow C$
71	TG	(A) > Yes: M $\longrightarrow C$ (A + 1) No : (C) + 1 $\longrightarrow C$
72	TZ	(A) = Yes: M $\longrightarrow C$ Zero No : (C) + 1 $\longrightarrow C$
73	TGZ	(A) > Yes: M $\longrightarrow C$ Zero No : (C) + 1 $\longrightarrow C$
74	TLX	(A) < Yes: M $\longrightarrow C$ Zero No : (C) + 1 $\longrightarrow C$
75	TTE	(A') = Yes: M $\longrightarrow C$ (A + 2)' No : (C) + 1 $\longrightarrow C$
76	TTG	(A') > Yes: M $\longrightarrow C$ (A + 2)' No : (C) + 1 $\longrightarrow C$
80	BIT	$N - 1 \rightarrow N$ [N = 0] Yes: (C) + 1 $\longrightarrow C$ $\Delta + D \rightarrow \Delta$ No : M $\longrightarrow C$
81	BDT	$N - 1 \rightarrow N$ [N = 0] Yes: (C) + 1 $\longrightarrow C$ $\Delta - D \rightarrow \Delta$ No : M $\longrightarrow C$
82	BIC	$N - 1 \rightarrow N$ [N = 0] Yes: M $\longrightarrow C$ $\Delta + D \rightarrow \Delta$ No : (C) + 1 $\longrightarrow C$
83	BDC	$N - 1 \rightarrow N$ [N = 0] Yes: M $\longrightarrow C$ $\Delta - D \rightarrow \Delta$ No : (C) + 1 $\longrightarrow C$
85	BI	$\Delta + D \longrightarrow \Delta$
86	BD	$\Delta - D \longrightarrow \Delta$
90	T	M $\longrightarrow C$
91	TR	$990(C) + 1 \longrightarrow M, M + 1 \longrightarrow C$
92	TB	(C) $\longrightarrow A, M \longrightarrow C$
93	SLJ	(C2) $\longrightarrow M$ [990 - C2 $\longrightarrow M$ or 0 - 0 C2 $\longrightarrow A$]
95	TF	FF A Yes: M $\longrightarrow C$ Set? No : (C) + 1 $\longrightarrow C$
96	RF	Reset FF A
97	SF	Set FF A
99	H	Stop

FLIP-FLOPS

NUMBER	CONSOLE DESIGNATION	NAME
00-09	0-9	Sense
10	DIS	Disclosure
11	IOP	Processor Intervention †
15	II	Manual and IOP Intervention Inhibit
20	TM	Enter Tracing Mode †
21-29	1-9	Tracing Mode
30-34	0-4	Computing Unit Manual Intervention †
38	TAPE	Improper Paper Tape †
39	ADD	Improper Operand †
40	ZERO	Zero floating point adder result †
41	DIV	Non-normalized divisor †
42	EX †	Exponent overflow †
43	EX ‡	Exponent underflow †
44	OF	Fixed decimal overflow †
45	SGN	Sign anomaly †
46	STALL	Stall †
47	MISC	Control Error †
48	RES	A-register control error on result time †
49	DEC	Decoding error on tracing digit †
50	CALL	B-adder error to memory address decoder †
51	IOE	Instruction error †
52	OOE	Operand error †
53	B	A-register error on B-modification †
54	M	A-register error on M-slot †
55	W	A-register error on result time †
56	C1	B-adder error to C1, HSB, or AU †
57	IR2	B-adder error to A-storage, A-selector, or M of IR2 †
58	C2	B-adder error to C2
59	AB	AB-adder error †



60	AS	AS-register error †
61	COMP	Comparator error †
62	QIE	Multiplier, quotient, or extraction error †
63	SFC	Shift controls error †
64	OF	Overflow error †
65	PC	Program counter or decoding error †
66	EP	Ending pulse error †
67	AH	AH-register error †
68	AD	AD-register error †
69	SGN	Sign position error †
70	A	A-register error on A-slot †
71	1	Digit #1 error
72	2	Digit #2 error
73	3	Digit #3 error
74	4	Digit #4 error
75	5	Digit #5 error
76	6	Digit #6 error
77	7	Digit #7 error
78	8	Digit #8 error
79	9	Digit #9 error
80	10	Digit #10 error
81	11	Digit #11 error
82	12	Digit #12 error
84	CY	Cycling unit error
90	R (on Flex)	Start paper tape
98	Master Check	Master error †
99	Master Contingency	Master contingency †

NOTE: † Contingency Flip Flop
‡ Error Flip Flop









RULES FOR SIGN POSITION

I. STORE INSTRUCTIONS: SM, SN, SSN

LEGEND:

A + 2, A + 3
OR M, M + 1

A, A + 1 DOUBLE PRECISION

 TRANSFER AFTER TEST
 NO TRANSFER AFTER TEST
 CONTINGENCY-FF 45**
 11-DIGIT COMPARISON
 12-DIGIT COMPARISON
 SIGN IS CALCULATED
 NUMERIC
 NON-NUMERIC

SM

O	O
-	O
.	O
N	O
N̄	O

SN, SSN*

O	-
-	O
.	.
N	
N̄	

** WHEN SIGN CONTINGENCY OCCURS A ZERO → S
 * SIGN OF EACH HALF IS HANDLED SEPARATELY.

II. EQUALITY & MAGNITUDE TESTS: TE, TTE, TZ, TGZ, TLZ, TG, TTG

TE, TTE*
A + 1

	O	-	.	N	N̄
A	O	11		11	
	-		11		
	.	11		11	
	N				12
	N̄				

TGZ

A	
O	11
-	
.	11
N	
N̄	

TLZ

A	
O	
-	
.	
N	
N̄	

TG, TTG*
A + 1

	O	-	.	N	N̄
A	O	11		11	
	-		11		
	.	11		11	
	N				12
	N̄				

TZ

A	
O	11
-	11
.	11
N	
N̄	

III. ARITHMETIC INSTRUCTIONS: FIXED AND FLOATING POINT

1. ADD AND SUBTRACT: AX, AM, NX, A, AU, AAX, AA, N, NU, NNX, NN

AX
M

	O	-	.	N	N̄
A	O	O	S	O	N
	-	S	-	-	N
	.	O	-	.	N
	N	N	N	N	N
	N̄				

AM
M

	O	-	.	N	N̄
A	O	O	O	O	O
	-	S	S	S	S
	.	O	O	O	O
	N				
	N̄				

NX
M

	O	-	.	N	N̄
A	O	S	O	O	N
	-	-	S	-	N
	.	-	O	.	N
	N	N	N	N	N
	N̄				

A, AU, AAX, AA
M

	O	-	.	N	N̄
A	O	O	S	O	
	-	S	-	-	
	.	O	-	.	
	N				
	N̄				

N, NU, NNX, NN
M

	O	-	.	N	N̄
A	O	S	O	O	
	-	-	S	-	
	.	-	O	.	
	N				
	N̄				

2. MULTIPLY AND DIVIDE:

MXR, MXE, MR, M, MU, ME, MMX, MM, DX, DXE, DR, DUR, DDX, DD, DSE

M

	O	-	.	N	N̄
A	O	O	-	.	
	-	-	O	.	
	
	N				
	N̄				

IN MM & MMX THE SIGN OF THE LEAST SIGNIFICANT HALF IS USED.