

STANDARD INSTRUCTION SET

MNEMONIC	FIRST BYTE	OPERANDS	TYPE	CONDITION CODE			
				0	1	2	3
ADD	A8-A9	A(I),B(I)	3	=0	<0	>0	OFL
ADDD	A0-A3	A(I),B(I)	3	=0	<0	>0	OFL
ADI	8A-8B	A(I),M	4	=0	<0	>0	OFL
ADID	82-83	A(I),M	4	=0	<0	>0	OFL
AND	B0-B3	A(I),B(I)	3	=0	≠0		
ANDI	92-93	A(I),M	4	=0	≠0		
AP	FC-FF	A(L0)(I),B(Lb)(I)	2	=0	<0	>0	OFL
BC	64-65	K,A(I)	7				
BR	2E-2F	A	11				
BSB	60-61	A(I)	8				
CLK	28		12	=0	=1		
CM	C0-C3	A(I),B(I)	3				
CP	F0-F3	A(L0)(I),B(Lb)(I)	2	A=B	A<B	A>B	
CR	C8-CB	A(I),B(I)	3	A=B	A<B	A>B	
CRD	C4-C7	A(I),B(I)	3	A=B	A<B	A>B	
CRF	CC-CF	A(L0)(I),B(I)	1	A=B	A<B	A>B	
CRLI	B8-B9	A(I),M	4	A=M	A<M	A>M	
EDMK	D0-D3	A(L0)(I),B(I)	1	=0	<0	>0	
MP	EC-EF	A(L0)(I),B(Lb)(I)	2				
MVC	DC-DF	A(L0)(I),B(I)	1				
MVI	9A-9B	A(I),M	4				
MYN	D8-DB	A(L0)(I),B(I)	1				
MVO	E0-E3	A(L0)(I),B(Lb)(I)	2				
MVZ	D4-D7	A(L0)(I),B(I)	1				
NOP	2A		12				
OR	B4-B7	A(I),B(I)	3	=0	≠0		
ORI	96-97	A(I),M	4	=0	≠0		
PACK	E8-EB	A(L0)(I),B(Lb)(I)	2				
RDC	3A-3B	C,A(I)	9				
RDK	3E-3F	A(I)	8				
RDT	35-37	T,H,Bk	10				
RTDL	68-69	A(I),N	5				
RTL	78-79	A(I),N	5				
RWD	25-27	T	14				
SAVP	66-67	R,A(I)	6				
SBI	8E-8F	A(I),M	4	=0	<0	>0	OFL
SBID	86-87	A(I),M	4	=0	<0	>0	OFL
SDB	2D	N,D	13				
SDC	2C	N,D	13				
SETP	00-1F	R,A	15				
SLA	90-91	A(I),N	5	=0	<0	>0	OFL
SLDA	80-81	A(I),N	5	=0	<0	>0	OFL
SLDL	88-89	A(I),N	5				
SLL	98-99	A(I),N	5				
SP	F8-FB	A(L0)(I),B(Lb)(I)	2	=0	<0	>0	OFL
SRA	94-95	A(I),N	5	=0	<0	>0	
SRDA	84-85	A(I),N	5	=0	<0	>0	
SRDL	8C-8D	A(I),N	5				
SRL	9C-9D	A(I),N	5				
SUB	AC-AF	A(I),B(I)	3	=0	<0	>0	OFL
SUBD	A4-A7	A(I),B(I)	3	=0	<0	>0	OFL
UNPK	E4-E7	A(L0)(I),B(Lb)(I)	2	=0	<0	>0	OFL
WRC	38-39	C,A(I)	9				
WRT	31-33	T,H,Bk	10				
XOR	BC-BF	A(I),B(I)	3	=0	≠0		
XORI	9E-9F	A(I),M	4	=0	≠0		
ZAP	F4-F7	A(L0)(I),B(Lb)(I)	2				

A = A operand address K = Mask bits for conditional Branch
B = B operand address C = Channel (0-F)
I = Indirect Address Flag T = Tape Unit (1-3)
M = Immediate Data H = Half page (0-F)
La = Length of A operand R = Page Register (A or B)
Lb = Length of B operand D = Device (0-14)
Bk = Block (0-4AF) N = Count Field

INSTRUCTION FORMAT TYPES

	Byte 0	Byte 1	Byte 2	Byte 3
1	J I	A	B	La
2	J I	A	B	La Lb
3	J I	A	B	
4	I	A	M	
5	I	A	N	
6	I R	A		
7	I K	A		
8	I	A		
9	I C	A		
10	T H	Bk		
11	X	N		
12				
13	N	D		
14	T			
15	R	P		

J = Indirect Address Flag for B
X = Direction (0 = Fwd., 1 = Backward)

NUMERIC INSTRUCTION LISTING

0X, 1X	SETP	98-99	SLL
25-27	RWD	9A-9B	MVI
28	CLK	9C-9D	SRL
2A	NOP	9E-9F	XORI
2C	SDC	A0-A3	ADDD
2D	SDB	A4-A7	SUBD
2E-2F	BR	A8-AB	ADD
31-33	WRT	AC-AF	SUB
35-37	RDT	B0-B3	AND
38-39	WRC	B4-B7	OR
3A-3B	RDC	B8-B9	CRLI
3E-3F	RDK	BC-BF	XOR
60-61	BSB	C0-C3	CM
64-65	BC	C4-C7	CRD
66-67	SAVP	C8-CB	CR
68-69	RTDL	CC-CF	CRF
78-79	RTL	D0-D3	EDMK
80-81	SLDA	D4-D7	MVZ
82-83	ADID	D8-DB	MYN
84-85	SRDA	DC-DF	MVC
86-87	SBID	E0-E3	MVO
88-89	SLDL	E4-E7	UNPK
8A-8B	ADI	E8-EB	PACK
8C-8D	SRDL	EC-EF	MP
8E-8F	SBI	F0-F3	CP
90-91	SLA	F4-F7	ZAP
92-93	ANDI	F8-FB	SP
94-95	SRA	FC-FF	AP
96-97	ORI		

KEYBOARD CHARACTER CODES

ESC	Q	W	E	R	T	Y	U	I	O	P	U	CR
CTL	A	S	D	F	G	H	J	K	L	;	+	ENTER
SHIFT	Z	X	C	V	B	N	M	<	>	.	/	SHIFT

HEX	ASCII	KEY(S)	HEX	ASCII	KEY(S)
00	NUL	Ctrl. shift P	31	1	1
01	SOH	Ctrl. A	32	2	2
02	STX	Ctrl. B	33	3	3
03	ETX	Ctrl. C	34	4	4
04	EOT	Ctrl. D	35	5	5
05	ENQ	Ctrl. E	36	6	6
06	ACK	Ctrl. F; INSERT	37	7	7
07	BEL	Ctrl. G	38	8	8
08	BS	Ctrl. H; F1	39	9	9
09	HT	Ctrl. I; F3	3A	:	:
0A	LF	Ctrl. J; LF	3B	;	;
0B	VT	Ctrl. K; F5	3C	<	<
0C	FF	Ctrl. L	3D	=	=
0D	CR	Ctrl. M; CR	3E	>	>
0E	SO	Ctrl. N	3F	?	?
0F	SI	Ctrl. O	40	@	@
10	DLE	Ctrl. P	41	A	A
11	DC1	Ctrl. Q	42	B	B
12	DC2	Ctrl. R	43	C	C
13	DC3	Ctrl. S	44	D	D
14	DC4	Ctrl. T	45	E	E
15	NAK	Ctrl. U; DELETE	46	F	F
16	SYN	Ctrl. V	47	G	G
17	ETB	Ctrl. W	48	H	H
18	CAN	Ctrl. X; F7	49	I	I
19	EM	Ctrl. Y	4A	J	J
1A	SUB	Ctrl. Z	4B	K	K
1B	ESC	Ctrl. shift K; ESC	4C	L	L
1C	FS	Ctrl. shift L; F8	4D	M	M
1D	GS	Ctrl. shift M; F6	4E	N	N
1E	RS	Ctrl. shift N; F4	4F	O	O
1F	US	Ctrl. shift O; F2	50	P	P
20	SP	SPACE	51	Q	Q
21	!	!	52	R	R
22	"	"	53	S	S
23	#	#	54	T	T
24	\$	\$	55	U	U
25	%	%	56	V	V
26	&	&	57	W	W
27	'	'	58	X	X
28	(	(	59	Y	Y
29	)	)	5A	Z	Z
2A	*	*	5B	[	[
2B	+	+	5C	\	\
2C	,	,	5D	]	]
2D	-	-	5E	^	^
2E	.	.	5F	_	_
2F	/	/	60-7E	Unassigned	
30	0	0	7F	DEL	ERASE

DEVICE ADDRESS - CHANNEL MAPPING TABLE

DEVICE NUMBER	CHANNEL
0-15	0-15
16	Keyboard
17	Cassette #1
18	Cassette #2
19	Cassette #3
20	any cassette

DEBUG COMMAND SUMMARY

OVERLAY	COMMAND	MEANING
Normal	Bxxx	Begin execution at xxx
	C	Continue after Breakpoint
	Dxxx	Display location xxx
	Dxxx(yy	Display locations xxx-xxx+yy-1
	Ixxx	Input program from block xxx
	M	Call Memory Print overlay
	Oxxx	Output program to block xxx
	T	Call Tape Dump overlay
Breakpoint	W	Call Breakpoint overlay
	(ESC)	Exit from Debug
	Sxxx	Set a breakpoint at xxx
	Rxxx	Remove a breakpoint from xxx
	R/	Remove all breakpoints
Tape Dump	L	List breakpoints
	E	End overlay
Memory Print	Py,xxx	Print block xxx from tape y
	E	End overlay
Memory Print	Pxxx	Print location xxx
	Pxxx;yyy	Print locations xxx to yyy
	E	End overlay
LOCATION		CONTENTS
'C00		User's CC
'C01-C02		User's locations 2-3
'C05		User's A page register
'C06		User's B page register
'F45-F46		Breakpoint Address + 3 or 4

EDITOR COMMAND SUMMARY

COMMAND	MEANING	
Dxxx:yyy	Delete	Line(s) xxx to yyy inclusive
Ixxx:yyy,iii	Insert	Line(s) xxx to yyy incrementing by iii
Rxxx:yyy,iii	Replace	Line(s) xxx to yyy incrementing by iii
Exxx:yyy	Examine	Line(s) xxx to yyy
Pxxx:yyy	Print	Line(s) xxx to yyy
Lxxx:yyy	List	Line(s) xxx to yyy
Nxxx:yyy,ni,nf	Re-number	Line(s) xxx to yyy incrementing by ni beginning with nf as first number
S text (ESC) [xxx:yyy	Search	Line(s) xxx to yyy for text
Axxx:yyy	Alter	Line(s) xxx to yyy
F	Complete	Edit run with no further change
Z	Cancel	Edit run and re-initialize.
(C)	Examine	Next line

TAPE CASSETTE ERROR DISPLAYS

	Tape #1	Tape #2	Tape #3
RDT or WRT and no cassette	E	I	M
WRT and cassette write protected	F	J	N

TAPE CASSETTE ERROR FLAGS

	Tape #1	Tape #2	Tape #3
RDT or WRT and no block address	'04	'08	'0C
RDT with bad data	'04	'08	'0C

ASSEMBLER LANGUAGE CONSTANTS

CODE	TYPE	DATA
P	Packed	Packed decimal constant
Z	Zoned	Zoned decimal constant
D	Binary	1 or 2 byte signed binary integer
X	Hexadecimal	4-bit code for each character
A	Address	2-byte auto-indexing address vector
F	Format	Display control or EDMK control constant

SPECIAL CONTROL SYMBOLS

HEX	ASSEMBLER SYMBOL	MEANING
F0	*	Display end of frame character
E0	/	Display end of line character
80-BF	nX	Display multispace character
CX XX	L(xxx)	Display link character
80	↑	EDMK Digit selector character
81	>	EDMK Significance starter character
82	□	EDMK Field separator character

SPECIAL STORAGE ASSIGNMENTS

LOC	MEANING
'000-001	EDMK mark address
'002-003	Starting address of display scan
'004	Cassette tape error indicator
'005-006	Memory Block pointer 1 & 2
	PROGRAM CONTROL BLOCK
'F86	Half Page Table
'FA6	Program Entry address
'FD8	Segment Table

ASSEMBLER INSTRUCTIONS

ASSEMBLER CONTROL

CODE	MEANING
ORG	Origin
END	End of assembly
SEG	Segment definition

CONDITIONAL ASSEMBLY

CODE	MEANING
IFD	If defined
IFE	If equal to zero
IFG	If greater than zero
IFGE	If greater than or equal to zero
IFL	If less than zero
IFLE	If less than or equal to zero
IFND	If not defined
IFNE	If not equal to zero
ENDC	End conditional

LISTING CONTROL

CODE	MEANING
LST	List
UNL	Unlist
SKP	Skip to top of page
HED	Listing heading

EXTENDED MNEMONICS

CODE	MEANING	MASK
HALT	BR *	—
NOOP	No operation	0
B	Branch unconditional	15
BH	Branch high	2
BL	Branch low	4
BE	Branch equal	8
BNH	Branch not high	13
BNL	Branch not low	11
BNE	Branch not equal	7
BO	Branch overflow	1
BP	Branch positive	2
BM	Branch minus	4
BZ	Branch zero	8
BNP	Branch not positive	13
BNM	Branch not minus	11
BNZ	Branch not zero	7

SYMBOL DEFINITION

CODE	MEANING
DC	Define constant
DS	Define symbol
EQU	Equate
LEQU	Length equate
ICS	Identify control section

MACROS

CODE	MEANING
MACR	Define macro
ENDM	End macro definition