CONTROL DATA CORPORATION
160A Computer Instructions

SYMBOLS

E	= Low order 6 bits
X	= Operand
A	= A register
P	= P register
Y	= Address to be used
bdir	= Storage bank control
BER	= Buffer entrance register
BXR	= Buffer exit register
( )	= Contents of
NI	= Next instruction

N	No address	X = 00E	NI P+1
D	Direct	X=(d00E)	NI P+1
I	Indirect	Y=(d00E)	NI P+1
M	Memory	Y=(P+1)	NI P+2
F	Forward	X=(P+E)	NI P+1
C	Constant	X=(P+1)	NI P+2
B	Backward	X=(P−E)	NI P+1
S	Specific*	X=(7777)	NI P+1

*Always Bank 0

ARITHMETIC/LOGICAL

	N	D	I/M	F/C	B/S	
LP	02	10	11	12	13	Logical product
SC	03	14	15	16	17	Selective comp.
LD	04	20	21	22	23	Load A
LC	05	24	25	26	27	Load comp.
AD	06	30	31	32	33	Add
SB	07	34	35	36	37	Subtract
ST*		40	41	42	43	Store A
SR*		44	45	46	47	Shift replace
RA*		50	51	52	53	Replace add
AO*		54	55	56	57	Replace Add 1
	1	2	3	2	2	Cycles (*Add 1)

A TEST

	F	B	
ZJ	60	64	Zero jump
NZ	61	65	Non-zero jump
PJ	62	66	Positive jump
NJ	63	67	Negative jump

JUMP/STOP

JFI	71XX	Jump to Y, Y=(P+E)
JPR	7100	Return jump: Y=(P+1) P+2 to Y, jump to Y+1
JPI	70XX	Jump to Y, Y=(d00E)
SLS	770S	Selective stop
SLJ	77J0	Selective jump to Y Y=(P+1), No? NI P+2
SJS	77JS	Selective jump/stop
CIL	0120	Clear Interrupt lockout

EXTERNAL FUNCTION

EXF	75XX	Code at P+E, NI P+1
EXC	7500	Code at P+1, NI P+2

SHIFTS

LS1	0102	Left shift one
LS2	0103	Left shift two
LS3	0110	Left shift three
LS6	0111	Left shift six
RS1	0114	Right shift one
RS2	0115	Right shift two
MUT	0112	Multiply by 10
MUH	0113	Multiply by 100

1 CYCLE

BANK CONTROLS

CTA	0130	(bdir) to A
SRJ	001X	r=X, NI r(A)
SIC	002X	i =X
JRJ	003X	ir=X, NI r(A)
SDC	004X	d =X
DRJ	005X	d r=X, NI r(A)
SID	006X	di =X
ACJ	007X	dir=X, NI r(A)
SBU	014X	b =X

1 CYCLE

SPECIAL

PTA	0101	(P) to A
STP	015X	(P) to d005X
NOP	000X	No operation
HLT	7700	Halt, NI P+1
ERR	0000	Error, NI P+1
HWI	76XX	Half write, E of A to E of (Y) Y=(d00E)

INPUT/OUTPUT INSTRUCTIONS

BUFFER

IBI 7200 Initiate buffer input, NI P+2
Buffer active jump to Y=(P+1)

IBO 7300 Initiate buffer output, NI P+2
Buffer active jump to Y=(P+1)

ATE 0105 (A) to BER, NI P+2
Buffer active jump to Y=(P+1)

ATX 0106 (A) to BXR, NI P+2
Buffer active jump to Y=(P+1)

CBC 0104 Clear buffer controls

BLS 0100 Store (A) from (BER) to (BXR)

ETA 0107 (BER) to A

STE 016X (BER) to d006X, (A) to BER

NORMAL

INP 72XX Initiate input from I(P+E) to I(P+1)−1

OUT 73XX Initiate output from I(P+E) to I(P+1)−1

INA 7600 Input to A

OTA 7677 Output from A

OTN 74XX Output X=00E

External Function Codes
163/164 Magnetic Tape Control

211X Write 12-bit (with OUT)
111X Write 6-bit (with OUT)
Write end-of-file (if no OUT)
112X Backspace record (with INA)
Backspace File (if no INA)
213X Read 12-bit (with INP)
113X Read 6-bit (with INP)
Search file forward (if no INP)
115X Rewind unload
116X Rewind load
1171 Set odd parity
1172 Set even parity

114X MT STATUS REQUEST

(Status response codes)

0001 Even parity selected
0002 Not ready
0004 Parity error
0010 Illegal BCD on write
0020 File mark read
0040 End of tape or load point

READER & PUNCH CONTROL

4102 Select papertape reader
4104 Select papertape punch

161 TYPEWRITER CONTROL

4210 Typewriter output
4220 Typewriter input

4240 TYPEWRITER STATUS REQUEST

(Status response codes)

0004 Power not on
0010 Not ready
0020 Character in input buffer
0040 Character being output

CONTROL DATA CORPORATION

COMPUTER DIVISION

MINNEAPOLIS, MINNESOTA

Form SA 322A