



The Core Memory Project

NCR 399

Handbook for Systems Analysts

<http://www.thecorememory.com>



WORLDWIDE HEADQUARTERS
DAYTON, OHIO 45479

EP-9840 0574

TABLE OF CONTENTS

LEGEND (FOR CONTROL CHARACTERS)

L	USPSI (CODE SET)
N	NULL
SOH	START OF HEADING
STX	START OF TEXT
ETX	END OF TEXT
END	END OF TRANSMISSION
ACK	ACKNOWLEDGE
BEL	BELL (AUDIBLE OR ATTENTION SIGNAL)
BS	BACKSPACE
HT	HORIZONTAL TABULATION (PUNCHED CARD SKIP)
VF	VERTICAL TABULATION
FF	FORM FEED
CR	CARRIAGE RETURN
SO	SHIFT OUT
SI	DATA INK ESCAPE
DC1	DEVICE CONTROL 1
DC2	DEVICE CONTROL 2
DC3	DEVICE CONTROL 3
DC4	DEVICE CONTROL 4 (STOP)
SYN	SYNCHRONOUS IDLE (SYNC CODE)
ETB	END OF TRANSMISSION BLOCK
CAN	CANCEL (VOID DATA)
EM	END OF MEDIA
SUB	SUBSTITUTE
ESC	ESC
FILE	FILE SEPARATOR (END OF FILE)
GR	GROUP SEPARATOR
RE	RECORD SEPARATOR (END OF RECORD)
UP	UNIT SEPARATOR (END OF UNIT)
DEL	DELETE

NCR CENTURY CODE CHART																	
B ₄ -B ₁		0000	0001	0010	0011	0100	0101	0110	0111	1000	1010	1011	1100	1101	1110	1111	
B ₃ -B ₅		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NULL	SOH	STX	ETX	EOT	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
0001	DLE	DC1	DC2	DC3	#	\$	%	&	'	()	*	+	,	-	.	/
0010	SP	!	"	#	\$	%	&	'	()	*	+	,	-	.	/	?
0011	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
0100	Q	R	S	T	U	V	W	X	Y	Z	[	\	\]	^	_	~	DEL
0101	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_	~
0110	S	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
0111	r	s	t	u	v	w	x	y	z	{		}	~	DEL	DEL	DEL	DEL

NCR Century Code Chart Inside Front Cover

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BRS Status Code Table 69

EBCDIC CODE CHART Inside Back Cover

Operation	Operand A	Operand B	Operand C	Action	N-Fields	Function
ADD	A	B	C		1-31	A + B → C. A, B operands remain unchanged.
ADDN	A	B	C		1-31	A + B1 → B1; A2 + B2 → B2; A3 + B3 → B3 etc. 1 to 31 consecutive fields may be specified.
ADDNA	A	B			1-31	A1 + A2 + A3, etc. → B 1 to 31 consecutive fields may be specified.
ADDNB	A	B			1-31	A + B1 → B1; A + B2 → B2; A + B3 → B3 etc. 1 to 31 consecutive fields may be specified.
BR			REF			Unconditional branch.
BRE	A	B	REF			Compares (A) to (B), branches if equal.
BRION	IND		REF			Tests indicator, ON — transfers control.
BRIOFF	IND		REF			Tests indicator, OFF — transfers control.
BRG	A	B	REF			Compares (A) to (B), branches if (A) greater.
BRL	A	B	REF			Compares (A) to (B), branches if (A) less.
BRS	D-CODE	B	REF	AC-CODE		Tests status, ON — transfers control.
BRU	A	B	REF			Compares (A) to (B), branches if unequal.
CNTL	D-CODE			AC-CODE	n	Controls actions of peripheral devices. N-fields associated with specific devices.

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Operation	Operand A	Operand B	Operand C	Action	N-Fields	Function
DIV	A	B	C	RD		B ÷ A → C, rounding optional - specify RD. A & B remain unchanged.
DIVN	A	B		RD	1-31	B1 ÷ A1 → B1; B2 ÷ A2 → B2; B3 ÷ A3 → B3 etc. 1 to 31 consecutive fields may be specified. Specify RD.
FILL	A				1-999	Zero or space fills fields depending on data type. 1 to 999 contiguous fields may be specified.
GET	D-CODE	B		AC-CODE	1-255	Accepts data from device, stores in memory. Begins with (B).
GBP	BRK	B	REF	E-CODE		Accepts data from numeric keyboard, stores it in (B), prints according to edit code. Branch key branches without printing.
MOVE	A	B		AC-CODE	1-31	Moves A → B. 1 to 31 contiguous fields may be moved.
MOVENA	A	B		AC-CODE	1-31	Move A 1, A2, A3 → B. 1 to 31 contiguous fields may be moved.
MOVENB	A	B		AC-CODE	1-31	Move A → B1, B2, B3 1 to 31 contiguous fields may be moved.
MOVEP	A	B	C	AC-CODE		Move (C2 bytes) from (A + C3) → (B + C1)
MULT	A	B	C	RD		A x B → C, optional rounding (RD). A & B remain unchanged.
MULTN	A	B		RD	1-31	B1 x A1 → B1; B2 x A2 → B2; B3 x A3 → B3, opt. rounding 1 to 31 contiguous fields may be specified.

Operation	Operand A	Operand B	Operand C	Action	N-Fields	Function
PUT	D-CODE	B		AC-CODE	1-255	Outputs data to device, starts with (B). 1 to 255 contiguous fields may be specified. N-fields associated with specific device.
REDEF	A	FNAME			1-999	Redefines beginning at A with header beginning at FNAME.
RETURN						Returns program control to location saved by previous SAVERA instruction.
SAVERA						Saves address of command following branch.
SCAN	A	B			1-999	Scan N-fields bytes of data beginning at (A + B1) for the byte value in B2.
SUB	A	B	C			B - A → C.
SUBN	A	B			1-31	B1 - A1 → B1; B2 - A2 → B2; B3 - A3 → B3 etc. 1 to 31 contiguous fields may be specified.
SUBNA	A	B			1-31	B - (A1 + A2 + A3 etc.) → B. 1 to 31 contiguous fields may be specified.
SUBNB	A	B			1-31	B1 - A → B1; B2 - A → B2; B3 - A → B3 etc. 1 to 31 contiguous fields may be specified.
TBLADD	TNAME	B	PNTR		1-63	B1 + C1 → C1; B2 + C2 → C2 etc. (B) work area, (C) table area. 1 to 63 contiguous fields may be specified.

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Operation	Operand A	Operand B	Operand C	Action	N-Fields	Function
TBLIN	TNAME	B	PNTR		1-63	Moves B (work area) → A (table area). 1 to 63 contiguous fields may be specified. PNTR indicates position in table (TNAME).
TBLOUT	TNAME	B	PNTR		1-63	Moves A (table area) → B (work area). PNTR indicates position in table (TNAME). 1 to 63 contiguous fields may be specified.
TYPE						Unlimited typing to the serial printer. Data not entered into memory.
TYPEK						Console TYPE key must be pressed. Performs same as TYPE.
TYPEL					1-999	Allows typing to serial printer. 1 to 999 consecutive chars. may be typed.
TYPEM	A				1-63	Data typed on serial printer, entered in memory. Begins in (A). 1 to 63 fields may be typed. Each field max. of 256 characters.
WAIT						Machine enters halt. Resume by pressing RESUME bar or any BR key.
RDID	FILRF	USERD				Read volume serial no.
OPEN	FILRF			AAA		File open NEW; OLD; PBK
CLOSE	FILRF			AAA		File close option DLF
SEARCH	FILRF	KEYFLD		AA		Random access E, G, L, LE, GE

Operation	Operand A	Operand B	Operand C	Action	N-Fields	Function
DELETE	FILRF	KEYFLD				Random delete
RDNXT	FILRF					Sequential access.
WRTNXT	FILRF					Sequential write
RDCUR	FILRF					Read current sector
WRTCUR	FILRF			AAA		Write current sector DLR
ADDRC	FILRF					Add records to file.
MARK	FILRF	FILPTR				Save current sector address.
RESET	FILRF	FILPTR				Restore to saved address.
SETBP	FILRF	BUFPTR				Manipulate buffer pointer.
FPUT	FILRF	USERDT			1-127	Place data into buffer.
FGET	FILRF	USERDT			1-127	Get data from buffer.
FDIR	FILRF	DATE		AAA		Current date move — GCD, PCD
BRS	DISC		ERROR	SSS		Status testing

PRINT EDITING CHARACTERS: PUNCTUATION

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Character in Column 65	Meaning
E (dollar edit)	Suppress all high-order nonsignificant zeros and insert commas where necessary. Insert a decimal point when and as required by the data definition. A field of all zeros may print as: 0.00 (defined with a decimal point) or 0 (defined without a decimal point)
▣ (absolute)	Print all digits of a field including any decimal point indicated in the data definition. Print a field of zeros as all zeros.
S (zero suppress)	Suppress all high-order nonsignificant zeros. Do not insert commas. Insert decimal point if indicated in the data definition. An all zero field prints .00 if a decimal point is defined; nothing prints if a decimal point is not defined.
\$ or P (dollar protect)	Print the \$ symbol in any position from the immediate left of the unit dollar position (\$1.00). Insert commas where needed and a decimal point if indicated in the data definition. A field of all zeros prints as: \$0.00 (defined with a decimal point) or \$0 (defined without a decimal point).

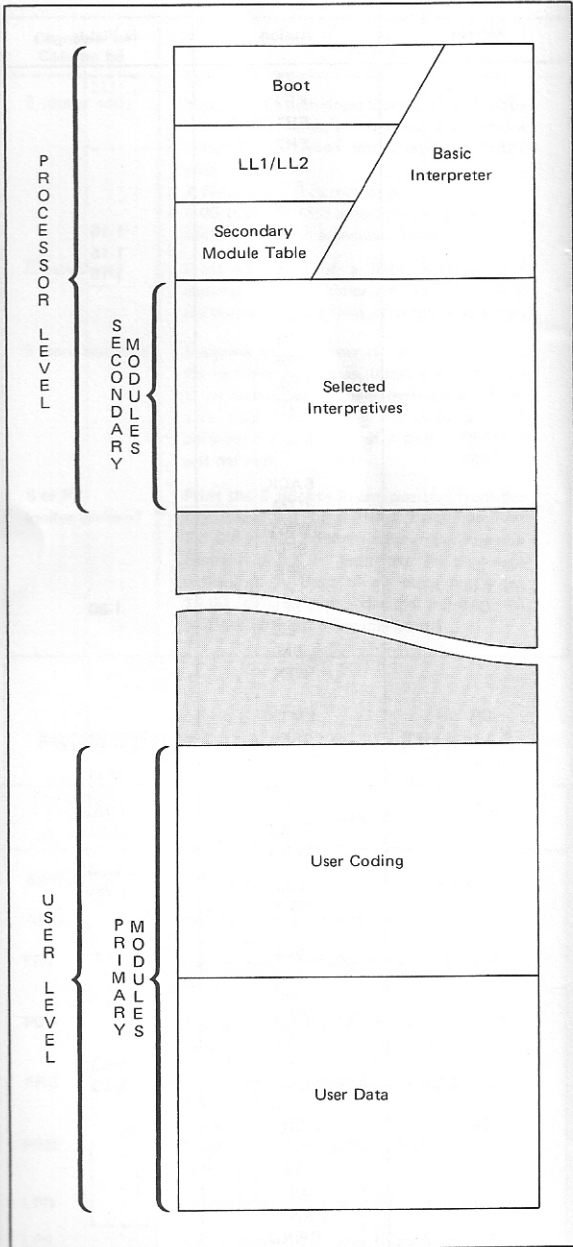
PRINT EDITING CHARACTERS: SYMBOLS

Character in Columns 62, 63, 64	Meaning
ABN or ▣ ▣ ▣	All black — no symbols (serial printer)
ARN	All red — no symbols (serial printer)
PBC	Positive black, negative red with CR symbol (serial printer)
PBD	Positive black, negative red with ◊ symbol (serial printer)
PRC	Positive red, negative black with CR symbol (serial printer)
PRD	Positive red, negative black with ◊ symbol (serial printer)
LPN	Line Printer — no sign (Line Printer only)
LPS	Line Printer — print sign (Line Printer only)

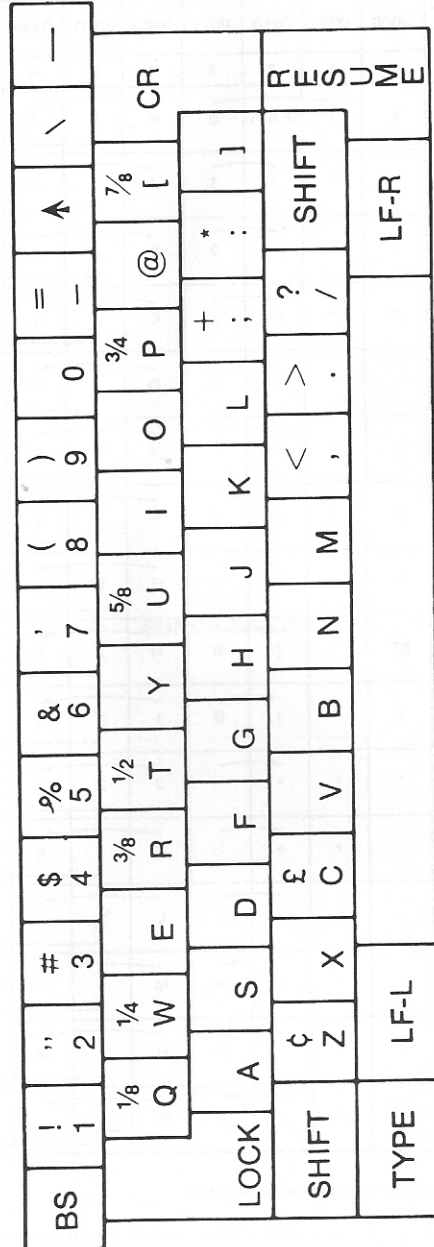
DEVICE AND ACTION CODES

Device	Action	N-Fields
FH	FF1	
	FF2	
	FH1	
	FH2	
	LE	
	RE	
	RRE	
	LFB	1-15
	LFL	1-15
	LFR	1-15
	PCB	
	PCL	
	PCR	
POB		
POL		
POR		
CAS1 CAS2		
	BACK	
	CTM	
	RWND	
	SFD	
	SFE	
CP	FSEL	1-80
	PLZ	
	EM ETX	
CR	EMTX	
	FSEL	1-80
LITE		0-31
LPR	PFP	1-132
	PRNT	▣-127
	SLEW	1-127
SPR	PFP	1-265
	RVP	
TP	046	
	315	
	500	
	ASC	
	KAT	
	DEL	1-63
	NUL	1-63
TR	046	
	315	
	500	
	ASC	
	KAT RWND	

NCR 399 MEMORY MAP
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ALPHANUMERIC KEYBOARD



399 KEYBOARD CODING CHART

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B_8-B_5 B_4-B_1		0000	0001	0010	0011	0100	0101	0110	0111
		0	1	2	3	4	5	6	7
0000	0	*	*	SPACE	0	@	P	↑	3/4
0001	1	*	*	!	1	A	Q	a	1/8
0010	2	*	*	"	2	B	R	b	3/8
0011	3	*	*	#	3	C	S	£	↑
0100	4	*	*	\$	4	D	T	d	1/2
0101	5	*	*	%	5	E	U	e	5/8
0110	6	*	*	&	6	F	V	f	↑
0111	7	*	*	'	7	G	W	g	1/4
1000	8	BS	*	(	8	H	X	h	↑
1001	9	*	*	)	9	I	Y	i	↑
1010	A	*	*	*	:	J	Z	j	¢
1011	B	*	*	+	;	K	[	k	7/8
1100	C	*	*	,	<	L	\	l	◇
1101	D	*	*	-	=	M	]	m	C R
1110	E	*	*	.	>	N	↑	■	↑
1110	F	*	*	/	?	O	—	o	

Arrows indicate shifted codes and characters.

An asterisk (*) or ↑ prints in place of characters not present on the printer.

PUNCH CARDS

**PRIMARY PROGRAM
(Coding Sheet)**

<u>AUTO. FUNC.</u>	<u>COLUMNS</u>	<u>FIELDS</u>	<u>MODE</u>
Dup.	1-3	Page No.	N
	4-6	Line No.	N
Dup.	7	C	A
	8-31	Comments	A
	32-37	Reference	A
	38-43	Operation	A
	44-49	A Operand	A
	50-55	B Operand	A
	56-61	C Operand	A
	62-67	Action	A
	68-73	N-Fields	N
	74	Not Used	
	Dup.	75-80	Ident.	A

**ALTERNATE PROGRAM
(Data Sheet)**

<u>AUTO. FUNC.</u>	<u>COLUMNS</u>	<u>FIELDS</u>	<u>MODE</u>
Dup.	1-3	Page No.	N
	4-6	Line No.	N
Dup.	7	D	A
	8-31	Description	A
	32-37	Reference	A
	38	Data Type	A
	39-41	Length	N
	42-43	Decimal Positions	N
	44-46	Print Position	N
	47	Slew Code	A
	48	Sign	N
	49-73	Value	A
	74	Not Used	
Dup.	75-80	Ident.	A

SPECIAL CHARACTER CONFIGURATIONS			
[	12,2,8	e	12,0,5
<	12,4,8	f	12,0,6
(	12,5,8	g	12,0,7
+	12,6,8	h	12,0,8
!	12,7,8	i	12,0,9
]	11,2,8	j	12,11,1
)	11,5,8	k	12,11,2
;	11,6,8	l	12,11,3
↑	11,7,8	m	12,11,4
/	0,1,8	■	12,11,5
-	0,5,8	°	12,11,6
>	0,6,8	3/4	12,11,7
?	0,7,8	1/8	12,11,8
:	2,8	3/8	12,11,9
#	3,8	1/2	11,0,3
'	5,8	5/8	11,0,4
=	6,8	1/4	11,0,6
"	7,8	1/2	11,0,9
a	12,0,1	7/8	12,0
b	12,0,2	◇	12,11
£	12,0,3	C	11,0
d	12,0,4	R	

0123456789	ABCDEFGHIJKLMN	OPQRSTUVWXYZ	& [. < (+ ! -] \$ *) ; ^ / \ , % < > ? : # @ ' = "
0000	0000	0000	0000
1234	5678	91011	1213
1111	1111	1111	1111
2222	2222	2222	2222
3333	3333	3333	3333
4444	4444	4444	4444
5555	5555	5555	5555
6666	6666	6666	6666
7777	7777	7777	7777
8888	8888	8888	8888
9999	9999	9999	9999

NCR 399 ANSI DATA AND CONTROL CHARACTERS

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CHARACTER I/D	8	7	6	5	4	3	2	1	INTERNAL VALUE HEX
SP (␣)	●					•			20
!			●			•			21
"			●			•	●		22
# (£)	●					•	●		23
\$			●			•	●		24
%	●	●				•	●		25
&	●					•	●	●	26
'			●			•	●	●	27
(•				28
)	●	●			•			●	29
*	●		●		•		●		2A
+			●		•	•	●		2B
,			●		•	•	●		2C
-			●		•	•	●	●	2D
.			●		•	•	●	●	2E
/	●				•	•	●	●	2F
0			●	●		•			30
1	●			●		•		●	31
2	●			●		•		●	32
3			●	●		•		●	33
4	●			●		•		●	34
5			●	●		•		●	35
6			●	●		•	●	●	36
7	●			●		•	●	●	37
8	●			●	●				38
9			●	●		•		●	39
:			●	●		•		●	3A
;	●			●		•		●	3B
<			●	●		•		●	3C
=	●			●		•		●	3D
>	●			●		•		●	3E
?			●	●		•		●	3F

CHARACTER I/D	8	7	6	5	4	3	2	1	INTERNAL VALUE HEX
@	●	●				•			40
A						•		●	41
B			●			•		●	42
C			●			•	●	●	43
D			●			•	●		44
E	●	●				•	●	●	45
F	●	●				•	●	●	46
G			●			•	●	●	47
H			●			•	●		48
I	●	●			•			●	49
J	●	●			•		●		4A
K	●	●			•		●	●	4B
L	●	●			•	●			4C
M			●			•	●	●	4D
N			●			•	●	●	4E
O	●	●				•	●	●	4F
P			●			•			50
Q	●	●			•			●	51
R	●	●			•			●	52
S	●	●			•		●	●	53
T	●	●			•	●			54
U			●			•	●	●	55
V			●			•	●	●	56
W	●	●				•	●	●	57
X	●	●			•	●			58
Y			●			•		●	59
Z	●	●			•	●		●	5A
[	●	●			•	●		●	5B
\			●			•	●		5C
]	●	●			•	●		●	5D
^	●	●			•	●		●	5E
_			●			•	●	●	5F

NUL						•			00
BS	●					•			08
CR	●					•	●		0D
CAN				●	●	•			18
EM	●					•		●	13
ESC				●	●	•		●	1B
FS	●					•	●		1C
RS				●	●	•	●		1E
US				●	●	•	●	●	1F
DEL	●	●	●			•	●	●	7F
SO	●					•	●	●	0E
SI				●	●	•	●	●	0F
SYN	●			●	●	•	●		16
GS				●	●	•	●	●	1D

*1
*2
*3
*4
*5
*6
*7
*8
*9
*10
*11
*12
*13
*14

- *1 - Null
- *2 - Back Space
- *3 - Carriage Return
- *4 - Cancel (Void)
- *5 - End-of-Media
- *6 - Escape
- *7 - End-of-File
- *8 - End-of-Record
- *9 - End-of-Field
- *10 - Delete
- *11 - Shift Out
- *12 - Shift In
- *13 - Synchronize
- *14 - End-of-Group

a	●	●	●			•		●	61
b	●	●	●			•		●	62
£ (c)	●	●	●			•		●	63
d	●	●	●			•	●		64
e			●			•		●	65
f			●			•	●	●	66
g	●	●	●			•		●	67
h	●	●	●			•			68
i			●			•		●	69
j			●			•		●	6A
k	●	●	●			•	●	●	6B
l			●			•		●	6C
m	●	●	●			•	●	●	6D
■ (n)	●	●	●			•	●	●	6E
o	●	●	●			•	●	●	6F
3/4 (p)	●	●	●			•			70
1/8 (q)	●	●	●			•		●	71
3/8 (r)	●	●	●			•		●	72
1/2 (t)	●	●	●			•	●		74
5/8 (u)	●	●	●			•	●	●	75
1/4 (w)	●	●	●			•	●	●	77
£ (z)	●	●	●			•	●	●	7A
7/8 (())	●	●	●			•	●	●	7B
◇ (i)	●	●	●			•	●	●	7C
CR ()	●	●	●			•	●	●	7D

PAPER TAPE

IBM 046-047 8-

(Odd-

INPUT-OUTPUT

CHANNEL CODE

Parity)

CHARACTERS		CHANNELS								HEX	
046-047	399	8	7	6	5	4	3	2	1	IMAGE	
		EL	X	0	√	8	+	4	2	1	IN 399
0	0			•			•				30
1	1							•		•	31
2	2							•		•	32
3	3				•		•		•	•	33
4	4							•	•		34
5	5				•		•	•	•	•	35
6	6					•		•	•	•	36
7	7							•	•	•	37
8	8						•	•			38
9	9				•	•	•		•	•	39
A	A	•	•			•		•		•	41
B	B	•	•				•		•		42
C	C	•	•	•		•		•	•	•	43
D	D	•	•			•	•				44
E	E	•	•	•		•		•	•	•	45
F	F	•	•				•		•	•	46
G	G	•	•				•	•	•	•	47
H	H	•	•			•					48
I	I	•	•	•	•	•			•	•	49
J	J	•	•			•		•		•	4A
K	K	•	•			•		•		•	4B
L	L	•	•			•		•	•	•	4C
M	M	•	•	•		•		•			4D
N	N	•	•			•		•	•	•	4E
⊙	⊙	•	•			•		•	•	•	4F
P	P	•	•			•		•	•	•	50
Q	Q	•	•	•	•						51
R	R	•	•			•		•		•	52
S	S	•	•	•		•		•		•	53
T	T	•	•			•		•	•	•	54
U	U	•	•			•		•	•	•	55
V	V	•	•			•		•	•	•	56
W	W	•	•			•		•	•	•	57

CHARACTERS		CHANNELS								HEX	
046-047	399	8	7	6	5	4	3	2	1	IMAGE	
		EL	X	0	√	8	+	4	2	1	IN 399
X	X			•	•	•	•	•	•	•	58
Y	Y			•	•	•	•				59
Z	Z			•		•		•		•	5A
.	.			•	•	•	•	•	•	•	2E
,	,			•	•	•	•	•	•	•	2C
SPACE	SPACE				•		•				20
-	-		•			•					2D
&	&		•	•	•		•				26
@	@				•	•	•	•	•	•	40
⊠	■			•	•	•	•	•	•	•	6E
%	%			•		•		•	•	•	25
\$	\$			•	•	•	•	•	•	•	24
/	/			•	•		•		•	•	2F
*	*			•		•	•	•	•		2A
#	#						•	•	•	•	23
PI1	US					•	•	•	•	•	1F *
PI2	US			•		•		•	•	•	1F
PI3	US			•		•		•	•	•	1F
PI4	US			•	•	•	•	•	•	•	1F
PI5	US			•	•	•	•	•	•	•	1F
PI6	US			•	•	•	•	•	•	•	1F
PI7	US					•	•	•	•	•	1F
EC1	NUL					•	•	•	•	•	00
EC2	NUL			•		•	•	•	•	•	00
SP1	NUL			•	•	•	•	•	•	•	00
SP2	NUL			•	•	•	•	•	•	•	00
ENDLI	RS	•				•					1E *
ERROR	NUL			•		•	•	•	•	•	00
SKIP	NUL			•	•	•	•	•	•	•	00
RUNIN	DEL			•	•	•	•	•	•	•	FF
CORR	NUL			•	•	•	•	•	•	•	00
CARET	RS	•		•	•	•	•	•	•	•	1E

* Denotes the punch configuration which is punched into paper tape for the unit and record separator.

PAPER TAPE
NCR 315 GENER
(Odd-
LOWER SHIFT TR

INPUT-OUTPUT
AL-PURPOSE CODE
Parity)
ANSULATION TABLE

TYPEWRITER CHARACTER		CHANNELS							HEX IMAGE IN 399	
Lower Shift	399 Character	8	7	6	5	4	3	2	1	
0	0									30
1	1									31
2	2									32
3	3									33
4	4									34
5	5									35
6	6									36
7	7									37
8	8									38
9	9									39
A	A									41
B	B									42
C	C									43
D	D									44
E	E									45
F	F									46
G	G									47
H	H									48
I	I									49
J	J									4A
K	K									4B
L	L									4C
M	M									4D
N	N									4E
⊘	⊘									4F
P	P									50
Q	Q									51
R	R									52
S	S									53
T	T									54

SYMBOL ROW	TYPEWRITER CHARACTER		CHANNELS							HEX IMAGE IN 399	
	Lower Shift	399 Character	8	7	6	5	4	3	2	1	
	U	U									55
	V	V									56
	W	W									57
	X	X									58
	Y	Y									59
	Z	Z									5A
4	SPACE	SPACE									20
8	COMP ₄	US									1F*
7	CLEAR _⊗	US									1F
6	PUT _λ	US									1F
5	PDISC _J	US									1F
9	STOP _⊘	US									1F
3	CARET	RS									1E*
2	TAB	RS									1E
1	LINE ₃	RS									1E
0	RUNIN	NUL									00
	DELE	DEL									7F
	UP SHIFT	Note 1									
	DOWN SHIFT	Note 2									

SEPARATE CODES
For Numeric Keyboards

Amount Key	399 Character	CHANNELS							HEX IMAGE IN 399	
		8	7	6	5	4	3	2	1	
0	0									30
1	1									31
2	2									32
3	3									33
4	4									34
5	5									35
6	6									36
7	7									37
8	8									38
9	9									39

* Denotes the punch configuration which is punched into paper tape for the unit and record separator.

PAPER TAPE
NCR 315 GENER
(Odd-
Parity)
UPPER SHIFT TR

INPUT-OUTPUT
AL-PURPOSE CODE
Parity)
ANSLATION TABLE

TYPEWRITER CHARACTER		CHANNELS							HEX IMAGE IN 399	
Upper Shift	399 Character	8	7	6	5	4	3	2	1	
=	=	•		•	•	•	•	•	•	3 D
#	#	•	•			•	•	•	•	2 3
!	!	•				•		•	•	2 1
\$	\$				•		•	•	•	2 4
%	%	•	•			•			•	2 5
&	&	•	•		•	•		•	•	2 6
"	"	•			•	•	•	•	•	2 2
(	(					•	•	•	•	2 8
)	)			•	•	•			•	2 9
<	<	•	•			•			•	3 C
*	*	•	•		•	•				2 A
.	.	•			•	•				2 E
+	+				•	•	•	•		2 B
-	-	•	•	•	•	•	•	•		2 D
,	,	•	•			•	•			2 C
?	?			•	•	•	•			3 F
:	:	•	•	•	•	•				3 A
←	←	•	•	•		•				5 F
↑	↑			•	•	•	•			5 E
>	>	•			•	•		•		3 E
/	/			•		•				2 F

* Denotes the punch configuration which is punched into paper tape for the unit and record separator.

	TYPEWRITER CHARACTER		CHANNELS							HEX IMAGE IN 399	
	Upper Shift	399 Character	8	7	6	5	4	3	2	1	
	'	'					•	•	•		2 7
	[	[		•	•	•		•	•	•	5 B
	]	]			•			•	•	•	5 D
	\	\		•	•	•	•		•		5 C
	;	;			•		•		•		3 B
	@	@		•	•			•	•		4 0
8	COMP ₁	US				•	•	•	•	•	1 F *
7	CLEAR ₂	US				•	•		•	•	1 F
6	PUT ₃	US					•	•	•	•	1 F
5	PDJSC ₄	US		•				•	•	•	1 F
9	STOP ₅	US		•	•	•	•	•			1 F
3	CARET	RS				•		•			1 E *
2	TAB	RS						•		•	1 E
1	LINE ₃	RS						•	•		1 E
0	RUNIN	NUL	•	•	•	•	•	•	•	•	0 0
	DELE	DEL	•	•	•	•	•	•	•	•	7 F
	UP SHIFT	Note 1				•	•	•	•	•	
	DOWN SHIFT	Note 2				•	•	•	•	•	

NOTE 1: A 315 Tape Code of '3E' will not be translated. It only indicates to the Translation Table logic that the following 315 Tape Code should be searched for in the Upshift Symbol portion of the Translation Table.

NOTE 2: A 315 Tape Code of '3D' will not be translated. It only indicates to the Translation Table logic that the following 315 Tape Code should be searched for in the Downshift Symbol portion of the Translation Table.

PAPER TAPE INPUT-OUTPUT

The Core Memory Project CHANNEL CODE

(Odd-Parity)

TRANSLATION TABLE

CHARACTER		CHANNELS								HEX IMAGE IN 399
		8	7	6	5	4	3	2	1	
500	399				✓					31
1	1						.		•	32
2	2							.	•	33
3	3				•		.		•	34
4	4							.	•	35
5	5				•		.	•	•	36
6	6				•		.	•	•	37
7	7							.	•	38
8	8						•	.		39
9	9				•	•	.		•	30
0	0				•		.			1 E
AI	RS				•	•	.		•	1 E
EOR	RS	•	•		•	.	•	•		1 E *
EOR	RS				•	.	•	•		1 F *
EOW	US				•	.	•	•		00
EOT	NUL				•	.		•	•	2 D
MINUS	MINUS				•	•	.	•		FF
IGNORE	DELETE				•	•	.	•	•	FF
BROKEN TAPE	DELETE	•	•	•	•	•	.	•	•	FF

NOTE: Since NCR 399 convention requires reading a field from its highest order position to its lowest, it is necessary to know the creation order of the NCR 500 tape. By following the below outlined procedures, correct processing on the NCR 399 will be assured.

A. *High to low creation* — Place the NCR 500 created tape on the left hand spool of the NCR 366, narrow side out, unwinding clockwise. Respool to the right hand reel. The tape is now ready for processing.

B. *Low to high creation* — A low to high created tape must be read trailer end first to meet the NCR 399 requirements. However, in order for the tape to be read narrow side out, as required on the NCR 366, it must first be respooled in a direction opposite of that which it was created. Place the NCR 500 created tape on the right hand reel of the NCR 366, narrow side out unwinding clockwise. Respool to the left hand reel by lowering the left hand tension arm. Without removing the "reverse wound" tape from the left hand reel, thread its loose end back to the right hand reel and respool by lowering the right hand tension arm. The tape is now ready for processing.

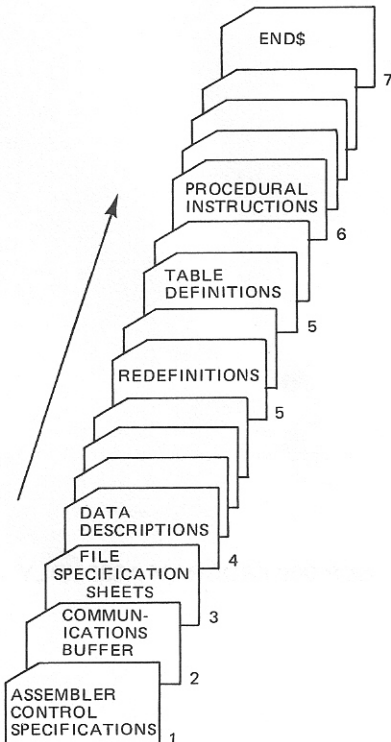
NOTE: In both A. and B. above, the read head must be bypassed.

* Denotes the punch configuration which is punched into paper tape for the unit and record separator.

NCR 399 PROGRAM ASSEMBLY

STRUCTURE OF THE SOURCE PROGRAM

The Core Memory Project



7. END\$ must always be the last source line.
6. The procedural instructions must reflect the logic of the program.
5. Tables and redefinitions, if used, must follow the formats explained under TABLES AND REDEFINITIONS.
4. Data descriptions are explained under DATA DESCRIPTION.
3. File Specification Sheets follow the Assembler Control Specifications.
2. The communication buffer, if used, must follow the format explained under DATA DESCRIPTION.
1. The Assembler Control Specifications must be the first source line of every program.

FILE SPECIFICATION WORKSHEET DISC

399

NCR

FILE SPECIFICATION WORKSHEET
DISC

Program _____ Prepared by _____
Date _____ Page _____ of _____

ALL SOURCE REFERENCES MUST BE SPECIFIED AND MUST CONTAIN AT LEAST ONE ALPHABETIC CHARACTER
ALL NUMBERING ENTRIES MUST BE FULLY IDENTIFIED AND MUST BE ZERO-FILLED TO THE LEFT.

(Shaded Boxes Are Optional)

Paper Tape Format Code: 1 2 3

1. Page/Line
2. File Reference - Enter the name to be in the first operand of all I/O instructions referring to this file.
3. Disc - (F = Fixed, R = Removable)
4. Type of Buffers - (S = Share, R = Reserve)
5. File Usage - (I = Input, O = Output, B = Input/Output)
6. File Length - Maximum 9504 sectors (Must be multiple of 12)
7. Record Length - Maximum 512 characters
8. Record Key Length - Maximum 26 characters
9. Record Key Offset - (Relative) (0-511)
10. Does the Primary Key contain any Negative Amounts? (Y = Yes, blank or N = No)
11. File Name
12. File Error Exit - An optional coding reference to a user routine.
13. End of File Exit - An optional coding reference to a user routine.
14. (Reserved)
15. Identification

NOTE: FILE SPECIFICATION WORKSHEETS, IF USED, MUST BE THE FIRST SOURCE STATEMENTS OF A PROGRAM.

ST-61878 0674

The Core Memory Project

NCR 399 ASSEMBLER SPECIFICATION WORKSHEET FOR NCR 399 ASSEMBLER

NCR 399 ASSEMBLY PROCESS

399

399 ASSEMBLER SPECIFICATION WORKSHEET FOR NCR 399 ASSEMBLER

NCR

Program _____ Prepared by _____
Date _____ Page _____ of _____

ALL SYMBOLIC REFERENCES MUST BE LEFT JUSTIFIED AND MUST CONTAIN AT LEAST ONE ALPHABETIC CHARACTER
ALL NUMERIC ENTRIES MUST BE RIGHT JUSTIFIED AND MUST BE ZERO FILLED TO THE LEFT

(Shaded Boxes Are Optional)

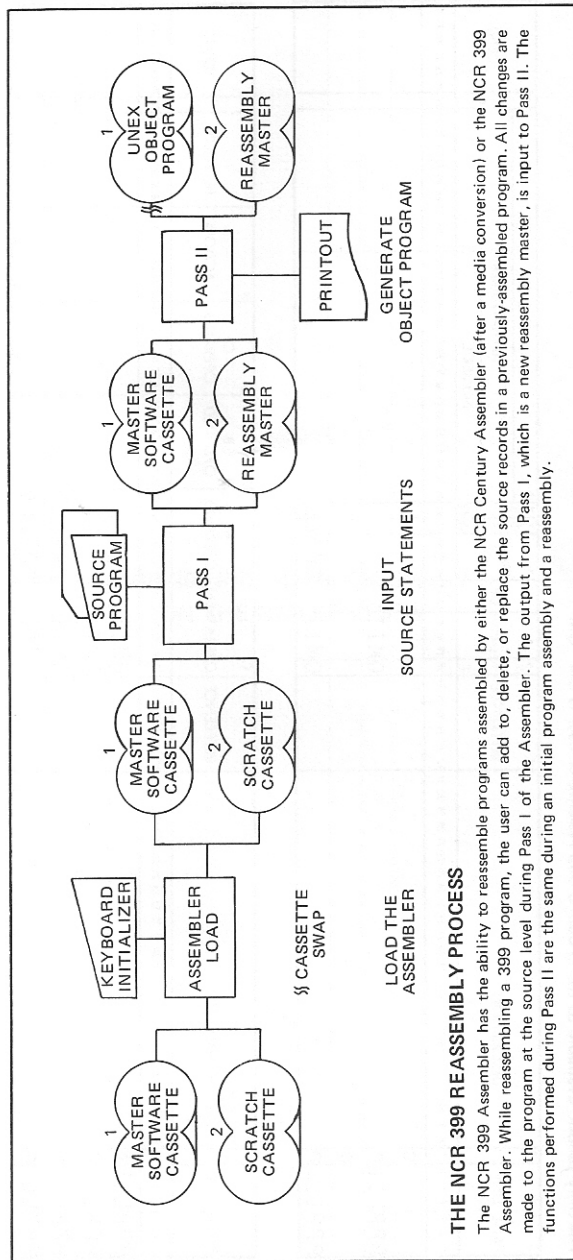
1. Page-Line
2. Program Name
3. Language Name
4. Reassembly Name (Enter name of program to be reassembled; enter N in position 24 for initial assembly)
5. Should source input be sequence checked? (Y or N)
6. Should source statements be renumbered? (Enter 0 for increments of 100; enter N for no renumbering)
7. Error statement, re-entry option for keyboard input (Y or N)
8. Is a partial assembly listing requested? (Y-only erroneous lines output; N or blank-entire program output)
9. Type of printer to be used for the assembly listing (S or blank-serial printer; L-line printer)
10. Should assembly listing be single or double spaced? (1 or blank-single space; 2-double space)
11. Assembly memory size (Enter 08, 10, 12, 14, 16, 20, 24, 28, or 32 to represent increments of 1024 bytes)
12. Object memory size (Enter 08, 10, 12, 14, 16, 20, 24, 28, or 32 to represent increments of 1024 bytes)
13. (Reserved)
14. Identification

0	0	0	0	0	0
P					
C	3	3	9		

NOTE: THIS WORKSHEET IS TO BE USED WHEN ASSEMBLING NCR 399 PROGRAMS ON AN NCR 399 SYSTEM.

CHANGES TO THIS SHEET BECOME EFFECTIVE WITH ISSUE 5 OF THE ASSEMBLER.

51 61650 0474



THE NCR 399 REASSEMBLY PROCESS

The NCR 399 Assembler has the ability to reassemble programs assembled by either the NCR Century Assembler (after a media conversion) or the NCR 399 Assembler. While reassembling a 399 program, the user can add to, delete, or replace the source records in a previously-assembled program. All changes are made to the program at the source level during Pass I of the Assembler. The output from Pass I, which is a new reassembly master, is input to Pass II. The functions performed during Pass II are the same during an initial program assembly and a reassembly.

C-399/C-399 ASSEMBLER

The Core Memory Project

The only pseudo available to the C-399/C-399 Assembler user is the "OMIT."

PAGE LINE	DESCRIPTION	REFERENCE	Y P	LENGTH DP	PRINT COL	S I E G MIN	VALUE		IDENT.
							ALPHANUMERIC	NUMERIC	
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80									
PPPLLD				OMIT					
PPPLLD				OMIT					
PPPLLD				OMIT					

PAGE LINE	COMMENTS	REFERENCE	OPERATION	A OPERAND	B OPERAND	C OPERAND	ACTION	N - FIELDS	IDENT.
PPPLLF			OMIT						
PPPLLC			OMIT						
PPPLLF			OMIT	PPPLLL					
PPPLLC			OMIT	PPPLLL					

NCR 399 PROGRAM ASSEMBLY
ON THE NCR CENTURY

NCR 399 ASSEMBLER SPECIFICATION WORKSHEET FOR NCR CENTURY ASSEMBLER

399399 ASSEMBLER SPECIFICATION WORKSHEET
FOR NCR CENTURY ASSEMBLER**NCR**

Program _____ Prepared by _____

Date _____ Page _____ of _____

ALL SYMBOLIC REFERENCES MUST BE LEFT JUSTIFIED AND MUST CONTAIN AT LEAST ONE ALPHABETIC CHARACTER.
ALL NUMERIC ENTRIES MUST BE RIGHT JUSTIFIED AND MUST BE ZERO FILLED TO THE LEFT.(Shaded Boxes Are Optional) Punched Tape Format Code 1.2

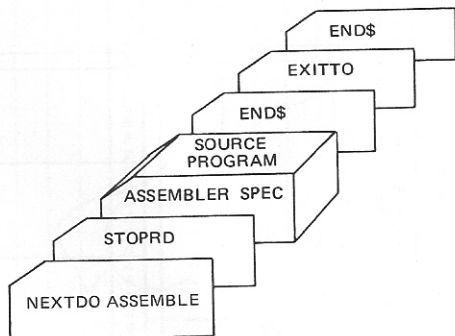
1. Page-Line 1 2 3 4
0 0 0 0 0 0
2. Program Name 7 8 9 10 11 12
P
3. Language Name 13 14 15 16 17 18
C 2 9 9
4. Reassembly Name (Enter name of program to be reassembled; enter N in position 24 for initial assembly) 19 20 21 22 23 24
5. Should source input be sorted? (Y-source lines will be sorted if out of sequence; N-source lines will be renumbered but not sorted; Y must be entered for reassembly) 25
6. Should source statements be renumbered? (Enter 1 thru 0 for renumbering increments 10 thru 100; enter N for no renumbering; if position 35 contains N, statements will be renumbered) 36
7. Should program listing be double spaced? (Y-double spacing; N-single spacing; N if blank) 37
8. Should program listing include cross reference? (Y or N; N if blank) 38
9. Indicate type of additional object output desired: 39
 2 for Punched Tape
 3 for Magnetic Tape
 N or blank for none
10. Indicate type of additional source output desired: 40
 2 for Punched Tape
 3 for Magnetic Tape
 N or blank for none
11. Object memory size (Enter 08, 10, 12, 14, 16, 20, 24, 28, or 32 to represent multiples of 1024 bytes) 41 42
43
12. (Reserved) 44
13. Identification 45 46 47 48
49

NOTE: THIS WORKSHEET IS TO BE USED WHEN ASSEMBLING
NCR 399 PROGRAMS ON AN NCR CENTURY SYSTEM.

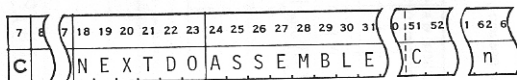
ST 61850 0474

NCR CENTURY CONTROL INSTRUCTIONS

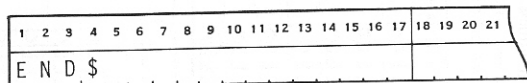
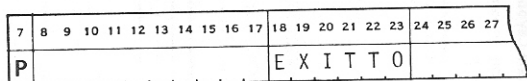
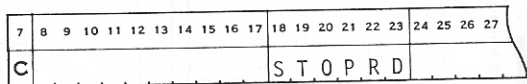
The Core Memory Project



Four NCR Century control instructions are required when assembling 399 programs on an NCR Century System: NEXTDO ASSEMBLE, STOPRD, EXITTO, and ENDS\$. The NEXTDO and STOPRD instructions must be placed at the beginning of a program or series of programs (i.e., preceding the first assembler specification card). NCR Century control instructions should be preceded by a /00 format code when punched tape is being used.



- n = 1 Punched Tape
- 2 Punched Cards
- 5 736 Magnetic Tape on the 736 Encoder
- 6 736 Magnetic Tape on Magnetic Tape Handler
- 7 735 Magnetic Tape on Magnetic Tape Handler



DEBUGGING

NCR CENTURY ASSEMBLER ERROR DIRECTORY

The Core Memory Project

Error Code	Meaning
D	Operand is duplicated
I	Field contains an illegal value
M	Missing value in designated field
P	Presentation sequence error
R	Field outside minimum or maximum range
U	Operand is undefined within data or coding section
X	No driver included by GET/PUT to this device
Z	Zero is invalid
C	Caution — check operand data types

NCR 399 ASSEMBLER ERROR DIRECTORY

Error Code	Meaning
C Caution	The value in this field may cause unexpected results.
D Double Definition	This reference has been used previously in this section of the program. This reference is ignored. All Coding references to this reference will use the address assigned to previously-input like reference.
F Tag Table Full	The tag table is full. This reference is ignored. Any Coding reference to this tag will cause an "Undefined Tag" error condition.
I Illegal Entry	The entry in this field is illegal to the Assembler.
P Presentation Error	The Assembler expected a different source statement to be input. Check the program for a possible source-line omission.
U Undefined Tag	The reference used in this instruction is undefined. An address of zero is assigned by the Assembler to this operand.
R Range Error	The branch to address exceeds its maximum range. The low-order 14 or 15 bits are assembled into the instructions.

CODING STATEMENT ERRORS

Field	Error Code	Error Definition	Assembler Action
A operand used as a branch key	M	This field was left blank a branch key must be present.	In both cases a branch key #00 will be assigned.
	I	Branch key is illegal.	
A operand used as a peripheral device	M	This field was left blank a peripheral device must be specified.	In both cases a peripheral device code of 1F (HEX) will be assigned.
	I	Peripheral device illegal	
Action	M	This field was left blank, an action code must be present.	In all cases the action bits will be set to zero in the object.
	I	Field contains an illegal action code.	
N-Fields	M	This field was left blank, N-contiguous fields must be present.	In all cases the assembler will assume one (1) contiguous field.
	I	Field contains at least one character other than 0-9, or > than allowed.	
	Z	Field is equal to zero.	

HEXADECIMAL AND DECIMAL CONVERSION

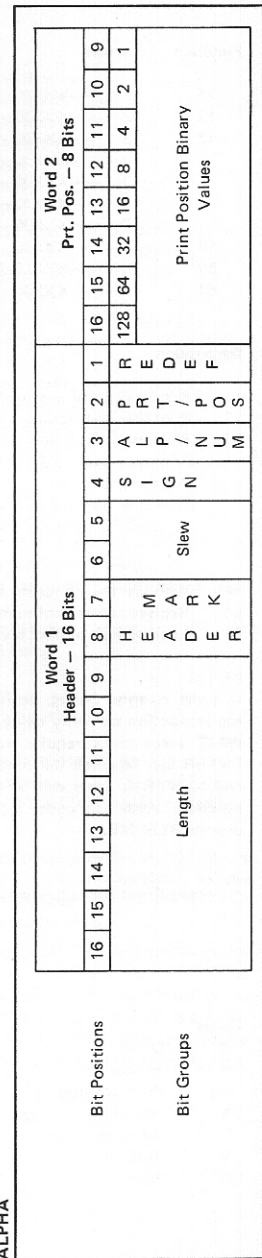
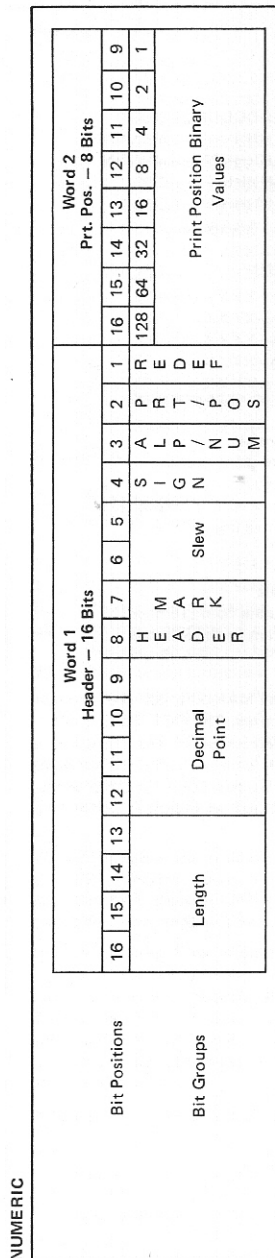
The Core Memory Project

To find the decimal number, locate the Hex number and its decimal equivalent for each position. Add these to obtain the decimal number. To find the Hex number, locate the next lower decimal number and its Hex equivalent. Each difference is used to obtain the next Hex number until the entire number is developed.

BYTE		BYTE		BYTE							
0123	4567	0123	4567	0123	4567						
0	0	0	0	0	0						
1	1,048,576	1	65,536	1	4,096	1	256	1	16	1	1
2	2,097,152	2	131,072	2	8,192	2	512	2	32	2	2
3	3,145,728	3	196,608	3	12,288	3	768	3	48	3	3
4	4,194,304	4	262,144	4	16,384	4	1,024	4	64	4	4
5	5,242,880	5	327,680	5	20,480	5	1,280	5	80	5	5
6	6,291,456	6	393,216	6	24,576	6	1,536	6	96	6	6
7	7,340,032	7	458,752	7	28,672	7	1,792	7	112	7	7
8	8,388,608	8	524,288	8	32,768	8	2,048	8	128	8	8
9	9,437,184	9	589,824	9	36,854	9	2,304	9	144	9	9
A	10,485,760	A	655,360	A	40,960	A	2,560	A	160	A	10
B	11,534,336	B	720,896	B	45,056	B	2,816	B	176	B	11
C	12,582,912	C	786,432	C	49,152	C	3,072	C	192	C	12
D	13,631,488	D	851,968	D	53,248	D	3,328	D	208	D	13
E	14,680,064	E	917,504	E	57,344	E	3,584	E	224	E	14
F	15,728,640	F	983,040	F	61,440	F	3,840	F	240	F	15
	6		5		4		3		2		1

Powers of 16				Powers of 2			
16 ⁿ		n		2 ⁿ		n	
		1	0		512		9
		16	1	1	024		10
		256	2	2	048		11
	4	096	3	4	096		12
	65	536	4	8	192		13
	1	048	576	16	384		14
	16	777	216	32	768		15
	268	435	456	65	536		16
4	294	967	296	131	072		17
68	719	476	736	262	144		18
1	099	511	627	524	288		19
17	592	186	044	1	048	576	20
281	474	976	710	2	097	152	21
4	503	599	627	4	194	304	22
72	057	594	037	8	388	608	23
1	152	921	504	16	777	216	24
		606	846	976	15		

DATA HEADER FORMATS



DEBUG

The Core Memory Project

Function	Format
11	11----XXXX
12	12----XXXX-----DDDDDDDDDDDD
13	13----XXXX-----HHHH-----NNNNNN
	13----XXXX-----HHHHPP --NNNNN
	13----XXXX-----HHHH-----CCC
	13----XXXX-----HHHHPP --CCCC
	13----XXXX-----AAAAA
14	14----XXXX
53*	53----XXXX--NNNNN
61	61----XXXX

Description

11	Print address of next instruction to be executed
12	Print user instruction
13	Print user data field — Numeric
	Print user data field — With print position
	Print user data field — Alpha
	Print user data field — Alpha with print position
	Print user data field — 24 hex digits
14	Print last branch return address
53	Replace contents of numeric data field (16 max.)
61	Load address of next instruction to be executed

NOTE:

In order to enter Debug, depress the MANUAL key and terminate the instruction currently being executed. The GET, PUT, TYPE or WAIT instructions require the depression of the RESUME or ENTER bar. When all the conditions have been met, the MANUAL and NUMERIC lights will be ON. At this point, you can select a function, index it's code, type format as indicated above, then depress RESUME.

* Depress Space bar before entering data.

Codes

D	Digits
H	Header
P	Print position
A	Hex digits
C	Alpha characters
X	Address
N	Numeric

FIXER

Function	Format
00	
13	13----XXXX-----HHHH-----H
	13----XXXX-----HHHHPP --H
	13----XXXX-----HHHH-----L
	13----XXXX-----HHHHPP --L
52*	52----XXXX--NNNNN
53*	53----XXXX--NNNNN
	53----XXXX--NNNNN
72	72----XXXX-----DDDDDDDDDDDD
73	73----XXXX-----HHHH-----NNNNNN
	73----XXXX-----HHHHPP --NNNNN
	73----XXXX-----HHHH-----CCC
	73----XXXX-----HHHHPP --CCCC
	73----XXXX-----AAAAA
	73----XXXX-----HHHH-----H
	73----XXXX-----HHHHPP --H
	73----XXXX-----HHHH-----L
	73----XXXX-----HHHHPP --L

Description

00	Repeat function
13	REDEF header — begin in high byte of word
13	— begin in high byte of word with pr. pos.
13	— begin in low byte of word
13	— begin in low byte of word with pr. pos.
52	Replace user instruction
53	Replace user data — numeric (16 max.)
	Replace user data — hex (20 max.)
72	Dump user instructions
73	Dump user data — Numeric
	Dump user data — With print position
	Dump user data — Alpha
	Dump user data — Alpha with print position
	Dump user data — 25 hex digits
73	REDEF header — Same as '13' REDEF header formats

Note:

The above codes are in addition to function codes 11, 12, 13, 14 and 61. Function codes in Fixer function identically to the corresponding codes in Debug with the exception of the '53'. All Debug function codes will be recognized by Fixer.

In order to enter Fixer, press the MANUAL key and terminate the instruction currently being executed. The GET, PUT, TYPE or WAIT instructions require the depression of the RESUME or ENTER bar. When all the conditions have been met, the MANUAL and NUMERIC lights will be ON. At this point, you can select a function, index it's code, type format as indicated above, then depress RESUME.

* Depress Space bar before entering data.

Codes

D	Digits	A	Hex digits	N	Numeric
H	Header	C	Alpha characters		
P	Print position	X	Address		

CHANGING DATA DEFINITION AND HEADER

REFERENCE	T	LENGTH	DP	PRT. COL.	SL	SN	A=1010	D=1101
K A P	N	1 1	2	1 5 5			B=1011	E=1110
K A P	N	8	3	1 2 0			C=1100	F=1111
HEADER WORD								
16, 15, 14, 13, 12, 11, 10, 9	8	7	6	5	4	3	2	1
A	2	C		2			9	B
LENGTH 1-256								
		HDR	SLEW	SN _A	PP		128 64 32 16	8 4 2 1
LENGTH 1-16								
		DP		HDR	SLEW	SN _A	PP	128 64 32 16 8 4 2 1
0 1 1 1	0 0 1 1	1 1 0 0	0 0 1 0	0 0 1 0	0 1 1 1	1 1 0 0	0	0
7	3	C		2			7	8

Old Data Definition

New Data Definition

Bit Positions

Old Header Hex

Alpha Bit Groups

New Binary

New Alpha Header Hex

Numeric Bit Groups

New Binary

New Numeric Header Hex

CHANGING PROCEDURAL INSTRUCTIONS

1	2	3	4	5	6	7	8	9	10	11	12
OPERN.	A	B	C	ACTION	N-FIELD						
FROM ASSEMBLY LISTING A=1010 D=1101 B=1011 E=1110 OBJECT BIT STRING C=1100 F=1111											
LOCATION:											
OPERN.	A	B	C	ACTION	N-FIELD						
New Instruction											
New Q-Code											
Object Bit Changes											
New Hex											

Bit Group

Description

Assembly Printout

Hex Object Printout

Object Bit String

Old Q-Code

New Instruction

New Q-Code

Object Bit Changes

New Hex

Q-CODE/BIT STRING CHART LEGEND

The Core Memory Project

(CODE EXPLANATION)

A	- A operand	First data field specified
B	- B operand	Second data field specified
C	- C operand	Third data field specified
D	- Device code	See Device Code Table
E	- Major Printer Edit Code	See Printer Edit Code Table
F	- Space/zero fill	0 = perform fill, 1 = no fill
L	- Program status lights	Binary value - 0-31
H	- Modify header/modify data	See Zone Bit Table
N	- Contiguous fields	Binary value
P	- Paper feed lines - forms handler	Binary value - 0-15 lines
R	- Round	0 = no round, 1 = perform round
S	- Move sign	0 = move sign 1 = don't move sign
T	- Status Code	
V	- Directory operation option	00 = no operation 01 = GET date created 10 = PUT date created
W	- File type modifier	00 = old 01 = new 10 = piggyback
X	- Delete file or record	
Y	- Key modifier	001 = E 010 = G 100 = L 011 = GE 101 = LE
Z	- Zone bits	See Zone Bit Table
a	- Instruction Address	Hex shown on assembly listing
b	- Card column	Binary value - 1-80
c	- Print position	Binary value - SPR - 1-265 Binary value - LPR - 1-132
e	- Minor Printer Edit Code	See Printer Edit Code Table
f	- Paper Tape Translation Code	See Paper Tape Translation Code Table
i	- Indicator Code	See Indicator Code Table
m	- GET/PUT LAST	0 = all others 1 = Last Get, Last Put
n	- Number of Characters	Binary value
p	- Slew lines- line printer	Binary value - 1-127 lines
r	- Line Number Counters	0 = LNCR, 1 = LNCL
x	- Line printer column	
v	- MOVEP repeat	

Q-CODE BIT STRING CHART

INSTR	REF	1	2	3	4	5	6	7	8	9	10	11	12
WAIT		0000	0000	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			
ADDNA		0000	010N	NNNN	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB			
ADDNB		0000	100N	NNNN	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB			
ADDN		0000	110N	NNNN	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB			
SUB		0001	0000	AAAA	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB			
SUBNA		0001	010N	NNNN	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB			
SUBNB		0001	100N	NNNN	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB			
SUBN		0001	110N	NNNN	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB			
ADD		0010	0000	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			
BR		0010	10aa	aaaa	aaaa	aaaa	aaaa	aaaa	aaaa	aaaa			
BRION		0010	11ii	iiii	iaaa	iaaa	iaaa	aaaa	aaaa	aaaa			
BRE		0011	00aa	aaaa	aaaa	aaaa	aaaa	AAAA	AAAA	AAAA			
BRU		0011	01aa	aaaa	aaaa	aaaa	aaaa	AAAA	AAAA	AAAA			
BRL		0011	10aa	aaaa	aaaa	aaaa	aaaa	AAAA	AAAA	AAAA			
BRG		0011	11aa	aaaa	aaaa	aaaa	aaaa	AAAA	AAAA	AAAA			
BRIOFF		0100	00ij	iiii	iaaa	iaaa	iaaa	aaaa	aaaa	aaaa			
TYPE		0100	0100	NNNN	AAAA	AAAA	AAAA	AAAA	AAAA	AAAA			
TYPEK		0100	0101	NNNN	AAAA	AAAA	AAAA	AAAA	AAAA	AAAA			
TYPEM		0100	10NN	NNNN	nnnn	nnnn	nnnn	AAAA	AAAA	AAAA			
TYPEL		0100	11nn	nnnn	NNNN	NNNN	NNNN	AAAA	AAAA	AAAA			
GET		0101	00DD	DDm	0000	0000	0000	NNNN	NNNN	NNNN			
GET-LNCr		0101	0000	1010	0000	0000	0000	NNNN	NNNN	NNNN			
PUT:SPR		0101	0100	00EE	EeeN	EeeN	EeeN	NNNN	NNNN	NNNN			
PUT:LPR		0101	0101	0000	EeeN	EeeN	EeeN	NNNN	NNNN	NNNN			

Q-CODE BIT STRING CHART (Cont.)
The Core Memory Project

INSTR	REF	1	2	3	4	5	6	7	8	9	10	11	12
PUT: LPR	slew	0101	0101	0001	0000	0001	BBBB	BBBB	BBBB	BBBB	BBBB	BBBB	
PUT: LNCr		0101	0100	1010	0000	000r	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC	
PUT:	all other	0101	01DD	DDm	NNNN	NNNN	aaaa	aaaa	aaaa	BBBB	CCCC	CCCC	
GBP		0101	10EE	Eeei	iiii	iaaa				BBBB	CCCC	CCCC	
SAVERA		0110	0000	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	
RETURN		0110	01RN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	CCCC	CCCC	CCCC	
MULTN		0110	10R0	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	
DIV		0110	11RN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	CCCC	CCCC	CCCC	
DIVN		0111	00R0	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	BBBB	BBBB	
MULT		0111	01HZ	F0SN	NNNN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
MOVEVA		0111	10HZ	F0SN	NNNN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
MOVEVB		0111	110N	FRSN	NNNN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
MOVE		1000	00NN	NNNN	NNNN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
REDEF		1000	01NN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	
TBLIN		1000	10NN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	
TBLOUT		1000	11NN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	
TBLADD		1001	00NN	NNNN	NNNN	NNNN	AAAA	AAAA	AAAA	BBBB	CCCC	CCCC	
FILL	LPR	1001	0101	0000	NNNN	NNNN	aaaa	aaaa	aaaa	BBBB	CCCC	CCCC	CCCC
BRS		1001	1000	00nn	NNNN	0aaa	AAAA	AAAA	AAAA	BBBB	CCCC	CCCC	CCCC
SCAN		1010	0000	00vv	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC
MOVEP		1010	0000	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC
OPEN		1010	0100	0000	0000	0000	AAAA	AAAA	AAAA	BBBB	CCCC	CCCC	CCCC
CLOSE		1010	0100	0010	0000	0000	AAAA	AAAA	AAAA	BBBB	CCCC	CCCC	CCCC
ADDRAC		1010	0100	0100	0000	0000	AAAA	AAAA	AAAA	BBBB	CCCC	CCCC	CCCC
RDCUR		1010	0100	0110	0000	0000	AAAA	AAAA	AAAA	BBBB	CCCC	CCCC	CCCC

Q-CODE BIT STRING CHART (Cont.)

INSTR	REF	1	2	3	4	5	6	7	8	9	10	11	12
WRTCUR		1010	0100	1000	0000	000X	AAAA	AAAA	AAAA	AAAA	BBBB	BBBB	
RDNXT		1010	0100	1010	0000	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
WRNXT		1010	0100	1100	0000	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
SETBP		1010	1000	1110	0000	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
MARK		1010	1001	0000	0000	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
RESET		1010	1001	0010	0000	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
DELETE		1010	1001	0100	0000	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
SEARCH		1010	1001	0110	0000	0YYY	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
FPUT		1010	1001	1000	NNNN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
FGET		1010	1001	1010	NNNN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
RDID		1010	1001	1100	0000	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
FDIR		1010	1001	1110	0000	00VV	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
BRS	DISC	1001	0100	110T	TTTT	0aaa	aaaa	aaaa	aaaa	BBBB	BBBB	BBBB	
CNTL		0010	0100	0110	0000	0000	Form Handler	Form Handler	Form Handler	Eject Left	Eject Right	Eject right rear	
		0010	0100	0110	0001	0000							
		0010	0100	0110	0010	0000							
		0010	0100	0110	0011	0000							
		0010	0100	0110	0100	0000							
		0010	0100	0110	0101	0000							
		0010	0100	0110	0110	0000							
		0010	0100	0110	0111	0000							
		0010	0100	0110	1000	0000							
		0010	0100	0110	1001	0000							

Q-CODE BIT STRING CHART (Cont.)

The Core Memory Project

INSTR	REF	1	2	3	4	5	6	7	8	9	10	11	12
CNTL(Cont)		0010	0100	0110	1010	0000							
		0010	0100	0110	1011	0000							
		0010	0100	0110	1100	0000							
		0010	0100	0110	1101	0000							
		0010	0100	0110	1110	0000							
		0010	0100	000c	cccc	cccc							
		0010	0101	0001	1000	0000							
		0010	0101	0001	0ppp	pppp							
		0010	0101	0001	1ppp	pppp							
		0010	0101	0000	xxxx	xxxx							
		0010	0101	1000	0001	0000							
		0010	0101	1000	0000	0000							
		0010	0101	1000	0000	0000							
		0010	0101	0110	0110	0010							
		0010	0101	0110	0110	0000							
		0010	0101	0110	0110	0100							
		0010	0101	1000	0001	0000							
		0010	0100	0100	1000	000L	LLLL						
		0010	0101	0100	0100	0bbb	bbbb						
		0010	0101	0101	0101	0000	0000						

Platen Close Left
 Platen Close Right
 Line Feed Left
 Line Feed Right
 Line Feed Both
 Platen Close Both
 SPR print pos. 1-265
 LPR print, no slew
 LPR print, slew 1-127 lines
 LPR print and slew 1-127
 LPR print pos. 1-132
 Rewind Cassette #1
 Rewind Cassette #2
 Backspace CAS1
 Backspace CAS2
 Write Tape Mark, CAS1
 Write Tape Mark, CAS2
 Sep. Flag Enable, CAS1
 Sep. Flag Disable, CAS1
 Sep. Flag Enable, CAS2
 Sep. Flag Disable, CAS2
 Lights Sequence Control
 Field Select
 Field Terminate

Serial Prt.
 Line printer

Cassette

Program status
 Card Reader

Q-CODE BIT STRING CHART (Cont.)

INSTR	REF	1	2	3	4	5	6	7	8	9	10	11	12
CNTL (Cont)		0010	0101	1110	0bbb	bbbb							
		0010	0101	1111	0000	0000							
		0010	0101	1111	1000	0000							
		0010	0101	1110	1000	0000							
		0010	0101	0010	0000	0001	0000						
		0010	0101	0010	0010	0000	ffff						
		0010	0110	0000	0000	0000	ffff						
		0010	0110	0000	10hn	00hn	nnnn						
		0010	0110	0001	00hn	00hn	nnnn						
		0010	0100	1110	0011	0011	0000						
		2,3,4	0010	0100	1110	0101	0000						
		2,3,4	0010	0100	1110	0110	0000						
		2,3,4	0010	0100	1110	0111	0000						
		2,3,4	0010	0100	1110	1001	0000						
		2,3,4	0010	0100	1110	1100	0000						
		2,3,4	0010	0100	1110	1011	0000						
		2,3,4	0010	0100	1110	1101	0000						
		2,3,4	0010	0100	1110	1010	0000						
		A	0010	0100	1110	0000	0000						
		A	0010	0100	1110	0001	0000						
	A	0010	0100	1110	0010	0000							
	A	0010	0100	1110	0100	0000							
	A	0010	0100	1110	1000	0000							
	3,4	0010	0100	1111	0011	0000							
	3,4	0010	0100	1111	0101	0000							

Field Select Card Col.
 Print Leading Zeros
 Punch ETX
 Punch EM
 RWIND to Leader
 Translation Table
 Translation Table
 1-63 DELETES, never zero
 Establish Communications
 Change Identification Code 1
 Change Identification Code 2
 Enter Multi Block Mode
 Enter Single Block Mode
 Communications Header Field
 Monitor for Ring Indicator
 Input Data Terminator (CNTL LAST)
 Load Enable Buffer
 Retransmit Communications Buffer
 Get Enable Buffer
 Inhibit Communications
 Enable Communications
 Start of Text
 End of Transmission

Card Punch

PPT Reader

PPT Punch

PRINTER EDIT CODE TABLE

The Core Memory Project

Printer Edit Codes are used with the following instructions:

INSTR	REF	1	2	3	4	5	6	7	8	9	10	11	12
PUT:SPR													
PUT:LPR				EE|Eee									
GBP			EE|Eee										

For the Serial Printer, the Major edit codes are:

CODE	EE E	DESCRIPTION
ABN	00 0	Print all data in black regardless of sign with no symbol.
ARN	00 1	Print all data in red regardless of sign with no symbol.
PBD	10 0	Print positive data in black with no symbol, negative data in red with a diamond (◇) symbol.
PRD	10 1	Print positive data in red, negative data in black with a diamond (◇) symbol.
PBC	01 0	Print positive data in black, negative data in red with a credit (CR) symbol.
PRC	01 1	Print positive data in red, negative data in black with a credit (CR) symbol.

For the Line Printer, the Major edit codes are:

CODE	E	DESCRIPTION
LPN	0	Do not print sign.
LPS	1	Print a "." sign to the right of a negative field.

For both the Serial and the Line Printers, the Minor edit codes are:

CODE	ee	DESCRIPTION
S	00	Zero suppress
\$ or P	01	Dollar Protect
E	10	Dollar Edit
∅	11	Absolute, with decimal point

SLEW CODE TABLE

The Core Memory Project
Slew Code bits for data headers are listed below:

SERIAL PRINTER		
BITS 6 & 5	CODE	DESCRIPTION
00	∅	No Line Feed
01	R	Line Feed Right
10	L	Line Feed Left
11	B	Line Feed Both
LINE PRINTER		
BITS 6 & 5	CODE	DESCRIPTION
00	0	No print, no slew
01	1	Print, Slew 1 space
10	2	Print, Slew 2 spaces
11	3	Print, Slew 3 spaces

ZONE BIT TABLE

Zone Bit addition or deletion is used with the following instructions:

INSTR	REF	1	2	3	4	5	6	7	8	9	10	11	12
MOVENA													
MOVENB			01HZ 10HZ										
MOVENA													

If Z = 0, zone bits are not added
 If Z = 1, zone bits are added
 If H = 0, MD option not requested
 If H = 1, MD option requested

MOVENB

If Z = 0, zone bits are not stripped
 If Z = 1, zone bits are stripped
 If H = 0, MH option not requested
 If H = 1, MH option requested

INDICATOR CODE TABLE

INDICATOR CODE TABLE (Cont'd.)

Indicator Codes are issued with the following instructions:

INSTR	REF	1	2	3	4	5	6	7	8	9	10	11	12
BRION			ii	iiii	i								
BRIOFF			ii	iiii	ii								
GBP				i	iiii	ii							

HARDWARE	MNEMONIC CODE	ii	iiii	i	DESCRIPTION								
Branch Keys	ALL	00	1111	1	All branch key indicators Off								
	ANY	00	1111	0	Any branch key indicator ON								
	BK00	00	0000	0	Branch Key 00								
	BK01	00	0000	1	Branch Key 01								
	BK02	00	0001	0	Branch Key 02								
	BK03	00	0001	1	Branch Key 03								
	BK04	00	0010	0	Branch Key 04								
	BK05	00	0010	1	Branch Key 05								
	BK06	00	0011	0	Branch Key 06								
BK07	00	0011	1	Branch Key 07									
BK08	00	0100	0	Branch Key 08									
BK09	00	0100	1	Branch Key 09									
	BK10	00	1000	0	Branch Key 10								
	BK11	00	1000	1	Branch Key 11								
	BK12	00	1001	0	Branch Key 12								
	BK13	00	1001	1	Branch Key 13								
	BK14	00	1010	0	Branch Key 14								
	BK15	00	1010	1	Branch Key 15								
	BK16	00	1011	0	Branch Key 16								
	BK17	00	1011	1	Branch Key 17								
	BK18	00	1100	0	Branch Key 18								
BK19	00	1100	1	Branch Key 19									
Cassettes	CBT	01	1101	0	Cassette Blank Tape								
	CET	01	1000	0	Cassette End of Tape								
	CFO	01	1100	1	Cassette Field Overflow								
	CTM	01	1000	1	Cassette Tape Mark								
	MCE	01	0101	1	Magnetic Cassette Error								
	SB5	01	1111	1	Separator Bit 5								
	SB6	10	0000	0	Separator Bit 6								
SGN	01	1111	0	Sign Bit (header)									
Magnetic Ledger	FLI	01	0001	1	Full Ledger Left								
	FLR	01	0010	0	Full Ledger Right								
	MLE	01	0100	1	Magnetic Ledger Error (Read or Write)								

NOTE: Leftmost bit of indicator code is not used in GBP instructions.
GBP indicator bits apply to Branch Keys only.

INDICATOR CODE TABLE (Cont'd.)

The Core Memory Project

HARDWARE	MNEMONIC CODE	ii	iiii	i	DESCRIPTION	
Continuous Forms Feeders	LL1	01	0010	1	Last Line — Continuous Forms Feeder #1	
	LL2	01	0011	0	Last Line — Continuous Forms Feeder #2	
Other Console Indicators	KBF	01	0001	0	Keyboard Buffer Full	
	P1	01	0011	1	Program Key #1	
	P2	01	0100	0	Program Key #2	
Card Reader & Card Punch	RBF	01	0111	0	Card Reader Buffer Full	
	PBA	01	0111	1	Card Punch Buffer Available	
Paper Tape Reader	PTE	01	1010	1	Paper Tape Reader Error	
Communications	CSE	01	0110	0	Communications Send Error	
	CRE	01	0110	1	Communications Receive Error	
	EOT	01	1100	0	End of Transmission	
	ETX	01	1001	1	End of Text	
	GEA	01	0000	1	Get Enable Buffer	
	HDR	01	1001	0	Header Field	
	LEB	01	0101	0	Load Enable Buffer	
	LES	01	1010	1	Line Established	
	RV1	01	1011	0	Reverse Interrupt	
	TMS	01	1011	1	Transmit Message Status	
		1,2,3,4				
		1,2,3,4				
		3,4				

A = All Communication 1 = 399-270 Central 2 = 399-399 3 = B1SYNC ASCII 4 = B1SYNC EBCDIC 5 = 399-TC500 Central

ACTION CODE AND N-FIELD TABLE

Action codes and N-field entries for the Control. Instructions are listed below.

DEVICE	ACTION CODE	N-FIELD	DESCRIPTION
Forms Handler	LE		Eject Left ALF Document
	LR		Eject Right ALF Document
	RRE		Right Rear Eject of ALF Document
	POB		Platen Open Both
	POL		Platen Open Left
	POR		Platen Open Right
	PCB		Platen Close Both
	PCL		Platen Close Left
	PCR		Platen Close Right
	FF1		Feed CFF #1 to Field punch
	FF2		Feed CFF #2 to Field punch
	FH1		Feed CFF #1 to Home punch
	FH2		Feed CFF #2 to Home punch
	LFL	1-15	Line Feed Left Side of Platen
	LFH	1-15	Line Feed Right Side of Platen
LFB	1-15	Line Feed Both Sides of Platen	
Cassettes	RWND		Rewind Cassette specified
	BACK		Backspace Cassette specified, 1 field
	CTM		Write Tape Mark on specified cassette
	SFE		Separator Flag Enable
	SFD		Separator Flag Disable
Program Status Lights	LITE	0-31	Indicator Light Panel Sequence Lights

ACTION CODE AND N-FIELD TABLE (Cont'd.)

The Core Memory Project

DEVICE	ACTION CODE	N-FIELD	DESCRIPTION
Serial Printer	PFP	1-265	Position SPR for PUT:SPR first position
Line Printer	RVP	1-132	Reverse print (Hebrew only)
	PRNT	1-127	Position Print Pointer in Buffer
Card Punch	SLEW	1-127	Print, or print and slew
	FSEL	1-80	Slew Paper specified number of lines
	PLZ		Field Select Card Column
	ETX		Print Leading Zeros
Card Reader	EM		Punch ETX symbol
	EM		Punch EM symbol
Paper Tape Punch	FSEL	1-80	Field Select Card Column
	EMTX		Field Terminate
	046		IBM 046 Translation Table
	315		NCR 315 Translation Table
	500		NCR 500 Translation Table
	ASC		ASCII Standard Translation Table
	KAT		Katakana Translation Table
	DEL	1-63	Punch Delete Characters
	NUL	1-63	Punch Null Characters
	046		IBM 046 Translation Table
Paper Tape Reader	315		NCR 315 Translation Table
	500		NCR 500 Translation Table
	ASC		ASCII Standard Translation Table
	KAT		Katakana Translation Table
	RWIND		Rewind Paper Tape to Leader

ACTION CODE AND N-FIELD TABLE (Cont'd.)

DEVICE	ACTION CODE	N-FIELD	DESCRIPTION
Communications	BEL		Insert BEL
	CONN		Establish Communications
	DSGN		Disable Sign
	DSS		Disable Space Suppress
	DUS		Disable Unit Separator
	DZS		Disable Zero Suppress
	ECOM		Enable Communications
	EOT		End of Transmission
	ESS		Enable Space Suppress
	EZS		Enable Zero Suppress
	GEB		Get Enable Buffer
	HDR		Communication Header Field
	ICOM		Inhibit Communications
	ID1		Change Identification Code 1
	ID2		Change Identification Code 2
	LAST		Input Data Terminator
	LEB		Load Enable Buffer
	MBM		Enter Multi Block Mode
	RING		Monitor for Ring In
	RTB		Retransmit Communications Buffer
SBM		Enter Single Block Mode	
STX		Start of Text	

PAPER TAPE TRANSLATION CODE TABLE
The Core Memory Project

Paper Tape codes are used with the following instructions:

INSTR	REF	1	2	3	4	5	6	7	8	9	10	11	12
CNTL CNTL	Reader - TR Punch - TP					fff fff							

MNEMONIC	CODE	DESCRIPTION
046	0100	IBM 046 Translation Table
315	0010	NCR 315 Translation Table
500	0011	NCR 500 Translation Table
ASC	0000	ASCII Standard Translation Table
KAT	0001	Katakana Translation Table

BRS STATUS CODE TABLE

Q	INSTR	1	2	3	4	5	6	7	8
37	BRS	1001	0100	110T	TTTT	Oaaa	aaaa	aaaa	aaaa

TTTT	BRS Status
00000	NDE - No Disc Error
00001	FOO - File Out of Order
00010	FNC - File Not Closed
00011	FPO - File Previously Opened For Output
00100	DPO - Disc Previously Opened For Output
00101	FPE - File Previously Established
00110	BFO - Buffer Overflow
00111	ISD - Illegal Sign Digit
01000	DIE - Disc Error
01001	FNF - File Not Found
01010	ISP - Insufficient Space
01011	DDF - Disc Directory Full
01100	FNO - File Not Opened
01101	CNE - Current Sector Not Established
01110	RNF - Record Not Found
01111	CNA - Current Record Not Available
10000	ONI - Attempt to Open New Input
10001	ESF - End of Sequential File
10010	EOF - End of File
10011	EOS - End of Space

NOTE: Disc Status is contained in the Disc Driver

