

2nd Edition – Oct. 1973

CONTENTS

Commands - Abbreviations	2	Utilities - Link Loader	51
Formats	4	- C399ASMB	54
Communications Buffers	9	- PTCT	58
Data Definition Formats	10	- CSTPRNT	60
Pseudos	11	- CCOPY	62
		- UDUMP1 & UDUMP2	64
Binary ↔ Hex Conversion	12		
Header Structure	14		68
Bit Strings	15		70
			72
Fixer /Debug	24		
Interpreter Wait Codes	26		
Keyboards & Translate Tables	35		
Codes - ASCII	43	Paper Sizes	73
- EBCDIC	44	Some Hardware Data	74
- EBCDIC ↔ ASCII	46	Interpreter Bytes	76
- Hollerith ↔ ASCII	48		
-	49		
-	50		

GLOSSARY OF ABBREVIATIONS

Communication Indicators

CRE Comm. Receive Error
 CSE Comm. Send Error
 EOT End of Transmission
 ETX End of Text
 GEB Get Enabled Buffer
 HDR Header Field
 LEB Load Enabled Buffer
 LES Line Established
 RVI Reverse Interrupt
 TMS Transmit Message Status

Other Indicators

CBT Cass. Blank Tape
 CET Cass. End Tape
 CFO Cass. Field Overflow
 CTM Cass. Tape Mark
 KBF Keyboard Buffer Full
 FLL/R Full Ledger /Left/Right
 LL1/2 Last Line CFF1/2
 MCE Cass. Error
 MLE Mag. Ledger Error
 P1/2 P1/2 Key
 PBA Card Punch Buffer Available
 PTE Punched Tape Read Error
 RBF Card Read Buffer Full
 SGN Cass. Data Sign
 SB5/6 Cass. Separator Bit 5/6

Edit Codes

ABN All black, no sign
 ARN All Red, no sign
 PBC +ve black, -ve red CR
 PBD +ve black, -ve red ◊
 PRC +ve red, -ve black CR
 PRD +ve red, -ve black ◊
 □ Absolute value
 S Zero suppress
 E as S, but edited
 \$ as E, but protected
 LPN No sign
 LPS Sign if -ve

CNTL: COMM A-Codes

BEL Ring Bell
 CONN Establish Connection
 DSGN Disable Sign
 DSS Disable Space Suppression
 DUS Disable Unit Separator
 DZS Disable Zero Suppression
 ECOM Enable Communications
 EOT End of Transmission
 ESS Enable Space Suppression
 EZS Enable Zero Suppression
 GEB Get Enable Buffer
 HDR Enable Header
 ICOM Inhibit Communications
 ID1 Change Ident Code 1
 ID2 Change Ident Code 2
 INEM Insert End of Media
 INHT Insert Horizontal Tab
 LAST Input data terminator
 LEB Load Enable Buffer
 MBM Enter Multi-Block Mode
 RESC Receive Escape Char.
 RING Monitor Ring Indicator
 RTB Retransmit Comm. Buffer
 SBM Enter Single Block Mode
 STX Start of Text
 TESC Transmit Escape Char.

CNTL: A-Codes (except COMM)

046 IBM 046 Trans. Table
 315 315 Trans. Table
 500 500 Trans. Table
 ASC ASCII Trans. Table
 BACK Back 1 Block
 CTM Cass. Tape Mark
 DEL Delete Char.
 FF1/2 Slew to Field CFF1/2
 FH1/2 Slew to Home CFF1/2
 FSEL P.C. Field Select
 KAT Katakana Trans. Table
 LE Left Eject
 LFB/L/R Line Feed Both/Left/Right
 NUL NUL Char.
 PCB/L/R Platen Close Both/Left/Right
 PFP Position for Print
 PGS Page Sentinel
 PLZ Print Leading Zeros
 POB/L/R Platen Open Both/Left/Right
 PRNT Print
 RE Right Eject
 RRE Right Rear Eject
 RWND Rewind
 SLEW Slew

Other A-Codes

AZ Add Zone Bits
 NF No pre-clearing
 NS No Sign Transfer
 RD Round
 SZ Strip Zone Bits

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COMMAND FORMATS	NOTES	OPERATION	A OPERAND	B OPERAND	C OPERAND	ACTION	MAXIMUM N-FIELDS (0 = 1 except when marked <input type="checkbox"/>)	
		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	
<p>1. All entries are literal except:-</p> <p>a. XDATA, NDATA, XNDATA, TDATA, FDATA, RDATA, REF.</p> <p>b. nn, DDDD, AAAA, iiiii, EEE, e (possible values for these are shown on the pages on which they occur).</p> <p>c. Numeric N field examples are maximums.</p> <p>E.g. 31 = 1 → 31.</p> <p>2. A box <input type="checkbox"/> round an entry means the entry is optional i.e. there is a valid format with, and a valid format without, this entry.</p> <p>E.g. <input type="checkbox"/>31 = 0 → 31</p> <p><input type="checkbox"/>LAST = <input type="checkbox"/><input type="checkbox"/><input type="checkbox"/><input type="checkbox"/> or LAST</p>								
		M O V E	X N D A T A	X N D A T A		<input type="checkbox"/> N <input type="checkbox"/> F <input type="checkbox"/> I <input type="checkbox"/> S <input type="checkbox"/> R <input type="checkbox"/> D	3 1	
		M O V E N A	X N D A T A	X N D A T A		<input type="checkbox"/> A <input type="checkbox"/> Z <input type="checkbox"/> I <input type="checkbox"/> N <input type="checkbox"/> S	3 1	
		M O V E N B	X N D A T A	X N D A T A		<input type="checkbox"/> S <input type="checkbox"/> Z <input type="checkbox"/> I <input type="checkbox"/> N <input type="checkbox"/> S	3 1	
		F I L L	X N D A T A				9 9 9	
		RDATA must be 4H	T B L I N	T D A T A	X N D A T A	R D A T A		6 3
		"	T B L O U T	T D A T A	X N D A T A	R D A T A		6 3
		"	T B L A D D	T D A T A	N D A T A	R D A T A		6 3
		R E D E F	X N D A T A	F D A T A				9 9 9

4

NOTES	OPERATION	A OPERAND	B OPERAND	C OPERAND	ACTION	MAXIMUM N-FIELDS (0 = 1 except when marked <input type="checkbox"/>)
	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
	A D D	N D A T A	N D A T A	N D A T A		
	A D D N	N D A T A	N D A T A			3 1
	A D D N A	N D A T A	N D A T A			3 1
	A D D N B	N D A T A	N D A T A			3 1
	S U B	N D A T A	N D A T A	N D A T A		
	S U B N	N D A T A	N D A T A			3 1
	S U B N A	N D A T A	N D A T A			3 1
	S U B N B	N D A T A	N D A T A			3 1
	M U L T	N D A T A	N D A T A	N D A T A	<input type="checkbox"/> R <input type="checkbox"/> D	
	M U L T N	N D A T A	N D A T A		<input type="checkbox"/> R <input type="checkbox"/> D	3 1
	D I V	N D A T A	N D A T A	N D A T A	<input type="checkbox"/> R <input type="checkbox"/> D	
	D I V N	N D A T A	N D A T A		<input type="checkbox"/> R <input type="checkbox"/> D	3 1

5

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Values for AAAA		CNTL - CASn		CNTL - COM ONLY		270 CENTRAL		399 to 399		BISYNC ASCII & EBCDIC		2780 ASCII & EBCDIC		TC 500	
BACK CTRM RWD	SFD SFE	FSEL													
CNTL - CP		BEL													
EM	FSEL	CONN													
ETX	PLZ	DSGN													
CNTL - CR		DSS													
EMTX	FSEL	DUS													
CNTL - FH		DZS													
FF1	PCB	ECOM													
FF2	PCL	EOT													
FH1	PCR	ESS													
FH2	PCB	EZS													
LE	POL	GEB													
LFB	POR	HDR													
LFL	RRE	ICOM													
LFR		ID1													
CNTL - TP		ID2													
046	KAT	INEM													
315	DEL	INHT													
500	NUL	LAST													
ASC		LEB													
CNTL - TR		HBM													
046	KAT	RSC													
315	RWD	RING													
500		RT6													
ASC		SBH													
		STX													
		TESC													

NOTES	OPERATION	A OPERAND	B OPERAND	C OPERAND	ACTION	MAXIMUM N-FIELDS (0 = 1 except when marked)
	CNTL	CASn			AAAA	
		C'OH			AAAA	
AAAA = FSEL only		CP			AAAA	8 0
		CR			AAAA	
AAAA = FSEL only		CR			AAAA	8 0
		CR			AAAA	
AAAA = LFB LFL or LFR		FH			AAAA	1 5
All other FH A Codes		FH			AAAA	
		LITE				3 3
		LPR			PFP	1 3 2
		LPR			PRNT	
		LPR			PRNT	1 2 7
		LPR			SLEW	1 2 7
		SPR			PFP	2 6 5
AAAA = DEL or NUL only		TP			AAAA	6 3
		TP			AAAA	
		TR			AAAA	

8

COMMUNICATIONS BUFFERS (is optional)

LLL=001-999 CC=01=270 ASCII
 or invalid = 100 =02=TC500 (compatible Central)
 =03 to 32= Not Implemented

If CC=01 then N=2
 P=Hex 21-2F, 40-4F or 60-6F
 Q=Hex 20 if NO concentrator in system
 If concentrator present > Hex 20
 SS is not used

If CC=02 then N=4
 P> Hex 20
 Q> Hex 20
 SS> Hex 20Z0 (Select Code)

POLLED DEVICE

32	33	34	35	36	37	38	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		
							B	L	L	L						C	C																								
							.	P	O	L	L	X	N			P	Q	S	S																						
							.	T	A	L	Y	I	N	1	6																										
							.	T	A	L	Y	2	N	1	2																										

No Tally Table necessary if CC=01

LLL=001-999 Ident 1 each ch. used > Hex 20
 or invalid = 100 Ident 2 each ch. used > Hex 20

CC=33=399 to 399
 =34=BISYNC EBCDIC
 =35=BISYNC ASCII
 =36 to 64= Not Implemented

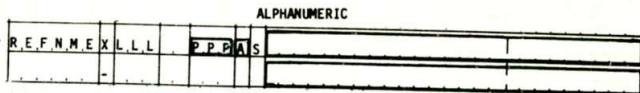
POINT-TO-POINT

32	33	34	35	36	37	38	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		
							B	L	L	L						C	C																								
							.	T	A	L	Y	I	N	1	6																										
							.	T	A	L	Y	2	N	1	2																										

DATA DEFINITIONS **The Core Memory Project**

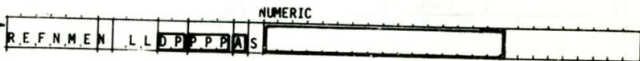
LLL=1-256 PPP=1-132 (LP) 1-221/255 (SP)
 Ⓚ or invalid = 25 Invalid=1

A=0 =No feed (SP, LPR) US (Cass) S=+or- Invalid==
 =1 or B=1 line (LP) Right (SP) RS (Cass)
 =2 or L=2 lines (LP) Left (SP) GS (Cass)
 =3 or B=3 lines (LP) Both (SP) FS (Cass)



LL=1-16 DP < LL=0-15
 Ⓚ or invalid=16

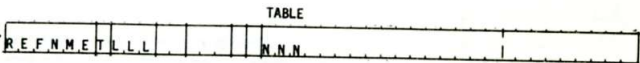
PPP=1-132 (LP) 1-221/255 (SP) S=+or- Invalid==
 Invalid=1



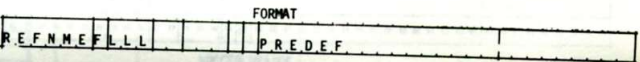
LLL=1-63 NNN=1-256
 Ⓚ or invalid=0 Ⓚ or invalid =1

Table size limited only by memory
 if NNN=1 and LLL=1

The Data Definitions referred to by LLL must be X or N type and, unless NNN=1, must contain no value in cols. 49-73



LLL=1-999 PREDEF=Previously defined REFNME.
 Ⓚ or invalid=0 Associated data definitions must be
 of X or N type without values in
 cols. 49-73.



399 DATA PSEUDOS - NCR CENTURY ASSEMBLER

P	P	P	L	L	L	L	D			O	M	I	T															
P	P	P	L	L	L	L	D				O	M	I	T														
P	P	P	L	L	L	L	D				C	O	P	Y	A				P	R	O	G	N	A	M	E	V	N
P	P	P	L	L	L	L	D				C	O	P	Y	P				P	R	O	G	N	A	M	E	V	N
P	P	P	L	L	L	L	D				S	E	T	P	L				P	P	P	L	L	L				

399 DATA PSEUDOS - 399 ASSEMBLER

P	P	P	L	L	L	L	D				O	M	I	T															
P	P	P	L	L	L	L	D												O	M	I	T							
P	P	P	L	L	L	L	D												O	M	I	T		P	P	P	L	L	L

399 CODING PSEUDOS - NCR CENTURY ASSEMBLER

P	P	P	L	L	L	L	C				O	M	I	T														
P	P	P	L	L	L	L	C				O	M	I	T														
P	P	P	L	L	L	L	C				C	O	P	Y	A				P	R	O	G	N	A	M	E	V	N
P	P	P	L	L	L	L	C				C	O	P	Y	P				P	R	O	G	N	A	M	E	V	N
P	P	P	L	L	L	L	C				S	E	T	P	L				P	P	P	L	L	L				

399 CODING PSEUDOS - 399 ASSEMBLER

P	P	P	L	L	L	L	C				O	M	I	T															
P	P	P	L	L	L	L	C												O	M	I	T							
P	P	P	L	L	L	L	C												O	M	I	T		P	P	P	L	L	L

HEXADECIMAL ↔ DECIMAL CONVERSION
Table 1 converts Hex-Characters in position 4 and 3 (4321)

$\overline{4}$ 3	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	0	256	512	768	1024	1280	1536	1792	2048	2304	2560	2816	3072	3328	3584	3840
1	4096	4352	4608	4864	5120	5376	5632	5888	6144	6400	6656	6912	7168	7424	7680	7936
2	8192	8448	8704	8960	9216	9472	9728	9984	10240	10496	10752	11008	11264	11520	11776	12032
3	12288	12544	12800	13056	13312	13568	13824	14080	14336	14592	14848	15104	15360	15616	15872	16128
4	16384	16640	16896	17152	17408	17664	17920	18176	18432	18688	18944	19200	19456	19712	19968	20224
5	20480	20736	20992	21248	21504	21760	22016	22272	22528	22784	23040	23296	23552	23808	24064	24320
6	24576	24832	25088	25344	25600	25856	26112	26368	26624	26880	27136	27392	27648	27904	28160	28416
7	28672	28928	29184	29440	29696	29952	30208	30464	30720	30976	31232	31488	31744	32000	32256	32512
8	32768	33024	33280	33536	33792	34048	34304	34560	34816	35072	35328	35584	35840	36096	36352	36608
9	36864	37120	37376	37632	37888	38144	38400	38656	38912	39168	39424	39680	39936	40192	40448	40704
A	40960	41216	41472	41728	41984	42240	42496	42752	43008	43264	43520	43776	44032	44288	44544	44800
B	45056	45312	45568	45824	46080	46336	46592	46848	47104	47360	47616	47872	48128	48384	48640	48896
C	49152	49408	49664	49920	50176	50432	50688	50944	51200	51456	51712	51968	52224	52480	52736	52992
D	53248	53504	53760	54016	54272	54528	54784	55040	55296	55552	55808	56064	56320	56576	56832	57088
E	57344	57600	57856	58112	58368	58624	58880	59136	59392	59648	59904	60160	60416	60672	60928	60184
F	61440	61696	61952	62208	62464	62720	62976	63232	63488	63744	64000	64256	64512	64768	65024	65280

12

Table 2 converts Hex-Characters in position 2 and 1 (4321)

$\overline{2}$ 2	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
3	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
4	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
5	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
6	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
7	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
8	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
9	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
A	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
B	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
C	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
D	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
E	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
F	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

DATA HEADER STRUCTURE

N Type	1	2	3		4			5	6
	LENGTH -1	D.P.	HEADER MARK	SLEW	SIGN	DATA TYPE	PRNT. POSN.	RE-DEF	PRINT POSITION (if present)
V A L U E S	0 - F = 1 - 16	0 - F = 0 - 15	1 1			0			01 - FF = 1 - 255
			C = No Slew or US D = 1 or LFR or RS E = 2 or LFL or GS F = 3 or LFB or FS		0 = +ve, 1 = +ve, R 2 = +ve, PP 3 = +ve, R, PP 8 = -ve, 9 = -ve, R A = -ve, PP B = -ve, R, PP				
X Type	1	2	3		4			5	6
	LENGTH -1		HEADER MARK	SLEW	SIGN	DATA TYPE	PRNT. POSN.	RE-DEF	PRINT POSITION (if present)
V A L U E S			1 1		1				01 - FF = 1 - 255
	00 - FF = 1 - 256		C = No Slew or US D = 1 or LFR or RS E = 2 or LFL or GS F = 3 or LFB or FS		4 = +ve 5 = +ve, R 6 = +ve, PP 7 = +ve, R, PP C = -ve D = -ve, R E = -ve, PP F = -ve, R, PP				

14

Q CODE INDEX

Q.	Command	Pg.	Q.	Command	Pg.
00	WAIT	18	19	TYPEL	20
01	ADDNA	17	20	GET	20
02	ADDNB	17	21	PUT	20
03	ADDN	17	22	GBP	20
04	SUB	17	23	SAVERA	18
05	SUBNA	17	24	RETURN	18
06	SUBNB	17	25	MULTN	17
07	SUBN	17	26	DIV	17
08	ADD	17	27	DIVN	17
09	CNTL	22	28	MULT	17
10	BR	18	29	MOVENA	16
11	BRION	18	30	MOVENB	16
12	BRE	18	31	MOVE	16
13	BRU	18	32	REDEF	16
14	BRL	18	33	TBLIN	16
15	BRG	18	34	TBLOUT	16
16	BRIOFF	18	35	TBLADD	16
17	TYPE	20	36	FILL	16
	TYPEK	20	37	BRS	18
18	TYPEM	20			

Each Bit String page shows the values for all variables on that page except for:-

- a = address
- N = N field value
- A = A operand address
- B = B operand address
- C = C operand address

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Q	# DIGITS	MNEMONIC	1	2	3	4	5	6	7	8	9	10	11	12
31	10	MOVE	0111	1100	FRSN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB		
29	10	MOVENA	0111	010U	10SN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB		
30	10	MOVENB	0111	100P	10SN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB		
36	7	FILL	1001	00NN	NNNN	NNNN	AAAA	AAAA	AAAA					
33	12	TBLIN	1000	01NN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC
34	12	TBLOUT	1000	10NN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC
35	12	TBLADD	1000	11NN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC
32	10	REDEF	1000	00NN	NNNN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB		

F = 0 No Fill R = 0 No Round S = 0 No Sign
 = 1 Fill = 1 Round = 1 Sign
 U = 0 No Unpacking P = 0 No Packing
 = 1 Unpack (Add Zone) = 1 Pack (Strip Zone)

16

Q	# DIGITS	MNEMONIC	1	2	3	4	5	6	7	8	9	10	11	12
08	11	ADD	0010	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC	
03	9	ADDN	0000	110N	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			
01	9	ADDNA	0000	010N	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			
02	9	ADDNB	0000	100N	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			
04	11	SUB	0001	0000	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC	
07	9	SUBN	0001	110N	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			
05	9	SUBNA	0001	010N	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			
06	9	SUBNB	0001	100N	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			
28	11	MULT	0111	00RO	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC	
25	9	MULTN	0110	01RN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			
26	11	DIV	0110	10RO	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	CCCC	CCCC	CCCC	
27	9	DIVN	0110	11RN	NNNN	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB			

R = 0 No Round R = 1 Round

The Core Memory Project

Q	# DIGITS	MNEMONIC	1	2	3	4	5	6	7	8	9	10	11	12
00	2	WAIT	0000	0000										
23	2	SAVERA	0101	1100										
24	2	RETURN	0110	0000										
10	5	BR	0010	10aa	aaaa	aaaa	aaaa							
12	11	BRE	0011	00aa	aaaa	aaaa	aaaa	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
13	11	BRU	0011	01aa	aaaa	aaaa	aaaa	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
14	11	BRL	0011	10aa	aaaa	aaaa	aaaa	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
15	11	BRG	0011	11aa	aaaa	aaaa	aaaa	AAAA	AAAA	AAAA	BBBB	BBBB	BBBB	
37	8	BRS	1001	01DD	DDDD	0100	0aaa	aaaa	aaaa	aaaa				
11	7	BRION	0010	11ii	iiii	iaaa	aaaa	aaaa	aaaa					
16	7	BRIOFF	0100	00ii	iiii	iaaa	aaaa	aaaa	aaaa					

18

Values for iiiiii					
0000000	BK00	0011110	ANY	0110010	HDR
0000001	BK01	0011111	ALL	0110011	ETX
0000010	BK02	0100001	GEB	0110100	PTE
0000011	BK03	0100010	KBF	0110101	LES
0000100	BK04	0100011	FLL	0110110	RVI
0000101	BK05	0100100	FLR	0110111	TMS
0000110	BK06	0100101	LL1	0111000	EOT
0000111	BK07	0100110	LL2	0111001	CFO
0001000	BK08	0100111	P1	0111010	CBT
0001001	BK09	0101000	P2		
0010000	BK10	0101001	MLE	0111110	SGN
0010001	BK11	0101010	LEB	0111111	SB5
0010010	BK12	0101011	MCE	1000000	SB6
0010011	BK13	0101100	CSE		
0010100	BK14	0101101	CRE		
0010101	BK15	0101110	RBF		
0010110	BK16	0101111	PBA		
0010111	BK17	0110000	CET		
0011000	BK18	0110001	CTM		
0011001	BK19				

Cassette Separators		
	SB5	SB6
US	0	0
GS	0	1
RS	1	0
FS	1	1

BRS values for DDDDD	01000	LPR
----------------------	-------	-----

19

The Core Memory Project

Q	# DIGITS	MNEMONIC		1	2	3	4	5	6	7	8	9	10	11
22	11	GBP		0101	10EE	Eeei	iiii	iaaa	aaaa	aaaa	aaaa	AAAA	AAAA	AAAA
20	8	GET	LNC	0101	0000	1010	0000	000r	AAAA	AAAA	AAAA			
20	8	GET		0101	00DD	DDm	NNNN	NNNN	AAAA	AAAA	AAAA			
21	8	PUT	LNC	0101	0100	1010	0000	000r	AAAA	AAAA	AAAA			
21	8	PUT	LPR(slew)	0101	0101	0001	0000	0001	AAAA	AAAA	AAAA			
21	8	PUT	LPR(data)	0101	0101	0000	Eeen	NNNN	AAAA	AAAA	AAAA			
21	8	PUT	SPR	0101	0100	00EE	Eeen	NNNN	AAAA	AAAA	AAAA			
21	8	PUT		0101	01DD	DDm	NNNN	NNNN	AAAA	AAAA	AAAA			
17	2	TYPE		0100	0100									
17	2	TYPEK		0100	0101									
19	4	TYPEL		0100	11nn	nnnn	nnnn							
18	6	TYPEM		0100	10NN	NNNN	AAAA	AAAA	AAAA					

r = 0 LNCr	m = 1	Last Get/Put	n = no. of characters
= 1 LNCL	= 0	Not Last	

20

DEVICE CODES (DDDDD)	EDIT CODES	GBP values for iiiii
00000 - SPR - Serial Printer	SPR	00000 BK00
00001 - SPR - Serial Printer	EEE	00001 BK01
00010 - KB - Keyboard	000	00010 BK02
00011 - FH - Forms Handler	001	00011 BK03
00100 - LITE ^R - Status Lights	010	00100 BK04
00101 - LNC ^L - Auto Line Find	011	00101 BK05
00110 - DISC ^L - Disc	100	00110 BK06
00111 - COM - Communications	101	00111 BK07
01000 - LPR - Line Printer	LPR	01000 BK08
01001 - TR - Paper Tape Reader	E	01001 BK09
01010 - CR - Card Reader	0	01000 BK10
01011 - CAS1 - Cassette 1	1	10001 BK11
01100 - CAS2 - Cassette 2	SPR & LPR	10010 BK12
01101 - ML - Magnetic Ledger	ee	10011 BK13
01110 - MLFR - Magnetic Ledger Feeder		10100 BK14
		10101 BK15
01111 - CP - Card Punch	00	10110 BK16
10000 - TP - Paper Tape Punch	01	10111 BK17
	10	11000 BK18
	11	11001 BK19

The Core Memory Project

Q	#	DIGITS	MNEMONIC	1	2	3	4	5
09	5	CNTL	SPR	0010	0100	000c	cccc	cccc
09	5	CNTL	FH (LFL,R B)	0010	0100	0110	xxxx	pppp
			(others)	0010	0100	0110	xxxx	oooo
09	5	CNTL	LITE	0010	0100	1000	000L	LLLL
09	5	CNTL	COM	0010	0100	111x	xxxx	oooo
09	5	CNTL	LPR(PFP)	0010	0101	0000	cccc	cccc
			(SLEW)	0010	0101	0001	0ppp	pppp
			(PRINT)	0010	0101	0001	1000	0000
			(PRINT & SLEW)	0010	0101	0001	1ppp	pppp
09	5	CNTL	TR (Rwnd Tran. Table)	0010	0101	0010	0001	0000
				0010	0101	0010	0000	ffff

FH x values		COM x values		TR f values	
0000	LE	00000	LEB	10111	DSS
0001	RE	00001	RTB	11000	RESC
0010	RRE	00010	GEB	11001	BEL
0011	POB	00011	CONN		
0100	FF1	00100	ICOM		
0101	FF2	00101	ID1		
0110	FH1	00110	ID2		
0111	FH2	00111	MBM		
1000	POL	01000	ECOM		
1001	POR	01001	SBM		
1010	PCL	01010	LAST		
1011	PCR	01011	RING		
1100	LFL	01100	HDR		
1101	LFR	01101	DZS		
1110	PCB	01110	EZS		
1111	LFB	01111	DSGN		
		10000	DUS		
		10001	INHT		
		10010	INEM	0000	ASC
		10011	STX	0001	KAT
		10100	TESC	0010	315
		10101	EOT	0011	500
		10110	ESS	0100	D46

c = print position L = Light display p = # lines of feed

22

Q	#	DIGITS	MNEMONIC	1	2	3	4	5
09	5	CNTL	CR (FSEL EMTX)	0010	0101	0100	0bbb	bbbb
				0010	0101	0101	0000	oooo
09	5	CNTL	CAS1	0010	0101	0110	xxxx	oooo
09	5	CNTL	CAS2	0010	0101	1000	xxxx	oooo
09	5	CNTL	CP (FSEL Others)	0010	0101	1110	0bbb	bbbb
				0010	0101	111x	xooo	oooo
09	5	CNTL	TP (Tran. Table)	0010	0110	0000	0000	ffff
			(NUL)	0010	0110	0000	10nn	nnnn
			(DEL)	0010	0110	0001	00nn	nnnn

CAS 1/2 x values		CP x values		TR f values	
0000	BACK	01	EM	0000	ASC
0001	RWND	10	PLZ	0001	KAT
0010	CTM	11	ETX	0010	315
0011	SFE			0011	500
0100	SFD			0100	046

b = card col. 1 - 80 n = # chars. 1 - 63

The Core Memory Project

FIXER & DEBUG

Load Fixer or Debug during Link Loading.

* Notes: Code 53

Operation 3: For Debug the address must be the Header address of Numeric data.
For Fixer the address may be any address of header or data.

Operation 4: For Debug the new data is from the start of the data following the Header in Op. 3
For Fixer the new data is from the start of the address in Op. 3

LEGAL FUNCTION CODES

Invalid codes will print but be ignored.

Debug:-

- 11 Print Sequence Control Register (BO)
- 12 Print Instruction
- 13 Print Data
- 14 Print Last Branch Return Address
- 53* Replace Numeric Data
- 61 Load Sequence Control Register (BO)

NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
1		Set	Manual ON		2
2	To exit totally	Set	Manual OFF (user program continues)		-
	To exit for one user step	Select	Step Key (after completion)		2)
	For codes 11, 14	Index	Function Code	Enter bar	2
	For other codes	Index	Function code	Enter bar	3

24

Fixer:-

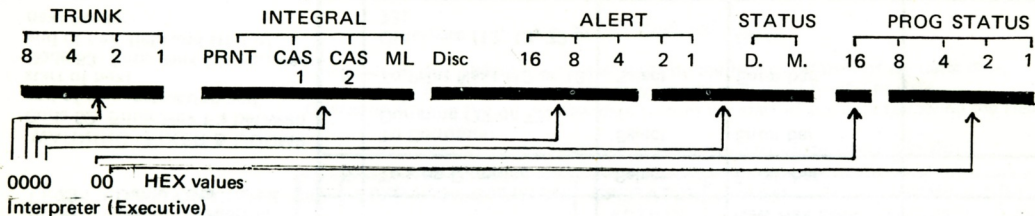
- 11 Print Sequence Control Register (BO)
- 12 Print Instruction
- 13 Print Data
- 14 Print Last Branch Return Address
- 52 Replace Instruction
- 53* Replace Data
- 61 Load Sequence Control Register (BO)
- 72 Dump Instruction
- 73 Dump Data

3	To Abort	Select	Resume		2
	If 61	Type	Address (4 alpha)	Resume	2
	If 12 or 13	Type	Address (4 alpha)	Resume	6
	If 72 or 73	Type	Address (4 alpha)	Resume	5
	If 52 or 53	Type	Address (4 alpha)*		4
4	(52 or 53)	Type	One space then New Hex Data*	Resume	2
5	To stop Dumping	Select	Enter bar		6
6	To Continue Dumping (72 or 73)	Select	Enter bar		5
	To Print Next (12 or 13)	Select	Enter bar		6
	Otherwise (12, 13, 72 or 73)		Go to		2

WARNING—FIXER & UDUMP
Code 52. Enter Hex F's between end of new instruction and start of next.
Code 53. Enter Hex O's between end of new field and start of next header.

For light displays see Interpreter Wait Codes

INTERPRETER WAIT CODES



Shared Prog.

0004	00	Non existent routine. Assembly or patch error.	To bypass command - COMPUTE
001C	00	Move alpha to alpha, source ≠ destination in length. Move numeric to alpha, destination > 8 characters.	To bypass command - COMPUTE
002C	00	TBLOUT length error: table field length or decimal point > destination field length or decimal point.	To bypass command - COMPUTE
003C	00	Data field addressed does not have legal 'word mark'.	To bypass command - COMPUTE
004C	00	Debug or Fixer illegal address entry.	To re-enter address - COMPUTE
005C	00	Illegal attempt to change alpha data while in Debug.	To continue - COMPUTE

26

Interpreter (Communications) N.B. Communications alert indicator also on.

006C	00	GET:COM attempting to move alpha to numeric, or large numeric to small numeric.	To bypass command - COMPUTE
007C	00	PUT:COM buffer capacity exceeded.	To determine ≠ of excess characters, count COMPUTE's required to clear condition.

Interpreter (Magnetic Ledger)

0101	00	Card incorrectly positioned, or stripe holds no data.	MLE turned on by - COMPUTE
0102	00	Read or write error in ledger.	MLE turned on by - COMPUTE.

Interpreter (Load & Go Cassette Creation)

0408	00	Program is completely resident in memory.	To run - HALT, RESET COMPUTE. To write a load & go program to cassette on transport 1, - COMPUTE
0410	00	Write error during write option.	Rewind cassette - COMPUTE

Interpreter (Load & Go Cassette Loading)

0410	00 (LOAD)	Read error during load phase of L.A.G.	Rewind - LOAD
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The Core Memory Project

Interpreter (Cassette 1 program lights)

0402	00	Read or write error on CAS1.	MCE turned on by - COMPUTE
0404	00	Cassette on transport 1 is in clear trailer.	CET turned on by - COMPUTE
040D	00	Transport 1 inoperative - no cassette in transport, lid open, or cassette rewinding.	Correct - COMPUTE
041D	00	Write enable tab on Transport 1 does not permit write to function.	Correct - COMPUTE
047C	00	Lid opened while tape in motion.	ABORT

Interpreter (Cassette 2 program lights)

0202	00	Read or write error on CAS2.	MCE turned on by - COMPUTE
0204	00	Cassette on transport 2 is in clear trailer.	CET turned on by - COMPUTE
020D	00	Transport 2 inoperative - no cassette in transport, lid open or cassette rewinding.	Correct - COMPUTE
021D	00	Write enable on Transport 2 does not permit write to function.	Correct - COMPUTE
027C	00	Lid opened while tape in motion.	ABORT

28

Interpreter (Printer & CFF)

0801	00	Out of paper in CFF units.	Correct - COMPUTE
0802	00	Print error in PUT:SPR command.	Retry - COMPUTE
0806	00	Print error in TYPEM command.	Retry - COMPUTE
080A	00	Print error in TYPEK, TYPEL or TYPE command.	Retry - COMPUTE
080C	00	CFF unit inoperative.	Correct - COMPUTE

Interpreter (Card Reader)

2000	00	Card reader out of synchronisation.	Correct - COMPUTE
2001	00	Card not present at 'ready' or 'read' stations, output hopper full, or access door open on reader.	Correct - COMPUTE
2002	00	Parity error or read error in reader.	Re-position card - COMPUTE
2004	00	No card movement in reader. Could be jammed.	Re-position card - COMPUTE
2008	00	Fibre optic read malfunction.	Re-position card - COMPUTE
200C	00	Card reader inoperative.	Correct - COMPUTE
2010	00	No response from card reader.	Correct - COMPUTE

The Core Memory Project

Interpreter (Card Punch)

3000	00	Trunk deselected before transfer complete	COMPUTE to retry
3001	00	Card jam, output hopper full or feed rolls open on card punch.	Correct - COMPUTE
3002	00	Parity error during punching.	Feed new card - COMPUTE
3004	00	Jam in card punch.	Correct - COMPUTE
300C	00	Card punch inoperative.	Correct - COMPUTE
301C	00	No response	Correct - COMPUTE

Interpreter (Paper Tape Reader)

4001	00	Broken tape, or 16 delete characters read.	PTE turned on by - COMPUTE
4002	00	Parity error detected on tape.	PTE turned on by - COMPUTE
4006	00	Field overflow, in GET:TR	PTE turned on by - COMPUTE
400A	00	Record has more fields than specified.	PTE turned on by - COMPUTE
400C	00	Paper tape reader inoperative.	Correct - COMPUTE

30

Interpreter (Paper Tape Punch)

5001	00	Paper Tape supply low.	Correct - COMPUTE
5002	00	Parity error detected on punch.	Retry - COMPUTE
5005	00	P.T. Punch malfunction	Retry - COMPUTE
500C	00	P.T. Punch inoperative.	Correct - COMPUTE

Interpreter (Line Printer)

100D	00	Slew error	Correct - COMPUTE
100E	00	Printer error	Retry - COMPUTE
100C	00	Inoperative	Correct - COMPUTE
1002	00	Parity error	Retry - COMPUTE
101C	00	No response	Retry - COMPUTE
1001	00	Paper malfunction	Correct - COMPUTE

with printer programmer
statements

main was key
control key

locks 11 in buttons

control bar.

TO PRINT PROGRAM

STATEMENTS

USE

- MAIN KEY

- RESEARCH KEY

- INPUT 11

- ENTER BAR

ASCII CODE CHART

$B_4 - B_1$ $B_8 - B_5$		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI
0001	1	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
0010	2	SP	!	"	#	\$	%	&	'	()	*	+	,	-	.	/
0011	3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
0100	4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
0101	5	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
0110	6	'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
0111	7	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	DEL

EBCDIC CODE CHART

B_8 ↓ B_5 ← $B_4 - B_1$		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0	NUL	SOH	STX	ETX	PF	HT	LC	DEL			SMM	VT	FF	CR	SO	SI
0001	1	DLE	DC1	DC2	TM	RES	NL	BS	ILCAN	EM	CC	CU1	IFS	IGS	IRS	IUS	
0010	2	DS	SOS	FS		BYP	LF	ETB	ESC		SM	CU2		ENQ	ACK	BEL	
0011	3			SYN		PN	RS	UC	EOT			CU3	DC4	NAK		SUB	
0100	4	SP										¢	.	<	(	+	|
0101	5	&										!	\$	*)	;	∟
0110	6	-	/									,	%	_	>	?	
0111	7											:	#	@	'	=	"

44

1000	8		a	b	c	d	e	f	g	h	i						
1001	9		j	k	l	m	n	o	p	q	r						
1010	A		s	t	u	v	w	x	y	z							
1011	B																
1100	C		A	B	C	D	E	F	G	H	I						
1101	D		J	K	L	M	N	O	P	Q	R						
1110	E		S	T	U	V	W	X	Y	Z							
1111	F	0	1	2	3	4	5	6	7	8	9						

The Core Memory Project

ASCII to EBCDIC conversion:

- Codes not listed will not be converted. (Transmission control characters in the range Hex 00 to Hex 1F are generated in EBCDIC by the OCD).
- Codes 7F to FF unpredictable conversion.
- 7A converts to 4A. 6. 69 converts to 89.
- 21 converts to 5A. 7. 72 converts to 99.
- 22 converts to 7P.

EBCDIC to ASCII conversion:

- Codes not listed will not be converted. (Transmission control characters are dealt with by the OCD in their EBCDIC form, and are never passed on to the user program. Other unlisted EBCDIC Hex values will be treated as ASCII Hex values e.g. EBCDIC 43 will be treated as ASCII 43 i.e. as ASCII C.)
- 5A & 4F convert to 21. 6. 99 & AO convert to 72.
- 4A & A9 convert to 7A. 7. CO converts to 7B.
- 7F & 80 convert to 22. 8. DO converts to 7D.
- 89 & 90 convert to 69.

NOTE:- ■ = no character assigned.

ASCII		EBCDIC		ASCII		EBCDIC	
CH	HX	HX	CH	CH	HX	HX	CH
SP	20	40	SP	0	30	FO	0
!	21	5A 4F	!	1	31	F1	1
"	22	7F 80	"	2	32	F2	2
#	23	7B	#	3	33	F3	3
\$	24	5B	\$	4	34	F4	4
%	25	6C	%	5	35	F5	5
&	26	50	&	6	36	F6	6
'	27	7D	'	7	37	F7	7
(	28	4D	(	8	38	F8	8
)	29	5D	)	9	39	F9	9
*	2A	5C	*	:	3A	7A	:
+	2B	4E	+	;	3B	5E	;
,	2C	6B	,	<	3C	4C	<
-	2D	60	-	=	3D	7E	=
.	2E	4B	.	>	3E	6E	>
/	2F	61	/	?	3F	6F	?

46

ASCII		EBCDIC		ASCII		EBCDIC		ASCII		EBCDIC		ASCII		EBCDIC	
CH	HX	HX	CH	CH	HX	HX	CH	CH	HX	HX	CH	CH	HX	HX	CH
@	40	7C	@	P	50	D7	P	`	60	79	■	p	70	97	p
A	41	C1	A	Q	51	D8	Q	a	61	81	a	q	71	98	q
B	42	C2	B	R	52	D9	R	b	62	82	b	r	72	99	r
C	43	C3	C	S	53	E2	S	c	63	83	c	s	73	A2	s
D	44	C4	D	T	54	E3	T	d	64	84	d	t	74	A3	t
E	45	C5	E	U	55	E4	U	e	65	85	e	u	75	A4	u
F	46	C6	F	V	56	E5	V	f	66	86	f	v	76	A5	v
G	47	C7	G	W	57	E6	W	g	67	87	g	w	77	A6	w
H	48	C8	H	X	58	E7	X	h	68	88	h	x	78	A7	x
I	49	C9	I	Y	59	E8	Y	i	69	89	i	y	79	A8	y
J	4A	D1	J	Z	5A	E9	Z	j	6A	91	j	z	7A	4A	z
K	4B	D2	K	[	5B	CO*	■	k	6B	92	k	}	7B	CO*	■
L	4C	D3	L	\	5C	EO	■	l	6C	93	l	}	7C	6A	■
M	4D	D4	M	]	5D	DO*	■	m	6D	94	m	}	7D	DO*	■
N	4E	D5	N	^	5E	5F	┘	n	6E	95	n	~	7E	A1	■
O	4F	D6	O	_	5F	6D	—	o	6F	96	o				

47

The Core Memory Project

CONVERSION: HOLLERITH CODE ← → 8 BIT ASCII CODE																		
$B_4 - B_1$ $B_8 - B_5$		0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111	
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
*	0000	0	12-0-9 8-1	12-9 1	12-9 2	12-9 3	9-7	0-9-8 5	0-9-8 6	0-9-8 7	11-9 6	12-9 5	0-9 5	12-9-8 3	12-9-8 4	12-9-8 5	12-9-8 6	12-9-8 7
*	0001	1	12-11-6 8-1	11-9 1	11-9 2	11-9 3	9-8 4	9-8 5	9-2 5	0-9 6	11-9 8	11-9-8 1	9-8 7	0-9 7	11-9-8 4	11-9-8 5	11-9-8 6	11-9-8 7
	0010	2	NO PUNCH	12-8 7	8-7	8-3	11-8 3	0-8 4	12	8-5	12-8 5	11-8 5	11-8 4	12-8 6	0-8 3	11	12-8 3	0-1
	0011	3	0	1	2	3	4	5	6	7	8	9	8-2	11-8 6	12-8 4	8-6	0-8 6	0-8 7
	0100	4	8-4	12-1	12-2	12-3	12-4	12-5	12-6	12-7	12-8	12-9	11-1	11-2	11-3	11-4	11-5	11-6
	0101	5	11-7	11-8	11-9	0-2	0-3	0-4	0-5	0-6	0-7	0-8	0-9	12-8 2	0-8 2	11-8 2	11-8 7	0-8 5
*	0110	6	NOT USED	12-0 1	12-0 2	12-0 3	12-0 4	12-0 5	12-0 6	12-0 7	12-0 8	12-0 9	12-11 1	12-11 2	12-11 3	12-11 4	12-11 5	12-11 6
*	0111	7	12-11 7	12-11 8	12-11 9	11-0 2	11-0 3	11-0 4	11-0 5	11-0 6	11-0 7	11-0 8	11-0 9	12-0	12-11	11-0	NOT USED	NOT USED

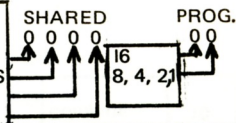
* Characters cannot be printed by the punch for codes in rows 0, 1, 6 or 7.

UTILITY OPERATING INSTRUCTIONS

LINK LOADER

CFF's Both Off: Tension Sensors ON rollers.
 Program loaded may be Software or Object.

KEY TO LIGHTS
 Hex value of:-
 TRUNK LIGHTS
 INTEGRAL LIGHTS
 DISC →ALERT4
 ALERT2 →MEDIA



SHARED	PROG.	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
			1		Mount	Program Cassette on transport 1		2
			2		Select	Load key		3
0000	15	ENA	3		Select	Clear key		4
0000	15	ALPHA	4	If only 1 399 Program on track	Select	Resume	Resume	5
				If > 1 399 Program or if 605 Program	Type	Program name		5
0000	1B	ALPHA	5		Select	Resume		6
			6	If 399 object	Go to			7
				If not		Program is loaded and begins.		

The Core Memory Project

SHARED	PROG.	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
0000	1E	ALPHA	7		Remove	Object Cassette from Transport 1		8
			8		Mount	MSC on transport 1		9
			9	For Fixer	Type	F	Resume	10
				For Debug	Type	D	Resume	10
				For Neither	Select	Resume		10
0408	00		10	To Run	Select	Reset	Compute	-
				To make L.A.G.	Remove	Cassette from transport 1	-	11
			11		Mount	Scratch cassette on transport 1	Compute	10

(At step 10 control has passed from Link Loader to Interpreter. Display 0408 - 00 is an Interpreter display.)

52

Link Loader Wait Codes

Load Light Flashing

0004	11	Program name not entered for 605 program.	Abort
0004	12	Coding about to be loaded over references.	Abort
0004	13	Coding about to be loaded over primary module.	Abort
0004	14	Too many symbols and references in memory.	Abort
0010	00 (Load lamp OFF)	Requested program not on cassette.	Abort
0010	00 (Load lamp ON)	Invalid record type found on cassette.	Abort
0402	00	Read error in load process. (If lights flashing HALT)	Abort
040D	00	Transport 1 not ready.	Correct - COMPUTE
0439	00	End of tape or clear trailer detected, or transport not ready.	Abort
0801	00	Forms handler not ready.	Correct - COMPUTE
0802	00	Serial printer error.	COMPUTE - Re-type

Interpreter Wait Code

0410	00 (Load lamp OFF)	Write error in write option.	Rewind - COMPUTE
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53

The Core Memory Project

C399ASMB

For S.P. Min. stationery 10½"; from position 1.
 For L.P. Min. S.P. stationery to cover positions 1-8. Set-up L.P.
 Load program using Link Loader.

SHARED	STATUS	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
0211	00		1		Mount	Scratch cassette on transport 2.	Compute	2
0000	11	NUM	2	To use Keyboard	Select	Compute		3
				To use P.C.	Select	BK05 (Option not yet available)		3
				To use P.T.	Select	BK06 (Option not yet available)		3
0000	11	ALPHA	3	MANUAL INPUT	Select	Compute		4
				If selection still valid				
2000	11							
4000	11			If not valid	Select	Any branch key except BK05 & BK06		2
			4		Type	Assembler Specification	BK00	5

54

During input:-		
To terminate partial fields	Select	Resume
To terminate a good line	Select	BK00
To reject one field	Select	BK01
To reject whole line	Select	BK04

			5	For initial assembly For re-assembly				6 10
			6	Initial Assembly - manual input	Type	Data & Coding lines then END\$	BK00	7
				During input use Resume, BK00, O1 and O4 as before.				
0400	03	ALPHA	7		Remove	MSC from transport 1		8
			8		Mount	Scratch cassette on to transport 1	Compute	9
0000	0F		9			Assembly Complete		-

55

The Core Memory Project

SHARED	PROG.	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
0040	13	ALPHA	10	Re-assembly - manual input		MSC from transport 1		11
					Remove			
					Mount			
			11		Mount	Re-assembly master	Compute	12
			12		Type	Re-assembly source lines (data, coding, ENDS)	BKOO	13
During input use Resume BKOO, O1 and O4 as before								
0400	03	ALPHA	13		Remove	Re-assembly master from transport 1		14
			14		Mount	Scratch cassette on transport 1	Compute	15
0000	0F		15			Re-assembly complete		-

56

399/399 ASSEMBLER WAIT CODES For lights not shown see Interpreter Wait Codes

0402	00	Cassette 1 write error	Retry - COMPUTE
0404	00	Cassette 1 in clear trailer	ABORT
041D	00	Write tab not enabled, cassette 1	Correct - COMPUTE
0202	00	Cassette 2 write error	Retry - COMPUTE
0204	00	Cassette 2 in clear trailer	ABORT
021D	00	Write tab not enabled, cassette 2	Correct - COMPUTE
067C	00	Lid opened on transport 1 or 2	ABORT

57

The Core Memory Project

PTCT

Stationery to cover at least Print Positions 1 - 4. Mount Paper Tape in Reader.
Load program using Link Loader.

SHARED PROG.	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
0400	0A	1		Remove	Cassette from Transport 1		2
		2		Mount	Scratch cassette on Transport 1	Compute	3
	WAIT	3	To restart (no rewind)	Mount	New P. Tape on Reader		5
			To rewind	Select	Resume		4
0000	0F	4	To restart	Mount	New P. Tape on Reader		5
		5	If P.T. is Object	Mount	Software Cassette on Transport 1		6
			If P.T. is Source	Go to			6
		6		Select	Reset	Compute	1

58

PTCT WAIT CODES

for lights not shown see Interpreter Wait Codes.

4000	00		Paper tape not a source or object tape.	RESET - COMPUTE
0400	00		Cassette in transport 1 not MSC.	RESET - COMPUTE
4000	12		Mount next reel of paper tape.	COMPUTE
4000	13		Too many reels of paper tape.	ABORT
4002	00		Parity error on input.	ABORT
4001	00		Paper tape torn or 16 delete characters read.	ABORT
400C	00		Paper tape reader inoperative.	Turn on - COMPUTE
0402	00	WAIT	Cassette 1 write error.	ABORT
0441	00		Cassette 1 End of Tape.	ABORT
041D	00		Write table not enabled, cassette 1.	Correct - COMPUTE
067C	00		Lid opened on transport.	ABORT

59

The Core Memory Project

CSTPRNT

Platen Solid. 12 inch wide stationery from position 1.
Load program from Software cassette using Link Loader.

SHARED	PROG.	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
			1			Prints 'LOAD CASSETTE AND ENTER BLOCK NUMBER.....'		2
			2		Mount	Cassette for Printing on Transport 1.		3
0000	00	NUM	3	To print entire cassette	Select	Enter bar	Enter bar	4
				To print from XXXX to end.	Index	XXXX		4
				To print from XXXX to YYYY inclusive	Index	XXXXXXXXXX		4

60

During printing:- To terminate current block and continue from next.	Select	BK01
To terminate all printing	Select	BK02

0000	01		4			Prints "End of program".		5
			5	To restart	Select	Compute		1.

CSTPRNT WAIT CODES

for lights not shown see Interpreter Wait Codes.

0402 00 WAIT

Unrecoverable read error on transport 1.
- To Print a different cassette
- Otherwise

RESET - COMPUTE
ABORT

040D 00

Transport 1 inoperative.

Correct - COMPUTE

0802 00

Serial printer error.

Continue - COMPUTE

61

The Core Memory Project

CCOPY

Platen solid. Min. 4 inch stationery from Position 1.
Load program from Software Cassette using Link Loader.

SHARED	PROG.	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
0000	19		1	To copy	Set	P1 on		2
				To verify	Set	P2 on		2
0600	03		2	To reselect otherwise	Select Mount	Resume Copy Source (or Verify Master) on transport 1. Destination (or cassette to be verified) on trans.2.	Compute	1 3
0000	01		3			End of copy/verify		4
			4	To restart	Select	Reset	Compute	1

CCOPY WAIT CODES For lights not shown see Interpreter Wait Codes

0202	00	Unrecoverable read/write error on transport 2.	If verify - ABORT If Copy - change cass.-RESET-COMPUTE
0204	00	Cassette 2 in clear trailer.	ABORT

62

020D	00	Transport 2 inoperative.	Correct - COMPUTE
Q21D	00	Write tab not enabled, transport 2.	Correct - COMPUTE
0241	00	Cassette 2 at end of tape.	ABORT
0242	00	Blank tape read on cassette 2.	ABORT
027C	00	Lid opened on transport 2.	ABORT
0402	00	Unrecoverable read/write error on transport 1.	ABORT
0404	00	Cassette 1 in clear trailer.	ABORT
040D	00	Transport 1 inoperative.	Correct - COMPUTE
0441	00	Cassette 1 at end of tape.	ABORT
0442	00	Blank tape read on cassette 1.	ABORT
047C	00	Lid opened on transport 1.	ABORT
XXXX	07	Blocks Cassette 1 & 2 unequal length XXXX = Error Block No. in BCD	(Abandon verify) - COMPUTE
XXXX	0F	Unequal characters - XXXX = Error block No. in BCD	Note-COMPUTE for next display.
ZZZZ	0F	ZZZZ = Relative position of word in Hex	Note-(Abandon verify)-COMPUTE

63

The Core Memory Project

UDUMP1

399 User Program, without gaps made by FIXER, must be resident.

Load UDUMP1 using Link Loader.

SHARED	PROG.	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
0000	11	NUM	1	To use Transport 1	Mount	Scratch Cassette on Transport 1	BK01	2
				To use Transport 2	Mount	Scratch Cassette on Transport 2	BK02	2
0000	0F		2	To Print Cassette now	Go to	Op. Instructions for UDUMP2		-
				To Continue User Program	Re-load	Basic Interpreter Using Linking Loader, typing LEXEC at L.L. step 4		-

UDUMP2

[cannot cope with gaps left by FIXER]

Min. Stationery 10½ inches wide; from position 1

Load program using Link Loader.

After invalid typing prog. returns to same step to retrv except step 6 returns to 5.

SHARED	PROG.	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
0000	11	ALPHA	1	For Serial Printer [Other options not yet available]	Type	S	Resume	2

0000	12	ALPHA	2		Mount	UDUMP1 cassette on Transport 1 or 2		3	
			3	If Transport 1	Type	1	Resume	4	
				If Transport 2	Type	2	Resume	4	
0000	13	ALPHA	4	To Terminate the Run	Type	END	Conscious typing errors:- Use Back-space to correct OR select BK04, then re-do this step.	Resume	9
				To Print another cassette or change transport	Type	NEW		Resume	8
				To Print all data & coding	Type	ALL		Resume	7
				To Print all data	Type	DATA		Resume	7
				To Print all coding	Type	CODE		Resume	7
			5	To Print part data or part coding	Type	AREA	Resume	5	
				To Print from data address XXXX	Type	XXXXD	Use Back-space or BK04 as before.	Resume	6
				To Print from coding address XXXX	Type	XXXXC		Resume	6

The Core Memory Project

SHARED	PROG.	OTHER	NO.	OPERATOR DECISION	OPERATOR ACTION	ITEM	TERMINATING KEY	NEXT DO
			6	For data end address YYYY	Type	YYYYD	Resume	7
				For coding end address YYYY	Type	YYYYC		Resume	7
		NUM	7			Prints as asked		4
					To Abandon this print	Select	Any branch key		4
0400 0200	02 02		8		Remove	UDUMP1 cassette from transport 1 or 2	Compute	1
0000	0F		9			End of UDUMP2		

UDUMP1 and UDUMP2 WAIT CODES For lights not shown see Interpreter Wait Codes

0200	14	Cassette 2 is rewind - wrong cassette	Correct - COMPUTE
0200	15	Cassette 2 format error - to restart at Step 2 (UDUMP2)	COMPUTE
0202	00	Read/Write error cassette 2 - If Reading (UDUMP2) - If Writing, go to step 1 (UDUMP1)	Abort START
0204	00	Cassette 1 in clear trailer	Abort
020D	00	Transport 2 not ready	Correct - COMPUTE
66			
021D	00	Cassette 2 Write tab not enabled	Correct - COMPUTE
0241	00	Cassette 2 End of Tape	Abort
0242	00	Cassette 2 Blank Tape	Abort
027C	00	Cassette 2 lid opened while tape in motion	Abort
0400	14	Cassette 1 is rewind - wrong cassette	Correct - COMPUTE
0400	15	Cassette 1 format error - to restart at Step 2 (UDUMP2)	COMPUTE
0402	00	Read/Write error Cassette 1 - If Reading (UDUMP2) - If Writing, go to step 1 (UDUMP1)	Abort START
0404	00	Cassette 1 in clear trailer	Abort
040D	00	Transport 1 not ready	Correct - COMPUTE
041D	00	Cassette 1 Write tab not enabled	Correct - COMPUTE
0441	00	Cassette 1 End of Tape	Abort
0442	00	Cassette 1 Blank tape	Abort
047C	00	Cassette 1 lid opened while tape in motion	Abort

CONSOLE FORM SIZES

<i>Back feed</i>	Depth: 6 - 25 inches Max. Dia.: Tally Roll 3.5 inches	Width: 4 - 23 inches
Front feed	Depth: 3 - 25 inches (with card stops 4 - 15 inches)	Width: 4 - 23 inches
C.F.F.	Depth: 3.5 - 17 inches Sprocket hole margin: 0.5 inch	Width: 3.5 - 23 inches (print line overhang 0.5 inch left or right but only 0.1 inch right if M.L. fitted).
A.L.F.	Depth: 6 - 16 inches	Width - Right: 6 - 14.9 inches (with no M.L. 6 - 16 inches) Max. left of right edge, 3.2 inches from A.L.F. side frame Width - Left: 6 - 12.5 inches Max. right of left edge, 3.7 inches from A.L.F. side frame
	Top Margin: Min. $\frac{4}{6}$ inch No. of lines = (Card length - Top and Bottom Margin) x 6 Beginning Print Line No. = 87 - No. of Lines	Bottom Margin: Min. $\frac{2}{6}$ inches
M.L. [See also M.L.F.R.]	Depth: 6 - 16 inches in 1 inch steps	Width - Stripe One Side: 6 - 8 inches; 8.3 - 10.6 inches; 11 - 16 inches Width - Stripe Both Sides: 6.9 - 8 inches; 8.3 - 8.5 inches; 9.6 - 10.6 inches; 11 - 11.1 inches; 12.2 - 16 inches; (subject to front stripe fouling on Lower Comp. Roll)
	M.L. Margin: 1.2 inches Stripe Capacity in Bytes:	6 inches (177) 7 inches (235) 8 inches (294) 9 inches (352) 10 inches (415) 11 inches (469) 12 inches (527) 13 inches (584) 14 inches (642) 15 inches (702) 16 inches (761)

The Core Memory Project

SOME HARDWARE DATA

Serial Printer	88ch ball 22.1 inches Print Line Platen length 23.9 inches Splits 5/17.1 by 2 inches to 17.1/5	20ch p. sec. alphanumeric 24ch p. sec. num. Tab & Ret. 18 inches p. sec.	12 to the inch (265chs) 10 to the inch (221chs) 6 lines per inch
Cassette	Serial 8 bit ASCII 800 BPI. 0.8 inch IRG. 160000ch p. track @ 80ch blocks	6000 b.p.s. @ 7.5 inches p. sec. EOT/BOT 18 inches from clear leader/trailer	280-290 ft. x 2 tracks
M.L.F.R. 314	8-15 inches Deep 6-16 inches Wide	Optimum ratios 8-10 x 6-11 11 x 8-14 12 x 8-16 13-15x10-16	47 x 11 inches card p min. (1.3 secs. to read)
C.F.F.	6 lines to the inch	Slew at 30 lines p. sec.	Up to 10 copies 3.5-23 inches wide 3.5-17 inches deep. VFU loop 8-20.4 inches in tenths.

74

Line Printer 349-1	132 cols. 64chs	44ch/col. Drum 3 Phase	125 l.p.m. 445ms between PUTs	
349-2	132 cols. 64chs	44ch/col. Drum 3 Phase	200 l.p.m. 265ms between PUTs	10chs per inch. 6 or 8 lines per inch
349-3	132 cols. 64 chs	66ch/col. Drum 2 Phase	300 l.p.m. 165ms between PUTs	Up to 6 part copies 4-20.5 inches wide Up to 22 inches wide
P.C. Reader 368	Serial	12 Bit Hollerith	300 c.p.m.	Hoppers: 1000 card
P.C. Punch 378	Serial	12 Bit Hollerith	40 cols. p. sec. (20 print & punch) 8 cols. p. sec. Release 0.33 secs. feed time	Hoppers: 500 card
P.T. Reader 366	1 inch tape	Various codes by program	125ch. p. sec. read/rewind	350 ft. on 6 inch reels
P.T. Punch 367	1 inch tape	Various codes by program	75ch. p. sec. (no rewind)	1000 ft. supply 350 ft. take up

The Core Memory Project

Basic Interpreter
Debug
Move
Move NA/NB (includes MOVE)
Multiply/Round
Multiply/Divide/Round
Redefine
Table In/Out/Add
Fixer
Fill
Auto Line Find (LNCR only)
Auto Line Find (LNCR & LNCL)
Card Reader
Card Reader Translation Table
 Denmark
 France
 Germany
 Katakana
 Latin America
 Portugal
 Spain
 Sweden
 United Kingdom
Card Punch
Card Punch Translation Tables
 Denmark

INTERPRETER BYTES

France
Germany
Katakana
Latin America
Portugal
Spain
Sweden
United Kingdom
Cassette
Communications:
 399 to 270 Central
 399 to 399
 Bisync EBCDIC
 Bisync ASCII
 TC 500
Disc
Last Line (BRION/OFF;
LL1/ & 2; FLR/L)
Line Printer
Line Printer Translation Tables
 Denmark
 France
 Germany
 Katakana
 Latin America
 Portugal

Spain
Sweden
 United Kingdom
Magnetic Ledger (ALF extra)
Punched Tape Reader
Tape Punch
Punched Tape Translation
Keyboard & Printer Translation:
 Denmark
 France
 Germany
 Katakana
 Latin America
 Spain
 Sweden
 South Africa
 United Kingdom
Edit