Burroughs

SERIES B 700 HANDBOOK

AA 334188
AA 370492

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CONTENTS

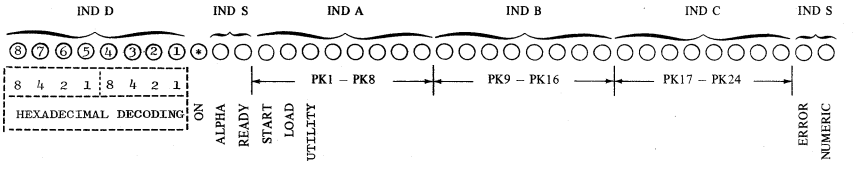
Page

CONSOLE INDICATOR LOCATION AND DATA WORDS. . 2
CONSOLE KEYBOARD CODES, ASCII. 3
CONSOLE PRINTER CHARACTER SET, ASCII 5
DECIMAL AND HEXADECIMAL CONVERSION 6
FE CARD SWITCH DESCRIPTION 7
INTERCHANGE CODES. 8
INTERPRETER WARM-START HARDWARE
CONFIGURATION TABLES:
I/O DEVICE CONFIGURATION CODE
DERIVATION 12
I/O DEVICES ELIGIBLE FOR TRANSLATION
ALGORITHMS 13
MEDIA FORMATS:
CASSETTE TAPE FORMATS. 14
CONFIGURATION CARD FORMAT
(80 COLUMN) RJE. 16
DISK SEGMENT FORMAT. 17
OBJECT (USER) PROGRAM CARD FORMATS . . . 18
PARAMETER CARD FORMATS RJE 23
PUNCHED PAPER TAPE COMPACT OB-
JECT CODE. 24
SORT FIELD SPECIFIER CARD FORMATS. . . . 25
MEMORY ADDRESS CONVERSION. 26
MICROCONTROLS. 27
NANOCONTROLS 28
NANOINSTRUCTION LIST 32
NANOMEMORY DECODING. 38
S-LEVEL INSTRUCTIONS 39
SYSTEM ERROR MESSAGES AND OPERATOR
RECOVERY OPTIONS:
DISK INITIALIZATION (MICRO-LEVEL
UTILITY ERRORS). 47
DISK SYSTEM COLD START ERRORS. 41
DISK SYSTEM ERROR MESSAGES AND
OPERATOR RECOVERY. 42
DISK SYSTEM RESTART ERRORS 46
DISK SYSTEM WARM START (WSTRT) ERRORS
(CONSOLE INDICATIONS). 45

Page

DISK SYSTEM WARM START (WSTRT) ERRORS
(SPO MESSAGES). 46
OPERATING SYSTEM ERRORS (FATAL) 52
OPERATING SYSTEM ERRORS (FATAL) DIS-
PLAY FORMAT EXAMPLE 52
OPERATOR RECOVERY RESPONSES 49
RJE BOOTSTRAP LOAD ERROR MESSAGES (NON-
DISK SYSTEM WITH SPO) 54
SPO AND CONSOLE ERROR MESSAGE FORMATS . . 49
SPO REPRESENTATION (DISPLAY) OF
CONSOLE INDICATORS. 52
SYSTEM ERROR MESSAGES AND OPERATOR
RECOVERY RESPONSES. 50
UTILITY PROGRAM EXCEPTION CONDITION
MESSAGES AND RECOVERY OPTIONS 51
WORD FORMATS:
B043 CONSOLE IOC/DDP WORD FORMATS 55
B044 SPO IOC/DDP WORD FORMATS 55
B0111 CARD READER IOC/DDP WORD FORMATS. . 56
B0115 CARD READER IOC/DDP WORD
FORMATS 56
B0121-1 PPT/EPC READER IOC/DDP WORD
FORMATS 57
B0221 PPT/EPC PUNCH IOC/DDP WORD
FORMATS 57
B0243, B0244, OR B0245 LINE PRINTER
IOC/DDP WORD FORMATS. 58
B0311 CARD READER IOC/DDP WORD
FORMATS 58
B0351 SINGLE-LINE CONTROL IOC/DDP
WORD FORMATS. 59
B0391 TAPE UNIT IOC/DDP WORD FORMATS. . . 59
B0392 TAPE CASSETTE IOC/DDP WORD
FORMATS 60
B0418-2 READER-PUNCH-RECORDER IOC/DDP
WORD FORMATS. 60
B0489 DISK IOC/DDP WORD FORMATS 61
SL7 I/O DESCRIPTOR FORMATS. 62

CONSOLE INDICATOR LOCATION AND DATA WORDS



* "ON" INDICATOR GOES ON WHEN POWER IS APPLIED TO CONSOLE

INDICATOR DATA WORDS

	CONTROL (MSB)								DATA							(LSB)
MIR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
IND "S" DATA WORD	1	0	Ø	0	0	0	0	1	Ø	Ø	Ø	Ø	NUM	ERROR	READY	ALPHA
IND "D" DATA WORD	1	0	Ø	0	0	0	1	0	⑧	⑦	⑥	⑤	④	③	②	①
IND "C" DATA WORD	1	0	Ø	0	0	1	0	0	PK24	PK23	PK22	PK21	PK20	PK19	PK18	PK17
IND "B" DATA WORD	1	0	Ø	0	1	0	0	0	PK16	PK15	PK14	PK13	PK12	PK11	PK10	PK9
IND "A" DATA WORD	1	0	Ø	1	0	0	0	0	PK8	PK7	PK6	PK5	PK4	PK3 or UTIL	PK2 or LOAD	PK1 or START

CONSOLE KEYBOARD CODES, ASCII

	Keyboard Symbol	Keyboard Code	Keyboard Symbol	Keyboard Code	Keyboard Symbol	Keyboard Code
	0	0001 0000	Space	0011 0000		0101 0000
	1	0001 0001		0011 0001	A	0101 0001
	2	0001 0010		0011 0010	B	0101 0010
	3	0001 0011		0011 0011	C	0101 0011
	4	0001 0100		0011 0100	D	0101 0100
	5	0001 0101	OCK I	0011 0101	E	0101 0101
	6	0001 0110	OCK II	0011 0110	F	0101 0110
	7	0001 0111		0011 0111	G	0101 0111
	8	0001 1000	;	0011 1000	H	0101 1000
	9	0001 1001	–	0011 1001	I	0101 1001
		0001 1010	,	0011 1010	J	0101 1010
		0001 1011	.	0011 1011	K	0101 1011
	←	0001 1100	:	0011 1100	L	0101 1100
LEFT	↑	0001 1101	\	0011 1101	M	0101 1101
	o/c	0001 1110	/	0011 1110	N	0101 1110
RESET	N	0001 1111	~	0011 1111	O	0101 1111
	0_N	0010 0000	P	0100 0000	PK18	0110 0000
	1_N	0010 0001	Q	0100 0001	PK19	0110 0001
	2_N	0010 0010	R	0100 0010	PK20	0110 0010
	3_N	0010 0011	S	0100 0011	PK21	0110 0011
	4_N	0010 0100	T	0100 0100		0110 0100
	5_N	0010 0101	U	0100 0101		0110 0101
	6_N	0010 0110	V	0100 0110		0110 0110
	7_N	0010 0111	W	0100 0111		0110 0111
	8_N	0010 1000	X	0100 1000		0110 1000
	9_N	0010 1001	Y	0100 1001		0110 1001
	00_N	0010 1010	Z	0100 1010		0110 1010
	000_N	0010 1011		0100 1011		0110 1011
	C_N	0010 1100	OCK IIII$_N$	0100 1100	PK17	0110 1100
	RE_N	0010 1101	OCK I$_N$	0100 1101	PK22	0110 1101
	M_N	0010 1110	OCK II$_N$	0100 1110	PK23	0110 1110
	$\cdot_N$	0010 1111	OCK III$_N$	0100 1111	PK24	0110 1111

SEE NOTES 1, 2 NEXT PAGE

CONSOLE KEYBOARD CODES, ASCII (CONT)

Keyboard Symbol	Keyboard Code
PK01	0111 0000
PK02	0111 0001
PK03	0111 0010
PK04	0111 0011
PK05	0111 0100
PK06	0111 0101
PK07	0111 0110
PK08	0111 0111
PK09	0111 1000
PK10	0111 1001
PK11	0111 1010
PK12	0111 1011
PK13	0111 1100
PK14	0111 1101
PK15	0111 1110
PK16	0111 1111

Keyboard Symbol	Keyboard Code
	1011 0000
	1011 0001
	1011 0010
	1011 0011
	1011 0100
OCK |||	1011 0101
OCK ||||	1011 0110
	1011 0111
+	1011 1000
=	1011 1001
<	1011 1010
>	1011 1011
*	1011 1100
[	1011 1101
?	1011 1110
^	1011 1111

	@	1001 0000
	!	1001 0001
	"	1001 0010
	#	1001 0011
	$	1001 0100
	%	1001 0101
	&	1001 0110
	'	1001 0111
	(	1001 1000
	)	1001 1001
		1001 1010
		1001 1011
		1001 1100
RIGHT		1001 1101
	↑	1001 1110
	]	1001 1111

NOTES:

1. Only these codes are valid when loading micro/nano memories from numeric keyboard or memory loader unit. All other codes will be ignored.
2. All 256 code combinations are valid when loading data/program memory (DPM) from memory loader unit.
3. When the "shift" key is depressed the left most bit of the keyboard code will be "1".

CONSOLE PRINTER CHARACTER SET, ASCII

Print Char.	Printer Code	Print Char.	Printer Code	Print Char.	Printer Code	Print Char.	Printer Code
~[2]	0000 0000	0	0001 0000	@	0100 0000	P	0101 0000
!	0000 0001	1	0001 0001	A	0100 0001	Q	0101 0001
"	0000 0010	2	0001 0010	B	0100 0010	R	0101 0010
#	0000 0011	3	0001 0011	C	0100 0011	S	0101 0011
$	0000 0100	4	0001 0100	D	0100 0100	T	0101 0100
%	0000 0101	5	0001 0101	E	0100 0101	U	0101 0101
&	0000 0110	6	0001 0110	F	0100 0110	V	0101 0110
'	0000 0111	7	0001 0111	G	0100 0111	W	0101 0111
(	0000 1000	8	0001 1000	H	0100 1000	X	0101 1000
)	0000 1001	9	0001 1001	I	0100 1001	Y	0101 1001
*	0000 1010	:	0001 1010	J	0100 1010	Z	0101 1010
+	0000 1011	;	0001 1011	K	0100 1011	[	0101 1011
,	0000 1100	<	0001 1100	L	0100 1100	\	0101 1100
-	0000 1101	=	0001 1101	M	0100 1101	]	0101 1101
.	0000 1110	>	0001 1110	N	0100 1110	^	0101 1110
/	0000 1111	?	0001 1111	O	0100 1111	_	0101 1111

TILT \ ROTATE	7	6	5	4	3	2	1	0	15	14	13	12	11	10	9	8
0	#	"	!	~	3	2	1	0	C	B	A	@	S	R	Q	P
1	'	&	%	$	7	6	5	4	G	F	E	D	W	V	U	T
2	+	*	)	(	;	:	9	8	K	J	I	H	[	Z	Y	X
3	/	.	-	,	?	>	=	<	O	N	M	L	_	^	]	\

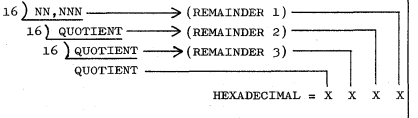
PRINT BALL LAYOUT

[1] ASCII code is compatible with console printer code except for "space"; code 0010 0000 ASCII will print ~ (tilda).

[2] To "print" a space the PRINT bit of the printer data word must be zero to suppress printing and the appropriate escapement bit must be one.

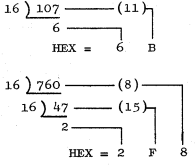
DECIMAL-TO-HEXADECIMAL CONVERSION

USE THE FOLLOWING FORMULA TO CONVERT A DECIMAL NUMBER TO ITS HEXADECIMAL EQUIVALENT:



WHERE: NN,NNN IS DECIMAL NUMBER TO FIVE PLACES. THE DECIMAL NUMBER AND SUBSEQUENT QUOTIENTS ARE DIVIDED BY 16 UNTIL THE REDUCTION IS COMPLETED. THE REMAINDERS AND THE FINAL QUOTIENT ARE USED TO FORM THE HEXADECIMAL EQUIVALENT.

EXAMPLES:



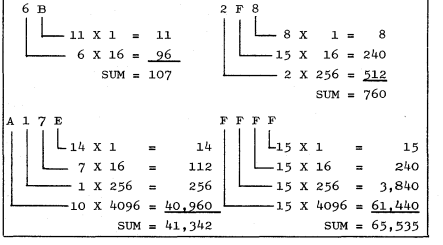
HEXADECIMAL-TO-DECIMAL CONVERSION

USE THE FOLLOWING FORMULA TO CONVERT A HEXADECIMAL NOTATION TO ITS DECIMAL EQUIVALENT:

(NX4096)+(NX256)+(NX16)+(NX1)=DECIMAL EQUIVALENT

WHERE: N'S ARE DIGITS IN A HEXADECIMAL EXPRESSION TO FOUR PLACES (NNNN). EACH HEXADECIMAL DIGIT IS MULTIPLIED BY 1, 16, 256, OR 4096, ACCORDING TO ITS RESPECTIVE RIGHT-TO-LEFT POSITION; THEN THE RESULTS ARE SUMMED TO OBTAIN THE DECIMAL EQUIVALENT.

EXAMPLES:



FE CARD SWITCH DESCRIPTION

NAME	FUNCTION	SWITCH TYPE
FST	FORCE STEP	Pushbutton
SGL	SINGLE PULSE	Pushbutton
NORM/SGL	NORMAL CLOCK/SINGLE PULSE	Toggle
* SEL0	SELECT 0	Toggle
* SEL1	SELECT 1	Toggle
PRO	PROCEED	Pushbutton
8K/4K	MEMORY MODULE SIZE	Toggle
RER	RESET ERROR	Pushbutton
REP/NORM	RECYCLE/NORMAL	Toggle
SOE/EOR	STOP ON ERROR/ERROR OVERRIDE	Toggle
MTR/MEM	MTR TEST PROGRAMS/HARDWARE TEST MEMORY	Toggle
IRQ/EXT	PROCESSOR/DEVICE RECYCLE (PSIRQ/ – OFF – SMEXT/)	3 Position

* SEL0 & SEL1 used for selecting register to be displayed on the lights on F E 1 and F E 2 cards. Refer to table below.

SEL0	SEL1	DISPLAY
1	1	MPM
1	0	MIR
0	1	INCR
0	0	ADDR CTR

PARITY ERROR INDICATIONS

CONSOLE "D" INDICATORS	ERROR
1 0 0 0 0 0 0 0	Paper Tape Parity
1 0 0 0 0 0 0 1	MPM Parity
1 0 0 0 0 0 1 0	DPM Parity
1 0 0 0 0 0 1 1	NPM Parity
1 0 0 0 0 1 0 0	DPM Address Limit
1 0 0 0 0 1 0 1	NPM Illegal Write

SPO STATUS INDICATORS*	ERROR
0 0 1	MPM Parity
0 1 0	DPM Parity
0 1 1	NPM Parity
1 0 0	Mem. Addr. Limit
1 0 1	Card Loader

* Listed in top-to-bottom order.

INTERCHANGE CODES

USASCII				EBCDIC			BCL		96-COLUMN	
PAPER TAPE CODE	USASCII CHAR	7-BIT INT.CODE COL, ROW	L & TC GRAPHIC	GRAPHIC CHAR	CARD CODE	8-BIT INT.CODE COL, ROW	GRAPHIC CHAR	CARD CODE	GRAPHIC CHAR	CARD CODE
P 7 6 5 4 F 3 2 1										BA 8421
	NUL	0,0	End of Alpha	NUL	12-0-9-8-1	0,0				
●	SOH	0,1		SOH	12-9-1	0,1				
●	STX	0,2		STX	12-9-2	0,2				
	ETX	0,3		ETX	12-9-3	0,3				
●	EOT	0,4		EOT	9-7	3,7				
	ENQ	0,5		ENQ	0-9-8-5	2,D				
	ACK	0,6		ACK	0-9-8-6	2,E				
●	BEL	0,7		BEL	0-9-8-7	2,F				
●	BS	0,8		BS	11-9-6	1,6				
	HT	0,9		HT	12-9-5	0,5				
	LF	0,A		LF	0-9-5	2,5				
●	VT	0,B		VT	12-9-8-3	0,B				
	FF	0,C		FF	12-9-8-4	0,C				
●	CR	0,D		CR	12-9-8-5	0,D				
●	SO	0,E		SO	12-9-8-6	0,E				
	SI	0,F		SI	12-9-8-7	0,F				
●	DLE	1,0		DLE	12-11-9-8-1	1,0				
	DC1	1,1		DC1	11-9-1	1,1				
	DC2	1,2		DC2	11-9-2	1,2				
●	DC3	1,3		DC3	11-9-3	1,3				
	DC4	1,4		DC4	9-8-4	3,C				
●	NAK	1,5		NAK	9-8-5	3,D				
●	SYN	1,6		SYN	9-2	3,2				
	ETB	1,7		ETB	0-9-6	2,6				
	CAN	1,8		CAN	11-9-8	1,8				
●	EM	1,9		EM	11-9-8-1	1,9				
●	SUB	1,A		SUB	9-8-7	3,F				
	ESC	1,B		ESC	0-9-7	2,7				
●	FS	1,C		FS	11-9-8-4	1,C				
	GS	1,D		GS	11-9-8-5	1,D				
	RS	1,E		RS	11-9-8-6	1,E				
●	US	1,F		US	11-9-8-7	1,F				

INTERCHANGE CODES (CONT)

PAPER TAPE CODE P 7 6 5 4 F 3 2 1	USASCII CHAR	USASCII 7-BIT INT.CODE COL, ROW	USASCII L & TC GRAPHIC	EBCDIC GRAPHIC CHAR	EBCDIC CARD CODE	EBCDIC 8-BIT INT.CODE COL, ROW	BCL GRAPHIC CHAR	BCL CARD CODE	96-COLUMN GRAPHIC CHAR	96-COLUMN CARD CODE BA 8421
● ● ● SP	SP	2,0	SP	SP	Blank	4,0	SP	Blank	SP	00 0000
● ● ● !	!	2,1	!	! (mz)	11-0	D,0	x	11-0	!	10 1010
● ● ● "	"	2,2	"	"	8-7	7,F	"	0-8-7	"	00 1111
● ● ● #	#	2,3	#	#	8-3	7,B	#	8-3	#	00 1011
● ● ● $	$	2,4	$	$	11-8-3	5,B	$	11-8-3	$	10 1011
● ● ● %	%	2,5	%	%	0-8-4	6,C	%	0-8-4	%	01 1100
● ● ● &	&	2,6	&	&	12	5,0	&	12	&	01 1010
● ● '	'	2,7	'	'	8-5	7,D	≥	8-7	'	00 1101
● ● (	(	2,8	(	(	12-8-5	4,D	(	12-8-5	(	11 1101
● ● ●)	)	2,9	)	)	11-8-5	5,D	)	11-8-5	)	10 1101
● ● ● *	*	2,A	*	*	11-8-4	5,C	*	11-8-4	*	10 1100
● ● ● +	+	2,B	+	+	12-0	4,E	+	12-0	+	11 1110
● ● ● ,	,	2,C	,	,	0-8-3	6,B	,	0-8-3	,	00 1101
● ● -	-	2,D	-	-	11	6,0	-	11	-	10 0000
● ● ● .	.	2,E	.	.	12-8-3	4,B	.	12-8-3	.	11 1011
● ● ● /	/	2,F	/	/	0-1	6,1	/	0-1	/	01 0001
● ● 0	0	3,0	0	0	0	F,0	0	0	0	01 0000
● ● ● 1	1	3,1	1	1	1	F,1	1	1	1	00 0001
● ● ● 2	2	3,2	2	2	2	F,2	2	2	2	00 0010
● ● ● 3	3	3,3	3	3	3	F,3	3	3	3	00 0011
● ● ● 4	4	3,4	4	4	4	F,4	4	4	4	00 0100
● ● ● 5	5	3,5	5	5	5	F,5	5	5	5	00 0101
● ● ● 6	6	3,6	6	6	6	F,6	6	6	6	00 0110
● ● ● 7	7	3,7	7	7	7	F,7	7	7	7	00 0111
● ● ● 8	8	3,8	8	8	8	F,8	8	8	8	00 1000
● ● ● 9	9	3,9	9	9	9	F,9	9	9	9	00 1001
● ● :	:	3,A	:	:	8-2	7,A	:	8-5	:	00 1010
● ● ● ;	;	3,B	;	;	11-8-6	5,E	;	11-8-6	;	10 1110
● ● <	<	3,C	< or $\frac{1}{2}$	<	12-8-4	4,C	≤	12-8-6	<	11 1100
● ● =	=	3,D	=	=	8-6	7,E	=	0-8-5	=	
● ● ● >	>	3,E	> or $\frac{1}{4}$	>	0-8-6	6,E	>	8-6	>	01 1110
● ● ● ?	?	3,F	?	?	0-8-7	6,F	?	All Other Codes	?	01 1111

INTERCHANGE CODES (CONT)

PAPER TAPE CODE P7 6 5 4 F 3 2 1	USASCII CHAR	USASCII 7-BIT INT.CODE COL, ROW	USASCII L & TC GRAPHIC	EBCDIC GRAPHIC CHAR	EBCDIC CARD CODE	EBCDIC 8-BIT INT.CODE COL, ROW	BCL GRAPHIC CHAR	BCL CARD CODE	96-COLUMN GRAPHIC CHAR	96-COLUMN CARD CODE BA 8421
●● ●	@	4,0	@	@	8-4	7,C	@	8-4	@	00 1100
● ●	A	4,1	A	A	12-1	C,1	A	12-1	A	11 0001
● ●	B	4,2	B	B	12-2	C,2	B	12-2	B	11 0010
●● ● ●	C	4,3	C	C	12-3	C,3	C	12-3	C	11 0011
● ●●	D	4,4	D	D	12-4	C,4	D	12-4	D	11 0100
●● ● ●	E	4,5	E	E	12-5	C,5	E	12-5	E	11 0101
●● ●●	F	4,6	F	F	12-6	C,6	F	12-6	F	11 0110
● ●●●●	G	4,7	G	G	12-7	C,7	G	12-7	G	11 0111
●● ●	H	4,8	H	H	12-8	C,8	H	12-8	H	11 1000
●● ●● ●	I	4,9	I	I	12-9	C,9	I	12-9	I	11 1001
●● ●●	J	4,A	J	J	11-1	D,1	J	11-1	J	10 0001
● ●● ●●	K	4,B	K	K	11-2	D,2	K	11-2	K	10 0010
●● ●● ●	L	4,C	L	L	11-3	D,3	L	11-3	L	10 0011
● ●●●● ●	M	4,D	M	M	11-4	D,4	M	11-4	M	10 0100
● ●●●●●	N	4,E	N	N	11-5	D,5	N	11-5	N	10 0101
●● ●●●●●	O	4,F	O	O	11-6	D,6	O	11-6	O	10 0110
● ● ●	P	5,0	P	P	11-7	D,7	P	11-7	P	10 0111
●● ● ●	Q	5,1	Q	Q	11-8	D,8	Q	11-8	Q	10 1000
●● ● ● ●	R	5,2	R	R	11-9	D,9	R	11-9	R	10 1001
● ●● ●●	S	5,3	S	S	0-2	E,2	S	0-2	S	10 0010
●● ● ●●	T	5,4	T	T	0-3	E,3	T	0-3	T	01 0011
● ● ● ●	U	5,5	U	U	0-4	E,4	U	0-4	U	01 0100
● ● ●●●	V	5,6	V	V	0-5	E,5	V	0-5	V	01 0101
●● ● ●●●	W	5,7	W	W	0-6	E,6	W	0-6	W	01 0110
●● ●●●	X	5,8	X	X	0-7	E,7	X	0-7	X	01 0111
● ●●● ●	Y	5,9	Y	Y	0-8	E,8	Y	0-8	Y	01 1000
● ●●● ● ●	Z	5,A	Z	Z	0-9	E,9	Z	0-9	Z	01 1001
●● ●●● ●●	[	5,B	[or 3/4	[	12-8-2	4,A	[	12-8-4		
● ●●●● ●	\	5,C	\ or ¢	¬	11-8-7	5,F	≤	11-8-7	¢	11 1010
●● ●●● ●●	]	5,D	] or CR	]	11-8-2	5,A	]	0-8-6	¬	10 1111
●● ●●●●●	^	5,E	^ or °	+(PZ)	12-8-6	C,0				
● ●●●●●●	_	5,F	_	_	0-8-5	6,D	≠	0-8-2	_	01 1101

INTERCHANGE CODES (CONT)

PAPER TAPE CODE	USASCII CHAR	USASCII 7-BIT INT.CODE COL, ROW	USASCII L & TC GRAPHIC	EBCDIC GRAPHIC CHAR*	EBCDIC CARD CODE	EBCDIC 8-BIT INT.CODE COL, ROW	BCL GRAPHIC CHAR	BCL CARD CODE	96-COLUMN GRAPHIC CHAR	96-COLUMN CARD CODE BA 8421
P 7 6 5 4 F 3 2 1										
	`	6,0	`	`	8-1	7,9				
	a	6,1	a	a	12-0-1	8,1				
	b	6,2	b	b	12-0-2	8,2				
	c	6,3	c	c	12-0-3	8,3				
	d	6,4	d	d	12-0-4	8,4				
	e	6,5	e	e	12-0-5	8,5				
	f	6,6	f	f	12-0-6	8,6				
	g	6,7	g	g	12-0-7	8,7				
	h	6,8	h	h	12-0-8	8,8				
	i	6,9	i	i	12-0-9	8,9				
	j	6,A	j	j	12-11-1	9,1				
	k	6,B	k	k	12-11-2	9,2				
	l	6,C	l	l	12-11-3	9,3				
	m	6,D	m	m	12-11-4	9,4				
	n	6,E	n	n	12-11-5	9,5				
	o	6,F	o	o	12-11-6	9,6				
	p	7,0	p	p	12-11-7	9,7				
	q	7,1	q	q	12-11-8	9,8				
	r	7,2	r	r	12-11-9	9,9				
	s	7,3	s	s	11-0-2	A,2				
	t	7,4	t	t	11-0-3	A,3				
	u	7,5	u	u	11-0-4	A,4				
	v	7,6	v	v	11-0-5	A,5				
	w	7,7	w	w	11-0-6	A,6				
	x	7,8	x	x	11-0-7	A,7				
	y	7,9	y	y	11-0-8	A,8				
	z	7,A	z	z	11-0-9	A,9				
	{	7,B	{							
	!	7,C	¦							
	}	7,D	}						)	11 0000
	~	7,E	~ or <>	¦	12-8-7	4,F	←	12-8-7	¦	11 1111
	DEL	7,F		DELETE	12-9-7	0,7				

* DELIMETER character has a card code of 12-0, 9-8, 7 and an internal code of CF.

I/O DEVICE CONFIGURATION CODE DERIVATION

DIGITS 1 AND 2:	DEVICE TYPE
00	80-COLUMN CARD READER
01	96-COLUMN CARD READER
02	PAPER TAPE READER
03	PAPER TAPE PUNCH
04	85/160/250 LPM PRINTER
05	96-COLUMN CARD READER/PUNCH/PRINTER OR MULTI-PURPOSE UNIT.
06	MAGNETIC TAPE UNIT
07	MAGNETIC TAPE CASSETTE
08	ANY DISK CARTRIDGE DRIVE
09	ANY LINE PRINTER
10	80-COLUMN CARD READER/PUNCH/PRINTER
11	SINGLE LINE CONTROL
DIGIT 3:	HARDWARE PORT CONNECTION
1-7	DETERMINED ACCORDING TO DDP LOCATIONS ASSIGNED TO I/O DEVICE CONTROLS FOR PARTICULAR SYSTEM BEING CONFIGURED.
DIGIT 4:	INTERPRETER DESCRIPTOR PORT NUMBER
0 OR 1	80-COLUMN CARD DEVICE
0 OR 1	96-COLUMN CARD DEVICE
0 OR 1 2 OR 3	PAPER TAPE READER PAPER TAPE PUNCH
0 THROUGH 3	ANY DISK CARTRIDGE DRIVE
0 THROUGH 3	ANY MAGNETIC TAPE DEVICE
2	ANY LINE PRINTER
DIGIT 5:	INTERPRETER SUBSYSTEM NUMBER
0	LOW-SPEED SUBSYSTEM (A), INCLUDING: 80-COLUMN CARD READER PAPER TAPE READER PAPER TAPE PUNCH
1	SUBSYSTEM (C), (INCLUDES SLC FOR RJE)
2	MID-SPEED SUBSYSTEM (D), INCLUDING: 96-COLUMN READER/PUNCH/PRINTER 80-COLUMN READER/PUNCH/PRINTER 96-COLUMN CARD READER
3	SUBSYSTEM (E) ANY MAGNETIC TAPE DEVICE

I/O DEVICE CONFIGURATION CODE DERIVATION (CONT)

DIGIT 5 (CONT)	INTERPRETER SUBSYSTEM NUMBER
4	HIGH-SPEED SUBSYSTEM (B), INCLUDING: ANY LINE PRINTER 96-COLUMN CARD READER*
5	ANY DISK CARTRIDGE DRIVE

* NOTE: USE ONLY WITH UTILITIES IDENTIFIED WITH 97 IN UTILITY NAME.

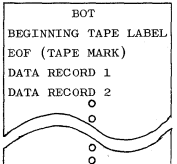
I/O DEVICES ELIGIBLE FOR TRANSLATION ALGORITHMS

DEVICE TYPE	DIGIT	ALGORITHM
MAGNETIC TAPE CASSETTE	0 1 2-9	NO TRANSLATION EBCDIC TRANSLATION ILLEGAL
PAPER TAPE READER	0 1 2 3-7 8-9	NO TRANSLATION 8-BIT ASCII TRANSLATION 5-BIT BAUDOT RESERVED ILLEGAL
PAPER TAPE PUNCH	0 1 2 3-7 8-9	NO TRANSLATION 8-BIT ASCII TRANSLATION 5-BIT BAUDOT RESERVED ILLEGAL
MAGNETIC TAPE UNIT	0 1 2-9	NO TRANSLATION EBCDIC TRANSLATION ILLEGAL
80-COLUMN CARD READER (ANY STYLE) OR 80-COLUMN CARD READER/PUNCH/PRINTER	0 1 2 3-9	ILLEGAL BCL TRANSLATION EBCDIC TRANSLATION* ILLEGAL

* DIGIT 1 = EBCDIC TRANS. DIGIT 2 = BCL TRANS. FOR MARK II.4 AND SUBSEQ. RELEASES.

CASSETTE TAPE FORMATS

CONTENT FORMAT



TAPE LABEL FORMAT

FIELD POSITION	SIZE (BYTES)	CONTENTS
0	1	BLANK
1	7	"LABEL"
8	1	ZERO
9	6	MULTIFILE IDENTIFIER (MFID) FIELD; ZEROS IF NO MFID
15	1	BLANK
16	1	ZERO
17	6	FILE IDENTIFIER (FID); BLANK FOR SCRATCH FILES
23	1	BLANK
24	3	REEL NUMBER
27	5	CREATION DATA, "YYDDD" (JULIAN FORMAT)

FIELD POSITION	SIZE (BYTES)	CONTENTS
32	2	RESERVED. ACCESSIBLE TO USER TO DISTINGUISH BETWEEN MULTIPLE RUNS ON THE SAME DAY. CONTAINS "01" BY DEFAULT.
34	5	PURGE DATE: "99999"
39	1	SENTINEL (0=END-OF-FILE; 1=END-OF-REEL) (ENDING LABEL ONLY)
40	5	BLOCK COUNT (ENDING LABEL ONLY)
45	7	BLOCK COUNT (ENDING LABEL ONLY)
52	1	ZERO
53	5	PHYSICAL TAPE NUMBER (INSERTED OPERATOR COMMAND)
58	21	RESERVED

CASSETTE TAPE FORMATS (CONT)

DATA RECORD FORMATS

CAPACITY (FOR STANDARD LENGTH OF 280 FT):

1. APPROXIMATELY 2,450 80-COL. CARD IMAGES.
2. APPROXIMATELY 20 PAGES OF PRINTER OUTPUT (60 LINES PER PAGE).

NOMINAL LENGTH: VARIABLE UP TO 256 BYTES.

RJE LENGTH: FIXED-LENGTH RECORDS OF 168 CHARACTERS EACH. A TAPE RECORD MAY CONTAIN ONE 132-CHARACTER PRINT LINE IMAGE RECORD OR TWO 80-CHARACTER CARD IMAGE RECORDS.

RJE PRINT LINE IMAGE RECORD

POSITION	SIZE (BYTES)	CONTENTS
0	2	NUMBER OF ITEMS THIS RECORD; FOR PRINT LINE IMAGE = 01.
2	2	RECORD TYPE; FOR PRINT LINE RECORD = 01.
4	2	CONTROL CHARACTER(S) FOR PRINT LINE RECORD.
6	132	DATA RECORD = 132-CHARACTER PRINT LINE IMAGE.
138	30	ALL ZEROS.

RJE 80-COLUMN CARD IMAGE RECORD

POSITION	SIZE (BYTES)	CONTENTS
0	2	NUMBER OF ITEMS THIS RECORD; FOR CARD IMAGE = 01 OR 02.
2	2	RECORD TYPE; FOR CARD IMAGE RECORD = 02.
4	2	CONTROL CHARACTER(S) FOR ITEM 1.
6	80	ITEM 1: 80-CHARACTER CARD IMAGE.
86	2	CONTROL CHARACTER(S) FOR ITEM 2.
88	80	ITEM 2: 80-CHARACTER CARD IMAGE.

CONFIGURATION CARD FORMAT (80 COLUMN) RJE

1	2	4	5	8	9	10	13	14	17	18	80
C		XX = Y		XX = Y		XX = Y		(REPEAT XX = Y ENTRIES, AS REQUIRED.)			

WHERE XX IS DEVICE TYPE AS FOLLOWS:

XX	DEVICE
CR	CARD READER
SI	SINGLE-LINE CONTROL
PN	CARD PUNCH
C4	CASSETTE TAPE DRIVE NO. 4
C3	CASSETTE TAPE DRIVE NO. 3
C2	CASSETTE TAPE DRIVE NO. 2
C1	CASSETTE TAPE DRIVE NO. 1
SP	SUPERVISORY PRINTER (SPO)
LP	LINE PRINTER

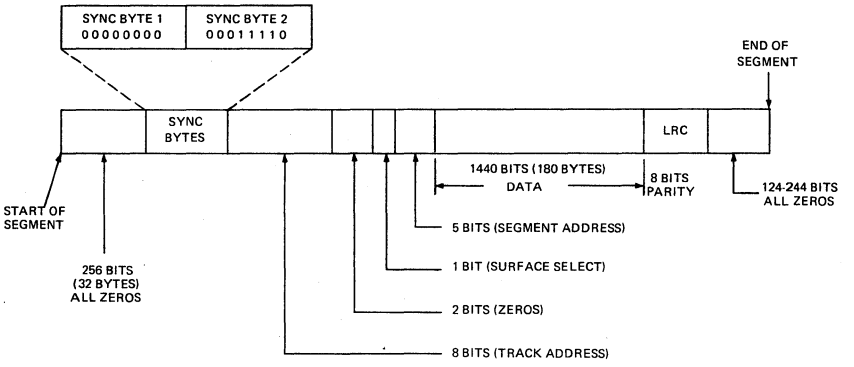
WHERE Y IS IOC (DDP) PORT NUMBER IN WHICH DEVICE XX IS LOCATED. NORMAL CONFIGURATION IS AS FOLLOWS:

Y (PORT)	XX (DEVICE)
1	CR
2	LP
3	PN
4	C3
5	C2
6	C1
7	SL
8	SP

EXAMPLES:

COL.	1	5-8	9	10-13	14-17	18-21	22	80
CARDS	C	CR = 1		SP = 8				
	C	SL = 7		PN = 3	CP = 2	CR = 5		
	C	C1 = 6						

DISK SEGMENT FORMAT



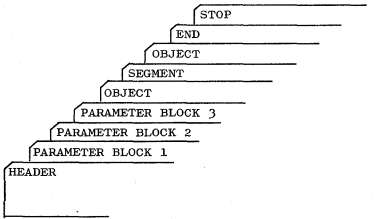
OBJECT (USER) PROGRAM CARD FORMATS

PROGRAM HEADER (80-COL.)

1 7	8	9 13	14 33	34 36	37 48	49 55	56	57 61	62 64	65 66	74	75 80
PROGRAM	∅	PROGRAM NAME	SP	PROGRAM DISK SEG. REQ.	SP	PROGRAM	SP	PROGRAM NAME	SP	COMPILER TYPE C=COBOL	SP	DATE MMDDYY
(ACTUAL ENTRY) (COMPACT HEX)				(COMPACT HEX)		(ACTUAL ENTRY BCL ALPHA)		(BCL ALPHA)		(BCL ALPHA)		(BCL NUMERIC)

PROGRAM HEADER (96-COL.)

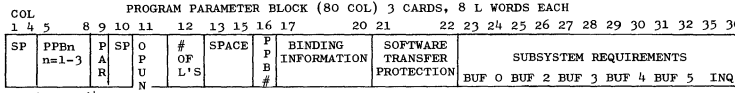
1 7	8	9 13	14 52	53 56	57 96
PROGRAM	SP	PROGRAM NAME	SP	PROGRAM DISK SEG. REQ.	SP
(ACTUAL ENTRY IN BCL ALPHA)		(BCL ALPHA)		(HEX)	

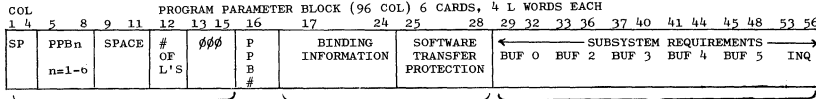


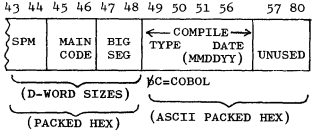
COMPACT HEX CODES FOR PROGRAM HEADER CARDS

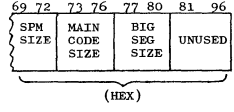
ASCII CHAR	PUNCH	ASCII CHAR	PUNCH	ASCII CHAR	PUNCH	ASCII CHAR	PUNCH
A	11,1	I	11,8,1	R	11,9,2	BLANK	0
B	11,2	J	11,8,2	S	11,9,3	ZERO	0,9
C	11,3	K	11,8,3	T	11,9,4	1	0,9,1
D	11,4	L	11,8,4	U	11,9,5	2	0,9,2
E	11,5	M	11,8,5	V	11,9,6	3	0,9,3
F	11,6	N	11,8,6	W	11,9,7	4	0,9,4
G	11,7	O	11,8,7	X	11,9,8	5	0,9,5
H	11,8	P	11,9	Y	11,9,8,1	6	0,9,6
		Q	11,9,1	Z	11,9,8,2	7	0,9,7
						8	0,9,8
						9	0,9,8,1

OBJECT (USER) PROGRAM CARD FORMATS (CONT.)





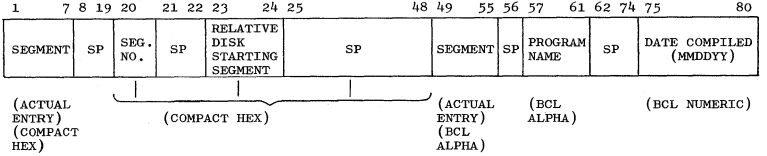




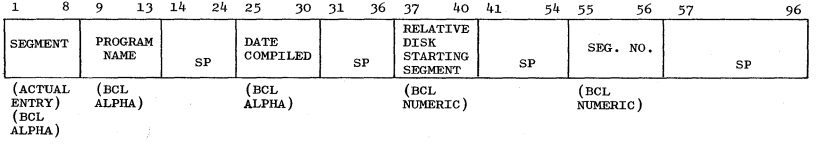
COLS			17 OR(17*18)	18 OR(19*20)	19 OR(21*22)	20 OR(23*24)	21	22 OR(27*28)
DIGIT BITS	UPPER	8	SL7=0, DIL=1	CASSETTE	EDIT SPEC SL7=0, RPG=1	EXPAND COMPRESS	1 PUNCH	COMPAT.
		4	MT UNIT	80 COL MFU	SO20	EXP CMP, NO CNT OPT		LOAD IF AE NOT BUSY
		2	80 COL RDR	96 COL RDR	MULTIPLY	MOVE CHARACTERS		LOAD IF NO ACT BRKOUT
		1	96 COL MFU		MULTIPLY LIT MEM	MOVE-4		INQUIRY PROGRAM
	LOWER	8	LINE PRTR		DAC	SCAN	PUNCH OR G.	DIL PROGRAM
		4	PT I/O		BRBS OR BRBN	DIVIDE		RPG PROGRAM
		2	PT READER		LOGICAL FUNCTIONS			0=B770, 1=B700
		1	PT PUNCH		BRANCH INDIRECT			NOT A UTILITY PROGRAM

OBJECT (USER) PROGRAM CARD FORMATS (CONT)

SEGMENT HEADER CARD (80-COL.)

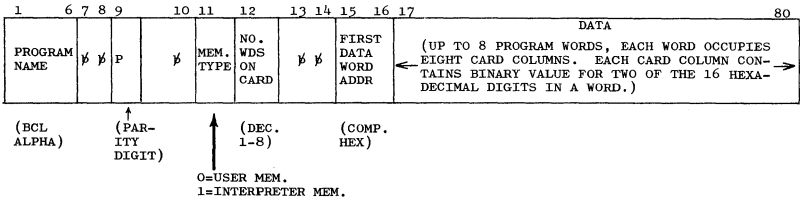


SEGMENT HEADER CARD (96-COL.)

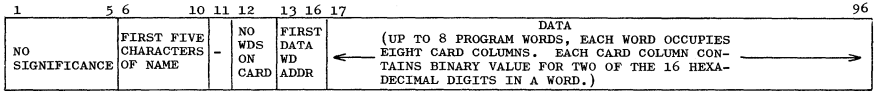


OBJECT (USER) PROGRAM CARD FORMATS (CONT)

DATA CARD (80-COL.)

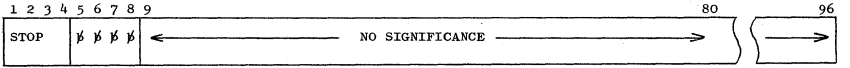


DATA CARD (96-COL.)



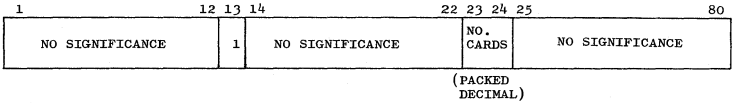
OBJECT (USER) PROGRAM CARD FORMATS (CONT)

STOP CARD (80 OR 96 COL.)

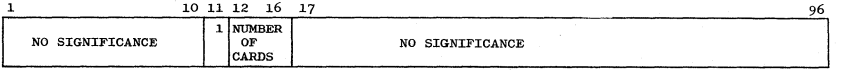


(80-COL. = ASCII PACKED HEX)
(96-COL. = BCL)
(␣ = BLANK)

END CARD (80-COL.)



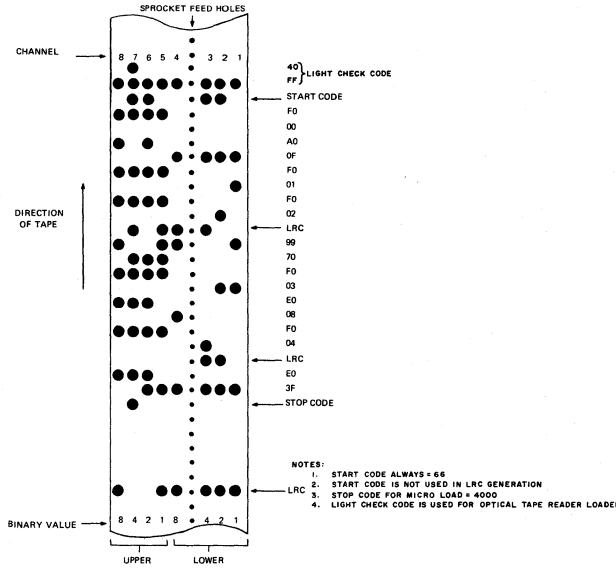
END CARD (96-COL.)



PARAMETER CARD FORMATS RJE

PARAMETER	CARD COLUMNS	ENTRY	DEFAULT VALUE
RECEIVE RETRY LIMIT	1 THROUGH 11	RXRTY = XXXXX WHERE: XXXXX IS DECIMAL VALUE LESS THAN 65536.	100
TRANSMIT RETRY LIMIT	1 THROUGH 11	TXRTY = XXXXX WHERE: XXXXX IS DECIMAL VALUE LESS THAN 65536.	100
NO-RESPONSE RETRY LIMIT	1 THROUGH 11	NORSP = XXXXX WHERE: XXXXX IS DECIMAL VALUE LESS THAN 65536.	100
LINE TYPE	1 THROUGH 7	LINES = X WHERE X = MODE AS FOLLOWS: X MODE 2 ASYNCHRONOUS (LEASED) 3 ASYNCHRONOUS (SWITCHED) 4 DIRECT CONNECT 8 SYNCHRONOUS (LEASED) 9 SYNCHRONOUS (SWITCHED)	9
TRANSMIT DELAY	1 THROUGH 10	TDLAY = XXXXX WHERE: XXXXX IS DECIMAL VALUE OF DELAY IN MILLI-SECONDS (DELAY BETWEEN REQUEST-TO-SEND AND DATA TRANSMISSION).	NA
NO-RESPONSE TIME VALUE	1 THROUGH 10	NRLAY = XXXXX WHERE: XXXXX IS NO-RESPONSE VALUE IN MILLISECONDS	2.5 SECONDS
RECEIVE DELAY	1 THROUGH 10	RDLAY = XXXXX WHERE: XXXXX IS RECEIVE DELAY VALUE IN MILLISECONDS.	30 MILLISECONDS

PUNCHED PAPER TAPE COMPACT OBJECT CODE



NOTES:

1. START CODE ALWAYS = 66
2. START CODE IS NOT USED IN LRC GENERATION
3. STOP CODE FOR MICRO LOAD = 4000
4. LIGHT CHECK CODE IS USED FOR OPTICAL TAPE READER LOADER

SORT FIELD SPECIFIER CARD FORMATS

COL. NO.	FIELD NAME	TAG SORT	RECORD SORT	FULL SORT	BASIC SORT	UPDATE SORT
1-6	SORT MODE	X	X	X	X	X
7-11	MASTER FILE NAME	X	X	X		X
12	MASTER FILE DRIVE	X	X	X	X	X
13-17	TAG FILE NAME	X		X	X	X
18-22	OVERFLOW FILE NAME	X		X	X	X
23	ROUGH TABLE OPTION	X		X	X	
24	TAG FILE DRIVE	X		X	X	X
25-28	MEMORY SIZE (UNUSED)	X	X	X	X	X
29-30	BLOCKING FACTOR	X	X	X		
31-32	TOTAL KEY LENGTH	X	X	X		
33-35	KEY #1 POSITION	X	X	X		
36-37	KEY #1 LENGTH	X	X	X		
38-40	KEY #2 POSITION	X	X	X		
41-42	KEY #2 LENGTH	X	X	X		
43-45	KEY #3 POSITION	X	X	X		
46-47	KEY #3 LENGTH	X	X	X		
48-50	KEY #4 POSITION	X	X	X		
51-52	KEY #4 LENGTH	X	X	X		
53-55	KEY #5 POSITION	X	X	X		
56-57	KEY #5 LENGTH	X	X	X		
58-80	AVAILABLE TO USER (FOR 80-COLUMN CARD)					
58-96	AVAILABLE TO USER (FOR 96-COLUMN CARD)					

NOTE: X = FIELD APPLICABLE TO SORT

MEMORY ADDRESS CONVERSION

	"A"				"B"				"C"				"D"			
FE INDICATORS —	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1
SMADR LINES —	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

DECODING BINARY WEIGHT: 2 1 1

2 1 → MODULE SELECT

1 → STACK SIZE

MODULE SELECT

0 = MODULE 1
1 = MODULE 2
2 = MODULE 3

STACK SIZE

0 = LOWER 4K
1 = UPPER 4K

Y COMMON SWITCH

LOWER 4K →

Y DRIVER SWITCH	7 / 15	6 / 14	5 / 13	4 / 12	3 / 11	2 / 10	1 / 9	0 / 8
7	00 -03	20 -23	40 -43	60 -63	80 -83	A0 -A3	C0 -C3	E0 -E3
6	04 -07	24 -27	44 -47	64 -67	84 -87	A4 -A7	C4 -C7	E4 -E7
5	08 -0B	28 -2B	48 -4B	68 -6B	88 -8B	A8 -AB	C8 -CB	E8 -EB
4	0C -0F	2C -2F	4C -4F	6C -6F	8C -8F	AC -AF	CC -CF	EC -EF
3	10 -13	30 -33	50 -53	70 -73	90 -93	B0 -B3	D0 -D3	F0 -F3
2	14 -17	34 -37	54 -57	74 -77	94 -97	B4 -B7	D4 -D7	F4 -F7
1	18 -1B	38 -3B	58 -5B	78 -7B	98 -9B	B8 -BB	D8 -DB	F8 -FB
0	1C -1F	3C -3F	5C -5F	7C -7F	9C -9F	BC -BF	DC -DF	FC -FF

UPPER 4K ←

INDICATOR DIGITS B AND C

X COMMON SWITCH

X DRIVER SWITCH	7	6	5	4	3	2	1	0
7	00	08	10	18	20	28	30	38
6	01	09	11	19	21	29	31	39
5	02	0A	12	1A	22	2A	32	3A
4	03	0B	13	1B	23	2B	33	3B
3	04	0C	14	1C	24	2C	34	3C
2	05	0D	15	1D	25	2D	35	3D
1	06	0E	16	1E	26	2E	36	3E
0	07	0F	17	1F	27	2F	37	3F

INDICATOR DIGITS C (LEAST TWO BITS) AND D

MICROCONTROLS

	MPM BIT LOCATION																INSTR. TYPE
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
HEX. CODE⟶	8	4	2	1	8	4	2	1	8	4	2	1	8	4	2	1	
AMPCR =	0	0	LOAD AMPCR														II
MPCR =(Jump)	0	1	LOAD INCR & MPCR +1														II
CPCR =(Call)	1	0	AMPCR REPLACED BY MPCR LOAD INCR & MPCR +1														II
SAR =, LIT =	1	1	0	0	LOAD SAR				LOAD LIT								II
SAR =	1	1	0	1	LOAD SAR				ø ---------- ø								II
LIT =	1	1	1	0	ø ----- ø				LOAD LIT								II
ALL OTHERS	1	1	1	1	@ NANO ADDRESS												I

B7MPL
RESERVED
WORDS

NOTE: ø = Unused

@ = This bit is not used for addressing.

NANOCONTROLS

NANO BITS	CONDITION TESTED 1 2 3 4	FT CONDITION VALUE 5	LOGIC UNIT CONDITIONAL 6	CONDITION ADJUST AND EXT OP CONDITIONAL 7	CONDITION ADJUST 8 9 10
	0 0 0 0 GC1	0 NOT CND = SC	0 DO UNCONDITIONALLY	0 DO UNCONDITIONALLY	0 0 0
	0 0 0 1 GC2	1 CND = SC	1 DO COND IF SC	1 DO COND IF SC	0 0 1 SET LC2
	0 0 1 0 LC1				0 1 0 SET GC2
	0 0 1 1 LC2				0 1 1 RESET GC2
	0 1 0 0 MST				1 0 0 SET LC3
	0 1 0 1 LST				1 0 1 RESET GC1
	0 1 1 0 ABT				1 1 0 SET GC1
	0 1 1 1 AOV				1 1 1 SET LC1
	1 0 0 0 COV				
	1 0 0 1 RMI				
	1 0 1 0 RDC				
	1 0 1 1 IRQ				
	1 1 0 0 EXT				
	1 1 0 1 LC3				
	1 1 1 0 SRQ				
	1 1 1 1 URQ				

NANOCONTROLS (CONT)

NANO BITS	SUCCESSOR THEN PART SC = 1				SUCCESSOR ELSE PART SC = 0			ADDER X INPUT				ADDER Y INPUT								INHIBIT CARRIES INTO BYTES	
	11	12	13		14	15	16	17	18	19		20	21	22	23	24	25	26		27	
	0	0	0	WAIT	0	0	0	0	0	0	(0)	0	0	–	–	–	–	–	BO--	0	ALLOW
	0	0	1	STEP	0	0	1	0	0	1	LIT	0	1	–	–	–	–	–	BT--	1	INHIBIT
	0	1	0	SAVE	0	1	0	0	1	1	CTR	1	0	–	–	–	–	–	BF--		
	0	1	1	SKIP	0	1	1	1	0	0	Z	1	1	–	–	–	–	–	B1--		
	1	0	0	EXEC	1	0	0	1	0	1	A1	–	–	0	0	0	–	–	B-O-		
	1	0	1	JUMP	1	0	1	1	1	0	A2	–	–	1	0	0	–	–	B-T-		
	1	1	0	CALL	1	1	0	1	1	1	A3	–	–	–	–	–	0	0	B--O		
	1	1	1	RETN	1	1	1					–	–	–	–	–	0	–	B--T		
												–	–	–	–	–	1	0	B--F		
												–	–	–	–	–	1	1	B--1		
												*	*	1	0	0	*	*	B-F-		
												*	*	0	0	0	*	*	B-1-		
												0	0	0	0	1	0	1	LIT		
												0	1	0	1	1	0	0	CTR		
												0	1	1	0	1	0	1	Z		
												0	0	1	1	0	0	1	AMPCR		
												0	1	1	1	1	0	1	BMAR		
												* Use Adder Operation with Complement Y									

NANOCONTROLS (CONT)

NANO BITS	ADDER OPERATION							SHIFT TYPE SELECTION FOR BSW				A REGISTER INPUT FROM BSW				
	28	29	30	31			LOGIC	32	33			34	35	36		
	0	0	0	0	X	+ Y		0	0		NO SHIFT	0	0	0	--	NO CHANGE
	0	0	0	1	X	NOR Y	$\overline{X \vee Y}$	0	1	R	RIGHT END OFF	1	-	-	A1	
	0	0	1	0	X	NRI Y	$\overline{X}Y$	1	0	L	LEFT END OFF	-	1	-	A2	
	0	0	1	1	X+	Y +1		1	1	C	RIGHT CIRCULAR	-	-	1	A3	
	0	1	0	0	X	NAN Y	$\overline{X} \vee \overline{Y}$									
	0	1	0	1	X	OAD Y	$X+(X \vee Y)$									
	0	1	1	0	X	XOR Y	$X\overline{Y} \vee \overline{X}Y$									
	0	1	1	1	X	NIM Y	$X\overline{Y}$									
	1	0	0	0	X	IMP Y	$\overline{X} \vee Y$									
	1	0	0	1	X	EQV Y	$XY \vee \overline{X}\overline{Y}$									
	1	0	1	0	X	AAD Y	$X+(XY)$									
	1	0	1	1	X	AND Y	XY									
	1	1	0	0	X-	Y -1	$X + \overline{Y}$									
	1	1	0	1	X	RIM Y	$X \vee \overline{Y}$									
	1	1	1	0	X	OR Y	$X \vee Y$									
	1	1	1	1	X	- Y	$X+\overline{Y}+1$									

NANOCONTROLS (CONT)

NANO BITS

B REGISTER INPUT SELECT						MIR INPUT FROM BSW		AMPCR INPUT FROM BSW		MEMORY DEVICE ADDRESS INPUT					
37	38	39	40			41		42		43	44	45	46		
0	0	0	0		NO CHANGE	0	NO CHANGE	0	NO CHANGE	0	0	0	-		NO CHANGE
0	0	0	1	BC4	COMP 4 BIT CARRIES	1	MIR	1	AMPCR	-	-	1	0	LMAR	FROM LIT
1	0	0	0	BAD	ADDER					-	-	1	1	MAR	FROM BSW
1	0	0	1	BC8	COMP 8 BIT CARRIES					-	1	0	-	BR2	FROM BSW
1	0	1	0	BBA	BSW▾ ADDER					-	1	1	1	MAR2	FROM BSW
1	0	1	1	B	BSW					1	-	0	-	BR1	FROM BSW
1	1	0	0	BEX	EXTERNAL					1	-	1	1	MAR1	FROM BSW
1	1	0	1	BMI	MIR										
1	1	1	0	BBE	BSW▾ EXTERNAL										
1	1	1	1	BBI	BSW▾ MIR										

NANO BITS

COUNTER INPUT					SAR INPUT				MEMORY DEVICE OPERATION					SAVE SIGN BIT		PARITY
46	47	48			49	50			51	52	53	54		55		56
-	0	0		NO CHANGE	0	0		NO CHANGE	0	0	0	0	NO CHANGE	0	DO NOT SAVE	0**
0	0	1	LCTR	FROM LIT	0	1	CSAR	COMPLEMENT	0	0	1	0	MR1	1	SAVE	1
1	0	1	CTR	FROM BSW	1	0	SAR	FROM BSW	0	0	1	1	MR2			
-	1	0	INC	+1					0	1	0	0	IOL			
									0	1	1	0	MW1			
									0	1	1	1	MW2			
									1	0	0	0	ASR			
									1	0	1	0	DR1			
									1	0	1	1	DR2			
									1	1	0	-	USEL			
									1	1	1	0	DW1			
									1	1	1	1	DW2			

** State of bit set so as to produce odd parity in NPN word.

NANOINSTRUCTION LIST

ADDR.	INSTRUCTION	ADDR.	INSTRUCTION	ADDR.	INSTRUCTION
0000 *	WAIT.	0021	A2.	0042	A3 = A1.
0001	A1.	0022	A2 EQV BOOO.	0043	A3 = A2.
0002 *	IF GC1 STEP ELSE SKIP.	0023	A2 = AMPCR.	0044	A3 = A3 C.
0003	A1 EQV B.	0024	A2 = A1.	0045	A3 = A3 L.
0004	A1 EQV BOOO.	0025	A2 = A2 C.	0046	A3 = A3 R.
0005 *	IF GC1 STEP ELSE RETN.	0026	A2 = A2 L.	0047	A3 = A3 AND LIT.
0006 *	SET GC1.	0027	A2 = A2 R.	0048	A3 = A3 OR B.
0007	A1 = AMPCR.	0028	A2 = A2 OR B.	0049	A3 = A3 XOR B.
0008 *	IF GC1 SKIP.	0029	A2 = A2 + LIT.	004A	A3 = A3 OR LIT.
0009	A1 = A1 AND LIT.	002A	A2 = A2 + 1.	004B	A3 = A3 - 1.
000A	A1 = A1 - LIT.	002B	A2 = A2 - 1.	004C	A3 = A3 + 1.
000B	A1 = A1 L.	002C	A2 NAN LIT.	004D	A3 = A3 + B.
000C *	RESET GC1.	002D	A2 = A2 AND LIT.	004E	A3 = A3 + LIT.
000D	A1 = A1 R.	002E *	IF COV SKIP.	004F	A3 = A3 - LIT.
000E *	IF NOT GC1 EXEC.		(Bit 5 ignored)	0050 *	IF ABT SET LC1.
000F	A1 = A1 - 1.	002F	A2 = A2 OR LIT.	0051	A3 = B.
0010	A1 = A1 + B.	0030 *	INC.	0052	A3 = B L.
0011	A1 = A1 + LIT.	0031	A2 = A2 + B.	0053	A3 = B R.
0012	A1 = A1 + 1.	0032	A2 = A3.	0054	A3 = BOOO.
0013	A1 = A2.	0033	A2 = B.	0055	A3 = BOO1.
0014 *	IF LC1 SKIP.	0034	A2 = BOOO.	0056	A3 = BMAR.
0015 *	IF LC2 SKIP.	0035	A2 = BMAR.	0057	A3 = LIT L.
0016	A1 = A3.	0036	A2 = B L.	0058	A3 = LIT.
0017	A1 = B.	0037	A2 = B R.	0059	A3 = LIT AND B.
0018 *	SET LC1.	0038	A2 = LIT.	005A	A3 = Z.
0019 *	SET LC2.	0039	A2 = LIT L.	005B	AMPCR = B.
001A *	SET LC3.	003A	A2 = LIT + B.	005C	AMPCR = A1.
001B	A1 = B L.	003B	A3.	005D	ASE.
001C	A1 = BMAR.	003C	A3 EQV B.	005E	ASR.
001D	A1 = LIT.	003D	A3 EQV BOOO.	005F	B.
001E *	IF LC3 SKIP.	003E	A3 EQV LIT.	0060	B = AMPCR.
	(Bit 5 ignored)	003F	A3 EQV Z.	0061	B = A1 L.
001F *	RESET GC2.	0040	A3 - B.	0062	B = A1 AND LIT.
0020	A1 = LIT + B.	0041	A3 = AMPCR.	0063	B = A1 + B.

NOTE: * INDICATES ENTRY OUT OF ALPHABETICAL ORDER.

NANOINSTRUCTION LIST (CONT)

ADDR.	INSTRUCTION	ADDR.	INSTRUCTION	ADDR.	INSTRUCTION
0064	B = A1 - B.	0086	B = LIT AND B.	00A8	IF LC1 SET LC1 SKIP.
0065	B = A1 OR B.	0087	B = LIT OR B.	00A9	IF LC2 STEP.
0066	B = A1.	0088	B = LIT - B.	00AA	IF LC2 JUMP.
0067	B = A1 R.	0089	B = LIT.	00AB	IF LC2 SET LC2 ELSE SKIP.
0068	B = A2.	008A	B = Z.	00AC	IF LC2 SET LC2 SKIP.
0069	B = A2 R.	008B	BBI = B.	00AD	IF LC3 STEP.
006A	B = A2 L.	008C	BMI, MIR = B.	00AE	IF LC3 SET LC3 SKIP.
006B	B = A2 + B.	008D	BMI.	00AF	IF LC3 SET LC3 ELSE SKIP.
006C	B = A2 OR B.	008E	BR2 = A2 OR B100.	00B0	IF LST SET LC1.
006D	B = A2 AND LIT.	008F	BR2 = LIT L.	00B1	IF LST JUMP.
006E	B = A3 + B.	0090	BR2 = A2.	00B2	IF LST SKIP.
006F	B = A3 OR B.	0091	CALL.	00B3	IF MST SKIP.
0070	B = A3 - B.	0092	CSAR.	00B4	IF NOT ABT JUMP.
0071	B = A3.	0093	CSAR, B = B L.	00B5	IF NOT ABT SKIP.
0072	B = A3 R.	0094	CTR = B001 + 1.	00B6	IF NOT AOV JUMP.
0073	B = A3 L.	0095	CTR = B.	00B7	IF NOT AOV SKIP.
0074	B = A3 AND LIT.	0096	DR1 BEX.	00B8	IF NOT COV SKIP.
0075	B = BTT0.	0097	DR2 BEX.	00B9	IF NOT COV JUMP.
0076	B = B111.	0098	DW2.	00BA	IF NOT EXT SKIP.
0077	B = B001.	0099	DW1.	00BB	IF NOT GC1 SKIP.
0078	B = BOTT.	009A	EXEC.	00BC	IF NOT GC2 SKIP.
0079	B = B100.	009B	IF ABT LUOP, JUMP.	00BD	IF NOT IRQ SKIP.
007A	B = B1TT.	009C	IF ABT JUMP.	00BE	IF NOT LC1 JUMP.
007B	B = B000.	009D	IF ABT SKIP.	00BF	IF NOT LC1 SKIP.
007C	B = B L.	009E	IF AOV SKIP.	00C0	IF NOT LC2 SKIP.
007D	B = B C.	009F	IF COV JUMP.	00C1	IF NOT LC3 SKIP.
007E	B = B + 1.	00A0	IF EXT SKIP.	00C2	IF NOT LST JUMP.
007F	B = B R.	00A1	IF GC1 JUMP.	00C3	IF NOT LST SKIP.
0080	B = BMAR.	00A2	IF GC2 SKIP.	00C4	IF NOT MST SKIP.
0081	B = NOT CTR R.	00A3	IF IRQ EXEC.	00C5	IF SRQ THEN DR2 BEX SKIP.
0082	B = LIT L.	00A4	IF IRQ JUMP.	00C6	IF SRQ DW2 SKIP.
0083	B = LIT + B.	00A5	IF LC1 STEP.	00C7	IF URQ SET LC2 ELSE JUMP.
0084	B = LIT NRI B.	00A6	IF LC1 JUMP.	00C8	INC IF COV SKIP.
0085	B = LIT XOR B.	00A7	IF LC1 SET LC1 ELSE SKIP.	00C9	JUMP.

NANOINSTRUCTION LIST (CONT)

ADDR.	INSTRUCTION
00CA	LCTR.
00CB	LIT EQV B.
00CC	LIT - B.
00CD	LIT NAN B.
00CE	LMAR.
00CF	MAR1 = AMPCR.
00D0	MAR1 = A1.
00D1	MAR1 = A2.
00D2	MAR1 = A3.
00D3	MAR1 = A3 + LIT.
00D4	MAR1 = A3 + 1.
00D5	MAR1 = B.
00D6	MAR1 = B + 1.
00D7	MAR1 = BMAR + 1.
00D8	MAR1 = LIT.
00D9	MAR1 = LIT + B.
00DA	MIR = AMPCR.
00DB	MIR = A1.
00DC	MIR = A1 + B.
00DD	MIR = A2.
00DE	MIR = A3.
00DF	MIR = A3 OR B.
00E0	MIR = A3 OR LIT.
00E1	MIR = B.
00E2	MIR = B C.
00E3	MIR = B + 1.
00E4	MIR = B L.
00E5	MIR = B R.
00E6	MIR = B000.
00E7	MIR = B001.
00E8	MIR = B111.
00E9	MIR = BMAR.
00EA	MIR = LIT.
00EB	MIR = LIT AND B.
00EC	MIR = LIT OR B.
00ED	MIR = LIT + B.
00EE	MIR = LIT L.
00EF	MIR = Z.
00F0	MIR = 0 + Z + 1.
00F1	MR1.
00F2	MR1 A1 = A1 + 1.
00F3	MW1.
00F4	SAR = B.
00F5	SAVE.
00F6	SET GC2.
00F7	SKIP.
00F8	WHEN IRQ STEP.
00F9	WHEN RDC BEX.
00FA	WHEN RDC BEX, MAR1 = BMAR + 1.
00FB	WHEN RMI MAR1 = BMAR + 1.
00FC	WHEN SRQ STEP.
00FD	WHEN URQ STEP.
00FE	Z EQV B.
00FF	0 EQV B.
0100	AMPCR = A1 + AMPCR.
0101	AMPCR = A3.
0102	AMPCR = A2.
0103	AMPCR = A2 + AMPCR.
0104	AMPCR = A3 + AMPCR.
0105	AMPCR = AMPCR + 1.
0106	AMPCR = LIT + B.
0107	ASE, BMI, MAR1 = B, JUMP.
0108	ASR BEX.
0109	A1 - LIT - 1.
010A	A1 = LIT EQV B.
010B	A1 = A1 C.
010C	A1 = A1 NIM B.
010D	A1 = A1 OR B.
010E	A1 = B + 1.
010F	A1 = B000.
0110	A1 = B111 R.
0111	A1 EQV LIT.
0112	A1 EQV Z.
0113	A1 = LIT - B.
0114	A1 EQV 0, IF COV SKIP.
0115	A1 = Z.
0116	A2 EQV B.
0117	A2 EQV LIT.
0118	A2 EQV 0, IF LC2 SET LC2 SKIP.
0119	A2 - B.
011A	A2 - B - 1.
011B	A2 - LIT.
011C	A2 RIM LIT.
011D	A2 = A2 + AMPCR.
011E	A2 = A2 - B.
011F	A2 = A2 - LIT.
0120	A2 = A2 XOR LIT.
0121	A2 = A2 XOR B111.
0122	A2 = A3 L.
0123	A2 = B C.
0124	A2 EQV Z.
0125	A2 = LIT C.
0126	A2 = LIT AND B.
0127	A2 = LIT - B.
0128	A2 = Z.
0129	A2 BC4 = A3 + B.
012A	A3 NAN B.
012B	A3 - B - 1.
012C	A3 - LIT.
012D	A3 = A2 C.
012E	A3 = A2 L.
012F	A3 = A2 R.
0130	A3 = A3 AND B.

NANOINSTRUCTION LIST (CONT)

ADDR.	INSTRUCTION
0131	A3 = A3 - B.
0132	A3 = A3 NIM B.
0133	A3 = A3 AND B110.
0134	A3 = A3 - B C, IF NOT AOV SET LC1, JUMP ELSE JUMP.
0135	A3 = A3 - B C, IF AOV SET LC1, JUMP ELSE JUMP.
0136	A3 = A3 XOR LIT.
0137	A3 = B110.
0138	A3 = B111 L.
0139	A3 = B111 R.
013A	A3 = B + 1.
013B	A3 = LIT NRI B.
013C	A3 = LIT + B.
013D	A3 = 0 + LIT.
013E	A3 SSC = A2 L.
013F	A3 SSC = A2 R.
0140	A3 SSC = LIT + B.
0141	B = A1 AND B.
0142	B = A1 XOR B.
0143	B = A2 AND B.
0144	B = A2 NIM B.
0145	B = A2 XOR B.
0146	B = A2 - LIT.
0147	B = A2 C.
0148	B = A3 - 1.
0149	B = A3 + 1.
014A	B = A3 AND B.
014B	B = A3 C.
014C	B = A3 NRI B.
014D	B = A3 NRI B C.
014E	B = A3 XOR B R.
014F	B = A3 R, IF ABT SKIP.
0150	B = B000 JUMP.
0151	B = B001 JUMP.
0152	B = B100 JUMP.
0153	B = B101.
0154	B = B111 R.
0155	B = B01T.
0156	B = BT00.
0157	B = BT0T.
0158	B = BTT1.
0159	B = BFTF.
015A	B = CTR.
015B	B = LIT - 1.
015C	B = LIT NRI B C.
015D	B = LIT XOR B L.
015E	B = Z AAD B.
015F	B = Z IMP B.
0160	B = Z NAN B.
0161	B = Z NOR B.
0162	B = 0 - B.
0163	B = 0 - B - 1.
0164	B = 0 - LIT.
0165	B = 0 - LIT - 1.
0166	BAD A3 = A3 + B.
0167	BBI = B R.
0168	BC4.
0169	BC4 CSAR, A3 = A3 - B C.
016A	BC4 SAR = B001.
016B	BC8.
016C	BR1 = LIT L.
016D	BR2 = A3 L.
016E	BR2 = B.
016F	BR2 = B1TT.
0170	CSAR A1 = A3 L.
0171	CSAR A3 = B R.
0172	CSAR, B = B C.
0173	CSAR BC4 A3 = A3 + B C.
0174	CSAR MIR = B000.
0175	CTR = A1.
0176	CTR = A1, IF ABT SKIP.
0177	CTR = A2 R.
0178	CTR = A3.
0179	CTR = BMAR + 1.
017A	CTR = CTR + LIT + 1.
017B	CTR EQV 0.
017C	CTR = LIT + CTR.
017D	DLD.
017E	DR2 BEX, BR2 = B.
017F	IF ABT LUOP ELSE SKIP.
0180	IF ABT RESET GC1.
0181	IF ABT RESET GC2.
0182	IF ABT SET LC2.
0183	IF AOV JUMP.
0184	IF GC1 SET LC1 SKIP.
0185	IF GC1 SET LC2 SKIP.
0186	IF GC1 STEP ELSE EXEC.
0187	IF GC1 STEP ELSE JUMP.
0188	IF GC1 STEP ELSE SAVE.
0189	IF GC1 STEP ELSE WAIT.
018A	IF GC1 RETN.
018B	IF GC1 SAVE.
018C	IF GC1 WAIT.
018D	IF IRQ, ASR, BEX, JUMP.
018E	IF IRQ SKIP.
018F	IF LC1 A2 = A2 + 1.
0190	IF LC1 INC.
0191	IF LC1 SET LC1 ELSE JUMP.
0192	IF LC2 SET LC2 ELSE JUMP.

NANOINSTRUCTION LIST (CONT)

ADDR.	INSTRUCTION
0193	IF LC2 SET LC2 JUMP.
0194	IF LC3 SET LC3 ELSE JUMP.
0195	IF LST CALL.
0196	IF LST SET GC1
0197	IF LST SET LC2.
0198	IF LST SET LC2 SKIP.
0199	IF NOT ABT RESET GC1.
019A	IF NOT ABT SET GC1.
019B	IF NOT ABT SET LC1.
019C	IF NOT GC1 JUMP.
019D	IF NOT GC1 SET GC1 JUMP.
019E	IF NOT GC1 STEP ELSE SKIP.
019F	IF NOT GC2 JUMP.
01A0	IF NOT GC2 LUOP SKIP.
01A1	IF NOT GC2 SET GC2 JUMP.
01A2	IF NOT LC1 SET LC1.
01A3	IF NOT LC1 SET LC1 ELSE SKIP.
01A4	IF NOT LC1 SET LC1 SKIP.
01A5	IF NOT LC1 SET LC1 JUMP.
01A6	IF NOT LC2 SET LC2 JUMP.
01A7	IF NOT LC3 JUMP.
01A8	IF NOT LC3 SET LC3 JUMP.
01A9	IF NOT LC3 SET LC3 SKIP.
01AA	IF NOT LST SET GC2 JUMP.
01AB	IF NOT MST JUMP.
01AC	IF NOT IRQ JUMP.
01AD	IF NOT SRQ SKIP.
01AE	IF NOT URQ SKIP.
01AF	IF MST JUMP.
01B0	IF MST SET LC1.
01B1	IF SRQ THEN DW2 JUMP.
01B2	IF URQ SET GC1 ELSE JUMP.
01B3	IF URQ SET GC2 ELSE JUMP.
01B4	IF URQ SET LC2.
01B5	IF URQ SKIP.
01B6	INC, B = BMAR.
01B7	INC IF COV JUMP.
01B8	INC, IF NOT COV SKIP ELSE STEP.
01B9	INC, SAVE.
01BA	LIT EQV 0.
01BB	LIT IMP B.
01BC	MAR1 = A1 + LIT.
01BD	MAR1 = A2 + 1.
01BE	MAR1 = A2 + B.
01BF	MAR1 = A2 + LIT.
01C0	MAR1 = A3 + AMPCR.
01C1	MAR1 = A3 - B.
01C2	MAR1 = B R. **********(B711)*********
01C2	MAR1 = B R, SKIP.********(B705)*********
01C3	MAR1 = BOO1.
01C4	MAR1 = BOO1 + 1.
01C5	MAR1 = BMAR + 1 IF NOT COV JUMP ELSE SAVE.
01C6	MAR1 = LIT XOR BMAR.
01C7	MIR = AMPCR + 1.
01C8	MIR = A1 L.
01C9	MIR = A2 L.
01CA	MIR = A2 + B.
01CB	MIR = A2 OR B.
01CC	MIR = A2 OR LIT.
01CD	MIR = A3 L.
01CE	MIR = A3 R.
01CF	MIR = A3 AND B.
01D0	MIR = A3 AND LIT.
01D1	MIR = A3 AND LIT L.
01D2	MIR = A3 + B.
01D3	MIR = A3 - B.
01D4	MIR = B, SAVE.
01D5	MIR = BOO1 + 1.

NANOINSTRUCTION LIST (CONT)

ADDR.	INSTRUCTION
01D6	MIR = NOT CTR R.
01D7	MIR = Z + B001.
01D8	MIR = 0 AAD Z.
01D9	MIR = 0 0AD B000.
01DA	MIR = 0 0AD Z.
01DB	MIR = 0 + Z.
01DC	MIR = 0 - Z.
01DD	MIR = 0 - Z - 1.
01DE	MIR BC8 = A1 + B IC.
01DF	MR1, A3 = B R.
01E0	MR1, CTR = B.
01E1	MR1, IF LC1 STEP.
01E2	MR1, INC.
01E3	MR1, MIR = B.
01E4	MW1, A2 = A2 + 1.
01E5	MW1, INC, A3 = A3 XOR B.
01E6	RESET GC1, SAVE.

ADDR.	INSTRUCTION
01E7	RETN.
01E8	SAR = A2 R.
01E9	SAR = A3 R.
01EA	SAR = B L.
01EB	SET GC1, JUMP.
01EC	WHEN RDC BEX JUMP.
01ED	WHEN RDC THEN BEX, A1 = A1 + 1, JUMP.
01EE	WHEN RDC THEN BEX, A2 = A2 + 1, JUMP.
01EF	WHEN RDC BEX A3 = B.
01F0	WHEN RDC BEX CTR = B.
01F1	WHEN RDC BEX, MAR1 = A1.
01F2	WHEN RDC BEX, MAR1 = B, JUMP.
01F3	WHEN RDC THEN BEX, MAR1 = BMAR + 1, JUMP.
01F4	WHEN RMI A1 = A1 + 1, JUMP.
01F5	WHEN RMI A2 = A2 + 1, JUMP.
01F6	WHEN RMI THEN MAR1 = BMAR + 1, JUMP.
01F7	WHEN RMI MAR1 = LIT.

NANOMEMORY DECODING

TIMING AND GENERAL ACTION	N-MEMORY BITS	SPECIFIC ACTION	
DURING PHASE 1			
Conditional Control	1-4	Condition selection	
	5	Condition test (true/complement)	
	6	Conditionally update command register from bits 17-50 of nanomemory	
	7	Conditionally initiate actions shown below under "at end of Phase 1"	
AT END OF PHASE 1			
(a) Successor Determination	11-16	Microprogram address (MPAD) controls	
(b) External Operations	8-10	Condition adjust (local; global; interrupt Interpreters)	
	51-54	Request signals for main memory or peripheral device operations	
PHASE 3			
Adder Operation Commands	17-19	Adder input X select	
	20-26	Adder input Y select	
	27	Inhibit carries	
	28-31	Adder or logic operation	
		Dynamic conditions available for test in concurrent phase 1	
	32-33	Shift (right, left, circular) by amount in SAR	
AT END OF PHASE 3			
Destination Specification	34-36	Input to A registers (A1, A2, A3) from BSW.	
	37-40	B register input source selection	
	41	MIR input from BSW	
	42	AMPCR input from BSW	Input clock commands
	43	BR1 input from BSW	
	44	BR2 input from BSW	
	45-46	MAR input from BSW or LIT	
	47-48	CTR input from LIT, BSW, or increment CTR	
	49-50	SAR input from BSW, or complement SAR	
	55	Load SSF	

S-LEVEL INSTRUCTIONS

OP CODE	INSTRUCTION	OP CODE	INSTRUCTION	OP CODE	INSTRUCTION
00	ADD 4 ACM IX	34	CLKB 4	57	DIV 6 LIT ACM
02	MVE 4 ACM IX	34	OFF 4	60	BRU 6
06	MVD 4 AVM	34	RR 4	61	SRJ 6
08	REM 4	34	STOP 4	62	BRPS 6
08	DATE	35	PC 4 LIT	63	BRC A2
09	LSR 4	37	RPOS	65	COMM 6 M/2 ACM
0A	INK 4 ACM	37	SPOS	67	SIND 6
0C	RST 4 F G	40	MVE 6 M ACM	68	PNS- 6 ACM
0D	SET 4 F G	41	MVE 6 M/2 ACM	69	PNS+ 6 ACM
0E	CHG 4 F G	42	MVE 6 ACM M	6A	PN 6 ACM
18	NK 4 KBD ACM	43	MVE 6 ACM M/2	6B	PC+- 6 LIT LIT
19	NKR 4 KBD ACM	44	ADD 6 LIT ACM	6C	TK KBD
1A	SK 4	45	SUB 6 LIT ACM	6D	POS 6
1B	SKC AZ 4	46	MVE 6 LIT ACM	70	SKC LGA LIT 6
1D	LAT	47	COMN 6 LIT ACM	71	SKC LEA LIT 6
1F	SKID 4	48	ADD 6 M ACM	72	SKC LLA LIT 6
28	AL	49	ADD 6 M/2 ACM	73	SKC LUA LIT 6
29	AR 4	4A	ADD 6 ACM M	74	SKC AS F G 6
2A	ALTO 4	4B	ADD 6 ACM M/2	75	SKC ES F G 6
2B	ARTO 4	4C	SUB 6 M ACM	76	SKC ANS F G 6
2C	ALR 4	4D	SUB 6 M/2 ACM	77	SKC ENS F G 6
2D	OT 4	4E	SUB 6 ACM M	78	DUMP
2E	SWN	4F	SUB 6 ACM M/2	7C	TRAC 0
2E	SWC	50	CONV 6 D B	7C	TRAC 1
30	SRR 4	51	CONV 6 B D	7C	TRAC 2
31	PKA 4	52	IATA 6 ACM	7C	TRAC 6
32	PKB 4	53	COMM 6 M ACM	7D	SETB 6
33	PKC 4	54	MUL 6 M ACM	7E	RSTB 6
34	ALRM 4	55	DIV 6 M ACM	7F	LOAD
34	CT 4	56	MUL 6 LIT ACM	7F	ZIP

S-LEVEL INSTRUCTIONS (CONT)

OP CODE	INSTRUCTION
80	BRC LGA LIT 6
81	BRC LEA LIT 8
82	BRC LLA LIT 2
83	BRC LUA LIT 8
84	BRC AS F G 3
85	BRC ES F G 8
86	BRC ANS F G 8
87	BRC ENS F G 8
88	ADD 8 M/L IX
89	SUB 8 M/L IX
8A	MVE 8 M/L IX
8B	COM 8 M/L IX
8C	MVE 8 IX M
90	NK 8 KBD M
91	NKR 8 KBD M
94	EAM 6 KBD M
97	PA 8 M
9F	SCAN 8 M
A2	MAMK 8 ACM M
A4	BRU 8 IA
A5	EDIT 8 ACM M
AB	LOGL 8 ACM/M M/ACM
AE	CDC 8
AF	CDV 8
B0	RETM 8 MR
B1	LODM 8 MR
B2	IATM 8 ACM ML
B3	IATM 8 ACM MR
C0	CPRS 10
9C	SRJC 8 AS
9D	SRJC 8 FS

OP CODE	INSTRUCTION
C1	EXPD 10
C3	SPRD 10 LIT M
C4	MVE 10 S/CM C/SM
C5	MVE 10 S/CM S/CM
C6	SRCH 10 RG
C7	SRCH EQ 10
C8	SEA EQ 10
C9	SEA LW 10
CA	SEA LS 10
CC	MVE 10 M M
CD	MVE 10 M M/2
CE	MVE 10 M/2 M
CF	MVE 10 M/2 M/2
D0	COMN 10 M M
D1	COM 10 M M
D2	COMN 10 M/2 M/2
D4	COMN 10 LIT M
D6	ADDB 10 LIT M
D7	SUBB 10 LIT M
D8	PNS- M
D9	PNS+ 10 M
DA	PN 10 M
E0	MV4 10 M M
E1	CMCH M M
E2	CLCH 10 LIT M
E3	CLST 10 LIT M
E4	TKM 10 KBD M
E5	EXCH M M
E6	SRCH 10 H
D5	COMN LIT M/2 10

OP CODE	INSTRUCTION
E7	SRCH 10 L
E8	ADD 10 LIT M
E9	ADD 10 LIT M/2
EA	SUB 10 LIT M
EB	SUB 10 LIT M/2
EC	MVE 10 LIT M
ED	MVE 10 LIT M/2
EE	MUL 10 LIT M
F0	ADD 10 M M
F1	ADD 10 M M/2
F2	ADD 10 M/2 M
F3	ADD 10 M/2 M/2
F4	SUB 10 M M
F5	SUB 10 M M/2
F6	SUB 10 M/2 M
F7	SUB 10 M/2 M/2
F8	BRBS 10
F9	BRBN 10
FB	MVCH 10 M/ACM ACM/M
FC	SRJS 10
FD	MVSB 10
FD	MVSB 10
FD	MVBS 10
FD	MVBS 10
FD	READ/WRIT 10
FD	READ/WRIT 10
FE	DAC 10
FF	TBRU 10

DISK SYSTEM COLD START ERRORS

C = CONSOLE S = SPO B = BOTH

CONSOLE HEXADECIMAL "D" INDICATORS	SPO STATUS INDICATOR TOP - BOT	PRINTED MESSAGE	DESCRIPTION OF ERROR
FF	-	(S) CD PTY	80-COLUMN CARD LRC ERROR (CSTRT 80 PROGRAM)
FF	-		CASSETTE TAPE PREAMBLE CHARACTER MISSING (CSTRT-TC PROGRAM)
XX	-		DDP STATUS WORD BITS (9 THROUGH 16) (CSTRT-TC OR CSTRT-MT)

DISK PRIMER COLD START ERRORS

80 OR 81	0 0 1	(B) "TROUBLE" 0001 MPM PARITY-MPCR-MPM-OS REG. VAL.	CORE MEMORY PARITY ERROR IN MICRO PROGRAM AREA.
80 OR 82	0 1 0	(B) "TROUBLE" 0002 DPM PARITY REG. VAL.	CORE MEMORY PARITY ERROR OUTSIDE MICRO PROGRAM AREA.
80 OR 83	0 1 1	(B) "TROUBLE" 0003 NPM PARITY REG. VAL.	NANO MEMORY PARITY ERROR OR OUTSIDE NANO LIMIT.
80 OR 84	1 0 0	(B) "TROUBLE" 0004 ADDR LIMIT REG. VAL. ERROR	CORE MEMORY ADDRESS ABOVE LIMITS.

DISK SYSTEM ERROR MESSAGES AND OPERATOR RECOVERY

DISK PRIMER COLD START (DPCS) ERRORS

ERROR PRINTOUT	PROBABLE CAUSE	OPERATOR ACTION
ADDR DISK ERROR ***	A. BAD SECTOR ON DISK CARTRIDGE. OPERATE-COMPARE SUCCESSFUL BUT RETURNED ADDRESS INCORRECT. B. ILLEGAL TRACK ADDRESS.	A. INITIALIZE CARTRIDGE. B. THIS ERROR USUALLY INDICATES A FIRMWARE OR HARDWARE MALFUNCTION.
CD PRTY ERROR ***	80-COLUMN DATA CARD HAS FAILED LRC PARITY CHECK.	IF OPERATOR DESIRES TO IGNORE ERROR (FOR EXAMPLE, CARD HAS BEEN HAND-PUNCHED) PRESS PK1 TO CONTINUE. TO RETRY FAULTY CARD, REPLACE CARD IN INPUT HOPPER AND PRESS PK8. OTHERWISE, PRESS SYSTEM-CLEAR AND TRY ANOTHER DECK, STARTING AT LAST HEADER CARD TO HAVE BEEN READ.
COPY DISK ERROR ***	A TRACK WITHIN PROTECTED SPACE ON BOTTOM CARTRIDGE HAS BAD SEGMENT.	A. RE-INITIALIZE BOTTOM CARTRIDGE. B. TRY ANOTHER CARTRIDGE.
DATA CD ERROR ***	ADDRESS ON DATA CARD JUST READ IS LOWER THAN ADDRESS FIELD OF LAST PRECEDING HEADER CARD. IF USING CASSETTE OR MAGNETIC TAPE, TAPE IS BAD. AN "END" CARD MAY BE MISSING FROM DECK.	TRY ANOTHER DECK, CASSETTE, OR TAPE REEL.
DIRECTORY ERROR ***	NO PROTECTED DIRECTORY SPACE AVAILABLE FOR THIS LOAD.	THIS AND SUBSEQUENT LOADS REQUIRING DIRECTORY ENTRIES MUST BE MADE AFTER WARM START WITH S-LEVEL CARD LOADER UTILITY.
DVCE DISK ERROR ***	STATUS ERROR IN DISK UNIT WHICH FIRMWARE DOES NOT RECOGNIZE. DISK UNIT, PROCESSOR, OR FIRMWARE ERROR.	TECHNICAL ASSISTANCE REQUIRED.
DVCE TAPE ERROR ***	SAME AS "DVCE DISK ERROR", BUT REFERS TO CASSETTE DRIVE OR MAGNETIC TAPE UNIT.	CHECK THAT TAPE DRIVE IS OPERATIONAL.

DISK SYSTEM ERROR MESSAGES AND OPERATOR RECOVERY (CONT)

DISK PRIMER COLD START (DPCS) ERRORS (CONT)

ERROR PRINTOUT	PROBABLE CAUSE	OPERATOR ACTION
FILE DISK ERROR ***	A. DISK UNIT NOT OPERATIONAL. B. WRITE LOCKOUT ON DISK DRIVE. C. CABLE CONNECTOR TO DISK UNIT NOT PROPERLY SEATED.	A. READY UNIT. B. ENABLE WRITE ON CARTRIDGE. C. ENSURE PROPER CONNECTION TO DISK UNIT.
FILE TAPE ERROR ***	CASSETTE DRIVE OR MAGNETIC TAPE UNIT NOT OPERATIONAL.	READY UNIT.
HDR CRD ERROR ***	LOAD PHASE DID NOT FIND VALID HEADER CARD WHEN ONE WAS EXPECTED. EITHER HEADER CARD IS ERRONEOUS, OR DECK IS SCRAMBLED. IF USING CASSETTE OR MAGNETIC TAPE, TAPE IS INCORRECT.	A. CORRECT DECK AND RETRY LOAD. B. TRY ANOTHER CARTRIDGE OR TAPE REEL.
INIT DISK ERROR ***	MORE THAN 50 BAD SEGMENTS OR 9 BAD AREAS HAVE BEEN FOUND WHILE INITIALIZING THIS DISK CARTRIDGE. THIS CONDITION MAY ALSO BE CAUSED BY A MALFUNCTIONING DISK DRIVE.	A. RETRY INITIALIZATION. B. TRY ANOTHER CARTRIDGE. C. CHECK FOR PROPER FUNCTIONING OF DISK UNIT.
	CAUTION: ABOVE ERROR CONDITION MAY INDICATE SERIOUS MISALIGNMENT OF CARTRIDGE. DO NOT ATTEMPT MORE THAN ONE RETRY WITH THE SAME CARTRIDGE, OTHERWISE READ/WRITE HEADS MAY BE DAMAGED.	
LOAD DISK ERROR ***	CAN OCCUR DURING LOAD OR COPY PHASES IF ANY TRACK WITHIN PROTECTED SPACE ON TOP DISK CARTRIDGE HAS A BAD SEGMENT.	A. REINITIALIZE TOP CARTRIDGE. B. USE ANOTHER CARTRIDGE.
PRTY DISK ERROR ***	DURING ANY PHASE OF DPCS OPERATION, INDICATES AN LRC READ ERROR ON TOP CARTRIDGE.	A RETRY OF THE OPERATION MAY BE SUCCESSFUL, HOWEVER, A TRUE LRC ERROR MEANS THAT CARTRIDGE IS NO LONGER USABLE AND MUST BE INITIALIZED. ALL DATA ON CARTRIDGE WILL BE LOST. FIRST DETERMINE THAT DISK UNIT IS OPERATING PROPERLY BEFORE ATTEMPTING RETRY.

DISK SYSTEM ERROR MESSAGES AND OPERATOR RECOVERY (CONT)

DISK PRIMER COLD START (DPCS) ERRORS (CONT)

ERROR PRINTOUT	PROBABLE CAUSE	OPERATOR ACTION
PRTY TAPE ERROR ***	TAPE CASSETTE OR MAGNETIC TAPE RECORD HAS FAILED CYCLIC REDUNDANCY CHECK FOR DATA VALIDITY.	A. RETRY LOAD. B. TRY ANOTHER CASSETTE OR TAPE REEL.
SEEK DISK ERROR ***	SEEK ERROR ON DISK UNIT.	TECHNICAL ASSISTANCE REQUIRED.
SERV TAPE ERROR ***	SERVICE LATE ON DISK READ OR WRITE. DISK UNIT, PROCESSOR, OR FIRMWARE ERROR.	"DPCS" SOURCE MAY BE FAULTY; TRY AGAIN.
SERV TAPE ERROR ***	SERVICE LATE ON MAGNETIC TAPE OR CASSETTE READ OPERATION. TAPE DRIVE, PROCESSOR, OR FIRMWARE ERROR.	SAME AS "SERV DISK ERROR".
SPACE ERROR ***	NO PROTECTED DISK SPACE REMAINS FOR THIS LOAD.	IF THIS AND SUBSEQUENT LOADS MUST BE TO PROTECTED SPACE, THEN INITIALIZATION OF DISK AND COMPLETE COLD START IS REQUIRED. IF USING CARD INPUTS, SOME PROGRAMS MAY HAVE TO BE OMITTED FROM COLD START AND LOADED AFTER WARM START WITH S-LEVEL CARD LOADER UTILITY.
TAPE ERROR ***	A. CASSETTE RECORD IS MISSING A POSTAMBLE OR PREAMBLE CHARACTER. B. END OF TAPE REACHED WITHOUT FINDING "STOP" CARD IMAGE.	RETRY LOAD WITH THIS CASSETTE, OR TRY ANOTHER CASSETTE OR TAPE REEL.
TIME DISK ERROR ***	INSTRUCTION TIMEOUT ON DISK UNIT. CAN BE CAUSED BY HARDWARE MALFUNCTION OR BAD CARTRIDGE SECTOR ADDRESS.	A. DISK CARTRIDGE MAY REQUIRE INITIALIZATION. B. SYSTEM CLEAR BUTTON SHOULD BE PRESSED.

DISK SYSTEM WARM START (WSTRT) ERRORS (CONSOLE INDICATIONS)

HEX. "D" INDICATOR PATTERN	PROBABLE CAUSE	OPERATOR RESPONSE
01	MPM PARITY ERROR	TECHNICAL ASSISTANCE REQUIRED
02	DPM PARITY ERROR	TECHNICAL ASSISTANCE REQUIRED
03	NPM PARITY ERROR	TECHNICAL ASSISTANCE REQUIRED FIRMWARE CARTRIDGE MAY BE BAD.
04	ADDRESS LIMIT ERROR	FIRMWARE CARTRIDGE MAY BE BAD. TECHNICAL ASSISTANCE REQUIRED.
06	ERRONEOUS I/O ALGORITHM NUMBER	DEPRESS "RESET" KEY; RE-DO WARM-START USING CORRECT INFORMATION.
07	MEMORY SIZE ERROR	DEPRESS "RESET" KEY; REENTER CORRECT SIZE.
08	DISK UNIT NOT OPERATIONAL	READY UNIT. RECOVERY IS AUTOMATIC IF UNIT IS FUNCTIONING. ENSURE THAT CORRECT IOC/DDP NUMBER WAS ENTERED IN "HARDWARE CONFIGURATION".
09	TOP DISK UNIT IS NOT INTERPRETER	CARTRIDGE MAY BE BAD. CHANGE CARTRIDGE AND PRESS RESET KEY.
0A	DISK UNIT ERROR	RETRY ENTIRE WARMSTART. TECHNICAL ASSISTANCE MAY BE REQUIRED.
0B	DISK READ ERROR	RETRY ENTIRE WARMSTART. CARTRIDGE MAY BE BAD. TRY ANOTHER CARTRIDGE.
FF	DISK SECTOR ADDRESS COMPARE INCORRECT	RETRY ENTIRE WARMSTART. TECHNICAL ASSISTANCE MAY BE REQUIRED.
xx	INDICATES ACTUAL DISK STATUS WORD (BITS 9 THROUGH 16) FOR ALL OTHER ERRORS	

DISK SYSTEM WARM START (WSTRT) ERRORS (SPO MESSAGES)

MESSAGE	MEANING	OPERATOR RESPONSE*
"ERROR 0"	HARDWARE ERROR	NO ACTION; SYSTEM MUST BE MANUALLY CLEARED.
"ERROR 1"	INVALID INPUT	"HARDWARE CONFIGURATION" PRINTED; OPERATOR MUST REENTER ALL INFORMATION.
"ERROR 2"	DISK NOT READY	SYSTEM ATTEMPTS TO RELOAD ALL CODE MODULES.
"ERROR 3"	NON-SYSTEMS PLATTER	SYSTEM ATTEMPTS TO RELOAD ALL CODE MODULES.
"ERROR 4"	DISK STATUS ERROR	SYSTEM ATTEMPTS TO RELOAD ALL CODE MODULES.
"ERROR 5"	DISK PARITY ERROR	SYSTEM ATTEMPTS TO RELOAD ALL CODE MODULES.
"ERROR 6"	DISK ADDRESS ERROR	SYSTEM ATTEMPTS TO RELOAD ALL CODE MODULES.

* ACTION TAKEN AFTER ERROR PUSHBUTTON IS PRESSED.

DISK SYSTEM RESTART ERRORS

HARDWARE-DETECTED ERRORS

MESSAGES

MPM PARITY ERROR

DPM PARITY ERROR

NPM PARITY ERROR

DPM OVERLIMIT

NOTE: CONSOLE HEXADECIMAL D INDICATION 80. OPERATOR SHOULD RETRY ENTIRE PROCEDURE IN RESPONSE TO EACH ERROR CONDITION.

SOFTWARE-DETECTED ERRORS

CONSOLE/SPO MESSAGE	OPERATOR RESPONSE
DISK NOT OPERATIONAL	READY DISK UNIT; RETRY.
NOT A SYSTEMS PLATTER	PLACE CORRECT CARTRIDGE IN DRIVE 1.
DISK PARITY ERROR	RETRY OR REPLACE CARTRIDGE.
UNWANTED DISK STATUS	READY DISK UNIT; RETRY.

NOTE: THE RESET OR ERROR KEY IS ENABLED FOR THE OPERATOR TO REQUEST A RETRY OF THE DISK ACCESS.

DISK INITIALIZATION (MICRO-LEVEL UTILITY ERRORS)

NUMERIC ERROR MESSAGES

ERROR MSG NO.	PROBABLE CAUSE	OPERATOR RESPONSE
0000	DISK CARTRIDGE LOCKOUT	ENABLE WRITE DEVICE.
0001	DISK FILE NOT OPERATIONAL	READY DISK UNIT. CHECK CABLE CONNECTOR.
0002	DISK SEEK ERROR	PROCESSOR OR DISK UNIT MALFUNCTION REQUIRING TECHNICAL ASSISTANCE
0003	DISK TIMEOUT	FOR INITIALIZE: DEPRESS SYSTEM CLEAR, RETRY "INITD" FROM START. FOR COPY: DESTINATION DISK MAY REQUIRE INITIALIZATION. SOURCE DISK MAY BE IN ERROR. REPEATED ERRORS INDICATE NEED FOR TECHNICAL ASSISTANCE.
0004	SERVICE LATE	DEPRESS "SYSTEM CLEAR", RETRY "INITD" FROM START.
0005	ILLEGAL ADDRESS TRACK	PROCESSOR, DISK UNIT, OR PROGRAMMING ERROR. TECHNICAL ASSISTANCE REQUIRED.
0006	INITIALIZATION FAILURE (MORE THAN 50 BAD SEGMENTS OR 9 BAD AREAS)	RETRY ONLY ONCE WITH SAME CARTRIDGE. GENERALLY INDICATES DISK UNIT MALFUNCTION.
0009	DISK DEVICE ERROR	CAUSE NOT KNOWN, BUT 0001 IS MOST LIKELY.

DISK INITIALIZATION (MICRO-LEVEL UTILITY ERRORS) (CONT)

NARRATIVE ERROR MESSAGES (CONSOLE/SPO)

MESSAGE	MEANING
DRVE X ERR:	PREFIX TO NUMERIC ERROR MESSAGE FOR GIVEN DRIVE. (X = DRIVE NUMBER.)
COPY ERR AT	FOLLOWED BY FOUR HEX DIGIT DISK CONTROL WORD; INDICATES READ-AFTER-WRITE FAILURE IN COPY. OPERATOR MAY RETRY. DESTINATION CARTRIDGE MAY REQUIRE INITIALIZATION.
READ ERR AT	ALSO FOLLOWED BY FOUR HEX DIGITS; INDICATES PARITY ERROR ON SOURCE DISK BEING COPIED.
ADDR ERR AT	WITH HEX DIGITS, INDICATES SEGMENT ADDRESSING FOR THE TRACK SHOWN ON THE SOURCE DISK IS NOT SEQUENTIAL.
BAD SEGMENT	FOLLOWED BY FOUR HEX DIGITS, INDICATES SEGMENT FAILED READ-AFTER-WRITE CHECK DURING INITIALIZATION AND WAS DELETED FROM DISK AVAILABLE TABLES.
NOT FOR INT USE	BAD SEGMENT WAS FOUND WITHIN PROTECTED ZONE FOR INTERPRETER, HENCE THIS CARTRIDGE MUST NOT BE USED FOR INTERPRETERS.
INTERP REQUIRED	THE CARTRIDGE ON DRIVE 1 DOES NOT CONTAIN AN INTERPRETER. "INITD" WILL NOT TERMINATE TO INTERPRETER CONTROL.
ILLEGAL COPY	A REQUEST TO COPY A CARTRIDGE TO ITSELF IS ILLEGAL.
INV DRIVE	THE REQUESTED DISK DRIVE HAS NOT BEEN WARMSTARTED TO THE SYSTEM.
TRK 0 BAD - DISK UNUSABLE	BAD SEGMENT WAS FOUND IN TRACK 0 OF THIS CARTRIDGE. THE CARTRIDGE CANNOT BE USED FOR ANY PURPOSE. OPERATOR MAY WISH TO RETRY INITIALIZATION.

SYSTEM ERROR MESSAGES AND OPERATOR RECOVERY OPTIONS

SPO ERROR MESSAGE FORMAT

```
NN XXXXXXXXX:MMMMM

     WHERE:  NN IS UNIQUE TWO-DIGIT
             DECIMAL EXCEPTION CODE.

             XXXXXXXXX IS ABBREVIATED
             NARRATION OF EXCEPTION
             OR ERROR CONDITION.

             MMMMM IS RECOVERY OPTION
             SELECTED BY OPERATOR.
```

CONSOLE ERROR MESSAGE FORMAT

```
NN XXXXXXXXXX:M

     WHERE:  NN IS UNIQUE TWO-DIGIT
             DECIMAL EXCEPTION CODE.

             XXXXXXXXXX IS ABBREVIATED
             NARRATION OF EXCEPTION
             CONDITION.

             M IS RECOVERY OPTION
             SELECTED BY OPERATOR.
```

OPERATOR RECOVERY RESPONSES

A - RETRY INITIATE. (* FOR PARITY ERROR, RELOAD CARD READER AND RETRY INITIATE.)
B - ENABLES KEYBOARD TO ALLOW OPERATOR ENTRY OF FIVE-CHARACTER ALTERNATE FILE NAME.
C - ENTER NEW DEVICE NUMBER.
D - PURGE OLD FILE OR TAPE CASSETTE.
E - TERMINATE JOB.
F - END OF FILE.
G - IGNORE ERROR AND PROCESS.
H - DO NOT PUT OBJECT PROGRAM ON DISK.
I - LOAD CONTINUATION TAPE CASSETTE AND RETRY INITIATE.
J - GO TO READY MODE.

SYSTEM ERROR MESSAGES AND OPERATOR RECOVERY RESPONSES

ERROR MESSAGE / SPO ENTRY CONS. KEY / REMARKS	OPERATOR RESPONSE (PAGE 49) SKID1 SHIFT 1	SKID2 SHIFT 2	SKID3 SHIFT 3	SKID4 SHIFT 4
01 CR1 NOT RDY:	A*			F
02 CR2 NOT RDY:	A*			F
10 PT1 NOT RDY:	A			E
11 PT2 NOT RDY:	A			E
12 PT1 PAR ERR:	A	A	A	E
13 PT2 PAR ERR:	A	A	A	E
20 LP PAR ERR:	A	A		
21 LP NOT RDY:	A			
40 Cnn READ ERR:	A			E
41 Cnn PCH ERR:	A	G		
42 Cnn HOP EMP:	A			E
43 Cnn NOT RDY:	A*			
Cnn = 96-1,96-2,80-1, OR 80-2.				
DISK				
50 DSK SEEK ER:	A			E
51 DSK READ ER:	A	G		E
52 DSK WRIT ER:	A	G		E
53 DSK ADD ERR:	A			E
54 DSK DEV ERR:	A			E
55 N-F XXXXX:	A	B	C	E
56 D-F XXXXX:	A	B	D	H
57 NO USER DSK:	A		C	E
58 DSK INV KEY:	J	J	J	J
59 DKn NOT RDY:	A		C	
61 O-C XXXXX:	J	J	J	J
62 RT LENGTH:	J	J	J	J
CASSETTE AND MAGNETIC TAPE				
70 N-F XXXXX:	A	G	B	A
71 TPn NOT PRG: n=UNIT NO.	A	A	D	A
72 TPn TP REQD:	I	I	I	I
73 TPn REC LEN:	A	G		E
74 TPn LOCKED:	A			
75 TPn TP ERR:	A	G		E
76 TPn NOT RDY:	A	G		E
77 O-C XXXXX:	J	J	J	J
79 TPn OP REQD: TAPE ON CLEAR LEADER	A	A	G	A
80 TPn NO TM:	J	J	J	J
83 TPn REC ERR:	J	J	G	J
84 TPn BLK ERR:	J	J	G	J
XXXXX REEL #NNN REQD. XXXXX IS FILE NAME. NNN IS REEL NO.	A	A	A	E

UTILITY PROGRAM EXCEPTION CONDITION MESSAGES AND RECOVERY OPTIONS

EXCEPTION CONDITION (MESSAGE)	ATTEMPT RECOVERY USING SHIFTED NUMERIC KEY(S) 1	2	3	4
01 CR1 NOT RDY:	A*			B
02 CRD PAR ERR:	A*	C		G
10 PT1 NOT RDY:	A			G
11 PT2 NOT RDY:	A			G
14 PP1 NOT RDY:	A			G
15 PP2 NOT RDY:	A			G
16 PP1 ECHO CK:				G
17 PP2 ECHO CK:				G
20 LP PAR ERR:	A	C		G
21 LP NOT RDY:	A			G
40 C96 NOT RDY:	A*			B
50 DSK SEEK ER:	A			G
51 DSK READ ER:	A			G
52 DSK WRIT ER:	A			G
53 DSK ADD ERR:	A			G

EXCEPTION CONDITION (MESSAGE)	ATTEMPT RECOVERY USING SHIFTED NUMERIC KEY(S) 1	2	3	4
54 DSK DEV ERR:	A			G
55 N:F XXXXX:	A	D	E	G
56 D:F XXXXX:		D	F	G
57 NO USER DSK:	A		E	G
70 N-F XXXXX:	NOT APPLICABLE			
71 TPn NOT PRG:	A		H	G
72 TPn TP RQD:	A**			G
73 TPn RECD ER:	NOT APPLICABLE			
74 TPn LOCKED:	A			G
75 TPn TP ERR:	A	C		G
76 TPn NOT RDY:	A			G
79 TPn OP RQD:	NOT APPLICABLE			
81 TPn INV CONT:	A**			G
82 TPn NO BOF:XXXXX:	A	C		G
84 TPn REC ERR:	I	J		G

KEY FUNCTIONS

A - RETRY INITIATE. *FOR PARITY ERROR, RELOAD CARD READER AND RETRY INITIATE. **LOAD CONTINUATION TAPE AND RETRY INITIATE.

B - END OF FILE, NORMAL TERMINATION FOR BCL80, BCL96, I8096, AND O8096 PROGRAMS.

C - IGNORE ERROR AND PROCESS.

D - ENABLES KEYBOARD TO ALLOW OPERATOR ENTRY OF 5-CHARACTER ALTERNATE FILE NAME.

E - ENTER NEW DEVICE NUMBER

F - PURGE OLD FILE.

G - TERMINATE PROGRAM.

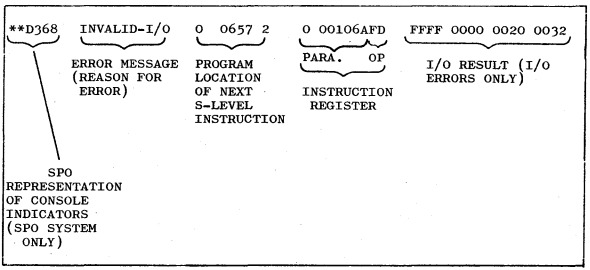
H - PURGE THE TAPE.

I - USE THE NUMBER OF TAPE RECORDS ACTUALLY READ TO COMPUTE THE NUMBER OF DISK RECORDS.

J - USE THE NUMBER OF TAPE RECORDS SPECIFIED THROUGH THE KEYBOARD TO COMPUTE THE NUMBER OF DISK RECORDS.

OPERATING SYSTEM ERRORS (FATAL)

DISPLAY FORMAT EXAMPLE



SPO REPRESENTATION (DISPLAY) OF CONSOLE INDICATORS

```
**ABCDS12345678

WHERE:  ** IS CONSTANT DENOTING DISPLAY FUNCTION.

          A, B, C, D, AND S DENOTE INDICATOR BANK(S), WHERE:
               A = PK1-PK8
               B = PK9-PK16
               C = PK17-PK24
               D = UNNUMBERED BANK
               S = R, A, N, OR E FOR READY, ALPHA,
                   NUMERIC, AND ERROR, RESPECTIVELY.
          1 THROUGH 8 REPRESENT INDICATORS OF DENOTED
            BANK(S) (A1-A8, B1-B8, ETC.)

EXAMPLES: **D18   (FIRST AND LAST ERROR INDICATORS LIT)
          **C6    (PK22 LIT)
          **AB34  (PK3, PK4, PK11, AND PK12 LIT)
          **SA    (ALPHA LIT)
          **SR    (READY LIT)
```

OPERATING SYSTEM ERRORS (FATAL) (CONT)

HARDWARE ERRORS

HEX "D" IND. PATTERN	ERROR MESSAGE	DESCRIPTION
80	(NO ERROR MSG)	HARDWARE DETECTED PARITY ERROR IN PAPER TAPE DATA DURING READ-IN OF DATA FROM CONSOLE MEMORY LOADER TO MPM.
81	MPM - PARITY	HARDWARE DETECTED PARITY ERROR IN MPM PORTION OF SHARED MEMORY WHILE ATTEMPTING TO ACCESS A MICROINSTRUCTION, OR PARITY ERROR WAS DETECTED IN MPM READ-AFTER-WRITE CHECK DURING LOADING FROM CONSOLE PAPER TAPE READER.
82	DPM - PARITY	HARDWARE DETECTED PARITY ERROR IN DPM PORTION OF SHARED MEMORY WHILE ATTEMPTING TO READ OR WRITE DATA MEMORY.
83	NPM - PARITY	HARDWARE DETECTED PARITY ERROR IN AN NPM WORD WHILE ATTEMPTING TO READ A NANO-INSTRUCTION.
84	DPM - OVER - LIMIT	HARDWARE DETECTED MEMORY ADDRESS IN EXCESS OF THE MEMORY.
92	SPM - LIMIT	INTERPRETER DETECTED AN ATTEMPT TO WRITE OUTSIDE SPM AREA DEFINED FOR THIS PROGRAM.
93	DPM - UNDER - LIMIT	INTERPRETER DETECTED A WRAP-AROUND (THROUGH INDEXING) OF DATA MEMORY.
94	POSITION	CARRIER STALL DETECTED WHILE POSITIONING; CARRIER OVERSPEED DETECTED WHILE PRINTING; OR INTERPRETER DETECTED AN ATTEMPT TO POSITION CARRIER BEYOND LIMIT IMPOSED BY PLATEN SIZE VALUE OF KEYBOARD DATA SEGMENT CURRENTLY IN USE BY INTERPRETER.
95	INVALID - INST	INTERPRETER DETECTED AN INVALID OP CODE OR AN INVALID OPTION ON A VALID OP CODE.

OPERATING SYSTEM ERRORS (FATAL) (CONT)

HARDWARE ERRORS (CONT)

HEX "D" IND. PATTERN	ERROR MESSAGE	DESCRIPTION
A2	ILLEGAL - I/O	INTERPRETER DETECTED AN ILLEGAL REQUEST TO I/O DEVICE.
A3	BUFFER - LIMIT	INTERPRETER DETECTED ONE OF THE FOLLOWING ON AN "INITIATE" OR "CALL" OPERATION: A. STARTING BUFFER ADDRESS > BUFFER SIZE. B. NUMBER OF WORDS > BUFFER SIZE. C. (A) + (B) > BUFFER SIZE.
A4	INVALID - I/O	ATTEMPT WAS MADE TO ACCESS DEVICE NOT WARM-STARTED TO SYSTEM, OR A BUFFER OR SUB-SYSTEM NOT DEFINED FOR THIS PROGRAM.
A5	I/O - INCOMPLETE	ATTEMPT TO ACCESS A VALID DEVICE HAS "TIMED-OUT" DUE TO AN ERROR, AN AMBIGUOUS RESPONSE, OR NO RESPONSE FROM THIS DEVICE.

RJE BOOTSTRAP LOAD ERROR MESSAGES (NON-DISK SYSTEM WITH SPO)

SPO MSG	CAUSE
PAR	THE GENERATED LPC DOES NOT AGREE WITH THE LRC ON THE CARD. THE MOST PROBABLE CAUSE IS THAT AN UNIDENTIFIED CARD CAUSED THE LRC CHECK.
?ST	A STATUS CONDITION OCCURRED DURING THE LOAD PROCESS. THE CAUSE MAY BE: 1. INVALID MULTI-PUNCH COLUMN. 2. READ CHECK. 3. FEED CHECK.
CNT	THE WORD COUNT ON THE LAST CARD READ IS INCORRECT.
ILL	A NON-DECIMAL CHARACTER WAS DETECTED (POSSIBLY CAUSED BY MISPLACED FIELDS).

B043 CONSOLE IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	–	–	–	–	–	–	–	–	–	–	–	ENABLE CARRIER DINT	ENABLE FORMS DINT	ENABLE PRTR DINT	ENABLE KB DINT	–
KB DATA WORD	–	–	–	–	–	–	–	–	KBU8	KBU4	KBU2	KBU1	KBL8	KBL4	KBL2	KBL1
PRINTER DATA WORD	0	1	–	–	ESCAPE RIGHT	ESCAPE LEFT	RED RIBBON	PRINT	–	R8	–	R4/	T2	T1	R2	R1
INDICATOR DATA WORD	1	0	–	IND BNK A	IND BNK B	IND BNK C	IND BNK D	IND BNK S	IND 9	IND 7	IND 6	IND 5	IND 4	IND 3	IND 2	IND 1
CARRIER DATA WORD	0	0					INIT.	LEFT	128	64	NO. 32	OF POSI 16	TIONS T 8	O MOVE 4	2	1
FORMS DATA WORD	1	1								LEFT PLAT. ADV.		RIGHT PLAT. ADV.	OPEN TRANS.	CLOSE TRANS.	PWR OFF	ALARM
STATUS WORD	DATA REQUEST			16	DE 8	VICE AD 4	DRESS 2	1	CARR. RDY	FORMS RDY	PRTR RDY	KB RDY	READY BUTTON	INTRPT NOT HONORED	OVER-SPEED	STALL

B044 SPO IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	ENABLE OUTPUT	ENABLE OUTPUT
DATA WORD	---	---	---	---	---	---	---	---	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
STATUS WORD	DATA REQUEST	---	---	DEV ADDR 4	DEV ADDR 3	DEV ADDR 2	DEV ADDR 1	DEV ADDR 0	---	---	---	SERVICE TOO LATE	ERROR	END OF MSG	INPUT REQ	NOT READY

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT THE PSU.

B0111 CARD READER IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	Ø	←										→	Ø	DEV. CLR.	PICK OR READ	TERM
DATA WORD	0	←						→	0	CC12	CC11	CC10	CC9	CC8	OCT4	OCT2	OCT1
STATUS WORD	DR	0	0	DA	DA	DA	DA	DA	0	0	0	SEFC	SLEC	TRBL	NO FEED	RDY	

WHERE: DA IS GENERATED BY PSU.
0 = NOT USED
Ø = NOT APPLICABLE

B0115 CARD READER IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	---	---	---	---	---	---	---	---	---	---	---	ENABLE INTER	READ BIN	CLEAR	READ NORM	TERM
DATA WORD, NORMAL	CON-TROL CHECK								DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
DATA WORD, BINARY	---	---	---	---	DATA 11	DATA 10	DATA 9	DATA 8	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
STATUS WORD	DATA REQ	---	---	DEV ADDR 4	DEV ADDR 3	DEV ADDR 2	DEV ADDR 1	DEV ADDR 0	---	---	---	---	---	TROU-BLE	---	RDY

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.

B0121-1 PPT/EPC READER IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	OPEN CLAMP	READ
DATA WORD	---	---	---	---	---	---	---	---	DATA 7 MSB	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0 LSB
STATUS WORD	DATA	---	DEV ADDR 4 MSB	DEV ADDR 3	DEV ADDR 2	DEV ADDR 1	DEV ADDR 0 LSB	---	---	---	---	---	---	---	SERVICE TOO LATE	DEV NOT RDY

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.

B0221 PPT/EPC PUNCH IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	PUNCH
DATA WORD	---	---	---	---	---	---	---	---	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
STATUS WORD	DATA REQ	---	---	DEV ADDR 4	DEV ADDR 3	DEV ADDR 2	DEV ADDR 1	DEV ADDR 0	---	---	---	ECHO CHECK	TAPE LOW	PUNCH OFF	MEDIA NOT PRESENT	NOT READY

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.

B0243, B0244, OR B0245 LINE PRINTER IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	---	---	---	---	---	---	---	LOAD PRINT DATA	FORM CONT. 7	FORM CONT. 6	FORM CONT. 5	FORM CONT. 4	FORM CONT. 3	FORM CONT. 2	FORM CONT. 1	FORM CONT. 0
DATA WORD	---	---	---	---	---	---	---	---	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
STATUS WORD	DATA RE-QUEST	---	---	DEV. ADDR 4	DEV. ADDR 3	DEV. ADDR 2	DEV. ADDR 1	DEV. ADDR 0	---	---	---	PRINT COMPL.	---	---	END OF PAGE	NOT READY

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.

B0311 CARD READER IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	OPER ALERT	DISABLE STATUS	CLEAR	TERM	STKR SEL 4	STKR SEL 2	STKR SEL 1	SEP PRINT	INH INPUT FEED	PRINT	PUNCH	SECOND FEED SELECT	SELECT SECOND PATH	LOAD OUTPUT BUFFER	UNLOAD INPUT BUFFER	START CARD CYCLE
96 COL. 6 BITS	---	---	---	---	---	---	---	---	---	---	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
96 COL. 8 BITS	---	---	---	---	---	---	---	---	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
80 COL. 12 BITS					DATA 11	DATA 10	DATA 9	DATA 8	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
STATUS WORD	DATA REQ	OPER REQ			DEV ADDR 4	DEV ADDR 3	DEV ADDR 2	DEV ADDR 1	DEV ADDR 0	PRINT LINE LGTH.		SELECT HOPPER EMPTY	PUNCH CHECK	READ CHECK	CARD CYCLE COMPL	NOT READY

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.

B0351 SINGLE-LINE CONTROL IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	ENABLE INTER-RUPTS	SYN MODE	EBCDIC MODE	FULL DUPLX MODE	LINE BREAK	---	MON. DIAL RESP	---	---	LOAD PROG TIME	RUN TIMER	DATA MODE	DATA TERM RDY	ORIG	TRANS-MIT	RE-CEIVE
DATA WORD	PARITY ERROR	RCV TEST BIT	XMT TEST BIT	---	---	---	---	---	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
DIAL RESPONSE WORD	---	---	---	---	---	---	---	---	---	---	---	---	---	---	LINE CHANGE	LINE STATUS
STATUS WORD	DATA RE-QUEST	BREAK	---	DEV ADDR 4	DEV ADDR 3	DEV ADDR 2	DEV ADDR 1	DEV ADDR 0	CARR ON	CLEAR TO SEND	TRANS MIT CYCLE	TIME FLAG	SERV TOO LATE	DATA SET RDY	RING INDI-CATOR	CARRIER LOST

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.

B0391 TAPE UNIT IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	---	---	---	---	---	---	---	---	---	---	TAPE RWND	ENABLE 5 MSEC MARKS	ENABLE DATA INTER-	WRITE	READ	BACK-SPACE
DATA WORD	PARITY AVAIL	---	---	---	---	---	---	PARITY	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
STATUS WORD	DATA REQ	DATA CYCLE	---	DEV ADDR 4	DEV ADDR 3	DEV ADDR 2	DEV ADDR 1	DEV ADDR 0	5 MSEC TIME MARK	SERV TOO LATE	REC. GAP	BEGIN OF TAPE	END OF TAPE	FILE PROT.	TAPE ERROR	DEV NOT RDY

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.

B0392 TAPE CASSETTE IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	---	---	---	---	---	---	TAPE ERASE	TAPE REWND	THRESH SELECT	HIGH SPEED	ENABLE 5 MSEC MARK	ENABLE DATA INTER	WRITE INHIBIT	TAPE WRITE	TAPE READ	BACK SPACE
DATA WORD	---	---	---	---	---	---	---	---	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
STATUS WORD	DATA REQ	---	---	DEV ADDR 4	DEV ADDR 3	DEV ADDR 2	DEV ADDR 1	DEV ADDR 0	5 MSEC TIME MARK	SERV TOO LATE	RE-CORD GAP	BEGIN OF TAPE	END OF TAPE	FILE PROT	TAPE ERROR	DEVICE NOT READY

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.

B0418-2 READER-PUNCH-RECORDER IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	OPER ALERT	DISABLE STATUS	CLEAR	TERM	STKR SEL. 4	STKR SEL. 2	STKR SEL. 1	SEP. PRINT	INHIBIT INPUT FEED	PRINT	PUNCH	SECOND FEED SELECT	SELECT SECOND PATH	LOAD OUTPUT BUF	UNLOAD INPUT BUF	START CARD CYCLE
96 COL., 6 BITS	–	–	–	–	–	–	–	–	–	–	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
STATUS WORD	DATA REQUEST	OPER REQUEST	–	DEV. ADDR 4	DEV. ADDR 3	DEV. ADDR 2	DEV. ADDR 1	DEV. ADDR 0	–	PRINT LINE LENGTH	PRIM HOPPER EMPTY	SECOND HOPPER EMPTY	PUNCH CHECK	READ CHECK	CARD CYCLE COMPL.	NOT READY

NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.
96 COL 8 BITS BIT 16-9.
80 COL 12 BITS BIT 16-5.

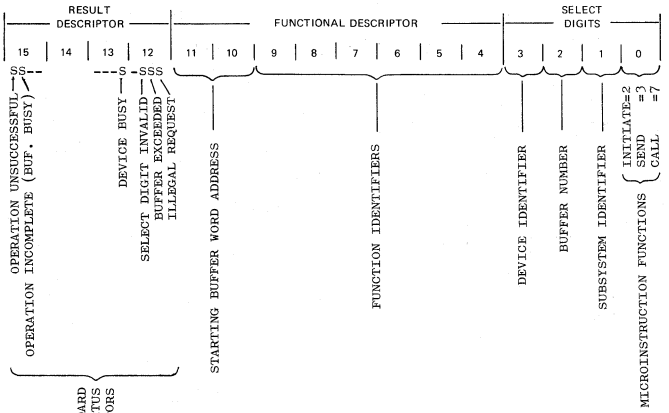
B0489 DISK IOC/DDP WORD FORMATS

	MSB 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	LSB 16
CONTROL WORD	UNIT SEL	DRIVE SEL	TRACK 8	TRACK 7	TRACK 6	TRACK 5	TRACK 4	TRACK 3	TRACK 2	TRACK 1	TRACK 0	FACE	TERM	OPER 2	OPER 1	OPER 0
DATA WORD	DATA 15	DATA 14	DATA 13	DATA 12	DATA 11	DATA 10	DATA 9	DATA 8	DATA 7	DATA 6	DATA 5	DATA 4	DATA 3	DATA 2	DATA 1	DATA 0
STATUS WORD	DATA REQ	TIME-OUT	–	DEV ADDR 4	DEV ADDR 3	DEV ADDR 2	DEV ADDR 1	DEV ADDR 0	FILE NOT OPER	SECT MARK	INDEX MARK	POS SET	POS ER	ILL ADDR	WRITE INHIB	SERV LATE
ADDRESS VERIFY WORD	–	–	TRACK 7	TRACK 6	TRACK 5	TRACK 4	TRACK 3	TRACK 2	TRACK 1	TRACK 0	FACE	SECT 4	SECT 3	SECT 2	SECT 1	SECT 0

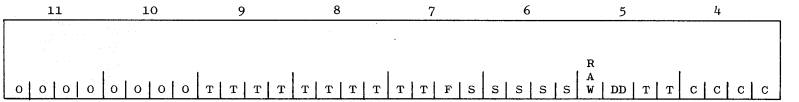
NOTE: DEVICE ADDRESS BITS OF STATUS WORD ARE INSERTED AT PSU.

OPERATION	OP2	OP1	OP0
NO OP	0	0	0
SEEK	0	0	1
READ NEXT SECT	0	1	0
NOT ALLOWED	0	1	1
WRT NEXT SECT	1	0	0
ENABLE MKS	1	0	1
LOC & VERIFY	1	1	0
NOT ALLOWED	1	1	1

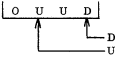
SL7 I/O DESCRIPTOR FORMAT



DISK CARTRIDGE DRIVE FUNCTIONAL DESCRIPTORS



THE DRIVE BIT FOR THE DISK OPERATION IS INCLUDED WITH THE PORT DIGIT OF THE SELECT PORTION OF AN INITIATE DESCRIPTOR:



SSSSS = SEGMENT (0-31)

F = FACE

T . . . TT = TRACK (0-202)

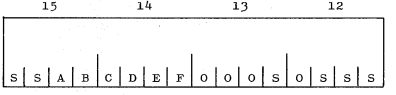
CCCC = 0 0 0 0 READ
0 0 0 1 WRITE
0 0 1 0 INDIRECT READ
1 0 0 0 STREAM READ
1 0 0 1 STREAM WRITE
0 1 1 0 LOAD

TT = 0-3 (WORD TAGS)

DD = 1 (PERMISSION TO WRITE TO TRACK 0)

RAW = 1 (RAW CHECK)

RESULT DESCRIPTOR

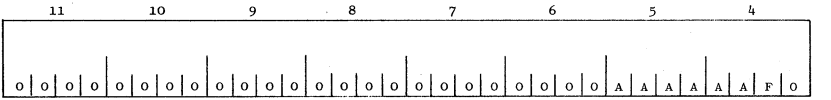


A = SEEK ERROR
B = INDIRECT ERROR
C = ADDRESS ERROR
D = DEVICE ERROR
E = WRITE ERROR
F = READ ERROR
S = STANDARD

SUBSYSTEM = 5

DEVICE PORT = 0, 1, 2, 3

LINE PRINTER FUNCTIONAL DESCRIPTORS

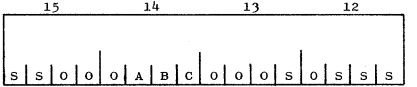


AAAAAA = 000000 NO SPACE
000001 SINGLE SPACE
000010 DOUBLE SPACE
001000 VARIABLE SKIP (CHANNEL 1)
110000 BOTTOM OF FORM (CHANNEL 2)
000100 TOP OF FORM (CHANNEL 3)
100000 VARIABLE SKIP (CHANNEL 4)

F = 1 FORMAT ONLY
F = 0 PRINT THEN FORMAT

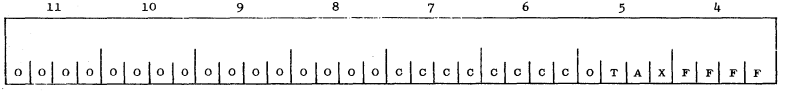
SUBSYSTEM = 4
DEVICE PORT = 2

RESULT DESCRIPTOR



A = NOT READY
B = END OF PAGE
C = DEVICE ERROR (PARITY)
S = STANDARD

TAPE CASSETTE FUNCTIONAL DESCRIPTORS



CC . . . C = 0-255
WHERE 0 → 1 CHAR
.
.
.
255 → 256 CHAR

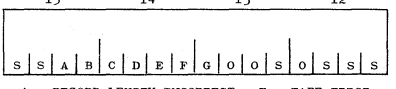
T = 1: TRANSLATE

A = 1: CC NOT AVAILABLE

X = 1: HIGH THRESHOLD

FFFF = 0000 READ
0001 WRITE
0010 REWIND
0011 ERASE
0100 BACKSPACE
0101 WRITE TAPE MARK
0110 SEARCH FORWARD
0111 SEARCH REVERSE (CASS. ONLY)
1000 REWIND/INHIBIT (CASS. ONLY)

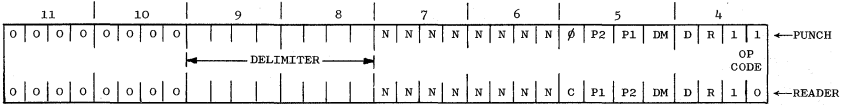
RESULT DESCRIPTOR



A = RECORD LENGTH INCORRECT
B = TAPE MARK
C = END OF TAPE
D = FILE PROTECT
E = TAPE ERROR
F = NOT READY
G = OPERATOR INTERVENTION
S = STANDARD

SUBSYSTEM = 3
DEVICE PORTS = 0-3

TAPE/EPC PUNCH AND READER FUNCTIONAL AND RESULT DESCRIPTORS



N . . . N = 0-143 (1-144 CHANNELS)

C = 1 IF N . . . N > 143, OPEN CLAMP ONLY; OTHERWISE OPEN CLAMP AT END OF READ.

R = 1: NO TRANSLATE
= 0: TRANSLATE

D = 1: READ THROUGH DELIMITER
= 0: READ NUMBER OF ITERATIONS

DM = 1: CHECK 8 BITS IF P1=1, OTHERWISE CHECK 7 LEAST SIGNIFICANT BITS.

0: CHECK BITS 5, 6, 7 IF P1=1, OTHERWISE CHECK BITS 5, 6.

P1 = 1: CHECK PARITY
= 0: NO PARITY CHECK

P2 = 1: ODD PARITY
= 0: EVEN PARITY

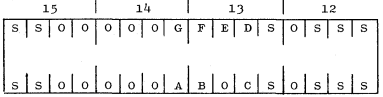
Ø = "DONT CARE" BIT

SUBSYSTEM = 0

READER DEVICE PORTS = 0, 1

PUNCH DEVICE PORTS = 2, 3

RESULT DESCRIPTOR



A = PARITY CHECK

B = NO DELIMITER PRESENT

C = NOT READY

D = NO MEDIA

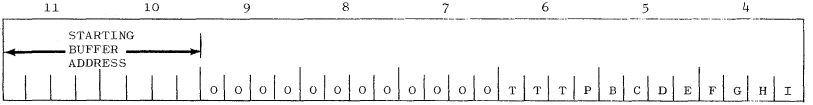
E = POWER OFF

F = TAPE LOW

G = ECHO CHECK

S = STANDARD

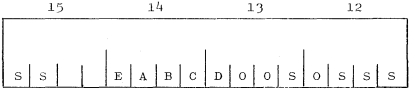
80 AND 96-COLUMN CARD READER/PUNCH FUNCTIONAL DESCRIPTORS



TTT = STACKER SELECT
P = SEPARATE PRINT
B = NO FEED
C = PRINT
D = PUNCH
E = HOPPER SELECT
0 = PRIMARY HOPPER
1 = SECONDARY HOPPER
F = TRANSLATE (ALWAYS ON)
G = LOAD OUTPUT BUFFER
H = READ
I = CYCLE

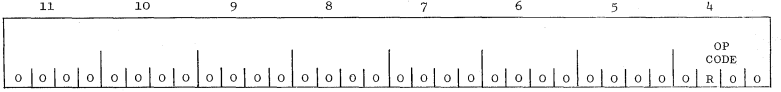
SUBSYSTEM = 2
DEVICE PORTS = 0-3

RESULT DESCRIPTOR



A = SELECTED HOPPER EMPTY
B = PUNCH CHECK
C = READ CHECK
D = NOT READY
E = END OF FILE
S = STANDARD

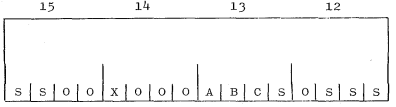
80-COLUMN CARD READER FUNCTIONAL AND RESULT DESCRIPTORS



R = 1 NO TRANSLATE

R = 0 TRANSLATE

RESULT DESCRIPTOR



A = FEED SWITCH OFF

B = TROUBLE

C = INCOMPLETE FEED

X = SYSTEM END CARD

S = STANDARD

SUBSYSTEM = 0

DEVICE PORTS = 0, 1

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