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M/E/F-Series Computer Systems

CE HANDBOOK



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This information contained in this handbook has been compiled in quick-reference form to aid the Customer Engineer in maintaining HP equipment. The contents do not define HP policies, procedures, or specifications.

COMMON DATA

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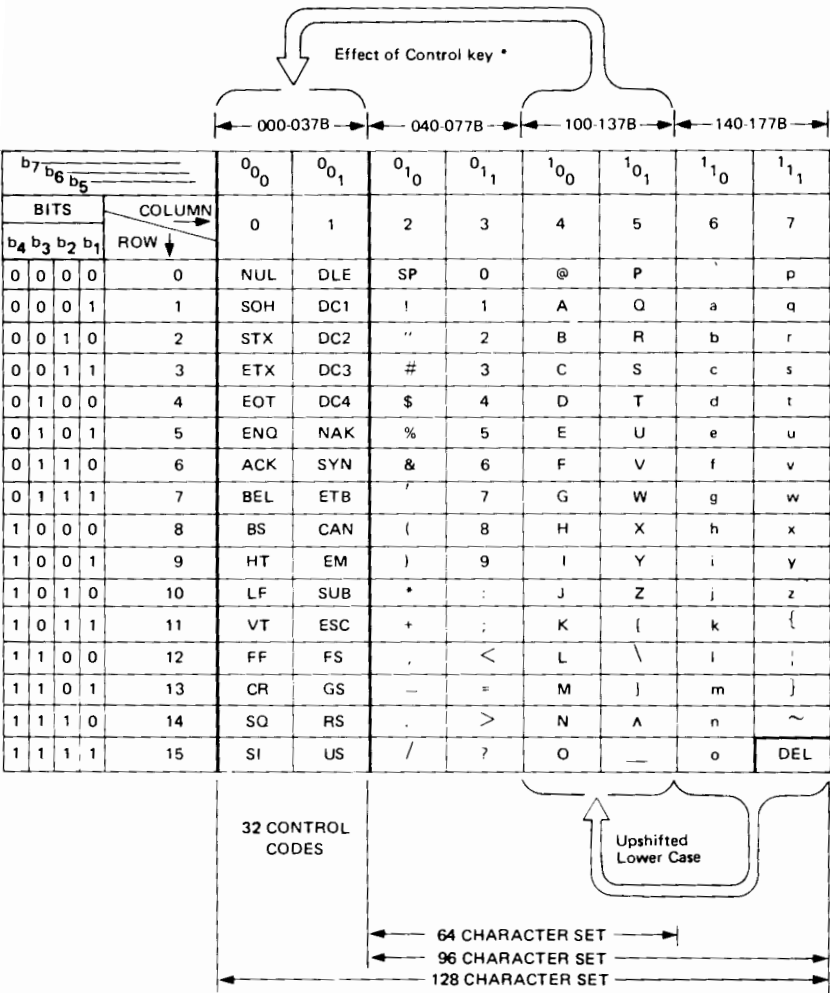
ABBREVIATIONS USED IN THIS HANDBOOK

ABBREVIATION	MEANING
ASync	— asynchronous
BATT	— battery
BCS	— basic control system
BD	— board
BUFF	— buffered
CONTRL	— controller
CPU	— Central Processing Unit
CRT	— Cathode Ray Tube
CTL	— control
DCL	— Data Code List
DCPC	— Dual-Channel Port Controller
DMA	— Direct Memory Access
DMI	— Dynamic Mapping Instructions
DOS	— Disc Operating System
DS	— Distributed System
DUP	— duplex
EIG	— Extended Instruction Group
EXP	— expansion
EXT	— extender
EXT'D	— extended
FAB	— Firmware Accessory Board
FC	— Fault Control
FEM	— Firmware Expansion Module
FFP	— Fast FORTRAN Processor
FLPT	— floating point
FLEX	— flexible
FPP	— Floating Point Processor
FRMWR	— firmware
GEN	— generator
HD	— high density
HP-IB	— Hewlett-Packard Interface Bus
HS	— high speed
I/O	— input/output
IF	— interface
INTRPT	— interrupt
IPS	— inches per second
KB	— kilobyte
KW	— kiloword
LCPS	— low cost power supply
LDR	— loader
LSC	— lower select code
MAG	— magnetic
MEM	— memory
MICROCKT	— microcircuit
MOD	— module
MPP	— microprocessor port
MTRS	— Magnetic Tape Reformatting System
MULTIPT	— multipoint
MUX	— multiplexer
OB	— obsolete
OP	— operating
ORIG	— original



ABBREVIATION	MEANING
PNL	— panel
PREREG	— preregulator
PRIV	— privileged
PROG	— programmable
PROM	— Programmable Read-Only Memory
PS	— power supply
REG	— register
ROM	— Read-Only Memory
RPL	— Remote Program Load
SIS	— Scientific Instruction Set
STD	— standard
SYNC	— synchronous
TTY	— teletype
UCS	— User Control Store
USC	— upper select code
VIS	— Vector Instruction Set
WCS	— Writable Control Store

HP CHARACTER SET



EXAMPLE: The representation for the character "K" (column 4, row 11) is.

b₇ b₆ b₅ b₄ b₃ b₂ b₁
BINARY 1 0 0 1 0 1 1
OCTAL 1 1 3

* Depressing the Control key while typing an upper case letter produces the corresponding control code on most terminals. For example, Control-H is a backspace.

HP CHARACTER SET (Cont'd)

The left and right byte columns show the octal patterns in a 16-bit word when the character occupies bits 8 to 14 (left byte) or 0 to 6 (right byte) and the rest of the bits are zero. To find the pattern of two characters in the same word, add the two values. For example, "AB" produces the octal pattern 040502. (The parity bits are zero in this chart.)

The octal values 0 through 37 and 177 are control codes. The octal values 40 through 176 are character codes.

Decimal Value	Octal Values		Mnemonic	Graphic ¹	Meaning
	Left Byte	Right Byte			
0	000000	000000	NUL	N	Nul
1	000400	000001	SOH	S	Start of Heading
2	001000	000002	STX	Sx	Start of Text
3	001400	000003	ETX	Ex	End of Text
4	002000	000004	EOT	E	End of Transmission
5	002400	000005	ENO	Eo	Enquiry
6	003000	000006	ACK	Ax	Acknowledge
7	003400	000007	BEL	B	Bell Attention Signal
8	004000	000010	BS	B	Backspace
9	004400	000011	HT	H	Horizontal Tabulation
10	005000	000012	LF	L	Line Feed
11	005400	000013	VT	V	Vertical Tabulation
12	006000	000014	FF	F	Form Feed
13	006400	000015	CR	C	Carriage Return
14	007000	000016	SO	S	Shift Out
15	007400	000017	SI	S	Shift In } Alternate Character Set
16	010000	000020	DLE	D	Data Link Escape
17	010400	000021	DC1	D	Device Control 1 (X-ON)
18	011000	000022	DC2	D	Device Control 2 (TAPE)
19	011400	000023	DC3	D	Device Control 3 (X-OFF)
20	012000	000024	DC4	D	Device Control 4 (TAPE)
21	012400	000025	NAK	N	Negative Acknowledge
22	013000	000026	SYN	S	Synchronous Idle
23	013400	000027	ETB	E	End of Transmission Block
24	014000	000030	CAN	C	Cancel
25	014400	000031	EM	E	End of Medium
26	015000	000032	SUB	S	Substitute
27	015400	000033	ESC	E	Escape ²
28	016000	000034	FS	F	File Separator
29	016400	000035	GS	G	Group Separator
30	017000	000036	RS	R	Record Separator
31	017400	000037	US	U	Unit Separator
127	077400	000177	DEL	■	Delete Rubout ³

Notes: 1. This is the standard HP display representation.

2. Escape is the first character of a special control sequence.

3. Delete may be displayed as "—", "@", or space.

HP CHARACTER SET (Cont'd)

Decimal Value	Octal Values		Character	Meaning
	Left Byte	Right Byte		
32	020000	000040		Space, Blank
33	020400	000041	!	Exclamation Point
34	021000	000042	"	Quotation Mark
35	021400	000043	#	Number Sign, Pound Sign
36	022000	000044	\$	Dollar Sign
37	022400	000045	%	Percent
38	023000	000046	&	Ampersand, And Sign
39	023400	000047	'	Apostrophe, Acute Accent
40	024000	000050	(	Left (opening) Parenthesis
41	024400	000051	)	Right (closing) Parenthesis
42	025000	000052	*	Asterisk, Star
43	025400	000053	+	Plus
44	026000	000054	,	Comma, Cedilla
45	026400	000055	-	Hyphen, Minus, Dash
46	027000	000056	.	Period, Decimal Point
47	027400	000057	/	Slash, Slant
48	030000	000060	0	} Digits, Numbers
49	030400	000061	1	
50	031000	000062	2	
51	031400	000063	3	
52	032000	000064	4	
53	032400	000065	5	
54	033000	000066	6	
55	033400	000067	7	
56	034000	000070	8	} Colon
57	034400	000071	9	
58	035000	000072	:	Colon
59	035400	000073	;	Semicolon
60	036000	000074	<	Less Than
61	036400	000075	=	Equals
62	037000	000076	>	Greater Than
63	037400	000077	?	Question Mark

Note: 4. Normally, the caret and underline are displayed. Some devices substitute the up arrow and back arrow.

HP CHARACTER SET (Cont'd)

Decimal Value	Octal Values		Character	Meaning
	Left Byte	Right Byte		
96	060000	000140	`	Grave Accent ⁵
97	060400	000141	a	Lower Case Letters ⁵
98	061000	000142	b	
99	061400	000143	c	
100	062000	000144	d	
101	062400	000145	e	
102	063000	000146	f	
103	063400	000147	g	
104	064000	000150	h	
105	064400	000151	i	
106	065000	000152	j	
107	065400	000153	k	
108	066000	000154	l	
109	066400	000155	m	
110	067000	000156	n	
111	067400	000157	o	
112	070000	000160	p	
113	070400	000161	q	
114	071000	000162	r	
115	071400	000163	s	
116	072000	000164	t	
117	072400	000165	u	
118	073000	000166	v	
119	073400	000167	w	
120	074000	000170	x	
121	074400	000171	y	
122	075000	000172	z	
123	075400	000173	{	Left (opening) Brace ⁵
124	076000	000174		Vertical Line ⁵
125	076400	000175	}	Right (closing) Brace ⁵
126	077000	000176	~	Tilde, Overline ⁵

Note: 5. Some devices upshift lower case letters and symbols (` through ~) to the corresponding upper case character (@ through ~). For example, the left brace would be converted to a left bracket.

RTE SPECIAL CHARACTERS

Mnemonic	Octal Value	Use
SOH (Control A)	1	Backspace (TTY)
EM (Control Y)	31	Backspace (2600)
BS (Control H)	10	Backspace (TTY, 2615, 2640, 2644, 2645)
EOT (Control D)	4	End-of-file (TTY 2615, 2640, 2644, 2645)

9206-1D

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ALPHABETICAL INDEX OF INSTRUCTION COOES

ADA	Add to A	FAD	Floating Point Add
ADB	Add to B	FDV	Floating Point Divide
ADX	Add Memory to X	FIX	Floating Point to Integer
ADY	Add Memory to Y	FLT	Integer to Floating Point
ALF	Rotate A Left Four	FMP	Floating Point Multiply
ALOG	Natural Logarithm	FSB	Floating Point Subtract
ALOGT	Common Logarithm	HLT	Halt
ALR	A Left Shift, Clear Sign	INA	Increment A
ALS	A Left Shift	INB	Increment B
AND	"And" to A	IOR	"Inclusive Or" to A
ARS	A Right Shift	ISX	Increment X and Skip if Zero
ASL	Arithmetic Shift Left (32)	ISY	Increment Y and Skip if Zero
ASR	Arithmetic Shift Right (32)	ISZ	Increment and Skip if Zero
ATAN	Arctangent	JLY	Jump and Load Y
BLF	Rotate B Left Four	JMP	Jump
BLR	B Left Shift, Clear Sign	JPY	Jump Indexed by Y
BLS	B Left Shift	JSB	Jump to Subroutine
BRS	B Right Shift	LAX	Load A Indexed by X
CAX	Copy A to X	LAY	Load A Indexed by Y
CAY	Copy A to Y	LBT	Load Byte
CBS	Clear Bits	LBX	Load B Indexed by X
CBT	Compare Bytes	LBY	Load B Indexed by Y
CBX	Copy B to X	LDA	Load A
CBY	Copy B to Y	LDB	Load B
CCA	Clear and Complement A	LDX	Load X from Memory
CCB	Clear and Complement B	LDY	Load Y from Memory
CCE	Clear and Complement E	LIA	Load Input to A
CLA	Clear A	LIB	Load Input to B
CLB	Clear B	LSL	Logical Shift Left (32)
CLC	Clear Control	LSR	Logical Shift Right (32)
CLE	Clear E	MBT	Move Bytes
CLF	Clear Flag	MIA	Merge Into A
CLO	Clear Overflow	MIB	Merge Into B
CMA	Complement A	MPY	Multiply
CMB	Complement B	MVW	Move Words
CME	Complement E	NOP	No Operation
CMW	Compare Words	OTA	Output A
COS	Cosine	OTB	Output B
CPA	Compare to A	RAL	Rotate A Left
CPB	Compare to B	RAR	Rotate A Right
CXA	Copy X to A	RBL	Rotate B Left
CXB	Copy X to B	RBR	Rotate B Right
CYA	Copy Y to A	RRL	Rotate Left (32)
CYB	Copy Y to B	RRR	Rotate Right (32)
DBLE	Single Floating Point to Extended Floating Point	RSS	Reverse Skip Sense
DDINT	Extended Floating Point to Double Integer	SAX	Store A Indexed by X
DIV	Divide	SAY	Store A Indexed by Y
DLD	Double Load	SBS	Set Bits
DPOLY	Polynomial Evaluation	SBT	Store Byte
DST	Double Store	SBX	Store B Indexed by X
DSX	Decrement X and Skip if Zero	SBY	Store B Indexed by Y
DSY	Decrement Y and Skip if Zero	SEZ	Skip if E is Zero
ELA	Rotate E Left with A	SFB	Scan For Byte
ELB	Rotate E Left with B	SFC	Skip if Flag Clear
ERA	Rotate E Right with A	SFS	Skip if Flag Set
ERB	Rotate E Right with B	SIN	Sine
EXP	E to the Power X	SLA	Skip if LSB of A is Zero
		SLB	Skip if LSB of B is Zero

ALPHABETICAL INDEX OF INSTRUCTION CODES (Cont'd)

SNGL	Extended Floating Point to Single Floating Point	.FLUN	Unpack Floating Point Quantity
SOC	Skip if Overflow Clear	.FPWR	Exponentiation
SOS	Skip if Overflow Set	.GOTO	Transfer Control
SQRT	Square Root	.NGL	Double Floating Point to Single Floating Point
SSA	Skip if Sign of A is Zero	.PACK	Normalize Floating Point Quantity
SSB	Skip if Sign of B is Zero	.PWR2	X Times 2 to the Power N
STA	Store A	.TADD	Double Floating Point Add
STB	Store B	.TDIV	Double Floating Point Divide
STC	Set Control	.TFTD	Double Integer to Double Floating Point
STF	Set Flag	.TFTS	Single Integer to Double Floating Point
STO	Set Overflow		
STX	Store X to Memory	.TFXD	Double Floating Point to Double Integer
STY	Store Y to Memory	.TFXS	Double Floating Point to Single Integer
SZA	Skip if A is Zero	.TMPY	Double Floating Point Multiply
SZB	Skip if B is Zero	.TPWR	Exponentiation
TAN	Tangent	.TSUB	Double Floating Point Subtract
TANH	Hyperbolic Tangent	.XADD	Extended Floating Point Add
TBS	Test Bits	.XCOM	Complement Extended Floating Point
XAX	Exchange A and X	.XDIV	Extended Floating Point Divide
XAY	Exchange A and Y	.XFER	Transfer Extended Floating Point
XBX	Exchange B and X	.XFTD	Double Integer to Extended Floating Point
XBY	Exchange B and Y	.XFTS	Single Integer to Extended Floating Point
XOR	"Exclusive Or" to A	.XFXD	Extended Floating Point to Double Integer
.BLE	Single Floating Point to Double Floating Point	.XFXS	Extended Floating Point to Single Integer
.CFER	Transfer Complex or Double Floating Point	.XMPY	Extended Floating Point Multiply
.DAD	Double Integer Add	.XPAK	Normalize and Pack Extended Floating Point
.DCO	Double Integer Compare	.XSUB	Extended Floating Point Subtract
.DDE	Double Integer Decrement	.DCM	Complement and Normalize Extended Floating Point
.DDI	Double Integer Divide	.FCM	Complement and Normalize Single Floating Point
.DDIR	Double Integer Divide Reverse	.MAP	Compute Array Element Address
.DDS	Double Integer Decrement and Skip if Zero	.TCM	Complement and Normalize Double Floating Point
.DFER	Transfer Extended Floating Point	/ATLG	$(1-X)/(1+X)$
.DIN	Double Integer Increment	\$SETP	Set a Table
.DIS	Double Integer Increment and Skip if Zero		
.DMP	Double Integer Multiply		
.DNG	Double Integer Negate		
.DSB	Double Integer Subtract		
.DSBR	Double Integer Subtract Reverse		
.ENTP	Transfer Parameter Addresses		
.ENTR	Transfer Parameter Addresses		
.FIXD	Floating Point to Double Integer		
.FLTD	Double Integer to Floating Point		

ALPHABETICAL INDEX OF VECTOR INSTRUCTIONS

VABS/DVABS	Vector Absolute Value	VMPY/DVMPY	Vector Multiply
VADD/DVADD	Vector Add	VNRM/DVNRM	Vector Norm
VDIV/DVDIV	Vector Divide	VPIV/DVPIV	Vector Pivot
VDOT/DVDOT	Vector Dot Product	VSAD/DVSAD	Scalar-Vector Add
VMAB/DVMAB	Vector Maximum Absolute Value	VSDV/DVSDV	Scalar-Vector Divide
VMAX/DVMAX	Vector Maximum Value	VSMY/DVSMY	Scalar-Vector Multiply
VMIB/DVMIB	Vector Minimum Absolute Value	VSSB/DVSSB	Scalar-Vector Subtract
VMIN/DVMIN	Vector Minimum Value	VSUB/DVSUB	Vector Subtract
VMOV/DVMOV	Vector Move	VSUM/DVSUM	Vector Sum
		VSWP/DVSWP	Vector Swap

ALPHABETICAL INDEX OF DYNAMIC MAPPING SYSTEM INSTRUCTIONS*

DJP	Disable MEM and JMP	SJP	Enable System Map and JMP
DJS	Disable MEM and JSB	SJS	Enable System Map and JSB
JRS	Jump and Restore Status	SSM	Store Status Register Into Memory
LFA	Load Fence From A	SYA	Load/Store System Map per A
LFB	Load Fence From B	SYB	Load/Store System Map per B
MBF	Move Bytes From Alternate Map	UJP	Enable User Map and JMP
MBI	Move Bytes Into Alternate Map	UJS	Enable User Map and JSB
MBW	Move Bytes Within Alternate Map	USA	Load/Store User Map per A
MWF	Move Words From Alternate Map	USB	Load/Store User Map per B
MWI	Move Words Into Alternate Map . .	XCA	Cross Compare A
MWW	Move Words Within Alternate Map	XCB	Cross Compare B
PAA	Load/Store Port A Map per A	XLA	Cross Load A
PAB	Load/Store Port A Map per B	XLB	Cross Load B
PBA	Load/Store Port B Map per A	XMA	Transfer Maps Internally per A
PBB	Load/Store Port B Map per B	XMB	Transfer Maps Internally per B
RSA	Read Status Register Into A	XMM	Transfer Maps or Memory
RSB	Read Status Register Into B	XMS	Transfer Maps Sequentially
RVA	Read Violation Register Into A	XSA	Cross Store A
RVB	Read Violation Register Into B	XSB	Cross Store B

*Standard on HP 2117F Computer, optional on HP 2111F.

MACHINE INSTRUCTIONS

MEMORY REFERENCE

Jump and Increment-Skip

ISZ	$m [I]$	$(m) \rightarrow m$: then if $(m) = 0$, execute $P + 2$ otherwise execute $P + 1$
JMP	$m [I]$	Jump to m ; $m \rightarrow P$
JSB	$m [I]$	Jump subroutine to m : $P + 1 \rightarrow m$; $m + 1 \rightarrow P$

Add, Load and Store

ADA	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	$(m) + (A) \rightarrow A$
ADB	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	$(m) + (B) \rightarrow B$
LDA	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	$(m) \rightarrow A$
LDB	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	$(m) \rightarrow B$
STA	$m [I]$	$(A) \rightarrow m$
STB	$m [I]$	$(B) \rightarrow m$

Logical

AND	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	$(m) \wedge (A) \rightarrow A$
XOR	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	$(m) \nabla (A) \rightarrow A$
IOR	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	$(m) \vee (A) \rightarrow A$
CPA	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	If $(m) \neq (A)$, execute $P + 2$, otherwise execute $P + 1$
CPB	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	If $(m) \neq (B)$, execute $P + 2$, otherwise execute $P + 1$

Word Processing

MVW	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	Move (m) words from array $(A) \rightarrow$ array (B)
CMW	$\left\{ \begin{matrix} m \\ \text{lit} \end{matrix} [I] \right\}$	Compare (m) words of array (A) against (m) words of array (B) ; if the two arrays are equal, execute $P + 3$, if array (A) is less than array (B) , execute $P + 4$, if array (A) is greater than array (B) , execute $P + 5$

MACHINE INSTRUCTIONS (Cont'd)**Byte Processing**

LBT		B contains a 16-bit byte address; $((B)) \rightarrow A_{0-7}$; 0's to A_{8-15}
SBT		B contains a 16-bit byte address; $(A_{0-7}) \rightarrow (B)$
MBT	$\left\{ \begin{array}{l} m \\ \text{lit} \end{array} \right\}$	A and B contain 16-bit byte addresses; move (m) bytes from array (A) $\rightarrow$ array (B)
CBT	$\left\{ \begin{array}{l} m \\ \text{lit} \end{array} \right\}$	A and B contain 16-bit byte addresses; compare (m) bytes of array (A) against (m) bytes of array (B); if the two arrays are equal, execute $P + 3$; if array (A) is less than array (B), execute $P + 4$; if array (A) is greater than array (B), execute $P + 5$
SFB		A_{0-7} contain the test byte, A_{8-15} contain the termination byte, and B contains a 16-bit byte address; scan array (B); if test byte found, execute $P + 1$, B contains address of test byte; if termination byte found, execute $P + 2$, B contains address of termination byte; if neither is found, execute $P + 2$, B contains zero

Bit Processing

TBS	$\left\{ \begin{array}{l} m \\ \text{lit} \end{array} \right\}$	$n [..I]$	Compare all "set" bits in (m) against corresponding bits in (n); if all bits tested are set, execute $P + 3$; if any of the bits tested are clear, execute $P + 4$
SBS	$\left\{ \begin{array}{l} m \\ \text{lit} \end{array} \right\}$	$n [..I]$	Set all bits in (n) which correspond to "set" bits in (m)
CBS	$\left\{ \begin{array}{l} m \\ \text{lit} \end{array} \right\}$	$n [..I]$	Clear all bits in (n) which correspond to "set" bits in (m)

REGISTER REFERENCE**Shift-Rotate**

CLE	$0 \rightarrow E$
ALS	Shift (A) left one bit, $0 \rightarrow A_0$, A_{15} unaltered
BLS	Shift (B) left one bit, $0 \rightarrow B_0$, B_{15} unaltered
ARS	Shift (A) right one bit, $(A_{15}) \rightarrow A_{14}$
BRS	Shift (B) right one bit, $(B_{15}) \rightarrow B_{14}$
RAL	Rotate (A) left one bit
RBL	Rotate (B) left one bit
RAR	Rotate (A) right one bit
RBR	Rotate (B) right one bit
ALR	Shift (A) left one bit, $0 \rightarrow A_{15}$
BLR	Shift (B) left one bit, $0 \rightarrow B_{15}$
ERA	Rotate E and A right one bit
ERB	Rotate E and B right one bit
ELA	Rotate E and A left one bit
ELB	Rotate E and B left one bit
ALF	Rotate A left four bits
BLF	Rotate B left four bits
SLA	If $(A_0) = 0$, execute $P + 2$, otherwise execute $P + 1$
SLB	If $(B_0) = 0$, execute $P + 2$, otherwise execute $P + 1$

MACHINE INSTRUCTIONS (Cont'd)

Shift-Rotate instructions can be combined as follows:

$$\begin{array}{c} \left[\begin{array}{c} \text{ALS} \\ \text{ARS} \\ \text{RAL} \\ \text{RAR} \\ \text{ALR} \\ \text{ALF} \\ \text{ERA} \\ \text{ELA} \end{array} \right] \end{array} \quad \begin{array}{c} \text{[CLE]} \quad \text{[SLA]} \end{array} \quad \begin{array}{c} \left[\begin{array}{c} \text{ALS} \\ \text{ARS} \\ \text{RAL} \\ \text{RAR} \\ \text{ALR} \\ \text{ALF} \\ \text{ERA} \\ \text{ELA} \end{array} \right]$$

$$\begin{array}{c} \left[\begin{array}{c} \text{BLS} \\ \text{BRS} \\ \text{RBL} \\ \text{RBR} \\ \text{BLR} \\ \text{BLF} \\ \text{ERB} \\ \text{ELB} \end{array} \right] \end{array} \quad \begin{array}{c} \text{[CLE]} \quad \text{[SLB]} \end{array} \quad \begin{array}{c} \left[\begin{array}{c} \text{BLS} \\ \text{BRS} \\ \text{RBL} \\ \text{RBR} \\ \text{BLR} \\ \text{BLF} \\ \text{ERB} \\ \text{ELB} \end{array} \right]$$

No-Operation

NOP Execute P + 1

Alter-Skip

CLA 0's → A
 CLB 0's → B
 CMA $\overline{(A)} \rightarrow A$
 CMB $\overline{(B)} \rightarrow B$
 CCA 1's → A
 CCB 1's → B
 CLE 0 → E
 CME $\overline{(E)} \rightarrow E$
 CCE 1 → E
 SEZ If (E) = 0, execute P + 2, otherwise execute P + 1
 SSA If (A₁₅) = 0, execute P + 2, otherwise execute P + 1
 SSB If (B₁₅) = 0, execute P + 2, otherwise execute P + 1
 INA (A) + 1 → A
 INB (B) + 1 → B
 SZA If (A) = 0, execute P + 2, otherwise execute P + 1
 SZB If (B) = 0, execute P + 2, otherwise execute P + 1
 SLA If (A₀) = 0, execute P + 2, otherwise execute P + 1
 SLB If (B₀) = 0, execute P + 2, otherwise execute P + 1
 RSS Reverse sense of skip instructions. If no skip instructions precede, execute P + 2

MACHINE INSTRUCTIONS (Cont'd)

Alter-Skip instructions can be combined as follows:

$$\left[\begin{array}{l} \text{CLA} \\ \text{CMA} \\ \text{CCA} \end{array} \right] \left[\text{,SEZ} \right] \left[\begin{array}{l} \text{CLE} \\ \text{CME} \\ \text{CCE} \end{array} \right] \left[\text{,SSA} \right] \left[\text{,SLA} \right] \left[\text{,INA} \right] \left[\text{,SZA} \right] \left[\text{,RRS} \right]$$

$$\left[\begin{array}{l} \text{CLB} \\ \text{CMB} \\ \text{CCB} \end{array} \right] \left[\text{,SEZ} \right] \left[\begin{array}{l} \text{CLE} \\ \text{CME} \\ \text{CCE} \end{array} \right] \left[\text{,SSB} \right] \left[\text{,SLB} \right] \left[\text{,INB} \right] \left[\text{,SZB} \right] \left[\text{,RSS} \right]$$

INDEX REGISTER

CAX		(A) → X
CBX		(B) → X
CAY		(A) → Y
CBY		(B) → Y
CXA		(X) → A
CXB		(X) → B
CYA		(Y) → A
CYB		(Y) → B
XAX		(A) → X and (X) → A
XBX		(B) → X and (X) → B
XAY		(A) → Y and (Y) → A
XBY		(B) → Y and (Y) → B
ISX		(X) + 1 → X, then test new (X); if (X) = 0, execute P + 2, otherwise execute P + 1
ISY		(Y) + 1 → Y, then test new (Y); if (Y) = 0, execute P + 2, otherwise execute P + 1
DSX		(X) - 1 → X, then test new (X); if (X) = 0, execute P + 2, otherwise execute P + 1
DSY		(Y) - 1 → Y, then test new (Y); if (Y) = 0, execute P + 2, otherwise execute P + 1
LDX	m [I] lit	(m) → X
LDY	m [I] lit	(m) → Y
STX	m [I]	(X) → m
STY	m [I]	(Y) → m
LAX	m [I]	(m + (X)) → A
LBX	m [I]	(m + (X)) → B
LAY	m [I]	(m + (Y)) → A
LBY	m [I]	(m + (Y)) → B
SAX	m [I]	(A) → m + (X)
SBX	m [I]	(B) → m + (X)
SAY	m [I]	(A) → m + (Y)
SBY	m [I]	(B) → m + (Y)
ADX	m [I] lit	(m) + (X) → X
ADY	m [I] lit	(m) + (Y) → Y
JLY	m [I]	Jump to m; P + 2 → Y
JPY	m	Jump to m + (Y)

MACHINE INSTRUCTIONS (Cont'd)**INPUT/OUTPUT, OVERFLOW, AND HALT****Input/Output**

STC	sc [,C]	Set control bit _{sc} , enable transfer of one element of data between device _{sc} and buffer _{sc}
CLC	sc [,C]	Clear control bit _{sc} . If sc = 0 clear all control bits
LIA	sc [,C]	(buffer _{sc}) → A
LIB	sc [,C]	(buffer _{sc}) → B
MIA	sc [,C]	(buffer _{sc}) (A) → A
MIB	sc [,C]	(buffer _{sc}) (B) → B
OTA	sc [,C]	(A) → buffer _{sc}
OTB	sc [,C]	(B) → buffer _{sc}
STF	sc	Set flag bit _{sc} . If sc = 0, enable interrupt system. sc = 1 sets overflow bit.
CLF	sc	Clear flag bit _{sc} . If sc = 0, disable interrupt system. If sc = 1, clear overflow bit.
SFC	sc	If (flag bit _{sc}) = 0, execute P + 2, otherwise execute P + 1. If sc = 1, test overflow bit.
SFS	sc	If (flag bit _{sc}) = 1, execute P + 2, otherwise execute P + 1. If sc = 1, test overflow bit.

Overflow

CLO		0 → overflow bit
STO		1 → overflow bit
SOC	[C]	If (overflow bit) = 0, execute P + 2, otherwise execute P + 1
SOS	[C]	If (overflow bit) = 0, execute P + 2, otherwise execute P + 1

Halt

HLT	[sc [,C]]	Halt computer
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MACHINE INSTRUCTIONS (Cont'd)**EXTENDED ARITHMETIC UNIT**

MPY	$\left\{ \begin{smallmatrix} m \\ \text{lit} \end{smallmatrix} \right\}$	$(A) \times (m) \rightarrow (B_{\pm\text{msb}} \text{ and } A_{\text{lsb}})$
DIV	$\left\{ \begin{smallmatrix} m \\ \text{lit} \end{smallmatrix} \right\}$	$(B_{\pm\text{msb}} \text{ and } A_{\text{lsb}}) / (m) \rightarrow A, \text{ remainder} \rightarrow B$
DLD	$\left\{ \begin{smallmatrix} m \\ \text{lit} \end{smallmatrix} \right\}$	$(m) \text{ and } (m + 1) \rightarrow A \text{ and } B$
DST	$\left\{ \begin{smallmatrix} m \\ \text{lit} \end{smallmatrix} \right\}$	$(A) \text{ and } (B) \rightarrow m \text{ and } m + 1$
ASR	b	Arithmetically shift (BA) right b bits, B_{15} extended
ASL	b	Arithmetically shift (BA) left b bits, B_{15} unaltered, 0's to A_{lsb}
RRR	b	Rotate (BA) right b bits
RRL	b	Rotate (BA) left b bits
LSR	b	Logically shift (BA) right b bits, 0's to B_{msb}
LSL	b	Logically shift (BA) left b bits, 0's to A_{lsb}

FLOATING POINT

FMP	$\left\{ \begin{smallmatrix} m \\ \text{lit} \end{smallmatrix} \right\}$	$(AB) \times (m, m + 1) \rightarrow AB$
FDV	$\left\{ \begin{smallmatrix} m \\ \text{lit} \end{smallmatrix} \right\}$	$(AB) / (m, m + 1) \rightarrow AB$
FAD	$\left\{ \begin{smallmatrix} m \\ \text{lit} \end{smallmatrix} \right\}$	$(m, m + 1) + (AB) \rightarrow AB$
FSB	$\left\{ \begin{smallmatrix} m \\ \text{lit} \end{smallmatrix} \right\}$	$(AB) - (m, m + 1) \rightarrow AB$
FIX		(AB) converted from floating-point to fixed-point; result $\rightarrow A$
FLT		(A) converted from fixed-point to floating-point; result $\rightarrow AB$

MACHINE INSTRUCTIONS (Cont'd)**MEMORY EXPANSION**

DJP	$m[.I]$	Disable MEM and jump to m; $m \rightarrow P$
DJS	$m[.I]$	Disable MEM and jump subroutine to m; $P + 1 \rightarrow m$; $m + 1 \rightarrow P$
JRS	$m_1[.I] m_2[.I]$	Jump and restore status
LFA		$A \rightarrow \text{fence}$
LFB		$B \rightarrow \text{fence}$
MBF		Move bytes from alternate map. $X \leftarrow 0$; $A \leftarrow A + \text{no. bytes moved}$; $B \leftarrow B + \text{no. bytes moved}$.
MBI		Move bytes into alternate map. $X \leftarrow 0$; $A \leftarrow A + \text{no. bytes moved}$; $B \leftarrow B + \text{no. bytes moved}$.
MBW		Move bytes within alternate map. $X \leftarrow 0$; $A \leftarrow A + \text{no. bytes moved}$; $B \leftarrow B + \text{no. bytes moved}$.
MWF		Move words from alternate map. $X \leftarrow 0$; $A \leftarrow A + \text{no. words moved}$; $B \leftarrow B + \text{no. words moved}$.
MWI		Move words into alternate map. $X \leftarrow 0$; $A \leftarrow A + \text{no. words moved}$; $B \leftarrow B + \text{no. words moved}$.
MWW		Move words within alternate map. $X \leftarrow 0$; $A \leftarrow A + \text{no. words moved}$; $B \leftarrow B + \text{no. words moved}$.
PAA		If $A(15) = 0$, Port A map $\leftarrow$ memory; if $A(15) = 1$, Port A map $\rightarrow$ memory.
PAB		If $B(15) = 0$, Port A map $\leftarrow$ memory; if $B(15) = 1$, Port A map $\rightarrow$ memory.
PBA		If $A(15) = 0$, Port B map $\leftarrow$ memory; if $A(15) = 1$, Port B map $\rightarrow$ memory.
PBB		If $B(15) = 0$, Port B map $\leftarrow$ memory; if $B(15) = 1$, Port B map $\rightarrow$ memory.
RSA		$A \leftarrow$ status register
RSB		$B \leftarrow$ status register
RVA		$A \leftarrow$ violation register
RVB		$B \leftarrow$ violation register

MACHINE INSTRUCTIONS (Cont'd)**MEMORY EXPANSION (CONT)**

SJP	m [1]	Enable System map and jump to m
SJS	m [1]	Enable System map and jump subroutine to m
SSM	m [1]	$m \leftarrow \text{status-register}$
SYA		If $A(15) = 0$, System map $\leftarrow$ memory; if $A(15) = 1$, System map $\rightarrow$ memory.
SYB		If $B(15) = 0$, System map $\leftarrow$ memory; if $B(15) = 1$, System map $\rightarrow$ memory.
UJP	m [1]	Enable User map and jump to m
UJS	m [1]	Enable User map and jump subroutine to m
USA		If $A(15) = 0$, User map $\leftarrow$ memory; if $A(15) = 1$, User map $\rightarrow$ memory.
USB		If $B(15) = 0$, User map $\leftarrow$ memory; if $B(15) = 1$, User map $\rightarrow$ memory.
XCA	m [1]	Compare A with m; if $A = m$, execute $P + 1$; if $A \neq m$, execute $P + 2$.
XCB	m [1]	Compare B with m; if $B = m$, execute $P + 1$; if $B \neq m$, execute $P + 2$.
XLA	m [1]	$A \leftarrow m$
XLB	m [1]	$B \leftarrow m$
XMA		If $A(15) = 0$ and $A(0) = 0$, Port A map $\leftarrow$ System map. If $A(15) = 0$ and $A(0) = 1$, Port B map $\leftarrow$ system map. If $A(15) = 1$ and $A(0) = 0$, Port A map $\leftarrow$ User map. If $A(15) = 1$ and $A(0) = 1$, Port B map $\leftarrow$ User map.
XMB		If $B(15) = 0$ and $B(0) = 0$, Port A map $\leftarrow$ System map. If $B(15) = 0$ and $B(0) = 1$, Port B map $\leftarrow$ System map. If $B(15) = 1$ and $B(0) = 0$, Port A map $\leftarrow$ User map. If $B(15) = 1$ and $B(0) = 1$, Port B map $\leftarrow$ User map.
XMM		A = register no., B = memory address, X = no. of registers. If $X > 0$, Maps $\leftarrow$ memory; if $X < 0$, Memory $\leftarrow$ maps.
XMS		A = first register no., B = first page no., X = positive no. of registers. First register is loaded with the page number indicated in B, the second register is loaded with that value + 1, and so forth.
XSA	m [1]	$A \rightarrow m$
XSB	m [1]	$B \rightarrow m$

INSTRUCTION SET CROSS-REFERENCE GUIDE

The following list contains the July 1981 list of RP's for 2100, 1000-M, E., and both old and new F-Series CPU's. The list is sorted by octal opcode. Order of entry point name...ie, \$SETP first followed by the entry points that start with periods...etc.

The SIGNAL/1000 (92835A) entry point are shown. Since this product occupies the user-control addresses, a failure of one of these opcodes must be followed by whether the user has SIGNAL/1000 or user developed microcode installed.

RTE6 has two sets of special firmware for E/F-Series (none for M-Series). The first is VMA or Virtual Memory Arrays. This set occupies the exact same addresses as EMA but performs different functions and cannot be enabled under RTE4. The second is the opsystem firmware that improves the system throughput. This set is required in order to boot RTE6 on E/F cpu's. There are no software equivalents for VMA or opsystem firmware for E/F cpu's. Note that the opcodes 105354 thru 105357 are marked as "double use" opcodes. This means that the microcode performs a different function if executed from a trap cell versus anywhere else.

The opcode description is for non-trap cell execution. The RTE6 opsystem ROM self test is a 105355 and will show X = Rev code (will be 1 at initial release), and the Y-register will contain the RPL switch settings. In addition, the contents of the loader ROM's can be read by executing the self test opcode in a program where B-REG = loader ROM address (0-1023 for the 4 ROMs @ 8 bits per ROM address) and the A-REG will return the ROM contents. This could be done with a front panel program such as:

ADDR	DATA	OPCODE
100	006400	CLB
101	105255	OCT 105355
102	000000	NOP
103	006004	INB
104	024101	JMP *-3

The loader ROMs are 8 bits so that the 64 words per ROM will have to be read with 128 steps. Since the self test will do a 102077 halt automatically, this program can be single stepped via the RUN switch.

The columns marked for different CPUs can be used to determine if the firmware package is a standard part of the CPU's normal configuration (SIS, FPP...), or optional (12907, 13306...). It can also serve to isolate a failing opcode to a particular portion of the CPU.

OPCODE PROBLEMS

All firmware options are first mapped through the base set and then into the individual ROMs on the FAB, UCS, WCS, or FEM boards. Thus, a failing FFP opcode could be due to a faulty Base Set.

Another problem is that an unimplemented opcode (ie, 105054 in a 1000-M CPU) will execute as a NOP. Unfortunately, the next word is usually an address — not an instruction. The value at that location could send the program anywhere in memory. Thus, an MP error or DM error may point to an opcode that executes incorrectly, or to a location that was never intended to be executed (ie, data or addresses).

Another symptom is an illegal opcode (ie, 101260). This actually maps into the middle of the HALT opcode and manifests itself as a running HALT...different than the new version of the base set where Forced Cold Load was implemented. You detect this condition with being able to select registers with the RUN lamp on, or by hitting the HALT button on the front panel. What happened is that the microcode to reset the RUN lamp was bypassed with this illegal opcode. In essence, there is no guaranteed method to discover illegal or uninstalled opcodes except by tracing the program execution.

INSTRUCTION SET CROSS-REFERENCE GUIDE (Cont'd)

In some cases, a program can run 'incorrectly' with firmware and 'correctly' with the software version. This usually proves to be a program bug (typically, invalid array subscripts) that is not working correctly anyway, but the manner in which an illegal array reference is handled in software may differ in firmware.

Some Diagnostic Notes:

The old F-Series CPUs could use the E-Series Fast FORTRAN (the 2-part version) for FFP tests, whereas the new F-Series would fail on the XADD series of tests. To get around this, there are now three diagnostics that apply. Use the old 2-set diagnostic for M/E CPUs and the new 1926+ diagnostic (DSN+101121) for all F-Series CPUs.

A basic problem is the deletion of 'old' diagnostics from various revisions of the offline diagnostic package 24396. After 1835 rev, various diagnostics began disappearing (such as 2644 CRT, 2883 disk, old F-Series diagnostics, etc). The best solution is to create a cumulative diagnostic tape in order to service some of these 'older' products. The Neely Santa Clara TSE's have created such a tape and will be glad to copy it onto a 600' magtape reel (1600 or 800 bpi). Included will be a list of the diagnostics, DSN's and description. !DISK and !DSKUP are both included with their own DSN. Be sure to look at the Utilities manual concerning !MTLDR when a customer doesn't have a magtape loader ROM. This tape will have all the files run through an absolute code compactor routine which reduces the tape required by over 60%! You can store the files from the tape onto CTUs with similar savings in tape and loading time.

The DMI chips can be 'quick tested' by executing a 101701 or 105701 opcode. If the chips are in place, P will increment and the A-register (101701) will complement into 076076, and the B-register contents will likewise be complemented for the 105701 opcode. Note that this is not a test of DMI capability, only their presence and strapping is correct. This works at the RTE-4 upgrade level.

S O R T E D B Y O P C O D E V A L U E

Entry	Opcode Description of the Entry Point Function	2100	1000M	1000E	F-cpu early	F-cpu 1920+
.MPY	= 100200 Integer Multiply	STD	STD	STD	STD	STD
.DIV	= 100400 Integer Divide	STD	STD	STD	STD	STD
.VECT	= 101460 Word 1 for 2-word VIS Opcodes in %VLIB	N/A	N/A	N/A	12824	12824
VPIV	= 101461 VIS: Pivot Routine for Array Processing	N/A	N/A	N/A	12824	12824
VABS	= 101462 VIS: Absolute Value for an Array	N/A	N/A	N/A	12824	12824
VSUM	= 101463 VIS: Sum an Array's Elements	N/A	N/A	N/A	12824	12824
VNRM	= 101464 VIS: Sum Absolute Value of Array	N/A	N/A	N/A	12824	12824
VDOT	= 101465 VIS: Dot Product of an Array	N/A	N/A	N/A	12824	12824
VMAX	= 101466 VIS: Find Largest Element in an Array	N/A	N/A	N/A	12824	12824
VMAB	= 101467 VIS: Find Largest Absolute Value in Array	N/A	N/A	N/A	12824	12824
VMIN	= 101470 VIS: Find Smallest Element in an Array	N/A	N/A	N/A	12824	12824
VMIB	= 101471 VIS: Find Smallest Absolute Value	N/A	N/A	N/A	12824	12824
VMOV	= 101472 VIS: Copy an Array into another Array	N/A	N/A	N/A	12824	12824
VSWP	= 101473 VIS: Exchange Elements in two Arrays	N/A	N/A	N/A	12824	12824
.ERES	= 101474 VIS: Calc 2 word offset for EMA Array	N/A	N/A	N/A	12824	12824
.ESEG	= 101475 Set Multiple Map registers	N/A	N/A	N/A	12824	12824
.VSET	= 101476 VIS: Calc Map Table from .ERES info	N/A	N/A	N/A	12824	12824
.....	= 101701 DMI Quick Selftest = CMA Instruction	N/A	N/A	DMI	DMI	DMI
.DLI	= 104200 Double Load (A/B)	STD	STD	STD	STD	STD
.DST	= 104400 Double Store (A/B)	STD	STD	STD	STD	STD
.FAD	= 105000 Floating Point Add	12901	STD	STD	HFP	HFP
.XADD	= 105001 3 word Float Add (F-cpu's only)	N/A	N/A	N/A	STD	STD
.TADD	= 105002 4-word Double Precision Add	N/A	N/A	N/A	FPP	FPP
.....	= 105004 Floating Point Processor Selftest	N/A	N/A	N/A	STD	STD
.DAD	= 105014 Double Integer Add	N/A	N/A	N/A	N/A	DBI

.FSB	= 105020	Float Point Subtract	12901	STD	STD	HFP	HFP
.XSUB	= 105021	3 word Float Subtract (F-cpu's only)	N/A	N/A	N/A	STD	STD
.TSUB	= 105022	4-word Double Precision Subtract	N/A	N/A	N/A	FPP	FPP
.DSB	= 105034	Double Integer Subtract	N/A	N/A	N/A	N/A	DBI
.FMP	= 105040	Float Point Multiply	12901	STD	STD	HFP	HFP
.XMPY	= 105041	3 word Float Multiply (F-cpu's only)	N/A	N/A	N/A	STD	STD
.TMPY	= 105042	4-word Double Precision Multiply	N/A	N/A	N/A	FPP	FPP
.DMP	= 105054	Double Integer Multiply	N/A	N/A	N/A	N/A	DBI
.FDV	= 105060	Float Point Divide	12901	STD	STD	HFP	HFP
.XDIV	= 105061	3 word Float Divide (F-cpu's only)	N/A	N/A	N/A	STD	STD
.TDIV	= 105062	4-word Double Precision Divide	N/A	N/A	N/A	FPP	FPP
.DDI	= 105074	Double Integer Divide	N/A	N/A	N/A	N/A	DBI
IFIX	= 105100	Float to Integer	12901	STD	STD	STD	STD
.DINT	= 105101	Same as .XFXS (HP-FTN Interface)	N/A	N/A	N/A	FPP	FPP
.XFXS	= 105101	3 word Float to 1 word Integer (.DINT)	N/A	N/A	N/A	FPP	FPP
.TINT	= 105102	Same as .TXFS (HP-FTN Interface)	N/A	N/A	N/A	FPP	FPP
.TFXS	= 105102	4-word Double to 1-word Integer (.TINT)	N/A	N/A	N/A	FPP	FPP
.FIXD	= 105104	2 word Float to 2 word Integer	N/A	N/A	N/A	FPP	FPP
.XFXD	= 105105	3 word Float to 2 word Integer	N/A	N/A	N/A	FPP	FPP
.TFXD	= 105106	4-word Double to 2-word Integer	N/A	N/A	N/A	FPP	FPP
.DSBR	= 105114	Double Subtract Reversed (Y-X VS. X-Y)	N/A	N/A	N/A	N/A	DBI
FLOAT	= 105120	Integer to Float	12901	STD	STD	STD	STD
.IDBL	= 105121	Same as .XFTS (HP-FTN Interface)	N/A	N/A	N/A	FPP	FPP
.XFTS	= 105121	1 word Integer to 3 word Float (.IDBL)	N/A	N/A	N/A	FPP	FPP
.TFTS	= 105122	1-word Integer to 4-word Double	N/A	N/A	N/A	FPP	FPP

S O R T E D B Y O P C O D E V A L U E

Entry	Opcode Description of the Entry Point Function	2100	1000M	1000E	F-cpu early	F-cpu 1920+
.ITBL	= 105122 Same as .TFTS (HP-FTN Interface)	N/A	N/A	N/A	FPP	FPP
.FLTD	= 105124 2 word Integer to 2 word Float	N/A	N/A	N/A	FPP	FPP
.XFTD	= 105125 2 word Integer to 3 word Float	N/A	N/A	N/A	FPP	FPP
.TFTD	= 105126 2-word Integer to 4-word Double	N/A	N/A	N/A	FPP	FPP
.DDIR	= 105134 Double Divide Reverse (Y/X VS. X/Y)	N/A	N/A	N/A	N/A	DBI
.....	= 105200 Fast Fortran Selftest	N/A	N/A	N/A	FPP	FPP
DBLE	= 105201 2 word Float to 3 word Float Precision	12907	12977	13306	FPP	FPP
SNGL	= 105202 3 word Float to 2 word Float Precision	12907	12977	13306	FPP	FPP
.XMPY	= 105203 3 word Float Multiply (non-F CPU's)	12907	12977	13306	N/A	N/A
.DNG	= 105203 Double Integer Negation (Change sign)	N/A	N/A	N/A	N/A	DBI
.DCO	= 105204 Double Integer Compare	N/A	N/A	N/A	N/A	DBI
.XDIV	= 105204 3 word Float Divide (non-F CPU's)	12907	12977	13306	N/A	N/A
.DFER	= 105205 Copy 3 word (DEFS = ADDR)	12907	12977	13306	FPP	FPP
.XPAK	= 105206 Create Normalized 3 word Floating point	N/A	12977	13306	FPP	FPP
.BLE	= 105207 2-word Real to 4-word Double	N/A	N/A	N/A	N/A	FPP
XADD	= 105207 Entry Point for HP-FTN to use .XADD	12907	12977	13306	N/A	N/A
.DIN	= 105210 Double Integer Increment	N/A	N/A	N/A	N/A	DBI
XSUB	= 105210 Entry Point for HP-FTN to use .XSUB	12907	12977	13306	N/A	N/A
.DDE	= 105211 Double Integer Decrement	N/A	N/A	N/A	N/A	DBI
XMPY	= 105211 Entry Point for HP-FTN to use .XMPY	12907	12977	13306	N/A	N/A
.DIS	= 105212 Double Increment ans Skip on Zero	N/A	N/A	N/A	N/A	DBI
XDIV	= 105212 Entry Point for HP-FTN to use .XDIV	12907	12977	13306	N/A	N/A
.DDS	= 105213 Double Decrement and Skip on Zero	N/A	N/A	N/A	N/A	DBI
.XADD	= 105213 3 word Float Add (non-F CPU's)	12907	12977	13306	N/A	N/A
.NGL	= 105214 4-word Double to 2-word Real	N/A	N/A	N/A	N/A	FPP

.XSUB	= 105214	3 word Float Subtract (non-F CPU's)	12907	12977	13306	N/A	N/A
.XCOM	= 105215	Complement a 3 word Float (Unpacked)	N/A	12977	13306	FFP	FFP
..DCM	= 105216	Complement a 2 word Floating point	N/A	12977	13306	FFP	FFP
DDINT	= 105217	Truncate 2 word Float to Integer	N/A	12977	13306	FFP	FFP
.XFER	= 105220	Copy 3 words (A/B REG = Address)	12907	12977	13306	FFP	FFP
.GOTO	= 105221	Computed GOTO	12907	12977	13306	FFP	FFP
..MAP	= 105222	Compute 2/3 dimensional Array addresses	12907	12977	13306	FFP	FFP
..ENTR	= 105223	Compute true ADDR for params, return	12907	12977	13306	FFP	FFP
..ENTP	= 105224	Same as .ENTR for Privileged Programs	12907	12977	13306	FFP	FFP
.PWR2	= 105225	$Y = X * 2^{**N(X)}$ is 2-word Float, N=integer	N/A	12977	13306	FFP	FFP
.FLUN	= 105226	Unpack 2 word Float Mantissa and Exponent	N/A	12977	13306	FFP	FFP
\$.SETP	= 105227	Setup Table of Ascending Numbers	12907	12977	13306	FFP	FFP
.PACK	= 105230	Create Normalized 2-word Floating point	N/A	12977	13306	FFP	FFP
.CFER	= 105231	Copy 4 words to another Address	N/A	N/A	Note1	FFP	FFP
..FCM	= 105232	Complement 2-word Real Number	N/A	N/A	N/A	N/A	FFP
..TCM	= 105233	Complement 4-word Double	N/A	N/A	N/A	N/A	FFP
.EMIO	= 105240	EMA I/O (Assures Buffer is in Window)	N/A	N/A	EMA	EMA	EMA
.PMAP	= 105240	VMA: Maps VMA page to map registers	N/A	N/A	VMA	VMA	VMA
MMAP	= 105241	Map Physical into Logical Address	N/A	N/A	EMA	EMA	EMA
\$.LOC	= 105241	VMA: Memresident node - Load on call	N/A	N/A	VMA	VMA	VMA
.....	= 105242	EMA Selftest	N/A	N/A	EMA	EMA	EMA
.....	= 105242	VMA Selftest	N/A	N/A	VMA	VMA	VMA
.....	= 105243	VMA: Swap A and B registers	N/A	N/A	VMA	VMA	VMA
.....	= 105244	VMA: (Part of 105243 code for old EMA)	N/A	N/A	VMA	VMA	VMA
.....	= 105245	VMA: (Part of 105243 code for old EMA)	N/A	N/A	VMA	VMA	VMA
..MYAD	= 105246	VMA: multiply 2 signed integers	N/A	N/A	VMA	VMA	VMA

S O R T E D B Y O P C O D E V A L U E

Entry	Opcode Description of the Entry Point Function	2100	1000M	1000E	F-cpu early	F-cpu 1920+
.UMAP	= 105247 VMA: Performs $AREG*(P+1,I)+BREG$	N/A	N/A	VMA	VMA	VMA
.IMAP	= 105250 VMA: FTN4X integer array calc and map	N/A	N/A	VMA	VMA	VMA
.IMAR	= 105251 VMA: Integer subscript calculation	N/A	N/A	VMA	VMA	VMA
.JMAP	= 105252 VMA: Double integer array calc & map	N/A	N/A	VMA	VMA	VMA
.JMAR	= 105253 VMA: Double integer subscript compute	N/A	N/A	VMA	VMA	VMA
.LPXR	= 105254 VMA: 32 bit DEF pointer add and map	N/A	N/A	VMA	VMA	VMA
.LPX	= 105255 VMA: ABREG pointer + offset and map	N/A	N/A	VMA	VMA	VMA
.LBPR	= 105256 VMA: 16 bit DEF pointer map	N/A	N/A	VMA	VMA	VMA
.EMAP	= 105257 EMA Element Mapping	N/A	N/A	EMA	EMA	EMA
.LBP	= 105257 VMA: map pointer in ABREG	N/A	N/A	VMA	VMA	VMA
.....	= 105304 DS/1000 Selftest for 1000-E or F only	N/A	91740	N/A	N/A	N/A
TAN	= 105320 Tangent	N/A	N/A	N/A	SIS	SIS
SQRT	= 105321 Square Root	N/A	N/A	N/A	SIS	SIS
ALOG	= 105322 Natural Logarithm (Base E)	N/A	N/A	N/A	SIS	SIS
ATAN	= 105323 Arc Tangent	N/A	N/A	N/A	SIS	SIS
COS	= 105324 Cosine	N/A	N/A	N/A	SIS	SIS
SIN	= 105325 Sine	N/A	N/A	N/A	SIS	SIS
EXP	= 105326 Raise E to 2 word Float power	N/A	N/A	N/A	SIS	SIS
ALOGT	= 105327 Common Logarithm (Base 10)	N/A	N/A	N/A	SIS	SIS
TANH	= 105330 Hyperbolic Tangent	N/A	N/A	N/A	SIS	SIS
DPOLY	= 105331 4-word Polynomial Evaluator (was TRNL)	N/A	N/A	N/A	N/A	SIS
/CMRT	= 105332 4-word Common Range Reduction	N/A	N/A	N/A	N/A	FPP
/ATLG	= 105333 4-word Computation of $(1-X) (1+X)$	N/A	N/A	N/A	N/A	SIS
.FPWR	= 105334 2-word Float to 1-word +Power	N/A	N/A	N/A	N/A	SIS
.TPWR	= 105335 4-word Double to 1-word +Power	N/A	N/A	N/A	N/A	SIS

.....	= 105337 Scientific Instruction Set (SIS) Selftest	N/A	N/A	N/A	N/A	SIS	SIS
.LIBR	= 105340 \$LIBR sequence in microcode.	N/A	N/A	N/A	N/A	RTE6	RTE6
.LIBX	= 105341 \$LIBX sequence in microcode	N/A	N/A	N/A	N/A	RTE6	RTE6
.TICK	= 105342 TBG tick interrupt handler	N/A	N/A	N/A	N/A	RTE6	RTE6
.TNAM	= 105343 Find ID segment that matches a name	N/A	N/A	N/A	N/A	RTE6	RTE6
.STIO	= 105344 Configure I/O for drivers	N/A	N/A	N/A	N/A	RTE6	RTE6
.FNW	= 105345 Compare words with variable increment	N/A	N/A	N/A	N/A	RTE6	RTE6
.IRT	= 105346 Interrupt return processing	N/A	N/A	N/A	N/A	RTE6	RTE6
.LLS	= 105347 Search a linked list	N/A	N/A	N/A	N/A	RTE6	RTE6
.SIP	= 105350 Skip if interrupt pending	N/A	N/A	N/A	N/A	RTE6	RTE6
.YLD	= 105351 .SIP completion return point	N/A	N/A	N/A	N/A	RTE6	RTE6
.CPM	= 105352 Compare words without register mods	N/A	N/A	N/A	N/A	RTE6	RTE6
.ETEQ	= 105353 Setup base page EQT values	N/A	N/A	N/A	N/A	RTE6	RTE6
.ENTN	= 105354 Double use opcode, similar to .ENTR	N/A	N/A	N/A	N/A	RTE6	RTE6
.....	= 105355 Double use opcode, RTE6 ROM selftest	N/A	N/A	N/A	N/A	RTE6	RTE6
.ENTC	= 105356 Double use opcode, similar to .ENTP	N/A	N/A	N/A	N/A	RTE6	RTE6
.STU	= 105357 Double use opcode, fill with a constant	N/A	N/A	N/A	N/A	RTE6	RTE6
.DVCT	= 105460 VIS: Similar to .VECT for 2-word Opcodes	N/A	N/A	N/A	N/A	12824	12824
DVPIV	= 105461 VIS: Pivot for 4-word Real Arrays	N/A	N/A	N/A	N/A	12824	12824
DVABS	= 105462 VIS: Absolute Value for 4-word Arrays	N/A	N/A	N/A	N/A	12824	12824
DVSUM	= 105463 VIS: Sum 4-word Array Elements	N/A	N/A	N/A	N/A	12824	12824
DVNRM	= 105464 VIS: Sum Absolute Value OF 4-word Array	N/A	N/A	N/A	N/A	12824	12824
DVDOT	= 105465 VIS: Dot Product for 4-word Arrays	N/A	N/A	N/A	N/A	12824	12824
DVMAX	= 105466 VIS: Return Largest Element in Array	N/A	N/A	N/A	N/A	12824	12824
DVMAB	= 105467 VIS: Find Largest ABS Value in Array	N/A	N/A	N/A	N/A	12824	12824

S O R T E D B Y O P C O D E V A L U E

Entry	Opcode	Description of the Entry Point Function	2100	1000M	1000E	F-cpu early	F-cpu 1920+
DVMIN	= 105470	VIS: Return Smallest Value in Array	N/A	N/A	N/A	12824	12824
DVMIB	= 105471	VIS: Find Smallest ABS Value in Array	N/A	N/A	N/A	12824	12824
DVMOV	= 105472	VIS: Copy a 4-word Array to another Array	N/A	N/A	N/A	12824	12824
DVSWP	= 105473	VIS: Exchange a 4-word Array with another	N/A	N/A	N/A	12824	12824
....	= 105477	VIS: Vector Instruction Set Selftest	N/A	N/A	N/A	12824	12824
....	= 105524	DS/1000 Selftest for 1000-M only	N/A	91740	N/A	N/A	N/A
BITRV	= 105600	SIGNAL/1000 Swap 2 elements in array	N/A	N/A	N/A	N/A	92835
BTRFY	= 105601	SIGNAL/1000 Butterfly algorithm	N/A	N/A	N/A	N/A	92835
UNSCR	= 105602	SIGNAL/1000 Unscramble for phasor MPY	N/A	N/A	N/A	N/A	92835
PRSCR	= 105603	SIGNAL/1000 Unscramble for phasor MPY	N/A	N/A	N/A	N/A	92835
BITR1	= 105604	SIGNAL/1000 Swap 2 elements, alt. format	N/A	N/A	N/A	N/A	92835
BTRF1	= 105605	SIGNAL/1000 Butterfly algorithm	N/A	N/A	N/A	N/A	92835
.CADD	= 105606	SIGNAL/1000 Complex Number Addition	N/A	N/A	N/A	N/A	92835
.CSUB	= 105607	SIGNAL/1000 Complex number subtract	N/A	N/A	N/A	N/A	92835
.CMPY	= 105610	SIGNAL/1000 Complex Number Multiply	N/A	N/A	N/A	N/A	92835
.CDIV	= 105611	SIGNAL/1000 Complex Number Division	N/A	N/A	N/A	N/A	92835
CONJG	= 105612	SIGNAL/1000 Opcode (F-cpu with VIS only)	N/A	N/A	N/A	N/A	92835
..CCM	= 105613	SIGNAL/1000 Opcode (F-cpu with VIS only)	N/A	N/A	N/A	N/A	92835
AIMAG	= 105614	SIGNAL/1000 Return imaginary part	N/A	N/A	N/A	N/A	92835
CMPLX	= 105615	SIGNAL/1000 Form complex number	N/A	N/A	N/A	N/A	92835
....	= 105616	SIGNAL/1000 Reserved opcode	N/A	N/A	N/A	N/A	92835
....	= 105617	SIGNAL/1000 Selftest opcode	N/A	N/A	N/A	N/A	92835
....	= 105701	DMI Quick Selftest = CMB Instruction	N/A	N/A	DMI	DMI	DMI
.LBT	= 105763	Load Byte	N/A	EIG	EIG	EIG	EIG
.SBT	= 105764	Store Byte	N/A	EIG	EIG	EIG	EIG

.MBT	= 105765	Move Bytes	N/A	EIG	EIG	EIG
.CBT	= 105766	Compare Bytes	N/A	EIG	EIG	EIG
.SFB	= 105767	Scan for Bytes	N/A	EIG	EIG	EIG
.SBS	= 105773	Set Bits	N/A	EIG	EIG	EIG
.CBS	= 105774	Clear Bits	N/A	EIG	EIG	EIG
.TBS	= 105775	Test for Set Bits	N/A	EIG	EIG	EIG
.CMW	= 105776	Compare words	N/A	EIG	EIG	EIG
.MVW	= 105777	Move words	N/A	EIG	EIG	EIG

Entry	S O R T E D	B Y	E N T R Y	P O I N T	N A M E				
					Opcode Description of the Entry Point Function				
\$LOC					2100	N/A	1000M	1000E	F-cpu 1920+
\$SETP					12907	N/A	VMA	VMA	VMA
.....					N/A	N/A	12977	13306	FFP
.....					N/A	N/A	DMI	DMI	DMI
.....					N/A	N/A	N/A	N/A	STD
.....					N/A	N/A	N/A	N/A	FFP
.....					N/A	N/A	N/A	N/A	EMA
.....					N/A	N/A	N/A	N/A	VMA
.....					N/A	N/A	N/A	N/A	VMA
.....					N/A	N/A	N/A	N/A	VMA
.....					N/A	N/A	N/A	N/A	VMA
.....					N/A	N/A	N/A	N/A	SIS
.....					N/A	N/A	N/A	N/A	RTE6
.....					N/A	N/A	N/A	N/A	12824
.....					N/A	N/A	N/A	91740	91740
.....					N/A	N/A	N/A	91740	91740
.....					N/A	N/A	N/A	N/A	92835
.....					N/A	N/A	N/A	N/A	92835
.....					N/A	N/A	N/A	DMI	DMI
..CCM					N/A	N/A	N/A	N/A	92835
..DCM					N/A	N/A	N/A	N/A	FFP
..FCM					N/A	N/A	N/A	N/A	FFP
..MAP					12907	N/A	12977	13306	FFP
..TCM					N/A	N/A	N/A	N/A	FFP
..BLE					N/A	N/A	N/A	N/A	FFP
..CADD					N/A	N/A	N/A	N/A	92835

.CBS	= 105774	Clear Bits	N/A	EIG	EIG	EIG	EIG	EIG
.CBT	= 105766	Compare Bytes	N/A	EIG	EIG	EIG	EIG	EIG
.CDIV	= 105611	SIGNAL/1000 Complex Number Division	N/A	N/A	N/A	N/A	N/A	92835
.CFER	= 105231	Copy 4 words to another Address	N/A	N/A	Note1	FFP	FFP	FFP
.CMPY	= 105610	SIGNAL/1000 Complex Number Multiply	N/A	N/A	N/A	N/A	N/A	92835
.CMW	= 105776	Compare words	N/A	EIG	EIG	EIG	EIG	EIG
.CPM	= 105352	Compare words without register mods	N/A	N/A	RTE6	RTE6	RTE6	RTE6
.CSUB	= 105607	SIGNAL/1000 Complex number subtract	N/A	N/A	N/A	N/A	N/A	92835
.DAD	= 105014	Double Integer Add	N/A	N/A	N/A	N/A	N/A	DBI
.DCO	= 105204	Double Integer Compare	N/A	N/A	N/A	N/A	N/A	DBI
.DDE	= 105211	Double Integer Decrement	N/A	N/A	N/A	N/A	N/A	DBI
.DDI	= 105074	Double Integer Divide	N/A	N/A	N/A	N/A	N/A	DBI
.DDIR	= 105134	Double Divide Reverse (Y/X VS. X/Y)	N/A	N/A	N/A	N/A	N/A	DBI
.DDS	= 105213	Double Decrement and Skip on Zero	N/A	N/A	N/A	N/A	N/A	DBI
.DFER	= 105205	Copy 3 word (DEFS = ADDR)	12907	12977	13306	FFP	FFP	FFP
.DIN	= 105210	Double Integer Increment	N/A	N/A	N/A	N/A	N/A	DBI
.DINT	= 105101	Same as .XFXS (HP-FTN Interface)	N/A	N/A	N/A	N/A	N/A	DBI
.DIS	= 105212	Double Increment ans Skip on Zero	N/A	N/A	N/A	N/A	N/A	FFP
.DIV	= 100400	Integer Divide	N/A	N/A	N/A	N/A	N/A	DBI
.DLA	= 104200	Double Load (A/B)	STD	STD	STD	STD	STD	STD
.DMP	= 105054	Double Integer Multiply	N/A	N/A	N/A	N/A	N/A	DBI
.DNG	= 105203	Double Integer Negation (Change sign)	N/A	N/A	N/A	N/A	N/A	DBI
.DSB	= 105034	Double Integer Subtract	N/A	N/A	N/A	N/A	N/A	DBI
.DSBR	= 105114	Double Subtract Reversed (Y-X VS. X-Y)	N/A	N/A	N/A	N/A	N/A	DBI
.DST	= 104400	Double Store (A/B)	STD	STD	STD	STD	STD	STD
.DVCT	= 105460	VIS: Similar to .VECT for 2-word Opcodes	N/A	N/A	N/A	N/A	N/A	12824

Entry	Opcode	Description of the Entry Point Function	S O R T E D B Y E N T R Y P O I N T				N A M E				F-cpu	
			2100				1000M 1000E				early	1920+
.EMAP	= 105257	EMA Element Mapping	N/A	N/A	N/A	N/A	N/A	N/A	EMA	EMA	EMA	EMA
.EMIO	= 105240	EMA I/O (Assures Buffer is in Window)	N/A	N/A	N/A	N/A	N/A	N/A	EMA	EMA	EMA	EMA
.ENTC	= 105356	Double use opcode, similar to .ENTP	N/A	N/A	N/A	N/A	N/A	N/A	RTE6	RTE6	RTE6	RTE6
.ENTN	= 105354	Double use opcode, similar to .ENTR	N/A	N/A	N/A	N/A	N/A	N/A	RTE6	RTE6	RTE6	RTE6
.ENTP	= 105224	Same as .ENTR for Privileged Programs	12907	12977	13306	FPP	FPP	FPP	FPP	FPP	FPP	FPP
.ENTR	= 105223	Compute true ADDR for params, return	12907	12977	13306	FPP	FPP	FPP	FPP	FPP	FPP	FPP
.ERES	= 101474	VIS: Calc 2 word offset for EMA Array	N/A	N/A	N/A	N/A	N/A	N/A	12824	12824	12824	12824
.ESEG	= 101475	VIS: Set Multiple Map registers	N/A	N/A	N/A	N/A	N/A	N/A	RTE6	RTE6	RTE6	RTE6
.ETEQ	= 105353	Setup base page EQT values	12901	STD	STD	HFP	HFP	HFP	HFP	HFP	HFP	HFP
.FAD	= 105000	Floating Point Add	12901	STD	STD	HFP	HFP	HFP	HFP	HFP	HFP	HFP
.FDV	= 105060	Float Point Divide	N/A	N/A	N/A	N/A	N/A	N/A	FPP	FPP	FPP	FPP
.FIXD	= 105104	2 word Float to 2 word Integer	N/A	N/A	N/A	N/A	N/A	N/A	FPP	FPP	FPP	FPP
.FLTD	= 105124	2 word Integer to 2 word Float	N/A	N/A	N/A	N/A	N/A	N/A	FPP	FPP	FPP	FPP
.FLUN	= 105226	Unpack 2 word Float Mantissa and Exponent	N/A	12977	13306	FPP	FPP	FPP	FPP	FPP	FPP	FPP
.FMP	= 105040	Float Point Multiply	12901	STD	STD	HFP	HFP	HFP	HFP	HFP	HFP	HFP
.FNW	= 105345	Compare words with variable increment	N/A	N/A	N/A	N/A	N/A	N/A	RTE6	RTE6	RTE6	RTE6
.FPWR	= 105334	2-word Float to 1-word +Power	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
.FSB	= 105020	Float Point Subtract	12901	STD	STD	HFP	HFP	HFP	HFP	HFP	HFP	HFP
.GOTO	= 105221	Computed GOTO	12907	12977	13306	FPP	FPP	FPP	FPP	FPP	FPP	FPP
.IDBL	= 105121	Same as .XFTS (HP-FTN Interface)	N/A	N/A	N/A	N/A	N/A	N/A	FPP	FPP	FPP	FPP
.IMAP	= 105250	VMA: FTN4X integer array calc and map	N/A	N/A	N/A	N/A	N/A	N/A	VMA	VMA	VMA	VMA
.IMAR	= 105251	VMA: Integer subscript calculation	N/A	N/A	N/A	N/A	N/A	N/A	VMA	VMA	VMA	VMA
.IRT	= 105346	Interrupt return processing	N/A	N/A	N/A	N/A	N/A	N/A	RTE6	RTE6	RTE6	RTE6
.ITBL	= 105122	Same as .TFTS (HP-FTN Interface)	N/A	N/A	N/A	N/A	N/A	N/A	FPP	FPP	FPP	FPP
.JMAP	= 105252	VMA: Double integer array calc & map	N/A	N/A	N/A	N/A	N/A	N/A	VMA	VMA	VMA	VMA

.JMAR	= 105253 VMA: Double integer subscript compute	N/A	N/A	VMA	VMA	VMA
.LBP	= 105257 VMA: map pointer in ABREG	N/A	N/A	VMA	VMA	VMA
.LBPR	= 105256 VMA: 16 bit DEF pointer map	N/A	N/A	VMA	VMA	VMA
.LBT	= 105763 Load Byte	N/A	EIG	EIG	EIG	EIG
.LIBR	= 105340 \$LIBR sequence in microcode.	N/A	N/A	RTE6	RTE6	RTE6
.LIBX	= 105341 \$LIBX sequence in microcode	N/A	N/A	RTE6	RTE6	RTE6
.LLS	= 105347 Search a linked list	N/A	N/A	RTE6	RTE6	RTE6
.LPX	= 105255 VMA: ABREG pointer + offset and map	N/A	N/A	VMA	VMA	VMA
.LPXR	= 105254 VMA: 32 bit DEF pointer add and map	N/A	N/A	VMA	VMA	VMA
.MBT	= 105765 Move Bytes	N/A	EIG	EIG	EIG	EIG
.MPY	= 100200 Integer Multiply	STD	STD	STD	STD	STD
.MVW	= 105777 Move words	N/A	EIG	EIG	EIG	EIG
.MYAD	= 105246 VMA: multiply 2 signed integers	N/A	N/A	VMA	VMA	VMA
.NGL	= 105214 4-word Double to 2-word Real	N/A	N/A	N/A	N/A	FPP
.PACK	= 105230 Create Normalized 2-word Floating point	N/A	12977	13306	FPP	FPP
.PMAP	= 105240 VMA: Maps VMA page to map registers	N/A	N/A	VMA	VMA	VMA
.PWR2	= 105225 Y = X*2**N(X is 2-word Float, N=integer)	N/A	12977	13306	FPP	FPP
.SBS	= 105773 Set Bits	N/A	EIG	EIG	EIG	EIG
.SBT	= 105764 Store Byte	N/A	EIG	EIG	EIG	EIG
.SFB	= 105767 Scan for Bytes	N/A	EIG	EIG	EIG	EIG
.SIP	= 105350 Skip if interrupt pending	N/A	N/A	RTE6	RTE6	RTE6
.STIO	= 105344 Configure I/O for drivers	N/A	N/A	RTE6	RTE6	RTE6
.STU	= 105357 Double use opcode, fill with a constant	N/A	N/A	RTE6	RTE6	RTE6
.TADD	= 105002 4-word Double Precision Add	N/A	N/A	N/A	FPP	FPP
.TBS	= 105775 Test for Set Bits	N/A	EIG	EIG	EIG	EIG
.TDIV	= 105062 4-word Double Precision Divide	N/A	N/A	N/A	FPP	FPP
.TFTD	= 105126 2-word Integer to 4-word Double	N/A	N/A	N/A	FPP	FPP

Entry	Opcode	Description of the Entry Point Function	S O R T E D B Y E N T R Y P O I N T N A M E				F-cpu	
			2100	1000M	1000E	early	1920+	
.TFTS	= 105122	1-word Integer to 4-word Double	N/A	N/A	N/A	FPP	FPP	
.TFXD	= 105106	4-word Double to 2-word Integer	N/A	N/A	N/A	FPP	FPP	
.TFXS	= 105102	4-word Double to 1-word Integer (.TINT)	N/A	N/A	N/A	FPP	FPP	
.TINT	= 105102	Same as .TFXS (HP-FTN Interface)	N/A	N/A	N/A	FPP	FPP	
.TICK	= 105342	TBG tick interrupt handler	N/A	N/A	RTE6	RTE6	RTE6	
.TMPY	= 105042	4-word Double Precision Multiply	N/A	N/A	N/A	FPP	FPP	
.TNAM	= 105343	Find ID segment that matches a name	N/A	N/A	RTE6	RTE6	RTE6	
.TPWR	= 105335	4-word Double to 1-word +Power	N/A	N/A	N/A	N/A	N/A	SIS
.TSUB	= 105022	4-word Double Precision Subtract	N/A	N/A	N/A	FPP	FPP	
.UMAP	= 105247	VMA: Performs AREG*(P+1,D)+BREG	N/A	N/A	VMA	VMA	VMA	
.VECT	= 101460	VIS: Word 1 for 2-word VIS Opcodes	N/A	N/A	N/A	12824	12824	
.VSET	= 101476	VIS: Calc Map Table from .ERES info	N/A	N/A	N/A	12824	12824	
.XADD	= 105213	3 word Float Add (non-F CPU's)	12907	12977	13306	N/A	N/A	
.XADD	= 105001	3 word Float Add (F-cpu's only)	N/A	N/A	N/A	STD	STD	
.XCOM	= 105215	Complement a 3 word Float (Unpacked)	N/A	12977	13306	FPP	FPP	
.XDIV	= 105061	3 word Float Divide (F-cpu's only)	N/A	N/A	N/A	STD	STD	
.XDIV	= 105204	3 word Float Divide (non-F CPU's)	12907	12977	13306	N/A	N/A	
.XFER	= 105220	Copy 3 words (A/B REG = Address)	12907	12977	13306	FPP	FPP	
.XFTD	= 105125	2 word Integer to 3 word Float	N/A	N/A	N/A	FPP	FPP	
.XFTS	= 105121	1 word Integer to 3 word Float (.IDBL)	N/A	N/A	N/A	FPP	FPP	
.FXFD	= 105105	3 word Float to 2 word Integer	N/A	N/A	N/A	FPP	FPP	
.FXFS	= 105101	3 word Float to 1 word Integer (.DINT)	N/A	N/A	N/A	FPP	FPP	
.XMPY	= 105041	3 word Float Multiply (F-cpu's only)	N/A	N/A	N/A	STD	STD	
.XMPY	= 105203	3 word Float Multiply (non-F CPU's)	12907	12977	13306	N/A	N/A	
.XPAK	= 105206	Create Normalized 3 word Floating point	N/A	12977	13306	FPP	FPP	

.XSUB	= 105021	3 word Float Subtract (F-cpu's only)	N/A	N/A	N/A	N/A	STD	STD
.XSUB	= 105214	3 word Float Subtract (non-F CPU's)	12907	N/A	13306	N/A	N/A	N/A
.YLD	= 105351	.SIP completion return point	N/A	N/A	RTE6	RTE6	RTE6	RTE6
/ATLG	= 105333	4-word Computation of (1-X) (1+X)	N/A	N/A	N/A	N/A	N/A	SIS
/CMRT	= 105332	4-word Common Range Reduction	N/A	N/A	N/A	N/A	N/A	FFP
AIMAG	= 105614	SIGNAL/1000 Return imaginary part	N/A	N/A	N/A	N/A	N/A	92835
ALOG	= 105322	Natural Logarithm (Base E)	N/A	N/A	N/A	N/A	SIS	SIS
ALOGT	= 105327	Common Logarithm (Base 10)	N/A	N/A	N/A	N/A	SIS	SIS
ATAN	= 105323	Arc Tangent	N/A	N/A	N/A	N/A	SIS	SIS
BTRF1	= 105605	SIGNAL/1000 Butterfly algorithm	N/A	N/A	N/A	N/A	N/A	92835
BTR1	= 105604	SIGNAL/1000 Swap 2 elements, alt. format	N/A	N/A	N/A	N/A	N/A	92835
BTRV	= 105600	SIGNAL/1000 Swap 2 elements in array	N/A	N/A	N/A	N/A	N/A	92835
BTRFY	= 105601	SIGNAL/1000 Butterfly algorithm	N/A	N/A	N/A	N/A	N/A	92835
CMPLX	= 105615	SIGNAL/1000 Form complex number	N/A	N/A	N/A	N/A	N/A	92835
CONJG	= 105612	SIGNAL/1000 Opcode (F-cpu with VIS only)	N/A	N/A	N/A	N/A	N/A	92835
COS	= 105324	Cosine	N/A	N/A	N/A	N/A	SIS	SIS
DBLE	= 105201	2 word Float to 3 word Float Precision	12907	12977	13306	FFP	FFP	FFP
DDINT	= 105217	Truncate 2 word Float to Integer	N/A	12977	13306	FFP	FFP	FFP
DPOLY	= 105331	4-word Polynomial Evaluator (was TRNL)	N/A	N/A	N/A	N/A	N/A	SIS
DVABS	= 105462	VIS: Absolute Value for 4-word Arrays	N/A	N/A	N/A	N/A	12824	12824
DVDOT	= 105465	VIS: Dot Product for 4-word Arrays	N/A	N/A	N/A	N/A	12824	12824
DVMAB	= 105467	VIS: Find Largest ABS Value in Array	N/A	N/A	N/A	N/A	12824	12824
DVMAX	= 105466	VIS: Return Largest Element in Array	N/A	N/A	N/A	N/A	12824	12824
DVMIB	= 105471	VIS: Find Smallest ABS Value in Array	N/A	N/A	N/A	N/A	12824	12824

S O R T E D B Y E N T R Y P O I N T N A M E				
Entry	Opcode Description of the Entry Point Function	2100	1000M 1000E	F-cpu F-cpu early 1920+
DVMIN	= 105470 VIS: Return Smallest Value in Array	N/A	N/A	12824 12824
DVMOV	= 105472 VIS: Copy a 4-word Array to another Array	N/A	N/A	12824 12824
DVNRM	= 105464 VIS: Sum Absolute Value OF 4-word Array	N/A	N/A	12824 12824
DVPIV	= 105461 VIS: Pivot for 4-word Real Arrays	N/A	N/A	12824 12824
DVSUM	= 105463 VIS: Sum 4-word Array Elements	N/A	N/A	12824 12824
DVSWP	= 105473 VIS: Exchange a 4-word Array with another	N/A	N/A	12824 12824
EXP	= 105326 Raise E to 2 word Float power	N/A	N/A	SIS
FLOAT	= 105120 Integer to Float	12901	STD	STD
IFIX	= 105100 Float to Integer	12901	STD	STD
MMAP	= 105241 Map Physical into Logical Address	N/A	EMA	EMA
PRSCR	= 105603 SIGNAL/1000 Unscramble for phasor MPY	N/A	N/A	N/A 92835
SIN	= 105325 Sine	N/A	N/A	SIS
SNGL	= 105202 3 word Float to 2 word Float Precision	12907	12977	13306 FFP
SQRT	= 105321 Square Root	N/A	N/A	SIS
TAN	= 105320 Tangent	N/A	N/A	SIS
TANH	= 105330 Hyperbolic Tangent	N/A	N/A	SIS
UNSCR	= 105602 SIGNAL/1000 Unscramble for phasor MPY	N/A	N/A	N/A 92835
VABS	= 101462 VIS: Absolute Value for an Array	N/A	N/A	N/A 12824
VDOT	= 101465 VIS: Dot Product of an Array	N/A	N/A	12824 12824
VMAB	= 101467 VIS: Find Largest Absolute Value in Array	N/A	N/A	12824 12824
VMAX	= 101466 VIS: Find Largest Element in an Array	N/A	N/A	12824 12824
VMIB	= 101471 VIS: Find Smallest Absolute Array Value	N/A	N/A	12824 12824
VMIN	= 101470 VIS: Find Smallest Element in an Array	N/A	N/A	12824 12824
VMOV	= 101472 VIS: Copy an Array into another Array	N/A	N/A	12824 12824
VNRM	= 101464 VIS: Sum Absolute Value of an Array	N/A	N/A	12824 12824

VPV	= 101461	VIS: Pivot Routine for Array Processing	N/A	N/A	N/A	12824	12824
VSUM	= 101463	VIS: Sum an Array's Elements	N/A	N/A	N/A	12824	12824
VSWP	= 101473	VIS: Exchange Elements in two Arrays	N/A	N/A	N/A	12824	12824
XADD	= 105207	Entry Point for HP-FTN to use .XADD	12907	12977	13306	N/A	N/A
XDIV	= 105212	Entry Point for HP-FTN to use .XDIV	12907	12977	13306	N/A	N/A
XMPY	= 105211	Entry Point for HP-FTN to use .XMPY	12907	12977	13306	N/A	N/A
XSUB	= 105210	Entry Point for HP-FTN to use .XSUB	12907	12977	13306	N/A	N/A

MEMORY-STATUS, VIOLATIONS, PARITY ERRORS**MEM Status Register Format**

BIT	SIGNIFICANCE
15	0 = MEM disabled at last interrupt 1 = MEM enabled at last interrupt.
14	0 = System map selected at last interrupt 1 = User map selected at last interrupt
13	0 = MEM disabled currently 1 = MEM enabled currently
12	0 = System map selected currently 1 = User map selected currently
11	0 = Protected mode disabled currently 1 = Protected mode enabled currently
10	0 = Portion mapped*
9	Base page fence bit 9
8	Base page fence bit 8
7	Base page fence bit 7
6	Base page fence bit 6
5	Base page fence bit 5
4	Base page fence bit 4
3	Base page fence bit 3
2	Base page fence bit 2
1	Base page fence bit 1
0	Base page fence bit 0

*Bit 10	Mapped Address (M)
0	Fence $\leq$ M < 2000 _h
1	1 < M < Fence

Note: The base page fence separates the reserved (mapped) memory from the shared (un-mapped) memory. Bit 10 specifies which area is reserved (mapped). (Refer to LFA and LFB instructions contained in paragraph 4-6.)

MEM Violation Register Format

BIT	SIGNIFICANCE
15	Read violation*
14	Write violation*
13	Base page violation*
12	Privileged instruction violation*
11	Reserved
10	Reserved
9	Reserved
8	Reserved
7	0 = ME bus disabled at violation 1 = ME bus enabled at violation
6	0 = MEM disabled at violation 1 = MEM enabled at violation
5	0 = System map enabled at violation 1 = User map enabled at violation
4	Map address bit 4
3	Map address bit 3
2	Map address bit 2
1	Map address bit 1
0	Map address bit 0

*Significant when associated bit is set.

MEMORY-STATUS, VIOLATIONS, PARITY ERRORS (Cont'd)

Read or write violations will interrupt to SC5. A DMS violation can be distinguished from a memory protect violation by executing an SFS05. If the strip occurs, DMS is in violation, otherwise it is a memory protect violation.

STC 05 Enable memory protect (disables interrupt)
 OTA/OTB 05 Load fence register from A/B register
 LIA/LIB 05 Load violation register into A/B

A parity error is distinguished from a memory protect error after the LIA/LIB 05 instruction execution by bit 15 of the selected register where a logic 1 is a parity error. The remaining bits contains the logical address of the error location.

Memory protect violations

1.	DST	ISZ	JLY	JMP	JPY	JSB
	MVB	MVW	SAX	SAY	SBX	SBY
	STA	STB	STX	STY		

- Location 00002 is normally the lower boundary. JMP, JLY, and JPY may not reference A or B.
- Any I/O instruction (including Halt 01) except those referencing I/O select code 01.

After the third level of indirect addressing a pending interrupt is allowed.

MEMORY-STATUS, VIOLATIONS, PARITY ERRORS (Cont'd)**RTE-II/III/IV DETECTED PARITY ERRORS**

Beginning with revision 1604 of RTE-III (92060A) and revision 1602 of RTE-II (92001A), the system detects parity errors. If a parity error is found, the system halts with T = 102005 and the B-register set the violation address (the memory location where the error occurred). When the system is RTE-III, the address refers to a logical address. The logical address usually falls within either the system map or the user map. The physical address (which points to a specific memory module) is found by examining the proper map and doing some elementary calculations as follows:

1. Determine whether the violation address is in the user map or the system map. A good guess is to assume the user map is enabled at the time of the interrupt. If the violation address is above the starting address for disc resident partitions then this is a good guess. (It could also be from high memory in the system map which is not included in the user map.) An accurate method is to examine location \$MEU, which is located in RTIOCM. Upon receiving an interrupt, the system stores the MEM status register in \$MEU. If bit 14 of \$MEU is 0, then the system map was enabled at time of interrupt; if bit 14 of \$MEU is 1, then the user map was enabled at the time.
2. Represent the violation address as a five digit octal number of the form MNXXX. Compute the index into the map as

$$I = 4 * M = N/2 \quad (0 \leq I \leq 31) \quad ; N = \text{Integer}$$
 Convert I to octal.
3. Select the M-register. Set the M-register to look at the register I within the proper map. Set the bits in M as below but do not press STORE!

Bits 15, 14 = On
 Bit 5 = On if User Map, else off
 Bits 4,0 = Octal value of I found above.
4. Select the T-register. The contents displayed is the physical page in memory where the violation address was reported.

Each memory module has 8 pages (8K module) or 16 pages (16K module).

Remember that a parity error can be due to a cause other than a defective memory module, e.g., a defective memory controller.

If a parity error is found, a halt 102005 occurs, and the error address will be loaded into the violation register of the memory protect logic. It is accessible by programming an LIA 05 or LIB 05 instruction. The RTE-IV Parity Error Module PERR4 loads the A-register with the physical page number and the B-register with the logical parity error address.

The parity indicator will light and remain lit until PRESET is pressed. Switch A1S1 on the CPU can enable or disable the halt.

Note

Soft parity errors cause a message to be displayed giving the logical parity error address and the DMS status register contents at the time of interrupt.

MEMORY-STATUS, VIOLATIONS, PARITY ERRORS (Cont'd)**RTE-6/VM PARITY ERROR MESSAGES**

HARD PARITY ERROR MESSAGE	(reproducible):
PE PG# nnnnn BAD	(physical page # of parity error)
ABE aaaaaa bbbbbb e	(A,B, and E registers)
XYO xxxxxx yyyyyy o	(X,Y, and O registers)
PE ppppp mmmmmm pppp ABORTED	(program name and logical memory address of parity error)
SOFT PARITY ERROR MESSAGE	(not reproducible):
SOFT PE PG# nnnnn	(physical page # of parity error)
ABE aaaaaa bbbbbb e	(A,B, and E registers)
XYO xxxxxx yyyyyy o	(X,Y, and O registers)
PE ppppp mmmmmm	(program name and logical memory address of parity error)

INTERRUPT AND I/O CONTROL SUMMARY

INST	S.C. 00	S.C. 01	S.C. 02	S.C. 03
STC	NOP	NOP	Prepares DCPC channel 1 to receive and store the block length in 2's complement form.	Prepares DCPC channel 2 to receive and store the block length in 2's complement form.
CLC	Clears all Control FF's from S.C. 06 and up; effectively turns off all I/O devices.	NOP	Prepares DCPC channel 1 to receive and store the direction of data flow and the starting memory address.	Prepares DCPC channel 2 to receive and store the direction of data flow and the starting memory address.
STF	Turns on interrupt system.	STO sets overflow bit.	NOP	NOP
CLF	Turns off interrupt system except power fail (S.C. 04) and parity error (S.C. 05).	CLO clears overflow bit.	NOP	NOP
SFS	Skip if interrupt system is on.	SOS	NOP	NOP
SFC	Skip if interrupt system is off.	SOC	NOP	NOP
LIA/B	Loads A/B register with all zeros. (Equivalent to CLA/B instruction.)	Loads display register contents into A/B register.	Loads present contents of DCPC channel 1 word count register into A/B register.	Loads present contents of DCPC channel 2 word count register into A/B register.
MIA/B	Equivalent to a NOP.	Merges display register contents into A/B register.	Merges present contents of DCPC channel 1 word count register into A/B register.	Merges present contents of DCPC channel 2 word count register into A/B register.
OTA/B	NOP	Outputs A/B register contents into display register.	1. Outputs to DCPC channel 1 the block length in 2's complement form (previously prepared by an STC 02 instruction). 2. Outputs to DCPC channel 1 the direction of data flow and the starting memory address (previously prepared by a CLC 02 instruction).	1. Outputs to DCPC channel 2 the block length in 2's complement form (previously prepared by an STC 03 instruction). 2. Outputs to DCPC channel 2 the direction of data flow and the starting memory address (previously prepared by a CLC 03 instruction).

INTERRUPT AND I/O CONTROL SUMMARY

	S.C. 04	S.C. 05	S.C. 06	S.C. 07	S.C. 10-77
	Re-initializes power-fail logic and restores interrupt capability to lower priority functions.	Turns on memory protect.	Sets Control FF on DCPC channel 1 (activates DMA).	Sets Control FF on DCPC channel 2 (activates DMA).	Sets PCA Control FF and turns on device on channel specified by S.C.
	Re-initialize power-fail logic and restores interrupt capability to lower priority functions.	NOP	Clears Control FF on DCPC channel 1 (reestablishes priority with STF; does not turn off DCPC).	Clears Control FF on DCPC channel 2 (reestablishes priority with STF; does not turn off DCPC).	Clears PCA Control FF and turns off device.
	Flag FF sets automatically when power comes up. (No program control possible.)	Turns on parity error interrupt capability.	Aborts DCPC channel 1 data transfer.	Aborts DCPC channel 2 data transfer.	Sets PCA Flag FF.
	Flag FF clears automatically when power fail occurs. (No program control possible.)	Turns off parity error interrupt capability and clears violation register bit 15.	Clears Flag FF on DCPC channel 1.	Clears Flag FF on DCPC channel 2.	Clears PCA Flag FF.
	NOP	Skip if Dynamic Mapping System (DMS) interrupt.	Tests if DCPC channel 1 data transfer is complete.	Skip if DCPC channel 2 data transfer is complete.	Skip if I/O channel Flag FF is set.
	Skip if power fail has occurred.	Skip if memory protect interrupt.	Tests if DCPC channel 1 data transfer is still in progress.	Skip if DCPC channel 2 data transfer is still in progress.	Skip if I/O channel Flag FF is clear.
	Loads contents of central interrupt register (S.C. of last interrupting device) into least-significant bits of A/B register.	Loads contents of violation register into A/B register: Bit 15 = 1 = PE Bit 15 = 0 = MPV	Loads A/B register with all ones. (Equivalent to CCA/CCB instruction.)	Loads A/B register with all ones. (Equivalent to CCA/CCB instruction.)	Loads contents of PCA data buffer into A/B register.
	Merges contents of central interrupt register into least-significant bits of A/B register.	Merges contents of violation register into A/B register.	Same as LIA/B 06 above.	Same as LIA/B 07 above.	Merges contents of PCA data buffer into A/B register.
	NOP	Outputs first address of unprotected memory to fence register.	Outputs to DCPC channel 1 the S.C. of I/O channel. Specify STC after each word; CLC after block.	Outputs to DCPC channel 2 the S.C. of I/O channel. Specify STC after each word; CLC after block.	Outputs data from A/B register into PCA data buffer.

DIAGNOSTIC REFERENCE TABLES

DIAGNOSTIC REFERENCE TABLE FOR HP 24396 PRODUCTS

		SINGLE FILE PAPER TAPE			MULTIPLE FILES					
DSN	DESIGNATION	REQ MEM SZ				PAPER TAPE		2644 45 CARTRIDGE	DISC/MAG TAPE	MANUAL VOL.
			BINARY	D.C.	MANUAL	BINARIES	D.C.	BINARIES	D.C.	
000200	DIAGNOSTIC CONFIGURATOR	4K	24296-60001	1627	02100-90157	24296-60001	1627	THE DIAGNOSTIC CONFIGURATOR IS THE FIRST FILE ON EVERY CARTRIDGE TAPE, DISC AND MAG TAPE.		
101100	MEMORY REFERENCE INSTRUCTION GROUP	4K	24315-16001	1624	02100-90219	24396-12001	1644			24396-14001
101001	ALTER SKIP INSTRUCTION GROUP	4K	24316-16001	1431	02100-90211					
101002	SHIFT ROTATE INSTRUCTION GROUP	4K	24317-16001	1431	02100-90212					
102000	CORE MEMORY (2100-15-15,14)	4K	24320-16001	1624	02100-90219					
102104	SEMICONDUCTOR MEMORY (21MX)	4K	24355-16001	1644	24355-90001	24396-12002	1901	24396-13301	1901	
101004	EAU INSTRUCTION GROUP	4K	24319-16001	1431	02100-90214					
101207	FLOATING POINT INSTRUCTION GROUP	4K	24320-16001	1551	24320-90001					
102305	MEM PROT/PARTY ERROR (2100 21MX)	4K	12892-16001	1705	12892-90005					
101206	POWER FAIL AUTO RESTART	4K	24321-16001	1635	02100-90216	24396-12003	1901			
141203	IO INSTR-GROUP ID CHANNEL EXTENDER	8K	24318-16001	1810	02100-90213					
143300	GENERAL PURPOSE REGISTER	4K	24361-16001	1913	24361-90001					
101220	DIRECT MEMORY ACCESS (2100 21MX)	4K	24322-16002	1705	24322-90002					
101011	EXT INSTR GROUP (INDEX)	4K	12943-16002	1432	12943-90004	24396-13302	1926			
101112	EXT INSTR GROUP (WORD BYTE BIT)	4K	12943-16001	1728	12943-90004					
101110	2100 FAST FORTRAN PACKAGE	4K	12907-16003	1632	12907-90003					
101213	M/E-Series FAST FORTRAN PACKAGE 1	4K	12977-16004	1822	12977-90002					
101114	M/E-Series FAST FORTRAN PACKAGE 2	4K	12977-16005	1632	12977-90002	24396-13303	1830	24396-13001	1928	24396-14002
101121	F-Series FPP/SIS-FPP	15K	12740-16001	1926	12740-90004					
102103	MEMORY EXPANSION UNIT	16K	12929-16001	1830	12929-90003					
102006	SEMICOND MEMORY MICROCODED F 21MX	4K	24395-16002	1644	24395-90003					
103001	TIME BASE GENERATOR	4K	12938-16001	1636	12938-90011	24396-13304	1928	7907E MAG TAPE	24396-13501	1928
103115	12936 PRIVILEGED INTERRUPT	4K	12936-16001	1643	12936-90003					
103105	12908 12978 WCS 256 W	4K	12908-16001	1502	12908-90013					
103023	13197 WCS 1024 W	4K	13197-16002	1640	13197-90002					
103007	12889 HARDWIRED SERIAL INTERFACE	4K	24335-16001	1717	02100-90169	24396-13305	1913	7970E MAG TAPE	24396-13601	1928
103122	59310 INTERF. BUS INTERFACE	4K	59310-16001	1728	59310-90061					
103003	12587 ASYN. DATA SET INTERF.	8K	12587-16001	1552	12587-90013					
103110	12920 ASYN. MULTIPLEXER (DATA)	4K	12920-16001	1805	12920-90009					
103011	12920 ASYN. MULTIPLEXER (CNTRL)	4K	12920-15002	1444	12920-90009	24396-13306	1928	7970E MAG TAPE	24396-13801	1928
103012	12621 SYNC. DATA SET (RECEIVE)	4K	12621-16001	1532	12621-90008					
103013	12622 SYNC. DATA SET (SEND)	4K	12622-16001	1532	12622-90008					
103116	12967 SYNC. INTERFACE	4K	12967-16001	1438	12967-90001					
103017	12966 ASYN. DATA SET	8K	12966-16001	1519	12966-90004	24396-13307	1901			24396-14003
103121	12968 ASYN. COMM. INTERFACE	4K	12968-16001	1602	12968-90003					
103024	12821 I/O DISC INTERFACE	8K	12821-16001	1928	12821-90002					
105102	2607 LINE PRINTER	4K	24340-16001	1446	12987-90004					
145103	2613 1716 LINE PRINTER	4K	02618-16001	1633	02618-90006	24396-13308	1913			
105106	2631 PRINTER	8K	02631-16001	1913	02631-90906					
105107	2635 PRINTING TERMINAL	8K	02635-16001	1913	02635-90906					
105005	2608 LINE PRINTER	8K	02608-16001	1835	02608-90906					
105104	9866 LINE PRINTER	4K	12996-16001	1541	12996-90001	24396-13309	1901			
111104	12732 FLEXIBLE DISC SUBSYSTEM	8K	12732-16003	1708	12732-90003					
151302	7900/01 CARTRIDGE DISC	8K	12960-16001	1805	12960-90003					
151403	7905/06/20/25 DISC	16K	12962-16001	1805	12962-90001					
104117	92900 TERMINAL SUBSYS (3070.40280)	8K	92900-16001	1814	92900-90003	24396-13310	1901			
112100	9-TRACK MAG TAPE (7970.13181.3)	8K	13181-16001	1629	13181-90005					
112102	7-9 TRACK MAG TAPE (13184 INTF)	8K	13184-16001	1629	13184-90008					
010000	DIAGNOSTIC CROSS LINK	4K	24296-16003	1627	02100-90157					
010000	7900/06/20 DISC INITIALIZATION	4K	24296-16002	1627	02100-90157	24396-13311	1901			24396-14004
146200	PAPER TAPE READER/PUNCH	4K	12597-16001	1725	12597-90031					
107000	DIG. PLOTTER INTERFACE (CALCOMP)	4K	12560-16001	1540	12560-90029					
113100	2892 CARD READER	4K	12924-16001	1537	12924-90006					
113001	2894 CARD READER/PUNCH	8K	12968-16001	1726	12968-90001	24396-13312	1901			
104003	TELEPRINTER	4K	12531-16001	1509	12531-90042					
104007	2615 VIDEO TERMINAL	4K	24351-16001	1347	02615-90002					
103006	129096 PROM WRITER	4K	24360-16001	1420	24360-90001					

DIAGNOSTIC REFERENCE TABLES (Cont'd)

DIAGNOSTIC REFERENCE TABLE FOR 24998 PRODUCTS

DSN	DESIGNATION*	REQ MEM SIZ	SINGLE FILE PAPER TAPE			MULTIPLE FILES	
			BINARY	D.C.	MANUAL	2645 CARTRIDGE BINARIES	D.C.
000200	DIAGNOSTIC CONFIGURATOR	4K	24296-60001	1627	02100-90157	THE DIAGNOSTIC CONFIGURATOR IS THE FIRST FILE ON EVERY CARTRIDGE TAPE	
101100	MEMORY REFERENCE INSTRUCTION GROUP	4K	24315-16001	1624	02100-90218	24998-13301	1926
101001	ALTER SKIP INSTRUCTION GROUP	4K	24316-16001	1431	02100-90211		
101002	SHIFT ROTATE INSTRUCTION GROUP	4K	24317-16001	1431	02100-90212		
102104	SEMICONDUCTOR MEMORY (21MX)	4K	24395-16001	1644	24395-90001		
101004	EAU INSTRUCTION GROUP	4K	24319-16001	1431	02100-90214		
101207	FLOATING POINT INSTRUCTION GROUP	4K	24320-16001	1551	24320-90001		
102305	MEM PROT-PARITY ERROR (2100-21MX)	4K	12892-16001	1705	12892-90005		
101206	POWER FAIL AUTO RESTART	4K	24321-16001	1635	02100-90216		
141203	I/O INSTR GROUP I/O CHANNEL EXTENDER	8K	24318-16001	2226	02100-90213		
143300	GENERAL PURPOSE REGISTER	4K	24391-16001	1813	24391-90001		
101220	DIRECT MEMORY ACCESS (2100-21MX)	4K	24322-16002	1705	24322-90002		
101011	EXT INSTR GROUP (INDEX)	4K	12943-16002	1432	12943-90004		
101112	EXT INSTR GROUP (WORD-BYTE BIT)	4K	12943-16001	1728	12943-90004		
101213	M/E-Series FAST FORTRAN PACKAGE 1	4K	12977-16004	1822	12977-90002		
101114	M/E-Series FAST FORTRAN PACKAGE 2	4K	12977-16005	1632	12977-90002		
101121	F-Series FPP SIS FPP	16K	12740-16001	1926	12740-90004	24998-13302	1926
102103	MEMORY EXPANSION UNIT	16K	12929-16001	1830	12929-90003		
102006	SEMICON MEMORY MICROCODED F 21MX	4K	24395-16002	1644	24395-90003		
103001	TIME BASE GENERATOR	4K	12539-16001	1830	12539-90011		
103023	13197 WCS 1024 W	4K	13197-16002	1640	13197-90002		
103110	12920 ASYN MULTIPLEXER (DATA)	4K	12920-16001	1805	12920-90009	24998-13303	1928
103011	12920 ASYN MULTIPLEXER (CNTL)	4K	12920-16002	1444	12920-90009		
103012	12621 SYNC DATA SET (RECEIVE)	4K	12621-16001	1532	12621-90006		
103013	12622 SYNC DATA SET (SEND)	4K	12622-16001	1532	12622-90006		
103116	12967 SYNC INTERFACE	4K	12967-16001	1438	12967-90001		
103017	12966 ASYN DATA SET	8K	12966-16001	1519	12966-90004		
104003	TELEPRINTER	4K	12531-16001	1509	12531-90042		
103207	12869 HARDWIRED SERIAL INTERFACE	4K	24335-16001	1717	02100-90189		
103122	59310 INTERF BUS INTERFACE	4K	59310-16001	1728	59310-90061		
103024	12821 ICD DISC INTERFACE	8K	12821-16001	1928	12821-90002		
105102	2607 LINE PRINTER	4K	24340-16001	1446	12987-90004	24998-13304	1913
145103	2613 17.18 LINE PRINTER	4K	02618-16001	1533	02618-90006		
105106	2631 PRINTER	8K	02631-16001	1913	02631-90906		
105107	2635 PRINTING TERMINAL	8K	02635-16001	1913	02631-90906		
105005	2608 LINE PRINTER	8K	02608-16001	1835	02608-90906		
105104	9866 LINE PRINTER	4K	12996-16001	1541	12996-90001	24998-13305	1822
111104	12732 FLEXIBLE DISC SUBSYSTEM	8K	12732-16003	1708	12732-90003		
151302	7900 01 CARTRIDGE DISC	8K	12960-16001	1805	12960-90003		
151403	7905 06-20 25 DISC	16K	12962-16001	1805	12962-90001		
104117	92900 TERMINAL SUBSYS (3070-40280)	8K	92900-16001	1814	92900-90003	24998-13306	1901
112100	9-TRACK MAG TAPE (7970-131813)	8K	13181-16001	1629	13181-90095		
146200	PAPER TAPE READER-PUNCH	4K	12597-16001	1725	12597-90031		
113100	2892 CARD READER	4K	12924-16001	1537	12924-90006		
010000	DIAGNOSTIC CROSS LINK	4K	24296-16003	1627	02100-90157		
011000	7900 05-20 DISC INITIALIZATION	4K	24296-16002	1627	02100-90157		

Note: Part no. 24998-14002 consists of the 6 cartridge tapes 24998-13301, 24998-13302, 24998-13303, 24998-13304, 24998-13305 and 24998-13306 plus all manuals listed in the table.

*The diagnostics and control programs listed in this reference table are stored on the appropriate media in the sequence specified by the table. This does not imply that a specific system delivered to a user is compatible with all the hardware listed in the table.

DIAGNOSTIC OPERATING PROCEDURES

The diagnostics listed should be executed in the order given.

The diagnostic serial number (DSN) is contained in memory location 126 (octal) of the program.

MEMORY REFERENCE INSTRUCTIONS DIAGNOSTIC

Paper Tape Binary 24315-16001

In order for the diagnostic to run, the HLT instruction must work. To check the HLT (and RUN) instructions, toggle-in and single step thru the following program beginning from memory location 10.

ADDRESS	CONTENTS	MNEMONIC
10	102501	LP0 LIA 1
11	102000	HLT 0
12	102601	OTA 1
13	024010	JMP LP0

1. Load diagnostic.
2. P-Reg = 100_8 ; S-Reg = 0.
3. Press PRESET, RUN. HALT 102077. (Refer to listing for HALT 10200_8 .)
4. Switch option:
Bit 12 — Loop on diagnostic.
5. Restart, P-Reg = 130_8 , PRESET, RUN.



DIAGNOSTIC OPERATING PROCEDURES (CONT)**ALTER-SKIP INSTRUCTIONS DIAGNOSTIC**

Paper Tape Binary 24316-16001. Date Code 1431.

1. Load diagnostic.
2. P-Reg = 100₆; S-Reg = Switch options.
3. Press PRESET, RUN.
4. Switch options:
 Bit 0 — Loop on failing instruction. HALT 102076 then press RUN.
 Bit 12 — Loop on diagnostic.

SHIFT-ROTATE INSTRUCTIONS DIAGNOSTIC

Paper Tape Binary 24317-16001

1. Load diagnostic.
2. P-Reg = 100₆; S-Reg = Switch options.
3. Press PRESET, RUN.
4. Switch options:
 Bit 0 — Loop on failing instruction. HALT 102076 then press RUN.
 Bit 12 — Loop on diagnostic.

EXTENDED ARITHMETIC INSTRUCTIONS DIAGNOSTIC

Paper Tape Binary 24319-16001. Date Code 1431.

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. P-Reg = 100₆; S-Reg = Switch options.
4. Press PRESET, RUN.
5. Switch options:

BITS	MEANING WHEN SET
0-5	Reserved.
6	Set to suppress the number generator at the beginning of each instruction test. Clear to generate new arguments for each execution of an instruction test.
7	Suppress the indirect addressing portions of the instruction tests.
8	Reserved.
9	Break out of any test which finds an error.
10	Suppress non-error messages.
11	Suppress error messages.
12	Clear to halt the program at the end of a pass. (MDR = 102077 ₆) Set to loop on diagnostic.
13	Repeat current test (with new arguments if bit 6 is OFF).
14	Suppress error HALTS.
15	Halt the program at the end of a test. (102076 ₆ and A- and B-registers contain the octal test number.)

DIAGNOSTIC OPERATING PROCEDURES (CONT)**2100-21MX FLOATING POINT DIAGNOSTIC**

Paper Tape Binary 24320-16001. Date Code 1551.

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. P-Reg = 100₆; S-Reg = Switch options.
4. Press PRESET, RUN.
5. Restart, P-Reg = 2000₆.
6. Switch options:

BIT	MEANING IF SET	
15	Halt (102076) at the end of each test; the A-Register will contain the octal equivalent of the test just completed.	
14		
13		
12		
11		
10		
9		
	A-REG BIT	IF SET WILL EXECUTE
	0	TST00 — FLOATING POINT TO INTEGER
	1	TST01 — INTEGER TO FLOATING POINT
	2	TST02 — FLOATING POINT ADD
	3	TST03 — FLOATING POINT SUBTRACT
	4	TST04 — FLOATING POINT MULTIPLY
	5	TST05 — FLOATING POINT DIVIDE
	6-15	NOT SIGNIFICANT
8-0	Reserved	

DIAGNOSTIC CONFIGURATOR (24296-60001)

Manual P/N 02100-90157

1. Load Diagnostic Configurator.
2. To execute Pretest before configuration:
 - a. Set P-Reg = 2.
 - b. Set S-Reg:

Bits 5-0 = SC of device to execute basic I/O test

Bit 12 = Set to loop on Pretest. (Press HALT to exit loop.)

NOTE

Automatic configuration may also be selected at this time.

- c. Press PRESET, RUN. HALT 102077
3. To start configuration:
 - a. Set P-Reg = 100
 - b. Set S-Reg as indicated in Conversational or Automatic Configuration procedure.

CONVERSATIONAL CONFIGURATION

1. Set S-Reg:

Bits 5-0 = Console SC

Bits 15-6 = 0
2. Press PRESET, RUN. (Messages printed on the console.)

NOTE

If S- or A-Reg is flashing, memory protect has failed. Press HALT, PRESET, RUN.

AUTOMATIC CONFIGURATION

1. Set S-Reg as follows:

SET S - REG TO:			
15	14-12	11-6	5-0
X	DIAG. INPUT DEVICE		CONSOLE SC
	TYPE	SC	

Set if A-REG specifies a DSN and B-REG a diagnostic selection.

Clear to load next sequential file and halt before execution. If computer is a 2114, 2115, or 2116, load S-Reg last.

If no console, leave 0.
If using cross link in I/O processor, use SC of link.

000 Paper tape 2737/2748/2758/2752/2754
 001 Mag tape 7970B/E (9 - track only, Unit 0 only)
 010 Cartridge disc 7900/1 (removable platter)
 011 Cartridge disc 7905/20 (removable platter, upper surface)
 100 Cartridge tape 2644/45
 111 Cross link input device coupler (lower SC)

2. Press PRESET, RUN.

DIAGNOSTIC CONFIGURATOR HALT CODES

HALT CODE	REASON/RESPONSE
102000-102004	Manual Configuration input halt. (Also Halt 102071)
102010	Illegal select code (< 10) for diagnostic input device or console was chosen. Restart at P = 100 for configuration or P = 2 for Pretest. (If halt occurs during disc initialization, there was no console specified and program cannot be run.)
102011	Checksum error during the loading of a binary file.
102022	Conversational or Automatic Configuration was selected and the console interface type could not be determined by the configurator from the select code input to the S-REG.
102033	The disc boot has been loaded and executed. During execution the boot could not find the DMA/DCPC control word in upper memory (for the select code). Load A-REG bits 5-0 with the disc select code and press RUN.
102044	Disc did not respond with a flag. Restart program.
102045	Disc not ready or a hardware failure has occurred. Press RUN to try operation again.
102055	Address violation during the loading of a binary file.
102066	Pretest failed. Refer to M-REG for memory location in Pretest and appendix D in the Diagnostic Configurator Reference Manual for program listing.
102077	End-of-operation.
106070	"End-of-Files" was reached during a diagnostic load operation. The specified DSN was not found. If a different diagnostic(s) selection on the current tape is desired: a. Load the A-REG with a new DSN. b. Clear the B-REG if sequential execution is not desired, otherwise set B-REG to appropriate sequential selection. c. Ready input device, set P-REG = 120, press PRESET and RUN. If the diagnostic(s) originally selected is on a different tape: a. Load the new tape (If a 2644/45 cartridge tape, manually file forward over the configurator.) b. If sequential execution was selected (B $\neq$ 0) set P-REG = N6500. c. Ready input device, press PRESET and RUN.
106071*	No console was specified during configuration. Press RUN to return to the program — but it should be noted that the request is in error.
106072*	No diagnostic input device was specified during Manual or Automatic configuration.

DIAGNOSTIC CONFIGURATOR HALT CODES (Cont'd)

HALT CODE	REASON/RESPONSE
106073*	This halt has two meanings as follows: a. During a transfer using the I/O processor loader link, an error was encountered. Restart the loader program in the I/O processor. b. The diagnostic memory size exceeded the available space.
106074*	Error on diagnostic input device (paper tape, magnetic tape, cartridge tape, or disc): a. Device not ready; ready device: Press RUN. b. Time-out on long paper tape leader: Press RUN. c. Incorrect SC or device type specified: Reconfigure Configurator. d. Data error on device: Restart loader in Configurator by setting P= 120, A-REG to DSN, and B-REG to serial execution.
106075*	All unused memory locations in the first 4K are loaded with halts 106075.
106076*	An output request to the line printer has been generated and the line printer was not ready. Ready the line printer and press RUN.
106077*	Trap cell halt. M-REG = trap cell address.

*These halts can occur during diagnostic execution.

BOOTSTRAP LOADER

20	1037xx	STC XX,C	}	Read 1st char.
21	1023xx	SFS XX		
22	024021	JMP *-1		
23	1025xx	LIA XX	}	Pack
24	001727	ALF, ALF		
25	1037xx	STC XX		
26	1023xx	SFS XX	}	Read 2nd char.
27	024026	JMP *-1		
30	1024xx	MIA XX		
31	170001	STA,1,I		
32	006004	INB		
33	024020	JMP 20B		

xx = Paper tape reader select code.

Toggle in program, B-reg = *77700, S.A. = 20, load special bootstrap tape in reader, enable protected loader area. RUN. Press HALT.

***Loader Starting Addresses**

MEMORY SIZE	STARTING ADDRESS OF LOADER		
	For Paper Tape	For FH Disc	For MH Disc
4K	07700		
8K	17700	17760	17750
12K	27700	27760	27750
16K	37700	37760	37750
24K	57700	57760	57750
32K	77700	77760	77750

BOOTSTRAP LOADER GENERATOR (A008-22009)

BOOTSTRAP LOADER GENERATOR (A008-22009)

Load tape, S.A. = 2, Sw reg = SC of TTY, RUN. Follow directions printed on TTY.

LOADER LOADER (24353)**A. STARTUP FROM SCRATCH**

1. Enter instructions shown in table 13-1 via switch register.
2. Place paper tape in reader (be it photoreader or teletype); set P to 3000g.
3. Set switch register to indicate desired loader and select codes per table 13-2.
4. Press PRESET (External and Internal, if applicable), LOADER ENABLE, and RUN. Tape will be read in and new loader placed into top locations of memory.

B. IF PAPER TAPE LOADER EXISTS

Unwind paper tape to first section of blank tape and place paper tape into reader at this blank area. Load tape using existing paper tape loader. Set P to 100g and proceed as in steps 3 and 4 above.

LOADER LOADER (Cont'd)**C. PROGRAM HALTS**

<u>Memory Data</u>	<u>Meaning</u>
102077	Program completed successfully.
102001	Select code is less than 10g (bad select code displayed in A-reg).
102002	Loader number not implemented yet.
102003	An instruction was not stored correctly — possibly caused by not enabling the loader.

After any program halt, the program may be restarted by resetting the switch register (if necessary) and pressing PRESET (External and Internal, if applicable), LOADER ENABLE, and RUN.

Instructions Entered Via Switch Register

<u>Memory Location</u>	<u>Contents</u>	<u>Source Code</u>
2765	. . . READ	BSS 1
2766	002500	CLA,CLE
2767	1037XX	STC RDR,C
2770	1023XX	SFS RDR
2771	026770	JMP *-1
2772	001626	ELA,ELA
2773	001626	ELA,ELA
2774	1024XX	MIA RDR
2775	002040	SEZ
2776	126765	JMP READ,I
2777	026767	JMP READ+2
3000	016765 START	JSB READ
3001	073003	STA *+2
3002	016765	JSB READ

XX = paper tape reader select code

LOADER LOADER (CONT)

Switch Register Options

Loader	Switch Register		
	Bits 15-12	Bits 11-6	Bits 5-0
BBL	0000	Not used	Paper Tape Reader Select Code
BBDL	0001	Fixed-head Disc Select Code	Paper Tape Reader Select Code
BMDL-7900	0010	Moving-head Disc Select Code	Paper Tape Reader Select Code
BMDL 2883	0011	Moving-head Disc Select Code	Paper Tape Reader Select Code
BMDL 2870	0100	Moving-head Disc Select Code	Paper Tape Reader Select Code
BMDL-7905	0110	Moving-head Disc Select Code	Paper Tape Reader Select Code
MTRS	0101	Magnetic Tape Select Code	Not Used
ACCESS IOP	0111	I.C.K. Select Code	Paper Tape Reader Select Code
BBL-2644	1000	HP 12966/8 Interface Select Code	Not Used
ABS MAG TP	1001	Magnetic Tape Select Code	Not Used
BBL SCE/1	1010	I.F.C. Select Code	Not Used

Note: For interfaces with two select codes, the lower numbered code must be used.

BINARY LOADER

```

ASMB,A,B,L,I
17700      ORG 17700B  DEPENDS ON CORE SIZE
17700 107700 LOAD  CLC 0,C  TURN OFF ALL DEVICES
17701 063770      LDA STAI
17702 106501      LIB I      CHECK FOR OPTIONS
17703 004010      SLB        S-REG(0)=1?
17704 002400      CLA        YES: CHECKSUM OPTION
17705 006020      SSB        S-REG(15)=1?
17706 063771      LDA CPAI   YES: VERIFY CORE OPT.
17707 073736      STA OPTI   STORE OPTIONAL INST.
17710 006401      CLB,RSS    BYPASS EOT CHECK
17711 067773 CONT  LDB CM1 I B=-11 FOR EOT CHECK
17712 006006 EOTCH INB,SZB  END OF TAPE?
17713 027717      JMP LD1    NO: GET NEXT CHAR
17714 107700      CLC 0,C    TURN OFF ALL DEVICES
17715 102077      HLT 77B    END OF TAPE
17716 027700      JMP LOAD   START NEXT TAPE
17717 017762 LD1  JSB CHAR   GET A CHARACTER
17720 002003      SZA,RSS    IS IT THE WORD COUNT?
17721 027712      JMP EOTCH  NO: CHECK FOR EOT
17722 003104      CMA,CLE,INA (2'S COMP WORD COUNT)
17723 073774      STA COUNT  SAVE WORD COUNT
17724 017762      JSB CHAR   SKIP NEXT CHAR
17725 017753      JSB WORD   GET STARTING ADDRESS

```

BINARY LOADER (Cont'd)

```

17726 070001      STA 1      INITIALIZE CHECKSUM IN B
17727 073775      STA ADDR5  ALSO IN ADDRESS
17730 063775      LD2 LDA ADDR5  CHECK FOR ADDR>=LOADER
17731 043772      ADA MAXAD
17732 002040      SEZ          E-REG=0 OK
17733 027751      JMP ADERR   BAD ADDRESS
17734 017753      JSB WORD    NEXT WORD IN A-REG
17735 044000      ADB 0       CONTINUE CHECKSUM
17736 000000      OPTI NOP     STA, CPA, OR NOP
17737 002101      CLE,RSS     NORMALLY BYPASS HALT
17740 102000      HLT 0B      DID NOT COMPARE
17741 037775      ISZ ADDR5   INCREMENT ADDRESS
17742 037774      ISZ COUNT   UPDATE WORD COUNT
17743 027730      JMP LD2     NEXT WORD
17744 017753      JSB WORD    END OF RECORD
17745 054000      CPB 0       COMPARE CHECKSUMS
17746 027711      JMP CONT    LOOK FOR END OF TAPE
17747 102011      HLT 11B     CHECKSUM ERROR
17750 027700      JMP LOAD    START OVER
17751 102055      ADERR HLT 55B ILLEGAL ADDRESS
17752 027700      JMP LOAD    START OVER
17753 000000      WORD NOP     READ ONE BYTE
17754 017762      JSB CHAR    FIRST BYTE
17755 001727      ALF,ALF     POSITION BYTE
17756 073776      STA TEMP    SAVE IT
17757 017762      JSB CHAR    SECOND BYTE
17760 033776      IOR TEMP    MERGE BYTES
17761 127753      JMP WORD,I  RETURN WITH WORD
17762 000000      CHAR NOP     READ BYTE FROM READER
† 17763 1037XX      STC RDR,C  INITIATE READ
† 17764 1023XX      SFS RDR    ** CHECK THESE IF **
17765 027764      JMP *-1     ** LOADER BOMBED **
† 17766 1025XX      LIA RDR    GET BYTE
17767 127762      JMP CHAR,I  HAVE BYTE A-REG(0-7)
17770 173775      STAI STA ADDR5,I HAVE OPTI FOR NORMAL LOAD
17771 153775      CPAI CPA ADDR5,I OPTI FOR VERIFY OPTION
† 17772 1X0100      MAXAD ABS -LDR LOADER ADDRESS (2'S COMP)
17773 177765      CM11 DEC -11 EOI CHAR COUNT
17774 000000      COUNT BSS 1  WORD COUNT
17775 000000      ADDR5 BSS 1  ADDRESS LOCATION
17776 000000      TEMP BSS 1   HOLDS FIRST BYTE
00013 RDR EQU 13B  READER SELECT CODE
17700 LDR EQU 17700B LOADER ADDRESS
*CHECK 17764,17765 IF LOADER IS BOMBED
*17763,17764,17766 DEPEND ON READER SELECT CODE
*17772 DEPENDS ON CORE SIZE
END

```

† X = Opcode varies depending on size of memory (see table at end of Disc Loader).

‡ XX = Select code of paper tape reader.

DISC LOADER

```

ASMB,A,B,L,T
17700      ORG 17700B  DEPENDS ON CORE SIZE
17700 107700  START CLC 0,C
17701 002401      CLA,RSS
17702 063726  CONT LDA M.17  FEED FRAME COUNTER
17703 006700      CLB,CCE  SET E TO READ BYTE
17704 017742      JSB READ  GET # OF CHAR
17705 007306      CMB,CCE,INB,SZB (2'S COMP)
17706 027713      JMP *-5    NON-ZERO BYTE
17707 002006      INA,SZA  FEED FRAME COUNTER
17710 027703      JMP *-5
17711 102077      HLT 77B   END OF TAPE

```

DISC LOADER (Cont'd)

```

17712 027700      JMP START
17713 077754      STB WD.CT # WORDS IN RECORD
17714 017742      JSB READ GET FEED FRAME
17715 017742      JSB READ GET ADDRESS
17716 074000      STB 0 INITIATE CHECKSUM
17717 077757      STB ADDR
17720 067757      CHECK LDB ADDR
17721 047755      ADB MAXAD CHECK ADDR BELOW LOADER
17722 002040      SEZ E-1 OK
17723 027740      JMP HLT55 ADDR>=LOADER
17724 017742      JSB READ GET NEXT WORD
17725 040001      ADA 1 CONTINUE CHECKSUM
17726 177757      M.17 STB ADDR,I ALSO USED AS CONSTANT
17727 037757      ISZ ADDR
17730 000040      CLE
17731 037754      ISZ WD.CT
17732 027720      JMP CHECK
17733 017742      JSB READ
17734 054000      CPB 0
17735 027702      JMP CONT
17736 102011      HLT 11B CHECKSUM ERROR
17737 027700      JMP START
17740 102055      HLT55 HLT 55B ADDRESS >= LOADER
17741 027700      JMP START
17742 000000      READ NOP E=0 READ WORD, =1 BYTE
17743 006600      CLB,CME E-REG BYTE POINTER
17744 103713      STC RDR,C START READER
17745 102313      SFS RDR ** CHECK THESE IF **
17746 027745      JMP *-1 ** LOADER BOMBED **
17747 107413      MIB RDR,C GOT BYTE
17750 002041      SEZ,RSS
17751 127742      JMP READ,I
17752 005767      BLF,CLE,BLF
17753 027744      JMP *-7
17754 000000      WD.CT NOP WORD COUNT
*17755 1X0100      MAXAD ABS -LDR LOADER ADDR (2'S COMP)
17756 0200XX      DMA.C OCT 0200XX DISC SC (DATA CHANNEL)
17757 000000      ADDR NOP
17760 107700      CLC 0,C
17761 063756      LDA DMA.C
17762 102606      OTA DMA.6 PROG WORD
17763 002700      CLA,CCE
17764 102615      OTA DISC+1 DISC TRACK 0,SECTOR 0
17765 001500      ERA
17766 102602      OTA DMA.2 CORE ADDRESS
17767 063777      LDA M.64
17770 102702      STC DMA.2
17771 102602      OTA DMA.2 WORD COUNT, BYTE
17772 103706      STC DMA.6,C
17773 102714      STC DISC
17774 067776      LDB JMP.
17775 074077      STB BP.77 FOR JUMP SELF
17776 024077      JMP. JMP BP.77
17777 177700      M.64 DEC -64 TRANSFER ONE SECTOR
00013 RDR EQU 13B READER SELECT CODE
17700 LDR EQU 17700B LOADER ADDRESS
00014 DISC EQU 14B DISC SELECT CODE
00006 DMA.6 EQU 6B USE CHANNEL ONE
00002 DMA.2 EQU 2B
00077 BP.77 EQU 77B BASE PAGE (JMP SELF)
CHECK 17745,17746 IF LOADER IS BOMBED
END

```

* 8K = 160100
12K = 150100
16K = 140100
24K = 120100
32K = 100100

BMDL-7900/7901*

Address	Contents	Address	Contents
x7700	002701	x7740	1023kk
x7701	063722	x7741	027740
x7702	002307	x7742	1064kk
x7703	102077	x7743	002041
x7704	017735	x7744	127735 y = 0 select Boot from head 0
x7705	007307	x7745	005767 y = 1 select Boot from head 2
x7706	027702	x7746	027737
x7707	077733	x7747	03y000 x = 2 for 12k, 3 for 16k,
x7710	017735	x7750	002400 4 for 20k, 5 for 24k,
x7711	017735	x7751	1026dd 6 for 28k, 7 for 32k
x7712	074000	x7752	1037dd
x7713	077734	x7753	067747
x7714	067734	x7754	1066cc kk = tape input device
x7715	047777	x7755	1037cc select code
x7716	002040	x7756	1066dd
x7717	102055	x7757	063776 cc = low priority (higher
x7720	017735	x7760	102606 numbered) disc
x7721	040001	x7761	067732 select code
x7722	177734	x7762	106602
x7723	037734	x7763	1037dd dd = high priority (lower
x7724	000040	x7764	102702 numbered) disc
x7725	037733	x7765	106602 select code
x7726	027714	x7766	013741
x7727	017735	x7767	1026cc n = 5 for 12k, 4 for 16k,
x7730	054000	x7770	1037dd 3 for 20k, 2 for 24k,
x7731	027701	x7771	103706 1 for 28k, 0 for 32k
x7732	102011	x7772	1037cc
x7733	000000	x7773	1023cc
x7734	000000	x7774	027773
x7735	000000	x7775	127717
x7736	006600	x7776	1200dd
x7737	1037kk	x7777	1n0100

*This is not usable with an RTE-II system that has a Grandfather disc (Halt 102074).

MTRS LOADER

```

ASM8.A.H.L.T.C      MTHS ABSOLUTE PROTECTED LOADER
17700 063775        LDA SLOWW      SELECT UNIT 0
17701 102611        OTA CMND        AND
17702 103711        STC CMND.C      REWIND TAPE.
17703 106501        LIR SSW         GET ORDINAL NUMBER OF PROGRAM.
17704 007307        CMH.CCE,INH,SH,RSS MAKE < 0, PRESET -F-.
17705 067767        LUR DFALT       USE DEFAULT IF SWREG = 0.
17706 077773        STH PROG#       SAVE FOR COUNTER.
17707 063774        HEAD LDA RRF     OUTPUT
17710 102611        OTA CMND        READ COMMAND
17711 102511        LIA CMND        AND
17712 001323        PAR,RAR        TEST
17713 001310        RAR,SLA         FOR REJECT.
17714 027707        JMP READ        REJECTED, KEEP TRYING UNTIL O.K.
17715 103711        STC CMND.C      START TAPE.
17716 103710        STC DATA.C     INITIALIZE DATA CHANNEL.
17717 063773        LDA PROG#       GET PROG ORDNL CNTR - 0 IF LOAD.
17720 006645        CLB,SEZ,CME,INH,RSS -B- = DATA RECORD MASK.
17721 027725        JMP DATAR       DATA RECORD, SKIP NEXT.

```

MTRS LOADER (Cont'd)

```

17722 067766      LUB AURSA      POST RECORD.
17723 077777      STB PTR        INITIALIZE ADDRESS POINTER.
17724 067771      LDH MASK1      -H- _ POST REC MASK (S.A. ONLY).
17725 002042 DATA SEZ,SZA      IF DATA RECORD AND NOT LOADING,
17726 027707      JMP READ        IGNORE THE RECORD.
17727 102211      SFC CMND      POST RECORD OR (DATA RECORD AND
17730 027741      JMP DONE        LOADING); WAIT FOR DATA OR
17731 102310 LOOP  SFS UATA      FOR TAPE TO STOP.
17732 027727      JMP *-3
17733 103510      LIA DATA,C    GET WORD FROM TAPE
17734 173777      STA PTR,I      AND STORE IT.
17735 006011      SL4,RSS        IF WORD IS TO BE SAVED,
17736 037777      ISZ PTR        HUMP ADDRESS POINTER.
17737 004065      CLC,ERR        SHIFT STORE/NO STORE MASK.
17740 027731      JMP LOOP      RETURN FOR NEXT WORD.
17741 005500 DONE  ERH          FINAL SHIFT, -C- _ 1 IF WE JUST
                                READ POST RECORD, 0 IF DATA.
                                SAVE UATA LOAD ADDR IF POST.
                                GET PROGRAM ORDINAL COUNTER.
                                GET PROGRAM STARTING ADDRESS.
                                IF THIS WAS DATA RECORD
                                OR CONTINUATION POST RECORD,
                                SKIP INITIAL POST REC STEPS.
                                INITIAL POST REC, INCLUDE JUMP
                                TO STARTING ADDRESS. IF THIS
                                IS OUR PROG, STORE THE JUMP.
                                WIPE OUT -F- CAUSED BY INB,SZH.
                                IF WE HAVEN'T FOUND OUR PROG YET
                                UPDATE PROG#, READ NEXT REC.
                                OUR PROG OR POST RECORD OF NEXT
                                ONE, CHECK FOR PARITY ERROR
                                OR END-OF-FILE.
                                ERROR HALT. **NOT PROTECTED**
                                1ST POST REC OF NEXT PROGRAM?
                                NO, UPDATE PROG#, CONTINUE.
                                YES, STORE FINAL HALT.
                                GO TO IT.

17742 073777      STA PTR
17743 067773      LD3 PROG#
17744 063776      LDA S.A.
17745 002240      SEZ,CME
17746 002003      SZA,RSS
17747 027754      JMP ZTEST
17750 033765      IOR JMP
17751 006007      INH,SZH,RSS
17752 070002      STA Z
17753 000040      CLC
17754 006020 ZTEST SSW
17755 027706      JMP READ-1
17756 102511      LIA CMND
17757 013772      AND MASK2
17760 002002      SZA
17761 102001      HLT 1
17762 006003      SZH,RSS
17763 027706      JMP READ-1
17764 063770      LDA HLT0
17765 024000 JMP  JMP A

```

CONSTANTS AND STORAGE.

```

00000      A      EQU 0          -A- REGISTER ADDRESS DEFINITION.
17766 017776 ADRSA DEF CORSZ-2  POINTER TO 2-WORD BUFFER.
00011      CMND   EQU DATA+1    MAG TAPE COMMAND CHANNEL S.C.
17767 177774 DFALT ABS -DEFLT    - (PROGRAM ORDINAL DEFAULT).
17770 102070 HLT0  HLT 709       FINAL HALT (GOOD HALT).
17771 001677 MASK1 OCT 1677     POST RECORD READ MASK.
17772 000202 MASK2 OCT 202*     MAG TAPE STATUS MASK.
17773 000000 PROG# NOP          PROGRAM ORDINAL COUNTER.
17774 000023 RWF  OCT 23        MT READ ONE RECORD COMMAND CODE.
17775 001501 SLOW* OCT 1501     MT SELECT 0/REWIND COMMAND CODE.
00001      SSW    EQU 1        SWITCH REG ADDRESS DEFINITION.

```

THE FOLLOWING TWO WORDS MUST BE CONTIGUOUS, AND THEIR ORDER
MUST NOT BE CHANGED.

```

17776 000000 S.A. BSS 1        PROG START ADDR (IN POST REC).
17777 000000 PTR  HSS 1        MOVING PTR/DATA REC LOAD ADDR.

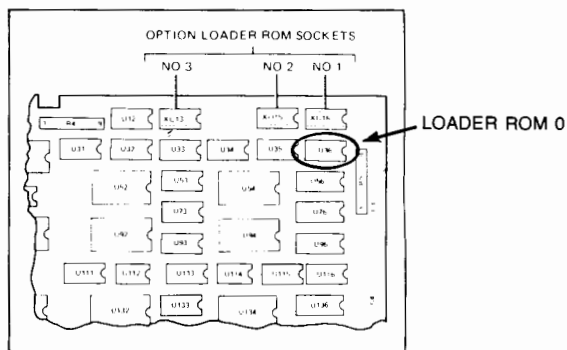
```

END

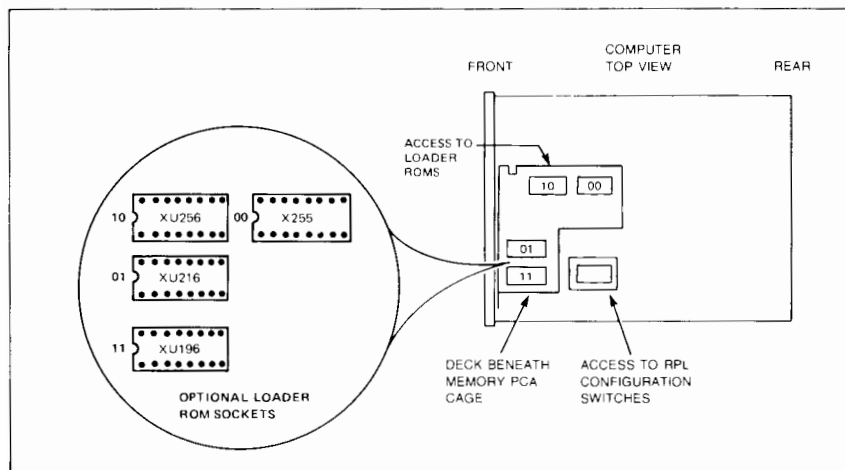
*OCT 200 TO INHIBIT PARITY CHECK

OPTIONAL LOADER ROM SOCKETS

M-Series Computer



E/F-Series Computer



7700 80

Note: ROMs are listed in the Parts section of this manual.

LOADER ROM S-REGISTER SETTINGS (EXCEPT FOR CS80 DISC MEMORIES)

Loader ROM S-Register Settings

S-REGISTER BIT SETTINGS																
DEVICE	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Cartridge Tape			0	0										0	0	0
Paper Tape			0	0										0	0	0
HP 7900A (Removable Platter) or HP 7901			0	0										0	0	1
HP 7900A (Fixed Platter)			0	0										0	0	0
HP 2883A	L	S										*				
HP 7905A (Removable Platter, Upper Surface)	O	E	1	0								R		0	0	0
or 7920M (Platter 1, Upper Surface)	A	L										E				
	D	E	0	1								S		0	0	0
	E	C										E				
HP 7905A (Removable Platter, Lower Surface)	R	T	0	1								R		0	0	1
or 7920M (Platter 1, Lower Surface)	I											V		0	0	1
	R	O	0	1								E		0	1	0
HP 7905A (Fixed Platter) or 7920M (Platter 2, Upper Surface)	O	N										D				
HP 7920M (Platter 2, Lower Surface)	M		0	1										0	1	1
HP 7970B/E Magnetic Tape			0	0										0	0	0
														0	0	0
HP 9885 Flexible Disc			0	0										0	0	0
														0	0	0
HP 7906H (Removable Platter, Upper Surface, Head 00) or 7920H/7925H (Platter 1, Upper Surface, Head 00) or 9895 (drive 0, head 0)			0	1												
HP 7906H (Removable Platter, Lower Surface, Head 01) or 7920H/7925H (Platter 1, Lower Surface, Head 01) or 9895 (drive 0, head 1)			0	1								R*		1	0	
												E				
												S				
HP 7906H (Fixed Platter, Head 10) or 7920H/7925H (Platter 2, Upper Surface, Head 10)			0	1								V		1	1	
												E				
												D				
HP 7906H (Fixed Platter, Head 11) or 7920H/7925H (Platter 2, Lower Surface, Head 11)																

* S-Register bits 5-3 are reserved and must be 0 unless called for by the operating system; i.e., diagnostics bit 3 set.

** S-Register bit 0 = 0 = Read next sequential file.
= 1 = Rewind magnetic tape and search for the file number specified in A-register; for example, file 1 = 1. The A-reg cannot be 0.

*** S-Register bit 0 = 0 = Load from track and sector address specified in B-register.
(Bits 4-0 = physical sector address.
Bits 11-5 = starting track address.)
= 1 = Load from track 0, sector 1.

**LOADER ROM S-REGISTER SETTINGS
(EXCEPT FOR CS80 DISC MEMORIES)**

7908/7911/7912/7914/7933 CS80 Cartridge

DEVICE	S-REGISTER BIT SETTINGS															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	LDR		0	0	SELECT CODE OF LOADING DEVICE						0	0	0	Unit #		

LOADER ROM HALTS

DISPLAY REGISTER	MEANING
(Octal)	
102077	Successful load
102055	Address error (record exceeds available memory).
102011	Checksum error (record data incorrect)
102000	Device error (no tape or tape read error) or wrong data format.

If an attempt is made to load a file which is not in absolute binary, a HALT 102000 may occur or the loader may hang up.

PAPER TAPE LOADER ROM**Part No. 1816-0420**

X7700	107700	START	CLC	O,C	TURN OFF THE INTERRUPT SYSTEM
X7701	002401		CLA,	RSS	
X7702	063756	CONT	LDA	M.11	FEED FRAME COUNTER
X7703	006700		CLB,	CCE	SET E TO READ BYTE
X7704	017742		JSB	READ	GET # OF CHAR
X7705	007306		CMB,CCE,INB,SZB		2'S COMP)
X7706	027713		JMP	*+5	NON ZERO BYTE
X7707	002006		INA,	SZA	FEED FRAME COUNTER
X7710	027703		JMP	*-5	
X7711	102077		HLT	77B	END OF TAPE
X7712	027700		JMP	START	
X7713	077754		STB	WD.CT	WORDS IN RECORD
X7714	017742		JSB	READ	GET FEED FRAME
X7715	017742		JSB	READ	GET ADDRESS
X7716	074000		STB	0	INITIATE CHECKSUM
X7717	077755		STB	ADDR	
X7720	067755	CHECK	LDB	ADDR	
X7721	047777		ADB	MAXAD	CHECK ADDR BELOW LOADER
X7722	002040		SEZ		E OK
X7723	027740		JMP	HLT55	ADDR>=LOADER
X7724	017742		JSB	READ	GET NEXT WORD
X7725	040001		ADA	1	CONTINUE CHECKSUM
X7726	177755		STB	ADDR, I	
X7727	037755		ISZ	ADDR	
X7730	000040		CLE		
X7731	037754		ISZ	WD.CT	
X7732	027720		JMP	CHECK	
X7733	017742		JSB	READ	
X7734	054000		CPB	0	
X7735	027702		JMP	CONT	
X7736	102011		HLT	11B	CHECKSUM ERROR
X7737	027700		JMP	START	
X7740	102055	HLT55	HLT	55B	ADDRESS>=LOADER
X7741	027700		JMP	START	
X7742	000000	READ	NOP		E READ WORD =1 BYTE
X7743	006600		CLB,	CME	E REG BYTE POINTER
X7744	1037KK		STC	RDR,C	START THE READER
X7745	1023KK		SFS	RDR	CHECK THESE IF \$\$
X7746	027745		JMP	*-1	LOADER BOMBED \$1
X7747	1064KK		MIB	RDR	GOT BYTE
X7750	002041		SEZ,	RSS	
X7751	127742		JMP	READ,I	
X7752	005767		BLF,	CLE,BLF	
X7753	027744		JMP	*-7	
X7754	000000	WD.CT	NOP		
X7755	000000	ADDR	NOP		
X7756	177765	M.11	DEC-11		FEED FRAME CONST.
X7777		MAXAD	EQU	X7777B	LOADER ADDRESS
00010		RDR	EQU	KKB	READER SELECT CODE
			END		



X = 1 for 8K
 2 for 12K
 3 for 16K
 4 for 20K
 5 for 24K
 6 for 28K
 7 for 32K

KK = Paper Tape Reader

MTRS LOADER ROM**Part No. 1816-0426**

X7700	063774		LDA SLOW	SELECT UNIT 0
X7701	1026CC		OTA CMND	AND
X7702	1037CC		STC CMND,C	REWIND TAPE.
X7703	106501		LIB SSW	GET ORDINAL NUMBER OF PROGRAM.
X7704	007307		CMB,CCE,INB,SZB, RSS	MAKE < 0, PRESET -E-.
X7705	067767		LDB DFALT	USE DEFAULT IF SWREG = 0.
X7706	077772		STB PROG#	SAVE FOR COUNTER.
X7707	063773	READ	LDA RRF	OUTPUT
X7710	1026CC		OTA CMND	READ COMMAND
X7711	1025CC		LIA CMND	AND
X7712	001323		RAR, RAR	TEST
X7713	001310		RAR, SLA	FOR REJECT.
X7714	027707		JMP READ	REJECTED, KEEP TRYING UNTIL O.K.
X7715	1037CC		STC CMND,C	START TAPE.
X7716	1037DD		STC DATA,C	INITIALIZE DATA CHANNEL CHANNEL.
X7717	063772		LDA PROG#	GET PROG ORDNL CNTR - 0 IF LOAD.
X7720	006644		CLB,SEZ,CME,INB	-B ← DATA RECORD MASK.
X7721	067771		LDB MASK1	-B ← POST REC MASK (S.A. ONLY).
X7722	002042		SEZ, SZA	IF DATA RECORD AND NOT LOADING,
X7723	027707		JMP READ	IGNORE THE RECORD.
X7724	1022CC		SFC CMND	POST RECORD OR (DATA RECORD AND
X7725	027741		JMP DONE	LOADING), WAIT FOR DATA OR
X7726	1023DD	LOOP	SFS DATA	FOR TAPE TO STOP.
X7727	027724		JMP *-3	
X7730	1035DD		LIA DATA,C	GET WORD FROM TAPE.
X7731	004031		SLB, BRS	TEST IF WE STORE, SHIFT MASK.
X7732	027726		JMP LOOP	NO STORE, GET NEXT WORD.
X7733	073775		STA S.A.	WE DO, SAVE WORD IN S.A. TOO.
X7734	002041		SEZ, RSS	IF THIS IS POST RECORD,
X7735	027726		JMP LOOP	SKIP STORE AND ADDRESS BUMP.
X7736	173776		STA PTR,I	STORE THE WORD, THEN
X7737	037776		ISZ PTR	BUMP ADDRESS POINTER
X7740	027726		JMP LOOP	RETURN FOR NEXT WORD.
X7741	073776	DONE	STA PTR	STORE LOAD ADDR IF POST RECORD.
X7742	067772		LDB PROG#	GET PROGRAM ORDINAL COUNTER.
X7743	063775		LDA S.A.	GET PROGRAM STARTING ADDRESS.
X7744	006021		SSB, RSS	ARE WE LOADING?
X7745	027750		JMP *+3	YES, SKIP S.A. TEST.
X7746	002020		SSA	NO, IS THIS DUMMY END- OF FILE?
X7747	102001	HLT1	HLT 1	YES, OR PARITY ERROR, HALT.
				!!!HALT IS NOT PROTECTED!!!
X7750	002241		SEZ,CME,RSS	NO ERROR, IF WE READ DATA RECORD

MTRS LOADER ROM (Cont'd)**MTRS LOADERS - Continued**

X7751	002003		SZA, RSS	OR CONTINUATION POST RECORD.
X7752	027756		JMP ZTEST	SKIP INITIAL POST REC STEPS.
X7753	033766		IOR JMP	INITIAL POST REC, INCLUDE JUMP
X7754	006007		INB,SZB,RSS	TO STARTING ADDRESS. IF THIS
X7755	070002		STA 2	IS OUR PROG, STORE THE JUMP.
X7756	006220	ZTEST	CME, SSB	IF WE HAVEN'T FOUND OUR PROG YET
X7757	027706		JMP READ-1	UPDATA PROG#, READ NEXT REC.
X7760	1025CC		LIA CMND	OUR PROG OR POST RECORD OF NEXT
X7761	001332		RAR,SLA,RAL	ONE, IF IT HAS A PARITY ERROR
X7762	027747		JMP HLT1	GO NO FURTHER.
X7763	006003		SZB, RSS	1ST POST REC OF NEXT PROGRAM?
X7764	027706		JMP READ-1	NO, UPDATE PROG#, CONTINUE.
X7765	063770		LDA HLT70	YES, STORE FINAL HALT.
X7766	024000	JMP	JMP A	GO TO IT.
00000		A	EQU 0	-A- REGISTER ADDRESS DEFINITION.
000DD		CMND	EQU DATA+1	MAG TAPE COMMAND CHANNEL S.C.
X7767	177774	DEFAULT	ABS -DEFLT	-(PROGRAM ORDINAL DEFAULT).
X7770	102070	HLT70	HLT 70B	FINAL HALT (GOOD HALT).
X7771	000677	MASK1	OCT 677	POST RECORD READ MASK.
X7772	000000	PROG#	NOP	PROGRAM ORDINAL COUNTER.
X7773	000023	RRF	OCT 23	MT READ ONE RECORD COMMAND CODE.
X7774	001501	SL0RW	OCT 1501	MT SELECT 0/REWIND COMMAND CODE.
00001		SSW	EQU 1	SWITCH REG ADDRESS DEFINITION.

THE LOCATIONS OF THE FOLLOWING TWO WORDS MUST NOT BE CHANGED TO PRESERVE 2105, -08, ETC. BOOT LOADER CAPABILITY.

X7775	600000	S.A.	BSS 1	PROG START ADDR (IN POST REC).
X7776	000000	PTR	BSS 1	DATA RECORD LOAD ADDRESS.

END

X =	2 for 12K	DD — Lower Number (Higher Priority)
	3 for 16K	
	4 for 20K	CC — Higher Number (Lower Priority)
	5 for 24K	
	6 for 28K	
	7 for 32K	

HP 12992A 7900/7901/2883 LOADER ROM

```

0001          ASMB,A,B,L,C
0003 07700          ORG 77008
0004*****
0005*
0006*          REV.          1-27-76          *
0007*          PART NUMBER    1816-0863      *
0008*          PRODUCT NUMBER  12992A        *
0009*
0010*****
0011*
0012* SWITCH REGISTER USAGE
0013*
0014*
0015* 15-14          LOADER SELECT
0016* 13-12          00 - 7900 DISC
0017*                01 - RESERVED
0018*                10 - 2883 DISC
0019* 11-6           DISC SELECT CODE
0020* 5-3            RESERVED FOR DIAGNOSTIC GROUP
0021* 2-0           SUBCHANNEL NUMBER
0022*
0023*
0024 00010          DC      EQU 10B
0025 00011          CC      EQU DC+1
0026*
0027*** "PRESET" MUST BE PRESSED
0028*

0030 07700          START EQU *
0031 07700 102501    LIA 1          GET CONTENTS OF S-REG
0032 07701 106501    LIB 1
0033 07702 013765    AND D7          ISOLATE SUBCHANNEL #
0034 07703 005750    BLF,CLE,SLB
0035 07704 027741    JMP READ
0036 07705 005335    RBR,SLB,ERB    PUT BIT 13 IN E - SET = 2883
0037 07706 027717    JMP ISS
0038*
0039* FALL THROUGH
0040*          A HAS LAST 3 BITS OF S REG
0041*          B HAS S REG SHIFTED
0042*          13 / 12 11 10 / 9 8 7 / 6 5 4 / 3 2 1 / 0 15 14
0043*          E IS 0
0044*
0045 07707          LOOP EQU *
0046 07707 102611    OTA CC          DO 7900 STATUS TO
0047 07710 103711    STC CC,C        CLEAR FIRST SEEK
0048 07711 102310    SFS DC          STATUS
0049 07712 027711    JMP *-1
0050 07713 002004    INA            GET NEXT DRIVE
0051 07714 053765    CPA D7          ALL CLEARED?
0052 07715 002001    RSS            YES
0053 07716 027707    JMP LOOP
0054*

```

HP 12992A 7900/7901/2883 LOADER ROM (Cont'd)

```

0055* FALL THROUGH
0056*   A HAS A 7
0057*   B HAS S REG SHIFTED - SEE ABOVE COMMENT
0058*   E HAS CONDITION OF BIT 13 OF S REG
0059*
0060* JMP ISS
0061*   A HAS LAST 3 BITS OF S REG
0062*   B HAS S REG SHIFTED - SEE ABOVE COMMENT
0063*   E IS A 1
0064*
0065 07717          ISS EQU *
0066 07717 067761   LDB SEEKC      GET SEEK COMND
0067 07720 106610   OTB DC         ISSUE CYLINDER ADDR (0)
0068 07721 103710   STC DC,C       TELL CTRL. CYC. ADDR LOADED
0069 07722 106611   OTB CC
0070 07723 103711   STC CC,C       START SEEK
0071 07724 102310   SFS DC
0072 07725 027724   JMP *-1
0073 07726 006400   CLB
0074 07727 102501   LIA 1
0075 07730 002051   SEZ,SLA,RSS    SUBCHAN=1 OR ISS SKIP
0076 07731          ISSRD EQU *
0077 07731 047770   ADB BIT9
0078 07732 106610   OTB DC         SEND SECTOR ADDR
0079 07733 103710   STC DC,C
0080 07734 102311   SFS CC         WAIT FOR SEEK
0081 07735 027734   JMP *-1
0082 07736 063731   LDA ISSRD      GET ISS READ COMND
0083 07737 002341   SEZ,CCE,RSS    ISS DISC?
0084 07740 001100   ARS            NO-MAKE 7900 READ COMND
0085*
0086* FALL THROUGH
0087*   A HAS DISC READ COMND
0088*   B HAS EITHER A 0 OR BIT 9 SET
0089*   E IS A 1
0090*
0091* JMP READ
0092*   A HAS LAST 3 BITS OF THE S REG
0093*   B HAS S REG SHIFTED
0094*   E IS A 0
0095*
0096 07741          READ EQU *
0097 07741 067776   LDB DMACW      GET DMA CONTROL WORD
0098 07742 106606   OTB 6          ISSUE DMA CONTROL WORD
0099 07743 067762   LDB ADDR1      GET MEMORY ADDR
0100 07744 077741   STB READ       MAKE BOOT NONREEXECUTABLE
0101 07745 106602   OTB 2          ISSUE MEMORY ADDR
0102 07746 102702   STC 2          SET WORD COUNT
0103 07747 067764   LDB CNT        GET WORD COUNT
0104 07750 106602   OTB 2          ISSUE WORD COUNT
0105*
0106* FALL THROUGH
0107*   A HAS EITHER THE DISC READ COMND
0108*   OR THE LAST 3 BITS OF THE S REG
0109*   B HAS DMA WORD COUNT
0110*   E IS EITHER A 1

```

HP 12992A 7900/7901/2883 LOADER ROM (Cont'd)

```

0111*          OR A 0
0112*
0113 07751 002041      SEZ,RSS
0114 07752 027766      JMP MEM
0115 07753 102611      OTA CC          ISSUE READ COMND
0116 07754 103710      STC DC,C
0117 07755 103706      STC 6,C          START DMA
0118 07756 103711      STC CC,C          START DISK READING
0119 07757 037773      ISZ SKIP
0120 07760 027773      JMP SKIP
0121*
0122*
0123* CONSTANTS
0124*
0125 07761 030000      SEEKC OCT 30000
0126 07762 102011      ADDR1 OCT 102011
0127 07763 102055      ADDR2 OCT 102055
0128 07764 164000      CNT DEC -6144
0129 07765 000007      DT DEC 7
0130*
0131*
0132 07766 106710      MEM CLC DC          SET *NEXT WRD IS COMND FLG*
0133 07767 001720      ALF,ALS          MOVE TO HEAD NUMBER LOC
0134 07770 001000      BIT9 ALS
0135 07771 103610      OTA DC,C          OUTPUT CGLD LGND COMND
0136 07772 103706      STC 6,C
0137 07773              SKIP EQU *
0138 07773 102310      SFS DC
0139 07774 027773      JMP *-1
0140 07775 117763      EXIT JSB ADDR2,1
0141*
0142* EXIT
0143* TRACK 0, SECTOR 0 OF APPROPRIATE
0144* SUBCHANNEL NOW IN MEMORY
0145*
0146 07776 120010      DNACW ABS 120000B+DC
0147 07777 170100      ABS -START
0148                      END
** NO ERRORS* RTE ASMB 92001B (10/74)**

```

HP 12992B 7905 LOADER ROM (OBSOLETE VERSION)

```

0001          ASMB,A,B,L,C
0003 07700          ORG 7700B
0004*****
0005*
0006*          REV.          1-20-76          *
0007*          PART NUMBER    1816-0869      *
0008*          PRODUCT NUMBER 12992B         *
0009*
0010*****
0011*
0012* SWITCH REGISTER USAGE
0013*
0014*
0015* 15-14      LOADER SELECT
0016* 13-12      IGNORED
0017* 11-6        DISC SELECT CODE
0018* 5-3         RESERVED FOR DIAGNOSTIC GROUP
0019* 2-0         SUBCHANNEL NUMBER
0020*
0021*

```

HP 12992B 7905 LOADER ROM (OBSOLETE VERSION) (Cont'd)

```

0022 00010      DC    EQU 108
0023 00011      CC    EQU DC+1
0024*
0025*** "PRESET" MUST BE PRESSED
0026*
0028 07700      START EQU *
0029 07700 102501 LIA 1      GET CONTENTS OF S-REG
0030 07701 013716 AND D7     ISOLATE SUBCHANNEL #
0031*
0032* FALL THROUGH
0033*      A HAS LAST 3 BITS OF THE S REG
0034*      B HAS S REG SHIFTED
0035*
0036 07702 067776 LDR DMACW   GET DMA CONTROL WORD
0037 07703 106606 OTB 6       ISSUE DMA CONTROL WORD
0038 07704 067713 LDB ADDR1   GET MEMORY ADDR
0039 07705 077705 STB *       MAKE BOOT NOT REEXECUTABLE
0040 07706 106602 OTB 2       ISSUE MEMORY ADDR
0041 07707 102702 STC 2       SET WORD COUNT
0042 07710 067715 LDR CNT     GET WORD COUNT
0043 07711 106602 OTB 2       ISSUE WORD COUNT
0044*
0045* FALL THROUGH
0046*      A HAS THE LAST 3 BITS OF THE S REGISTER
0047*      B HAS DMA WORD COUNT
0048*
0049 07712 027766 JMP NEW
0050*
0051*
0052* CONSTANTS
0053*
0054 07713 102011 ADDR1 OCT 102011
0055 07714 102055 ADDR2 OCT 102055
0056 07715 164000 CNT DEC -6144
0057 07716 000007 D7 DEC 7
0058*
0059* 39 NOP'S
0060*
0064      LST
0065*
0066* 7905 COLD LOAD ROUTINE
0067*
0068 07766 106710 NEW CLC DC    SET "NEXT WRD IS COMND FLG"
0069 07767 001720 ALF,ALS     MOVE TO HEAD NUMBER LOC
0070 07770 001000 BIT9 ALS
0071 07771 103610 OTA DC,C    OUTPUT COLD LOAD COMND
0072 07772 103706 STC 6,C
0073 07773      SKIP EQU *
0074 07773 102310 SFS DC
0075 07774 027773 JMP *-1
0076 07775 117714 EXIT JSB ADDR2,I
0077*
0078* EXIT
0079*      TRACK 0 OF THE APPROPRIATE
0080*      SUBCHANNEL NOW IN MEMORY
0081*
0082 07776 000010 DMACW ABS DC
0083 07777 170100 ABS -START
0084      END
** NO ERRORS* RTE ASMB 92001B (10/74)**

```

HP 12992B 7905/7906/7920/7925 DISC LOADER ROM PROGRAM LISTING

7905/06/20 DISC BOOT LOADER (12992B) - RPL COMPATIBLE

```

0001          ASMB,A,B,L
0003 07700          ORG 7700B
0004*****
0005*
0006*      REVISION          05 AUG 77      *
0007*      PART NUMBER      12992-80002    *
0008*      PRODUCT NUMBER   12992B        *
0009*
0010*****
0011*
0012*      SWITCH REGISTER USAGE
0013*
0014*      15-14      LOADER SELECT
0015*      13         UNUSED
0016*      12         =0/1=RPL/MANUAL BOOT
0017*      11-6      DISC SELECT CODE
0018*      5-3       RESERVED
0019*      2-0       SUECHANNEL NUMBER
0020*
0021 00010          DC      EQU 10B
0022*
0023 07700 01727      START JSB STAT      GET STATUS
0024 07701 002021     SSA,RSS            IS DRIVE READY ?
0025 07702 027742     JMP DMA            YES, SET UP DMA
0026 07703 013714     AND B20            NO, CHECK STATUS BITS
0027 07704 002002     SZA                IS DRIVE FAULTY OR HARD DOWN ?
0028 07705 102030     HLT 30B            YES, HALT 30B, "RUN" TO TRY AGAIN
0029 07706 027700     JMP START          NO, TRY AGAIN FOR DISC READY
0030*
0031*      CONSTANTS
0032*
0033 07707 102011     ADDR1 OCT 102011
0034 07710 102055     ADDR2 OCT 102055
0035 07711 164000     CNT  DEC -6144
0036 07712 000007     D7   OCT 7
0037 07713 001400     STCMD OCT 1400
0038 07714 000020     B20  OCT 20
0039 07715 017400     STMSK OCT 17400
0040*      9 NOP'S
0044          LST
0045*
0046 07727 000000     STAT NOP            STATUS CHECK SUBROUTINE
0047 07730 107710     CLC DC,C            SET STATUS COMMAND MODE
0048 07731 063713     LDA STCMD          GET STATUS COMMAND
0049 07732 102610     OTA DC            OUTPUT STATUS COMMAND
0050 07733 102310     SFS DC            WAIT FOR STATUS#1 WORD
0051 07734 027733     JMP *-1
0052 07735 107510     LIB DC,C            B-REG = STATUS#1 WORD
0053 07736 102310     SFS DC            WAIT FOR STATUS#2 WORD
0054 07737 027736     JMP *-1
0055 07740 103510     LIA DC,C            A-REG = STATUS#2 WORD

```

HP 12992B 7905/7906/7920/7925 DISC LOADER ROM PROGRAM LISTING (Cont'd)

```

0056 07741 127727      JMP STAT,I      RETURN
0057*
0058*  SET UP DMA CHANNEL
0059*
0060 07742 067776  DMA  LDB DMACW      GET DMA CONTROL WORD
0061 07743 106606      OTB 6          OUTPUT DMA CONTROL WORD
0062 07744 067707      LDB ADDR1      GET MEMORY ADDRESS
0063 07745 106702      CLC 2          SET MEMORY ADDRESS INPUT MODE
0064 07746 106602      OTB 2          OUTPUT MEMORY ADDRESS TO DMA
0065 07747 102702      STC 2          SET WORD COUNT INPUT MODE
0066 07750 067711      LDB CNT        GET WORD COUNT
0067 07751 106602      OTB 2          OUTPUT WORD COUNT TO DMA
0068*FALL THRU
0069* 7905/20 COLD LOAD COMMAND
0070*
0071 07752 106710  CLEDE CLC DC      SET COMMAND INPUT MODE
0072 07753 102501      LIA 1          LOAD SWITCH
0073 07754 106501      LIB 1          REGISTER SETTINGS
0074 07755 013712      AND D7        ISOLATE HEAD NUMBER
0075 07756 005750      BLF,CLE,SLB   BIT 12=0?
0076 07757 027762      JMP *+3       NO,MANUAL BOOT
0077 07760 002002      SZA          YES,RPL BOOT. HEAD#=0?
0078 07761 001000      ALS          NO,HEAD#=1, MAKE HEAD#=2
0079 07762 001720      ALF,ALS       FORM COLD LOAD
0080 07763 001000      ALS          COMMAND WORD
0081 07764 103706      STC 6,C       ACTIVATE DMA
0082 07765 103610      OTA DC,C      OUTPUT COLD LOAD COMMAND
0083 07766 102310      SFS DC       IS COLD LOAD COMPLETED ?
0084 07767 027766      JMP *-1       NO, WAIT
0085 07770 017727      JSB STAT      YES, GET STATUS
0086 07771 060001      LDA 1
0087 07772 013715      AND STMSK     A-REG = STATUS BITS OF STATUS#1 WORD
0088 07773 002002      SZA          IS TRANSFER OK ?
0089 07774 027700      JMP START     NO,TRY AGAIN
0090 07775 117710  EXIT  JSB ADDR2,I  YES, EXECUTE LOADED PROGRAM @ 2055B
0091*FALL THRU
0092* THE NEXT 2 WORDS MUST BE THE LAST 2 WORDS
0093* IN THE BOOTSTRAP LOADER IN THE LAST 2 MEMORY LOCATIONS
0094 07776 000010  DMACW ABS DC
0095 07777 170100      ABS -START
0096                      END

```

HP 12992C 2644/2645/2648 LOADER ROM

```

0001          ASMB,A,B,L      CARTRIDGE TAPE BINARY LOADER
0003 07700          ORG 7700B
0004.....
0005*
0006*          REV          2-18-76
0007*          PART NUMBER 1816-0857
0008*
0009.....
0010 00010          SC      EQU 10B
0011 00000          A      EQU 0
0012 00001          B      EQU 1
0013*
0014*          THIS ASSUMES THE INTERFACE IS A 12966 OR 12968
0015*          THE BAUD RATE IS EXTERNAL
0016*          THE CARTRIDGE IS POSITIONED AT THE FILE TO BE READ
0017**** *RUN* CAN NOT BE PRESSED AFTER HALT 77B OR HALT 11B
0018*
0019 07700 063773    START LDA LDOTP      RESET POINTER
0020 07701 073702    STA *+1
0021 07702 063763    NCW LDA OTP          GET A WORD FROM THE TABLE
0022 07703 037702    ISZ *-1             MOVE TO NEXT WORD IN TABLE
0023 07704 103610    OTA SC,C           OUTPUT CURRENT WORD
0024 07705 053771    CPA EOT           END OF TABLE?
0025 07706 027717    JMP NRD           YES - START INPUT
0026 07707 001727    ALF,ALF           IS THIS A CHARACTER?
0027 07710 013772    AND 377
0028 07711 002002    SZA
0029 07712 027702    JMP NCW           NO - DO NEXT CONTROL WORD
0030 07713 103710    STC SC,C           PUT CARD IN DATA MODE
0031 07714 102310    SFS SC           IS CHARACTER OUT?
0032 07715 027714    JMP *-1           NO - WAIT FOR IT
0033 07716 027702    JMP NCW           YES - DO NEXT CONTROL WORD
0034 07717 017750    HRD JSB INPUT      READ IN FIRST WORD (RECORD COUNT)
0035 07720 005727    BLF,BLF           POSITION COUNT TO LOWER BYTE
0036 07721 007007    CMB,INB,SZB,RSS   MAKE IT NEG AND IS IT EOF?
0037 07722 102077    HLT 77B          YES - END-OF-FILE
0038 07723 006021    SSB,RSS          IF COUNT WAS ALL ONES
0039 07724 102000    HLT 0            THEN TAPE ERROR
0040 07725 077776    STB WCT          SAVE COUNT
0041 07726 017750    JSB INPUT      READ STORE ADDRESS
0042 07727 077774    STB CKSUM      START CHECKSUM
0043 07730 077775    STB ADD        AND SAVE ADDRESS
0044 07731 017750    NWD JSB INPUT      GET WORD TO BE STORED
0045 07732 063775    LDA ADD        CHECK IF ADDRESS
0046 07733 043777    ADA MXAD        IS ABOVE LOADER
0047 07734 002040    SEZ            IS IT?
0048 07735 102055    HLT 55B        YES
0049 07736 177775    STB ADD,I      NO - PUT WORD IN MEMORY
0050 07737 047774    ADB CKSUM      ADD IT TO CHECKSUM
0051 07740 077774    STB CKSUM
0052 07741 037775    ISZ ADD        MOVE ADDRESS UP ONE
0053 07742 037776    ISZ WCT        FINISHED WITH THIS RECORD?
0054 07743 027731    JMP NWD        NO - READ NEXT WORD
0055 07744 017750    JSB INPUT      YES - READ CHECKSUM
0056 07745 057774    CPB CKSUM      IS CHECKSUM OK?
0057 07746 027717    JMP NRD        YES - READ NEXT RECORD
0058 07747 102011    HLT 11B        NO
0059 07750 000000    INPUT NOP        INPUT ONE WORD FROM INTERFACE
0060 07751 006700    CLB,CCE        ZERO WORD AND START WITH UPPER HALF
0061 07752 102510    LIA SC          GET DATA
0062 07753 002021    SSA,RSS        IS IT VALID DATA?
0063 07754 027752    JMP *-2        NO
0064 07755 013772    AND 377        YES - ELIMINATE UPPER HALF
0065 07756 044000    ADB A          ADD DATA TO B REG.
0066 07757 002041    SEZ,RSS        SECOND HALF READ?
0067 07760 127750    JMP INPUT,I    YES - RETURN WITH WORD IN B REG.
0068 07761 005767    BLF,CLE,BLF    NO - MOVE BYTE TO UPPER HALF
0069 07762 027752    JMP INPUT+2    SET LOWER HALF FLAG AND READ IT
0070
0071*

```

HP 12992C 2644/2645/2648 LOADER ROM (Cont'd)

```

0072 07763 150377 OTP OCT 150077 MASTER RESET
0073 07764 040740 OCT 40740 INTERFACE CONTROL
0074 07765 030003 OCT 30003 CHAR FRAME CONTROL
0075 07766 000033 CHR1 OCT 33 ASCII "ESC"
0076 07767 030077 OCT 50077 RESET BUFFER STATUS
0077 07770 000145 CHR2 OCT 145 ASCII LOWER CASE "E"
0078 07771 040340 EOT OCT 40340 INPUT COMMAND WORD
0079*
0080 07772 000377 377 OCT 377 UPPER HALF WORD MASK
0081 07773 063763 LDOTP LDA OTP POINTER TO OUTPUT TABLE
0082 07774 000000 CKSUM NOP CHECKSUM STORAGE
0083 07775 000000 ADD NOP ADDRESS STORAGE
0084 07776 000000 WCT NOP INPUT WORD COUNT
0085 07777 170100 MXAD ABS -START START BINARY LOADER AREA
0086 END
** NO ERRORS* RTE ASMB 92001B (10/74)**

```

HP 12992D 7970B/7970E LOADER ROM

```

0001 ASMB,A,B,L MAG TAPE LOADER
0003 07700 ORG 7700B
0004*****
0005*
0006* REV. 6-23-76 *
0007* PART NUMBER 1816-U962 *
0008*
0009*****
0010 00010 DC EQU 10B
0011 00011 CC EQU DC+1
0012*
0013*** "RUN" CAN NOT BE PRESSED AFTER ANY HALT
0014*
0015 07700 106501 START LIB 1 CHECK IF FILE FORWARD WAS REQUESTED
0016 07701 006011 SLB,RS: ???
0017 07702 027714 JMP NRD NO JUST READ A FILE
0018 07703 003004 CMA,INA MAKE REQUEST NEG FOR COUNTER
0019 07704 073775 STA WCT SAVE NUMBER AS COUNTER
0020 07705 067772 LDB SLORW SELECT 0 AND REWIND
0021 07706 017762 FFL JSB CMD OUTPUT COMMAND
0022 07707 102311 SFS CC WAIT FOR COMPLETION
0023 07710 027707 JMP *-1
0024 07711 067774 LDB FFC GET FILE FORWARD COMMAND
0025 07712 037775 ISZ WCI ANY FILES LEFT?
0026 07713 027706 JMP FFL YES
0027 07714 067773 NRD LDB RDCMD GET READ COMMAND
0028 07715 017762 JSB CMD DO IT
0029 07716 103710 STC DC,C START DATA CHANNEL
0030 07717 102211 SFC CC CHECK FOR STATUS
0031 07720 027752 JMP STAT YES
0032 07721 102310 SFS DC ANY DATA
0033 07722 027717 JMP *-3 NO
0034 07723 107510 LIB DC,C YES GET IT (RECORD COUNT)
0035 07724 005727 BLF,BLF POSITION COUNT TO LOWER BYTE
0036 07725 007000 CMB MAKE IT NEGATIVE
0037 07726 077775 STB WCT SAVE INPUT COUNT
0038 07727 102211 SFC CC CHECK FOR STATUS
0039 07730 027752 JMP STAT YES EXIT TO STATUS
0040 07731 102310 SFS DC WAIT TO READ NEXT WORD
0041 07732 027727 JMP *-3
0042 07733 107510 LIB DC,C GET LOAD ADDRESS
0043 07734 074000 STB 0 START CHECKSUM
0044 07735 077762 STB CMD AND ADDRESS POINTER
0045 07736 027742 JMP **4
0046 07737 177762 NWL STB CMD,I PUT WORD IN MEMORY
0047 07740 040001 ADA 1 ADD IT TO CHECK SUM
0048 07741 037762 ISZ CMD MOVE UP ADDRESS
0049 07742 102310 SFS DC WAIT FOR NEXT WORD
0050 07743 027742 JMP *-1

```


HP 12992D 7970B/7970E LOADER ROM (Cont'd)

```

0051 07744 107510      LIB DC,C      GET DATA TO STORE IN MEMORY
0052 07745 037775      ISZ WCT      FINISHED WITH DATA?
0053 07746 027737      JMP NWD      NO READ NEXT WORD
0054 07747 054000      CPB 0        IS CHECKSUM OK?
0055 07750 027717      JMP NRD+3    YES - WAIT FOR COMMAND CHANNEL STATUS
0056 07751 102011      HLT 11B      NO
0058 07752 102511      STAT LIA CC    GET STATUS
0059 07753 001727      ALF,ALF      POSITION EOF BIT
0060 07754 002020      SSA          IS IT EOF?
0061 07755 102077      HLF 77B      YES
0062 07756 001727      ALF,ALF      REPOSITION STATUS
0063 07757 001310      RAR,SLA      YES READ OK?
0064 07760 102000      HLT 0        NO TELL OPERATOR
0065 07761 027714      JMP NRD      YES READ NEXT RECORD
0066*
0067*
0068 07762 000000      CMD  NOP
0069 07763 106611      OFB CC      OUTPUT COMMAND
0070 07764 102511      LIA CC      CHECK IF REJECTED
0071 07765 001323      RAR,RAR
0072 07766 001310      RAR,SLA      ??
0073 07767 027763      JMP *-4      YES TRY AGAIN
0074 07770 103711      SFC CC,C      NO START COMMAND
0075 07771 127762      JMP CMD,1    RETURN
0076*
0077*
0078 07772 001501      SLURW UC1 1501  MT SELECT 0 / REWIND
0079 07773 001423      RDCMD UC1 1423  MT READ A RECORD COMMAND
0080 07774 000203      FFC UC1 203     MT FILE FORWARD COMMAND
0081 07775 000000      WCT  NOP        INPUT WORD COUNT
0082 07776 000000      NOP
0083 07777 000000      NOP
0084          END
** NO ERRORS *TOTAL **RTE ASMB 750420**

```

HP 12992E 9885 FLEXIBLE DISC LOADER ROM

```

0001          ASMB,A+H+L      761227
0003*.....*
0004*
0005*      PART NO. 1816-1051
0006*
0007*      LOADER JUMPS TO 2 UPON SUCCESSFUL COMPLETION (NO HALT).
0008*      ENTER STARTING TRACK IN H-REG BITS 11-5.
0009*      ENTER STARTING SECTOR IN H-REG BITS 4-0.
0010*      SET S-REG BIT 0 TO SELECT TRACK 0, SECTOR 1.
0011*      RESTART LOADING PROCEDURE IF HALT OCCURS.
0012*      LOADER USUALLY HANGS UP IF DEVICE ERROR OCCURS.
0013*.....*
0014 07700          ORG 7700B
0015 00010          CC  EQU 10R
0016 00011          UC  EQU CC+1
0017 00000          A   EQU 0
0018 00001          R   EQU 1
0019*
0020 07700 102501    START LIA 1      IF S-REG BIT 0 IS SET
0021 07701 000010    SLA
0022 07702 006404    CLH,INH        ASSUME TR 0, SEC 1
0023 07703 060001    LDA R
0024 07704 013711    AND R36       MASK OPERATOR INPUT
0025 07705 053711    CPA R36       SEC=3A: FORMAT -- SEC=37: MARK DEFECT
0026 07706 027706    JMP *         ILLEGAL SECTOR -- LOADER CANNOT PROCEED
0027 07707 002504    CLA,CLH,INA
0028 07710 103610    OTA CC,C      PRESET CONTROLLER
0029 07711 000036    B36 SLA,ELA
0030 07712 102610    OTA CC      CLEAR PRESET BIT
0031 07713 017766    JSH OTA      CLEAR POSSIBLE ERROR FLAG

```

HP 12992E 9885 FLEXIBLE DISC LOADER ROM (Cont'd)

```

0032 07714 063774 LDA PASWD
0033 07715 017766 JSR OTA OUTPUT PASSWORD TO CONTROLLER
0034 07716 060001 LDA H
0035 07717 033775 INR SEEK CONVERT OPERATOR INPUT TO SEEK COMMAND
0036 07720 017766 JSR OTA OUTPUT SEEK TO CONTROLLER
0037 07721 063774 LDA PASWD
0038 07722 017766 JSR OTA OUTPUT PASSWORD AGAIN
0039 07723 063734 LDA READ READ AT LEAST 3300 SECTORS
0040 07724 017766 JSR OTA OUTPUT READ COMMAND
0041 07725 002400 CLA CLEAR INTERFACE
0042 07726 017766 JSR OTA
0043 07727 017760 RECLP JSR OTLI INPUT FMGR WORD COUNT
0044 07730 002007 INA,SZA,RSS END OF FILE?
0045 07731 024002 JMP PH LOAD COMPLETE -- START PROGRAM
0046 07732 017760 JSR OTLI INPUT ABSOLUTE COUNT
0047 07733 001727 ALF,ALF POSITION COUNT TO LOWER BYTE
0048 07734 001304 READ CMA,CCE,INA
0049 07735 073766 STA COUNT
0050 07736 017760 JSR OTLI INPUT ADDRESS
0051 07737 073777 STA ADDR
0052 07740 070001 STA R START CHECKSUM
0053 07741 102311 DATLP SFS DC WAIT FOR DATA CHANNEL
0054 07742 027741 JMP *-1
0055 07743 103711 STC DC,C START NEXT TRANSFER
0056 07744 102511 LIA DC INPUT DATA
0057 07745 173777 STA ADDR,I STORE INTO MEMORY
0058 07746 044000 ADX A ADD TO CHECKSUM
0059 07747 037777 ISZ ADDR MOVE TO NEXT ADDRESS
0060 07750 037766 ISZ COUNT DONE?
0061 07751 027741 JMP DATLP NO, DO NEXT DATA WORD
0062 07752 017760 JSR OTLI INPUT CHECKSUM
0063 07753 050001 CPA R DOES CHECKSUM AGREE?
0064 07754 006401 CLB,RSS
0065 07755 102011 HLT ILM NO, TELL OPERATOR
0066 07756 017760 JSR OTLI DISCARD SECOND FMGR COUNT
0067 07757 027727 JMP RECLP
0068*
0069 07760 000000 OTLI NOP INPUT FROM DATA CHANNEL
0070 07761 102311 SFS DC WAIT FOR DATA CHANNEL
0071 07762 027761 JMP *-1
0072 07763 103711 STC DC,C START NEXT TRANSFER
0073 07764 102511 LIA DC INPUT DATA
0074 07765 127760 JMP OTLI,I
0075*
0076 07766 000000 OTA NOP OUTPUT TO DATA CHANNEL
0077 07767 102311 SFS DC WAIT FOR DATA CHANNEL
0078 07770 027767 JMP *-1
0079 07771 102611 OTA DC OUTPUT DATA
0080 07772 103711 STC DC,C START NEXT TRANSFER
0081 07773 127766 JMP OTA,I
0082*
0083*
0084 07774 127207 PASWD OCT 127207
0085 07775 140000 SEEK OCT 140000
0086 07776 000010 SC ABS CC
0087 07777 000000 ADDR NOP
0088*
0089 07766 COUNT EQU OTA
0090*
0091*
0092*
END
** NO ERRORS *TOTAL **RTE ASM# 760924**

```

HP 12992F 7900/7901 DISC LOADER ROM

7900 DISC BOOT LOADER (12992F) - RPL COMPATIBLE

```

0001          ASMB,A,B,L
0003 07700          ORG 7700B
0004*-----*
0005*
0006*      REVISION          05 AUG 77          *
0007*      PART NUMBER      12992-80003        *
0008*      PRODUCT NUMBER   12992F            *
0009*-----*
0010*-----*
0011*
0012*      SWITCH REGISTER USAGE
0013*
0014*      15-14      LOADER SELECT
0015*      13-12      UNUSED
0016*      11-6       DISC SELECT CODE
0017*      5-3        RESERVED
0018*      2-0        HEAD(SUBCHANNEL) NUMBER
0019*
0020 00010          DC      EQU 10B
0021 00011          CC      EQU DC+1
0022*
0023 07700 106710    START CLC DC      INSURE CONTROL SIGNALS ARE CLEARED
0024 07701 106711    CLC CC      ON COMMAND AND DATA CHANNELS
0025*
0026 07702 017757    JSB STAT      GET DISC STATUS
0027*
0028*      ISSUE SEEK COMMAND
0029*
0030 07703 067746    SEEK LDB SEEKC    GET SEEK COMMAND
0031 07704 106610    OTB DC      OUTPUT CYLINDER ADDRESS
0032 07705 103710    STC DC,C      TO DATA CHANNEL
0033 07706 106611    OTB CC      OUTPUT SEEK COMMAND
0034 07707 103711    STC CC,C      TO COMMAND CHANNEL
0035 07710 102310    SFS DC      FIRST ADDRESS WORD ACCEPTED ?
0036 07711 027710    JMP *-1      NO, WAIT
0037 07712 006400    CLB          YES, SET UP HEAD/SECTOR ADDRESS
0038 07713 102501    LIA 1        INPUT SWITCH REGISTER
0039 07714 002011    SLA,RSS      IS SUBCHANNEL 0 SELECTED ?
0040 07715 047747    ADB BIT9     YES, SET BIT 9 IN HEAD ADDRESS
0041 07716 106610    OTB DC      NO, BIT 9 = 0, OUTPUT HEAD/SECTOR
0042 07717 103710    STC DC,C      ADDRESS TO DATA CHANNEL
0043 07720 102311    SFS CC      IS SEEK COMPLETE ?
0044 07721 027720    JMP *-1      NO, WAIT
0045*
0046*
0047 07722 017757    JSB STAT      YES, CHECK STATUS ON DRIVE 0
0048*
0049*      ALLOCATE DMA CHANNEL
0050*
0051 07723 067776    DMA LDB DMACW    START DMA SET-UP
0052 07724 106606    OTB 6         OUTPUT DMA CONTROL WORD

```

HP 12992F 7900/7901 DISC LOADER ROM (Cont'd)

```

0053 07725 067750      LDB ADDR1      GET MEMORY ADDRESS
0054 07726 106602      OTB 2          OUTPUT MEMORY ADDRESS TO DMA
0055 07727 102702      STC 2          SET WORD COUNT INPUT
0056 07730 067752      LDB CNT        GET WORD COUNT
0057 07731 106602      OTB 2          OUTPUT WORD COUNT TO DMA
0058 07732 063745      READ LDA RDCMD  GET READ COMMAND
0059 07733 102611      OTA CC         OUTPUT READ COMMAND
0060 07734 103710      STC DC,C       PREPARE DATA CHANNEL FOR READING
0061 07735 103706      STC 6,C       ACTIVATE DMA
0062 07736 103711      STC CC,C       INITIATE READ COMMAND
0063 07737 102311      SFS CC         IS READ COMPLETE ?
0064 07740 027737      JMP *-1        NO, WAIT
0065*
0066*
0067 07741 017757      JSB STAT       CHECK STATUS ON DRIVE 0
0068*
0069*
0070 07742 027775      JMP EXIT
0071*
0072*
0073*  CONSTANTS
0074*
0075*
0076 07743 037766      FSMSK OCT 37766
0077 07744 004000      STMSK OCT 4000
0078 07745 020000      RDCMD OCT 20000
0079 07746 030000      SEEKC OCT 30000
0080 07747 001000      BIT9 OCT 1000
0081 07750 102011      ADDR1 OCT 102011
0082 07751 102055      ADDR2 OCT 102055
0083 07752 164000      CNT DEC -6144
0084*  4NOP'S
0088*  LST
0089*
0090*  REQUEST DISC STATUS
0091*
0092 07757 000000      STAT NOP
0093 07760 002400      CLA
0094 07761 102611      OTA CC         OUTPUT STATUS REQUEST
0095 07762 103711      STC CC,C       INITIATE STATUS REQUEST
0096 07763 102310      SFS DC        IS STATUS READY?
0097 07764 027763      JMP *-1        NO, WAIT
0098 07765 102510      LIA DC         YES, INPUT STATUS WORD
0099 07766 013743      AND FSMSK     MASK BITS 14,3,0 OFF
0100 07767 002003      SZA,RSS      IS DRIVE READY?
0101 07770 127757      JMP STAT,1    YES, EXIT
0102 07771 013744      AND STMSK     NO, MASK BIT 9
0103 07772 002002      SZA          IS DRIVE FAULTY?
0104 07773 102030      HLT 30H      YES, HALT 30H, "RUN" TO TRY AGAIN
0105 07774 027700      JMP START     NO, REPEAT SEEK REQUEST
0106*
0107*
0108 07775 117751      EXIT JSB ADDR2,1  YES, EXECUTE LOADED PROGRAM @ 2055B
0109*  THE FOLLOWING 2 WORDS MUST BE THE LAST 2 LOCATIONS
0110*  IN THE BOOT STRAP
0111 07776 120010      DMAC*,ABS 120000B+DC
0112 07777 170100      ABS -START
0113*  END

```

HP 12992H 7906H/7920H/7925H/9895 DISC LOADER ROM

```

0001          ASMB,A,B,L
0002* * * * *
0003*      ICD DISC BOOT LOADER - RPL COMPATABLE
0004*
0005*      PRODUCT NUMBER - 12992H
0006*      PART NUMBER - 12992-80004
0007*
0008* * * * *
0009*      SWITCH REGISTER OPTIONS:
0010*
0011*      15-14  LOADER SELECT
0012*      12      0/1 = RPL/MANUAL BOOT
0013*      11-6   IBI SELECT CODE
0014*      1-0   HEAD #
0015* * * * *
0016 07700          ORG 7700B
0017 00010          IBI EQU 10B
0018*
0019 07700 102501    START LIA 1      GET SWITCH REGISTER SETTING
0020 07701 100044    LSL 4          SHIFT A LEFT 4
0021 07702 006111    CLC,SLB,RSS   SR BIT 12 SET FOR MANUAL BOOT?
0022 07703 100041    LSL 1          NO. SHIFT HEAD # FOR RPL BOOT
0023 07704 001424    ALR,ALR       SHIFT HEAD 2, CLEAR SIGN
0024*
0025*      WAIT FOR DRIVE 0 READY
0026*
0027 07705 033744    IOR HDSEC     SET EOI BIT
0028 07706 073744    STA HDSEC     PLACE IN COMMAND BUFFER
0029 07707 017756    JSB BTCTL     SEND DUMMY,U-CLR,PP
0030 07710 102510    LIA IBI       READ INPUT REGISTER
0031 07711 101027    ASR 7         SHIFT DRIVE 0 RESPONSE TO LSB
0032 07712 002011    SLA,RSS       DID DRIVE 0 RESPOND?
0033 07713 027710    JMP *-3       NO, GO LOOK AGAIN
0034 07714 107700    CLC 0,C
0035 07715 017756    JSB BTCTL     SEND TALK,CL-RD,BUS HOLDER
0036 07716 002300    CCE
0037 07717 017756    JSB BTCTL     TELL CARD TO LISTEN
0038*
0039*      NEXT PERFORM THE DMA TRANSFER
0040*
0041 07720 063776    LDA DMACW     LOAD DMA CONTROL WORD
0042 07721 102606    OTA 6         OUTPUT TO DCPC
0043 07722 106702    CLC 2         READY DCPC
0044 07723 063735    LDA ADDR1     LOAD DMA BUFFER ADDRESS
0045 07724 102602    OTA 2         OUTPUT TO DCPC
0046 07725 063740    LDA DMAWC     LOAD DMA WORD COUNT
0047 07726 102702    STC 2         READY DCPC
0048 07727 102602    OTA 2         OUTPUT TO DCPC
0049 07730 103706    STC 6,C       START DCPC
0050 07731 102206    TEST SFC 6    SKIP IF DMA NOT DONE
0051 07732 117750    JSB ADDR2,I   SUCCESSFUL END OF TRANSFER
0052 07733 102310    SFS IBI       SKIP IF DISC ABORTED TRANSFER
0053 07734 027731    JMP TEST      RECHECK FOR TRANSFER END
0054 07735 102011    ADDR1 HLT 11B  ERROR HALT
0055*

```

HP 12992H 7906H/7920H/7925H/9895 DISC LOADER ROM (Cont'd)

```

0056*
0057*      PROGRAM CONSTANT TABLE
0058*
0059*
0060 07736 000677 UNCLR OCT 677      UNLISTEN
0061 07737 000737      OCT 737      UNTALK
0062 07740 176624 DMAWC OCT 176624  UNIVERSAL CLEAR,LBO
0063 07741 000440 LIST OCT 440      LISTEN BUS ADDRESS 0
0064 07742 000550 CMSEC OCT 550      SECONDARY GET COMMAND
0065 07743 000000 BOOT OCT 0        COLD LOAD READ COMMAND
0066 07744 001000 HDSEC OCT 1000     HEAD,SECTOR PLUS EOI
0067 07745 000677 UNLST OCT 677     ATN,PRIMARY UNLISTEN,PARITY
0068 07746 000500 TALK OCT 500      SEND READ DATA
0069 07747 100740 RDSEC OCT 100740  SECONDARY READ DATA
0070 07750 102055 ADDR2 OCT 102055  BOOT EXTENSION STARTING ADDRESS
0071 07751 004003 CTLP OCT 4003     INT=LBO,T,CIC
0072 07752 000047      OCT 47      PPE,L,T,CIC
0073 07753 004003      OCT 4003     INT=LBO,T,CIC
0074 07754 000413      OCT 413      ATN,P,L,CIC
0075 07755 001015      OCT 1015     INT=EOI,P,L,CIC
0076*
0077*
0078*
0079 07756 000000 BTCTL NOP
0080 07757 107710      CLC IBI,C      RESET IBI
0081 07760 063751 BM LDA CTLP      LOAD CONTROL WORD
0082 07761 102610      OTA IBI      OUTPUT TO CONTROL REGISTER
0083 07762 102710      STC IBI      RETURN IBI TO DATA MODE
0084 07763 037760      ISZ BM        INCREMENT CONTROL WORD POINTER
0085 07764 002240      SEZ,CME
0086 07765 127756      JMP BTCTL,I   RETURN
0087 07766 063736 LABL LDA UNCLR    LOAD DATA WORD
0088 07767 037766      ISZ LABL      INCREMENT WORD POINTER
0089 07770 102610      OTA IBI      OUTPUT TO HPIB
0090 07771 002021      SSA,RSS      SKIP IF LAST WORD
0091 07772 027766      JMP LABL      GO BACK FOR NEXT WORD
0092 07773 102310      SFS IBI      SKIP IF LAST WORD SENT TO BUS
0093 07774 027773      JMP *-1      RECHECK ACCEPTANCE
0094 07775 027757      JMP BTCTL+1
0095 07776 000010 DMACW ABS IBI
0096 07777 170100      ABS -START
0097      END
** NO ERRORS *TOTAL **RTE ASMB 92067-16011**

```

HP 12992J 7908/7911/7912/7914/7933 CS80 DISC LOADER ROM

```

00001          ASMR,A,L
00002*****
00003*   CS80 BOOT LOADER      RPL COMPATIBLE      810915      *
00004*
00005*
00006*   PRODUCT NUMBER 12292J
00007*   PART NUMBER   12992-80005
00008*
00009*
00010*   S REG
00011*   15 - 14  BOOT ROM
00012*   11 - 6   IBI SELECT CODE
00013*   2 - 0   UNIT
00014*****
00015*
00016 07700          ORG 7700B
00017          000010  IBI  EQU 10B
00018 07700 102501  START LIA I      GET SWITCH REGISTER
00019 07701 013751  AND XXX      AND OUT UNIT
00020 07702 033742  TOR UNIT      PUT IN UNIT COMMAND
00021 07703 073742  STA UNIT      SAVE FOR BUS
00022 07704 000040  CLE
00023*
00024*   WAIT FOR DRIVE 0 READY
00025*
00026 07705 017756  JSB BTCTL      SEND UDC,PPOL
00027 07706 102510  LIA IBI      READ INPUT REGISTER
00028 07707 101027  ASR 7        SHIFT DRIVE 0 RESPONSE TO LSB
00029 07710 002011  SLA,RSS      DID DRIVE 0 RESPOND
00030 07711 027706  JMP *-3      NO GO WAIT
00031*
00032 07712 107700  CLC 0,C      SHUT DOWN EVERYONE ELSE
00033 07713 017756  JSB BTCTL      SEND TALK,READ,BUS HOLDER
00034 07714 002300  CCE
00035 07715 017756  JSB BTCTL      TELL CARD TO LISTEN
00036*
00037*   PERFORM DMA TRANSFER
00038*
00039 07716 063776  LDA DMACH      LOAD DMA CONTROL WORD
00040 07717 102606  OTA 6        OUTPUT TO DCPC
00041 07720 106702  CLC 2        READY DCPC
00042 07721 063733  LDA ADDR1     LOAD DMA BUFFER ADDRESS
00043 07722 102602  OTA 2        OUTPUT TO DCPC
00044 07723 063736  LDA DMAWC     LOAD DMA WORD COUNT
00045 07724 102702  STC 2        READY DCPC
00046 07725 102602  OTA 2        OUTPUT TO DCPC
00047 07726 103706  STC 6,C      START DCPC
00048 07727 102206  TEST SFC 6    SKIP IF DMA NOT DONE
00049 07730 117747  JSB ADDR2,I   SUCCESSFUL END OF TRANSFER

```

HP 12992J 7908/7911/7912/7914/7933 CS80 DISC LOADER ROM (Cont'd)

```

00050 07731 102310      SFS IBI      SKIP IF DISC ABORTED TRANSFER
00051 07732 027727      JMP TEST     WAIT...WAIT...WAIT
00052 07733 102011  ADDR1 HLT 11B     ERROR HALT
00054*
00055*      PROGRAM CONSTANT TABLE
00056*
00057 07734 000677  UNCLR OCT 677     UNLISTEN
00058 07735 000737      OCT 737     UNTALK
00059 07736 176624  DMAWC OCT 176624  UNIVERSAL CLEAR,LBO/DMA WORD COUNT
00060 07737 000624      OCT 624     SECOND UNIVERSAL CLEAR
00061 07740 000440  LIST  OCT 440     LISTEN BUS ADDRESS 0
00062 07741 000745  CMSEC OCT 745     COMMAND MESSAGE
00063 07742 000040  UNIT  OCT 40      UNIT
00064 07743 001000  READ  OCT 1000    READ
00065 07744 000677  UNLST OCT 677     UNLISTEN
00066 07745 000500  TALK  OCT 500     DEVICE TALK
00067 07746 100556  EXEC  OCT 100556  EXECUTION MESSAGE
00068 07747 102055  ADDR2 OCT 102055  BOOT EXTENSION STARTING ADDRESS
00069 07750 004003  CTLP  OCT 4003    INT=LBO,T,CIC
00070 07751 000047  XXX   OCT 47      PPE,L,T,CIC
00071 07752 004003      OCT 4003    INT=LBO,T,CIC
00072 07753 000413      OCT 413     ATN,P,L,CIC
00073 07754 001015      OCT 1015    INT=EOI,P,L,CIC
00074 07755 000000      NOP
00075*
00076*
00077*
00078 07756 000000  BTCTL NOP
00079 07757 107710      CLC IBI,C     RESET IBI
00080 07760 063750  BM   LDA CTLP     LOAD CONTROL WORD
00081 07761 102610      OTA IBI       OUTPUT TO IBI
00082 07762 102710      STC IBI       RETURN IBI TO DATA MODE
00083 07763 037760      ISZ BM        INCREMENT CONTROL WORD POINTER
00084 07764 002240      SEZ,CME
00085 07765 127756      JMP BTCTL,I   RETURN
00086 07766 063734  LABL  LDA UNCLR    LOAD DATA WORD
00087 07767 037766      ISZ LABL      INCREMENT WORD POINTER
00088 07770 102610      OTA IBI       OUTPUT TO HPIB
00089 07771 002021      SSA,RSS       SKIP IF LAST WORD
00090 07772 027766      JMP LABL      GO BACK FOR NEXT WORD
00091 07773 102310      SFS IBI       SKIP IF LAST WORD SENT TO BUS
00092 07774 027773      JMP *-1      WAIT FOR ACCEPTANCE
00093 07775 027757      JMP BTCTL+1
00094 07776 000010  DMAWC ABS IBI
00095 07777 170100      ABS -START
00096      END
MACRO:  No errors total

```



HP 12992K PAPER TAPE LOADER ROM

X7700	107700	START	CLC	O,C	TURN OFF THE INTERRUPT SYSTEM
X7701	002401		CLA	RSS	
X7702	063756	CONT	LDA	M.11	FEED FRAME COUNTER
X7703	006700		CLB	CCE	SET E TO READ BYTE
X7704	017742		JSB	READ	GET # OF CHAR
X7705	007306		CMB,CCE,INB,SZB		2'S COMP)
X7706	027713		JMP	*+5	NON ZERO BYTE
X7707	002006		INA	SZA	FEED FRAME COUNTER
X7710	027703		JMP	*-5	
X7711	102077		HLT	77B	END OF TAPE
X7712	027700		JMP	START	
X7713	077754		STB	WD.CT	WORDS IN RECORD
X7714	017742		JSB	READ	GET FEED FRAME
X7715	017742		JSB	READ	GET ADDRESS
X7716	074000		STB	0	INITIATE CHECKSUM
X7717	077755		STB	ADDR	
X7720	067755	CHECK	LDB	ADDR	
X7721	047777		ADB	MAXAD	CHECK ADDR BELOW LOADER
X7722	002040		SEZ		E OK
X7723	027740		JMP	HLT55	ADDR > LOADER
X7724	017742		JSB	READ	GET NEXT WORD
X7725	040001		ADA	1	CONTINUE CHECKSUM
X7726	177755		STB	ADDR, I	
X7727	037755		ISZ	ADDR	
X7730	000040		CLE		
X7731	037754		ISZ	WD.CT	
X7732	027720		JMP	CHECK	
X7733	017742		JSB	READ	
X7734	054000		CPB	0	
X7735	027702		JMP	CONT	
X7736	102011		HLT	11B	CHECKSUM ERROR
X7737	027700		JMP	START	
X7740	102055	HLT55	HLT	55B	ADDRESS > LOADER
X7741	027700		JMP	START	
X7742	000000	READ	NOP		E READ WORD --1 BYTE
X7743	006600		CLB	CME	E REG BYTE POINTER
X7744	1037KK		STC	RDR,C	START THE READER
X7745	1023KK		SFS	RDR	CHECK THESE IF \$\$
X7746	027745		JMP	*-1	LOADER BOMBED \$1
X7747	1064KK		MIB	RDR	GOT BYTE
X7750	002041		SEZ	RSS	
X7751	127742		JMP	READ,I	
X7752	005767		BLF	CLE,BLF	
X7753	027744		JMP	*-7	
X7754	000000	WD.CT	NOP		
X7755	000000	ADDR	NOP		
X7756	177765	M.11	DEC-11		FEED FRAME CONST.
X7777		MAXAD	EQU	X7777B	LOADER ADDRESS
00010		RDR	EQU	KKB	READER SELECT CODE
			END		

X = 1 for 8K KK = Paper Tape Reader
 2 for 12K
 3 for 16K
 4 for 20K
 5 for 24K
 6 for 28K
 7 for 32K

LOADER ROM IDENTIFICATION

HP PRODUCT NUMBER	HP PART NUMBER	ASSOCIATED DEVICE			FORMAT
		PERIPHERAL PRODUCT	INTERFACE	SUBSYSTEM NUMBER	
12992A	12992-80008	7900 Cartridge Disc 7901 Cartridge Disc 2883 Disc Drive	13210A Disc Interface 13210A Disc Interface 12565A Disc Interface	12960A 12961A 12965A	Disc Boot Disc Boot Disc Boot
12992B	12992-80002	7905 Cartridge Disc 7906 Cartridge Disc 7920 Cartridge Disc 7925 Cartridge Disc	13175A/B Disc Interface 13175A/B Disc Interface 13175A/B Disc Interface 13175A/B Disc Interface	12962C/D N/A N/A N/A	Disc Boot Disc Boot Disc Boot Disc Boot
12992C	12992-80009	CRT Terminal 2644/ 2645/4648	12966A Buffered Async Interface or 12968A Async Interface	N/A	Absolute Binary
12992D	1816-0962	7970B Mag Tape 7970E Mag Tape	13181A Mag Tape Interface 13183A Mag Tape Interface	12970A 12972A	Absolute Binary Absolute Binary
12992E	12992-80007	9885 Flexible Disc	Included in Subsystem	12732A	Absolute Binary
12992F	12992-80003	7900 Cartridge Disc 7901 Cartridge Disc	13210A Disc Interface 13210A Disc Interface	12960A 12961A	Disc Boot Disc Boot
12992H	12992-80004	7906H Cartridge Disc 7920H Cartridge Disc 7925H Cartridge Disc 9895 Flexible Disc	12821A Disc Interface 12821A Disc Interface 12821A Disc Interface 12821A Disc Interface	N/A N/A N/A N/A	Disc Boot Disc Boot Disc Boot Disc Boot
12992J	12992-80005	7908 Cartridge Disc 7911 Cartridge Disc 7912 Cartridge Disc 7914 Cartridge Disc 7933 Cartridge Disc	12821A Disc Interface 12821A Disc Interface 12821A Disc Interface 12821A Disc Interface 12821A Disc Interface	N/A N/A N/A N/A N/A	Disc Boot Disc Boot Disc Boot Disc Boot Disc Boot
12992K	12992-80010	Paper Tape	12597A Interface	N/A	Absolute Binary

M/E/F-SERIES COMPATIBILITY MATRIX

The following tables show the compatibility of the various combinations of products available for the M/E/F-Series of Computers. They are arranged by category of component vs. the computer model number and operating system. These tables are also contained in the Hardware History Library, part no. 92851-90002 Section III; the HP 1000 System Designer's Guide, part no. 92007-90001, and in the HP 1000 Systems Ordering and Compatibility Information, part no. 5953-8745.

The HP 1000 A/L-Series and M/E/F-Series Compatibility Matrices in the remaining pages of this section summarize the functional compatibility of HP 1000 Computer Systems, plug-in accessories, peripheral devices, and software. Compliance of HP 1000 Systems, computers, and peripheral devices with FCC and FTZ Electro-Magnetic (Radio Frequency) Interference (EMI) regulations is also summarized.

Functional Compatibility

Functional compatibility is basically coded as follows:

- C = Compatible (Compatible systems and peripheral devices also comply with applicable safety standards)
- N = Not compatible
- Nt = Not Tested

Products designated as Nt may in fact be functionally compatible, but at the time of publication of the compatibility matrix, Hewlett-Packard takes no responsibility for their degree of compatibility. Relatively new Nt items may later be tested and designated as compatible, but until such testing has been completed and a C designation given to an item, establishing and maintaining its compatibility is the responsibility of the customer who wishes to use the Nt item.

Qualifications required for compatibility and/or further compatibility information is provided in numbered C and N footnotes and additional footnotes.

Electro-Magnetic (Radio Frequency) Interference Compliance of Products

EMI compliance is specified in the compatibility matrices by additional lower-case letters appended to the C designation of functionally-compatible items. The complete codes are:

- Cz = A functionally-compatible item whose compliance with EMI regulations in Germany is attested by its having received an FTZ license. Items that do not have an FTZ license may require a special license and/or site certification for use in Europe, a costly, time-consuming procedure that seriously limits European sales of non-licensed data processing equipment.
- Cc = A functionally compatible item which has demonstrated compliance with FCC Class A EMI regulations in tests at the HP factory. All systems and peripherals must comply with FCC EMI regulation to be deliverable to U.S. unless they are to be used in exempt applications.
- Ccz = A functionally compatible item which meets both the Cc and Cz EMI qualifications.
- Cep = A functionally compatible item whose EMI compliance is pending, either waiting for successful completion of EMI tests or the issuance of an FTZ license. This category generally indicates HP's intention to make the respective product comply with EMI regulations.
- Cn = Non-compliance with FCC and FTZ EMI regulations of a functionally-compatible product. As noted above, products designated Cn can be delivered to U.S. customers only for applications that exempt from FCC EMI regulations.

FCC EMI Qualification Exempt Applications

In the United States, certain applications are exempt from FCC EMI regulations. Customers who wish to buy non-complying products for use in exempt applications must fill out a prepared form that is available through the order processing coordinator at the local HP sales office.

EMI Testing

HP 1000 Computer Systems are tested for compliance in a configuration pursuant to FCC/VDE rules and regulations. The system is also tested to confirm its compliance with FCC Class A/VDE Level A EMI standards with any of the peripherals in the table below.

Micro 26	2486A	248xA Opt 110 7908P/R 7911P/R 7912P/R 7914P/R 7914TD 7933H 7935H	2563A+214 2608S+214 2631B+214 2671A/G 2673A 2932A 2932A+046 82905B 82906A	2621B 2622A 2623A 2624B 2627A 2655B
Micro 27	2487A			
Micro 29	2489A			
26	2196C 2196D	7908R 7911R 7912R 7914R 7914TD 7933H 7935H	2563A+214 2608S+214 2631B+214 2671A/G 2673A 2932A 2932A+046 82905B 82906A	2621B 2622A 2623A 2624B 2627A 2655B
27	2197C 2197D			
29	2199C 2199D			
40	2176E	7906M 7906MR 7908M 7925M	2608A+210 2932A	2621B 2622A 2623A 2624B 2627A 2655B+ 007 2647A 2648A+ 007
45	2177F			
60	2178C	7906M 7906MR 7908M 7925M	2563A+210 2608A+210 2608S+210 2932A	
65	2179C	7906M 7906MR 7908M 7925M 7908R 7911R 7912R 7914R 7914TD+ 236 7933H 7935H		

HP 1000 System Models	SPU Product Numbers	Disc Product Numbers	Printer Product Numbers	Console Product Numbers
6+	2186C 2186D	7908P 7911P 7912P 7914P 7914TD 7933H 7935H	2563A+214 2608S+214 2631B+214 2671A/G 2673A 2932A 2932A+046 82905B 82906A	2621B 2622A 2623A 2624B 2627A 2655B

LEGEND:		COMPATIBILITY														
		COMPUTERS AND SYSTEMS														
		OP SYSTEM														
PRODUCT AND OPTION NUMBERS	DESCRIPTION	2108M/2112M	2109E/2113E	2111F/2117F	2176C	2176E	2177C	2177F	2178A	2178C	2179A	2179C	RTE-6/VM	RTE-IVB	RTE-IVE	
1. HP 1000 M/E/F-SERIES COMPUTERS																
2108M	Computer with 64kb memory, up to 2Mb avail.	Cn	N	N	N	N	N	N	N	N	N	N	0000 0000	0000 0000	0000 0000	
2108MK	Board Computer with 64kb memory	I	N	N	N	N	N	N	N	N	N	N	0000 0000	0000 0000	0000 0000	
2109E	Computer with 64kb memory, up to 2Mb avail.	N	Cn	N	N	N	N	N	N	N	N	N	0000 0000	0000 0000	0000 0000	
2109EK	Board Computer with 64kb memory	I	N	N	N	N	N	N	N	N	N	N	0000 0000	0000 0000	0000 0000	
2111F	Computer with 64kb memory, up to 2Mb avail.	N	N	N	N	N	N	N	N	N	N	N	0000 0000	0000 0000	0000 0000	
2112M	Computer with 128kb memory, up to 2Mb av.	Cn	N	N	N	N	N	N	N	N	N	N	0000 0000	0000 0000	0000 0000	
2113E	Computer with 128kb memory, up to 2Mb av.	N	Cn	N	N	N	N	N	N	N	N	N	0000 0000	0000 0000	0000 0000	
2117F	Computer with 128kb memory, up to 2Mb av.	N	N	N	N	N	N	N	N	N	N	N	0000 0000	0000 0000	0000 0000	
2. HP 1000 E/F-SERIES SYSTEM PROCESSOR UNITS (SPUs)																
2176C	Model 40 SPU with 128kb memory	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
2176E	EMI-qualified Model 40 SPU w/256kb memory	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
2177C	Model 45 SPU with 128kb memory	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
2177F	EMI-qualified Model 45 SPU w/256kb memory	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
2178A	Model 60 SPU with 256kb memory	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
2178C	EMI-qualified Model 60 SPU w/256kb memory	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
2179A	Model 65 SPU with 256kb memory	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
2179C	EMI-qualified Model 65 SPU w/256kb memory	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
3. M/E/F-SERIES MEMORY PRODUCTS (see pages 2.4-5 through 2.4-8)																
2102B	Std Perf Mem Ctrlr (Incl. in 12784/6A-D)	C2	C3	N	C	C	N	N	C	C	N	N	C2	C3	C2	
2102C	Std Perf Fault Control Memory Controller (Included in 12785/7A-D)	C3	C3	N	C	C	N	N	C	C	N	N	C3	C3	C3	

[illegible]

FOOTNOTES

- = **FOUNTAINES** = 2108M and 2112M Computers are compatible with RTE-6/VM only for purposes of program transportability. Because of insufficient control store capacity, these computers cannot use the RTE-6/VM firmware and must use much slower equivalent software routines.
- = **C1** = Memory controller with date code 1728 or later is compatible.
- = **C2** = Memory controller with date code 1720 or later is compatible when used in computer with date code 1720 or later.
- = **C3** = Memory controller with date code 1720 or later is compatible when used in computer with date code 1720 or later.
- = **C4** = Requires 2102C or 2102H Fault Control Memory Controller in Computer or SPU, but high performance memory cycle time is achieved only with 210H Memory Controller in 2108E, 2111F, 2113E, or 2117F Computer or 2176C/E, 2177C/F, 2178A/C, or 2179A/C System Processor Unit.
- = **C5** = High performance memory can be used with any 2102X Memory Controller, but high performance cycle time is achieved only with 2102E/H Memory Controller in 2109E, 2111F, 2113E, or 2117F Computer or 2176C/E, 2177C/F, 2178A/C, or 2179A/C System Processor Unit.
- = **C6** = Requires Memory Controller with date code 1801 or later; note C5 also applies to the 12747H and 12749H Memory Modules.
- = **C7** = Requires 2102C Fault Control Memory Controller in Computer or SPU.
- = **C8** = Requires 1278x (1024kb) Memory Package will require 12950B Memory Extender when used with 2108M, 2109E, or 2111F Computer.
- = **I1** = Computer with 1278A/12786A (128kb) Standard Performance Memory Package is included in 2112M/2113E Computer and 2176C SPU.
- = **I2** = Computer with 12666H, 12699H, 12747H, 12749H, 12779A and 12780A Memory Modules and Check Bit Boards are included in various 1278x Memory packages.

[illegible]

[illegible]

5. M/E/F-SERIES EXTENDERS

[illegible]

FOOTNOTES:

C9 = Memory Protect module with date code 1704 or later is compatible.
C10 = 12987B Dual-Channel Port Controller with date code 1649 or later is compatible.
C11 = 12987A Dual-Channel Port Controller with date code 1647 or later is compatible.
C12 = Requires 13300AA Firmware Accessory Board, which is provided as 2109F/2113E Computer option 003.
C13 = Compatible when 13305A and/or 13307A/B includes Dynamic Mapping Instruction ROMS with part numbers 13307-80021 through 80026 or higher.
C14 = Memory Expansion Module with date code 1652 or later is compatible.
C15 = Compatibility with software equivalents included in the 12824A/12829A Vector Instruction Set.
C16 = Compatible in 2103M/2112M Computer with "B" revision of base instruction set.
C17 = Requires 95061A RIE Microprogramming Package.
I1 = 12788A (128kb) High Performance Memory Package and 13307B Dynamic Mapping Instr. are included in 2117F Computer.
I2 = 12731A is included in 2112M, 2113E, and 2117F Computers.
na = Not Applicable
na = Obsolete product listed here for reference only.

[illegible]

- C18 = Compatible when used with 2665A Display Stations with serial number 1747A06465 or later, 2648A Graphics Terminals with serial number 1747A0808 or later, 264x OEM versions of these terminals, the 2248 Display Terminal, 2626A Display Station, and 262x OEM versions of these terminals when equipped with the appropriate multipoint terminal option or accessory software.
- C19 = Requires 91730A Multipoint Subsystem Software.
- C20 = Requires 91730A Multipoint Subsystem Software.
- C21 = 12956A interface card with date code 1629 or later, is compatible with 2109E, 2111F, 2113E, and 2117F Computers and 2170C/E, 2177/F, 2178A/C, and 2179A/C System Processor Units.
- C22 = 12956A is software-supported in RTE only for use with 238x, 262x, 2635A*/B, and 264x Terminals.
- C23 = This terminal is usable as a system console if a 264x Terminal with Mini cartridge I/O and 12866A+107 interface or another system load device is available at the system site for loading of diagnostics and updates.
- C24 = Requires 91730A Multipoint Subsystem Software and 92080A DATACAP/1000 software.
- * Obsolete product listed here for reference only.

PRODUCT AND OPTION NUMBERS	DESCRIPTION	COMPATIBILITY													
		COMPUTERS AND SYSTEMS												OP SYSTEM	
		2108M/2112M	2109E/2113E	2111F/2117F	2176C	2176E	2177C	2177F	2178A	2178C	2179A	2179C	RTE-6/VM	RTE-IVB	RTE-IVE

LEGEND: Cc = Compatible and qualified under FCC Class A EMI stds Cz = Compatible and FIZ licensed Ccz = Compatible, qualified under FCC Class A EMI stds and FIZ licensed Cep = Compatible, EMI qualification pending Cn = Compatible, but not EMI qualified C = Compatible or supported without reference to EMI qualification N = Not compatible Nt = Not tested I = Currently included hardware																
10 M/E/F-SERIES DISC INTERFACES AND DISC MEMORIES, continued																
7906M/S	19 6Mb MAC Master/Slave Cartridge Disc Memory via 13175D/13178D interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7906MR+020	19 6Mb MAC Master Cartridge Disc Memory via 13175D/13178D interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7908P	16 5Mb Fixed Disc** via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7908R	16 5Mb Fixed Disc** via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7911P	28 1Mb Fixed Disc** via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7911R	28 1Mb Fixed Disc** via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7912P	65 6Mb Fixed Disc** via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7912R	65 6Mb Fixed Disc** via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7914P	132 1Mb Fixed Disc** via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7914R	132 1Mb Fixed Disc** via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7914TD+236	132 1Mb Fixed Disc and 2970E+236 Meg Tape in 63-In cabinet w/13183A two-card I/F	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7920H/7925H	50Mb/120Mb ICD Memory via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7920M and S	50Mb MAC Master and Slave Disc Memories via 13175D/13178D interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7925M and S	120Mb MAC Master and Slave Disc Memories via 13175D/13178D interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C	C	N	N
7923H	40Mb Fixed Disc via 12821A interface	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C25	C25	N	N
7935H	40Mb Removable Media Disc via 12821A I/F	Cn	Cn	Cn	Cn	Ccz	Cn	Ccz	Cn	Ccz	Cn	Ccz	C25	C25	N	N
9121D/S	512kb/286kb Microfloppy disc via 12821A interface	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt
9133A/B	4 8Mb/9.2Mb Fixed disc and single 286kb Microfloppy disc via 12821A interface	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt
9134A/B	4 8Mb/9.2Mb Fixed disc via 12821A I/F	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt
9135A	4 8Mb Fixed disc and single Minifloppy disc via 12821A interface	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt



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LEGEND:		COMPATIBILITY														
PRODUCT AND OPTION NUMBERS	DESCRIPTION	COMPUTERS AND SYSTEMS														
		2108M/2112M	2109E/2113E	2111F/2117F	2176C	2176E	2177C	2177F	2178A	2178C	2179A	2179C	RTE-6/VM	RTE-IVB	RTE-IVE	
Cc	= Compatible and qualified under FCC Class A EMI stds															
Cz	= Compatible and FTZ licensed															
Ccz	= Compatible, qualified under FCC Class A EMI stds and FTZ licensed															
Cep	= Compatible, EMI qualification pending															
Cn	= Compatible, but not EMI qualified															
C	= Compatible or supported without reference to EMI qualification															
N	= Not compatible															
Nt	= Not tested															
I	= Currently included hardware															

LEGEND:
 Cc = Compatible and qualified under FCC Class A EMI stds
 Cz = Compatible and FTZ licensed
 Ccz = Compatible, qualified under FCC Class A EMI stds and FTZ licensed
 Cep = Compatible, EMI qualification pending
 Cn = Compatible, but not EMI qualified
 C = Compatible or supported without reference to EMI qualification
 N = Not compatible
 Nt = Not tested
 I = Currently included hardware

13. M/E/F-SERIES GRAPHICS INTERFACES AND GRAPHICS/1000-II SUPPORTED GRAPHICS DEVICES (for connections, see pages 5-3-3 and 4)

12966A+107	Buffered Async Interface to 264x Graphics Terminal	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C26	C26	C
12966A+004	Buffered Async Interface to 722xC/T RS-232 Plotter and required 2635A*/B*051 or 262x Terminal	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
12966A+105	Buffered Async Interface to 262x Graphics Terminal	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
59310B	HP-IB Interface to 1350S*/1351S, 7225A* W/17801/7245A*, 7470A, 7480A+002*/7580B, 7585A+002*/7585B, 9111A, 9872A*/B*/C/S*/T, or 9874A*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
1350S*/1351S	Graphics Display System via 1/14 of 59310B Interface	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C26	C26	C26
2608A+210	Line printer (includes 26099A interface)	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C26	C26	N
2608S+210	Line printer (includes 12921A+001 I/F)	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C26	C26	N
2623A	Graphics Terminal via 12966A+105 I/F	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C26	C26	C26
2627A	Color Graphics Terminal via 12966A+105 I/F	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C27	C27	C27
2647A*	Intelligent Graphics Terminal via 12966A+107 interface	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C26	C26	C26
2647F	Intelligent Graphics Terminal	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt	Nt
2648A	Graphics Terminal via 12966A+107 interface	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C26	C26	C26
7220C/T	RS-232 Graphics Plotter w/8 pens & HP/GL programming via 12966A+004 I/F and 2635A*/B*051 or 264x Terminal	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C26	C26	C26
7221C/T or	RS-232 Graphics Plotter w/8 pens & compacted binary programming via 12966A+004	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	Cn	C26	C26	C26

[illegible]

114. OTHER PERIPHERAL DEVICES (for more information, see pages 5.6-1 and 5.6-2)

	Punched Tape Reader Subsystem	Tape Punch Subsystem	Card Reader Subsystem
1292A*	C	C	C
1292A	C	C	C
1298A*	C	C	C

15. HP 1000 DSN INTERFACES AND PROGRAMMABLE SERIAL INTERFACE (for more information, see pages 4.3-1 thru 12)

Model	DSN/V.25 Network (modem) I/F to Packet Switched Networks	C29	C29	C29	C29	C29	C29	C29	C29
12250A	4x1 USB Network Interface to Packet	0	0000	0	0000	0	0000	0	0000
12250A	DSN/WX25 Network Interface to Hp 1000	0	0000	0	0000	0	0000	0	0000
12270A	Computer Serial Interface to Hp 1000	0	0000	0	0000	0	0000	0	0000
12270A	Computer Modem Interface to Hp 1000	0	0000	0	0000	0	0000	0	0000
12270A	Data Link Master Interface to Hp 1000	0	0000	0	0000	0	0000	0	0000

FOOTNOTES:

=	Requires	9288A Graphics/1000-II Device-independent Graphics Library.
=	Requires	9288A Graphics/1000-II Device-independent Graphics Library having date code 2301 or higher.
=	Requires	9288A Graphics/1000 Graphics Plotting (mature) Software.
=	Requires	9171A DSN/X-25 Communications Software.
=	Requires	91762A DSN/MRJE 1000 Multileaving Remote Job Entry Software.
=	Requires	91750A DS/1000-IV Network Software and 91740P/R DS/1000 firmware; 12773A will also require 12620A interface used as privileged fence.
=	Requires	91730A Multipoint Subsystem Software and 91750A DS/1000-IV Network Software.
=	Obsolete	Product listed here for reference only.

LEGEND: Cc = Compatible and qualified under FCC Class A EMI stds Cz = Compatible and FTZ licensed Ccz = Compatible, qualified under FCC Class A EMI stds and FTZ licensed Cep = Compatible, EMI qualification pending Cn = Compatible, but not EMI qualified C = Compatible or supported without reference to EMI qualification N = Not compatible Nt = Not tested I = Currently included hardware		COMPATIBILITY															
		COMPUTERS AND SYSTEMS													OP SYSTEM		
		2108M/2112M	2109E/2113E	2111F/2117F	2176C	2176E	2177C	2177F	2178A	2178C	2179A	2179C	RTE-6/VM	RTE-1VB			RTE-1VE
PRODUCT AND OPTION NUMBERS	DESCRIPTION	15. HP 1000 DSN INTERFACES AND PROGRAMMABLE SERIAL INTERFACE, continued															
12793A*/B	DS/1000-IV Bisync (modem) I/F to HP 3000	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C33	C33
12794A*/B	DS/1000-IV HDLC (modem) I/F to HP 1000	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C33	C33
12825A	DS/1000-IV HDLC Dir Conn I/F to HP 1000	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C33	C33
12826A/B	Programmable Serial (modem) Interface	C	C	C	C	C	C	C	C	C	C	C	C	C	C	N1	N1
12830A	DS/1000-IV Data Link Slave I/F to HP 1000	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C33	C33
12834A	DS/1000-IV Bisync Dir Conn I/F to HP 3000	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C33	C33
12839A	Hardwired Serial I/F to HP 3000 Ser II/III	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C33	C33
16. OTHER M/E/F-SERIES DATA COMMUNICATIONS INTERFACES																	
12261A	Multi-Use Prog Mpxer for PCL/1000-AB	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C34	N1
12587B	Asynchronous Communications Interface	C	C	C	C	C	C	C	C	C	C	C	C	C	C	Nt	N1
12589B	Automatic Calling Unit Interface	C	C	C	C	C	C	C	C	C	C	C	C	C	C	Nt	N1
12618A	Sync Data Set I/F w/send & receive cards	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C35	C35
12667A	Asynchronous Communications Interface	C	C	C	C	C	C	C	C	C	C	C	C	C	C	N1	N1
12668A	Asynchronous Communications Interface	C	C	C	C	C	C	C	C	C	C	C	C	C	C	N1	N1
3950iA	Fiber Optic Multiplexer (pair of 39301As and 39200B cabling are used with 12792B)	C	C	C	C	C	C	C	C	C	C	C	C	C	C	N1	C
17. M/E/F-SERIES MEASUREMENT AND CONTROL INTERFACES AND PERIPHERALS (for connections, see pages 5.4-3 and 5.4-4)																	
59310B	HP-IB I/F for 224D/2250 & other HP-IB Inst	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
91000A	Plug-in A-to-D Interface Subsystem	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
2240A*/	Measurement & Control Processor & Access	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
2250M*/N/R	Measurement & Control Processor & Access	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
2313B*	Analog I/O Subsystem (includes interface)	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

19. M/E/F-SERIES SOFTWARE (See pages 2.4-1 through 2.4-4 for application requirements)

[illegible]

FOOTNOTES:

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= Requires 91750A DS/1000-IV Network software.
C33 = Requires 92140A PC/1000-AB Programmable Controller Link software.
= Requires 91800A RJE/1000 (which includes the 12618A interface).
C34 = Requires 92066A RTE Measurement and Control Software.
= Compatible as RTE Privileged Interrupt Fence; support as user-developed
C35 = software.
= Compatible in 2108/2112 Computer with Serial Prefix 1810 or later. 2109/2113 Computer with Serial Prefix
C38 = 1812 or later, and all 2108/2109/2112/2113 Computers that have been upgraded for use with RTE-IV/IVB or
RTE-6/VM.
= Compatible only in system with 79xxM MAC Discs and computer that meets the criteria of C38, above.
C39 = Support of this interface requires user-developed software.
= Obsolete product listed here for reference only.
= Inactive software product listed here for reference only.
**

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LEGEND:		COMPATIBILITY												
PRODUCT AND OPTION NUMBERS	DESCRIPTION	COMPUTERS AND SYSTEMS											OP SYSTEM	
		2108M/2112M	2109E/2113E	2111F/2117F	2176C	2176E	2177C	2177F	2178A	2179A	2179C	RTE-6/VM	RTE-IVB	RTE-IVE
19. M/E/F-SERIES SOFTWARE, continued														
91751A	DSN/X 25 Communications software	C	C	C	C	C	C	C	C	C	C	C	C	C
91780A	RJE/1000 Remote Job Entry Package	C	C	C	C	C	C	C	C	C	C	C	C	C
91782A	DSN/MJRE 1000 Multileaving Remote Job Entry Package	C	C	C	C	C	C	C	C	C	C	C	C	C
92001B**	RTE-IX Operating System	C	C	C	C	C	C	C	C	C	C	C	C	C
92060A**	RTE-III Operating System	C	C	C	C	C	C	C	C	C	C	C	C	C
92061A	RTE Microprogramming Package	C	C	C	C	C	C	C	C	C	C	C	C	C
92063A**	Image/1000 with Query	C	C	C	C	C	C	C	C	C	C	C	C	C
92064A**	RTE-M Operating System	C	C	C	C	C	C	C	C	C	C	C	C	C
92065A**	BASIC/1000M	C	C	C	C	C	C	C	C	C	C	C	C	C
92066A	RTE Meas and Control Software Package	C	C	C	C	C	C	C	C	C	C	C	C	C
92067A**	RTE-IV Operating System	C	C	C	C	C	C	C	C	C	C	C	C	C
92068E	RTE-IVB Operating System	C	C	C	C	C	C	C	C	C	C	C	C	C
92069E	RTE-IVE Operating System	C	C	C	C	C	C	C	C	C	C	C	C	C
92069A	Image/1000 with Query	C	C	C	C	C	C	C	C	C	C	C	C	C
92073A**	Image/1000 without Query	C	C	C	C	C	C	C	C	C	C	C	C	C
92080A	DATACAP/1000-II	C	C	C	C	C	C	C	C	C	C	C	C	C
92081A	Image/1000-II with Query	C	C	C	C	C	C	C	C	C	C	C	C	C
92082A**	ACCEL/1000 software	C	C	C	C	C	C	C	C	C	C	C	C	C
92083A	RTE Profile Monitor	C	C	C	C	C	C	C	C	C	C	C	C	C
92084A	RTE-6/VM Operating System	C	C	C	C	C	C	C	C	C	C	C	C	C
92091A	HPSPEC Circuit Simulation Program	C	C	C	C	C	C	C	C	C	C	C	C	C

FOOTNOTES:

C40 = Requires 13197A 1k Writable Control Store board.
C41 = Only WCS Driver and WCS Load Utility are supported in RTE-IVE.
C42 = Compatible in 2108/2112 Computer with Serial Prefix 1810 or later, 2109/2113 Computer with Serial Prefix 1812 or later, and 2108/2109/2112/2113 Computers having earlier serial prefixes that have been upgraded for use with RTE-IV/IVB/IVE or RTE-6/VM.
* = Inactive software product listed here for reference only.

INDEX — SERVICE NOTE MICROFICHE

ISSUE DATE - AUGUST, 1983

* = ISSUES NOT ON PREVIOUSLY ISSUED MICROFICHE

ISSUE NO.	TITLE	LOC/COUNT
2100A-1a	HP 2100A RECOMMENDED SPARE PARTS	1-A20 15
2100A-2	WIRE WRAP TOOLS	1-B11 1
2100A-3	SERIAL PREFIXES PRIOR TO 1148	1-B12 2
2100A-4	SERIAL NUMBERS PRIOR TO 1202-A-00481	1-B14 1
2100A-5	HP 2100A SERIAL PREFIXES PRIOR TO 1215A	1-B15 3
2100A-6	INCREASED NOISE IMMUNITY FOR THE PWU SIGNAL	1-B18 2
2100A-7	REMOVAL AND REPLACEMENT OF FRONT PANEL MOUNTING BRACKET	1-B20 2
2100A-8A	COLOR CODED EXTRACTOR HANDLES	1-B22 1
2100A-9	A4 BOARD REVISIONS	1-B23 1
2100A-10A	A8 I/O BUFFER ASSEMBLY CHANGE FOR SOFTWARE COMPATIBILITY	1-B24 2
2100A-11	A6 BOARD MODIFICATION	1-C 2 1
2100A-12A	A6 BOARD NOISE PROBLEM	1-C 3 2
2100A-13	STATIC PROBLEMS FROM COMPUTER ROOM CARPETS	1-C 5 1
2100A-14	POWER SUPPLY CONNECTOR PROBLEM	1-C 6 1
2100A-15A	DMA DIAGNOSTIC AND TTY INTERFACE COMPATIBILITY	1-C 7 1
2100A-16	BOARD INTERCHANGEABILITY	1-C 8 1
2100A-17a	FRONT PANEL SWITCH DEBOUNCE MODIFICATION	1-C 9 2
2100A-18B	INTERMITTENT HALTS WITH THE SWITCH REGISTER ILLUMINATED	1-C11 1
2100A-19	POWER SUPPLY +4.85 VOLTS	1-C12 1
2100A-20	FRONT PANEL GROUNDING	1-C13 1
2100A-21A	OMITTED CAPACITOR ON A3 BOARD 02100-60109	1-C14 1
2100A-22	8K AND 24K S-BUS NOISE PROBLEM	1-C15 2
2100A-23	ERRATIC PARITY ERRORS	1-C17 1
2100A-24A	FAN REPLACEMENT ON POWER SUPPLY AND PLENUM CHAMBER	1-C18 1
2100A-25A	RADIATED NOISE WITHIN POWER SUPPLY	1-C19 2
2100A-26	POWER SUPPLY UPDATE	1-C21 1
2100A-27A	REMOVAL OF PRINTED CIRCUIT CONNECTOR ALIGNMENT KEY	1-C22 1
2100A-28	NOISE ON I/O BUS LINES	1-C23 1
2100A-29	MEMORY PROBLEM CAUSED BY DATA CONTROL BOARD COMPATIBILITY	1-C24 1
2100A-30A	MISLABELING ON DATA CONTROL A107 BOARD	1-C25 1

INDEX — SERVICE NOTE MICROFICHE (Cont'd)

ISSUE NO.	TITLE	LOC/COUNT
2100A-31	SKIPPING HALTS AFTER PUSHING BUTTON	1-D 2 1
2100A-32A	CORE MEMORY PARITY FAILURES	1-D 3 1
2100A-33	U.L. POWER SUPPLY EXCHANGE PART NUMBER	1-D 4 1
2100A-34B	NEW MID2 BOARD 02100-60112 (A4)	1-D 5 1
2100A-35A	HARDWARE CORRECTION FOR DMA SOFTWARE CODING SEQUENCE ERRORS	1-D 6 2
2100A-36	IMPROVED NOISE IMMUNITY DURING TURN ON	1-D 8 1
2100A-37	NOISE ON IR11 LINE ALTERING PROGRAM	1-D 9 2
2100A-38	POWER SUPPLIES FAN FILTERS	1-D11 1
2100A-39	CIRCUITRY ERROR ON A4 INSTRUCTION DECODER II BOARD	1-D12 2
2100A-40	EXCESSIVE NOISE ON +20 VOLT LINE	1-D14 1
2100A-41	INVERTER DRIVERS EXTERNAL WIRES	1-D15 1
2100A-42b	DEFECTIVE FRONT PANEL SWITCHES	1-D16 1
2100A/S-01	2100A/S AND 2155A BACKPLANE SUPPORT	1-D17 1
2100A/S-43	2100A/S AND 2155A POWER SUPPLY DC VOLTAGE LIMITS AND ADJUSTMENTS	1-D18 2
2100A/S-44	POWER FAIL ADJUSTMENT	1-D20 1
2100A-45	CAPACITOR ACTING AS AN ANTENNA	1-D21 2
2100A/S-46	2100A/S INTERMITTENT MEMORY PROBLEMS	1-D23 1
2100A/S-47	PROPER HANDLING OF SENSE AMPLIFIER BOARDS	1-D24 1
2100A-48A	INTERMITTENT PARITY ERRORS DUE TO MEMORY COMPATIBILITY PROBLEMS	1-D25 5
2100A-49	MISSING TRACE ON ROM CONTROL ASSEMBLIES	1-E 6 1
2100A-50	DOUBLE INTERRUPTS (MULTIPLE, SPURIOUS, OR FALSE INTERRUPTS)	1-E 7 2
2100A-51	BLOWN FUSES IN POWER SUPPLY	1-E 9 1
2100A-52	FRONT PANEL GROUND NOISE	1-E10 1
2100A-53	BACKPLANE NOISE	1-E11 3
2100A-54	UNSTABLE VOLTAGE, NOISE PROBLEMS	1-E14 1
2100A-55	FRONT PANEL CONTROL LOCKOUT	1-E15 1
2100A-56	FAN INSTALLATION IN 2100/2155 POWER SUPPLY, P/N 3160-0224	1-E16 1
2100A-57	CHANGE IN M/E/F-SERIES COMPUTER FANS P/N 3160-0301, 3160-0224, 3160-0302)	1-E17 1
2100S-02A	INTERMITTENT PARITY ERRORS DUE TO MEMORY	1-E18 5
2100S-03	BLOWN FUSES IN POWER SUPPLY	1-E23 1
2100S-04	FRONT PANEL GROUND NOISE	1-E24 1
2100S-05	BACKPLANE NOISE	1-E25 3
2100S-06	UNSTABLE VOLTAGE, NOISE PROBLEMS	1-F 4 1
2100S-07	FRONT PANEL CONTROL LOCKOUT	1-F 5 1
2100S-08	FAN INSTALLATION IN 2100/2155 POWER SUPPLY, P/N 3160-0224	1-F 6 1
2100S-09	CHANGE IN M/E/F-SERIES COMPUTER FANS (P/N 3160-0301, 3160-0224, 3160-0302)	1-F 7 1

INDEX — SERVICE NOTE MICROFICHE (Cont'd)

ISSUE NO.	TITLE	LOC/COUNT
2102A-1	PARITY ERRORS	1-F 8 2
2102A-02	PARITY ERRORS WITH D.C.P.C.	1-F 10 2
2102A-03	PARITY ERRORS AND MEMORY CONTROLLER UPDATE	1-F 12 2
2102A-04A	MEMORY CHIP COMPATIBILITY	1-F 14 1
2102A-05	DMS UPGRADE INFORMATION	1-F 15 2
2102A-06A	MEM CONTROLLER DAT CODE 1520 ERRONEOUS DATA CLOCKED INTO 'T' REGISTER WHEN MORE THAN 64K OF MEMORY CONFIGURED	1-F 17 2
2102A-07A	A) IMPROVE THE ADJUSTMENT CAPABILITIES OF THE REFRESH CYCLE. B) IMPROVE THE OPERATING MARGIN DURING MEMORY ACCESS.	1-F 19 1
2102A-08	PARITY ERRORS IN 16K MODULES	1-F 20 2
2102A-09	2102A MEMORY CONTROLLER	1-F 22 1
2102B-01	2102B MEMORY CONTROLLER NOT COMPATIBLE WITH M-SERIES COMPUTERS (2105, 2108, 2112)	1-F 23 1
2102B-02	2102B MEMORY CONTROLLER WITH 12747A HI-DENSITY	1-F 24 2
2102C-01	2102C MEMORY CONTROLLER FAILS WITH M-SERIES CPU	1-G 2 1
2102E-01	RANDOM MEMORY PROBLEMS	1-G 3 1
2102E-02	INTRODUCTION OF REVISION "C" ARTWORK	1-G 4 1
2102H-01	INTRODUCTION OF REVISION "B" ARTWORK	1-G 5 1
2105A-01B	RECOMMENDED SPARE PARTS	1-G 6 1
2105A-02	PARITY ERRORS WITH D.C.P.C.	1-G 7 1
2105A-03A	SOFT LINE CONDITION CAUSING RESISTOR IN POWER SUPPLY TO OPEN	1-G 8 1
2105A-04B	BLOWING LINE FUSES	1-G 9 1
2105A-05A	SUMMARY OF CHANGES NEEDED TO UPGRADE CPU BOARD TO LATEST DATE CODE	1-G 10 3
2105A-06A	FLOATING POINT PROBLEM	1-G 13 5
2105A-07	INTERMITTANT POWER SUPPLY PROBLEMS	1-G 18 2
2105A-08	NOISE ON DMALO SIGNAL CAUSING MEMORY PROTECT ERRORS	1-G 20 1
2105A-09	SERIAL PREFIX UPDATE	1-G 21 1
2105A-10B	NOISE ON DMACYC SIGNAL CAUSING 7905A DATA OVERRUN ERRORS	1-G 22 1
2105A-11	A) STATIC ELECTRICITY CAUSING INCORRECT POWER-UP SEQUENCE B) BATTERY/POWERFAIL LIGHT CONTANTLY ON	1-G 23 2
2105A-12	COMPARE WORDS INSTRUCTION (CMW) INTEGERS RESTRICTED TO +/- 16,383	1-G 25 1
2105A-13	2105A-2108A POWER SUPPLY ERRONEOUS TRIGGERING OF MEMORY VOLTAGES	1-H 2 2
2105A-14	2105A MEMORY BACKPLANE	1-H 4 1
2105A-15	PARITY ERROR UPON AUTO RESTART FROM BATTERY BACKUP WITH 2105A	1-H 5 2

INDEX — SERVICE NOTE MICROFICHE (Cont'd)

ISSUE NO.	TITLE	LOC/COUNT
2105A-16	NEW EXCHANGE ASSEMBLY CONFIGURATION FOR THE 2105A 'A' POWER SUPPLY	1-H 7 2
2108A-01B	RECOMMENDED SPARE PARTS	1-H 9 1
2108A-02A	EARLY TERMINATION OF BLOCK TRANSFER USING D.C.P.C. WITH THE I/O EXTENDER	1-H10 2
2108A-03A	NOT SERVICING INTERRUPTS	1-H12 1
2108A-04A	PARITY ERRORS WITH D.C.P.C.	1-H13 1
2108A-05B	SOFT LINE CONDITION CAUSING RESISTOR IN POWER SUPPLY TO OPEN	1-H14 1
2108A-06A	BLOWING LINE FUSES	1-H15 1
2108A-07A	SUMMARY OF CHANGES NEEDED TO UPGRADE CPU BOARD TO LATEST DATE CODE	1-H16 3
2108A-08A	FLOATING POINT PROBLEM	1-H19 4
2108A-09	INTERMITTENT POWER SUPPLY PROBLEMS	1-H23 2
2108A-10	NOISE ON DMALO SIGNAL CAUSING MEMORY PROTECT ERRORS	1-H25 1
2108A-11	UPGRADE FOR D.M.S. COMPATIBILITY	1-I 2 3
2108A-12	SERIAL PREFIX UPDATER	1-I 5 1
2108A-13	DMS UPGRADE INFORMATION/DCPC WORD COUNT PROBLEM	1-I 6 3
2108A-14	DMS UPGRADE FOR RTE-III	1-I 9 1
2108A-15	HARDWARE NEEDED TO RUN RTE-II/III	1-I10 1
2108A-16	SERIAL PREFIX UPDATE	1-I11 1
2108A-17B	NOISE ON DMACYC SIGNAL CAUSING 7905A DATA OVERRUN ERRORS	1-I12 1
2108A-18	A) STATIC ELECTRICITY CAUSING INCORRECT POWER-UP SEQUENCE B) BATTERY/POWERFAIL LIGHT CONSTANTLY ON	1-I13 2
2108A-19	COMPARE WORDS INSTRUCTION (CMW) INTEGERS RESTRICTED TO +/-16, 383	1-I15 1
2108A-20A	INPUT FILTER CAPACITOR DEFECT	1-I16 1
2108A-21	NEW MEMORY BACKPLANES FOR THE 2108 COMPUTERS	1-I17 1
2108A-22	2105A/2108A POWER SUPPLY	1-I18 2
2108A-23	NEW EXCHANGE ASSEMBLY CONFIGURATION FOR THE 2108A/2109A/12979A	1-I20 2
2108B-01	NEW MEM BACKPLANES FOR THE 2108 COMPUTERS	1-I22 1
2108B-02	REV 'B' MOTHER BOARD INTRODUCTION	1-I23 4
2108B-03	B POWER SUPPLY UPDATE REV B MOTHER BOARD INTRODUCTION	1-J 3 4
2108B-04	B POWER SUPPLY	1-J 7 4
2108B-05	B POWER SUPPLY JUMPER BOARD (5061-1351)	1-J11 1
2108B-06	CHANGE IN M/E/F-SERIES COMPUTER FANS (P/N 3160-0301, 3160-0224, 3160-0302)	1-J12 1
2108B-07	B POWER SUPPLY THERMAL SHUTDOWN OPERATION	1-J13 2
2108B-08	REQUIRED CONFIGURATION FOR RETURN TO CSD	1-J15 2
2108B-09	REDESIGNED "B" TYPE POWER SUPPLY	1-J17 7
2108B-10	* SELF-TEST FAILURE WITH POWER FAIL OPTION	1-J24 1

INDEX — SERVICE NOTE MICROFICHE (Cont'd)

ISSUE NO.	TITLE	LOC/COUNT
2108B-11	* FRONT PANEL SILK SCREEN ERROR	1-J25 2
2108B-12	* 1255A DIGITAL-TO-ANALOG CONVERTER	1-K 3 1
2108B-13	* NEW VERSION OF LOW COST POWER SUPPLY	1-K 4 3
2109A-01A	INPUT FILTER CAPACITOR DEFECT	1-K 7 1
2109A-02	ERRATIC INDICATIONS DURING POWER UP/ NORMAL OPERATION OF COMPUTER	1-K 8 1
2109A-03	FRONT PANEL 'RUN' LIGHT TURNS ON WITHOUT PRESSING 'RUN' SWITCH	1-K 9 3
2109A-04A	NEW MEMORY BACKPLANE FOR 2109A	1-K12 1
2109A/B-04	E-SERIES BASE SET AND EIG/FLOATING POINT ROMS COMBINED INTO THREE 8K ROMS	1-K13 3
2109A/B-05	E-SERIES BASE SET MICROCODE CHANGE	1-K16 2
2109A-06	NEW EXCHANGE ASSEMBLY CONFIGURATION FOR THE 2108A/2109A/12979A 'A' POWER SUPPLY	1-K18 2
2109B-06	REV 'B' MOTHER BOARD INTRODUCTION	1-K20 4
2109B-07	B POWER SUPPLY UPDATE REV B MOTHER	1-K24 4
2109B-08	B POWER SUPPLY	1-L 4 4
2109B-09	B POWER SUPPLY JUMPER BOARD (5061-1351)	1-L 8 1
2109B-10	CHANGE IN M/E/F-SERIES COMPUTER FANS (P/N 3160-0301, 3160-0224, 3160-0302)	1-L 9 1
2109B-11	B POWER SUPPLY THERMAL SHUTDOWN OPERATION	1-L10 2
2109B-11a	REQUIRED CONFIGURATION FOR RETURN TO CSD	1-L12 2
2109B-12	REDEFINITION OF RPL FEATURE	1-L14 6
2109B-13	REDESIGNED "B" TYPE POWER SUPPLY	1-L20 1
2109B-14	* SELF-TEST FAILURE WITH POWER FAIL OPT.	1-L21 1
2109B-15	* NEW VERSION OF LOW COST POWER SUPPLY	1-L22 3
2109E-01	HP 1000 E/F-SERIES COMPUTER'S RUN LIGHT REMAINS ON WHEN COMPUTER IS HALTED	2-A 2 2
2109E-02	* MINI-CARTRIDGE TAPE LOADER ROM REPLACES PAPER TAPE LOADER ROM	2-A 4 1
2111F-01	2111F, 2117F FPP ARITHMETIC ASSY.	2-A 5 1
2111F-02	2111F/2117F BASE SET, FAST FORTRAN PROCESSOR, AND SCIENTIFIC INSTRUCTION SET FIRMWARE ENHANCEMENTS	2-A 6 2
2111F-03	REV 'B' MOTHER BOARD INTRODUCTION	2-A 8 4
2111F-04	B POWER SUPPLY UPDATE REV B MOTHER BOARD INTRODUCTION	2-A12 4
2111F-05	B POWER SUPPLY	2-A16 4
2111F-06	B POWER SUPPLY JUMPER BOARD (5061-1351)	2-A20 1
2111F-07	F-SERIES (2111F, 2117F) SCIENTIFIC INSTRUCTION SET FIRMWARE ERROR	2-A21 2
2111F-08	CHANGE IN M/E/F-SERIES COMPUTER FANS (P/N 3160-0301, 3160-0224, 3160-0302)	2-A23 1
2111F-09	B POWER SUPPLY THERMAL SHUTDOWN OPERATION	2-A24 2
2111F-10	HP 1000 E/F-SERIES COMPUTER'S RUN LIGHT REMAINS ON WHEN COMPUTER IS HALTED	2-B 2 2
2111F-11	F-SERIES BASE SET AND EIG/FLOATING POINT ROMS COMBINED INTO THREE 8K ROMS	2-B 4 2

INDEX — SERVICE NOTE MICROFICHE (Cont'd)

ISSUE NO.	TITLE	LOC/COUNT
2111F-12	2111F/2117F F-SERIES COMPUTER SERIAL NUMBER PREFIX PRIOR TO 2033	2-B 6 4
2111F-13	REQUIRED CONFIGURATION FOR RETURN TO CSD	2-B10 2
2111F-14	REDEFINITION OF RPL FEATURE	2-B12 1
2111F-15	REDESIGNED "B" TYPE POWER SUPPLY	2-B13 1
2111F-16	* SELF-TEST FAILURE WITH POWER FAIL OPT.	2-B14 1
2111F-17	* MINI-CARTRIDGE TAPE LOADER ROM REPLACES PAPER TAPE LOADER ROM	2-B15 1
2111F-18	* NEW VERSION OF LOW COST POWER SUPPLY	2-B16 3
2112A-01	RECOMMENDED SPARE PARTS	2-B19 1
2112A-2	DMS UPDATE FOR RTE-III	2-B20 1
2112A-03	HARDWARE NEEDED TO RUN RTE-II/III	2-B21 1
2112A-04	SERIAL PREFIX UPDATE	2-B22 1
2112A-05	+28 VOLTS AVAILABLE TO THE I/O BACKPLANE	2-B23 2
2112A-06B	NOISE ON DMACYC SIGNAL CAUSING 7905A DATA OVERRUN ERRORS	2-B25 1
2112A-07S	A.C. INPUT WIRING REVERSED	2-C 2 1
2112A-08	UNIT WILL NOT COME UP AFTER THE POWER FAIL WITH BATTERIES INSTALLED	2-C 3 1
2112A-09	A) STATIC ELECTRICITY CAUSING INCORRECT POWER UP SEQUENCE B) BATTERY/POWERFAIL LIGHT CONSTANTLY ON	2-C 4 2
2112A-10	COMPARE WORDS INSTRUCTION (CMW) INTEGERS RESTRICTED TO +/-16,383	2-C 6 1
2112A-11	PARITY ERROR GENERATION IN CPU WHEN POWERED UP WITH HP 12979A/B I/O EXTENDER	2-C 7 2
2112A-12	NEW MEMORY BACKPLANES FOR THE 2112 COMPUTERS	2-C 9 1
2112A-13	2112A/2113A FAN, P/N 3160-0224	2-C10 1
2112A-14A	NEW EXCHANGE ASSEMBLY CONFIGURATION FOR THE 2112A/2113A 'A' POWER SUPPLY	2-C11 2
2112B-01	NEW MEMORY BACKPLANES FOR THE 2112 COMPUTERS	2-C13 1
2112B-02	REV 'B' MOTHER BOARD INTRODUCTION	2-C14 4
2112B-03	B POWER SUPPLY UPDATE REV B MOTHER BOARD INTRODUCTION	2-C18 4
2112B-04A	B POWER SUPPLY	2-C22 4
2112B-05	B POWER SUPPLY	2-D 2 1
2112B-06	CHANGE IN M/E/F-SERIES COMPUTER FANS	2-D 3 1
2112B-07	B POWER SUPPLY THERMAL SHUTDOWN OPERATION	2-D 4 2
2112B-08	REQUIRED CONFIGURATION FOR RETURN TO CSD	2-D 6 2
2112B-09	REDESIGNED "B" TYPE POWER SUPPLY	2-D 8 1
2112B-10	* SELF-TEST FAILURE WITH POWER FAIL OPT.	2-D 9 1
2112B-13	* NEW VERSION OF LOW COST POWER SUPPLY	2-D10 3
2113A-01	ERRATIC INDICATIONS DURING POWER-UP/ NORMAL OPERATION OF COMPUTER	2-D13 1

INDEX — SERVICE NOTE MICROFICHE (Cont'd)

ISSUE NO.	TITLE	LOC/COUNT
2113A-02	FRONT PANEL 'RUN' LIGHT TURNS ON WITHOUT PRESSING 'RUN' SWITCH	2-D14 3
2113A-03A	NEW MEMORY BACKPLANE FOR 2113A	2-D17 1
2113A-04	PARITY ERROR GENERATION IN CPU WHEN POWERED UP WITH HP 12797A/B I/O EXTENDER	2-D18 2
2113A/B-04a	E-SERIES BASE SET AND EIG/FLOATING POINT ROMS COMBINED INTO THREE 8K ROMS	2-D20 3
2113A/B-05	E-SERIES BASE SET MICROCODE CHANGE	2-D23 2
2113A-06	2112A/2113A FAN, P/N 3160-0224	2-D25 1
2113A-07	NEW EXCHANGE ASSEMBLY CONFIGURATION FOR THE 2112A/2113A	2-E 2 2
2113B-06	REV 'B' MOTHER BOARD INTRODUCTION	2-E 4 4
2113B-07	B POWER SUPPLY UPDATE REV B MOTHER BOARD INTRODUCTION	2-E 8 4
2113B-08	B POWER SUPPLY	2-E12 4
2113B-09	B POWER SUPPLY JUMPER BOARD (5061-1351)	2-E16 1
2113B-10	CHANGE IN M/E/F-SERIES COMPUTER FANS	2-E17 1
2113B-11	B POWER SUPPLY THERMAL SHUTDOWN OPERATION	2-E18 2
2113B-12	REQUIRED CONFIGURATION FOR RETURN TO CSD	2-E20 2
2113B-13	REDEFINITION OF RPL FEATURE	2-E22 1
2113B-14	REDESIGNED "B" TYPE POWER SUPPLY	2-E23 1
2113B-15	* SELF-TEST FAILURE WITH POWER FAIL OPT.	2-E24 1
2113B-16	* NEW VERSION OF LOW COST POWER SUPPLY	2-E25 3
2113E-01	HP 1000 E/F-SERIES COMPUTER'S RUN LIGHT REMAINS ON WHEN COMPUTER IS HALTED	2-F 4 2
2113E-02	* MINI-CARTRIDGE TAPE LOADER ROM REPLACES PAPER TAPE LOADER ROM	2-F 6 1
2117F-01A	THE 2117F DOES NOT POWER FAIL AUTO RESTART	2-F 7 2
2117F-02	2111F, 2117F FPP ARITHMETIC ASSEMBLY	2-F 9 1
2117F-03	2117F FPP POWER SUPPLY	2-F10 1
2117F-04	2117F MAY NOT POWER FAIL AUTO RESTART CORRECTLY	2-F11 1
2117F-05	REV 'B' MOTHER BOARD INTRODUCTION	2-F15 4
2117F-06	2111F/2117F BASE SET, FAST FORTRAN PROCESSOR, AND SCIENTIFIC INSTRUCTION SET FIRMWARE ENHANCEMENTS.	2-F16 2
2117F-07	B POWER SUPPLY UPDATE REF B MOTHER BOARD INTRODUCTION	2-F18 4
2117F-08	B POWER SUPPLY	2-F22 4
2117F-09	B POWER SUPPLY JUMPER BOARD (5061-1351)	2-G 2 1
2117F-10	F-SERIES (2111F, 2117F) SCIENTIFIC INSTRUCTION SET FIRMWARE ERROR	2-G 3 2
2117F-11	OCCASSIONAL TRIPPING OF 2117F HARDWARE FLOATING POINT PROCESSOR CIRCUIT BREAKER AT 220/240V OPERATION	2-G 5 1
2117F-12	CHANGE IN M/E/F-SERIES COMPUTER FANS	2-G 6 1

INDEX — SERVICE NOTE MICROFICHE (Cont'd)

ISSUE NO.	TITLE	LOC/COUNT
2117F-13	B POWER SUPPLY THERMAL SHUTDOWN OPERATION	2-G 7 2
2117F-14	HP 1000 E/F-SERIES COMPUTER'S RUN LIGHT REMAINS ON WHEN COMPUTER IS HALTED	2-G 9 2
2117F-15	F-SERIES BASE SET AND EIG/FLOATING POINT ROMS COBINED INTO THREE 8 K ROMS	2-G11 2
2117F-16	2111F/2117F F-SERIES COMPUTER SERIAL NUMBER PREFIX PRIOR TO 2033	2-G13 4
2117F-17	REQUIRED CONFIGURATION FOR RETURN TO CSD	2-G17 2
2117F-18	REDEFINITION OF RPL FEATURE	2-G19 1
2117F-19	REDESIGNED "B" TYPE POWER SUPPLY	2-G20 1
2117F-20	* SELF-TEST FAILURE WITH POWER FAIL OPT.	2-G21 1
2117F-22	* BACKPLANE PINS SHORT AGAINST SHIELD	2-G22 1
2117F-23	* MINI-CARTRIDGE TAPE LOADER ROM REPLACES PAPER TAPE LOADER ROM	2-G23 1
2117F-24	* NEW VERSION OF LOW COST POWER SUPPLY	2-G24 3
2146A/B-01	HP 1902 TWO-SIDED DISC MEDIA	2-H 3 2
2146B-02	PWOER CONSUMPTION INCORRECTLY SPECIFIED	2-H 5 2
2155A-1	RECOMMENDED SPARE PARTS	2-H 7 8
2155A-2	POWER SUPPLY PROTECTION AND CONTROL CARD A3 MODIFICATIONS	2-H15 2
2155A-3A	RADIATED NOISE WITHIN POWER SUPPLY	2-H17 2
2155A-4	POWER SUPPLY UPDATE	2-H19 1
2155A-5A	REMOVAL OF PRINTED CIRCUIT CONNECTOR ALIGNMENT KEY	2-H20 1
2155A-06	POWER SUPPLY INSTALLATION	2-H21 1
2155A-7	U.L. POWER SUPPLY EXCHANGE PART NUMBER	2-H22 1
2155A-8	IMPROVED NOISE IMMUNITY DURING TURN ON	2-H23 1
2155A-09	POWER SUPPLIES FAN FILTERS	2-H24 1
2155A-10	INVERTER DRIVERS EXTERNAL WIRES	2-H25 1
2155A-11	2100A/S AND 2155A POWER SUPPLY DC VOLTAGE LIMITS AND ADJUSTMENTS	2-I 2 2
2155A-12	POWER FAIL ADJUSTMENT	2-I 4 1
2155A-13	CAPACITOR ACTING AS AN ANTENNA	2-I 5 2
2155A-14	UNSTABLE VOLTAGE, NOISE PROBLEMS	2-I 7 1
2155A-15	FAN INSTALLATION IN 2100/2155 POWER SUPPLY P/N 3160-0224	2-I 8 1
2155A-16	CHANGE IN M/E/F-SERIES COMPUTER FANS	2-I 9 1
2155A-17	2100A/S AND 2155A BACKPLANE SUPPORT	2-I10 1
2174A/B-01	MEMORY BOARD CHANGE FOR 2174A/B SYSTEMS	2-I11 1
2175A/B-01	MEMORY BOARD CHANGE FOR 2175A/B SYSTEMS	2-I12 1
217X-01	CORRECTING POSITION OF SERIALIZATION METAL TAGS ON 79XX DISC PACKS	2-I13 1
217X-02	2001 DIAGNOSTICS UPDATE	2-I14 3
217X-03	* DATA OVERRUNS WHEN WRITING TO MINICART.	2-I17 1
21MX-01	HP MODEL 21MX ROM LOADERS	2-I18 9
21MX-02	SLIDE FAILURES	2-J 3 4
21MX-03C	21MX BOARD COMPATIBILITY	2-J 7 2

INDEX — SERVICE NOTE MICROFICHE (Cont'd)

ISSUE NO.	TITLE	LOC/COUNT
21MX-04	MEMORY PARITY ERRORS GENERATED IN 21MX CPU UPON INITIAL POWER UP OF I/O EXTENDER	2-J 9 3
21MX-05	MEMORY PROTECT BEING TURNED OFF INTERMITTENTLY WHILE RUNNING RTE-II AND RTE-III	2-J12 3
21MX-06A	INTERMITTANT MAPPING ERRORS IN RTE-III OPERATING SYSTEM	2-J15 2
21MX-07	ERRONEOUS MEMORY PROTECT VIOLATIONS IN 21MX CPU	2-J17 1
21MX-08	SERIAL NUMBERS AND INTERNAL DATE CODES	2-J18 1
21MX-09	2102B MEMORY CONTROLLER NOT COMPATIBLE WITH M-SERIES COMPUTERS (2105,2108,2112)	2-J19 1
21MX-10	INCOMPATIBILITY BETWEEN RTE-C AND 12892B	2-J20 1
21MX-11	NEW OPERATING PROCEDURE WHEN USING 12992B LOADER ROM	2-J21 1
21MX-12A	PARITY ERRORS WITH RTE-IV ON M-SERIES	2-J22 1
21MX-13	2105, 2108, 2112 COMPUTERS DISC LOADER ROM	2-J23 1
21MXE-01A	ERRONEOUS RESULT AFTER EXECUTION OF 'MPY B' AND 'MPY B,I' INSTRUCTIONS	2-J24 3
21MXE-02	MICROCODE RESTRICTIONS	2-K 3 2
21MXE-03	M-REGISTER PICKING UP BITS	2-K 5 1
21MXE-04A	INTERMITTENT MAPPING ERRORS IN RTE-III OPERATING SYSTEM	2-K 6 2
21MXE-05	MEMORY PROTECT BEING TURNED OFF INTERMITTENTLY WHILE RUNNING RTE-II AND RTE-III	2-K 8 3
21MXE-06	SERIAL NUMBERS AND INTERNAL DATE CODES	2-K11 1
21MXE-07	ASSEMBLIES	2-K12 1
21MXE-08	HIGH PERFORMANCE AND FAULT CONTROL MEMORY CONTROL CAPABILITY	2-K13 6
21MXE-09	INTERUPT PROCESSING PROBLEMS	2-K19 2
21MXE-10	NEW OPERATING PROCEDURE WHEN USING 12992B LOADER ROM	2-K21 1
21MXE-11	INCORRECT OPERAND VALUE WITH 13307A INSTRUCTIONS XLA, XLB, DCA, & XCB	2-K22 1
21MXE-12	INTERMITTENT CPU FAILURES	2-K23 1
2240A-01	POWER SUPPLY RECTIFIER (CR3) CHANGE	2-K24 1
2240A-02	2240A CONTROL CARD PART CHANGE	2-K25 1
2240A-03	HP 2240A/2241A POWER SUPPLY	2-L 2 1
2240A-04	HP 2240A CONTROL CARD PART CHANGE	2-L 3 1
2240A-05	SPRING RETAINER CLIPS FOR 2240A CONTROL CARD	2-L 4 1
2240A-06	HP 2240A AND HP 2241A 240 VAC OPERATION	2-L 5 1
2240A-07	HP 2240A/2241A POWER SUPPLY PROBLEM	2-L 6 1
2240A-08	HP 2240A SELF-TEST PROBLEM	2-L 7 1
2240A-09	HP 2240A CONTROL CARD CHANGE	2-L 8 1

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ISSUE NO.	TITLE	LOC/COUNT
2240A-10	HP 2240A CONTROL CARD (02240-60002)	2-L 9 2
2240A-11	HP 2240A/2241A POWER WIRING	2-L11 1
2241A-01	HP 2240A AND HP 2241A VAC OPERATION	2-L12 1
2241A-02	HP 2240A/2241A POWER SUPPLY PROBLEM	2-L13 1
2241A-03	HP 2240A/2241A POWER WIRING	2-L14 1
2313B-01-S	2313B ANALOG-DIGITAL INTERFACE SUBSYS.	2-L15 2
2313B-02	2313B VERIFICATION TEST CHANGE	2-L17 1
2313A/B-04	RTE VERIFICATION TESTS	2-L18 1
2402A-11	2402A PARTS CHANGE (R2)	2-L19 1
2402A-12	HP 2402A CALIBRATION	2-L20 1
2748A-1	2748A/2758A TAPE READER REROLLER RECOMMENDED TOOLS LIST	2-L21 1
2748A-2	RECOMMENDED SPARE PARTS LISTS	3-A 2 6
2748A-3	PREVENTIVE MAINTENANCE AND ADJUSTMENT PROCEDURES	3-A 8 6
2748A-4	2748A TAPE READER INSTALLATION PROC.	3-A14 2
2748A-5	SPEED IMPROVEMENT	3-A16 4
2748A-6	POWER SUPPLY CAPACITORS C3 & C22 SWAPPED	3-A20 1
2748A-7a	READ HEAD ASSEMBLY REPLACEMENT PARTS	3-A21 1
2748A-8A	BRAKE SOLENOID PART NO. CHANGE/PINCH ROLLER SOLENOID FIELD UPDATE KIT INSTALLATION	3-A22 3
2748B-1	RECOMMENDED SPARE PARTS	3-A25 4
2748B-2	SPECIAL TOOLS AND MAINTENANCE SUPPLIES	3-B 5 1
2748B-3	BRAKE SOLENOID POTTING MATERIAL PROBLEM	3-B 6 2
2748B-4A	BRAKE SOLENOID PART NUMBER CHANGE/ PINCH ROLLER SOLENOID FIELD UPDATE KIT INSTALLATION	3-B 8 3
2748B-5A	READ HEAD ADJUSTMENT PROCEDURE	3-B11 2
2753A-10a	PART NUMBER CROSS-REFERENCE	3-B13 5
2753B-1a	PART NUMBER CROSS-REFERENCE	3-B18 5
2758A-1	HP 2758A TAPE READER REROLLER RECOMMENDED TOOLS LIST	3-B23 1
2758A-2	RECOMMENDED SPARE PARTS LISTS	3-B24 8
2758A-3	INSTALLATION PROCEDURE	3-C 8 3
2758A-4	PREVENTIVE MAINTENANCE READ HEAD ADJUSTMENT PROCEDURE	3-C11 5
2758A-5	SPEED IMPROVEMENT	3-C16 3
2758A-6	MISSING GROUND WIRE	3-C19 1
2758A-7a	READ HEAD ASSEMBLY REPLACEMENT PARTS	3-C20 1
2860-01	INSTRUMENT SLIDE ALIGNMENT	3-C21 5
2895A-2	2895A PAPER TAPE PUNCH INSTALLATION PROCEDURES	3-D 2 2
2895B-01	2895B TAPE PUNCH	3-D 4 2
3480B/D-01	IMPROVED RELIABILITY	3-D 6 2
6940-01	IMPROVED RELIABILITY	3-D 8 2
8542-01	93256A POWER DISTRIBUTION UNIT	3-D10 1
8580-01	93256A POWER DISTRIBUTION UNIT	3-D11 1

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ISSUE NO.	TITLE	LOC/COUNT
8660A/C-01	IMPROVED RELIABILITY	3-D12 2
9206-01	IMPROVED RELIABILITY	3-D14 2
9401B/C-01	9401B/C DTU POWER SUPPLIES (+5 +/-17V) SPECIFICATIONS	3-D16 1
9402A-01	AMP PANEL REPAIR AND MAINTENANCE	3-D17 2
9411A-01	CONTROLLER MANUAL SCHEMATIC CHANGE	3-D19 1
9411A-02	CONTROL CARD CHANGE	3-D20 1
9411A-03A	HP 9411A SWITCH CONTROLLER	3-D21 1
9411A-04	CONTROL CARD PROMS	3-D22 1
9412A-01	HP 9412A CONTROL CARD CHANGE	3-D23 1
9412A-02	HP 9412A INDISCRIMINATE RELAY CLEARING	3-D24 1
9412A-03	AMP PANEL REPAIR AND MAINTENANCE	3-D25 2
9412A-04	TEST ADAPTER GROUNDING AND NOISE CONSIDERATION IN HP 9580/94XX	3-E 3 2
9412A-05	9412A MODULAR SWITCH FUNCTION CARD CABLES	3-E 5 1
9412A-06	* 9412A MODULAR SWITCH FUNCTION CARD CABLES	3-E 6 1
9413A-01	HP 9413A CONTROL CARD MISSING TRACE	3-E 7 1
9414-01	TEST ADAPTER GROUNDING AND NOISE SUPPRESSION CONSIDERATIONS IN HP 9580/94XX	3-E 8 2
94XX-01	94XX SWITCH TESTING WITH 9825A CALCULATOR	3-E10 5
9500A-01	HP 2100A/S TIMING INTERFACE ASSEMBLY	3-E15 1
9500-02	93256A POWER DISTRIBUTION UNIT	3-E16 1
9500A/B/D-03	IMPROVED RELIABILITY	3-E17 2
9510A-01	HP 2100A/S TIMING INTERFACE ASSEMBLY	3-E19 1
9510D-01	IMPROVED RELIABILITY	3-E20 2
9540A-01	2100A/S TIMING INTERFACE ASSEMBLY	3-E22 1
9540A-02	IMPROVED RELIABILITY	3-E23 2
9580-01	TEST ADAPTER GROUNDING AND NOISE SUPPRESSION CONSIDERATIONS IN HP 9580/94XX	3-E25 2
9580-02	93256A POWER DISTRIBUTION UNIT	3-F 3 1
9580-60056-1	INTERLOCK BOX ARC SUPPRESSION	3-F 4 1
9600-01	IMPROVED RELIABILITY	3-F 5 2
AMC-1010	RECOMMENDED SPARE PARTS	3-F 7 4
GENL-01A	WARRANTY ALWAYS SERVICE NOTES	3-F11 1
GENL-02	HP 1000 MEMORY PRODUCTS COMPATIBILITY MATRIXES	3-F12 3
12001A-01	L-SERIES PROCESSOR CARD P/N 12001-60001 AND 12001-69001	3-F15 1
12001B-02	NEW EPROM'S	3-F16 2
12005A-01	12005-60003 CABLE OBSOLETE	3-F18 1
12008A-01	12008A PROM STORAGE MODULE DATE CODE1 CHANGES FROM B-2001 TO B-2020 KERNEL DIAGNOSTIC FAILS ON I/O CARDS	3-F19 1

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ISSUE NO.	TITLE	LOC/COUNT
12035A-01	POWER FAIL ROUTINE FAILURES	3-F20 1
12035A-02	* BENT PINS ON 12035A POWER SUPPLY WHEN CONNECTING TO L-SERIES BACKPLANES	3-F21 2
12050A-01	NEW PROMS	3-F23 1
12531B-01	INCOMPATIBILITY WITH DMA/DCPC	3-F24 1
12531C-1A	CYRSTAL OSCILLATOR UPDATE	3-F25 1
12531C-02	INCOMPATIBILITY WITH DMA/DCPC	3-G 2 1
12531C-03	IMPROVED RELIABILITY OF DATA TRANSMISSION AT HIGH BAUD RATES	3-G 3 1
12531C-04	COMPUTER TERMINAL INTERFACE REQUIRES CONNECTION OF POWERED-ON TERMINAL	3-G 4 2
12531D-01	IMPROVED RELIABILITY OF DATA TRANSMISSION AT HIGH BAUD RATES	3-G 6 1
12531D-02	INCOMPATIBILITY WITH DMA/DCPC	3-G 7 1
12531D-03	COMPUTER TERMINAL INTERFACE REQUIRES CONNECTION OF POWERED-ON TERMINAL	3-G 8 2
12531D-04	* TTY/CRT INTERFACE CARDS	3-G10 1
12539C-01	TIME BASE GENERATOR PART # 12539- 60003, REV. A, B, & C	3-G11 2
12539C-02	12539C TIME BASE GENERATOR PCA RELAYOUT/PART NUMBER CHANGE	3-613 2
12551B-1	RELAY REGISTER DATE CODE A-810-6	3-G15 1
12555A-1	OSCILLATION OF AMPLIFICATION STAGE	3-G16 4
12566B-1	DEVICE COMMAND SIGNAL INVERTED	3-G20 1
12566B-02	I/O DATA ERRORS IN THE UPGRADE MODE	3-G21 1
12566B-03	'BAD' DATA SENT TO I/O DEVICE DURING BOTH DMA AND NONDMA TRANSFERS	3-G22 2
12575-1	TAPE WINDER--ELECTRIC MOTOR INTERFERENCE WITH MAGNETIC STORAGE DEVICES	3-G24 2
12587B-2	DATA PHONE INTERFACE, NEW TEST CONNECTOR (P/N 12587-60009)	3-H 2 1
12587B-03	12587B OPTION 002	3-H 3 1
12597A-1	12597-60061 CABLE CORRECTION	3-H 4 1
12620A-1a	POTENTIAL DAMAGE TO COMPUTER POWER SUPPLIES	3-H 5 1
12621A-1	LOSS OF SYNCHRONIZATION	3-H 6 1
12622A-1B	TRANSMIT ERRORS	3-H 7 1
12622A-02A	ARTWORK ERROR CAUSING LOSS OF SYNC CHARACTER	3-H 8 2
12665A-01	DATA OVERRUN ERRORS	3-H10 1
12731A-01A	INTERMITTENT MAPPING ERRORS IN RTE-III OPERATING SYSTEM	3-H11 2
12741A-01	'MEMSCREEN'	3-H13 1
12741A-02	RANDOM MEMORY PROBLEMS	3-H14 1
12741A-03	12741A, 12746A/H, 12747A/H, 12779A/H, 12780A/H, 12998A, AND 1187B DELAY LINE CHANGE	3-H15 1

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12746A/H-01	12741A, 12746A/H, 12747A/H, 12779A/H, 12780A/H, 12998A AND 13187B DELAY LINE CHANGE	3-H16 1
12746H-02	RANDOM PARITY ERRORS AND MEMORY PROTECT VIOLATIONS	3-H17 1
12747A-01	RANDOM MEMORY PROBLEMS	3-H18 1
12747A/H-02	12741A, 12746A/H, 12747A/H, 12779A/H, 12780A, 12998A AND 13187B DELAY LINE CHANGE	3-H19 1
12747H-03	* RANDOM PARITY ERRORS AND MEMORY PROTECT VIOLATIONS	3-H20 1
12750B-01	CAPACITOR C21 VALUE CHANGE	3-H21 1
12771A-01	DS CARD DATA OVERRUN ERRORS	3-H22 1
12773A-01	DATA OVERRUN ERRORS	3-H23 1
12773A-02	ERRONEOUS DATA TRANSMISSION	3-H24 1
12773A-03	EXTRA ZEROS INPUT BETWEEN CORRECT WORDS	3-H25 1
12779A/H-01	12779A AND 12779H CHECK BIT ARRAYS	3-I 2 2
12779A/H-02	12741A, 12746A/H, 12747A/H, 12779A/H, 12780A/H, 12998A AND 13187B DELAY LINE CHANGE	3-I 4 1
12779H-03	* RANDOM PARITY ERRORS AND MEMORY PROTECT VIOLATIONS	3-I 5 1
12780A/H-01	12741A, 12746A/H, 12747A/H, 12779A/H, 12780A/H, 12998A AND 13187B DELAY LINE CHANGE	3-I 6 1
12780H-02	* RANDOM PARITY ERRORS AND MEMORY PROTECT VIOLATIONS	3-I 7 1
12790A-01	12790A MULTIPOINT TERMINAL INTERFACE	3-I 8 1
12790A-02	HP 12790A MULTIPOINT FIRMWARE CHANGES	3-I 9 3
12845A-01	MISMARKED I.C.	3-I12 1
12845B-01	PREVENTING STROBE WHEN PRINTER OFF- LINE	3-I13 3
12880A-01	IMPROVED RELIABILITY OF DATA TRANS- MISSION	3-I16 1
12880A-02	INCOMPATIBILITY WITH DMA/DCPC	3-I17 1
12880A-03	COMPUTER TERMINAL INTERFACE REQUIRES CONNECTION OF POWERED-ON TERMINAL	3-I18 2
12889A-01A	CONNECTOR KIT FOR CUSTOMER FURNISHED CABLE	3-I20 1
12889A-02	NOISY INTERFACE CABLE	3-I21 1
12889A-03	INTERMITTENT DATA ERRORS	3-I22 1
12889A-04	INTERFACE CABLE CONNECTORS FOR 12889-60004 DO NOT MATE WITH 12889-60003	3-I23 3
12892A-01A	DATA ERRORS USING DCPC/RTE-II/III UPDATE	3-J 2 2
12892A-02	MEMORY PROTECT FUNCTION CAUSING ERRONEOUS I/O CONTROL PROBLEMS	3-J 4 2

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ISSUE NO.	TITLE	LOC/COUNT
12892A-03	MEMORY PROTECT BEING TURNED OFF INTERMITTENTLY WHILE RUNNING RTE-II & RTE-III	3-J 6 3
12892B-01	MEMORY PROTECT BEING TURNED OFF INTERMITTENTLY WHILE RUNNING RTE-II & RTE-III	3-J 9 3
12892B-02	INCOMPATIBILITY BETWEEN RTE-C AND 12892B	3-J12 1
12895-1	HARDWARE CORRECTION FOR DMA SOFTWARE CODING SEQUENCE ERRORS	3-J13 2
12897A-1	NOISE SPIKE CAUSING BIT PICKUP ON I/O BUS	3-J15 2
12897A-02-B	NOISE ON DMALO SIGNAL CAUSING MEMORY PROTECT/PARITY ERRORS	3-J17 3
12897A-03A	DMS UPGRADE INFORMATION/ERRONEOUS DCPC TRANSFER	3-J20 2
12897A-04A	DATA ERRORS USING DCPC/RTE-II/III UPDATE	3-J22 2
12897A-05	12897A/B INCOMPATIBILITY WITH EARLIER VERSIONS OF 7905A INTERFACES	3-J24 1
12897B-01	12897A/B INCOMPATIBILITY WITH EARLIER VERSIONS OF 7905A INTERFACES	3-J25 1
12908A-1B	WRITABLE CONTROL STORE UPDATE	3-K 2 1
12908A-2	INSTALLATION OF WRITABLE CONTROL STORE	3-K 3 1
12908A-3	JUMPER BOARD ASSEMBLY 12908-60003 REV A	3-K 4 1
12908B-1	INSTALLATION PROCEDURE	3-K 5 2
12908B-02	WCS TURN-ON WHEN ADDRESSING ANOTHER ROM BOARD	3-K 7 2
12909A-01	12909A GIVES LOW YIELDS WHEN RUNNING HARRIS ON MMI PROMS	3-K 9 1
12909B-01	PROM WRITER LONGER BURN TIMES	3-K10 1
12920A-01	WIRING ERROR ON PORTS 6 AND 7	3-K11 4
12920A-02A	HARDWARE PROBLEMS	3-K15 2
12920B-01	DIAGNOSTIC UPDATE FOR 21MX-E COMPUTERS WITH HIGH PERFORMANCE MEMORY	3-K17 2
12921A-1	DIAGNOSTIC TEST	3-K19 2
12930A-01	TEST CONNECTOR MODIFICATIONS	3-K21 1
12930A-02	DIAGNOSTICS	3-K22 2
12930A-03	ERROR E064 WHEN RUNNING GENERAL PURPOSE REGISTER DIAGNOSTIC TO TEST HP 12930A IN 21MX E-SERIES COMPUTER	3-K24 1
12930A-04	ERROR E064 WHEN TESTING HP 12930A WITH THE GENERAL PURPOSE DIAGNOSTIC	3-K25 1
12930A-05	ERROR E064 WHEN RUNNING GENERAL PURPOSE REGISTER DIAGNOSTIC TO TEST HP 12930A IN 21MX E-SERIES COMPUTER	3-L 2 2
12944A-01	INCREASED REGULATION	3-L 4 1
12944A-02A	BATTERY NOT HOLDING CHARGE	3-L 5 3

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ISSUE NO.	TITLE	LOC/COUNT
12944A-03A	COMPUTER DOES NOT AUTO-RESTART AFTER POWER FAILURE WITH BATTERY INSTALLED DUE TO MEMORY LOSS	3-L 8 5
12944B-01 *	+5M/+12M OUT OF SPECIFICATION AND +5M OSCILATES DURING OVERLOAD CONDITIONS	3-L13 3
12960-01	7900A CARTRIDGE DISC DIAGNOSTIC	3-L16 1
12966A-01	MALFUNCTION WHEN INTERNALLY PROGRAMMING BAUD RATE	3-L17 2
12966A-02	12966A UART FAILURES	3-L19 1
12966A-03	12966A I/F DIAGNOSTIC P/N 12966-16001, D.C. 1519 DSN 103017	3-L20 1
12968A-01	MALFUNCTION WHEN INTERNALLY PROGRAMMING BAUD RATE	3-L21 2
12976A-01	MEMORY PROTECT FUNCTION CAUSING ERRONEOUS I/O CONTROL PROBLEMS	3-L23 2
12976A-02A	INTERMITTENT MAPPING ERRORS IN RTE-III OPERATING SYSTEM	4-A 2 2
12976A-03A	DM VIOLATIONS WITH MEMORY PROTECT ENABLED	4-A 4 2
12977A-01	ERROR IN ADD ROUTINE	4-A 6 1
12977A-02	.XDIV CAUSING PARITY ERRORS	4-A 7 1
12977B-01	DMI-FFP ROM ADDRESS ERROR	4-A 8 2
12978A-01	WCS TURN-ON WHEN ADDRESSING ANOTHER ROM BOARD	4-A10 2
12978A-02	COMPATIBILITY OF 12978A 1/4K WCS WITH 12897B DUAL CHANNEL PORT CONTROLLER	4-A12 1
12979A-01	RECOMMENDED SPARE PARTS	4-A13 1
12979A-02A	EXTENDER CONTROL PCA JUMPERS	4-A14 1
12979A-03	FALSE OVERVOLTAGE CONDITION AFTER POWER FAIL	4-A15 1
12979A-04	NOT SERVICING INTERRUPTS	4-A16 1
12979A-05	SOFT LINE CONDITION CAUSING RESISTOR	4-A17 1
12979A-06A	BLOWING LINE FUSES	4-A18 1
12979A-07	DATE ERROR WITH RTE/DOS USING I/O EXTENDER	4-A19 1
12979A-08	DATE ERROR WITH RTE/DOS USING I/O EXTENDER	4-A20 1
12979A-09A	I/O EXTENDER LOCKS UP COMPUTER AFTER POWER FAIL	4-A21 1
12979A-10A	INPUT FILTER CAPACITOR DEFECT	4-A22 1
12979A-11	RANDOM LOSS OF DATA AND/OR CONTROL SIGNALS	4-A23 2
12979A-12	MEMORY PARITY ERRORS GENERATED IN 21MX CPU UPON INITIAL POWER UP OF I/O EXTENDER	4-A25 2
12979A-13A	COMPATIBILITY WITH 21MX E-SERIES COMPUTERS	4-B 3 5

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ISSUE NO.	TITLE	LOC/COUNT
12979A-14	NEW EXCHANGE ASSEMBLY CONFIGURATION FOR THE 2108A/2109A/12979A 'A' POWER SUPPLY	4-B 8 2
12979A-15	12979A/B I/O EXTENDER BUFFER BOARD PART NUMBER CHANGE	4-B 10 2
12979B-01	I/O EXTENDER	4-B 12 1
12979B-02	I/O CONTROL BOARD	4-B 13 2
12979B-03	REV 'B' MOTHER BOARD INTRODUCTION	4-B 15 4
12979B-04	'B' POWER SUPPLY UPDATE REF 'B' MOTHER BOARD INTRODUCTION	4-B 19 4
12979B-05A	'B' POWER SUPPLY CONTROL BOARD (5061-1345) AND PRE-REGULATOR BOARD (5061-1347) DATE CODE CHANGES	4-B 23 4
12979B-06	B POWER SUPPLY JUMPER BOARD	4-C 3 1
12979B-07	CHANGE IN M/E/F-SERIES COMPUTER FANS	4-C 4 1
12979B-08	B POWER SUPPLY THERMAL SHUTDOWN OPERATION	4-C 5 2
12979B-09	INTERMITTENT FAILURES OF THE 12979B I/O EXTENDER, 12966A BACI CARD COMBINATION	4-C 7 4
12979B-10	12979A/B I/O EXTENDER BUFFER BOARD PART NUMBER CHANGE	4-C 11 2
12979B-11	REQUIRED CONFIGURATION FOR RETURN TO CSD	4-C 13 2
12979B-12	REDESIGNED "B" TYPE POWER SUPPLY	4-C 15 1
12979B-13	* SELF-TEST FAILURE WITH POWER FAIL OPTION	4-C 16 1
12979B-15	* NEW VERSION OF LOW COST POWER SUPPLY	4-C 17 3
12990A-01	UNIT WILL NOT COME UP AFTER THE POWER FAIL WITH BATTERIES INSTALLED	4-C 20 2
12990A-02A	INPUT FILTER CAPACITOR DEFECT	4-C 22 1
12990B-01	REV 'B' MOTHER BOARD INTRODUCTION	4-C 23 4
12990B-02	B POWER SUPPLY UPDATE REV B MOTHER BOARD INTRODUCTION	4-D 3 4
12990B-03A	B POWER SUPPLY	4-D 4 4
12990B-04	B POWER SUPPLY JUMPER BOARD	4-D 11 1
12990B-05	CHANGE IN M/E/F-SERIES COMPUTER FANS	4-D 12 1
12990B-06	B POWER SUPPLY THERMAL SHUTDOWN OPERATION	4-D 13 2
12990B-07	REQUIRED CONFIGURATION FOR RETURN TO CSD	4-D 15 2
12990B-08	REDESIGNED "B" TYPE POWER SUPPLY	4-D 17 1
12990B-09	* NEW VERSION OF LOW COST POWER SUPPLY	4-D 18 3
12991A-01A	COMPUTER DOES NOT AUTO-RESTART AFTER POWER FAILURE WITH BATTERY INSTALLED DUE TO MEMORY LOSS	4-D 21 5
12991B-01	* +5M/+12M OUT OF SPECIFICATION AND +5M OSCILLATES DURING OVERLOAD CONDITIONS	4-E 2 3
12992A-01	CANNOT BOOT PROPERLY WITH MULTI-DRIVES/7905 LOADER	4-E 5 4
12992A-02	7900/1A, 7905A, AND 2883A DISC LOADER ROM	4-E 9 6

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12992B-01	NEW OPERATING PROCEDURE WHEN USING 12992B LOADER ROM	4-E 15 1
12992D-01	ROM WILL NOT WORK WITH 7970E MAG TAPE	4-E 16 3
12998A-01A	OBSOLESCENCE OF 5080-9780 4K RAM	4-E 19 1
12998A-02	12741A, 12746A/H, 12747A/H, 12779A/H, 12780A/H, 12998A AND 13187B DELAY LINE CHANGE	4-E 20 1
13047A-01	2K USER CONTROL STORE UPDATE	4-E 21 3
13187B-01	'MEMSCREEN'	4-E 24 1
13187B-02	RANDOM MEMORY PROBLEMS	4-F 25 1
13187B-03	12741A, 12746A/H, 12747A/H, 12779A/H 12780A/H, 12998A, AND 13187B DELAY LINE CHANGE	4-F 2 1
13197A-01	RE-LAYOUT OF 13197A 1K WCS BOARD	4-F 3 1
13215A-02	ELIMINATION OF POTENTIAL SAFETY HAZARD	4-F 4 2
13304A-01	ERRATIC INDICATIONS DURING POWER-UP/ NORMAL OPERATION OF COMPUTER	4-F 6 1
13306A-01	ROUTINES DO NOT PROPERLY HANDLE INTERRUPTS	4-F 7 2
13306A-02	FAST FORTRAN PROCESSOR	4-F 9 1
13306A-03	13306A UPGRADE ROM	4-F 10 1
13307A-01	DYNAMIC MAPPING INSTRUCTIONS UPDATE	4-F 11 2
13307A-02	INCORRECT OPERAND VALUE WITH 13307S INSTRUCTIONS XLA, XLB, XCA & XCB	4-13 1
13307A-03A	MAP SELECTION PROBLEMS	4-F 14 1
22900A-01	22915A/B & 22900A TEST AND ADJUSTMENT AID FOR USE IN HP 1000 ENVIRONMENT	4-F 15 3
22909A-01	2240A CARD EXTENDER PROBLEM	4-F 18 1
22915A-01	22915A LOW LEVEL ANALOG CARD AND 22915- 60003 CABLE	4-F 19 1
22915A-02	22915A TEST AID WHEN USED WITH HP 1000	4-F 20 1
22915A/B-03	22915A/B & 22900A TEST AND ADJUSTMENT AID FOR USE IN HP 1000 ENVIRONMENT	4-F 21 3
24396-01	1901 DIAGNOSTIC	4-F 24 5
24396-02	REVISION 1913 DIAGNOSTICS UPDATE	4-G 5 3
24396-03	1926 DIAGNOSTICS UPDATE	4-G 8 5
24396-04	2001 DIAGNOSTICS UPDATE	4-G 13 3
29400-2A	INSTRUMENT SLIDE ALIGNMENT	4-G 16 5
29400B-01	MULTI-BAY POWER OVERLOAD	4-G 21 1
59310B-01	ERRONEOUS DATA DURING DMA TRANSFERS	4-G 22 1
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91740B-01	ORIGINAL DS/1000 FIRMWARE INCOMPATIBLE WITH REVISION 1813 DS/1000 SOFTWARE AND LATER	4-H11 2
91740B-02	DS/1000 SYSTEM DOWNLOAD TIME-OUT	4-H13 2
91740B-03	DS/1000 FIRMWARE ENHANCEMENTS	4-H15 1
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2100 COMPUTER

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COMPUTER SPECIFICATIONS

Memory Cycle Time:	980nS
Microinstruction Execution Time:	196nS
I/O Slots in Mainframe:	14
Memory Size:	4K to 32K
Ambient Operating Temp:	0-55°C (32-131°F)
Weight:	91 pounds (41 kg) minimum 121 pounds (55 kg) maximum
Dimensions:	12" x 16.75" x 26" 30.1 cm x 42.6 cm x 66 cm

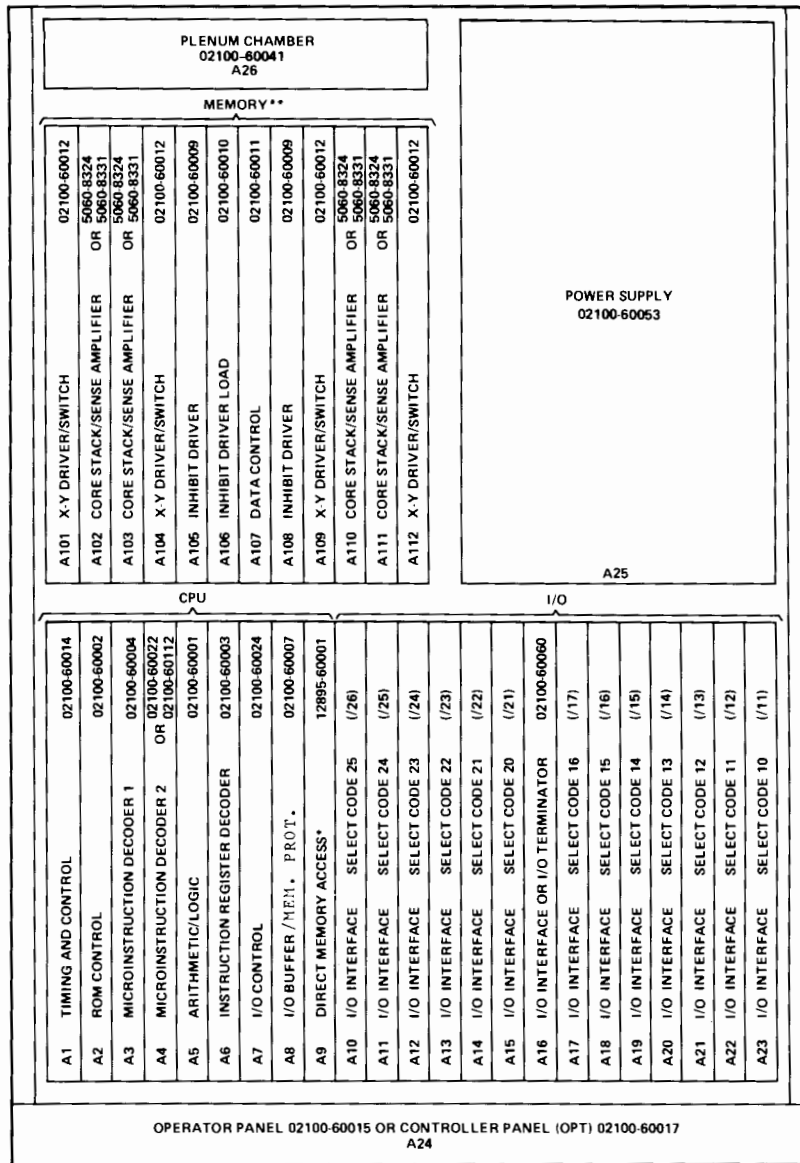
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HP 2100A I&M*	02100-90002	02100-90132
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HP 2100A Reference	02100-90001	
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*Installation and Maintenance

**Illustrated Parts Breakdown

PRINTED-CIRCUIT CARD LOCATIONS

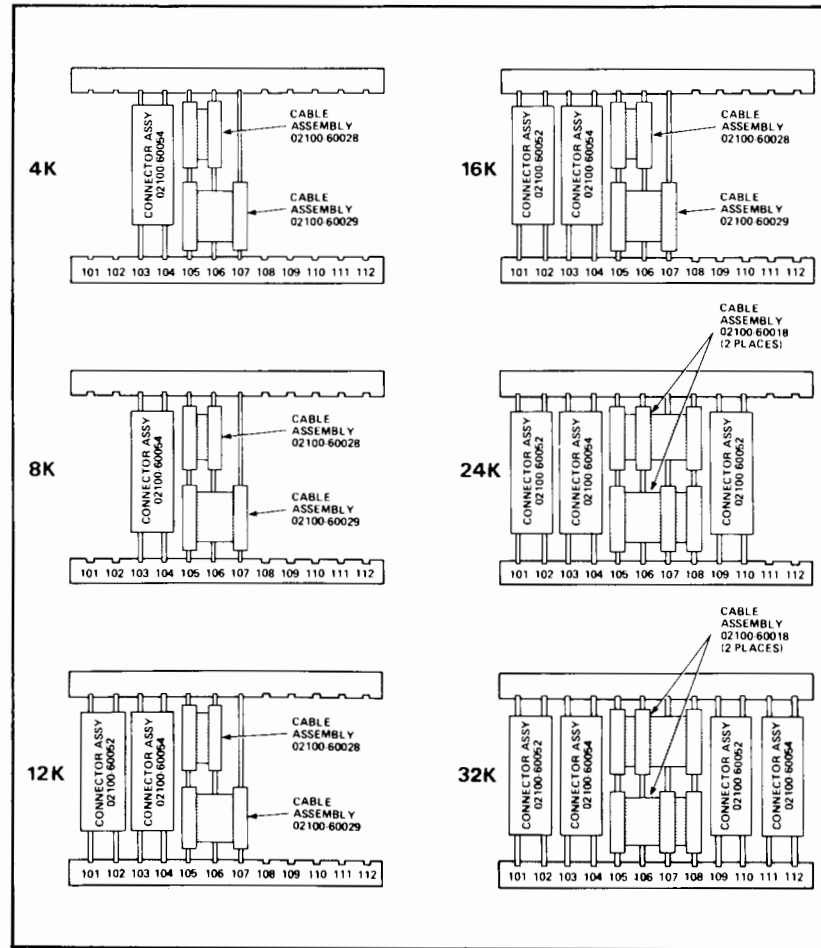


FRONT

NOTES: *DIRECT MEMORY ACCESS CARD IS AN ACCESSORY TO THE COMPUTER AND IS NOT PART OF THE BASIC CONFIGURATION.

*MEMORY SECTION LOADING SHOWN IS FOR 32K MEMORY. REFER TO FIGURE 4-2 FOR OTHER MEMORY SIZE LOADING.

MEMORY CARD CAGE LOADING



2100 MEMORY DATA TRANSFER

This program is useful in transferring a loader to another memory module in a 2100 computer. It is used when you want to replace the module in which the loader resides without losing the loader contents.

B-Reg = Ending address of data to be transferred.
HLT77 indicates end of transfer.

ADDR	CONTENTS	MNEMONIC
100	034110	ISZ 110
101	034111	ISZ 111
102	160111	LDA 111,I STARTING ADDRESS
103	170110	STA 110,I
104	060111	LDA 111
105	054000	CPB A
106	102077	HLT 77
107	024100	JMP 100
110	XXXXXX	STARTING ADDR FOR DUMP AREA (TO)
111	XXXXXX	STARTING ADDR OF DATA TO BE TRANSFERRED (FROM)

DMA TEST

To check operation of the DMA word count register:

Address	Mnemonic	Octal
100B	LIA 1	102501
101	STC XX	1037XX
102	OTA XX	1026XX
103	LIB XX	1065XX
104	JMP *-4	024100

XX = DMA channel programming select code 2 or 3 sends data from switches as programmed word count. Reads actual word count from DMA word count register up to 2¹³.

LOADER ADDRESS FOR MEMORY DATA TRANSFER

Size	Address
4K	07700
8K	17700
12K	27700
24K	57700
32K	77700

MEMORY PARITY ERROR TEST (2100 COMPUTERS)**SET P=2**

ADDRESS	MNEMONIC	CONTENTS
2	LDB 16	064016
3	CME	002200
4	ELA	001600
5	STA1,I	170001
6	CPA,I	150001
7	RSS	002001
10	HLT 0	102000
11	OTA,1	102601
12	LDB,4	006004
13	CPB 17	054017
14	JMP 2	024002
15	JMP 4	024004
16	20 TEST	
17	BBL RANGE	

Halts 102000 on Errors

"A" = Proper Data

"B" = Failing Address

LONG DIAGNOSTIC (FIELD SERVICE VERSION)

1. Load 1st segment using ABL
2. S.A. 10g
3. RUN; Halt 107000g
4. SW Reg. =0-5 Photoreader or buffered TTY select code
 - 6-11 TTY Select Code
 - 14 Delete central interrupt test
 - 15 Serial TTY
5. RUN; Halt 107001g
6. SW Reg. =0 Test 2 channels if DMA present
 - 1-14 Delete test # that corresponds to switch #
 - 15 Short version (one pass per test)
7. RUN; Halt 107002g
8. SW Reg. = Upper memory limit (normally ABL-1)
9. RUN; Halt 107003g
10. SW Reg. =0
11. RUN
12. Normal halt 102077g

DIAGNOSTICS INCLUDED IN TAPE

- #1 Hi Memory Address — Error Halt 102001g
 A Reg. = Address Expected
 B Reg. = Address Read
- #2 Hi Memory Crusher — Error Halt 102001g
 A Reg. = Data Read
 B Reg. = Data Expected
 RUN; Halt 102002g
 A Reg. = Data Read
 B Reg. = Address of failure
- #3 MRG Test 24209 Rev A
- #4 ASG Test 24208 Rev A
- #5 SRG Test 24210 Rev A
- #6 EAU Test 24214 Rev A
- #7 Memory Protect 24222 Rev A
- #8 Reserved for Floating Point
- #9 Basic I/O W/Interrupt 24215 Rev A
- #10 Super Duper DMA
- Error Halts 102011 Ch. #1 102021 #2 —CLF failure
 102012 Ch. #1 102022 Ch. #2 —STF failure
 102013 Ch. #1 102023 Ch. #2 —Wd.-Cntr bit failure
 102014 Ch. #1 102024 Ch. #2 —Data Output Failure
 102015 Ch. #1 102025 Ch. #2 —Data Input Failure
 102016 Ch. #1 102026 Ch. #2 —Interrupt failure
 102017 Ch. #1 102027 Ch. #2 —Wd.-Cntr Counting
- #11 Lo Memory Address — Same as #1
- #12 Lo Memory Crusher — Same as #2
- #77 End-of-Tapes

LONG DIAGNOSTIC (FIELD SERVICE VERSION) (Cont'd)**CONTROL PROGRAM HALTS**

107000 – Set SW Reg. for I/O devices
 107001 – Set SW Reg. for program options
 107002 – Set SW Reg. for Upper Memory Limit
 107003 – Set SW Reg. for diagnostic parameters
 102051 – No reader select code specified (restart)
 102055 – Checksum on control program (Restart)
 102065 – Reader time out (RUN to continue)

RESTART (TO READ NEXT TEST)

In Hi Control =7070g
 In Lo Control =145g (Last two tests)

MEMORY ADDRESS TEST

MEM ADDR	CONTENTS	LABEL	INSTRUCTION
00002	006204		INB, CME
00003	060023		LDA FRST
00004	150000	CMPAR	CPA 0, I
00005	002001		RSS
00006	102000		HLT
00007	052022		CPA LAST
00010	024014		JMP START
00011	002004		INA
00012	024004		JMP CMPAR
00013	000000		NOP
00014	060023	START	LDA FRST
00015	170000	STORE	STA 0, I
00016	050022		CPA LAST
00017	024002		JMP CMPAR-2
00020	002004		INA
00021	024015		JMP STORE
00022*	007777	LAST	OCT 7777
00023	000024	FRST	OCT 00024

*For 8K machines (22) 017777

Use 007677 or 017677 if you do not desire to test protected area.

Starting address 14.

Depress PRESET and RUN. The computer shall run. If it halts, there is an address error.

Extend bit shall blink on and off, B-reg increments each pass.

Locations 00022 and 00023 may be changed to test any core area.
 (requires ≈ 1 sec)

COMPUTER CHECK PROGRAM

If the computer runs, halt it manually. Get the contents of the "M" Register (on 2100A, Press "M"). If $77 < M < 122$ then O.K. - Press RUN and let it run (especially if looking for intermittent).

ASMB,A,B,L

THIS PROGRAM MAY BE USED TO CHECK CERTAIN INSTRUCTIONS USED BY THE BBL. IT ASSUMES THAT THE LOADER IS INTACT (I.E. CHECKED AGAINST LISTING OR BOOTED). THIS PROGRAM DOES NOT CHECK THOSE INSTRUCTIONS USED BY THE BOOT WHICH ARE:
STC,C SFS JMP LIA MIA STA B,I

THIS PROGRAM CHECKS THE FOLLOWING:
A REGISTER - SET AND CLEAR ALL BITS
B REGISTER - SET AND CLEAR ALL BITS
E REGISTER - SET BY CARRY AND CLEAR BY INSTRUCTION
ARITHMETIC - ALL ADDERS & CARRIER & COMPARE
MEM REFERENCE - A CRUDE TEST OF LOAD, STORE & JSB.

IT IS EQUALLY USEFUL IN THE FIELD OR CAN BE TOGGLED BY A CUSTOMER OVER THE TELEPHONE.

```
00100          ORG 100B
00100 003500  START CCA,CLE      DONT'T START HERE AGAIN
00101 007400  CCB
00102 054000  CPB 0              A=B=177777?
00103 002040  SEZ                E=0 AFTER CLE?
00104 102001  HLT 1B
00105 002004  INA                BUMP "A"
00106 002040  SEZ                DID "E" SET?
00107 002002  SZA                DID "A" ROLL OVER
00110 102003  HLT 2B
00111 006004  INB                BUMP "B"
00112 006002  SZB                DID "B" ROLL OVER
00113 102003  HLT 3B
00114 060122  LDA B377           GET 8 LOW BITS
00115 070001  STA 1B            ALSO IN "B"
00116 001727  ALF,ALF           NOW HIGH 8 BITS
00117 030001  IOR 1B            A=177777
00120 000040  CLE
00121 014100  JSB START         THAT'S RIGHT, JSB!
00122 000377  B377 OCT 377
          END
```

NO ERRORS*

REPETITIVE CPU-MEMORY TEST PROGRAM

This program stores a bit pattern in memory, reads it back, and compares it. A constant is added and the sum is stored in the same memory location repetitively. When an overflow is reached the next sequential memory location is loaded with the same variable bit patterns. When the specified ending address is reached the program will repeat the test. If an error occurs, a HLT 33 will be displayed. Run time is a function of memory size, the value in location 40, and the computer.

Mem Loc 35 = Failing address; A-Reg = Good data; B-Reg = Faulty data.

Mem Loc 36 and 37 = Starting and ending locations to be tested.

Mem Loc 40 = Value to increment data by.

10 103101 CLO	Starting address
11 064036 LDB 36	Establish starting addr to be tested
12 074035 STB 35	
13 106601 OTB 1	Put addr in S-reg
14 003534 CCA,CLA,SSA,SLA,INA	
15 000135 SLA,ERA A=100000;E=0	
16 102011 HLT 11	Halt 11
17 170035 STA I,35	Store data in memory
20 164035 LDB I,35	Get data from memory
21 054000 CPB A	Retrieved data = stored data
22 024024 JMP*+ 2	= Yes
23 102033 HLT 33	# A=good B=bad
24 040040 ADA 40	Increment A-reg by loc 40
25 103301 SOS,C	A-reg=077777+1,clo
26 024017 JMP 17	No overflow, continue
27 064035 LDB 35	Current addr=last
30 054037 CPB 37	addr to be tested?
31 024011 JMP 11	Yes: restart
32 034035 ISZ 35	No: increment addr by 1
33 106601 OTB 1	Output new addr to S-reg
34 024014 JMP 14	
35 000000	Addr under test by prog
36 000041	Addr to start test on*
37 XXXXXX	Addr to end test on*
40 000001	Increment data by this value*

*CHANGE FOR DESIRED TEST CONDITIONS

SHORT CPU-MEMORY TEST PROGRAM

This test program is useful if absolute programs cannot be loaded with the ABL due to hardware failures. It first tests a selection of ASG and SRG instructions followed by some MRG instructions. With the help of this program a certain bit pattern is stored in the first available memory location, read back and compared. A constant is added and the sum is stored in the same memory location repetitively. When a positive overflow is reached the next sequential memory location is loaded with the same variable bit patterns. Whenever the ABL is reached or one memory location does not compare a HLT 33 occurs with memory location 20 displaying the failing address or starting address of the ABL, the A-Reg. displaying the proper and the B-Reg. the faulty data pattern. Run time is a function of memory size and computer.

ADDR CONTENTS

2	103101	CLO	
3	003534	CCA,CLE,SSA,SLA,INA	A-Reg:000000,E=1
4	000135	SLA,ERA	A-Reg:100000,E=0
5	102011	HLT 11	
6	170020	STA I,20	
7	164020	LDB I,20	
10	054000	CPB A	Go to HLT 33 if not equal
11	002003	SZA,RSS	JMP to 13
12	102033	HLT 33	
13	040004	ADA 4	ADD 135 ₈ to A-Reg
14	103301	SOS,C	OVFF set if A-Reg 07777,CLO
15	024006	JMP 6	
16	034020	ISZ 20	Go to next mem. loc.
17	024003	JMP 3	
20	000021	DEF 21	Starting Address

NOTE: If location 20 contains the address of the ABL at HLT 33, the test ran correctly. To restart, location 000020 must be changed to 000021.

SUPER JUMP SELF MEMORY TEST

ASMB,A,B,L,T
 OPERATING PROCEDURE
 STARTING ADDRESS 100
 SWITCH REGISTER (BITS 0-5) SELECT CODE OF OUTPUT DEVICE
 SET BIT 15 TO A 1 TO LOOP
 OUTPUT DEVICE=BUF'D TTY CARD(MOST EFFECTIVE)OR GND TRUE I/O
 TTY CARD MUST HAVE HOOD REMOVED,GRD TRUE I/O MUST HAVE
 SPECIAL HOOD CONNECTOR (SAME AS DMA TEST)
 "RUN"
 HALT 08
 SET SWITCH REGISTER FOR LAST AVAILABLE WORD OF MEMORY
 "RUN"
 THIS PROGRAM MUST BE RELOADED TO RESTART.

		ORG 4B	
102004		HLT 4B	
102005		HLT 5B	
		ORG 100H	
064137		LDB WRD1	GET "JMP GO" INSTRUCTION.
102001		LIA 1	GET DEVICE SELECT CODE.
0641021		ELA,ANS	PUT LOOPING FLAG IN E REG.
174000		STB 0,I	PUT "JMP GO" IN TRAP CELL.
030121		IOH S1	CONFIGURE
070121		STA S1	I/O
030126		IOH S2	INSTRUCTIONS.
070126		STA S2	
002440		CLA,SEZ	LOOPING FLAG SET?
070116		STA END	YES.
102000		HLT 0	
102001		LIA 1	GET MAXIMUM MEMORY
070143		STA MAXAD	ADDRESS AND SAVE IT.
002001		RSS	
102077	END	HLT 77H	DONE. "RUN" TO RESTART.
102100		STF 0	ENABLE INTERRUPTS.
060140		LDA OUT	CONFIGURE INTERFACE
102000	S1	OTA 0	FOR OUTPUT.
060141		LDA BEGIN	STARTING ADDRESS FOR
064142	R1	LDB INSTR	JUMP SELF INSTRUCTION.
174000	R2	STB 0,I	
102001		OTA 1	
001100	S2	OCT 1100	THIS BECOMES A STC CHAN,C.
124000		JMP 0,I	EXECUTE JUMP SELF.
050143	GU	CPA MAXAD	END OF MEMORY?
024110		JMP END	YES.
002004		INA	BUMP MEMORY ADDRESS OF
000004		INB	JUMP SELF INSTRUCTION.
054144		CPH PAGE	END OF MEMORY PAGE?
024123		JMP R1	YES.
024124		JMP R2	NO.
024130	WRD1	JMP GO	
110000	OUT	OCT 110000	
002000	HEGIN	OCT 2000	
020000	INSTH	OCT 2000H	
000000	MAXAD	RSS 1	
030000	PAGE	OCT 30000	
		END	



CLEARING CORE

Address	Mnemonic	Octal
2	STA 1,1	170001
3	INB	006004
4	JMP *-2	024002

Initialize: P-Reg = 2
 B-Reg = 5₆ Will destroy loader if left enabled
 A-Reg contains bit pattern stored in core (0)

MEMORY ADDRESS TEST

Address	Mnemonic	Contents
2 Start	LDA First	060012
3	STA ,1	170000
4	CPA ,1	150000
5	INA, RSS	002005
6	HLT	102005
7	CPA Last	050013
10	JMP Start	024002
11	JMP Start + 1	024003
12 First	OCT 14	000014
13 Last	OCT *	

*Set to last location to be tested @ 1 location 12 may also be changed to test a different starting location.

Start at address 2. Stores memory address in the address. If an error occurs, the program halts with failing address in the A register.

MEMORY CHECKERBOARD TEST (CORE MEMORY)

Address	Mnemonic	Contents
2 Start	LDB First	064022
3	INB	006004
4	LDA CT	060021
5	STA CTR	070020
6	CLA	002400
7 Loop	STA B, I	170001
10	CPA B, I	150001
11	CMA, RSS	003001
12	HLT	102001
13	ISZ CTR	034020
14	JMP Loop	024007
15	CPB Last	054023
16	JMP Start	024002
17	JMP Start + 1	024003
20 CTR	BSS 1	
21 CT	OCT *	
22 First	OCT **	
23 Last	OCT **	

Start at address two. Alternately stores all ones and zeros in a given location. Will continue this on that location for a number of times determined by contents of memory location.

*Number of times for test — 21 in this case.

**Starting and ending locations to be tested are determined by the contents of locations 22 and 23. Error halts with correct pattern in A Register and falling location in B Register.

CPU BIT AND MEMORY CHECKER

ADDRESS	MNEMONIC	CONTENTS
02	OCT	177777
03	OCT	017677
04	OCT	000026
05	OCT	000026
06	NOP	000000
07	LDA 4	060004
10	INA	002004
11	STA 4	070004
12	CPA 3	050003
13	JMP 25	026025
14	LIA 1	102501
15	STA 4,I	170004
16	LDB 4,I	164004
17	CPB 2	054002
20	JMP 22	026022
21	HLT 22	102022
22	CLA	002400
23	STA 4,I	170004
24	JMP 6	026006
25	LDA 5	060005
26	JMP 10	026010

02 (Changed for bit pattern)
 03 (Stop address)
 04 (Start address and error)
 05 (Auto restart address)
 06 (Program starting address)
 07 (SW reg = address 02)

2100 CORE MEMORY SCHM00 TEST

The following procedure is used to determine a midpoint for the $\pm 20V$ at which the memory section will properly operate. The $\pm 20V$ will be adjusted to locate the highest and lowest voltages where parity errors may occur while running a memory diagnostic.

NOTE

It is not necessary to decrease the $\pm 20V$ supply below 17.5 volts or higher than 23 volts.

1. Turn power OFF; remove computer bottom cover; turn power ON.
2. If using Low Memory Pattern Test (24193-60001) perform steps 1 through 7 as outlined on page X-Y in the section.
If some other memory diagnostic is used, load and prepare it to execute the standard tests. Do not execute at this time.
3. Decrement the $\pm 20V$ supply by a .5V by adjusting R40 on the power supply board A2 and execute one pass of the memory diagnostic. If a parity error occurs, note the $\pm 20V$ supply value and proceed to step 4. Otherwise, repeat this step.
4. Set the $\pm 20V$ supply to its original value.
5. Increment the $\pm 20V$ supply by .5V and execute one pass of the diagnostic. If a parity error occurs, note the $\pm 20V$ supply value and proceed to step 6. Otherwise, repeat this step.
6. Using the voltages noted in steps 3 and 5, determine the midpoint voltage and set the $\pm 20V$ supply to that value.
7. Execute the memory diagnostic to ensure there are no parity errors.

NOTE

This procedure may be used on the 2114/15/16 computers. It should be noted that the minimum and maximum values for the $\pm 20V$ supply and components specified in this procedure may not apply to the 2114/15/16.

21MX-M AND 21MX-E/F

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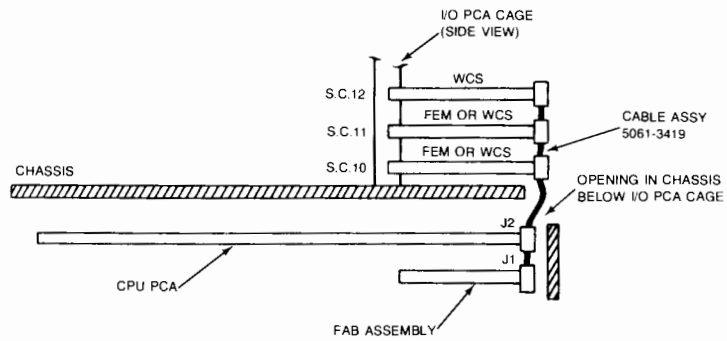
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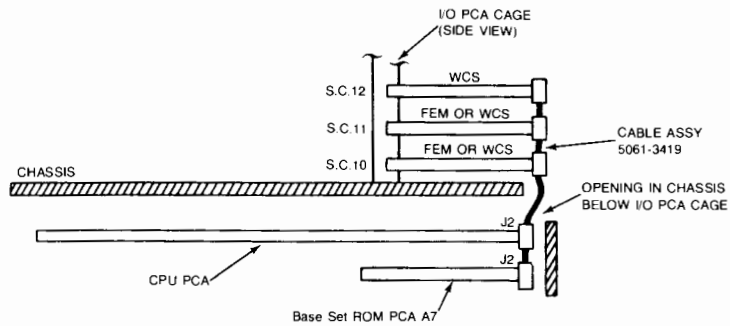
21MX-M SPECIAL REGISTER DISPLAY MODE POINTERS

REGISTER DESIRED	POINTER			
	15	14	3	0
X	1	0	0000	
Y	1	0	0001	
COUNTER	1	0	0010	
S3	1	0	0011	
S4	1	0	0100	
S5	1	0	0101	
S6	1	0	0110	
S7	1	0	0111	
S8	1	0	1000	
S9	1	0	1001	
S10	1	0	1010	
S11	1	0	1011	
S12	1	0	1100	
CIR	1	0	1101	
OVERFLOW	1	0	1110	
EXTEND	1	0	1111	
DMS MAPS	POINTER MAP REG. NO.			
	15	14	6	5 4 3 2 1 0
SYSTEM	1	1	0	0
USER	1	1	0	1
PORT A	1	1	1	0
PORT B	1	1	1	1

WCS AND FEM BOARD INSTALLATION DETAILS



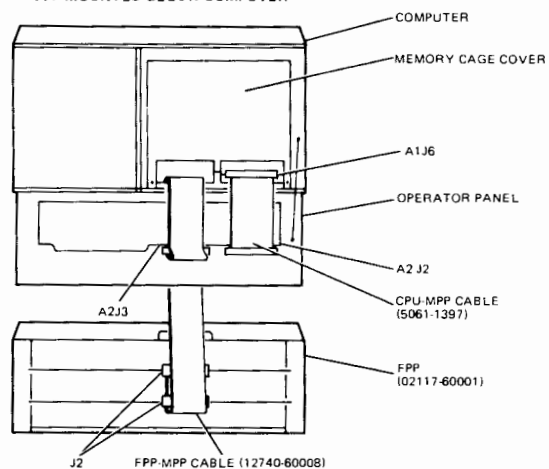
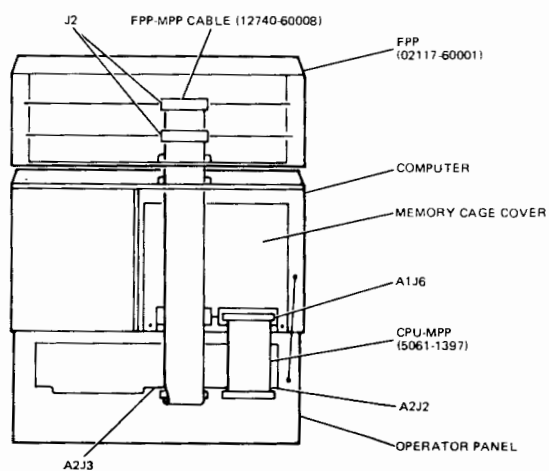
a. Installation Details (HP 1000 E/F-Series Computer)

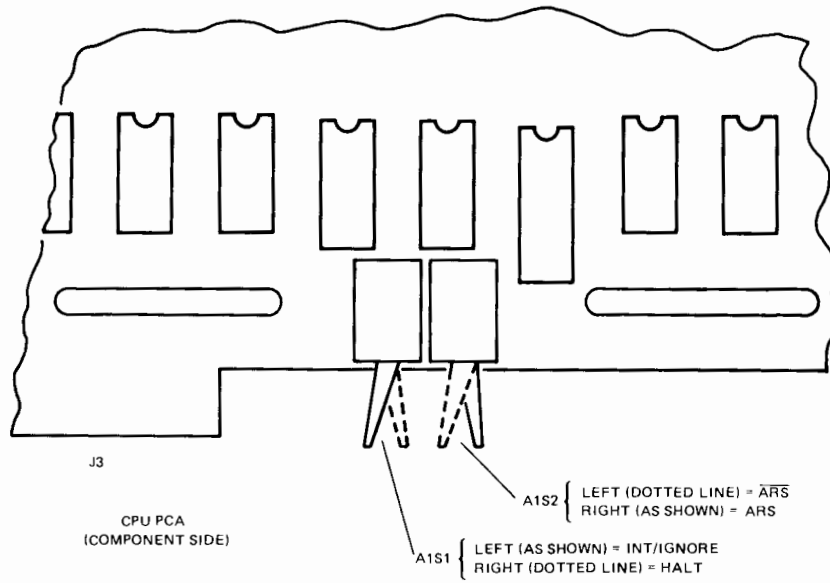
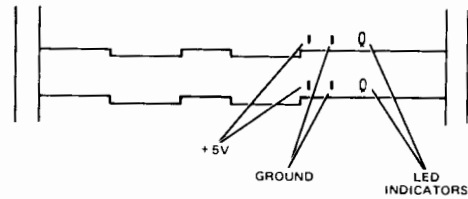


NOTES:

FEM → 12791A FIRMWARE EXPANSION MODULE
 FAB → 13304A FIRMWARE ACCESSORY BOARD
 WCS → 13197A WRITABLE CONTROL STORE

b. Installation Details (HP 1000 M-Series Computer)

F-SERIES FPP-MPP AND CPU-MPU CABLE CONNECTIONS**RECOMMENDED CONFIGURATION
FPP MOUNTED BELOW COMPUTER****FPP MOUNTED ABOVE COMPUTER**

F-SERIES INTERNAL SWITCH CONFIGURATION**F-SERIES FLOATING POINT PCA VOLTAGE TEST POINTS**

7700-178

- NOTES:
- Both LEDs lit verify that the DVM indicates +4.75 to +5.25 volts. If either LED is not lit the voltage is not within tolerance.
 - The Arithmetic and FPP controller PCA can be in either position.

21MX-E/F RPL CONFIGURATION SWITCHES

U173S1-S8

TYPICAL CONFIGURATION

FRONT COMPUTER TOP VIEW REAR

ACCESS TO LOADER ROMS

DECK BENEATH MEMORY PCA CAGE

ACCESS TO RPL CONFIGURATION SWITCHES

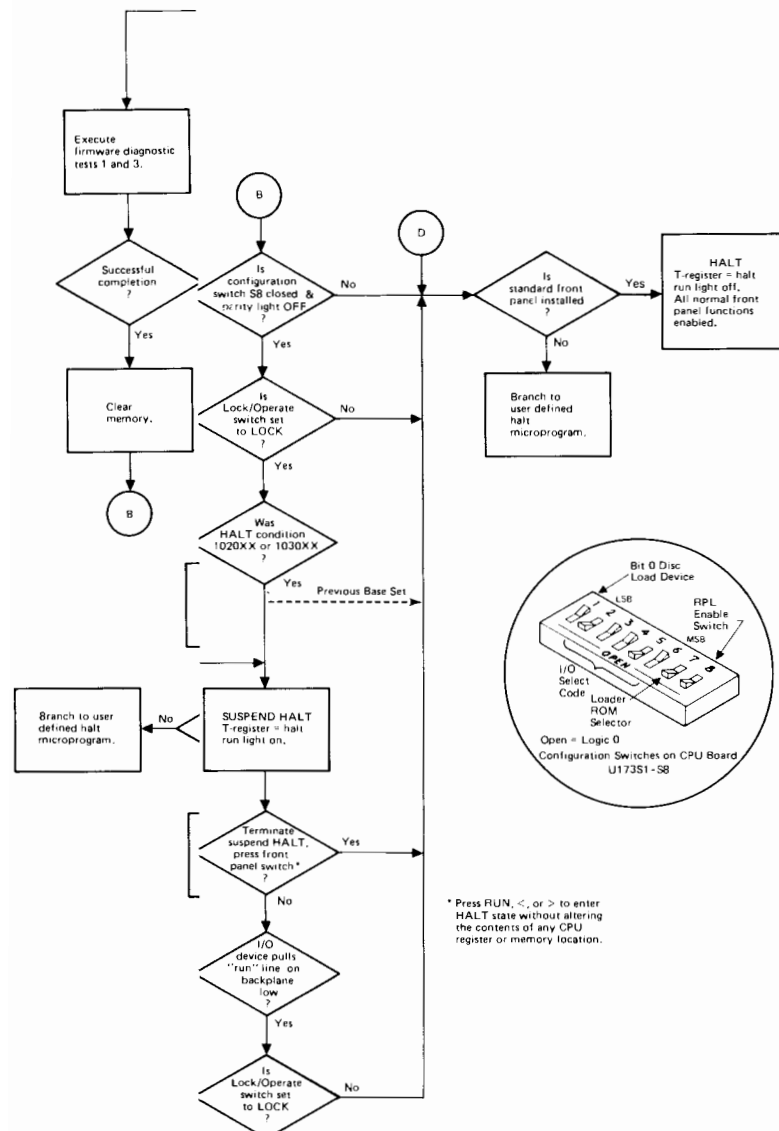
SWITCH	FUNCTION
U173S1	CHANNEL SELECT, 0 OR 1.
U173S2 (LSB) U173S3 U173S4 U173S5 U173S6 (MSB)	DECODES THE FIVE BIT OCTAL SELECT CODE OF THE INPUT DEVICE (S.C. 10-37). SWITCHES SHOWN SET TO SELECT CODE 11 ₈ (01001 ₂).
U173S7 U173S8	SELECTS ONE OF TWO LOADER ROMS, IF SWITCH S8 IS CLOSED. CLOSED POSITION (AS SHOWN) ENABLES REMOTE PROGRAM LOAD (RPL); OPEN POSITION SELECTS STANDARD FRONT PANEL (SFP).*

SWITCHES		RPL SELECTIONS
U173S8	U173S7	
0	0	RPL NOT ENABLED, SFP* CAPABILITY
0	1	RPL NOT ENABLED, SFP* CAPABILITY
1	0	RPL WITH STANDARD DISC LOADER, ROM 10
1	1	RPL WITH OPTIONAL LOADER, ROM 11

NOTE: OPEN POSITION = LOGIC 0
CLOSED POSITION = LOGIC 1

*STANDARD FRONT PANEL = SFP

7700-86A



7700 577

Remote Program Load Flowchart

31-7/31-8

PARITY ERROR TEST PFIND

Macro/1000 Version 2226

ASMB,A,B,L

THE PROGRAM 'PFIND' IS USED TO FIND THE PHYSICAL PAGE
NUMBER OF A PARITY ERROR AFTER A SYSTEM OR DIAGNOSTIC
PARITY HALT.

UPON SYSTEM OR DIAGNOSTIC PARITY ERROR HALT:

1. TEST 1ST 32K WITH THIS PROGRAM:

```

2 LDA 1,I 160001
3 INB      006004
4 JMP *-2 024002
5 HLT 5 102005

```

P=2, B=0, PRESET, RUN
IF PARITY ERROR OR HALT 5, B CONTAINS FAILING ADDRESS
IF NO ERROR, CONTINUE

2. LOAD PFIND WITH ABSOLUTE LOADER

3. P=100, PRESET, RUN, PROGRAM TESTS 1ST 32K AGAIN

HALT 77 OR PARITY ERROR:

-IF PARITY ERROR OR HALT 5, S REG CONTAINS
PHYSICAL PAGE NUMBER IN OCTAL
-IF HALT 77, PRESS RUN TO TEST NEXT 32K
DON'T HIT PRESET!

```

00005          ORG 5B
00005 102005    HLT 5      PUT HALT IN PARITY TRAP CELL

00100          ORG 100B

00100 006400    START CLB      MAKE PROGRAM REUSABLE, INITIALIZE STOR TO 0
00101 074000    STB STOR
00102 014135    JSB IMAP      INITIALIZE SYSTEM MAP
00103 060153    LDA ADDR      A REG CONTAINS ADDRESS OF BUFFER
00104 101710    SYA          LOAD SYSTEM MAP
00105 105734    SJP *-2      ENABLE SYSTEM MAP
00106 000107

00107 105745    LDX K        X REG IS 1K LOOP COUNTER
00110 000151
00111 002400    CLA
00112 102601    OTA 1B      CLEAR S REG, S CONTAINS PAGE NUMBER

00113 060153    LOOP1 LDA ADDR  A REG CONTAINS ADDRESS OF BUFFER
00114 101711    USA          LOAD USER MAP
00115 006400    CLB
00116 101724    LOOP2 XLA 1,I  CROSS LOAD A PER B INDIRECT
00117 100001

00120 105761    DSX          FINISHED THIS PAGE?
00121 024127    JMP INC      NO, KEEP GOING
00122 102501    LIA 1B      YES, INCREMENT PAGE NUMBER
00123 002004    INA
00124 102601    OTA 1B
00125 105745    LDX K        RE-INITIALIZE 1K LOOP COUNT
00126 000151

```

PARITY ERROR TEST PFIND (Cont'd)

```

00127 006004 INC      INB      INCREMENT MEMORY ADDRESS
00130 006021          SSB,RSS  FINISHED 32K SEGMENT?
00131 024116          JMP  LOOP2  NO,CONTINUE
00132 102077          HLT  77B   YES, GOOD HALT

```

PRESS RUN TO CHECK NEXT 32K SEGMENT, DON'T HIT PRESET

```

00133 014135          JSB  IMAP  LOAD USER MAP AGAIN
00134 024113          JMP  LOOP1  CHECK NEXT 32K

```

INIALIZE MAP SUBROUTINE

```

00135 000000 IMAP  NOP
00136 105755          LDY  U40   Y=COUNTER FOR THIS LOOP
00137 000152
00140 064153          LDB  ADDR  B REG CONTAINS ADDRESS OF BUFFER
00141 060000          LDA  STOR  GET BEGINING PAGE NO. FOR NEXT 32K
00142 170001 COPY  STA  1,I    STORE IN BUFFER
00143 002004          INA
00144 006004          INB      INCREMENT PAGE NUMBER
00145 105771          DSY      INCREMENT MAP NUMBER
00146 024142          JMP  COPY  DECREMENT LOOP COUNTER, SKIP IF 0
00147 070000          STA  STOR  NOT FINISHED
00150 124135          JMP  IMAP,I  SAVE LAST PAGE NUMBER AND RETURN
00151 002000 K      DEC  1024
00152 000000 STOR  EQU  0
00153 000040 U40   OCT  40
00154 000154 ADDR  DEF  BFFR
00154          BFFR  BSS  37B
END

```

NOTE: Due to a CPU timing problem, the E- and F-Series Fault Control Memory Controller may incorrectly indicate an error at power up. To verify correct operation of the Fault Control Memory Controller, the following CPU power on self-test must be executed from the front panel:

1. Set P=0
2. Set A=00000 (octal)
3. Press PRESET
4. Press INSTR/STEP

After the test is completed, all six LEDs on the Fault Control Memory Controller should be on (normal condition).

SEMICONDUCTOR MEMORY TEST

Manual: 24395-90001

Required Hardware:

- a. Minimum of 4K memory with a 21MX-M/E/F Computer.
- b. An absolute binary loading device.

NOTE

Messages are reported via various halt codes; therefore a terminal is not required.

Required Software:

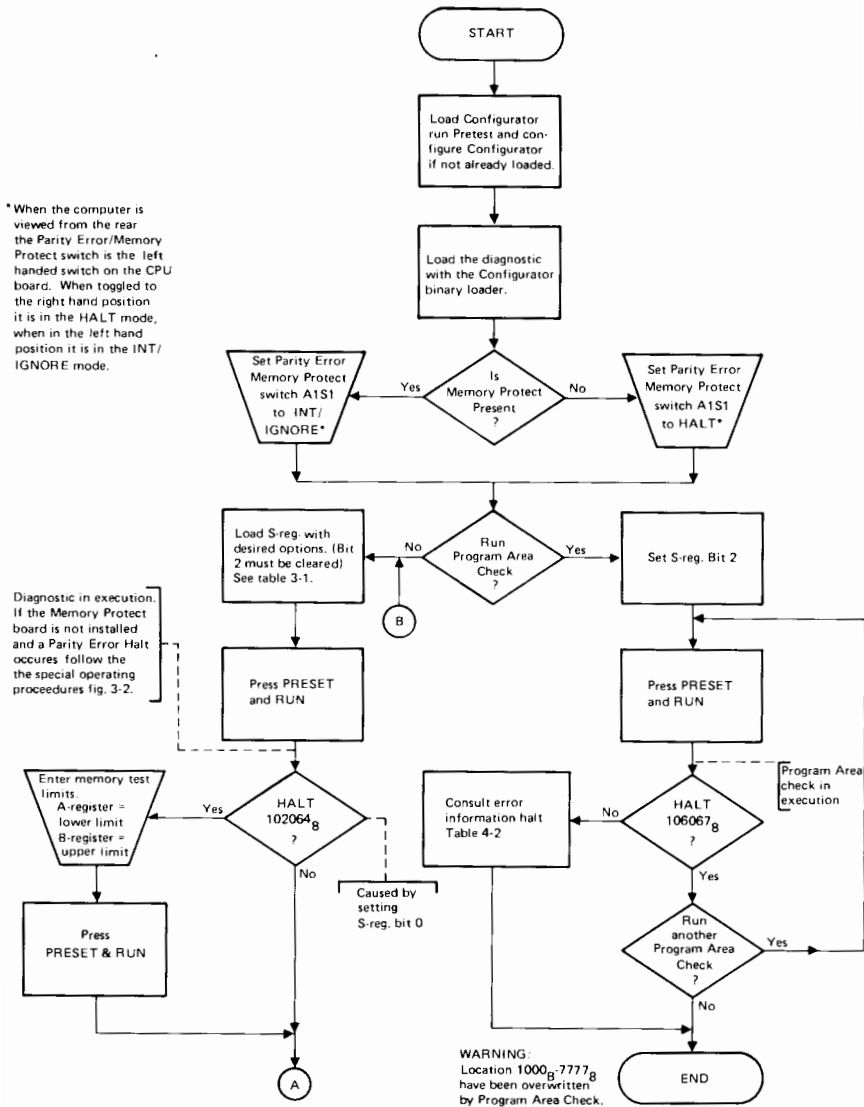
- a. Diagnostic Configurator p/n 24296-60001.
- b. Diagnostic for Semiconductor Memory
 - 24395-16001 Single file paper tape
 - 24396-12001 (1644 or later) multiple file paper tape
 - 24396-13301 (1901 or later) cartridge tape
 - 24396-14001 Mag tape

To execute, refer to flowchart.

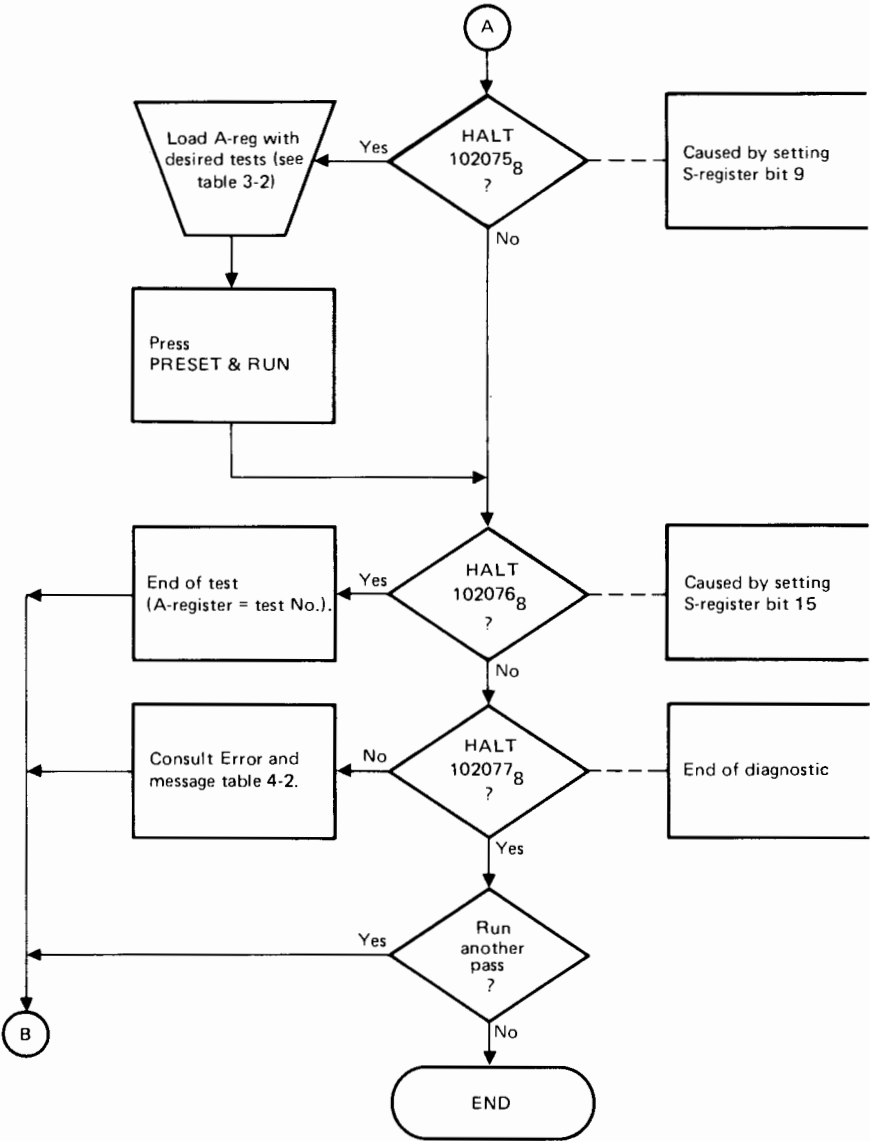


SEMICONDUCTOR MEMORY TEST FLOWCHART (1 of 2)

* When the computer is viewed from the rear, the Parity Error/Memory Protect switch is the left handed switch on the CPU board. When toggled to the right hand position it is in the HALT mode, when in the left hand position it is in the INT/IGNORE mode.

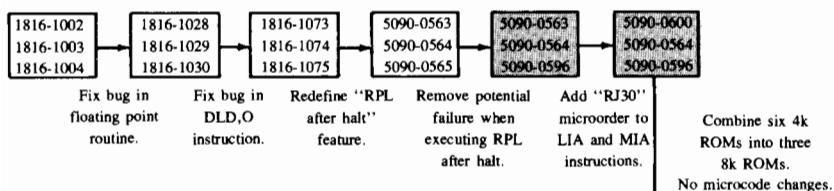


SEMICONDUCTOR MEMORY TEST FLOWCHART (2 of 2)

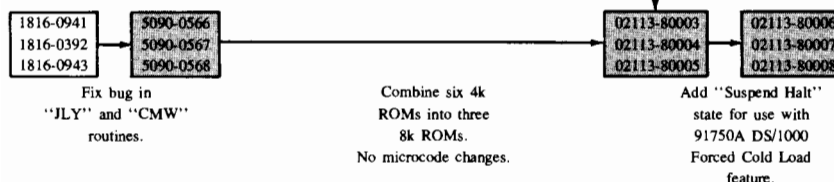


ROM PART NUMBER HISTORY (1 of 4)

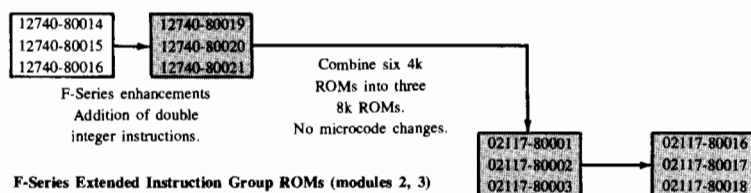
E-Series Base Set ROMs (modules 0, 1)



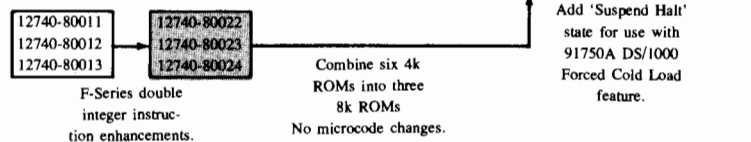
E-Series Extended Instruction Group ROMs (modules 2, 3)



F-Series Base Set ROMs (modules 0, 1)



F-Series Extended Instruction Group ROMs (modules 2, 3)



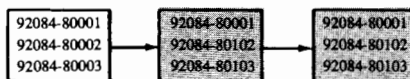
ROM PART NUMBER HISTORY (2 of 4)

E/F-Series RTE-6/VM Extended Memory Area/Virtual Memory Area ROMs (modules 36, 37)

92084-80004
92084-80005
92084-80006

Original Release

E/F-Series RTE-6/VM Operating System ROMs (E-Series modules 44, 45; F-Series modules 16, 17)



Original Release

E-Series Fast FORTRAN Processor ROMs (modules 33, 34, 35)

Module 33 ROMs (13306-80001 to 13306-80006, 1816-0944 to 1816-0946): Changed because PWR2 and MAP instructions did not restore A and B registers when interrupted.

Module 34 ROMs (13306-80011 to 13306-80006, 1816-0944 to 1816-0946): Changed to remove a microcode rule violation and speed up some routines.

Module 35 ROMs (13306-80001 to 13306-80006, 5090-0569 to 5090-0571): Changed to make FFP compatible with F-Series computers. Addition of CFER routine.

FFP ROMs (13306-80011 to 13306-80018, 5090-0589 to 5090-0591): Combination of 1k DMI and 1k FFP ROMs into 4k ROMs. No microcode changes.

E-Series Dynamic Mapping Instructions (module 32)

Module 32 ROMs (13307-80001 to 13307-80006, 13307-80011 to 13307-80016, 13307-80021 to 13307-80026): Changed because interrupts were not held off correctly for certain instructions.

Module 32 ROMs (13307-80011 to 13307-80016, 13307-80021 to 13307-80026): Changed to provide RTE-IV compatibility. XLA/B and XCA/B instructions did not function correctly using the A or B register as an operand.

DMT ROMs (13307-80027 to 13307-80032): Remove potential loss of data when executing MBL, MWW, and MBF instructions during DMA freezes and transfers.

DMT ROMs (13307-80033 to 13307-80035, 5090-0589 to 5090-0591): Combination of 1k DMT and 1k FFP ROMs into 4k ROMs. No microcode changes.

Diagram illustrating the combination of DMI and FFP into 8k ROMs for the F-Series Dynamic Mapping Instructions (module 32).

Left Column (Instruction Ranges):

- 13306-80013
- 13306-80014
- 13306-80015
- 13306-80016
- 13306-80017
- 13306-80018
- 5090-0589
- 5090-0590
- 5090-0591

Right Column (Instruction Ranges):

- 5090-1615
- 5090-1616
- 5090-1617
- 5090-1618
- 5090-1619
- 5090-1620
- 5090-1621
- 5090-1622
- 5090-1623

Bottom Left (Instruction Range):

- 13307-80027 to 13307-80032

Bottom Right (Instruction Range):

- 5180-0141
- 5180-0142
- 5180-0143

Annotations:

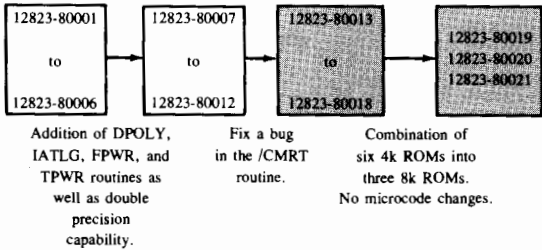
- Combination of DMI and FFP into 8k ROMs. No microcode changes.
- Combination of DMI and FFP into 8k ROMs. No microcode changes.

F-Series Dynamic Mapping Instructions (module 32)

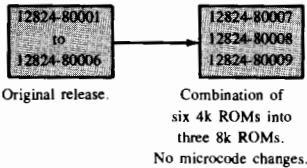
Original Release

ROM PART NUMBER HISTORY (4 of 4)

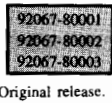
F-Series Scientific Instruction Set ROMs (modules 40, 41, 42, 43)



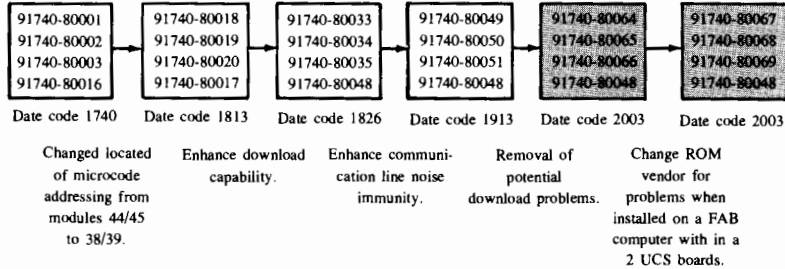
F-Series Vector Instruction Set ROMs (modules 12, 13, 14, 15)



E/F-Series RTE-IVA/B Extended Memory Area ROMs (modules 36, 37)



E/F-Series DS/1000 ROMs (modules 38, 39)



13304A FAB ROM LOCATIONS

Table 1. ROM Location for Block A

4-BIT SET	ROM PACKAGE LOCATION	
	LEAST SIGNIFICANT MODULE (LSM)	MOST SIGNIFICANT MODULE (MSM)
23-20 MSB	A6 (XU606)	A12 (XU806)
19-16	A5 (XU607)	A11 (XU807)
15-12	A4 (XU606)	A10 (XU806)
11-8	A3 (XU604)	A9 (XU804)
7-4	A2 (XU603)	A8 (XU803)
3-0 LSB	A1 (XU602)	A7 (XU802)

Notes:

- Locations A1-A6 are selected first (the lower 1/4K configuration).
- Locations A7-A12 are selected last (the upper 1/4K configuration).
- See figure for ROM locations.

Table 2. ROM Location for Blocks B, C, and D

8-BIT SET	ROM PACKAGE LOCATION	
	LEAST SIGNIFICANT MODULE PAIR (LSMP)	MOST SIGNIFICANT MODULE PAIR (MSMP)
23-16 MSB	B3 (XU404) C3 (XU204) D3 (XU104)	B6 (XU409) C6 (XU209) D6 (XU109)
15-8	B2 (XU402) C2 (XU202) D2 (XU102)	B5 (XU408) C5 (XU208) D5 (XU108)
7-0 LSB	B1 (XU401) C1 (XU201) D1 (XU101)	B4 (XU406) C4 (XU206) D4 (XU106)

Notes:

- Locations suffixed 1, 2, and 3 are selected first (the lower 1/2K configuration).
- Locations suffixed 4, 5, and 6 are selected last (the upper 1/2K configuration).
- See figure for ROM locations.

13304A FAB ROM LOCATIONS (Cont'd)

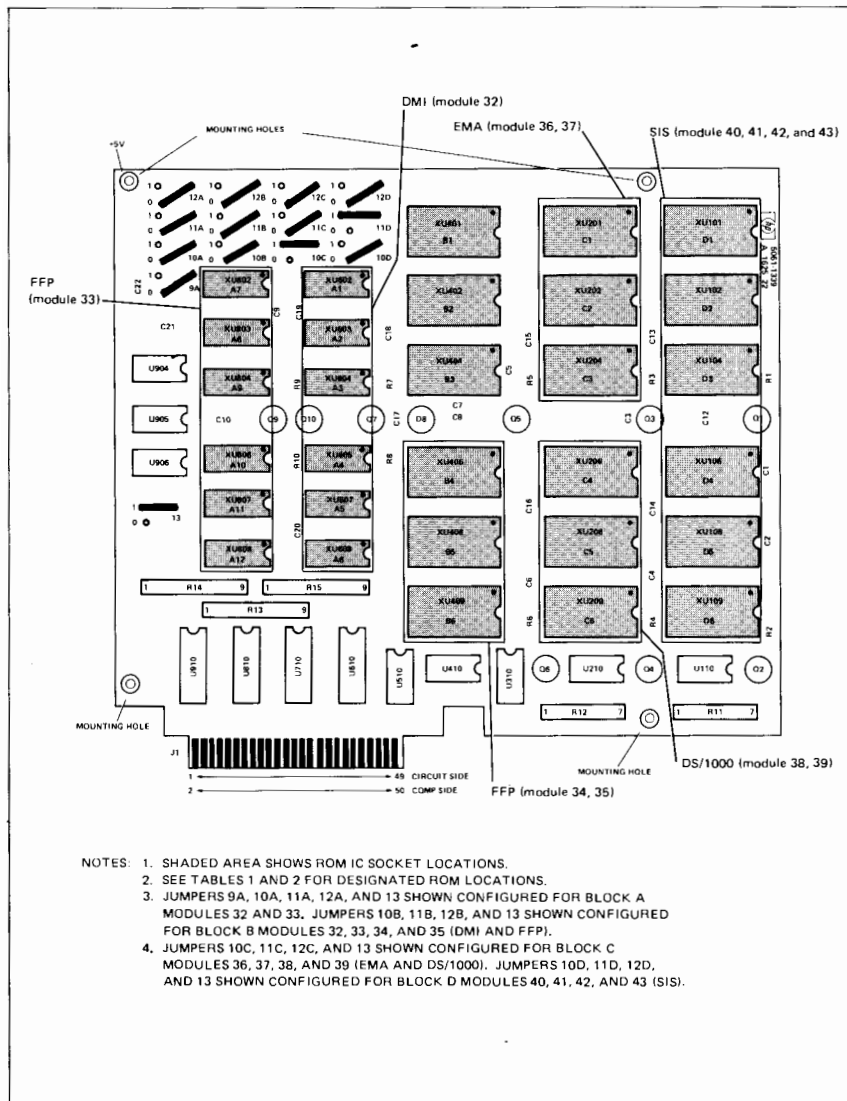
FAB Jumper Configurations

MODULE NO.	ADDRESSES		JUMPER PREFIX				UPPER/ LOWER 8K JUMPER
	DECIMAL	OCTAL	NOTE 1 9	10	11	12	
0	0.00255	00000-00377	0				
1	00256-00511	00400-00777	0				
2	00512-00767	01000-01377	1	0	0	0	0
3	00768-01023	01400-01777	1				
4	01024-01279	02000-02377	0				
5	01280-01535	02400-02777	0	1	0	0	0
6	01536-01791	03000-03377	1				
7	01792-02047	03400-03777	1				
8	02048-02303	04000-04377	0				
9	02304-02559	04400-04777	0				
10	02560-02815	05000-05377	1	0	1	0	0
11	02816-03071	05400-05777	1				
12	03072-03327	06000-06377	0				
13	03328-03583	06400-06777	0				
14	03584-03849	07000-07377	1	1	1	0	0
15	03850-04095	07400-07777	1				
16	04096-04351	10000-10377	0				
17	04352-04607	10400-10777	0				
18	04608-04863	11000-11377	1	0	0	1	0
19	04864-05119	11400-11777	1				
20	05120-05375	12000-12377	0				
21	05376-05631	12400-12777	0				
22	05632-05887	13000-13377	1	1	0	1	0
23	05888-06143	13400-13777	1				
24	06144-06399	14000-14377	0				
25	06400-06655	14400-14777	0				
26	06656-06911	15000-15377	1	0	1	1	0
27	06912-07167	15400-15777	1				
28	07168-07423	16000-16377	0				
29	07424-07679	16400-16777	0				
30	07680-07935	17000-17377	1	1	1	1	0
31	07936-08191	17400-17777	1				
32	08192-08447	20000-20377	0				
33	08448-08703	20400-20777	0				
34	08704-08959	21000-21377	1	0	0	0	1
35	08960-09215	21400-21777	1				
36	09216-09571	22000-22377	0				
37	09572-09727	22400-22777	0				
38	09728-09983	23000-23377	1	1	0	0	1
39	09984-10239	23400-23777	1				
40	10240-10495	24000-24377	0				
41	10496-10751	24400-24777	0				
42	10752-10917	25000-25377	1	0	1	0	1
43	10918-11263	25400-25777	1				
44	11264-11519	26000-26377	0				
45	11520-11775	26400-26777	0				
46	11776-12031	27000-27377	1	1	1	0	1
47	12032-12287	27400-27777	1				
48	12288-12543	30000-30377	0				
49	12544-12799	30400-30777	0				
50	12800-13055	31000-31377	1	0	0	1	1
51	13056-13311	31400-31777	1				
52	13312-13567	32000-32377	0				
53	13568-13823	32400-32777	0				
54	13824-14079	33000-33377	1	1	0	1	1
55	14080-14335	33400-33777	1				
56	14336-14591	34000-34377	0				
57	14592-14847	34400-34777	0				
58	14848-15103	35000-35377	1	0	1	1	1
59	15104-15359	35400-35777	1				
60	15360-15615	36000-36377	0				
61	15616-15871	36400-36777	0				
62	15872-16127	37000-37377	1	1	1	1	1
63	16128-16383	37400-37777	1				

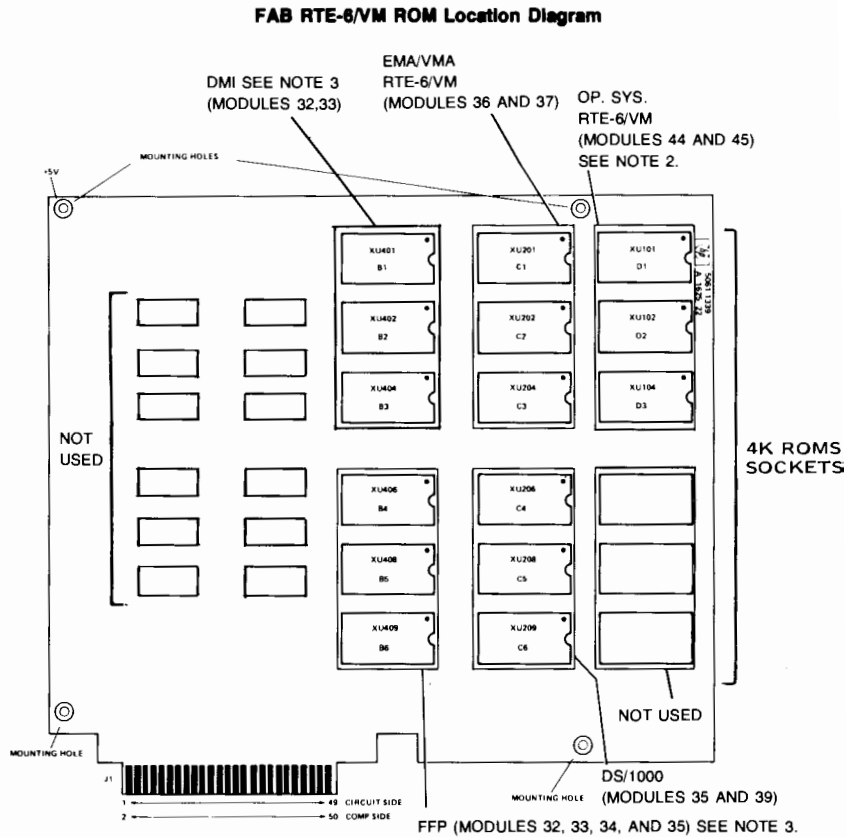
1. Jumper 9 applies to block A only.
2. Jumper 13 selects upper or lower 8K of control store.
3. See figure for jumper locations.

13304A FAB ROM LOCATIONS (Cont'd)

FAB RTE-IVB ROM Location Diagram



13304A FAB ROM LOCATIONS (Cont'd)



NOTES:

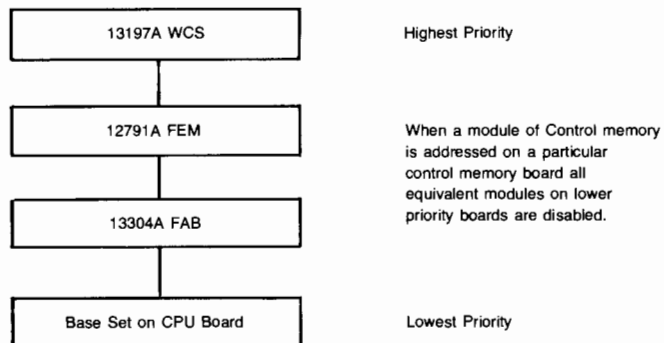
1. For RTE-IVB EMA and RTE-6/VM EMA/VMA in the same CPU, install these ROMs on the FEM.
2. E-Series ROMs are shown. F-Series ROMs use modules 16, 17, 36, 37.
3. Also modules 33 if there are no FFP ROMs.

12791A FIRMWARE EXPANSION MODULE (FEM)**SPECIFICATIONS**

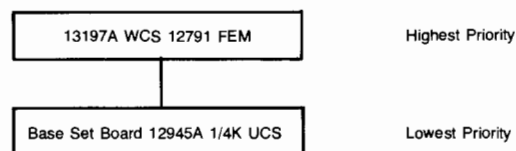
Equipment: 12791-60001 Firmware Expansion Module Assy.
 5061-3419 Ribbon Cable Assy.

Power Requirements: Worst case (fully loaded)
 5.0V 5.4A

In an E/F-Series Computer the priority is as follows:



In a M-Series Computer the priority is as follows:



NOTE: A red LED mounted on the FEM will be lit whenever the control memory located on the FEM is addressed.

12791A FIRMWARE EXPANSION MODULE (FEM) (Cont'd)

FEM ADDRESS SWITCH SETTINGS

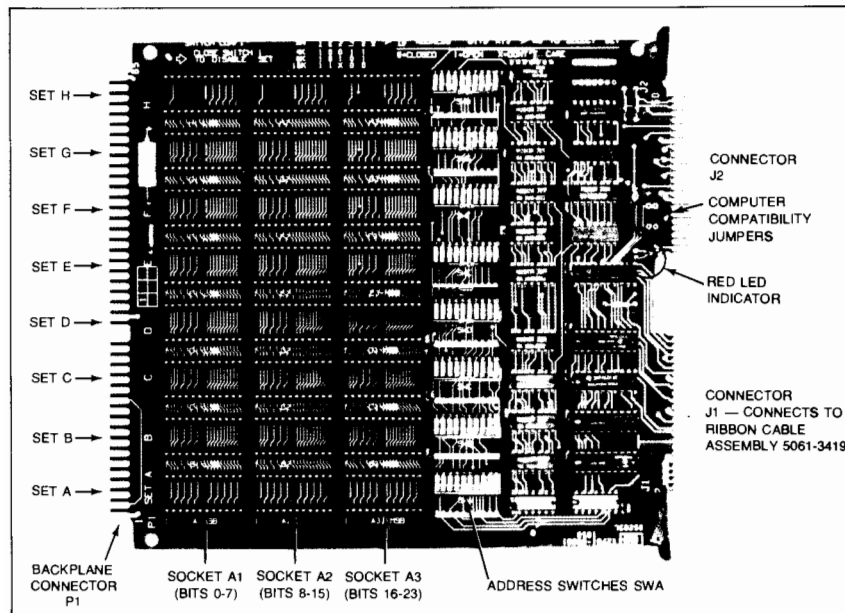
MODULE NO.	ADDRESSES		4K ROMS										8K ROMS									
	DECIMAL	OCTAL	SWITCHES										SWITCHES									
0	0-00255	00000-00377	1	0	0	1	1	0	0	0	0	0										
1	00256-00511	00400-00777											1	0	1	0	1	0	0	0	0	X
2	00512-00767	01000-01377	1	0	0	1	1	0	0	0	0	1										
3	00768-01023	01400-01777											1	0	1	0	1	0	0	0	0	X
4	01024-01279	02000-02377	1	0	0	1	1	0	0	0	1	0										
5	01280-01535	02400-02777											1	0	1	0	1	0	0	0	1	X
6	01536-01791	03000-03377	1	0	0	1	1	0	0	0	1	1										
7	01792-02047	03400-03777											1	0	1	0	1	0	0	0	1	X
8	02048-02303	04000-04377	1	0	0	1	1	0	0	1	0	0										
9	02304-02559	04400-04777											1	0	1	0	1	0	0	1	0	X
10	02560-02815	05000-05377	1	0	0	1	1	0	0	1	0	1										
11	02816-03071	05400-05777											1	0	1	0	1	0	0	1	0	X
12	03072-03327	06000-06377	1	0	0	1	1	0	0	1	1	0										
13	03328-03583	06400-06777											1	0	1	0	1	0	0	1	1	X
14	03584-03839	07000-07377	1	0	0	1	1	0	0	1	1	1										
15	03840-04095	07400-07777											1	0	1	0	1	0	0	1	1	X
16	04096-04351	08000-08377	1	0	0	1	1	0	1	0	0	0										
17	04352-04607	08400-08777											1	0	1	0	1	0	1	0	0	X
18	04608-04863	09000-09377	1	0	0	1	1	0	1	0	0	1										
19	04864-05119	09400-09777											1	0	1	0	1	0	1	0	0	X
20	05120-05375	10000-10377	1	0	0	1	1	0	1	0	1	0										
21	05376-05631	10400-10777											1	0	1	0	1	0	1	0	1	X
22	05632-05887	11000-11377	1	0	0	1	1	0	1	0	1	1										
23	05888-06143	11400-11777											1	0	1	0	1	0	1	0	1	X
24	06144-06399	12000-12377	1	0	0	1	1	0	1	1	0	0										
25	06400-06655	12400-12777											1	0	1	0	1	0	1	1	0	X
26	06656-06911	13000-13377	1	0	0	1	1	0	1	1	0	1										
27	06912-07167	13400-13777											1	0	1	0	1	0	1	1	0	X
28	07168-07423	14000-14377	1	0	0	1	1	0	1	1	1	0										
29	07424-07679	14400-14777											1	0	1	0	1	0	1	1	1	X
30	07680-07935	15000-15377	1	0	0	1	1	0	1	1	1	1										
31	07936-08191	15400-15777											1	0	1	0	1	0	1	1	1	X
32	08192-08447	16000-16377	1	0	0	1	1	1	0	0	0	0										
33	08448-08703	16400-16777											1	0	1	0	1	1	0	0	0	X
34	08704-08959	17000-17377	1	0	0	1	1	1	0	0	0	1										
35	08960-09215	17400-17777											1	0	1	0	1	1	0	0	0	X
36	09216-09471	18000-18377	1	0	0	1	1	1	0	0	1	0										
37	09472-09727	18400-18777											1	0	1	0	1	1	0	0	1	X
38	09728-09983	19000-19377	1	0	0	1	1	1	0	0	1	1										
39	09984-10239	19400-19777											1	0	1	0	1	1	0	0	1	X
40	10240-10495	20000-20377	1	0	0	1	1	1	0	1	0	0										
41	10496-10751	20400-20777											1	0	1	0	1	1	0	1	0	X
42	10752-10917	21000-21377	1	0	0	1	1	1	0	1	0	1										
43	10918-11263	21400-21777											1	0	1	0	1	1	0	1	0	X
44	11264-11519	22000-22377	1	0	0	1	1	1	0	1	1	0										
45	11520-11775	22400-22777											1	0	1	0	1	1	0	1	1	X
46	11776-12031	23000-23377	1	0	0	1	1	1	0	1	1	1										
47	12032-12287	23400-23777											1	0	1	0	1	1	0	1	1	X
48	12288-12543	24000-24377	1	0	0	1	1	1	1	0	0	0										
49	12544-12799	24400-24777											1	0	1	0	1	1	1	0	0	X
50	12800-13055	25000-25377	1	0	0	1	1	1	1	0	0	1										
51	13056-13311	25400-25777											1	0	1	0	1	1	1	0	0	X
52	13312-13567	26000-26377	1	0	0	1	1	1	1	0	1	0										
53	13568-13823	26400-26777											1	0	1	0	1	1	1	0	1	X
54	13824-14079	27000-27377	1	0	0	1	1	1	1	0	1	1										
55	14080-14335	27400-27777											1	0	1	0	1	1	1	1	0	X
56	14336-14591	28000-28377	1	0	0	1	1	1	1	1	0	0										
57	14592-14847	28400-28777											1	0	1	0	1	1	1	1	0	X
58	14848-15103	29000-29377	1	0	0	1	1	1	1	1	0	1										
59	15104-15359	29400-29777											1	0	1	0	1	1	1	1	1	X
60	15360-15615	30000-30377	1	0	0	1	1	1	1	1	1	0										
61	15616-15871	30400-30777											1	0	1	0	1	1	1	1	1	X
62	15872-16127	31000-31377	1	0	0	1	1	1	1	1	1	1										
63	16128-16383	31400-31777											1	0	1	0	1	1	1	1	1	X

1 0 = CLOSED 1 = OPEN X = DON'T CARE
CLOSED AND OPEN REFER TO THE SETTINGS ON THE DIP ROCKER SWITCHES

2 ALL UNUSED SETS MUST BE DISABLED BY SETTING S1 CLOSED

12791A FIRMWARE EXPANSION MODULE (FEM) (Cont'd)

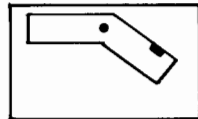
FEM SWITCH AND JUMPER LOCATIONS



NOTE: Install the FEM in slot 10 if no WCS is present, otherwise install the FEM in slot 11.

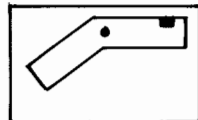
SWITCH SENSE

OPEN



CLOSED "0"

OPEN



OPEN "1"

13047A USER CONTROL STORE (UCS)

SPECIFICATIONS

Equipment:	13047-60001	User Control Store Board
	5061-3419	Ribbon Cable Assy
No.of IC Socket:	48 IC sockets to accommodate 8 modules of control store	
Power Requirement:	+5V	1.15A + 0.78A (for each additional module of control store)
Jumper Configuration:	W1	always in
	W2	out HP 1000 M-Series in HP 1000 E-Series

Note
If no WCS PCA is present, install UCS board in slot 10.
If one WCS PCA is present, install UCS in slot 11. If two
WCS PCA's are present, install UCS board in slot 12.

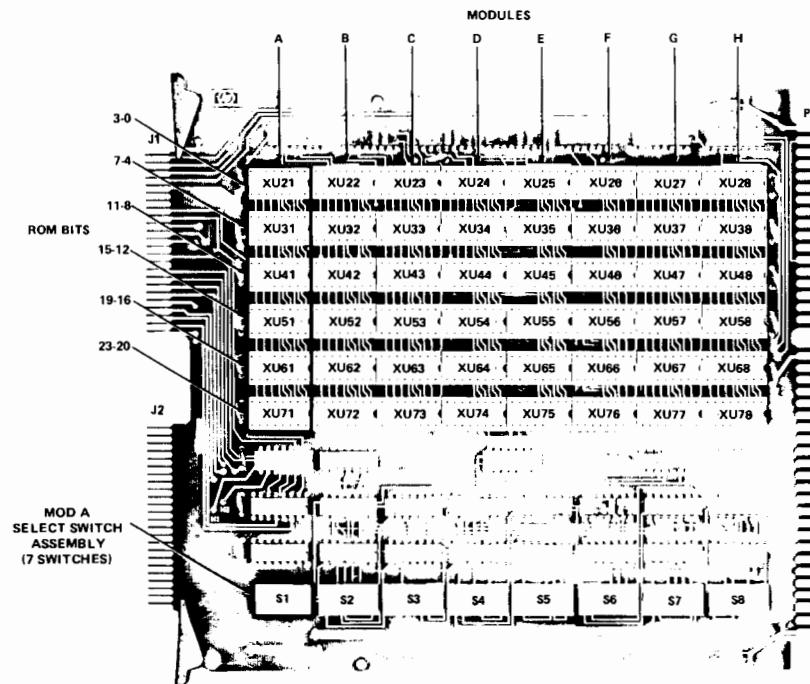
13047A USER CONTROL STORE (UCS) (Cont'd)

UCS MODULE SELECT SWITCH SETTINGS

7	6	5	4	3	2	1	MODULE NO.
2 ⁴	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	
0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	1
0	0	0	0	0	1	0	2
0	0	0	0	0	1	1	3
0	0	0	0	1	0	0	4
0	0	0	0	1	0	1	5
0	0	0	0	1	1	0	6
0	0	0	0	1	1	1	7
0	0	0	1	0	0	0	8
0	0	0	1	0	0	1	9
0	0	0	1	0	1	0	10
0	0	0	1	0	1	1	11
0	0	0	1	1	0	0	12
0	0	0	1	1	0	1	13
0	0	0	1	1	1	0	14
0	0	0	1	1	1	1	15
*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*
1	1	1	1	1	1	1	63

Open switch = logic 0
CLOSED switch = logic 1

UCS ROM & SWITCH LOCATIONS



E/F-SERIES DYNAMIC MAPPING INSTRUCTIONS**EQUIPMENT**

13304A Firmware Accessory Board
 or
 13047A User Control Store Board
 13307-80027
 thru 1K ROM IC (bits 0-23)
 13307-80032

Note: Later versions are combined with FFP firmware.

FAB ROM Locations — Old Version

LOCATION	ROM IC	BITS	MODULE NO.
A1 (XU602)	13307-80027	3-0	} 32
A2 (XU603)	13307-80028	7-4	
A3 (XU604)	13307-80029	11-8	
A4 (XU606)	13307-80030	15-12	
A5 (XU607)	13307-80031	19-16	
A6 (XU608)	13307-80032	23-20	

JUMPER**SETTING**

9A	0
10A	0
11A	0
12A	0
13	1

FAB ROM Locations — New Version

LOCATION	ROM IC	BITS	MODULE NO.
B1	13307-80033	7-0	32, 33
B2	13307-80034	15-8	
B3	13307-80035	23-16	

JUMPER**SETTING**

10B	0
11B	0
12B	0
13	1

Note: If an UCS Board is used install the 6 ROMs into any vacant set of sockets and configure the switches for module 32.

DMI TEST AND VERIFICATION

The DMI chips can be 'quick tested' by executing a 101701 or 105701 opcode. If the chips are in place, P will increment and the A-register (101701) will complement into 076076, and the B-register contents will likewise be complemented for the 105701 opcode. Note that this is not a test of DMI capability, only their presence and strapping is correct.

Verify the DMI by running the following diagnostics:

DIAGNOSTIC	MANUAL	ABSOLUTE BINARY NO.
Memory Protect- Parity Error Test	12892-90005	12892-16001
Memory Expansion Module Test	12929-90003	12929-16001

E-SERIES BASE INSTRUCTION SET AND EIG/FPP

EQUIPMENT

5090-0600
5090-0564 4K ROMs Base Set/FP
5090-0596

5090-0566
5090-0567 4K ROMs Extended Instruction Group
5090-0568
 or
02113-80006
02113-80007 8K ROMs BS/EIG/FP
02113-80008

E-Series CPU 2109A or 2113A
 or
12791A FEM

F-SERIES BASE INSTRUCTION SET AND EIG/FPP

EQUIPMENT

12740-80019
12740-80020 4K ROMs Base Set/FP
12740-80021

12740-80022
12740-80023 4K ROMs Extended Instruction Group
12740-80024
 or
02117-80016
02117-80017 8K ROMs BS/EIG/FP
02117-80018

F-Series CPU 2111F or 2113F
 or
12791A FEM

BASE SET/EIG FL. PT. INSTALLATION ON CPU BOARD

4K ROMs		8K ROMs	
ROM P/N	MODULES	ROM P/N	MODULES
<u>E-SERIES</u>			
5090-0600 (U21)	0,1	02113-80006 (U23)	0,1,2,3
5090-0564 (U41)	0,1	02113-80007 (U43)	0,1,2,3
5090-0596 (U81)	0,1	02113-80008 (U83)	0,1,2,3
5090-0566 (U23)	2,3	VACANT (U21)	
5090-0567 (U43)	2,3	VACANT (U41)	
5090-0568 (U83)	2,3	VACANT (U81)	
<u>F-SERIES</u>			
12740-80019 (U21)	0,1,2,3	02117-80001 (U23)	0,1,2,3
12740-80020 (U41)	0,1,2,3	02117-80002 (U43)	0,1,2,3
12740-80021 (U81)	0,1,2,3	02117-80003 (U83)	0,1,2,3
12740-80022 (U23)	0,1,2,3	VACANT (U21)	
12740-80023 (U43)	0,1,2,3	VACANT (U41)	
12740-80024 (U83)	0,1,2,3	VACANT (U81)	

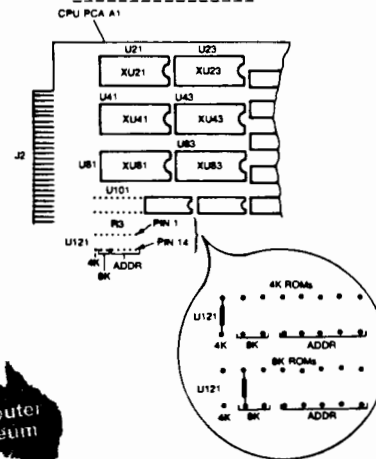
CPU BOARD JUMPERING

The CPU board must be jumpered for 4K or 8K ROMs. The silk screen indicating the 8K ROM jumpers is in error. Only the one shown below must be installed. DO NOT INSTALL THE 2ND 8K JUMPER.

COMPATIBILITY

	4K	8K
REV A/B	YES	NO
REV C/D	YES	YES

JUMPER LOCATIONS



E-SERIES CONTROL MEMORY MAP

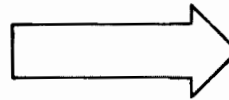
CONTROL MEMORY MODULE ALLOCATION	MODULE NO.	ADDRESS		SOFTWARE ENTRY POINT	
		DECIMAL	OCTAL		
HP BASE SET	0	0-002551	00000-00377	YES	1K
	1	00256-00511	00400-00777	YES	
	2	00512-00767	01000-01377	YES	
	3	00768-01023	01400-01777	YES	
	4	01024-01279	02000-02377	NO	2K
	5	01280-01535	02400-02777	NO	
	6	01536-01761	03000-03377	NO	
	7	01762-02047	03400-03777	NO	
	8	02048-02303	04000-04377	NO	3K
	9	02304-02559	04400-04777	NO	
	10	02560-02815	05000-05377	NO	
	11	02816-03071	05400-05777	NO	
	12	03072-03327	06000-06377	NO	4K
	13	03328-03583	06400-06777	NO	
	14	03584-03849	07000-07377	NO	
	15	03850-04095	07400-07777	NO	
AVAILABLE FOR USER MICROPROGRAMMING	16	04096-04351	10000-10377	NO	5K
	17	04352-04607	10400-10777	NO	
	18	04608-04863	11000-11377	NO	
	19	04864-05119	11400-11777	NO	
	20	05120-05375	12000-12377	NO	6K
	21	05376-05631	12400-12777	NO	
	22	05632-05887	13000-13377	NO	
	23	05888-06143	13400-13777	NO	
	24	06144-06399	14000-14377	NO	7K
	25	06400-06655	14400-14777	NO	
	26	06656-06911	15000-15377	NO	
	27	06912-07167	15400-15777	NO	
HP DYNAMIC MAPPING SYSTEM	28	07168-07423	16000-16377	NO	8K
	29	07424-07679	16400-16777	NO	
	30	07680-07935	17000-17377	NO	
	31	07936-08191	17400-17777	NO	
HP FAST FORTRAN PROCESSOR	32	08192-08447	20000-20377	YES	9K
	33	08448-08703	20400-20777	NO	
	34	08704-08959	21000-21377	YES	
	35	08960-09215	21400-21777	YES	
RTE-IV EMA OR RTE-6/VM EMA/VMA DS/1000	36	09216-09571	22000-22377	YES	10K
	37	09572-09727	22400-22777	YES	
	38	09728-09983	23000-23377	YES	
	39	09984-10239	23400-23777	YES	
HP RESERVED	40	10240-10495	24000-24377	YES	11K
	41	10496-10751	24400-24777	NO	
	42	10752-10917	25000-25377	NO	
	43	10918-11263	25400-25777	NO	
RTE-6/VM OPERATING SYSTEM	44	11264-11519	26000-26377	YES	12K
	45	11520-11775	26400-26777	YES	
	46	11776-12031	27000-27377	YES	
	47	12032-12287	27400-27777	YES	
	48	12288-12543	30000-30377	YES	13K
	49	12544-12799	30400-30777	YES	
	50	12800-13055	31000-31377	YES	
	51	13056-13311	31400-31777	NO	
RECOMMENDED FOR USER MICROPROGRAMMING	52	13312-13557	32000-32377	NO	14K
	53	13558-13823	32400-32777	NO	
	54	13824-14079	33000-33377	NO	
	55	14080-14335	33400-33777	NO	
	56	14336-14591	34000-34377	YES	15K
	57	14592-14847	34400-34777	YES	
	58	14848-15103	35000-35377	YES	
	59	15104-15359	35400-35777	YES	
	60	15360-15615	36000-36377	YES	16K
	61	15616-15871	36400-36777	NO	
	62	15872-16127	37000-37377	YES	
	63	16128-16383	37400-37777	NO	

F-SERIES CONTROL MEMORY MAP

CONTROL MEMORY MODULE ALLOCATION	MODULE NO.	ADDRESS		SOFTWARE ENTRY POINT
		DECIMAL	OCTAL	
HP BASE SET	0	0-002551	00000-00377	YES
	1	00256-00511	00400-00777	YES
	2	00512-00767	01000-01377	YES
	3	00768-01023	01400-01777	YES
HP RESERVED	4	01024-01279	02000-02377	YES
	5	01280-01535	02400-02777	NO
	6	01536-01761	03000-03377	NO
	7	01762-02047	03400-03777	NO
HP RESERVED	8	02048-02303	04000-04377	YES
	9	02304-02559	04400-04777	NO
	10	02560-02815	05000-05377	NO
	11	02816-03071	05400-05777	NO
VECTOR INSTRUCTION SET	12	03072-03327	06000-06377	YES
	13	03328-03583	06400-06777	NO
	14	03584-03849	07000-07377	NO
	15	03850-04095	07400-07777	NO
RTE-6/VM OPERATING SYSTEM	16	04096-04351	10000-10377	YES
	17	04352-04607	10400-10777	NO
	18	04608-04863	11000-11377	YES
	19	04864-05119	11400-11777	NO
HP RESERVED	20	05120-05375	12000-12377	YES
	21	05376-05631	12400-12777	NO
	22	05632-05887	13000-13377	NO
	23	05888-06143	13400-13777	NO
HP RESERVED	24	06144-06399	14000-14377	NO
	25	06400-06655	14400-14777	NO
	26	06656-06911	15000-15377	NO
	27	06912-07167	15400-15777	NO
AVAILABLE FOR USER MICROPROGRAMMING	28	07168-07423	16000-16377	NO
	29	07424-07679	16400-16777	NO
	30	07680-07935	17000-17377	NO
	31	07936-08191	17400-17777	NO
HP DYNAMIC MAPPING SYSTEM HP FAST FORTRAN PROCESSOR	32	08192-08447	20000-20377	YES
	33	08448-08703	20400-20777	NO
	34	08704-08959	21000-21377	YES
	35	08960-09215	21400-21777	YES
RTE-IV EMA OR RTE-6/VM EMA/VMA DS/1000	36	09216-09571	22000-22377	YES
	37	09572-09727	22400-22777	NO
	38	09728-09983	23000-23377	YES
	39	09984-10239	23400-23777	NO
SCIENTIFIC INSTRUCTION SET	40	10240-10495	24000-24377	YES
	41	10496-10751	24400-24777	NO
	42	10752-10917	25000-25377	NO
	43	10918-11263	25400-25777	NO
HP RESERVED	44	11264-11519	26000-26377	NO
	45	11520-11775	26400-26777	NO
	46	11776-12031	27000-27377	YES
	47	12032-12287	27400-27777	YES
HP RESERVED	48	12288-12543	30000-30377	YES
	49	12544-12799	30400-30777	YES
	50	12800-13055	31000-31377	YES
	51	13056-13311	31400-31777	NO
RECOMMENDED FOR USER MICROPROGRAMMING	52	13312-13557	32000-32377	NO
	53	13558-13823	32400-32777	NO
	54	13824-14079	33000-33377	NO
	55	14080-14335	33400-33777	NO
HP RESERVED	56	14336-14591	34000-34377	YES
	57	14592-14847	34400-34777	YES
	58	14848-15103	35000-35377	YES
	59	15104-15359	35400-35777	YES
HP RESERVED	60	15360-15615	36000-36377	YES
	61	15616-15871	36400-36777	NO
	62	15872-16127	37000-37377	YES
	63	16128-16383	37400-37777	NO

MEMORY CHIP MALFUNCTION ISOLATION

S-REGISTER* BITS 2:0	MEMORY MODULE NUMBERS**
000	0, 1, 2, 3
001	4, 5, 6, 7
010	8, 9, 10, 11
011	12, 13, 14, 15
100	16, 17, 18, 19
101	20, 21, 22, 23
110	24, 25, 26, 27
111	28, 29, 30, 31
*S-register will be zero if DMS is not installed in computer.	
**Each module number represents 16K bytes of memory.	



In the example shown in the shaded areas, the computer halts on a cold power-up with the register "dots" lighted and 000003 (octal) in the S-register. This signifies that a memory failure has occurred somewhere in the fourth contiguous 64k byte block of memory in memory module number 12, 13, 14, or 15.

The M-register is selected and displays a value between 34000 and 35777 (octal). Examining the memory module column shows that the module number 13 matches one of the module numbers identified by the S-register. If module number 13 is a 16k byte memory board, the failing address is in the second 8k byte segment of that board; if module number 13 is a 32k byte memory board, the failing address is in the fourth 8k byte segment of the board; and if module number 13 is a 128k byte memory board, then the failing address is in the third 32k byte segment of that board.

The A-register is selected and its contents noted as shown below. (The A-register will always contain the expected or good data.)

A bit-by-bit comparison is made and indicates that bit 9 in the B-register is a logical "1" instead of a logical "0". After module number 13 is identified by the jumper configurations shown in the E/F-Series Memory Maps, the failing chip associated with bit 9 on that memory module or the memory module may be replaced.

If more than 128k bytes of memory are used, this cycle must be repeated for each 128k byte section.

A-REGISTER (EXPECTED DATA)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	1	1	1	0	0	0	1	1	0	1	1	1	0	0	1

B-REGISTER (ACTUAL DATA)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	1	1	1	0	0	1	1	1	0	1	1	1	0	0	1

MEMORY CHIP MALFUNCTION ISOLATION (Cont'd)

M-REGISTER ADDRESS (OCTAL)	MEMORY MODULE NUMBERS	16k BYTES MM (8k BYTES)	32k BYTES MM (8k BYTES)	128k BYTES MM (32k BYTES)
00000 to 07777	0, 8, 16, 24	Row 1 (1st 8k bytes)	Row 1 (1st 8k bytes)	Row 1 (1st 32k bytes)
10000 to 17777		Row 2 (2nd 8k bytes)	Row 2 (2nd 8k bytes)	
20000 to 27777	1, 9, 17, 25	Row 1 (1st 8k bytes)	Row 3 (3rd 8k bytes)	
30000 to 37777		Row 2 (2nd 8k bytes)	Row 4 (4th 8k bytes)	
40000 to 47777	2, 10, 18, 26	Row 1 (1st 8k bytes)	Row 1 (1st 8k bytes)	Row 2 (2nd 32k bytes)
50000 to 57777		Row 2 (2nd 8k bytes)	Row 2 (2nd 8k bytes)	
60000 to 67777	3, 11, 19, 27	Row 1 (1st 8k bytes)	Row 3 (3rd 8k bytes)	
70000 to 77777		Row 2 (2nd 8k bytes)	Row 4 (4th 8k bytes)	
00000 to 10000	4, 12, 20, 28	Row 1 (1st 8k bytes)	Row 1 (1st 8k bytes)	Row 3 (3rd 32k bytes)
10000 to 17777		Row 2 (2nd 8k bytes)	Row 2 (2nd 8k bytes)	
20000 to 27777	5, 13, 21, 29	Row 1 (1st 8k bytes)	Row 3 (3rd 8k bytes)	
30000 to 37777		Row 2 (2nd 8k bytes)	Row 4 (4th 8k bytes)	
40000 to 47777	6, 14, 22, 30	Row 1 (1st 8k bytes)	Row 1 (1st 8k bytes)	Row 4 (4th 32k bytes)
50000 to 57777		Row 2 (2nd 8k bytes)	Row 2 (2nd 8k bytes)	
60000 to 67777	7, 15, 23, 31	Row 1 (1st 8k bytes)	Row 3 (3rd 8k bytes)	
70000 to 77777		Row 2 (2nd 8k bytes)	Row 4 (4th 8k bytes)	

E/F-SERIES SELF-TEST SUMMARIES**CPU AND MEMORY — E/F-SERIES**

1. A-Reg. = 100000 (octal)
2. B-Reg. = 0
3. S-Reg. = Bit pattern to be stored in memory.
4. PRESET and INSTR STEP

RTE-6/VM OS SELF-TEST — E-SERIES

1. A-Reg. = 105355
2. P = 0
3. PRESET and INSTR STEP

SCIENTIFIC INSTRUCTION SET — F-SERIES (SIS)

1. A-Reg. = 105337
2. P = S = X = 0
3. PRESET and INSTR STEP
S-Reg. = 102077;
x-Reg. = Set # (revision)

FLOATING POINT PROCESSOR — F-SERIES (FPP)

1. A-Reg. = 105004
2. P = S = X = 0
3. PRESET and INSTR STEP
S-Reg. = 102077
x-Reg. = Set # (revision)

VECTOR INSTRUCTION SET — F-SERIES (VIS)

1. A-Reg. = 105477
2. P = S = X = 0
3. PRESET and INSTR STEP
S-Reg. = 102077;
x-Reg. = Set # (revision)

FAST FORTRAN PROCESSOR — F-SERIES (FFP)

1. A-Reg. = 105200
2. P = S = X = 0
3. PRESET and INSTR STEP
S-Reg. = 102077;
x-Reg. = Set # (revision)

EXTENDED MEMORY AREA — E/F-SERIES (EMA)

1. A-Reg. = 105242
2. P = S = 0
3. PRESET and INSTR STEP
4. x-Register will show the firmware revision number.

**DS/1000 FIRMWARE — M/E/F-SERIES (DS)
(CBL NOT TESTED)**

1. A-Reg. = 105304 for E/F-Series
105524 for M-Series
2. P = S = 0
3. PRESET and INSTR STEP
S-Reg. = date code in BCD

BASE SET FIRMWARE DIAGNOSTIC

Test 1 — Tests most of the computer registers and functions. An error condition will set all display register indicator bits (A, B, M, T, P, S) and the overflow register.

Test 2 — Checks the presently enabled memory space (up to 32K words). The M-register will contain the logical memory location of a failure, the A-register will contain the expected (good) data, and the B-register will contain the actual (bad) data.

Test 3 — Checks all memory installed in the computer. Error reporting is the same as in Test 2 except the S-register will contain the number of the 32K word space where the memory failure occurred.

CPU AND MEMORY SELF-TEST

On a cold power-up, Tests 1 and 3 will each be executed once.

Pressing the IBL-TEST switch on the operator panel will perform the loader function, it will also cause the execution of Tests 1 and 2.

Tests 1 and 3 may also be executed via the operator panel as follows:

- a. Set P = 0.
- b. Set A = 100000 (octal).
- c. At the end of the diagnostic (when executed once), memory will be filled with the value in the S-register. Set the S-register if desired.
- d. Press PRESET.
- e. To loop the diagnostic, set the LOCK/OPERATE switch to LOCK.
- f. Press INSTR STEP, the diagnostic will now be executed.
- g. While the diagnostic is being executed, if S-register bit 5 is set, the S-register will display the number of executions (bit 5 = LSB) if MEM installed.

F-SERIES SCIENTIFIC INSTRUCTION SET (SIS)**EQUIPMENT**

12823-80007
 thru 4K ROMs
 12823-80012
 or
 12823-80019
 thru 8K ROMs
 18823-80021

13304A Firmware Accessory Board
 or
 12791A Firmware Expansion Module

FAB 4K ROM LOCATIONS

LOCATION	ROM IC	BITS	MODULE NO.
D1 (XU101)	12823-80007	7-0	40,41
D2 (XU102)	12823-80008	15-8	
D3 (XU104)	12823-80009	23-16	
D4 (XU106)	12823-80010	7-0	
D5 (XU108)	12823-80011	15-8	42,43
D6 (XU109)	12823-80012	23-16	

FEM 8K ROM LOCATIONS

LOCATION	ROM IC	BITS	MODULE NO.
A-H 1	12823-80019	7-0	40, 41, 42, 43
A-H 2	12823-80020	15-8	
A-H 3	12823-80021	23-16	

FAB JUMPERS

JUMPER	SETTING
10D	0
11D	1
12D	0
13	1

Note: If a FEM is used, install the ROMs in any available set of sockets.

SIS VERIFICATION**F-Series SIS Self-Test:**

To execute proceed as follows:

- a. Store 105337 in the A-register.
- b. Store 0 in the P-register.
- c. Store 0 in the X-register.
- d. Press PRESET; INSTR STEP

One of the three results of the test should be returned in the S-register.

1. S=102077 indicates successful completion.
2. S=102001 floating point PCAs not cabled or not powered.
3. S=102002 a numerical error in the diagnostic calculation; defective floating point PCAs or ROMs.

NOTE: 12823-80001 }
 thru } Return 0 in the X-register
 12823-80006 }

12823-80007 }
 thru } Return 3 in the X-register
 12823-80012 }

12823-80013 }
 thru } Return 4 in the X-register
 12823-80018 }

12823-80019 }
 thru } Return 4 in the X-register
 12823-80021 }



F-SERIES FLOATING-POINT VERIFICATION

To execute the firmware self-test, proceed as follows:

- a. Store 105004 (octal) in the A-register.
- b. Store 0 in the P-register and press PRESET. If the OVFL light remains on, check that the FPP-MPP cable is installed correctly (not twisted). Otherwise, a defective CPU, floating point PCA, or FPP is indicated. Use software diagnostics for further troubleshooting.
- c. Press INSTR STEP.
- d. A 102077 (octal) in the display register (S) indicates successful completion. If 10200X (octal) is returned in the display register, the firmware test failed and the halt code is interpreted as shown in the table. If the firmware test returns an error halt code, use software diagnostics for further troubleshooting.

FLOATING POINT SELF-TEST ERROR HALTS

HALT	PROBABLE PROBLEM
102001	a. Power not supplied to floating-point PCA's. b. FPP-MPP cable not properly connected. Refer to Installation and Reference Manual. c. Floating point CONTROL PCA not installed or not connected properly. d. If A-register not 177777 (octal) and B-register not 0, then floating point ROMs defective.
102002	a. If A- and B-registers equal 0 and OVFL lit, then FPP-MPP cable twisted. b. If A- and B-registers equal 177777 (octal), then floating point ARITH PCA not connected properly or CPU-MPP cable not connected.
102003	a. Floating point PCA, ALU PCA, or cables defective.
102004	a. Floating point PCA, ALU PCA, or cables defective.
XXXXXX	a. If display register does not indicate any of the above halts, either the floating point ROMs are not present, ROMs are defective, or computer is defective.

F-SERIES VECTOR INSTRUCTION SET (VIS)**EQUIPMENT**

12824-80001
 thru six 4K ROMs (F-Series only)
 12824-80006
 or
 12824-80007
 12824-80008 three 8K ROMs (F-Series only)
 12824-80009
 12791A Firmware Expansion Module

FEM 4K ROM LOCATIONS

LOCATION	ROM IC	BITS	MODULE NO.
A1	12824-80001	7-0	} 12,13
A2	12824-80002	15-8	
A3	12824-80003	23-16	
B1	12824-80004	7-0	} 14,15
B2	12824-80005	15-8	
B3	12824-80006	23-16	

SWITCH SETTINGS

SWA		SWB	
SWITCH	SETTING	SWITCH	SETTING
S1	1	S1	1
S2	0	S2	0
S3	0	S3	0
S4	1	S4	1
S5	1	S5	1
S6	0	S6	0
S7	0	S7	0
S8	1	S8	1
S9	1	S9	1
S10	0	S10	1

F-SERIES VECTOR INSTRUCTION SET (VIS) (Cont'd)**FEM 8K ROM LOCATIONS**

LOCATION	ROM IC	BITS	MODULE NO.
A-H 1	12824-80007	7-0	} 12, 13, 14, 15
A-H 2	12824-80008	15-8	
A-H 3	12824-80009	23-16	

SWITCH SETTINGS

SW A-H	
SWITCH	SETTING
S1	1
S2	0
S3	1
S4	0
S5	1
S6	0
S7	0
S8	1
S9	1
S10	X (Don't care)

VIS VERIFICATION

To execute proceed as follows:

- Store 105477B in the A-register.
- Store 0 in the P-register.
- Store 0 in the X-register.
- Press PRESET; then INSTR STEP.

A 102077 in the display register indicates successful completion.

NOTE: The VIS ROMs 12824-80001/6 will return a 3 in the X-register.

E-SERIES FAST FORTRAN PROCESSOR (FFP)**EQUIPMENT****FFP ROMS**

5090-0589
 thru 4K ROM IC (bits 0-23)
 5090-0591 (FAB or FEM)

Add to combine FFP/DMI/DMS in E-Series of Serial Prefixes >21XX

13307-80033
 thru 4K ROM includes DMI/DMS
 13307-80035

13304A Firmware Accessory Board
 or
 12791A Firmware Expansion Module

OBSOLETE DMI

13306-80013
 thru 1K ROM IC (bits 0-23)
 13306-80018 (FAB only)

FAB Locations

LOCATION	ROM IC	BITS	MODULE NO.
B1 (XU401)	13307-80033	7-0	} 32, 33
B2 (XU402)	13307-80034	15-8	
B3 (XU404)	13307-80035	23-16	
B4 (XU406)	5090-0589	7-0	} 34, 35
B5 (XU408)	5090-0590	15-8	
B6 (XU409)	5090-0591	23-16	

Note: If the FEM board is used, the six ROMs can be installed in any available socket sets; e.g., Set A and Set B.

Obsolete ROM FAB Locations

LOCATION	ROM IC	BITS	MODULE NO.
A7 (XU802)	13306-80013	3-0	} 33
A8 (XU803)	13306-80014	7-4	
A9 (XU804)	13306-80015	11-8	
A10 (XU806)	13306-80016	15-12	
A11 (XU807)	13306-80017	19-16	
A12 (XU808)	13306-80018	23-20	} 34, 35
B4 (XU406)	5090-0589	7-0	
B5 (XU408)	5090-0590	15-8	
B6 (XU409)	5090-0591	24-16	

F-SERIES FFP AND DMI**EQUIPMENT****FFP Only**

5090-1615 }
thru } 1K ROMs (bits 0-23)
5090-1620 } (FAB only)

5090-1621 }
thru } 4K ROMs (bits 0-23)
5090-1623 } (FAB or FEM)

13304A Firmware Accessory Board
or
12791A Firmware Expansion Module

FFP and DMI

5180-0141 }
thru } 8K ROMs
5180-0143 }

Note: F-Series FFP ROMs, part nos. 5090-1615 thru 5090-1623, require compatible F-Series Base Instruction Set ROMs, part nos. 12740-80019 thru 12740-80024 and vice versa for correct operation.

FFP ROM FAB Locations

LOCATION	ROM IC	BITS	MODULE NO.	JUMPER	SETTING
A7 (XU802)	5090-1615	3-0	33	9A	0
A8 (XU803)	5090-1616	7-4		10A	0
A9 (XU804)	5090-1617	11-8		11A	0
A10 (XU806)	5090-1618	15-12		12A	0
A11 (XU807)	5090-1619	19-16		10B	0
A12 (XU808)	5090-1620	23-20		11B	0
B4 (XU406)	5090-1621	7-0	34, 35	12B	0
B5 (XU408)	5090-1622	15-8		13	1
B6 (XU409)	5090-1623	23-16			

Note: If a FEM is used install the 4K ROMs in any vacant set of sockets, and configure the switches for module 34 and 35.

FFP/DMI ROMs FEM Locations

LOCATIONS	ROM IC	BITS	MODULE NO.
A-H 1	5180-0141	7-0	32, 33, 34, 35
A-H 2	5180-0142	15-8	
A-H 3	5180-0143	23-16	

F-SERIES FFP/DMI VERIFICATION

FFP Self Test:

To execute proceed as follows:

- a. Store 105200B in the A-register.
- b. Store 0 in the P-register.
- c. Store 0 in the X-register.
- d. Press PRESET; INSTR STEP

One of three results should be displayed in the S-register.

1. S=102077 indicates successful completion.
2. S=102001 module 33 defective or missing.
3. S=102002 module 35 defective or missing.

NOTE: FFP firmware (P/N 13306-80016/18 and 5090-0589/91) will return a 4 in the x-register when self test is run. FFP firmware (P/N 5090-1615 thru 1623) does not have a self test, and a zero will be in the x-register.

RTE-IVA/B EXTENDED MEMORY AREA FIRMWARE (EMA)**EQUIPMENT**

No. of ROMs: 3 4K ROMs

Equipment: 13304A Firmware Accessory Board
 or
 12791A Firmware Expansion Module
 92067-80001
 thru
 92067-80003 } 4K ROM IC (bits 0-23)

ROM Locations on the FAB

LOCATION	ROM IC	BITS	MODULE NO.	JUMPER	SETTING
B1 (XU401) C1 (XU201) D1 (XU101)	92067-80001 (EMA ROM)	7-0	} 36, 37	10C	1
				11C	0
				12C	0
				13	1
B2 (XU402) C2 (XU202) D2 (XU102)	92067-80002 (EMA ROM)	15-8	} 38, 39		
B3 (XU404) C3 (XU202) D3 (XU104)	92067-80003 (EMA ROM)	23-16	} 36, 37		
B4 (XU406) C4 (XU206) D4 (XU106)	91740-80049 (DS 1000 ROM)	7-0	} 38, 39		
B5 (XU408) C5 (XU208) D5 (XU108)	91740-80050 (DS 1000 ROM)	15-8	} 36, 37		
B6 (XU409) C6 (XU209) D6 (XU109)	91740-80051 (DS 1000 ROM)	23-16	} 38, 39		

Notes: 1. Sockets C1 through C3 are recommended for the EMA firmware location on the FAB.

2. If a FEM with an unused block of sockets is available, it may be desirable to install the ROMs on the FEM to facilitate future access to the ROMs. The three ROM ICs may be installed in any available set of sockets on the FEM, and the switches configured for modules 36 and 37.

RTE-IVA/B EXTENDED MEMORY AREA FIRMWARE (EMA) (Cont'd)**EMA VERIFICATION**

EMA Self Test:

To execute proceed as follows:

- a. Store 105242 in the A-register.
- b. Store 0 in the P-register.
- c. Store 0 in the X-register.
- d. Press PRESET.
- e. Press INSTR STEP.

A 102077 in the S-register indicates that the firmware is operational. If the test is not successful then check for the following conditions:

- a. Incorrect IC orientation on the FAB or FEM.
- b. Incorrect jumper positioning on the FAB board, or switch settings on the FEM.
- c. IC pin(s) are bent under or broken off.

NOTE: ROMs 92067-80001 thru 80003 return a 0 in the X-register.

91740B DISTRIBUTED SYSTEM FIRMWARE**EQUIPMENT**

13304A Firmware Accessory Board

or

12791A Firmware Expansion Module

91740-80067 }
thru } 4K ROMs (bits 0-23) Driver Microcode
91740-80069 }

Note: 91740-80048 1K Communications Bootstrap Loader ROM is required on the CPU board.

FAB ROM Locations

LOCATION	ROM IC	BITS	MODULE NO.	JUMPER	SETTING
C4 (XU106)	91740-80067	7-0	} 38,39	10C	1
C5 (XU108)	91740-80068	15-8		11C	0
C6 (XU109)	91740-80069	23-16		12C	0
				13	1

Note: If a FEM is used install the 4K ROMs in any available set of sockets.

91740B DISTRIBUTED SYSTEM FIRMWARE (Cont'd)**DS/1000 VERIFICATION**

To execute proceed as follows:

- a. Select the S-register.
- b. Press CLEAR DISPLAY. If the CBL ROM was installed in loader socket binary 11_2 (XU196), press switches 14 and 15. If the CBL ROM was installed in loader socket binary 10_2 (XU256), press switch 15.
- c. Set bits 6 through 11 of the Display Register to the select code of the DS/1000 communications interface. If a system contains multiple DS/1000 communications PCA's, choose the select code of the primary downloading PCA.
- d. Press STORE.
- e. Press PRESET and then IBL/TEST. Do NOT press RUN!
- f. Select the P-register. Do NOT clear the display. Press switches 3, 4, and 5. Press STORE.
- g. Press RUN.

If the DS/1000 CBL ROM and Driver Microcode ROM's are installed properly, the RUN light should remain lit and the Display Register should indicate the date code of the installed firmware. If the Display Register is partitioned into four equal sections, (see the table below) with each section representing a BCD digit (bits 15-12 representing the most significant digit), the number displayed corresponds to the approximate release time of the firmware.

If the Display Register indicates 102055, the RUN light is off, and the T-register select light is on, then the CBL ROM is installed properly; but, a problem concerning the DS/1000 Driver Microcode ROM's has been detected. The FAB assembly should be removed and inspected for the following:

- a. Incorrect ROM IC orientation.
- b. Incorrect jumper positioning.
- c. Bent or broken ROM IC pin(s).
- d. Incorrect 4K ROM IC part numbers.
- e. Damaged parts.

If the Display Register contains any other value, the CBL ROM should be inspected for the following:

- a. Incorrect orientation.
- b. Bent or broken pin(s).
- c. Incorrect part number. Also, other Display Register values may result from a CPU failure.

Note: A defective DS/1000 interface can also cause a halt 102055.

Display Register with Self-Test Passed

BCD	1				9				1				3			
LAMPS ON BITS	★ ★				★				★				★ ★			
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
OCTAL	0				1				4				2			

NOTE: The Display Register returns the data code of the firmware as a BCD number.

91740B DISTRIBUTED SYSTEM FIRMWARE (Cont'd)**DS/1000 VERIFICATION (Cont'd)**

DS/1000 Firmware Self Test (CBL not tested): Proceed as follows:

- a. Select the A-register and set it as follows:
 - E/F-Series: 105304 (octal)
 - M-Series: 105524
- b. Set the P and S-registers to 0.
- c. If the firmware passes the self-test, the S-register will display the date code in BCD as described on the previous page.

E-SERIES RTE-6/VM OPERATING SYSTEM/EMA/VMA

The HP RTE-6/VM OS/VMA/EMA firmware consists of six 4K ROMs that are installed on the FEM or FAB. The six ROMs are divided into two groups, a set of three 4K ROMs for the RTE-6/VM Operating System firmware allocated to control memory modules 44 and 45, and a set of three 4K ROMs for the RTE-6/VM EMA/VMA firmware allocated to control memory modules 36 and 37.

FAB ROM Locations

LOCATION	ROM IC	BITS	MODULE NO.	JUMPER	SETTING
D1 (XU101)	92084-80001	7-0	44, 45	10C	1
D2 (XU102)	92084-80102	15-8	44, 45	11C	0
D3 (XU103)	92084-80003	23-16	44, 45	12C	0
				13C	1
C1 (XU201)	92084-80004	7-0	36, 37	10D	1
C2 (XU202)	92084-80005	15-8	36, 37	11D	1
C3 (XU203)	92084-80006	23-16	36, 37	12D	0
				13D	1

Note: If DS/1000 ROMs 91740-80064, 91740-80065, and 91740-80066 are located on the FAB board, they must be located in sockets C4, C5, and C6 respectively.

VERIFICATION

To execute the RTE-6/VM OS Firmware Self-Test proceed as follows:

- a. Store 105355B in the A-register.
- b. Store 0 in the P-register.
- c. Press PRESET.
- d. Press INSTR STEP.

If the Self-Test passes, a 102077B will appear in the S-register. The contents of the x-register will indicate the revision of the installed firmware. Any other value displayed in the S-register indicates the RTE-6/VM OS Firmware Self-Test failed.

E-SERIES RTE-6/VM OPERATING SYSTEM/EMA/VMA (Cont'd)**VERIFICATION (Cont'd)**

To execute the RTE-6/VM EMA/VMA Firmware Self-Test proceed as follows:

- a. Store 105242B in the A-register.
- b. Store 0 in the P-register.
- c. Press PRESET.
- d. Press INSTR STEP.

If the Self-Test passes, a 102077B will appear in the S-register. The contents of the x-register indicate the revision of the installed firmware. Any other value displayed in the S-register indicates the RTE-6/VM VMA/EMA Firmware Self-Test failed.

SIGNAL/1000 FIRMWARE

The Signal Processing Instruction microcode used by SIGNAL/1000 is contained in three ROMs part nos.: 92835-80001, 92835-80002 and 92835-80003.

This microcode resides in modules 56 through 59 of the F-Series processor control store, corresponding to the address space 34000B-35777B. Macro entry points 105600B through 105617B are used to link to these instructions.

These ROMs must be installed on the 12791A Firmware Expansion Module (FEM) of the F-Series processor.

Switch S1 = 1
 Switch S2 = 0
 Switch S3 = 1
 Switch S4 = 0
 Switch S5 = 1
 Switch S6 = 1
 Switch S7 = 1
 Switch S8 = 1
 Switch S9 = 0
 Switch S10 = 0

SIGNAL/1000 VERIFICATION

The internal self-test opcode can be executed from the CPU front panel by the following sequence:

Set P = 0
 Set A = 105617B
 PRESET
 INSTR STEP

The S-register on the front panel should now show the content "102077B". Any other display content indicates improper firmware installation. Following a successful self-test execution, the firmware revision number will be contained in the x-register. Additional firmware verification can be accomplished with the on-line firmware diagnostic program.

Software module %FFTRP, contained in relocatable library \$HPFFT, will link a program to the appropriate entry point for the Signal Processing Instructions.

21MX-E/F FFP DIAGNOSTIC**Required Hardware:**

- a. Minimum 4K memory
- b. 12977 FFP, or 13306 FFP
- c. Standard I/O interface board

To execute proceed as follows:

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100 (octal), S-Reg (5-0) = SC of standard I/O device used by interruptible tests.
4. Press PRESET,RUN,HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET,RUN.
7. Restart: P-Reg = 2000 (octal), S-Reg = Switch options, press PRESET,RUN.

Switch Options

BIT	MEANING IF SET
8-0	Reserved.
9	Abort current diagnostic execution and halt (102075); user may specify a new group of tests in the A-register clear bit 9, and then press RUN.
10	Suppress non-error messages.
11	Suppress error messages.
12	Repeat all selected tests after diagnostic run is complete without halting. Message "PASS XXXXXX" will be output before looping unless bit 10 is set or console is not present. Also those tests requiring operator intervention will be suppressed.
13	Repeat last test executed (loop on test).
14	Suppress error halts.
15	Halt (102076) at the end of each test; the A-register will contain the test number in octal.

F-SERIES FPP/SIS/FFP DIAGNOSTIC

Manual: 12740-90004

Required Hardware:

- a. Minimum 32K memory.
- b. Absolute binary loading device.
- c. Console device for message reporting.
- d. I/O card other than the system console interface.

Required Software:

- a. Diagnostic Configurator (1627 or later) Absolute Binary Program 24296-60001.
- b. FPP/SIS/FFP Diagnostic Absolute Binary Program 12740-16001.

To execute proceed as follows:

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100 (octal), S-Reg (5-0) = SC of standard I/O device used by the interruptible tests.
4. Press PRESET,RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET,RUN.
7. Restart: P-Reg = 2000 (octal), S-Reg = Switch options.

Switch Options:

S-REGISTER BITS	MEANING IF SET
15	Halt at the end of each test (HALT 102076 octal). A-register contains the octal number of the test just run.
14	Suppress error halts.
13	Repeat last test (loop on one test).
12	Repeat all tests without halting (loop on entire diagnostic).
11	Suppress error messages.
10	Suppress non-error messages.
9	Abort current test (HALT 102075 octal). New tests may be specified in the A-register.
8	Execute in the short pass mode.
7-0	Reserved (all zero).

VIS ON-LINE DIAGNOSTIC

The RTE Operating System should be up and running. The proper entry points for VIS firmware should be specified during generation or declared to the loader with a separate RPL file.

The diagnostic program is supplied as a relocatable file which is loaded using the RTE loader. The main program to be loaded and library to search are:

	RTE-6/VM	RTE-A	RTE-IVB
Main	%VIS06	%VIS0A	%VISOD
Library	\$VLB6A	\$VLBA1	\$VLIB1

Once the diagnostic has been loaded, it can be executed as follows:

:RU,VISOD[,LU] [,#PASSES] [,PRIV]

LU = output logical unit number. Specifies where message are to be output.
If 0 or not specified, defaults to user terminal.

#PASSES = number of passes to be run.
If 0 or not specified, 1 pass is run.

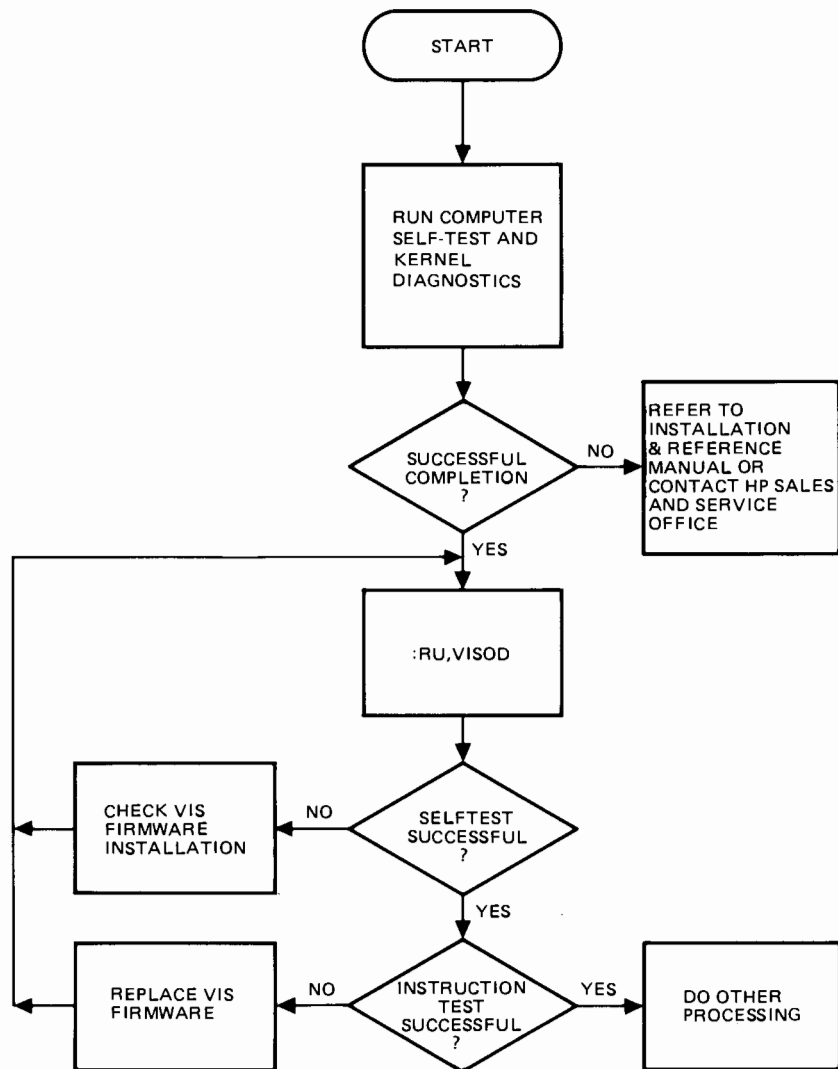
PRIV = privileged section flag.
If 0 or not specified, do not run privileged section test.
If 1, run privileged section test.

CAUTION

When executing the privileged section, malfunctions in VIS firmware could cause overwriting of the operating system. It is recommended that other critical tasks not be executing concurrently.

VIS ON-LINE DIAGNOSTIC (Cont'd)

VIS ON-LINE TROUBLESHOOTING FLOWCHART



91711B DIAGNOSTIC/VERIFICATION PACKAGE**MEDIA PART NUMBERS**

Mini-cartridges: Part numbers 91711-13319 thru 91711-13328 and 91711-13334

Mag tape (800 bpi) Part number 91711-13503

Mag tape (1600 bpi) Part number 91711-13504

PRODUCT DESCRIPTION

The 91711B provides three types of troubleshooting tools as follows:

1. On-line Verification Programs:

These programs which run under the operating system concurrently with other system activity, provide basic functional pass-fail testing of various processor sections and peripherals. These are not extensive and exhaustive tests, and successful completion of the verification program assures a basic level of integrity.

2. On-line Diagnostic Programs:

These programs which run under the operating system concurrently with other system activity, provide in-depth testing of various processor sections and peripherals, attempting to isolate the failure to a particular module. Where applicable, the diagnostic will indicate the order of probability in which individual sub-assemblies should be replaced.

3. Stand Alone Diagnostics:

Stand alone diagnostics do not run under the operating system. Stand alone diagnostics are loaded into the computer as absolute programs. A stand alone diagnostic is loaded through an absolute binary loading device (2645/48 mini-cartridge, 800 bpi mag tape, 1600 bpi mag tape) using the appropriate loader ROM. The diagnostic interacts with the operator via the system console for program operation and error reporting.



91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)

91711B Library Structure (Minicartridges)

FILE NAME	DATE CODE	DESIGNATION	MINICARTRIDGE
DIR #1	2201	Minicartridge #1 Directory	} Minicart #1 91711-13319
%TXPM0	2201	Main Processor Verification	
%RODFK	2201	- Subroutine	
#TXPM0	2201	- Loader Command File	
%TXPM1	2226	Memory Verification Father	
%NPART	2226	- Subroutine	
#TXPM1	2201	- Loader Command File	
%TXPM2	2201	Memory Verification Son #1	
#TXPM2	2201	- Loader Command File	
%TXPM3	2201	Memory Verification Son #2	
#TXPM3	2201	- Loader Command File	
%TXPFO	2201	Supported Firmware Verification	
%RPTBL	2201	- Table of Entry Points	
%MORFE	2201	- Subroutine	
%FFPVF	2201	- Subroutine	
%HFPVF	2201	- Subroutine	
%SISVF	2201	- Subroutine	
%VMAVF	2201	- Subroutine	
%DISVF	2201	- Subroutine	
%VISVF	2201	- Subroutine	
#TXPFO	2201	- Loader Command File	
%TXMVO	2226	7900/06/20/25 Disc Verification	
#TXMVO	2201	- Loader Command File	
%TXDS0	2201	DS/1000 Verification	
#TXDS0	2201	- Loader Command File	
%TXIB0	2201	HP-IB Interface Verification	
#TXIB0	2201	- Loader Command File	
%TXMT0	2201	7970 Mag Tape Verification	
#TXMT0	2201	- Loader Command File	
%TXTD0	2201	3070 Data Terminal Verification	
#TXTD0	2201	- Loader Command File	
DIR #2	2201	Minicartridge #2 Directory	} Minicart #2 91711-13320
%TXTD1	2201	3075A/76A/77A Verification	
%TXTD2	2201	- Segment 1	
%TXTD3	2201	- Segment 2	
%CFTML	2201	- Segment 3	
%IWRZZ	2201	- Segment 4	
%IMPTM	2201	- Segment 5	
\$XXTD1	2201	- Library	
#TXTD1	2201	-Loader Command File	

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)

91711B Library Structure (Minicartridges) (Cont'd)

FILE NAME	DATE CODE	DESIGNATION	MINICARTRIDGE
DIR #3	2201	Minicartridge #3 directory	Minicart #3 91711-13321
%TXTT0	2201	2645/48 Terminal Verification	
#TXTT0	2201	- Loader Command File	
%TXTT1	2201	2645/48 Multipoint Verification	
#TXTT1	2201	- Loader Command File	
%TXTR0	2201	RS-232 Terminal Verification	
#TXTR0	2201	- Loader Command File	
%TXPF1	2201	F-Series HFP Processor Diagnostic	
%RODSK	2201	- Subroutine	
#TXPF1	2201	- Loader Command File	
%TXPF2	2201	F-Series SIS Diagnostic	
%RODTK	2201	- Subroutine	
#TXPF2	2201	- Loader Command File	
%TXPF3	2201	RTE IV EMA Diagnostic	
#TXPF3	2201	- Loader Command File	
%TXPF4	2201	F-Series VIS Diagnostic	
#TXPF4	2201	- Loader Command File	
%VMACK	2201	RTE-6/VM VMA Diagnostic	
#VMACK	2201	- Loader Command File	
DIR #4	2201	Minicartridge #4 directory	Minicart #4 91711-13323
!ICD01	2201	RTE-IVE Off-Line Host	
DIR#5	2201	Minicartridge #5 Directory	Minicart #5 91711-13324
FORM	2201	H-Disc RTE-IVE Format Utility	
DIAG	2201	H-DISC RTE-IVE Diagnostic	
DIR#6	2201	Minicartridge #6 Directory	Minicart #6 91711-13325
ERT	2201	H-Disc RTE-IVE Error Rate Test	
DISCZ	2201	H-Disc RTE-IVE Disc Analyzer	
DIR#7	2201	Minicartridge #7 Directory	Minicart #7 91711-13322
%TXWLO	2201	Line Printer Verification	
#TXWLO	2201	-loader command file	
%TXMV1	2201	7900/06/20/25 Disc Verification	
#TXMV1	2201	-loader command file	
%VIS06	2201	RTE-6/VM VIS Diagnostic	
#VIS06	2201	-loader command file	Minicart #8 91711-13326
DIR#8	2226	Minicartridge #8 Directory	
!CS801	2226	RTE-IVE CS80 Off-line Host	
DIR#9	2226	Minicartridge #9 Directory	Minicart #9 91711-13327
EXR1	2226	CS80 Disc Exerciser	
TAPE	2301	CS80 Cartridge Tape Exerciser	Minicart #10 91711-13328
OPER	2226	CS80 OP-Design	
DIR#11	2301	Minicartridge #11 Directory	Minicart #11 91711-13334
!MUXST	2301	Offline MUX Diagnostic	
%MUXST	2301	Online MUX Diagnostic	
%TESTM	2301	37214A Systems Modem Verification	
%JENTS	2301	Subroutine for TESTM	
#TESTM	2301	Loader Command File for TESTM	

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)

91711B Library Structure (800/1600 BPI Mag Tape)

FILE NAME	DATE CODE	DESIGNATION	FILE NO.	
			DECIMAL	OCTAL
DIR.MT	2201	Mag Tape Directory	1	1
!ICD01	2201	RTE-IVE H Series Host	2-14	2-16
FORM	2201	H-Disc RTE-IVE Format Utility	15	17
DIAG	2201	H-Disc RTE-IVE Diagnostic	16	20
ERT	2201	H-Disc RTE-IVE Error Rate Test	17	21
DISCZ	2201	H-Disc RTE-IVE Disc Analyzer	18	22
!CS801	2226	RTE-IVE CS80 Off-line Host	19-32	23-40
EXR1	2226	CS80 Disc Exerciser	33	41
TAPE	2301	CS80 Cartridge Tape Exerciser	34	42
OPER	2226	CS80 OP-Design	35	43
!MUXST	2301	Offline MUX Diagnostic	36	44
%TXPM0	2201	Main Processor Verification	37	45
%RODFK	2201	- Subroutine	38	46
#TXPM0	2201	- Loader Command File	39	47
%TXPM1	2226	Memory Verification Father	40	50
%NPART	2226	- Subroutine	41	51
#TXPM1	2201	- Loader Command File	42	52
%TXPM2	2201	Memory Verification Son	43	53
#TXPM2	2201	- Loader Command File	44	54
%TXPM3	2201	Memory Verification Son	45	55
#TXPM3	2201	- Loader Command File	46	56
%TXPF0	2201	Supported Firmware Verification	47	57
%RPTBL	2201	- Table of Entry Points	48	60
%MORFE	2201	- Subroutine	49	61
%FFPVF	2201	- Subroutine	50	62
%HFPVF	2201	- Subroutine	51	63
%SISVF	2201	- Subroutine	52	64
%VMAVF	2201	- Subroutine	53	65
%DISVF	2201	- Subroutine	54	66
%VISVF	2201	- Subroutine	55	67
#TXPF0	2201	- Loader Command File	56	70
%TXMV0	2226	7900/06/20/25 Disc Verification	57	71
#TXMV0	2201	- Loader Command File	58	72
%TXDS0	2201	DS/1000-IV Verification	59	73
#TXDS0	2201	- Loader Command File	60	74
%TXIB0	2201	HP-IB Interface Verification	61	75
#TXIB0	2201	- Loader Command File	62	76
%TXMT0	2201	7970 Mag Tape Verification	63	77
#TXMT0	2201	- Loader Command File	64	100
%TXWL0	2201	Line Printer Verification	65	101
#TXWL0	2201	- Loader Command File	66	102
%TXTT0	2201	2645/48 Terminal Verification	67	103
#TXTT0	2201	- Loader Command File	68	104
%TXTT1	2201	2645/48 Multipoint Verification	69	105
#TXTT1	2201	- Loader Command File	70	106

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)

91711B Library Structure (800/1600 BPI Mag Tape) (Cont'd)

FILE NAME	DATE CODE	DESIGNATION	FILE NO.	
			DECIMAL	OCTAL
%TXTR0	2201	RS232 Terminal Verification	71	107
#TXTR0	2201	- Loader Command File	72	110
%TXTD0	2201	3070 Data Terminal Verification	73	111
#TXTD0	2201	- Loader Command File	74	111
%TXTD1	2201	3075A/76A/77A Verification	75	113
%TXTD2	2201	- Segment 1	76	114
%TXTD3	2201	- Segment 2	77	115
%CFTML	2201	- Segment 3	78	116
%IWRZZ	2201	- Segment 4	79	117
%IMPTM	2201	- Segment 5	80	120
%XXTD1	2201	- Library	81	121
#TXTD1	2201	- Loader Command File	82	122
%TXMV1	2201	7906H/20H/25H ICD Disc and 1303 Controller Disc Verification	83	123
#TXMV1	2201	- Loader Command File	84	124
%TXPF1	2201	F-Series HFP Processor Diagnostic	85	125
%RODSK	2201	- Subroutine	86	126
#TXPF1	2201	- Loader Command File	87	127
%TXPF2	2201	F-Series SIS Diagnostic	88	130
%RODTK	2201	- Subroutine	89	131
#TXPF2	2201	- Loader Command File	90	132
%TXPF3	2201	RTE IVB EMA Diagnostic	91	133
#TXPF3	2201	- Loader Command File	92	134
%TXPF4	2201	F-Series VIS Diagnostic	93	135
#TXPF4	2201	- Loader Command File	94	136
%VMACK	2201	RTE-6/VM VMA Diagnostic	95	137
#VMACK	2201	- Loader Command File	96	140
%VISO6	2201	RTE-6/VM VIS Diagnostic	97	141
#VISO6	2201	- Loader Command File	98	142
%MUXST	2301	Online MUX Diagnostic	99	143
%TESTM	2301	32714A Systems Modem Verification	100	144
%JENTS	2301	Subroutine for TESTM	101	145
#TESTM	2301	Loader Command File for TESTM	102	146

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)**LOADING STAND-ALONE DIAGNOSTICS**

From mag tape:

1. Mount the mag tape containing the 91711A product.
2. Refer to the tables at the front of this section to determine the file number of the desired stand-alone diagnostic.
3. Execute the loader ROM as follow:
 - a. A-Reg. = file number (in octal).
 - b. Set S-Reg. bits:

15-14	= loader ROM select
13-12	= 0
11-6	= mag tape select code
5-1	= 0
0	= 1
 - c. Press PRESET, IBL, RUN.
 - d. The file specified in the A-Reg. will load and the CPU will stop with a HALT 77B (102077).

From mini-cartridges:

1. Refer to the tables at the front of this section to determine the file number of the desired stand-alone diagnostic.
2. Insert the correct mini-cartridge in the left CTU of a 2645/28.
3. To display the directory on file 1, press "GOLD-f1-f7-GREEN-f2" and the file will be displayed on the screen.
4. Press "GREEN-f8-n-f5" to advance the tape to file n where n is the file number of the desired stand-alone diagnostic.
5. Once the tape is loaded and positioned, execute the loader ROM as follows:
 - a. Set S-Reg. bits:

15-14	= loader ROM select
13-12	= 0
11-6	= console select code
5-0	= 0
 - b. Press PRESET, IBL, RUN.
 - c. The file selected on the tape will be read and the CPU will stop with a HALT 77B (102077).
 - d. In some situations, the code for the diagnostic is contained in two files on two different cartridges. Consult the directory files and repeat the procedure above until all pertinent files for the desired diagnostic have been loaded in the proper sequence.

STARTING THE STAND-ALONE DIAGNOSTIC AFTER LOADING

1. Set S-Reg. bits:

15-12	= 0
11-6	= select code of the device under test
5-0	= console select code

 Press STORE.
2. Set P-Reg. = 2. Press STORE.
3. Press PRESET, RUN.
4. An appropriate opening message will be output to the console, and the diagnostic will begin execution. The diagnostic will interact with the operator via the console.

If the program completes, it can be restarted by entering:

*RU,DIAG

where the asterisk (*) is the system prompt (the stand-alone alone diagnostics run under an RTE-M system).

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)**Disc Files**

Each program has a corresponding Loader Command File (same name as the program with a "#" as the first character instead of "%") which will relocate all the necessary main and subroutine sections required for diagnostic operation and search the necessary system libraries.

To load the program on-line:

```
:RU,LOADER,<loader cmnd file>,,<list output device>
```

Mag Tape and Minicartridge Files

The individual files may be stored onto the disc individually from the mag tape or CTU by using the FMGR "ST" command as follows:

1. Mount the mag tape or position minicartridge at the start of the required file.
2. :ST,<LU #>,<disc file namr>,BR(binary relocatable) or AS(ASCII)

To load the program, run the RTE loader.

```
:RU,LOADR,<loader cmnd file>,,<list output lu>
```

The program UPDATE will store all programs into the system disc area once all required files are available to the system.

DIAGNOSTIC/VERIFICATION PROGRAM SUMMARY**HP 1000 M/E/F-Series Processors**

```
:RU,TXPM0,loglu,#passes
```

HP 1000 M/E/F-Series Memory System

```
:RU,TXPM1[,loglu,#passes]
```

NOTE

Execution time is about one second per 32K partition. It may be excessively long if another program is currently executing in the partition to be tested and is not in a swappable state or has a higher priority than TXPM2 or TXPM3.

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)**Supported Firmware Identification**

```
:RU, TXPFO, loglu [,option]

option    specify 'CH' to change system entry point table ($SYENT)
```

Notes:

1. TXPFO should be run stand-alone because in certain cases it will crash the system.
2. The question "DO YOU WANT ALL TESTS PERFORMED? YE OR NO" is asked. If YE, then TXPFO will test for the presence of all possible firmware without further questioning. If NO, then TXPFO will ask what firmware you want tested (HPF, FFP, SIS, VIS, VMA, DS)?
3. The optional 'CH' should not be performed unless you are certain that you want a permanent modification of the system. If you elect to proceed with this change option, first back up the system, e.g., LSAVE LU02 and LU03.

MUX Interface 12966A On-Line - %MUXST

Load on-line diagnostic from disc:

```
:RU, LOADR, %MUXST
or
:RU, LOADR
/LOADR; RE, %MUXST
```

Execute:

```
:RU, DIAG
```

MUX Interface 12966 Stand-Alone - !MUXST

Requires at least 32k memory, memory protect and DCPC, 12966A interface, and a 12992A minicartridge loader ROM.

Follow procedure for loading and running stand-alone diagnostics for file name !MUXST

7900/06/20/25 and 7908/11/12 CS80 Disc Drives

```
:RU, TXMVO, loglu, disclu
```

7970B/E Mag Tape

```
:RU, TXMTO, ilu, maglu, #passes
```

2608/17/19/31 Line Printer

```
:RU, TXWLO, ilu, [op], prntlu, [prntc], [vfct]
```

```
op      is the program mode selection:
        1. 1 for the verification mode.
        2. 2 for the diagnostic mode.
```

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)

prntc is the line printer specification.

1. 1 for the 2608A
2. 2 for the 2619A
3. 3 for the standard line printer under DVA12.

vfct is the VFC tape code. (Applicable to the 2619 only).

1. 0 defaults to 0 and signifies that a 12 channel VFC tape is installed on the 2619 printer under test.
2. 1 if an 8 channel VFC tape is installed on printer under test.

NOTE: prntc and op can be omitted and the program will request them as a default.

2645/48 or 2621 (keyboard only) Terminals

:RU,TTTT0,loglu,k,l or M,r

loglu is the LU for logging information and error messages.

k is the keyboard/display LU (always required).

l is the left cartridge tape unit LU (0 if N/A).

M specifies the menu mode (default is automatic mode).

r is the right cartridge tape unit LU (not required if M is specified as previous parameter, 0 if N/A).

Notes:

1. The program requires operator interaction at the terminal to be tested.
2. This test runs in one (of two) modes specified in the run command.
3. Insert scratch CTU in appropriate tape drive and slide RECORD tab to record and then protect as prompted by the test.

2645/48 Multipoint Terminal with DVR07

:RU,TTTT1,loglu,tstlu

Notes:

1. The test runs in about 5 seconds per terminal.
2. The test can be run in a system environment with other programs scheduled and running.
3. The multipoint line must be enabled and the multipoint terminal straps must match the initialization parameters.
4. Since use of CTUs as system LUs is not supported by Multipoint, CTUs are not tested by this test.

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)**3070A/B Data Terminal with 40280A**

```
:RU,TEXTD0,loglu,tstlu
```

Note: The test runs in approximately two minutes.

3075A/76A/77A Data Terminal in a 12790A Subsystem

```
:RU,TEXTD1,loglu,ilu,iop,lilu,telu
```

loglu is the LU for logging information and error messages (default to operator console).

ilu is the operator console LU (must not be part of the multipoint system under test).

iop is the operation code (OP CODE, see details below) (default is SV).

lilu is the LU number of the multipoint line for test.

telu is the LU number of the terminal to be tested.

iop codes (OP CODES):

```
?? Display list of operation codes.
VL Verify multipoint line then end.
VT Verify terminal.
OF Off-line terminals survey
SV Multipoint LU survey message.
IL Initialize a line.
RL Remove a line.
IT Initialize a terminal.
RT Remove a terminal.
CF Configure a terminal.
GP Who are you on all groups
TG Who are you on specified group?
LN Multipoint line assignment.
EN End.
/E End.
EX End.
space space End.
```

If the following message appears on the operator's console:

```
TEXTD1 - INPUT AN OP CODE_
```

enter an operation code from the above list.

If CF is chosen the following message will appear after entry of basic information:

```
TEXTD1 - ENTER OP CODE (?? FOR CFIML OP CODE LIST):_
```

If ?? is entered, a terminal operation codes list will be printed that is valid while in the configure terminal mode.

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)**RS232 Terminal with DVR00**

```
:RU,XTTRO,loglu,tstlu
```

This program requires operator interaction. The program can be run in a system environment with other programs scheduled and running.

HPIB Bus with 59310B Interface

```
:RU,TXIB0,loglu,tstlu
```

Note: This program requires no operator interaction, and it can be run in a system environment with other programs scheduled and running.

H-Series or 13037 Controlled Disc Drives and 7906H/20H/25H/9895A ICD or 7906/20/25 with 13037

```
:RU,TXMV1,loglu,disclu,ST,MT or MM,xxx
```

loglu is the LU for logging information and error messages.

disclu is the legal disc LU for testing.

ST if "ST" is specified, the optional self-test for H-Series discs will be run. Default is no self-test.

MT if "MT" is specified the optional media test will be executed (test file = rest of cartridge).

MM same as MT, but information messages are returned indicating the % completion as the test executes.

xxx is the optional number of passes (default = 1)

Note: The test requires no operator interaction. and it can be run in a system environment with other programs scheduled and running.

DS/1000 Interface with M-Series Computer

```
:RU,TXDS0,loglu,tstlu,node#
```

node# is the remote node number to which the test is run if = 0, the program requests the operator to input the node#.

The operator should consult the DS/1000 Programmer's Manual, DS/1000 Network Manager's Manual, and Guide for New Users of DS/1000 for information regarding initialization of remote and local nodes for testing.

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)**37214 Systems Modem**

Initialize a Port as a modem LU. For example, initialize Port 2 to a modem, LU=36, BRG=1, 1200 baud, 8-bits/char, 1 stop bit, and enable ENQ/ACK:

```
:CN,36,30B,172272B
```

There are two options: 0 for local analog loop test and 1 for same test plus the remote digital loop test.

Program Execution:

```
:RU,TESTM,loglu,locsc,loccp,#test,iopt,remno,locno
```

loglu is the log device (default=terminal).
 locsc is the local modem select code (B for octal required).
 loccp is the local modem card cage port (default=0).
 #test is the number of tests (default=1).
 iopt is the run option (default=0).
 remno is the remote telephone number (prefix P=pulse or dialed, or T=touchtone).
 locno is the local telephone number (prefix P=pulse or dialed, or T=touchtone).

Hdw Floating-Point Diagnostic TXPF1, F-Series Computer

Floating-Point Instructions Executed:

Single Precision		Extended Precision	
FAD	FIX	.XADD	.XFXS
FSB	FLT	.XSUB	.XFXD
FMP	.FIXD	.XMPY	.XFTS
FDV	.FLTD	.XDIV	.XFTD

Program Execution:

```
:RU,TXPF1,loglu,#passes
```

The program requires no operator interaction. The program can be run in a system environment with other programs scheduled and running.

SIS Diagnostic TXPF2, F-Series Computer

The following instructions are tested:

SIN	COS	TAN	EXP	TANH
ALOG	ATAN	ALOGT	SQRT	

The following instructions are not tested:

DPOLY	/ATLG	.FPWR	.TPWR
-------	-------	-------	-------

Program Execution:

```
:RU,TXPF2,loglu,#passes
```

The program requires no operator interaction. The program can be run in a system environment with other programs scheduled and running.

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)**RTE-IVB EMA Diagnostic TXPF3, E/F-Series Computer****Program Execution:**

```
:RU,TXPF3,loglu,#passes
```

The program requires no operator intervention. The program can be run in a system environment while other programs are scheduled and running.

RTE-IVB, VIS TXPF4, F-Series

The VIS instructions for TXPF4 are:

VADD	VSSB	VSUM	VMIN	.ESEG
VSUB	VSMY	VNRM	VMIB	.VSET
VMPY	VSDV	VDOT	VMOV	WSUM
VDIV	VPIV	VMAX	VSWP	
VSAD	VABS	VMAB	.ERES	

A 12 page partition is required for operation.

The diagnostic contains self-test, non-privileged and privileged sections. In the self-test section, the VIS self-test op-code (105477B) is executed and checked for proper results. If the self-test fails, a message is issued and the program executes a STOP 11.

The non-privileged section contains all the tests that can be performed in a non-privileged user environment. These include all the non-EMA VIS instructions as well as the .ERES, the EMA call-by-reference address resolver. Any error will cause a message to be issued and a STOP 11 executed.

NOTE

The privileged section tests the VIS instructions .ESEG and .VSET by temporarily entering a privileged user environment. In addition, the program must lock itself into memory for this portion of the tests. It is recommended that this section be executed only on a quiescent system.

Program Execution:

```
:RU,TXPF4,loglu,#passes,priv
```

priv is the privileged section flag (default is 0)

```
(0 = privileged section not executed)
(1 = privileged section is executed)
```

The program requires no operator intervention. The program can be run in a system environment with other programs scheduled and running.

91711B DIAGNOSTIC/VERIFICATION PACKAGE (Cont'd)**RTE-6/VM VMA TXPF5/VMACK, E/F-Series Computer**

Program Execution:

```
:RU,VMACK,loglu,#passes
```

Note: VMACK can be run while other programs are being run

RTE-6/VM. VIS VISO6, F-Series Computer

The program is divided into three main sections:

1. Self-Test: The VIS self-test opcode (105477B) is executed and checked. The self-test should return the octal value 102077B.
2. Non-privileged: The non-privileged user environment includes all of the non-EMA VIS instructions and .ERES which resolves EMA call by reference addressing.
3. Privileged: Tests the VIS instructions .ESEG and .VSET by temporarily entering a privileged environment. Since malfunctions in VIS firmware could cause catastrophic system failure, it is recommended that this section be executed only on a quiescent system.

CAUTION

When executing the privileged section, malfunctions in VIS firmware could cause overwriting of the operating system. It is not recommended that other critical tasks execute concurrently with diagnostics in a privileged section.

The last test in the privileged section executes the VIS EMA sum routine, WSUM, to assure that individually tested instructions correctly perform together.

Program Execution:

```
:RU,VISOD[,LU][, #PASSES][,PRIV]
```

PRIV privileged section flag. If zero or not specified, do not run privileged section test. If one, run privileged section test.

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2100 POWER SUPPLY**POWER REQUIREMENTS**

LINE VOLTAGE: 115V ac $\pm$ 10%, single phase, 12A, or
230V ac $\pm$ 10%, single phase, 6A

LINE FREQUENCY: 47.5 to 66 Hz

POWER CONSUMPTION: 1400 volt-amperes, maximum

POWER CABLE (CONNECTED TO COMPUTER OR EXTENDER)

LENGTH: 10 feet (304, 8 centimeters)

CONNECTOR: NEMA Type 5-15P (for 115V ac operation), or
NEMA Type 6-15P (for 230V ac operation)

DC SUPPLY VOLTAGES AND CURRENTS

+30V, 0.1A
+12V, 5A for 2155A Extender; +12V, 3A for 2100 Computer
+4.85V, 50A
-2V, 23A
-12V, 5A for 2155A Extender; +12V, 3A for 2100 Computer
+20V, 6A } For 2100 Computer only
-20V, 0.5A }

ENVIRONMENTAL LIMITS**AMBIENT TEMPERATURE RANGE:**

Operating: 0° to 55°C (32° to 131°F)
Non-operating: -40° to 75°C (-40° to 167°F)

RELATIVE HUMIDITY: 50 to 95% at 25° to 40°C (77° to 104°F)
without condensation

ALTITUDE:

Operating: 15,000 feet (4572 meters)
Non-operating: 25,000 feet (7620 meters)

VENTILATION

AIR FLOW: 200 cubic feet (5,6634 cubic meters) per minute

HEAT DISSIPATION: 2300 BTUs (579,6 kilocalories) per hour,
maximum

WEIGHT AND DIMENSIONS

WEIGHT: 36 pounds (16,344 kilograms)
HEIGHT: 10 inches (254 millimeters)
WIDTH: 7.75 inches (196,85 millimeters)
DEPTH: 12 inches (304,8 millimeters)

2100 POWER SUPPLY (CONT)**CONFIGURATION**

POWER SUPPLY DATE CODE	CARD REVISION CODE					REMARKS
	A1	A2	A3	A4	A5	
1126	1133	1126	1132	1126	1125	
1140	1139	1126	1132	1126	1125	
1141	1140	1140	1132	1126	1139	
1146	1140	1140	1132	1126	1139	
1148	1140	1140	1132	1144	1139	(Note 1)
1149	1140	1140	1147	1144	1139	
1150	1140	1140	1147	1144	1150	
1215	1148	1140	1215	1144	1150	
1220	1148	1140	1215	1144	1150	(Note 2)
1229	1148	1140	1215	1144	1150	(Note 3)
1240	1224	1140	1243	1224	1150	(Note 4)
1243	1224	1140	1243	1224	1150	(Note 5)
1249	1249	1249	1243	1224	1150	
1250	1249	1249	1250	1224	1150	
1314	1249	1249	1250	1224	1150	(Note 6)
1320	1249	1249	1320	1224	1150	
1322	1249	1249	1322	1224	1150	
1330	1249	1330	1322	1224	1330	
1345	1249	1345	1322	1224	1330	

NOTES: 1. Cards A1 through A5 did not change. Part number of A6Q1 and A6Q2 changed to 1884 0219.
2. Cards A1 through A5 did not change. Change made to power supply to bring up to UL, CSA, and IEC standards.
3. Cards A1 through A5 did not change. Change made to A11 120 volts Regulator.
4. Part no. of cards A1, A3, and A4 changed to 02100-60108, 02100-60109, and 02100-60110, respectively.
5. Date code 1243 is identical to date code 1240.
6. Cards A1 through A5 did not change. Assembly A7 changed mechanically.

REGULATOR BOARDS

These boards cannot be indiscriminately changed from "old" to "new." The A1 and A4 boards must be changed as a pair when changing to the "new" A4 board. The A1 and A3 boards, however, can be changed separately.

ASSY	PART NO.	ASSY	PART NO.
A1 (old)	02100-60046	A4 (old)	02100-60061
A1 (new)	02100-60108	A4 (new)	02100-60110
A3 (old)	02100-60047	A2	02100-60058
A3 (new)	02100-60109		

2100 POWER SUPPLY (CONT)**DC SUPPLY VOLTAGES**

TEST JACK	READING		RIPPLE AND NOISE VOLT. TOL. P-P
	MIN.	MAX.	
+30	+29.0	+31.5	<20%
+20*	+19.8	+20.2	±1%
+12	+12.0	+13.1	<2%
+4.85	+4.80	+4.90	<2%
-2	-1.85	-2.5	<2%
-12	-12.0	-13.1	<2%
-20*	-19.8	-20.2	±1%
*@25°C (room temperature)			

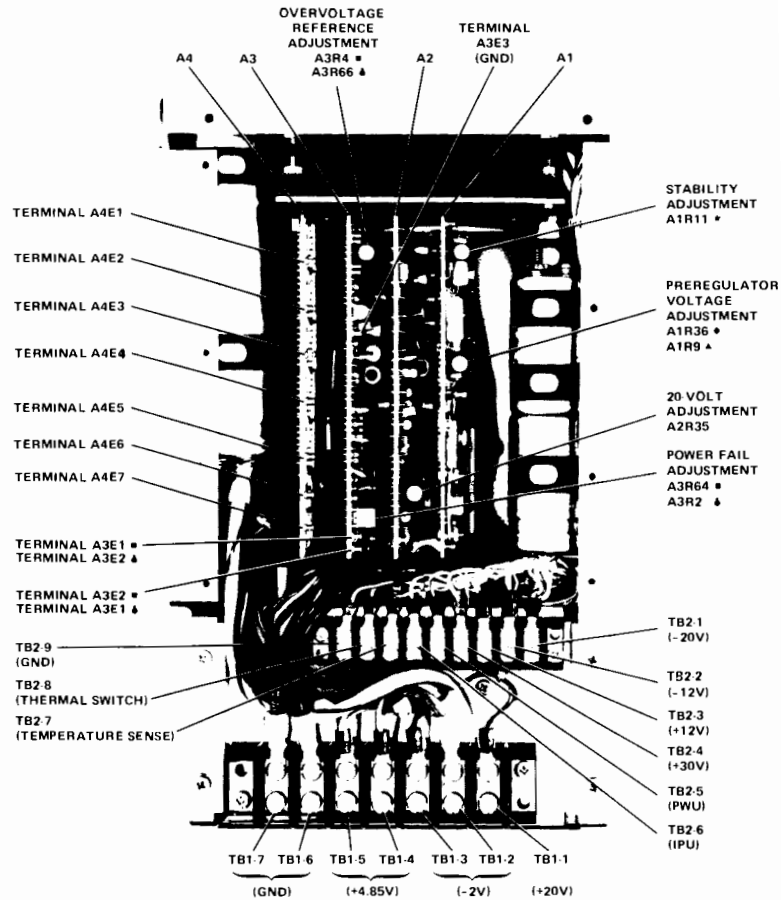
CURRENT AVAILABLE FOR I/O CARDS

SUPPLY VOLTAGE	CURRENT AVAILABLE DEPENDING ON MEMORY SIZE (AMPERES)					
	4K	8K	12K	16K	24K	32K
+30	0.1	0.1	0.1	0.1	0.1	0.1
+12	3.0	3.0	3.0	3.0	3.0	3.0
+4.85	23.6	23.6	22.7	22.7	21.6	20.8
-2	10.9	10.9	10.1	10.1	9.3	8.5
-12	3.0	3.0	3.0	3.0	3.0	3.0
NOTE: The currents specified are available with the DMA accessory kit installed.						

VOLTAGE RANGE FOR OVERVOLTAGE (CROWBAR TRIGGER CONDITION)

OUTPUT VOLTAGE	OUTPUT TERM.	OVERVOLTAGE (VDC) RANGE
-2	TB1-2,3	-2.8 to -3.1
+4.85	TB1-4,5	+5.3 to +5.75
-12	TB2-2	-14.0 to -15.5
+12	TB2-3	+14.0 to +15.5
-20	TB2-1	-23.5 to -27.0
+20	TB1-1	+23.5 to +25.5

2100 POWER SUPPLY (CONT)

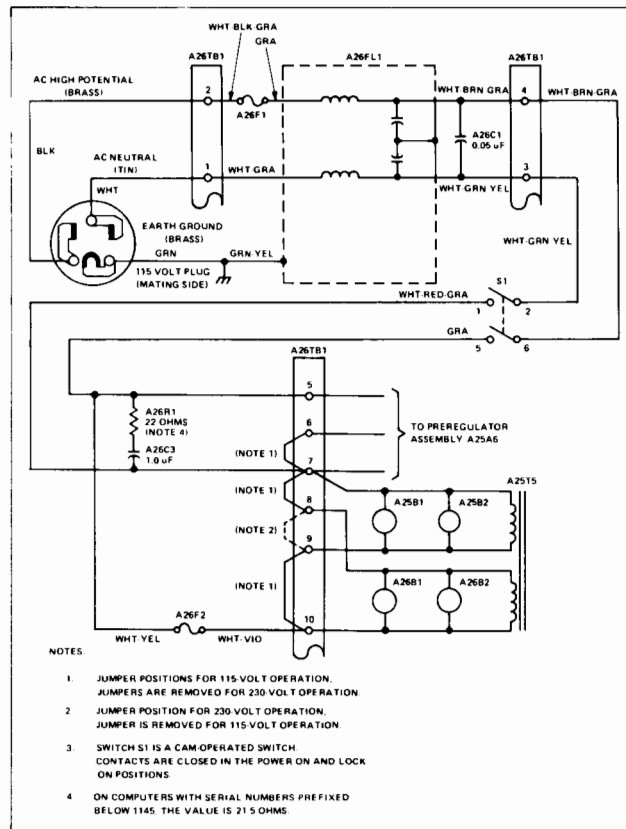


NOTES: FOR COMPLETE REFERENCE DESIGNATIONS WHEN POWER SUPPLY IS INSTALLED IN A COMPUTER OR EXTENDER, PREFIX ALL REFERENCE DESIGNATIONS WITH A25.

- * APPLIES TO A3, PART NO. 02100-60047.
- * APPLIES TO A3, PART NO. 02100-60109.
- * APPLIES TO A1, PART NO. 02100-60046 ONLY.
- * APPLIES TO A1, PART NO. 02100-60046.
- * APPLIES TO A1, PART NO. 02100-60108.

2100 POWER SUPPLY (CONT)

AC POWER CONNECTIONS



When converting to 230V from 115V, or vice versa, change fuse current ratings as listed below. Also change power cord plug as described in 2100 Installation and Maintenance Manual.

VOLTAGE	A26F1	A26F2
115	12A	2A
230	6A	1A

2105A/2108A/2109A AND 12979A POWER SUPPLY**EQUIPMENT**

2105A Power Supply 02105-60012
 2108A/2109A and 12979A Power Supply 02108-60023

POWER REQUIREMENTS

Line Voltage: 110V ac $\pm$ 20%, single-phase
 220V ac $\pm$ 20%, single-phase

Line Frequency: 47.5 to 66 Hz

Power Consumption: HP 2105A — 400 watts, maximum
 HP 2108A/2109A and 12979A — 525 watts, maximum

DC SUPPLY VOLTAGES AND CURRENTS**MAXIMUM CURRENT AVAILABLE FOR MEMORY, ACCESSORIES, AND I/O CARDS**

SUPPLY VOLTAGE	2105A	2108A	2109A	12979A ¹
+5V	12.8A	24.8A	24.6A	33.0A
-2V	1.5A	4.5A	4.5A	7.6A
+12V	1.0A	1.5A	1.5A	3.5A ²
-12V	1.0A	1.5A	1.5A	3.5A ²
+28V	.25A	.25A	.25A	0.1A

¹ Current available to I/O assumes DCPC is installed.

² 1.75A is available to both front and rear I/O backplanes.

ENVIRONMENTAL LIMITS**Ambient Temperature**

Operating: 0° to 55°C (32° to 131°F)
 Nonoperating: -40° to 75°C (-40° to 167°F)

Altitude

Operating: 15,000 feet (4,573 meters)
 Nonoperating: 40,000 feet (12,199 meters)

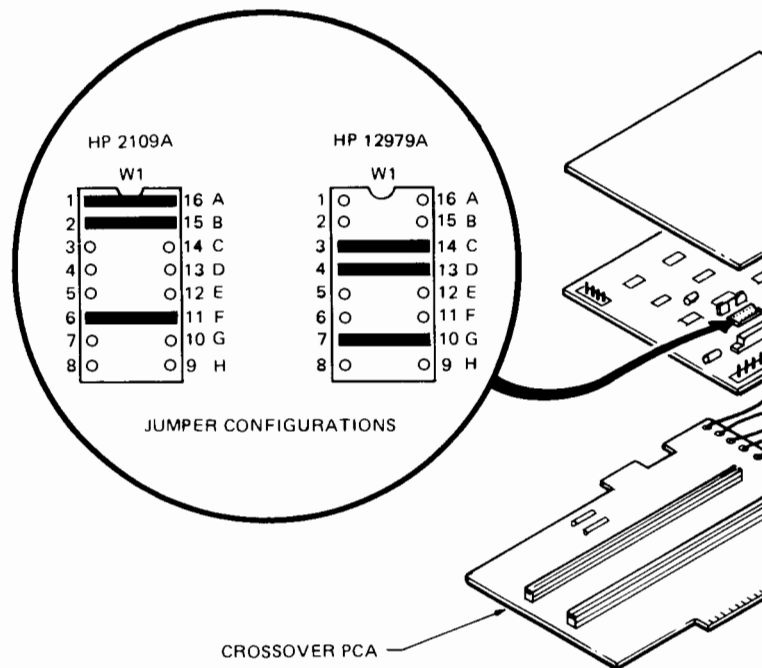
Relative Humidity

20 to 95° at 25° to 40°C (77° to 104°F) without condensation.

2105A/2108A/2109A AND 12979A POWER SUPPLY (CONT)

INSTALLATION NOTES

Power Supply Jumper Configurations



IN-1 Refer to 2112A/2113A Power supply section for crossover PCA power connections and for +28V DC jumper location.

SERVICE INFORMATION

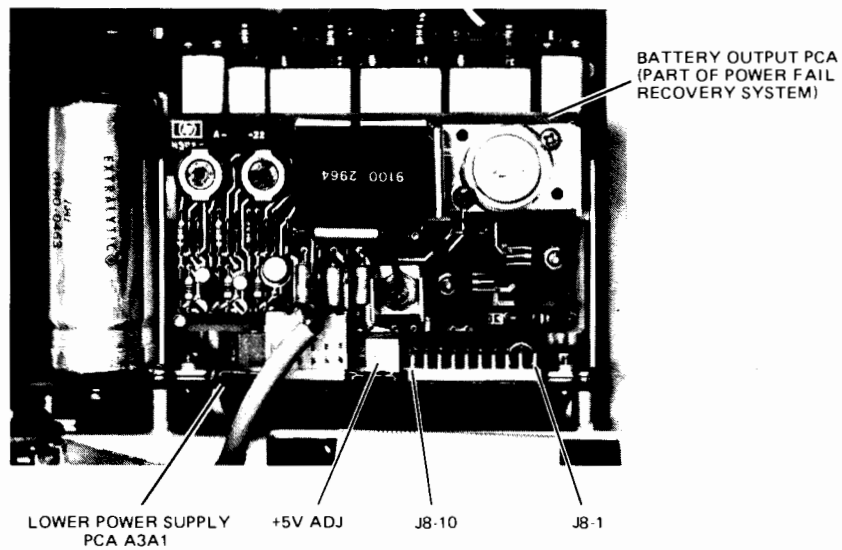
HP 2105A/2108A/2109A and 12979A Power Supply Tolerances

SUPPLY	TEST POINT*	TOLERANCE
-12V	J8-1	±0.6V
Common	J8-2	—
+12V	J8-3	±0.6V
-2.3V	J8-4	±0.2V
+5V	J8-5	±0.25V
+5VM**	J8-6	±0.25V
V+ (BAT)**	J8-7	—
PUUP	J8-8	—
+12VM**	J8-9	±0.6V
-12VM**	J8-10	±0.6V

*J8 is mounted on lower power supply PCA.
 **Not applicable for 12979A.

2105A/2108A/2109A AND 12979A POWER SUPPLY (CONT)

HP 2105A/2108A/2109A and 12979A Power Supply Field Adjustment and Test Points



2112A/2113A POWER SUPPLY**EQUIPMENT**

Power Supply 02112-60006

POWER REQUIREMENTSLine Voltage: 110V ac $\pm$ 20%, single-phase
220V ac $\pm$ 20%, single-phase

Line Frequency: 47.5 to 66 Hz

Power Consumption: 800 watts, maximum

DC SUPPLY VOLTAGES AND CURRENTS**CURRENT AVAILABLE FOR MEMORY ACCESSORIES, AND I/O CARDS**

SUPPLY VOLTAGE	2112A	2113A
+5V	38.2A	38.0A
-2V	9.5A	9.5A
+12V	3.0A	3.0A
-12V	3.0A	3.0A
+28V	.25A	.25A

ENVIRONMENTAL LIMITS**Ambient Temperature**

Operating: 0° to 55°C (32° to 131°F)

Nonoperating: -40° to 75°C (-40° to 167°F)

Altitude

Operating: 15,000 feet (4,573 meters)

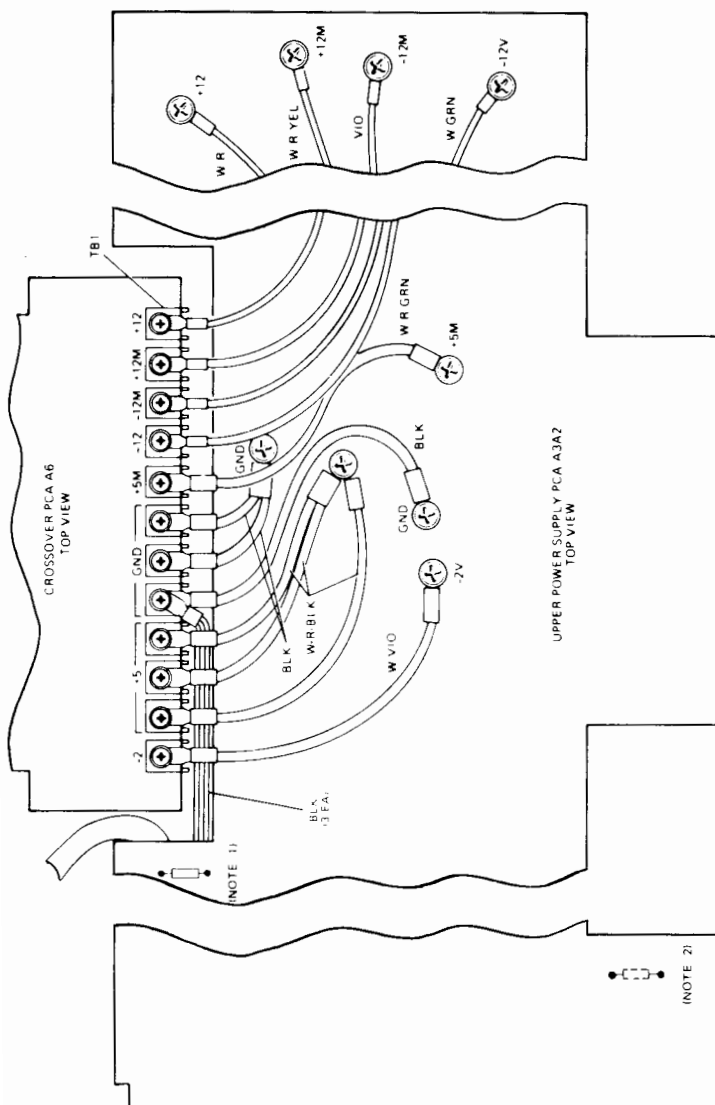
Nonoperating: 40,000 feet (12,199 meters)

Relative Humidity

20 to 95% at 25° to 40°C (77° to 104°F) without condensation.

2112A/2113A POWER SUPPLY (CONT)

INSTALLATION NOTES



NOTES:

1. ☐ Denotes applicable to HP 2108A/2109A and 12979A. For HP 2108A/2109A and 12979A, Jumper W2 must be installed if +28V DC is required at the I/O backplane.

2. ☒ Denotes applicable to HP 2112A/2113A for HP 2112A/2113A. Jumper W2 must be installed if +28V DC is required at the I/O backplane.

REAR VIEW OF CPU

P3

1	2	3
○	○	○
4	5	6
○	○	○
7	8	9
○	○	○

1- BROWN
2- RED
3- ORN
4- YEL
5- GRN
6- BLU

RESET
STANDBY
OPERATE
GROUND
PWU —
MLOST

2112A/2113A POWER SUPPLY (CONT)

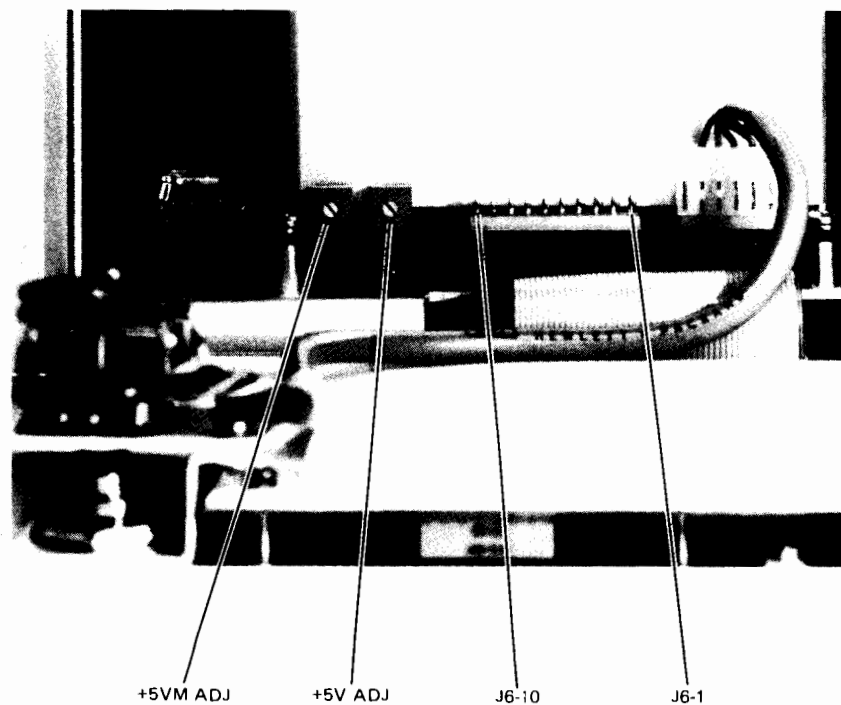
SERVICE NOTES

HP 2112A/2113A Computer Power Supply Voltage Tolerances

SUPPLY	TEST POINT*	TOLERANCE
$\overline{\text{PUUP}}$	J6-1	—
Common	J6-2	—
+28V**	J6-3	$\pm 2.8\text{V}$
-2.3V	J6-4	$\pm 0.2\text{V}$
+5V	J6-5	$\pm 0.25\text{V}$
+5VM	J6-6	$\pm 0.25\text{V}$
+12VI/O	J6-7	$\pm 0.6\text{V}$
-12VI/O	J6-8	$\pm 0.6\text{V}$
+12VM	J6-9	$\pm 0.6\text{V}$
-12VM	J6-10	$\pm 0.6\text{V}$

*J6 is mounted on lower power supply PCA.
 **+28V is present if jumper is installed on upper power supply PCA.

HP 2112A/2113A Computer Power Supply Field Adjustments and Test Points



21MX-SERIES "B" TYPE POWER SUPPLIES

INTRODUCTION

Two versions of the "B" type power supply currently exist in the field. The older 5061-1356 and 5061-3476 supplies are basically the same but the current 5061-6615 is quite different. These supplies are equivalent functionally but the adjustment procedures differ slightly. The following pages contain information that is unique to the different versions as well as information common to them.

The new version supplies are covered by computer type in Service Notes issued 02/83-22 titled "New Version of Low Cost Power Supply".

PART NO. CROSS REFERENCE

Computer Prefix	MOLEX CONNECTOR VERSIONS		TERMINAL BLOCK VERSION
	2108 & Earlier	2108 - 2204	2305 & Later
Complete New PS	5061-1356	5061-3476	5061-6615
Complete Exch. PS	5061-3401	5061-3477	5061-6616 - 6631
Control Board	5061-1345	5061-3455	5061-3455
Inverter Board	5061-1344	5061-3454	5061-3454
Pre-reg Board	5061-1347	5061-3457	5061-3457
Jumper	5061-1351 (unchanged)		5061-1351
Battery Backup	5061-1349 (unchanged)		5061-1349
Battery Charger	5061-1348 (unchanged)		5061-1348
High Current Cable	--	--	5061-6613
Low Current Cable	--	--	5061-6614
Cross-Over CPU Cable	5061-1363	5061-1363	5061-6612
Cross-Over I/O Ext Cbl	12979-60020	12979-60020	12979-60033
Cross-Over Mem Ext Cbl	12990-60016	12990-60016	12990-60019
Terminal Block Cover	None	None	5040-6309

INSTALLATION DIFFERENCES

Installation for the supplies are identical except as follows: For the 5061-3476 and 5061-6615 supplies the upper fan cables are part of the exchange power supply and should be returned with the defective supply to CSD. For the 5061-6615, the high and low current cables are now fastened to a terminal block where previously they were connected by a Molex connector.

ADJUSTMENT PROCEDURE

For the +5V CPU voltage and LPU are not adjustable. There are no potentiometers on the control board. Adjustments are as follows:

1. Check +5V CPU on the crossover test point. If not within specification, refer to the troubleshooting procedure.
2. For NO BATTERY BACKUP, check +12VM and adjust R12 as necessary on the jumper board. Check all other voltages. They cannot be adjusted, but should be within specification.
3. For BATTERY BACKUP, check +5VM and +12VM and adjust R1 and R2 respectively as necessary on the battery backup board. Check all other voltages. They cannot be adjusted, but should be within specification.

All battery charger circuit adjustments are unchanged. Refer to the subsequent section.

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)

TROUBLESHOOTING

The control board and the pre-reg board contain LEDs which give some indication of the fault condition of the power supply. The following parts location indicates the LED locations.

The control LED is visible through a hole in the control board cover. Below are the various LED combinations and their fault status meaning:

Control	&	Pre-reg	Normal Operating state.
OFF		OFF	
Control	&	Pre-reg	Not normal fault condition (will not occur).
OFF		ON	
Control	&	Pre-reg	Over current on +12I/O, -12I/O, -2I/O or an
ON		OFF	overtemperature shutdown.
Control	&	Pre-reg	Not normal fault condition (will not occur).
ON		ON	
Control	&	Pre-reg	Power supply unable to turn on. Possible low line
FLASHING		OFF	voltage or primary switching circuit failure.*
Control	&	Pre-reg	Primary circuit unable to turn on. Due to primary
FLASHING	&	ON	circuit over-current.**

* For example, this will occur if an attempt is made to turn on the power supply with the inverter board removed, or shorted inverter/pre-regulator transistor.

** This situation will occur following an inverter transistor failure for example. However, if the supply is turned off and then on, the failing condition will switch to -1-, since the supply now cannot turn on due to the short in the primary circuit.

LED Information:

The Pre-reg LED is mainly intended for use in manufacturing. All required fault status information is available from the control LED.

Control Off - Power supply OK

Control ON - +12, -12, or -2 overcurrent or overtemperature. Allow cool-down time for power supply. Check fans. Remove all I/O and memory cards to remove possible short. If the power supply now powers up with the control LED OFF, failure is due to overtemperature of external short.

Control FLASHING - Main switching circuit cannot turn on. Failure or short in the +5V CPU circuit. Remove DC output connector to remove possible short. If the LED remains at power up, replace the power supply.

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)**POWER SUPPLY CONFIGURATIONS****1. Power Supply WITHOUT the Power-Fail Option**

The supply will contain the following vertical plug-in boards:

Control Board
Inverter Board
Pre-regulator Board
Jumper Board

and a Battery Load Simulator Plug (BISP), HP P/N 12991-60002, must be connected to the BATT IN connector at the rear of the supply.

2. Power Supply WITH the Power-Fail Option

The supply will contain the following vertical plug-in boards:

Control Board
Inverter Board
Pre-regulator Board
Battery Backup Board
Battery Charger Board

and a battery pack must be connected to the BATT IN connector at the rear of the supply.

POWER SUPPLY REMOVAL AND INSTALLATION

REMOVAL. Proceed as follows:

- a. Disconnect the output voltage connector and the status connector from the front of the supply. For later supplies, disconnect cable from the terminal board.
- b. Unfasten the two clips at the front of the supply, and remove the two screws located at the bottom rear panel of the supply.
- c. If the power recovery system is installed, set the BATTERY switch to OFF and disconnect the battery cable from the BATT INPUT connector at the rear of the supply.
- d. If the computer is a 2112B, 2113B, 2111F, or 2117F the cables for the top two fans must be disconnected. Slide the power supply rearward (toward the rear of the computer) about 50mm (2 in.) and stop. Reach in and disconnect the fan cables by squeezing the latching sides of the connector.
- e. Continue sliding the power supply out and remove it from the computer.

INSTALLATION. Install the power supply in the reverse order of removal procedure.

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)**VOLTAGE AND SIGNAL TEST POINTS**

VOLTAGE/SIGNAL	TEST POINT	ADJUSTMENT LOCATION
+5V CPU	CROSSOVER BOARD	R1 ON CONTROL BD. *
+12V I/O	CROSSOVER BOARD	NOT ADJUSTABLE
-12V I/O	CROSSOVER BOARD	NOT ADJUSTABLE
-2V I/O	CROSSOVER BOARD	NOT ADJUSTABLE
+30V I/O	CROSSOVER BOARD	NOT ADJUSTABLE
+5V MEMORY	CROSSOVER BOARD	R1 ON BATT. BOARD (ONLY IF PFRS IS IS INSTALLED)
+12V MEMORY	CROSSOVER BOARD	R12 ON JUMPER BD (PFRS NOT INSTALLED) -OR- R2 ON BATTERY BACKUP BOARD (PFRS INSTALLED)
-12V MEMORY	CROSSOVER BOARD	NOT ADJUSTABLE
PON	CROSSOVER/STATUS CONNECTOR	NOT ADJUSTABLE
PWU	CROSSOVER/STATUS CONNECTOR	NOT ADJUSTABLE
MLOST	CROSSOVER/STATUS CONNECTOR	NOT ADJUSTABLE
PSU	POWER CONTROL IN/OUT CONN.	NOT ADJUSTABLE
LPU	POWER CONTROL IN/OUT CONN.	R2 ON CONTROL BD. *
MLO	POWER CONTROL IN/OUT CONN.	NOT ADJUSTABLE
BATTERY CHARGER CURRENT ADJUST	TEST POINT LABELED "REP" ON THE BATTERY CHARGER BOARD	R2 ON BATTERY CHARGER BOARD
BATTERY CUTOFF LIMIT ADJUST	TEST POINT LABELED "CUT OFF" ON THE BATTERY CHARGER BOARD	R1 ON BATTERY CHARGER BOARD
16.25+/- 0.25V BATTERY CHARGER RAIL	YELLOW WIRE CONNECTED TO ANODE OF DIODE IN THE CENTER OF THE BATTERY CHARGER BOARD -OR- "EXT" TERMINALS ON BATTERY PACK WITH SWITCH SET TO EXT	R3 ON A BATTERY CHARGER BOARD

* 5561-1356 only.

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)

VOLTAGES AND TOLERANCES (5061-1356)

SUPPLY VOLTAGE	MAXIMUM CURRENT	SUPPLY UPPER LIMIT	VOLTAGE LOWER LIMIT	TEST POINT
+5V I/O	50 A	+5.25 vdc set to +5.15	+5.00 vdc	A6 Crossover* Assy +5V
+5V M	5.5 A	+5.25 vdc set to +5.15	+5.00 vdc	A6 Crossover Assy +5M
+12V I/O	2.5 A	+12.6 vdc set to +12.5	+11.4 vdc	A6 Crossover Assy +12V
+12V M	2.0 A	+12.6 vdc	+11.4 vdc	A6 Crossover Assy +12M
-2V I/O	6.0 A	-2.2 vdc	-1.8 vdc	A6 Crossover Assy -2V
-12V I/O *	2.0 A	-12.6 vdc	-11.4 vdc	A6 Crossover Assy -12V
-12V M	250 ma	-16 vdc (unregulated)	-9 vdc	A6 Crossover Assy -12M
+30V I/O **	250 ma	+42 vdc (unregulated)	+22 vdc	A6 Crossover Assy J2 in Pin 4

* Maybe -13V if unloaded in I/O Extender (some I/O PCAs do not use -12V).

** ONLY if 1 amp fuse installed on power supply mother board (A6F2)

VOLTAGES AND TOLERANCES (5061-6615/5061-3476)

SUPPLY VOLTAGE	MAXIMUM CURRENT	SUPPLY UPPER LIMIT	NOMINAL SETTING	VOLTAGE LOWER LIMIT	TEST POINT
+5V I/O	50A	+5.25Vdc	+5.15Vdc	+5.00Vdc	A6 Crossover Assy +5V
+5V M	4.5A	+5.25Vdc	+5.15Vdc	+5.00Vdc	A6 Crossover Assy +5M
+12V I/O	2.5A	+12.6Vdc	*	+11.4Vdc	A6 Crossover Assy +12V
+12V M	2.0A	+12.6Vdc	+12.5Vdc	+11.4Vdc	A6 Crossover Assy +12M
-2V I/O	4.0A	-2.2Vdc	*	-1.8Vdc	A6 Crossover Assy -2V
-12V I/O	2.0A	-12.6Vdc	*	-11.4V	
-12V M	250mA	-16Vdc	*	-9Vdc	A6 Crossover Assy -12M
+30V I/O	250mA	+42Vdc	Unregulated	+22Vdc	A6 Crossover Assy J2 Pin 4

* Not adjustable

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)

VOLTAGE ADJUSTMENTS WITHOUT THE POWER-FAIL OPTION

- a. Some power supplies will have a slot in the top cover. If a variable resistor can be seen through the slot, it will not be necessary to remove the computer top cover. If necessary, remove the supply and remove the top cover of the supply. Install the supply in the computer and reconnect all cables.
- b. 5061-1356 Only: Connect a DVM between the +5V CPU(+5VOUT) and GND test points on the crossover board.
- c. 5061-1356 Only: Set the LOCK/OPERATE SWITCH to OPERATE, and the POWER switch to the ON position.
- d. 5061-1356 Only: Adjust the +5V control (R1 on the control board, access through the cutout at the front of the supply) until the DVM indicates +5.15.
- e. Connect the DVM between the +12VM (+12M) and GND test points on the crossover board.
- f. Adjust the +12VM control (R12 on the jumper board) until the DVM indicates +12.5 volts.
- g. The other voltages are not adjustable, and should fall within the specified range.

VOLTAGE ADJUSTMENTS WITH THE POWER-FAIL OPTION

- a. Remove the supply from the computer and remove the top cover. Install the supply in the computer and reconnect all cables.
- b. Remove the top cover of the computer.
- c. Set the BATTERY switch to the OFF position.
- d. 5061-1356 Only: Connect a DVM between the +5V CPU (+5V) and GND test points on the crossover board.
- e. 5061-1356 Only: Set the LOCK/OPERATE switch to OPERATE and the POWER circuit breaker to the ON position.
- f. 5061-1356 Only: Adjust the +5V control (R1 on the control board, access through the cutout at the front of the supply) until the DVM indicates +5.15 volts.
- g. Connect the DVM to the +5Vdc (+5M) test point on the Crossover Assy (A6).
- h. Adjust R1 on the Battery Backup Board (A4) until the DVM indicates +5.15V (+.1V, -.15V).
- i. Connect the DVM between +12VM (+12M) and GND test points on the crossover board.
- j. Adjust the +12VM control (R2 on the Battery Backup Board) until the DVM indicates +12.5 volts.

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)**BATTERY CHARGING CIRCUIT ADJUSTMENTS WITH THE POWER-FAIL OPTION**

BATTERY CUTOFF ADJUST - This adjustment is set at the factory, and should only be adjusted if it is known to be out of specification.

- a. Set the POWER circuit breaker to the OFF position.
- b. Connect the DVM to the test point labeled "CUT OFF" on the Battery Charger Board.
- c. Set the BATTERY switch to the EXT position. Connect a +12.5V dc source to the external terminals of the battery pack.
- d. The DVM should indicate approximately 0.0 volts.
- e. Adjust the cutoff control (R1 on the Battery Charger Board) until the voltage indicated by the DVM jumps to approximately 2.0 volts. R1 should be adjusted so that the voltage seen at "CUT OFF" is at the crossover point.
- f. Connect the DVM to test point labeled "REF" on the Battery Charger Board.
- g. Adjust R2 on the Battery Charger Board for a DVM reading of +5.0 +/- 0.25 Vdc.
- h. Connect the DVM to the anode of CR4 which is the yellow wire on the Battery Charger Board.
- i. Adjust R3 on the Battery Charger Board for a DVM reading of +16.25 +/- 0.25 Vdc.

POWER UP THRESHOLD ADJUSTMENT (5061-1356)

The computer is shipped with the power-up threshold set at the lower limit of the line configuration (88 volts for 110 volt operation and 176 volts for 220 volt operation).

- a. Remove the protective cover on the front of the supply to expose the top of the control board.
- b. Connect the power cord of the computer to an autotransformer, and connect an AC voltmeter across the output of the autotransformer. Set the transformer output to 115 Vac (standard) or 220 Vac (option 15).
- c. Set the POWER switch to ON, the LOCK/OPERATE switch to OPERATE, and the ARS switch (on the rear of the CPU PCA) to the ARS position.

NOTE

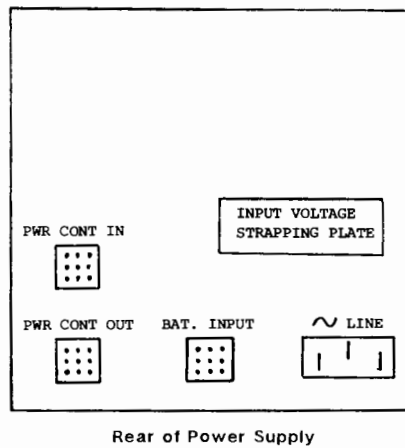
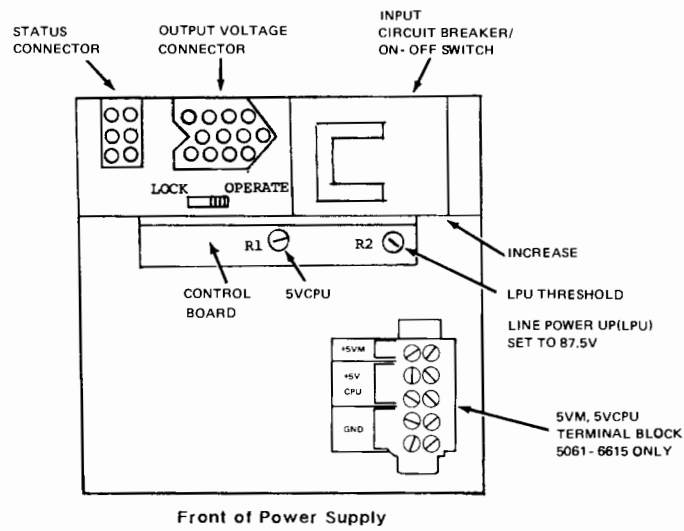
The RUN indicator must be lighted in order to perform the power-fail adjustments.

- d. Lower the voltage of the autotransformer to 87.5 Vac rms (standard) or 174 Vac rms (option 15).
- e. Adjust the power-fail control (R2 on the control board) until the RUN indicator extinguishes.
- f. Lower the output voltage of the autotransformer to approximately 60 Vac rms (standard) or 150 Vac rms (option 15). Slowly increase the voltage, noting that at approximately 87.5 Vac rms (standard) or 174 Vac rms (option 15) the POWER-FAIL indicator will light and the T-Register will be displayed.



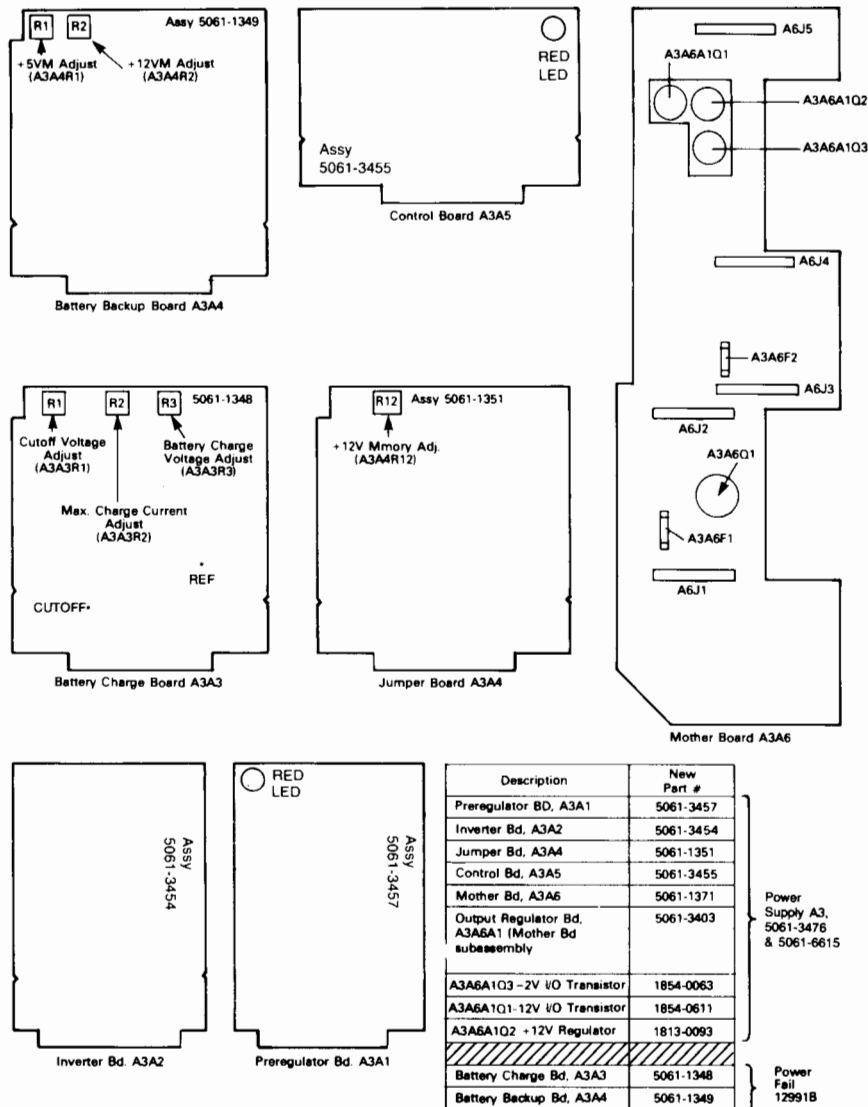
21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)

FRONT AND REAR PANEL ASSEMBLIES



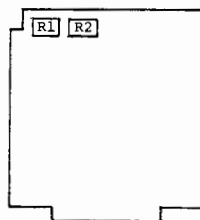
21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)

BOARDS AND PARTS IDENTIFICATION FOR THE 5061-6615 AND 5061-3476



21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)

BOARDS AND PARTS IDENTIFICATION FOR THE 5061-1356

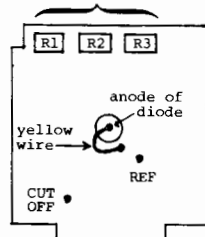


BATTERY BACKUP BOARD

New part no. 5061-1349
Exch part no. 5061-1379

R1 -- +5V Memory Adjustment
R2 -- +12V Memory Adjustment

Do not adjust unless
out of specifications

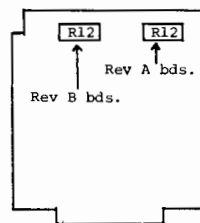


BATTERY CHARGER BOARD

New part no. 5061-1348
Exch part no. 5061-1378

R1 -- Battery Cutoff Adjust
(adjusted so that memory
voltage generation ceases
when battery voltage drops
below +12V).
R2 -- Max Charge Current Adjust
(adjusted so that max battery
charging current is 2.0
amps).
R3 -- Battery Charge Voltage Adjust
(adjusted so that the battery
charger voltage is +16.45V).

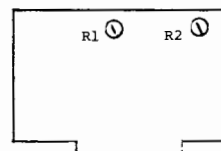
"CUT OFF" -- Test point for adjusting R1.
"REF" -- Test point for adjusting R2.
yellow wire -- Test point for adjusting R3.



JUMPER BOARD

New part no. 5061-1351
Exch part no. none

R12 -- +12V Memory Adjust.



CONTROL BOARD

New part no. 5061-1345
Exch part no. 5061-1370

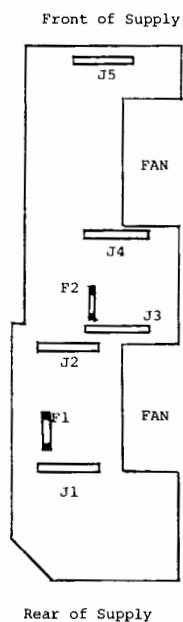
R1 -- +5V CPU Adjust
R2 -- LPU Adjust

INVERTED BOARD

New part no. 5061-1344
Exch part no. 5061-1375

PRE-REGULATOR BOARD

New part no. 5061-1347
Exch part no. 5061-1377

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)**BOARDS AND PARTS IDENTIFICATION FOR THE 5061-1356 (Cont'd)****MOTHER BOARD**

New part no. 5061-1371
 Exch part no. none

J1 -- Pre-regulator Board
 (component side facing FRONT
 of the supply).

J2 -- Inverter Board
 (component side facing REAR of
 the supply).

J3 -- Battery Charger Board
 (component side facing FRONT
 of the supply).

J4 -- Jumper Board
 (component side facing FRONT
 of the supply)

-or-

Battery Backup Board
 (component side facing FRONT
 of the supply).

J5 -- Control Board
 (component side facing FRONT
 of the supply).

F1 -- 1A fuse for pre-reg circuit
 (required).

F2 -- 1A fuse for +30V I/O
 (optional).

Supply without Power Fail Option Installed will have the following boards installed:

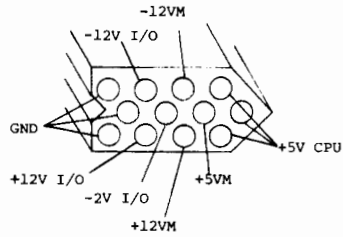
J1 -- Pre-regulator Board
 J2 -- Inverter Board
 J4 -- Jumper Board
 J5 -- Control Board

Supply with the Power Fail Option Installed will have the following boards installed:

J1 -- Pre-regulator Board
 J2 -- Inverter Board
 J3 -- Battery Charger Board
 J4 -- Battery Backup Board
 J5 -- Control Board

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)

TEST POINTS AND SIGNAL LOCATIONS

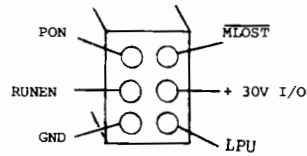


OUTPUT VOLTAGE CONNECTOR

- located on the front of the supply.
- connects to crossover load.

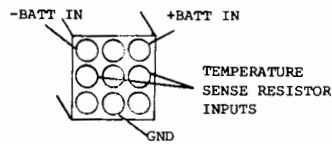
+5V CPU* +5VM*

* Not used on the 5061-6615 supply



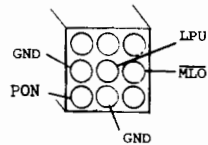
STATUS CONNECTOR

- located on the front of the supply.
- connects to the crossover board.



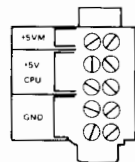
BATTERY INPUT CONNECTOR

- located on the rest of the supply



POWER CONTROL IN/OUT CONNECTOR

- located on the rest of the supply.



TERMINAL BLOCK CONNECT (5061-6615 Supply).

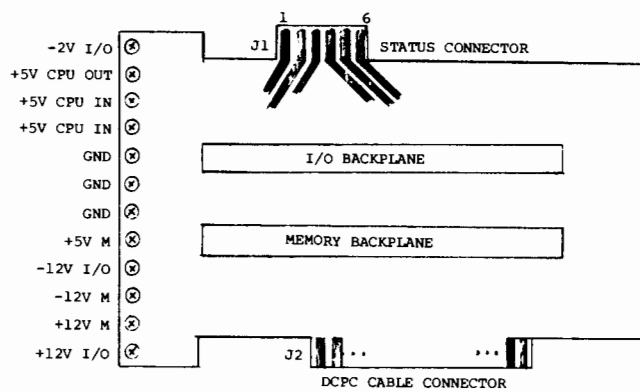
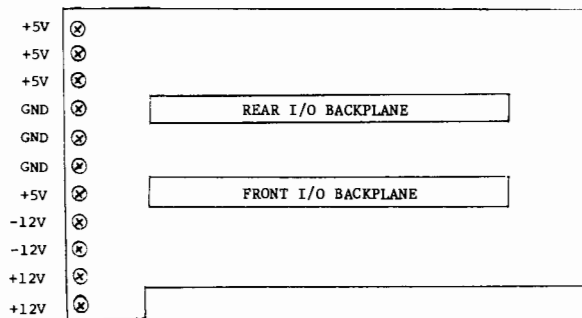
- located on front panel.
- connects to crossover board.

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)**TEST POINTS AND SIGNAL LOCATIONS (Cont'd)****Computer Crossover Board****J1**

Pin 1 -- PWU
 Pin 2 -- PON*
 Pin 3 -- PON*
 Pin 4 -- +30V I/O
 Pin 5 -- RUNDN
 Pin 6 -- MLOST

Crossover Board Status Edge
 Connector Pin Assignments

* Pins 2 and 3 tied on CPU crossover PCA.

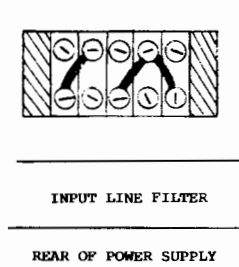
**I/O Extender Crossover Board**

21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)

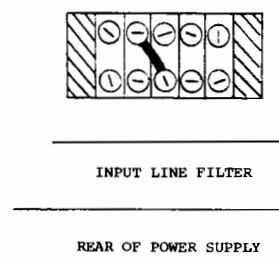
INPUT VOLTAGE CONFIGURATION

To access the input configuration block, remove the supply from the computer and remove the top cover. Remove the protective cover, and configure for the appropriate configuration.

Input configuration block jumpering for 110 volt operation.

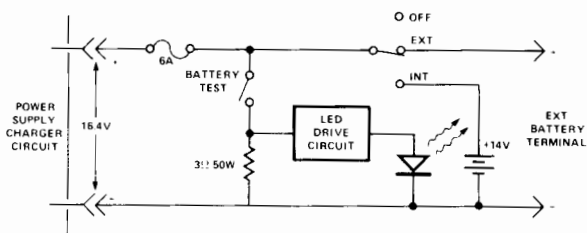


Input configuration block jumpering for 220 volt operation.



21MX-SERIES "B" TYPE POWER SUPPLIES (Cont'd)

TESTING PROCEDURE FOR BATTERY CHARGER



CHARGER VOLTAGE TEST

1. Set the POWER circuit breaker to the ON position.
2. Put the switch on the battery pack in the EXT position.
3. Check the voltage across the EXT BATT terminals. It should read 16.25V $\pm$ 0.25V. If the voltage is out of spec, adjust R3 on the Battery Charger Board.

-NOTE-

If the power supply top cover is removed and the internal boards are accessible, the voltage on the yellow wire (the anode of the large diode in the center of the Battery Charger Board) can be monitored instead of the voltage on the EXT BATT terminals.

CHARGER CURRENT LIMIT TEST

1. Set the POWER circuit breaker to the ON position.
2. Put the switch on the battery pack in the EXT position.
3. The voltage at the EXT BATT terminals should be 16.25V $\pm$ 0.25V. Depress the BATT TEST switch and the voltage should drop to 6.0V $\pm$ 0.50V indicating that the charger circuit is outputting 2 amps. If not within spec, adjust R2 on the battery charger board.

-NOTE-

If the power supply top cover is removed, and the internal boards are accessible, the test point labeled "REF" on the Battery Charger Board can be monitored. The voltage at this point should be set to 5.0V $\pm$ 0.25V.

12991B POWER-FAIL RECOVERY SYTEM

The 12991B Power Fail Recovery System (PFRS) is an accessory for HP 2112B, 2113B, 2111F, and 2117F computers and for the HP 12990B Memory Extender.

Product Contents

- a. Battery Charger Board (P/N 5061-1348)
- b. Battery Backup Board (P/N 5061-1349)
- c. Battery Load Simulator Plug (P/N 12991-60002)
- d. Battery Box Assembly (P/N 12991-60001), which contains:
 - 1. Battery Status PCA (P/N 5061-1352)
 - 2. Two Battery Packs (P/N 0950-1596)
- e. Battery Cable (12944-60002)

Sustaining Battery

14 volt, 10 amp-hour sealed lead acid

Memory Sustaining Time

No. of Memory Modules	1	2	3	4	5	6	7	8	9	10
No. of Hours	4.4	3.8	3.4	3.0	2.6	2.3	2.2	2.1	2.0	1.8

Operation

A terminal block and two switches are mounted on the battery box. The BATTERY SELECT switch has three positions.

- a. INT connects the internal battery pack voltage to the power supply.
- b. EXT connects an external battery voltage (if used) to the power supply. The battery must be connected to the terminal block.
- c. OFF disconnects battery voltage from the power supply. This position allows the line power to be turned off without the battery discharging through memory.

The BAT. TEST switch allows a fast check of the battery. When the switch is moved to the TEST position (BATTERY SELECT at INT), the indicator lights if the battery power source has sufficient energy to sustain memory for at least five minutes.

NOTE

If the BAT.TEST switch is moved to the TEST position when the BATTERY SELECT switch is not in the INT position (or EXT with an external battery connected), and the computer is running, the memory voltages will be pulled down, and parity errors will result.

12991B POWER-FAIL RECOVERY SYTEM (Cont'd)

If an external battery is used, it must have an output voltage above 14 volts and below 18 volts, and must be capable of accepting a maximum charge current of 2 amperes.

Installation

- a. Remove the power supply as described in the power supply removal section.
- b. Remove the Jumper Board from connector J4
- c. Install the Battery Charger Board in connector J3 (component side facing the front of the supply).
- d. Install the Battery Backup Board in connector J4 (component side facing the front of the supply).
- e. Install the power supply in the computer, and check +5V memory, and +12V memory and adjust if necessary.
- f. Secure the battery pack to the back of the computer.
- g. Connect battery cable between BAT.INPUT connector on the computer/extender and the matching connector on the battery box.

NOTE

The BLSP connector (12991-60002) must be connected if the computer is to be operated with the battery box disconnected. This connector must be plugged into the BAT. INPUT connector.

- g. Verify that a 6A fast-blow fuse is installed in the battery box fuse holder.

Internal Switch Settings

Automatic restart switch ALS2 which is mounted on the CPU PCA will alternatively enable or disable the automatic restart capability of the computer. The action that the computer will take upon restoration of primary power following a power failure is determined by the following switch settings:

- a. ARS. The automatic restart feature is enabled
- b. ARS. The automatic restart feature is disabled. The computer is halted immediately regardless of whether the computer was running when the power failure occurred.

Checkout

- a. Set the BATTERY SELECT switch to INT and move the BAT. TEST switch to TEST. The battery status indicator should light.
- b. Perform the diagnostic test as described in the POWER FAIL/ AUTO RESTART DIAGNOSTIC REFERENCE MANUAL, part no. 02100-90216.

12944B POWER-FAIL RECOVERY SYSTEM

The 12944B Power Fail Recovery System (PFRS) is an accessory for the HP 2108E and 2109B computers.

Product Contents

- a. Battery Charger Board (P/N 5061-1348)
- b. Battery Backup Board (P/N 5061-1349)
- c. Battery Cable (P/N 12994-60002)
- d. Battery Load Simulator Plug (P/N 12991-60002)
- e. Battery Box Assembly (P/N 12944-60001), which contains:
 - (1) Battery Status PCA (P/N 5061-1352)
 - (2) One Battery Pack (P/N 0950-1596)

The Operation, Installation, Internal Settings, and Checkout for the 12944B are the same as those for the 12991B.

Sustaining Battery

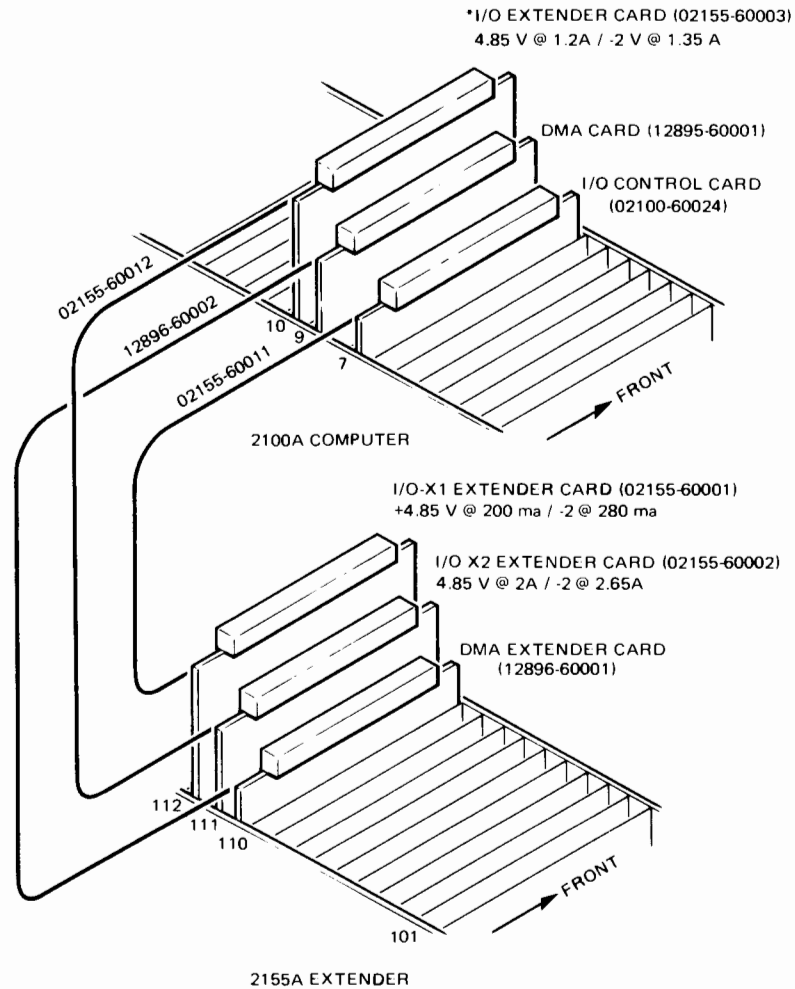
14 volt, 5 amp-hour sealed lead acid

Memory Sustaining Time

No. of Memory Modules	1	2	3	4	5
No. of Hours	4.1	3.3	2.5	1.9	1.6

2155A I/O EXTENDER

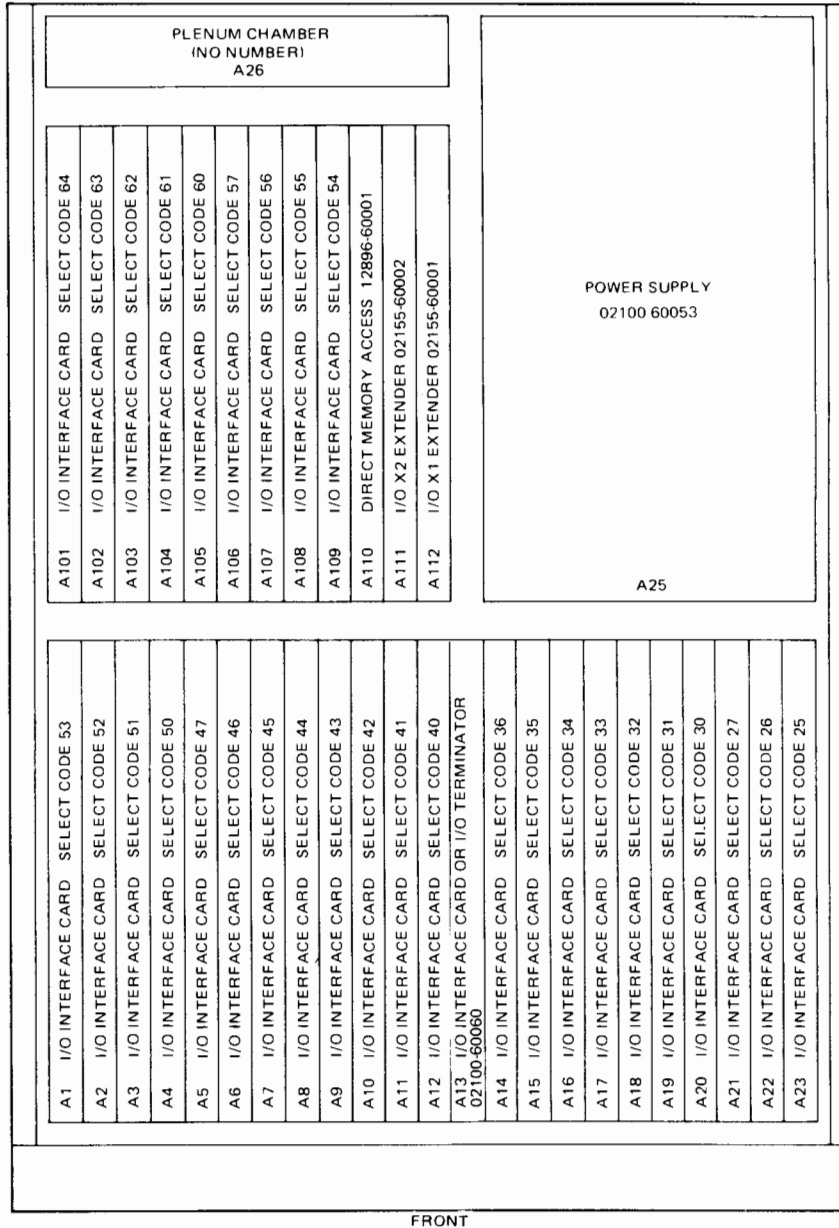
I/O EXTENDER WITH 12896A DMA KIT INTERFACE TO COMPUTER



*FURNISHED WITH EXTENDER

2155A I/O EXTENDER (Cont'd)

LOCATION OF ASSEMBLIES IN 2155 I/O EXTENDER



NOTE: *DIRECT MEMORY ACCESS CARD IS AN ACCESSORY TO THE
EXTENDER AND IS NOT PART OF THE BASIC CONFIGURATION

12979B INPUT/OUTPUT EXTENDER

EQUIPMENT

12979B	Extender & Power Supply
12979-60022	Extender Buffer PCA
12979-60008	Flat I/O Extension Cable
12979-60024	I/O Extension Cable
12979-60025	Power Control Cable
12979-69029	I/O Buffer
12979-60028	I/O Buffer Cable
02100-60060	Terminator PCA

DOCUMENTATION

HP 12979B Input/Output Extender Installation and Service Manual

HP P/N 12979-90016

HP 12979B Input/Output Extender Operating and Reference Manual

HP P/N 12979-90014

POWER REQUIREMENTS

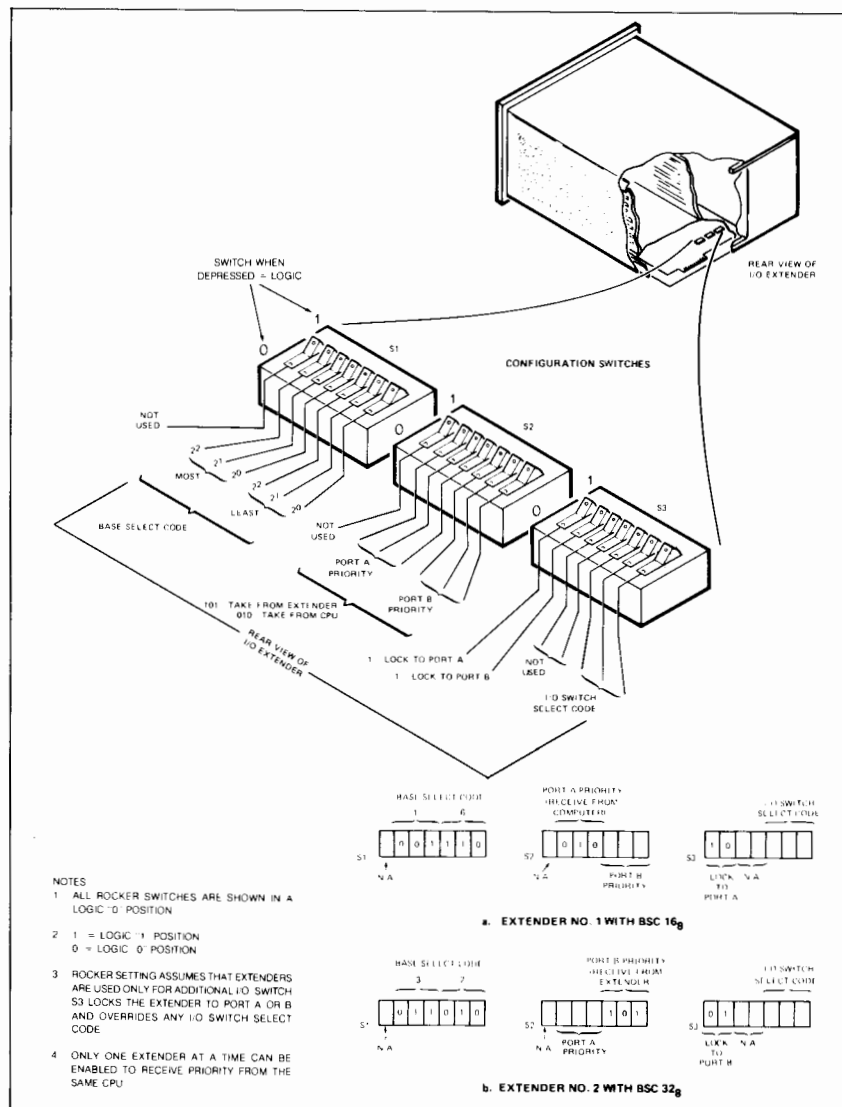
770 Watts Max Power Consumption at:

110 + 20% VAC or 220 + 20% VAC

12979B INPUT/OUTPUT EXTENDER (Cont'd)

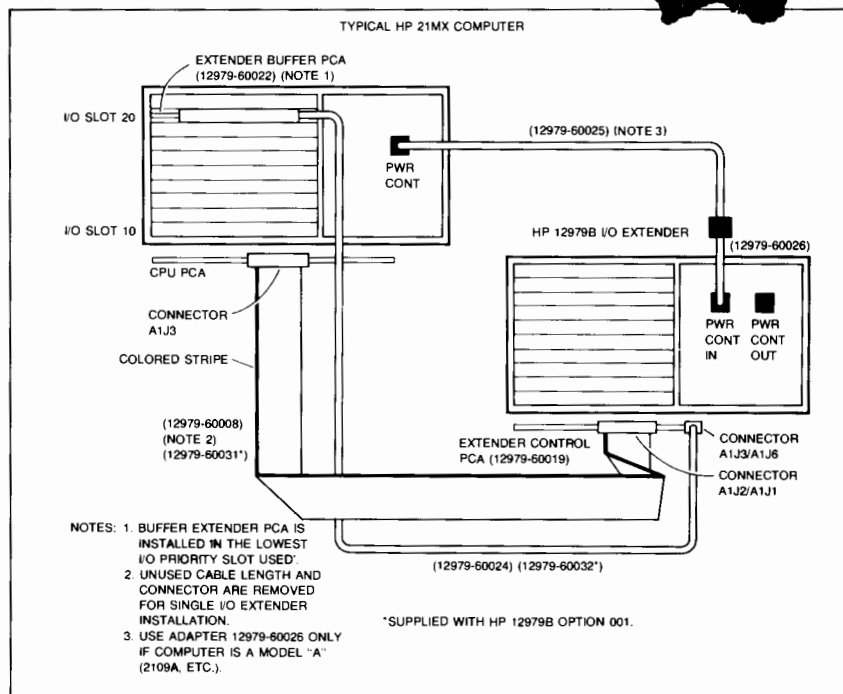
CONFIGURATION

Extender Control PCA Rocker Switch Settings



12979B INPUT/OUTPUT EXTENDER (Cont'd)

Single I/O Extender, Interface to Computer (Rear View)

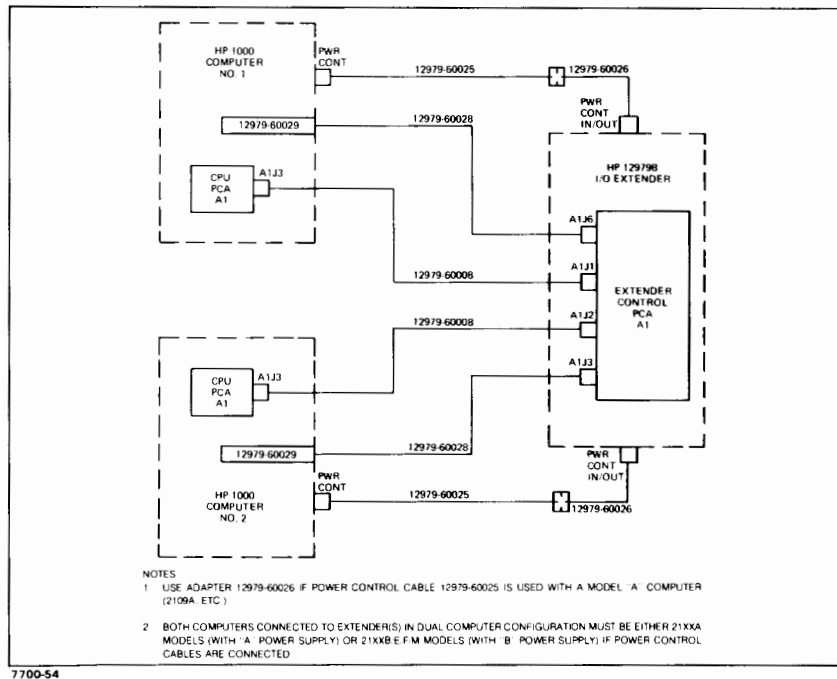


PROCEDURE:

1. Set the rocker switches AIS1 to the desired base select code (octal). Note that the least significant bit is on the right and that a "1" is set by depressing the top of a rocker.
2. Set rocker switches AIS2 to receive priority from the computer at either Port A or B, as appropriate for the cabling setup.
3. Set rocker switch AIS3 only to lock the computer to Port A or B, as appropriate.

12979B INPUT/OUTPUT EXTENDER (Cont'd)

One Extender, Two Computers

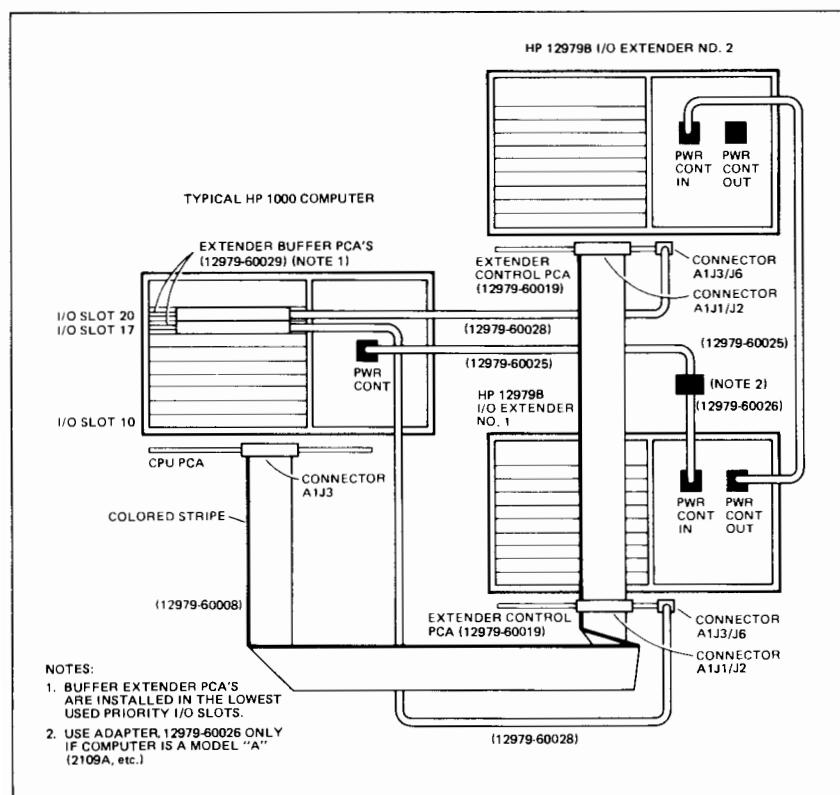


PROCEDURE:

1. Set the rocker switches A1S1 to the desired select code. (Usually the same select code as the I/O buffer PCA.)
2. Set rocker switches A1S2 so that both Port A and B can receive priority from the computer.
3. Rocker switches A1S3 must not be set to lock to either Port A or B but must be set for an individual I/O bus switch select code (octal 70 to 77). Note that only the least significant bit can be set; the most significant digit is built in.

12979B INPUT/OUTPUT EXTENDER (Cont'd)

Dual I/O Extenders, Interface to Processor (Rear View)



Second I/O extender used for I/O redundancy

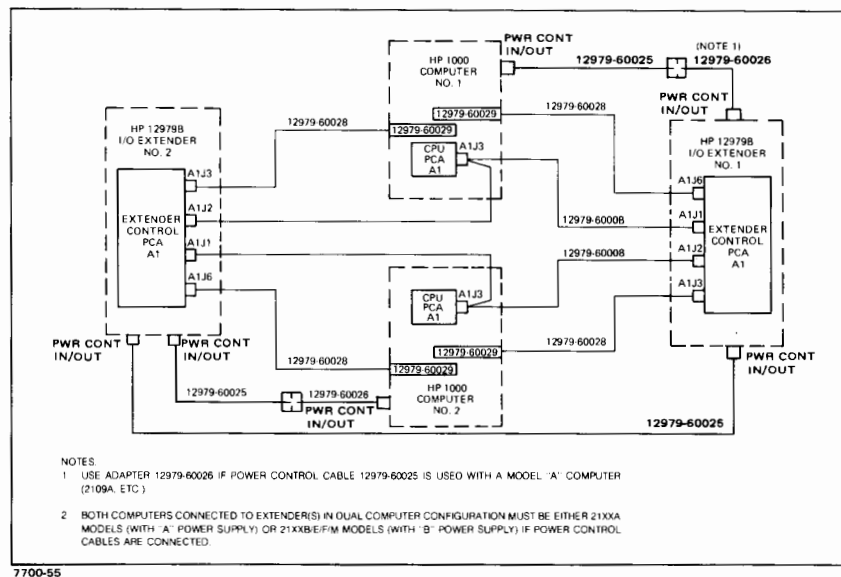
1. Set the rocker switches A1S1 to same base select code on both extenders.
2. Set rocker switches A1S2 so both extenders receive priority from the computer.
3. Rocker switches A1S3 on both extenders must not be set to lock either Port A or B, but must be set for an individual I/O bus switch select code (octal 70 to 77). Note that only the last significant digit can be set; the most significant digit is built in.

Second I/O extender used for additional I/O

1. Set rocker switches A1S1 on each extender for sequential base select codes.
2. Set rocker switches A1S2 so that the higher priority extender receives priority from the computer and the lower priority extender receives priority from the higher priority extender.
3. Set rocker switches A1S3 so that each extender locks to Port A or B as appropriate.

12979B INPUT/OUTPUT EXTENDER (Cont'd)

Two Extenders. Two Computers

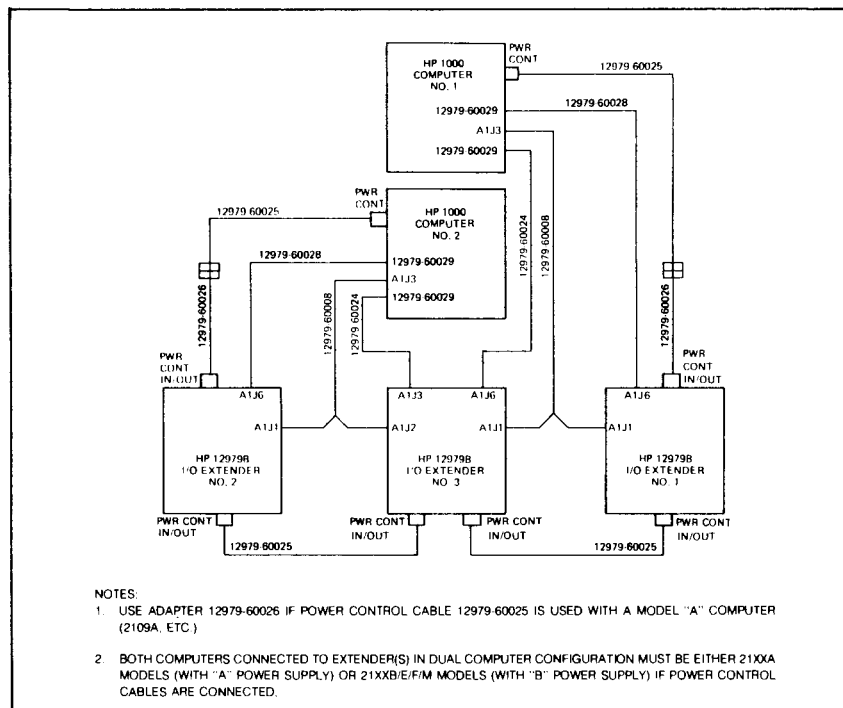


PROCEDURE:

1. Set rocker switches A1S1 such that each extender has a unique base select code.
2. a. Second I/O Extender used for additional I/O:
Set rocker switches A1S2 so that the higher priority extender receives priority from the computer and the lower priority extender receives priority from the higher priority extender.
b. Second I/O Extender used for redundancy:
Set rocker switches A1S2 so that both extenders receive priority from the computer.
3. Rocker switches A1S3 must not be set to lock to either Port A or B but must be set for an individual I/O bus switch select code (octal 70 to 77). Note that only the least significant digit can be set; the new significant digit is built in.

12979B INPUT/OUTPUT EXTENDER (Cont'd)

Shared I/O and Independent I/O



7700-56

POWER SUPPLY CHECK

Check the power supply with all I/O PCAs installed in the extender.

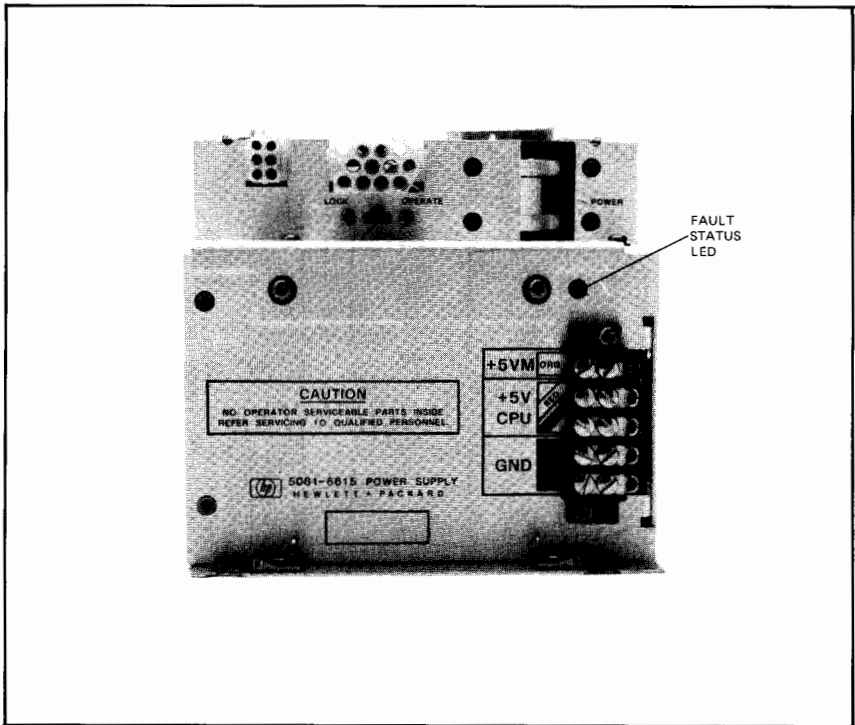
Power Supply Voltage Tolerances:

Supply	Tolerance
+5V	+5.00V to +5.25V
+12V	+/- 0.60V
-2V	+/- 0.40V
-12V	+/- 0.60V
+30V	+12V, -8V



12979B INPUT/OUTPUT EXTENDER (Cont'd)

Power Supply Fault Status LED



The following tapes and reference manuals are used in the diagnostic check.

Diagnostics	Manual	Tape
Input/Output Channel	02100-90213	24318-16001
Power-Fail/Auto Restart	02100-90216	24321-16001

If the diagnostic tests indicate an error halt, refer to the troubleshooting flowcharts for the optional DCPC, run the DCPC diagnostic test also.

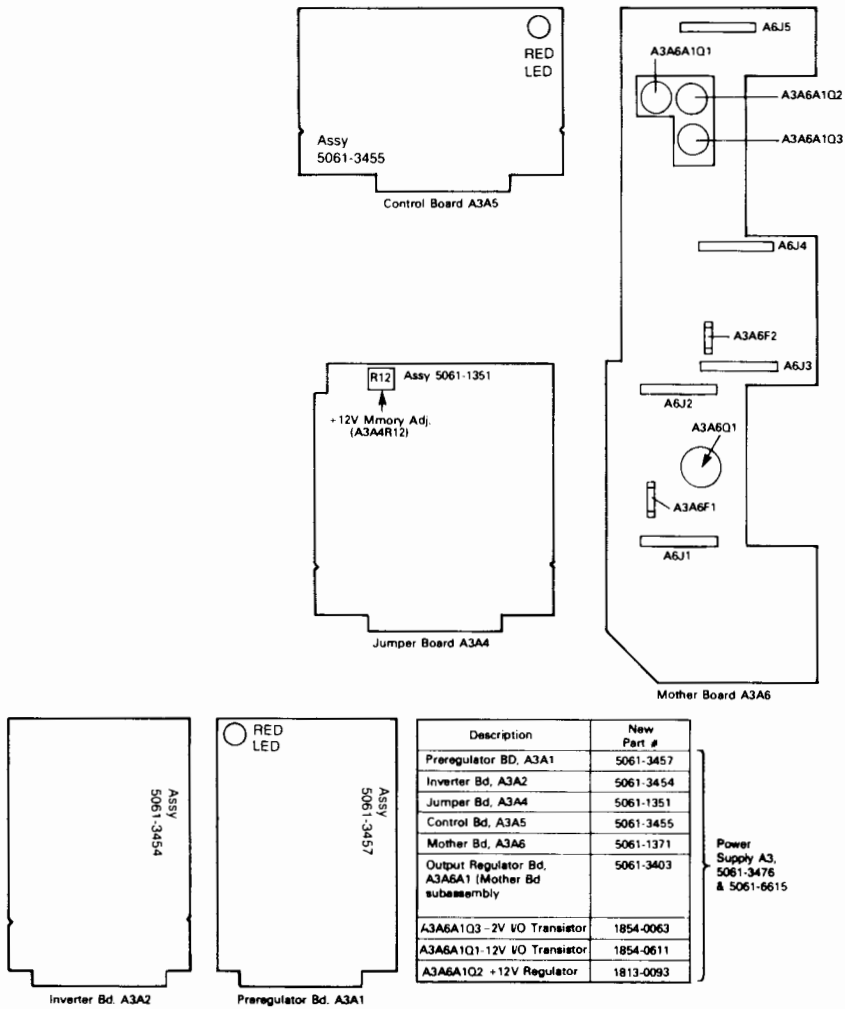
Test of I/O Slot Interrupt Capability

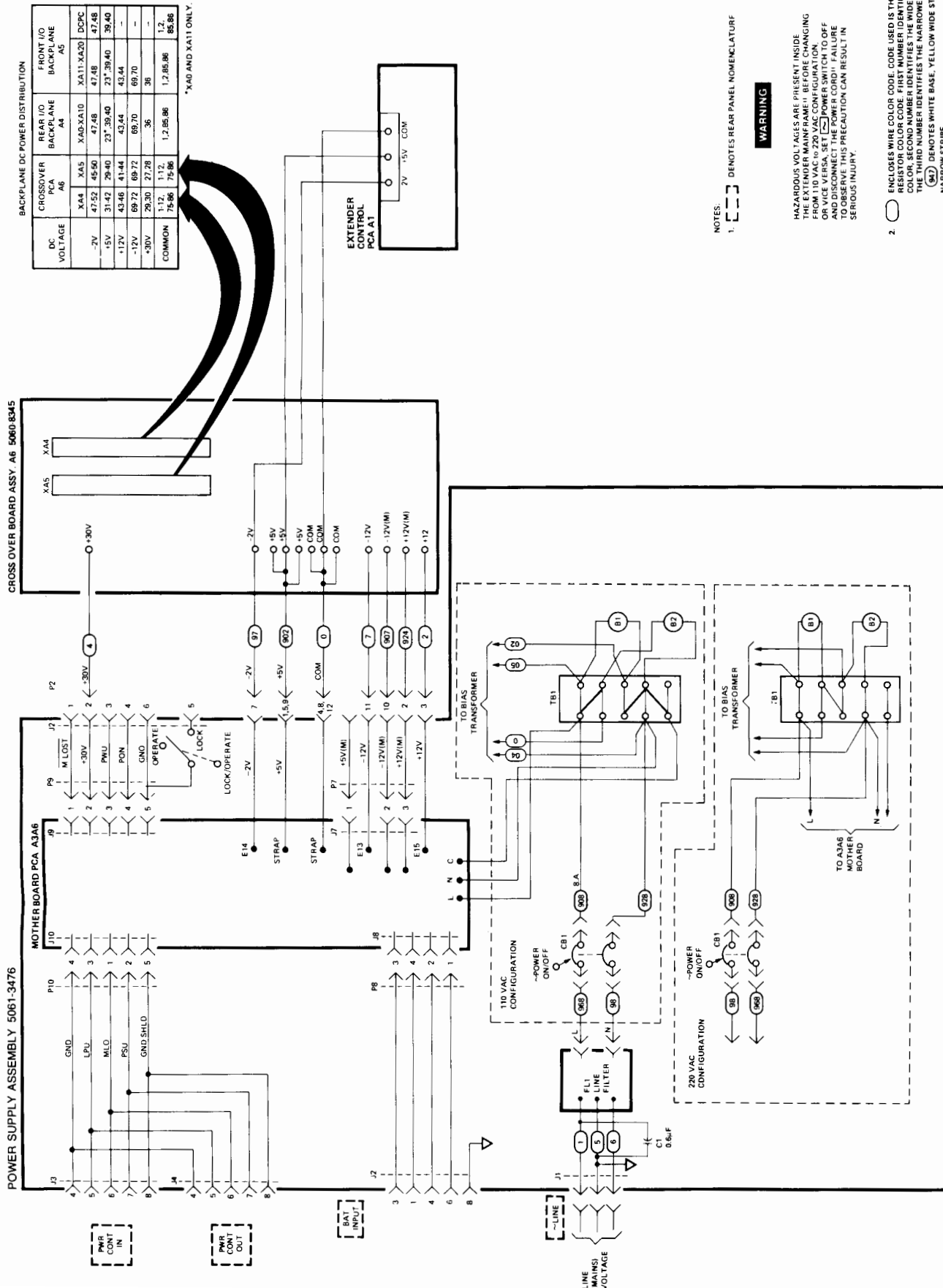
LABEL	I/O INSTRUCTION		MACHINE CODE (IN OCTAL)	COMMENTS
	OPCODE	OPERAND		
START	NOP		000000	
	CLF	00	103100	Turn off interrupt system
	STC	XX,C	1037XX	Turn on selected I/O PCA
	STF	00	102100	Turn on interrupt system
	STF	XX	1021XX	Force interrupt condition on I/O PCA
END	NOP		000000	I/O PCA should interrupt
	NOP		000000	
	JMP	START	024100	Did not interrupt, loop on program
	HLT	77	102077	I/O PCA interrupted properly (Halt in trap cell)

NOTE: XX is device octal select code.

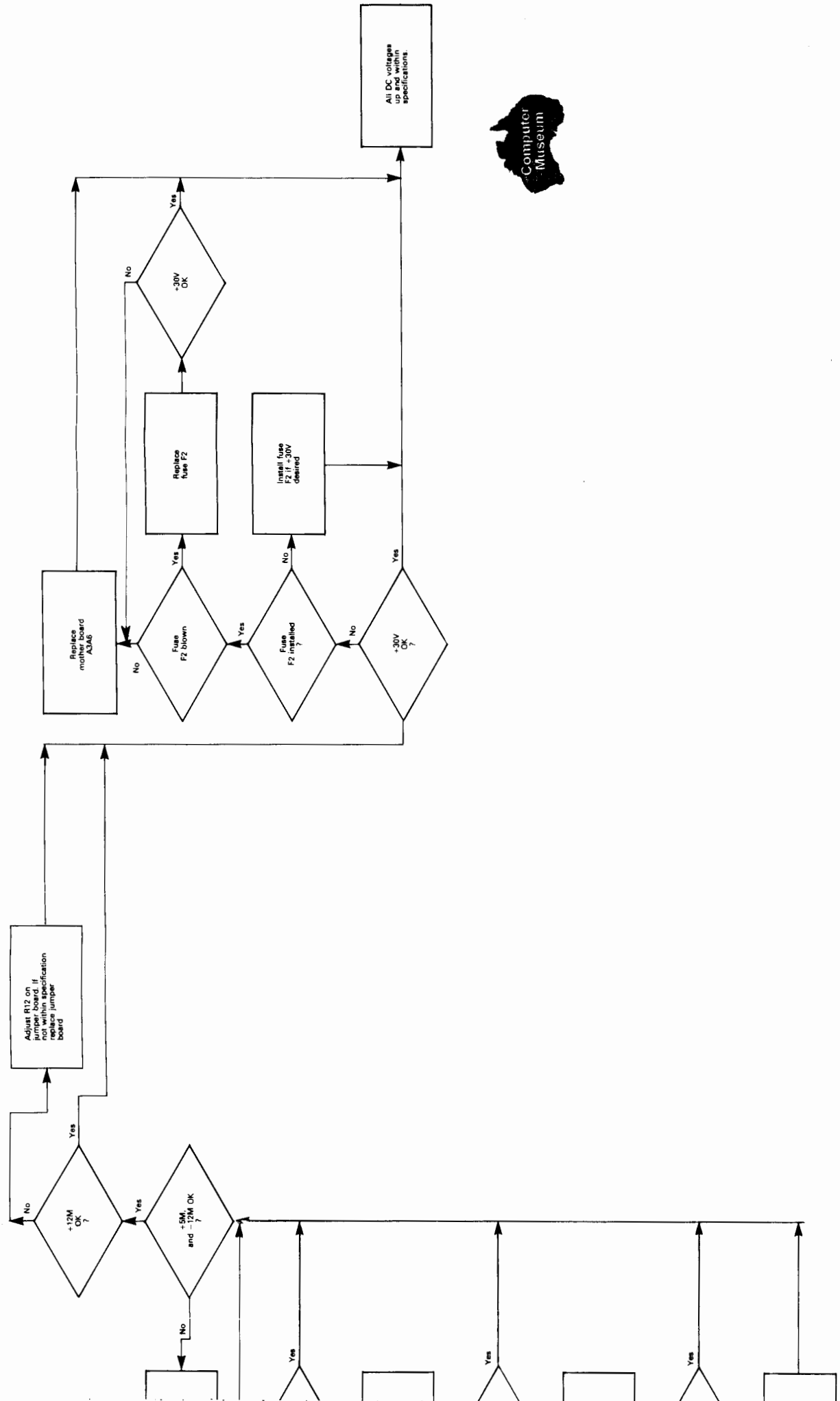
12979B INPUT/OUTPUT EXTENDER (Cont'd)

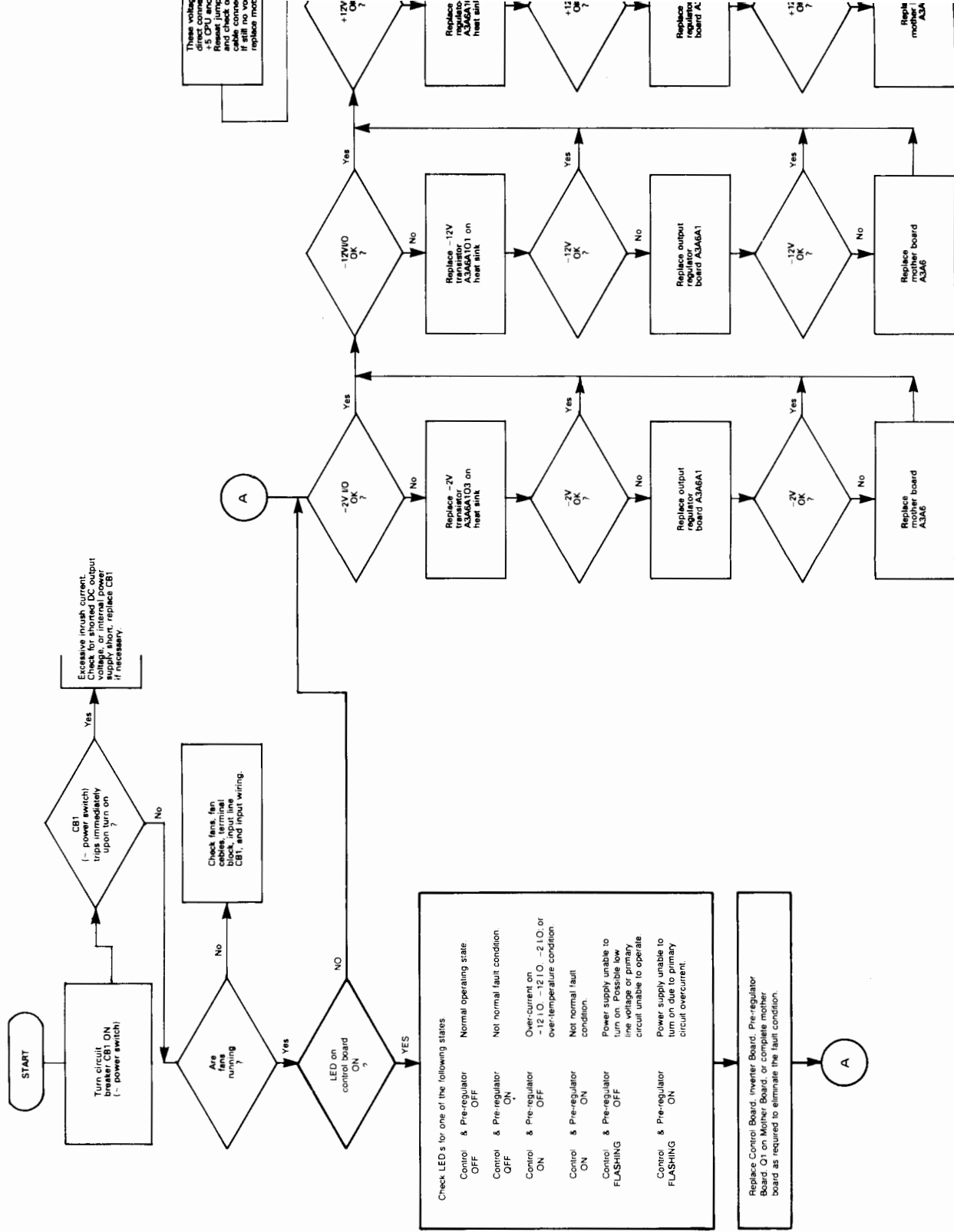
PARTS LOCATION FOR 12979B POWER SUPPLY





7700-R1A





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DIAGNOSTICS**CURRENT DRAIN**

MEMORY PRODUCT	Direct Current at				
	+5V	+5V(M)	+12V	-12V	-2V
2102B	1.2A	-0.5A	0A	0A	-0.1A
2102C	3.3A	-0.68A	0A	0A	0A
2102E	2.6A	-0.64A	0A	0A	0A
2102H	3.3A	-0.69A	0A	0A	0A
12666H 1Mb x	0.5A	0.91A	0A	0A	0A
12666H 1Mb xx	0.5A	0.76A	0A	0A	0A
12699H 256kb x	0.5A	1.07A	0A	0A	0A
12699H 256kb xx	0.5A	0.53A	0A	0A	0A
12741A 16kb	0.849A	0.48A	0.697A	0.02A	—
12746A/H 64kb	0.5A	0.57A	0A	0A	0A
12747A/H 128kb	0.5A	0.57A	0A	0A	0A
12749H 512kb x	0.5A	1.19A	0A	0A	0A
12749H 512kb xx	0.5A	0.65A	0A	0A	0A
12779A/H 256kb	0.3A	0.78A	0A	0A	0A
12780A/H 512kb	0.3A	0.78A	0A	0A	0A
12994A 4kb	.51A	.38A	.57A	.02A	—
12998A 8kb	.51A	.38A	.61A	.02A	—
13187A 16kb	.59A	.26A	.76A	.02A	—
x Operating xx Standby					

BINARY	MANUAL	TITLE
*24395-16001	24395-90001	Semiconductor Memory (21MX)
*24395-16001	24395-90003	Microcoded Memory Diagnostic (21MX)
**12892-16001	12892-90005	Mem Prot/Parity Error (2100/21MX)

*Requires UCS card for operation.

**See ACCESSORIES section under 12892B for operating procedure.

DIAGNOSTICS (Continued)

SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC

1. Load Diagnostic Configurator.
2. Run PRETEST: set P-Reg = 2; S-Reg (5-0) = SC of device to execute basic I/O test; PRESET, RUN, HALT 102077.
3. Configure the Diagnostic Configurator.
4. Load the diagnostic, use DSN #102104 for 24395-16001, or DSN #102006 for 24395-16002
5. If Memory Protect is present, set Parity Error/Memory Protect switch A1S1 to INT/IGNORE; otherwise set switch A1S1 to HALT.
6. Set P = 100 (octal).
7. Set S-Reg = Configuration Switch options (Bit 2 cleared); PRESET, RUN.

NOTE

If locations 1000₈ to 7777₈ have memory failures the diagnostic may produce unpredictable results. To identify errors in this area set S-Reg bit 2 in step 7. After the Program Area Check has been executed, the entire diagnostic must be reloaded in order to return the diagnostics and vice versa.

8. To restart, set S-Reg = Configuration Switch options; P-Reg = 2000₈; PRESET, RUN. (For the 24395-60001, the program may not be restarted if the initialization section, TST07, or TST10 have been aborted.)

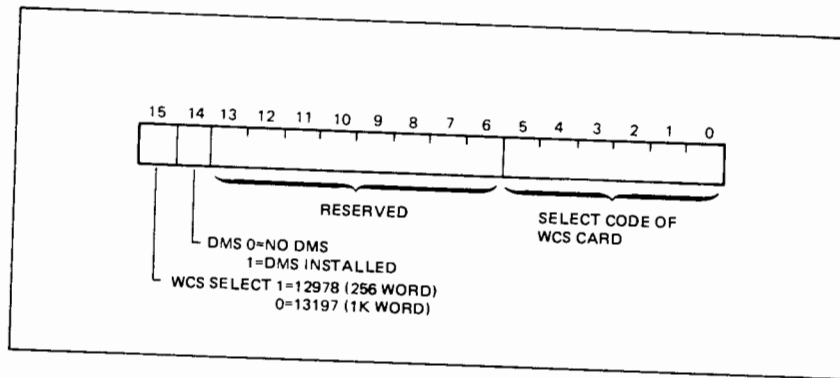
DIAGNOSTICS (Continued)**SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC (Cont'd)****S-Register Switch Options — 24395-16001**

S-REG BIT	MEANING IF SET																																		
0	Abort execution at end of current test and halt 102064 to enter new test limits (must be less than 32K of memory). A-Reg = Lower limit; B-Reg = Upper limit.																																		
1	Reserved.																																		
2	Run Program Area Check.																																		
3, 4	Reserved.																																		
5	Store nonfatal errors occurring above address 17777 in the Error Table instead of halting.																																		
6, 7	Reserved.																																		
8	Suppress operator intervention.																																		
9	Abort diagnostic execution at end of current test section and halt 102075. User may specify a new group of tests in the A-register. Press RUN.																																		
	<table> <tr> <th>A-REG BIT</th><th>IF SET WILL EXECUTE</th></tr> <tr><td>0</td><td>TST00 — Ones and Zeros Test.</td></tr> <tr><td>1</td><td>TST01 — Address Parity Test.</td></tr> <tr><td>2</td><td>TST02 — Marching Ones and Zeros Test.</td></tr> <tr><td>3</td><td>TST03 — Checkerboard Test.</td></tr> <tr><td>4</td><td>TST04 — Rows and Columns Test.</td></tr> <tr><td>5</td><td>TST05 — Disturbance Test.</td></tr> <tr><td>6</td><td>TST06 — Diagonal Test.</td></tr> <tr><td>7</td><td>TST07 — Relocating Test.</td></tr> <tr><td>8</td><td>TST10 — Module 0 Test.</td></tr> <tr><td>9</td><td>*TST11 — Galloping Read Recovery Test.</td></tr> <tr><td>10</td><td>*TST12 — Lonely Bit Test.</td></tr> <tr><td>11</td><td>*TST13 — Extended Instruction Group Test.</td></tr> <tr><td>12</td><td>*TST14 — Memory Protect Test.</td></tr> <tr><td>13</td><td>*TST15 — Intervention Refresh Test.</td></tr> <tr><td>14</td><td>*TST16 — Dynamic Mapping System Test.</td></tr> <tr><td>15</td><td>Reserved.</td></tr> </table>	A-REG BIT	IF SET WILL EXECUTE	0	TST00 — Ones and Zeros Test.	1	TST01 — Address Parity Test.	2	TST02 — Marching Ones and Zeros Test.	3	TST03 — Checkerboard Test.	4	TST04 — Rows and Columns Test.	5	TST05 — Disturbance Test.	6	TST06 — Diagonal Test.	7	TST07 — Relocating Test.	8	TST10 — Module 0 Test.	9	*TST11 — Galloping Read Recovery Test.	10	*TST12 — Lonely Bit Test.	11	*TST13 — Extended Instruction Group Test.	12	*TST14 — Memory Protect Test.	13	*TST15 — Intervention Refresh Test.	14	*TST16 — Dynamic Mapping System Test.	15	Reserved.
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13	*TST15 — Intervention Refresh Test.																																		
14	*TST16 — Dynamic Mapping System Test.																																		
15	Reserved.																																		
10, 11	Reserved.																																		
12	Loop on all selected tests. Tests requiring operator intervention are skipped.																																		
13	Loop on current test section.																																		
14	Suppress error halts.																																		
15	Halt 102076 at the end of each test section; A-Reg = test number (octal).																																		
*TST 11 through TST16 are optional tests and must be selected via test selection. The default set or clearing the A-register will result in Execution of TST00 through 10. If bit 14 is set, all other selected tests will be performed on base memory, then all selected tests will be executed as subtests of TST16 in expanded memory. If only bit 14 is set, the default tests TST00 through TST10 will be performed on base memory, then on expanded memory. Anytime TST16 is executed, the maximum page number will be displayed in the switch-register as soon as execution is initiated.																																			

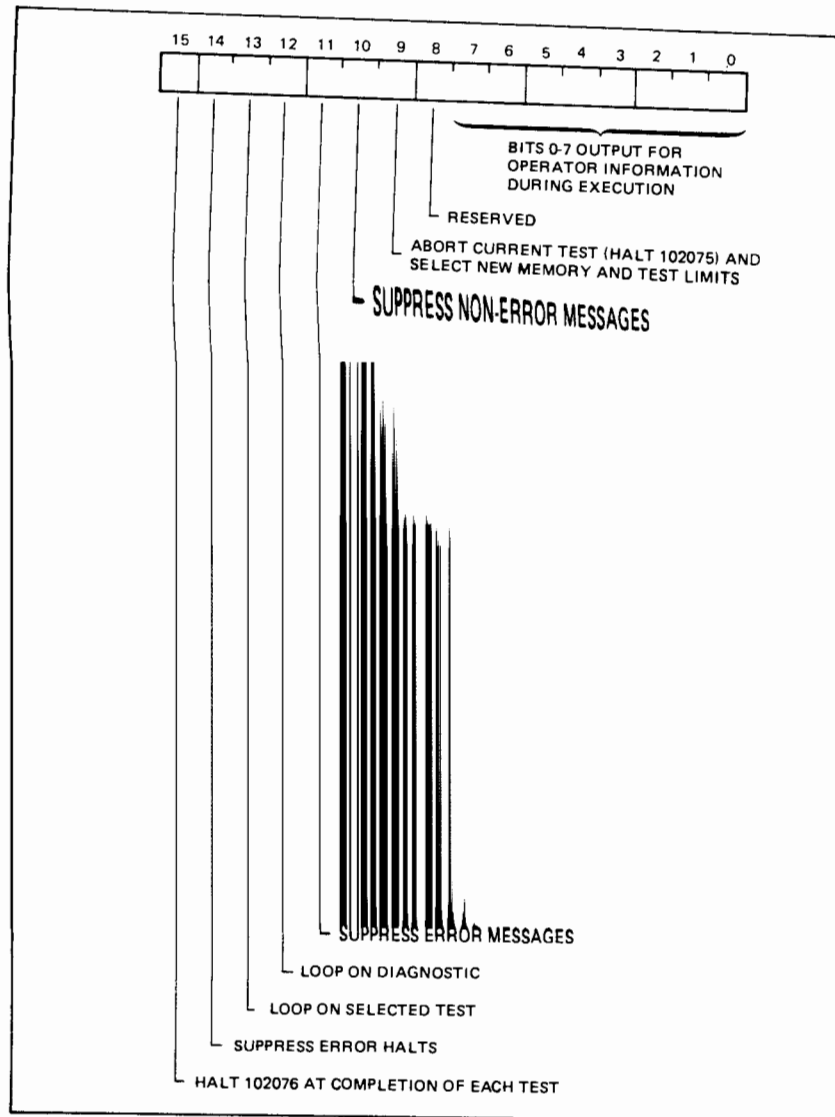
SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC (Cont'd)

S-Register Switch Option — 24395-16002

Configuration



Program



DIAGNOSTICS (Continued)**SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC (Continued)****Error and Information Halts — 24395-16001**

HALT CODE (OCTAL)	TEST SECTION	MEANING
102000	TST00	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102001	TST01	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102002	TST02	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102003	TST03	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102004	TST04	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102005	TST05	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102006	TST06	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102007	TST07	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102011	TST11	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102012	TST12	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102013	TST13	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102014	TST14	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102015	TST15	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.
102016	TST16	Data error. A-register contains the data written and the B-register contains the data read. Press RUN for failing address.

DIAGNOSTICS (Continued)**SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC (Continued)****Error and Information Halts — 24395-16001 (Cont'd)**

HALT CODE (OCTAL)	TEST SECTION	MEANING
102027	ANY	Secondary error halt. A-register contains the failing address (page address if in expanded memory). B-register contains all ones if error is in base memory, or the page number if in expanded memory. Press RUN to continue.
102030	TEST CONTROL	Memory upper limit entered in B-register after halt 102065 is still greater than calculated memory size. Re-enter limit in B-register or leave current value to run tests on memory above calculated size. Press RUN.
102034	ANY	Parity error occurred above address 7777 and the program was not verifying data previously written. A-register contains the failing address (Page address if in expanded memory). B-register contains all ones if address is in base memory or page number if in expanded memory. If in TST07, the test section is aborted. Press RUN to continue.
102035	TST07, TST11, or TST12	Test selected cannot be executed due to test limits not being located on 4K main memory boundaries. Press RUN to go back to enter new test limits.
102036	TEST CONTROL	No expanded memory could be found. Press RUN to return to operator selection.
102060	TST15	Halt to allow memory to refresh itself. Press RUN to continue. Do not press PRESET. Occurs three times consecutively. In TST16, however, this halt may occur any number of times depending on memory size.
102061	ANY	Test selected cannot be run because there is only 4K of memory present.
102062	TST14	Test selected cannot be run because memory protect is not present.
102063	INITIALIZATION or TST07	Data error at destination of a move occurred. A-register contains data written and B-register contains data read. Press RUN to get failing address.
102064	TEST CONTROL	Halt to enter new test limits (less than 32K memory only). Put lower limit in A-register and upper limit in B-register, press RUN.
102065	TEST CONTROL	Memory upper limit entered in B-register greater than calculated memory. Re-enter limit in B-register or leave current value to check above calculated memory. Press RUN.

DIAGNOSTICS (Continued)

SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC (Continued)

Error and Information Halts — 24395-16001 (Cont'd)

HALT CODE (OCTAL)	TEST SECTION	MEANING
102066	TEST CONTROL	Memory lower limit entered in A-register is larger than or equal to upper limit in B-register. Correct values and press RUN.
102067	TEST CONTROL	Memory lower limit entered in A-register is below 10000 ₈ . Re-enter limit in A-register and press RUN.
102075	TEST CONTROL	Test selection request resulting from Switch-register bit 9 being set. Enter the desired group of tests to be run into the A-register, and press RUN. See table 3-1.
102076	TEST CONTROL	End-of-test halt resulting from Switch-register bit 15 being set. A-register contains the test number. Press RUN to continue.
102077	TEST CONTROL	Diagnostic pass complete. A-register contains the pass count. To do another pass, press RUN.
106001	ANY	Irrecoverable parity error in module 0. A-and B-register contain the address of the parity error.
106002	ANY	Erroneous memory protect error. Fix problem before restarting.
106004	INITIALIZATION, PROGRAM AREA CHECK, or TST10	Data error in memory module 0 precludes further testing. A-register contains the data written and the B-register contains the data read. Press RUN to obtain the failing address.
106005	INITIALIZATION, PROGRAM AREA CHECK, or TST10	Secondary error halt. A- and B-register both contain the failing address. Irrecoverable.
106010	INITIALIZATION	Memory determination routine wrote all ones and read something other than ones or zeros back. Fix problem and reload or set desired last word of memory address in the B-register and press RUN.
106011	INITIALIZATION	Memory determination routine could not find any memory. Fix problem before proceeding.
106012	ANY	Program destroyed. If available, see listing.
106013	INITIALIZATION	The Switch-register failed. A-register contains the data output to the Switch-register and the B-register contains the data loaded from the Switch-register. Irrecoverable.
106014	INITIALIZATION	Memory protect failed. Run memory protect diagnostic to analyze failure. Irrecoverable.

DIAGNOSTICS (Continued)**SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC (Continued)****Error and Information Halts — 24395-16001 (Cont'd)**

HALT CODE (OCTAL)	TEST SECTION	MEANING
106015	ANY	An interrupt to location 5 occurred without memory protect. Fix problem before proceeding.
106016	INITIALIZATION, PROGRAM AREA CHECK or TST10	Parity error in memory module 0 occurred during testing of module 0. A-register contains the data written and the B-register contains the data read. Press RUN to get the failing address.
106067	PROGRAM AREA CHECK	Program check complete. To run another pass, press RUN.
106075	ANY	Halt placed in unused memory to trap unwanted transfer of control to the location in the M-register. Fix problem before proceeding.
106077	ANY	Trap cell halt stored in locations 2 through 77 ₈ . User must determine cause of erroneous interrupt or transfer of control to location in the M-register before proceeding.
107002	TST16	The page determination routine wrote all ones in a page and read back something other than all ones or all zeros. Fix problem and reload, or set desired maximum page number in the B-register and press RUN.

DIAGNOSTICS (Continued)**SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC (Continued)****Error and Information Halts — 24395-16002**

Halt Code	Test Section	Meaning or Routine where a failure occurred
102000	FRONT PANEL	Only occurs when 4K of memory is installed. This halt precedes the entry of the Front Panel microcoded routine, resulting in destruction of the diagnostic program. Press RUN to continue.
102001	FRONT PANEL	Data error (WRT.READ). Refer to paragraph 3-4.
102002	FRONT PANEL	Data error (READ). Refer to paragraph 3-4.
102003	FRONT PANEL	Data error (GAL.READ) if X-register bit 15 is set. Otherwise, operator has interrupted microcode by setting bit 9 of the S-register.
102004	FRONT PANEL	Data error (WRT.READ). Refer to paragraph 3-4.
102005	FRONT PANEL	REFRESH routine was interrupted.
102006	FRONT PANEL	Data error (READ). Refer to paragraph 3-4.
102007	—	Reserved.
102010	TST00	Data error *. Address and Pattern test Failed.
102011	TST01 through TST04	Data error* (WRT.READ)
102012	TST01 through TST04	Data error.* (READ)
102013	TST01 through TST02	Data error.* (GAL.READ)
102014	TST01 through TST04	Data error.* (WRT.READ)
102015	TST01 through TST04	REFRESH routine was interrupted.
102016	TST01 through TST04	Data error.* (READ)

DIAGNOSTICS (Continued)

SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC (Continued)

Error and Information Halts — 24395-16002 (Cont'd)

Halt Code	Test Section	Meaning or Routine where a failure occurred
102017	—	Reserved.
102020	TST05	Data error.* Address and Pattern Test failed in Module 0.
102021	TST05	Data error* in Module 0 (WRT.READ).
102022	TST05	Data error* in Module 0 (READ).
102023	TST05	Data error* in Module 0 (GAL.READ).
102024	TST05	Data error* in Module 0 (WRT.READ).
102025	TST05	REFRESH routine was interrupted
102026	TST05	Data error* in Module 0 (READ).
102027 to 102063	—	Reserved.
102064	TST05	Parity Error interrupt during the Module 0 Test.
102065	TST00 through TST04	Parity Error* interrupt caused by the parity chip (bit 16).
102066	All	Parity Error interrupt occurred and the address of the parity error was not the test address (the A-Register contains the address)
102067	All	Memory Protect interrupt.
102070	INITIAL- IZATION	HP 12978A 256 word WCS cannot be used on a 21MX E-Series computer.
102071	INITIAL- IZATION	WCS did not load correctly (check WCS board) or wrong WCS select code may have been used. Set the P-register to 100 and reenter WCS select code.
102072	INITIAL- IZATION	Computer type specified is not a 21MX. Irrecoverable.
102073	INITIAL- IZATION	Select code specified in the S-register is less than 10 (octal). Correct S-register and press RUN.
102074	INITIAL- IZATION	Configuration complete. Set the S-register according to table 3-2 and press RUN.
102075	CONTROL	Operator has aborted current test and requested test and memory module selection by setting S-register bit 9. Refer to paragraph 3-2.

DIAGNOSTICS (Continued)**SEMICONDUCTOR/MICROCODED MEMORY DIAGNOSTIC (Continued)****Error and Information Halts — 24395-16002 (Cont'd)**

Halt Code	Test Section	Meaning or Routine where a failure occurred
102076	CONTROL	Operator has requested to halt after each test by setting S-register bit 15. The A-register contains the number of the test last executed. Press RUN to continue.
102077	CONTROL	Successful termination. The A-register contains the number of passes completed. Press RUN to execute another pass.
103003	FRONT PANEL	Operator has requested to abort current test by setting bit 9 of the S-register. See paragraph 3-4.
106010	TST00	Soft Error*. Address and Pattern test failed. Refer to paragraph 3-3.
106011	TST01 through TST04	Soft Error* (WRT.READ). Refer to paragraph 3-3.
106012	TST01 through TST04	Soft Error* (READ). Refer to paragraph 3-3.
106013	TST01 through TST04	Soft Error* (GAL.READ). Refer to paragraph 3-3.
106014	TST01 through TST04	Soft Error* (WRT.READ). Refer to paragraph 3-3.
106016	TST01 through TST04	Soft Error*. (READ)
106065	TST00 through TST05	Soft Error*. Parity Error Interrupt caused by the parity chip.

MEMORY SELF TEST ON E/F-SERIES COMPUTERS

NOTE: SELF TEST SHOULD BE RUN WITH THE STOP OR CORRECT JUMPER REMOVED ON THE 2102C OR 2102H

- a) set P-reg. to 000000 octal
- b) set A-reg. to 100000 octal
- c) press PRESET
- d) to loop set LOCK/OPERATE switch to LOCK
- e) press INSTRUCTION STEP: As the test executes the display reg. will display the count of each 32K word segment of memory tested.

ANALYSIS OF SELF TEST USING HIGH PERFORMANCE FAULT CONTROL OR STANDARD PERFORMANCE FAULT CONTROL WITH 2102C CONTROLLER DATE CODE 1820 OR LATER

DISPLAY INDICATOR LAMPS	DISPLAY REGISTER LAMPS	PARITY LAMP	OVERFLOW LAMP	32K SEGMENT COUNT (DISPLAY REGISTER)	SINGLE BIT ERROR CORRECTION LED	FAULT LATCH LED'S	INDICATION
T-Register Lamp ON all others OFF	100000 (octal)	OFF	ON	Smooth and Consecutive	Remains ON	Remain ON 77 (octal)	Self test passes, memory system OK
T-Register Lamp ON all others OFF	100000 (octal)	ON	ON	Smooth and Consecutive	Goes OFF	Flashing ON and OFF during execution	Misconfigured or faulty check bit array module or bit 16 error on MEM MOD or faulty controller
T-Register Lamp ON all others OFF	100000 (octal)	Flashes ON but does not latch	ON	Smooth and Consecutive	Goes OFF	Latches on octal #'s does not flash	Bad check bit or parity bit on memory module
T-Register Lamp ON all others OFF	100000 (octal)	OFF	ON	Not Consecutive			Misconfigured or faulty memory module
ALL Lamps ON	177777 (octal)	ON	OFF		Goes OFF	Latches on octal #'s does not flash	Data bit failure(s)
ALL Lamps ON	177777 (octal)		ON				CPU failure

MEMORY SELF TEST ON E/F-SERIES COMPUTERS (Cont'd)

ANALYSIS OF SELF TEST USING STANDARD PERFORMANCE FAULT
CONTROL WITH 2102C CONTROLLER DATE CODE LESS THAN 1820

DISPLAY INDICATOR LAMPS	DISPLAY REGISTER LAMPS	PARITY LAMP	OVERFLOW LAMP	32K SEGMENT COUNT (DIS- PLAY REGISTER)	FAULT LATCH LED'S	INDICATION
T-Register Lamp ON all others OFF	100000 (octal)	OFF	ON	Smooth and Consecutive		Self test passes, memory system OK
T-Register Lamp ON all others OFF	100000 (octal)	ON	ON	Smooth and Consecutive		Misconfigured or faulty check bit array module or bit 16 error on MEM MOD or faulty controller
T-Register Lamp ON all others OFF	100000 (octal)	OFF	ON	Not Consecutive		Misconfigured or faulty memory module
ALL Lamps ON	177777 (octal)	ON	OFF		Latches on octal #'s does not flash	Data bit failure(s)
ALL Lamps ON	177777 (octal)		ON			CPU failure

ANALYSIS OF SELF TEST USING HIGH PERFORMANCE OR
STANDARD PERFORMANCE MEMORY 2102B OR 2102E CONTROLLERS

DISPLAY REGISTERS INDICATORS	DISPLAY REGISTER	PARITY INDICATOR	OVERFLOW INDICATOR	32K SEGMENT COUNT	INDICATION
T-Register indicator lit, all others OFF	100000 (octal)	OFF	ON	Smooth and consecutive	Memory System O.K. Return system to normal operating condition
T-Register indicator lit, all others OFF	100000 (octal)	ON	ON	Smooth and consecutive	Parity bit error (Bit 16)
All indicators ON	177777 (octal)		OFF		Data bit(s) error
All indicators ON	177777 (octal)		ON		CPU failure
T-Register indicator lit, all others OFF	100000 (octal)			Not consecutive	Misconfigured or faulty module

NOTE: Any other condition, run the software diagnostics.

2102B SEMICONDUCTOR MEMORY CONTROLLER

EQUIPMENT

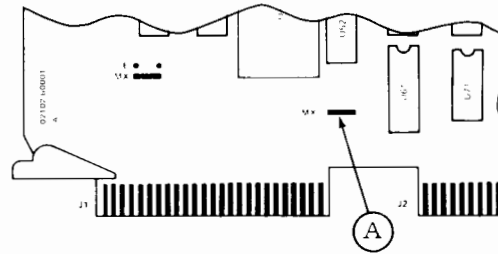
02102-60001	Memory controller PCA
02112-60016	Memory cable assembly
5955-4310	Standard Performance Memory
	System Install. and Service Manual

INSTALLATION NOTES

IN-1 It is recommended that the 2102B Memory Controller be installed in slot 118 (2108/2109) and slot 123 (2112/2113).

2102B Memory Controller Jumper Configurator

Revision "A" Board



Install jumpers in indicated positions

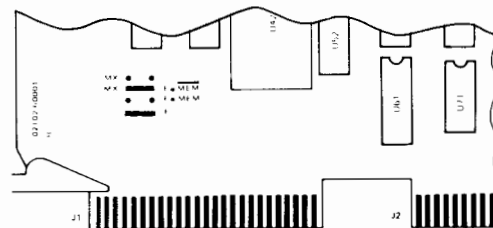
MX = 21MX M-Series Computer

E = 21MX E-Series Computer

(A) For 21MX E-Series Computer with Memory Expansion Module (MEM) not installed, also install "MX" jumper near U61.

Board as shown configured for a 21MX M-Series Computer.

Revision "B" or "C" Board



Install jumpers in indicated positions
(There will always be 2 jumpers installed)

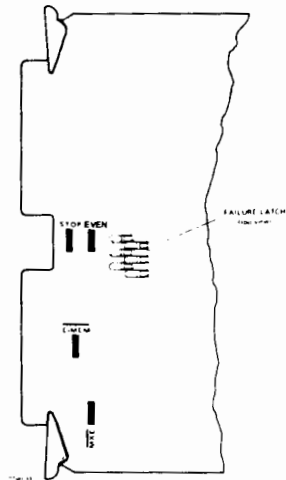
MX = 21MX M-Series Computer
E • MEM = 21MX E-Series Computer, Memory Expansion Module (MEM) installed

E • MEM = 21MX E-Series Computer, Memory Expansion Module (MEM) Not Installed
E = 21MX E-Series Computer

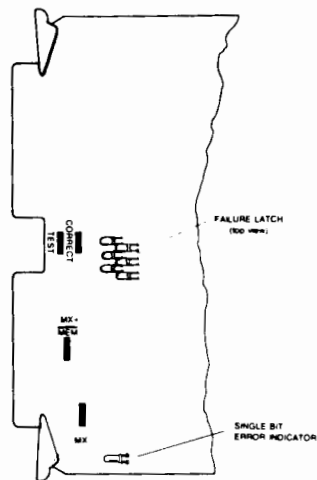
Board as shown configured for a 21MX E-Series Computer, MEM not installed.

2102C STANDARD PERFORMANCE FAULT CONTROL MEMORY CONTROLLER

Manual: 5955-4310 Standard Performance Memory Systems Install. and Service Manual



02102-60003 DATE CODE 1721



02102-60003 DATE CODE 1820 OR LATER

Configure jumpers as described in the following table:

COMPUTER	JUMPER	
	MXE	E+MEM
HP 1000 M-Series	IN	IN
HP 1000 E-Series, Memory Expansion Module (MEM) not installed	OUT	IN
HP 1000 E-Series, Memory Expansion Module (MEM) installed	OUT	OUT

To disable Fault Control, remove jumper labeled "STOP".
EVEN jumper normally removed.
Used for Memory Protect/Parity Error Diagnostic.

Configure jumpers as described in the following table:

COMPUTER	JUMPER	
	MX	MX+MEM
HP 1000 M-Series	IN	IN
HP 1000 E-Series, Memory Expansion Module (MEM) not installed	OUT	IN
HP 1000 E-Series, Memory Expansion Module (MEM) installed	OUT	OUT

To disable Fault Control, remove jumper labeled "CORRECT". TEST jumper normally removed. Used for Memory Protect/Parity Error Diagnostic.

2102C FAULT LATCH INDICATIONS (With STOP Jumper)

YELLOW DIGIT	RED DIGIT	ERROR DETECTED	YELLOW DIGIT	RED DIGIT	ERROR DETECTED
X	1	Double (or greater) error, X=don't care	2	4	Bit 10
X	3	Double (or greater) error, X=don't care	3	4	Bit 11
X	5	Double (or greater) error, X=don't care	4	4	Bit 12
0	0	Bit 0	5	4	Triple (or greater) error
1	0	Triple (or greater) error	6	4	Triple (or greater) error
2	0	Triple (or greater) error	7	4	Bit 19
3	0	Bit 1	0	6	Bit 13
4	0	Triple (or greater) error	1	6	Bit 14
5	0	Bit 2	2	6	Triple (or greater) error
6	0	Bit 3	3	6	Bit 18
7	0	Bit 4	4	6	Bit 15
0	2	Triple (or greater) error	5	6	Bit 17
1	2	Bit 5	6	6	Bit 16
2	2	Bit 6	7	6	Bit 21
3	2	Triple (or greater) error	0	7	Double (or greater) error
4	2	Bit 7	1	7	Double (or greater) error
5	2	Triple (or greater) error	2	7	Double (or greater) error
6	2	Bit 8	3	7	Double (or greater) error
7	2	Bit 20	4	7	Double (or greater) error
0	4	Triple (or greater) error	5	7	Double (or greater) error
1	4	Bit 9	6	7	Double (or greater) error

2102C FAULT LATCH INDICATIONS (With CORRECT Jumper)

YELLOW DIGIT	RED DIGIT	ERROR DETECTED	YELLOW DIGIT	RED DIGIT	ERROR DETECTED
X	1	Double (or greater) error, X=don't care	2	4	Bit 10
X	3	Double (or greater) error, X=don't care	3	4	Bit 11
X	5	Double (or greater) error, X=don't care	4	4	Bit 12
0	0	Bit 0	5	4	Triple (or greater) error
1	0	Triple (or greater) error	6	4	Triple (or greater) error
2	0	Triple (or greater) error	7	4	Bit 19
3	0	Bit 1	0	6	Bit 13
4	0	Triple (or greater) error	1	6	Bit 14
5	0	Bit 2	2	6	Triple (or greater) error
6	0	Bit 3	3	6	Bit 18
7	0	Bit 4	4	6	Bit 15
0	2	Triple (or greater) error	5	6	Bit 17
1	2	Bit 5	6	6	Bit 16
2	2	Bit 6	7	6	Bit 21
3	2	Triple (or greater) error	0	7	Double (or greater) error
4	2	Bit 7	1	7	Double (or greater) error
5	2	Triple (or greater) error	2	7	Double (or greater) error
6	2	Bit 8	3	7	Double (or greater) error
7	2	Bit 20	4	7	Double (or greater) error
0	4	Triple (or greater) error	5	7	Double (or greater) error
1	4	Bit 9	6	7	Double (or greater) error
			7	7	Normal state and result of PRESET

Note: All LEDs "on" is the normal state.

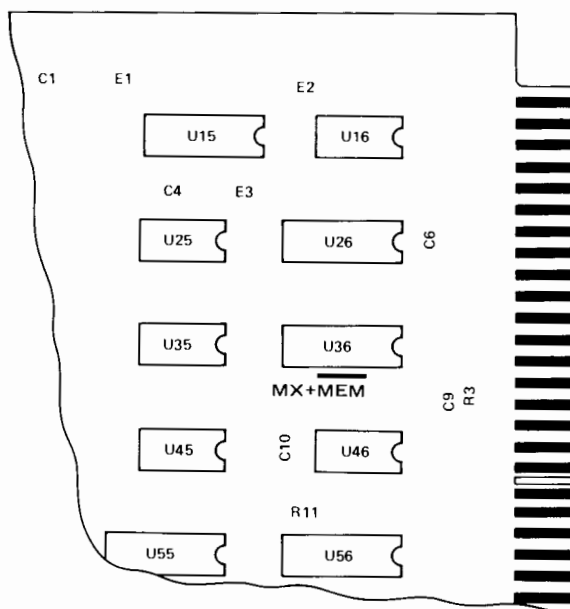
2102E HIGH PERFORMANCE MEMORY CONTROLLER**EQUIPMENT**

02102-60002	Memory controller PCA
02112-60015	Memory cable assembly
5955-4311	High Performance Memory Systems Installation and Service Manual

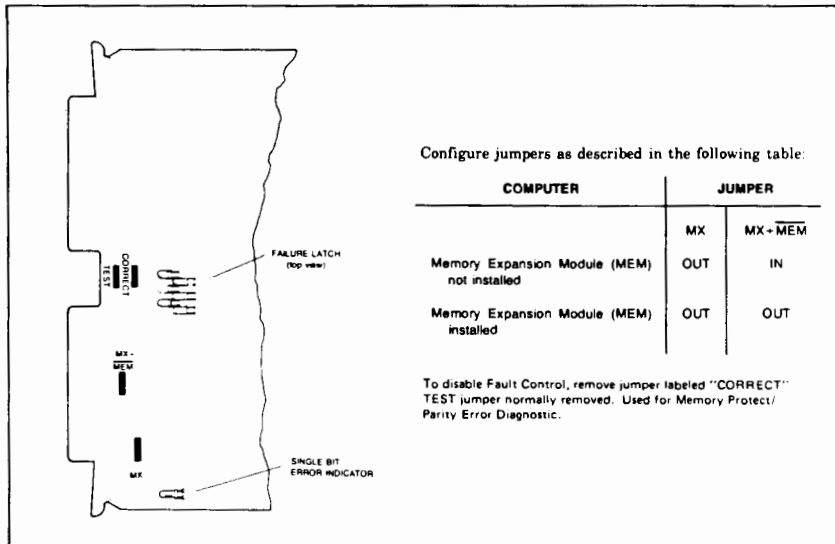
INSTALLATION NOTES

IN-1 If the Memory Expansion Module (MEM) is not installed in the E-Series computer, install jumper on controller PCA as shown in figure 51-1.

Figure 51-1. MEM Jumper Configuration



2102H HIGH PERFORMANCE FAULT CONTROL MEMORY CONTROLLER



Fault Latch Error Indications

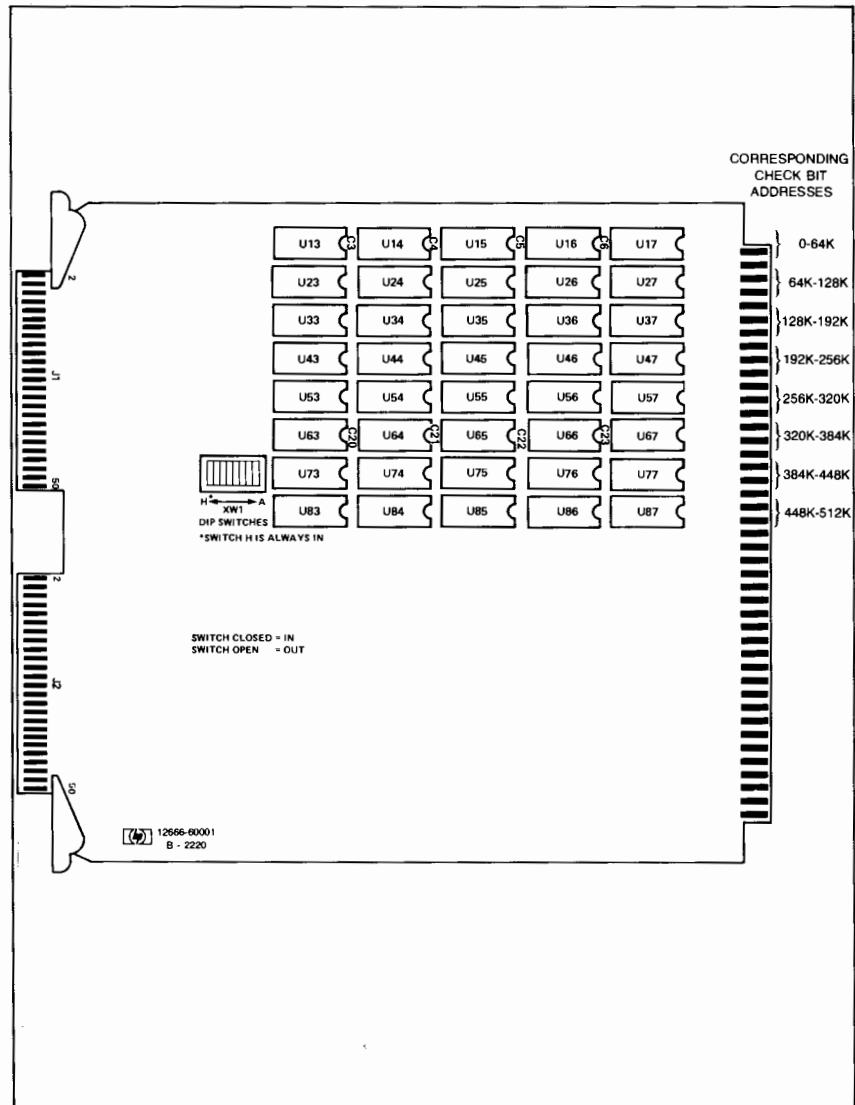
YELLOW DIGIT	RED DIGIT	ERROR DETECTED	YELLOW DIGIT	RED DIGIT	ERROR DETECTED
X	1	Double (or greater) error. X=don't care	2	4	Bit 10
X	3	Double (or greater) error. X=don't care	3	4	Bit 11
X	5	Double (or greater) error. X=don't care	4	4	Bit 12
0	0	Bit 0	5	4	Triple (or greater) error
1	0	Triple (or greater) error	6	4	Triple (or greater) error
2	0	Triple (or greater) error	7	4	Bit 19
3	0	Bit 1	0	6	Bit 13
4	0	Triple (or greater) error	1	6	Bit 14
5	0	Bit 2	2	6	Triple (or greater) error
6	0	Bit 3	3	6	Bit 18
7	0	Bit 4	4	6	Bit 15
0	2	Triple (or greater) error	5	6	Bit 17
1	2	Bit 5	6	6	Bit 16
2	2	Bit 6	7	6	Bit 21
3	2	Triple (or greater) error	0	7	Double (or greater) error
4	2	Bit 7	1	7	Double (or greater) error
5	2	Triple (or greater) error	2	7	Double (or greater) error
6	2	Bit 8	3	7	Double (or greater) error
7	2	Bit 20	4	7	Double (or greater) error
0	4	Triple (or greater) error	5	7	Double (or greater) error
1	4	Bit 9	6	7	Double (or greater) error
			7	7	Normal state and result of PRESET

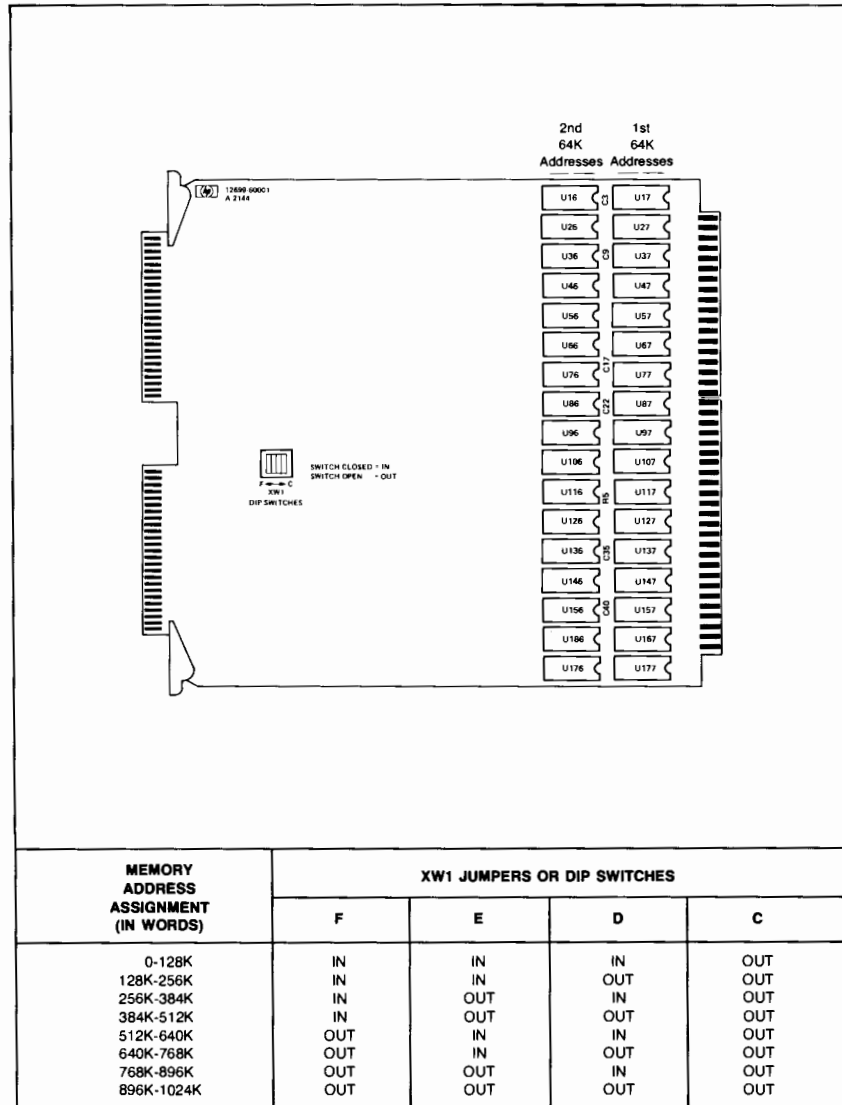
NOTE: Due to a CPU timing problem, the E and F-Series Fault Control Memory Controller may incorrectly indicate an error at power up. To verify correct operation of the Fault Control Memory Controller, the following CPU power on self test must be executed from the front panel.

1. Set P=0
2. Set A=100000 (octal)
3. Press PRESET
4. Press INSTR/STEP

After the test is completed, all six LED's on the Fault Control Memory Controller should be on (normal condition).

12666H 512K-WORD HIGH-PERFORMANCE CHECK BIT ARRAY



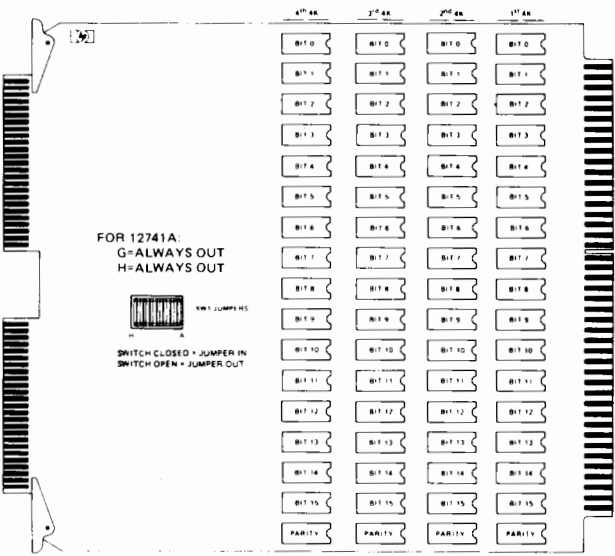
12699H 128K-WORD HIGH-PERFORMANCE MEMORY MODULE

12741A 16K-WORD HIGH-PERFORMANCE MEMORY MODULE

5955-4311

High Performance Memory System
Installation and Service Manual

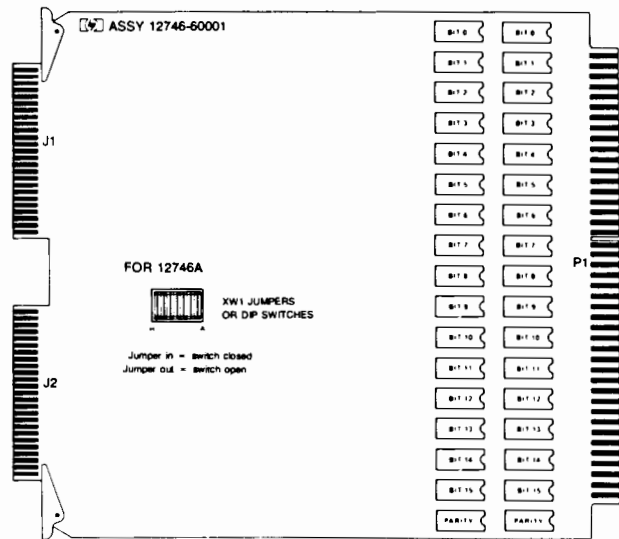
12741A MEMORY MODULE JUMPER CONFIGURATION



16K MEMORY MODULE NO.	XW1 JUMPER							
	H	G	F (2 ⁵)	E (2 ⁴)	D (2 ³)	C (2 ²)	B (2 ¹)	A (2 ⁰)
0	ALWAYS OUT	ALWAYS OUT	IN	IN	IN	IN	IN	IN
1			IN	IN	IN	IN	IN	OUT
2			IN	IN	IN	IN	OUT	IN
3			IN	IN	IN	IN	OUT	OUT
4			IN	IN	IN	OUT	IN	IN
5			IN	IN	IN	OUT	IN	OUT
6			IN	IN	IN	OUT	OUT	IN
7			IN	IN	IN	OUT	OUT	OUT
8			IN	IN	OUT	IN	IN	IN
9			IN	IN	OUT	IN	IN	OUT
10			IN	IN	OUT	IN	OUT	IN
11			IN	IN	OUT	IN	OUT	OUT
12			IN	IN	OUT	OUT	IN	IN
13			IN	IN	OUT	OUT	IN	OUT
14			IN	IN	OUT	OUT	OUT	IN
15			IN	IN	OUT	OUT	OUT	OUT
16			IN	OUT	IN	IN	IN	IN

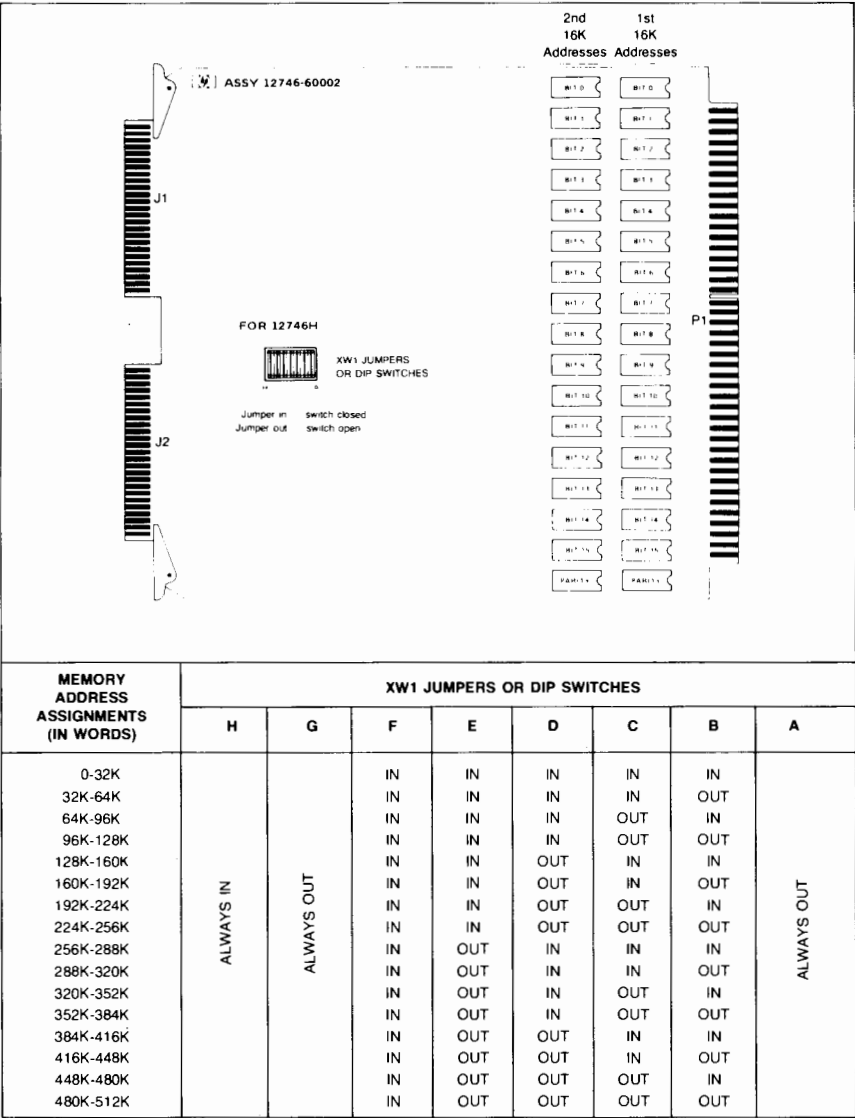
2102 2A

12746A 32K WORD STANDARD PERFORMANCE MEMORY MODULE

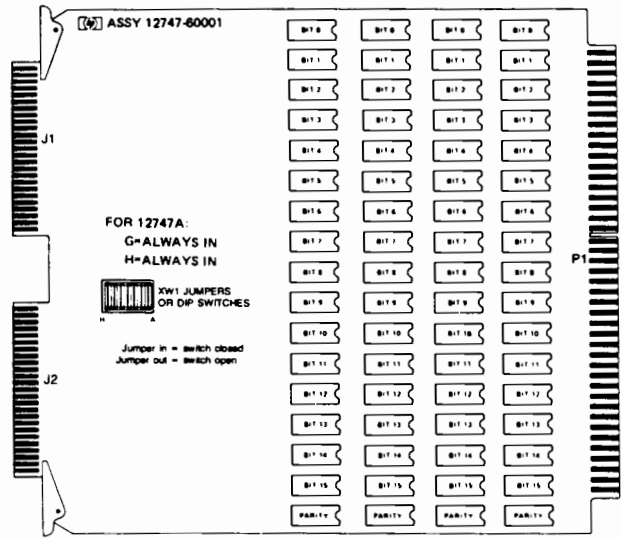


MEMORY ADDRESS ASSIGNMENTS (IN WORDS)	XW1 JUMPERS OR DIP SWITCHES							
	H	G	F	E	D	C	B	A
0-32K	ALWAYS IN	ALWAYS IN	IN	IN	IN	IN	IN	ALWAYS OUT
32K-64K			IN	IN	IN	IN	OUT	
64K-96K			IN	IN	IN	OUT	IN	
96K-128K			IN	IN	IN	OUT	OUT	
128K-160K			IN	IN	OUT	IN	IN	
160K-192K			IN	IN	OUT	IN	OUT	
192K-224K			IN	IN	OUT	OUT	IN	
224K-256K			IN	IN	OUT	OUT	OUT	
256K-288K			IN	OUT	IN	IN	IN	
288K-320K			IN	OUT	IN	IN	OUT	
320K-352K			IN	OUT	IN	OUT	IN	
352K-384K			IN	OUT	IN	OUT	OUT	
384K-416K			IN	OUT	OUT	IN	IN	
416K-448K			IN	OUT	OUT	IN	OUT	
448K-480K			IN	OUT	OUT	OUT	IN	
480K-512K			IN	OUT	OUT	OUT	OUT	

12746H 32K WORD HIGH PERFORMANCE MEMORY MODULE

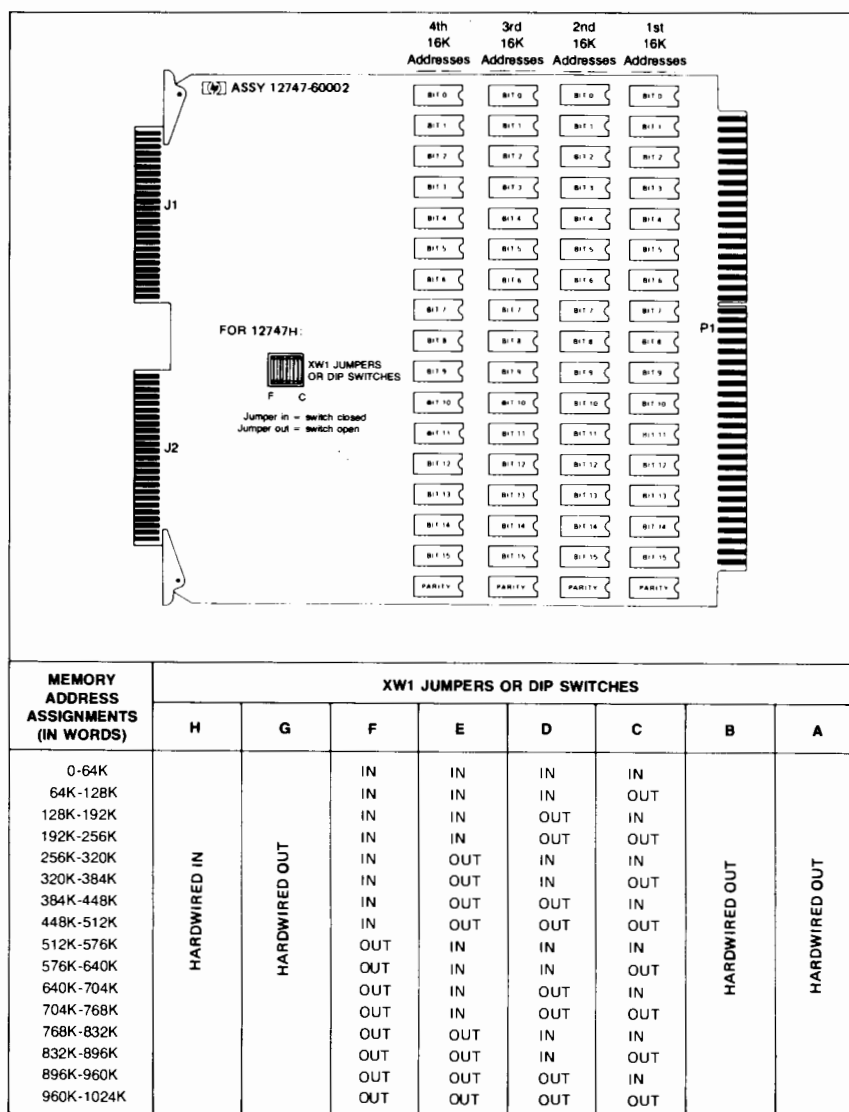


12747A 64K WORD STANDARD PERFORMANCE MEMORY MODULE

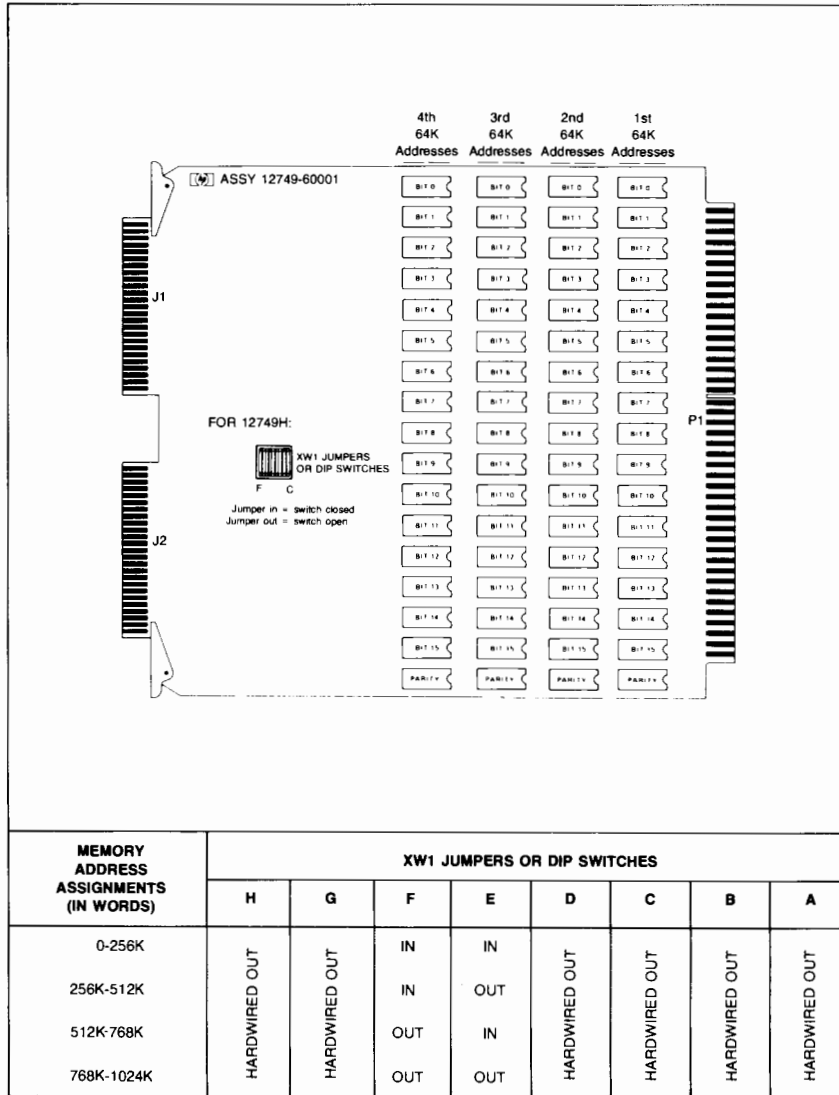


MEMORY ADDRESS ASSIGNMENTS (IN WORDS)	XW1 JUMPERS OR DIP SWITCHES							
	H	G	F	E	D	C	B	A
0-64K	ALWAYS IN	ALWAYS IN	IN	IN	IN	IN	ALWAYS OUT	ALWAYS OUT
64K-128K			IN	IN	IN	OUT		
128K-192K			IN	IN	OUT	IN		
192K-256K			IN	IN	OUT	OUT		
256K-320K			IN	OUT	IN	IN		
320K-384K			IN	OUT	IN	OUT		
384K-448K			IN	OUT	OUT	IN		
448K-512K			IN	OUT	OUT	OUT		
512K-576K			OUT	IN	IN	IN		
576K-640K			OUT	IN	IN	OUT		
640K-704K			OUT	IN	OUT	IN		
704K-768K			OUT	IN	OUT	OUT		
768K-832K			OUT	OUT	IN	IN		
832K-896K			OUT	OUT	IN	OUT		
896K-960K			OUT	OUT	OUT	IN		
960K-1024K			OUT	OUT	OUT	OUT		

12747H 64K WORD HIGH PERFORMANCE MEMORY MODULE

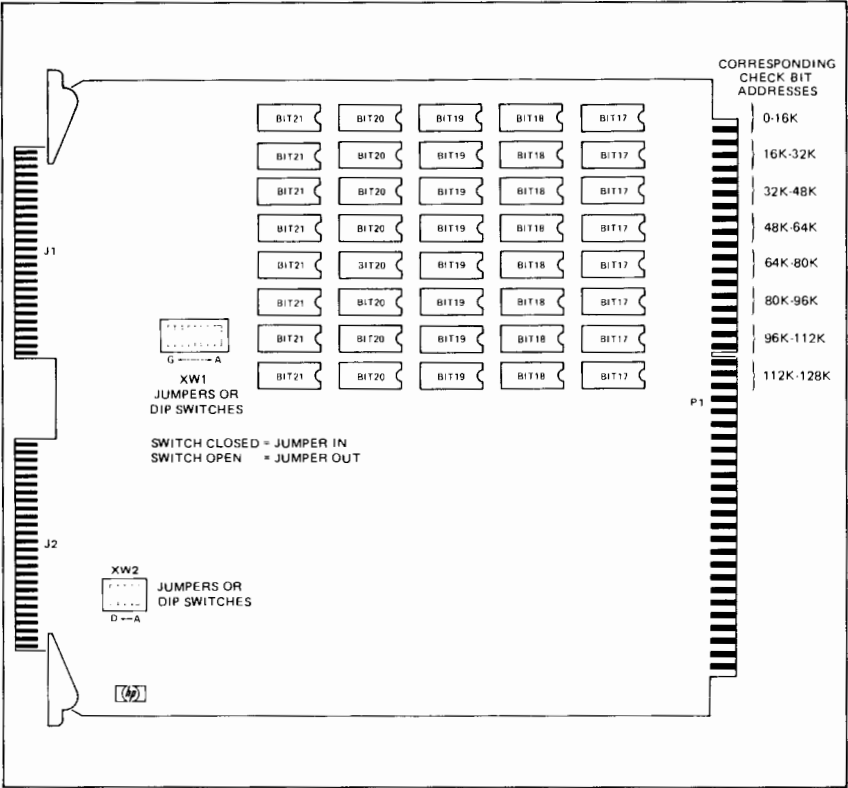


12749H 256K WORD HIGH PERFORMANCE MEMORY MODULE

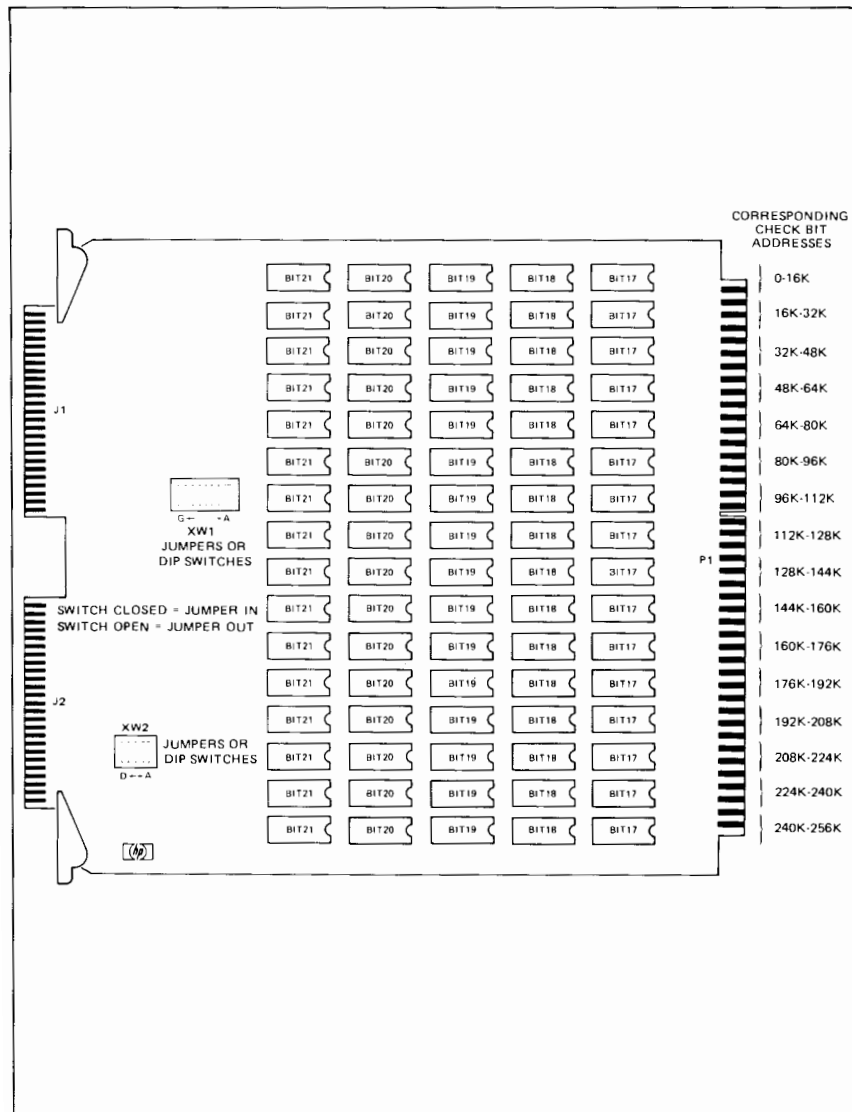


Can continue if more mem. flip D (in)

12779H 128K WORD HIGH PERFORMANCE CHECK-BIT ARRAY



12780H 256K WORD HIGH PERFORMANCE CHECK-BIT ARRAY



12779A/H AND 12780A/H CHECK BIT ARRAYS

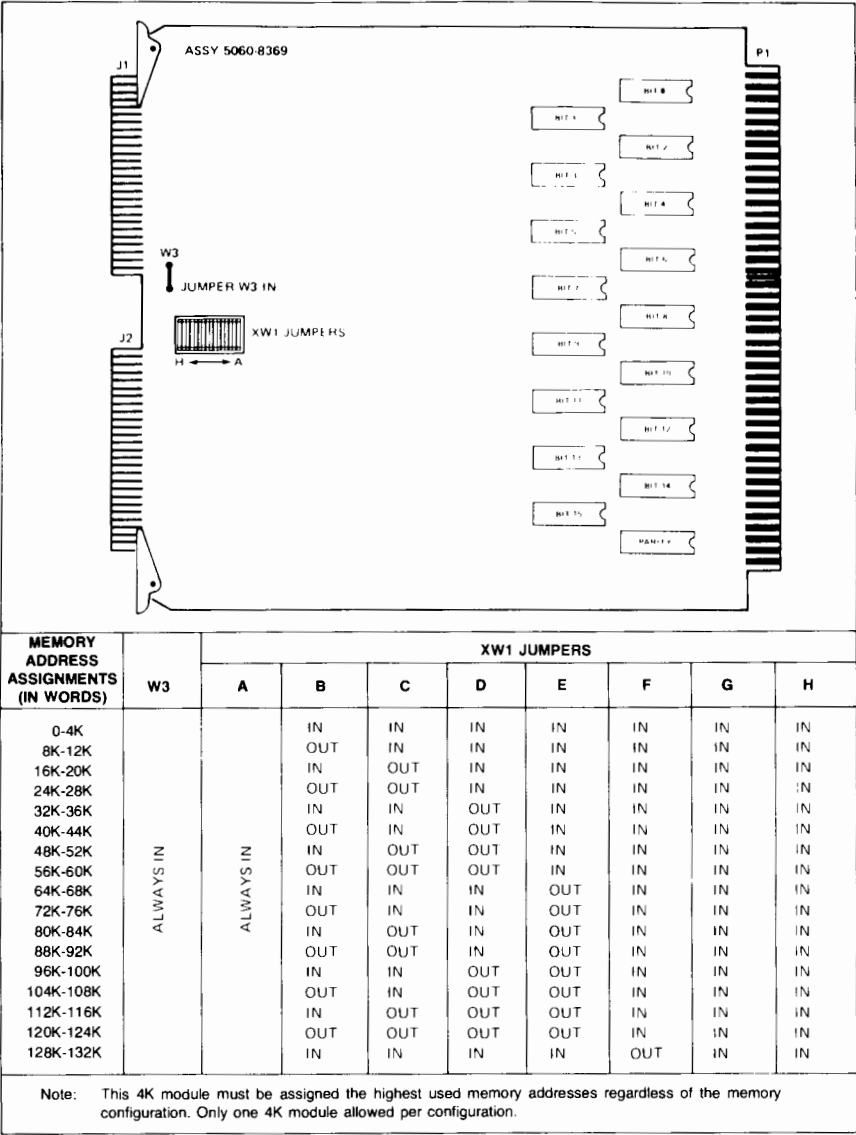
MEMORY SIZE (WORDS)	CHECK BIT ARRAY REQUIREMENTS (WORDS)	XW1							XW2			
		G	F	E	D	C	B	A	D	C	B	A
32k	12779/12780/12666	IN	IN	IN	IN	IN	IN	IN	OUT	IN	IN	OUT
64k	12779/12780/12666	IN	IN	IN	IN	IN	IN	IN	OUT	OUT	OUT	OUT
128k	12779/12780/12666	IN	IN	OUT	IN	IN	IN	OUT	OUT	OUT	OUT	OUT
192k	12779/12780/12666 + 12779*/12780/12666	IN IN	IN IN	OUT IN	IN IN	IN IN	IN OUT	OUT IN	OUT OUT	OUT OUT	OUT OUT	OUT OUT
256k	12780/12666 or 12779 + 12779*	IN	OUT	OUT	IN	IN	OUT	OUT	OUT	OUT	OUT	OUT
		IN	IN	OUT	IN	IN	IN	IN	OUT	OUT	OUT	OUT
320k	12780/12666 + 12779/12780/12666	IN IN	OUT IN	OUT IN	IN IN	IN OUT	OUT IN	OUT IN	OUT OUT	OUT OUT	OUT OUT	OUT OUT
384k	12780/12666 + 12779/12780/12666	IN IN	OUT IN	OUT OUT	IN IN	IN OUT	OUT IN	OUT OUT	OUT OUT	OUT OUT	OUT OUT	OUT OUT
448k	12780/12666 + 12779/12780/12666 + 12779*/12780/12666	IN IN IN	OUT IN IN	OUT OUT IN	IN IN IN	IN OUT OUT	OUT OUT IN	OUT OUT IN	OUT OUT OUT	OUT OUT IN	OUT OUT IN	OUT OUT IN
512k	12780 + 12780 or 12666	IN IN	OUT OUT	OUT OUT	IN IN	IN OUT	OUT OUT	OUT OUT	OUT OUT	OUT OUT	OUT OUT	OUT OUT
		OUT	OUT	OUT	IN	IN	IN	IN	OUT	OUT	IN	IN
576k	12780 + 12780 + 12779/12780/12666 or 12666 + 12779/12780/12666	IN	OUT	OUT	IN	IN	OUT	OUT	OUT	OUT	OUT	OUT
		IN	OUT	OUT	IN	OUT	OUT	OUT	OUT	OUT	OUT	OUT
		IN	IN	IN	OUT	IN	IN	IN	OUT	OUT	IN	IN
640k	12780 + 12780 + 12779/12780/12666 or 12666 + 12779/12780/12666	IN	OUT	OUT	IN	IN	OUT	OUT	OUT	OUT	OUT	OUT
		IN	OUT	OUT	IN	OUT	IN	IN	OUT	OUT	OUT	OUT
		IN	IN	OUT	OUT	IN	IN	OUT	OUT	OUT	IN	IN
896k	12780 + 12780 + 12780/12666 + 12779/12780/12666 or 12666 + 12780/12666 + 12779/12780/12666	IN	OUT	OUT	IN	IN	OUT	OUT	OUT	OUT	OUT	OUT
		IN	OUT	OUT	IN	OUT	OUT	OUT	OUT	OUT	OUT	OUT
		IN	IN	OUT	OUT	IN	OUT	OUT	OUT	OUT	OUT	OUT
1024k	12780 + 12780 + 12780 or 12666 + 12666	IN	OUT	OUT	IN	IN	OUT	OUT	OUT	OUT	OUT	OUT
		IN	OUT	OUT	IN	OUT	OUT	OUT	OUT	OUT	OUT	OUT
		IN	OUT	OUT	OUT	OUT	IN	IN	OUT	OUT	OUT	OUT
		OUT	OUT	OUT	IN	IN	IN	IN	OUT	OUT	IN	IN
		OUT	OUT	OUT	OUT	IN	IN	IN	OUT	OUT	IN	IN
		OUT	OUT	OUT	OUT	IN	IN	IN	OUT	OUT	IN	IN

NOTES: 1. Only a 12779 with Date Code 1905 or later can be used in this space.
2. Switch H in 12666H is always IN.

Note: Maximum configuration is 2Mb using the 12666H ECC Array.

12994A 4K MEMORY MODULE

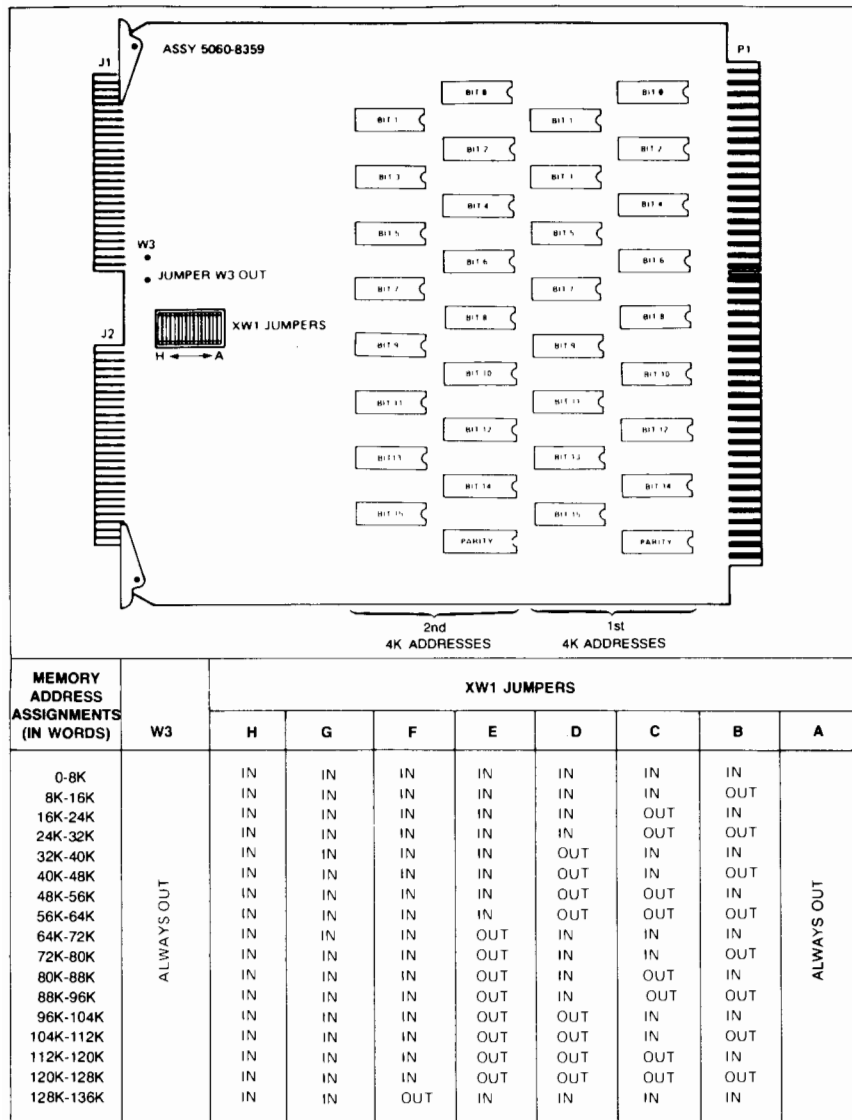
Manual: 5955-4310 Standard Performance Memory Systems Installation and Service Manual.



12998A 8K MEMORY MODULE

5955-4310

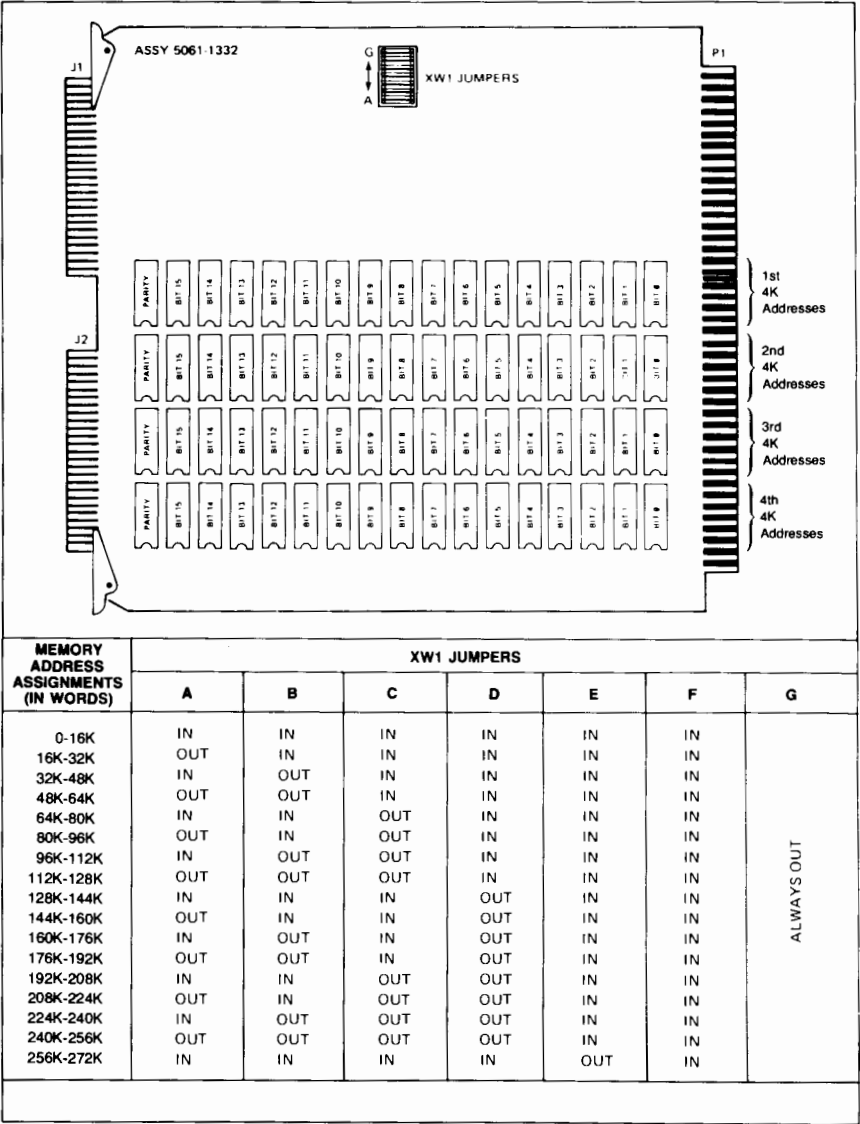
Standard Performance Memory Systems Installation and Service Manual



13187A 16K MEMORY MODULE

5955-4310 Standard Performance Memory Systems Installation and Service Manual

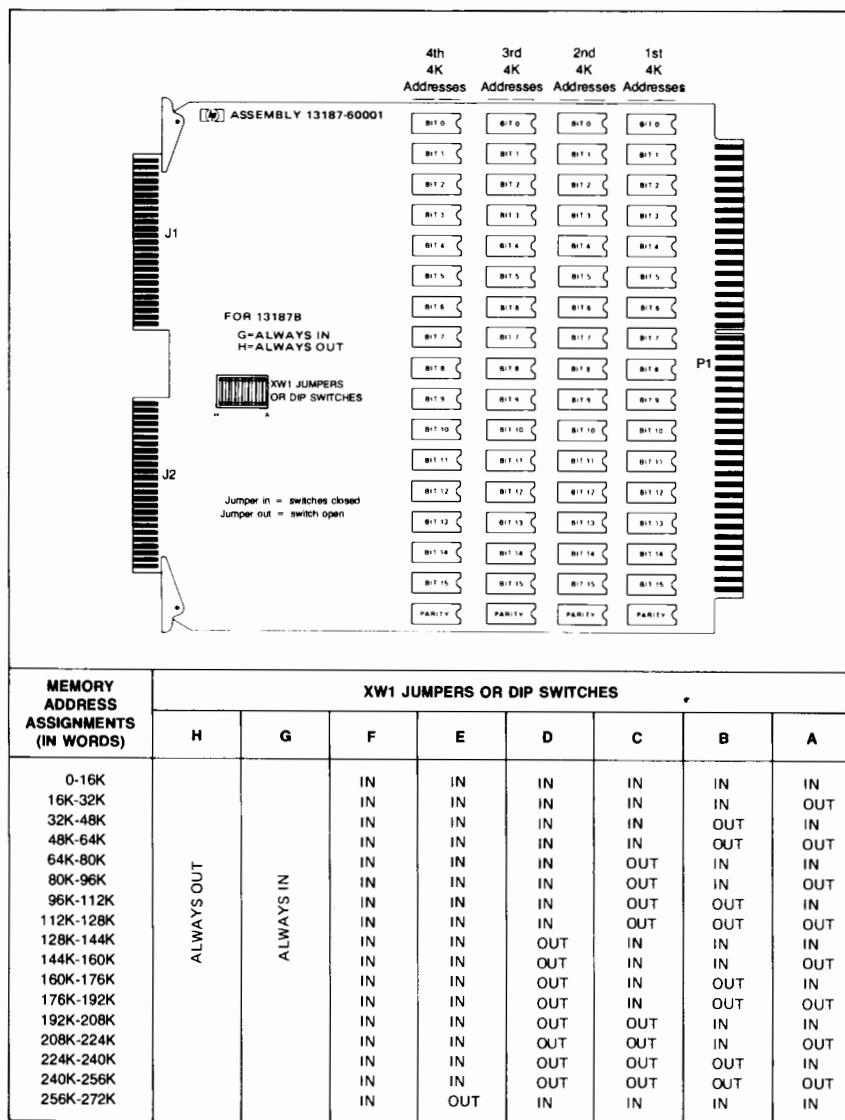
13187A 16K MEMORY MODULE JUMPER CONFIGURATION



13187B 16K MEMORY MODULE

5955-4310

Standard Performance Memory Systems Installation and Service Manual

13187B 16K MEMORY MODULE JUMPER CONFIGURATION

12892B MEMORY PROTECT**EQUIPMENT**

12892-60003 12892B Memory Protect Card

DOCUMENTATION

P/N	MANUAL
12892-90007	12892B Installation
12892-90005	Memory Protect/Parity Error Diagnostic

ELECTRICAL SPECIFICATIONS**DC Required:**

+5V	1.25A
-2V	.05A

INSTALLATION NOTES

- IN-1. For HP 2109/2113 Computers, remove MX jumper on jumper block U21; leave the MX jumper installed for HP 2108/2112 Computers.
- IN-2. Install into Slot 111 of Memory Backplane.

MEMORY PROTECT-PARITY ERROR DIAGNOSTIC (2100/21MX)

Paper Tape Binary 12892-16001. Date Code 1705.

Required Hardware:

- a. Minimum 4K memory.
 - b. 2100A/S or 21MX M- or E-Series Computer.
 - c. DMA (DCPC) for Test 11 only.
1. If testing a 21MX computer, set switch A1S1 to INT-IGNORE and set the Memory Protect jumpers as follows:

PCA	JUMPER SETTING	COMMENTS
12892A	W1 = A	Setting used through-out entire diagnostic.
12892B	RME = OUT SEL1 = OUT INT = IN JSB = IN HLTPE = OUT MX = OUT = 21MX E-Series = IN = 21MX M-Series	} Setting used for Test 00 thru 10 only.

2. If testing a 2100A/S, set switch S1 on Data Control Card A107 to PROTECT and switch S2 on I/O Buffer Card A8 to P.E. INT.
 3. Load Diagnostic Configurator.
 4. Configure configurator and load diagnostic.
- Note: DSN = 102305

MEMORY PROTECT-PARITY ERROR DIAGNOSTIC (2100/21MX) (CONT)

5. Configure diagnostic: P-Reg = 100₈, S-Reg = Configuration options.

Configuration Options

S-REG BITS	MEANING IF SET
15	12892B under test; if clear 12892A or 2100A/S computer under test.
14*	DMS present (DMS related test will be exercised); if clear, no DMS (MEM) present.
13-6	Not used.
5-0	Select code of I/O interface to verify I/O related Memory Protect functions.

* If bit 14 = 0, tests will halt (due to bug).

6. Press PRESET, RUN. HALT 102074.
7. Set S-Reg = Switch options.
8. Press PRESET, RUN.
9. HALT 106000 (Test 10 executed).
 - a. Generate even parity as follows:
 - 21MX — On 2102A/B Memory Controller, connect jumper wire between PAR (parity) and ↓ (ground) terminal posts.
 - 2100A/S — On Data Control Card A107, connect jumper wire between ODD terminal post E1 and GND terminal post E2 and connect another jumper wire between EVEN terminal post E3 and +5V terminal post E4.
 - b. Set parity error and power fail/auto restart switches as follows:
 - 21MX — Set switch A1S1 to HLT and switch A1S2 to ARS.
 - 2100A/S — Set switch S2 to HALT and switch S1 to ARS.
10. Press PRESET (INT), RUN. Parity HALT 5.
11. Set parity halt switch A1S1(S2) to INT-IGNORE (P.E. INT).
12. Press PRESET (INT). Parity light should go out.
13. Press RUN. HALT 106001.
14. For the "A" Power Supply, go to Standby. For the "B" Power Supply, go to Battery Backup Enabled.
15. Remove even parity jumper(s).
16. Power on the CPU.
17. If Test 12 was selected and the E-Register flashes, press HALT, PRESET and RUN within 30 seconds.

MEMORY PROTECT-PARITY ERROR DIAGNOSTIC (2100/21MX) (CONT)

18. If Test 11 was executed and HALT 102062, change jumpers (step 15) to initial settings.
19. Press RUN. HALT 102077. (Return to step 5.)
20. Switch options:

S-REG BIT	MEANING IF SET		
15	Halt 102076 (octal) at the end of each test. The A-Register contains the test number in octal.		
14	Suppress error halts.		
13	Loop on last test section being executed.		
12	Loop on diagnostic.		
11	Suppress error messages.		
10	Suppress information messages.		
9	Abort diagnostic execution after the current test section and halt (102075). Operator can specify a new group of test(s) in the A-Register. Then clear Switch Register bit 9 and press RUN.		
	A-REG BIT	TEST	IF SET WILL EXECUTE
	0	00	Halt Test (MPT)
	1	01	Basic Fence Test
	2	02	I/O Violation Test
	3	03	MPT Control Test
	4	04	MPT Trap Cell Logic Test
	5	05	MPT Indirect Logic Test
	6	06	Memory Expansion-MPT Test
	7	07	Fence and Violation Register Test
	8	08	Non-Violation Instruction Test
	9	09	Violation Instruction Test
	10	10	Parity Error Halt and Interrupt Logic Test
	11*	11	12892B Special Jumper Test
	12	12	DMA Test
	13	13	Preset Test (to clear MPT)
8	Suppress operator intervention tests.		
7-0	Reserved.		

12897B DUAL-CHANNEL PORT CONTROLLER (DCPC)**EQUIPMENT**

12897-60004 12897B DCPC assy
 12897-60002 Cable assy

DOCUMENTATION

P/N **MANUAL**

12897-90005 12897B Installation
 24322-90002 DMA-DCPC Diagnostic

12897B DUAL-CHANNEL PORT CONTROLLER (DCPC) (CONT)

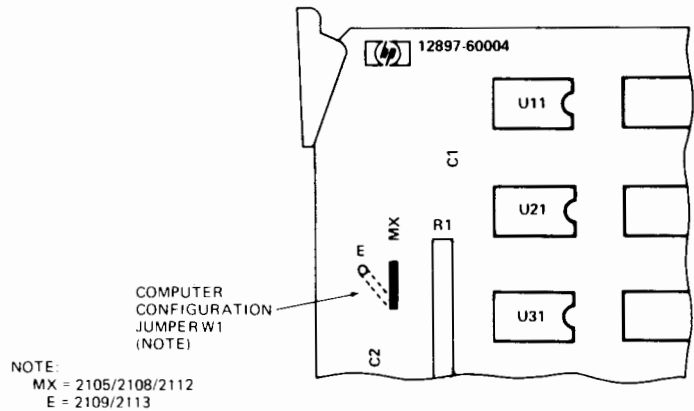
ELECTRICAL SPECIFICATIONS

DC Required:

+5V	2.4A
-2V	.08A

INSTALLATION NOTES

- IN-1. Install into Slot 110 of 21MX Memory Backplane.
- IN-2. DCPC jumper configuration.



DMA-DCPC (2100/21MX) DIAGNOSTIC

Paper Tape Binary 24322-16002. Date Code 1705.

Required Hardware:

- a. Minimum 4K memory.
- b. DMA/DCPC — On 2100, DMA card A9 requires test connector, P/N 1251-0335 (2 x 24 pin connector).
- c. 12554A*, 12597A*, 12566B*, or 12930A** interface.

*Requires test connector P/N 1251-0332. (If 12566B, connect pins 22, Z to pins 23, AA.)
**Require test connector P/N 12930-60006, and a special cable for Test 15.

1. Configure interface (for TST00 — TST14) as follows:

HP 12554A 16-BIT DUPLEX REGISTER (Either Configuration 1 or Configuration 2 can be used)			
CONFIGURATION 1		CONFIGURATION 2	
JUMPERS	POSITION	JUMPERS	POSITION
W4-W6	B	W4-W5	A
W7	A	W6-W7	B
W8-W12	IN	W8-W12	IN
W13	A (if applicable)	W13	A (if applicable)
W14	A (if applicable)	W14	A (if applicable)

OMA-DCPC (2100/21MX) DIAGNOSTIC (CONT)

HP 12597A 8-BIT DUPLEX REGISTER (Either Configuration 1 or Configuration 2 can be used)			
CONFIGURATION 1		CONFIGURATION 2	
JUMPERS	POSITION	JUMPERS	POSITION
W1-W2	A	W1-W2	B
W3-W4*	IN	W8*	IN
*W3 and W8 must not be installed at the same time.			

MICROCIRCUIT INTERFACE			
HP 12566B		HP 12566C	
JUMPERS	POSITION	JUMPERS	POSITION
W1	C or A	W1	C
W2-W4	B	W2-W4	B
W5-W8	IN	W5-W8	OUT
W9	A	W10	B
		W11	IN
		W12-W13	OUT

HP 12930A UNIVERSAL INTERFACE (12930-60001) (These switch settings are only applicable for TST00-TST14)			
SWITCH	POSITION	SWITCH	POSITION
U85S1	1	U102S1	2
S2	5	S2	7
S3	10(0)	S3	10(0)
U87S1	1	U106S1	1
S2	4	S2	5
S3	8	S3	9
U97S1	2		
S2	5		
S3	10(0)		
Note: These programmable switches are set using a screwdriver to position the contact mechanism. Switch settings are for 12930A with diagnostic test connector (12930-60006) when running the standard test run (tests 0-14). When running test 15 set switch U85S1 to 2.			

DMA-DCPC DIAGNOSTIC (CONT)

2. Load Diagnostic Configurator.
3. Configure configurator and load diagnostic.
4. Configure diagnostic: P-Reg = 100₈, S-Reg (5-0) = SC of test card.
5. Press PRESET, RUN. HALT 102074.
6. Set S-Reg = Switch options.
7. Press PRESET, RUN.
8. Restart: P-Reg = 2000₈, S-Reg = Switch options, press PRESET, RUN.
9. Switch options:

BITS		MEANING IF SET	
0		Abort current test when reporting error.	
7-1		Reserved.	
8		Suppress tests requiring operator intervention.	
9		Abort current diagnostic execution and halt (102075). User may specify a new group of tests in the A-Reg, clear bit 9, and then press RUN.	
		A-REG BIT (IF SET)	TESTS SELECTED
		0	TST00 — DMA Flag test
		1	TST01 — DMA Interrupt test
		2	TST02 — DMA Control Reset test
		3	TST03 — Preset test
		4	TST04 — Priority test
		5	TST05 — Basic Word Count Register test
		6	TST06 — Basic Word Count Rollover test
		7	TST07 — STC Decision Control test
		8	TST08 — CLC Decision Control test
		9	TST09 — DMA CLF test
		10	TST10 — Illegal Select Code test
		11	TST11 — Incremental Word Count Register test
		12	TST12 — Incremental Memory Address Register test
		13	TST13 — DMA Input Transfer test
		14	TST14 — STC, CLF and Override test
		Note: Test 15 cannot be selected by A-register.	
10		Suppress non-error messages.	
11		Suppress error messages.	
12		Repeat all selected tests after diagnostic run is complete without halting. Also, those tests requiring operator intervention will be suppressed.	
13		Repeat last test executed (loop on test).	
14		Suppress error halts.	
15		Halt (102076) at the end of each test; A-Reg = test number (octal).	

12991A/B POWER FAIL RECOVERY SYSTEM**EQUIPMENT****12991A**

02112-6003 Battery inverter PCA
 1420-0206 Battery packs
 02108-00007 Battery boxes
 02108-00006 Battery box covers
 9220-2070 Foam pads

12991B

5061-1348 Battery charge PCA
 5061-1349 Battery backup PCA
 12944-60002 Battery cable
 12991-60002 Connector
 12991-60001 Battery box

DOCUMENTATION**P/N****MANUAL**

12991-90001 12991A Installation
 12991-90004 12991B Installation
 02100-90216 Power Fail/Auto Restart Diagnostic

POWER FAIL/AUTO RESTART DIAGNOSTIC

Paper Tape Binary 24321-16001. Date Code 1635.

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Place ARS/ARS switch to ARS position.
4. Set S-Reg = Switch options
5. Press PRESET, RUN.
6. Terminate CPU power.
7. Restore power and press RUN.
8. To restart after HLT 77, press RUN.
9. Switch options:

Switch	Meaning If Set
0-7	Reserved to display background cycling pattern
8	Reserved
9	Reserved
10	Suppress non-error messages
11	Suppress error messages to teleprinter
12	Loop on diagnostic. Clear to print number of passes and HALT 102077 ₈
13	Reserved
14	Suppress HALT after each test failure (MDR = 102002 ₈ to 102077 ₈)
15	HALT execution of background program (MDR = 102076 ₈)

13197A WRITABLE CONTROL STORE**EQUIPMENT**

13197-60001	1K Writable Control Store Board
5060-8393	Flat Cable Assy.

DOCUMENTATION**P/N MANUAL**

13197-90005	13197A WCS Reference
13197-90002	13197A WCS Diagnostic

ELECTRICAL SPECIFICATIONS**DC Required:**

+5V	2.2A
-2V	.007A

INSTALLATION NOTES

IN-1. Remove jumper W1 if installing WCS in a 21MX M-Series computer.

13197A WCS DIAGNOSTIC

Paper Tape Binary 13197-16002. Date Code 1640.

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: S-Reg (5-0) = WCS select code, PRESET, RUN. HALT 102074.
4. S-Reg = Switch options.
5. Press PRESET, RUN.
6. Switch options:

BITS	MEANING IF SET
6-0	Reserved.
7	Abort TST25 and end current pass of diagnostic.*
8	Suppress tests requiring operator intervention.
9	Abort diagnostic execution at end of current test section and halt 102075. User may specify a new group of tests in the A-Reg. Clear S-Reg bit 9 and press RUN.
10	Suppress non-error messages.
11	Suppress error messages.
12	Loop on diagnostic and suppress tests requiring operator intervention.
13	Repeat last test section.
14	Suppress error halts.
15	Halt 102076 at the end of each test; A-Reg = test number (octal).
*Setting of bit 7 applies only when executing TST25.	

13197A WCS DIAGNOSTIC (CONT)**TEST SELECTION VIA A- AND B-REGISTERS**

A-REG BIT	IF SET WILL EXECUTE
0	TST00 — Basic Load Test
1	TST01 — Command State Test
2	TST02 — Data Mode Screen Test
3	TST03 — Command State Screen Test
4	TST04 — I/O Screen Test
5	TST05 — RAM Address Rollover Test
6	TST06 — Preset Test
7	TST07 — Zeros Data Test
8	TST10 — Ones Data Test
9	TST11 — Lonely Bit Data Test
10	TST12 — RAM Address Parity Test
11	TST13 — RAM Checkerboard Test
12	TST14 — Alternate Word Data Test
13	TST15 — DCPC Test
14	TST16 — Control Memory Priority Test
15	TST17 — WCS Enable/Disable Test
B-REG BIT	IF SET WILL EXECUTE
0	TST20 — WCS Enable/Disable Screen Test
1	TST21 — Command State Alteration Test
2	TST22 — Block Priority Test
3	TST23 — RAM Data Test
4	TST24 — RAM MOD Decoder Test
5	TST25 — User Looping Test
6-15	Reserved
Note: If the A- and B-registers are clear, the default set of tests (TST00 through TST24) are run. TST25 is an optional test.	

13305A DYNAMIC MAPPING SYSTEM AND 12731A MEMORY EXPANSION MODULE**EQUIPMENT**

12731-60001	12731A Memory Expansion Module
12892-60003	12892B Memory Protect Board
	13307A Dynamic Mapping Instruction ROM's (refer to firmware section of this manual).
	One of the following accessories is required;
	13304A Firmware Accessory Board Kit, for E-Series
	12791A for F-Series

DOCUMENTATION

P/N	MANUAL
13305-90001	13305A DMS Installation*
12892-90005	Memory Protect/Parity Error Diagnostic
12929-90003	Memory Expansion Module Diagnostic

*Includes installation instructions for 12731A and 13307A.

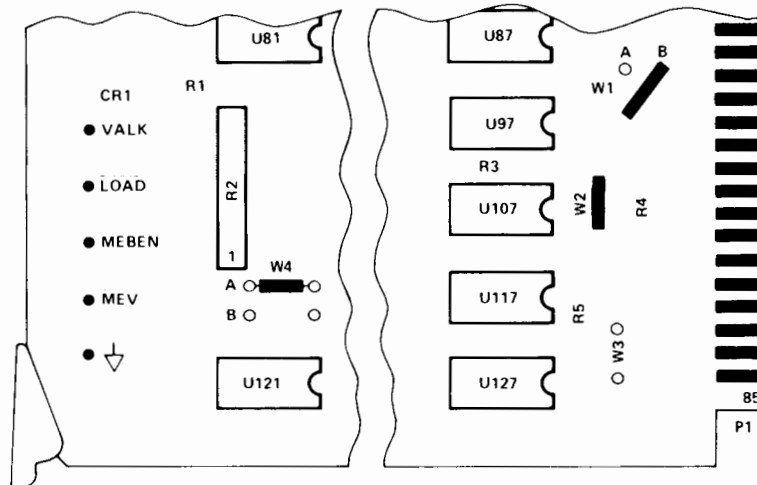
ELECTRICAL SPECIFICATIONS**DC Required:**

MODEL	+ 5V
13307A	.78A
12731A	3.9A
12892B	2.0A
13305A	6.68A

13305A DYNAMIC MAPPING SYSTEM AND 12731A MEMORY EXPANSION MODULE (CONT)

INSTALLATION NOTES

IN-1. Memory Expansion Module configuration jumpers:



W1 = A = 21MX Computer (2108/2112)
 W1 = B = 21MX E-Series Computer (2109/2113)

W2 = IN
 W3 = OUT

W4 = A = MEM remains in System Map.
 W4 = B = MEM returns to same map in use prior to IAK being issued.

Note

MEM jumper W4 and Memory Protect RME jumper *must* be configured alike to respond to the RME signal. That is, if the Memory Protect RME jumper is OUT, MEM jumper W4 must be in position "A"; if the Memory Protect RME jumper is IN, MEM jumper W4 must be in position "B". If W1 is jumpered wrong, DM violations will occur.

MEMORY EXPANSION MODULE DIAGNOSTIC

Paper Tape Binary 12929-16001. Date Code 1506.

Required Hardware:

- a. Minimum 16K memory
- b. 12976A Dynamic Mapping System
- c. 12566A/B Microcircuit Interface PCA
- d. 1251-0332 Test Connector with pins 22 and 23 wired together.

1. Configure 12566A/B/C Microcircuit I/F as follows:

12566A/B		12566C	
W1	Position A	W1	Position C
W2	Position B	W2-W4	Position B
W3	Position B	W5-W8	OUT
W4	Position A/B	W9	Position A
W5-W8	Connected	W10	Position B
W9	Position A	W11	IN
		W12-W13	OUT

2. Load Diagnostic Configurator.
3. Configure configurator and load diagnostic.
4. Configure diagnostic: P-Reg = 100₈, S-Reg (5-0) = SC of microcircuit interface.
5. Press PRESET, RUN. HALT 102074.
6. Set S-Reg = Switch options.
7. Press PRESET, RUN.
8. Restart: P-Reg = 2000₈, S-Reg = Switch options, press PRESET, RUN.
9. Switch options:

BIT	MEANING IF SET
15	Halt (102076) at the end of each test; A-Reg = test just completed.
14	Suppress error halts.
13	Repeat last test executed (loop on test).
12	Repeat all selected tests after diagnostic run is complete without halting. Also suppresses tests requiring operator intervention.
11	Suppress error messages.
10	Suppress information messages.
9	Abort the current diagnostic execution and halt (102075); user may at this time specify a new set of tests in the A/B-register, clear bit 9 of the Switch Register, and press RUN.
8	Suppress tests requiring operator intervention.
7-0	Reserved.

Note: Without the 12566 card, tests 15 and 20 fail, and all others are OK.

MEMORY EXPANSION MODULE DIAGNOSTIC (CONT)**A/B-Register Test Selection**

A-REG BIT	IF SET WILL EXECUTE
0	Test 00 XMM Test
1	Test 01 XMS Test
2	Test 02 XMA/B Test
3	Test 03 Load/Read Maps Instructions Test
4	Test 04 Status-Fence Test
5	Test 05 Cross Store-Load-Compare Test
6	Test 06 Move Words Test
7	Test 07 Move Bytes Test
8	Test 10 Protected Mode Preset Test
9	Test 11 Violations Test (READ/WRITE/ BASE PAGE)
10	Test 12 Write Violations Test
11	Test 13 Privileged Instruction Violation Test
12	Test 14 Maps Violations Test
13	Test 15 DCPC Ports Enable Test
14	Test 16 Read Violations Test
15	Test 17 Interruptible Instructions Test
B-REG BIT	IF SET WILL EXECUTE
0	Test 20 DCPC Interference Test
1	Test 21 Violation Register Map Bits Test
2	Test 22 Register Completion Test
3*	Test 23 Extended Memory Test
4*	Test 24 Basic I/O Test
5-15	Reserved
*Tests 23 and 25 are not part of the standard run; these tests must be selected by the operator.	

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PTO

1277

INPUT/OUTPUT

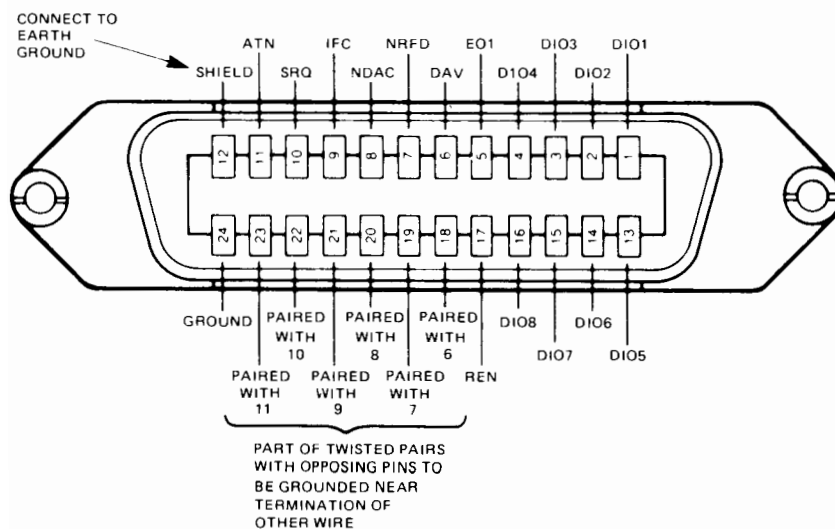
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RS-232C SIGNAL INTERFACE

DATA SET PIN	CIRCUIT	SIGNAL	HP MPX PIN
1	AA	Protective ground	1
2	BA	Transmitted data	3
3	BB	Received data	2
4	CA	Request to send	8
5	CB	Clear to send	22
6	CC	Data set ready	20
7	AB	Signal ground (common return)	7
8	CF	Carrier detect	4
9	—	(Reserved for testing)	—
10	—	(Reserved for testing)	—
12	SCF	Secondary carrier detect	—
13	SCB	Secondary clear to send	—
14	SBA	Secondary transmitted data	12
15	DB	Transmission signal element timing (DCE source)	—
16	SBB	Secondary received data	11
17	DD	Receiver signal element timing (DCE source)	—
19	SCA	Secondary request to send	—
20	CD	Data terminal ready	6
21	CG	Signal quality detector	—
22	CE	Ring indicator	—
23	CH/CI	Data signal rate selector (DTE/DCE source)	23
24	DA	Transmit signal element timing (DTE source)	—

HP-IB Connector



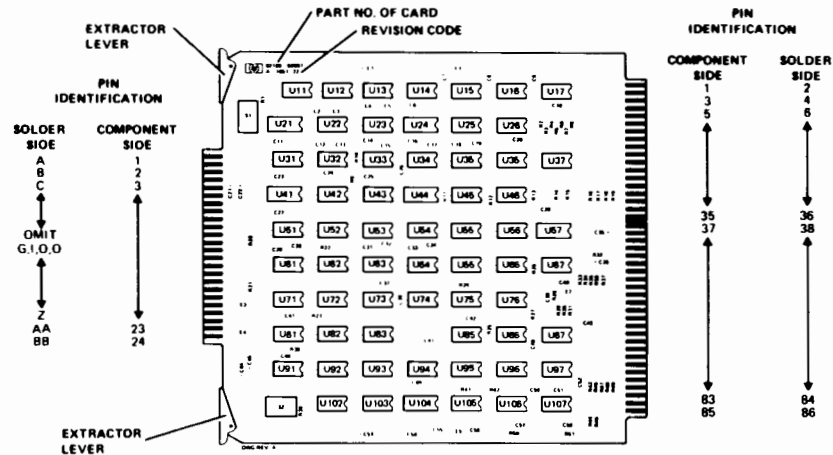
TERMINAL CABLES

	INTERFACE		CABLE NO.
2100	12889A	—	12889-60003
21MX	12889A	—	12889-60003
2600A	12966A	—	12966-60004
	12968A	—	12966-60004
	12880A	—	12880-60003
	12587B	001	12587-60010
	12920B	—	30062-60006
	12920B	—	30062-60009
	12920B	—	30062-60012
2615A	12966A	—	12966-60004
	12968A	—	12966-60004
	12920B	—	30062-60006
	12880A	—	12880-60003
	12587B	001	12587-60010
	12920B	—	30062-60009
	12920B	—	30062-60012
2640-6	12880A	—	12880-60001
2640A	12966A	001	12966-60005
	12968A	001	12966-60005
	12920B	—	02640-60043
	12920B	—	30062-60006
	12920B	—	30062-60009
	12920B	—	30062-60012
2749B	12966A	003	12966-60007
	12968A	003	12966-60007
	12920B	—	30062-60006
	12531C	001	12531-60021
	12920B	—	30062-60006
	12920B	—	30062-60009
	12920B	—	30062-60012
2762A/B	12966A	—	12966-60004
	12968A	—	12966-60004
	12531D	001	12531-60026
	12531D	002	12531-60024
	12531D	003	12531-60028
	12531D	004	02640-60058
	12587B	001	12587-60010
	12920B	—	30062-60006
	12920B	—	30062-60009
	12920B	—	30062-60012
3000	12889A	—	12889-60003
801ACU	12589A	—	12589-60004
CPU	12889A	—	12889-60003
CPU	12889A	—	12889-60003
	12920B	—	30062-60005
	12920B	—	30062-60008

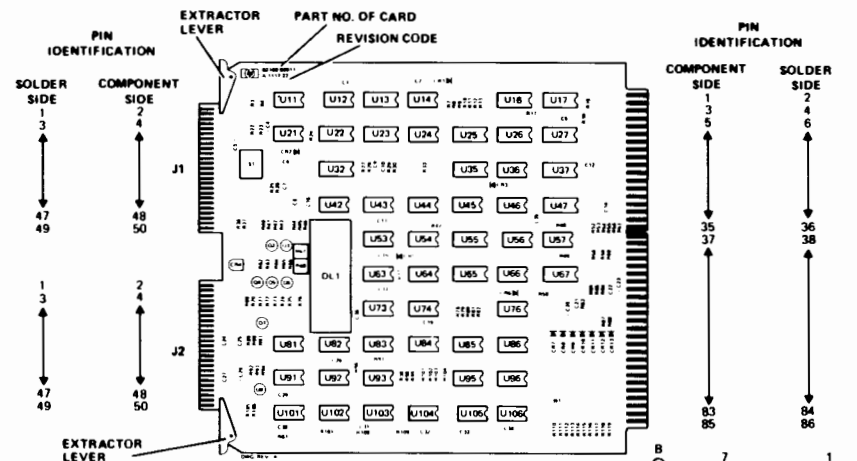
TERMINAL CABLES (Cont'd)

	INTERFACE		CABLE NO.
M103FX	12966A	002	12966-60006
	12968A	002	12966-60006
	12920B	—	30062-60004
	12531C	002	12531-60024
	12531D	002	12531-60024
	12587B	—	12587-60006
	12920B	—	30062-60007
	12920B	—	30062-60010
M201FX	12967A	—	12967-60004
	12618A	—	12618-60001
M201HX	12967A	—	12967-60004
	12618A	—	12618-60001
M202FX	12966A	002	12966-60006
	12968A	002	12966-60006
	12920B	—	30062-60004
	12587B	002	12587-60011
	12920B	—	30062-60007
	12920B	—	30062-60010
M202HX	12966A	002	12966-60006
	12968A	002	12966-60006
	12920B	—	30062-60004
	12587B	—	12587-60006
	12920B	—	30062-60007
	12920B	—	30062-60010
M208FX	12967A	—	12967-60004
	12618A	—	12618-60001
M208HX	12967A	—	12966-60004
	12618A	—	12618-60001

PRINTED-CIRCUIT CARD DETAILS

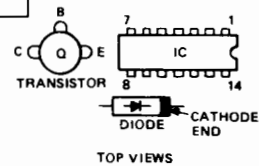


A. ONE 48-PIN EDGE-CONNECTOR



B. TWO 50-PIN EDGE CONNECTORS

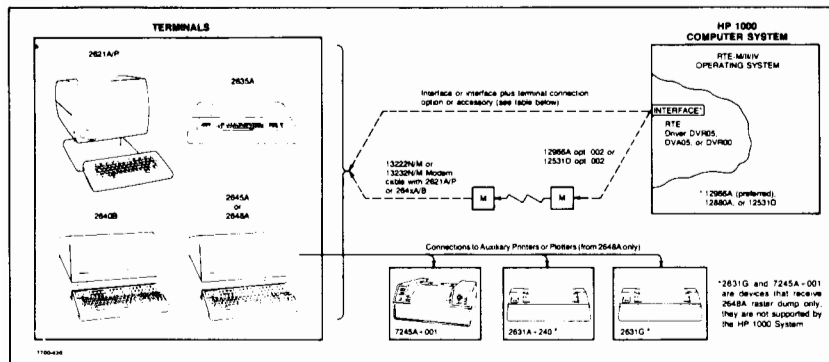
NOTE: INTEGRATED CIRCUITS ARE NUMBERED IN ROW AND COLUMN ORDER.



NOTE: All boards are marked with a date stamp; this stamp is updated at each rework. If no trouble is found an "X" is placed next to the date. A board with 2 "X" 's will be removed from the program.

26XX TERMINALS

INTERFACE-PER-TERMINAL CONFIGURATIONS



TERMINAL CONFIGURATIONS SUMMARY

TERMINAL Model Number & Name	H* or M*	TERMINAL CONNECTION REQUIREMENTS (IF ANY)		INTERFACE Model Number & Cable Option	RTE DRIVER	MAX. DATA RATE† (char per sec)	OTHER COMPATIBLE TERMINAL OPTIONS/ACCESSORIES			
		Option	Accessory				Auxiliary Plotter or Printer	Mini-cartridge I/O Option	Mini-cartridge I/O add-on Accessory	Auxiliary Printer add-on Accessory
2621A/P Interactive Terminal	H	None	None	12966A + 005	DVR05/DVA05	960	n/a	n/a	n/a	n/a
	M	None	13222N/M**	12966A + 002	DVA05 only	120				
	H	None	13222C	12531D + 001	DVR00	240				
	H	None	12966A	12966A	DVR00	960				
	M	None	13222N/M**	12531D + 002	DVR00	120				
2635A Printing Terminal	H	051	None	12966A + 001	DVR05/DVA05	180	n/a	n/a	n/a	n/a
	M	None	None	12966A + 004	DVR05/DVA05	180				
2640B CRT Display Terminal	H	None	None	12966A + 001	DVR05/DVA05	240	n/a	n/a	n/a	n/a
	M	None	None	12966A + 004	DVR05/DVA05	240				
	M	None	13232N/M**	12966A + 002	DVA05 only	120				
	H	None	None	12880A + 001	DVR00	240				
	M	None	13232N/M**	12531D + 001	DVR00	120				
2645A Display Station	H	032‡		12966A + 001	DVR05/DVA05	960	n/a	007§	13261A & 13236B§	2631A + 240 & A
	M	None	13232N/M**	12966A + 004	DVR05/DVA05	960				
	M	None	13232N/M**	12966A + 002	DVA05 only	120				
	H	None	None	12880A + 001	DVR00	960				
	M	None	13232N/M**	12531D + 002	DVR00	120				
2648A Graphics Terminal	H	032‡		12966A + 001	DVR05/DVA05	960	n/a	Same choices as 2645A Display Station with 12966A interface, summarized above	n/a	n/a
	M	None	13232N/M**	12966A + 004	DVR05/DVA05	960				
	M	None	13232N/M**	12966A + 002	DVA05 only	120				
	H	030‡	13260B + 003‡	12966A + 001	DVR05/DVA05	960				
	M	None	13232N/M**	12966A + 002	DVA05 only	120				
	H	None	None	12880A + 001	DVR00	960				
	M	None	13232N/M**	12531D + 002	DVR00	120				

NOTE: The 12966A interface plus DVR05/DVA05 combination is preferable to the 12880A/12531D interface plus DVR00 combination, because of the superior efficiency and much better overall system throughput that is achieved by the preferred combination.

* H = Hardwired, local connection, M = Modem, remote connection using Bell Type 103 Data Sets or Vadic VA3400 Modems.

** 13222N/M and 13232N/M are modem cables; the suffix N cable is for connection to U.S. modems and suffix M cable is for connection to European modems.

† 120 characters per second is the maximum data rate for modem communications, but the actual rate will depend upon the user's choice of modem. The indicated maximum rate holds for system-to-display communication; rates to/from Mini cartridges or auxiliary printer connected to the 2645A Display Station or 2648A Graphics Terminal differ as noted in the price table descriptions.

‡ 2645A/2648A option 032 is required only for 2645A/2648A Terminal with Mini cartridge I/O, and/or auxiliary printer.

§ Terminal option 007 provides 13261A & 13236B, which are used only to provide Mini cartridge I/O for terminal without option 007.

A 13261A is also required in terminal without Mini cartridge I/O.

26XX TERMINALS (Cont'd)

26XX TERMINAL KEYBOARD STRAPPING OPTIONS

STRAP	STRAPPING OPTION	NORMAL OPERATION (switch closed)	OPERATION WITH STRAPPING OPTION (switch open)
A	FUNCTION KEY TRANSMISSION	ESCAPE CODE SEQUENCES GENERATED LOCALLY, NOT TRANSMITTED	ALL ESCAPE CODES TRANSMITTED
B	SPACE OVERWRITE LATCH ENABLE	SPACES TYPED WILL OVERWRITE EXISTING CHARACTERS	LATCH OFF; OVERWRITE LATCH ON; NO OVER- WRITE
C	CURSOR END-OF- LINE WRAPAROUND	CR&LF GENERATED AT END OF EACH LINE	CURSOR REMAINS IN COLUMN 80 AT END OF EACH LINE
D	LINE/PAGE	TRANSFER LINE AT A TIME IN BLOCK MODE	ENTIRE PAGES TRANSFERRED IN BLOCK MODE
E	PAPER TAPE MODE	EACH RECORD BEGINS WITH LF AND ENDS WITH CR	EACH RECORD ENDS WITH CR LF
F	FAST BINARY READ	BAUD RATE SET BY BAUD RATE SWITCH	BAUD RATE SET BY COMPUTER
G	BLOCK TRANSFER HANDSHAKE	DATA TRANSFERRED AFTER RECEIPT OF DC1 FROM COMPUTER	FULL HANDSHAKE BETWEEN TERMINAL AND CPU REQUIRED
H	INHIBIT DC2	DC2 ISSUED UPON RECEIPT OF DC1 DATA FOLLOWS	NO HANDSHAKE REQUIRED
J	AUTO TERMINATE	NO EFFECT	PLACE TERMINATOR BEFORE CURSOR
K	CLEAR TERMINATOR	NO EFFECT	CLEAR TERMINATOR CAUSED BY STRAP J
L	SELF TEST INHIBIT	NO EFFECT	PROHIBITS EXECUTION OF SELF TEST
M	INSERT OR DELETE CHAR	NO EFFECT	REVERSES EFFECT OR CNTL KEY ON INSERT AND DELETE
N	ESCAPE CODE TO PRINTER	NO EFFECT	ESCAPE CODES SENT TO PRINTER
P,Q	COMPATIBILITY MODE	THESE SWITCHES FIX COMPATIBILITY WITH TEKTRONIC CONTROL COMMANDS	
		P-CLOSED; Q-CLOSED	NORMAL OPERATION
		P-CLOSED; Q-OPEN	UNSCALED COMPAT.
		P-OPEN; Q-CLOSED	SCALED COMPAT.
		P-OPEN; Q-OPEN	2048 COMM BUFFER

26XX TERMINALS (Cont'd)

26XX TERMINAL KEYBOARD STRAPPING OPTIONS (Cont'd)

STRAP	STRAPPING OPTION	NORMAL OPERATION (switch closed)	OPERATION WITH STRAPPING OPTION (switch open)
R	CIRCUIT ASSURANCE	TRANSITION FROM RECEIVE STATE TO TRANSMIT STATE OCCURS AFTER CB (106) (CLEAR TO SEND) AND SB (122) (SECONDARY RECEIVE DATA) GO ON WITHIN 2.6 SECS. OTHERWISE, TERMINAL RETURNS TO RECEIVE STATE.	THE TRANSITION FROM RECEIVE STATE TO TRANSMIT STATE OCCURS AFTER CB (106) (CLEAR TO SEND) GOES ON.
S,T	MAIN CHANNEL PROTOCOL	REVERSE CHANNEL PROTOCOL (BOTH SWITCHES CLOSED).	S-CLOSED, T-OPEN: MAIN CHANNEL WITH STX/ETX AS START OF DATA AND END OF DATA. S-OPEN, T-CLOSED: MAIN CHANNEL WITH EQT AS END OF DATA. S-OPEN, T-OPEN: MAIN CHANNEL WITH ETX AS END OF DATA.
U	CPU BREAK	CPU CAN INTERRUPT TERMINAL WHILE IT IS IN TRANSMIT STATE. CPU INITIATES AN ON TO OFF TRANSITION OF SB (122) (SECONDARY RECEIVE DATA) LINE. TERMINAL RESPONDS BY TURNING OFF CA (106) (REQUEST TO SEND) AND GOING TO THE RECEIVE STATE.	TERMINAL IGNORES ALL TRANSITIONS ON SB (122) (SECONDARY RECEIVE DATA) LINE FROM MODEM IN TRANSMIT STATE.
V	CARRIER DETECT	WHEN TERMINAL IS IN RECEIVE STATE, AN ON TO OFF TRANSITION OF CF (109) (CARRIER DETECT) LINE FROM MODEM CAUSES TERMINAL TO GO INTO TRANSMIT STATE. TRANSITIONS OF CF HAVE NO EFFECT WHILE TERMINAL IS IN TRANSMIT STATE.	TRANSITIONS OF CR (109) (CARRIER DETECT) LINE HAVE NO EFFECT ON THE TERMINAL.

26XX TERMINALS (Cont'd)

26XX TERMINAL KEYBOARD STRAPPING OPTIONS (Cont'd)

STRAP	STRAPPING OPTION	NORMAL OPERATION (switch closed)	OPERATION WITH STRAPPING OPTION (switch open)
W	DATA COMM SELF TEST ENABLE	ENABLES DATA COMM SELF TEST FROM EITHER THE KEYBOARD OR ESCAPE SEQUENCE.	DISABLES DATA COMM SELF TEST. IF SELF TEST IS ATTEMPTED (BY) EITHER THE KEYBOARD OR ES- CAPE SEQUENCE), THE TEST WILL BE ABORT- ED AND ERROR 0 WILL APPEAR ON DISPLAY.
X	DATA SPEED SELECT	HOLDS DATA SPEED SIGNAL LOW (CH (111) = 0).	SETS DATA SPEED HIGH (CH (111) = 1)
Y	TRANSMIT LED	TRANSMIT LIGHT ON KEYBOARD IS TURNED ON WHEN CB (106) (CLEAR TO SEND) LINE FROM MODEM IS HIGH. IS TURNED OFF WHEN CB (106) LINE GOES LOW.	TRANSMIT LIGHT ON KEYBOARD IS TURNED ON WHEN CC (107) (DATA SET READY) LINE FROM MODEM IS HIGH AND 13260B EX- TENDED ASYNCHRONOUS COMMUNICATIONS IN- TERFACE PCA IS USED IS TURNED OFF WHEN CC LINE GOES LOW.
Z	PARITY	PARITY SWITCH ON TERMINAL KEYBOARD IS AFFECTED AS FOLLOWS: NO PARITY: SEND 8 BITS AND RECEIVE 8 BITS. FORCE BIT 8 TO ZERO. CHECK FOR PARITY ERROR. ODD PARITY: SEND 7 DATA BITS + ODD PARITY. CHECK FOR PARITY ERROR. EVEN PARITY: SEND 7 DATA BITS + EVEN PARITY. RECEIVE 7 DATA BITS + EVEN PARITY. CHECK FOR PARITY ERROR.	PARITY SWITCH ON TERMINAL KEYBOARD IS AFFECTED AS FOLLOWS: NO PARITY: SEND 8 BITS AND RECEIVE 8 BITS. FORCE BIT 8 TO ONE ON SEND. NO CHECK FOR PARITY ERROR. ODD PARITY: SEND 7 DATA BITS + ODD PARITY. RECEIVE 7 DATA BITS + ODD PARITY. CHECK FOR PARITY ERROR. EVEN PARITY: SEND 7 DATA BITS + EVEN PARITY. RECEIVE 7 DATA BITS. NO CHECK FOR PARITY ERROR.

TELEPRINTER AND 12531B/C I/F DIAGNOSTIC

Paper Tape Binary 12531-16001. Date Code 1509,
 Cartridge Binary 24998-13303. Date Code 1928, and 24396-13307
 Date Code 2040. DSN 104003
 Manual: 12531-90042

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100₈, S-Reg (5-0) = SC of 12531B/C I/F.
4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.
7. Restart: P-Reg = 2000₈, S-Reg = Switch options, press PRESET, RUN.
8. Switch options:

BIT	MEANING IF SET																						
0	Reserved.																						
1	Abort Sections.																						
2	Print *U.																						
3	Print '[.																						
4	Print ?C.																						
5	Punch ALL 1s — ALL 0s.																						
6	Read ALL 1s — ALL 0s.																						
7	Reserved.																						
8	Suppress tests requiring operator intervention.																						
9	Abort current diagnostic execution and halt (102075); the user may specify a new group of tests in the A-Register; clear bit 9 and press RUN.																						
	<table> <tr> <th>A-REG BIT</th><th>IF SET WILL EXECUTE</th></tr> <tr> <td>0</td><td>Test 0 — Basic I/O</td></tr> <tr> <td>1</td><td>Test 1 — Punch</td></tr> <tr> <td>2</td><td>Test 2 — Read</td></tr> <tr> <td>3</td><td>Test 3 — Print</td></tr> <tr> <td>4</td><td>Test 4 — Full Keyboard</td></tr> <tr> <td>5</td><td>Test 5 — Free Input</td></tr> <tr> <td>6</td><td>Test 6 — Keyboard Echo</td></tr> <tr> <td>7</td><td>Test 7 — Oscillator Tolerance</td></tr> <tr> <td>8</td><td>Test 10 — Alignment Routines*</td></tr> <tr> <td>15-9</td><td>Reserved</td></tr> </table>	A-REG BIT	IF SET WILL EXECUTE	0	Test 0 — Basic I/O	1	Test 1 — Punch	2	Test 2 — Read	3	Test 3 — Print	4	Test 4 — Full Keyboard	5	Test 5 — Free Input	6	Test 6 — Keyboard Echo	7	Test 7 — Oscillator Tolerance	8	Test 10 — Alignment Routines*	15-9	Reserved
A-REG BIT	IF SET WILL EXECUTE																						
0	Test 0 — Basic I/O																						
1	Test 1 — Punch																						
2	Test 2 — Read																						
3	Test 3 — Print																						
4	Test 4 — Full Keyboard																						
5	Test 5 — Free Input																						
6	Test 6 — Keyboard Echo																						
7	Test 7 — Oscillator Tolerance																						
8	Test 10 — Alignment Routines*																						
15-9	Reserved																						
10	Suppress non-error messages.																						
11	Suppress error messages.																						
12	Repeat all selected tests after diagnostic run has completed without halting. Tests requiring operator intervention will be suppressed.																						
13	Repeat last test executed (loop on test).																						
14	Suppress error halts.																						
15	Halt (102076) at the end of each test; A-Reg = Test number (octal).																						
*The Alignment Routines test is not included in the default tests and must be user selected to have the test run.																							

7900/7901 DISC DIAGNOSTIC

Paper Tape Binary 12960-16001. Date Code 1803,
 Cartridge Binary 24998-13305. Date Code 1822,
 and 24396-13306 Date Code 1901. DSN 151302.
 Manual: 12960-90003

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100₈, S-Reg = Configuration options.

Configuration Options

BITS	FUNCTION IF SET
5-0 14	SC of disc interface 1. 0 = DMA channel 6; 1 = channel 7.

4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.
7. Restart: P-Reg = 2000₈, S-Reg = Switch options, press PRESET, RUN.
8. Switch options:

BITS	FUNCTION WHEN SET
0	Spare.
1	Skip to end of section when set.
2	Alter cylinder table and/or pattern table and/or select heads and/or change unit removal threshold and/or alter unit table. Reset to terminate requests.
3	Execute operator design program (OPDSN or Section 6).
4	Execute interactive part of S1.
5	Shorten test in S2, S3, S4 and S5.
6	Restrict cylinder selection.
7	Repeat last section.
8	Suppress spaces, print message 65 independent of bit 10 when an error occurs.
9	Halt after each section of the program.
10	All non-error messages will be suppressed, except current operation messages, message 51 and message 65 when bit 8 is set and an error occurred.
11	All messages are suppressed.
12	Print timing messages in Sections 2 and 4.
13	Loop on last step.
14	Program will not halt after each error.
15	Halt at the end of the current step.

7900/7901 DISC DIAGNOSTIC (Cont'd)**STATUS WORDS**

Bit	Function
0	Any Error.
1	Data Error.
2	Drive Busy.
3	Flagged Cylinder (when write operation attempted and OVER-RIDE switch not on).
4	Address Error.
5	End of Cylinder.
6	Not Ready.
7	Not Used.
8	Seek Check.
9	Not Used
10	Write Protected (when write operation attempted).
11	Drive Unsafe.
12	Not Used.
13	Overrun.
14	First Seek.
15	Not Used.

FORMATTING

To format a new disc pack using operator design (S7), type in the following program:

```
SD,X      X = unit number
FU        (or FL for Fixed - 7900)
EN
```

NOTE: Protect/Override switch must be in override position for formatting.

7900/7901 DISC DIAGNOSTIC (Cont'd)**7900/7901 OPDSN PROGRAMMING****NOTES: OPERATOR INSTRUCTION LIST NOTES:**

1. The AR, CD, DS, ID, IS, RD, RR, RS, SR and WD instructions include a software status check unless they are followed by a SC instruction. The expected status is zero. The SC instruction allows use of a different expected status.
2. Field limits are as follows:
 - a. $0 \leq \text{Cylinder} \leq 202$
 - b. $0 \leq \text{Head} \leq 3$
 - c. $0 \leq \text{Sector} \leq 23$
 - d. $1 \leq \text{Read or Compare Buffer Size} \leq 1024$
 - e. $1 \leq \text{Write Buffer or Check Data Count} \leq 6144$
 - f. $0 \leq \text{Unit Number} \leq 3$

Except for type d, no limit checks are made on numerical fields. If the limits are exceeded, fields may merge and produce unusual results (especially cylinder, head and sector). All numerical fields are decimal unless specified as octal in the instruction list.
3. Any time bit 3 of the switch register is reset, control is given back to START when the next instruction is reached.
4. An EN or LP instruction will be rejected if undefined labels exist.
5. To initialize a pack on drive X, use the following input:


```
SD,X
FU      (or FL for fixed disc — 7900)
EN
```
6. Labels are exactly two characters. All printing characters are legal. Spaces are skipped.
7. No facility is provided to restart programs.
8. Following an H16 overflow message, the program may be shortened by using the EE instruction or completely erased using the EP instruction. (Or by making sure that the diagnostic configurator is located outside of the first 8K of core.)

7900/7901 DISC DIAGNOSTIC (Cont'd)**7900/7901 OPDSN PROGRAMMING****OPERATOR INSTRUCTION LIST — S6**

INSTRUCTION	FUNCTION
AR , [CCC] , [H] [SS]	Address Record. Sets up the RAR. Default: RAR = 0. (CCC = cylinder, H = head, SS = sector.)
CB , [XXXX] , [YY]	Compare Write Buffer with Read Buffer. Default case is 128 words and 1 error printout. (XXXX = word count.) (YY = allowed number of error printouts.)
CD , [XXXX]	Check Data. Default case checks 128 words (1 sector). (XXXX = word count.) End of cylinder may occur.
CE	Seek and loop on cylinder 95, 100 or 105 if switch register bits 0 and 1 are 00, 01 or 10. If the bits are 11, continue. HEAD = bit 5 * 2 + bit 4.
DB , [XXXX] , YYYYYY [C]	Define Write Buffer. Default case fills 128 words. Default pattern is (XXXX = word count, YYYYYY = pattern word in octal.) If C is present and pattern is not random, the pattern is complemented in successive words. Maximum word count = 1024.
DS , [CCC] , [H] [SS]	Decrement Seek. Does an initial seek to the location specified and decrements the cylinder by 1 each execution until cylinder 0. Following cylinder 0, it seeks cylinder 202. Default condition sets RAR to zero.
EE	Erase Entry. Erases last instruction entered.
EN , [LL]	End. Terminates instruction entry and starts execution (LL = label).
EP	Erase program. S6 is restarted.
FL	Format Lower Disc. 7900 only.
FU	Format Upper disc.
GO, LL	GOTO. Go to label (LL = label).

7900/7901 DISC DIAGNOSTIC (Cont'd)**7900/7901 OPDSN PROGRAMMING**

INSTRUCTION	FUNCTION
HT [,XXXXXX]	Halt. Display value in A-register (XXXXXX = display value in octal).
ID D [,XXXX] ,P	Initialize Data. The override switch must be ON. If (D) is added, the sector is tagged defective. If (P) is added, the sector is tagged as protected. The default case writes 6144 words. (XXXX = word count.)
IS , [CCC] ,[H] [,SS]	Incremental Seek. Does an initial seek to the location specified and increments the cylinder by 1 each execution until it reaches cylinder 202. Following cylinder 202 seeks cylinder 0. Default condition sets RAR to zero.
LB,LL	Label. Define location of label. (LL = label.)
LP [,LL]	Loop. (Similar to EN.) Program starts at LL, but loops back to beginning.
RD [,XXXX]	Read Data (XXXX = word count).
RL	Reload. Reset RAR to last loaded value.
RR	Refine Record. A straddle erase* is performed on the sector currently contained in the RAR address.
RS	Random Seek.
RT,LL,X	Repeat. Return to the indicated label (LL = label) the indicated number of times (X = number of times to repeat in decimal).
SC [,XXXXXX]	Status Check. (XXXXXX = expected status in octal).
SD,X	Select Drive. Indicated drive is selected. (X = drive number; $0 \leq X \leq 3$.)

**STRADDLE ERASE – A special recovery procedure performed on sector to improve magnetic characteristics of data.*

7900/7901 DISC DIAGNOSTIC (Cont'd)**7900/7901 OPDSN PROGRAMMING**

INSTRUCTION	FUNCTION
SR , [CCC] ,[H] [,SS]	Seek Record. Sets up the RAR and seeks to the disc location defined by the RAR (CCC = cylinder, H = head, SS = sector).
ST	Status (hardware).
VL	Verify Lower Disc. 7900 only. This instruction checks status except for bits 3 (flagged cylinder) and 10 (Write protected).
VU	Verify Upper disc. This instruction checks status except for bits 3 (flagged cylinder) and 10 (write protected).
WD [,XXXX]	Write Data (XXXX = word count).

put 06/20/25 DISC DIAGNOSTIC

Paper Tape Binary 12962-16001. Date Code 1805.
 Cartridge Binary 24998-13305, Date Code 1822 and
 24396-13306 Date Code 1901. DSN 151403
 Manual: 12962-90001

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100₈, S-Reg = Configuration options.

Configuration Options

BIT	FUNCTION IF SET
5-0	SC of controller interface PCA.
14	0 = DMA channel 6; 1 = channel 7.

4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.
7. Restart: P-Reg = 2000₈. - s switch options
8. Switch options:

BIT	MEANING WHEN SET
0	Allow defective and spare tracks and flag a track defective if five consecutive attempts to verify that track are unsuccessful.
1	Skip to end of current test section.
2	Allow operator to alter the unit table, unit removal threshold, head table, determine status heading, alter pattern table, change decision on printing soft errors alter cylinder table, and decide whether or not MCPU mode is entered.
3	Enter OPDSN section.
4	Execute interactive tests (test section 1).
5	Skip test section 2 and shorten test in test sections 3, 4, and 5.
6	Select cylinder numbers from the cylinder table when set; from all those available on drive, when clear.
7	Loop on current test section.
8	Eliminate all blank lines between messages output, and output the pass message H65 if an error occurs during a pass in which bit 10 is set.
9	Halt (10201X) after each test section of the diagnostic is complete. Push RUN.
10	Suppress all non-error messages. Exceptions are current operation messages when an error occurs, the cylinder, head, and sector where the error occurs, and the pass message H65 on each pass where the error occurs, when bit 8 is set.
11	All messages are suppressed.
12	Print timing messages in test sections 2 (H53 AVERAGE SINGLE CYLINDER SEEK TIME X.XX) and 4 (H54 AVERAGE RANDOM SEEK TIME XXXX.X, LENGTH XXXX.X).
13	Loop on current step.
14	Program will not halt after each error.
15	Halt (102004) after the current step is complete.

7905/06/20/25 DISC DIAGNOSTIC (Cont'd)

HALT CODES

HALT	MEANING
102001	Error halt; non-information type message.
102002	Operating instruction or comment; operator action required.
102004	Orderly halt at end of current step.
102005	Push RUN to restart diagnostic.
102006	Push RUN to restart diagnostic. (See messages E50 and E103.)
10201X	Halt between sections (X = section number).
102073	Illegal select code during configuration of the diagnostic.
102074	Halt at end of diagnostic configuration.
1060XX	Trap cell interrupt. P-Reg = memory address when interrupted, XX = trap cell location.

SUMMARY OF OPDSN COMMANDS

COMMAND	FUNCTION
AI	Add instructions.
AR [, [ccc] [, [h] [,ss]]] *	Address record.
CA,LL	Call subroutine LL.
CB [, [xxx] [,yy]]	Compare buffers.
CC [,n]	Change cylinder variable.
CH [,n]	Change head variable.
CL	Issue clear command.
CP,X,Y	Compare surface X with surface Y.
CR [, [xxx] [, [h] [,ss]]]	Cold load read.
CS [,n]	Change sector variable.
CW,X,Y	Change word X (decimal) of write buffer to Y(octal).
DA	Request disc address.
DB [, [xxx] [,yyyyyy [,c]]] **	Define buffer.
DC	Disable checking.
DL [,N]	Delay N milliseconds.
DR,X [,y]	Display contents of word X (or read buffer).
DS [, [ccc] [, [h] [,ss]]]	Decrement seek.
DW,X [,y]	Display contents of word X (or write buffer).
EE	Erase last instruction entered.
EN [,ll]	End instruction entry and begins program execution.

* ccc = cylinder, h = head, ss = sector.

Limits: cyl. 0-202, head 0-3; sector 0-23.

** xxx = word count, yyyyyy = pattern of word in octal. c = compliment successive words.

7905/06/20/25 DISC DIAGNOSTIC (Cont'd)

SUMMARY OF OPDSN COMMANDS (Cont'd)

COMMAND	FUNCTION
EP	Erase present program.
EX	Exit OPDSN section.
FH	Format all heads in head table.
FN	Format surface N.
GO,LL	GOTO label LL.
HT [,xxxxxx]	Halt.
ID [, [xxxx] [,s]] d p	Initialize data.
IS [, [ccc] [, [h] [,ss]]]	Incremental seek.
LB,LL	Define a label.
LP [,I,I]	End instruction entry and loop on program.
LS,N	Loop on step N.
LV,LL	Leave subroutine LL.
MC [, [ccc] [, [h] [,ss]]]	Multiple CPU check.
NO	Nop.
PR,SS	Output symbol SS followed by an integer number plus 1.
RA	Request sector address.
RC	Issue a recalibrate command.
RD [,xxxx]	Transfer xxxx words from disc to read buffer.
RF [,xxxx]	Perform read full sector for xxxx words.
RI	Run instructions previously entered.
RL	Reload.
RN	Restore information stored by last SN instruction.
RO [, [xxxx] [, [±cc] [,a]]] d	Issue a read with offset.
RS	Random seek.
RT,LL,X	Return to label LL, X number of times.
RW	Read without verify.
SB,LL	Define subroutine LL.
SC	Status check.
SD,X	Select drive X.
SK [, [ccc] [, [h] [,ss]]]	Seek to cylinder, head, and sector specified.
SM [,xxxxxx]	Set file mask to xxxxxx (octal).
SN	Save current cylinder, head, and sector.
ST	Issue status command.
TB [,n]	Transfer first n words of read buffer to write buffer.
TC,CCC,X,Y	Transfer cylinder CCC from surface X to surface Y. (7905 only)
TS,X,Y	Transfer surface X to surface Y. (7905 only)

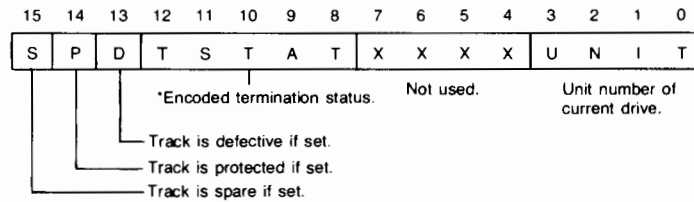
7905/06/20/25 DISC DIAGNOSTIC (Cont'd)

SUMMARY OF OPDSN COMMANDS (Cont'd)

COMMAND	FUNCTION
VD	Verify defective.
VF [,xxxx]	Verify xxxx number of sectors.
VH	Verify all heads in head table.
VN	Verify surface N.
VP	Verify protected.
VS	Verify spare.
WD [,xxxx]	Transfer xxxx words from write buffer to disc.
WF [,xxxx]	Write full sector for xxxx words.

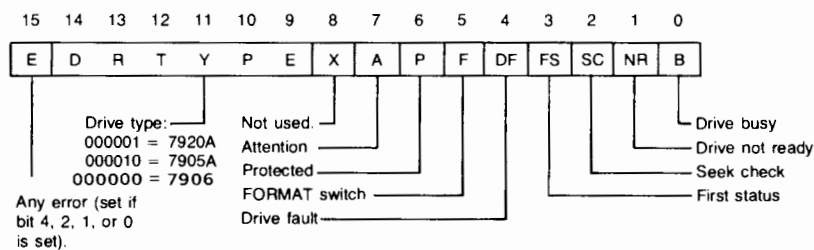


STATUS-1 WORD



*Encoded termination status

STATUS-1 WORD (octal)	TSTAT (binary)	DEFINITION
000000	00000	No errors. (NORMAL COMPLET).
000400	00001	Illegal opcode. (ILLEGAL OPCODE).
001000	00010	Unit available. (UNIT AVAILABLE).
003400	00111	Cylinder compare error. (CYL CMP ERR).
004000	01000	Uncorrectable data error. (UNCOR DATA ERR).
004400	01001	Head-sector compare error. (HD/SEC CMP ERR).
005000	01010	I/O program error.
006000	01100	End of cylinder. (END OF CYLINDER).
007000	01110	Data overrun. (OVERRUN).
007400	01111	Possibly correctable data error. (POSS CORR DATA).
010000	10000	Illegal access to spare track. (SPR TRK ACCESS).
010400	10001	Defective track. (DEFECTIVE TRK).
011000	10010	Access not ready during data operation. (ACCSS NR DATOP).
011400	10011	Status-2 error. (STATUS-2 ERROR).
013000	10110	Attempt to write on protected or defective track. (WRT PROTEC TRK).
013400	10111	Unit unavailable. (UNIT UNAVAIL).
017400	11111	Drive attention. (DRIVE ATTENTION).

7905/06/20/25 DISC DIAGNOSTIC (Cont'd)**STATUS-2 WORD****SERVICE DATA****Verification Test**

To verify a surface using operator design (TS6), type the following program:

```
SD,X      Select Drive X.
Vz        z = H, to verify all heads in head table, or
          = head number (0-2).
EN
```

Formatting

To format a surface on a drive using operator design (TS6), type the following program:

```
SD,X      Select Drive X.
Fz        z = H, to format all heads in head table, or
          = head number (0-2).
EN
```

Surface Transfer (7905 only)

Set PROTECT switch to: ON for surface Z, OFF for Y.
 Set FORMAT switch to ON.

```
SD,X
TS,Z,Y    Transfer surface Z to surface Y.
EN
```

Check Transfer (7905 only)

Clear PROTECT switch for surface Z.

```
SD,X
CP,Z,Y    Z and Y same as in surface transfer.
EN
```


9885M (MASTER) FLEXIBLE DISC DRIVE**12732A/12733A FLEXIBLE DISC SUBSYSTEM****EQUIPMENT**

9885M Disc Drive
 12735A Computer Interface
 12735-60001 Control I/F PCA
 12735-60002 Data I/F PCA
 12735-60003 I/F Cable, 4.5m (15 ft.)
 9885S Disc Drive
 09885-61617 Chaining cable 2m (6 ft.)
 9164-0074 Blank disc

DOCUMENTATION

P/N	MANUAL
09885-90030	9885 Service
09885-90020	Flexible Disc Maintenance Note
12732-90005	12732A/12733A Operating & Service
12732-90001	12732A/12733A Programming
12732-90003	12732A Diagnostic Reference

IN-1. Interface PCA Jumper Configurations.

JUMPER	POSITION	
	CONTROL INTERFACE	DATA INTERFACE
	12735-60001	12735-60002
W1	A	A
W2	B	A
W3	B	B
W4	B	B
W5	IN	IN
W6	IN	IN
W7	IN	IN
W8	OUT	IN
W9	B	B

IN-2. Install control and data interface PCA's in adjacent slots with the control interface PCA occupy the lower numbered slot (higher priority).

12732A/12733A FLEXIBLE DISC DIAGNOSTIC (9885 FLEX DISC DRIVE)

Paper Tape Binary 12732-16003. Date Code 1708.

Cartridge 24396-13308. Date Code 1901 and 24998-13305 Date Code 1822.

DSN 111104.

A Standard pass with no operator intervention, no errors, a sector offset of five, and no formatting requires about 20 minutes.

CAUTION

DO NOT HALT DIAGNOSTIC. Use bit 15 to terminate properly.

1. Load Diagnostic Configurator.
2. Configure configurator and load 12732 diagnostic.
3. Configure diagnostic: P-Reg = 100₆; S-Reg (5-0) = SC of Control Interface PCA.
4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.

12732A/12733A FLEXIBLE DISC DIAGNOSTIC (9885 FLEX DISC DRIVE) (Cont'd)

7. Switch options:

BITS	MEANING IF CLEAR
15-6	Standard tests in sequence one pass, no options, and no formatting unless 0, 1, 4, and 5 are set.
BITS	MEANING IF SET
0,1,4,5	Enable format-altering operations.
2	Alter patterns for TRAK test.
3*	Abort current operation and go to OPDSN input section.
6	Spare.
7	Echo console on line printer.
8	Suppress operator intervention in TEST 0 (CARD test) and TEST 4 (ERRR test).
9*	Abort current operation and go to user control section. Set A-Register bits to desired test numbers.
	EXECUTE IF SET
A-REG BIT	
0	TEST 00 Interface PCA's and Interrupts
1	TEST 01 Format Entire Disc
2	TEST 02 Read-Only Media Test
3**	TEST 03 Verify Test
4	TEST 04 Error Status Test
5	TEST 05 Pattern Test
6	TEST 06 Random Seek and Position
7	TEST 07 Random Seek and Write
8	TEST 08 Seek Test
9	TEST 09 Head Step-Mark Defective Test
10	TEST 10 Dump Test
11	TEST 11 DCPC Modes Test
12**	TEST 12 Non-DCPC Modes Test
10	Suppress non-error messages.
11	Suppress error messages.
12	Loop on diagnostic and suppress operator intervention in TEST 0 (CARD test) and TEST 4 (ERRR test).
13	Loop on last test.
14	Suppress halt on error.
15	Halt at the end of each test.
*Setting bits 3 or 9 during a format operation may leave the disc improperly or partially formatted.	
**Optional tests.	

12732A/12733A FLEXIBLE DISC DIAGNOSTIC (9885 FLEX DISC DRIVE) (Cont'd)

Function of S-Register Bits 0, 1, 4 and 5

TEST	FUNCTION FORMAT ENABLED*	FUNCTION FORMAT NOT ENABLED
TEST 1 & FALL	Formats all of disc.	No action.
TEST 4 & ERRR	Checks error reporting capability of disc including ("track not found" and "sector not found") and then formats all of disc. Disc must be previously formatted.	Checks error reporting capability of disc (except "track not found" and "sector not found"). Disc must be previously formatted.
TEST 9	Marks all tracks defective, then formats all of disc.	Steps head from track 0 to track 66.
FTRK & FX	Formats a single track.	No action.
MARK	Marks a track defective.	No action.
TEST 5 & TRAK	Writes worst case patterns in track-0 sector-0, and then rewrites original contents (no. of good tracks and sector offset).	Only sectors 1-29 of track 0 are tested. Sectors 0-29 of other tracks are tested.
WD & WX	Track-0 and sector-0 may be overwritten.	Track-0 and sector-0 may NOT be overwritten.

*Bits 0, 1, 4, and 5 set in S-Register during execution of the OPDSN statements and standard tests listed.

Summary of OPDSN Commands

COMMAND*	FUNCTION
CARD	Test interface cards and interrupts.
CB I N	Compare buffers (I = words, N = maximum errors).
CBP I N	Compare buffers, output errors on line printer (I = words, N = maximum errors).
DB	Fill output buffer with random data.
DBFK K B	Fill output buffer with octal alternating pattern. (K = odd word pattern, B = even word pattern).
DBRK I N**	Replace words I to N with octal data from console.
DBSZ	Print output buffer size.
DUMP A	Dump 128 words and compare buffers. (A = C to compare).
DLY I	Delay I milliseconds.
DX K B	Dump (K = expected status, B = mask).
ERRR	Force error status.
EP**	Erase program.
EX	Exit OPDSN.
FALL I N	Format entire disc (I = number of patterns, N = sector offset).
FTRK I N	Format track I (N = sector offset).
FX I K	Format track I (K = expected status).
GO**	Execute user program.
GOTO I†	Jump to line I.
GOSB I N†	Repeat subroutine starting at line I, N times.
LI I N	List input buffer from word I to word N.
LIP I N	List input buffer from word I to N on line printer.

12732A/12733A FLEXIBLE DISC DIAGNOSTIC (9885 FLEX DISC DRIVE) (Cont'd)

Summary of OPDSN Commands (Cont'd)

COMMAND*	FUNCTION
LO I N	List output buffer from word I to N.
LOP I N	List output buffer from word I to N on line printer.
LP**	List user program.
LPP**	List user program on line printer.
MARK K B	Mark track defective (K = expected status, B = mask).
MDIS I	Mount disc (I = number of good tracks).
MODE A I	Set mode of I/O AND DCPC (A = mode, I = DCPC channel).
MOVE I	Seek I sectors forward or backward.
MSG A S	Output four character ASCII message to console.
PRST	Preset controller and seek home.
RAND I A	I = iteration count. A = S, Z, R, W, or D for random seeks, writes, reads, or dumps.
RD I A	Read I words and compare buffers (A = C to compare).
RTN†	Return from subroutine.
RTRY I	Set up retry count.
RX I K	Read I words (K = expected status).
SD I	Set up drive number (0 to 3).
SK I N	Seek track I, sector N.
ST K B	Request status (K = expected status, B = mask).
SX I K	Seek (I = [track x 100] + sector, K = expected status).
STAT	Print last status.
STEP K B	Step head in one track (K = expected status, B = mask).
STOP†	Stop execution of OPDSN program.
TEST I	Execute standard diagnostic test I.
UX I K	Undefined command (I = "track", K = expected status).
TRAK I N	Pattern test of track I (N = number of patterns).
VRFY I A	Verify I words and compare buffers.
VX I K	Verify I words (K = expected status).
WAIT†	Wait for operator (operator enters ST or CO I).
WD I	Write I words (Negative I = write entire disc).
WX I K	Write I words (K = expected status).
* Command use requires line number for program statements and no line number for immediate execution upon CR-LF. Some commands can be used in only one of the two modes as footnoted (** = without line number, † = with line number). ** Use without line number for immediate execution. † Use with line number in program statements.	

12732A/12733A FLEXIBLE DISC DIAGNOSTIC (9885 FLEX DISC DRIVE) (Cont'd)**Status Words**

		BIT NO.															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CODE		P	0	0	0	E	E	E	E	0	T	S	R	W	C	D	D
BIT	CODE	MEANING														DATA (OCTAL)	
0	D	Drive Number														000000	to
1	D															000003	
2	C															000004	
3	W	Write Protected Disc														000010	
4	R	Drive Not Ready (no drive power, door open, no disc in drive)														000020	
5	S	Seek or Step Complete														000040	
6	T	Transfer Complete (read, write, verify, dump, format)														000100	
7	0	Not Used															
	E	No Error														000000	
	E	No Drive Power														000400	
	E	Drive Door Open														001000	
8	E	No Disc in Drive														001400	
9	E	Invalid Command														002000	
10	E	Sector Not Found														002400	
11	E	Track Not Found														003000	
	E	Data Checkword Error														003400	
	E	Data Overrun														004000	
	E	Verify Error														004400	
12	0	Not Used															
13	0	Not Used															
14	0	Not Used															
15	P	Controller Power Off or Current Operation Not Successful														100000	

Notes: All disc controller commands, except seek, return status in bits 15-0 of the data channel. Status P, shown in bit 15, is signal PSTS (bit 15 of control channel) logically inverted.

SERVICE DATA

- For additional testing of the 12735 interface, run the General Purpose Register Diagnostic, manual P/N 24391-90001. Prior to running this diagnostic, be sure to place data interface PCA jumper W2 in position B. (Do not forget to replace jumper W2 in position A before attempting to operate the subsystem.)

7970B 9-TRACK MTU**12970A MAG TAPE SUBSYSTEM****EQUIPMENT**

7970B	MTU
13181A/13181B	Interface Kit
13181-60030	Cable
9162-0025	Magnetic Tape, 731.5m (2400 ft)
8500-1251	Head Cleaner, Freon

DOCUMENTATION

P/N	MANUAL
12970-90001	12970A Subsystem
07970-90383	7970B Operating and Service
13181-90000	13181A Operating and Service
13181-90095	MTU Subsystem Diagnostic

SPECIFICATIONS**Transport**

Number of tracks - nine
 Density: 9-track: 800 cpi
 Write Enable - supply reel ring required to write
 Reel Diameter - up to 10.5 inches (266.7 mm)
 Read/Write Speed - 25, 37.5, or 45 ips
 Data Transfer Rate - 36 kHz (800 cpi, 45 ips)
 Rewind Speed - 160 ips

Tape

Width - 0.5 inches (12.7 mm)
 Thickness - 1.5 mils (0.038 mm)
 Start/Stop Times - 8.33 ms (read/write) at 45 ips
 End-of-Tape/Beginning-of-Tape Detection - IBM compatible

Physical Characteristics

Height: 24 in. (60.9 cm)
 Width: 19 in. (48.2 cm)
 Depth: 12 in. (30.4 cm) from mounting surface
 Overall Depth: 15-3/4 in. (40.0 cm)
 Weight: 130 lbs. (59.02 Kg) maximum

Environmental (Hardware)

Ambient Temperature - 32° to 131°F (0° to 55°C)
 Relative Humidity - 20% to 80% (non-condensing)

Power

7970B:
 115 or 230 VAC $\pm 10\%$ (switch selectable)
 48 to 60 Hz single phase
 400 VA maximum (high line)

Interface:
 2.9A (+4.5V); 0.09A (-2V)

7970B 9-TRACK MTU (CONT)

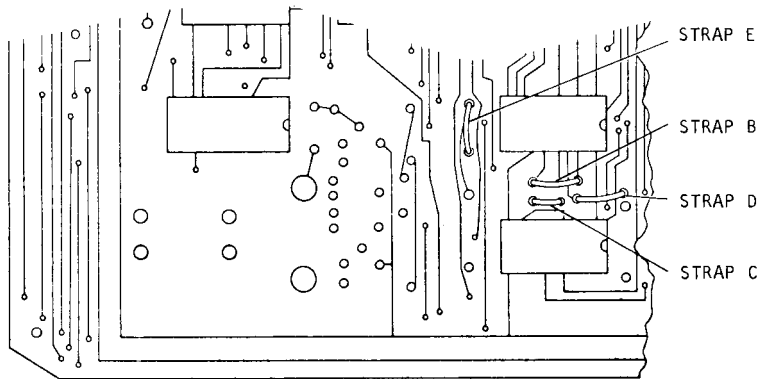
SERVICE DATA

1. 13181A Speed-Strapping
- Tape speed strapping is shown below and described as follows:
- a. For 12.5 IPS speed, use straps B, D, and E.

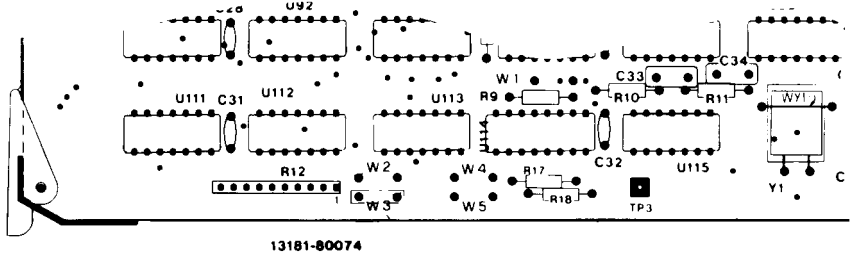
b. For 25 IPS speed, use straps B and E.

c. For 37.5 IPS speed, use strap D.

d. For 45 IPS speed, use strap D and change from 300-kHz crystal (part no. 0410-0163) to 360-kHz crystal (part no. 0410-0431).



2. 13181B Speed Strapping.



JUMPER	TAPE SPEED IPS			
	12.5	25	37.5	45
W5				
W4				
W3				
W2				
W1 *				

*No crystal change required,
W1 selects 300 kHz or 360 kHz.

7970E 9-TRACK MTU**12972A MAG TAPE SUBSYSTEM****EQUIPMENT**

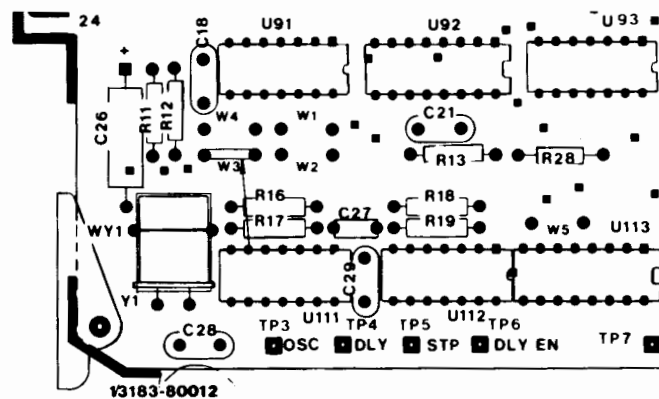
7970E	9-track, 1600 CPI, read-after-write, Mag Tape Drive
13183A/B	Interface Controller
13183-60003	Cable, 20 ft
9162-0025	Magnetic Tape, 731.5m (2400 ft)
8500-1251	Head Cleaner, Freon

DOCUMENTATION

P/N	MANUAL
12972-90001	12972A Subsystem
07970-90765	7970E Operating and Service
13183-90000	13183A Operating and Service
13181-90095	Mag Tape Subsystem Diagnostic

SERVICE DATA

13183B Strapping



JUMPER	TAPE SPEED IPS			
	12.5	25	37.5	45
W5	☐	☐	☐	
W4	☐	☐		
W3	☐		☐	☐
W2	☐			
W1		☐		

7970A/B/E 9-TRACK MTU DIAGNOSTIC

Paper Tape Binary 13181-16001. Date Code 2040,
Cartridge 24396-13307. Date Code 2040, and
24998-13306. Date Code 2040. DSN 112200

7970A/B INTERFACE 13181A, or**7970E INTERFACE 13183A/B**

1. Load Diagnostic Configurator.
2. Configure configurator and load 7970 diagnostic.
3. Configure diagnostic: P-Reg = 100₈, S-Reg = Configuration options.

Configuration Options

BITS	MEANING IF SET
0-5	Select code mag tape 1.
6 thru 8	Not used.
9	Non-DMA (DCPC) for 13183.
10	13181 Interface.
11	13183 Interface.
12	12.5 IPS.
13	25 IPS.
14	37.5 IPS.
15	45 IPS.

4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.
7. Restart: P-Reg = 2000₈.
8. Switch options:

SW BITS	MEANING IF SET
0-3	Unit select (if reset auto select) [auto select for multi-unit only]
4	Use DMA (DCPC) channel 1 on all Read/Write
5*	Use DMA (DCPC) channel 2 on all Read/Write
6	Inhibit test with embedded rewinds
7	Delete CRCC and LRCC checks (13181 only)
8	Suppress test which require operator intervention
9	Go to User Test Selection Section. Selected test in A or B register. See table below.
→ 10	Suppress non-error messages
11	Suppress error messages
12	Loop on diagnostic
13	Loop on last test
14	Suppress error halts
15	Halt 76 at end of each test

*If DMA (DCPC) is not available, the program will override switch register setting.

7970A/B/E 9-TRACK MTU DIAGNOSTIC (Cont'd)

List of test with A/B-register settings.

TEST NO.			TEST TITLE
A-REG BIT	OCT	DEC	
0	0	0	Basic I/O
1	1	1	Initial clear controller and unit selection
2	2	2	Beginning of tape (BOT)
3	3	3	Command reject at BOT
4	4	4	Write command execution time
5	5	5	Gap command execution time
6	6	6	File mark command
7	7	7	Multiple file mark
8	10	8	Initial Write/Read
9	11	9	125125 Write/Read
10	12	10	Force data and timing error status
11	13	11	Record spacing
12	14	12	File spacing
13	15	13	Clear time check during a motion command command
14	16	14	Interrecord gap
15	17	15	Negative interrecord gap creep
TEST NO.			TEST TITLE
B-REG BIT	OCT	DEC	
0	20	16	Write/Read single rotating bit pattern
1	21	17	Write/Read channel sawtooth pattern
2	22	18	Write/Read track sawtooth pattern
3	23	19	Write/Read (non DMA) random data
4	24	20	DMA channel 1 write/read with random data
5	25	21	DMA channel 2 write/read with random data
6	26	22	Rapid write
7	27	23	Echo check on all on-line units

7970A/B/E 9-TRACK MTU DIAGNOSTIC (Cont'd)

List of test with A/B-register settings (continued)

B-REG BIT	TEST NO.		TEST TITLE
	OCT	DEC	
8	30	24	Controller check for multi-unit operation
9	31	25	Inter-unit compatibility
10	32	26	Write ring enable
11	33	27	Rewind off-line
12	34	28	Write all ones record
13	35	29	Read an all ones record
14	36	30	Operator service routine
15	37	31	Operator Design *

* For operator design procedure consult MOD.

7970A/B/C/E 9-TRACK MTU ON-LINE ADJUSTMENTS**FOR ADJUSTMENT OF START/STOP TIME**

1. Prepare 7970 diagnostic (13181-16001) for execution.
2. Set S-Reg bit 9.
3. Press PRESET, RUN. HALT 102075.
4. Clear S-Reg bit 9.
5. Set B-Reg bit 14.
6. Press PRESET, RUN. Message "H146 SELECT OP. SER". HLT 46.
7. Set S-Reg bit 2.
8. Press PRESET, RUN. Message "SELECT COMMAND". HLT 51.
9. Set S-Reg bits 3, 11, 12, 13 and 14.
10. Mount Scratch Tape and set Unit on-line.
11. Press PRESET, RUN. The tape should be starting and stopping. To vary delay, turn bits 12-14 on or off for desired timing.
12. Set S-Reg bit 15 to terminate routine. HLT 46.

7970A/B/C/E 9-TRACK MTU ON-LINE ADJUSTMENTS (Cont'd)**FOR ADJUSTMENT OF START/STOP TIME (Cont'd)****WRITE ALL ONES FOR PREAMP AND WRITE SKEW ADJUSTMENT (7970A/B with 13181 only)**

1. Perform steps 1 through 8 of above procedure.
2. Set S-Reg bit 0 (write command).
3. Mount Scratch Tape and set Unit on-line.
4. Press PRESET, RUN. The unit should be writing all 1's.
5. Set S-Reg bit 15 to terminate routine. HLT 46.

Note: "B" interfaces will fail diagnostics issued prior to DSN 112200.

13181 OPDSN SUMMARY

To enter OPDSN select Test 31.

PROGRAM COMMANDS

LF List sources statement file
 LO List user output buffer
 LI List user input buffer
 IL List user input buffer length
 CF Clear source statement file
 CB Clear user output buffer
 DB Define buffer
 GO Execute user program
 BY Exit operator design

PROGRAM CONTROL STATEMENTS

NN GOTO X Go to line X.
 NN GOSB X Y Go to subroutine starting at line X and repeat it Y number of times.
 NN RTN
 Return to the last GOSB line number +1 (if no repeat count).
 NN WAIT Wait for the operator.
 NN MSG XY Output "" XY"" on the console (see 7.5.6).
 NN DLY X Delay further execution by X number of milliseconds.
 NN TEST X Execute Test number X (where X is an octal number).
 NN STOP Terminate execution of user program.
 NN CNT Increments and outputs a counter each time it is executed.

Peripheral Control Statements (magnetic tape unit)

NN SR Status report of magnetic tape unit.
 NN SC X Y Branches to line X if tape unit status is not equal to Y.
 NN TC Execute tape unit command (see Table VII).

13181 OPDSN SUMMARY (Cont'd)

NN SFC X Y	Branches to line X if channel Y flag is clear.
NN SD X Y	Places standard data patterns in user buffer.
NN WORD X Y	Places special data pattern in user buffer.
NN RD	Reads a record.
NN WR	Writes a record.
NN COMP	Compares input buffer to output buffer.
NN CRC	Outputs current CRCC from tape unit.
NN CRCI	Computes CRCC from input buffer.
NN CRCO	Computes CRCC from output buffer.
NN LRCI	Computes LRCC from input buffer.
NN LRCO	Computes LRCC from output buffer.
NN DMA X	Read/write under DMA (DCPC) channel X.
NN DMAW	Outputs DMA (DCPC) word count.
NN INTR	Read/write with interrupt system on.
NN TRAP X Y	Fills interrupt trap cell X with jump to line Y.
NN FLAG	Read/write under skip flag method.

2607A LINE PRINTER**12987A SUBSYSTEM****EQUIPMENT**

2607A	Line Printer
12845B	Interface

DOCUMENTATION

P/N	MANUAL
12987-90001	Line Printer Subsystem
12845-90011	12845B Interface
12987-90004	2607 Diagnostic Reference

2607 LINE PRINTER DIAGNOSTIC

Paper Tape Binary 24340-16001. Date Code 1446.
 Cartridge Binary 24396-13305. Date Code 2026 and
 24998-13304. Date Code 2026. DSN 105102
 Manual: 12987-90004

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100₆, S-Reg (5-0) = SC of line printer.
4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.

2607 LINE PRINTER DIAGNOSTIC (Cont'd)

7. Switch options:

BITS	FUNCTION IF SET
0 1 2 3 4 5 6 7 8 9	Reserved Suppress character "H" in dot matrix test Suppress character "I" in dot matrix test Suppress character "#" in dot matrix test Suppress character "." in dot matrix test Reserved Reserved Reserved Suppress test requiring operator intervention Abort current run and perform HALT with MDR = 102075g; user sets bits of A-register with test selection where bit <i>i</i> selects test <i>i</i> ; e.g. bit 0 set selects test 0, bit 1 selects test 1, etc. Clear switch register bit 9, press run.
A-REG BITS	EXECUTE IF SET
0 1 2 3 4 5 6 7 8	Basic I/O Channel Functions Manual Control Ripple Print Triangular Print Vertical Format Control Character Set Dot Matrix DMA Operator Design
10 11 12 13 14 15	Suppress all non error messages. Suppress printing of error messages. Repeat all selected tests of the diagnostic except those requiring operator intervention. Repeat the currently executing test (LOOP) Suppress error HLTS Halt at end of each test. HLT 102076

2613A LINE PRINTER**12975A SUBSYSTEM****EQUIPMENT**

2613A	Line Printer
12845B	Interface

**DOCUMENTATION**

P/N	MANUAL
02613-90010	2613A Printer Operator's
12845-90011	12845B Interface
02618-90006	2613 Diagnostic

2617A LINE PRINTER**13053A SUBSYSTEM****EQUIPMENT**

2617A	Line Printer
12845B	Interface

DOCUMENTATION

P/N	MANUAL
02613-90010	2617A Printer Operators
12845-90011	12845B Interface
02618-90006	2617 Diagnostic

2618A LINE PRINTER**12983A SUBSYSTEM****EQUIPMENT**

2618A	Line Printer
12845B	Interface

DOCUMENTATION

P/N	MANUAL
02618-90001	2618A Printer Operating and Service
02618-90002	2618A Printer Diagrams and Parts Breakdown
12845-90011	12845B Interface
02618-90006	2618 Diagnostic

2613/17/18 LINE PRINTER DIAGNOSTIC

Paper Tape Binary 02618-16001. Date Code 1633.
 Cartridge Binary 24396-13305. Date Code 2026 and
 24998-13304. Date Code 2026. DSN 145103.

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100₈, S-Reg (5-0) = SC of line printer interface.
4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.
7. Switch options:

BIT	FUNCTION IF SET	
0	thru 7 reserved	
8	Suppress tests requiring operator intervention.	
9	Abort current diagnostic execution and HLT 102075. User may specify a new group of test in "A" register, clear bit 9 and press run.	
	A-REG BIT	EXECUTE IF SET
	0	Basic I/O operation
	1	Manual Control Test
	2	Ripple Print Test
	3	Triangular Print Test
	4	Vertical Format Control Test
	5	Character Set Test
	6	Over Print Test
	7	DMA Operation Test
	8	OP Design Test
10	Suppress non error messages.	
11	Suppress error message.	
12	Repeat all selected tests.	
13	Repeat last test executed (loop on test).	
14	Suppress error halts.	
15	Halt (102076) at end of each test.	

2767A/12653A LINE PRINTER AND I/F DIAGNOSTIC

Paper Tape Binary 12984-16001. Date Code 1611.

Manual P/N 12984-90005

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100₈, S-Reg (5-0) = Interface SC.
4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.
7. Restart: P-Reg = 2000₈.
8. Switch options:

BIT	MEANING IF SET		
7-0	Reserved.		
8	Suppress test requiring operator intervention.		
9	Abort current test and halt (102075); specify tests in A-Reg; clear bit 9 and press RUN.		
	A-REG BIT	TEST	EXECUTE IF SET
	0	00	Basic I/O
	1	01	Manual Control
	2	02	Paper Handling and Cyclic Print
	3	03	Illegal Operations
	3	04	Alignment
	5	05*	Operator Design
	15-6		Reserved
	*Must be selected by the operator.		
10	Suppress non-error messages.		
11	Suppress error messages.		
12	Repeat all selected tests. Also, suppress those tests requiring operator intervention.		
13	Repeat last test executed (loop on test).		
14	Suppress error halts.		
15	Halt (102076) at the end of each test; A-Reg = test number.		

2892A CARD READER**12985A SUBSYSTEM****EQUIPMENT**

2892A Card Reader
 12924A Card Reader Interface Kit
 12924-60001 Interface PCA
 12924-60002 Cable Assembly

DOCUMENTATION

P/N	MANUAL
12985-90001	12985A Subsystem
02892-90001	2892A Operating and Service
12924-90001	12924A I/F Operating and Service
12924-90006	2892A/12924A Diagnostic

OPDESIGN

P = 2000
 S = Bit 9 ON
 WAIT 30 SEC
 HALT 102075
 A = BIT 6 ON
 (All OFF)
 S = CLR BIT 9
 PRESET — RUN
 WAIT
 HALT 10

2892A/12924A CARD READER AND I/F DIAGNOSTIC

Paper Tape Binary 12924-16001. Date Code 1537.
 Cartridge Binary 24396-13307. Date Code 2040 and
 24998-13306. Date Code 2040. DSN 113100.

Punched card test deck, P/N 12924-90004.

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100_h, S-Reg = Configuration options.

Configuration Options

BIT	MEANING IF SET
5-0	Card Reader I/O select code.
14-9	Time Base Generator I/O select code (optional).

4. Press PRESET, RUN. HALT 102074.

2892A/12924A CARD READER AND I/F DIAGNOSTIC (Cont'd)

5. Set S-Reg = Switch options.
6. Press PRESET, RUN.
7. Restart: P-Reg = 2000₈.
8. Switch options:

BIT	MEANING IF SET
0	Loop on Pseudo Operator Design.
1	Check for ready.
2	Read a card and put data in read buffer.
3	Compare read buffer with standard data pattern.
4	List read buffer.
5	Delay 1 second between picks.
6	Print Status.
7	Reserved.
8	Reserved.
9	Abort current diagnostic execution and halt (102075); user may specify a new group of tests in the A-Reg, clear bit 9 and then press RUN.
10	Suppress non-error messages.
11	Suppress error messages.
12	Repeat all selected tests. Also, those tests requiring operator intervention will be suppressed.
13	Repeat last test executed (loop on test).
14	Suppress error halts.
15	Halt (102076) at the end of each test; A-Reg = test number (octal).

2748B TAPE READER**12925A PTR SUBSYSTEM****EQUIPMENT**

2748B Tape Reader
 12597A-002 8-Bit Duplex Register I/F Kit
 12597-6001 Interface PCA
 12597-6004 Interface cable
 1251-0332 Test connector, 24-pin
 12575C Electric Tape Winder

DOCUMENTATION

P/N	MANUAL
12925-90001	12925A Subsystem
12597-90022	12597A-002
12597-90031	Tape Reader/Punch Diagnostic

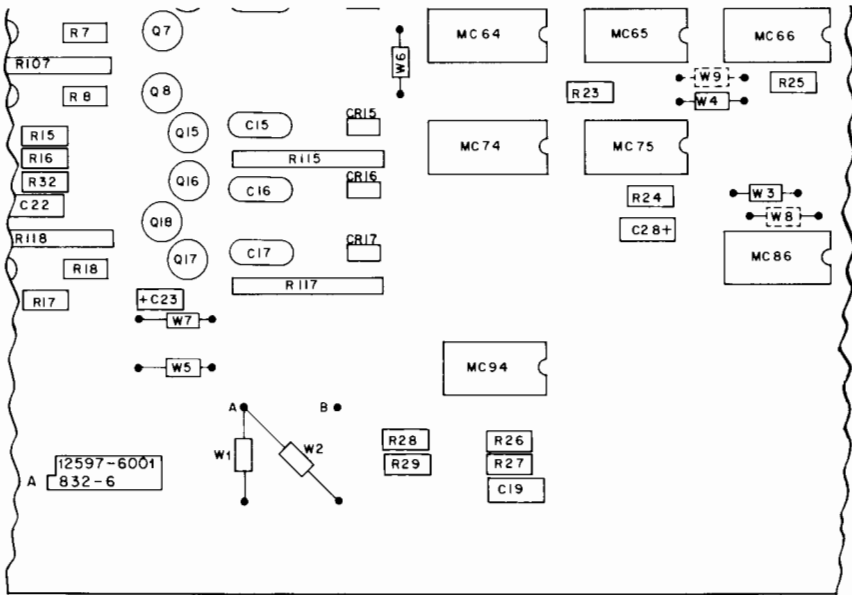
2748B TAPE READER (Cont'd)

INSTALLATION NOTES

Interface card jumper positions.

JUMPER	POSITION
W1	A
W2	A
W3	Connected
W4	Connected
W5	Connected
W6	Connected
W7	Connected
W8	Disconnected
W9	Disconnected

Interface card jumper positions.



2748B TAPE READER (Cont'd)**PHOTO READER OPERATION CHECK**

Address	Mnemonic	Octal
100 B	STC PR, C	1037 PR
101	SFS PR	1023 PR
102	JMP * -1	024101
103	LIA PR	1025 PR
104	HLT	102000
105	JMP * -5	024100

PR = Photo Reader select code. When program halts, A Register contains character — just read from photo reader. Pushing RUN reads next character on tape.

2895B TAPE PUNCH**12926A TP SUBSYSTEM****EQUIPMENT**

2895B Tape Punch
 12597A-005 Tape Punch I/F Kit
 12597-6001 Interface PCA
 12597-60061 Interface cable
 1251-0332 Test connector, 24-pin
 9280-0063 Paper Tape

DOCUMENTATION**P/N****MANUAL**

12926-90001	12926A Subsystem Manual
02895-90008	2895B Operating and Service Manual
12597-90025	12597A-005 I/F Operating and Service Manual
12597-90031	Tape Reader/Punch Diagnostic Manual

INSTALLATION NOTES

Refer to installation notes for 2748B Tape Reader.

2895B TAPE PUNCH (Cont'd)**TAPE PUNCH OPERATION CHECK**

Address	Mnemonic	Octal
100 B	LIA 01	102501
101	OTA TP	1026TP
102	STC TP,C	1037TP
103	SFS TP	1023TP
104	JMP *-1	024103
105	JMP *-5	024100

TP = Tape Punch select code. Will continuously punch information in Switch Register.

PHOTO READER/HIGH SPEED PUNCH DIAGNOSTIC

Paper Tape Binary 12597-16001. Date Code 1725.
 Cartridge Binary 24396-13307. Date Code 2040 and
 24998-13306. Date Code 2040. DSN 146200

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100₈, S-Reg (5-0) = Punch SC, S-Reg (11-6) = Reader SC.
4. Press PRESET, RUN. HALT 102074.
5. To punch a test tape for the reader, perform following:
 - a. Set S-Reg bit 9.
 - b. Press PRESET, RUN. HALT 102075.
 - c. Set A-Reg bit 7.
 - d. Press PRESET, RUN. HALT 102060.
 - e. Turn punch ON and press RUN (tape punched). HALT 102077.
 - f. Create a continuous loop with the tape punched.
6. Set S-Reg = Switch options.
7. Press PRESET, RUN.
8. Restart: P-Reg = 2000₈.

PHOTO READER/HIGH SPEED PUNCH DIAGNOSTIC (Cont'd)

9. Switch options:

BIT	FUNCTION IF SET	
0	START/EXIT Tests.	
1	Abort Test 3.	
2	RESYNC.	
3	Variable Record Length Output (TST02).	
4	Time Delays between Reads.	
5	2737 Reader (TST11).	
6	2753 Punch (TST12).	
7	Loop on TST11 and TST12.	
8	Suppress tests requiring operator.	
9	Abort current test and halt 75. Enter new tests, clear bit 9, and press RUN.	
	A-REG BIT	EXECUTE IF SET
	0	0* BIO on punch I/F
	1	1* BIO on Reader I/F
	2	2* Punch all Character Combos
	3	3* Verify all Character Combos
	4	4* Continuous Loop Read Delays
	5	5* Continuous Loop Variable Lengths
	6	6* Punch/Verify
	7	7 Punch loop (doesn't work on TTY Punch)
	8	10 Punch S-Reg contents.
	9	11 Reader Speed Test
	10	12 Punch Speed Test
	11	13 2753 Status Test
	12	14 2895 Manual Functions Test
	*Default tests.	
10	Suppress non-error messages.	
11	Suppress error messages.	
12	Repeat selected tests and suppress tests requiring operator.	
13	Repeat last test executed.	
14	Suppress Error Halts.	
15	Halt 76 at end of each test; A-Reg = test number.	

12531C/D HIGH SPEED TERMINAL INTERFACE KIT**Equipment**

12531D:	12531-60022	Teleprinter Interface
12531D:	12551-60025	High Speed Terminal Interface Kit

12531C Options:

001:	Add 12531-60021	EIA Terminal Cable, 7.6m
002:	Add 12531-60024	Cable for Bell type 103A Modem

12531D Options:

001:	Add 12531-60026	Interconnect Cable for EIA devices
002:	Add 12531-60024	Cable for Bell type 103A Modem
004:	Add 02640-60058	Cable for certain 264X terminals

Documentation

12531-90033	12531C Operating and Service Manual
12531-90038	12531D Operating and Service Manual

12531C DIAGNOSTIC — TELEPRINTER

Paper Tape Binary 12531-16001. Date Code 1509.
 Cartridge Binary 24396-13307. Date Code 1901, and
 24998-13303. Date Code 1922. DSN 104003.
 Manual: 12531-90042

12531D DIAGNOSTIC — TERMINALS

To verify operation of the 12531D card, perform the on-line diagnostic test for the I/O device connected to the card.

12539C TIME BASE GENERATOR

EQUIPMENT

12539-60003	12539C TBG Card
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DOCUMENTATION

P/N	MANUAL
12539-90008	12539C Operating and Service
12539-90011	12539B/C TBG Diagnostic

ELECTRICAL SPECIFICATIONS

DC Required:

+5 volts	0.76 Amp
-2 volts	0.016 Amp

Base Intervals:

0.1	millisecond
1	millisecond
10	milliseconds
0.1	second
1	second
10	seconds
100	seconds
1000	seconds
1 min.	40 second
16 min.	40 second

Stability:

2 parts in 10⁶ per week

Temperature Effects:

20 parts in 10⁶ over the temperature range of 15°C to 35° (59° to 95°F)

Total Stability:

1/2 second per 24-hour day

12539B/C TBG DIAGNOSTIC

Paper Tape Binary 12539-16001. Date Code 1830.
Cartridge Binary 24396-13303. Date Code 1830, and
24998-13302. Date Code 1926. DSN 103301.

Required Hardware:

- a. Minimum 4K memory
 - b. 12539B TBG with jumper W1 in position A or B, or 12539C with jumpers W1 and W2 in position A or B.
1. Load Diagnostic Configurator.
 2. Configure configurator and load diagnostic.
 3. Configure diagnostic: P-Reg = 100₈, S-Reg (5-0) = Configuration options.

12539B/C TBG DIAGNOSTIC (Cont'd)

Configuration Options

BITS	12539B BOARD	12539C BOARD
0-5	Select code of 12539B/C board.	Select code of 12539B/C board.
6-13	Reserved.	Reserved.
14	Clear.	Clear if W1 in position A; set if in position B.
15	Clear if W1 in position A; set if in position B.	Clear if W2 in position A; set if in position B.

4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.
7. Restart: P-Reg = 2000₈, S-Reg = Switch options, press PRESET, RUN.
8. Switch options:

BIT	MEANING																										
0-7	Reserved.																										
8	Suppress tests requiring operator intervention.																										
9	Abort current diagnostic execution and halt (102075); the user may specify a new group of tests in the A-register. Then clear bit 9 and press RUN.																										
	<table> <tr> <th>A-REG BIT</th><th>EXECUTE IF SET</th></tr> <tr> <td>0</td><td>Test 00 BASIC I/O</td></tr> <tr> <td>1</td><td>Test 01 0.1 Millisecond Relative Time</td></tr> <tr> <td>2</td><td>Test 02 1.0 Millisecond Relative Time</td></tr> <tr> <td>3</td><td>Test 03 10 Milliseconds Relative Time</td></tr> <tr> <td>4</td><td>Test 04 100 Milliseconds Relative Time</td></tr> <tr> <td>5</td><td>Test 05 1 Second Relative Time</td></tr> <tr> <td>6</td><td>Test 06 10 Seconds Relative Time</td></tr> <tr> <td>7</td><td>Test 07 100 Seconds Relative Time</td></tr> <tr> <td>8</td><td>Test 10 1000 Seconds Relative Time</td></tr> <tr> <td>9</td><td>Test 11 Logic Test</td></tr> <tr> <td>10</td><td>Test 12 Time Tolerance Test</td></tr> <tr> <td>11 to 15</td><td>Reserved</td></tr> </table>	A-REG BIT	EXECUTE IF SET	0	Test 00 BASIC I/O	1	Test 01 0.1 Millisecond Relative Time	2	Test 02 1.0 Millisecond Relative Time	3	Test 03 10 Milliseconds Relative Time	4	Test 04 100 Milliseconds Relative Time	5	Test 05 1 Second Relative Time	6	Test 06 10 Seconds Relative Time	7	Test 07 100 Seconds Relative Time	8	Test 10 1000 Seconds Relative Time	9	Test 11 Logic Test	10	Test 12 Time Tolerance Test	11 to 15	Reserved
A-REG BIT	EXECUTE IF SET																										
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4	Test 04 100 Milliseconds Relative Time																										
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6	Test 06 10 Seconds Relative Time																										
7	Test 07 100 Seconds Relative Time																										
8	Test 10 1000 Seconds Relative Time																										
9	Test 11 Logic Test																										
10	Test 12 Time Tolerance Test																										
11 to 15	Reserved																										
10	Suppress non-error messages.																										
11	Suppress error messages.																										
12	Repeat all selected tests after diagnostic run has completed without halting. Message "PASS XXXXXX" will be output before looping unless bit 10 is set or a teletype is not present. Also, those tests requiring operator intervention will be suppressed.																										
13	Repeat last test executed (loop on test).																										
14	Suppress error halts.																										
15	Halt (102076) at the end of each test; the A-register will contain the test number in octal.																										

12539B/C TBG DIAGNOSTIC (Cont'd)

SERVICE INFORMATION

1. Output frequency at test point E4 is 1-MHz $\pm$ 0.5 Hz. Adjust capacitor C19.
2. Jumper W2 must be in position A for proper operation.

12554A/12554A-001 16-BIT DUPLEX REGISTER

Equipment

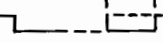
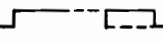
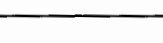
12554A:	12554-60023	16-Bit Duplex Register Card — Pos. Logic
12554A-001:	12554-60024	16-Bit Duplex Register Card — Neg. Logic
Both Cards:	5060-8339	Connector Kit, 48-pin

Documentation

12554A:	12554-90021	Operating and Service Manual
12554A-001:	12554-90022	Operating and Service Manual

12554A/12554A-001 16/BIT DUPLEX REGISTER (Cont'd)

RELOCATABLE JUMPERS

12554A Jumper Positions for Operation		
SIGNAL AND FUNCTION	JUMPER	POSITION
Device Flag +V 0V  see below		
Set flag buffer FF and reset command FF on leading edge.	W4 W5 W6	B B A or B
Set flag buffer FF and reset command FF on trailing edge.	W4 W5 W6	A B A
Set flag buffer FF trailing edge, reset command FF on leading edge.	W4 W5 W6	B A A
Command FF Reset (W4/W5 have no affect)	W6	C
Device Command Signal see above		
+V  0V  +V  0V 	W7 W7	A B

12554A/12554A-001 16-BIT DUPLEX REGISTER (Cont'd)

12554A-001 Jumper Positions for Operation		
SIGNAL AND FUNCTION	JUMPER	POSITION
Device Flag 		
Set flag buffer FF and reset command FF both on leading edge.	W4 W5 W6	A A A or B
Set flag buffer FF and reset command FF on trailing edge.	W4 W5 W6	B B A or B
Set flag buffer FF on leading edge, reset command FF on trailing edge.	W4 W5 W6	B A A
Set flag buffer FF on trailing edge, reset command FF on leading edge.	W4 W5 W6	A B A
Command FF Reset (W4/W5 have no affect)		
Device Command Signal		
0V  -V	W7	A
0V  -V	W7	B

12554A AND 12554A-001 DIAGNOSTIC

Use the 24391 General Purpose Register Diagnostic. Refer to the information provided at the end of the Input/Output Section.

Manual: 24391-90001

12554A (Positive Logic) Jumper Combinations for Diagnostic					
	Under Combination Number				
	1	2	3	4	5
W4	B	B	A/B	A	A
W5	B	A	A/B	A	B
W6	A/B	A	C	A/B	A
W7	A	A	A/B	B	B

12554A AND 12554A-001 DIAGNOSTIC (Cont'd)

12554A-001 (Negative Logic) Jumper Combinations for Diagnostic					
	Under Combination Number				
	1	2	3	4	5
W4	A/B	A	A/B	A/B	B
W5	A	A	A/B	B	A
W6	B	A	C	B	A
W7	B	B	A/B	A	A

12560A DIGITAL PLOTTER INTERFACE KIT**Equipment**

12560-6001 Digital Plotter Interface Card
 12560-6004 Interface Cable
 12560-9001 Operating and Service Manual

12560A DIAGNOSTIC

Manual: 12560-90029 12560A Digital Plotter Interface Diagnostic

Paper Tape Binary: 12560-16001 Date Code 1540. Cartridge Binary 24396-13307 Date Code 1901.
 DSN 107000.

Note: Be sure that the pen writes before starting the diagnostic.

Halts: 102075 (octal) S-reg bit 9 was set. Select test.
 102076 (octal) S-reg bit 15 was set. End of test.
 102077 (octal) End. If not, consult error and message table.

12560A DIGITAL PLOTTER INTERFACE KIT (Cont'd)**Switch Register Options:**

Bit	Meaning If Set
0-6	Reserved for Pseudo Op Design.
7	Not Used.
8	Suppress tests requiring operator intervention.
9	Abort current diagnostic execution and halt (102075).
10	Suppress non-error messages.
11	Suppress error messages.
12	Repeat selected tests after run is complete.
13	Repeat last test executed (loop on test).
14	Suppress error halts.
15	Halt (102076) at the end of each test. A-register holds the test number.

Test Selection Summary

A-Register Bit	If Set Will Execute
0	Test 00 BI-O Test
1	Test 01 One-Shot Test
2	Test 03 Octagon Test (over draw)
3	Test 03 Octagon Test (over draw)
4	Test 04 Pseudo Opdesign
5-15	Reserved

12566B/C MICROCIRCUIT INTERFACE CARD**Equipment**

This card has been manufactured in several versions as follows:

12566-60024	12566B	Ground True Microcircuit
12566-60025	12566B	Positive True Microcircuit
12566-60031	12566C	Microcircuit (old version)
12566-60032	12566C	Microcircuit (new version)
5060-8339		Connector Kit, 48-pin
5180-1905		Cable with 36-pairs of wire, 4.6m
1251-0332		Test Connector, 24-pin

**Documentation**

12566-90015	12566B Microcircuit Interface Kit Operating and Service Manual
12566-90032	12566C Interface Manual

12566B/C Jumper Positions for Operation

JUMPER	POSITION		FUNCTION
	12566B	12566C	
W1	A	A	Ground "true" device command signal.
W1	B	B	Positive "true" device command signal.
W1	C	none	Ground "true" device command pulse using the party line FF. The pulse is from the leading edge of T6 to the following T3.
W1	none	C	Ground "true" device command from the leading edge of T6 as either a signal (W10-A) or pulse (W10-B). If a pulse it, ends at T3.
W1	none	D	Same as W1-C except that a positive "true" signal/pulse is produced.
W2	A	A	Senses a positive going edge of the device flag to clear device command FF and signal/pulse. In 12566C, for W1-C/D, then W2-A/B/C will clear the device command according to W10-A.
W2	B	B	Same as W2-A except that a negative going edge is sensed.
W2	C	C	Clears device command FF and signal/pulse on leading edge of T2.
W3	A	A	Sets flag buffer FF on sensing "positive" going edge of the device flag. Used in conjunction with W5, W6, W7, and W8.
W3	B	B	Senses "negative" going edge of the device flag, otherwise same as W3-A.

12566B/C MICROCIRCUIT INTERFACE CARD (Cont'd)**12566B/C Jumper Positions for Operation (Cont'd)**

JUMPER	POSITION		FUNCTION
	12566B	12566C	
W4	A	A	Data Output Enabled to I/O device on set of the data FF and disabled at T5.
W4	B	B	Data Output Enabled continuously.
W5,W6 W7,W8	ALL IN	ALL OUT	Input bits associated with jumpers are latched after device flag signal/pulse. W5 (bits 0-3), W6 (bits 4-7), W7 (bits 8-11), W8 (bits 12-15).
W5,W6 W7,W8	ALL OUT	ALL IN	Input bits associated with jumpers are continuously available to card from I/O device. See above for bits.
W9	A	A	Device command signal/pulse clears upon either CLC or CRS.
W9	B	B	Device command signal/pulse clears upon CRS only.
W10	none	A	If W1 is positioned to C or D, then W10-A allows W2-A/B/C and W9-A/B to provide the party line device command (pulse) clear conditions.
W10	none	B	If W1 is positioned to C or D, then W10-B causes the party line device command pulse to end at T3.
W11	none	OUT	For positive "true" output data.
W11	none	IN	For negative "true" output data.
W12	none	IN	Input data is positive "true".
W12	none	OUT	Input data is negative "true".
W13	none	IN	The OTA/OTB signal generates device command and output data enable.
W13	none	OUT	Makes the 12566C backwards compatible with the 12566B.

12566B/C DIAGNOSTIC

Use the 24391 General Purpose Register Diagnostic. Refer to the end of the Input/Output Section for information on this subject.

Manual: 24391-90001

Test Connector: 1251-0332. Modify by connecting pin Z/22 to pin AA/23.

JUMPER POSITIONS FOR DIAGNOSTIC		
Jumper	12566B	12566C
W1	C	C
W2	B	B
W3	B	B
W4	B	B
W5	IN	OUT
W6	IN	OUT
W7	IN	OUT
W8	IN	OUT
W9	A	A
W10	NA	B
W11	NA	OUT
W12	NA	OUT
W13	NA	OUT
Note: Jumpers not listed may be in any position described in the operating and service manual.		

12587B ASYNCHRONOUS DATA I/F DIAGNOSTIC

Paper Tape Binary 12587-16001. Date Code 1552.
Cartridge Binary 24396-13304, Date Code 1928, DSN 103003.
Manual P/N 12587-90013.

1. Install test connector, P/N 12587-60009.
2. Load Diagnostic Configurator.
3. Configure configurator and load diagnostic.
4. Configure diagnostic: P-Reg = 100_8 , S-Reg (5-0) = Interface SC, S-Reg (14) = Set if I/F jumpered for 2 stop bits, S-Reg (15) = Set if I/F jumpered for high speed mode. (Incorrect selection of bits 14 and 15 will result in error E103.)
5. Press RUN. HALT 102074.
6. Set S-Reg = Switch options.
7. Press PRESET, RUN.
8. Restart: P-Reg = 2000_8 .
9. Switch options:

BIT	MEANING IF SET
6-0	Reserved.
7	Omit PRESET test.
8	Omit Clock Frequency test.
9	Reserved.
10	Suppress non-error messages.
11	Suppress error messages.
12	Repeat all tests.
13	Repeat last test executed.
14	Suppress error halts.
15	Halt after each test.

12597A 8-BIT DUPLEX REGISTER INTERFACE KIT**Equipment**

12597-6001 8-Bit Duplex Register Card
 5060-8339 Connector Kit, 48-pin
 1251-0332 Test Connector, 24-pin
 12597-9002 Operating and Service Manual

Relocatable Jumpers

Jumper	Position	Function
W1	A	Command FF clears on negative-going edge of Device Flag signal.
W1	B	Command FF clears on positive-going edge of Device Flag signal.
W2	A	Flag Buffer FF sets on negative-going edge of Device Flag signal.
W2	B	Flag Buffer FF sets on positive-going edge of Device Flag signal.
W3	Connected	Device Command signal will be ground "true" (W8 must be disconnected).
W4	Connected	Input storage register will be loaded by the Device Flag.
W8	Connected	Device Command signal will be positive "true" (W3 must be disconnected).
W9	Connected	Input storage register will be loaded by an STF signal.
Note: Jumpers W5, W6, and W7 must be kept in their original positions.		

12597A DIAGNOSTIC

Use the 24391 General Purpose Register Diagnostic. Refer to the end of the Input/Output Section for Information on this subject.

Manual: 24391-90001

JUMPER POSITIONS FOR DIAGNOSTIC

Use any one of the two combinations allowed:		
Jumper	Comb. 1	Comb. 2
W1	A	B
W2	A/B	A/B
W3	Connected	Removed
W4	Connected	Connected
W8	Removed	Connected
W9	Removed	Removed
Note: All other jumpers must remain in the factory installed position.		

12618A SYNCHRONOUS DATA SET I/F KIT**Equipment**

12621-60001 Synchronous data set (Receive) I/F PCA.
 12622-60001 Synchronous data set (Transmit) I/F PCA.
 12618-60001 Branched cable assembly.
 12621-60005 Test connector assembly.
 12622-60005 Test connector assembly.

Documentation

12621-90001 Operating and service manual (Receive Card).
 12622-90001 Operating and service manual (Transmit Card).
 12618-90001 Operating and service manual (Kit).

12621-60001 RECEIVE (ONLY) I/F DIAGNOSTIC

Paper Tape Binary 12621-16001. Date Code 1532.

Cartridge Binary 24396-13304, Date Code 1928, and 24998-13303, Date Code 1928. DSN 103012

264X Minicartridge P/N 24396-13304.

Diagnostic Manual P/N 12621-90008.

1. Install test connector, P/N 12621-60005.
2. Load Diagnostic Configurator.
3. Configure configurator and load diagnostic.
4. Configure diagnostic: P-Reg = 100B, S-Reg = Interface SC.
5. Press PRESET, RUN. HALT 102074.
6. Set S-Reg = Switch options.
7. Press PRESET, RUN.
8. Restart: P-Reg = 2000B.
9. Switch options:

BIT	MEANING IF SET
8-0	Spare.
9	Suppress start and stop messages.
10	Run PRESET test within BI/O.
11	Suppress all messages.
12	Repeat diagnostic program.
13	Repeat last test executed.
14	Suppress error halts.
15	Halt at end of each test.

12618A SYNCHRONOUS DATA SET I/F KIT (Cont'd)**12622-60001 TRANSMIT (ONLY) I/F DIAGNOSTIC**

Paper Tape Binary 12622-16001. Date Code 1532.
 264X Minicartridge P/N 24396-13304.
 Diagnostic Manual P/N 12622-90008.
 DSN: Refer to Diagnostic Reference Table.

1. Install test connector, P/N 12622-60005:
 Pin 2,B to 20,X
 4,D to 23,AA or 19,W
 1,A to 21,Y
 3,C to 22,Z
2. Load Diagnostic Configurator.
3. Configure configurator and load diagnostic.
4. Configure diagnostic: P-Reg = 100B, S-Reg (5-0) = Interface SC.
5. Press PRESET, RUN. HALT 102074.
6. Set S-Reg = Switch options.
7. Press PRESET, RUN.
8. Restart: P-Reg = 2000B.
9. Switch options:

BIT	MEANING IF SET
0	Reserved.
1	Skip Basic I/O test.
2	Skip Function/Status test.
3	Skip Test Sync/Non-Sync test.
4	Skip Auto-Sync On test.
5	Skip Auto-Sync Off test.
6	Skip Auto-Sync Pattern test.
7	Repeat last subtest executed.
8	Halt at end of current subtest.
9	Suppress start and stop message.
10	Run PRESET subtest in B/I/O test.
11	Suppress all console device messages.
12	Repeat diagnostic program.
13	Repeat last test executed.
14	Suppress error halts.
15	Halt at end of current test.

12621A RECEIVE I/F DIAGNOSTIC

Refer to information on the 12621-60001 in the 12618A section.

12622A TRANSMIT I/F DIAGNOSTIC

Refer to information on the 12622-60001 in the 12618A section.

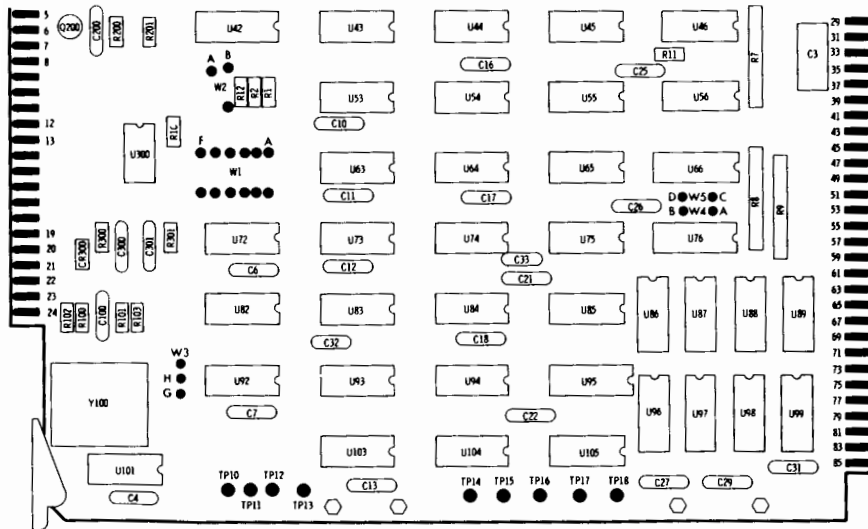
12771A COMPUTER SERIAL I/F KIT**Equipment**

- | | | |
|---|-------------|----------------------------|
| 2 | 12665-60001 | Computer serial I/F PCA's. |
| 1 | 12665-60002 | 12-foot male I/F cable. |
| 1 | 12665-60003 | 12-foot female I/F cable. |
| 2 | 12665-60004 | Diagnostic hoods. |

Note: The diagnostic is supplied with DS software.

Documentation

- | | | |
|---|-------------|--|
| 2 | 12665-90001 | Operating and service manuals (one for each terminal). |
|---|-------------|--|

JUMPER POSITIONING**JUMPER W1: Cable length:**

LINE LENGTH (FT)	K BYTES/ SEC	W1 POSITION
0 to 600	62.5	A
601 to 1,200	39.2	B
1,201 to 4,000	22.4	C
4,001 to 5,400	12.1	D
5,401 to 7,300	6.3	E
7,301 to 10,000	3.2	F

12771A COMPUTER SERIAL I/F KIT (Cont'd)

JUMPER W2: Type of operation:

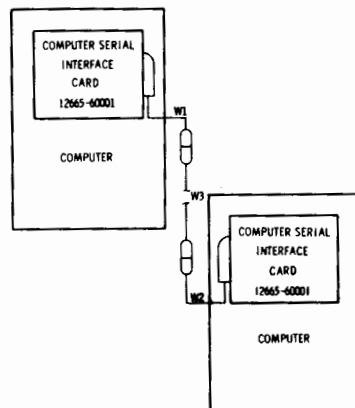
- Position A — Computer-to-computer operation. (19 bit communication words)
- Position B — Computer-to-coupler/controller. (14 bit communication words)

JUMPERS W3,W4,W5: Even/Odd parity select:

- Even parity — W3,W4,W5 in positions G, A-B, C-D.
- Odd parity — W3,W4,W5 in positions H, A-D, B-C.

Note: Hardwired at factory in even parity positions.

CABLES



CABLE W1: 12-foot male I/F cable P/N 12665-60002.

CABLE W2: 12-foot female I/F cable P/N 12665-60003.

CABLE W3: Communication cable, or user fabricated cable, or various combinations of these cables oriented to mate with connectors of W1 and W2. HP cables available for use here are:

- HP 91720A: 250-foot Communication cable (with unassembled connectors)
- HP 91721A: 250-foot Communication cable (with assembled connectors)

HP 91720A and HP 91721A OPTIONS:

- 001: Adds 250 feet to cable length for total of 500 feet.
- 002: Adds 725 feet to cable length for total of 975 feet.

12771A COMPUTER SERIAL INTERFACE DIAGNOSTIC

Paper Tape Binary P/N 29005-60001.

(Furnished as part of Distributed Systems Software)

1. Check the positions of W1 through W5.
2. Install an 86-pin card extender, P/N 02116-63216.
3. Install I/O card in the extender.
4. Install test connector, P/N 12665-60004.
5. Load diagnostic.
6. Set P-Reg = 000002B.
7. Set S-Reg = Switch options.
8. Press PRESET, RUN. HALT 102077.
9. On card, connect jumper wire from TP18 to gnd. (Do not turn off computer.)
10. Press PRESET, RUN. HALT 102076.
11. Restart: P-Reg = 000002B.
12. Switch options:

BITS	SETTING	MEANING OF SETTING
15,14	00	Required setting.
13	0	Non-DMA.
	1	*DMA.
12	0	Communication word size: 19-bit; W2 set to A.
	1	*14-bit; W2 set to B.
11-9	000	Microseconds of bit time: 1 (W1 in position A).
	001	2 (W1 in position B).
	010	4 (W1 in position C).
	011	8 (W1 in position D).
	100	16 (W1 in position E).
	101	32 (W1 in position F).
	110	Illegal. (Gives HALT 03)
	111	Illegal. (Gives HALT 03)
8-6	000	Computer type: Illegal. (Gives HALT 01)
	001	2116.
	010	2100.
	011	2114/2115.
	100	HP 1000 M-Series.
	101	HP 1000 E-, F-Series.
	110	Illegal. (Gives HALT 01)
	111	Illegal. (Gives HALT 01)
5-0	000000	Select Code for the card:
	thru	Illegal. (Gives HALT 02)
	000111	
	001000	
	thru	Legal.
	111111	

*Bits 12 and 13 may not be set at the same time.

12773A COMPUTER MODEM INTERFACE KIT

Equipment

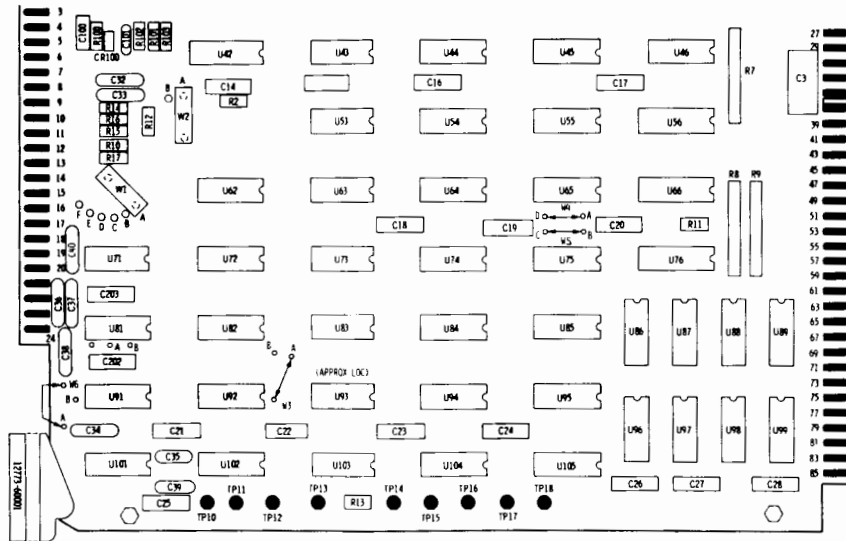
12773-60001	Modem I/F PCA.
12773-60002	12-foot male I/F cable.
12773-60003	Diagnostic hood.
29024-60001	Software diagnostic paper tape.

Documentation

12773-90001 Operating and service manual.

12773A JUMPER POSITIONS

Original Version Of Card



12773A COMPUTER MODEM INTERFACE KIT (Cont'd)

JUMPER W2: Type of operation:

- Position A — Computer-to-computer operation. (19-bit communication words)
- Position B — Computer-to-couple/controller. (14-bit communication words)

JUMPER W3: Parity select for Receiver circuits:

- Even Parity — W3 to A.
- Odd Parity — W3 to B.

JUMPERS W4,W5: Parity select for Transmitter circuits:

- Even Parity — W4 from A to D, W5 from B to C.
- Odd Parity — W4 from A to C, W5 from B to D.

JUMPER W6: High/Low Baud Rate select:

- Low — W6 to A.
- High — W6 to B.

SWITCHES

- S1,S2,S3: SYN for synchronous operation.
- ASYN for asynchronous operation.

12773A COMPUTER MODEM INTERFACE DIAGNOSTIC

Paper Tape Binary P/N 29024-60001.

1. Check positions of jumpers W1 through W5.
2. Set switches S1, S2, and S3 to ASYN.
3. Install 86-pin extender, P/N 02116-63216.
4. Install card in extender.
5. Note select code of I/O slot.
6. Install Diagnostic Hood on card edge connector.
7. Set P-Reg = 000002B; S-Reg = Switch options.
8. Press PRESET, RUN. HALT 102077.
9. On card, connect jumper wire from TP18 to gnd. (Do not turn off computer.)

12773A COMPUTER MODEM INTERFACE DIAGNOSTIC (Cont'd)

10. Press PRESET, RUN. HALT 102076.
11. Disconnect jumper between TP18 and gnd.
12. Switch options:

BITS	SETTING	MEANING OF SETTING
15,14	00	Required setting.
13	0	Non-DMA
	1	*DMA
12	0	Communication word size: 19-bit (W2 set to A)
	1	*14-bit (W2 set to B)
11-9	000	Legal.
	thru	
	101	
	110	
	111	Illegal. (Gives HALT 03)
8-6	000	Computer type: Illegal. (Gives HALT 01)
	001	2116.
	010	2100.
	011	2114/2115.
	100	HP 1000 M-Series.
	101	HP 1000 E-, F-Series.
	110	Illegal. (Gives HALT 01)
	111	Illegal. (Gives HALT 01)
5-0	000000	Select Code for card:
	thru	Illegal. (Gives HALT 02)
	000111	
	001000	
	thru	Legal.
	111111	

*Bits 12 and 13 may not be set at the same time.

12790A MULTIPPOINT TERMINAL I/F**Equipment**

- 1 5061-1389 Multipoint terminal I/F PCA.
 4 Microcode ROM's, P/N's 12790-80036 through 12790-80039.
 1 5061-1393 I/F cable for direct connection.

Documentation

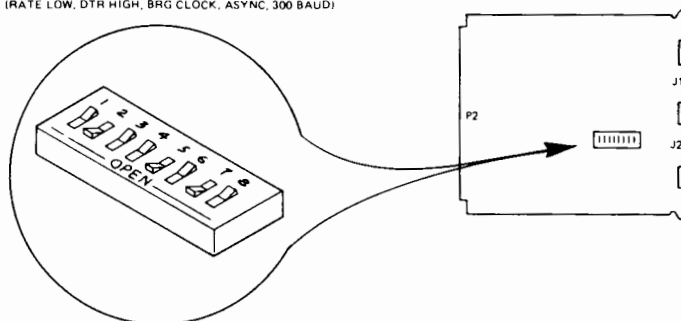
- 1 12790-90001 Multipoint terminal I/F reference manual.
 91730-90002 Multipoint terminal I/F subsystem user's guide (not supplied with product).

Option

- 001 Substitutes modem cable, part no. 5061-1391, for direct connection cable.

Configuration Switch

TYPICAL CONFIGURATION
 (RATE LOW, DTR HIGH, BRG CLOCK, ASYNC, 300 BAUD)



MICROCODE CONFIGURATION SETTINGS					
SWITCH NO.*				MODEM LATCHES	NOTES
1	2	3	4		
0				CH,CCITT-111	"RATE SEL" INITIALLY HIGH
1					"RATE SEL" INITIALLY LOW
	0			CD	"DATA TERMINAL READY" INITIALLY HIGH
	1				"DATA TERMINAL READY" INITIALLY LOW
		0		CLOCK	MODEM CLOCK (SYNCHRONOUS)
		1			BRG CLOCK (ASYNCHRONOUS)
			0	SYNC	SYNCHRONOUS MODE
			1	ASYNC	ASYNCHRONOUS MODE
SWITCH NO.				ASYNC BAUD RATE**	SYNCHRONOUS CLOCK OUTPUT (J2 PIN 13)
5	6	7	8		
0	1	0	1	300	2.4 kHz OUTPUT
0	1	1	0	600	4.8 kHz OUTPUT
0	1	1	1	1200	9.6 kHz OUTPUT
1	0	0	0	1800	14.4 kHz OUTPUT
1	0	0	1	2400	19.2 kHz OUTPUT
1	0	1	0	3600	28.8 kHz OUTPUT
1	0	1	1	4800	38.4 kHz OUTPUT
1	1	0	0	7200	57.6 kHz OUTPUT
1	1	0	1	9600	76.8 kHz OUTPUT
1	1	1	1	19.2k	153.6 kHz OUTPUT

*SWITCH CLOSED IS LOGICAL 0.

SWITCH OPEN IS LOGICAL 1.

**BAUD RATE AS USED IN THE MTI IS EQUIVALENT TO "BITS PER SECOND."

12790A MULTIPOINT TERMINAL I/F SELF TEST

Located in on-board firmware.

1. Connect terminal or modem cable to MT1.
2. HALT computer.
3. Load code for LIB (Load Into B) into A-Reg. This is 1065sc (octal) where sc is the select code or slot number of the card.
4. Clear the B-Reg.
5. Press PRESET.
6. Set P-Reg = 000000B.
7. Press INSTRUCTION STEP.
8. LED on card will turn on during test and go out only if test passed. Check test results in B-Reg:

STATUS WORDS (OCTAL)	MEANING
100000	Self Test completed successfully.
100001	Failed Vector Latch Test.
100002	Failed RAM Address Register Test.
100003	Failed Control Latch Test.
100004	Failed: Baud rate generator not functioning or no interrupts.
100005	Failed: Interrupt not cleared by output of Vector Latch.
100006	Failed: Interrupt not cleared by control pulse.
100007	Failed RAM Test.
100008	Failed: 10 Hz Oscillator not functioning.

12792A MULTIPLEXER**Equipment**

5061-3415	Multiplexer Interface
12792-80001	Multiplexer Firmware
5061-3467	80-pin Connector Kit

Documentation

P/N	Manual
12792-90001	Installation and Reference
12792-90002	User's
12792-90003	Configuration Guide
12792-18999	Numbering Catalog

12792A MULTIPLEXER DIAGNOSTIC

Relocatable File %MUXST: Cartridge 12792-13302

Memory Based File !MUXST: Cartridge 12792-13302

Off-Line Diagnostic:

1. Put diagnostic tape in system console tape drive and position it to !MUXST. (Use index of first file).
2. Set S-register bits as follows:
15-14 to address of the 12992C loader ROM; 11-6 to S.C. of system console; and 13, 12, 5-0 to 0.
3. PRESET, IBL, RUN.
4. !MUXST loads. Halt 102077B = successful load.
5. To Execute, store P=2, PRESET, RUN. The interactive DIAG section runs and asks for the MUX select code, etc.
6. After complete, DIAG may be restarted by typing "RU, DIAG". DIAG can be aborted by typing "OF, DIAG,!".
7. If a test fails a test number is output. See list below for Test Failed meanings.

On-Line Diagnostic:

1. Put diagnostic tape in system console and position it to %MUXST.
2. Store %MUXST on a disc cartridge using the ST command
3. CAUTION: Before running the diagnostic, be sure that all active sessions on all devices connected to the MUX are terminated. The program name set up by LOADR is called DIAG. DIAG can be run from any terminal including a MUX terminal. To run type "RU.DIAG". Execution is in the interactive mode.

12792A MULTIPLEXER DIAGNOSTIC (Cont'd)

#N indicates failures as follows:

#N	TEST FAILED
1	Z80 CPU
2	EPROM
3	RAM
4	Z80 DMA
5	Z80 CTC
6	Z80 SIO Port 7
7	Z80 SIO Port 6
8	Z80 SIO Port 5
9	Z80 SIO Port 4
10	Z80 SIO Port 3
11	Z80 SIO Port 2
12	Z80 SIO Port 1
13	Z80 SIO Port 0
14	MUX-to-host latch circuit

Notes: Certain failures such as SIO chips or "cable hood not attached" results in a message "MUX LOOPING IN TEST NUMBER #N" where N has the same meaning as in the list above.

The message "NO RESPONSE FROM THE MUX" indicates that DIAG cannot communicate with the MUX board. If the select code number entered is correct, you must assume that the board failed.

12793A/B BISYNC MODEM INTERFACE KIT**Equipment (A Version/B Version)**

5061-3418/4913	Programmable Serial Interface Card
91750-80005/80016	BISYNC Firmware ROM
91759-80006/80017	BISYNC Firmware ROM
5061-3424/4914	EIA RS-232-C Modem Cable (5 meter)
5061-3453/4916	Diagnostic Hood
12793-90001	12793A Installation and Service Manual
12826-91001	PSI Manual (12793B)
5955-7627	BISYNC Firmware Manual (12793B)

Note: The 12793A and 12793B are the same except that 12793B is compatible with CCITT standards V.10, V.11, V.28.

Options

- 001 Firmware upgrade discount for previously purchased firmware.
- 002 Replace RS-232-C cable with RS-449 cable part no. 5061-3436/4923.

12793A/B BISYNC MODEM INTERFACE KIT (Cont'd)**ROM FIRMWARE PARTS**

Various vendor PROM part numbers from Intel and TI were used for the ROMs. Jumper XW1A through XW1G adapt the card to the possible combinations. If the ROMs are changed and different from those originally on the card, consult the PSI manual for configuration.

DIP Switches

12793A/B Switch Assignments	
SWITCH	FUNCTION
1	Must be open.
2	Closed for external clock (for use with a synchronous modem). Open for internal clock (for use with a modem eliminator).
3	Closed for Ring Detect. Open for immediate TR (auto-answer). For specific modem needs, refer to modem documentation. Must be open for use with a modem eliminator.
4,5	Not used.
6,7,8	Select clock rate.

12793A/B Clock Rate Selection (Settings for Internal Clock Only)	
SWITCH SETTINGS 6,7,8	CLOCK RATE (bps)
OOO	300
OOX	1200
OXO	2400
OXX	4800
XOO	9600
XOX	19200
XXO	57600
XXX	*230000

NOTE:
X = closed side depressed = logic "1"
O = open side depressed = logic "0"

* Not used with BISYNC firmware.

Firmware Self Test

The firmware self-test is executed everytime there is power-up or PRESET is pushed. It is recommended that the node is quiesced before powering down to allow completion of pending DS transactions. Use command RU,DSMOD followed by /Q for the DSMOD prompt. Test results are made available to the driver. Run DSINF to check the test result and, with the LU command, check the information returned (LU,#,AL).

LEDs on the card also indicate successful test completion: LED0 through LED2 should be lit (LED3 is clock selection where it is lit for external clock).

12793A/B BISYNC MODEM INTERFACE KIT (Cont'd)**Modem Diagnostic Hood**

1. Quiesce the node: Run DSMOD and on the following DSMOD prompt, enter /Q, then off the power.
2. Remove the interface cable and install the diagnostic hood.
3. Restore power and the self-test executes. Results are returned to the driver. Run DSINF and check the information returned with the LU command (LU,# ,AL).
4. Remove power, and replace the hood with the modem cable.
5. Restore power and reinitialize the system and DS software.

12794A/B HDLC MODEM INTERFACE**Equipment (A Version/B Version)**

5061-3418/4913	Programmable Serial Interface Card
91750-80008	HDLC Firmware ROMs
91750-80009	HDLC Firmware ROMs
5061-3124/4914	EIA RS-232-C Modem Cable (5 meters)
5061-3425	Loop-back verifier hood
12974-90001	12974A Installation and Service Manual
12826-91001	PSI Manual (B version)
5955-7626	HDLC Firmware Manual (B version)

Note: The 12794A and 12794B are the same except that the 12794B complies with the CCITT standards V.28, V.10, and V.11.

Options

- 001 Upgrade discount for replacing previously purchased firmware.
- 002 Replace the RS-232-C cable and verifier hood with an RS-449 modem cable (5061-3436) and hood (5061-3441).

ROM FIRMWARE PARTS

Various vendor PROM part numbers from Intel and TI were used for the ROMs. Jumpers XW1A through XW1G adapt the card to the possible combinations. If the ROMs are changed and different from those originally on the card, consult the manual for configuration.

12794A/B HDLC MODEM INTERFACE (Cont'd)**DIP Switches**

12794A/B Switch Assignments	
SWITCH	FUNCTION
1	Closed to enable forced cold load (FCL)/slave request. Open to disable.
2	Closed to select 1024 byte information field. Open to select *128 byte information field. BOTH ENDS OF THE LINK MUST HAVE THIS SWITCH SET THE SAME TO AVOID DATA OVERRUN.
3,4,5	Not used.
6,7,8	Transmission clock rate.
* 128 byte information field is the recommended configuration for minimizing frame retransmissions.	

12794A/B Transmission Clock Rate		
SWITCH SETTINGS 6,7,8	CLOCK RATE (bps)	
OOO	300	NOTE: X = closed = logic "1" O = open = logic "0"
OOX	1200	
OXO	2400	
OXX	4800	
XOO	9600	
XOX	19200	
X XO	57600	
XXX	230000	

Firmware Self Test

The firmware self-test is executed everytime there is power-up or PRESET is pushed. It is recommended that the node is quiesced before powering down to allow completion of pending DS transactions. Use command RU,DSMOD followed by /Q for the DSMOD prompt. Test results are made available to the driver. Run DSINF to check the test results and, with the LU command, check the information returned (LU,#,AL).

LEDs on the card also indicate successful test completion: LED0 through LED2 should be all off after the test and before the DS software has been initialized. LED0 is lit in normal operation and indicates that it is logically connected to another interface.

12794A/B HDLC MODEM INTERFACE (Cont'd)**Modem Diagnostic Hood**

1. Quiesce the node: Run DSMOD and on the following DSMOD prompt enter /Q, then off the power.
2. Remove the interface cable and install the diagnostic hood.
3. Restore power and the self-test executes. Results are returned to the driver. Run DSINF and check the information returned with the LU command (LU,#,AL).
4. A further test is to send a message to the card and have it loop back on itself. To configure the card to talk to itself, run DSMOD. Enter CN, and DSMOD will prompt for the network security code, enter code, DSMOD prompts for node number to change so enter local node number. DSMOD will display the current routing vector for the local node which should be LU 0. After the prompt for a new configuration, enter the LU no. of the card having the loop-back verifier hood. Now enter /E in response to a request for the next node number and another /E to exit DSMOD.
5. Run REMAT and execute some REMAT commands as described below.
6. Run DSMOD and reconfigure the local node to again specify LU 0.
7. Remove power, and replace the hood with the modem cable.
8. Restore power and reinitialize the system and DS software.

Communications Link Check

Exercise a few REMAT commands:



1. RU,REMAT
REMAT will prompt with a \$ for commands referred to the local node and # for remote node reference (another HP 1000).
2. \$SW<NODE1,NODE2,SC
The SW instruction defines the action and destination nodes. Set NODE1 to the node number of the neighbor node to be exercised. Set NODE2 to the local node's number. SC is the security code of the network.
3. #TI OR #TM
These commands will obtain the time from the remote node, thus checking the link. TI is for M/E/F-Series computers and TM for L-Series computers. Or try a DL or CL command to get a directory or cartridge list.
4. #EX to Exit.

12821A DISC INTERFACE**Equipment**

12821-60001	Disc Interface Card
59310-60002	Cable Assembly (3.69 metres)
12992H	Loader ROM

Manuals

12821-90006	12821A Installation and Service Manual
12992-90001	Loader ROM Installation and Service Manual
12821-90002	12821A ICD Disc Interface Diagnostic Manual

12821A DISC INTERFACE DIAGNOSTIC

Paper Tape Binary 12821-16001. Date Code 1928.
 Cartridge Binary 24396-13304, Data Code 1928 and 24998-13302, Date Code 1928.
 DSN 103024.

Two interfaces and two interface cables are required to run the complete diagnostic. The M/E/F computer should have DCPC.

The diagnostic has two modes of operation: Console Mode and the Non-console Mode. The diagnostic will automatically execute in either the console or non-console mode according to whether a console was specified or not during the configuration with the diagnostic configurator. Since running this diagnostic has many considerations and switch selections, thus it is not included here. Please use the 12821A Diagnostic Manual for instructions.

12825A HDLC DIRECT-CONNECT INTERFACE KIT**Equipment**

5061-3432	Programmable Serial Interface Card
91750-80008	HDLC Firmware ROM.
91750-80009	HDLC Firmware ROM.
5061-3422	Interface Cable (5 metres) with Male Connector
5061-3432/4908	Interface Cable (5 metres) with Female Connector
5061-3425/3421	Loop-back Verifier Hoods, two.
12825-90001	12825A Installation and Service Manual
12826-91002	PSI Manual (Replaces 12825A manual)
5955-7626	HDLC Firmware Manual (Replaces 12825A Manual)

Options

001	Upgrade discount for later firmware.
002	Delete both standard cables, and delete the verifier hoods.
003	Add 5061-3437, a 75 metre extension cable with connectors.

12825A HDLC DIRECT-CONNECT INTERFACE KIT (Cont'd)

Transmission Clock Rate Selection		
SWITCH SETTINGS 8,7,6	CLOCK RATE (bps)	
OOO	300	NOTE: X = closed = logic "1" O = open = logic "0"
OOX	1200	
OXO	2400	
OXX	4800	
XOO	9600	
XOX	19200	
XXO	57600	
XXX	230000	
Note: The communications computers can be set to different speeds.		

Switch Assignments	
SWITCH	FUNCTION
1	Closed to enable forced cold load (FCL)/slave request. Open to disable.
2	Open to select 1024 byte information field. Closed to select *128 byte information field. BOTH ENDS OF THE LINK MUST HAVE THIS SWITCH SET THE SAME TO AVOID DATA OVERRUN.
3,4,5	Not used.
6,7,8	Select transmission clock rate.
* 128 byte information field is the recommended configuration for minimizing frame retransmissions.	

ROM FIRMWARE PARTS

Various vendor PROM part numbers from Intel and TI were used for the ROMs. Jumpers XW1A – XW1G and XW2A – XW2D are used to adapt the card to the possible combinations. If the ROMs are changed and different from those originally on the card, consult the PSI manual for configuration.

Firmware Self Test

The firmware self-test is executed everytime there is power-up or PRESET is pushed. It is recommended that the node is quiesced before powering down to allow completion of pending DS transactions. Use command RU,DSMOD followed by /Q for the DSMOD prompt. Test results are made available to the driver (to check, run DSINF and with the LU command check the information returned (LU,# ,AL).

12825A HDLC DIRECT-CONNECT INTERFACE KIT (Cont'd)**Loop-Back Verifier Diagnostic Hood**

1. Quiesce the node: Run DSMOD and on the following DSMOD prompt enter /Q, then off the power.
2. Remove the interface cable and install the diagnostic hood.
3. Restore power and the self-test executes. Results are returned to the driver. Run DSINF and check the information returned with the LU command (LU,#,AL).
4. A further test is to send a message to the card and have it loop back on itself. To configure the card to talk to itself, run DSMOD. Enter CN, and DSMOD will prompt for the network security code, enter code, DSMOD prompts for the node number to change so enter local node number. DSMOD will display the current routing vector for the local node which should be LU 0. After the prompt for a new configuration, enter the LU no. of the card having the loop-back verifier hood. Now enter /E in response to a request for the next node number and another /E to exit DSMOD.
5. Run REMAT and execute some REMAT commands as described below.
6. Run DSMOD and reconfigure the local node to again specify LU 0.
7. Remove power, and replace the hood with the modem cable.
8. Restore power and reinitialize the system and DS software.

Communications Link Check

Exercise a few REMAT commands:

1. RU,REMAT
REMAT will prompt with a \$ for commands referred to the local node and # for remote node references (another HP 1000).
2. \$SW<NODE1,NODE2,SC
The SW instruction defines the action and destination nodes. Set NODE1 to the node number of the neighbor node to be exercised. Set NODE2 to the local node's number. SC is the security code of the network.
3. #TI OR #TM
These commands will obtain the time from the remote node, thus checking the link. TI is for M/E/F-Series computers and TM for L-Series computers. Or try a DL or CL command to get a directory or cartridge list.
4. #EX to Exit.

12830A DATA-LINK SLAVE INTERFACE**Equipment**

5061-4902	Data Link Slave Interface Card
5180-1957/1965	Data Link Slave Firmware
1818-1114	Static RAM, 1K × 8
5061-4903	Data Link Interface Card (5 metres)
5061-4909	Diagnostic Test Connector
12830-13301	Diagnostic Software

Manual

12830-90001	Installation and Service Manual
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Configuration**SWITCH SET 1 (OPEN#1)**

SW8	SW7	SW6	SW5	SW4	SW3	SW2	SW1
MODE	MODE	MODE	BAUD	BAUD	BAUD	DEVICE	DEVICE
CLK	LINK		RATE	RATE	RATE	ID	ID
INT+	END+	SYNC+	BIT 2	BIT 1	BIT 10	BIT 4	BIT 3

MODE:

SW6=1 — Synchronous with X1 clock; SW6=0 — Asynchronous with X16 clock.

SW7=1 — Selects HPDL interface (12830); SW7=0 — Selects RS232 interface.

SW8=1 — Select 12830A internal clock; SW8=0 — Selects external clock.

SWITCH SET 2 (OPEN#1)

SW8	SW7	SW6	SW5	SW4	SW3	SW2	SW1
DEVICE	DEVICE	DEVICE	GROUP	GROUP	GROUP	GROUP	GROUP
ID	ID	ID	ID	ID	ID	ID	ID
BIT 2	BIT 1	BIT 0	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0

BAUD RATE			
SW5	SW4	SW3	RATE (SYNC. OR ASYNC)
1	1	1	300
1	1	0	600
1	0	1	1200
1	0	0	2400
0	1	1	4800
0	1	0	9600
0	0	1	19200

12830A DATA LINK SLAVE INTERFACE DIAGNOSTICS

Manual: Same as for installation and service.

Cartridge Tape Binary 12830-13301

Self Test: The firmware self-test checks the card every time that power is applied and when PRESET is pressed.

Preparing for Diagnostic:

1. Install the Diagnostic Test Connector
2. Set switches as follows:

SWITCH SET 1:	SW1 — SW2	OPEN
	SW4 — SW6	CLOSED
	SW7 — SW8	OPEN

SWITCH SET 2: ALL OPEN

Loading Diagnostic Program:

1. Reset computer.
2. Hard reset the terminal and insert cartridge into left CTU.
3. Set S bits 15-14 to loader ROM socket number.
4. Set S bits 11-6 to select code of terminal (12 octal).
5. PRESET, RUN.
6. Set P to 100 (octal).
7. Terminal should display:

12830A DATA LINK DIAGNOSTIC — REV XXXX

READY

>
8. RUN

Commands:

?? — Displays HELP and lists available tests.
EX — Exit diagnostic
LD — Disable loop mode
LE — Enable loop mode
PD — Disable message printing
PE — Enable message printing
RF — Run tests 1 through 10
SC — Sets select code of DSLI card

12834A BISYNC DIRECT CONNECT INTERFACE KIT**Equipment**

5061-3432	Programmable Serial Interface Card
91750-80017	BISYNC Firmware ROM
91750-80018	BISYNC Firmware ROM
5061-3422	Direct Connect Interface Cable (5 metres)
5061-3460	Direct Connect Diagnostic Hood

Options

001	Upgrade discount for the latest revision of firmware.
002	Delete 5061-3422 Cable.

Manual

12834-90001	Installation and Service (old)
12826-91002	MEF PSI Interface Hardware Reference Manual
5955-7627	BISYNC Protocol Firmware Manual

Switch Configuration

SWITCH	FUNCTION - UP TO DC 2027	FUNCTION - DC 2213
1	Must be open	Not defined
2	Open for int. clock	Open for int. clock or closed for ex. clock
3	Open for immediate TR	Open for immediate TR
4	Not used	Open for direct connect interface (needs int. clock). No connect timeout.
5	Not used	Not used
6 - 8 below	Transmission clock rate (closed is logic 1)	Transmission clock rate (closed is logic 1)
00	300	300
001	1200	1200
010	2400	2400
011	4800	4800
100	9600	9600
101	19200	19200
110	57600	57600
111	Not used	Not used

12834A BISYNC DIRECT CONNECT INTERFACE KIT (Cont'd)**ROM FIRMWARE PARTS**

Various vendor PROM part numbers from Intel and TI were used for the ROMs. Jumpers XW1A — XW1G and XW2A — XW2D are used to adapt the card to the possible combinations. If the ROMs are changed and different from those originally on the card, consult the manual for configuration.

Firmware Self Test

The firmware self-test is executed everytime there is power-up or PRESET is pushed. It is recommended that the node is quiesced before powering down to allow completion of pending DS transactions. Use command RU,DSMOD followed by /Q for the DSMOD prompt. Test results are made available to the driver (to check, run DSINF and with the LU command check the information returned (LU,#,AL).

LEDs on the card also indicate successful test completion: LED0 is on the right. LEDs 0-2 should be all off after the test and before the DS software has been initialized. LED3 when lit indicates the clock selected is external.

Direct Connect Diagnostic Hood Test

1. Quiesce the node: Run DSMOD and on the following DSMOD prompt enter /Q, then off the power.
2. Remove the interface cable and install the diagnostic hood.
3. Restore power and the self-test executes. Results are returned to the driver. Run DSINF and check the information returned with the LU command (LU,#,AL).
4. Run RMOTE and execute some RMOTE commands as described below.
5. Remove power, and replace the hood with the modem cable.
6. Restore power and reinitialize the system and DS software.

Communications Link Check

Exercise a few RMOTE commands:

1. RU,RMOTE
RMOTE is a program that handles operator commands for an HP 1000 to an HP 3000 in a DS network. RMOTE prompts with a \$ sign, the remote 3000 prompt is #.
2. \$SW
Transfer command to the remote 3000 system. A second SW will transfer execution back to the 1000.
3. #HELLO<ACCOUNT NAME>
Log onto a 3000 account. A log-on message should be displayed.
4. #SHOWJOB command will display all sessions that are active.
5. #EX commands logs off from the 3000 and exit RMOTE.

12889A HARDWIRED SERIAL INTERFACE**EQUIPMENT**

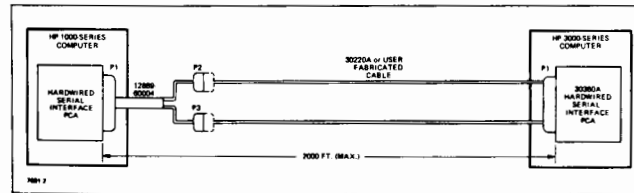
12889-60001	Hardwired serial I/F PCA.
1813-0046	15 MHz oscillator.
12889-60004	Hardwired serial I/F cable assembly. (10-feet, 304.8 centimeters)

OPTION

001: Replaces 15 MHz oscillator with 7.5 MHz oscillator P/N 1813-0052.

DOCUMENTATION

12889-90001 Installation and service manual.

CONFIGURATION**12889A HARDWIRED SERIAL INTERFACE DIAGNOSTIC**

Paper Tape Binary P/N 24335-16001. Date Code 1717.

Cartridge Binary 24396-13306, Date Code 1830 and 24998-13303, Date Code 1928.

DSN 103207

Manual P/N 02100-90169.

1. For single-CPU/single-HSI mode, connect the two ends of the HSI cable assembly together. For dual-CPU/dual-HSI mode, connect the two cable assemblies together.
2. Load Diagnostic Configurator, binary object tape P/N 24296-60001, manual P/N 02100-90157.
3. Configure configurator and load diagnostic.

NOTE

In dual-CPU/HSI mode, load configurator and diagnostic into each CPU.

4. Configure diagnostic: P-Reg = 100B, S-Reg (5-0) = Interface SC, and S-Reg (8) = Clear if single mode; set if dual mode.
5. Press PRESET, RUN.
6. Set S-Reg = Switch options.
7. Press PRESET, RUN.
8. If in dual mode and halt 106000, start transmitter and receiver at the same time.
9. Restart: P-Reg = 2000B.

12889A HARDWIRED SERIAL I/F DIAGNOSTIC (Cont'd)

10. Switch options:

BIT	FUNCTION WHEN SET		
0	Reserved.		
1	When set in Dual Mode, CPU acts as receiver. (When clear, CPU acts as transmitter.)		
2	Abort receiver wait loop (first set then clear). If bit not cleared within 15 seconds, the CPU will abort the receive mode with bit set.		
3-7	Reserved.		
8	Output all messages to line printer (line printer must have been configured in the configurator).		
9	Abort at end of test with halt 102075 _h . User may specify a new group of tests in the A-Register.		
	A-REG BIT	TEST	EXECUTE IF SET
	0	TST00	Header Message
	1	TST01	Basic I/O, Interrupt Circuitry
	2	TST02	Basic I/O, Interrupt Off
	3	TST03	Basic I/O, Interface PCA Flag Test
	4	TST04	Basic I/O Select Code Screen Test
	5	TST05	Basic I/O, Interrupt Hold Off
	6	TST06	Basic I/O, Interface PCA Control Test
	7	TST07	Basic I/O, Preset
	8	TST08	100 Word Transfer without interrupt and DCPC (DMA)
	9	TST09	100 Word Transfer with interrupt and without DCPC (DMA)
	10	TST10	Watch Dog Timer Test
	11	TST11	Checks CLC
	12	TST12	CRC Testing after 100 Word Transfer
	13	TST13	Handshake Mode Verification*
	14	TST14	Listen/Repeat Mode Verification*
	15	TST15	Tag Bit and Interrupt of DCPC (DMA) Transfer*
	*Not applicable if diagnostic executed in single mode.		
10	Suppress non-error messages.		
11	Suppress error messages.		
12	Loop on all selected tests. Tests requiring manual intervention are omitted.		
13	Loop on last test.		
14	Suppress error halts.		
15	Halt at end of each test with 102076 _h . A-Register holds test number.		

12920B ASYNCHRONOUS MULTIPLEXER**EQUIPMENT**

12920-60001	Upper Data PCA
12920-60002	Lower Data PCA
12921-60003	Data Cable (12 ft.)
12922-60001	Control PCA*
12922-60003	Control Cable (12 ft.)*
30062-60016	Connector Panel
30062-60003	Test Cable

*Items comprising 12920B-001 Multiplexer.

DOCUMENTATION

P/N	MANUAL
12920-90007	12920B Reference and Application
12920-90009	12920A/B I/F Diagnostic Reference

SPECIFICATIONS

PARAMETERS	REQUIREMENTS			
	Lower Data PCA (Part No. 12920-60002) Amperes	Upper Data PCA (Part No. 12920-60001) Amperes	Control PCA (Part No. 12922-60001) Amperes	Total
CURRENT REQUIRED FROM COMPUTER:				
+12 Volt Supply	0.085	0.0	0.156	0.241
-12 Volt Supply	0.120	0.121	0.236	0.477
+4.5 Volt Supply	2.04	2.05	1.44	5.53
-2 Volt Supply	0.125	0.031	0.102	0.258

INSTALLATION NOTES

- IN-1. On lower data PCA (P/N 12920-60002), ensure jumper wire W1 is in position "A". (Jumper wire W1 is located on the upper right-hand corner of the PCA.)
- IN-2. The lower and upper data PCA's must be inserted into adjacent slots. The lower data PCA must be installed in the higher numbered slot (lower select code).

12920A/B MULTIPLEXER I/F DIAGNOSTIC

Paper Tape Binary 12920-16001, 16002. Date Code 1644 and 1644.

1. Load Diagnostic Configurator.
2. Configure configurator and load one of the 12920A/B diagnostic tapes.
3. Configure diagnostic: P-Reg = 100₈; S-Reg = Configuration options.

CONFIGURATION OPTIONS

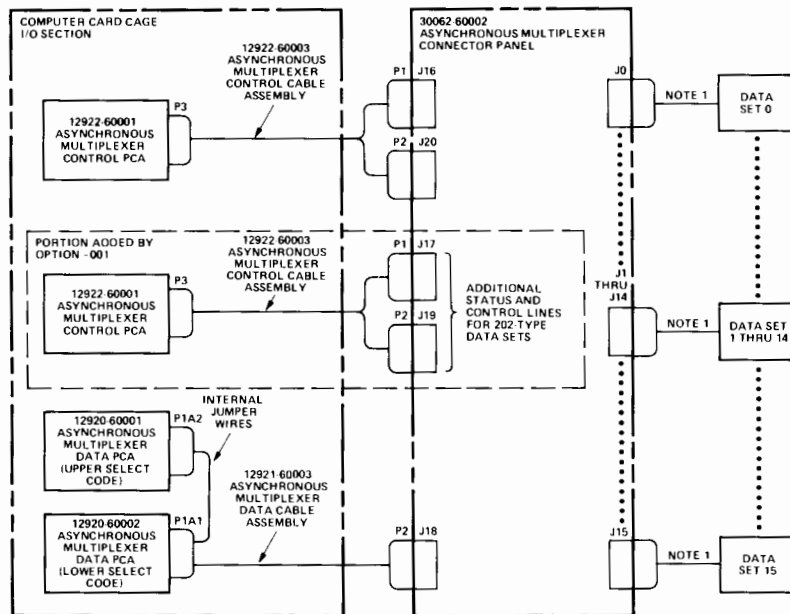
15 14 13 12	11	10	9 8 7 6	5 4 3 2 1 0
Transmit Port #	B/A	AUTO	Receive Port #	Interface Select Code
Port Number 0-15	1 → 12920A or 0 → 12920B MUX		Port Number 0-15	For Data: Lower Select Code For Control: Interface Select Code

NOTE: If bits 12-15 and 6-9 are zero diagnostic will assume auto mode. A port is defined as one of the 16 connectors J0-J15 on the connector panel No. 30062-60002.

12920A/B MULTIPLEXER I/F DIAGNOSTIC (Cont'd)

4. Press RUN. HALT 102074 (HALT 102072 indicates port number input error)
5. Set S-Reg = Switch options.
6. Press RUN.
7. Switch options:

BIT	MEANING IF SET
0-7	Reserved.
8	Suppress tests requiring operator intervention.
9	Abort current test and halt (102075); user may specify a new group of tests in the A-Reg. clear bit 9 and then press RUN.
For 12920-16001 (DATA) tape	
A-REG BIT	MEANING IF SET
0	Test 00 BI-O Test
1	Test 01 Send/Receive Test
2	Test 02 Break Test
3	Test 03 Parity Test
4	Test 04 Diagnostic
5	Test 05 Echo Test
6	Test 06 Echo Test
7	Test 07 Character Lost Test
For 12920-16002 (CONTROL) tape	
A-REG BIT	MEANING IF SET
0	Test 00 BI-O
1	Test 01 Address Register Test
2	Test 02 Command and Register Test
3	Test 03 Command Register Addressing Test
4	Test 04 Status Interrupt Test
5	Test 05 Scan Test
10	Suppress non-error messages.
11	Suppress error messages.
12	Repeat all selected tests. Also, suppress tests requiring operator intervention.
13	Repeat last test executed (loop on test).
14	Suppress error halts.
15	Halt (102076) at the end of each test; A-Reg = test number.

12920A/B MULTIPLEXER I/F DIAGNOSTIC (Cont'd)**SERVICE DATA****1. Multiplexer Simplified Connection Diagram****NOTES**

1. DATA SET CONNECTOR CABLES ARE FABRICATED AS REQUIRED. REFER TO PARAGRAPH 2.8
2. THE ASYNCHRONOUS MULTIPLEXER TEST CABLE, PART NO. 30062 60003, IS CONNECTED BETWEEN ANY TWO DATA SET CONNECTORS (J0 THRU J15) WHEN RUNNING DIAGNOSTIC PROGRAMS.
3. REFER TO THE INTERCONNECTING DIAGRAM, FIGURE 24 FOR CONNECTOR PIN NUMBERS.



12930A UNIVERSAL INTERFACE KIT**Equipment**

Kit	PCA Part No.	Diagnostic Connector†	Interconnecting Cable	Priority Jumper PCA
12930A	12930-60001	12930-60013	8120-1895*	02116-6110
Option 001	12930-60004	12930-60014	8120-1895*	02116-6110
Option 002	12930-60005	12930-60015	8120-1895*	02116-6110
Option 003	12930-60004	12930-60014	12930-60012**	02116-6110

† Diagnostic connector wiring lists are given in Appendix B of the General Purpose Register Diagnostic Reference Manual.

* 7.6 metre cable. Former part no. 12930-60007.

** 15.2 metre cable for 2894A Reader/Punch.

12930A DIAGNOSTIC

Use the 24391 General Purpose Register Diagnostic. Refer to the end of the Input/Output Section for information on this subject.

Manual: 24391-90001

Different jumper switch settings are required for each of the tests (TST 08, 09, 10, and 11). At the beginning of 09, 10, and 11 the CPU will halt and request a change in jumpers. The switch settings to be changed from the previous test are asterisked (*). The appropriate test connectors will be required for TST 11.

SWITCH POSITIONS FOR DIAGNOSTIC

Use any one of the two combinations allowed:

Switch	Test 00-08	Test 09	Test 10	Test 11
U85 S1	1	1	1	1
S2	6	6	5*	5
S3	10	10	9*	8*
U87 S1	1	1	1	1
S2	5	5	5	5
S3	8	8	8	8
U97 S1	1	1	1	1
S2	5	5	5	4*
S3	10	10	10	9*
U102 S1	2	2	2	2
S2	7	7	7	6*
S3	10	10	10	10
U106 S1	1	1	1	2*
S2	6	5*	5	5
S3	9	9	9	10*

12936 PRIVILEGED INTERRUPT FENCE DIAGNOSTIC

Paper Tape Binary, 12936-16001. Date Code 1643.
Manual P/N 12936-90003.

Hardware required:

- a. Minimum 4K memory.
 - b. Two standard I/O interfaces.
 - c. 12936 Privileged Interrupt PCA.
 - d. I/O jumpers to effect unbroken priority.
1. The SC of the first standard I/F must be less than the SC of the 12936 PCA which must be less than the SC of the second standard I/F. The priority chain from SC 10 to the SC of the second standard I/F must be maintained.
 2. Load Diagnostic Configurator.
 3. Configure configurator and load diagnostic.
 4. Set S-Reg (11-6) = SC of second standard I/F, S-Reg (5-0) = SC of first standard I/F.
 5. Press PRESET, RUN. HALT 102070.
 6. Set S-Reg (5-0) = SC of 12936 PCA.
 7. Press RUN. HALT 102074.
 8. Set S-Reg = Switch options.
 9. Press PRESET, RUN.
 10. Restart: P-Reg = 2000₈.

12936 PRIVILEGED INTERRUPT FENCE DIAGNOSTIC (Cont'd)

11. Switch options:

S-REG BIT	MEANING IF SET		
15	Halt 102076 (octal) at the end of each test; A-Reg = test number.		
14	Suppress error halts.		
13	Loop on last test section being executed.		
12	Loop on diagnostic.		
11	Suppress error messages.		
10	Suppress information messages.		
9	Abort diagnostic execution after the current test section and halt (102075). Operator can specify a new group of test(s) in the A-Reg. Then clear Switch Register bit 9 and press RUN.		
	A-REG BIT	TEST	IF SET WILL EXECUTE
	0	00	High SC Interrupt Test
	1	01	Low SC Interrupt Test
	2	02	Set Control/Clear Control Fence Channel Test
	3	03	Clear Control and Flag With Preset Test
	4	04	No Action: Flag and Control Cleared Test
	5	05	High SC: Flag Cleared and Control Set Test
	6	06	High SC: Flag and Control Set Test
	7	07	High SC and Interrupt: Flag Set and Control Cleared Test
	8	08	Low SC/Fence Priority Test
	9	09	Scope Loop Test (Not part of standard tests.)
8	Suppress operator intervention tests.		
7-0	Reserved.		

12966A BUFFERED ASYNCHRONOUS DATA COMMUNICATIONS INTERFACE**EQUIPMENT**

12966-60004	Buffered Asynchronous Data Set PCA
12966-60004	Interconnecting Cable Assembly (ICA), 50 feet
12966-60003	Test Connector
12966-60008	Option 001 (Direct Cable to HP 264X) — ICA, 50 feet
12966-60006	Option 002 (Modem Cable) — ICA, 50 feet
12966-60007	Option 003 (Direct Cable to HP 2749B) — ICA, 50 feet
12966-60014	Option 105 (Direct Cable to 262X, RFI qualified 9600 baud) — ICA, 16.4 ft (5m).
12966-60015	Option 106 (2626A or 2635B, RFI qualified, hardwired 9600 baud) — ICA, 16.4 ft (5m).
12966-60016	Option 107 (Direct Cable to 264X, RFI qualified, hardwired 9600 baud) — ICA, 16.4 ft (5m).

12966A BUFFERED ASYNCHRONOUS DATA COMMUNICATIONS INTERFACE (Cont'd)**DOCUMENTATION**

P/N	MANUAL
12966-90001	12966A I/F Reference
12966-90004	12966A Diagnostic Reference

SPECIFICATIONS**Power Consumption**

+5-volt supply:	1.95A nominal, 3A maximum
+12-volt supply:	18 mA nominal
−2-volt supply:	66 mA nominal, 100 mA maximum
−12-volt supply:	59 mA nominal

INSTALLATION NOTES

IN-1. Jumper Connections for Baud Transfer Rates

BAUD RATE	BIT PATTERN	CONNECT +5V (PIN 8) TO PINS:	CONNECT SIGNAL GROUND (PINS 1, A, 24, OR BB) TO PINS:
External Clock (X16)	0000	—	12, 13, 14, 15
50	0001	14	12, 13, 15
75	0010	13	12, 14, 15
110	0011	13, 14	12, 15
134.5	0100	12	13, 14, 15
150	0101	12, 14	13, 15
300	0110	12, 13	14, 15
600	0111	12, 13, 14	15
900	1000	15	12, 13, 14
1200	1001	14, 15	12, 13
1800	1010	13, 15	12, 14
2400	1011	13, 14, 15	12
3600	1100	13, 15	13, 14
4800	1101	12, 14, 15	13
7200	1110	12, 13, 15	14
9600	1111	12, 13, 14, 15	—

12966A ASYNCHRONOUS DATA I/F DIAGNOSTIC

Paper Tape Binary 12966-16001. Date Code 1519.

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: R-Reg = 100₈, S-Reg (5-0) = 12966A I/F SC.
4. Press PRESET, RUN. HALT 102074.
5. Install test hood, P/N 12960-60003.
6. Set S-Reg = Switch options.
7. Press PRESET, RUN.
8. Restart: P-Reg = 2000₈.
9. Switch options:

BIT	MEANING IF SET	
0-1	Reserved.	
2	Report all errors. If clear, suppress excessive error reports.	
3-7	Reserved.	
8	Suppress tests requiring operator intervention.	
9	Abort current test and halt (102075); user may specify a new group of tests in the A-Reg, clear bit 9 and then press RUN.	
	A-REG BIT	TEST EXECUTE IF SET
	0	Test 00 BASIC I/O
	1	Test 01 MASTER RESET
	2	Test 02 MODEM STATUS
	3	Test 03 REF. & ENABLE COMMANDS
	4	Test 04 FIFO BUFFER
	5	Test 05 CHARACTER COUNTER
	6	Test 06 SPECIAL CHARACTER RAM
	7	Test 07 UART TRANSMIT
	8	Test 10 UART RECEIVE
	9	Test 11 BAUD RATE SELECT
	10	Test 12 OVER-RUN AND PARITY ERR
	11	Test 13 DCPC/DMA
	12-15	Reserved.
10	Suppress non-error messages.	
11	Suppress error messages.	
12	Repeat all selected tests. Also, suppress tests requiring operator intervention.	
13	Repeat last test executed (loop on test).	
14	Suppress error halts.	
15	Halt (102076) at the end of each test; A-Reg = test number.	

12967A SYNC DATA I/F DIAGNOSTIC

Paper Tape Binary 12967-16001. Date Code 1438.
Manual P/N 12967-90001.

1. Install test connector, P/N 12967-60003.
2. Load Diagnostic Configurator.
3. Configure configurator and load diagnostic.
4. Configure diagnostic: P-Reg = 100₈, S-Reg (5-0) = Interface SC, S-Reg (13-6) = SYNC character bit configuration (switch assembly U101).
5. Press PRESET, RUN. HALT 102074.
6. Set S-Reg = Switch options.
7. Press PRESET, RUN.
8. Restart: P-Reg = 2000₈.
9. Switch options:

BIT	MEANING IF SET	
1-0	Reserved.	
2	Report all errors.	
7-3	Reserved.	
8	Suppress tests requiring operator intervention.	
9	Abort current test and halt (102075); specify tests in A-Reg; clear bit 9 and press RUN.	
	A-REG BIT	EXECUTE IF SET
	0	TEST 00 Basic I/O
	1	TEST 01 Master Reset
	2	TEST 02 Modem Status
	3	TEST 03 Arm and Mask Commands
	4	TEST 04 Internal Control State
	5	TEST 05 Data Path
	6	TEST 06 Receive Mode
	7	TEST 07 Transmit
	8	TEST 10 Receive
	9	TEST 11 DMA/DCPC
10	Suppress non-error messages.	
11	Suppress error messages.	
12	Repeat all selected tests. Also, suppress tests requiring operator intervention.	
13	Repeat last test executed.	
14	Suppress error halts.	
15	Halt (102076) at the end of each test; A-Reg = test number.	

12968A ASYNCHRONOUS COMMUNICATIONS I/F DIAGNOSTIC

Paper Tape Binary 12968-16001. Date Code 1602.
Manual P/N 12968-90003

1. Install test connector, P/N 12966-60003.
2. Load Diagnostic Configurator.
3. Configure configurator and load diagnostic.
4. Configure diagnostic: P-Reg = 100₈, S-Reg (5-0) = Interface SC.
5. Press PRESET, RUN. HALT 102074.
6. Set S-Reg = Switch Options.
7. Press PRESET, RUN.
8. Restart: P-Reg = 2000₈.
9. Switch options:

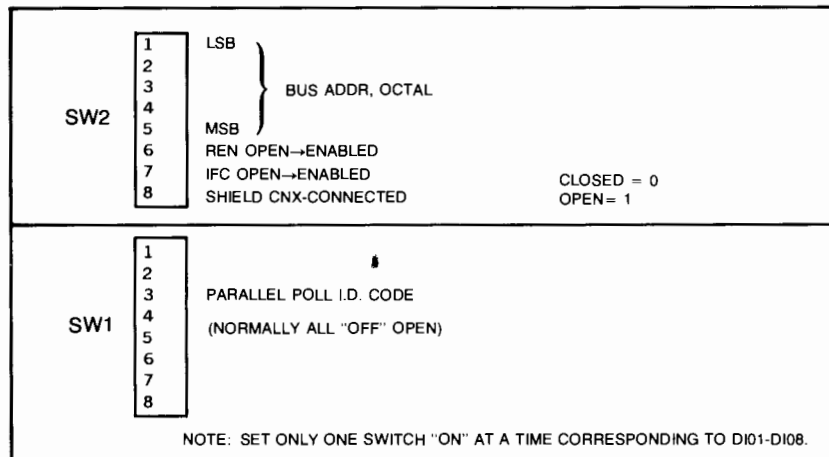
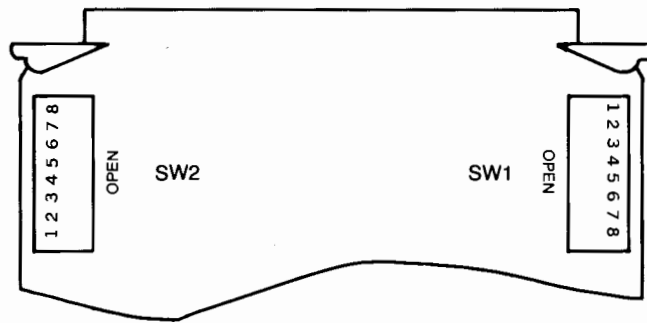
BIT	MEANING IF SET		
1-0	Reserved.		
2	Report all errors.		
7-3	Reserved.		
8	Suppress tests requiring operator intervention.		
9	Abort current test and halt (102075); specify tests in A-Reg; clear bit 9 and press RUN.		
	A-REG BIT	TEST	EXECUTE IF SET
	0	00	Basic I/O
	1	01	Master Reset
	2	02	Modem Status
	3	03	Reference and Enable Commands
	4	04	Character Counter
	5	05	UART Transmit
	6	06	UART Receive
	7	07	Baud Rate Select
	8	10	Over-run and Parity Error
	9	11	DCPC
	15-10	—	Reserved
10	Suppress non-error messages.		
11	Suppress error messages.		
12	Repeat all selected tests. Also suppress those tests requiring operator intervention.		
13	Repeat last test executed (loop on test).		
14	Suppress error halts.		
15	Halt (102076) at the end of each test; A-Reg = test number.		

59310A/B INTERFACE BUS I/F DIAGNOSTIC

Paper Tape Binary 59310-16001. Date Code 1728.
Manual P/N 59310-90061.

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Set P-Reg = 100₈, S-Reg (5-0) = First IBI select code, and S-Reg (11-6) = Second IBI select code (optional).
4. Press PRESET, RUN. HALT 102070.
5. Set S-Reg (5-0) = First IBI MYADDR, and S-Reg (11-6) = Second IBM MYADDR. (The REN and IFC jumpers must be open.)
6. Press PRESET, RUN. HALT 102071.
7. Set S-Reg (7-0) = First IBI Service Request Identification, and S-Reg (15-8) = Second IBI S.R.I.
8. Press PRESET, RUN. HALT 102074.
9. Set S-Reg = Switch options.
10. Press PRESET, RUN.
11. Restart: P-Reg = 2000₈.
12. Switch options:

BIT	MEANING IF SET
0	Execute cable test.
1	Use first IBI select code in troubleshooting.
2	Use second IBI select code in troubleshooting.
3	Do Parallel Poll Request Test.
7-4	Reserved.
8	Suppress Preset Test.
9	Reserved.
10	Suppress non-error messages.
11	Suppress error messages.
12	Loop on diagnostic.
13	Reserved.
14	Suppress error halts.
15	Reserved.

59310A/B INTERFACE BUS I/F DIAGNOSTIC (Cont'd)**59310B SWITCH CONFIGURATION**

GENERAL PURPOSE REGISTER DIAGNOSTIC

Paper Tape Binary 24931-16001. Data Code 1813. Cartridge Binary 24396-13301, Date Code 1901 and 24998-13301, Date code 1926. DSN 143300
Manual P/N 24391-90001.

Interfaces tested: 12551B/12554A/12566B/12566G/12589A/12597A/12602B/12849A/12589A/12875B/12930A

1. Load Diagnostic Configurator.
2. Configure configurator and load diagnostic.
3. Configure diagnostic: P-Reg = 100₈, S-Reg = Configuration options.

Configuration Options

BIT		MEANING IF SET
0-5	S.C.	Set to select code of interface under test.
6		Reserved.
7	HP 12930A	Universal interface kit (standard, option 001 or option 002 is under test).
8	HP 12589A	Automatic Dialer interface kit is under test.
9		Relay Register has data read-back capabilities (12551B-01).
10	HP 12551B	Relay Register is under test (12551B or 12551B-01).
11	HP 12597A	8-bit duplex register interface bit is under test (12597A ground true/positive, 12597A-001 negative true/ground, or 12597A-002, -003 or -005).
12		Set if W5 of 12849A is removed (W4 must be in positive B), cleared if W5 is installed (W4 may be in positive A or B).
13		Set if 12849A-001, positive true, cleared if 12849A, ground true.
14		Set if W10 on 12849A is in positive B (PON ground true), cleared if W10 on 12849A is in positive A (PON positive true).
15	HP 12849A	Controller Microcircuit interface kit 12849A or 12849A-001 is under test.
The default case (bits 7 through 15 cleared) is for the HP 12554A, HP 12566B, HP 12602B or the HP 12875B interface.		

4. Press PRESET, RUN. HALT 102074.
5. Set S-Reg = Switch options.
6. Press PRESET, RUN.
7. Restart: P-Reg = 2000₈.

GENERAL PURPOSE REGISTER DIAGNOSTIC (CONT)

8. Switch options:

BIT	MEANING IF SET	
0	Increment test pattern by one.	} OPDSN Instructions
1	Output test pattern to interface (OTA SC).	
2	Encode test pattern (STC SC,C)	
3	Wait for flag (SFS SC) (E042-possible).	
4	Input pattern from interface (LIA SC).	
5	Compare input with output test pattern (E034-possible).	
6	Loop on opdesign selection.	
7	Reserved.	
8	Suppress Preset test.	
9	Abort current diagnostic execution and halt (102075); the user may specify a new group of tests in the A-Reg, then clear bit 9 of the Switch Register and press RUN. This may also be used after error halt 102034 or 102042.	
A-REG BIT	TEST	EXECUTE IF SET
0	00	Basic I/O (BI-O) Test
1	01	Pattern Test (Relay Reg only)
2	02	Command Test (Relay Reg only)
3	03	Data Buffer Test (all cards except the Relay Reg and Auto Dialer)
4	04	Control Signals Test (12849A only)
5	05	I/O Test
6	06	Multiline Test
7	07	Dialer turn on, wait, turn off test
8	08	Command/Status and Data Test without STC
9	09	Command/Status and Data Test with STC
10	10	Command Channel Test
11	11	Data Channel and power on circuit test
12	12	Pseudo Opdesign
13-15		Reserved
10	Suppress non-error messages.	
11	Suppress error messages.	
12	Repeat all selected tests. Also, the Preset test (in BI-O) will be suppressed.	
13	Repeat last test executed (loop on test).	
14	Suppress error halts.	
15	Halt (102076) at the end of each test; A-Reg = test number.	

PARTS

PARTS

Fuses, Lamps, Switches, Teletype.	71-1
Ribbons, Tapes, Disc Packs, LEDs.	71-2
Miscellaneous	71-3
2100A/S New and Exchange Assemblies	71-3
1000 M/E/F-Series New & Exch. Assembly Data Codes	71-5

Butler

12944-6000.

6950 - 1596.



FUSES

SIZE	TYPE	PART NUMBER	SIZE	TYPE	PART NUMBER
0.2	SLOW	2110-0235	4A	SLOW	2110-0014*
0.25A	SLOW	2110-0201	4A	SLOW	2110-0365
0.25A	MED	2110-0004*	4A	MED	2110-0055*
0.5A	SLOW	2110-0202	5A	SLOW	2110-0030*
0.5A	MED	2110-0012*	5A	MED	2110-0010*
1A	SLOW	2110-0007*	6A	MED	2110-0056*
1A	MED	2110-0001*	6A	SLOW	2110-0016*
1A	FAST	2110-0516	8A	SLOW	2110-0383
1.5A	SLOW	2110-0304	8A	SLOW	2110-0035*
1.5A	MED	2110-0043	8A	MED	2110-0342
2A	SLOW	2110-0303	8A	MED	2110-0036*
2A	MED	2110-0006*	10A	MED	2110-0051*
2A	MED	2110-0002*	10A	SLOW	2110-0037*
2.5A	SLOW	2110-0380	15A	SLOW	2110-0025*
2.5A	MED	2110-0083	15A	MED	2110-0048*
3A	MED	2110-0003*	15A	SLOW	2110-0054
3A	SLOW	2110-0029*	20A		2110-0459
			12A	MED	2110-0250

* Denotes a type commonly used by HP

LAMPS COMMONLY USED IN HP EQUIPMENT

PART NUMBER	BULB #	VOLTAGE/CURRENT	USED IN
1535-0655	24D	--	2883/2888
1535-2610	7327	--	2762A/B
1536-2890		6V 40 mA	2607
1535-3153	3024	--	2613/2617 (old type)
1535-3663	394	--	2613/1617 (old type)
2140-0035	345	6V	2116
2140-0039	328	6V	2892/2893
2140-0068	330	14V	2618
2140-0094	Leads	5V	7200 Sector XDCR
2140-0203	428	5V	7970B/E Photo Sense
2140-0209	328	14V	7970B/E
2140-0256	370	18V	7260/7261
2140-0315	--	--	2748 Read Head Lamps
2140-0343	330	14V	7900/05/06/20/25
2140-0364	783BP	5V	2100
2140-0383	1819	28V	29402B Cabinet Power

SWITCHES

DESCRIPTION	PART NUMBER
2100 Panel	3101-1531
21MX/21MXE	
White	5040-6076
Gray	5040-6077
Bracket for Switches	02108-40002

TELETYPE

Ribbon	9283-0002
Tape Spool	1530-1436
TTY Kit	5080-6610

Parts

DISC SCRATCH PACKS & CS/80 TAPE

2870	12536A
2883/2884	12868A
7900/7901	12869A
7905/06	12940A
7920	13394A
7925	13356A
7908/14	88140S
7911/12	88140L or 88140S
7935	97935A
9885	9164-0074
9121/9133	92191A
9895A	92195A

MAGNETIC TAPE

IBM Alignment	9162-0027
1200' Magnetic Tape	9162-0026
2400' Magnetic Tape	9162-0025

LIGHT EMITTING DIODES

21MX-M	1990-0733
21MX-E/F	1990-0529

SUPPLIES

2621P Thermal Paper	9270-0638, 24 rolls
2608 Ribbon	02608-60038
2610 Ribbon	1535-2098

MISCELLANEOUS

Spring Contact	02108-00014
Switch Retainer	02108-40002
21MX "B" Pwr Sup Battery	0950-1596
7970 Take-up Reel	1490-0738
48-pin Connector Kit	5060-8339
21MX CPU Blank Loader PROM	1816-0015

2613A LINE PRINTER

Format Tape Punch	9164-0023
Blank Format Tape	4114-0371
Standard Format Tape 6 LPI	02613-80001
Standard Format Tape 8 LPI	02618-80003
Paper Fanfold 1516 Bond	9320-1659
Adhesive, Carriage Tape	0470-0391
Static Tinsel	0960-0585
Connector Puller	8710-0580

2100A/S NEW AND EXCHANGE ASSEMBLY PART NUMBERS

New

02100-60014	A1 Timing and Control	02100-60073
02100-60002	As Rom Control	02100-60069
02100-60004	A3 Microinstruction Decoder 1	02100-60071
02100-60022*	A4 Microinstruction Decoder 2	02100-60075
02100-60112	A4 Microinstruction Decoder 2	02100-60115
02100-60001	A5 Arithmetic/Logic	02100-60068
02100-60003	A6 Instruction Register Decoder	02100-60070
02100-60024	A7 I/O Control	02100-60076
02100-60007	A8 I/O Buffer and Memory Protect	02100-60072
12895-60001	A9 Direct Memory Access	12895-60087
02100-60012	A101, A104, A109, A112 X-Y Driver/Switch	02100-60083
5060-8331	A102, A103, A110, A111 Core Stack/Sense Amplifier	5060-8332
02100-60009	A105, A108 Inhibit Driver	02100-60080
02100-60010	A106 Inhibit Driver Load	No Exchange
02100-60011	A107 Data Control	02100-60082
02100-60015	A24 Front Panel Board	02100-60074
02100-60017	A24 Front Panel Assy (Option 001)	No Exchange
02100-60053	A25 Power Supply Assy (Non UL Approved)	02100-60077
02100-60053**	A25 Power Supply Assy (UL Approved)	02100-60116

2155A

02155-60001	A112 I/O Extender 1	No Exchange
02155-60002	A111 I/O Extender 2	02155-60016
02155-60003	A10 I/O Extender in 2100A/S	02155-60017
12896-60001	A110 Direct Memory Access	No Exchange

* Order 02100-60112 for new board.

** Should not be replaced with non UL approved supply.

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST

SECTION I-CPU'S

NOTE: 5061-1341 WAS THE ORIGINAL NUMBER ASSIGNED TO THE E-SERIES CPU BOARD. THE ASSIGNED EXCHANGE BOARD NUMBER FOR THE SAME PART WAS 5061-1369. DURING THIS TIME, THE SIX BASE SET FIRMWARE (MICROCODE) ROMS WERE INSTALLED AND INCLUDED ON ALL CPU BOARDS. WHEN THE F-SERIES COMPUTER SYSTEM WAS RELEASED, THE "E" CPU BOARD WAS ALSO USED AS THE CENTRAL PROCESSOR ASSEMBLY. SINCE THE F-SERIES "FLOATING POINT" INSTRUCTIONS CONTAIN MICROCODE THAT IS TAILORED SPECIFICALLY FOR CONTROLLING THE FPP ALU AND CONTROL BOARDS, THE ONLY DIFFERENCE BETWEEN THE "E" AND "F" CENTRAL PROCESSORS BECAME THE SIX BASE SET/EIG/FL.PT. FIRMWARE ROMS. TO AVOID CONFUSION WHEN PRODUCING THE "E" OR "F" SERIES CPU ASSEMBLIES WITH THE DIFFERENT BASE SET/EIG/FL.PT. ROMS, A NEW NUMBER (5061-1400) WAS ASSIGNED TO THE PROCESSOR BOARD. THIS NUMBER WOULD NOW REFERENCE THE CPU ASSEMBLY WITHOUT ROMS. THESE ROMS ARE THEN INSTALLED AS THE CPU ASSEMBLY ENTERS THE "E" OR "F" PRODUCTION LINES RESPECTIVELY. THE EXCHANGE NUMBER WAS ALSO CHANGED TO 5061-1390. AS THE CPU ASSEMBLIES ENTER THE EXCHANGE BOARD PIPELINE, THE ROMS, WHETHER THEY ARE "E" OR "F" SERIES, SHOULD BE TAKEN OFF EACH CPU ASSEMBLY BY THE CUSTOMER AND RETAINED FOR USE WITH THE NEW EXCHANGE ASSEMBLY. THUS, ALL FOUR OF THESE NUMBERS (5061-1341, 5061-1369, 5061-1400, AND 5061-1390) REFERENCE THE SAME PHYSICAL CPU BOARD. ALL FOUR NUMBERS ARE INCLUDED IN THE FOLLOWING SECTION FOR HISTORICAL REFERENCE PURPOSES.

NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
5060-8352	5060-8371	M-SERIES CPU	2105A 2108A/B, 2112A/B	1838h
5061-1341	5061-1369	E-SERIES CPU	2109A/B, 2113A/B	1827c
5061-1400	5061-1390	F-SERIES CPU	2109B, 2113B, 2111/17F	2301

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)

SECTION II-HARDWARE FLOATING POINT PROCESSOR

	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
	12740-60001	12740-69001	FL. PT ALU BOARD	2111/17F	2012a
OB	12740-60002	12740-69102	FL. PT CONTROL BD	2111/17F	2033b
	12740-60003	NONE	FL. PT POWER SUPPLY MOTHER BOARD	2117F	2039a
	12740-60004	NONE	FL. PT BACKPLANE	2117F	1815b
OB	12740-60005	12740-69005	FL. PT PWR SUPPLY REGULATOR BOARD	2117F	2105
	12740-60006	NONE	FL. PT PWR SUPPLY LOGIC BOARD	2117F	2108
	12740-60007	12740-69007	FL. PT PWR SUPPLY ASSEMBLY	2117F	2108
	12740-60025	12740-69025	FL. PT CONTROL BD	2111/17F	2315
	12740-60026	12740-69026	FL. PT POWER SUPPLY REGULATOR BOARD	2111/17F	2305

SECTION III-MEMORY CONTROLLERS

OB	5060-8360	5060-8374	MEMORY CONTROLLER	2102A	1623
	02102-60001	02102-69001	STD MEM CONTROLLER	2102B	1830
	02102-60002	02102-69002	HS MEM CONTROLLER	2102E	2010
	02102-60003	02102-69103	STD FC MEM CONTRLR	2102C	2112
	02102-60004	02102-69004	HS FC MEM CONTRLR	2102H	2010

SECTION IV-MEMORY MODULES

OB	5060-8369	5060-8378	8KB MEMORY MODULE	12994A	1758
OB	5060-8359	5060-8373	16KB MEMORY MODULE	12998A	1750
OB	5061-1332	5061-1337	32KB MEMORY MODULE	13187A	2011
OB	13187-60001	5061-1337	32KB MEMORY MODULE	13187B	2011
	12666-60001	12666-69001	HS FC 1MB CHECK	12666H	2220
	12699-60001	12699-69001	HS 256KB MEM MOD	12699H	2144
	12741-60001	12741-69001	HS 32KB MEMORY MOD	12741A	2011
OB	12746-60001	12746-69001	HD 64KB MEMORY MOD	12746A	2011b
	12746-60002	12746-69002	HS,HD 64KB MEM MOD	12746H	2220b
OB	12747-60001	12747-69001	HD 128KB MEM MOD	12747A	2011b
	12747-60002	12747-69002	HS,HD 128KB MEM MOD	12747H	2220b
	12749-60001	12749-69001	HS 512KB MEM MOD	12749H	2144
OB	12779-60001	12779-69001	STD FC 256KB CHECK	12779A	2011b
			BIT ARRAY MODULE		
	12779-60002	12779-69002	HS,FC 256KB CHECK	12779H	2220b
			BIT ARRAY MODULE		

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)					
SECTION IV-MEMORY MODULES (cont.)					
	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
OB	12780-60001	12780-69001	STD FC 512KB CHECK BIT ARRAY MODULE	12780A	2011b
	12780-60002	12780-69002	HS FC 512KB CHECK BIT ARRAY MODULE	12780H	2220b
SECTION V-BACKPLANES					
	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
	02105-60002	NONE	I/O BACKPLANE	2105A	1518
	02105-60005	NONE	MEMORY BACKPLANE	2105A	1518
	02108-60007	NONE	I/O BACKPLANE	2108A/B, 2109A/B	1727
	5061-1382	NONE	MEMORY BACKPLANE	2108A/B, 2109A/B	1713
OB	02108-60021	NONE	MEMORY BACKPLANE	2108A	1520
	02112-60001	NONE	I/O BACKPLANE	2112A/B, 2113A/B	1724
OB	02112-60002	NONE	MEMORY BACKPLANE	2112A	1518
	5061-1383	NONE	MEMORY BACKPLANE	2112A/B, 2113A/B	1713
	02111-60004	NONE	2111 FPP BACKPLANE	2111F	1826
SECTION VI-PANEL ASSEMBLIES					
	5061-1343	5061-1372	FRONT PANEL	2109A/B, 2113A/B, 2111F,	2005c
	5060-8343	5060-8372	FRONT PANEL	2105A, 2108A/B, 2112A/B	1911b
	02108-60028	NONE	REAR PNL ASSEMBLY (FOR "A" SUPPLY)	2108A, 2109A	N/A
	02112-60009	NONE	REAR PNL ASSEMBLY (FOR "A" SUPPLY)	2112A, 2113A	N/A

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)					
SECTION VII-EXTENDERS					
	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
	02100-60060	NONE	TERMINATOR CARD	12979A/B	1131
	12979-60002	NONE	I/O EXT FRONT BACKPLANE	2100/05A 12979A/B	1705
	12979-60003	NONE	I/O EXT REAR BACKPLANE	12979A/B REV B REV C	1705 2105
	12979-60005	12979-60016	I/O EXT CONTROLLER	12979A	1518
OB	12979-60018	12979-69018	I/O EXT BUFFER IF	12979A	1647
	12979-60019	12979-69019	I/O EXT CONTROLLER	12979B	2014
OB	12979-60022	12979-69022	I/O EXT BUFFER IF	12979A/B	1730
	12979-60029	12979-69029	I/O EXT BUFFER IF	12979A/B	2014
	12990-60001	NONE	MEM EXT BACKPLANE	12990A/B	1510
	12990-60003	NONE	MEM EXT REAR PANEL	12990A	N/A
SECTION VIII-CROSSEOVERS					
OB	5060-8345	NONE	"A" CROSSOVER	2105A, 2108A, 2112A, 2109A, 2113A	1518
	5061-1388	NONE	"B" CROSSOVER	2108B, 2112B, 2109B, 2113B, 2111F, 2117F	1837
	12979-60001	NONE	I/O EXT CROSSOVER	12979A/B	1616a
SECTION IX-POWER FAIL SYSTEMS					
"A" SUPPLY POWER FAIL SYSTEM					
	02112-60003	02112-69003	BATT BD 2112A,2113A	12991A	1603
	5060-8347	NONE	BATT BD 1 2105A, 2108A, 2109A	12944A	1624
	5060-8353	NONE	BATT BD 2 2105A, 2108A, 2109A	12944A	1353

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)

"A" SUPPLY POWER FAIL SYSTEM (cont.)

	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
	5060-8346	5060-8376	BATT OUTPUT BD 2105A, 2108A, 2109A	12944A	1624
"B" SUPPLY POWER FAIL SYSTEM					
	5061-1348	5061-1378	BATT CHARGER BD ("B" SUPPLY)	12944B, 12991B	1808
OB	5061-1349	5061-1379	BATT BACKUP BD ("B" SUPPLY)	12944B, 12991B	1833
	5061-1352	NONE	BATTERY STATUS ASSEMBLY	12944B, 12991B	2222
	5061-6609	5061-6610	BATTERY BACKUP BOARD ("B" SUPPLY)	12944B, 12991B	2238

SECTION X-POWER SUPPLIES

"A" POWER SUPPLY

	02105-60012	02105-69012*	PS MAIN ASSEMBLY	2105A	2038
	5061-1354	NONE	LOWER PS BD	2105A	2023
	5061-3403	NONE	OUTPUT REG PS BD	5061-1356	1643
	5061-1355	NONE	UPPER PS BD	2105A, 2108A, 2109A	1836c
OB	5060-8354	NONE	LOWER PS BD	2105A	1630
OB	5060-8355	NONE	UPPER PS BD	2105A	1617
	02108-60023	02108-69023*	PS MAIN ASSY	2108A, 2109A	2023
OB	5060-8348	NONE	LOWER PS BD	2108A, 2109A	1630
OB	5060-8349	NONE	UPPER PS BD	2108A, 2109A	1617
	02112-60006	02112-69007*	PS MAIN ASSEMBLY	2112A, 2113A	2146
	02112-60004	NONE	LOWER PS BD	2112A, 2113A	1720
	02112-60005	NONE	UPPER PS BD	2112A, 2113A	1836
	02112-60008	NONE	RISER PS BD	2112A, 2113A	1725b

* A CROSSOVER BOARD IS PROVIDED UNDER THE EXCHANGE PART NUMBER.

(continued)



HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)					
"B" POWER SUPPLY					
	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
OB	5061-1344	5061-1375	INVERTER PS BD	5061-1356	2020
OB	5061-1345	5061-1376	CONTROL PS BD	5061-1356	
				REV A/B	1818
				REV C/D	2020
OB	5061-1347	5061-1377	PREREG PS BD	5061-1356	1905
	5061-1351	NONE	JUMPER PS BD	5061-1356	1842
	5061-1356	5061-3401	LCPS ASSY	2108B,	2043
				2112B,	
				2109B,	
				2113B,	
				2111F,	
				2117F,	
				12979B,	
				12990B	
OB	5061-1371	5061-1380	MOTHER PS BD	5061-1371	
				REV A	1811
				REV B	2202a
				REV C	2305
	5061-3403	NONE	OUTPUT REG PS BD	5061-1356	2108a
	5061-3454	NONE	INVERTER PS II	5061-3476	2108
	5061-3455	NONE	CONTROL PS II	5061-3476	2305
	5061-3457	NONE	PRE-REGULATOR PS II	5061-3476	2108a
OB	5061-3476	5061-3477	"B" POWER SUPPLY II	2108B,	2204
				2109B,	
				2111F,	
				2112B,	
				2113B,	
				2117F,	
				12979B,	
				12990B	
	5061-6615	5061-6616	"B" POWER SUPPLY III	2108B,	2305
				2109B,	
				2111F,	
				2112B,	
				2113B,	
				2117F,	
				12979B,	
				12990B	
	12990-60002	12990-69002	MEMORY EXTENDER PS	12990A	1709
	12990-60007	NONE	MEMORY EXT UPPER PS	12990A	1709
	12990-60008	NONE	MEMORY EXT LOWER PS	12990A	1709
	12990-60005	NONE	MEMORY EXT RISER BD	12990A	1627

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)					
SECTION XI-OPTIONS/ACCESSORIES					
	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
OB	12897-60001	12897-60003	DCPC (M-SERIES)	12897A	1548
	12897-60004	12897-69004	DCPC (M/E/F-SERIES)	12897B	1649
	12898-60001	12898-60002	I/O EXT DCPC	12898A	1647
OB	12892-60001	12892-60002	MEM PROTECT (M-SERIES)	12892A	1704
	12892-60003	12892-69003	MEM PROTECT (M/E/F-SERIES)	12892B	1727a
OB	5060-8362	5061-1334	MEMORY EXP. MODULE (M-SERIES)	12976A	1652
	12731-60001	12731-69001	MEMORY EXP. MODULE (M/E/F-SERIES)	12731A	2305
	5060-8391	NONE	USER CONTROL STORE	12945A	1353
	5061-1339	5061-1370	FIRMWR ACCESSORY BD	13304A	2002a
OB	12908-60006	12908-60007	.25KW WCS	12908A,	1708
	13047-60001	NONE	2KW UCS	12978A	
	13197-60001	13197-60002	1KW WCS	13047A	1851
	12791-60001	12791-69001	FIRMWARE EXPANSION MODULE	13197A	2001a
	12909-60005	NONE	PROM WRITER (M-SERIES ONLY)	12791A	1850a
	5060-8400	5061-1320	BASE SET ROM BD (M-SERIES)	12909B	1641
	5061-1373	5061-1398	FFP/DMI ROM BD (M-SERIES)	2105A,	1741
				2108A/B,	
				2112A/M	
				12976B-	2049
				OPT 3,	
OB	5061-1328	5061-1329	FFP I (M-SERIES)	12977B	
				12976A-	1550
				OPT 3,	
				12977A	
OB	5060-8380	5061-1330	FFP II + DMI (M-SERIES)	12976A,	1516
				12976A	
				OPT 3,	
				12977A	
	5061-1374	5061-1399	DMI (ONLY) ROM BD (M-SERIES)	12976B,	2049
				12778B	
	91740-60002	91740-69002	DS/1000 ROM BD (M-SERIES)	91740A	1913
NOTE: DS/1000 (91740A) SOFTWARE MUST BE REVISION 1813 OR GREATER. ROM PART #'S ARE 91740-80052 THRU 91740-80063. THE LOADER ROM IS 91740-80048. INSTALLATION MANUAL IS 91740-90007 (3/79). E-SERIES DS/1000-IV ROMS ARE USED FOR M-SERIES DS/1000-IV ROMS.					
(continued)					

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)

SECTION XIII-FIRMWARE (E-SERIES)

FIRMWARE TYPE	PART NUMBER AND DATE CODE	PRODUCT
BASE SET: (SET 6)	5090-0600, 5090-0564, 5090-0596 CPU BOARD LOCATION (U21,41,81)	2109A/B, 2113A/B
EIG/FL.PT: (SET 2)	5090-0566, 5090-0567, 5090-0568 CPU BOARD LOCATION (U23,43,83)	2109A/B, 2113A/B
BASE SET & EIG/FL.PT: (SET 1)	02113-80003, 02113-80004, 02113-80005 CPU BOARD LOCATION U23,43,83) COMBINATION OF BS SET 6 AND EIG/FL.PT SET 2 IN THREE (3) 8K ROMS. MICROCODE DOES NOT CHANGE. (REFER TO SECTION VII FOR COMPATIBILITY REQUIREMENTS).	2109A/B, 2113A/B
(SET 2)	02113-80006, 02113-80007, 02113-80008	
FFP: (SET 4) 1K AND 4K ROMS	5090-0589, 5090-0590, 5090-0591 13306-80013, 13306-80014, 13306-80015, 13306-80016, 13306-80017, 13306-80018,	13306A, 2111F, 2117F
DMI: (SET 4) 1K ROMS	13307-80027, 13307-80028, 13307-80029, 13307-80030, 13307-80031, 13307-80032	13307A, 2111F, 2117F
DMI/FFP: (SET 1) 4K ROMS	5090-0589, 5090-0590, 5090-0591 13307-80033, 13307-80034, 13307-80035	13306B, 13306B OPT 100, 13307B
RTE-IVB EMA (SET 1)	92067-80001, 92067-80002, 92067-80003 ALL ROMS ARE E/F-SERIES COMPATIBLE	92067/8

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)

SECTION XIII-FIRMWARE (E-SERIES) (cont.)

FIRMWARE TYPE	PART NUMBER AND DATE CODE	PRODUCT
RTE-6/VM OS (SET 1)	92084-80001, 92084-80002, 92084-80003 ALL ROMS ARE E/F-SERIES COMPATIBLE	92084A
RTE-6/VM OS (SET 2)	92084-80001, 92084-80102, 92084-80003 ALL ROMS ARE E/F-SERIES COMPATIBLE	92084A
RTE-6/VM EMA/VMA (SET 1)	92084-80004, 92084-80005, 92084-80006 ALL ROMS ARE E/F-SERIES COMPATIBLE	92084A
DS/1000: (SET 6)	91740-80067 REV 2003, 91740-80068 REV 2003, 91740-80069 REV 2003 ALL DS/1000 ROMS ARE E/F-SERIES COMPATIBLE.	91740B

NOTE: DS/1000 (91740B) ARE ROMS INSTALLED IN POSITIONS C4, C5, OR C6 ON FAB ASSEMBLY. SOFTWARE MUST BE REV 1813 OR GREATER. LOADER ROM IS 91740-80048. INSTALLATION MANUAL IS 91740-90009 (3/79).

DS/1000-IV: -BISYNC -HDLC	91750-80010, 91750-80011 91750-80008, 91750-80009 ALL DS/1000-IV ROMS ARE M/E/F- SERIES COMPATIBLE.	12793B 12794A,
---------------------------------	--	-------------------

SECTION XIV-FIRMWARE (F-SERIES)

NOTE: SEVERAL OF THE INDIVIDUAL F-SERIES FIRMWARE MODULES (BASE SET, SIS AND FFP) ARE NOT BACKWARD COMPATIBLE WITH OLDER VERSIONS OF THE SAME MODULES:

1. F-SERIES BASE SET (BS), SET 2, REQUIRES F-SERIES FAST FORTRAN PROCESSOR (FFP), SET 2, (OR VICE VERSA) FOR CORRECT OPERATION. F-SERIES BASE SET, SET 1, REQUIRES F-SERIES FFP, SET 1, FOR CORRECT OPERATION.

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)

SECTION XIV-FIRMWARE (F-SERIES) (cont.)

2. IT IS RECOMMENDED THAT SCIENTIFIC INSTRUCTION SET, SET 3, BE USED INSTEAD OF SET 2 BECAUSE OF A MINOR "BUG" DISCOVERED IN SET 2 SHORTLY AFTER ITS RELEASE. THESE TWO SETS, IN ALL OTHER ASPECTS, ARE IDENTICAL. SIS SETS 2 & 3 ARE COMPATIBLE WITH BOTH F-SERIES BASE SET AND FFP COMBINATIONS.

FIRMWARE TYPE	PART NUMBER AND DATE CODE	PRODUCT
BASE SET: (SET 2)	12740-80019 12740-80020 12740-80021 CPU BOARD LOCATIONS U21,41,81	2111F, 2117F
(SET 1)	12740-80014 12740-80015 12740-80016 CPU BOARD LOCATIONS U21,41,81	
EIG/FL.PT: (SET 2)	12740-80022 12740-80023 12740-80024	2111F, 2117F
(SET 1)	12740-80011 12740-80012 12740-80013 CPU BOARD LOCATIONS U23,43,83	
BASE SET & EIG/FL.PT (SET 1)	02117-80001, 02117-80002, 02117-80003, CPU BOARD LOCATIONS U23,43,83 COMBINATION OF BS SET 2 AND EIG/FL.PT SET 2 IN THREE (3) 8K ROMS. MICROCODE DOES NOT CHANGE.	2111F, 21117F
(SET 2)	02117-80016, 02117-80017, 02117-80018	

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)

SECTION XIV-FIRMWARE (F-SERIES) (cont.)

FIRMWARE TYPE	PART NUMBER AND DATE CODE	PRODUCT
SIS: (SET 3) 4K ROMS	12823-80013, 12823-80014 12823-80015, 12823-80016 12823-80017, 12823-80018	
(SET 4) 8K ROMS	12823-80019, 12823-80020 12823-80021	
DMI: (SET 4)	SAME AS E-SERIES DMI ROMS, SEE E-SERIES DMI ROMS	2111F, 2117F
FFP: (SET 2)	5090-1615, 5090-1616, 5090-1617, 5090-1618, 5090-1619, 5090-1620, 5090-1621, 5090-1622, 5090-1623	2111F, 2117F,
(F-SERIES SET 1) & (E-SERIES SET 4)	F-SERIES FFP ROMS SET 1 ARE THE SAME AS E-SERIES FFP ROMS SET 4.	
FFP/DMI: (SET 1)	5180-0141, 5180-0142, 5180-0143	2111F, 2117F
VIS: (SET 1) 4K ROMS	12824-80001, 12824-80002, 12824-80003, 12824-80004, 12824-80005, 12824-80006	12824A
(SET 2) 8K ROMS	12824-80007, 12824-80008 12824-80009	

NOTE: E-SERIES RTE-IVB EMA, RTE-6/VM OS AND EMA/VMA, DS/1000,
AND DS/1000-IV ARE USED FOR F-SERIES RTE-IVB EMA, RTE-6/VM
OS AND EMA/VMA, DS/1000 AND DS/1000-IV ROMS.

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)

SECTION XV-LOADER ROMS

	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
OB	1816-0863	NONE	7900/7901/2883	12992A	
OB	1816-0869	NONE	7905/7906/7920	12992B	
OB	1816-0857	NONE	264X	12992C	
				2109/13B, 2111/17F	
	12992-80002	NONE	7905/7906/7920/7925 RPL COMPATIBLE	12992B	
OB	1816-0962	NONE	7970	12992D	
OB	1816-1051	NONE	9885 RPL COMPATIBLE	12992E	
	12992-80003	NONE	7900/01 RPL COMPATIBLE	12992F	
	12992-80004	NONE	7906H/10H/20H/25H RPL COMPATIBLE	12992H	
	12992-80005	NONE	7908/11/12 RPL COMPATIBLE	12992J	
	1816-0426	NONE	MAG TAPE REFORMATTING SYSTEM	2022	
OB	1816-0420	NONE	PAPER TAPE	12992K, 2105A, 2108A/B, 2112A/B, 2109A/B, 2113A/B, 2111F, 2117F	
	12992-80006	NONE	7970	12992D	
	12992-80007	NONE	9885 RPL COMPATIBLE	12992E	
	12992-80008	NONE	7900/76901/2883	12992A	
	12992-80009	NONE	264X	12992C, 2109/13B, 2111/17F	
	12992-80010	NONE	PAPER TAPE	12992K	
	5081-2361	NONE	7900/05/06/20/25	2105A, 2108A/B, 2112A/B, 2109A/B, 2113A/B, 2111F, 2117F	
	91740-80048	NONE	DS/1000 RPL COMPATIBLE	91740A/B	1826, 1923
	91750-80007	NONE	DS/1000-IV RPL COMPATIBLE	91750A	

(continued)

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HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)					
SECTION XVI-I/O INTERFACES					
	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
OB	12531-6001	12531-6002	TTY INTERFACE IF	12531B	821
	12531-60022	12531-60023	TELEPRINTER IF	12531C	1810
	12531-60025	12531-60027	HIGH SPEED TERM IF	12531D	1810
OB	02116-6002	02116-6027	TAPE READER IF	12532A	1810
OB	02116-6045	02116-6241	TAPE PUNCH IF	12536A	902
OB	12539-60001	12539-60002	TIME BASE GEN IF	12539B	1147
	12539-60003	12539-60004	TIME BASE GEN IF	12539C	1945
	12539-60005	12539-69005	TIME BASE GEN IF	12539C	2010
OB	02116-6006	02116-6229	GENL PURPOSE REG IF	12549A	708
OB	02116-6139	02116-6252	RELAY REGISTER IF	12551A	738
	12551-6001	12551-60021	RELAY REG IF	12551B	810
	12551-6002	12551-60022	RELAY REG IF (READ BACK)	12551B-001	810
	12554-60023	12554-60025	16-BIT DUP REG IF (POS TRUE)	12554A	939
	12554-60024	12554-60026	16-BIT DUP REG IF (NEG TRUE)	12554A-001	939
	12555-60001	12551-60002	D/A CONVERTER IF	12555B	1138
	12556-6002	NONE	40-BIT OUT REG IF (POSITIVE)	12556B	1208
	12556-60022	NONE	40-BIT OUT REG IF (NEGATIVE)	12556B-002	1208
OB	12560-6001	12560-60041	PLOTTER IF	12560A	1810
OB	12565-60001	12565-60004	DISC FILE (2883/4)	12560A	1030
OB	12565-60002	12565-60005	DISC FILE (2883/4)	12565A	1030
OB	12566-6001	12566-60021	16-BIT MICROCKT IF (NEGATIVE)	12566A	926
OB	12566-6002	12566-60022	16-BIT MICROCKT IF (POSITIVE)	12566A-002	926
OB	12566-60024	12566-60026	16-BIT MICROCKT IF (NEGATIVE)	12566B	1613
OB	12566-60025	12566-60027	16-BIT MICROCKT IF (POSITIVE)	12566B-002	1613
OB	12566-60031	12566-69031	16-BIT MICROCKT IF	12566C	2202
	12566-60032	12566-69032	16-BIT MICROCKT IF	12566C	2222
OB	12587-60001	12587-60003	ASYNC DATA SET IF	12587A	1145
	12587-60004	12587-60008	ASYNC DATA SET IF	12587B	1101
	12589-6001	12589-6003	AUTO DIALER IF	12589A	1003
	12597-6001	12597-6003	8-BIT DUPLEX REG IF (POSITIVE)	12597A	832
	12597-6002	12597-6006	8-BIT DUPLEX REG IF (NEGATIVE)	12597A-001	832

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)

SECTION XVI-I/O INTERFACE (cont.)

	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
	12604-60001	12604-60009	DATA SOURCE IF	12604B	1418
	5060-6282	NONE	BREADBOARD I/O IF	12620A	1012
	12621-60001	12621-60003	SYNC DATA SET IF (RECEIVER)	12621A	1120
	12622-60001	12622-60003	SYNC DATA SET IF (TRANSMIT)	12622A	1402
OB	12653-60002	12653-60003	LINE PRINTER IF	12653A	1024
	12665-60001	12665-60011	COMPTER SERIAL IF	12665A/ 12771A	1737
	12735-60001	12735-69001	FLEX DISC IF 1	12735A	1632
	12735-60002	12735-69002	FLEX DISC IF 2	12735A	1632
	12755-60001	12755-69001	PROG PACER CARD IF	12755A	1652
	12773-60001	12773-60004	COMPUTER MODEM IF (KIT)	12773A	1737
	02116-6110	NONE	JUMPER CARD IF	12777A	632
	5061-1389	5061-3402	MULTIPOINT IF	12790A	1838
	5061-3415	5061-3488	8-CHANNEL MUX I/F	12792A	2026
	5061-3418	5061-3442	PROGRAMMABLE SERIAL MODEM I/F	12793A, 12794A	2022
	12821-60001	12821-69001	DISC INTERFACE	12821A	1942
	5061-3432	5061-3462	PROGRAMMABLE SERIAL DIRECT CONNECT I/F	12825A	2027
OB	12880-60001	12880-60002	CRT TERMINAL IF	12880A	1810
OB	12882-60001	12882-60003	CARD READER IF	12882A	1040
	12889-60001	12889-60002	HARDWIRED SERIAL IF (KIT)	12889A	1608
	12920-60001	12920-60003	ASYNC MUX IF (USC)	12920B	1438
	12920-60002	12920-60004	ASYNC MUX IF (LSC)	12920B	1501
	12922-60001	12922-60002	ASYNC MUX (CONTRL)	12920A/B	1220
	12930-60001	12930-60003	UNIVERSAL IF (DIFF)	12930A	1214
	12930-60004	12930-60010	UNIVERSAL IF (GND)	12930A-001	1214
	12930-60005	12930-60011	UNIVERSAL IF (POS)	12930A-002	1214
	12936-60001	NONE	PRIV INTRRPT FENCE (DOS OP SYSTEM ONLY)	12936A	1315
	12966-60001	12966-60002	ASYNC DATA IF	12966A	2216a
	12967-60001	12967-60002	SYNC DATA IF	12967A	1503
	12968-60001	12968-60002	ASYNC DATA IF	12968A	1901
	13037-60023	13037-69023	DISC CONTROLLER IF (7905/06/20/25)	13175A/B	1635
OB	13037-60003	13037-69003	DISC CONTROLLER IF (7905/06)	13178A	1628

(continued)

HARDWARE HISTORY LIBRARY

DATE CODE LIST

HP 1000 M/E/F-SERIES NEW & EXCHANGE ASSEMBLY DATE CODE LIST (cont.)

SECTION XVI-I/O INTERFACES (cont.)

	NEW PART NUMBER	EXCHANGE PART NUMBER	DESCRIPTION	PRODUCT	DATE CODE
OB	13037-60013	13037-69013	DISC CONTROLLER IF (7905/06)	13187A	1628
	13037-60023	13037-69023	DISC CONTROLLER IF (7905/06/20/25)	13178B/C	1635
	13181-60010	13181-60011	MAG TAPE DATA IF 2	13181A	1540
	13181-60040	13181-60021	MAG TAPE CTL IF 1 27.5 IPS & LOWER	13181A	1651
	13181-60070	13181-60071	MAG TAPE CTL IF 1 45 IPS	13181A	1651
	13183-60001	13183-60008	7970E MAG TAPE 2	13183A	1243
	13183-60004	13183-60009	7970E MAG TAPE 1	13183A	1750
	13210-60000	13210-60006	DISC DRIVE IF 2 (7900/7901)	13210A	1740
	13210-60004	13210-60005	DISC DRIVE IF 1 (7900/7901)	13210A	1740
	13210-60009	13210-69009	DISC DRIVE IF 1 (7900/7901)	13210A	1740
	59310-60101	59310-69101	HP-IB I/O IF	59310B	1826
	91000-60001	91000-60003	A/D CONVERTER IF	91000A	1620
OB	91200-60001	91200-69001	VIDEO DISPLAY IF	91200A	1607
	91200-60007	91200-69007	VIDEO DISPLAY IF	91200B	1845

Fan CPU 3160-0418 } 2113
 P/S Fan. 3160-0341 }

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OPERATING SYSTEMS

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HP 2000 COMPUTER SYSTEM SOFTWARE REVISION 1628 AND LATER

I/O CONFIGURATION

Main Processor

SELECT CODE	REQUIRED	INTERFACE
10 & 11	*	Processor Interconnect
12	*	System Console (2762/2754)
13	*	TBG (12539C)
14	*	First Disc Controller a. If 7900/2883 use 14 and 15. b. If 7905 or 7920 use 14 only.
15	(See Note 1)	Second Disc Controller.
16 & 17		Mag Tape Controller.

I/O Processor

Select Code assignments depend on USER configuration.

SUGGESTED CONFIGURATION

SELECT CODE	NOTE	INTERFACE
10	2	TBG
11 - 13	3	MUX
14 & 15		Processor Interconnect
16	Up to 7 each	LP/CR/PP/PR/RP/SL

Note 1: Select Code 15 through 26 can be used by disc controllers (Provided the number of disc-drives does not exceed 8) and mag tape controller. There must be NO open I/O channels between the controllers.

Note 2: If a Synchronous Modem Interface is to be used, it must receive a high priority. It uses Select Code 10 & 11 and pushes the others down by 2 Select Codes.

Note 3: If 2 sets of multiplexors are used, 6 contiguous Select Codes must be used.

I/O DEVICES SUPPORTED ON THE 2000 COMPUTER SYSTEM

TERMINAL TYPE	USER TERMINALS
0	HP 2749A Teleprinter Terminal Teletype ® model 33 ASR Terminal Teletype ® model 38 ASR Terminal IBM 2741 Communication Terminal HP 3071A Transaction Terminal
1	HP 2640A Interactive Display Terminal HP 2644A Interactive Display Terminal
2	HP 2640A Interactive Display Terminal (in block mode) HP 2644A Interactive Display Terminal (in block mode)
3	HP 2600A Keyboard-Display Terminal
4	HP 2762A/B Terminal General Electric TermiNet 300 General Electric TermiNet 1200
5	Teletype ® model 37 ASR Terminal
6	General Electric TermiNet 30
7	Texas Instruments Silent 700 Series KSR Electronic Data Terminal
8	Execuport 300 Data Communications Transceiver Terminal

IBM 2741 COMMUNICATION TERMINAL**Note**

This terminal **MUST** be connected to the computer over telephone lines. In addition, it **MUST** be equipped with the following features:

- Interrupt, Receive (IBM #4708) and Transmit (IBM #7900) associated with the terminal's ATTN key.
- Dial-up (IBM #3255) to enable system connection through a 103A type modem or acoustic coupler.
- The "ATTN" Key is used to get the "PLEASE LOG IN" message. Refer to the *HP 2000 Basic Reference Manual* (22687-90001) and the *HP 2000 Operator's Manual* (22687-90005).

Line Printers

1. HP 2607A
2. HP 2610A
3. HP 2613A
4. HP 2614A
5. HP 2617A
6. HP 2618A
7. HP 2767A

Paper Tape Reader

1. HP 2748A/B

Card Readers

1. HP 2892A
2. HP 7261A

Synchronous Modem

1. HP 12618A

Reader Punch

1. HP 2894A

Paper Tape Punches

1. HP 2753B
2. HP 2895A

Mag Tape

1. 7970B/E 9 Trk (4 each)

Serial Link Terminal

1. HP 3070A
2. HP 3071A

HP 2000 DATA COMMUNICATIONS

1. IBM RJE
 - a. MRJE W/S Emulator
 - b. 2770/2780/3780 Terminal Emulator
2. CDC RJE
 - a. UT 200
3. 2000 to 2000 Communication
4. 2780 to 2780 Data Communications

2100 CROSS LOADING PROCEDURE

(For loading TSB LOADER into the main CPU.) (21MX series boots directly from the MCP tape.)

For 2100 processors, perform the following:

Note

See Appendix D to verify you have the proper BBL installed in the I/O processor.

- a. You were supplied a single paper tape containing two programs: a magnetic tape bootstrap loader and a cross loader program (22687-16001, Rev. 1536). Place this tape into the paper tape reader, ensuring the feed holes on the tape are inserted toward the front panel. Set the POWER and READ switches.
- b. On the I/O processor, press HALT, INTERNAL PRESET, and EXTERNAL PRESET.
- c. On the I/O processor, select the P-register and clear the display. Set the bits according to the memory size of your I/O processor as follows:

MEMORY	LOCATION	SET BITS
16K	037750	13 through 5, 3
24K	057750	14, 12 through 5, 3
32K	077750	14 through 5, 3

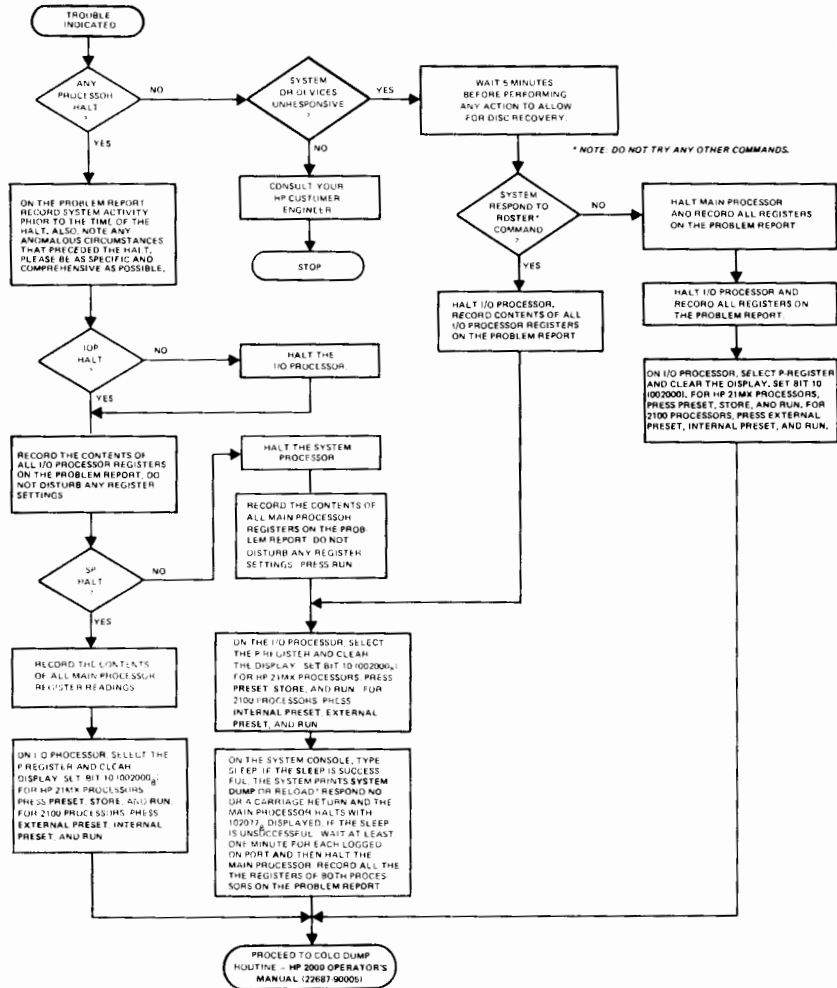
On the I/O processor, press LOADER ENABLE and then RUN. The first program is read from the paper tape and the processor halts with 102077₈ displayed. Any other halt codes indicate failure to read the paper tape properly. In this case, restart the procedure at step a.

- e. On the main processor, press HALT, INTERNAL PRESET, and EXTERNAL PRESET.
- f. On the main processor, select the P-register and clear the display. Set bits 14 through 6 (077700₈).
- g. On the main processor, press LOADER ENABLE and RUN. Nothing happens.
- h. On the I/O processor, select the P-register and clear the display. Set bit 1 (000002₈).
- i. On the I/O processor, press RUN. The second program is read from the paper tape into main processor memory. Both processors halt with 102077₈ displayed. Any other halt codes indicate a failure and the procedure should be restarted at step a.

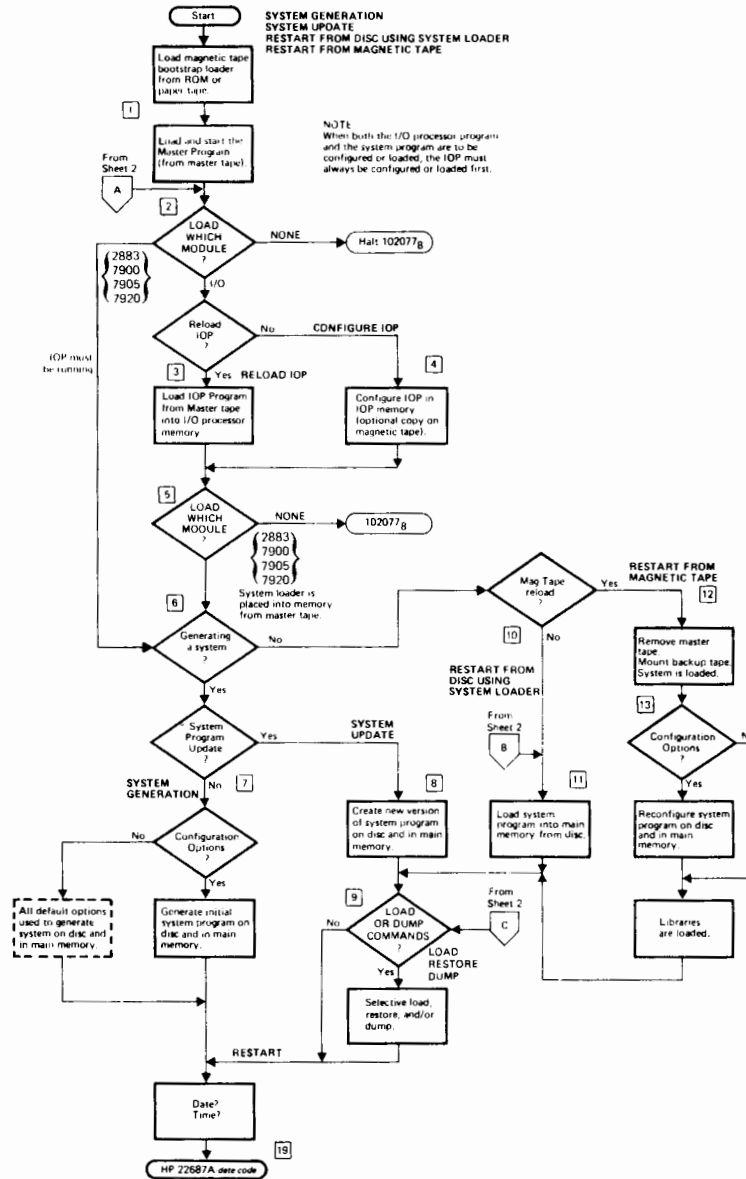
SYSTEM RECOVERY

Refer to Section V of the *HP 2000 Operator's Manual* (22678-90005).

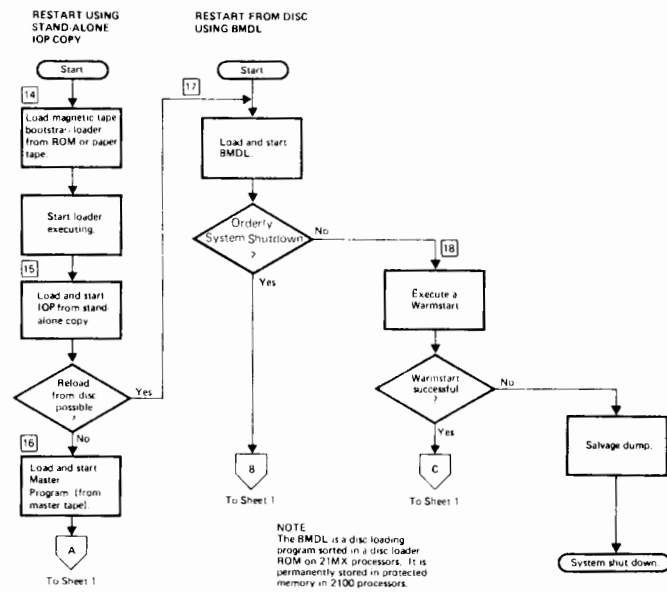
COLD DUMP PROCEDURES



HP 2000 COMPUTER SYSTEM FLOWCHART



HP 2000 COMPUTER SYSTEM FLOWCHART (Cont'd)



TOGGLE-IN PROGRAM TO TEST INTERCONNECT KIT**I/O PROCESSOR**

	4	102004	HLT	4		
	5	102005	HLT	5		
	XX	024103	JMP	103	Incoming data interrupt	XX high priority
S.A.	100	102100	STF	0	Turn on interrupt	low select code
	101	1037XX	STC	XX,C	Set up read on SC XX	of interconnect kit.
	102	024102	JMP	*	Hang fire	
	103	1025XX	LIA	XX	Read data from SC XX	
	104	102601	OTA	01	Display data	
	105	1026YY	OTA	YY	Write data to SC YY	YY low priority
	106	1037YY	STC	YY,C	Execute write	upper select code
	107	024101	JMP	101	Go do-it again	of interconnect kit.

SYSTEM PROCESSOR

	4	102004	HLT	4	
	5	102005	HLT	5	
	10	024107	JMP	107	Incoming data interrupt
	B reg = 125252				Initial data pattern
S.A.	100	102100	STF	0	Turn on interrupt
	101	060001	LDA	B	Get data for output
	102	102601	OTA	01	Display data for XFER
	103	102611	OTA	11	Write data to IOP
	104	103711	STC	11,C	Execute it
	105	103710	STC	10,C	Set up read from IOP
	106	024106	JMP	*	Hang fire
	107	102510	LIA	10	Got round trip data
	110	050001	CPA	B	Is this what I sent IOP?
	111	024113	JMP	113	Yes
	112	102022	HLT	22	No! halt
	113	007000	CMB		Complement B-Reg
	114	024101	JMP	101	Go do it again

- Notes:
1. Start IOP first at 100.
 2. Halt 22, A-Reg=bad data, B-Reg=good data.
 3. You do not have to disturb cables for testing.
 4. All bits alternated every pass.
 5. SP S-Reg displays transmitting data.
 6. IOP S-Reg displays received data.

2000 SYSTEM PREVENTIVE MAINTENANCE**GENERAL INFORMATION****I Minimum Division Requirements**

System Usage	Perform Maintenance
One 8 hour shift	24 weeks/6 months
Two 8 hour shifts	24 weeks/6 months
Three 8 hour shifts	24 weeks/6 months

II Usage Effects:

Customer use varies from site to site which may cause the Customer Engineer to decrease the time interval between PM periods in order to improve reliability. Experienced Customer Engineers may perform monthly PM's in order to detect minor problems, maintain maximum up time and improve user satisfaction.

III Environmental Effects:

A dirty contaminated area should be monitored by an Account Customer Engineer to determine if additional PM's are required. The Account Customer Engineer and the District Customer Engineer Manager will determine if an additional charge should be added to the BMMC or appropriate action be instituted due to environmental effects on unit reliability. Such decision is at the discretion of the DCEM.

IV Training Required:

Operator: Read operators manual
Customer Engineer: 2000, Level 100

V Minimum System Performance Requirements:

In order to assure you of good system performance and maximum satisfaction with Hewlett-Packard Computer Products, we have developed the following guidelines for minimum acceptable system performance that you should expect from your Hewlett-Packard equipment. If your system does not meet any one guideline, please contact your Customer Engineer as soon as possible. Hewlett-Packard will work to resolve your problem in the shortest period of time possible.

1. Downtime must be less than 5%. This is based on your service contract hours of coverage. Example: If you have 40 hours a week coverage, you should expect to be down less than 8 hours total per month.
2. System failures, halts or hangs must be less than 5 per month.
3. If an intermittent problem has not been resolved within 2 weeks.

NOTE

There may be additional local guidelines. If you have any questions regarding those guidelines, or exactly what constitutes downtime, please contact your local HP Representative.

2000 SYSTEM PREVENTIVE MAINTENANCE (Cont'd)**VI Customer PM Functions Prior to Scheduled HP PM:**

1. It is suggested that you contact your account CE a few days prior to your PM. Your CE may need to bring parts that are usually stocked at the local office and may be needed for your PM. Please be prepared to supply your CE with the following information:
 - a. Provide feedback to your CE on overall equipment performance.
 - b. Indicate if there are any burned out lamps, broken switches, or any hardware deficiencies that are affecting smooth operation.
2. Please be fully backed up when your CE arrives. There is a possibility that your data may be destroyed during disc verification. Be prepared, if necessary, to perform a reload after the PM is completed.

VII Customer PM Functions:

Vacuum all mainframe filters once a month.

PROCEDURE

1. Reboot System

2100: P=77750, RUN→ 102077, RUN
 21MXXM: S=041400 (typical), STORE, PRESET, IBL, RUN→ 102077, RUN
 21MXE: S=101400 (typical), STORE, PRESET, IBL, RUN→ 102077, RUN
 2754? Yes or No
 Date? Julian Date/Year (i.e., 136/81)
 Time? HR:MIN (i.e., 22:15 - 1015 p.m.)
2. Enable special dump feature on system

On console: DUMP-60
3. Log on to A000 account from user terminal

On user terminal: CR, LF→ PLEASE LOG ON
 HELLO-A000, password, terminal type

2000 SYSTEM PREVENTIVE MAINTENANCE (Cont'd)

Terminal Models Representative of Terminal Types

Terminal Type	Representative Terminal
0	HP 2749A Teleprinter Terminal Teletype Model 33 ASR Terminal Teletype Model 38 ASR Terminal HP 3071A Transaction Terminal
1	HP 2640A Interactive Display Terminal HP 2644A Interactive Display Terminal
2	HP 2640A Interactive Display Terminal (in block mode) HP 2644A Interactive Display Terminal (in block mode)
3	HP 2600A Keyboard-Display Terminal
4	HP 2762A/B Terminal General Electric TerminiNet 300 General Electric TerminiNet 1200
5	Teletype Model 37 ASR Terminal
6	General Electric TerminiNet 30
7	Texas Instruments Silent 700 Series KSR Electronic Data Terminal
8	Execuport 300 Data Communications Transceiver Terminal
9	IBM 2741 Communication Terminal

A terminal type (0-8) entered with the HELLO command is associated with each of the nine ASCII code terminals. Type 9 is associated with non-ASCII generating terminals, the type need not be specified, but is returned if requested by the SYS function.

4. Dump the ADT and check for proper format. (No repeats or ASCII characters)
On terminal:DUMP-ADT
5. Log off on terminal (BYE)
6. Sleep system. On console: SLEEP
SYSTEM DUMP OR RELOAD? CR→ 102077
7. Perform hardware preventive maintenance
8. Reboot system
9. Run on-line verification program (Installation Manual 19700-90007)
On user terminal: CR, LF→ PLEASE LOG ON
HELLO - Z100, password, terminal type
SYSTEM LOG ON MESSAGE
EXECUTE - VERITE
WHICH TEST? BASIC
 Basic - to test system
 Loop - to execute BASIC in a loop
 Device - to test a device, i.e., MTO, LPO, CR3, etc.
10. Log off terminal upon completion of testing (BYE)
11. Dump system status report. On console: STATUS

2000 SYSTEM PREVENTIVE MAINTENANCE (Cont'd)**SUPPORT INFORMATION****Off-Line Diagnostics**

02100-90157	Diagnostic Configurator Manual
24396-13501	7970B Mag Tape
24396-13601	7970E Mag Tape
24396-13001	7900 Disc
24396-13101	7905 Disc
5060-8340	24 Pin Connector Kit (DMA Test Hood)
30062-60003	MUX Text Hood (Wire per S. Note HP 12921A-1)

SYSTEM SOFTWARE**Master Configuration & Program Tapes (MCP Tapes)**

22689-16001	TSB Loader Bootstrap Tape
22687-10001	HP 2000 Operating System (21MX) mag tape 800 bpi
22687-10002	HP 2000 Operating System (2100) mag tape 800 bpi
22687-11001	HP 2000 Operating System (21MX) mag tape 1600 bpi
22687-11002	HP 2000 Operating System (2100) mag tape 1600 bpi
1816-0532	13206A Microcode for 2100 Computer
1816-0533	
1816-0534	
1816-0535	
1816-0536	
1816-0537	
13207-60001	13207A Microcode for 21MX Computer
1816-0996	22702A Microcode for 21MX-E Computer
1816-0997	(Note: A firmware accessory board is required
1816-0998	for the 21MX-E: part no. 13304A)
1816-0999	
1816-1000	
1816-1001	

**HP 2000/ACCESS (REV 1812) "SYSTEM" STATEMENT MAIN
PROCESSOR PATCH**

This patch prevents faulty system statement crashes.

This patch need to be installed every time the software is updated.

1. Sleep the system to tape then to disc.
2. Reload from MCP tape.
3. Load the correct module for your disc.
4. Before responding to the system generation prompt set bit 15 of the S-Register, then respond yes.
5. Respond yes to the "update" prompt.

2000 SYSTEM PREVENTIVE MAINTENANCE (Cont'd)

6. System will begin to read the MCP tape. Then it will halt with 102015. Press run four times (after pressing run each time wait for the computer to halt with 102015 before continuing).

- | | Old Data |
|--|----------|
| 7. Set the M-Register to 075172, press store | |
| 8. Set the T-Register to 027317, press store | 063175 |
| 9. Set the M-Register to 075317, press store | |
| 10. Set the T-Register to 063175, press store | 006004 |
| 11. Set the T-Register to 065577, press store | 160001 |
| 12. Set the T-Register to 006003, press store | 004361 |
| 13. Set the T-Register to 171603, press store | 034036 |
| 14. Set the T-Register to 027246, press store | 034036 |
| 15. Set the S-Register to 000000, press store | |
| 16. Press run. | |
| 17. The system will read in the rest of the system software and prompt with "Load or Dump Commands" proceed to bring the system up in the normal manner. | |
| 18. After doing this update it is wise to sleep the system so as to get a good copy of the system software out to tape. | |

ORDERING 2000 PRODUCTS AFTER DISCONTINUANCE

After the discontinuance date, consideration will be given to special orders for certain HP 2000 products. Acceptance of any special order will be dependent upon several factors, including availability of component parts, factory resources and management approval. All such orders will be subject to remaining support life for each product as outlined in this HP 2000 Discontinuance policy.

Product Number	Description
19700B	HP 2000 Computer System
19665A	HP 2000F Upgrade to HP 2000
22699A	CAI/2000 (IMF, IDF, MATH)
22700A	FCOPY/2000
22694A	CIS/2000 *
22701A	EDITOR/2000
20243A	SDE/2000
20240A	TSP/2000
22687A	HP 200 MCP (Operating System Software)

* CIS/2000 was originally sold with training included. There will NOT be any training included with this product.

ORDERING 2000 PRODUCTS AFTER DISCONTINUANCE (Cont'd)**SPECIAL DOCUMENTATION**

Part Number	Description
19700-90004	HP 2000 Site Planning Workbook
19700-90005	HP 2000 Site Preparation Workbook
19700-90007	HP 2000 Installation Manual
22687-90020	HP 2000 Internal Maintenance Specification Manual
22687-10006	HP 2000 Source Code 800 bpi Mag Tape
22687-10007	HP 2000 Source Listings 800 bpi Mag Tape
22687-11006	HP 2000 Source Code 1600 bpi Mag Tape
22687-11007	HP 2000 Source Listings 1600 bpi Mag Tape

2000 SYSTEM CONTRIBUTED LIBRARY

The HP 2000 Contributed Library comprises five volumes and an Addendum which updates volumes I-IV:

Volume I	Data Handling, Testing, Debugging and Programming Aids
Volume II	Math & Numerical Analyses, Probability & Statistics, and Scientific Engineering Applications
Volume III	Management Science, Operations Research, Business
Volume IV	Education
Volume V	Games
Addendum	To Volumes I-IV

Your Customer may order a complete library package (tapes and manuals), or individual components as indicated:

Part Number	Description
36600-10901	800 bpi Library Package-One magnetic tape and Six manuals for Vol I-V and Addendum
36600-11901	1600 bpi Library Package-One magnetic tape and Six manuals for Vol I-V and Addendum
36600-10001	800 bpi magnetic tape-software only, Vol I-V and Addendum
36600-11001	1600 bpi magnetic tape-software only, Vol I-V and Addendum
36600-90001	Manual Package for Volume I-V and Addendum
36000-91001	Manual for Vol I
36000-91002	Manual for Vol II
36000-91003	Manual for Vol III
36000-91004	Manual for Vol IV
36000-91005	Manual for Vol V (What to Do After you Hit Return)
36000-92001	Manual for Addendum to Vol I-V

SYSTEM CONFIGURATION

I/O Slot Assignments for the required interface boards for the standard 2026 system and for various optional devices are shown below. Optional devices are indicated by an asterisk (*) and must be replaced by a jumper board (HP Part No. 02116-6110) if not being configured.

HP 7905 Standard Configuration

SLOT NO.	DEVICE
10	SYNC (RECV) (12618A) ASYNC = (12587B)
11	SYNC (SEND) (12618A) JUMPER IF ASYNC
12	TIME BASE GENERATOR (12539C)
13	*2645 CRT (12966A-002)
14	*2645 CRT (12966A-002)
15	GEN. PURPOSE I. O. (12620A)
16	*PAPER TAPE READER (12597)
17	*PUNCH (12597)
20	*LINE PRINTER (12845B)
21	SYSTEM CONSOLE (12531 OR 12880)
22	DISC (13037A)
23	*MAG TAPE (13181A/13183A)
24	*MAG TAPE (Second Board)
25	*CARD READER (12985A)

SUPPORTED DEVICES

The following equipment is supported as part of the HP 2026 Data Entry/Communications System.

Standard System

HP 21MX-E Computer (32K)
 HP 7905 Disc Drive(s) (up to 8) (15M byte each)
 HP 2645 CRT Display Station system console
 Non-HP Modem

Optional Equipment

HP 2645 CRT Display Station terminal(s)
 HP 7970 Magnetic Tape Subsystem(s) (800 or 1600 bpi)
 HP 2607 200-lpm Line Printer
 HP 2613 300-lpm Line Printer
 HP 2617 600-lpm Line Printer
 HP 2618 1200-lpm Line Printer
 HP 2892 Card Reader
 HP 2895 Paper Tape Punch
 HP 2748 Paper Tape Reader
 HP 2762A Console/Printer (30 cps)



GENERAL NOTES

DISC ORGANIZATION

The system supports up to eight HP 7905 Disc Drives on one disc controller. Each drive contains three software subchannels: one on the fixed platter and two on the removable cartridge.

As received from the factory, all of subchannels 0, 1, and 2 contain copies of the system, with a label indicating the release.

If additional disc drives are installed on the system, the additional subchannels must be formatted before they can be used. Additional removable cartridges to be used on the system must also be formatted. Follow the instructions in HP 2026 User's Manual to format discs as necessary.

The system (software) disc is generally on subchannel 2. However, this is a customer option.

SELECTED SYSTEM DIRECTIVES

"Directives" or commands are entered on the system console. All system Directives must begin with a colon (:). An "at" symbol (@) on the console means that the computer is waiting for another system Directive.

Command	Meaning
:GO	Resume a suspended operation.
:LI,U,6	List the Directory Information of all User files on all active subchannels on the printer.
:LI,U,6,FILE1	List the Directory Information of the user file named "FILE1" on the printer.
:PU,FILE1	Purge "FILE1" from the Directory.
:RP	Repack all active subchannels.
:RUN,name	Run the program named "name".
:SS	Enable "system search" capacity.
:TR	Determine the next available track and the number of bad tracks on the current subchannel.
:UD	Interrogate the current user subchannel.
:UP.xx	Declare a device (EQT#=xx) available for use after an I/O Error.

PROGRAM MNEMONICS

Standard mnemonics or "device designators" have been given to each of the commonly used pieces of equipment on the system. Most of the programs require operator responses from the following list:

DESIGNATOR	DEVICE
LP	System Printer
CN	Console
T1	Mag Tape #1 (unit 0)
T2	Mag Tape #2 (unit 1)
D1	Disc Work Area #1
D2	Disc Work Area #2
DB	Data Base File
SF	Source File
PR	Paper Tape Reader
PN	Paper Tape Punch
PT	Paper Tape
LI	Library File
CR	Card Reader

All console directives and responses must be followed by a Carriage Return, Line Feed.

All CRT inputs and responses must be followed by pressing the ENTER key on the CRT terminal. This action causes the computer to read the information displayed on the screen.

BOOTSTRAPPING

"Bootstrapping" is the procedure by which a copy of the Operating System is loaded from the disc into the memory of the computer.

1. Turn on all equipment. If the computer RUN light is on, press HALT.
2. Press REGISTER SELECT, as required, to select the S-Register. The S light will be on once the S-Reg is selected.
3. Press CLEAR DISPLAY.
4. For HP 7905 Disc Systems, press buttons 1, 7, 10, 12, and 15 if the HP 2026 programs are stored on subchannel 2 (the fixed platter):

1 001 010 010 000 010

Press buttons 0, 7, 10, and 14 if the programs are stored on subchannel 1:

0 100 010 010 000 001

Press buttons 7, 10, and 14 if the programs are stored on subchannel 0:

Press buttons 7, 10, and 14 if the programs are stored on subchannel 0:

0 100 010 010 000 000

5. Press STORE.
6. Press PRESET.
7. Press IBL, and the bootstrap program will be loaded from the ROM (Read-Only Memory).
8. Press RUN on the computer.
9. The DISPLAY REGISTER should now look like this:

1 000 010 000 111 111

where 1 = "on"

and 0 = "off"

If it does not, go back to step 2 above.

10. Press RUN, and the operating system will be loaded from disc into the memory of the computer.
11. The following message will be typed on the console:

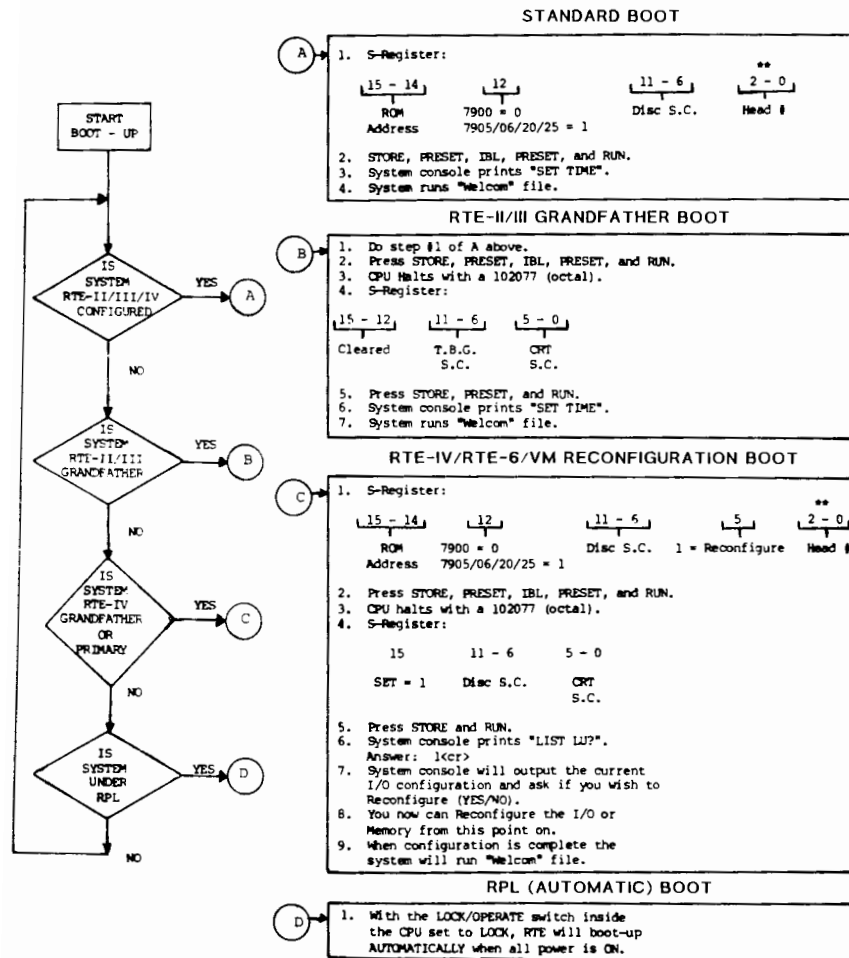
"SUBCHAN=nn" (indicates the subchannel to which you have bootstrapped.
 "LBL=label" "Label" is a code word used to identify the software version.)
 "@")

12. If more than one disc subchannel is used on the system, tell the operating system by typing ":SS,x,y, . . ." where x and y are the subchannels to be used (including the one to which you bootstrap).

The system is now ready to accept a "RUN Directive" for the program that is desired. For example:

:RUN,COMSYS

RTE BOOT-UP PROCEDURES SUMMARY



** Head for 7905/06/20/25 or
Subchannel for 7900: Removable = 1
Fixed = 0

SLOW-BOOT PROCEDURE FOR RTE-II/III SYSTEMS

1. Load in the ROM loader.
2. Patch ROM loader to halt after the boot extension is loaded but before it is executed:
 Location: 077775B
 Patch: 102077B
3. Execute the ROM boot from its starting location (usually 77700B). When the HALT 77 occurs, the RTE boot extension is in memory (if the hardware is working correctly).
4. Patch the RTE boot so that it halts before jumping into the system code:
 Location: 2016B
 Patch: 102077B
5. Execute the boot extension from location 2175 (see the listings following this section).
6. Because the boot extension moves itself to a higher location in memory, the halt at location 2016 will occur in higher memory. When it occurs, patches can be made to the system if desired. It is also possible to check a couple locations at this point to ensure that the system has been loaded correctly. A good check can be made by looking at a couple of locations on the base page:

+-----+-----+	
Location	Contents
+-----+-----+	
1651	Number of EQT entries
1653	Number of logical units
1674	Select code of the TBC
+-----+-----+	

RTE TURN ON**HP 2100 COMPUTER SERIES****Disc Loader**

- a. If the absolute RTE system is on subchannel 0 or 1 and starts on track 0, set the S-register to one of the following starting addresses:
 - 077750 for 32K
 - 057750 for 24K
 - 037750 for 16K
- b. Enable the loader and push RUN (bootstrap tape is not required). The system will halt with 102077 displayed. Push RUN again.
- c. When the absolute RTE system has been loaded into memory, it prints the following message:

SET TIME
- d. Set the clock to current time using the TM operator request. Any other request starts the clock at 8:00 on the approximate release date.

Paper Tape Loader

- a. Load the bootstrap tape into memory using the basic binary loader. Starting octal addresses are:
 - 077700 for 32K
 - 057700 for 24K
 - 037700 for 16K
- b. Set P-register to 100₈.
- c. Push RUN.
- d. When the absolute RTE system has been loaded into memory, it prints the following message:

SET TIME
- e. Set the clock to current time using the TM operator request. Any other request starts the clock at 8:00 on the approximate release date.

HP 21MX COMPUTER SERIES**Start Up**

- a. On the operator panel, set key-operated switch to OPERATE.
- b. Press left half (◀) or right half (▶) of register Select switch to select S-register.
- c. Press CLEAR DISPLAY and set bits 6 through 11 to octal select code of tape reader if paper tape bootstrap is to be used. If the absolute RTE system is on subchannel 0 or 1 and starts on track 0, the disc loader can be used. Set bits 6 through 11 to octal select code of disc.
- d. Set bits 15 and 14 to select the appropriate ROM loader.

15	14	13	12	
0	0	0	0	Paper Tape
1	0	0	0	7900
1	0	0	1	7905
- e. Press STORE then IBL.
- f. If required, place bootstrap in tape reader and turn it on.

RTE

RTE TURN ON (Cont'd)

- g. Press PRESET then RUN. (For paper tape, system halts with 102077 displayed: set P-register to 100₈ - the starting address of the bootstrap, then press RUN.)
- h. When the absolute RTE system has been loaded into memory, it prints the following message:
SET TIME
- i. The RTE FMGR is scheduled, control passes to the first file labelled WELCOM.
- j. Set the clock to current time using the TM operator request. Any other request starts the clock at 8:00 on the approximate release date.

ERROR HALTS DURING TURN-ON

The following halts can occur during use of the bootstrap.

102011

Cause	Recovery Action
Disc error status is in the A-Register.	Check that the disc drive is ready-push RUN to retry.

102031

Same as above. Occurs during execution of disc-resident part of boot-strap.	Check that the disc drive is ready-push RUN to retry.
---	---

RTE-II/III ERROR HALTS

The following halts can occur during use of the bootstrap.

Halt Code	Cause	Recovery Action
102011	Disc error status is in the A-Register.	Check that the disc drive is ready-push RUN to retry.
102031	Same as above. Occurs during execution of disc-resident part of bootstrap.	Check that the disc drive is ready-push RUN to retry.

SCHEDULING THE CONFIGURATOR FROM BOOTSTRAP LOADER
 (RTE-IV/RTE-IVB/RTE-6/VM)

A bootstrap loader can be used to load the boot extension into memory, e.g., the 264x Cartridge Tape Loader ROM (12992C). To load, proceed as follows:

1. Select the S-Register for display on the computer front panel.
2. Press CLEAR DISPLAY.
3. Set the S-Register as follows:

Bits	Enter
0-5	0 (reserved)
6-11	Input device select code
12-13	0 (reserved)
14-15	Loader ROM selection for input devices

4. Press PRESET, IBL, PRESET, and then RUN. Boot file will be loaded from the device specified.
5. When HLT 77B occurs, set the P-Register to 100B.
6. For MAC/ICD discs, set the S-Register to zero to signify no change.

Bits	Enter
0-5	Console select code
6-11	Disc select code
12-14	0 (reserved)
15	1 for reconfiguration

SCHEDULING THE CONFIGURATOR FROM DISC LOADER ROM (RTE-IV/RTE-IVB/RTE-6/VM)

Disc loader ROMs:

MAC RPL compatible - 12992B
ICD RPL compatible - 12992H
CS80 RPL compatible - 12992J

NOTE

The Boot Extension is assumed to reside on physical track 0, sector 0 of the system disc.

1. Select the S-Register.
2. Press CLEAR DISPLAY.
3. Set the S-Register as follows:

Bits	Enter
0-2	Surface number for MAC/ICD disc, & unit number for CS/80 disc
3-4	0 (reserved)
5	1 for reconfiguration (0 for no reconfiguration)
6-11	Disc select code
12	1 for MAC/ICD disc, 0 for CS/80 disc
13	0 (reserved)
14-15	Loader ROM selection for disc

4. Press STORE.
5. Press PRESET, IBL, PRESET and RUN.
6. Following the HLT 77B (successful load), set the S-Register:

Bits	Enter
0-5	Console select code
6-11	Disc select code
12-14	0 (reserved)
15	1 for reconfiguration (0 for no reconfiguration)

7. Press PRESET and RUN to perform reconfiguration processes.

RTE-IVA/IVB Error Halts

HLT	Meaning	User Action
4	Power-fail occurred and power-fail automatic restart is enabled.	Restart system boot-up procedure.
5	Memory protect switch was set and memory parity error occurred.	Restart system boot-up procedure.
10B	FMGR or D.RTR cannot be scheduled at startup because there is not a large enough partition (issued by the system).	Restart system boot-up and redefine memory to include a partition large enough for FMGR or D.RTR.
11B	Attempt was made to re-execute a non-RPL compatible ROM Loader Part #12992A, Bootstrap Loader, or Disc Loader ROM detected a disc error (check A-Register for error status).	Reload the ROM Loader or Bootstrap Loader before re-executing.
22B	One of the following conditions was encountered: 1. \$CNFG cannot find an ID segment for Configurator extension \$CNFX. 2. \$CNFX is not a Type 3 program. 3. A contiguous memory block of three good pages cannot be found in the user partition area.	Restart system boot-up procedure. If memory re-configuration is desired \$CNFX must be permanently loaded as a Type 3 program and there must be at least 3 good pages of contiguous memory in the user partition area.
30B	Error was encountered in the disc I/O process by one of the RPL-compatible ROM Loaders Part #12992B & 12992F. If the disc is a 7900, the disc status is displayed in the A-Register. If the disc is a 7905/20, the disc status word 1 is displayed in the B-Register and disc status word 2 in the A-Register.	Retry the system boot-up procedure.
31B	Error encountered in the disc I/O process by the Boot Extension. If the disc is a 7900, the disc status is displayed in the A-Register. If the disc is 7905 or 7920, the disc status word 1 is displayed in the B-Register and disc status word 2 is displayed in the A-Register.	Retry the system boot-up procedure.
55B	An EQT with the equipment type code of console cannot be found.	Restart boot-up procedure with a console for which an EQT is generated in the system.

RTE-6/VM Error Halts

Halt	Meaning and User Action Required
4	Meaning: Power-fail occurred and power-fail automatic restart is enabled. Action: Restart system boot-up procedure.
5	Meaning: Memory protect switch was set and memory parity error occurred. Action: Restart system boot-up procedure.
6	Meaning: A partition was found not properly linked into an operating system partition list. The operating system may be corrupt or a bug may exist. Action: Reboot the system and if the problem persists, call your HP representative.
10B	Meaning: FMGR or D.RTR cannot be scheduled at startup because there is not a large enough partition (issued by the system). Action: Restart system boot-up and redefine memory to include a partition large enough for FMGR and D.RTR.
11B	Meaning: Attempt was made to re-execute a non-RPL compatible ROM Loader Part #12992A, Bootstrap Loader, or Disc Loader ROM detected a disc error. For CS/80 discs: ROM Loader (12995J) could not bring in the boot extension. Action: Reload the ROM Loader or Bootstrap Loader before re-executing, or check A-Register for status. For CS/80 discs: check that the correct unit was specified in the S-Register at boot-up. If so, run diagnostics to isolate disc problem.
20B	Meaning: Uninstalled memory halt. The system will halt if memory has been defined but is not installed. The system checks pages from the beginning of the user partitions through the end of the memory stack. The first page it finds defined by the user but not physically installed will cause the HLT 20 instruction to be executed. The first uninstalled page number will be displayed in the A- and B-Registers. Action: Reconfigure memory such that the amount of memory specified in the reconfiguration is less than or equal to the amount of physically installed memory.
21B	Meaning: See HP representative. This halt may also appear in the T-Register as 105355.

RTE-6/VM ERROR HALTS (Cont'd)

Halt	Meaning and User Action Required
22B	Meaning: One of the following conditions was encountered: 1. \$CNFX is not a Type 3 program. 2. A contiguous memory block of three good pages cannot be found in the user partition area. Action: Restart system boot-up procedure. If memory reconfiguration is needed, \$CNFX must be permanently loaded as a Type 3 program and there must be at least three good pages of contiguous memory in the user partition area. If \$CNFG cannot find the ID segment for \$CNFX, the system will boot-up with no memory reconfiguration.
30B	Meaning: Error was encountered in the disc I/O process by one of the RPL-compatible ROM Loaders Part No. 12992B and 12992F. If the disc is a 7905/20, the status word 1 is displayed in the B-Register and disc status word 2 in the A-Reg. Action: Retry the system boot-up procedure.
31B	Meaning: Error encountered in the disc I/O process by the Boot Extension. If the disc is a 7905 and 7920, the disc status word 1 is displayed in the B-Register and disc status word 2 is displayed in the A-Register. For CS/80 discs: A-Register contains the failed status word number and B-Register contains the status indicated by A. "A=1" implied reject error, "A=2" is a fault error, "A=3" is an access error, "A=4" is an information error. Action: Retry the system boot-up procedure. For CS/80 discs: retry or run diagnostics to isolate disc error.
55B, 56B, or 57B	Meaning: While dispatching a program the operating system encountered an unexplainable condition. The operating system may be corrupt or a bug may exist. Action: Reboot the system and if the problem persists call your HP representative.

BACKUP OVERVIEW

The table below summarizes all the current backup programs supported by DSD, as well as a few widely used non-supported ones. The table indicates whether the program is on or off-line, the type of disc which can be used (H-Series discs use a 12821A disc interface), the type of backup media, if it is possible to spare tracks, which versions of RTE will support the programs, and whether the program can be used to backup the system LUs (LU 2 and LU 3).

BACKUP UTILITY MATRIX

Prog Name	On/ Off Line	MAC DISCS					H-Disc CS80 6/20/	Save Media	Spar Fix	Verf ?	RTE ?	LU2 LU3	Data Meth	Page No.
		7900	5/6/	20	25	25								
DSKUP	Off	yes	yes	Y*	no	no	D/T	yes	yes	yes	all	yes	TRK	86-1
SAVE	On	yes	yes	Y*	no	no	tape	no	yes	yes	all	yes	TRK	85-4
RSTOR	On	yes	yes	Y*	no	no	tape	no	yes	yes	all	no	TRK	85-5
COPY	On	yes	yes	Y*	no	no	disc	no	yes	yes	all	Y**	TRK	85-5
VERFY	On	yes	yes	Y*	no	no	D/T	no	yes	yes	all	Y**	TRK	85-3
DISK	Off	no	yes	yes	yes	no	D/T	yes	NO	yes	4/6	yes	TRK	86-7
LSAVE	On	no	yes	yes	yes	no	tape	no	yes	yes	4/6	yes	TRK	85-8
USAVE	On	no	yes	yes	yes	no	tape	no	yes	yes	4/6	yes	TRK	85-9
LCOPY	On	no	yes	yes	yes	no	disc	no	yes	yes	4/6	Y**	TRK	85-10
RESTR	On	no	yes	yes	yes	no	tape	no	no	yes	4/6	no	TRK	85-9
BCKOF	Off	yes	yes	yes	yes	yes	D/T/L	yes	yes	yes	6	yes	TRK	86-13
PSAVE	On	yes	yes	yes	yes	yes	D/T/L	no	yes	yes	6	yes	TRK	85-13
PRSTR	On	yes	yes	yes	yes	yes	D/T/L	no	yes	yes	6	yes	TRK	85-14
PCOPY	On	yes	yes	yes	yes	yes	disc	no	yes	yes	6	yes	TRK	85-16
READT	On	yes	yes	yes	yes	yes	tape	no	no	yes	4/6	no	TRK	85-18
WRITT	On	yes	yes	yes	yes	yes	tape	no	no	yes	4/6	no	TRK	85-17
READR	On	yes	yes	yes	yes	dsk	T/C	no	yes	yes	4/6	Y+	file	85-19
SAVER	On	yes	yes	yes	yes	dsk	T/C	no	yes	yes	4/6	Y+	file	85-20
FC	On	yes	yes	yes	yes	dsk	T/L	no	yes	yes	4/6	Y+	file	85-22
JSAVE	On	yes	yes	yes	yes	yes	tape	no	no	yes	4/6	no	TRK	85-24
JRSTR	On	yes	yes	yes	yes	yes	tape	no	no	yes	4/6	no	TRK	85-26
MFGET	On	yes	yes	yes	yes	yes	tape	no	no	yes	4/6	no	file	85-27

NOTE

Programs JSAVE, JRSTR, and MFGET are not supported, all others are supported by DSD.

DESCRIPTION OF BACKUP UTILITY MATRIX

The column marked "Spar fix" means that sparing can be handled by the listed utility. Otherwise, bad tracks can be fixed with the FORMT or FORMC utility (RTE-IV or RTE-6/VM), or the disc diagnostic. Off-line utilities do not care which RTE version is on the disc, but the on-line versions may or may not load due to opsystem limitations. For example, SAVE and RSTOR LOAD and RUN on any M/E/F Series RTE System, but PSAVE and PRSTR are too large to run on RTE-II/III and RTE-IV lacks some libraries to load them on-line.

Abbreviations for media:

D = disc
T = magtape (ie, 797x series)
C = CTU (terminal cassette)
L = Linus (CS/80 tape)

BACKUP OVERVIEW (Cont'd)

Conditional "yes" abbreviations:

- Y* means yes if later revisions.
- Y** means yes if destination LU is not LU 2 or LU 3.
- Y+ means yes for files only (not the opsystem area).

The column LU 2/LU 3 means that the contents of LU 2 or LU 3 can be saved or restored. In most cases, restoring LU 2 or LU 3 on-line with a TRK by TRK backup is not recommended or even possible. The file by file utilities will restore files but not opsystem areas. For session systems, the user must also have write-access to LU 2 or LU 3 to restore files. In all cases, LU 2 and LU 3 can be saved on-line and restored off-line (!DSKUP!/DISK!/BCKOF).

There are 2 sets of separate verify programs: VERIFY (which is used by SAVE/RESTOR) and JVERIFY (which is used by older versions of JSAVE/JRSTR). The PSAVE set of programs schedules FORMT or FORMC to verify the disc (which is not a true verify-just a media check).

Compatibility is shown by grouping the related utilities together. The following lists show which utilities are read/write compatible tape formats. All utilities on one line recognize or create compatible records.

```
!DSKUP/SAVE/RESTOR/VERIFY
!DISK/LSAVE/USAVE/RESTR
!BCKOF/PSAVE/PRSTR (!BCKOF also knows !DSKUP and !DISK tapes too).
READT/WRITT
JSAVE/JRSTR/JVERIFY (JRSTR/MFGET will read WRITT tapes too)
READR/SAVER
FC
```

Between M/E/F Series computers and L/A-Series, only two formats are usable:

1. FC (RTE-IV/6) can move FMGR type files between systems on magtape, and Linus tape (RTE-6/VM and L/A-Series only).
2. The FMGR "ST" command (e.g., ST,WELCOM,8) will write data to/from magtapes and CTUs that is 100% RTE-compatible. However, the Linus tapes (CS/80) are treated as discs and "ST" is rejected. Another advantage to "ST" is that it will work with FCOPY on the 3000.

CHOOSING THE RIGHT BACKUP**RTE-II, RTE-III, RTE-IVA AND NON ICD DISC**

If customer has mag tape - Use the on-line SAVE program. Perform a UNIT SAVE for entire discs, LU saves for individual disc LUs. This will create an off-line restore compatible mag tape with track sparing capability.

If customer has no mag tape, but multiple disc drives - Perform an off-line UNIT COPY with track sparing. You will need the system track map (found in system generation listing).

If customer has no mag tape and no multiple disc drives - Use the off-line !DSKUP program. Be sure to use version 1926 or higher. Refer to the section on single disc backup.

CHOOSING THE RIGHT BACKUP (Cont'd)

RTE-IVB AND NON 7900 DISC

If customer has mag tape - Use the on-line LSAVE or USAVE programs.

If customer has no mag tape - Use the off-line !DISC for ICD discs. Otherwise use !DSKUP so that disc copies can be verified. Refer to the section on single disc backup.

Single Disc Backup

A system with a single 7905/06 disc is a not supported system configuration, but never-the-less you will more than likely have to backup such a system.

1. To save the fixed platter (head 2 for 7905, heads 2 & 3 for 7906) insert a scratch cartridge on which to save the subchannels. All defective tracks must have been previously spared using the off-line disc diagnostic or FORMAT utility with RTE-IVB. The cartridge MUST be error free.
2. Load and run the off-line utility !DISK for ICD discs and !DSKUP for other discs.
3. Perform a FROM-TO SAVE, specifying only the actual LU tracks. DO NOT specify the spare track pools. This means that a FROM-TO 0-411 will not work since it may attempt to save spared tracks also. Do this for each LU on the bottom to save the information from the lower platter to the removable pack. Since FROM-TO saves do not do track sparing, the removable platter must be error free. It is suggested to save entire surfaces by just redefining the head number (for a 7906 copy heads 2 and 3 to heads 0 and 1; for a 7905 copy head 2 to head 0 or 1).
4. Now to save the removable cartridge. Insert the system cartridge to be saved. For a 7906 perform a FROM-TO SAVE of heads 0 and 1 (removable) to heads 2 and 3 (fixed). Remove the system cartridge and insert the backup cartridge. Now perform a FROM-TO SAVE to copy the information on the fixed platter back up to the removable cartridge. For a 7905 disc which only has one head on the fixed platter, the copy down and copy up operation to save the removable platter will have to be performed twice.

RTE-6/VM

If a customer has mag tape - Use the PSAVE program.

If the customer has no mag tape - Use the PCOPY program.

PSAVE (SA in off-line mode) saves discs to tape. PRSTR (RE in off-line mode) restores the saved tapes to disc. PCOPY (CO in off-line mode) copies from disc to disc.

If the off-line mode, BCKOF schedules the appropriate utility.

Compatibility:

These utilities replace the ICD/MAC and 7900 backup utilities. Tapes created by PSAVE are not compatible with these utilities, but PRSTR can read ICD/MAC or 7900 utility formats. Also these utilities are not compatible with tapes created by READT/WRITT, READR/SAVER, FC, or other file backup utilities.

You cannot transfer between discs with different track sizes unless you use utility FC to transfer the files individually or in groups, rather than track-by-track (on-line only).



IBCKOF/PSAVE/PRSTR

Disc Drive Source Destination Compability

Source	Destination						
	7900	7905	7906	7910	7920	7925	CS/80
7900	O.K.	*	*	N/A	*	N/A	+
7905	*	O.K.	O.K.	N/A	O.K.	N/A	+
7906	*	*	O.K.	N/A	O.K.	N/A	+
7910	N/A	N/A	N/A	O.K.	N/A	N/A	+
7920	*	*	*	N/A	O.K.	N/A	+
7925	N/A	N/A	N/A	N/A	N/A	O.K.	+
CS/80	+	+	+	+	+	+	O.K.

CS/80 Discs include the 7908, 7911, 7912, 7914 and 7933.

N/A Not available.

- * If restore is off-line, you must supply subchannel definition.
- + Logical track sizes for the CS/80 sealed discs have been set at 96 sectors per track. This is variable, so any CS/80 source can go to any CS/80 destination off-line. On-line operations use the current subchannel definitions.

TRACK SPARING

RTE-IVB/RTE-6/VM

Use the on-line program FORMT. This can only be run on RTE-IVB, revision 2001 or later. FORMT cannot be loaded or run on any other operating system or earlier revision code due to driver changes. Load the program as follows:

RTE-IVB	RTE-6/VM
:RU,LOADER	:RU,LOADER
/LOADR: SZ,17 (override program size req.)	/LOADR: SZ,18
/LOADR: LI,\$DSCLB (utility library)	/LOADR: RE,&FORMT
/LOADR: RE,%FORMT (search)	/LOADR: SE,\$DSCLB
/LOADR: END	/LOADR: END

CAUTION

No other program should access the disc LU which is being used by format. The INITIALIZE and SPARE tasks lock all disc drives with the game EQT as the disc LU being accessed for both MAC and ICD discs. Therefore, the system's performance is downgraded during execution of FORMTs "IN" tasks. Since "SP" takes place very quickly, sparing a track should present no particular problem.

The run command string to format a 9885 floppy is:

```
:RU,FORMT,log lu,FO,disc lu,n
```

using n as the fill sector value (0-28). A fill value of n=1 is recommended. The run command string to initialize a hard disc is:

```
:RU,FORMT,log lu,IN,disc lu
```

TRACK SPARING (Cont'd)

RTE-IVB/RTE-6/VM

The run command string to spare a bad track, where "track" is the logical bad track number within the disc LU, is:

```
:RU,FORMAT,log lu,SP,disc lu,track
```

where:

```
log lu = LU of the terminal being used interactively by the program FORMAT.
         Default is the user terminal.
disc lu = LU of the disc (a positive integer). With session monitor, the disc
         LU must be previously BEFORE in our SST. For initializing, it cannot
         be LU 2 or LU 3.
```

The program can also be run interactively (this is recommended mode). To run FORMAT interactively, enter RU,FORMAT and the program will prompt for the task you want to perform.

TASK?

Type one of the following:

```
SP (spare a track - hard disc only)
IN (initialize - hard disc only)
FO (format a floppy - floppy disc only)
EN (end)
?? (prints a list of all valid responses)
```

Typing EN, /E, or EX terminates FORMAT.

INITIALIZE AN LU

The initialization process prepares an ICD or MAC hard disc cartridge LU for use. The previous contents of the disc are overwritten with a pattern of all zeroes. Bad tracks are spared to the spare pool at the end of the disc cartridge LU. The disc must have been previously formatted. The directory track will be overwritten, therefore the following steps are recommended.

1. The disc LU must be defined in your SST.
2. Dismount the disc LU (FMGR DC,<LU>,RR command) and make sure no one is using the same LU. This can be verified using the CLAL command.
3. Invoke the initialization function which writes zeroes on the disc LU using the IN command. (Use the FO command for flexible discs.)
4. After initialization, the disc LU must be mounted with the complete FMGR MC command. For complete command field definitions, refer to the Terminal User's Guide, or the RTE-IVB Quick Reference Guide. For all default values, use MC,<LU,,,,,<cr>.

SPARE A TRACK

Sparing applies to individual tracks discovered while the disc is in use (i.e., reported by RTE-IVB, RTE-6/VM, or when running Format with the VErify option). A spare track is substituted for the defective track and as much data copies from the bad track as possible. Offset head reads are used in the recovery process and it is often possible to completely recover the data. In cases where this is not possible, usually only a single block will be lost.

TRACK SPARING (Cont'd)

RTE-IVB/RTE-6/VM

After inputting an invalid parameter and/or in the interactive mode, FORMT asks:

TRACK TO BE SPARED?

Entering ?? to the query returns to you the track range for the LU. Then enter the track (logical track) found defective on the disc LU. If the track number of a good track is entered, it will be spared also and will use up a spare track unnecessarily. If the track does not lie within the bounds of the disc LU specified, the messages are displayed.

INVALID TRACK #

ENTER BAD TRACK #X - XXXX

The program copies data block by block from the bad track to the spared track. If all the information on the track cannot be recovered, the following warning message is issued and FORMT continues:

WARNING! ALL INFORMATION ON TRACK NOT SUCCESSFULLY RECOVERED

NOTE

Due to the complex procedure used to attempt recovery, sparing one track can take up to 3 minutes. However, if data recovery is at all possible, it will be performed.

RTE-II, RTE-III, RTE-IVA

The fastest way to spare a bad track under RTE 2,3,4A systems is to use !DSKUP off-line to perform an LU copy to itself. (Note: Some early versions of !DSKUP (pre-1940) required the "D" bit to be set. Current versions normally spare a track when it has a track map and finds the destination track cannot be written to successfully.)

To perform an LU copy to itself, the task is a UNIT copy with track sparing. The UNIT (in this case) will be defined with just one LU. Only 4 values are needed: number of tracks, starting cylinder number, starting head number, and number of surfaces. This is the same data needed for the system generation and should be copied directly from the current system generation listing. The source unit (drive number) and the destination unit will be the same and ALWAYS verify. (You need specify only the one disc subchannel or LU and then enter "/E".) If a bad track without "D" bit is encountered, the utility will ask about continuing. Answer YES. Otherwise, the spare track message is issued automatically. The verify pass will indicate the sparing was done correctly. If the !DSKUP program will not spare the track, use the disc diagnostic to set the "D" bit and then run !DSKUP to spare the track. Although the diagnostic could be used to spare a track, too, it is too complex to be considered a reliable method.

NOTE

The data from the defective track is not saved in the spare track! Also, the !DSKUP program has no way of knowing the size of the spare track area. If only 5 spares are available, but 9 tracks were spared, the data on the next LU will be lost. Typical error counts for 7905/7906 disc platters is 5-10 bad tracks for 2 heads. Any more than this indicates a disc, head or media problem. Do not jump into spare tracks until it is confirmed that only a couple of tracks need sparing.

SAVE, RESTORE, COPY, VERIFY

ON-LINE DISC BACKUP UTILITY PROGRAMS FOR 7900, 7905/06/20/25 MAC
DISCS USING THE 13037B/C DISC CONTROLLER

These programs are supported with the following hardware:

- * 7900 Disc Drives (disc driver DVR31)
- * 7905/06/20/25 Disc Drives (13037 MAC disc controller, disc driver DVR32)
- * 7970 (9 track) magnetic tape
- * Consoles using DVR00 or DVR05 (264X, 262X)

Any kind of on-line save can be restored off-line. The table below shows the permitted save-restore combinations. Data saved off-line cannot be restored on-line. If such a restore is attempted, the utility prints OFF-LINE SAVE, CANNOT BE RESTORED ON-LINE and aborts. Verify is run interactively from SAVE, RESTORE and COPY.

NOTE

Older versions (pre 1926) could not save 7925 discs. It is not possible to copy data from a 7925 disc to a non-7925 disc with these utilities. Only a file-oriented (not track-oriented) utility can be used due to track size differences.

You can perform either UNIT or LU transfers on-line by running SAVE, RESTORE, or COPY. Because the transfer of data is done in a logical mode (on-line, under RTE), the formats of the source and destination disc types do not have to be the same. This is not true of off-line transfers. You transfer data between devices using the programs listed in the On-line Data Transfer Program table below.

CAUTION

If you want an exact duplicate of a disc from an on-line transfer, you must run the utilities while there is no other system activity affecting the disc. The utility programs do not check if anyone else is using the disc concurrently. For example, if an open FILE MANAGER is saved, it will be open when restored.

SAVE,RESTORE,COPY,VERIFY (Cont.)

7900/MAC DISC UTILITY APPLICATIONS

MODE FUNCTION TYPE	ON-LINE	OFF-LINE
SAVE LU	Saves all tracks on one sub-channel (not just FMGR files). Off-line restore will do track sparing.	Not available
SAVE UNIT	No need for track map table information if track sparing. If you restore off-line you can get track sparing.	Can define track map table with any # of subchannels (like multiple LU saves). Can get sparing.
SAVE FR-TO	Not available	Saves all tracks within specified bounds. Bounds need not fall at subchannel divisions.
RESTORE LU	Restore all tracks on one subchannel without shutting down system.	On-line LU save can be restored off-line. Track sparing is done.
RESTORE UNIT	For peripheral disc units (not LU 2 or LU 3) you can restore without shutting down system.	Only way to restore a UNIT save containing LU2 or LU3. On-line UNIT save can be restored off-line to get track sparing.
RESTORE FR-TO	Not available	Restore tracks designated by FR-TO save.
COPY LU	For fast backup of disc LUs if no magnetic tape unit is available.	Not available
COPY UNIT	Backup with multiple disc drives if no magnetic tape unit is available.	Disc unit backup with multiple disc drives if no magnetic tape unit is available. Also to initialize cartridges with track sparing (disc diagnostics must be performed prior to this utility to insure successful initialization).
COPY FR-TO	Not available	For disc backup (see on-line LU copy).

SAVE,RESTORE,COPY,VERIFY (Cont.)**7900/MAC SAVE-RESTORE COMBINATIONS**

RESTORE SAVE	ON-LINE		OFF-LINE
	LU	UNIT	
On-Line LU	X		X
On-Line Unit		X	X
Off-Line Unit			X
Off-Line FROM-TO			X

7900/MAC ON-LINE DATA TRANSFER PROGRAMS

DESTINATION SOURCE	7900	7905,7906,7920	7925	TAPE
7900	COPY	COPY	COPY*	SAVE
7905 7906 7920	COPY	COPY	COPY*	SAVE
7925	NA	NA	COPY	SAVE
MAGNETIC TAPE				
SAVE OF 7900	RSTOR	RSTOR	RSTOR*	
SAVE OF 7905 7906	RSTOR	RSTOR	RSTOR*	
7920				
SAVE OF 7925	NA	NA	RSTOR	
NA - Not allowed				
* Only 6144 words per track transferred				

The on-line utility programs are distributed to customers as four relocatable programs and a library of relocatable subroutines as part of the grandfather disc. The utilities can be loaded either during system generation or by the LOADR.

When you load the disc backup utility programs into an RTE-IVA/B system during generation or on-line using the LOADR, you must override the size and increase the partition size as follows:

Program	File Name	2048 word buffer	track size buffer
SAVE	%SAVE	8 pages	14 pages
RSTOR	%RSTOR	8 pages	15 pages
COPY	%COPY	8 pages	14 pages
VERFY	%VERFY	8 pages	20 pages

When you load the backup utilities into a RTE-III system during generation or on-line using the LOADR, you must override the program size and increase the partition size as follows:

Program	2048 word buffer	6144 word buffer
SAVE	8 pages	11 pages
RSTOR	8 pages	12 pages
COPY	8 pages	11 pages
VERFY	8 pages	15 pages

SAVE.RESTORE.COPY.VERIFY (Cont.)

For RTE-II systems, the minimum background area is 5600 words for SAVE and COPY, and 6300 words for RSTOR. Add 4100 words for a 6144 word buffer without verify. For 6144 word buffer with verify, the minimum background area is 13400 for all three utilities.

RTE-II/III LOADING

When using the loader, move the utility program to the LG area and run LOADR. For RTE-III, the program sizes given above must be specified in the runstring ("fmt", parameter 4) of the RU,LOADR command. If the library %DBKLB was not generated into the system, the loader will suspend itself. To satisfy the undefined externals, move the on-line utility library %DBKLB (part no. 92060-16043) into the LG area by using GO, LOADR with options (GO,LOADR,2,,1 is recommended).

RTE-IVA/B LOADING

For loading the utilities under RTE-IV, proceed as follows:

```
:RU,LOADR
/LOADR: SZ,xx      xx = size override (see previous tables)
/LOADR: LI,%DBKLB  Library to be searched by loader
/LOADR: RE,%xxxxx  xxxxx = Program to be loaded
/LOADR: END
```

SAVE

To run the save utility, use the RU or ON command. For example:

```
RU,SAVE,console,type,source,destination [,disc]
```

where:

```
console    = logical unit number (LU) for operator console. Default is 1 or
             the LU provided by the multi-terminal monitor.
type       = type of save: 0 for LU save (default), 1 for UNIT save.
source     = for LU save this is the source subchannel LU (no default) for
             UNIT save this is the source disc drive unit (default is 0).
destination = destination mag tape LU. Default is 8.
disc       = source disc type (UNIT save only). Input 7900, 7905, 7906, 7920,
             or 7925.
```

If a parameter is not acceptable, SAVE prints an appropriate error message and asks for a new value. The first question the program asks is whether you want a 6144 word buffer. If there is adequate room, SAVE asks if you want verification. The utility prompts for a file ID (a 72 character string written on the mag tape's header record) and the file number where the information is to be stored (a number from 1 to 8). The program then performs the operations you specified, printing a STOP message when done.

SAVE.RESTORE.COPY.VERIFY (Cont.)**RESTORE**

To run the RESTORE utility, use the RU or ON as follows:

```
RU,RSTOR,console,type,source,destination [,disc]
```

where:

```
console    = operator console LU. Default is 1 or the LU provided by the
             multi-terminal monitor.
type       = type of restore: 0 for LU restore (default), 1 for UNIT restore.
             Must match type of save.
source     = source mag tape LU. Default is 8.
destination = for a LU restore this is the subchannel LU (no default) for a
             UNIT restore this is the destination disc drive unit (default =
             0).
```

If a parameter is not acceptable, RSTOR prints an appropriate error message and asks for a new value. The first question the restore program asks is the file number (1 to 8) on your mag tape. After you enter the number, the program prints the file ID of that file and asks if it is the correct one. If you answer no, RSTOR suspends itself so you can mount another tape. After restarting the program with GO,RSTOR, you are asked for the file number again. Once the correct file is found, you are asked whether you want the data verified. If the type of restore does not match the type of save (recorded in the tape file's header record), RSTOR aborts. Otherwise program restores the data and prints a stop message when it is done.

LU 2 or LU 3 may only be restored off-line. If the source is too large, the RSTOR will not be done and an error message is printed. If the source LU was smaller than the destination LU, the directory tracks will not be moved. This means the restored disc cannot be mounted in the normal manner (see MC command in the FMGR manuals).

COPY

To run the copy utility use the RU or ON commands as follows:

```
RU,COPY,console,type,source,destination
```

where:

```
copy       = operator console LU. Default is 1 or the LU provided by the
             multi-terminal monitor.
type       = type of copy: 0 for LU copy (default), 1 for UNIT copy.
source     = for a LU copy this is the source LU (no default) for a UNIT copy
             this is the source disc drive unit (default = 0).
destination = for a LU copy this is the destination LU (no default) for a UNIT
             copy this is the destination disc drive unit (default = 0).
```

If a parameter is not acceptable, COPY prints an appropriate error and asks for a new value. The first question the program asks is whether you want a 6144 word buffer. If there is adequate room, the program asks if you want verification. If you specified an LU copy, you are asked the types of the source and destination discs. If the disc track maps are compatible and you are not writing on system discs (LU 2 or LU 3), the operations are performed and a stop message is printed. Unless the disc LUs are exactly the same size, the user must mount the copied disc LU in a special manner if it contains a disc directory (see the MC command in the Terminal User's Guide).

SAVE.RESTORE.COPY.VERIFY (Cont.)

ERROR MESSAGES

MESSAGE	MEANING AND ACTION
PARTITION SIZE TOO SMALL	The partition in which the utility program is running cannot hold a 2048 word buffer. The program's partition size must be 8 pages or more for SAVE, COPY, and RSTOR. The program is aborted.
WARNING-PARTITION SIZE TO SMALL FOR VERIFY W/6144 WORD BUF	The partition in which the utility program is running cannot hold two 6144 word buffers. If you want to verify your data, do not specify the large buffer.
FOLLOWING DISC LU# IMPROPER, ENTER AGAIN	The logical unit number specified is invalid; it does not belong to a valid disc type. Enter the correct disc LU#.
FOLLOWING DISC DRIVE# IMPROPER, ENTER AGAIN	The disc drive (unit number) is invalid. For 7900 discs, enter a number between 0 and 3. For discs other than 7900 enter a number between 0 and 7.
FOLLOWING DISC TYPE IMPROPER, ENTER AGAIN	Invalid disc type specification. Enter 7900, 7905, 7906, 7920, 7925.
IMPROPER MT LU#, LU#=?	The mag tape logical unit number is invalid. Enter a new value.
NO WRITE RING, WRITE ENABLE MT	The write ring is missing from the mag tape during a save operation. Put the write ring on and restart the utility with the GO command.
IMPROPER FILE#	The mag tape file number is not between 1 and 8. Enter a new value.
FILE NOT FOUND	The file number specified is greater than the number of files on the mag tape. Mount another tape, if necessary, and restart the utility with the GO command. Specify the correct file number.
EOT REACHED, MOUNT NEW TAPE	The entire mag tape has been read. Mount the next tape and restart the utility with the GO command.
FOLLOWING TRACK MAP TBL NOT FOUND	The entry point for the table describing the track map information (\$TB31 for 7900 and \$TB32 for other than 7900) for the source or destination disc unit cannot be found. The utility is aborted (system generation problem).
ASSIGN LU# TO FOLLOWING SUBCHNL	The indicated subchannel is defined in the track map table but is not assigned an LU number. Assign an LU number with the LU command and restart the utility with the GO command.
SOURCE & DEST TRACK MAP INFO NOT COMPATIBLE	One of the conditions described under Format Compatibility is not satisfied. Destination disc LU is too small or wrong type.

SAVE.RESTORE.COPY.VERIFY (Cont.)

ERROR MESSAGES (Cont.)

MESSAGE	MEANING AND ACTION
SAVE TYPE NOT SAME AS RESTORE TYPE	The type of restore is not the same as the type of save recorded in the file's header record. RSTOR is aborted. Usually the tape is not a standard save tape.
OFF-LINE SAVE, CANNOT BE RESTORED ON-LINE	The data was saved off-line and cannot be restored on-line. RSTOR is aborted.
DEST SUBCHNL IS LU2 OR LU3	Logical unit 2 or 3 is the destination sub-channel for an LU restore or copy operation or is the destination subchannel for a unit copy or restore operation. The utility is aborted.
WARNING-WRITING ON PROTECTED TRACKS	RSTOR or COPY is writing on protected tracks. This can be ignored if the disc format switch is on. (If it is off, the protected tracks are not restored.) It means that the disc at one time had another operating system on those tracks. Data is restored without problems if the format switch is on.
DISC ERROR AT FOLLOWING TRCK & LU#	The number of words actually transferred is not equal to the number of words requested to be or transferred to or from the disc (usually a hardware failure). The utility is aborted.
SAVE WAITING FOR MT LU LOCK RSTOR WAITING FOR MT LU LOCK	SAVE or RSTOR is waiting to lock the mag tape LU. Operation will continue when the mag tape LU is locked (check WHZAT for someone else using the mag tape).
MISSING REC FOR FOLLOWING TRCK & LU#	During a restore operation a record was missing on mag tape. Records are sequentially recorded. A record was not in order (hardware error or an invalid save).
WARNING-VERIFY NOT DEFINED OR PARTITION SIZE TOO SMALL	The verify programs not defined or its partition is not large enough. VERIFY must be RP'ed or otherwise have an active ID segment, otherwise, no verify is done.
VERIFY ERROR AT TRACK ttt & LU11	Data read from or written to the given track location does not verify. The utility continues.
IMPROPER TRCK MAP INFO	Subchannels for source or destination disc unit not defined in the track map table. The utility is aborted.
SAVE ABORTED RSTOR ABORTED COPY ABORTED	The utility program has been aborted because of one of the conditions listed above.
??	Carriage return prior to input or input device has timed-out waiting for a response. Re-enter input.

LSAVE, USAVE, RESTR, LCOPY**LOADING THE ON-LINE UTILITIES**

To load, the 2 libraries needed must be specified in this manner:

```
:RU,LOADR
/LOADR: LI,$DKULB
/LOADR: LI,$DSCLB
/LOADR: SZ,nn
/LOADR: re,%xxxxx
/LOADR: END
```

where nn is the page size increase and xxxxx is the program name. The size requirements for the on-line utility programs are:

```
LSAVE 17 pages
USAVE 17 pages
RESTR 16 pages
LCOPY 14 pages
```

MAG TAPE INFORMATION

The on-line saves and restore perform their operations starting at the current tape position. The tape is not rewound before or after a save or restore so you can save more than one LU or subchannel per mag tape. Use the FMGR command CN to position the mag tape.

When using the verify option with USAVE or LSAVE, the mag tape EQT should have a time-out value of zero to indicate no time-out. This will allow enough time to backspace a large file.

LSAVE

LSAVE is used to save on disc LU or subchannel onto mag tape. The RUN command format for LSAVE follows (if optional parameters are omitted, commas must be used as place holders):

```
:RU,LSAVE,log lu,disc lu,mt lu,VE,title
```

where:

```
log lu  = LU of the device where messages are sent. Optional parameter,
         default is the session LU of your terminal.
disc lu  = positive LU of the disc subchannel to be saved. Under Session
         Monitor, the disc LU must be in your SST (session switch table).
mt lu    = LU of the mag tape drive. Optional parameter, default = 8.
VE       = to verify the tape file after a save, enter VE to verify; NO for no
         verify. (Optional parameter: default=NO. Recommend that a VE is
         always entered.)
title    = Up to 40 characters of label information stored in the tape header,
         to identify the tape file. The utility also places the date and
         runstring preceding the title in the header for additional
         identification. Optional parameter, no default.
```

To have the program prompt you for the parameters, just enter "RU,LSAVE". Enter a valid response to each question or a SPACE and RETURN to take the default value. To stop the program enter /E, EN, or EX in response to a program question. This is recommended since comma counting can be error prone.

When the program has completed, it will print the number of tracks saved on the logical device.

LSAVE,USAVE,RESTR,LCOPY (Cont.)



USAVE

USAVE saves all of the subchannels associated with a disc unit (disc drive). The save is done according to the track map table currently defined in the system. The data is saved starting at the current tape position and the tape is not rewound before or after the save.

The RUN command format for USAVE is as follows (if optional parameters are omitted, commas must be used as place holders):

```
:RU,USAVE,log lu,disc lu,mt lu,VE,title
```

where:

```
loglu    = LU of the device where messages are sent. Optional parameter,
           default is the session LU of your terminal.
disc lu   = LU of any disc subchannel on the unit to be saved. USAVE will
           search the track map table and save all subchannels on the same unit
           as the LU given. The LU must be available to the user (in SST with
           Session Monitor).
mt lu     = LU of the mag tape drive. Optional parameter, default=8.
VE        = Verify the tape file after the save. Enter VE to verify; NO for no
           verify. (Optional parameter: default=NO. Verify is always
           recommended.)
title     = Up to 40 characters of information are stored in the tape header to
           identify the tape file. The utility appends this information to the
           date and the runstring in the tape header for identification.
```

To have the program prompt you for the parameters just enter "RU,USAVE". Enter a valid response to each question or a SPACE and RETURN to take the default value. To stop the program enter /E, EN, or EX in response to any program question. When the program has completed, it will print the number of tracks saved from each LU of the disc unit. Interactive mode is recommended since comma counting can be error prone.

RESTR

RESTR returns data saved on mag tape by USAVE or LSAVE to disc. RTE will not permit you to restore the system disc (LU 2 or LU 3). If LU 2 or LU 3 are included on a USAVE file, RESTR will skip LU 2 or LU3 and continue restoring the remaining subchannels.

Track sparing and initialization will not be performed. Use FORMT, revision 2001 or later.

The RUN command format for RESTR is as follows. If optional parameters are omitted, commas must be used as place holders.

```
:RU,RESTR,log lu,disc lu,mt lu,DE
```

where:

```
log lu    = LU of the device where messages are sent. Optional parameter
           default is the session LU of your terminal.
disc lu    = Destination disc LU of the restore. If the file being restored was
           saved with LSAVE, RESTR will restore the tape file to this disc LU.
           If the tape file was saved with USAVE, the track map table of the
           current system must match the track map table of the USAVE system as
           recorded in the tape header. In restoring either a USAVE tape file
           or a LSAVE tape file, the disc being restored must have the same
           track size (words per track) as the source save disc.
mt lu      = LU of the mag tape drive. Optional parameter, default=8.
DE         = Do not confirm the mag tape header. The program will list the tape
           file header and restore the disc LU or unit without further operator
           intervention (primarily for batch operation).
```

LSAVE,USAVE,RESTR,LCOPY (Cont.)**RESTR**

If the DE option is not specified, the program lists the tape file header and asks for confirmation (recommended):

The response may be:

```

YE[S]      - restore the mag tape file to the disc.
NO         - move the tape forward to the next file,
            print it's header, and ask to continue.
EN,/E, or EX - stop the program.

```

Enter /E, EN, or EX to any question to stop the program.

If the source LU on the tape file has more or less tracks than the destination LU, the program prints the decimal track sizes to your terminal:

```

xxxx TRACKS IN SOURCE LU
yyyy TRACKS IN DEST. LU
OK TO PROCEED?

```

If you enter "YES", the program copies tracks until it has restored the last track of the destination LU or the last track of the source file LU, whichever is smaller.

CAUTION

When restoring a disc LU with FMGR files and directory track(s), be careful if you try to restore a disc LU with less tracks than the source LU. The directory track may not be copied (the disc could not be mounted). Conversely, to restore to a disc LU with more tracks, you must do a complete FMGR MC command (by specifying the actual last track as restored) to recover the valid directory. In the MC command, specify the last track number restored from the source disc LU. This must be done every time that the restored LU is mounted.

LCOPY

LCOPY can copy one disc LU to another disc LU. The source and destination LU may or may not be subchannels at the same disc unit but the source and destination track size (words per track) must be the same.

Track sparing and initialization are not performed on-line. Use FORMT, revision 2001 or later.

The RUN command format for LCOPY is as follows:

```
:RU,LCOPY,source disc LU,destination disc LU
```

where:

```

source disc LU      = LU of the disc subchannel to copy from
destination disc LU = LU of the disc subchannel to copy to (cannot be LU 2 or
                    LU 3).

```

All parameters are required in the runstring. There are no defaults. Messages are always output to your terminal. LU 2 or LU 3 may be source disc LUs but never destination LUs.

LSAVE,USAVE,RESTR,LCOPY (Cont.)

LCOPY

If the source LU has more or fewer tracks than the destination LU, the program prints the decimal track sizes to your terminal.

```
xxxx TRACKS IN DEST LU
yyyy TRACKS IN SOURCE LU
OK TO PROCEED?
```

If you enter Yes, the program copies tracks until it has copied the last track of the source LU or has copied to the last track of the destination LU, whichever LU is smaller.

CAUTION

When restoring a disc LU with FMGR files and directory track(s), be careful if you try to restore a disc LU with less tracks than the source LU. The directory track may not be copied (the disc could not be mounted). Conversely, to restore to a disc LU with more tracks, you must do a complete FMGR MC command (by specifying the actual last track as restored) to recover the valid directory. In the MC command, specify the last track number restored from the source disc LU. This must be done every time that the restored LU is mounted.

ERROR MESSAGES

MESSAGE	MEANING AND ACTION								
BAD TRACK AT:	<table><tr><th>TRACK #</th><th>CYL</th><th>HEAD</th><th>UNIT/ADDR</th></tr><tr><td>xxxx</td><td>cccc</td><td>hhhh</td><td>uuuu</td></tr></table> The track is defective or ten tries have been made to read or write without success. Program continues operation. Off-line restore and copy will spare bad tracks automatically. The FORMT utility may also be used to spare bad tracks.	TRACK #	CYL	HEAD	UNIT/ADDR	xxxx	cccc	hhhh	uuuu
TRACK #	CYL	HEAD	UNIT/ADDR						
xxxx	cccc	hhhh	uuuu						
CANNOT RESTORE TO LU2 OR LU3	Attempt to restore LU 2 or LU 3 is not allowed. Program stops.								
ILLEGAL DISC LU	LU specified for disc does not belong to a valid disc type or is not in your SST. Re-enter the number.								
ILLEGAL MT LU	LU specified for MT does not belong to a valid MT device type or is not specified in your SST. Re-enter the number.								
ILLEGAL VERIFY PARAMETER-DEFAULT TO NO VERIFY	The verify parameter is valid, program assumes no verify and continues operation.								
MAG TAPE DOWN	The LU for the MT indicates "DOWN" status. Up the EQT for the LU.								
MAG TAPE OFF LINE	The mag tape unit is off-line. Re-run the program program when the tape is ready.								
MT LU LOCKED	The mag tape LU is locked to another program. Program stops.								
MT PARITY ERROR	Program encounters parity error from the mag tape. Program stops.								

LSAVE,USAVE,RESTR,LCOPY (Cont.)

ERROR MESSAGES

MESSAGE	MEANING AND ACTION
MT XMIT ERROR	The number of words transferred to or from the MT is zero. Check the EQT, driver and select code and restart the program.
TAPE EOF ILLEGAL	Program reaches end-of-tape on mag tape unexpectedly on a RESTORE operation. Program stops.
TAPE FORMAT ERROR	Header information in the mag tape does not match the expected format (possibly wrong tape is mounted).
TRACK MAP TABLES DO NOT MATCH	For on-line UNIT restore operation, the track map table saved in MT header must match the one in the current system. Program stops.
TRACK SIZES NOT EQUAL	Copy or restore to a disc with different track size (words per track) as the source disc is not allowed. Program stops.
SEEK ERROR	Hardware disc seek check error occurs. Program continues operation. Insure that the track map table matches the disc model and the UNIT/address.
WRITE RING MISSING	The write ring is missing from the mag tape during a SAVE operation. Put the write ring on and re-run the program.
WRITING ON PROTECTED TRACKS	On-line restore program encounters a track that is protected. Program continues operation although tracks will not be restored on the disc (if the format switch is off). This may occur when restoring to an old previously used disc pack where another Op System used to reside.
VERIFY DATA ERROR-TRK X	An error has occurred while verifying on logical track number X.

PSAVE, PRSTR, PCOPY

The on-line utility programs PSAVE, PRSTR, and PCOPY run under RTE-6/VM. Each can be run interactively. PSAVE does not lock the cartridge during the save operation. To restore a disc on-line, dismount all LUs on it. LU 2 and LU 3 cannot be dismounted and will be skipped in restoration. The environment and disc drives supported are the same as for WRITT and READT.

The on-line utilities %PSAVE, %PRSTR, and %PCOPY are loaded interactively as:

```
:RU,LOADR
/LOADR: FM,CP      !format current page links
/LOADR: OP,LE      !load program as large background
/LOADR: SZ,27
/LOADR: RE,%COMM
/LOADR: RE,%PSAVE  !load PSAVE, or
/LOADR: RE,%PRSTR  !load PRSTR, or
/LOADR: RE,%PCOPY  !load PCOPY
/LOADR: RE,$ONLIN  !load routine to resolve references needed
                    !only in off-line utility
/LOADR: SE,$BCKUP  !load system-independent physical backup
                    !library relocatable modules
/LOADR: SE,$DTCLB  !load CS/80 disc library relocatable modules
/LOADR: SE,$PLIB   !load Pascal library relocatable modules
/LOADR: SE         !search system libraries to assure that
                    !$BEGGT is relocated last
/LOADR: RE,$BEGGT  !this set of routines should be relocated
                    !last, as it can be overlaid for use as
                    !an I/O buffer

/LOADR: /E
```

The PSPAR utility, scheduled by PRSTR and PCOPY when the VErify option is selected, is loaded as:

```
:RU,LOADR
/LOADR: FM,CP
/LOADR: OP,LE
/LOADR: SZ,20
/LOADR: RE,%COMM
/LOADR: RE,%PSPAR
/LOADR: RE,$ONLIN
/LOADR: SE,$BCKUP
/LOADR: SE,$DTCLB
/LOADR: SE,$PLIB
/LOADR: /E
```

You can also use the LOADR command files #PSAVE, #PRSTR, #PCOPY, and #PSPAR to load the physical backup utilities into memory and then use the SP command to place them on any disc LU. The program LINK or LOADR can be used to load the utilities.

PSAVE

PSAVE saves one disc LU, a group of disc LUs or an entire disc unit to tape transports or tape cartridges. As an option, you can save an entire disc unit in CS/80 pushbutton-restorable format.

```
[RU,]PSAVE[,input[,srceLU[,destLU[,file#[,opts[,hcpy[,title]]]]]]]
```

where:

- input - is the LU (or file) from which the parameter inputs are to be read.
- srceLU - is the LU of the disc subchannel to be saved. If the UN (unit save) option is specified, the srce LU parameter is a target to the unit and may be any LU on the disc. If the MU (multiple save) option is specified, this parameter is meaningless and will be ignored. In any other case, this is a required parameter.

PSAVE, PRSTR, PCOPY (Cont'd)**PSAVE**

- destLU** - is the LU of the tape transport or tape cartridge to receive the saved data.
- file#** - is the integer number to be assigned to the saved file. This parameter specifies the start location on the tape for the save. Before writing, file# - 1 tape files are skipped from the start of the tape. The default is to the current tape position for tape transports or file #1 for CS/80 cartridges.
- opts** - are any of the following two-character ASCII option codes:
- VE** Turn on verify option. Track sparing is done only when the verify option is specified.
 - LU** Save is to be an LU save.
 - UN** Save is to be a disc unit save. The source LU parameter can be any LU on the disc unit.
 - FB** Unit save in CS/80 pushbutton-restorable format. The destination LU must be a CS/80 cartridge, and the source LU must be a CS/80 disc. PSPAR must be loaded into memory for this option.
 - MU** Multiple LU saves in one pass. The source LU parameter should be omitted; PSAVE will prompt for the source LUs. All LUs must be from the same class of discs, such as all MAC disc LUs.
- hcpy** - is the LU of the device on which information about the save is to be printed as a record of the save operation. The default is to your log device.
- title** - is the title (to a maximum of 40 ASCII characters) that will be placed in the tape header.

If you enter at least one parameter in the runstring, PSAVE defaults all optional parameters and prompts you for all required parameters not included in the runstring.

PRSTR**NOTE**

When restoring tapes saved using the ICD/MAC or 7900 utilities, be aware that the USAVE and SAVE UNIT utilities store a disc unit as a single tape file. These unit saves are therefore not selectively restorable; efforts to position the tape beyond the start of the save will fail.

PRSTR restores a single subchannel LU, a group of LUs, an entire disc drive unit, or selected files from a tape transport or tape cartridge previously saved by PSAVE. This utility also can be used to read tapes written in SAVE, LSAVE, and USAVE formats. When the verify option is selected, PRSTR spares the destination disc tracks in a prepass over the disc before data is written. (Sparing is not done for 7900 discs.)

Invoke PRSTR with the runstring:

```
[RU,]PRSTR[,input[,destLU[,srcLU[,file#[,opts[,hcpy]]]]]]
```

where:

input - is the LU (or file) from which the parameter inputs are to be read.

PSAVE, PRSTR, PCOPY (Cont'd)

PRSTR

destLU - is the LU of the disc subchannel on which the data is to be restored. If the UN (unit save) option is specified, the LU is a target and may be any LU on the disc. If the selective restore (SE) option is specified, this parameter must be omitted. In all other cases, the parameter is required.

srceLU - is the LU of the tape transport or CS/80 cartridge from which the save file is to be read.

file# - is the integer number of the file to be read. File# - 1 files will be skipped on the tape before the read begins. Default is to the current tape position for tape transports, or file #1 for CS/80 cartridges.

opts - are any of the following two-character ASCII option codes:

- VE Turn on data verify option. PRSTR also spares the destination disc tracks in a prepass over the disc before data is written. PSPAR must be loaded into memory for this option.
- DE Do not prompt for verification of tape file header. Do not prompt for OK TO CONTINUE? when disc source and destination sizes do not match. (PRSTR will continue with the restore.)
- UN Unit restore. This is the default if the tape is a unit save or a from-to save. (Note that from-to saves performed using !DSKUN must use the UN option to restore the save.)
- LU LU restore. This is the default if the tape is an LU or MU save.
- SE Selective restore from a unit save, or multiple LU restores in one pass. If this option is selected, the destination LU parameter must be omitted; PSAVE will prompt for the file:LU pairs. Not valid for a unit save in pushbutton-restorable format or a unit save in formats other than those created by PSAVE. All LUs must be of the same disc class.
- PB Unit save in CS/80 pushbutton-restorable format. PSPAR must be loaded into memory for this option.

hcpy - is the LU of the device on which information about the restore is to be printed. The default is to your log device.

If you enter at least one parameter in the runstring (beyond the input parameter), PRSTR defaults all of the optional parameters and prompts for the remaining required parameters not included in the runstring.

If the SE option is selected, PRSTR prompts with the message

ENTER FILE:LU PAIRS

and waits for you to enter the file number and destination LU.

PSAVE, PRSTR, PCOPY (Cont'd)**PCOPY**

The utility PCOPY allows you to execute a fast disc-to-disc copy operation. The source and destination disc LUs need not be on the same disc unit, but they must have the same track size. (Note, however, that CS/80 tracks are logical tracks, not physical tracks; thus a CS/80 to CS/80 copy is valid regardless of the physical track size, as long as the logical track sizes are identical.)

Invoke PCOPY with the runstring

```
[RU,]PCOPY[,input],srceLU,destLU[,VE[,hcpy]]
```

where:

- input - is the LU (or file from which the parameter inputs are to be read. If input is from a file or a non-interactive device, no other parameters may be specified in the runstring. The default is to be the log device.
- srceLU - is the LU of the disc subchannel to be copied.
- destLU - is the LU of the disc subchannel to which the data is to be copied.
- VE - is the verify option. When this option is selected, PCOPY spares the destination subchannel tracks in a prepass over the disc before data is written. The default is to suppress verify. PSPAR must be loaded into memory for this option.
- hcpy - is the LU of the device on which the read or verify errors are logged. The default is to the log device.

WRITT, READT

WRITT and READT operate in the following environments only:

RTE-IVB and RTE-6/VM Operating System

- * ICD (Integrated Controller Disc) - HP Models 9895 (flexible disc), 7906H, 7920H and 7925H with driver DVA32.
- * MAC (Multiple Access Controller Disc) - HP Models 7905, 7906, 7920 and 7925 with driver DVR32.
- * CS/80 Discs - HP Models 7908, 7911, 7912 and 7935 with drivers DVM33/DVN33.
- * HP Model 7900 Disc with driver DVR31.
- * HP Model 9895 Flexible Disc with driver DVR33.

The utilities can be called both under Session Monitor and in a non-session environment. In a non-session environment, you can operate under control of the Multi-Terminal Monitor (MTM) or direct to RTE via the system console.

Run WRITT by entering:

```
[RU,]WRITT[,sdisc[,MT:lu[,IH[,DC[,VE[, "..."]]]]]]
```

where:

sdisc - is the disc cartridge to be saved. This parameter can be either a negative LU number or a positive CRN number. The defaults are defined below.

The following optional parameters are order-independent. They can be specified in any sequence:

MT:lu - is the LU number of the magnetic tape unit on which the cartridge is to be saved. The default is to LU 8. This parameter also may be given using the LU number only (positive or negative), but then must be the second parameter in the runstring.

IH - inhibits tape rewind. The default is to rewind tape before and after each cartridge restoration.

DC - disables the overlay check. Unless disabled by this command, WRITT checks to see if a previously stored cartridge file will be overlaid by this operation.

VE - verify the mag tape; compare the data on tape with that on disc.

"..." - comment to be appended to tape header and displayed by WRITT during the overlays check; 40 characters maximum.

CAUTION

Do not attempt to replace a cartridge file previously saved on the tape as this can corrupt the remaining files on the tape.

WRITT, READT (Cont'd)

Multiple saves to a single tape should be performed in a series of WRITT operations to save the cartridges sequentially on the tape. If you want to add a cartridge save to an existing tape, use the FMGR CN command to position the tape past the last file. Use the IH parameter to inhibit the tape rewind before and after each save. With the rewind inhibited, you must use the CN command (CN,lu,RW) to rewind the tape after the last save operation.

Run READT by entering:

```
RU,READT[,disc[,MT:lu[,type[,SI:nnn[,IH[,VE[,CO]]]]]]]
```

where:

- disc - is the disc cartridge to which the saved FMP cartridge is to be restored. This parameter can be either a negative LU number or a positive CRN number. The defaults are defined below.
- MT:lu - is the LU of the magnetic tape unit on which the file is stored. The default is to LU 8. This parameter also may be given using the LU number only (positive or negative).
- type - is the type of cartridge to be restored: P for private cartridge, G for group cartridge. (System cartridges can only be restored by the System Manager.) If the type specified differs from that in the tape header, the cartridge type given in the command runstring is assigned. The default is to use the cartridge type specified in the tape header. This parameter is meaningless in a non-session environment.
- SI:nnn - is the size (specified in tracks) of the disc to which the magnetic tape contents are to be restored. The default is to the first pool cartridge large enough to accept the saved-cartridge file; the entire cartridge is mounted. This parameter also can be given without the SI designator, using only the decimal number of tracks required.

NOTE

The following optional parameters are order-independent and can be specified in any sequence.

- IH - inhibit tape rewind. The default is to rewind tape before and after the disc cartridge restoration.
- VE - verify the integrity of the data after the restore operation. The VE and CO options are mutually exclusive; only one may be specified.
- CO - perform a word-by-word comparison of the tape file and a previously restored cartridge.

SAVER. READR

These utilities are used to save individual files, especially when going from one system to another. They may be used with all disc drives available to RTE-IVA, RTE-IVB and RTE-6/VM.

System Requirements:

READR and SAVER execute only on RTE-IVA, RTE-IVB and RTE-6/VM Operating Systems. Your system configuration must include either:

7970B/E (9 track) magnetic tape, or

264x terminal with Cartridge Tape Units using driver DVR05 or DVA05.

A library called \$RSLIB which contains assembler routines is included with the READR/SAVER package. READR requires a minimum of 21 pages of memory. SAVER requires a minimum of 23 pages of memory.

NOTE

It is not recommended to generate READR and SAVER into an RTE system since there will be duplicate subroutine names created. \$RSLIB should not be generated into RTE for the same reason. Use the LOADR SE or LI command for \$RSLIB.

Documentation:

READR/SAVER Utility Reference Manual, part no. 92068-90016

READR

The READR program reads files from either magnetic tape or minicartridges and restores them to a disc cartridge. You decide which files are to be read and on what disc cartridge they are to be placed. The files can be verified as they are read. You may want to replace the same files on the disc if, for instance, the files on tape are more recent (i.e., they contain software updates).

When the files on tape were saved, the entire file name was placed in the directory. Unless you specify otherwise, the files will be restored by READR onto the same disc cartridge and with the same security code from which they were saved. READR provides an option to display the directory.

Load READR:

LOADR commands to on-line load READR:

Dialogue	Comment
:RU,LOADR	
/LOADR: SZ,28	Override program size requirements.
/LOADR: OP,LB	Specify large background.
/LOADR: RE,%READR	Load %READR utility.
/LOADR: SE,\$RSLIB	Search the READR/SAVER utility library.
/LOADR: EN	

NOTE

For RTE-6/VM, you can use OP,EB and SZ,32 to increase READR size.

Run READR by entering:

RU,READR[,option code[,option code...]]

where the option code is any number of the commands listed below in any order. If you are running from a runstring, READR does not give you the opportunity to correct errors or change options.

SAVER, READR (Cont'd)

READR Commands:

Command	Explanation	Default Values
AL: :	Restore all files	(NO)
CO	Comment Echo	Echo off.
EC	Echo file positioning	Echo on.
LI:lu	List directory, lu is output device	Log LU.
MT,n	magtape or minicartridge LU	LU 8.
OC,n	cartridge reference number override	File's original CRN as saved
OS,n	security code override	File's original SC.
SE,namr	Masked file name restore	Restore selected files.
TR,namr	Transfer to command file	N/A
TT	Select hardcopy mode	CRT mode.
UP	Update files mode	Update off.
VE	Verify	Verify on.
/A	Abort READR	
/E	Exit option setting mode	
??	List all flags and commands	

Documentation:

READR/SAVER Utility Reference Manual, part no. 92068-90016

SAVER

The SAVER program copies disc files onto either magnetic tape or minicartridge. From the file names you supply, it builds a file-name table in memory. You have the option to sort the directory before it is copied to tape. Then each file is copied onto the tape and verified bit by bit unless you bypass the verification.

SAVER rewinds the tape at the beginning and end of the program and will overwrite any information currently on the tape. Therefore be sure you are using a blank tape or that the contents of the tape can be overwritten. SAVER always begins writing on the beginning of the tape; it cannot skip over files to write to the middle of the tape.

Loading SAVER:

If you are using an RTE system with a revision data code less than 2101, you must assemble and relocate the entry point \$FREV for use with the SAVER utility. This entry point is required so that SAVER can properly handle extents with Type 1 file access. At revision data code 2101, this entry point was included within RTE File Manager and will not need to be loaded with SAVER. (Note: READR does not need \$FREV.)

SAVER, READR (Cont'd)

SAVER

For example, if your RTE File Manager is revision date code 2040, assemble this module:

```
ASMB,R,L
    NAM $FREV,7
    ENT $FREV
$FREV DEC 2040      ← Revision code for RTE/FMGR
    END
```

and SAVER will save all files with extents properly.

Dialogue	Comment
:RU,LOADR	
/LOADR SZ,28	Override program size requirements
/LOADR OP,LB	Specify large background.
/LOADR RE,%SAVER	Load SAVER utility.
/LOADR SE,\$RSLIB	Search the READR/SAVER utility library.
/LOADR SE,%\$FREV	Search for entry point \$FREV.
/LOADR EN	

NOTE

OP,EB and SZ,32 can be used in RTE-6/VM for larger file save capabilities.

Run SAVER by entering:

```
:RU,SAVER[,option code[,option code...]]
```

where the option codes is any number of the commands listed below, in any order. If you are running from a runstring, SAVER does not give you the opportunity to correct errors or change options.

SAVER Commands:

Command	Action	Setting
/A or AB	Abort SAVER immediately	
/E or EN	End search (start saving files)	
CO	Show TR files CComments	F
EC	Echo file search CRs	F
ER,lu	Assign ERror LU ##	F 0
LI	List files flag	0
MT,lu	Assign Mag Tape LU ##	8
PU	Purge files flag	F
SE,namr	SElect files via namr mask	
SO,lu	Sort the directory	F 0
SS	SuSpend SAVER	
SZ	Display tape SiZe	
T6	Save Type 6 files	
TR,namr	TRansfer to command file	
TT	Terminal type if TTY	F
UN,lu	UNselect ## of files	
VE	VERify	
??	Display SAVER commands & options	

Sort options:

0=no sort 1=Name,SC,CRN
 2=Last5,CRN 3=CRN,Name
 4=CRN,Last5 5=Size,CRN,Name
 6=CRn,size 7=SC,CRN,Name

(Last5 means to sort chars 2-6 and then char 1 of each name)

NO or NOT in front of any command negates or resets the state of the setting.

FC

The file backup utility FC provides a means for copying files between disc cartridges and 800/1600 bpi magnetic tape, either disc-to-disc, disc-to-tape, or tape-to-disc (tape-to-tape copying is not supported). The environment and disc drives supported are RTE-IVB (REV 2301 or higher) or RTE-6/VM (and RTE-XL, RTE-A.1, RTE-A). Files being copied may be given a different name, security code, or cartridge by specifying those fields of the destination namr. When copying from disc, file extents are automatically gathered and copied in ascending order following the main extent. As an option, you can eliminate extents and copy all sections of a file to the main extent. Options also can be selected to purge source disc files after copying, to list or suppress the listing of files copied, to replace duplicate files with the last duplicate copied, or to verify the copy. This verification compares FC-written checksums in addition to tape hardware checksums, which are always used.

```
:RU,FC
FC.nn:<command>
FC.nn:<command>
.
.
.
FC.nn:EX
```

where:

.nn in the utility prompt identifies your FMGR session.

COMMAND SUMMARY FUNCTION

Entering ? as the runstring command causes the command summary to be written to the log device, as

```
----- FC commands ----- commands may be abbreviated to 2 chars -----
COPY,src,dest,opts,[file1],[file2],[msc] copy files
DEFAULT , src , dest , opts set defaults for COPY command
GROUP / EG / AG begin / end / abort GROUP of COPY command
LL , namr set list file/device (dash means log device)
DL , src , [msc] , opts list tape directory (src = -tlu or -tlu{namr})
CL , [-tlu] , options list local cartridge list or tape cartridge list
CLAL list global cartridge list (RTE-IVB/6 only)
LH , -tlu , opts list tape header file
LC , -tlu , opts list tape comment file
ECHO [ , ON/OFF] turn ON/OFF cmd echo to list device (default ON)
TITLE , title set tape title (for subsequent COPYs to tape)
CF , comment-file-namr set comment file (for subsequent COPYs to tape)
TR , namr transfer to cmd file/device (dash means log device)
TR return from command file/device COPY commands
EXIT exit FC abort group of COPY commands
ABORT abort FC (same as EX except if copy group active)
SCRATCH , cartridge set cartridge that FC will use for scratch files
* comment command line starting with * treated as comment
HELP [ , key [ , lu]] get help, RTE-IVB/6 only (useful for FMGR errors)
? , <command> list info about particular command (incl. options)
? , <option> list info about particular option (all commands)
```

If you enter the ? command together with a command or option (as ?,SCRATCH), FC will respond with further information about the selected command/option.

Before running FC on RTE-IVB, ensure that any tape EQTs to be used are set to the unbuffered state using the system EQ command. If this is not done, FC may give unpredictable results since the status from EXEC writes is undefined, and since the System Available Memory (SAM) resource may be severely depleted by the buffering of large EXEC writes. (Refer to the RTE-IVB Terminal User's Reference Manual for details of the EQ command.)

FC (Cont'd)

PERFORMANCE CONSIDERATIONS

The following guidelines are presented as an aid in further increasing the speed of the file copy operation.

1. Specify source cartridges explicitly if multiple cartridges are contained in the cartridge list. For example, if the cartridge list includes cartridges 10, 20 and 30 and you want to copy from cartridge 30, use a COPY command of the form

```
CO,{A::30,B::30,C::30,D::30,E::30},-8
```

In this way, FC will not have to search cartridges 10 and 20 for the files to be copied. You also could use the DEFAULT command to specify the cartridge, as

```
DE,::30
CO,{A,B,C,D,E},-8
```

In the latter command form, be aware that sequences of commands cannot be put in the runstring.

2. Keep file extents collected. The speed of the FC COPY operation is increased if the file man and its extents are adjacent on the source cartridge. You can collect extents (make them adjacent) on all files on a cartridge using a COPY command of the form

```
CO,100,,LDF
```

which copies the contents of cartridge 100 to itself (the destination cartridge defaults to the same cartridge as the source). The L option is needed to ensure that extents created are adjacent. The D option is needed so that the new files (with extents collected) can replace the old files. The F option logs the name of each file copied.



JSAVE, JRSTR

Contributor: Software Service Kit

These programs are cataloged in the HP 1000 Software Service Kit (SSK) which is included as part of the SE Subscription Service. The following documentation is included in this handbook for your convenience. Consult the actual SSK for the most current documentation and software. (A customer normally does not have this program unless an SE gives it to him.)

JSAVE**Description:**

JSAVE will save a disc cartridge on to a mag tape with a cartridge header and directory of files in the cartridge. JSAVE will work on the following discs: 7900, 7905, 7906, 7920, 7925 (ICD or MAC discs).

Source Files: &JSAVE

Relocatable Files: %JSAVE (includes %JRPLS, %QUOTE, %CMPWD). Revision 2103 or higher.

Load Instructions:

:RU,LOADR,,%JSAVE

JSAVE requires a size of 14 pages to load.

Run Instructions:

RU,JSAVE,

Disc = x,
File = x,
Inhibit,
Last trk = x,
Mag Tape = x,
Repeat = x,
Verify,
" . . . "

Parameters may be in any order separated by commas (,)

NOTES:

1. Only the first letter of each option is necessary except for quote strings then both quotes are needed to delimit the string.
2. Equals signs(=) can be replaced with colons(:) if desired.
3. 'RU,JSAVE' with no parameters will cause JSAVE to prompt for all answers. (As it did.)
4. 'RU,JSAVE, . . .' with any parameters will cause JSAVE to use defaults for unspecified parameters. A list of JSAVE parameters and their defaults(if any) are described below.

Disc = x DEFAULT: Ask operator for +CRN or -LU. i.e., NO default either specify in runstring or let JSAVE ask you for it.

File = x DEFAULT: x = 0 which tells JSAVE to start at current position. Do not rewind tape on entry to program. (This is only true for the 'batch' mode.)

Inhibit RW DEFAULT: Rewind Mag Tape OFF-LINE when done. Specifying 'I' in the runstring will inhibit this function when JSAVE terminates.

JSAVE, JRSTR (Cont'd)

Last track = x DEFAULT: last track of the subchannel for the given disc LU.
 (NOTE: This need only be specified if the cartridge mounted was mounted with other than the last track for that subchannel. In addition, if the cartridge is currently mounted and the last track was not specified JSAVE will use the last track as given in the cartridge list, not the physical last track defined by the subchannel.)

Mag Tape = x DEFAULT: x = 8

Repeat = x DEFAULT: x = 1. 'x' specifies the number of times this disc LU will be saved on consecutive files on the tape.

Verify DEFAULT: Verify NOT performed.

" . . . " DEFAULT: Cartridge, label, time, and date put in header; e.g.:

CR 42 LU042 10:39 AM MON., 9 APR., 1979

NOTE

The default is ALWAYS put on the tape. Comments will be appended to the default. This is true for the interactive mode also.

JSAVE will lock the mag tape logical unit. Also, JVRFY is now a subroutine to JSAVE. The program JVRFY is obsolete.

Special Instructions:

JSAVE uses some of the extended instructions of the MX computer. If you need to run JSAVE on a 2100 or earlier machine, a library of MX instructions (simulated for the 2100) is provided in the source file.

Languages: FTN4

Examples:

RU,JSAVE,D=47,F=1,V,"SSK DEVELOPMENT"

This would save Disc CRN 47, start at file 1, verify, add 'SSK DEVELOPMENT' to the default header and rewind off-line when done.

RU,JSAVE,D:47,I

This would save Disc CRN 47, start at the current position of the tape, not do a verify, use the default header, and leave the mag tape positioned between the double EOF after the file just created.

JSAVE, JRSTR (Cont'd)**JRSTR**

Description: JRSTR will restore a disc cartridge from a mag tape saved by JSAVE.

Source Files: &JRSTR::T1

Relocatable Files: %JRSTR::T1 (includes %JDCMC, %CMPWD)

Load Instructions:

:RU,LOADR,,%JRSTR::T1

JRSTR requires a size of 13 pages to load.

Run Instructions:

:RU,JRSTR

JRSTR will prompt with the following questions:

Mag Tape LU: Enter LU of the mag tape drive.

MAG TAPE FILE: Enter the file position that contains the cartridge data to be restored. Entering 0 terminates JRSTR.

Entering a negative value causes JRSTR to display all of the file headers on the tape.

JRSTR positions the tape to the requested file and displays the header. If it is the desired file, type YES; otherwise, type NO.

Disc LU: Enter disc cartridge LU to restore to.

NOTE

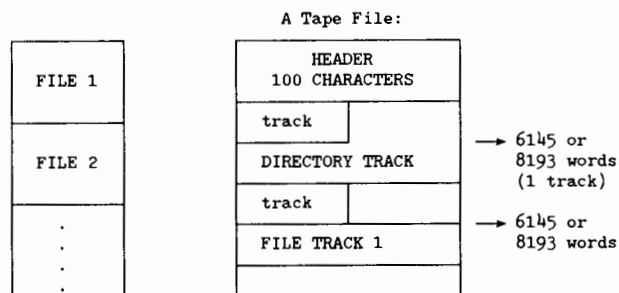
JRSTR will update the cartridge number for RTE-II, III and IV Operating Systems now. If the cartridge number on the JSAVE tape is already mounted, you will be prompted for a new cartridge number.

The following error messages can be returned from the subroutine which does the update:

DCMC ERR NF	LU not found in cartridge table
OV	Internal error
NG	Negative response to CRN prompt
ZE	Zero response to CRN prompt

Language: FTN4

JRSTR/JSAVE Tape Format:



MFGET

Description:

MFGET will "Get Many Files From a WRITT/JSAVE Tape." It allows you to retrieve any or all files on a WRITT/JSAVE tape. MFGET will not properly handle extended files; i.e., files larger than 16,383 blocks. This program is a Software Service Kit product and it is not normally available to customers.

Scheduling MFGET:

Run MFGET by entering:

```
:RU,MFGET
```

and answer the prompts for the mag tape LU and the file number of the cartridge you previously saved on tape (the first cartridge is 1). MFGET then reads the tape header, prints it, and asks if this is the one. Answer NO to seek to the next cartridge, YES to restore from this cartridge, or EX to stop.

MFGET appends the files from tape to the specified disc cartridge. If you're going to restore lots of files, be sure you've got enough room on the disc.

MFGET reads the tape and stores the directory recorded on the tape on scratch disc tracks. You can add files to a disc with the ADD command, which is usually done after marking some entries so they won't be taken.

This latest version of MFGET handles tapes from cartridges with up to 128 sectors per track, even when the destination disc has a smaller number of sectors per track (as small as 64). MFGET detects that the tape record is longer than the scratch tracks it gets from the current system and allocate an extra set of scratch tracks, dividing the tape record as necessary to fit. It must fit entirely within those two tracks, however, or you will lose data. It can handle the actual tape records from file tracks up to 128 sectors/trk. In actual practice, data is seldom lost.

MFGET commands:

PU,name[,extent]	Permanently removes the file named from the directory (and all extents). If an extent is given, then this extent and all higher-numbered ones are permanently removed from the directory. Default is extent = 0.
RN,oldname,newname	Changes the name of the file to <newname>. When the file is added to the existing file system, it will have the new name (does not change the status of the "don't take" flag, see below).
DE,name[,extent]	Permanently removes all files in the directory from the beginning until, but not including, the file named.
DL[,lu]	Print a directory listing of the current directory on the LU specified. Default is your terminal. Note that the permanently removed entries do not appear.
MA,name or MK,name	Mark the file names (and all extents) as "don't take" (i.e., will not be added to the file system). Note that this is not permanent, because this flag may be cleared (see the use of the minus (-) character below).
CL,name	Clear the "don't take" flag for the file named. Note that in the directory listings, the characters DT appear on the right of each file for which the "don't take" flag is set.

MFGET (Cont'd)

SK,n Set new sector skipping value. On 7900 discs, the optimum value is 14, which is the value used by the FMP. Unless you know for sure that a different value was used for the cartridge saved on tape, don't use this command!

?? Prints help information for the user.

ADD[,sc[,cr]] Add all files to the existing file system not excluded by the PU, DE, MA or MK commands. If <sc> is specified, then all files will be added using this security code. Otherwise, the security code of the original file will be used. If <cr> is specified, all files will be added on that disc. Otherwise, they will be added to the first disc found which has enough space. The new file will not have extents, regardless of whether the file on tape did or not.

As each file is added, its name, security code, crn and size are printed on the operator console (the attempt to create the file occurs after the name is printed, which is helpful to know if errors are detected).

EX
END Exit.
/E

Using the Minus Character (-):

A dash (-) in one or more positions of a file name will match any character in the same position as in the FMGR DL command.

For example:

MA,----- Marks all files "don't take". The flags for individual files can be cleared by name later.

PU,&----- Purge all files beginning with an ampersand (&). Usually program source files begin with this character, so this command keeps you from getting sources put onto the disc.

DE,&----- Purges all files up to but not including the first file beginning with ampersand.

EXAMPLES:

1. You have a disc which has source and relocatable files. You wish to add all but a few of the relocatables and none of the sources.

:RU,MFGET

```
COMMAND?
PU,&----- Don't give me any files beginning with &.
PU,%file1   Get rid of relocatables I don't want.
PU,%file2   .
PU,%file3   .
PU,%fileN   .
ADD,,-13    Add what's left to my disc LU 13.
END         Exit.
```

2. You have a disc with only a few files you want to add.

:RU,MFGET

```
COMMAND?
MK,----- Mark all files "don't take".
CL,%file1   Clear the flag for file1, because we want it.
CL,%file2   Clear the flags for the other files we want also.
CL,%fileN   .
ADD,LW,YY   Add file2 and fileN to CRN YY. All files will
            have security code LW.
/E         Exit.
```


WHZAT STATUS UTILITY**Running WHZAT:**

Invoke WHZAT, either in session mode or system mode, with the runstring:

```
[RU,]WH[ZAT][,lu[,option]]
```

Options for RTE-6/VM:

- AL all scheduled and suspended programs.
- SM only scheduled and suspended state 3 programs having a father-son relationship.
- PA all partitions in use.
- PL all active programs (added to RTE-6/VM around REV 2213).

NOTE

RTE-III and RTE-IV WHZAT has one option: WHZAT,,1 (the partition list).

Program States:

A program can exist in one of seven states relative to the RTE-6/VM Operating System environment:

- 0 Dormant - the program is not scheduled to run.
- 1 Scheduled - the program is in the schedule list.
- 2 I/O suspended - the system is currently performing an I/O operation requested by the program.
- 3 General wait - the program has requested services or resources that are temporarily unavailable, or has scheduled a second program, or a device is down.
- 4 Memory suspended - the program has requested an operation for which sufficient System Available Memory (SAM) is not currently available.
- 5 Disc suspended - the program has requested the use of more disc space than is currently available.
- 6 Operator/program suspended - the program is awaiting further operator action or a program EXEC call before it can continue.

WHZAT Output Codes, AI/SM Options:

PRGRM	Program name; ** = father program (precedes name)
T	Program type; E = EMA program
PRIOR	Program priority (0-32767); B = batch
PT	Partition number (1-64); 0 = memory-resident
	A = assigned to partition
SZ	Page size of program; ** = memory-resident
DO	Dormant (state 0)
SC	Scheduled (state 1)
IO	I/O suspended (state 2)
WT	General wait state (state 3)
ME	Memory suspended (state 4)
DS	Disc suspended (state 5)
OP	Operator suspended (state 6)
PRG CNTR	Program counter, in octal. Value is listed for all programs regardless of state; SWP = program is swapped out
NEXT TIME	Time at which program will next execute; 000000 = program not yet initiated

WHZAT STATUS UTILITY (Cont'd)

WHZAT Output Codes, PA Option:

PTN#	Partition number (1-64);
	M = Mother
	C = Subpartition, Chain mode
	S = Subpartition available
	R = Reserved
SIZE	Program page size
PAGES	Physical pages where program resides
BG/RT	Program run type; BG = Background
	RT = Real time
SHR/LBL	Shareable EMA partition and Label;
	SH = Shareable
	** = Mother with shareable subpartition
	* = Subpartition of mother
ACT	Number of current users of shareable EMA
L	Partition lock status; L = Locked
PRGRM	Program name

In the output, if a mother partition is currently being used for sharing EMA, the PRGRM entry will show \$EMA\$ as the name of the program occupying the mother partition and subpartitions.

WHZAT Output Codes, PL Option (late RTE-6/VM only *):

NAME	Program name
TY	Program type (see following discussion)
PRIOR	Program priority, 1-32767
LADDR	Low memory address
HADDR	High memory address
LOBP	Low base page
HIBP	High base page
SZ	Program size, in pages
EMA	Extended Memory Area size
MSEG	Memory Segment size, in pages
LBL	Shareable EMA partition label, if used
PTN	Partition number, if assigned to program
TM	Load type; TE = Temporary
	PE = Permanent
	= memory-resident
COM	System common type; SC = System common
	RC = Reverse common
	NC = No common
LU	Disc LU on which program is stored
S-ID	Session identifier if program loaded under session monitor.

* For RTE-IVA/B and early RTE-6/VM use RU,LOADR,,,LI.

The status output summary identifies the number of free 33-word program ID segments (long), the number of free 9-word program ID segments (short) available in the system, and the number of 3-word ID extensions available.

!DSKUP

OFF-LINE BACKUP UTILITY FOR 7900, 7905/06/20/25 DISCS USING
THE 13037B/C CONTROLLER -- PROGRAM !DSKUP

STARTING THE OFF-LINE UTILITY

To run the off-line utility (part no. 92067-16304) perform the following steps:

1. With the appropriate loader ROM, load the program !DSKUP from the input device.
2. The utility is preconfigured for mag tape (MT), and consoles using DVR00 as follows:

DEVICE	SELECT CODE (Octal)
console	15
MT	23

Set the switch register to 0 if you want this configuration. If you want to reconfigure these I/O select codes, set the switch register as follows:

bits 0-5 select code of console
bits 6-15 clear

Disc select codes are not preconfigured. Disc (and mag tape if switch register is not zero) are configured interactively with the program.

3. Set P-Register to 2.
4. Press PRESET and RUN.

After you perform these steps, the program uses the system console to send messages and receive replies. Typing ?? in response to any prompt causes the utility to print all the valid responses to the question. (The valid responses will also be printed if you enter an invalid reply.) When the utility starts running, it prints a heading "DISC BACKUP UTILITY" and asks which task you want performed. Type SA (for save), RE (for restore), or CO (for copy).

NOTE

If incorrect data is typed when responding to a question (that does not cause the !DSKUP program to issue an error message) and carriage return is pressed, the utility program must be reloaded (i.e., go back to step 1). Once the mag tape is selected, another mag tape may not be specified without reloading. This utility cannot be restarted.

SA - SAVE**NOTE**

Do not perform FROM-TO saves unless you can guarantee the data will be restored to an error free disc! Track sparing can never be done with a tape containing FROM-TO data. Also, FROM-TO saves will give an error message when trying to save an activated spare track. The only possible way around this error is to save only the LU portion. This requires an exact description of the LU as stored on the disc.

!DSKUP (Cont.)

SA - SAVE:

For FROM-TO saves you must answer the following questions:

RTE OR DOS DISC? (discs other than 7900, disc for other than DOS enter RT)
Enter RT or DO.

FROM TRACK #? (7900 only)
Enter a number between 0 and 202 specifying where the transfer begins.

FROM CYLINDER #? (discs other than 7900)
Enter appropriate values which will specify where the transfer is to begin.

OF TRACKS?
Indicate the number of tracks to be saved. For 7900 discs it must be between 1 and 203 minus FROM TRACK #. For DOS 7905 it must be between 1 and 200.

PLATTER #? (7900 only)
Indicate which platter is to be saved: 0 for fixed platter or 1 for removable platter.

OF SURFACES? (discs other than 7900)
Type the number of surfaces to be saved.

STARTING HEAD #? (disc other than 7900)
Enter the head number where save begins.

For UNIT saves (the RECOMMENDED method), you must answer the following questions:

RTE OR DOS DISC? (discs other than 7900, disc for other than DOS enter RT)
Enter RT or DO.

WANT TRACK SPARING? (RTE discs other than 7900)
Reply YES or NO. If you reply yes to track sparing, the program needs track map information for each subchannel. You must have the system generation listing (or answer file) to know how the LUs are laid out. NOTE!! all of this is handled automatically with an on-line save. Perform off-line saves only when system cannot run and data must be salvaged.

OF SUBCHNLS TO BE COPIED? (7905 DOS discs only)
Indicate the number of subchannels to be saved (1 through 3). The save operation starts with subchannel 0.

You next indicate whether you want a large buffer and (if there is enough memory) if you want data to be verified. The utility asks for the file number (1 to 8) on the mag tape where you want the data to be recorded. The FILE ID is a 72 character field written into the file's header record.

At this point the actual transfer of data begins. The switch register contains the relative track number being saved. When the transfer (and verification) is done, the utility prints TASK COMPLETED.

When the task has been completed or aborted, the program asks for another task. (You cannot reconfigure mag tape and console select codes.)

IDSKUP (Cont.)

RE - RESTORE

The exact questions depend upon the type of restore and type of disc. If the switch register is not zero, the program asks for the mag tape select code. (Note mag tape select code cannot be changed without reloading.) Reply with an octal value between 10 and 77. For the mag tape file number, type a number from 1 to 8 indicating which file contains the data to be restored. The utility prints the identification information and the tape number (which should be 1) from the files header record. If this is not the tape you want, do not answer YES to the OK? question. Instead, answer NO, mount a new tape, restart the utility by entering GO, and answer the questions again, beginning with MT FILE #?. When you get the right file mounted, the program asks for the destination disc channel number. Input an octal number between 10 and 77. The destination disc drive can be between 0 and 3 for 7900 discs or between 0 and 7 for 7905/06/20/25 discs. (The disc type is read from the header record.)

If the restore is FROM-TO (the type of restore is read from the header record), the program asks these questions.

TO TRACK #? (7900 only)

Enter a number between 0 and 202 specifying where the transfer begins.

TO CYLINDER #? (7905/06/20/25 discs with 13037B/C controller)

Specify where the transfer begins.

PLATTER #? (7900 only)

Indicate which platter is to be restored. 0 for fixed platter or 1 for removable platter.

OF SURFACES? (7905/06/20/25 with 13037B/C controller)

Type the number of surfaces to be restored.

STARTING HEAD #? (7905/06/20/25 with 13037B/C controller)

Enter the head number where restore begins.

You can have the data verified by answering VERIFY? with YES.

NOTE

The FROM-TO parameters used to save the original tape ARE NOT in the header. Thus, if it is not recorded on paper somewhere, there is no way to determine how to restore the tape. If the data is restored to the wrong head or wrong number of surfaces, the results are unpredictable. This is why a FROM-TO save is not recommended.

After the dialogue is complete, the data transfer operation begins. The switch register contains the relative track number being restored.

If the data was saved on-line or off-line with track sparing, only the number of the disc, and the verify question are asked. No other information is needed.

If the end-of-tape occurs during the restore, the program prints the message EOT REACHED, MOUNT NEXT TAPE. Mount the next tape (tape number 2) and restart the utility by typing GO followed by a carriage return. (If tape 2 is read to the end, mount tape 3, etc.)

IDSKUP (Cont.)

CO - COPY

The exact questions depend upon the type of copy and the type of disc. The source disc select code must be an octal number between 10 and 77. The source disc driver number is between 0 and 3 for 7900 discs or between 0 and 7 for 7905/06/20/25 discs. The type of copy is FR of FROM-TO and UN for UNIT.

For a FROM-TO copy (to be used only for platter-to-platter copies), you must answer the following questions.

RTE OR DOS DISC (7905/06/20/ 25 with 13037B/C controller)
Enter RT or DO

FROM TRACK#? (7900 only)
Enter a number between 0 and 202 specifying where the transfer begins.

FROM CYLINDER #? (7905/06/20/25 discs with 13037B/C controller)
Enter appropriate values which will specify where the transfer is to begin.

OF TRACKS?
Indicate the number of tracks to be copied. For 7900 discs it must be between 1 and 203 minus FROM TRACK #. For DOS 7905 it must be between 1 and 200.

PLATTER #? (7900 only)
Indicate which platter is to be copied: 0 for fixed platter or 1 for removable platter.

OF SURFACES? (7905/06/20/25 discs with 13037B/C controller)
Type the number of surfaces to be copied.

STARTING HEAD #? (7905/06/20/25 discs with 13037B/C controller)
Enter the head number where copy begins.

For a UNIT copy you must answer these questions:

RTE OR DOS DISC? (7905/06/20/25 discs with 13037B controller)
Enter RT or DO.

WANT TRACK SPARING? (7905/06/20/25 RTE discs with 13037B/C controller)
Reply YES or NO. If you reply yes to track sparing, the program needs track map information for each subchannel. See the sysgen listing (or answer file) for LU layout on disc. Enter four numbers separated by commas for each subchannel to indicate number of tracks, cylinder at which the subchannel begins, head number of the first track in the subchannel, and the number of surfaces the subchannel contains. Enter /E to terminate the subchannel prompts. This must match the system generation track map.

OF SUBCHNLS TO BE COPIED? (7905 DOS discs only)
Indicate the number of subchannels to be copied (1, 2, or 3). The copy operation starts with subchannel 0.

You next indicate whether you want a large buffer (answer yes if you have more than 30K words), and if you want the data to be verified. It is highly recommended that data is always verified.

At this point the actual transfer of data begins. The switch register contains the relative track number being copied. When the transfer (and verification) is done, the utility prints TASK COMPLETED.

When the task has been completed or aborted, the program asks for another task. (You cannot reconfigure the mag tape and console select code.)

IDSKUP (Cont.)

OFF-LINE ERROR MESSAGES

MESSAGE	MEANING AND ACTION
MT NOT READY	The mag tape is either off-line or busy. When it is ready, restart the utility by typing GO.
NO WRITE RING, WRITE ENABLE MT	The write ring is missing from the mag tape during a save operation. Put the write ring on and restart the utility by typing GO.
FILE NOT FOUND	The specified file number is greater than the number of files on the mag tape. Mount another tape, if necessary, and restart the utility by typing GO. Specify the correct file number.
EOT REACHED, MOUNT NEXT TAPE	The end of the mag tape has been detected. Mount the next tape and restart the utility by typing GO.
WARNING-SUBCHNLS ON SOURCE UNIT OVERLAP	7905/06/20/25 discs only. The subchannels defined in the track map table for the source unit overlap. The utility assumes the number of spare tracks for the subchannel is 0. This is usually an operator error. If suspect, stop and reload the utility of check track map validity.
IMPROPERLY DEFINED SUBCHNL	7905/06/20/25 discs only. The specified subchannel is defined such that the starting head number plus the number of surfaces is greater than nine. The utility is aborted.
READY DISC	The disc driver is not ready. Restart the utility by typing GO when the disc is ready.
TURN ON DISC PROTECT	The track is protected and the write protect switch is on. Turn off the disc protect switch and restart the utility.
TURN ON FORMAT SWITCH	The utility is formatting the disc, but the format switch is off. Turn it on and restart the utility. (Format switch allows defective, spare, and protect bits to be set.)
LAST TRACK TOO LARGE	7900 discs only. The number of tracks given in response to FROM TRACK # for FROM-TO save or copy is greater than 202. Re-enter the number of tracks.
BAD TRACK AT loc	Ten tries have been made to read or write on the specified track without success. The location, loc, is printed.
SPARED TO loc*	A bad track has been spared to the indicated track location (loc).
CYLINDER COMPARE ERROR AT loc*	7905/06/20/25 discs only. Ten tries have been made to recalibrate the disc. The program is aborted.

!DSKUP (Cont.)

OFF-LINE ERROR MESSAGES

MESSAGE	MEANING AND ACTION
ILLEGAL SPARE AT loc*	7905/06/20/25 discs only. During a read or write without track sparing, an active spare was found at destination. The source track has no where to go. If this is OK, type YES and the source track is skipped. Otherwise the program aborts.
VERIFY ERROR AT loc*	The verify operation was unsuccessful at specified location. The utility continues.
OUT OF SPARE TRACKS FOR SUBCHNL	7905/06/20/25 discs only. All spare tracks have been used up. The utility is aborted.
UNRECOVERABLE DISC ERROR-EOC OR SEEK CHECK	An end of cylinder or seek check error has occurred because the track map information is incorrect. Also occurred on early versions when copying 7920 discs using FROM-TO copies. Use the most recent version !DSKUP.
WARNING-TRACK AT FOLLOWING LOC WAS NOT SAVED SUCCESSFULLY	Restore only. The track about to be restored was not saved successfully. This was noted on the mag tape so the user could continue anyway. The utility continues.
WARNING-MEM SIZE TOO SMALL FOR VERIFY W/6144 WORD BUF	The memory size is not large enough to hold two 6144 word buffers for a verify. If you want to verify your data, do not request the 6144 word buffer.
I/O ERR PE EQT #2	A parity error occurred on the mag tape. The utility must be reloaded. (Cannot be restarted.)
I/O ERR NR EQT #2	The mag tape drive is not ready. The utility must be reloaded. (Cannot be restarted.)
* The format of the track location (loc) depends on the type of disc. For 7900 discs, the location is printed in the form:	
TRACK # ttt PLATTER # PP, UNIT# u	
For 7905/06/20/25 discs the location is printed in the form:	
SBCHNL# ss, TRACK# tt CYL# ccc, HEAD# h, UNIT# u	
The first line is not printed during UNIT transfers without track sparing or FROM-TO transfers (the track map table has not been defined).	

!DISK

Off-Line disc backup utility for 7905/0620/25 MAC DISCS using 13037B/C controllers and 7906H/20H/25H/9895 discs using 12821A disc interfaces. Program !DISK.

LOADING THE OFF-LINE UTILITY !DISK

The off-line utility program is a type 1 file and can be stored on mag tape, paper tape, or mini-cartridge. It consists of an RTE-M operating system, and I/O configuration program, and the program DISK.

1. Load the program using the appropriate loader ROM.
2. The utility is preconfigured for a mag tape and DVR05 console as follows:

DEVICE	SELECT CODE (OCTAL)
System Console	14
Mag Tape	16
Time Base Generator	10

If you want this configuration, set the S-Register to 0. Otherwise you can reconfigure these select codes by setting the S-Register as follows:

bits 0-5 console select code (DVR05 or DVR00)
 bits 6-11 mag tape select code
 bits 12-15 Time Base Generator select code (RTE-M requirement)

Select codes for the system console and TBG must be defined by this point. The off-line utility itself does not allow LU 1 (system console) nor the TBG to be reconfigured.

3. Set P-Register to 2.
4. Press PRESET and RUN.

After the above steps have been correctly executed, the system console will be used to send messages and receive replies. The utility now starts by asking you to reconfigure the drivers.

After the utility has been loaded and started, it prints a header (e.g. DISK BACKUP UTILITY REV 2001 790830) and displays the current I/O configuration. The following drivers are preconfigured in the utility:

LU	DRIVER	SELECT CODE
1	DVR00 or DVR00	14 (console)
4	DVA32	13 (12821A ICD Interface Card)
5	DVR32	11 (13037B/C MAC Disc Controller Card)
8	DVR23	16 (Magnetic Tape Interface Card)

DISK asks you to reconfigure the select codes for DVR32 and DVA32:

ENTER SELECT CODE FOR DVR32, DVA32:

Enter one of the following answers:

1. DVR32 select code and DVA32 select code separated by a comma to change the drivers select codes. A zero value does not change the select code.
2. /E, EN, or EX and carriage RETURN if you do not wish to change these select codes.

!DISK**LOADING THE OFF-LINE UTILITY !DISK****EXAMPLES:**

21,25 change MAC card to SC21 and the ICD card to SC25.
 21,0 the MAC card is at SC21 and the ICD card SC is not changed.
 0,25 the MAC card SC is not changed and the ICD card is at SC25.

After specifying the select codes, DISK prompts you with:

TASK?

which you answer with one of the off-line utility tasks.

OFF-LINE UTILITY TASKS

The following is a list of tasks you can perform:

IO List current I/O reconfiguration and ask for reconfiguration.
 RE Restore mag tape file to disc LU or subchannel.
 CO Copy one disc subchannel to another disc subchannel.
 RW Rewind mag tape.
 FF[,n] Forward space mag tape n files, default of n=1.
 BF[,n] Backward space mag tape n files, default of n=1.

NOTE

All saves, restores, and copies of the 9895 flexible disc should be done with the on-line utilities. Since the off-line utility does not do formatting of the flexible discs, the off-line utility cannot be used with the 9895.

The table below lists the allowable off-line data transfers.

DESTINATION SOURCE	7905 7906(H) 7920(H)	7925(H)	9895*	TAPE
7905 7906(H) 7920(H)	CO	N/A	N/A	N/A
7925(H)	N/A	CO	N/A	N/A
9895	N/A	N/A	N/A	N/A
TAPE	RE	RE	N/A	N/A

N/A Not Allowed

* 9895 Flexible Disc is used on-line only.

IDISK (Cont.)**IO - I/O CONFIGURATION**

After entering the IO command in response to TASK?, the utility prints the current I/O configuration and asks to be reconfigured.

LU	EQT	S.CHN	S.C.	DRIVER
1	1	1	14	DVR00 or DVR05 CONSOLE
4	4	0	13	DVA32 ICD DISC
5	2	0	11	DVR32 13037B/C MAC DISC
8	7	0	16	DVR23 MAGNETIC TAPE

The utility will automatically reconfigure LU 1 to the appropriate EQT and driver according to the I/O card.

The utility then asks you to reconfigure any of the devices listed:

LU,NEW S.C.?

If you want to change the configuraiton, enter the LU, followed by the octal select code, separated by a comma.

NOTE

LU 1 (console) cannot be reconfigured by this command. You must set it in the S-Register on boot-up. The program can be restarted by setting the P-Register to 2 and re-setting the S-Register as necessary.

To leave the configuration unchanged or to exit from this task, enter /E, EN, or EX and RETURN.

RE - RESTORE

The RE command restores an LSAVE or UNSAVE tape file to disc. The RE command has the following format:

RE,map source,model

where:

map source specifies where the track map information is to be found:

DE - Restore the tape file according to the track map information stored in the tape header. The header will be printed but the user cannot OK the header before the restore is performed.

TM - Print the header and track map information and ask the user for a new track map table definiton (see below). You CANNOT use this option with a USAVE tape file, since it must be restored exactly as saved.

If no option is given, the utility will print the tape header and ask if it is OK? to proceed. If YES, the restore will be done according to the track map information in the tape header.

model is the type of disc being restored to. This value is ignored if map source = TM. Enter one of the following values:

A - Restore tape file to a MAC disc according to the tape header.

H - Restore tape file to an ICD disc according to the tape header.

!DISK (Cont.)

RE - RESTORE

To define new track map information (map source = TM), you are given the following message:

```
ENTER MODEL, #TRACKS,1ST CYL,HEAD,#SURF,UNIT,#SPARES FOR SUBCHNL 00?
```

Enter values separated by commas in the same format as the utility message to define the disc subchannels starting with subchannel 00. Terminate the track map input with a /E, EN, or EX. This technique is only used when a new system needs the tracks rearranged for a new LU. Be careful with this option - it must match the operating system's track map or the LU cannot be mounted.

When the map source parameter is defaulted, the utility prints the header and asks to proceed:

OK?

Enter "YES" to perform the restore.

Enter "NO" to space forward the tape on file. The utility will then print the next header and ask if it is OK? to proceed.

Enter /E, EN, or EX to exit restore and get the TASK? again.

CO - COPY

The CO command allows you to copy one disc subchannel to another disc subchannel according to the information you enter. The format is as follows with no parameters:

```
CO
```

After typing the command, the program will ask you to define the source subchannel and the destination subchannel definition as shown below:

```
ENTER MODEL, #TRKS,1ST CYL,HEAD,#SURF,UNIT,#SPARES FOR SOURCE SUBCH?
```

Enter the appropriate value separated by commas, in the same format as the message.

The program then asks the same question for DESTINATION SUBCHANNEL. Enter /E, EN, or EX to terminate the copy operation and TASK? is asked again.

RE-STARTING THE OFF-LINE UTILITY PROGRAM !DISK

If you mistakenly perform a RESTR or COPY operation to a wrong disc interface select code, the program DISK will be I/O suspended. You may restart the program by typing the following:

```
* OF,DISK      Put the program in a dormant state
* OF,DISK,1    Abort the program
* RU,DISK      Run the program again
```

You are not advised to use the OF,DISK,1 in any other cases, since it could leave the disc partially copied.

!DISK (Cont.)

OFF-LINE ERROR MESSAGES

MESSAGE	MEANING AND ACTION
BAD SPARE AT: TRACK #xxxx CYL ccc HEAD hhh UNIT/ADDR uuu	The spare track is defective, program will ignore this spare track and use the next one in the pool.
BAD TRACK AT: TRACK #xxx CYL ccc HEAD hhh UNIT/ADDR uuu	The track is defective or ten tries have been made to read or write without success. If the track is marked spare and in the source subchannel, this message will also be printed.
DRIVE NOT READY - READY DISC AND ENTER "GO" TO CONTINUE	Ensure that the select code and disc unit no. are correct. If you do not wish to continue, enter /E, EX, or EN to stop and type *RU,DISK to re-start.
FORWARD/BACKWARD N FILES: N = XX	The utility program attempts to forward or backward space N number files. If the tape is at load point, the BF command will have no effect on the tape.
HEAD NO. OUT OF RANGE	The head number specified during a CO command or TM option is out of range for the disc model.
INVALID SEL.CODE	The select code specified for DVA32 or DVR32 is less than 0 or not an octal number.
MT. PARITY ERROR	Parity error detected on the mag tape. Probably caused by positioning the tape in the wrong file.
OUT OF SPARE TRACKS FOR THIS LU	Ensure that you have enough spare tracks in the subchannel. Any bad tracks occurring after this message will not be spared. The utility continues operation. Additional spare tracks will usually require a new system generation. Check for a hardware problem when a lot of spares are needed.
SEEK ERROR	Hardware disc seek error occurs. Program continues operation. Probably caused by restoring or copying to a wrong disc (e.g. 7906 to 7925).
SEL.CODE >77	The select code specified for DVR32 or DVA32 is greater than 77 octal.
TAPE EOF ILLEGAL	Program reaches end of file of mag tape unexpectedly. Program returns to TASK? mode. The tape was improperly saved.
TAPE FORMAT ERROR	Header information in the mag tape is incorrect (wrong tape mounted).
TRACK SIZES NOT EQUAL	Copy or restore a disc with different track size (words per track) is not allowed. Program returns to TASK? mode.
TURN DISC PROTECT SWITCH OFF FOR UNIT/ADDRESS xxx TYPE "GO" TO CONTINUE	Check the disc "READ ONLY" switch. If you do not wish to continue, enter /E, EX, or EN to stop and type *RU,DISK to restart.

IDISK (Cont.)

OFF-LINE ERROR MESSAGES (Cont.)

MESSAGE	MEANING AND ACTION
TURN FORMAT SWITCH OFF FOR UNIT/ADDRESS xxx TYPE "GO" TO CONTINUE	Check the format switch of the disc. If you do not wish to continue, enter /E, EX, or EN to stop and type *RU,DISK to restart.
UNIT # MUST BE FROM 0-7	Ensure that you enter the correct disc unit number.
# OF TRKS MUST BE FROM 1 to xxxx	Ensure the number of tracks for the disc model is correct.

BCKOF

The environment and disc drives supported by BCKOF are the same as for WRITT and READT. The program may be supplied as follows:

A. Three cartridge tapes, where:

1. !BCK01, contains the memory-based (off-line) operating system, reconfigurator, and the startup program BCKOF;
2. !BCK02, contains the off-line utilities FORMT and PPAR that are scheduled for execution in restore or copy operations where the VERIFY option has been selected, or in restore operations where the pushbutton option (PB) has been selected;
3. !BCK03, contains the off-line PRSTR, PCOPY, and PSAVE utilities.

To create another copy of the Off-Line Physical Backup Utilities, enter the command

```
TR,*BCKCT
```

from your RTE-6/VM Primary System and follow the directions given in the system response to the command.

B. One magnetic tape reel that contains all of the files !BCK01, !BCK02, !BCK03, together with a cartridge tape containing !MTLDR.

If you want to create your own copy of the off-line physical backup utilities on magnetic tape, use the transfer file *BCKMT supplied with the RTE-6/VM Primary System. Mount and load a magnetic tape and then enter the command

```
TR,*BCKMT,<mt>
```

where <mt> is the LU of your magnetic tape device.

To create your own copy of the cartridge tape !MTLDR, insert a cartridge tape in the left CTU drive of a 264x type terminal (LU 4) and enter the command

```
ST,!MTLDR,4,BA
```

from your RTE-6/VM Primary system. The file !MTLDR will be copied to your cassette.

Loading BCKOF From Cartridge Tape:

Place the cassette labeled !BCK01 in the left CTU of your 264x terminal (LU 4) and load the memory-based operating system as follows:

HALT the computer.

Select and CLEAR the S-Register, then

- set bits 15-14 to the CTU Load ROM location.
- set bits 11-6 to the 264x terminal select code.
- set bit 5 (to indicate a slow boot is desired).

Press STORE, PRESET, IBL, then PRESET again.

Press RUN. A HLT 77 should occur (102077 octal displayed).

BCKOF (Cont'd)

Loading BCKOF From Mag Tape:

Procedure One: Loading Utilities WITHOUT a Magnetic Tape Loader ROM.

1. Place a cassette tape containing !MTLDR in the left CTU of your 264x terminal and load !MTLDR into memory as follows:

HALT the computer.

Select and CLEAR the S-Register, then
set bits 15-14 to the location of the Cassette Loader ROM.
set bits 11-6 to the 264x terminal select code.

Press STORE, PRESET, IBL, then PRESET again.

Press RUN. A HLT 77 should occur (102077 octal displayed).

2. Mount and place the Off-Line Backup Utility tape on-line.

3. Load the memory-based operating system as follows:

Select and CLEAR the P-Register, then
set bit 1 (the P-Register now contains 2 octal).

Press STORE.

Select and CLEAR the S-Register, then
set bits 11-6 to the select code for the magnetic tape unit.

Press STORE.

Press RUN. A HLT 77 should occur (102077 octal displayed).

4. Load the reconfigurator and startup program into memory.

Procedure Two: Loading Utilities Using the Magnetic Tape Loader ROM. (Installed in the processor).

1. Mount and place the Off-Line Backup Utility Tape on-line.

2. Load the memory-based operating system as follows:

HALT the computer.

Select and CLEAR the S-Register, then
set bits 15-14 to the location of the Magnetic Tape Loader ROM
(12992D or P/Ns 1816-0962 or 12992-80006).
set bits 11-6 to the magnetic tape unit select code.
set bit 5 (to indicate a slow boot is desired).

Press STORE, PRESET, IBL, then PRESET again.

Press RUN. A HLT 77 should occur (102077 octal displayed).

3. Load the reconfigurator and startup program into memory, as described in the following section.

BCKOF (Cont'd)**RTE-6/VM PBU I/O RECONFIGURATOR****Loading the PBU I/O Reconfigurator:**

1. Select and CLEAR the P-Register, then set bit 1.
2. Press STORE.
3. Select and CLEAR the S-Register, then:
 - set bit 15 (reconfigure bit).
 - set bits 11-6 to select code of the H-Series disc (ICD) to be used, or otherwise to 0.
 - set bits 5-0 to the system console select code.
4. Press STORE.
5. Press RUN.

After loading the programs the reconfigurator will automatically start executing with display and input at your system console.

PBU I/O Reconfiguration:

The initial I/O configuration (known to !BCKOF) now must be changed to the system configuration.

The initial !BCKOF configuration is shown below (automatic reconfiguration occurring when you last set the S-Register may have changed this).

START RECONFIGURATION

LIST DEVICE LU #?

*Direct output to your terminal

1

I/O RECONFIGURATION ALREADY PERFORMED

CURRENT SELECT CODE#,NEW SELECT CODE#?

15,15

*SYSTEM CONSOLE

*ICD disc if S-Register set

CURRENT I/O CONFIGURATION:

SELECT CODE 11=TBG

*Time Base Generator card

SELECT CODE 15=EQT 1,TYPE 5

*System Console

SELECT CODE 17=EQT 8,TYPE 23

*Magnetic Tape Unit card #1

SELECT CODE 20=EQT 8,TYPE 23

*Magnetic Tape Unit card #2

SELECT CODE 50=EQT 9,TYPE 31

*7900 Disc card #1

SELECT CODE 51=EQT 9,TYPE 31

*7900 Disc card #2

SELECT CODE 52=EQT 3,TYPE 32

*79xx MAC Disc

SELECT CODE 53=EQT 4,TYPE 32

*79xx ICD Disc

SELECT CODE 54=EQT 5,TYPE 33

*79xx CS/80 discs

SELECT CODE 60=EQT 2,TYPE 0

PRMPT

*Interactive Terminal

SELECT CODE 61=EQT 7,TYPE 0

PRMPT

*Interactive Terminal

SELECT CODE 62=EQT 6,TYPE 5

PRMPT

*Interactive Terminal

I/O RECONFIGURATION? (YE/NO)

YE

Reconfigure your system as follows:

NOTE

It is not necessary to reconfigure the select code of your system console as it was done when you last set the S-Register.

BCKOF (Cont'd)

1. Reconfigure the TBG select code if it is not octal 11. In this case, enter:

11,<sc>

where <sc> is the TBG select code.

2. Reconfigure the select codes of the MTU if they are not octal 17 and 20. Enter

17,<sc lc>

20,<sc hc>

where <sc lc> is the lower numbered select code of the magnetic tape unit and <sc hc> is the higher numbered select code.

3. If only an ICD disc is to be used, it does not need to be reconfigured. Otherwise, you must reconfigure the appropriate discs:

<!BCKOF disc sc>,<your disc sc>

where <!BCKOF disc sc> is the select code of the type of disc (CS/80, MAC, or 7900 disc) to be reconfigured, and <your disc sc> is the select code of the same type of disc that you want to use in the system. Be aware that if you are reconfiguring a 7900 disc unit. The lower numbered select code in the !BCKOF system should be reconfigured to the lower numbered select code in the system.

4. Enter /E to terminate the I/O reconfiguration. The current configuration is then displayed as shown below. When the OK TO PROCEED? prompt appears, review your changes to the original configuration. If the changed configuration is correct, enter YE to continue. If the changes are incorrect, enter NO and correct any errors in the configuration (steps 1 through 4 above, as required). When the configuration has been corrected, enter /E to terminate the reconfiguration, and respond YE to the OK TO PROCEED? prompt.
5. Since memory reconfiguration is not necessary, enter NO when the MEM RECONFIGURATION? (YE/NO) prompt is displayed.
6. The operating system will now start its initialization pass and then start executing the startup (and user control) program BCKOF.

A sample system configuration display is shown below.

SET TIME

LU#	EQT#	SUBC#	S.C.	TYPE	DESCRIPTION
1	1	0	15B	5B	INTERACTIVE TERMINAL
4	1	1	15B	5B	LEFT C.T.U.
5	1	2	15B	5B	RIGHT C.T.U.
8	8	0	17B	17B	MAG TAPE/MASS STORAGE
9	5	1	11B	33B	CS/80 CARTRIDGE TAPE
10	2	1	60B	0B	INTERACTIVE TERMINAL
11	7	0	61B	0B	INTERACTIVE TERMINAL
12	9	0	50B	31B	7900 DISC
13	3	0	52B	32B	79XX (MAC) SERIES DISC
14	4	0	53B	32B	79XX (ICD) SERIES DISC
15	5	0	11B	33B	79XX (CS/80) SERIES DISC

Please enter tape-LU for reading 1BCK02: n

Your response to the "Please enter tape-LU" prompt above is determined by the tape media on which the Physical Backup Utilities are supplied.



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