

HANS KLOMP

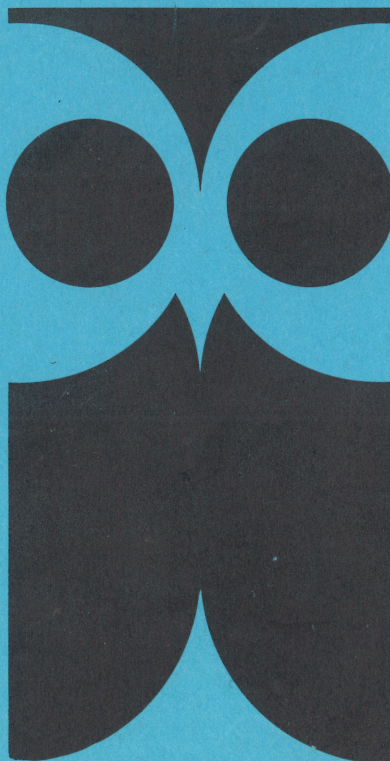
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1) Installation

2) Processor

3) M9301

4) M9312

5) Maindecs

6) Power

7) Cache

8) M7850

TRAP CATCHER INITIALIZE

LOAD ADDRESS = 500/START

```
500 - MOV #177776,%0
502 - 177776
504 - CLR%1
506 - ADD#4,%0
510 - 4
512 - MOV%0,(1)+
514 - CLR(1)+
516 - CMP#400,%1
520 - 400
522 - BNE-7
524 - HALT
```

PURPOSE:

To set up vector area with series of addresses that point to halts. Should multiple traps occur, we can cause a halt to occur that will indicate what type of trap it was.

RESULT:

Vector Area	}	0 - 2	PC
		2 - 0	HALT
		4 - 6	PC
		6 - 0	HALT
		10 - 12	PC
		12 - 0	HALT
		14 - 16	PC
		16 - 0	HALT
		20 - 22	PC
		22 - 0	HALT
		"	"
		"	"
		"	"
		"	"
		"	"
		"	"
		"	"
		"	"
		"	"
		374 - 376	PC
		376 - 0	HALT

	A	B	C	D	E	F
1						
2						
3						
4						
5						
6						
7						
8						
9						

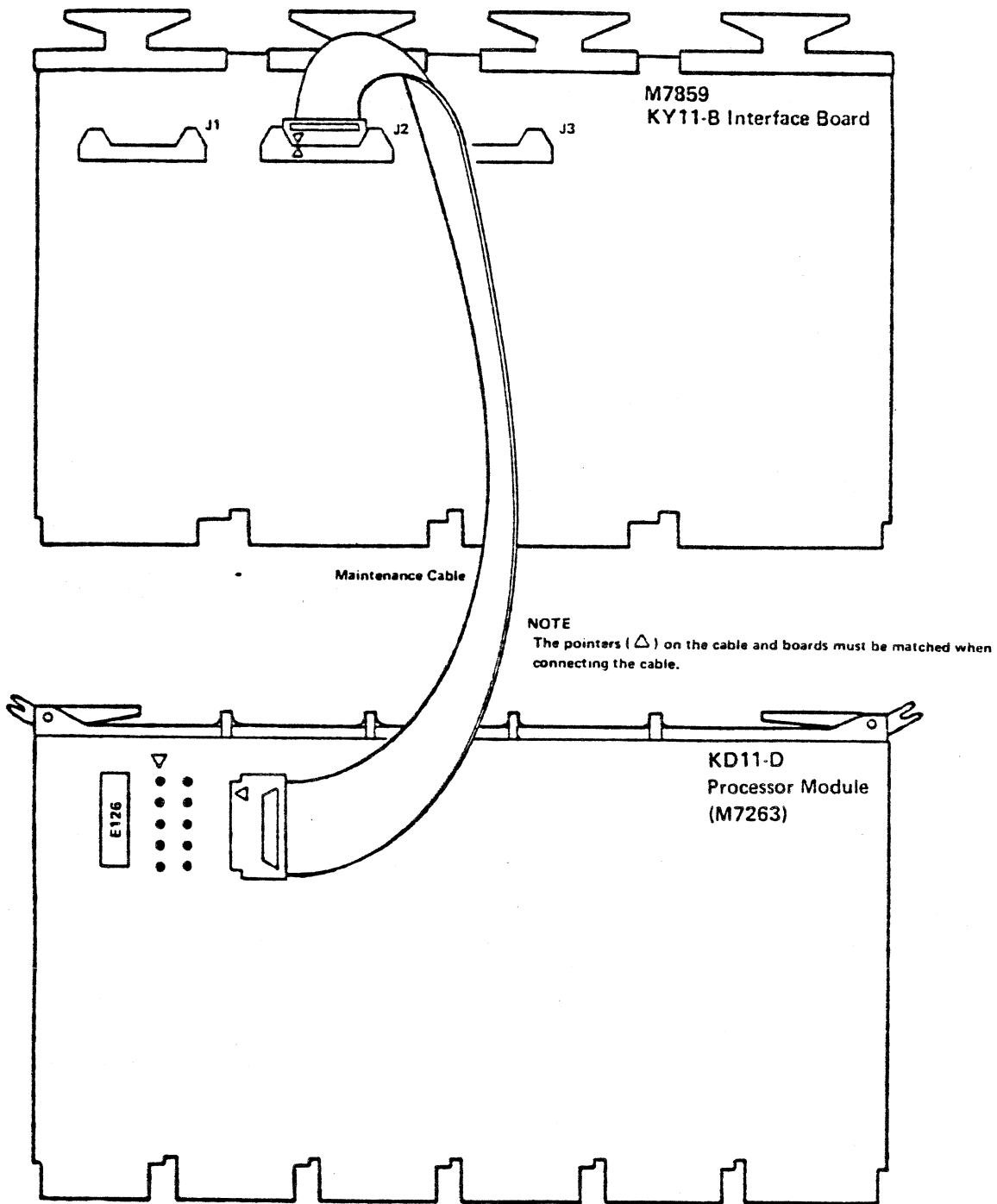
DD 11-PK

	A	B	C	D	E	F
1						
2						
3						
4						
5						
6						
7						
8						
9						

DD 11-DK

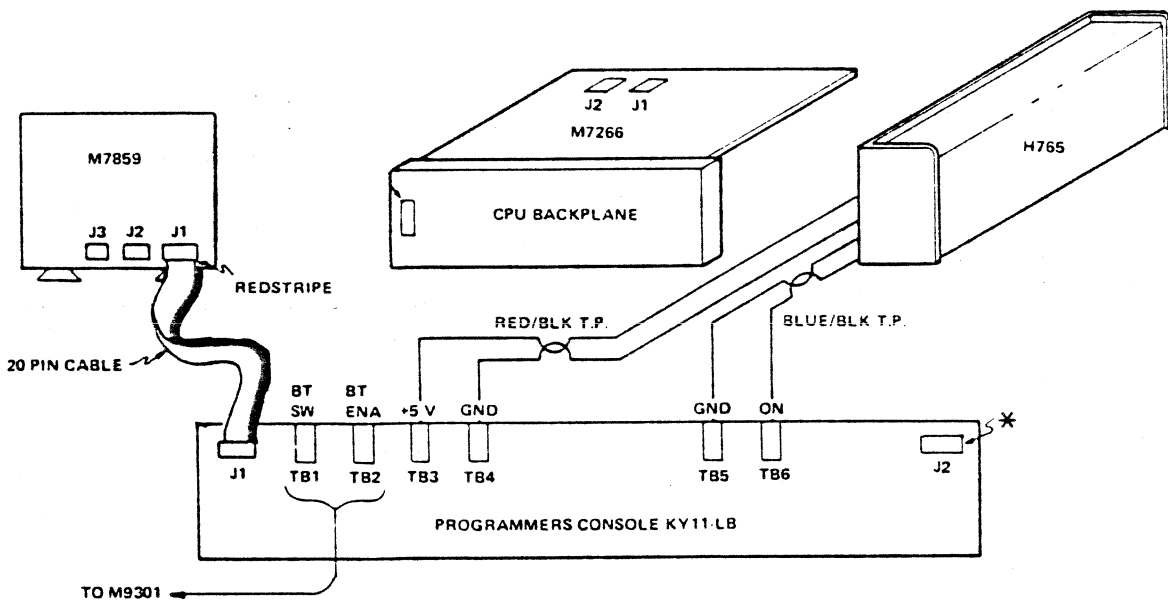
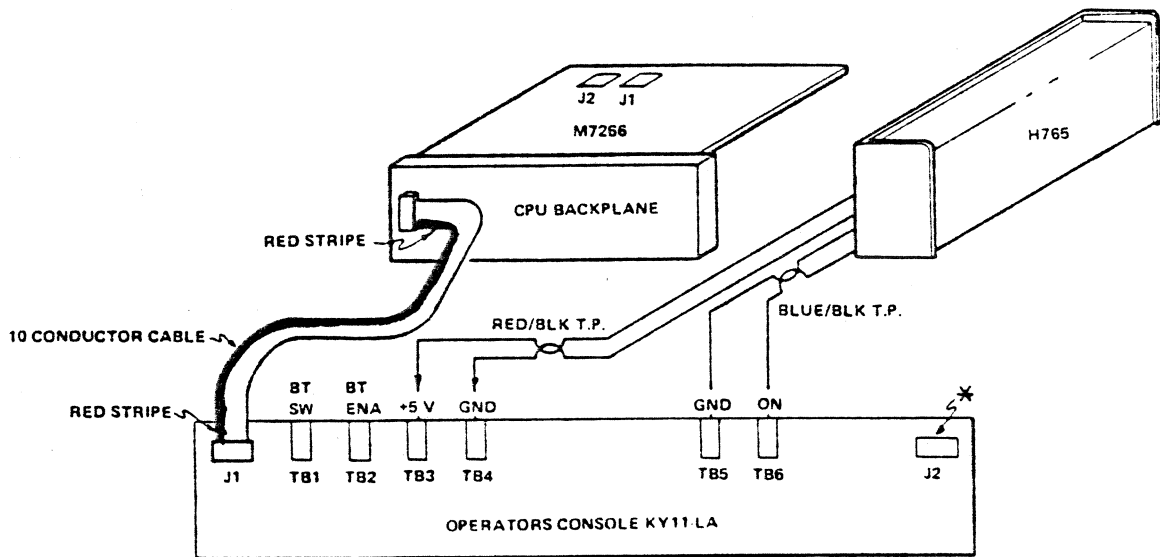
	A	B	C	D	E	F
1						
2						
3						
4						

DD 11-CK



11-4644

Figure A-1 KY11-LB Maintenance Cable Connection



* H775C

11 4848

CONTROL STORE ROM DEFINITIONS FOR THE POP 11A40

ROM SPA/=0,4,47,D
 R6=11
 SP=11
 PC=10
 R10=7
 R11=6
 R12=5
 R13=4
 R14=3
 R15=2
 R16=1
 R17=0
 R5=12
 FORCE KER/=0,1,43,D
 KER=1
 BUT SERV/=0,1,42,D
 SERV=1
 PREVIOUS MODE/=1,1,41,D
 ASSEM/=0
 FORCE RS+1/=1,1,40,D
 RS+1=0
 SPA DST SEL/=3,2,39,D
 RD=2
 RS=1
 ROM=0
 RHA=3
 SPA SRC SEL/=0,2,37,D
 RD=2
 RS=1
 ROM=0
 RHA=3
 BUT HITS/=0,4,35,D
 LOP=0
 NHT=1
 ZNIT=2
 CUSE=3
 JRG=4
 HX00=5
 HX01=6
 COUT=7
 SP15=10

0 = Default

4 = 4 BIT

47 = MOST RIGHT = 47

→ C out of 5

```

/ 59  NBITZBIT=11
/ 60  BX00SP15=12
/ 61  C05BX01RX00=14
/ 62  BX00C05=16
/ 63  ALL=15
/ 64  B0SERV=17
/ 65
/ 66  ANUX CTRL/=1,2,31,0
/ 67
/ 68  UHUS=3
/ 69  VFCT=2
/ 70  ALU=1
/ 71  PSW=0
/ 72
/ 73  SSMUX CTRL/=0,2,29,0
/ 74
/ 75  STRT=0
/ 76  SEX=1
/ 77  SWAB=2
/ 78  EXTRNL=3
/ 79
/ 80  BBX CTRL/=0,4,27,0
/ 81
/ 82  HOLD=0
/ 83  LOADR=1
/ 84  LOADHX=2
/ 85  SL(HX-0)LDH=3
/ 86  SL(HX-COUT)LDH=4
/ 87  SL(BX-1)LDH=5
/ 88  SL(B-0)=6
/ 89  SL(B-0)LDHX=7
/ 90  SL(B-BX15)=10
/ 91  SL(BX-0)=11
/ 92  SL(BX-1)=12
/ 93  SL(HX-OVX)=13
/ 94  SL(HX-COUT)=14
/ 95  SL(B-BX-0)=15
/ 96  SW(B15-B-RX)=16
/ 97  ENAB DRE=17
/ 98
/ 99  ALU RDEC/=5,5,23,0
/ 100
/ 101  ZERO=0
/ 102  ABAR=1
/ 103  A+1=2
/ 104  A-1=3
/ 105  A-R=4
/ 106  A=5
/ 107  H=6
/ 108  ONEHAR=7
/ 109  A+R=10
/ 110  A-R=11
/ 111  ABAR-D=12
/ 112  AVH=13
/ 113  AVD=14
/ 114  A-RBAR=15
/ 115  K16=16
/ 116  A+R+1=20
/ 117  A+R=21
/ 118  A-HX=22
/ 119  A+DX+1=23
/ 120  A+2=24
/ 121  A-2=25
/ 122  A+A=26
/ 123  RX=27
/ 124  B0AR=30

```

= don't go to Service

```

117  BXHAP=31
118  A+A1=32
127  AUX CTRL/=0,1,16,D
128  AUX CTRL/=0,1,16,D
129  AUX=1
130  AUX=1
131  LONG CYCLE/=1,1,17,D
132  LONG CYCLE/=1,1,17,D
133  LONG=0
134  LONG=0
135  LOAD BA/=0,1,16,D
136  LOAD BA/=0,1,16,D
137  BA=1
138  BA=1
139  ENAB MAINT/=0,1,15,D
140  ENAB MAINT/=0,1,15,D
141  MAINT=1
142  MAINT=1
143  BUS CTRL/=0,2,14,D
144  BUS CTRL/=0,2,14,D
145  DATI=0
146  DATI=0
147  DATIP=1
148  DATIP=1
149  DATO=2
150  DATO=2
151  DATA TRAN/=0,1,12,D
152  DATA TRAN/=0,1,12,D
153  TRAN=1
154  TRAN=1
155  MISC CTRL/=0,3,11,D
156  MISC CTRL/=0,3,11,D
157  NOP=0
158  NOP=0
159  LOADIR=1
160  LOADIR=1
161  LOADPSM=2
162  LOADPSM=2
163  LOADCC=3
164  LOADCC=3
165  BUTDFST=4
166  BUTDFST=4
167  ECARSTOV=5
168  ECARSTOV=5
169  LOADC=6
170  LOADC=6
171  COUNT=7
172  COUNT=7
173  J/=0,9,8,*
174  J/=0,9,8,*
175  J/=0,9,8,*
176  J/=0,9,8,*
177  J/=0,9,8,*
178  J/=0,9,8,*
179  J/=0,9,8,*
180  J/=0,9,8,*
181  J/=0,9,8,*
182  J/=0,9,8,*
183  J/=0,9,8,*
184  J/=0,9,8,*
185  J/=0,9,8,*
186  J/=0,9,8,*
187  J/=0,9,8,*
188  J/=0,9,8,*
189  J/=0,9,8,*
190  J/=0,9,8,*

```

MACRO DEFINITIONS

```

R_PC+B  "BX CTRL/LOADB,ROM SPA/PC,ALU BLEG/A+B"
R_PC    "BX CTRL/LOADB,ROM SPA/PC"
R_BX SL(BX-0)  "BX CTRL/SL(BX-0)LOB,ALU BLEG/BX"
R_BX SL(BX-1)  "BX CTRL/SL(BX-1)LOB,ALU BLEG/BX"
R_R17-B      "BX CTRL/LOADB,ALU BLEG/A-B"
R_RHAP      "BX CTRL/LOADB,ALU BLEG/HHAR"

```

191	B_PSW	"BBX CTRL/LOADB,AMUX CTRL/PSW"
192		
193	B_(R10.B)	"BBX CTRL/LOADB,ROM SPA/R10,ALU BLEG/A.B"
194		
195	B_B	"BBX CTRL/LOADB,ALU BLEG/B"
196		
197	B_R7+B+1	"BBX CTRL/LOADB,ROM SPA/PC,ALU BLEG/A+B+1"
198		
199	B_MINUS 1	"BBX CTRL/LOADB,ALU BLEG/DNEBAR"
200		
201	B_UDATA	"BBX CTRL/LOADB,AMUX CTRL/UDUS"
202		
203	B_RS	"BBX CTRL/LOADB,SPA SRC SEL/RS"
204		
205	B_RD	"BBX CTRL/LOADB,SPA SRC SEL/RD"
206		
207	B_RD+U	"BBX CTRL/LOADB,SPA SRC SEL/RD,ALU BLEG/A+B"
208		
209	B_BX	"BBX CTRL/LOADB,ALU BLEG/BX"
210		
211	B_0	"BBX CTRL/LOADB,AMUX CTRL/VECT"
212		
213	B_R12+B	"BBX CTRL/LOADB,ROM SPA/R12,ALU BLEG/A+B"
214		
215	B_R13+B+1	"BBX CTRL/LOADB,ROM SPA/R13,ALU BLEG/A+B+1"
216		
217	B_RD-RD-2	"BBX CTRL/LOADB,SPA SRC SEL/RD,SPA DST SEL/RD,ALU BLEG/A-2"
218		
219	B_RS-BX	"BBX CTRL/LOADB,SPA DST SEL/RS,ALU BLEG/BX"
220		
221	BA_R6	"LOAD BA/BA,ROM SPA/R6"
222		
223	BA_PC	"LOAD BA/BA,ROM SPA/PC"
224		
225	BA_RS	"LOAD BA/BA,SPA SRC SEL/RS"
226		
227	BA_R12	"LOAD BA/BA,ROM SPA/R12"
228		
229	BA_RD	"LOAD BA/BA,SPA SRC SEL/RD"
230		
231	BA_R13	"LOAD BA/BA,ROM SPA/R13"
232		
233	BA_R15	"LOAD BA/BA,ROM SPA/R15"
234		
235	BA_R17	"LOAD BA/BA,ROM SPA/R17"
236		
237	BX_RS ASL B	"BBX CTRL/SL(B-0)LDX,ROM SPA/RS"
238		
239	BX_UDATA	"BBX CTRL/LOADB,AMUX CTRL/URUS"
240		
241	BX_RSV1	"BBX CTRL/LOADB,SPA SRC SEL/RS,FORCE RS+1/RS+1"
242		
243	BX_B	"BBX CTRL/LOADB,ALU BLEG/B"
244		
245	BX_R17-BX	"BBX CTRL/LOADB,ROM SPA/R17,ALU BLEG/A-BX"
246		
247	BX_0	"BBX CTRL/LOADB,AMUX CTRL/VECT"
248		
249	BX_MINUS 1	"BBX CTRL/LOADB,ALU BLEG/DNEBAR"
250		
251	BX_R17+1	"BBX CTRL/LOADB,ROM SPA/R17,ALU BLEG/A+1"
252		
253	BX_S	"BBX CTRL/LOADB,SPA SRC SEL"
254		
255	BX_R17+BX+1	"BBX CTRL/LOADB,ROM SPA/R17,ALU BLEG/A+BX+1"

7 25	SS_R12+R	"ROM SPA/R12,ALU BLEG/A+B"
7 256	SS_R13+R+1	"ROM SPA/R13,ALU BLEG/A+R+1"
7 260	SS_RS	"ROM SPA/RS"
7 261	PSW_B	"MISC CTRL/LOADPSW,ALU BLEG/0"
7 262	PSW_UDATA	"MISC CTRL/LOADPSW,AMUX CTRL/UBUS"
7 263	IR_U_UDATA	"MISC CTRL/LOADIR,HBX CTRL/LOAD0,AMUX CTRL/UBUS"
7 264	IR_0	"MISC CTRL/LOADIR,ALU BLEG/ZERO"
7 265	PC_RD	"SPA DST SEL/ROM,ROM SPA/PC,SPA SMC SEL/RD"
7 266	PC_B	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/B"
7 267	PC_RD+B	"SPA DST SEL/ROM,ROM SPA/PC,SPA SMC SEL/RD,ALU BLEG/A+B"
7 268	PC_UDATA	"SPA DST SEL/ROM,ROM SPA/PC,AMUX CTRL/UBUS"
7 269	PC_PC+2	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/A+2,HBX CTRL/LOADBX"
7 270	PC_PC+2	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/A+2"
7 271	PC_HX	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/HX"
7 272	PC_PC+B	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/A+B"
7 273	PC_PC-B	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/A-B"
7 274	RD_B	"SPA DST SEL/RD,ALU BLEG/B"
7 275	RD_R12	"SPA DST SEL/RD,ROM SPA/R12"
7 276	RD_R12 OP B	"SPA DST SEL/RD,ROM SPA/R12,AUX CTRL/AUX"
7 277	RD_(RS OP B)	"SPA DST SEL/RD,SPA SMC SEL/RS,AUX CTRL/AUX,SSMUX CTRL/EXTRNL"
7 278	RD_RD OP B	"SPA DST SEL/RD,SPA SMC SEL/RD,AUX CTRL/AUX"
7 279	RD_(RD OP B)	"SPA DST SEL/RD,SPA SMC SEL/RD,AUX CTRL/AUX,SSMUX CTRL/EXTRNL"
7 280	RD_(R12 OP B)	"SPA DST SEL/RD,ROM SPA/R12,AUX CTRL/AUX,SSMUX CTRL/EXTRNL"
7 281	RD_RD-(2)	"SPA DST SEL/RD,SPA SMC SEL/RD,ALU BLEG/A-2,SSMUX CTRL/EXTRNL"
7 282	RD_RD+(2)	"SPA DST SEL/RD,SPA SMC SEL/RD,ALU BLEG/A+2,SSMUX CTRL/EXTRNL"
7 283	RD_RD+2	"SPA DST SEL/RD,SPA SMC SEL/RD,ALU BLEG/A+2"
7 284	RD_RD-2	"SPA DST SEL/RD,SPA SMC SEL/RD,ALU BLEG/A-2"
7 285	T_RS OP B	"SPA SMC SEL/RS,AUX CTRL/AUX"
7 286	T_RD OP B	"SPA SMC SEL/RD,AUX CTRL/AUX"
7 287	T_HX	"ALU BLEG/HX"
7 288	T_B	"ALU BLEG/B"
7 289	T_R12 OP B	"ROM SPA/R12,AUX CTRL/AUX"
7 290	T_R17	"ROM SPA/R17"
7 291		
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7 324	T-R12	"ROM SPA/R12"
7 324	T-R7	"ROM SPA/PC"
7 326	T-R13+1	"ROM SPA/R13,ALU BLEG/A+1"
7 329	T-RS+RS	"SPA SRC SEL/RS,ALU BLEG/A+A"
7 330	T-RSV1	"SPA SRC SEL/RS,FORCE RS+1/RS+1"
7 332	T-BUAR	"ALU BLEG/BRAR"
7 334	T-RS	"SPA SRC SEL/RS"
7 336	RS-B	"SPA DST SEL/ROM,ROM SPA/R5,ALU BLEG/B"
7 338	R6-B	"SPA DST SEL/ROM,ROM SPA/R6,ALU BLEG/B"
7 340	R6-R6-2	"SPA DST SEL/ROM,ROM SPA/R6,ALU BLEG/A-2"
7 341	R6-R6+B	"SPA DST SEL/ROM,ROM SPA/R6,ALU BLEG/A+B"
7 342	R6-R6+2	"SPA DST SEL/ROM,ROM SPA/R6,ALU BLEG/A+2"
7 344	R7-0	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/ZERO"
7 347	R7-R7+1	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/A+1"
7 349	R7-R7-1	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/A-1"
7 350	R7-R7+BX	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/A+HX"
7 351	R7-R7(XOR)B	"SPA DST SEL/ROM,ROM SPA/PC,ALU BLEG/A+B"
7 352	R10-B	"SPA DST SEL/ROM,ROM SPA/R10,ALU BLEG/B"
7 353	R12-RD	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RD"
7 354	R12-B	"SPA DST SEL/ROM,ROM SPA/R12,ALU BLEG/B"
7 355	R12-PSW	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/PSW"
7 356	R12-0	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/VFCT"
7 357	R12-UDATA	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/UDUS"
7 358	R12-RS+B	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RS,ALU BLEG/A+B"
7 359	R12-RD+BX	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RD,ALU BLEG/A+BX"
7 360	R12-RD+B	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RD,ALU BLEG/A+B"
7 361	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/LOADR,SPA SRC SEL/RS"
7 362	R12-RD	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/LOADR,AMUX CTRL/UDUS"
7 363	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/LOADR,AMUX CTRL/UDUS"
7 364	R12-UDATA	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/UDUS,SSMUX CTRL/EXTRNL"
7 365	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RS"
7 366	R12-RD	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RD"
7 367	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/LOADR,AMUX CTRL/UDUS"
7 368	R12-UDATA	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/UDUS,SSMUX CTRL/EXTRNL"
7 369	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RS"
7 370	R12-RD	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RD"
7 371	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/LOADR,AMUX CTRL/UDUS"
7 372	R12-UDATA	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/UDUS,SSMUX CTRL/EXTRNL"
7 373	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RS"
7 374	R12-RD	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RD"
7 375	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/LOADR,AMUX CTRL/UDUS"
7 376	R12-UDATA	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/UDUS,SSMUX CTRL/EXTRNL"
7 377	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RS"
7 378	R12-RD	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RD"
7 379	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/LOADR,AMUX CTRL/UDUS"
7 380	R12-UDATA	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/UDUS,SSMUX CTRL/EXTRNL"
7 381	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RS"
7 382	R12-RD	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RD"
7 383	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/LOADR,AMUX CTRL/UDUS"
7 384	R12-UDATA	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/UDUS,SSMUX CTRL/EXTRNL"
7 385	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RS"
7 386	R12-RD	"SPA DST SEL/ROM,ROM SPA/R12,SPA SRC SEL/RD"
7 387	R12-RS	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/LOADR,AMUX CTRL/UDUS"
7 388	R12-UDATA	"SPA DST SEL/ROM,ROM SPA/R12,AMUX CTRL/UDUS,SSMUX CTRL/EXTRNL"

391	R12 B-(UDATA)	"SPA DST SEL/ROP,ROM SPA/R17, X CTRL/LOADB,ANUX CTRL/URUS,SSMUX CTRL/EXTRNL"
392	RS_RS-(2)	"6PA DST SEL/RS,SPA SRC SEL/RS,ALU BLEG/A-2,SSMUX CTRL/EXTRNL"
393	RS_RS+(2)	"SPA DST SEL/RS,SPA SRC SEL/RS,ALU BLEG/A+2,SSMUX CTRL/EXTRNL"
395	RS_RS-2	"SPA DST SEL/RS,SPA SRC SEL/RS,ALU BLEG/A-2"
397	RS_RS+2	"SPA DST SEL/RS,SPA SRC SEL/RS,ALU BLEG/A+2"
399	RS_PC	"SPA DST SEL/RS,ROM 6PA/PC"
401	RS_RS-1	"SPA DST SEL/RS,SPA SRC SEL/RS,ALU BLEG/A-1"
403	RS_RX	"SPA DST SEL/RS,ALU BLEG/RX"
405	RS_B	"SPA DST SEL/RS,ALU BLEG/B"
407	RS_R17-BX	"SPA DST SEL/RS,ROM SPA/R17,ALU BLEG/A-BX"
409	RSV1-R17-B	"6PA DST SEL/RS,ROM SPA/R17,ALU BLEG/A-B,FORCE RS+1/RS+1"
411	RSV1_B	"6PA DST SEL/RS,ALU BLEG/B,FORCE RS+1/RS+1"
413	RSV1_0	"6PA DST SEL/RS,ANUX CTRL/VECT,FORCE RS+1/RS+1"
414	RSV1_BX	"SPA DST SEL/RS,ALU BLEG/RX,FORCE RS+1/RS+1"
416	R13_RD	"SPA DST SEL/ROM,ROM SPA/R13,SPA SRC SEL/RD"
417	R13_UDATA	"SPA DST SEL/ROM,ROM SPA/R13,ANUX CTRL/URUS"
419	R13_RD+B	"SPA DST SEL/ROM,ROM SPA/R13,SPA SRC SEL/RD,ALU BLEG/A+B"
421	R13 B-(UDATA)	"SPA DST SEL/ROM,ROM SPA/R13,BDX CTRL/LOADB,ANUX CTRL/URUS,SSMUX CTRL/EXTRNL"
422	R13 B_RD	"SPA DST SEL/ROM,ROM SPA/R13,BDX CTRL/LOADB,SPA SRC SEL/RD"
426	R13_BXBAR	"SPA DST SEL/ROM,ROM SPA/R13,ALU BLEG/BXBAR"
428	R13_RSBAR	"SPA DST SEL/ROM,ROM SPA/R13,SPA SRC SEL/RS,ALU BLEG/ABAR"
430	R15_0	"SPA DST SEL/ROM,ROM SPA/R15,ANUX CTRL/VECT"
431	R15_R15-2	"SPA DST SEL/ROM,ROM SPA/R15,ALU BLEG/A-2"
433	R15_R15+2	"SPA DST SEL/ROM,ROM SPA/R15,ALU BLEG/A+2"
435	R15_R15+R15+1	"SPA DST SEL/ROM,ROM SPA/R15,ALU BLEG/A+A+1"
436	R15_R15+R15	"SPA DST SEL/ROP,ROM SPA/R15,ALU BLEG/ATA"
438	R15_B	"SPA DST SEL/ROM,ROM SPA/R15,ALU BLEG/B"
439	R17_B	"SPA DST SEL/ROM,ROM SPA/R17,ALU BLEG/B"
440	R17_0	"SPA DST SEL/ROM,ROM SPA/R17,ANUX CTRL/VECT"
442	R17-R17-1	"6PA DST SEL/ROM,ROM SPA/R17,ALU BLEG/A-1"
444	R17-MINUS 1	"SPA DST SEL/ROM,ROM SPA/R17,ALU BLEG/ONEHAN"
446	R17-R17+2	"SPA DST SEL/ROM,ROM SPA/R17,ALU BLEG/A+2"
448	UDATA_R12	"ROM SPA/P12"
449		
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J 455 UDATA_R12 OP B "ROM SPA/R12,AUX CTRL/AUX"
 J 456 UDATA_B "ALU BLEG/B"
 J 458 UDATA_PC "ROM SPA/PC"
 J 460 UDATA_RS "SPA SRC SEL/RS"
 J 462 UDATA_(R12 OP R) "ROM SPA/R12,AUX CTRL/AUX,SSHUX CTRL/EXTRNL"
 J 464 C_RD "MISC CTRL/LOADC,SPA SRC SEL/RD"
 J 466 C_UDATA "MISC CTRL/LOADC,AUX CTRL/UBUS"
 J 468 C_16 "MISC CTRL/LOADC,ALU BLEG/K16"
 J 470 CC_RX "MISC CTRL/LOADC,ALU BLEG/RX"
 J 472 CC_R12.BBAR "MISC CTRL/LOADC,ROM SPA/R12,ALU BLEG/A.BBAR"
 J 474 CC_R12 V B "MISC CTRL/LOADC,ROM SPA/R12,ALU BLEG/AVB"
 J 476 CC_R12 "MISC CTRL/LOADC,ROM SPA/R12"
 J 478 CC_R17+1 "MISC CTRL/LOADC,ROM SPA/R17,ALU BLEG/A+1"
 J 480 CC_R17+2 "MISC CTRL/LOADC,ROM SPA/R17,ALU BLEG/A+2"
 J 482 KERNEL "FORCE KER/KER"
 J 484 PREVIOUS "PREVIOUS MODE/ASSERT"
 J 486 SL(B-BX15) "BX CTRL/SL(B-BX15)"
 J 488 SL(B-0) "BX CTRL/SL(B-0)"
 J 490 SL(BX-0) "BX CTRL/SL(BX-0)"
 J 492 SL(BX-1) "BX CTRL/SL(BX-1)"
 J 494 SL(BX-OVX) "BX CTRL/SL(BX-OVX)"
 J 496 SL(BX-COUI) B_R13+R1 "BX CTRL/SL(BX-COUI)DB,ROM SPA/R13,ALU BLEG/A+R1"
 J 498 SL(BX-COUI) R_P12+R "BX CTRL/SL(BX-COUI)DB,ROM SPA/R12,ALU BLEG/A+R"
 J 500 SL(BX-COUI) "BX CTRL/SL(BX-COUI)"
 J 502 SL(B-BX-0) "BX CTRL/SL(B-BX-0)"
 J 504 SR(R15-B-BX) "BX CTRL/SR(R15-B-BX)"
 J 506 ASL B "BX CTRL/SL(B-0)"
 J 508 ROT SP15 "ROT BITS/SP15"
 J 510 ROT ZBIT "ROT BITS/ZBIT,LONG CYCLE/LONG"
 J 512 ROT MHIT "ROT BITS/MHIT,LONG CYCLE/LONG"
 J 514 ROT C05 "ROT BITS/C05"
 J 516 ROT I19 "ROT BITS/I19"
 J 518 ROT I15/I19 "ROT BITS/I15/I19"
 J 519 ROT I15/BX00 "ROT BITS/BX00"
 J 520

/ 521	BUT COUNT	"BUT BITS/COUNT, LONG CYCLE/LONG"
/ 522	BUT NBIT COS	"BUT BITS/NBITCOS, LONG CYCLE/LONG"
/ 523	BUT RX00 COS	"BUT BITS/RX00COS"
/ 524	BUT NBIT ZBIT	"BUT BITS/NBITZBIT, LONG CYCLE/LONG"
/ 525	BUT RX00 SP15	"BUT BITS/RX00SP15"
/ 526	BUT C05 RX01 BX00	"BUT BITS/C05RX01BX00"
/ 527	BUT ALL	"BUT BITS/ALL"
/ 528	BUT N0SERV	"BUT BITS/N0SERV"
/ 529	NOP	"BUT BITS/NOP"
/ 530	ENAB DRE	"ENAB CTRL/ENAB DRE"
/ 531	SWAB	"SSHUX CTRL/SWAB"
/ 532	SEX	"SSHUX CTRL/SEX"
/ 533	BUT SERVICE	"BUT SERV/SERV"
/ 534	DATI	"DATA TRAN/TRAN"
/ 535	DATIP	"DATA TRAN/TRAN, BUS CTRL/DATIP"
/ 536	LOAD CC	"MISC CTRL/LOADCC"
/ 537	BUT DEST	"MISC CTRL/BUTDEST"
/ 538	ENAB STUV	"MISC CTRL/ENABSTOV"
/ 539	DATO	"DATA TRAN/TRAN, BUS CTRL/DATO, LONG CYCLE/LONG"
/ 540	DATUB	"DATA TRAN/TRAN, BUS CTRL/DATUB, LONG CYCLE/LONG"
/ 541	MAINT	"ENAB MAINT/MAINT"
/ 542	COUNT	"MISC CTRL/COUNT"

J 564				J 11A40 FLOWS ETC
J 565				
J 566				
J 568	U 000, 0160,0105,0460,1740	1-A:	000:	B_UDATA,BUT SERVICE,J/1-B
J 569	U 016, 0151,4305,0460,1710	1-B:	016:	DA_PC,DATI,IR B_UDATA,J/1-C
J 570	U 015, 0000,0124,1020,0310	1-C:	015:	BX_PC-PC+2,J/1-A
J 571				
J 572	U 002, 0151,4305,0460,1710	1-D:	002:	BA_PC,DATI,IR B_UDATA,J/1-C
J 573				
J 574	U 210, 0003,0145,0337,3300	2-A:	210:	RD-(RS UP B),LOAD CC,BUT NOSERV,J/1-A
J 575				
J 576	U 140, 2100,0105,0420,5700	2-B:	140:	A_RD,J/2-A
J 577				
J 578	U 270, 2030,0105,0420,5700	2-C:	270:	B_RD,J/2-D
J 579				
J 580	U 203, 0003,0145,0037,3700	2-D:	203:	T_RS UP B,LOAD CC,BUT NOSERV,J/1-A
J 581				
J 582	U 240, 2040,0105,0420,3700	2-E:	240:	B_RS,J/2-F
J 583				
J 584	U 204, 0003,0145,0037,5300	2-F:	204:	RD_RD UP B,LOAD CC,BUT NOSERV,J/1-A
J 585				
J 586	U 150, 0704,0105,0040,0305	2-G:	150:	R12_0,BUT DEST,J/5-A
J 587				
J 588	U 110, 0404,0105,0420,2305	3-A:	110:	R12 B_RS,BUT DEST,J/7-A
J 589				
J 590	U 111, 0404,4305,0760,2305	3-B:	111:	BA_RS,DATI,R12 B_(UDATA),BUT DEST,J/7-A
J 591				
J 592	U 114, 1115,0125,0320,2700	3-C:	114:	RS_RS-(2),ENAB STOV,J/3-B
J 593				
J 594	U 112, 2050,4305,0760,2305	3-D:	112:	BA_RS,DATI,R12 B_(UDATA),J/3-E
J 595				
J 596	U 205, 0404,0124,0320,2700	3-E:	205:	RS_RS+(2),BUT DEST,J/7-A
J 597				
J 598				
J 599				
J 600	U 113, 2060,4305,0060,2305	3-F:	113:	BA_RS,DATI,R12_UDATA,J/1-G
J 601				
J 602	U 206, 2110,0124,0020,2700	3-G:	206:	RS_RS+2,J/3-J
J 603				
J 604	U 115, 2075,0125,0020,2700	3-H:	115:	RS_RS-2,ENAB STOV,J/3-I
J 605				
J 606	U 207, 2110,4305,0060,2305	3-I:	207:	BA_RS,DATI,R12_UDATA,J/3-J
J 607				
J 608	U 211, 0404,4305,0760,0305	3-J:	211:	BA_R12,DATI,R12 B_(UDATA),BUT DEST,J/7-A
J 609				
J 610	U 116, 2120,4305,0460,1710	3-K:	116:	DA_PC,DATI,B_UDATA,J/3-L
J 611				
J 612	U 212, 2130,0124,0020,0310	3-L:	212:	PC_PC+2,J/3-W
J 613				
J 614	U 213, 2110,0110,0020,2305	3-M:	213:	R12_RS+U,J/3-J
J 615				
J 616	U 117, 2140,4305,0460,1710	3-N:	117:	BA_PC,DATI,B_UDATA,J/3-O
J 617				
J 618	U 214, 2150,0124,0020,0310	3-O:	214:	PC_PC+2,J/3-P
J 619				
J 620	U 215, 2160,0110,0020,2305	3-P:	215:	R12_RS+U,J/3-O
J 621				

U 216,	2110,4305,0060,0305	J 622	2161	3-01	BA_R12,DATA,R12_UDATA,J/3-J
U 217,	0003,7445,0337,1705	J 623	0501	4-A1	RD_(R12 OP R),LOAD CC,BUT NOSERV,J/1-A
U 218,	2170,0705,0020,5700	J 624	0511	4-B1	BA_RD,MAINT,J/4-E
U 219,	0515,0125,0320,5300	J 625	0541	4-C1	RD_RD-(2),ENAB STOV,J/4-B
U 220,	2170,0724,0320,5300	J 626	0521	4-D1	BA_RD,MAINT,RD_RD*(2),J/4-E
U 221,	0003,7445,0337,1705	J 627	2171	4-E1	DATOR,UDATA_(R12 OP R),LOAD CC,MAINT,BUT NOSERV,J/1-A
U 222,	1410,4305,0060,4304	J 628	0531	4-F1	BA_RD,DATA,R13_UDATA,J/4-G
U 223,	1430,0124,0020,5300	J 629	1411	4-G1	RD_RD+2,J/4-0
U 224,	1425,0125,0020,5300	J 630	0551	4-H1	RD_RD-2,ENAB STOV,J/4-I
U 225,	1430,4305,0060,4304	J 631	1421	4-I1	BA_RD,DATA,R13_UDATA,J/4-0
U 226,	1440,4305,0460,1710	J 632	0561	4-J1	BA_PC,DATA,H_UDATA,J/4-K
U 227,	1450,0124,0020,0310	J 633	1441	4-K1	PC_PC+2,J/4-L
U 228,	1430,0110,0020,4304	J 634	1451	4-L1	R13_RD+B,J/4-0
U 229,	1460,4305,0460,1710	J 635	0571	4-M1	HA_PC,DATA,H_UDATA,J/4-N
U 230,	1470,0124,0020,0310	J 636	1461	4-N1	PC_PC+2,J/4-0
U 231,	2410,0110,0020,4304	J 637	1471	4-O1	R13_RD+B,J/4-P
U 232,	1430,4305,0060,0304	J 638	2411	4-P1	BA_R13,DATA,R13_UDATA,J/4-0
U 233,	2170,0705,0020,1704	J 639	1431	4-Q1	BA_R13,MAINT,J/4-E
U 234,	0500,0105,0420,4304	J 640	0701	5-A1	R13 B_RD,J/4-A
U 235,	2170,5705,0760,4304	J 641	0711	5-B1	BA_RD,DATIP,R13 B_(UDATA),MAINT,J/4-E
U 236,	0715,0125,0320,5300	J 642	0741	5-C1	RD_RD-(2),ENAB STOV,J/5-B
U 237,	2420,5705,0760,4304	J 643	0721	5-D1	BA_RD,DATIP,R13 B_(UDATA),MAINT,J/5-E
U 238,	2170,0124,0320,5300	J 644	2421	5-E1	RD_RD*(2),J/4-E
U 239,	2430,4305,0060,4304	J 645	0731	5-F1	BA_RD,DATA,R13_UDATA,J/5-G
U 240,	2450,0124,0020,5300	J 646	2431	5-G1	RD_RD+2,J/5-J
U 241,	2445,0125,0020,5300	J 647	0751	5-H1	RD_RD-2,ENAB STOV,J/5-I
U 242,	2450,4305,0060,4304	J 648	2441	5-I1	BA_RD,DATA,R13_UDATA,J/5-J
U 243,	2170,5705,0760,0304	J 649	2451	5-J1	BA_R13,DATIP,R13 B_(UDATA),MAINT,J/4-E
U 244,	2460,4305,0460,1710	J 650	0761	5-K1	BA_PC,DATA,H_UDATA,J/5-L
U 245,	2470,0124,0020,0310	J 651	2461	5-L1	PC_PC+2,J/5-M
U 246,	2450,0110,0020,4304	J 652	2471	5-M1	R13_RD+B,J/5-J
U 247,	6610,4305,0460,1710	J 653	0771	5-N1	BA_PC,DATA,H_UDATA,J/5-O
U 248,	2610,0124,0020,0310	J 654	6611	5-O1	PC_PC+2,J/5-P
J 655		J 655			
J 656		J 656			
J 657		J 657			
J 658		J 658			
J 659		J 659			
J 660		J 660			
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J 675		J 675			
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J 677		J 677			
J 678		J 678			
J 679		J 679			
J 680		J 680			
J 681		J 681			
J 682		J 682			
J 683		J 683			
J 684		J 684			
J 685		J 685			
J 686		J 686			
J 687		J 687			

U 261,	2620,0110,0020,4304	J 688	2631	5-P1	R13_RD+B,J/5-0
J 689					
U 262,	2450,4305,0060,0304	J 690	2621	5-01	BA_R13,DATA,R13_UDATA,J/5-J
J 691					
U 060,	2650,0105,0420,4304	J 692	0601	6-A1	R13_R_PD,J/6-H
J 693					
U 061,	2650,4705,0760,4304	J 694	0611	6-H1	BA_RD,DATA,R13_R_(UDATA),MAINT,J/6-H
J 695					
U 064,	0615,0125,0320,5300	J 696	0641	6-C1	RD_RD-(2),ENAB STOV,J/6-0
J 697					
U 062,	2630,4705,0760,4304	J 698	0621	6-D1	BA_RD,DATA,R13_R_(UDATA),MAINT,J/6-E
J 699					
U 263,	2650,0124,0320,5300	J 700	2631	6-E1	RD_RD+(2),J/6-H
J 701					
U 063,	2640,4305,0060,4304	J 702	0631	6-F1	BA_RD,DATA,R13_UDATA,J/6-G
J 703					
U 264,	2670,0124,0020,5300	J 704	2641	6-G1	RD_RD+2,J/6-K
J 705					
U 265,	0003,0145,0037,1705	J 706	2651	6-H1	T_R12 UP B,LOAD CC,BUT NOSERV,J/1-A
J 707					
U 065,	2665,0125,0020,5300	J 708	0651	6-I1	RD_RD-2,ENAB STOV,J/6-J
J 709					
U 266,	2670,4305,0060,4304	J 710	2661	6-J1	BA_RD,DATA,R13_UDATA,J/6-K
J 711					
U 267,	2650,4705,0760,0304	J 712	2671	6-K1	BA_R13,DATA,R13_R_(UDATA),MAINT,J/6-H
J 713					
U 066,	6620,4305,0460,1710	J 714	0661	6-L1	BA_PC,DATA,B_UDATA,J/6-H
J 715					
U 662,	2710,0124,0020,0310	J 716	6621	6-M1	PC_PC+2,J/6-N
J 717					
U 271,	2670,0110,0020,4304	J 718	2711	6-N1	R13_RD+B,J/6-K
J 719					
U 067,	2720,4305,0460,1710	J 720	0671	6-O1	BA_PC,DATA,B_UDATA,J/6-P
J 721					
U 272,	2730,0124,0020,0310	J 722	2721	6-P1	PC_PC+2,J/6-0
J 723					
U 273,	2740,0110,0020,4304	J 724	2731	6-Q1	R13_RD+B,J/6-H
J 725					
U 274,	2670,4305,0060,0304	J 726	2741	6-R1	BA_R13,DATA,R13_UDATA,J/6-K
J 727					
U 040,	0003,0145,0337,5300	J 728	0401	7-A1	RD_(RD OP B),LOAD CC,BUT NOSERV,J/1-A
J 729					
U 041,	2170,5705,0360,4305	J 730	0411	7-N1	BA_RD,DATA,R12_(UDATA),MAINT,J/4-E
J 731					
U 044,	0415,0125,0320,5300	J 732	0441	7-C1	RD_RD-(2),ENAB STOV,J/7-B
J 733					
U 042,	2750,5705,0360,4305	J 734	0421	7-D1	BA_RD,DATA,R12_(UDATA),MAINT,J/7-E
J 735					
U 275,	2170,0124,0320,5300	J 736	2751	7-E1	RD_RD+(2),J/4-E
J 737					
U 043,	2760,4305,0060,4305	J 738	0431	7-F1	BA_RD,DATA,R12_UDATA,J/7-G
J 739					
U 276,	3000,0124,0020,5300	J 740	2761	7-G1	RD_RD+2,J/7-J
J 741					
U 045,	2775,0125,0020,5300	J 742	0451	7-H1	RD_RD-2,ENAB STOV,J/7-I
J 743					
U 277,	3000,4305,0060,4305	J 744	2771	7-I1	BA_RD,DATA,R12_UDATA,J/7-J
J 745					
U 300,	2170,5705,0360,0305	J 746	3001	7-J1	BA_R12,DATA,R12_(UDATA),MAINT,J/4-E
J 747					
U 046,	3010,4305,1060,1710	J 748	0461	7-K1	BA_PC,DATA,DX_UDATA,J/7-H
J 749					
U 301,	3020,0124,0020,0310	J 750	3011	7-L1	PC_PC+2,J/7-N
J 751					
U 302,	3000,0121,0020,4305	J 752	3021	7-N1	R12_RD+DX,J/7-J
J 753					

U 047, 3030,4305,1060,1710	750	047:	7-HI	BA_PC,DATA1,BX_UDATA,J/1-0
755				
U 303, 3040,0124,0020,0310	756	303:	7-01	PC_PC+2,J/7-P
757				
U 304, 3050,0121,0020,4305	758	304:	7-01	R12_RD+BX,J/7-0
759				
U 305, 3000,4305,0060,0305	760	305:	7-01	BA_R12,DATA1,R12_UDATA,J/7-J
761				
U 160, 0003,0145,0037,5700	762	160:	8-A1	T_RD OP B,LOAD CC,BUT NOSERV,J/1-A
763				
U 161, 2650,4705,0360,4305	764	161:	8-B1	BA_RD,DATA1,R12_(UDATA),MAINT,J/6-H
765				
U 164, 1615,0125,0320,5300	766	164:	8-C1	RD_RD-(2),ENAB STOV,J/H-H
767				
U 162, 3060,4705,0360,4305	768	162:	8-D1	BA_RD,DATA1,R12_(UDATA),MAINT,J/8-E
769				
U 306, 2650,0124,0320,5300	770	306:	8-E1	RD_RD+(2),J/6-H
771				
U 163, 3070,4305,0060,4305	772	163:	8-F1	BA_RD,DATA1,R12_UDATA,J/H-G
773				
U 307, 3110,0124,0020,5300	774	307:	8-G1	RD_RD+2,J/8-J
775				
U 165, 3105,0125,0020,5300	776	165:	8-H1	RD_RD-2,ENAB STOV,J/H-I
777				
U 310, 3110,4305,0060,4305	778	310:	8-I1	BA_RD,DATA1,R12_UDATA,J/U-J
779				
U 311, 2650,4705,0360,0305	780	311:	8-J1	BA_R12,DATA1,R12_(UDATA),MAINT,J/6-H
781				
U 166, 3120,4305,0460,1710	782	166:	8-K1	BA_PC,DATA1,6_UDATA,J/8-L
783				
U 312, 3130,0124,0020,0310	784	312:	8-L1	PC_PC+2,J/H-H
785				
U 313, 3110,0110,0020,4305	786	313:	8-M1	R12_RD+H,J/8-J
787				
U 167, 3140,4305,0460,1710	788	167:	8-N1	BA_PC,DATA1,8_UDATA,J/8-0
789				
U 314, 3150,0124,0020,0310	790	314:	8-O1	PC_PC+2,J/8-P
791				
U 315, 3160,0110,0020,4305	792	315:	8-P1	R12_RD+H,J/8-0
793				
U 316, 3110,4305,0060,0305	794	316:	8-Q1	BA_R12,DATA1,R12_UDATA,J/8-J
795				
U 021, 0000,0105,0037,4310	796	021:	9-A1	PC_RD,BUT NOSERV,J/1-A
797				
U 024, 0215,0125,0020,5300	798	024:	9-B1	RD_RD-2,ENAB STOV,J/9-A
799				
U 022, 3170,0105,0420,5700	800	022:	9-C1	B_RD,J/9-E
801				
U 023, 3170,4305,0460,5700	802	023:	9-D1	BA_RD,DATA1,8_UDATA,J/9-E
803				
U 317, 3200,0124,0020,5300	804	317:	9-E1	RD_RD+2,J/9-F
805				
U 320, 0000,0106,0037,0310	806	320:	9-F1	PC_B,BUT NOSERV,J/1-A
807				
U 025, 3215,0125,0020,5300	808	025:	9-G1	RD_RD-2,ENAB STOV,J/9-H
809				
U 321, 3200,4305,0460,5700	810	321:	9-H1	BA_RD,DATA1,8_UDATA,J/9-F
811				
U 026, 3220,4305,0460,1710	812	026:	9-I1	BA_PC,DATA1,8_UDATA,J/9-J
813				
U 322, 3230,0124,0020,0310	814	322:	9-J1	PC_PC+2,J/9-K
815				
U 323, 0000,0110,0037,4310	816	323:	9-K1	PC_RD+H,BUT NOSERV,J/1-A
817				
U 027, 3240,4305,0460,1710	818	027:	9-L1	BA_PC,DATA1,8_UDATA,J/9-M
819				

U 324,	3250,0124,0020,0310	/ 820	9-HI	PC_PC+2,J/9-H
/ 821				
U 325,	3260,0110,0020,4305	/ 822	9-NI	R12_RD+R,J/9-U
/ 823				
U 326,	3200,4305,0460,1705	/ 824	9-UI	RA_R12,DATA,R_UDATA,J/9-F
/ 825				
U 151,	3360,0105,0420,5700	/ 826	10-AI	R_RD,J/10-U
/ 827				
U 154,	3365,0125,0420,5300	/ 828	10-BI	B RD_RD-2,ENAB STOV,J/10-D
/ 829				
U 152,	3270,0105,0420,5700	/ 830	10-CI	R_RD,J/10-E
/ 831				
U 153,	3270,4305,0460,5700	/ 832	10-DI	RA_RD,DATA,R_UDATA,J/10-E
/ 833				
U 327,	3360,0124,0020,5300	/ 834	10-EI	RD_RD+2,J/10-U
/ 835				
U 155,	3305,0125,0020,5300	/ 836	10-FI	RD_RD-2,ENAB STOV,J/10-G
/ 837				
U 330,	3360,4305,0460,5700	/ 838	10-GI	RA_RD,DATA,R_UDATA,J/10-U
/ 839				
U 156,	3310,4305,0460,1710	/ 840	10-HI	BA_PC,DATA,R_UDATA,J/10-I
/ 841				
U 331,	3320,0124,0020,0310	/ 842	10-JI	PC_PC+2,J/10-J
/ 843				
U 332,	3360,0310,0420,5700	/ 844	10-KI	R_RD+R,J/10-U
/ 845				
U 157,	3330,4305,0460,1710	/ 846	10-LI	BA_PC,DATA,R_UDATA,J/10-L
/ 847				
U 333,	3340,0124,0020,0310	/ 848	10-MI	PC_PC+2,J/10-M
/ 849				
U 334,	3350,0110,0020,4305	/ 850	10-NI	R12_RD+R,J/10-R
/ 851				
U 335,	3360,4305,0460,1705	/ 852	10-OI	BA_R12,DATA,R_UDATA,J/10-U
/ 853				
U 336,	3375,0125,0020,0311	/ 854	10-PI	R6_R6-2,ENAB STOV,J/10-P
/ 855				
U 337,	3400,0305,0020,1711	/ 856	10-QI	RA_R6,J/10-U
/ 857				
U 340,	3410,6005,0020,3700	/ 858	10-SI	DATA,UDATA_RS,J/10-R
/ 859				
U 341,	3420,0105,0020,0710	/ 860	10-TI	RS_PC,J/10-S
/ 861				
U 342,	0000,0106,0037,0310	/ 862	10-UI	PC_R,ROT ROSEHV,J/1-A
/ 863				
U 030,	3430,0105,0220,4305	/ 864	11-AI	R12_RD,SWAB,J/11-B
/ 865				
U 343,	0003,0145,0037,1305	/ 866	11-BI	RD_R12 OP R_LOAD CC,ROT MOSERV,J/1-A
/ 867				
U 031,	3550,5305,0260,4305	/ 868	11-CI	BA_RD,DATA,R_UDATA,SWAB,J/11-S
/ 869				
U 034,	0315,0125,0020,5300	/ 870	11-DI	PD_RD-2,ENAB STOV,J/11-C
/ 871				
U 032,	3440,5705,0260,4305	/ 872	11-EI	BA_RD,DATA,R_UDATA,SWAB,MAINT,J/11-F
/ 873				
U 344,	3550,0124,0020,5300	/ 874	11-FI	PD_RD+2,J/11-S
/ 875				
U 033,	3450,4305,0060,4305	/ 876	11-GI	RA_RD,DATA,R12_UDATA,SWAB,J/11-H
/ 877				
U 345,	3540,0124,0020,5300	/ 878	11-HI	RD_RD+2,J/11-H
/ 879				
U 035,	3465,0125,0020,5300	/ 880	11-II	RD_RD-2,ENAB STOV,J/11-J
/ 881				
U 346,	3540,4305,0060,4305	/ 882	11-JI	RA_RD,DATA,R12_UDATA,J/11-R
/ 883				
U 036,	3470,4305,0460,1710	/ 884	11-KI	BA_PC,DATA,R_UDATA,J/11-L
/ 885				

U 347,	3500,0124,0020,0310	J 887	11-L1	PC_PC+2,J/11-K
J 888		J 888	11-M1	R12_RD+H,J/11-R
J 889		J 889	11-N1	0A_PC,DATA,R_UDATA,J/11-U
J 890		J 890	11-O1	PC_PC+2,J/11-P
J 891		J 891	11-P1	R12_RD+H,J/11-O
J 892		J 892	11-Q1	0A_R12,DATA,R12_UDATA,J/11-R
J 893		J 893	11-R1	HA_R12,DATA,R12_UDATA,SWAB,MAINT,J/11-S
J 894		J 894	11-S1	DATU,MAINT,UDATA_R12 OP B,LOAD CC,BUT ROSENV,J/1-A
J 895		J 895	12-A1	R_RD,J/12-B
J 896		J 896	12-B1	0_H,J/4-A
J 897		J 897	12-C1	HA_RD,DATA,R12 H_(UDATA),MAINT,J/12-S
J 898		J 898	12-D1	RD_RD-(2),ERAB STOV,J/12-C
J 899		J 899	12-E1	HA_RD,DATA,R12 H_(UDATA),MAINT,J/12-F
J 900		J 900	12-F1	RD_RD+(2),J/12-S
J 901		J 901	12-G1	HA_RD,DATA,R12_UDATA,J/12-H
J 902		J 902	12-H1	RD_RD+2,J/12-K
J 903		J 903	12-I1	RD_RD-2,ERAB STOV,J/12-J
J 904		J 904	12-J1	BA_RD,DATA,R12_UDATA,J/12-K
J 905		J 905	12-K1	HA_R12,DATA,R12 H_(UDATA),MAINT,J/12-S
J 906		J 906	12-L1	HA_PC,DATA,R_UDATA,J/12-M
J 907		J 907	12-M1	PC_PC+2,J/12-N
J 908		J 908	12-N1	R12_RD+H,J/12-H
J 909		J 909	12-O1	HA_PC,DATA,R_UDATA,J/12-P
J 910		J 910	12-P1	PC_PC+2,J/12-O
J 911		J 911	12-Q1	R12_RD+H,J/12-H
J 912		J 912	12-R1	HA_R12,DATA,R12_UDATA,J/12-K
J 913		J 913	12-S1	R_H,J/4-F
J 914		J 914	13-A1	R12_RD,PREVIOUS,J/13-S
J 915		J 915	13-B1	R12_RD,J/13-H
J 916		J 916	13-C1	RD_RD-2,ERAB STOV,J/13-H
J 917		J 917	13-D1	R12_RD,J/13-E
J 918		J 918	13-E1	HA_R12,DATA,R12 H_UDATA,PREVIOUS,J/13-F
J 919		J 919	13-F1	RD_RD+2,J/13-S
J 920		J 920		
J 921		J 921		
J 922		J 922		
J 923		J 923		
J 924		J 924		
J 925		J 925		
J 926		J 926		
J 927		J 927		
J 928		J 928		
J 929		J 929		
J 930		J 930		
J 931		J 931		
J 932		J 932		
J 933		J 933		
J 934		J 934		
J 935		J 935		
J 936		J 936		
J 937		J 937		
J 938		J 938		
J 939		J 939		
J 940		J 940		
J 941		J 941		
J 942		J 942		
J 943		J 943		
J 944		J 944		
J 945		J 945		
J 946		J 946		
J 947		J 947		
J 948		J 948		
J 949		J 949		
J 950		J 950		
J 951		J 951		

U 103, 4720,4305,0060,4305	J 952	13-G:	BA_RD, DAT1, R12_UDATA, J/13-H
J 953	J 953		
U 372, 4550,0124,0020,5300	J 954	13-H:	RD_RD+2, J/13-R
J 955	J 955		
U 105, 3735,0125,0020,5300	J 956	13-I:	RD_RD-2, ENAB STOV, J/13-I
J 957	J 957		
U 373, 4550,4305,0060,4305	J 958	13-J:	BA_RD, DAT1, R12_UDATA, J/13-R
J 959	J 959		
U 106, 3740,4305,0460,1710	J 960	13-K:	BA_PC, DAT1, B_UDATA, J/13-L
J 961	J 961		
U 374, 3750,0124,0020,0310	J 962	13-L:	PC_PC+2, J/13-H
J 963	J 963		
U 375, 4550,0110,0020,4305	J 964	13-M:	R12_RD+H, J/13-R
J 965	J 965		
U 107, 3760,4305,0460,1710	J 966	13-N:	BA_PC, DAT1, B_UDATA, J/13-O
J 967	J 967		
U 376, 3770,0124,0020,0310	J 968	13-O:	PC_PC+2, J/13-P
J 969	J 969		
U 377, 6430,0110,0020,4305	J 970	13-P:	R12_RD+H, J/13-O
J 971	J 971		
U 643, 4550,4305,0060,0305	J 972	13-Q:	BA_H12, DAT1, R12_UDATA, J/13-R
J 973	J 973		
U 455, 4630,4305,0460,0205	J 974	13-R:	BA_R12, DAT1, H12 B_UDATA, PREVIOUS, J/13-S
J 975	J 975		
U 463, 4725,0125,0020,0311	J 976	13-S:	R6_R6-2, ENAB STOV, J/13-T
J 977	J 977		
U 472, 2170,0705,0020,1711	J 978	13-T:	BA_R6, MAINT, J/4-E
J 979	J 979		
U 250, 0003,0145,0037,1205	J 980	14-A:	RD_H12 OP R, LOAD CC, PREVIOUS, BUT ROSEHV, J/1-A
J 981	J 981		
U 251, 5130,0105,0020,4304	J 982	14-B:	R13_RD, J/14-R
J 983	J 983		
U 254, 2515,0125,0020,5300	J 984	14-C:	RD_RD-2, ENAB STOV, J/14-B
J 985	J 985		
U 010, 6440,4305,0460,1711	J 986	14-D:	BA_R6, DAT1, B_UDATA, J/14-T
J 987	J 987		
U 644, 6420,0106,0020,0305	J 988	14-E:	R12_H, J/14-E
J 989	J 989		
U 642, 2504,0124,0020,0311	J 990	14-F:	R6_R6+2, BUT DEST, J/14-A
J 991	J 991		
U 252, 4740,0105,0020,4304	J 992	14-F:	R13_RD, J/14-G
J 993	J 993		
U 474, 5130,0124,0020,5300	J 994	14-G:	RD_RD+2, J/14-R
J 995	J 995		
U 253, 4740,4305,0060,4304	J 996	14-H:	BA_PD, DAT1, H13_UDATA, J/14-G
J 997	J 997		
U 255, 4755,0125,0020,5300	J 998	14-I:	RD_RD-2, ENAB STOV, J/14-J
J 999	J 999		
U 475, 5130,4305,0060,4304	J 1000	14-J:	BA_RD, DAT1, R13_UDATA, J/14-R
J 1001	J 1001		
U 256, 4760,4305,0460,1710	J 1002	14-K:	BA_PC, DAT1, B_UDATA, J/14-L
J 1003	J 1003		
U 476, 5520,0124,0020,0310	J 1004	14-L:	PC_PC+2, J/14-M
J 1005	J 1005		
U 552, 5130,0110,0020,4304	J 1006	14-M:	R13_RD+R, J/14-R
J 1007	J 1007		
U 257, 5060,4305,0460,1710	J 1008	14-N:	BA_PC, DAT1, B_UDATA, J/14-O
J 1009	J 1009		
U 506, 5100,0124,0020,0310	J 1010	14-O:	PC_PC+2, J/14-P
J 1011	J 1011		
U 510, 5140,0110,0020,4304	J 1012	14-P:	R13_PD+R, J/14-O
J 1013	J 1013		
U 514, 5130,4305,0060,0304	J 1014	14-Q:	BA_R13, DAT1, R13_UDATA, J/14-R
J 1015	J 1015		
U 513, 5200,0705,0020,1604	J 1016	14-R:	BA_R13, FAINT, PREVIOUS, J/14-S
J 1017	J 1017		

U	520	0003	6445	0037	1605	101	520:	14-S:	DATA,UDATA_R12 OP R,LOAD CC,N	PREVIOUS,BUT NOSERV,J/1-A
U	200	5220	0106	0520	1700	1020	2001	15-A:	R_B,SEX,J/15-B	
U	522	5230	0106	3020	1700	1022	5221	15-B:	T_B,ASL B,J/15-C	
U	523	0000	0110	0037	0310	1023	5231	15-C:	PC_PC+B,BUT NOSERV,J/1-A	
U	004	5250	0105	0020	4310	1025	0041	15-D:	PC_RD,J/15-E	
U	525	5270	4305	0460	1711	1027	5251	15-E:	BA_R6,DATA,R_UDATA,J/15-F	
U	527	5330	0124	0020	0311	1029	5271	15-F:	R6_R6+2,J/15-G	
U	533	0000	0106	0037	1300	1031	5331	15-G:	RD_B,BUT NOSERV,J/1-A	
U	011	6450	4305	0460	1711	1032	0111	15-H:	BA_R6,DATA,B_UDATA,J/15-T	
U	535	5370	0124	0020	0311	1033	5351	15-I:	R6_R6+2,J/15-J	
U	537	4500	4305	0460	1711	1034	5371	15-J:	BA_R6,DATA,B_UDATA,J/15-K	
U	450	7440	0124	0020	0311	1035	4501	15-K:	R6_R6+2,J/15-U	
U	014	0120	0105	0460	1740	1036	0141	15-L:	B_UDATA,BUT SERVICE,J/15-M	
U	012	0140	0105	0020	1700	1037	0121	15-M:	NOB,J/15-L	
U	013	4600	0106	0020	0302	1038	0131	15-N:	R15_B,J/17-H	
U	003	0000	0105	0020	1700	1039	0031	15-O:	J/1-A	
U	006	5410	0105	0000	0305	1040	0061	15-P:	R12_PSW,J/15-O	
U	541	0003	0115	0037	1705	1041	5411	15-Q:	CC_R12,RRAR,BUT NOSERV,J/1-A	
U	007	5420	0105	0000	0305	1042	0071	15-R:	R12_PSW,J/15-S	
U	542	0003	0113	0037	1705	1043	5421	15-S:	CC_R12 V B,BUT NOSERV,J/1-A	
U	645	5350	0106	0020	0310	1044	6451	15-T:	PC_R,J/15-I	
U	744	0002	0106	0020	1700	1045	7441	15-U:	PSW_B,J/1-A	
U	260	7000	0003	0022	2700	1046	2601	16-A:	RS_RS-1,BUT ZHIT,J/16-B	
U	700	5460	0106	3220	0307	1047	7001	16-B:	R10_B,SWAB,ASL B,J/16-C	
U	546	5470	0111	0520	1707	1048	5461	16-C:	B_(R10,B),SEX,J/16-D	
U	547	0000	0104	0037	0310	1049	5471	16-D:	PC_PC-B,BUT NOSERV,J/1-A	
U	551	5610	0106	0020	0312	1050	5511	16-E:	RS_B,J/16-L	
U	702	0000	0105	0037	1700	1051	7021	16-F:	BUT NOSERV,J/1-A	
U	020	5530	0106	0520	1700	1052	0201	16-G:	B_B,SEX,J/16-H	
U	553	5550	0105	3420	1712	1053	5531	16-H:	BA_RS ASL B,J/16-I	
U	555	4360	0110	0420	1710	1054	5551	16-I:	H_PC+B,J/16-M	
U	556	5570	0127	0020	0310	1055	5561	16-J:	PC_RX,J/16-K	
U	557	5510	4305	0460	1711	1056	5571	16-K:	NA_R6,DATA,B_UDATA,J/16-E	

U 561, 0000,0124,0037,0311	1084	5611	16-L1	R6_R6+2,BUT MUSERV,J/1-A
	1085			
U 436, 5560,0106,0020,0311	1086	4361	16-M1	R6_R6,J/16-J
	1087			
U 017, 4600,0106,0020,0302	1088	0171	17-A1	R15_R6,J/17-B
	1089			
U 460, 4700,0105,0400,1700	1090	4601	17-B1	R_PSM,J/17-C
	1091			
U 470, 5040,0124,0020,0302	1092	4701	17-C1	R15_R15+2,J/17-D
	1093			
U 504, 5602,4305,7460,1722	1094	5041	17-D1	RA_R15,DATA,PSM_UDATA,KERNEL,ENAB DRE,J/17-E
	1095			
U 560, 5625,0125,0020,0311	1096	5601	17-E1	R6_R6-2,ENAB STOV,J/17-F
	1097			
U 562, 5660,0305,0020,1711	1098	5621	17-F1	RA_R6,J/17-G
	1099			
U 566, 5700,6006,7420,1700	1100	5661	17-G1	DAT0,UDATA_B,ENAB DRE,J/17-H
	1101			
U 570, 5725,0125,0020,0311	1102	5701	17-H1	R6_R6-2,ENAB STOV,J/17-I
	1103			
U 572, 5730,0305,0020,1711	1104	5721	17-I1	UA_R6,J/17-J
	1105			
U 573, 5770,6005,7420,1710	1106	5731	17-J1	DAT0,UDATA_PC,ENAB DRE,J/17-K
	1107			
U 577, 6460,0125,0020,0302	1108	5771	17-K1	R15_R15-2,J/17-L
	1109			
U 646, 7450,4305,0460,1722	1110	6461	17-L1	RA_R15,DATA_B,UDATA,KERNEL,J/17-U
	1111			
U 740, 6470,0105,0040,0302	1112	7401	17-M1	R15_0,J/17-N
	1113			
U 647, 6540,0124,0020,0302	1114	6471	17-N1	R15_R15+2,J/17-O
	1115			
U 654, 6560,0132,0020,0302	1116	6541	17-O1	R15_R15+R15+1,J/17-P
	1117			
U 656, 2010,0132,0020,0302	1118	6561	17-P1	R15_R15+R15+1,J/17-Q
	1119			
U 201, 2020,0126,0020,0302	1120	2011	17-Q1	R15_R15+R15,J/17-R
	1121			
U 202, 5772,4305,0060,1722	1122	2021	17-R1	RA_R15,DATA,PSM_UDATA,KERNEL,J/17-K
	1123			
U 001, 4320,0105,0420,1710	1124	0011	17-S1	0_PC,J/17-T
	1125			
U 432, 7310,0106,0020,0312	1126	4321	17-T1	R5_R6,J/28-A
	1127			
U 745, 0000,0106,0020,0310	1128	7451	17-U1	PC_R6,J/1-A
	1129			
U 220, 6020,0105,1020,4305	1130	2201	18-A1	R12 BX_RD,J/18-P
	1131			
U 221, 6020,4305,1060,4305	1132	2211	18-B1	0A_RD,DATA,R12 BX_UDATA,J/18-R
	1133			
U 224, 2215,0125,0020,5300	1134	2241	18-C1	RD_RD-2,ENAB STOV,J/18-N
	1135			
U 222, 5630,4305,1060,4305	1136	2221	18-D1	0A_RD,DATA,R12 BX_UDATA,J/18-E
	1137			
U 563, 6020,0124,0020,5300	1138	5631	18-E1	RD_RD+2,J/18-R
	1139			
U 223, 5650,4305,0060,4305	1140	2231	18-F1	0A_RD,DATA,R12_UDATA,J/18-G
	1141			
U 565, 6010,0124,0020,5300	1142	5651	18-G1	RD_RD+2,J/18-Q
	1143			
U 225, 5675,0125,0020,5300	1144	2251	18-H1	RD_PD-2,ENAB STOV,J/18-T
	1145			
U 567, 6010,4305,0060,4305	1146	5671	18-I1	0A_RD,DATA,R12_UDATA,J/18-Q
	1147			
U 226, 5710,4305,0460,1710	1148	2261	18-J1	0A_PC,DATA_R_UDATA,J/18-K
	1149			

U 571, 5740,0124,0020,0310	1150	18-K1	PC_PC+2,J/18-L
U 574, 6010,0110,0020,4305	1151	18-L1	R12_RD+0,J/18-0
U 227, 5750,4305,0460,1710	1152	18-M1	BA_PC,DATI,U_UDATA,J/18-M
U 575, 5760,0124,0020,0310	1153	18-N1	PC_PC+2,J/18-0
U 576, 6000,0110,0020,4305	1154	18-O1	R12_RD+0,J/18-P
U 600, 6010,4305,0060,0305	1155	18-P1	BA_R12,DATI,R12_UDATA,J/18-0
U 601, 6020,4305,1060,0305	1156	18-Q1	BA_R12,DATI,R12 BX_UDATA,J/18-R
U 602, 4006,0116,0024,1700	1157	18-R1	C_16,BUT IR9,J/18-S
U 400, 4020,0031,0021,0304	1158	18-S1	R13_BXBAR,BUT NHIT,J/19-A
U 401, 4040,0027,0042,0300	1159	18-T1	R17_0,T_BX,BUT ZBIT,J/21-A
U 402, 4030,0002,0441,1704	1160	19-A1	B_0,T_R13+1,BUT NHIT,J/19-J
U 503, 4050,0005,0021,2305	1161	19-B1	R12_RS,BUT NHIT,J/19-0
U 505, 6030,0101,0020,2304	1162	19-C1	R13_RSHAR,J/19-E
U 405, 4070,0101,0020,2304	1163	19-D1	R13_RSDAH,J/19-U
U 603, 4070,0002,0021,1704	1164	19-E1	T_R13+1,BUT NHIT,J/19-0
U 507, 6040,0106,7020,1700	1165	19-F1	T_B,SR(R15-B-BX),J/19-G
U 604, 6050,0127,0420,0700	1166	19-G1	B RS_BX,J/19-H
U 605, 6100,0105,0040,0500	1167	19-H1	RSV1_0,J/20-B
U 502, 4030,0105,0440,1700	1168	19-I1	B_0,J/19-J
U 403, 6060,0105,1020,3700	1169	19-J1	BX_RS,J/19-K
U 606, 4070,0127,0025,1700	1170	19-K1	T_BX,BUT BX00,J/19-U
U 427, 4070,0120,0420,1704	1171	19-L1	B_R13+0+1,J/19-0
U 413, 4137,0127,7034,1700	1172	19-M1	T_BX,SR(U15-B-BX),COUNT,BUT C05 BX01 BX00,J/19-M
U 473, 4137,0127,7034,1700	1173	19-N1	T_BX,SR(R15-B-BX),COUNT,BUT C05 BX01 BX00,J/19-M
U 453, 4130,0120,0420,1704	1174	19-O1	R_R13+0+1,J/19-M
U 417, 6070,0106,0020,0700	1175	19-P1	RS_B,J/20-A
U 417, 6070,0106,0020,0700	1176	19-Q1	RS_B,J/20-A
U 457, 6070,0106,0020,0700	1177	19-R1	RS_B,J/20-A
U 477, 6070,0106,0020,0700	1178	19-S1	RS_B,J/20-A
U 433, 4730,0110,0420,1705	1179	19-T1	B_R12+B,J/19-M
U 407, 4137,0127,7034,1700	1180	19-U1	T_BX,SR(U15-B-BX),COUNT,BUT C05 BX01 BX00,J/19-M
U 607, 6100,0127,0020,0500	1181	20-A1	RSV1_BX,J/20-H
U 610, 7010,0126,6030,2300	1182	20-B1	P17_0,T_DS+RS,SI(BX-COUNT),J/20-M
	1183		
	1184		
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U 410, 4200,0030,4422,1700	/ 1216	4101	20-C1	T_BDAN,SL(HX-0),RUT ZHIT,J/20-E
	/ 1217			
U 422, 4150,0005,4421,3500	/ 1218	4221	20-D1	T_RSV1,SL(BX-0),RUT NRIT,J/20-G
	/ 1219			
U 420, 4150,0127,4420,1700	/ 1220	4201	20-E1	T_BX,SL(BX-0),J/20-G
	/ 1221			
U 515, 6110,0127,4420,1700	/ 1222	5151	20-F1	T_BX,SL(HX-0),J/20-M
	/ 1223			
U 415, 6110,0127,5020,1700	/ 1224	4151	20-G1	T_BX,SL(BX-1),J/20-M
	/ 1225			
U 412, 4140,0005,4422,3500	/ 1226	4121	20-H1	T_RSV1,SL(BX-0),RUT ZHIT,J/20-J
	/ 1227			
U 416, 4140,0123,1020,1700	/ 1228	4161	20-I1	BX_R17+HX+1,J/20-J
	/ 1229			
U 414, 4110,0005,4421,3500	/ 1230	4141	20-J1	T_RSV1,SL(HX-0),RUT NRIT,J/20-L
	/ 1231			
U 511, 6110,0127,5020,1700	/ 1232	5111	20-K1	T_HX,SL(BX-1),J/20-M
	/ 1233			
U 411, 6110,0127,4420,1700	/ 1234	4111	20-L1	T_HX,SL(HX-0),J/20-M
	/ 1235			
U 611, 0003,0127,0037,1700	/ 1236	6111	20-M1	CC_BX,RUT NOSERV,J/1-A
	/ 1237			
U 701, 4100,0006,0022,1700	/ 1238	7011	20-N1	T_B,RUT ZHIT,J/20-C
	/ 1239			
U 404, 6120,0131,0020,0304	/ 1240	4041	21-A1	R13_AXBAR,J/21-H
	/ 1241			
U 612, 4210,0005,0421,3700	/ 1242	6121	21-B1	B_RS,RUT NRIT,J/21-L
	/ 1243			
U 521, 6130,0105,1020,3500	/ 1244	5211	21-C1	BX_RSV1
	/ 1245			
U 613, 4230,0022,1027,1700	/ 1246	6131	21-D1	BX_R17-BX,RUT COUT,J/21-F
	/ 1247			
U 623, 4240,0004,0421,1700	/ 1248	6231	21-E1	B_R17-B,RUT NRIT,J/21-M
	/ 1249			
U 423, 4240,0130,0420,1700	/ 1250	4231	21-F1	R_BDAN,J/21-M
	/ 1251			
U 442, 6407,0105,4032,1705	/ 1252	4421	21-G1	T_R12,SL(B-BX15),COUNT,RUT HX00 SP15,J/21-U
	/ 1253			
U 660, 4420,0120,2023,1704	/ 1254	6601	21-H1	SL(HX-COUT) B_R13+H+1,RUT C05,J/21-G
	/ 1255			
U 670, 4420,0110,2023,1705	/ 1256	6701	21-I1	SL(HX-COUT) B_R12+B,RUT C05,J/21-G
	/ 1257			
U 640, 4420,0110,2023,1705	/ 1258	6401	21-J1	SL(HX-COUT) B_R12+B,RUT C05,J/21-G
	/ 1259			
U 650, 4420,0120,2023,1704	/ 1260	6501	21-K1	SL(HX-COUT) B_R13+H+1,RUT C05,J/21-G
	/ 1261			
U 421, 4240,0105,1020,3500	/ 1262	4211	21-L1	BX_RSV1,J/21-M
	/ 1263			
U 424, 4250,0105,4030,1705	/ 1264	4241	21-M1	T_R12,SL(H-BX15),RUT SP15,J/21-U
	/ 1265			
U 435, 4400,0010,2022,1705	/ 1266	4351	21-N1	SL(HX-COUT) B_R12+H,RUT ZHIT,J/21-P
	/ 1267			
U 425, 4400,0020,2022,1704	/ 1268	4251	21-O1	SL(HX-COUT) B_R13+H+1,RUT ZHIT,J/21-P
	/ 1269			
U 440, 4420,0127,0025,1700	/ 1270	4401	21-P1	T_BX,RUT BX00,J/21-G
	/ 1271			
U 446, 4410,0105,0032,1705	/ 1272	4461	22-A1	T_R12,RUT BX00 SP15,J/22-H
	/ 1273			
U 441, 4610,0110,0420,1705	/ 1274	4411	22-B1	B_R12+H,J/22-C
	/ 1275			
U 461, 4440,0005,0021,3700	/ 1276	4611	22-C1	T_RS,RUT NRIT,J/22-D
	/ 1277			
U 444, 6140,0106,0020,0500	/ 1278	4441	22-D1	RSV1_B,J/22-F
	/ 1279			
U 544, 6150,0104,0020,0500	/ 1280	5441	22-E1	RSV1_R17-B,J/22-U
	/ 1281			

U 614, 5300,0027,4422,0700	/ 1282	141	22-F1	RS_BX,SL(BX-0),RUT ZBIT,J/22-G
/ 1283				
U 530, 4310,0005,4421,1700	/ 1284	5301	22-G1	T_RS,SL(BX-0),RUT NBIT,J/22-J
/ 1285				
U 532, 4310,0102,1020,1700	/ 1286	5321	22-H1	BX_R17+1,J/22-J
/ 1287				
U 531, 6160,0127,5020,1700	/ 1288	5311	22-I1	T_BX,SL(BX-1),J/22-T
/ 1289				
U 431, 6160,0127,4420,1700	/ 1290	4311	22-J1	T_RX,SL(BX-0),J/22-T
/ 1291				
U 451, 4710,0120,0420,1704	/ 1292	4511	22-K1	R_R13+B*1,J/22-L
/ 1293				
U 471, 4440,0005,0021,3700	/ 1294	4711	22-L1	T_RS,RUT NBIT,J/22-H
/ 1295				
U 543, 6140,0104,0020,0500	/ 1296	5431	22-M1	RSV1_R17-B,J/22-F
/ 1297				
U 443, 6150,0106,0020,0500	/ 1298	4431	22-N1	RSV1_B,J/22-D
/ 1299				
U 615, 5340,0022,5022,0700	/ 1300	6151	22-O1	RS_R17-BX,SL(BX-1),RUT ZBIT,J/22-O
/ 1301				
U 536, 5260,0102,1020,1700	/ 1302	5361	22-P1	BX_R17+1,J/22-R
/ 1303				
U 534, 4260,0005,4421,1700	/ 1304	5341	22-Q1	T_RS,SL(BX-0),RUT NBIT,J/22-S
/ 1305				
U 526, 6160,0127,4420,1700	/ 1306	5261	22-R1	T_BX,SL(BX-0),J/22-T
/ 1307				
U 426, 6160,0127,5020,1700	/ 1308	4261	22-S1	T_BX,SL(BX-1),J/22-T
/ 1309				
U 616, 6170,0127,4420,1700	/ 1310	6161	22-T1	T_BX,SL(BX-0),J/22-U
/ 1311				
U 617, 0003,0127,0037,1700	/ 1312	6171	22-U1	CC_BX,RUT NOSERV,J/1-A
/ 1313				
U 524, 0003,0124,0037,1700	/ 1314	5241	22-V1	CC_R17+2,RUT NOSERV,J/1-A
/ 1315				
U 406, 6200,0124,0020,0300	/ 1316	4061	22-W1	R17_R17+2,J/22-X
/ 1317				
U 620, 0003,0102,0037,1700	/ 1318	6201	22-X1	CC_R17+1,RUT NOSERV,J/1-A
/ 1319				
U 462, 0003,0124,0037,1700	/ 1320	4621	22-Y1	CC_R17+2,RUT NOSERV,J/1-A
/ 1321				
U 230, 6336,0105,0020,5700	/ 1322	2301	23-A1	C_RD,J/23-R
/ 1323				
U 231, 6336,4305,0060,5700	/ 1324	2311	23-B1	BA_RD,DATI,C_UDATA,J/23-R
/ 1325				
U 234, 2415,0125,0020,5300	/ 1326	2341	23-C1	RD_RD-2,ERAB STUV,J/23-H
/ 1327				
U 232, 6216,4305,0060,5700	/ 1328	2321	23-D1	BA_RD,DATI,C_UDATA,J/23-E
/ 1329				
U 621, 6330,0124,0020,5300	/ 1330	6211	23-E1	RD_RD+2,J/23-R
/ 1331				
U 233, 6220,4305,0060,4305	/ 1332	2331	23-F1	BA_RD,DATI,R12_UDATA,J/23-G
/ 1333				
U 622, 6320,0124,0020,5300	/ 1334	6221	23-G1	RD_RD+2,J/23-O
/ 1335				
U 235, 6245,0125,0020,5300	/ 1336	2351	23-H1	RD_RD-2,FRAB STUV,J/23-I
/ 1337				
U 624, 6320,4305,0060,4305	/ 1338	6241	23-I1	BA_RD,DATI,R12_UDATA,J/23-O
/ 1339				
U 236, 6250,4305,0460,1710	/ 1340	2361	23-J1	BA_PC,DATI,P_UDATA,J/23-K
/ 1341				
U 625, 6260,0124,0020,0310	/ 1342	6251	23-K1	PC_PC+2,J/23-L
/ 1343				
U 626, 6320,0110,0020,4305	/ 1344	6261	23-L1	R12_RD+0,J/23-O
/ 1345				
U 237, 6270,4305,0460,1710	/ 1346	2371	23-M1	BA_PC,DATI,P_UDATA,J/23-H
/ 1347				

U 627, 6300,0124,0020,0310	J 1340	627I	23-NI	PC_PC+2,J/23-0
J 1349				
U 630, 6310,0110,0020,4305	J 1350	630I	23-OI	R12_RD+B,J/23-P
J 1351				
U 631, 6320,4305,0060,0305	J 1352	631I	23-PI	RA_R12,DATAI,R12_UDATA,J/23-0
J 1353				
U 632, 6336,4305,0060,1705	J 1354	632I	23-OI	RA_R12,DATAI,C_UDATA,J/23-R
J 1355				
U 633, 4307,0105,0023,1700	J 1356	633I	23-HI	COUNT,BUT C05,J/25-A
J 1357				
U 434, 5160,0105,0424,3700	J 1358	434I	24-AI	R_RS,BUT IR9,J/24-B
J 1359				
U 516, 5127,0127,7023,1700	J 1360	516I	24-HI	T_BX,SR(H15-B-HX),COUNT,BUT C05,J/24-C
J 1361				
U 512, 4450,0006,0031,0700	J 1362	512I	24-CI	RS_B,BUT NBIT ZBIT,J/24-E
J 1363				
U 447, 6340,0127,1420,1700	J 1364	447I	24-DI	B_BX SL(BX-0),J/24-G
J 1365				
U 485, 6350,0127,1420,1700	J 1366	445I	24-EI	B_BX SL(BX-0),J/24-H
J 1367				
U 545, 6350,0127,2420,1700	J 1368	545I	24-FI	B_BX SL(BX-1),J/24-H
J 1369				
U 634, 6360,0127,5020,1700	J 1370	634I	24-GI	T_BX,SL(BX-1),J/24-I
J 1371				
U 635, 6360,0127,4420,1700	J 1372	635I	24-HI	T_BX,SL(BX-0),J/24-I
J 1373				
U 636, 4540,0006,5421,1700	J 1374	636I	24-II	T_B,SL(BX-OVX),BUT NBIT,J/24-K
J 1375				
U 637, 5500,0127,5421,1700	J 1376	637I	24-JI	T_BX,SL(BX-OVX),BUT C05,J/24-M
J 1377				
U 454, 6410,0127,4420,1700	J 1378	454I	24-KI	T_BX,SL(BX-0),J/24-N
J 1379				
U 554, 6410,0127,5020,1700	J 1380	554I	24-LI	T_BX,SL(BX-1),J/24-N
J 1381				
U 550, 6410,0127,4420,1700	J 1382	550I	24-NI	T_BX,SL(BX-0),J/24-N
J 1383				
U 641, 0003,0127,0037,1700	J 1384	641I	24-NI	CC_BX,BUT NOSERV,J/1-A
J 1385				
U 517, 7070,0105,1020,3500	J 1386	517I	24-OI	RX_RSV1,J/24-0
J 1387				
U 727, 7037,0127,7036,1700	J 1388	727I	24-PI	T_BX,SR(H15-B-HX),COUNT,BUT BX00 C05,J/24-R
J 1389				
U 707, 7037,0127,7036,1700	J 1390	707I	24-OI	T_BX,SR(H15-B-HX),COUNT,BUT BX00 C05,J/24-R
J 1391				
U 703, 7237,0127,0020,1700	J 1392	703I	24-NI	T_BX,COUNT,J/24-S
J 1393				
U 723, 4640,0006,0031,0700	J 1394	723I	24-SI	RS_B,BUT NBIT ZBIT,J/24-U
J 1395				
U 466, 4650,0027,4422,0500	J 1396	466I	24-TI	RSV1_BX,SL(BX-0),BUT ZBIT,J/24-X
J 1397				
U 464, 4650,0127,4420,0500	J 1398	464I	24-OI	RSV1_BX,SL(BX-1),J/24-X
J 1399				
U 564, 4650,0127,5020,0500	J 1400	564I	24-VI	RSV1_BX,SL(BX-1),J/24-X
J 1401				
U 467, 6370,0127,5020,1700	J 1402	467I	24-WI	T_BX,SL(BX-1),J/24-J
J 1403				
U 465, 6370,0127,4420,1700	J 1404	465I	24-XI	T_BX,SL(BX-0),J/24-J
J 1405				
U 430, 4527,0105,0423,3700	J 1406	430I	25-AI	R_RS,COUNT,BUT C05,J/25-D
J 1407				
U 456, 5000,0105,1024,3500	J 1408	456I	25-BI	RX_RSV1,BUT IR9,J/25-C
J 1409				
U 500, 5120,0105,1040,1700	J 1410	500I	25-CI	BX_0,J/24-C
J 1411				
U 452, 6520,0105,1024,3500	J 1412	452I	25-DI	RX_RSV1,BUT IR9,J/25-H
J 1413				

U 653,	653J,	0106,	6423,	0300	J 14	653I	25-EI	R17-B,5L(B-DX-0),COUNT,NOT C	/25-E
U 657,	6510,	0005,	0021,	1700	J 1416	657I	25-FI	T-H17,BUT MAINT,J/25-N	
U 751,	6517,	0106,	0020,	1700	J 1418	751I	25-GI	T-B,COUNT,J/25-N	
U 652,	7530,	0105,	1040,	1700	J 1419	652I	25-HI	DX-0,J/25-I	
U 753,	7537,	0106,	6423,	0300	J 1421	753I	25-II	R17-B,5L(B-DX-0),COUNT,NOT C05,J/25-I	
U 757,	6550,	0005,	0021,	1700	J 1422	757I	25-JI	T-H17,BUT MAINT,J/25-K	
U 655,	5120,	0105,	1040,	1700	J 1424	655I	25-KI	DX-0,J/24-C	
U 755,	5120,	0107,	1020,	1700	J 1426	755I	25-LI	HX-MIRUS 1,J/24-C	
U 501,	6510,	0127,	0020,	1700	J 1427	501I	25-MI	T-HX,NUP,J/25-N	
U 651,	4640,	0006,	0031,	0700	J 1428	651I	25-NI	RS-B,BUT MAINT,ZBIT,J/24-U	
U 120,	6750,	0105,	0420,	4305	J 1429	120I	26-AI	R12 B-RD,J/26-R	
U 121,	6750,	4305,	0760,	4305	J 1430	121I	26-BI	BA-RD,DATI,R12 B-(UDATA),J/26-H	
U 124,	1215,	0125,	0320,	5300	J 1431	124I	26-CI	RD-RD-(2),FNAB STOV,J/26-B	
U 122,	6630,	4305,	0760,	4305	J 1432	122I	26-DI	BA-RD,DATI,R12 B-(UDATA),J/26-E	
U 663,	6750,	0124,	0320,	5300	J 1433	663I	26-FI	RD-RD+(2),J/26-R	
U 123,	6640,	4305,	0060,	4305	J 1434	123I	26-GI	BA-RD,DATI,R12-UDATA,J/26-G	
U 664,	6660,	0124,	0020,	5300	J 1435	664I	26-HI	RD-RD+2,J/26-J	
U 125,	6655,	0125,	0020,	5300	J 1436	125I	26-II	RD-RD-2,EMAB STOV,J/26-I	
U 665,	6660,	4305,	0060,	4305	J 1437	665I	26-JI	BA-RD,DATI,R12-UDATA,J/26-J	
U 666,	6750,	4305,	0760,	0305	J 1438	666I	26-KI	BA-R12,DATI,R12 B-(UDATA),J/26-R	
U 126,	6670,	4305,	0460,	1710	J 1439	126I	26-LI	BA-PC,DATI,B-UDATA,J/26-L	
U 667,	6710,	0124,	0020,	0310	J 1440	667I	26-MI	PC-PC+2,J/26-M	
U 671,	6660,	0110,	0020,	4305	J 1441	671I	26-NI	R12-RD+B,J/26-J	
U 127,	6720,	4305,	0460,	1710	J 1442	127I	26-OI	BA-PC,DATI,B-UDATA,J/26-U	
U 672,	6730,	0124,	0020,	0310	J 1443	672I	26-PI	PC-PC+2,J/26-P	
U 673,	6740,	0110,	0020,	4305	J 1444	673I	26-QI	R12-RD+B,J/26-Q	
U 674,	6660,	4305,	0060,	0305	J 1445	674I	26-RI	BA-H12,DATI,H12-UDATA,J/26-J	
U 675,	6760,	0107,	0020,	0300	J 1446	675I	26-SI	H17-MIRUS 1,J/26-S	
U 676,	6770,	0103,	0020,	0300	J 1447	676I	26-TI	R17-R17-1,J/26-T	
U 677,	7040,	0705,	0020,	1700	J 1448	677I	26-UI	BA-H17,MAINT,J/26-U	
U 704,	0000,	7405,	0037,	1705	J 1449	704I	26-VI	DAT00,UDATA-R12,MAINT,NOT NOSERV,J/1-A	
U 130,	7050,	0105,	0000,	0305	J 1474	130I	27-AI	R12-PSW,J/27-U	
U 705,	0003,	0145,	0137,	1305	J 1475	705I	27-BI	RD-R12 UP B,SFX,LOAD CC,NOT NOSERV,J/1-A	
					J 1476				
					J 1477				
					J 1478				
					J 1479				

U 131, 7060,0705,0020,5700	J 1480	1311	27-C1	BA_RD,MAINT,J/27-H
	J 1481			
U 134, 1315,0125,0320,5300	J 1482	1341	27-D1	RD_RD-(2),ERAR STOV,I/27-C
	J 1483			
U 132, 7060,0724,0320,5300	J 1484	1321	27-E1	BA_RD,MAINT,RD_RD+(2),J/27-R
	J 1485	1331	27-F1	BA_RD,DATI,R13_UDATA,J/27-G
U 133, 7100,4305,0060,4304	J 1486			
	J 1487			
U 710, 7170,0124,0020,5300	J 1488	7101	27-G1	RD_RD+2,J/27-O
	J 1489			
U 135, 7115,0125,0020,5300	J 1490	1351	27-H1	RD_RD-2,ERAR STOV,J/27-I
	J 1491			
U 711, 7170,4305,0060,4304	J 1492	7111	27-I1	HA_RD,DATI,R13_UDATA,J/27-O
	J 1493			
U 136, 7120,4305,0460,1710	J 1494	1361	27-J1	DA_PC,DATI,H_UDATA,J/27-K
	J 1495			
U 712, 7130,0124,0020,0310	J 1496	7121	27-K1	PC_PC+2,J/27-L
	J 1497			
U 713, 7170,0110,0020,4304	J 1498	7131	27-L1	R13_RD+R,J/27-Q
	J 1499			
U 137, 7140,4305,0460,1710	J 1500	1371	27-M1	DA_PC,DATI,H_UDATA,J/27-N
	J 1501			
U 714, 7150,0124,0020,0310	J 1502	7141	27-N1	PC_PC+2,J/27-O
	J 1503			
U 715, 7160,0110,0020,4304	J 1504	7151	27-O1	R13_RD+R,J/27-P
	J 1505			
U 716, 7170,4305,0060,0304	J 1506	7161	27-P1	HA-R13,DATI,R13_UDATA,J/27-Q
	J 1507			
U 717, 7060,0705,0020,1704	J 1508	7171	27-Q1	BA-R13,MAINT,J/27-R
	J 1509			
U 706, 2170,0105,0000,0305	J 1510	7061	27-R1	R12_P5H,J/4-E
	J 1511			
U 777, 0000,0105,0035,1700	J 1512	7771	27-S1	RUT_AH,J/1-A
	J 1513			
U 731, 7330,0100,0020,0310	J 1514	7311	28-A1	R7_0,J/28-B
	J 1515			
U 733, 7200,0005,0022,1710	J 1516	7331	28-B1	T_R7,RUT_ZBIT,J/28-L
	J 1517			
U 722, 7340,0103,0020,0310	J 1518	7221	28-C1	R7_R7-1,J/28-D
	J 1519			
U 734, 7240,0005,0022,1710	J 1520	7341	28-D1	T_R7,RUT_ZBIT,J/28-E
	J 1521			
U 724, 7350,0107,0420,1700	J 1522	7241	28-E1	H_MINUS 1,J/28-G
	J 1523			
U 726, 7411,0100,0020,1700	J 1524	7261	28-F1	IR_0,J/28-H
	J 1525			
U 735, 7300,0014,0022,0310	J 1526	7351	28-G1	R7_R7(XOR)B,RUT_ZBIT,J/28-I
	J 1527			
U 732, 7366,0116,0020,1700	J 1528	7321	28-H1	C_16,J/28-J
	J 1529			
U 730, 7411,0100,0020,1700	J 1530	7301	28-I1	IR_0,J/28-H
	J 1531			
U 736, 7430,0120,0420,1710	J 1532	7361	28-J1	R_R7+R+1,J/28-R
	J 1533			
U 743, 7370,0120,0420,1710	J 1534	7431	28-H1	R_R7+R+1,J/28-K
	J 1535			
U 737, 7420,0106,1020,1700	J 1536	7371	28-K1	RX_H,J/28-N
	J 1537			
U 720, 7411,0100,0020,1700	J 1538	7201	28-L1	IR_0,J/28-M
	J 1539			
U 741, 0000,0105,0020,1700	J 1540	7411	28-M1	J/1-A
	J 1541			
U 742, 7217,0121,0033,0310	J 1542	7421	28-N1	R7_R7+RX,COUNT,RUT_C05,J/28-O
	J 1543			
U 721, 7370,0106,3020,1700	J 1544	7211	28-O1	T_H,SL(H-0),J/28-K
	J 1545			

R7-R7+1, HU1 COUT, J/28-U

28-P1

725:

J 1548

U 725, 5400,0002,0027,0310

IR_0, J/28-M

28-U1

540:

J 1549

U 540, 7411,0100,0020,1700

J/1-A

X611

J 1551

U 746, 0000,0105,0020,1700

J/1-A

X621

J 1552

U 747, 0000,0105,0020,1700

J/1-A

X631

J 1553

U 750, 0000,0105,0020,1700

J/1-A

X641

J 1554

U 752, 0000,0105,0020,1700

J/1-A

X651

J 1555

U 754, 0000,0105,0020,1700

J/1-A

X661

J 1556

U 756, 0000,0105,0020,1700

J/1-A

X671

J 1557

U 760, 0000,0105,0020,1700

J/1-A

X681

J 1558

U 761, 0000,0105,0020,1700

J/1-A

X691

J 1559

U 762, 0000,0105,0020,1700

J/1-A

X701

J 1560

U 763, 0000,0105,0020,1700

J/1-A

X711

J 1561

U 764, 0000,0105,0020,1700

J/1-A

X721

J 1562

U 765, 0000,0105,0020,1700

J/1-A

X731

J 1563

U 766, 0000,0105,0020,1700

J/1-A

X741

J 1564

U 767, 0000,0105,0020,1700

J/1-A

X751

J 1565

U 770, 0000,0105,0020,1700

J/1-A

X761

J 1566

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J/1-A

X771

J 1567

U 772, 0000,0105,0020,1700

J/1-A

X781

J 1568

U 773, 0000,0105,0020,1700

J/1-A

X791

J 1569

U 774, 0000,0105,0020,1700

J/1-A

X801

J 1570

U 775, 0000,0105,0020,1700

J/1-A

X811

J 1571

U 776, 0000,0105,0020,1700

J/1-A

X811

J 1572

U 776, 0000,0105,0020,1700

J 1573

J NUMBER OF MICRO WORDS USED:

J U WORDS= 0

J U WORDS= 512

END

(U) ALU BLEG

99 #	106 #	117 #	128 #	130 #	131 #	151 #	644	650	666	670
A	106 #	117 #	128 #	130 #	131 #	151 #				
A+0	113 #	117 #	602	612	618	630	644	650	666	670
A+1	120 #	571	700	716	722	736	750	756	770	774
A+2	680	686	804	814	820	834	848	878	886	892
	784	790	926	932	950	962	990	994	1004	1010
	1030	1036	1040	1084	1092	1114	1150	1156	1314	1316
	1320	1330	1334	1342	1348	1442	1462	1484	1488	1496
	1502									
AVA	122 #	1120	1214							
AVA+1	126 #	1116	1118							
A+B	109 #	614	646	652	682	688	724	786	792	816
	822	844	880	894	928	934	964	1006	1012	1024
	1070	1152	1158	1208	1258	1266	1274	1350	1458	1464
A+B+1	1498	1504								
A+BX	116 #	1192	1198	1254	1268	1292	1532	1534		
A+BX+1	117 #	752	758	1542						
A-1	119 #	1228								
A-2	104 #	1062	1470	1518						
	121 #	593	604	628	662	672	708	732	742	766
	776	798	808	828	854	870	908	918	944	956
	976	984	998	1096	1108	1134	1326	1336	1438	1448
	1482	1490								
A-B	105 #	1068	1248	1280	1296					
A-BX	118 #	1246								
A.B	110 #	1066								
A.BBAR	114 #	1052								
AHAR	102 #	1174								
AHAR.B	111 #									
AVH	112 #	1056								
B	107 #	806	862	904	908	1020	1032	1046	1058	1060
	1064	1070	1074	1086	1088	1126	1180	1200	1202	1204
	1206	1238	1278	1298	1362	1394	1414	1422	1432	1536
	1544									
BBAR	124 #	1216	1250							
BX	123 #	1080	1168	1182	1190	1196	1210	1220	1222	1224
	1232	1234	1236	1270	1282	1290	1306	1310	1312	1360
	1364	1366	1368	1370	1372	1378	1380	1384	1388	1390
	1392	1396	1398	1400	1402	1404				
BXBAR	125 #	1166	1240							
K16	115 #	1164	1528							
QHEDAR	108 #	1428	1468	1522						
ZERO	101 #	1514	1524	1530	1548					
(U) ANUX CTRL	66 #									
ALU	70 #									
PSM	71 #	1050	1054	1090	1476	1510				
UBUS	68 #	567	569	573	591	595	608	610	616	622
	634	640	642	648	654	664	674	676	678	684
	690	694	698	702	710	714	720	730	734	738
	744	746	748	754	760	764	776	780	782	788
	794	802	810	812	818	824	834	846	852	868
	872	876	882	884	890	896	906	920	922	928
	934	930	936	948	952	958	966	974	986	996

	1000	1002	1008	1014	1028	1034	1038	1042	1082	1094	1110	1122
VECT	1132	1136	1140	1146	1148	1154	1160	1162	1174	1328	1332	1338
(U) AUX CTRL	1340	1346	1352	1354	1356	1440	1444	1450	1452	1454	1460	1466
AUX	1486	1492	1494	1500	1506							
ENAB DBE	69 #	587	1112	1168	1170	1184	1186	1214	1410	1420	1426	
HOLD	128 #											
LOADBX	130 #	575	581	585	624	632	706	728	762	866	900	980
LOADB	1018	1478										
	80 #		1100	1106								
	82 #	1094										
	84 #	571	748	754	1130	1132	1136	1162	1188	1278	1244	1246
	1262	1286	1302	1386	1408	1410	1412	1420	1426	1428	1536	
	83 #	567	569	573	577	579	583	589	591	595	608	610
	616	642	648	658	660	664	676	678	684	692	694	698
	712	714	720	782	788	800	802	810	812	818	824	826
	828	830	832	838	840	844	846	852	884	890	902	904
	906	910	922	924	930	938	948	960	966	974	986	1002
	1008	1020	1028	1034	1038	1042	1066	1074	1078	1082	1090	1110
	1124	1148	1154	1170	1182	1186	1192	1198	1208	1242	1248	1250
	1274	1292	1340	1346	1358	1406	1434	1436	1440	1452	1454	1460
	1494	1500	1522	1532	1534							
	95 #	1414	1422									
	90 #	1252	1264									
SL(B-DX-0)	88 #	1022	1064	1544								
SL(B-DX15)	89 #	1076										
SL(B-0)LDX	91 #	1216	1218	1220	1222	1226	1230	1234	1282	1284	1290	1304
SL(BX-0)	1306	1310	1372	1378	1382	1396	1398	1404				
SL(BX-0)LDX	85 #	1364	1366									
SL(BX-1)	92 #	1224	1232	1288	1300	1308	1370	1380	1400	1402		
SL(BX-1)LDX	87 #	1368										
SL(BX-COUT)	94 #	1214										
SL(BX-COUT)LDX	86 #	1254	1256	1258	1260	1266	1268					
SL(BX-COUT)LDX	93 #	1374	1376									
SL(BX-DVX)	96 #	1180	1194	1196	1210	1360	1388	1390				
SL(B15-B-DX)	144 #											
BUS CTRL	146 #											
DATI	147 #	660	664	676	730	734	746	868	872	898	906	910
DATIP	922											
DATU	148 #	858	900	1018	1100	1106						
DATUB	149 #	632	1474									
BUT BITS	48 #											
ALL	63 #	1512										
BX00	55 #	1190										
BX00C05	62 #	1388	1270									
BX00SP15	60 #	1252	1390									
BX01	56 #	1272	1272									
C05	53 #	1254	1256	1258	1260	1356	1360	1376	1406	1414	1422	1542
C05X01HX00	61 #	1194	1196	1210								
COUT	57 #	1246	1546									
LN9	54 #	1164	1358	1408	1412							
NOIT	51 #	1166	1170	1172	1178	1218	1230	1242	1248	1276	1284	1294
NOITZ01T	1304	1374	1416	1424								
NOITZ01T	59 #	1362	1394	1432								
NOITZ01T	50 #	1044	1430									

Label	64 #	575	581	585	624	632	706	728	762	796	806	816
NOSERV	862	866	900	980	1018	1024	1032	1052	1056	1068	1072	1084
SPI5	1236	1312	1314	1318	1320	1384	1474	1478				
ZHIT	58 #	1264										
(U) RUT SERV	52 #	1062	1168	1216	1226	1238	1266	1268	1282	1300	1396	1516
(U) DATA TRAN	1520	1526										
	22 #		1042									
	24 #	567										
	151 #											
	153 #	569	573	591	595	600	606	608	610	616	622	632
	634	640	642	648	654	660	664	668	674	676	678	684
	690	694	698	702	710	712	714	720	726	730	734	738
	744	746	748	754	760	764	768	772	778	780	782	788
	794	802	810	812	818	824	832	838	840	846	852	858
	868	872	876	882	884	890	896	898	900	906	910	914
	920	922	924	930	936	948	952	958	960	966	972	974
	986	996	1000	1002	1008	1014	1018	1028	1034	1038	1082	1094
	1100	1106	1110	1122	1132	1136	1140	1146	1148	1154	1160	1162
	1324	1328	1332	1338	1340	1346	1352	1354	1436	1440	1444	1450
	1452	1454	1460	1466	1474	1486	1492	1494	1500	1506		
(U) ENAB MAINT	140 #											
MAINT	142 #	626	630	632	656	660	664	676	694	698	712	730
	734	746	764	768	780	872	898	900	906	910	922	978
(U) FORCE KER	1016	1018	1472	1474	1480	1484						
KER	18 #											
(U) FORCE RS+1	20 #	1094	1110	1122								
RS+1	30 #											
	32 #	1184	1212	1218	1226	1230	1244	1262	1278	1280	1296	1298
	1386	1396	1400	1400	1408	1412						
(U) J	166 #											
X61	1552 #											
X62	1553 #											
X63	1554 #											
X64	1555 #											
X65	1556 #											
X66	1557 #											
X67	1558 #											
X68	1559 #											
X69	1560 #											
X70	1561 #											
X71	1562 #											
X72	1563 #											
X73	1564 #											
X74	1565 #											
X75	1566 #											
X76	1567 #											
X77	1568 #											
X78	1569 #											
X79	1570 #											
X80	1571 #											
X81	1572 #											
1-A	567 #	571	575	581	585	624	632	706	728	762	796	806
	816	862	866	900	980	1018	1024	1032	1048	1052	1056	1060
	1068	1072	1084	1128	1236	1312	1314	1318	1320	1384	1474	1478
	1512	1540	1552	1553	1554	1555	1556	1557	1558	1559	1560	1561

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 CROSS REFERENCE LISTING

1-B	1562	1563	1564	1565	1566	1567	1568	1569	1570	1571	1572
1-C	567	569 #									
1-D	569	571 #	573								
10-A	573 #										
10-B	826 #										
10-C	828 #										
10-D	830 #										
10-E	832 #										
10-F	830	832 #	834 #								
10-G	836 #										
10-H	840 #	838 #									
10-I	840	842 #									
10-J	842	844 #									
10-K	846 #										
10-L	846	848 #									
10-M	848	850 #									
10-N	850	852 #									
10-O	826	828	834	838	844	852	854 #				
10-P	854	856 #									
10-Q	856	858 #									
10-R	858	860 #									
10-S	860	862 #									
11-A	864 #										
11-B	864	866 #									
11-C	868 #	870									
11-D	870 #										
11-E	872 #										
11-F	872	874 #									
11-G	876 #										
11-H	876	878 #									
11-I	880 #										
11-J	880	882 #									
11-K	884 #										
11-L	884	886 #									
11-M	886	888 #									
11-N	890 #										
11-O	890	892 #									
11-P	892	894 #									
11-Q	894	896 #									
11-R	878	882	888	896	898 #						
11-S	860	874	888	896	898	898 #					
12-A	902 #										
12-B	902	904 #									
12-C	906 #	908									
12-D	908 #										
12-E	910 #										
12-F	910	912 #									
12-G	914 #										
12-H	914	916 #									
12-I	918 #										
12-J	918	920 #									
12-K	916	920	922 #	928						936	
12-L	924 #										
12-H	924	926 #									

12-N	926	920 #	
12-O	930 #		
12-P	930	932 #	
12-Q	932	934 #	
12-R	934	936 #	
12-S	906	912	938 #
13-A	940 #		
13-B	942 #	944	
13-C	944 #		
13-D	946 #		
13-E	946	948 #	
13-F	948	950 #	
13-G	952	954 #	
13-H	952		
13-I	956 #		
13-J	956	958 #	
13-K	960 #		
13-L	960	962 #	
13-M	962	964 #	
13-N	966 #		
13-O	966	968 #	
13-P	968	970 #	
13-Q	970	972 #	
13-R	942	954	958
13-S	940	950	974
13-T	976	978 #	976 #
14-A	980 #	990	972
14-B	982 #	984	
14-C	984 #		
14-D	986 #		
14-E	988	990 #	
14-F	992 #		
14-G	992	994 #	996
14-H	996 #		
14-I	998 #		
14-J	998	1000 #	
14-K	1002 #		
14-L	1002	1004 #	
14-M	1004	1006 #	
14-N	1008 #		
14-O	1008	1010 #	
14-P	1010	1012 #	
14-Q	1012	1014 #	
14-R	982	994	1000
14-S	1016	1018 #	1014
14-T	986	988 #	1006
15-A	1020 #		
15-B	1020	1022 #	
15-C	1022	1024 #	
15-D	1026 #		
15-E	1026	1028 #	
15-F	1028	1030 #	
15-G	1030	1032 #	
15-H	1034 #		
15-I	1036 #	1058	

Label	Value 1	Value 2
15-J	1036	1038 #
15-K	1038	1040 #
15-L	1042 #	1044
15-M	1042	1044 #
15-N	1046 #	
15-O	1048 #	
15-P	1050 #	
15-Q	1050	1052 #
15-R	1054 #	
15-S	1054	1056 #
15-T	1034	1058 #
15-U	1040	1060 #
16-A	1062 #	
16-B	1062	1064 #
16-C	1064	1066 #
16-D	1060	1068 #
16-E	1070 #	1082
16-F	1072 #	
16-G	1074 #	
16-H	1074	1076 #
16-I	1076	1078 #
16-J	1080 #	1086
16-K	1080	1082 #
16-L	1070	1084 #
16-M	1078	1086 #
17-A	1088 #	
17-B	1046	1088
17-C	1090	1092 #
17-D	1092	1094 #
17-E	1094	1096 #
17-F	1096	1098 #
17-G	1098	1100 #
17-H	1100	1102 #
17-I	1102	1104 #
17-J	1104	1106 #
17-K	1106	1108 #
17-L	1108	1110 #
17-M	1112 #	
17-N	1112	1114 #
17-O	1114	1116 #
17-P	1116	1118 #
17-Q	1118	1120 #
17-R	1120	1122 #
17-S	1124 #	
17-T	1124	1126 #
17-U	1110	1120 #
18-A	1130 #	
18-B	1132 #	1134
18-C	1134 #	
18-D	1136 #	
18-E	1136	1138 #
18-F	1140 #	
18-G	1140	1142 #
18-H	1144 #	
18-I	1144	1146 #

18-J	1148 #			
18-K	1148	1150 #		
18-L	1150	1152 #		
18-M	1154 #			
18-N	1154	1156 #		
18-O	1156	1158 #		
18-P	1158	1160 #		
18-Q	1142	1146	1152	1162 #
18-R	1130	1132	1138	1164 #
18-S	1164	1166 #		
18-T	1168 #			
19-A	1166	1170 #		
19-H	1172 #			
19-C	1174 #			
19-D	1172	1176 #		
19-E	1174	1178 #		
19-F	1180 #			
19-G	1180	1182 #		
19-H	1182	1184 #		
19-I	1186 #			
19-J	1170	1186	1188 #	
19-K	1188	1190 #		
19-L	1192 #			
19-M	1194	1194	1196	1198
19-N	1196	1208		1210
19-O	1198 #			
19-P	1200 #			
19-Q	1202			
19-K	1204 #			
19-S	1206 #			
19-T	1208 #			
19-U	1176	1178	1190	1192
2-A	575 #	577		1210 #
2-U	577 #			
2-C	579 #			
2-D	579	581 #		
2-E	583 #			
2-F	583	585 #		
2-G	587 #			
20-A	1200	1202	1204	1206
20-B	1184	1212	1214 #	1212 #
20-C	1216 #	1230		
20-D	1218 #			
20-E	1216	1220 #		
20-F	1222 #			
20-G	1218	1220	1224 #	
20-H	1226 #			
20-I	1228 #			
20-J	1226	1228	1230 #	
20-K	1232 #			
20-L	1230	1234 #		
20-H	1222	1224	1232	1234
20-N	1214	1238 #		1236 #
21-A	1168	1240 #		
21-U	1240	1242 #		

Label	Value 1	Value 2	Value 3	Value 4
21-C	1244 #			
21-D	1246 #			
21-E	1248 #			
21-F	1246 #	1250 #		
21-G	1252 #	1254	1256	1258
21-H	1254 #			1260
21-I	1256 #			
21-J	1252	1258 #		
21-K	1260 #			
21-L	1242	1262 #		
21-M	1248	1250	1262	1264 #
21-N	1266 #			
21-O	1264	1268 #		
21-P	1266	1268	1270 #	
22-A	1272 #			
22-B	1272	1274 #		
22-C	1274	1276 #		
22-D	1276	1278 #		
22-E	1280 #			
22-F	1278	1282 #	1296	
22-G	1282	1284 #		
22-H	1286 #			
22-I	1288 #			
22-J	1284	1286	1290 #	
22-K	1292 #			
22-L	1292	1294 #		
22-M	1296 #			
22-N	1294	1298 #		
22-O	1280	1298	1300 #	
22-P	1302 #			
22-Q	1300	1304 #		
22-R	1302	1306 #		
22-S	1304	1308 #		
22-T	1288	1290	1306	1310 #
22-U	1310	1312 #		
22-V	1314 #			
22-W	1316 #			
22-X	1316	1318 #		
22-Y	1320 #			
23-A	1322 #			
23-B	1324 #	1326		
23-C	1326 #			
23-D	1328 #			
23-E	1328	1330 #		
23-F	1332 #			
23-G	1332	1334 #		
23-H	1336 #			
23-I	1336	1338 #		
23-J	1340 #			
23-K	1340	1342 #		
23-L	1342	1344 #		
23-M	1346 #			
23-N	1346	1348 #		
23-O	1348	1350 #		
23-P	1350	1352 #		

Label	1334	1338	1344	1352	1354 #
23-Q	1322	1324	1330	1354	1356 #
24-A	1358 #				
24-B	1350	1360 #			
24-C	1364 #	1362 #	1410	1426	1428
24-D	1362	1366 #			
24-E	1368 #				
24-F	1364	1370 #			
24-G	1366	1368	1372 #		
24-H	1370	1372	1374 #		
24-I	1376 #	1402	1404		
24-J	1374	1378 #			
24-K	1380 #				
24-L	1376	1382 #			
24-M	1378	1380	1382	1384 #	
24-N	1386 #				
24-O	1388 #				
24-P	1386	1390 #			
24-R	1388	1390	1392 #		
24-S	1392	1394 #			
24-T	1396 #				
24-U	1394	1398 #	1432		
24-V	1400 #				
24-W	1402 #				
24-X	1396	1398	1400	1404 #	
25-A	1356	1406 #			
25-B	1408 #				
25-C	1408	1410 #			
25-D	1406	1412 #			
25-E	1414 #	1414			
25-F	1416 #				
25-G	1418 #				
25-H	1412	1420 #			
25-I	1420	1422 #	1422		
25-J	1424 #				
25-K	1424	1426 #			
25-L	1428 #				
25-M	1430 #				
25-N	1416	1418	1430	1432 #	
26-A	1434 #				
26-B	1436 #	1438			
26-C	1438 #				
26-D	1440 #				
26-E	1440	1442 #			
26-F	1444 #				
26-G	1444	1446 #			
26-H	1448 #				
26-I	1448	1450 #			
26-J	1446	1450	1452 #	1458	1466
26-K	1454 #				
26-L	1454	1456 #			
26-M	1456	1458 #			
26-N	1460 #				
26-O	1460	1462 #			

26-P	1462	1464 #
26-Q	1464	1466 #
26-R	1434	1436
26-S	1468	1470 #
26-T	1470	1472 #
26-U	1472	1474 #
27-A	1476 #	
27-B	1476	1478 #
27-C	1480 #	1482
27-D	1482 #	
27-E	1484 #	
27-F	1486 #	
27-G	1486	1488 #
27-H	1490 #	
27-I	1490	1492 #
27-J	1494 #	
27-K	1494	1496 #
27-L	1496	1498 #
27-M	1500 #	
27-N	1500	1502 #
27-O	1502	1504 #
27-P	1504	1506 #
27-Q	1488	1492
27-R	1480	1484
27-S	1512 #	
28-A	1526	1514 #
28-B	1514	1516 #
28-C	1518 #	
28-D	1518	1520 #
28-E	1520	1522 #
28-F	1524 #	
28-G	1522	1526 #
28-H	1528 #	
28-I	1526	1530 #
28-J	1528	1532 #
28-K	1534	1536 #
28-L	1516	1538 #
28-M	1524	1530
28-N	1536	1542 #
28-O	1542	1544 #
28-P	1546 #	
28-Q	1546	1548 #
28-R	1532	1534 #
3-A	589 #	
3-B	591 #	593
3-C	593 #	
3-D	595 #	
3-E	595	597 #
3-F	600 #	
3-G	600	602 #
3-H	604 #	
3-I	604	606 #
3-J	602	606
3-K	610 #	
3-L	610	612 #
	1442	1452
	1442	1468 #
	1498	1506
	1508	1510 #
	1498	1508 #
	1530	1540 #
	1538	1548
	608 #	614
	608 #	622

3-M	612 #	614 #							
3-N	616 #								
3-O	616 #	618 #							
3-P	618 #	620 #							
3-Q	620 #	622 #							
4-A	624 #		904						
4-B	626 #	628 #							
4-C	628 #								
4-D	630 #								
4-E	626 #	630 #	632 #	656 #	660 #	666 #	676 #	736 #	746 #
	1510								
4-F	634 #								
4-G	634 #	636 #							
4-H	638 #								
4-I	638 #	640 #							
4-J	642 #								
4-K	644 #	644 #							
4-L	644 #	646 #							
4-M	648 #								
4-N	648 #	650 #							
4-O	650 #	652 #							
4-P	652 #	654 #							
4-Q	646 #	640 #	646 #	654 #	656 #				
5-A	658 #								
5-B	660 #	662 #							
5-C	662 #								
5-D	664 #								
5-E	664 #	666 #							
5-F	668 #								
5-G	668 #	670 #							
5-H	672 #								
5-I	672 #	674 #							
5-J	670 #	674 #	676 #	682 #	690 #				
5-K	678 #								
5-L	678 #	680 #							
5-M	680 #	682 #							
5-N	684 #								
5-O	684 #	686 #							
5-P	686 #	688 #							
5-Q	688 #	690 #							
6-A	692 #								
6-B	694 #	696 #							
6-C	696 #								
6-D	698 #								
6-E	698 #	700 #							
6-F	702 #								
6-G	702 #	704 #							
6-H	692 #	694 #	700 #	706 #	712 #	764 #	770 #	780 #	
6-I	708 #								
6-J	708 #								
6-K	704 #	710 #	712 #	718 #	726 #				
6-L	714 #								
6-M	714 #	716 #							
6-N	716 #	718 #							
6-O	720 #								

6-P	720	722 #					
6-O	722	724 #					
6-R	724	726 #					
7-A	589		597	608	728 #		
7-H	730 #						
7-C	732 #						
7-D	734 #						
7-E	738 #						
7-F	738 #						
7-G	742 #						
7-H	742 #						
7-I	742 #						
7-J	740	744 #					
7-K	748 #		746 #	752	760		
7-L	748	750 #					
7-N	750	752 #					
7-H	754 #						
7-O	754	756 #					
7-P	756	758 #					
7-Q	758	760 #					
8-A	762 #						
8-B	764 #	766					
8-C	766 #						
8-D	768 #						
8-E	768	770 #					
8-F	772 #						
8-G	772	774 #					
8-H	776 #						
8-I	776	778 #					
8-J	774	778	780 #	786	794		
8-K	782 #						
8-L	782	784 #					
8-M	784	786 #					
8-N	788 #						
8-O	788	790 #					
8-P	790	792 #					
8-Q	792	794 #					
9-A	796 #	798					
9-B	798 #						
9-C	800 #						
9-D	802 #		804 #				
9-E	800	802	804 #				
9-F	804	806 #	810	824			
9-G	808 #						
9-H	808	810 #					
9-I	812 #						
9-J	812	814 #					
9-K	814	816 #					
9-L	818 #						
9-M	818	820 #					
9-N	820	822 #					
9-O	822	824 #					
(U) LOAD BA	136 #						
UA	138 #	569	573	591	595	600	608
	630	634	640	642	648	656	660
						664	668
							674
							676

CROSS REFERENCE LISTING

Label	678	684	690	694	698	702	710	712	714	720	726	730
(U) LONG CYCLE	678	684	690	694	698	702	710	712	714	720	726	730
LONG	734	738	744	746	748	754	760	764	768	772	778	780
	782	788	794	802	810	812	818	824	832	838	840	846
	852	856	868	872	876	882	884	890	896	898	906	910
	914	914	920	924	930	936	948	952	958	960	966	972
	974	978	986	996	1000	1002	1008	1014	1016	1028	1034	1038
	1082	1094	1098	1104	1110	1122	1132	1140	1146	1148	1154	1154
	1160	1162	1324	1328	1332	1338	1340	1346	1352	1354	1436	1440
	1444	1450	1452	1454	1460	1466	1472	1480	1484	1486	1492	1494
	1500	1506	1508									
(U) LONG CYCLE	132	632	858	900	1018	1062	1100	1106	1166	1168	1170	1172
LONG	134	1216	1218	1226	1230	1238	1242	1246	1248	1266	1268	1276
	1170	1282	1294	1300	1304	1362	1374	1394	1396	1416	1424	1432
	1474	1516	1520	1526	1546							
(U) MACROS	507	1022	1064									
ASL B	217	828										
B RD_RD-2	219	1182										
B RS_BX	223	569										
BA_PC	754	782	573	610	616	642	648	678	684	714	720	748
	966	1002	798	812	818	840	846	884	890	924	930	960
BA_R12	227	608	1008	1148	1154	1340	1346	1454	1460	1494	1500	
	936	948	972	746	760	780	794	824	852	896	898	922
BA_R13	231	654	656	676	690	712	726	1014	1016	1506	1508	
BA_R15	233	1094	1110	1122								
BA_R17	235	1472										
BA_R6	221	856	978	986	1028	1034	1038	1082	1098	1104		
BA_RD	229	626	630	634	640	660	664	668	674	694	698	702
	710	730	734	738	744	764	768	772	778	802	810	832
	838	868	872	876	882	906	910	914	920	952	958	996
	1000	1132	1136	1140	1146	1324	1328	1332	1338	1436	1440	1444
	1450	1480	1484	1486	1492							
	225	591	595	600	606							
BA-RS	533	1512										
BUT ALL	519	1190	1270									
BUT BX00	525	1388	1390									
BUT BX00 C05	529	1252	1272									
BUT BX00 SP15	521	1246	1546									
BUT C00T	515	1254	1256	1258	1260	1356	1360	1376	1406	1414	1422	1542
BUT C05	531	1194	1196	1210								
BUT C05 BX01 BX00	551	587	589	591	597	608	990					
BUT DEST	517	1164	1358	1408	1412							
BUT IN9	513	1166	1170	1172	1178	1218	1230	1242	1248	1276	1284	1294
BUT NBIT	1304	1374	1416	1424								
BUT NBIT C05	523	1362	1394	1432								
BUT NBIT ZBIT	535	575	581	585	624	632	706	728	762	796	806	816
BUT NOSENV	862	866	900	980	1018	1024	1032	1052	1056	1068	1072	1084
	545	567	1042	1314	1320	1384	1474	1478				
BUT SERVICE	509	1264										
BUT SP15	511	1062										
BUT ZBIT	1520	1526	1168	1216	1226	1238	1266	1268	1282	1300	1396	1516
BX PC_PC+2	219	571										

CROSS REFERENCE LISTING	247 #	1410	1420	1426	MICRO 21(164)	MICROCODE FILE	PAGE 16
HX_0	247 #	1410	1420	1426			
HX_0	243 #	1536					
HX_MINUS 1	249 #	1428					
HX_R17+1	251 #	1286	1302				
HX_R17+HX+1	255 #	1228					
HX_R17-HX	245 #	1246					
HX_RS ASL H	237 #	1076					
HX_RSVI	241 #	1244					
HX_RS	253 #	1188					
HX_UDATA	239 #	748					
H-(R10.0)	193 #	1066					
H_0	211 #	1170					
H_0	195 #	904					
H_0BAH	189 #	1250					
H_0X	209 #						
H_0X SL(BX-0)	183 #	1364					
H_0X SL(BX-1)	185 #	1368					
H_MINUS 1	199 #	1522					
H_PC	181 #	1124					
H_PC+H	179 #	1078					
H_PSM	191 #	1090					
H_R12+H	213 #	1208					
H_R13+H+1	215 #	1192					
H_R17-H	187 #	1248					
H_R7+H+1	197 #	1532					
H_RD	205 #	577					
H_RD+H	207 #	844					
H_RS	203 #	583					
H_UDATA	201 #	567					
	802	810					
	924	930					
	1110	1148					
	471 #	1236					
	477 #						
	475 #	1056					
	473 #	1052					
	479 #	1318					
	481 #	1314					
	563 #	1194					
	1418	1422					
	469 #	1164					
	465 #	1322					
	467 #	1324					
	547 #	569					
	640	642					
	710	712					
	772	778					
	838	840					
	930	936					
	1002	1008					
	1140	1146					
	1352	1354					
	1494	1500					
	549 #	660					
	922						
CC_HX							
CC_R12							
CC_R12 V B							
CC_R12.BBAR							
CC_R17+1							
CC_R17+2							
COUNT							
C_16							
C_RD							
C_UDATA							
DATI							
DATIP							

	419	634	640	654	668	674	690	702	710	726	796	1000
R13-UDATA	419	634	640	654	668	674	690	702	710	726	796	1000
R15-0	1014	1486	1492	1506								
R15-B	441	1112										
R15-R15+2	441	1046	1088									
R15-R15+R15	435	1092	1114									
R15-R15+R15+1	437	1120										
R15-R15-2	437	1116	1118									
R17-0	433	1108	1214									
R17-B	443	1414	1422									
R17-MINUS 1	449	1468										
R17-R17+2	451	1316										
R17-R17-1	447	1470										
RS-B	337	1070	1126									
R6-B	339	1086	1030	1036	1040	1084						
R6-R6+2	345	990	976	1096	1102							
R6-R6+B	343											
R6-R6-2	341	854										
R7-0	347	1514										
R7-R7(XOR)B	355	1526										
R7-R7+1	349	1546										
R7-R7+BX	353	1542										
R7-R7-1	351	1518										
RD-(RD OP B)	299	728										
RD-(RS OP B)	295	575										
RD-(R12 OP B)	301	624										
RD-B	289	1032										
RD-R12	291		980	1478								
RD-R12 OP B	293	866										
RD-RD OP B	297	585										
RD-RD+(2)	305	630										
RD-RD+2	307	636	666	700	736	770	912	1442	1484			
RD-RD-(2)	954	994	670	704	740	774	804	834	874	878	916	950
RD-RD-2	303	628	662	696	732	766	798	808	836			
	309	638	672	708	742	776	798	808	836	870	880	918
	944	956	984	998	1134	1144	1326	1336	1448	1490		
RSV1-B	411	1278	1298									
RSV1-BX	415	1212	1398	1400								
RSV1-R17-B	409	1280	1296	1398								
RSV1-0	413	1184										
RS-B	405	1200	1202	1204	1206	1362	1394	1432				
RS-PX	403	1282										
RS-PC	399	860										
RS-R17-BX	407	1300										
RS-RS+(2)	393	597										
RS-RS+2	397	602										
RS-RS-(2)	391	593										
RS-RS-1	401	1062										
RS-RS-2	395	604										
SEX	543	1020	1066	1074	1478							
SL(B-BX-0)	503	1414	1422									
SL(B-BX15)	487	1252	1264									
SL(B-0)	489	1544										
SL(BX-0)	491	1216	1218	1220	1222	1226	1230	1234	1282	1284	1290	1304
	1306	1310	1372	1378	1382	1396	1398	1404				

Label	493 #	1224	1232	1288	1300	1308	1370	1380	1400	1402
SL(OX-1)	493 #	1224	1232	1288	1300	1308	1370	1380	1400	1402
SL(OX-COUT)	501 #	1214								
SL(OX-COUT) B-R12+H	499 #	1256	1258	1266						
SL(OX-COUT) B-R13+H	497 #	1254	1260	1268						
SL(OX-OVX)	495 #	1374	1376							
SH(O15-H-HX)	505 #	1180	1194	1196	1210	1360	1388	1390		
SS-R12+B	257 #									
SS-R13+H+1	259 #									
SWAB	541 #	864	868	872	898	1064				
T-M	317 #	1022	1180	1238	1374	1418	1544			
T-HHAA	333 #	1216								
T-DX	315 #	1168	1190	1194	1196	1210	1220	1224	1232	1234
T-R12	1288	1290	1306	1308	1310	1360	1370	1372	1376	1380
T-R12 OP B	323 #	1252	1264	1272	1404	1430				1382
T-R13+1	319 #	706								
T-R17	321 #	1416	1178							
T-R7	325 #	1516	1424							
T-RD OP B	313 #	762	1520							
T-RS	335 #	1276	1284	1294	1304					
T-RS OP B	311 #	581								
T-RS+NS	329 #	1214								
T-RSV1	331 #	1218	1226	1230						
UDATA-(R12 OP B)	463 #	632								
UDATA-B	457 #	1100								
UDATA-PC	459 #	1106								
UDATA-R12	453 #	1474								
UDATA-R12 OP B	455 #	900	1018							
UDATA-RS	461 #	858								
(U) MISC CTRL	155 #									
NOTDEFST	161 #	587	589	591	597	608	990			
COURT	164 #	1194	1196	1210	1252	1356	1360	1388	1390	1392
	1418	1422	1542							1406
FHAUSTUV	162 #	593	604	628	638	662	672	696	708	732
	776	798	808	828	836	854	870	880	908	918
	976	984	998	1096	1102	1114	1144	1326	1336	1438
	1490									1482
LOADCC	160 #	575	581	585	624	632	706	728	762	866
	1018	1052	1056	1236	1312	1314	1318	1320	1384	900
LOADC	163 #	1164	1322	1324	1328	1354	1528			1478
LOADIR	158 #	569	573	574	590	1016	1018			
LOADPSW	159 #	1060	1094	1122						
RUP	157 #									
(U) PREVIOUS MODE	26 #	940	948	974	980	1016	1018			
ASSENT	28 #									
(U) ROM SPA	3 #									
PC	7 #	569	571	573	610	612	616	618	642	644
	678	680	684	686	714	716	720	722	748	754
	782	784	788	790	796	806	812	814	816	820
	842	846	848	860	862	884	886	890	892	896
	932	960	962	966	968	1002	1004	1008	1010	1024
	1068	1078	1080	1106	1124	1128	1148	1150	1154	1156
	1346	1348	1454	1456	1460	1462	1494	1496	1500	1502
										1516

J CROSS REFERENCE LISTING

	1206	1212	1278	1280	1282	1296	1298	1300	1362	1394	1396	1398
(U) SPA SRC SEL	1206	1212	1278	1280	1282	1296	1298	1300	1362	1394	1396	1398
RRA	1400	1432										
RD	41 #	46 #										
	43 #	577	579	585	626	628	630	630	634	636	638	640
	636	652	658	660	662	664	666	668	670	672	674	682
	688	692	694	696	698	700	702	704	708	710	718	724
	764	766	732	734	736	738	740	742	744	752	758	762
	800	802	768	770	772	774	776	778	786	792	796	798
	836	838	804	808	810	816	822	826	828	830	832	834
	882	888	844	850	864	868	870	872	874	876	878	880
	928	934	894	902	906	908	910	912	914	916	918	920
	970	982	940	942	944	946	950	952	954	956	958	964
	1132	1134	984	992	994	996	998	1000	1006	1012	1026	1130
	1326	1328	1136	1138	1140	1142	1144	1146	1152	1158	1322	1324
	1440	1442	1330	1332	1334	1336	1338	1344	1350	1434	1436	1438
	1486	1488	1444	1446	1448	1450	1458	1464	1480	1482	1484	1484
	45 #	575	1490	1492	1498	1504						
NUM	45 #	575	581	583	589	591	593	595	597	600	602	604
RS	606	614	620	658	1062	1172	1174	1176	1188	1214	1218	1226
	1230	1242	1244	1262	1276	1284	1294	1304	1358	1386	1406	1408
(U) SSMUX CTRL	1412											
EXTRNL	73 #											
	78 #	575	591	593	595	597	608	624	628	630	632	660
	662	664	666	676	694	696	698	700	712	728	730	732
	734	736	746	764	766	768	770	780	906	908	910	912
	922	1436	1438	1440	1442	1452	1492	1484				
SEX	76 #	1020	1066	1074	1478							
STRT	75 #											
SWAN	77 #	864	868	872	898	1064						

7 OUT112.MAC(160,162) 1983 12-NOV-1976 MICRO 21(164) MICROCODE FILE PAGE 22
3 LOCATION / LINE NUMBER INDEX 2 3 4 5 6 7
1 DCODE LOC'N 0
D 0000

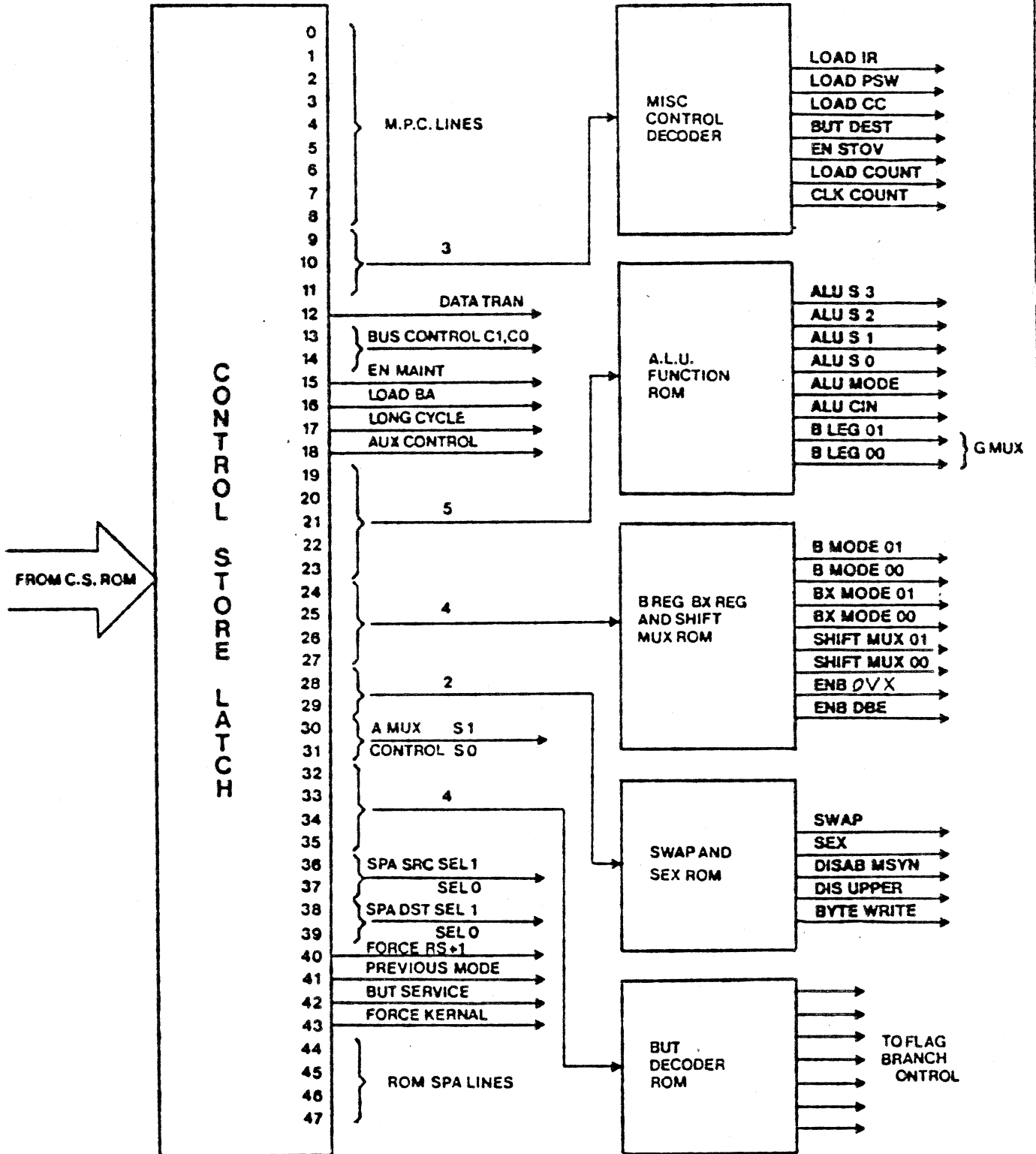
LOC	LOC	LOC	LOC	LOC	LOC	LOC	LOC	LOC	LOC
0	1	2	3	4	5	6	7	8	9
U 0000	567	1124	573	1048	1026	948	1050	1054	
U 0010	986	1034	1044	1046	1042	571	569	1088	
U 0020	1074	796	800	802	798	808	812	818	
U 0030	864	868	872	876	870	880	884	890	
U 0040	728	730	734	738	732	742	748	754	
U 0050	624	626	630	634	628	638	642	648	
U 0060	692	694	698	702	696	708	714	720	
U 0070	658	660	664	668	662	672	678	684	
U 0100	940	942	946	952	944	956	960	966	
U 0110	589	591	595	600	593	604	610	616	
U 0120	1434	1436	1440	1444	1438	1448	1454	1460	
U 0130	1476	1480	1484	1486	1482	1490	1494	1500	
U 0140	577	636	640	656	644	646	650	652	
U 0150	587	826	830	832	836	836	840	846	
U 0160	762	764	768	772	766	776	782	788	
U 0170	902	906	910	914	908	918	924	930	
U 0200	1020	1120	1122	581	585	597	602	606	
U 0210	575	608	612	614	618	620	622	632	
U 0220	1130	1132	1136	1140	1134	1144	1148	1154	
U 0230	1322	1324	1328	1332	1326	1336	1340	1346	
U 0240	583	654	666	670	674	676	680	682	
U 0250	980	982	992	996	984	998	1002	1008	
U 0260	1062	688	690	700	704	706	710	712	
U 0270	579	718	722	724	726	736	740	744	
U 0300	746	750	752	756	758	760	770	774	
U 0310	778	780	784	786	790	792	794	804	
U 0320	806	810	814	816	820	822	824	834	
U 0330	838	842	844	848	850	852	854	856	
U 0340	858	860	862	866	874	878	882	886	
U 0350	888	892	894	896	898	900	904	912	
U 0360	916	920	922	926	928	932	934	936	
U 0370	938	950	954	958	962	964	968	970	
U 0400	1166	1168	1170	1188	1230	1176	1316	1210	
U 0410	1216	1234	1226	1194	1230	1224	1228	1200	
U 0420	1220	1262	1218	1250	1264	1268	1308	1192	
U 0430	1406	1290	1126	1208	1358	1266	1086	1202	
U 0440	1270	1274	1252	1298	1278	1366	1272	1364	
U 0450	1040	1292	1412	1198	1378	974	1408	1204	
U 0460	1070	1276	1320	976	1398	1404	1396	1402	
U 0470	1092	1294	978	1196	994	1000	1004	1206	
U 0500	1410	1430	1186	1172	1094	1174	1010	1180	
U 0510	1012	1232	1362	1016	1014	1222	1360	1386	
U 0520	1018	1244	1022	1024	1314	1028	1306	1030	
U 0530	1248	1288	1286	1032	1304	1036	1302	1038	
U 0540	1548	1052	1056	1296	1280	1368	1066	1068	
U 0550	1382	1070	1066	1076	1380	1080	1080	1082	
U 0560	1096	1084	1098	1138	1400	1142	1100	1146	
U 0570	1102	1150	1104	1106	1152	1156	1158	1168	

/ OUT112.MAC(160,162) 18133 12-NDV-1976 MICROCODE FILE PAGE 24
 / LOCATION / LINE NUMBER INDEX
 / UCODE LOC'N 0 1 2 3 4 5 6 7

U 0600	1160	1162	1164	1178	1182	1184	1190	1212
U 0610	1214	1236	1242	1246	1282	1300	1310	1312
U 0620	1318	1330	1334	1248	1338	1342	1344	1348
U 0630	1350	1352	1354	1356	1370	1372	1374	1376
U 0640	1258	1384	990	972	988	1058	1110	1114
U 0650	1260	1432	1420	1414	1116	1426	1118	1416
U 0660	1254	686	716	1442	1446	1450	1452	1456
U 0670	1256	1458	1462	1464	1466	1468	1470	1472
U 0700	1064	1238	1072	1392	1474	1478	1510	1390
U 0710	1480	1492	1496	1498	1502	1504	1506	1508
U 0720	1530	1544	1518	1394	1522	1546	1524	1388
U 0730	1530	1514	1528	1516	1520	1526	1532	1536
U 0740	1112	1540	1542	1534	1060	1128	1552	1554
U 0750	1554	1418	1555	1422	1556	1428	1557	1424
U 0760	1558	1559	1560	1561	1562	1563	1564	1565
U 0770	1566	1567	1568	1569	1570	1571	1572	1512

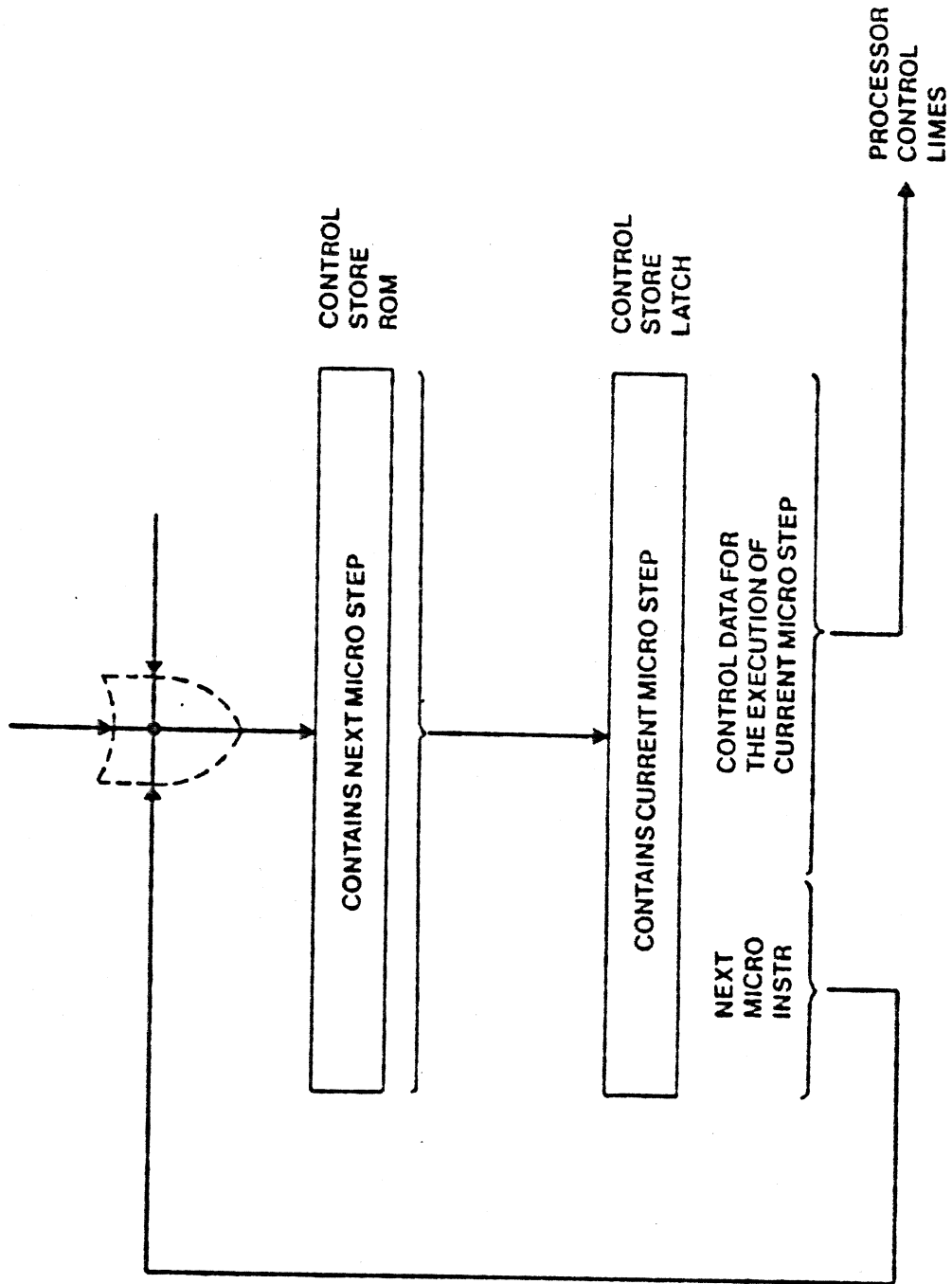
NO ERRORS DETECTED
 END OF MICRO CODE ASSEMBLY
 USED 25.59 SECONDS, 39 PAGES

CONTROL STORE LATCH



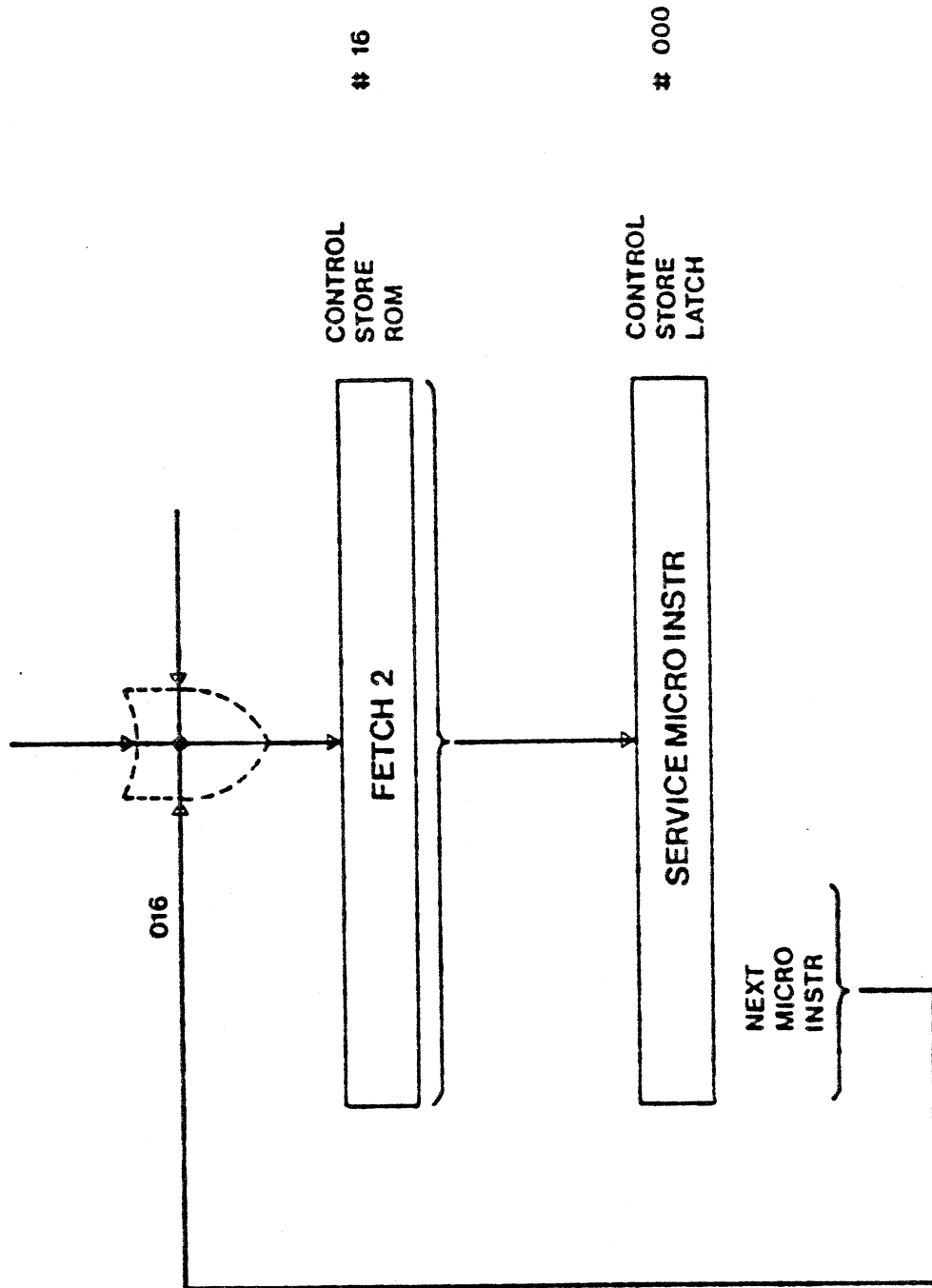
"NORMAL" MPC OPERATION

MICRO PROGRAM CONTROL LINES (M.P.C.)

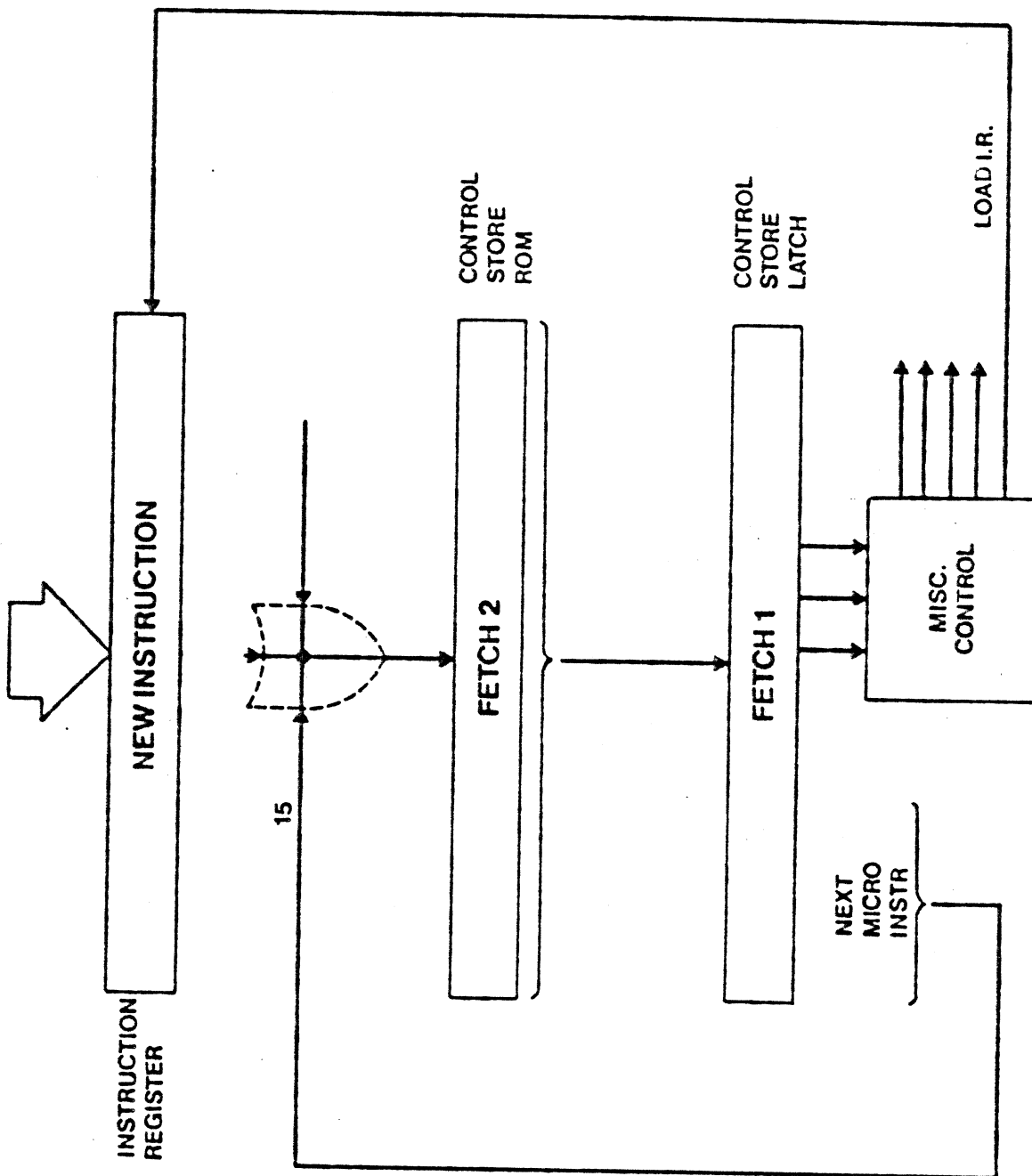


"LAST" MICRO STEP

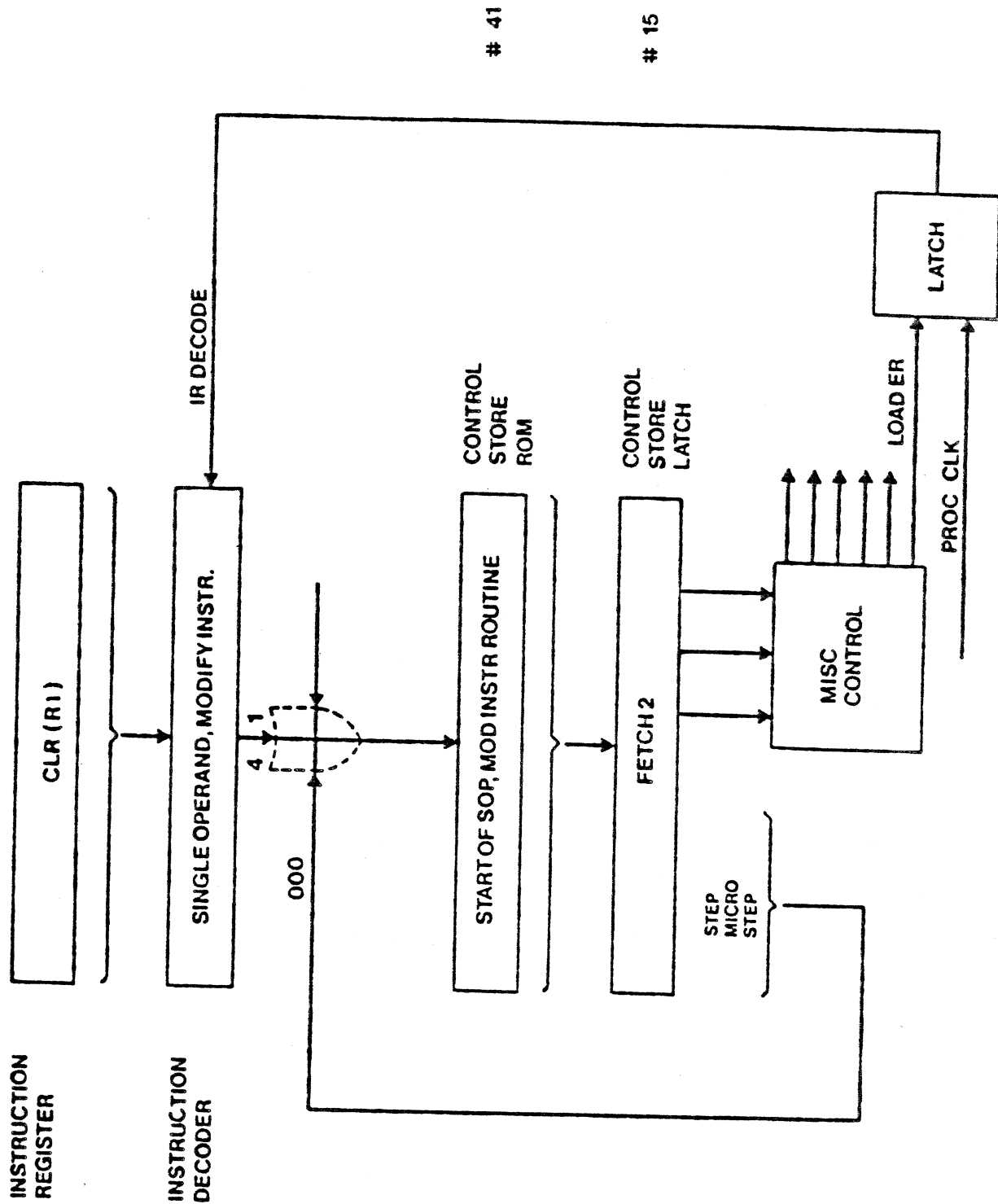
LAST MICRO STEP OF AN INSTRUCTION IS ALWAYS TO "SERVICE" WHICH HAS A MICRO STEP OF 000



FETCH CYCLE 1
FROM SS MUX



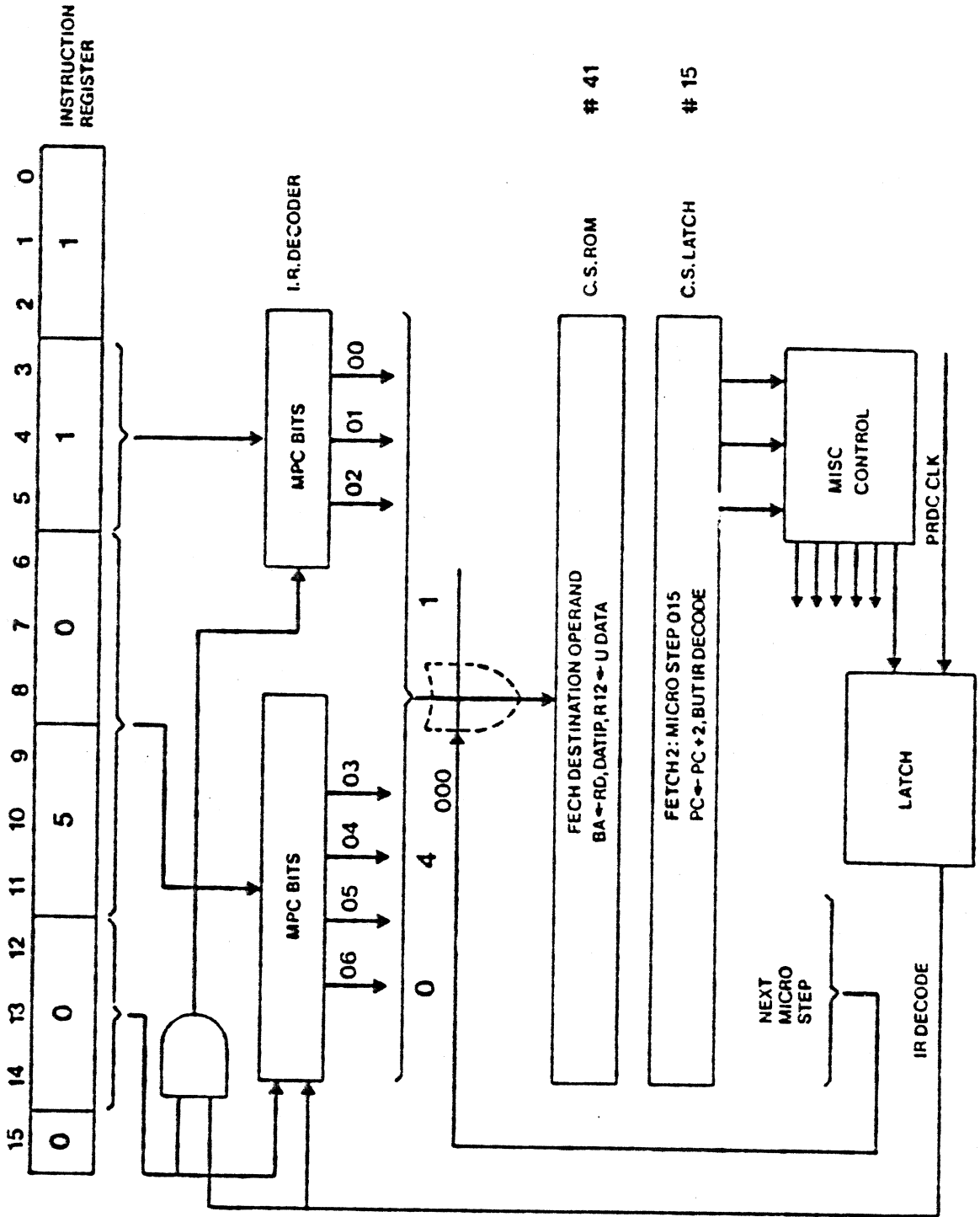
FETCH CYCLE 2



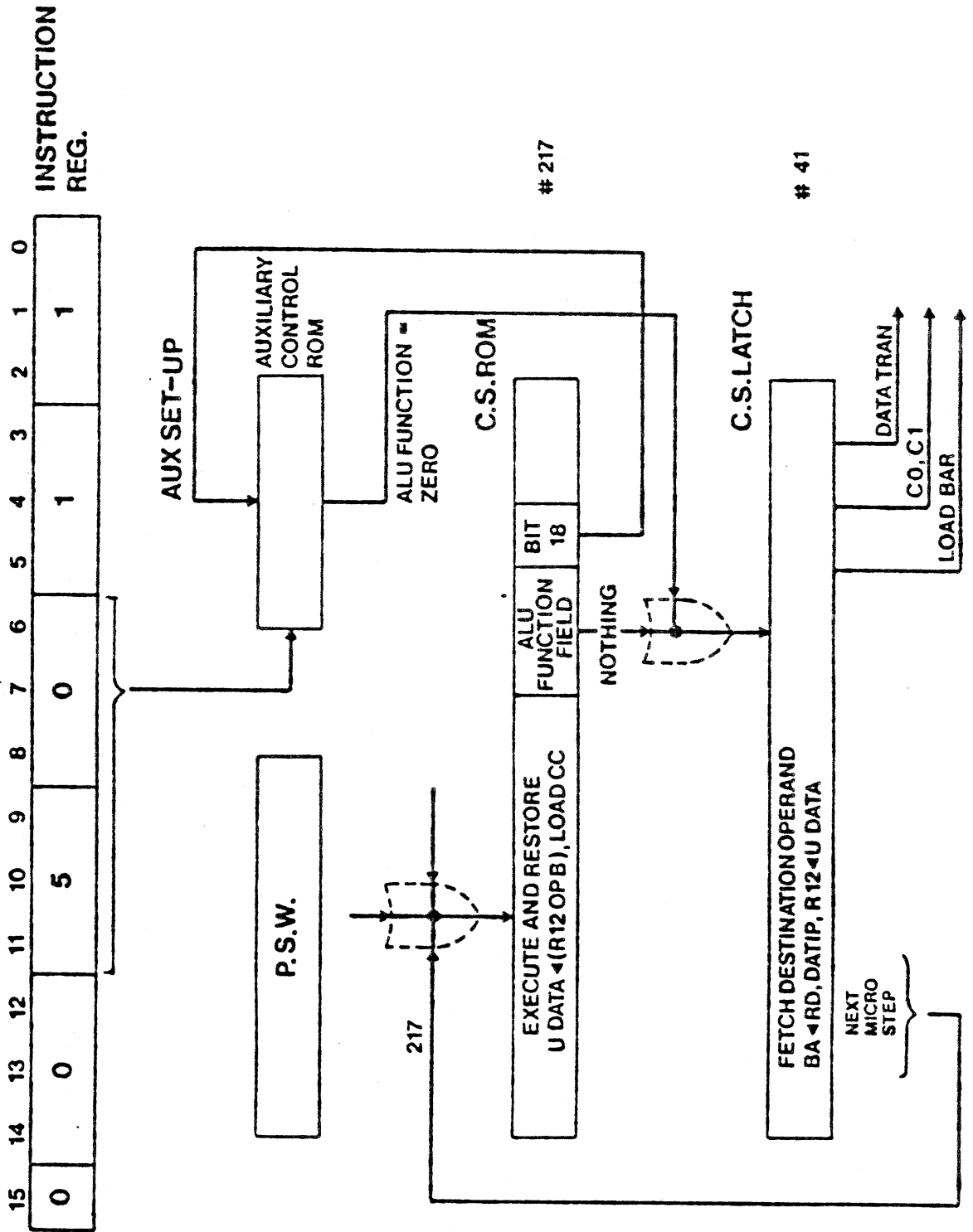
41

15

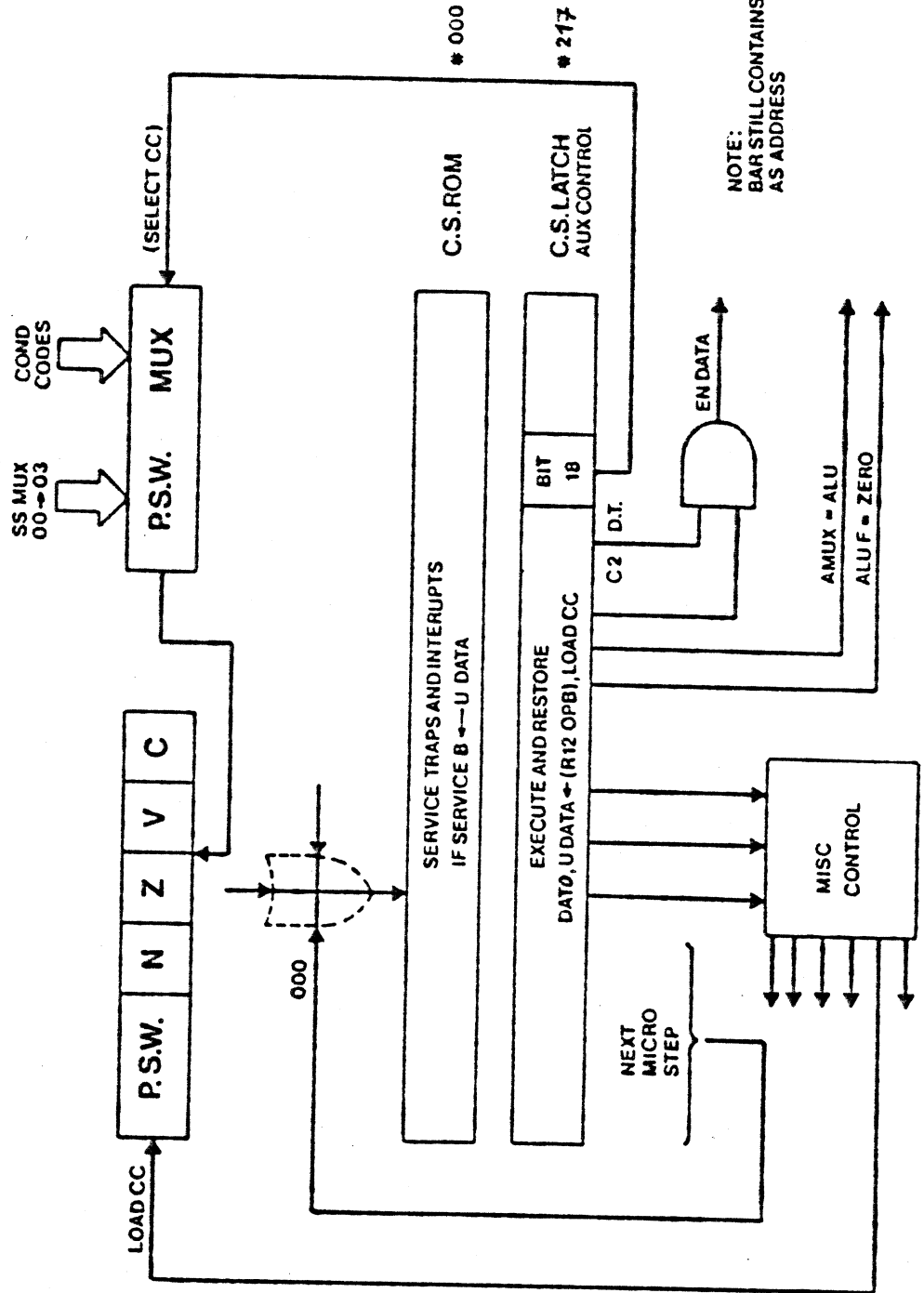
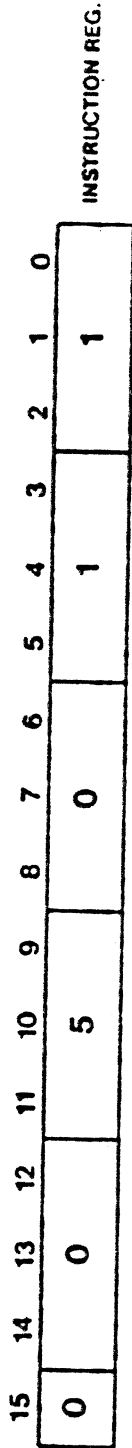
MICRO PROGRAM CONTROL LOGIC: END OF FETCH 2



MICRO - PROGRAM CONTROL LOGIC: GET DESTINATION OPERAND



MICRO - PROGRAM CONTROL LOGIC: EXECUTE AND RESTORE



CONTROL LOGIC

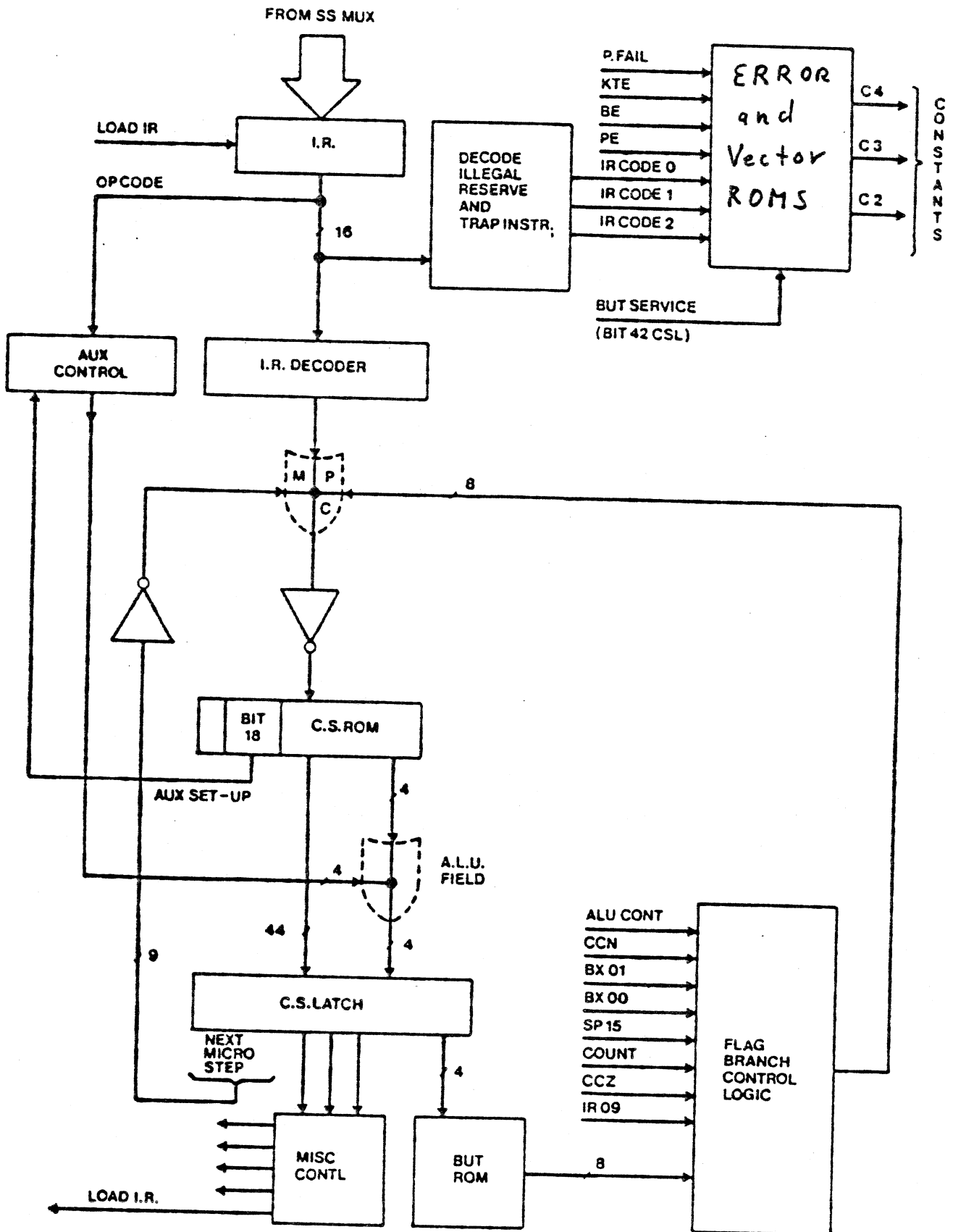
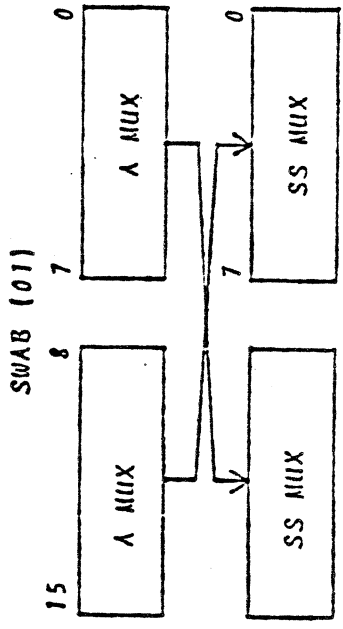


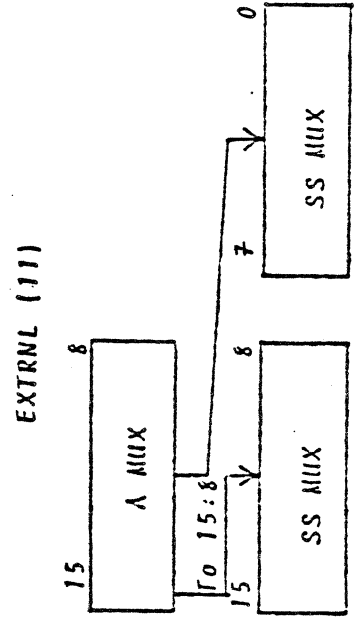
Table 4-5 SPM Register Utilization

Register Number	Description
R0	General-Purpose Registers
R1	
R2	
R3	
R4	
R5	
R6	(Processor Stack Pointer)
R7	(Program Counter)
R10	Temporary Storage
R11	Unused
R12	Temporary Storage
R13	Temporary Storage
R14	Unused
R15	Temporary Storage
R16	Processor Stack Pointer (Memory Management User Mode)
R17	Temporary Storage



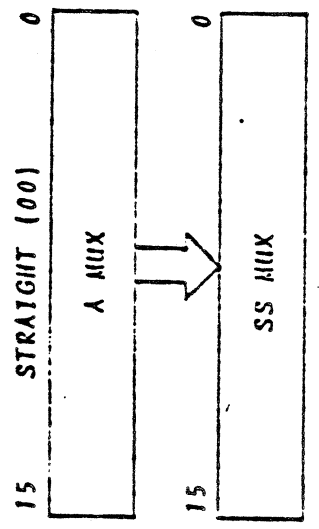
SS MUX 15:8
SS MUX 7:0

A MUX 7:0
A MUX 15:8



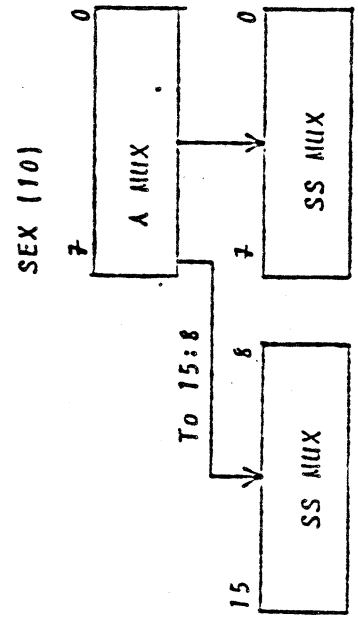
SS MUX 15:8
SS MUX 7:0

A MUX 15
A MUX 15:8



SS MUX 15:0

A MUX 15:0

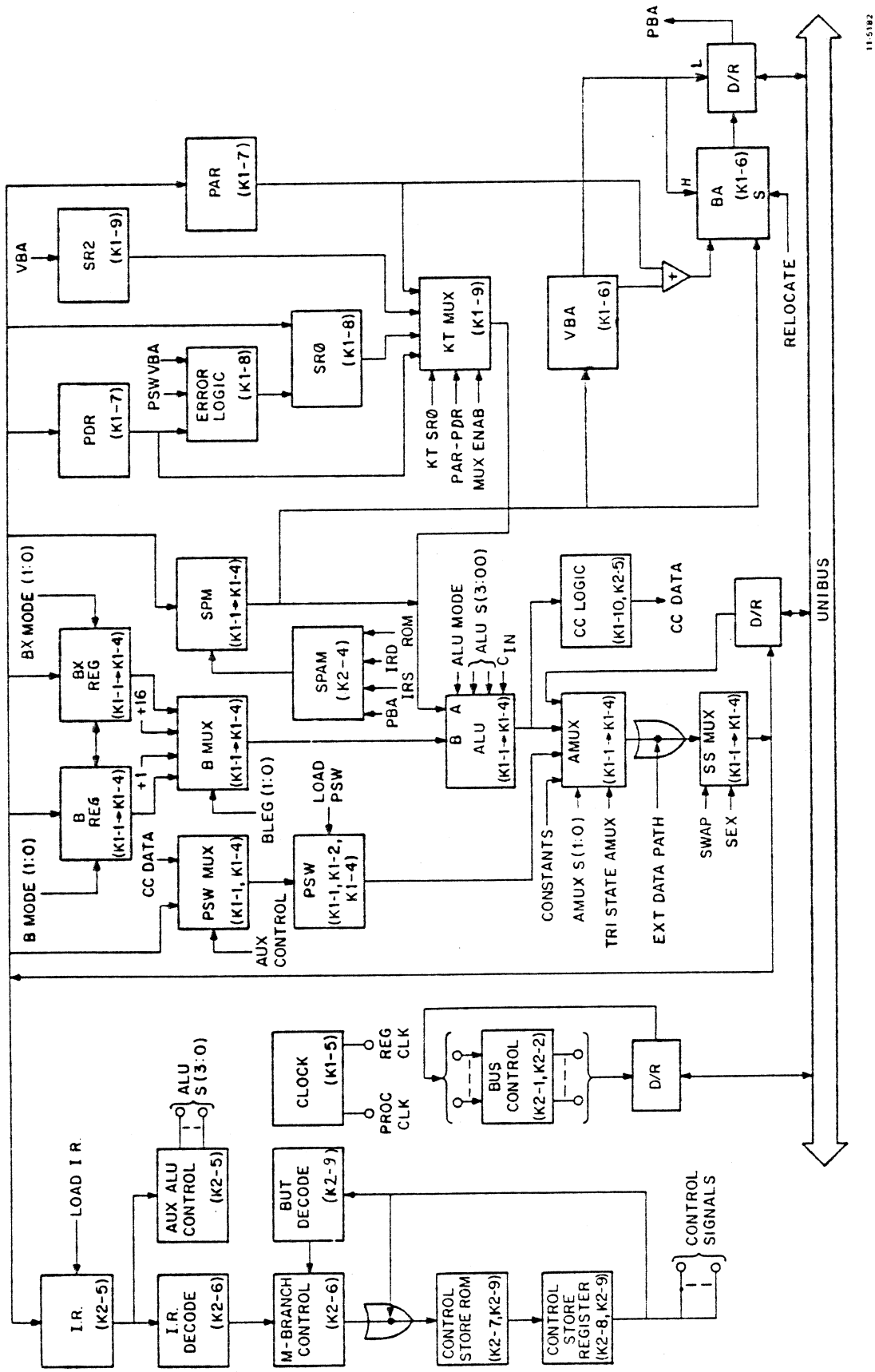


SS MUX 15:8
SS MUX 7:0

A MUX 7
A MUX 7:0

NOTES: SS MUX LOW--Accepts straight or upper A MUX
SS MUX UPPER--Accepts straight, lower A MUX, Sign 7 or Sign 15

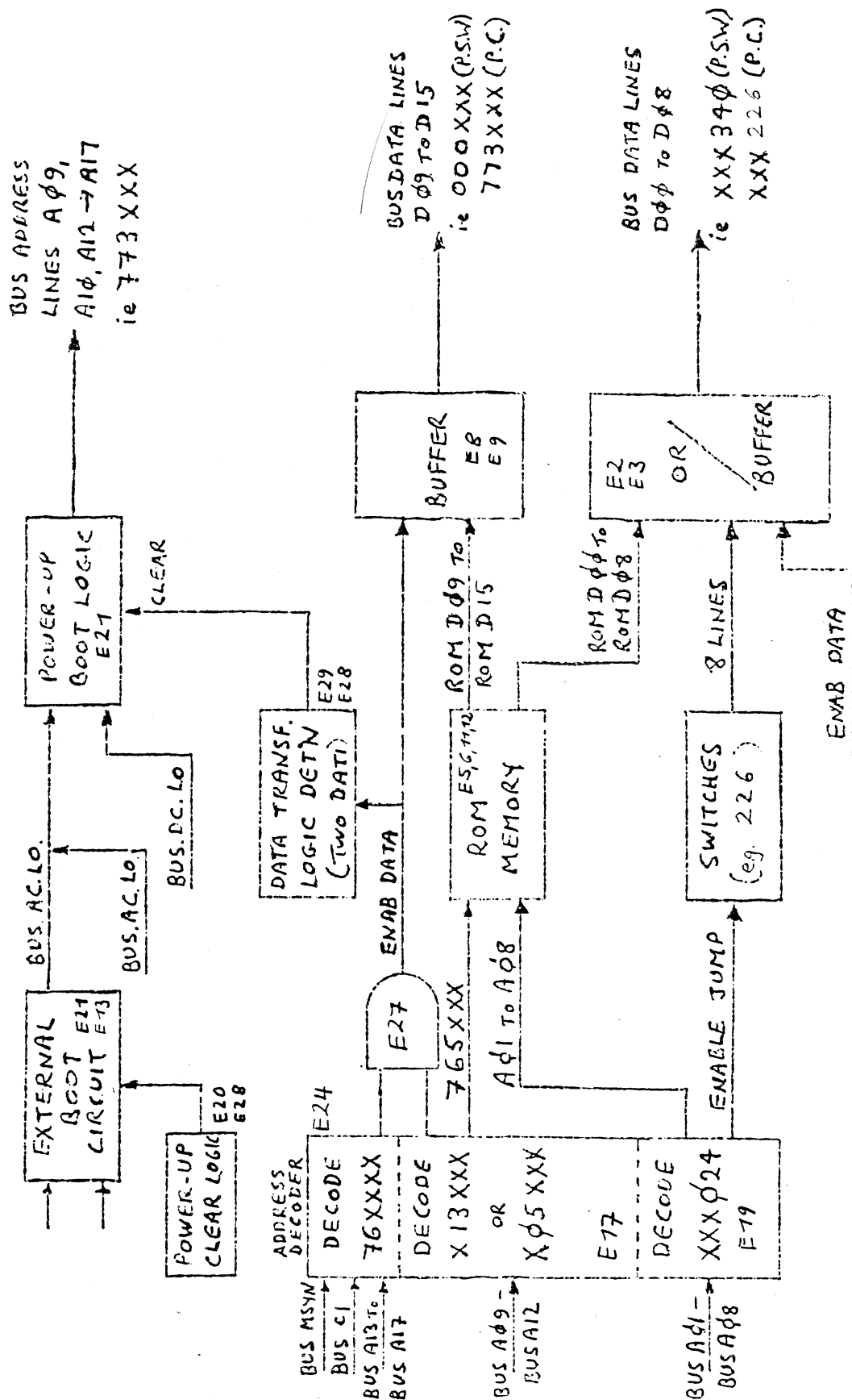
SS MUX CONFIGURATIONS

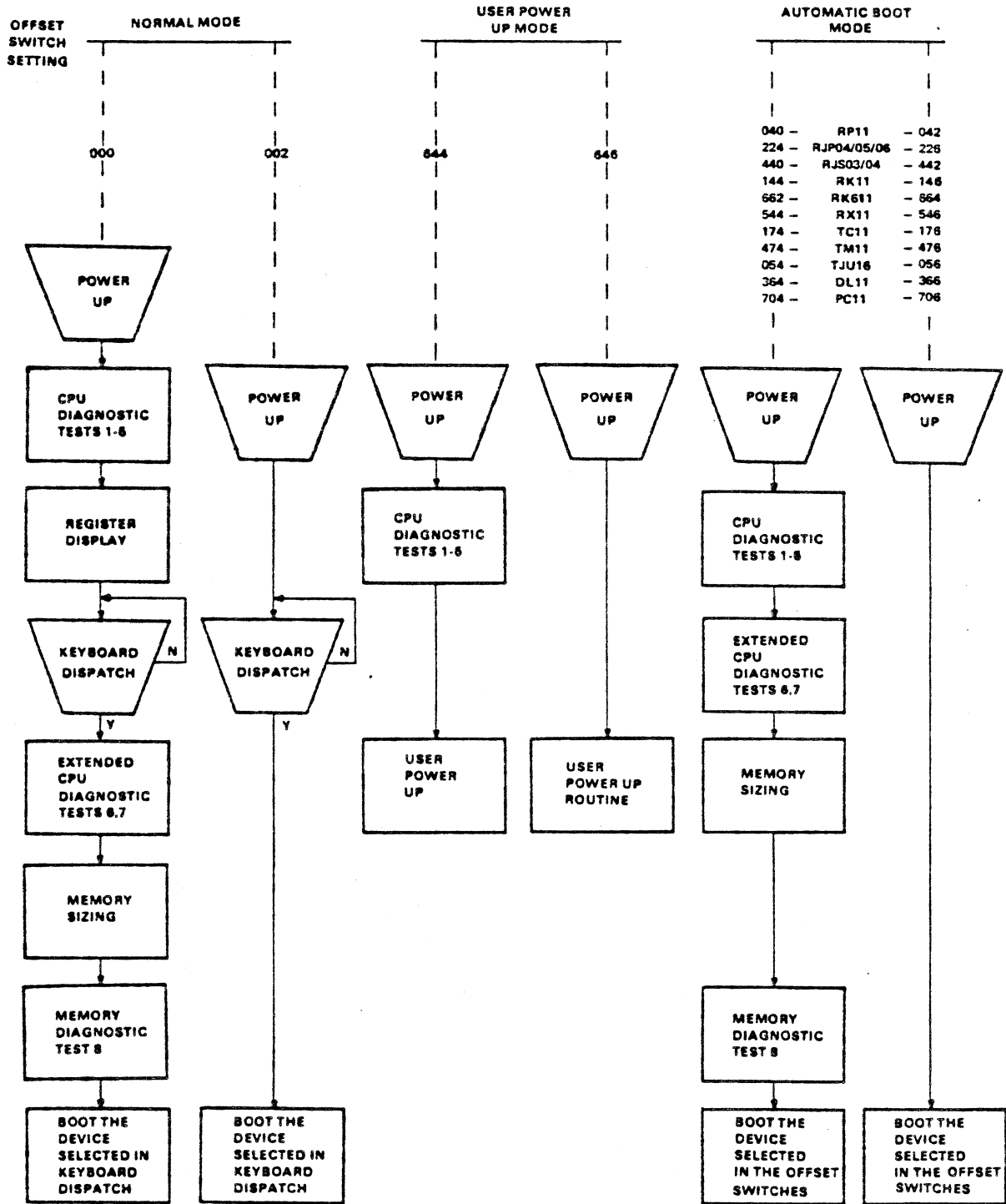


11.5182

Figure 4-1 KD11-EA Block Diagram

M9301 BLOCK DIAGRAM





11-4862

Figure 12-3 M9301-YF Flowchart

H9301-YB ROM BOOTSTRAP

SYSTEM LARRY PEARSON 07-JAN-75
 GO NOGO TEST R.D. FLORENTINO 20-FEB-75

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 DIGITAL EQUIPMENT CORPORATION
 MAYNARD, MASSACHUSETTS

DOCUMENTATION

** ROM AREA 173000 - 173777 **

INITIALIZATION AND BASIC CPU DIAGNOSTICS
 --- NORMAL ENTRY. DIAGNOSTICS + CONSOLE SIMULATION
 --- TEST1 ENTRY. CPU DIAGNOSTICS + NORMAL POWER-UP
 --- DSPLY ENTRY. NO DIAGNOSTICS + CONSOLE SIMULATION
 KBDDSP - KEYBOARD DISPATCHER
 GETCHR - GET A CHARACTER
 PUTCHR - TYPE A CHARACTER
 PUTW0 - TYPE <CH> & THEN <LF>
 PUTW0 - TYPE LOW & THEN HIGH BYTE OF W2
 PUTW0H - OUTPUT AN OCTAL VALUE IN W0
 MEMORY DIAGNOSTIC
 XIRIN - COMMON ROUTINE TO RETURN FROM SUBROUTINES
 DEFINITIONS AND SYMBOLS

** ROM AREA 165000 - 165777 **

GETR0H - GET OCTAL NUMBER INTO R0
 D<SFC> - DEPOSIT IN MEMORY A VALUE
 S<CR> - START AT SPECIFIED LOCATION
 L<SPC> - LOAD ADDRESS
 E<SPC> - EXAMINE A LOCATION
 BTSTRP - COMMON ENTRY FOR ALL HARDWARE BOOTSTRAPS
 BTERR - COMMON BOOTSTRAP ERROR ROUTINE

HARDWARE BOOTSTRAPS

DEVICE ADDRESS	DESCRIPTION
RK11 165150	DISK CARTRIDGE
RP11 165172	RP02/03 DISK PACK
TC11 165206	DECTAPE
TM11 165220	800 DPI MAGNETIC TAPE
HR05 165330	MASSBUS RS03/04 FIXED HEAD DISK
HR0P 165334	MASSBUS TU16 DISK PACK
TU16 165340	MASSBUS TU16 MAGNETIC TAPE
RM11 165346	MASSBUS DEVICE CONNECTIONS
TA11 165454	MAGNETIC CASSETTE
RX11 165546	RX01 DISKETTE
DL11 165640	TERMINAL HEADER
PC11 165644	PAPEK TAPE READER

COMMAND TABLE & OFFSET TABLE

2	
3	
4	
5	
6	
7	
8	
9	
10	
12	
13	
177	
178	
179	
189	
190	
286	
308	
416	
435	
455	
471	
489	
522	
582	
601	
602	
644	
645	
650	
678	
685	
690	
698	
713	
725	
726	
745	
746	
747	
748	
750	
758	
764	
772	
811	
814	
817	
821	
858	
891	
924	
927	
945	
947	

H9301 - ROM HOUTSTRAP V01.00 MACY11 27(732) 05-MAR-76 10:38 PAGE 8
YH.PAL

1	.TITLE	H9301	-	ROM	HOUTSTRAP	V01.00
2	.SHTTL	H9301-YH	ROM	HOUTSTRAP		
3	.SHTTL					
4	.SHTTL	SYSTEM		LARRY	PEARSON	07-JAN-75
5	.SHTTL	GO	HUGO	TEST	R.D. FIORENTINO	20-FEB-75
6	.SHTTL					
7	.SHTTL					
8	.SHTTL					
9	.SHTTL					
10	.SHTTL					

```
12 .SUTTL DOCUMENTATION
13 .SUTTL
14
15 / THE M9301-Y0 IS DESIGNED TO PROVIDE BOOTSTRAPPING CAPABILITIES FOR THE
16 / PDP-11 SYSTEMS WITHOUT THE CONSOLE SWITCH REGISTER. IN ADDITION TO
17 / BOOTSTRAPPING FUNCTIONS, THE M9301 PROVIDES SOME BASIC CPU AND MEMORY
18 / GO-NOGO DIAGNOSTICS.
19 /
20 / THE M9301 MAY BE ACTIVATED BY PRESSING THE "BOOT" SWITCH ON THE FRONT
21 / PANEL OR OPTIONALLY VIA THE POWER UP SEQUENCE. THIS OPTION IS ENABLED
22 / OR DISABLED DEPENDING UPON THE POSITION OF A MICRO SWITCH ON THE M9301
23 / MODULE.
24 /
25 / PRESSING THE "BOOT" SWITCH CAUSES THE NORMAL POWER-DOWN AND POWER-UP
26 / TRAP SEQUENCE TO OCCUR. PRIOR TO THE POWER-UP SEQUENCE, THE M9301
27 / ASSERTS 773000 ON THE UNIBUS ADDRESS LINES. THIS CAUSES THE NEW "PC"
28 / TO BE TAKEN FROM THE "ROM" LOCATIONS 773024/26 INSTEAD OF 24/26. THE
29 / NEW "PC" WILL BE THE "OR" OF THE CONTENTS OF 773024 (173000) AND THE
30 / EIGHT MICRO SWITCHES (BITS 8 THROUGH 1) ON THE MODULE. NORMALLY THE
31 / MICRO SWITCHES WILL BE SET TO ALL ZEROS (I. E. SET TO "ON").
32 /
33 / THE NORMAL SEQUENCE BEGINS AT 173000. AT THIS POINT THE BASIC CPU
34 / DIAGNOSTICS ARE EXECUTED. THESE DIAGNOSTICS WILL NOT DESTROY MEMORY.
35 / IF THESE ARE EXECUTED SUCCESSFULLY, THE DISPLAY ROUTINE IS ENTERED
36 / (KRDSP), IF NOT, A "OR TO SELF" IS EXECUTED.
37 /
38 / THE DISPLAY ROUTINE DISPLAYS THE CONTENTS OF R0, R4, SP, AND R5.
39 / PRESSING THE BOOT SWITCH CAUSES PDP-11 SYSTEMS WITHOUT CONSOLE
40 / SWITCH REGISTERS TO COPY THE PC INTO R5 BEFORE THE POWER UP SEQUENCE
41 / STARTS.
42 /
43 / THE KEYBOARD DISPATCH ROUTINE PRINTS A PROMPTING STRING <CR><LF><16>
44 / <DL> AND WAITS FOR TWO CHARACTERS TO BE TYPED BY THE USER. IF THE
45 / TWO CHARACTER COMMAND IS NOT FOUND IN THE LIST OF COMMANDS, THE COM-
46 / MAND IS IGNORED AND THE KEYBOARD DISPATCHER IS RESTARTED. IF THE COM-
47 / MAND IS A BOOT COMMAND, A SUBROUTINE IS CALLED TO READ AN OPTIONAL
48 / UNIT NUMBER WHICH IS RETURNED IN R0. THE MEMORY MODIFYING AND MEMORY
49 / DIAGNOSTICS ARE EXECUTED PRIOR TO DOING THE BOOTSTRAP OPERATION. IF
50 / AN ERROR IS DETECTED, THE MACHINE HALTS. IF THE ERROR WAS DETECTED BY
51 / THE MEMORY DIAGNOSTIC, THE EXPECTED DATA IS COPIED INTO R0. THE
52 / BOOT SWITCH WILL CAUSE THESE VALUES TO BE DISPLAYED ON THE CONSOLE
53 / DEVICE PLUS THE ADDRESS OF THE HALT PLUS 2. THIS ADDRESS INDICATES
54 / WHICH DIAGNOSTIC FAILED. IF A UNIQUE TIME OUT OCCURS AFTER THE MEMORY
55 / DIAGNOSTIC, THE DISPLAY ROUTINE WILL BE ENTERED.
56 /
57 / IF THE COMMAND IS NOT A BOOT COMMAND, THE FOLLOWING SEQUENCE OCCURS.
58 / THE ADDRESS OF THE COMMAND PROCESSOR (R2) IS COMPARED WITH THE ADDRESS
59 / OF THE PREVIOUS COMMAND PROCESSOR EXECUTED (R4). IF THEY ARE THE
60 / SAME, THE CONTENT OF THE MEMORY POINTER REGISTER (R5) IS INCREMENTED
61 / BY TWO. CONTROL IS THEN TRANSFERRED TO THE COMMAND PROCESSOR.
62 /
63 /
64 /
65 /
66 /
67 /
```

COMMAND PROCESSORS
- LOAD ADDRESS COMMAND

```

68 / AN OCTAL NUMBER IS READ FROM THE KEYBOARD AND STORED IN
69 / THE MEMORY POINTER REGISTER (R5). THE KEYBOARD DISPATCH
70 / ROUTINE IS ENTERED.
71 /
72 / E<SPC> - EXAMINE COMMAND
73 /
74 / THE CONTENT OF THE MEMORY POINTER REGISTER (R5) AND THE
75 / CONTENT OF THE LOCATION SPECIFIED BY IT ARE PRINTED
76 / IN OCTAL. THE KEYBOARD DISPATCH ROUTINE IS ENTERED.
77 /
78 / D<SPC> - DEPOSIT COMMAND
79 /
80 / AN OCTAL NUMBER IS READ FROM THE KEYBOARD AND STORED IN
81 / THE LOCATION POINTED TO BY THE MEMORY POINTER REGISTER
82 / (R5). THE KEYBOARD DISPATCH ROUTINE IS ENTERED.
83 /
84 / S<CR> - START COMMAND
85 /
86 / A "RESET" INSTRUCTION IS EXECUTED AND A TRANSFER IS MADE
87 / TO THE LOCATION DESIGNATED BY THE MEMORY POINTER REGIS-
88 / TER (R5).
  
```

BOOTSTRAPPING METHOD

```

90 /
91 / THE SO CALLED "NORMAL" OPERATION IS DESCRIBED BELOW.
92 /
93 /
94 /
95 / A CHARACTER STRING CONSISTING OF A TWO CHARACTER DEVICE CODE OPTION-
96 / ALLY FOLLOWED BY AN OCTAL UNIT NUMBER AND TERMINATED BY A CARRIAGE
97 / RETURN IS ENTERED AT THE KEYBOARD. THE DEFAULT UNIT NUMBER IS ZERO.
98 / THE POSITION OF THE DEVICE CODE IN THE DEVICE CODE TABLE CORRESPONDS
99 / WITH THE WORD OFFSET IN THE DEVICE OFFSET TABLE. THE WORD OFFSET IS
100 / A BYTE WHOSE VALUE IS THE NUMBER OF WORDS AFTER 173000 THAT THE DEVICE
101 / COMMAND/STATUS REGISTER POINTER IS LOCATED. THE BOOTSTRAP CODE IM-
102 / MEDIATLY FOLLOWS THE CSR POINTER. THE UNIT NUMBER IS LEFT IN R0 AND
103 / THE ADDRESS OF THE CSR POINTER IS LEFT IN R2. A TRANSFER IS MADE TO
104 / ADDITIONAL CPU AND MEMORY DIAGNOSTICS. IF THE DIAGNOSTICS FAIL, THE
105 / BOOT IS NOT EXECUTED. THE DIAGNOSTICS MUST LEAVE REGISTERS R0 AND R4
106 / INTACT AND RETURN THE ADDRESS OF THE TOP WORD OF MEMORY OR 157776,
107 / WHICHEVER IS LESS, IN R5. THE DIAGNOSTIC TRANSFERS TO THE COMMON
108 / BOOTSTRAP ENTRY POINT, "BYSTRP".
109 /
110 / THE PROCEDURE AT "BYSTRP" MOVES THE COMMAND STATUS REGISTER OF THE
111 / DEVICE TO BE BOOTED (POINTED TO BY R2) INTO R1, INDEXES R2 TO THE
112 / BOOT RESTART LOCATION AND SETS THE ERROR COUNT LIMIT. THE RESTART
113 / ROUTINE "BYRSTR" IS ENTERED TO CONTINUE THE INITIALIZATION.
114 /
115 / THE PROCEDURE AT "BYRSTR" COPIES THE UNIT NUMBER IN R0 TO R4 AND
116 / TRANSFERS TO THE BOOTSTRAP RESTART LOCATION SPECIFIED BY R2.
117 /
118 / THE BOOTSTRAP TYPICALLY READ IN THE FIRST PHYSICAL SECTOR, BLOCK,
119 / OR 512 WORDS, WHICHEVER IS LESS INTO LOCATION 0. THOSE DEVICES WHICH
120 / CAN READ MORE THAN ONE SECTOR OR BLOCK IN A SINGLE OPERATION WILL
121 / READ UNTIL 512 WORDS ARE TRANSFERRED. THE EXCEPTIONS TO THE RULE ARE
122 / THE PAPER TAPE BOOT, THE FLEXIBLE DISK, THE MAGNETIC TAPE (M11), AND
123 / THE CASSETTE. THE PAPER TAPE BOOT, WHICH IS UNLIKE IN THAT IT CAN DO
  
```

YB.PAL

124 / NO ERROR CHECKING AND THAT THE SECONDARY BOOT IS READ INTO THE UPPER
 125 / 256 BYTES INITIALLY SPECIFIED BY R5. THE ACTUAL LOCATIONS LOADED BY
 126 / THE PAPER TAPE BOOT IS PARTIALLY DETERMINED BY THE PAPER TAPE ITSELF.
 127 / THE FLEXIBLE DISK BOOT READS SECTOR 1 ON TRACK 1. THE MAGNETIC TAPE
 128 / AND CASSETTE BOOTS READ THE SECOND BLOCK. IF AN ERROR IS DETECTED BY
 129 / THE BOOTSTRAP, A TRANSFER IS MADE TO "MERR".
 130 / IF NO ERRORS ARE DETECTED, THE BOOTSTRAPS NORMALLY TRANSFER TO
 131 / LOCATION 0 WITH THE UNIT NUMBER SPECIFIED IN R0 AND THE ADDRESS OF
 132 / THE MAIN CONTROL STATUS REGISTERS IN R1. AGAIN THE EXCEPTION IS THE
 133 / PAPER TAPE BOOT WHICH TRANSFERS TO THE LOCATION XXXJ74, WHERE XXX
 134 / WAS INITIALLY DETERMINED BY THE CONTENT OF R5.
 135 /
 136 / THE ERROR PROCEDURE AT "MERR" NOTES THE NUMBER OF TIMES AN ERROR
 137 / OCCURS AND IF THE LIMIT IS NOT EXCEEDED, A "RESET" INSTRUCTION IS
 138 / EXECUTED AND A TRANSFER IS MADE TO THE BOOT RESTART ROUTINE SPECIFIED
 139 / IN R2.
 140 /
 141 /
 142 /

OPTIONS

143 / THERE ARE TWO ADDITIONAL OPTIONAL SETTINGS OF THE MICRO SWITCH FOR THE
 144 / M9301-YB. THE MICRO SWITCH MAY BE SET TO ENTER AT 77J002 IF BASIC CPU
 145 / DIAGNOSTICS ARE DESIRED PRIOR TO EXECUTING THE NORMAL POWER-UP
 146 / SEQUENCE AT 24 AND 26. THE MICRO SWITCHES MAY BE SET TO ENTER AT
 147 / "DSPLY" IF THE DIAGNOSTIC CAPABILITY IS NOT DESIRED.
 148 /
 149 / AN ADDITIONAL M9301 OPTION PERMITS DISABLING THE ROM ADDRESS SPACE.
 150 / 765000-765777. THE M9301-YB WILL NOT FUNCTION PROPERLY IF THIS OPTION
 151 / IS ELECTED.
 152 /
 153 /

DEVICE CODE	UNIBUS ADDRESS	DEVICE & SPECIAL NOTES IF ANY
TT	777560	TERMINAL PAPER TAPE HEADER
US	772040	RJS03/04 MASSBUS FIXED HEAD DISK
MM	772440	TJ016 MASSBUS TAPE DRIVE. TAPE MUST BE 9-TRACK, 800 BPI, AND ODD PARITY.
MC	776300	MIXED COMBINATION OF MASSBUS DEVICES. THE ACTUAL DEVICE IS DETERMINED BY THE SPECIFIED UNIT NUMBER. THE DEVICE CAN BE A TJ016, RJP04, OR RJS03/04.
DN	776700	RJP04 MASSBUS DISK PACK. FORMAT 22, ECC INHIBIT
DK	777404	RK11 MOVING HEAD DISK CARTRIDGE
DT	777342	TC11 DEC TAPE
MT	772522	TR11 MAGNETIC TAPE DRIVE. TAPE MUST BE 7 OR 9 TRACK, 800 BPI, ODD PARITY, AND DUMP MODE
DP	776714	RP11 MOVING HEAD DISK PACK FOR RP02/03.
CT	777500	TA11 CASSETTE.
PR	777550	PC11 HIGH SPEED PAPER TAPE READER. TAPE MUST BE IN A SPECIAL, BOOTSTRAP FORMAT (SUCH AS THE AHSDDR)
DX	777170	RK11 DISKETT.

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 YD.PAL ** ROM AREA 173000 - 173777 **

177 .SBYTL ** ROM AREA 173000 - 173777 **
 178 .SBYTL
 179 .SBYTL INITIALIZATION AND BASIC CPU DIAGNOSTICS
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000000
 173000
 .= GONUGO
 / CU - MUGD MINIMAL DIAGNOSTIC INSTRUCTION TEST

.SBYTL --- NORMAL ENTRY. DIAGNOSTICS + CONSOLE SIMULATION
 .SBYTL --- TEST1 ENTRY. CPU DIAGNOSTICS + NORMAL POWER-UP

CONTENTS AFTER EXECUTION	REG	NZVC
NORMAL: NR	TEST1	ENTRY FOR NORMAL EXECUTION
TEST1: CLR R1	R1	000000 0100
INC R1	R1	000001 0000
CUM R1	R1	177776 1001
ASH R1	R1	177777 1010
ASL R1	R1	177776 1001
ROR R1	R1	177777 1010
TST R1	R1	177777 1000
NEG R1	R1	177777 1000
DN TICONT	R1	000001 0001

/ THIS IS THE AUTO LOAD VECTOR

.LIF NE -GONUGO-24 -ERROR -FAUTOLOAD VECTOR NOT AT 173024
 OPTIURI .WORD GONUGO1776
 HITS 0-1 IN THIS LOCATION MUST BE
 ISET TO 1 BECAUSE OF HARDWARE REQUIRE-
 MENTS. THE NORMAL SETTING OF THE
 MICRO SWITCHES WILL CAUSE THESE BITS
 TO BE READ AS ZEROS ONLY IF THEY ARE
 ISET TO 1'S IN THE ROM.

.WORD 340
 TICONT: DEC R1
 SDC R1
 ROL R1
 ADC R1
 SWAN R1
 RNE .

173024 173776
 173026 000340
 173030 005J01
 173032 005601
 173034 006101
 173036 005501
 173040 000301
 173042 001377

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224
225
226 173044 012702 173120
227 173050 011201
228 173052 022201
229 173054 001377
230 173056 063201
231 173060 165201
232 173062 044201
233 173064 056201
234 173070 037201
235 173074 001777
236
237
238
239
240 173076 012701
241 173102 00121
242 173104 012701
243 173110 00131
244 173112 00111
245 173114 173112
246 173116 000413
247 173120 173120
248 173122 173120
249 173124 100000
250 173126 177777
251 173130 177777
252 173132 177777
253 173134 173132
254 173136 173130
255 173140 173142
256 173142 000500
257 173144 000501
258
259
260
261
262
263 173146 105767
264 173152 001377
265 173154 012702
266 173160 105722
267 173162 001377
268 173164 105712
269 173166 100377

; TEST DOUBLE OPCODES, ALL SOURCE MODES, D MODE 0
TEST21 MOV #POOL,R2
MOV (R2),R1
CMP (R2)+,R1
BNE .
ADD #4(R2)+,R1
SUB #4-(R2),R1
BIC -(R2),R1
RIS 12(R2),R1
BIT #14(R2),R1
NEO .

; JUMP TEST MODES 1,2, AND 3
;
;
TEST31 MOV #JMP1,R1
JMP (R1)
MOV #JMP2A,R1
JMP #R1)+
JMP21 JMP (R1)
JMP2A1 .WORD JMP2
POOL1 .WORD POOL
T4DATA1 .WORD 100000
T5DATA1 .WORD 177777
T6DATA1 .WORD 177777
T6DATA1 .WORD 16DATA
T6DATA1 .WORD T5DATA
T6DATA1 .WORD T6DATA1
T6DATA1 .WORD 500
T6DATA1 .WORD 501

; SETUP ADDR FOR MODE1 JUMP
; EXECUTE JUMP MODE2
; SET UP ADDR OF ADDR FOR MODE3
; GET ADDR OF ADDR AND JUMP
; USE INCREMENTED REG TO EXIT MODE 1
; COME HERE FROM JMP2
;
; WARNING- DATA WITHIN THIS
; LITERAL POOL IS POSITION
; DEPENDENT. INSERT DATA
; EITHER BEFORE OR AFTER THE
; ENTIRE DATA FIELD,
; NOT NOT
; WITHIN 1
; I
; I
; V

; TEST EVEN BYTE
; ODD BYTE IF EQUAL TO ZERO
; SET UP TEST ADDRESS
; EXAMINE DATA IN MODE2
; LOOP IF NOT ZERO
; TEST ODD BYTE, MODE1
; LOOP IF NOT NOT SET.

; SINGLE -OP, NON-MOD, BYTE TEST
;
;
TEST41 TSTB T4DATA
BNE .
MOV T4DATA,R2
TSTB (R2)+
BNE .
TSTB (R2)
MPL .

```

```

271      |
272      | | DOUBLE OP, NON-MOD TEST, SNOOP1 AND 4, DMODE2 AND 4
273      | |
274      | |
275      | TEST5:  MOV      #15DATA,R3      ;SET UP ADDRESSES FOR TEST
276      |       MOV      #16DATA,R2      ;EXECUTE SNOOP1, DMODE2
277      |       CMP      (R3),(R2)      ;LOOP IF ROM-COMPARE
278      |       BNE      -(R3),-(R2)     ;CHECK BITS
279      |       BFO      #1FEST1,OPTION  ;BITS SHOULD BE SAME
280      |       CMP      #24,SP         ;CHECK FOR RESTART OPTION
281      |       BNE      #24,SP         ;CONTINUE IF NOT SELECTED
282      |       MOV      #24,SP         ;SET UP POWER VECTOR ADDRESS
283      |       RTI
284      |

```



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Y0.PAL --- DSPLY ENTRY. NO DIAGNOSTICS + CONSOLE SIMULATION

286 .SOTTL --- DSPLY ENTRY. NO DIAGNOSTICS + CONSOLE SIMULATION
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306

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      DISPLAY R0,R4,SP,RS
      WHEN EITHER POWER-UP OR THE ROOT BUTTON IS PRESSED, THE
      SWITCH REGISTERLESS CPU COPIES THE CONTENTS OF THE PC INTO RS.
      THIS GIVES THE OPERATOR THE CAPABILITY OF DETERMINING WHERE A HALT
      OCCURRED.
      IF THE POWER-UP VECTOR IS SET FOR "DSPLY", THEN NO DIAGNOSTICS
      ARE EXECUTED.

```

```

010701
000551
010701
000556
010400
000554
010600
000552
010500
000550

```

```

DSPLY: MOV PC,R1
      RR PUTC
      MOV PC,R1
      RR PUTNUM
      MOV R4,R0
      RR PUTNUM
      MOV SP,R0
      RR PUTROM
      MOV R5,R0
      RR PUTNUM

```

```

      JCOPY PC FOR RETURN
      JCARRAIGE RETURN, LINE FEED
      JPRINT CONTENTS OF R0,R5,SP
      JGO TO PRINT ROUTINE

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- SUBTL KHDSP - KEYBOARD DISPATCHER
 REGISTER USAGE
 - USED TO PASS ARGUMENTS TO AND FROM "PUTNUM" AND "GETNUM".
 AFTER A BOOT COMMAND IS TYPED, IT CONTAINS THE UNIT NUMBER.
 - SUBROUTINE LINKAGE FOR THE HIGHEST LEVEL SUBROUTINES UNTIL A
 BOOTSTRAP IS INITIALIZED, THEN IT POINTS TO THE DEVICE'S MAIN
 CSR.
 - CONTAINS THE ADDRESS OF THE NEXT COMMAND PROCESSOR. USED AS A
 SCRATCH REGISTER BY NON-BOOT SUBROUTINES. POINTS TO THE
 ADDRESS OF THE BOOT DEVICE'S MAIN CSR AFTER A BOOT COMMAND IS
 TYPED AND TO THE RESTART ADDRESS AFTER A BOOT IS STARTED.
 - SUBROUTINE LINKAGE FOR THE LOWEST LEVEL SUBROUTINES AND AS A
 SCRATCH REGISTER
 - ADDRESS OF PREVIOUS NON-BOOT COMMAND. ADDRESS OF CURRENT BOOT
 DEVICE CSR ADDRESS BEFORE MEMORY DIAGNOSTIC IS DONE.
 - MEMORY ADDRESS POINTER FOR NON-BOOT COMMANDS. MEMORY DIAG-
 NOSTIC PASSES ADDRESS OF THE LAST WORD OF MEMORY OR 157776,
 WHICHEVER IS LESS TO THE BOOT ROUTINE IN R5.

173252 012700 KHDSP: BRSG,R0 J-> <CR><LF><16><0>
 173256 112002 PRINT: MOV (R0)+,R2 ;PRINT A CHAR
 173260 010703 MOV PC,R3 ;COPY PC FOR RETURN
 332 173262 000522 BR PUTCHR ;PRINT CHARACTER
 333 173264 001374 BRE PRINT ;BR IF MORE TO PRINT
 334 173266 010703 MOV PC,R3 ;COPY PC FOR RETURN
 335 173270 000514 BR GETCHR ;GET AND ECHO CHAR
 336 173272 000302 SWAR R2 ;ROTATE CHAR
 337 173274 001774 BRZ ;BR IF 2ND CHAR NOT READ
 338
 339 173276 005001 CLR R1 ;INDEX TO TABLE OF VECTORS
 340 173300 020220 CMP R2,(R0)+ ;SEARCH FOR MATCHING COMMAND
 341 173302 001404 BEQ MATCH ;BR IF MATCH MADE
 342 173304 005201 LDC R1 ;LOAD INDEX
 343 173306 005710 BEE TEST ;END OF LIST
 344 173310 001373 BR SEARCH ;BR IF NOT
 345 173312 000757 BR ;FIGURE & RESTART
 346 173314 012702 MOV #BOOT/2,R2 ;(BASE ADDR OF DEVICE BOOTS)/2
 347 173320 156102 BEE TEST ;(OFFSETS TO DEVICE BOOTS)/2
 348 173324 006302 R2 ;MULTIPLY BY 2
 349 173326 020204 CMP R2,R4 ;FOLLOWS COMMAND SAME AS LAST?
 350 173330 001001 BEE USPTCH ;BR IF NOT
 351 173332 005725 TEST (R5)+ ;INCREMENT LAST ADDR
 352 173334 010204 MOV R2,R4 ;REMEMBER THIS COMMAND NEXT TIME
 353 173336 020127 CMP R1,#BOOT ;DO MEMORY TEST?
 354 173342 103401 BEQ ;BR IF SO
 355 173344 000112 JBR ;TRANSFER TO SPECIFIED CMD
 356 173346 010701 MOV PC,R1 ;COPY PC FOR RETURN
 357 173350 000440 BR JGETNUM ;GET UNIT # IF ANY
 358 173352 005002 CLR R2 ;PRINT 2 DOLLS
 359 173354 000501 BR ;THIS WILL MAKE SURE ALL CHARS GET
 360 173356 022767 CMP #OSPLY,OPTION ;CHECK FOR BYPASS DIAG
 361 173364 001530 BEQ ;GO TO SIZE MEMORY IF SELECTED

363										
364										
365										
366	173366	012705	173132							
367	173372	012702	000500							
368	173376	011503								
369										
370										
371										
372	173400	005012								
373	173402	112512								
374	173404	005202								
375	173406	112512								
376	173410	005302								
377	173412	023512								
378	173414	001015								
379										
380										
381										
382	173416	005202								
383	173420	143522								
384	173422	024542								
385	173424	143522								
386	173426	001010								
387										
388										
389										
390	173430	011502								
391	173432	016505	177772							
392	173436	110532								
393	173440	150572	000000							
394	173444	020352								
395	173446	001404								
396	173450	000000								
397	173452	000167	171422							

```

/ / DOUBLE OP, MOD, BYTE TEST
/
TEST6: MOV 16DATA,R5      /SET UP TEST DATA ADDRESS
      MOV #500,R2        /SET UP DEST ADDR
      MOV (R5),R3       /SET UP COMPARED FOR TEST
/
/ / TEST SMODE 2, DMODE 1, ODD AND EVEN BYTE
/
      CLR (R2)          /CLEAR 500
      MOVB (R5)+,(R2)   /500 = 00377
      INC R2            /POINT AT UPPER ODD BYTE
      MOVB (R5)+,(R2)   /500 = 17777
      DFC R2            /MOVE BACK TO EVEN ADDR
      CRP #(R5)+,(R2)   /CHECK FOR ALL 1'S
      BNE T6ERR        /ERROR IF NOT ALL 1'S
/
/ / TEST SMODE 3, DMODE 2, ODD AND EVEN BYTE
/
      INC R2            /MOVE TO ODDBYTE
      BICH #(R5)+,(R2)+ /CLEAR 4SH
      CMP -(R5),-(R2)   /MOVE POINTERS BACK
      BICH #(R5)+,(R2)+ /CLEAR LSB
      BNE T6ERR
/
/ / TEST SMODE 0, DMODE 3, EVEN BYTE
/
      MOV (R5),R2       /GET DEFERRED ADDRESS OF 500 IN R2
      MOV -6(R5),R5     /GET TEST DATA
      MOVB R5,R(R2)    /500 SHOULD EQUAL 1'S
      BLSB R5,R(R2)    /SET UPPER BITS
      CMP R3,R-(R2)    /CHECK FOR ALL 1'S
      BFO TEST7       /GO TO MEMORY TEST IF OK
      T6ERR: HALT
      JGETR0: JNP CETH00

```

399						
400						
401						
402	173456	012701	173500			
403	173462	013206				
404	173464	005726				
405	173466	004311				
406	173470	000000				
407	173472	004361	000004			
408	173476	004455				
409	173500	005723				
410	173502	001372				
411	173504	021605				
412	173506	001370				
413	173510	000203				
414	173512	000000				


```

/ JSR TEST MODES 1 AND 6
/
TEST1: MOV      BTSTJSR,R1
      MOV      (R2),SP
      TST      (6P)+
      JSR      R3,(R1)
      HALT
      TTERR:
      JSR      P3,4(R1)
      BR      MEM00
      TSTJSR: TST  (R3)+
      BNE     T7ERR
      CMP     (SP),R5
      BNE     T7ERR
      RTS    R3
      HALT
  
```



```

/SET UP ADDR OF TEST SUB FOR JSR
/SET SP TO 502
/JSR MODE 1
/JSR MODE 6
/GO TO MEMORY TEST
/RTJ SHOULD POINT TO ZERO FIELD
/ERRR IF NOT
/CHECK FOR 17777 OH STACK
/RR IF NOT
/RETURN TO CALLER +2
  
```

```

416 .SUTL GETCHR - GET & ECHO CHARACTER
417 / SUBROUTINE TO GET AND ECHO A CHARACTER FROM THE CONSOLE KEYBOARD
418 /
419 / CALLING SEQUENCE:
420 /
421 /
422 / MOV PC,RJ
423 / BR GETCHR
424 /
425 / THE RESULT IS RETURNED IN THE LOW BYTE OF R2 WITH THE PARITY BIT
426 / CLEARED. THE 2 BIT WILL BE SET IF THE CHAR IS A NULL. THE HIGH
427 / BYTE OF R2 IS UNCHANGED.
428 /
429 / 4 IS ADDED TO R3.
430 GETCHR TSTB R2,R3 JCHAR READY
431 173514 105737 177560 RPL GETCHR JBR IF NOT
432 173520 100375 C1,RR R2 JCLEAR FOR TRANSFER
433 173522 105002 R1,R0 JTRANSFER CHAR
434 173524 153702 177562
435
436 .SUTL PUTCHR - TYPE A CHARACTER
437 / SUBROUTINE TO TYPE A CHARACTER
438 /
439 / CALLING SEQUENCE:
440 /
441 / SET R2 TO CONTAIN THE CHARACTER TO BE TYPED
442 / MOV PC,R3
443 / BR PUTCHR
444 /
445 / THE PARITY BIT OF THE CHARACTER IN R2 IS CLEARED.
446 / 4 IS ADDED TO R3.
447 PUTCHR TSTB R2,R3 JPRINTER READY
448 173530 105737 177564 RPL PUTCHR JBR IF NOT
449 173534 100375 MOVN R2,R2,RR JPRINT CHAR
450 173536 110237 177566 CWP (R3)+,(R3)+ JINDEX POINTER TO BR + 4
451 173542 022323 B1CB R2,R2 JCLEAR PARITY BIT
452 173544 142702 000200 JMP -2(R3) JRETURN TO BR + 2
453 173550 000163 177776
  
```

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455 .SRTTL PUTCR - TYPE <CR> & THEN <LF>
456 / SUBROUTINE TO TYPE CARRIAGE RETURN AND LINE FEED
457 /
458 / CALLING SEQUENCE:
459 /
460 /
461 / MOV PC,R1
462 / BR PUTCR
463 /
464 / REGISTERS R2 & R3 ARE USED WITHOUT RESTORING
465 / 4 IS ADDED TO R1
466 /
467 PUTCR MOV (PC),R2 ;LOAD CHAR CODES
468 .BYTE CR,LF ;THIS LOCATION IS AN OPERAND OF THE
469 ; PRECEDING INSTRUCTION
470 /
471 .SRTTL PUTTWO - TYPE LOW & THEN HIGH BYTE OF R2
472 /
473 / SUBROUTINE TO TYPE THE 2 CHARS IN R2
474 /
475 / CALLING SEQUENCE:
476 /
477 / MOV PC,R1
478 / BR PUTTWO
479 /
480 / REGISTERS R2 & R3 ARE USED WITHOUT RESTORING.
481 / 4 IS ADDED TO R1.
482 /
483 PUTTWO MOV PC,R3 ;COPY PC FOR RETURN
484 BR PUTCHR ;PRINT LOW BYTE
485 SWAB R2 ;GET HIGH BYTE
486 BR PUTCHR ;PRINT HIGH BYTE
487 BR AIRTN ;RETURN
  
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489 .SRTL PUTNUM - OUTPUT AN OCTAL VALUE IN R0
490
491 / SUBROUTINE TO DISPLAY THE CONTENTS OF R0 IN OCTAL ON THE CONSOLE
492 / DEVICE
493 /
494 / CALLING SEQUENCE:
495 /
496 / SET R0 TO CONTAIN THE NUMBER TO BE DISPLAYED IN OCTAL
497 / PC,R1
498 / RR
499 /
500 / REGISTERS R0, R2, AND R3 ARE USED WITHOUT RESTORING
501 / 4 IS ADDED TO R1
502
503 PUTNUM: MOV (PC)+,R2          / SET DIGIT SPECIAL CASE
504 173572 012702              /
505 173574 000030              /
506 173576 000261              /
507 173600 006100              / SET LAST DIGIT FLAG IN R0
508 173602 106102              / GET NEXT OCTIT
509 173604 010703              / FINAL SHIFT BEFORE PRINT
510
511 173606 000750              / COPY PC FOR RETURN
512 173610 012702              / PRINT OCTIT
513 173612 206                / R0 BYTE TO CURTAIN NEXT OCTIT
514 173613 040                / 2ND SHIFT FLAG & ASCII 0 RT SHFT 3
515 173614 006300              / SPACE PRINTED AFTER FINAL OCTIT
516 173616 001403              / R0 IF DONE
517 173620 106102              / CARRY TO ASCII OCTIT, FLAG TO CARRY
518 173622 103774              / R0 IF 2ND SHIFT TIME
519 173624 000765              / R0 DO 3RD SHIFT
520 173626 105002              / R2 = <OUL><SPACE>
521 173630 000753              / PRINT THEM AND RETURN
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Y0.PAL MEMORY DIAGNOSTIC

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        .SHTTL MEMORY DIAGNOSTIC
        / VERIFY LOWER FOUR K OF MEMORY

MEMD01 CLR SP
      MOV #17776,R5
      CLR R3
      MOV PC,R1
      RR FLOAT

        / STARTING ADDRESS
        / UPPER BOUNDARY FOR 4K
        / DATA
        / SUBROUTINE CALL
        / GO TO WRITE ROUTINE

        / SIZE MEMORY, 28K OR LESS

SIZE1 MOV #16000,R5
      MOV #6,R2
      CLR (R2)
      MOV PC, -(R2)
      MOV #502,SP
      TST -(R5)
      MOV #DUSPLY,(R2)
      CMP (R2),OPTION
      HFO 26
      MOV PC,R1

      RR FLOAT
      JMP BTSTRP

        / SET MAXIMUM ADDRESS
        / SET POINTER FOR TIMEOUT
        / MAKE SURE PSM IS VALID
        / SET STACK
        / SET STACK POINTER
        / CHECK IF MEMORY PRESENT
        / SET POINTER FOR FUTURE TIMEOUTS
        / CHECK FOR BYPASS DIAG
        / GO TO ROOT IF SELECTED
        / VERIFY TO TOP OF MEMORY OR 28K,
        / WHICHEVER IS LESS
        / ROOT THE DEVICE
261
173632 005006
173634 012705 017776
173640 005003
173642 010701
173644 000422

173646 012705 160000
173652 012702 000006
173656 005012
173660 010742
173662 012706 000502
173666 005745
173670 012712 173226
173674 021267 177124
173700 001402
173702 010701

173704 000402
173706 000167 171210
    
```



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548 / SUBROUTINE TO VERIFY MEMORY
549 /
550 / CALLING SEQUENCE:
551 /
552 /
553 / SET R3 = 0
554 / SET SP TO LOW ADDRESS FOR VERIFICATION
555 / SET H5 TO HIGH ADDRESS FOR VERIFICATION
556 / MOV PC,R1
557 / RR
558 /
559 /
560 /
561 / SUBROUTINE RETURNS ONLY IF NO ERROR IS DETECTED.
562 /
563 / THE CONTENTS OF R2 ARE LOST. THE CONTENT OF R1 IS REPLACED WITH
564 / R1 + 4.
565 /
566 / IF AN ERROR OCCURS, A TRANSFER IS MADE TO MEMERR WHERE THE CONTENTS
567 / OF THE MOST IMPORTANT REGISTERS ARE STORED IN R0, R4, AND SP SO
568 / THEY CAN BE DISPLAYED BY "DSPLY" AFTER PRESSING THE BOOT SWITCH.
569 /
570 /
571 /
572 /
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579 /
580 /

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173712	010602	SP,R2	ICOPY STARTING ADDRESS
173714	010322	R3,(R2)+	IWRITE BACKGROUND DATA
173716	020205	R2,R5	IFINISHED WITH BACKGROUND?
173720	101775	26	JBR IF NOT
173722	005103	R3	JINVERT TEST DATA
173724	020342	R3,-(R2)	ICHECK FOR CORRECT BACKGROUND
173726	001412	MEMERR	JENRR IF NO COMPARE
173730	010312	R3,(R2)	IWRITE TEST DATA
173734	001007	R3,(R2)	ICHECK FOR CORRECT DATA
173736	020206	MEMERR	JBR IF NOT AS EXPECTED
173740	101371	R2,SP	IFINISHED TEST?
173742	005703	48	JBR IF NOT
173744	001362	R3	JOOBE 1'S AND 0'S?
		MEMERR	JBR IF NOT

```

582 .SOTIL XIRTP - COMMON ROUTINE TO RETURN FROM SUBROUTINES
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582	022121	XIRTP	CMP	(R1)+,(R1)+					
583	173750		JMP	-2(R1)					
584	173754		MEMERR	MOV	R3,R0				JSAVE EXPECTED DATA
585	173756		MOV	(R2),R4					JSAVE RECEIVED DATA
586	173760		MOV	R2,SP					JSAVE FAILING ADDRESS
587	000000		HALT						

; ROUTINE TO RETURN FROM A SUBROUTINE WHICH IS ENTERED AS FOLLOWS:
 ;
 ; MOV PC,R1
 ; BR SUBROUTINE
 ; ***
 ; ***
 ; RETURNS HERE
 ; WITH R1 POINTING TO HERE
 ; JMP RETURN PAST BR+2
 ; MEMORY VERIFICATION FAILED. SAVE REGISTERS FOR DISPLAY.

```

601      601      .SHTTL      DEFINITIONS AND SYMBOLS
602      602      .SHTTL
603
604      177560      JKEYBOARD STATUS REGISTER
605      177562      JKEYBOARD BUFFER REGISTER
606      177564      JCONSOLE PRINTER STATUS REGISTER
607      177566      JCONSOLE PRINTER BUFFER REGISTER
608
609      000015      JCODE FOR CARTRIDGE RETURN <CR>
610      000012      JCODE FOR LINE FEED<LF>
611
612      / PERIPHERAL EXTERNAL PAGE REGISTERS ASSIGNMENTS
613
614      RKCS= 177404      JWORD COUNT REG. FOR RK11
615      LCKC= 177342      JWORD COUNT REG. FOR TC11
616      NYC= 172522      JBYTE/RECORD COUNT FOR TH11
617      176714      JWORD COUNT REG. FOR RP11
618      RPCS= 177560      JCONTROL REG. FOR DL11
619      TACS= 177500      JCONTROL REG. FOR TAIL CASSETTE
620      PCCS= 177550      JCONTROL REG. FOR PC11
621      RXCS= 177170      JCONTROL & STATUS REG FOR RX01 FLEXIBLE DISK
622
623      172440      JXCS#2 = -> RX01 DATA BUFFER REGISTER
624      KUCSA= 176300      JCONTROLLER REG. 1
625      NSCSA= 172040      JCONTROLLER REG. 1 FOR NH11
626      RPCSA= 176700      JCONTROLLER REG. 1 FOR RH/RP04
627
628      / OFFSETS TO MASSBUS DEVICE REGISTERS
629
630      NDDT= 26      JDRIVE TYPE
631      RKCS2= 10      JROL1 CONTROL/STATUS REGISTER 2
632      RBDSE= 12      JDRIVE STATUS
633      WBASE= 16      JATTENTION SUMMARY
634      RTTC= 32      JTU16 TAPE CONTROL
635      RTFC= 6      JTU16 FRAME COUNT
636      RTER= 14      JTU16 ERRORS
637      RPOF= 32      JROP04 OFFSET
638
639      / FUNCTION VALUE FOR PERIPHERALS
640      TUSPAC= J1      JSPACE FORWARD COMMAND FOR TU16
641      FCE= 1000      JFRAME COUNT ERROR BIT
642
  
```

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644 .SHTL          ** ROM AREA 165000 - 165777 **
645 .SHTL
646 .IIF HDF H00T H00T=165000
647
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662
663 165000 005000
664 165002 005002
665 165004 010703
666 165006 000441
667 165010 120227 000015
668 165014 001440
669 165016 162702 000070
670 165022 062702 000010
671 165026 103017
672 165030 006300
673 165032 006300
674 165034 006300
675 165036 050200
676 165040 000760

    165000

.SHTL GETNUM - GET OCTAL NUMBER INTO R0
; SUBROUTINE TO READ AN OCTAL NUMBER FROM THE CONSOLE KEYBOARD
;
; CALLING SEQUENCE
;
;   MOV   PC,R1
;   RR   GETNUM
;
; REGISTERS R2 AND R3 ARE USED AND NOT RESTORED.
; A IS ADDED TO THE CONTENT OF R1.
; THE RESULT IS RETURNED IN R0.

GETNUM: CLR   R0
261:   CLR   R2
      MOV   PC,R3
      RR   JGETCHR
      CHPB R2,R3
      BEO  JXIRTN
      SUB  R1,R2
      ADD  R1,R2,R2
      RCC  KBDCLR
      ASL  R0
      ASL  R0
      ASL  R0
      RLS  R2,R0
      RR
; INITIALIZE RESULT
; CLEAR FOR BYTE XFER
; COPY PC FOR RETURN
; GET & ECHO CHAR
; TERMINATED VIA CR?
; RETURN IF SO
; CHECK FOR OCTIT
;
; RR IF NOT
; MAKE ROOM FOR IT IN RESULT
;
;
; PUT IT IN RESULT
;
26

```

```

678      .SHYTL D<SPC> - DEPOSIT IN MEMORY A VALUE.
679      DE:  MOV      PC,R1      JCOPY PC FOR RETURN
680      165042 010701      BR      GETRUM      JGET VALUE
681      165044 000755      MOV      R0,(R5)      JSTORE VALUE
682      165046 010015      JNXTCH: JHP      KNDDSP      JGET NEXT COMMAND
683      165050 000167 006176
684
685      .SHYTL S<CR> - START AT SPECIFIED LOCATION
686      STI      RESET      JCLEAR THE WORD
687      165054 000005      JMP      WPS      JTRANSFER TO SPECIFIED ADDR
688      165056 000115
689
690      .SHYTL L<SPC> - LOAD ADDRESS
691      LAI      MOV      PC,R1      JCOPY PC FOR RETURN
692      165060 010701      BR      GETRUM      JGET OCTAL NUMBER
693      165062 000746      MOV      R0,R5      JSAVE NEW ADDR
694      165064 010005      KNDCLR: CLP      R4      JFORGET LAST CMD, DIDN'T DUMP INDEX
695      165066 005004      BR      JNXTCHD      JGET NEXT COMMAND
696      165070 000767
697
698      .SHYTL F<SPC> - EXAMINE A LOCATION
699      EXI      MOV      R5,R0      JLOCATION BEING EXAMINED
700      165072 010500      MOV      PC,R1      JCOPY PC FOR RETURN
701      165074 010701      RP      JPUTRUM      JPRINT IT
702      165076 000403      MOV      (R5),R0      JGET CONTENTS OF LOCATION
703      165100 011500      BR      JPUTRUM      JPRINT OCTAL VALUE
704      165102 000401      BR      JNXTCHD      JGET NEXT COMMAND
705      165104 000761
  
```

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707          / LINK TO SUBROUTINES
708
709          JPUTNU: JMP          PUTNUM
710          JGETCH: JMP          GETCHR
711          JXINTR: JMP          XINTR
712
713          .SMTTL BTSTRP - COMMON ENTRY FOR ALL HARDWARE BOOTSTRAPS
714
715          BTSTRP1
716          MOV          R4,R2          /COPY -> BOOT CODE
717          MOV          (R2)+,R1      /COPY COMMAND STATUS REGISTER &
718
719          MOV          R5,SP          /SET R2 -> RESTART ADDRESS
720          MOV          #10,(SP)      /SET FOR WORLD'S LARGEST STACK
721          MOV          R0,R4          /SET MAXIMUM NUMBER OF RETRIES
722          RESET
723          JMP          @R2          /CLEAR THE WORLD
724
725          .SMTTL BTERR - COMMON BOOTSTRAP ERROR ROUTINE
726
727          BTERR: DFC          (SP)      /REPEAT BOOT?
728          BNE          BTSTRP      /OK IF SO
729          HALT
730
731          .MACRO DEVICE DEVNAM,CSR,COMMEN
732          .IRP          LOC,<<,-HBOOT+165000>>
733          .LIST
734          .SMTTL DEVNAM LOC          COMMEN
735
736          DEVNAM: .WORD          CSR          /-> DEVNAM CONTROL/STATUS REGISTER
737
738          .NLIST
739          .ENDR
740          .ENDM
741
742          .NLIST FC
743

```

745	.SBTTL	HARDWARE BOOTSTRAPS	DESCRIPTION
746	.SBTTL		
747	.SBTTL		
748	.SBTTL		
749			
750	.SBTTL	RK11 165150	DISK CARTRIDGE
(2)			
(2)			
(2)			
751	.WORD	RKCS	J-> RK11 CONTROL/STATUS REGISTER
752	DIS	#10,R4	JSHIFT UNIT # TO BITS 15-13
753	ASL	R4	J
754	OCC	26	J
755	MOV	R4,6(R1)	JMOVE IN TO RKDA REGISTER
756	CLR	R4	JCLEAR UNIT #
757	BR	DSKRD	JGO LOAD READ COMMAND
758			
(2)			
(2)			
759	.SBTTL	RP11 165172	RP02/03 DISK PACK
760	RP11		
761	.WORD	RPCS	J-> RP11 CONTROL/STATUS REGISTER
762	SWAB	R4	JUNIT # TO BITS 10-0
763	MOV	R4,(R1)	JSELECT UNIT
764	ADD	#5,R4	JDISK READ COMMAND
765	BR	OTHER	
766			
(2)			
(2)			
767	.SBTTL	TC11 165206	DECTAPE
768	TC11		
769	.WORD	TCCH	J-> TC11 CONTROL/STATUS REGISTER
770	BR	TAPE5	
771	.WORD	4011	JREVERSE+STOP+GO
772	J.WORD	4003-4011	JREVERSE+SEARCH+GO
(2)			J4003-4011 = -6 IS USED
(2)			JREAD+GO
773	.WORD	5-4003	JCOMPLETION MASK
774	.WORD	100000	
775			
776	.SBTTL	TM11 165220	400 RPI MAGNETIC TAPE
777	TM11		
778	.WORD	MTC	J-> TM11 CONTROL/STATUS REGISTER
779	BR	TAPE5	
780	.WORD	60017	J800 RPI, ODD PARITY, REWIND, GO
781	J.WORD	60011-60017	J800 RPI, ODD PARITY, SKIP, GO
782	.WORD	60003-60011	J60011-60017 = -6 IS USED
783	.WORD	200	J800 RPI, ODD PARITY, HEAD, GO
784			JCOMPLETION MASK
785			
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J THIS IS THE TAPE DEVICE SERVICE ROUTINE

789	165252	010441	MOV	R4,-(R1)	!START 2ND FUNCTION
790	165254	062304	ADD	(R3)+R4	!COMPUTE READ FUNCTION
791	165256	031311	BIT	(R3),(R1)	!DONE?
792	165260	001776	BEQ	106	!BR IF NOT
793	165262	122341	CMQB	(R3)+-(R1)	!INDEX POINTERS TO
794					! ERROR MASK (R3)
795					! HIGH BYTE OF ERROR REGISTER (R1)
796	165264	122321	CMQB	(R3)+,(R1)+	! PERMISSIBLE ERROR?
797	165266	001325	ANE	BTERR	!BR IF NOT
798	165270	012761	MOV	R-256.*2,(R1)	!LOAD WORD COUNT OR BYTE COUNT
799	165276	010411	MOV	R4,(R1)	!LOAD READ FUNCTION AND GO
800	165300	105711	TSTB	(R1)	!DONE?
801	165302	100376	RPL	106	!BR IF NOT
802	165304	005711	TST	(R1)	!ERRORS?
803	165306	100006	RPL	126	!BR IF NONE
804	165310	030405	RIT	R4,R5	!WAS IT RUI1/TH02/TU16?
805	165312	100313	RPL	BTERR	!BR IF NOT, RETRY?
806	165314	022761	CMQB	BTERR	!FCB' ERROR?
807	165322	001307	ANE	BTERR	!BR IF NOT, RETRY?
808	165324	105011	CLR	(R1)	!STOP DECTAPE MOTION
809	165326	005007	CLR	PC	!START SECONDARY BOOT
810					
811					
(2)					
(2)	165330		RHS	165330	!MASSBUS RS03/04 FIXED HEAD DISK
(2)	165330	172040	.WORD	RSCSA	!-> RHS CONTROL/STATUS REGISTER
812	165332	000406	RR	RUCOMN	!PROCEED
813					
814					
(2)					
(2)	165334		RHNP	165334	!MASSBUS NP04 DISK PACK
(2)	165334	176700	.WORD	RPCSA	!-> RHP CONTROL/STATUS REGISTER
815	165336	000404	RR	RUCOMN	!PROCEED
816					
817					
(2)					
(2)	165340		TU16	165340	!MASSBUS TU16 MAGNETIC TAPE
(2)	165340	172440	.WORD	TUCS	!-> TU16 CONTROL/STATUS REGISTER
818	165342	010405	MOV	R4,R5	!SET TU16 SLAVE UNIT SELECT #
819	165344	000407	RR	RHTU16	!JOIN COMMON CODE
820					
(2)					
(2)	165346		RUI1	165346	!MASSBUS DEVICE COMBINATIONS
(2)	165346	176300	.WORD	RHCSA	!-> RUI1 CONTROL/STATUS REGISTER
822					! NOTES: IF TH02/TU16 SHOULD BE SELECTED, THE VALUE TYPED IN
823					! IS THE POSITION OF THE TH02 OR THE RUI1 INSTEAD OF
824					! THE UNIT # ON THE TU16 DRIVE. THE SLAVE UNIT #
825					! (1 OR THE TU16) MUST STILL BE ZERO.
826					
827					
828					!FOR DEVICE COMBINATIONS OR RUI1
829					!PROCEED RIGHT ON THROUGH
830					
831					
832	165350	110061	MOV	R0,RVCS7(R1)	!SELECT MASSBUS DEVICE

.FRANK, LSB

833	165354	016105	000026	MOV	RHDT(R1),R5	READ DEVICE DRIVE TYPE
834	165360	100017		RPL	206	FOR IF DEVICE IS SECTOR-ADDRESSABLE
835	165362	005005		CLR	R5	HITS A TJUST, SET SLAVE TO 0
836	165364	052705	101300	RHDTU16:RIS	#101300,R5	FOR DENSITY/FORHAT/PARITY WITH SLAVE #
837						AND KEEP NON-SECTOR-ADDRESSABLE FLAG
838						PROVE THAT BIT 15 OF "TAPE CONTROL" MUST
839						BE HEAD ONLY
840	165370	010561	000032	MOV	R5,MYTC(H1)	SELECT TJUST SLAVE UNIT
841	165374	012711	000007	MOV	#7,(R1)	REWIND TAPE
842	165400	012761	177777	MOV	#-1,MTEC(R1)	SET FRAME COUNT TO SKIP 1 RECORD
843	165406	012711	000031	MOV	#TUSPAC,(R1)	SKIP FORWARD 1 RECORD
844	165412	105761	000012	MOV	RHDS(R1)	DRIVE READY?
845	165416	100375		RPL	108	FOR IF NOT
846	165420	030527	020000	RIT	R5,#20000	MOVING HEAD DEVICE?
847	165424	001405		DEF	306	FOR IF NOT
848	165426	012711	000021	MOV	#21,(R1)	ISSUE READ-IN PRESET
849	165432	012761	014000	MOV	#14000,INOP(H1)	SET FME22 AND ECC INHIBIT
850	165440	016161	000016	MOV	RHAS(R1),RHAS(R1)	TURN DOWN ANY ACTIVE ATTN LINES
851						DEPENDS ON CARRY=0
852	165446	012704	100071	MOV	#100071,R4	RH11 HEAD FUNCTION (AND RH11 FLAG)
853						PROVE THAT RH11 CSI BIT 15 MUST BE HEAD-ONLY
854	165452	000706		BR	OTHER	GO SHARE CODE WITH ROME MASSBUS DEVICES
855						
856						

.DSABL LSH

YB-PAL	TAIL	165454	MAGNETIC CASSETTE
058			
(2)	165454		
(2)	165454	177500	
859	165456	000304	
860	165460	010411	
861	165462	012703	165540
862	165466	012704	000375
863	165472	112105	
864	165474	112311	
865	165476	100407	
866	165500	130511	
867	165502	001776	
868	165504	105204	
869	165506	100772	
870	165510	116114	000002
871	165514	000771	
872	165516	010103	
873			
874			
875	165520	005711	
876	165522	100607	
877	165524	122737	000240
878	165532	001203	
879	165534	010300	
880	165536	005007	
881			
882			
883			
884	165540	240	
885	165541	037	
886	165542	015	
887	165543	005	
888	165544	024	
889	165545	224	

.SHITL TAIL 165454 MAGNETIC CASSETTE
 TAIL:
 .WORD
 SWAB R4
 MOV R4,(R1)
 MOV TABLE,R3
 MOV R175,R4
 MOVB (R3),R5
 MOVB (R3),R1
 BUI 66
 BITB R5,(R1)
 BEO 46
 INCB R4
 BMI 28
 MOVB 2(R1),(R4)
 BR 46
 MOV R1,R3
 TST (R1)
 BMI BTERR
 CMPB #240,#80
 BNE HTERR
 MOV R3,R0
 CLR PC

YB-PAL	TAIL	165454	MAGNETIC CASSETTE
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J CASSETTE TAPE DEVICE COMMAND TABLE
 TABLE: .BYTE 240
 .BYTE 37
 .BYTE 15
 .BYTE 5
 .BYTE 24
 .BYTE 224

J-> TAIL CONTROL/STATUS REGISTER
 JUNIT # TO HIGH BYTE
 JSELECT UNIT
 JLOAD TRANSFER COUNTER
 JLOAD COMPANATOR
 JLOAD COMMAND
 JBR IF LAST COMMAND
 JCOMMAND COMPLETE?
 JRD. WAIT
 JINCREMENT ADDRESS CTR.
 JIF (-), GET COMMAND
 JSTORE DATA
 JGET ANOTHER BYTE
 JSPECIAL HACK FOR CASSETTE SOFTWARE
 JWHICH DOES CONFORM TO THE NEW BOOTSTRAP
 JSTANDARD
 JARY ERROR?
 JYES. RETRY
 JIT MUST BE 240
 JBR. IF ERROR, RETRY?
 JSPECIAL HACK CONTINUED

JCOMPARE WORD NOT A COMMAND
 JILBS+HWD+GO
 JSPACE FORWARD BLOCK+GO
 JHEAD
 JHEAD+ILBS
 JHEAD+ILBS+END FLAG

Address	OpCode	OpName	OpData	Comment
891				
(2)				
(2)				
892	MOV	PC1,R4		J-> RX11 CONTROL/STATUS REGISTER
893				JCOPY COMMAND/STATUS BITS
894				JTH, DONE, UNIT 1, HEAD, GO
895				JTH, DONE, UNIT 0, HEAD, GO
896				J SPECIAL HACK CONTINUED
897				J WHICH UNIT?
898				J LOW BYTE OF NEXT MUST BE 00 000 001
899				JRR IF UNIT 1, R4 IS OK
900				J SELECT UNIT 0, MOVE HIGH BYTE TO LOW
901				J 'TR' OR 'DONE', SET?
902				JRR IF NOT, IGNORE ERROR
903				J SET FOR SEQUENCING BITS
904				J SET FOR READ SEQUENCE
905				J COMMAND: "READ(6)" TO "EMPTY BUFFER"
906				J LOW BYTE OF NEXT MUST BE 0X 000 100
907				J 'ERR', 'TR', OR 'DONE', SET?
908				JRR IF NOT
909				JRR IF ROOT ERROR
910				JRR IF READ SEQUENCE
911				J 'TR' OR 'DRE', SET?
912				J DRE, GO TEST FOR 240 AT 0
913				J STORE DATA
914				J GO WAIT FOR 'TR' OR 'DONE'
915				J READ COMMAND SEQUENCE:
916				J 1ST - R5=1, CARRY=1
917				J 2ND - R5=0, CARRY=1
918				J 3RD - R5=0, CARRY=0
919				J 3RD TIME LOAD EMPTY BUFFER COMMAND
920				J 1ST TIME LOAD SECTOR # 1
921				J 2ND TIME LOAD TRACK # 1
922				J CONTINUE READ SEQUENCE

```

Y0.PAL DL11 165640 TERMINAL READER
      .SBTTL DL11 165640 TERMINAL READER
924 (2) 165640
925 (2) 165640 177560
926 (2) 165642 000401
927 (2)
928 (2) 165644
929 (2) 165644 177550
930 (2)
931 (2)
932 (2) 165646 010115
933 (2) 165650 042705 000024
934 (2) 165654 010515
935 (2) 165656 011503
936 (2) 165660 005211
937 (2) 165662 105711
938 (2) 165664 100376
939 (2) 165666 116113 000002
940 (2) 165672 005215
941 (2) 165674 120327 0000375
942 (2) 165700 001366
943 (2) 165702 105221
944 (2) 165704 000143
945 (2)

```

```

      .SBTTL DL11 165640 TERMINAL READER
DL11:
      .WORD DLCS      I-> DL11 CONTROL/STATUS REGISTER
      BR CKDEV      JARD TRANSFER TO HEADER SERVICE
      .SBTTL PC11 165644 PAPER TAPE READER
PC11:
      .WORD PCCS      I-> PC11 CONTROL/STATUS REGISTER
      I THE MEMORY DIAGNOSTIC ROUTINE LEAVES THE VALUE 157776 OR
      J THE LAST WORD ADDRESS OF MEMORY, WHICHEVER IS LESS, IN R5.
CKDEV:
      MOV R1,(R5)      I HEADER CMD/STATUS REG. ADDR
      DTC #24,R5      I THE DROP TO XX75?
      MOV R5,(R5)      JARD STORE IN ITSELF
      MOV (R5),R3      I COPY LOAD POINTER
      INC (R1)         I START READER
      TSTB (R1)        I READY?
      HPL 46           I WAIT IF NOT
      MOVB 2(R1),(R3)  I STORE THE DATA
      INC (R5)         I INDEX POINTER
      CMPL R3,#375    I JAR OFFSET STORED?
      HNE 26          I JAR IF NOT
      INCB (R3)       I INDEX THE OFFSET
      JMP -(R3)       I JARD GO TO THE BR
      .SBTTL

```

YB.PAL COMMAND TABLE & OFFSET TABLE

947			MSG:	
948	165706	005015	000044	
949	165712	052124		.ASCII <CR><LF><IS><O>
950	165714	051504		.ASCII /JT/
951	165716	046515		.ASCII /DS/
952	165720	041515		.ASCII /MN/
953	165722	041104		.ASCII /NC/
954	165724	045504		.ASCII /DR/
955	165726	052104		.ASCII /DK/
956	165730	052115		.ASCII /DT/
957	165732	050104		.ASCII /HT/
958	165734	052103		.ASCII /DP/
959	165736	051120		.ASCII /CT/
960	165740	054104		.ASCII /PW/
961	165742	006523		.ASCII /DX/
962	165744	020105		.ASCII /S/<CR>
963	165746	020104		.ASCII /E /
964	165750	020114		.ASCII /D /
965	165752	000000		.ASCII /L /
966				0

! SIGNALS END OF COMMAND LIST

! TABLE OF OFFSET

968			
969	165754		
970	165754	320	.BYTE <DI11-HROOT>/2
971	165755	154	.BYTE <RUHS-HROOT>/2
972	165756	160	.BYTE <TUI6-HROOT>/2
973	165757	163	.BYTE <RH11-HROOT>/2
974	165760	156	.BYTE <RHUP-HROOT>/2
975	165761	064	.BYTE <CK11-HROOT>/2
976	165762	103	.BYTE <TC11-HROOT>/2
977	165763	110	.BYTE <TM11-HROOT>/2
978	165764	075	.BYTE <RP11-HROOT>/2
979	165765	226	.BYTE <TA11-HROOT>/2
980	165766	322	.BYTE <PC11-HROOT>/2
981	165767	263	.BYTE <KX11-HROOT>/2
982			
983			
984			
985			
986	000014		NONHT= .-VECTOR
987			
988			
989			
990			
991	165770	026	.BYTE <ST-HROOT>/2
992	165771	035	.BYTE <EX-HROOT>/2
993	165772	021	.BYTE <DE-HROOT>/2
994	165773	030	.BYTE <LA-HROOT>/2
995			
996			.EVEN
997			
998	000001		.END

! ALL PRECEDING ARE FOR ROOT STRAP COMMANDS

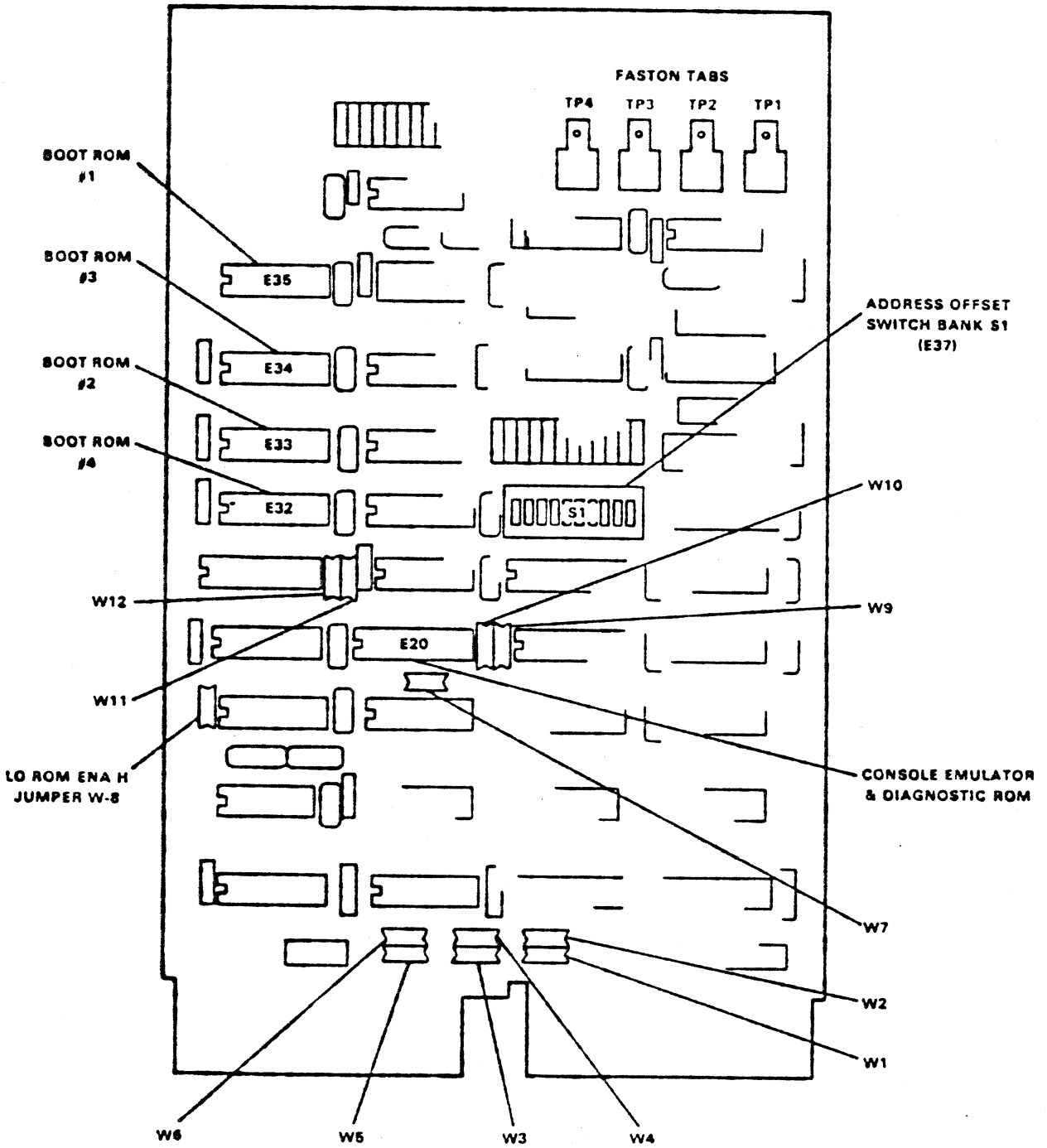
! ALL FOLLOWING ARE COMMANDS WHICH ARE NOT PRECEDED BY A MEMORY TEST

BTERR	165142	JMP2A	173114	OTHER	165270	TEST5	173170
UTSTR	165134	JMXTEH	165050	PC	= 8000007	TEST6	173366
BTSTRP	165132	JPUTRU	165106	PCC6	= 177550	TEST7	173456
CKDEV	165646	JXIRTN	165116	PC11	165644	TKH	= 177562
CR	= 000015	KNDCLR	165066	PODI	173120	TKS	= 177560
DE	165042	KNDDEP	173252	PRINT	173256	TH1	= 165220
DLCS	= 177560	LA	165060	PATCHR	173530	TPB	= 177566
DL11	165640	LF	= 000012	PATCH	173554	TPS	= 177564
DOMENT	173346	LATCH	173314	POTRM	173572	TSTJSH	173500
DSKRD	165200	HUAS	= 000016	POTRM	173560	TST240	165520
DSPLY	173226	HVCS2	= 000010	READ	173266	TUCS	= 174440
DSPTCH	173334	HND5	= 000012	MICOMN	165350	TUSPAC	= 000031
EX	165072	HNDT	= 000026	HVCSA	= 176300	TU16	165340
FCE	= 001000	HEHDD	174632	HRRP	165334	TICONT	173030
FLOAT	173712	HEHRR	173754	HRRS	165330	TADATA	173124
GETCHR	173514	HSG	165706	RHUI16	165364	T50DATA	173130
GETRDR	165000	HTC	= 172522	HU11	165346	T6DATA	173132
GOHGO	= 171000	HTEH	= 000014	HVCS	= 177404	T6DAT1	173142
HNDOT	= 165000	MTFC	= 000006	RK11	165150	T6ERR	173450
JGETCH	165112	MTTC	= 000032	NPCS	= 176714	T7ERR	173470
JGETNU	173452	HORHT	= 000014	HVCSA	= 176700	VECTOR	165754
JMP1	173102	NORMAL	173000	RPOF	= 000032	XIRTN	173746
JMP2	173112	OPTION	173024	RP11	165172	.	= 165774

. AUS. 173764 000
 000000 001

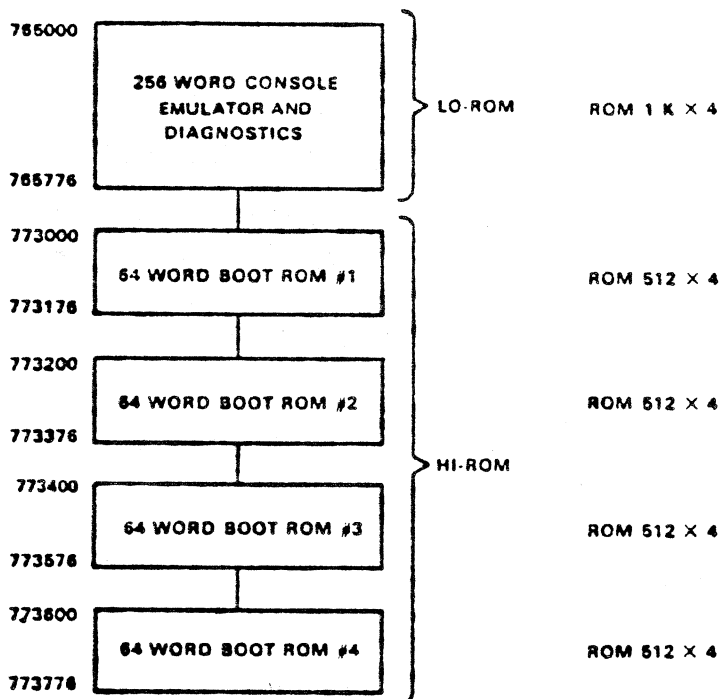
ERRORS DETECTED: 0
 DEFAULT GLOBALS GENERATED: 0

*YH.YH=YH.PAL/DB1ENFLZ
 RUN-TIME: 3 6 .2 SECONDS
 RUN-TIME RATIO: 48/10=4.6
 CORE USED: 5K (9 PAGES)



MA-0900

M9312 Bootstrap/Terminator Module



MA-0902

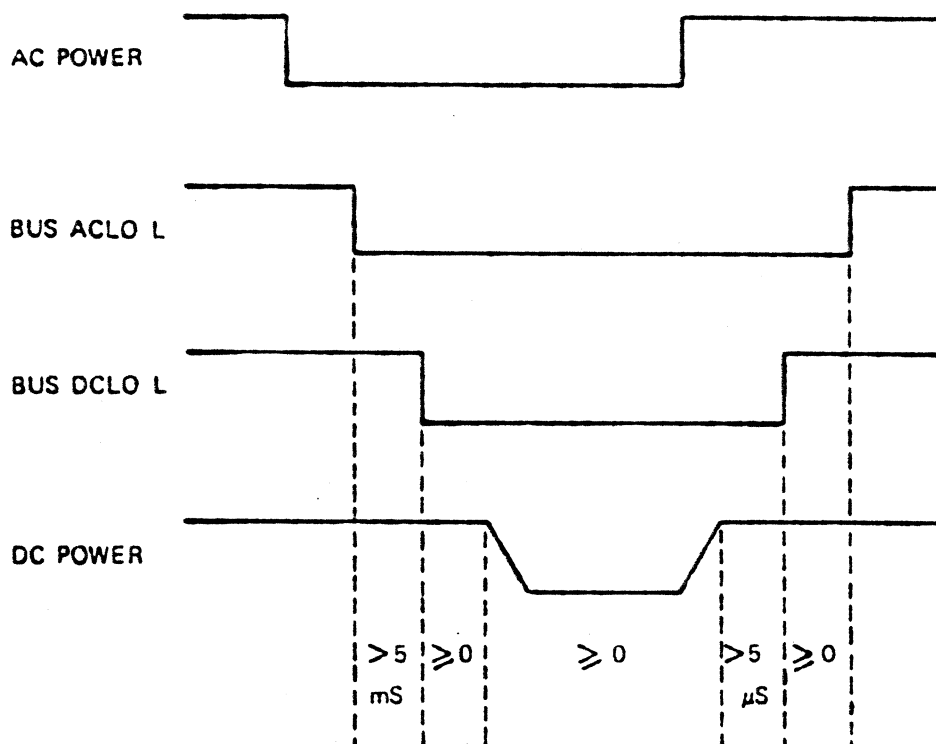
ROM Segregation

ROM Data Organization

ROM Output	Data	Word	Bit	Number
4	15	$\overline{11}$	7	3
3	14	$\overline{10}$	6	2
2	$\overline{13}$	9	5	1
1	$\overline{12}$	0	4	8
ROM Address	3 ₈	2 ₈	1 ₈	0 ₈
Data Word 1	377 ₈	376 ₈	375 ₈	374 ₈
ROM Address				
Data Word 64				

NOTE

Data word bits 10, 11, and 12 are stored inverted.



MA-0901

Power-Down/Power-Up Sequence

Jumper Explanation

Jumper	Function
W1	Connects Pull Up for BUS BG6 H (When in)
W2	Connects Pull Up for BUS BG7 H (When in)
W3	Connects Pull Up for BUS NPG H (When in)
W4	Connects Pull Up for BUS BG5 H (When in)
W5	Connects Pull Up for BUS BG4 H (When in)
W6	Connects BUF VECTOR L to finger BDI (IN for PDP-11/70)
W7	RESERVED (Always in)
W8	Connects LO ROM ENABLE H (When out)
W9, W10	Install for power-up boot to 773024 ₍₈₎ (IN for all CPUs except 11/60)
W11, W12	Install for power-up boot to 773224 ₍₈₎ (IN for PDP-11/60 only)

Table D-1 Faston Tab Description

Faston Tab	Function Performed
TP1	Boot input
TP2	Return for boot input
TP3	Return for enable boot on power-up
TP4	Enable boot on power-up

Table D-2 Faston Tab Substitution

Wire Connection			
From		To	
Module	Faston Tab	Module	Faston Tab
M9301	TP1	M9312	TP4
M9301	TP2	M9312	TP1
M9301	TP3	M9312	TP3

Cross Reference Device to Controller

Device	Controller
RL01	RL11
RK06/07	RK611
RX01	RX11
RX02	RX211
RP02/03	RP11C/E
RP04/05/06 RM02/03	RH11/70
RK03/05	RK11C/D
TU55/56	TC11
TU16/E16 TM02/03	RH11/70
TU10/E10 TS03	TM11/A11/B11
RS03/04	RH11/70
PC05 (HI SPD RDR)	PC11/R11
LO SPD RDR (ASR33)	DL11A/W
TU60	TA11

E.2 ROM IDENTIFICATION

When the ROM configuration of an M9312 already installed in a system is not known, it is desirable to identify the ROM configuration without removing the module. This can be accomplished by running diagnostic CZM9B, or by examining the data in five specific locations and using Table E-3 to identify the ROM. The locations are as follows:

- | | | |
|----|--------|----------------|
| 1. | 765774 | Diagnostic ROM |
| 2. | 773000 | ROM 1 |
| 3. | 773200 | ROM 2 |
| 4. | 773400 | ROM 3 |
| 5. | 773600 | ROM 4 |

By comparing the data observed at the above locations with Table E-3 you can identify the type and location of each ROM in the module.

ROM Identification

Octal Data	Mnemonic	P/N 23-	See Table
040460	A0	248F1	F-2
041060	B0	233F1	F-1
041524	CT	761A9	C-10
042113	CI	761A9	C-10
042113	DK	756A9	C-5
042114	DL	751A9	C-1
042115	DM	752A9	C-2
042120	DP	755A9	C-4
042123	DS	759A9	C-8
042130	DX	753A9	C-3
042131	DY	811A9	C-11
046515	MM	757A9	C-6
046524	MT	758A9	C-7
056122	PB	760A9	C-9
177776	This is a Continuation ROM of a Multiple-ROM Boot		
XXX777	Bad ROM or No ROM Present		

DIAGNOSTIC ROM (P/N 23-233F1)

There are no special M9312 switch settings that pertain to this ROM. The only way these diagnostics can be executed is by entering a bootstrap at the entry point which calls for diagnostics to be run. This ROM allows the user to boot via the console switch register. This can be done as follows:

1. Load Address 765744.
2. Set switch register according to Table F-1
3. Start.

Table F-1 Console Switch Register Settings for Diagnostic ROM

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
NA	NA	NA	NA												
				Octal Unit Number			SWR Code from Boot ROM Tables								

F.2 CONSOLE EMULATOR AND DIAGNOSTIC ROM (P/N 23-248F1)

This ROM contains an ASCII console emulator routine and diagnostics for use with PDP-11/04, 11/05, 11/34, 11/35, 11/40, 11/45, 11/50, 11/55. To enter the ASCII console via power-up boot or pushbutton boot, the M9312 switches must be set according to Table F-2.

Table F-2 Switch Settings for ASCII Console and Diagnostic ROM

Diagnostic	Starting Address*	S1 Switch Settings for Power-Up Boot or Push-Button Boot									
		1	2	3	4	5	6	7	8	9	10
NO	165144	ON	†	OFF	OFF	ON	ON	OFF	OFF	ON	OFF
YES	165020	ON	†	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF

Cross Reference ROM P/N to ROM Table Number

Part Number 23-	Function Performed by ROM				See Table
233F1 248F1	Diagnostic for 11/60/70 ROM ID=B0 ASCII Console and Diagnostic for 11/04/05/34/35/40/45/50/55 ROM ID=A0				F-1 F-2
	The following ROMS are Bootstrap ROMs				
	Bootable Devices				
	Mnemonic	First Device In ROM <i>a</i>	Mnemonic	Second Device in ROM <i>b</i>	
751A9	DL	RL01	NA	NA	C-1
752A9	DM	RK06/07	NA	NA	C-2
753A9	DX	RX01	NA	NA	C-3
811A9	DY	RX02	NA	NA	C-11
755A9	DP	RP02/03	DB	RP04/5/6 RM02/3	C-4
750A9	DK	RK03/05	DT	TU55/56	C-5
757A9	MM	TU16/E16 TM02/3	NA	NA	C-6
758A9	MT	TU10/TS03	NA	NA	C-7
759A9	DS	RS03/04	NA	NA	C-8
760A9	PR	PC05	TT	LO SPD RDR	C-9
761A9	CT	TU60	NA	NA	C-10

Table C-1 ROM P/N 23-751A9

Table C-3 ROM P/N 23-753A9

Table C-6 ROM P/N 23-757A9

Table C-7 ROM P/N 23-758A9

Table C-8 ROM P/N 23-759A9

Table C-10 ROM P/N 23-761A9

Table C-11 ROM P/N 754A9

Table C-2 ROM P/N 23-752A9

ROM Location	Diagnostic	Unit	Starting Address*	Switch Settings S1 - for Power-Up Boot or Push-Button Boot of Device										SWR Code			
				1	2	3	4	5	6	7	8	9	10				
ROM 1	NO	0	173004	OFF	†	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	NA
ROM 1	YES	0	173006	OFF	†	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	012
ROM 2	NO	0	173204	OFF	†	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	NA
ROM 2	YES	0	173206	OFF	†	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	212
ROM 3	NO	0	173404	OFF	†	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	NA
ROM 3	YES	0	173406	OFF	†	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	412
ROM 4	NO	0	173604	OFF	†	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	NA
ROM 4	YES	0	173606	OFF	†	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	612

*The starting address for the console load address and start sequence.

† S1-2: when ON, power-up boot is enabled; when OFF, power-up boot disabled. (Must be OFF for PDP-11/60. See PDP-11/60 documentation for power-up boot.)

NOTES

If diagnostics are to be run, a CPU diagnostic ROM must be in location E20, and jumper W8 must be out.

When booting from the console emulator, a device mnemonic and unit number are required. If unit number is not entered, it is assumed to be zero.

Table C-9 ROM P/N 23-760A9

Table C-5 ROM P/N 23-756A9

ROM Location	Diag- nostic	Unit	Starting Address	Switch Settings S1 - for Power-Up Boot or Push-Button Boot of Device										SWR Code			
				1	2	3	4	5	6	7	8	9	10				
ROM 1	NO	0	173004	OFF	+	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 1	NO	2	173164	OFF	+	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 1	YES	0	173006	OFF	+	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	012
ROM 2	NO	0	173204	OFF	+	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 2	NO	2	173364	OFF	+	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 2	YES	0	173206	OFF	+	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	212
ROM 3	NO	0	173404	OFF	+	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 3	NO	2	173564	OFF	+	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 3	YES	0	173406	OFF	+	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	412
ROM 4	NO	0	173604	OFF	+	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 4	NO	2	173764	OFF	+	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 4	YES	0	173606	OFF	+	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	612
ROM 1	NO	0	173034	OFF	+	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 1	YES	0	173036	OFF	+	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	042
ROM 2	NO	0	173234	OFF	+	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 2	YES	0	173236	OFF	+	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	242
ROM 3	NO	0	173434	OFF	+	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 3	YES	0	173436	OFF	+	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	442
ROM 4	NO	0	173634	OFF	+	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 4	YES	0	173636	OFF	+	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	642

a

b

Table C-4 ROM P/N 23-755A9

ROM Location	Diag- nostic	Unit	Starting Address	Switch Settings S1 - for Power-Up Boot or Push-Button Boot of Device										SWR Code		
				1	2	3	4	5	6	7	8	9	10			
ROM 1	NO	0	173004	OFF	+	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 1	YES	0	173006	OFF	+	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	012
ROM 2	NO	0	173204	OFF	+	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 2	YES	0	173206	OFF	+	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	212
ROM 3	NO	0	173404	OFF	+	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 3	YES	0	173406	OFF	+	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	412
ROM 4	NO	0	173604	OFF	+	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	NA
ROM 4	YES	0	173606	OFF	+	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	612
ROM 1	NO	0	173050	OFF	+	OFF	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	NA
ROM 1	YES	0	173052	OFF	+	OFF	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	ON	056
ROM 2	NO	0	173250	OFF	+	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	NA
ROM 2	YES	0	173252	OFF	+	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	256
ROM 3	NO	0	173450	OFF	+	ON	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	NA
ROM 3	YES	0	173452	OFF	+	ON	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	ON	456
ROM 4	NO	0	173650	OFF	+	ON	ON	OFF	ON	OFF	ON	OFF	ON	OFF	OFF	NA
ROM 4	YES	0	173652	OFF	+	ON	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	656

a

b

Alle MaindecTestprogramme fragen immer wieder das Switchregister (777570) ab. Durch Setzen bestimmter Schalter (Bits) kann der Testablauf gesteuert werden, ohne das Programm anzuhalten.

Einige Schalter haben in unterschiedlichen Programmen die gleiche Bedeutung. Auf diese Schalter (Bits) wird nun genauer eingegangen.

SW 15:

Ist dieser Schalter gesetzt, hält das Programm bei einem Fehler an. Das PSW wird abgespeichert ((R6) PC+2) und der Fehler wird ausgedruckt. Wird SW 15 nach einem Fehler gesetzt, dann hält das Programm an und der Fehler wird ebenfalls ausgedruckt.

SW 14:

Beim Setzen dieses Schalters, läuft das Unterprogramm in einer Schleife ohne Rücksicht auf den Fehler um.

SW 13:

Verhindert den Fehlerausdruck. In der Praxis wird dieser Schalter gesetzt, wenn ein Programm die ganze Nacht über laufen soll und man keine Kilometer Fehlerausdrucke haben möchte.

SW 11:

Das Programm ist so aufgebaut, daß jedes Unterprogramm 8mal ausgeführt wird, bevor es mit dem nächsten Unterprogramm weitergeht. Wird Schalter 11 gesetzt, dann wird jedes Unterprogramm nur einmal abgearbeitet. Dieser Schalter ist von großem Vorteil wenn ein Fehler behoben worden ist und eine Kontrolle durchgeführt werden soll.

Es wird Zeit gespart, da jedes Unterprogramm nur einmal und nicht achtmal durchgeführt wird.

SW 10:

"RING BELL ON ERROR"

11/04 11/34 Rechner mit Operators-Console KY11LA kennen die Adresse 777570 nicht.

Die folgenden vier Möglichkeiten zeigen, wie trotzdem der Testablauf gesteuert werden kann.

1. **Es geht gar nicht:**

Alte Testprogramme (z.B. TC 11, TU 56) laufen nicht auf Maschinen ohne Switchregister.

2. **Erste Neuauflage:**

Der Test benutzt ohne Vorwarnung die Adresse 176 als Software-Switchregister, falls das HW-SWR fehlt. Diese Adresse muß vor dem Starten des Programms geladen werden.

3. **Einmalige Eingabe:**

Nach dem Start fragt das Programm:

OLD = XXXXXX NEW =

Jetzt kann am LA 36 der neue Wert eingegeben werden. Zum Ändern des SWR muß der Test angehalten und neu gestartet werden.

CR := Alter Wert bleibt erhalten

4. **Control-G (Neueste Testausgabe):**

Die Abfrage unter 3) kann jederzeit hervorgerufen werden durch gleichzeitiges Drücken (ca 1 sec) der Taste "CNTL" und der Taste "G".

FKACAØ

11/34 EIS TEST

14		11		8		5		2
13	D	INH. ERROR PRINT /	10		7		4	1
15	D	HALT ON ERROR /	12		9		6	3
								Ø

DEFAULT: 000000

FKTGBØ

11/34 MEMORY MANAGEMENT

14	D	LOOP ON SUBTEST /	11	D	INH. ITE- RATION /	8		5	S	2	
13	D	INH. ERROR PRINT /	10	S	INH. PROC TEST	7	S	4	S	1	
15	D	HALT ON ERROR /	12	D	INH. TRACE TRAPS	9		6	S	3	S
										Ø	S
							INH TC11		INH RK11		INH TTY TYPEOUT

DEFAULT: 000311

ZQMCDØ

16-124 K MEM EXERCISER

14	D	11	D	8	5	D	2
LOOP ON SUBTEST	/	INH ITE- RATION	/	LOOP ON TEST IN SWR	INH VECTOR AREA		SUB TEST LOOP (8)
13	D	10	D	7	4		1
INH ERROR PRINT	/	RING ON ERROR	/	INH RELO- CATION	SUB TEST LOOP (8)		SUB TEST LOOP (8)
15	D	12	D	9	6	D	3
HALT ON ERROR	/	INH KT11	/	LOOP ON ERROR	INH PARITY	SUB TEST LOOP (8)	Ø SUB TEST LOOP (8)

DEFAULT: 000000

ZKMADØ

4 - 124 K MOS-CORE EXERCISER

14	D	11	D	8	5	D	2
LOOP ON SUBTEST	/	ENA PARITY		TYPE FIRST ERROR	INH END PRINT		SUB TEST LOOP (14)
13	D	10	D	7	4	D	1
INH ERROR PRINT	/	HALT AFTER EACH SUBTEST		ENA LONG	INH PRINT OUT		SUB TEST LOOP (14)
15	D	12	D	9	6	D	3
HALT ON ERROR	/	ENA KT11		INH RELO- CATION	INH SIZING	SUB TEST LOOP (14)	Ø SUB TEST LOOP (14)

5 4
DEFAULT: 014000

FKTHAØ 11/34 KT11 DIAGNOSTIC

14	D	11	D	8	5	2
LOOP ON SUBTEST	/	INH ITE- RATION	/	LOOP ON TEST IN SWR	LOOP (8)	LOOP (8)
13	D	10	D	7	4	1
INH ERROR PRINT	/	RING ON ERROR	/	LOOP (8)	LOOP (8)	LOOP (8)
15	D	12	D	6	3	Ø
HALT ON ERROR	/	INH TRACE TRAPS	/	LOOP IN ERROR	LOOP (8)	LOOP (8)

DEFAULT: ØØØØØØ

CMFADØ COMBINED PARITY MEM EXERCISER

14	D	11	D	8	5	2
LOOP ON SUBTEST	/	INH ITE- RATION	/	HALT AT END OF PASS		
13	D	10	D	7	4	1
INH ERROR PRINT	/	HALT AFTER BAD PARITY	/			
15	D	12	D	6	3	Ø
HALT ON ERROR	/	HALT AFTER MEM MAP	/			

DEFAULT: ØØØØØØ

ZKWAØ

KW11L LINE CLOCK TEST

14	D	11	D	8	S	5	2
LOOP ON SUBTEST	/	INH ITE- RATION	/	LOOP ON TEST IN SWR		TEST (8)	TEST (8)
13	D	10	D	7		4	1
INH ERROR PRINT	/	RING ON ERROR	/	TEST (8)		TEST (8)	TEST (8)
15	D	12	D	6		3	Ø
HALT ON ERROR	/	LOOP ON ERROR		TEST (8)		TEST (8)	TEST (8)

DEFAULT: 000000

FFP???

1134 FLOATING POINT # 1, 2, 3

14	D	11	D	8	S	5	2
LOOP ON SUBTEST	/	INH ITE- RATION	/	LOOP ON TEST IN SWR		TEST (8)	TEST (8)
13	D	10	D	7		4	1
INH ERROR PRINT	/	RING ON ERROR	/	PRINT SUMMARY (# 1)		TEST (8)	TEST (8)
15	D	12	S	6		3	Ø
HALT ON ERROR	/	LOOP ON TRAPS		TEST (8)		TEST (8)	TEST (8)

DEFAULT: 000200

ZDLDBØ

DL11W DIAGNOSTIC

14	D	11	8	5	2
LOOP ON SUBTEST	/		ENA BREAK	ALLOW DEVM	S
13	D	10	7	4	1
INH ERROR PRINT	/	D	ENA WRAP	INH SLU	
15	D	12	9	6	3
HALT ON ERROR	/	D	LOOP ON ERROR	INH RTC	Ø

DEFAULT: ØØØØØØ

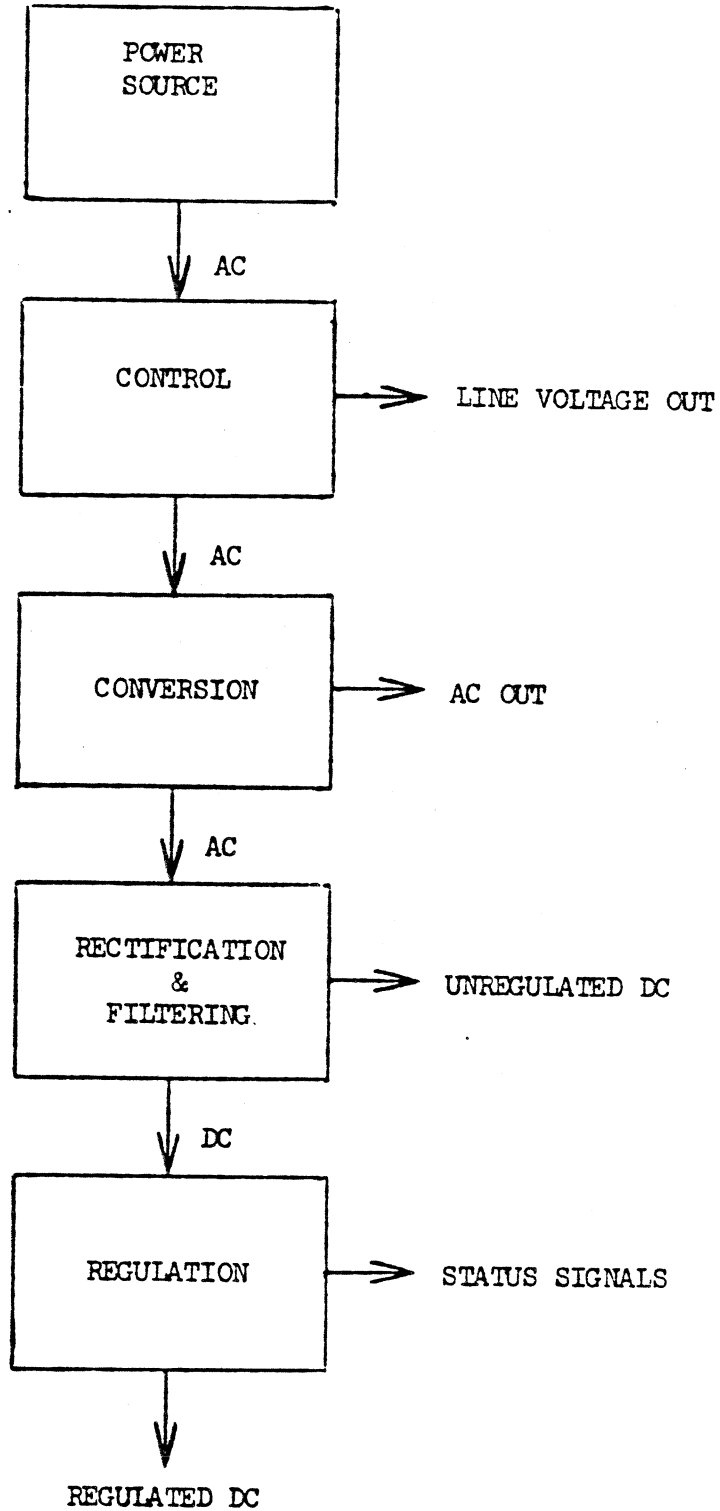
ZKLAEØ

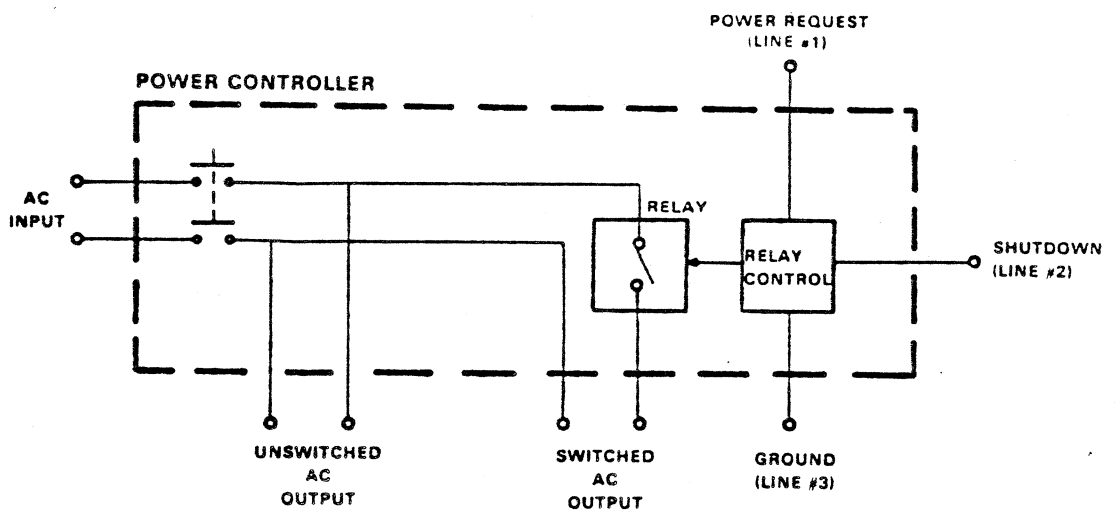
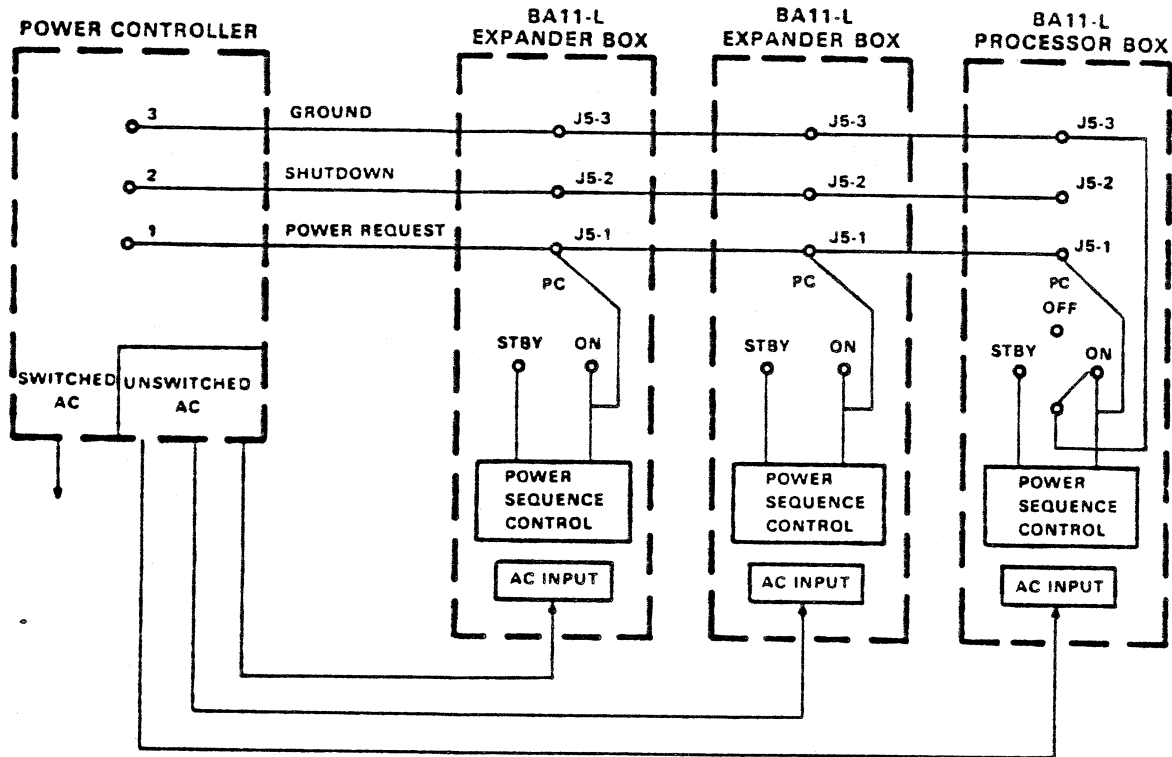
DL11, LA36 TEST

14	D	11	8	5	2
LOOP ON SUBTEST	/	D	RUN FULL SPEED	TEST (9)	TEST (9)
13		10	7	4	1
		D		TEST (9)	TEST (9)
15	D	12	9	6	3
HALT AT END		S	TEST (9)	TEST (9)	TEST (9)

DEFAULT: ØØØØØØ

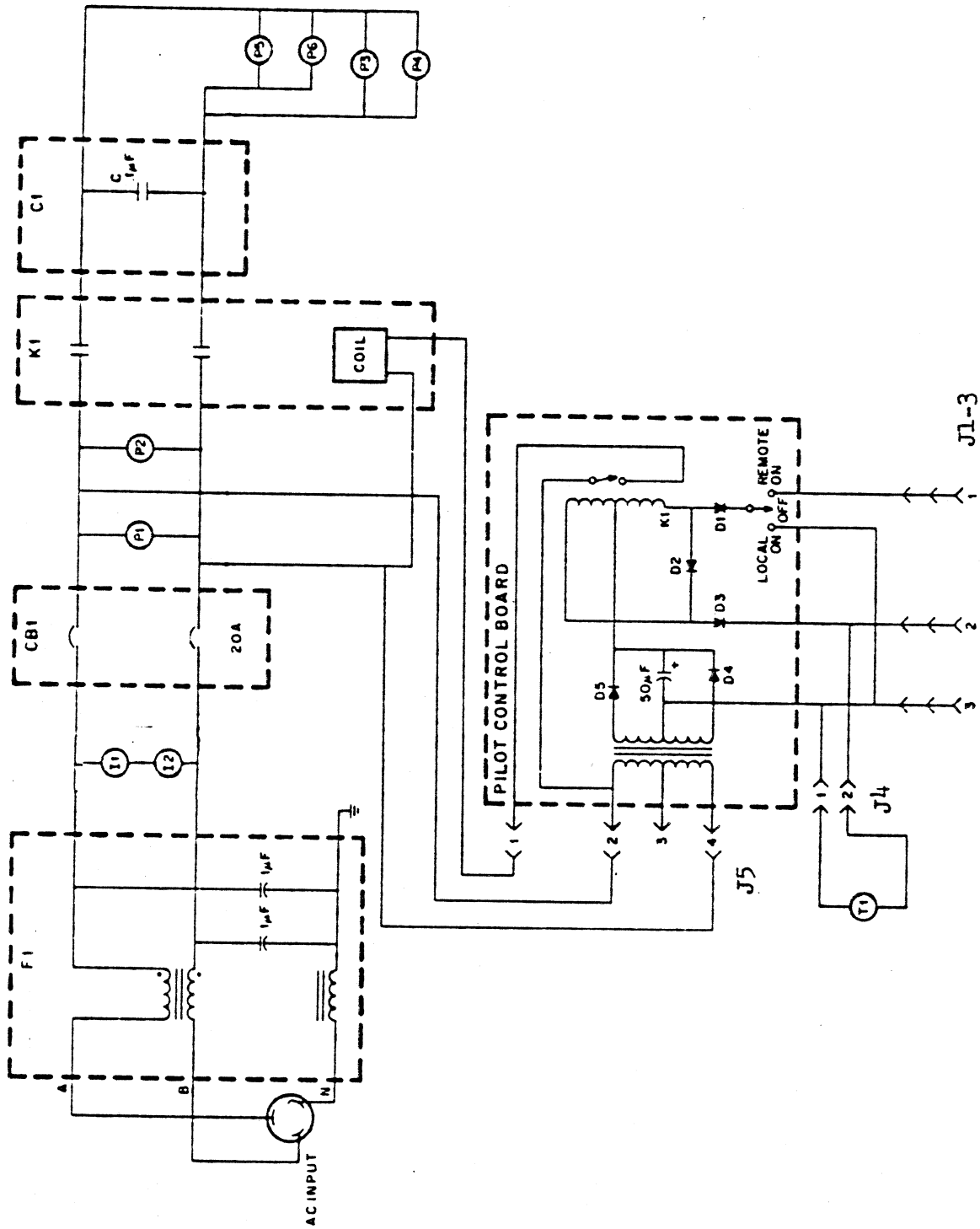
GENERAL POWER SUPPLY BLOCK





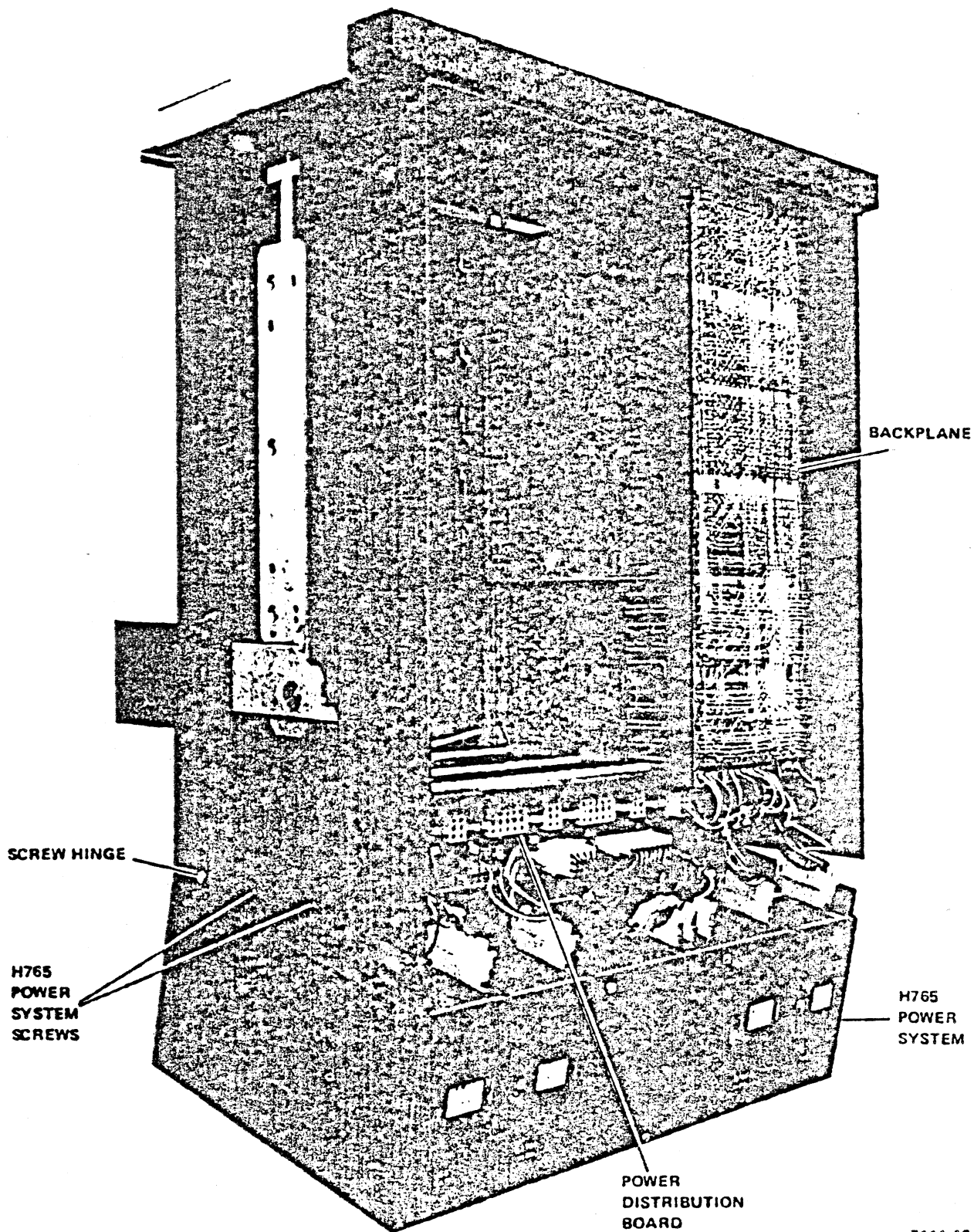
MA-0003

Remote Power Control



CS-0337

861 B Simplified Circuit Schematic Diagram



7111-16

Figure 4-4 H765 Power System Access (Maintenance Position)

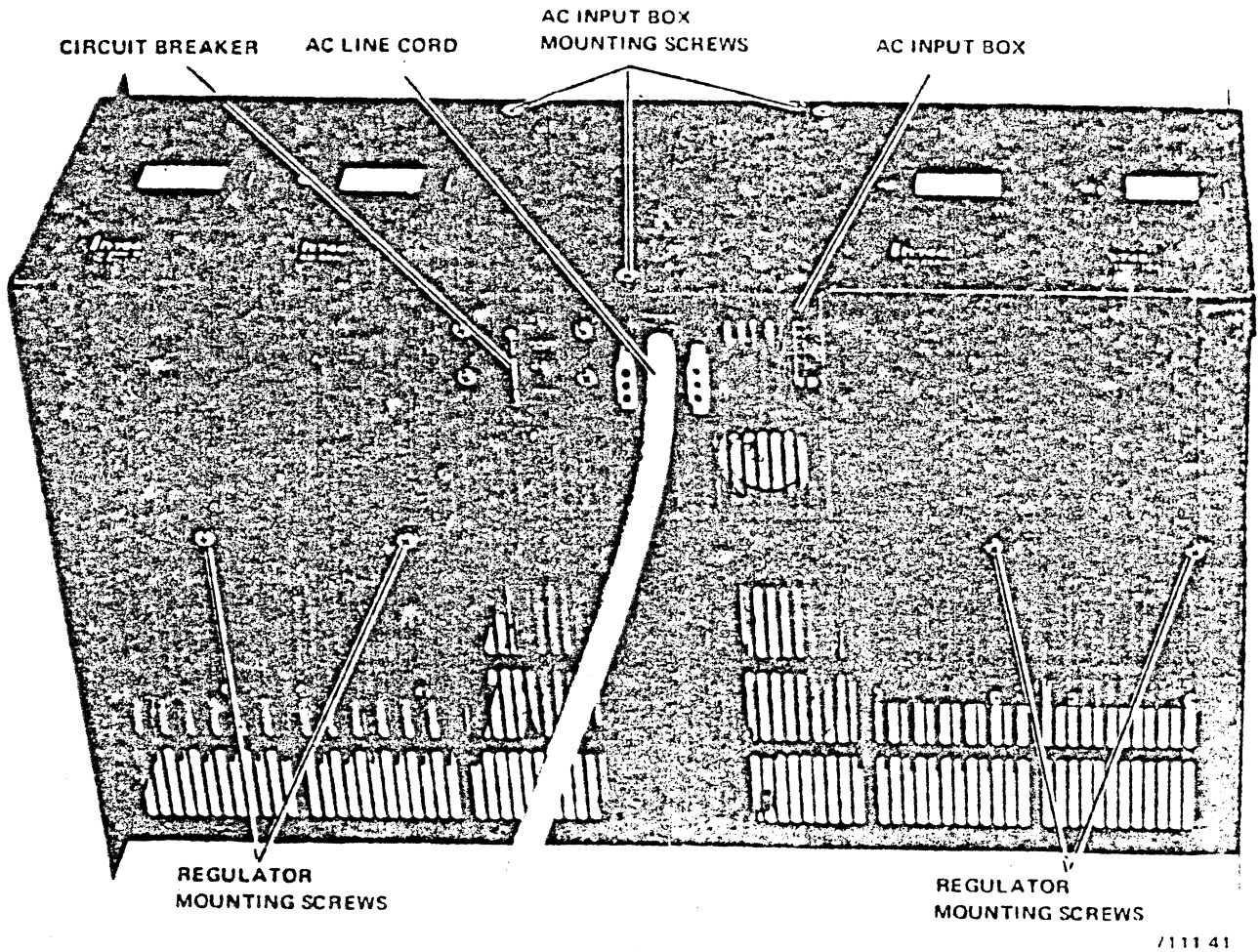


Figure 4-6 11765 Power System

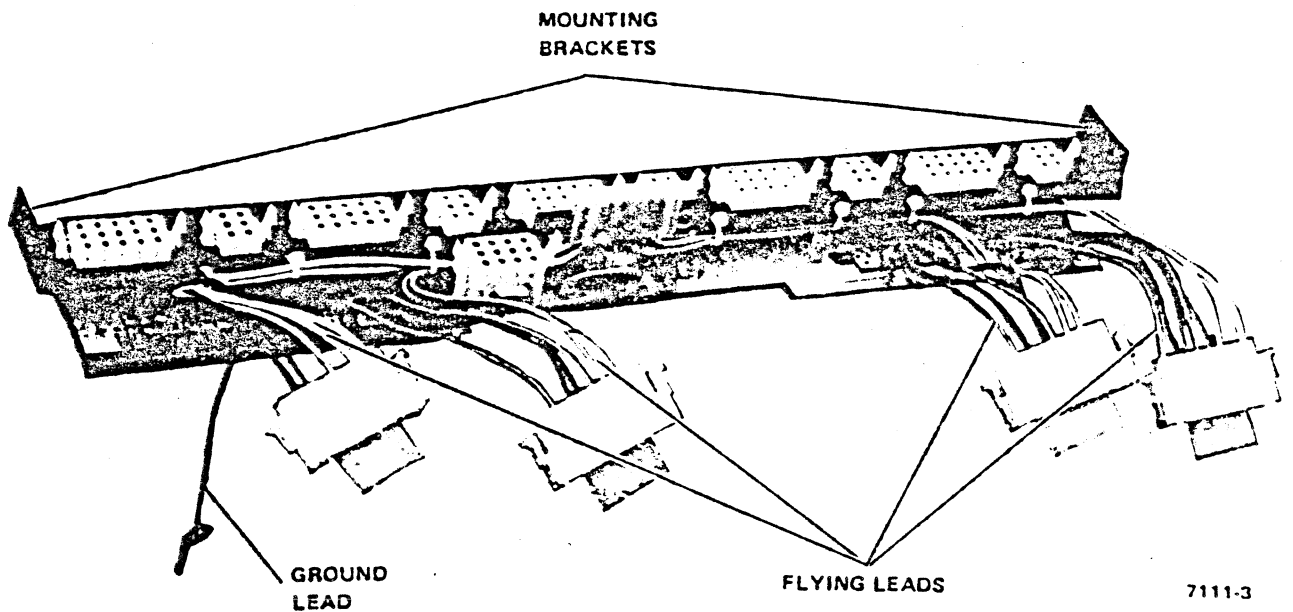
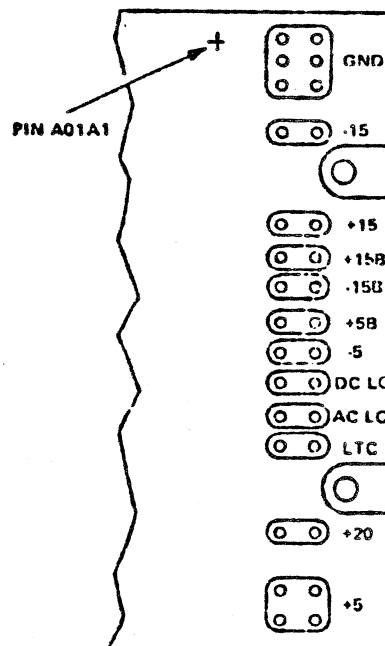
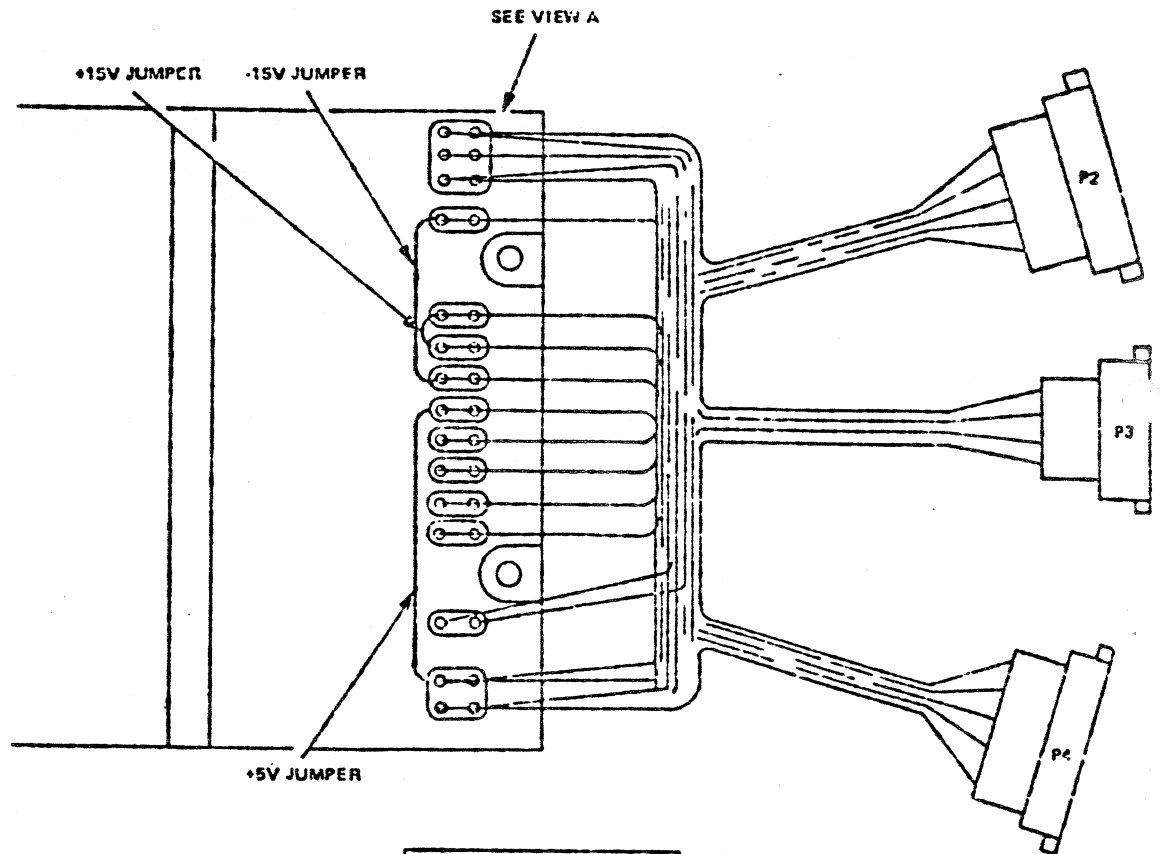


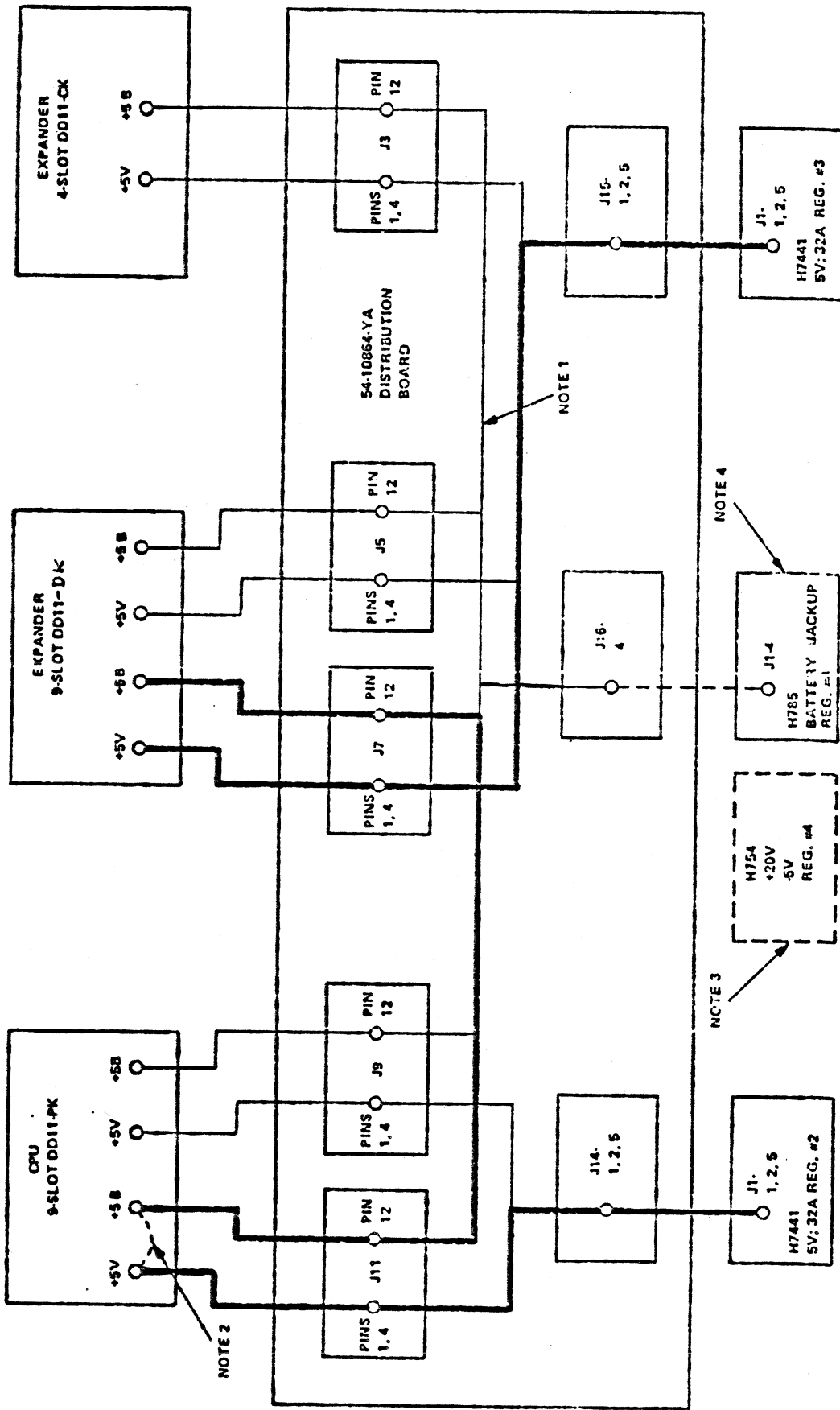
Figure 4-10 Power Distribution Board



NOTES

- 1. JUMPERS SHOWN ARE
 - 15 TO -15B
 - +15 TO +15B
 - +5 TO +5B
- 2. USE #20 INSULATED BUS WIRE FOR JUMPERS

VIEW A



NOTE 2

NOTE 1

NOTE 3

NOTE 4

NOTE 1

NOTE 2

NOTE 3

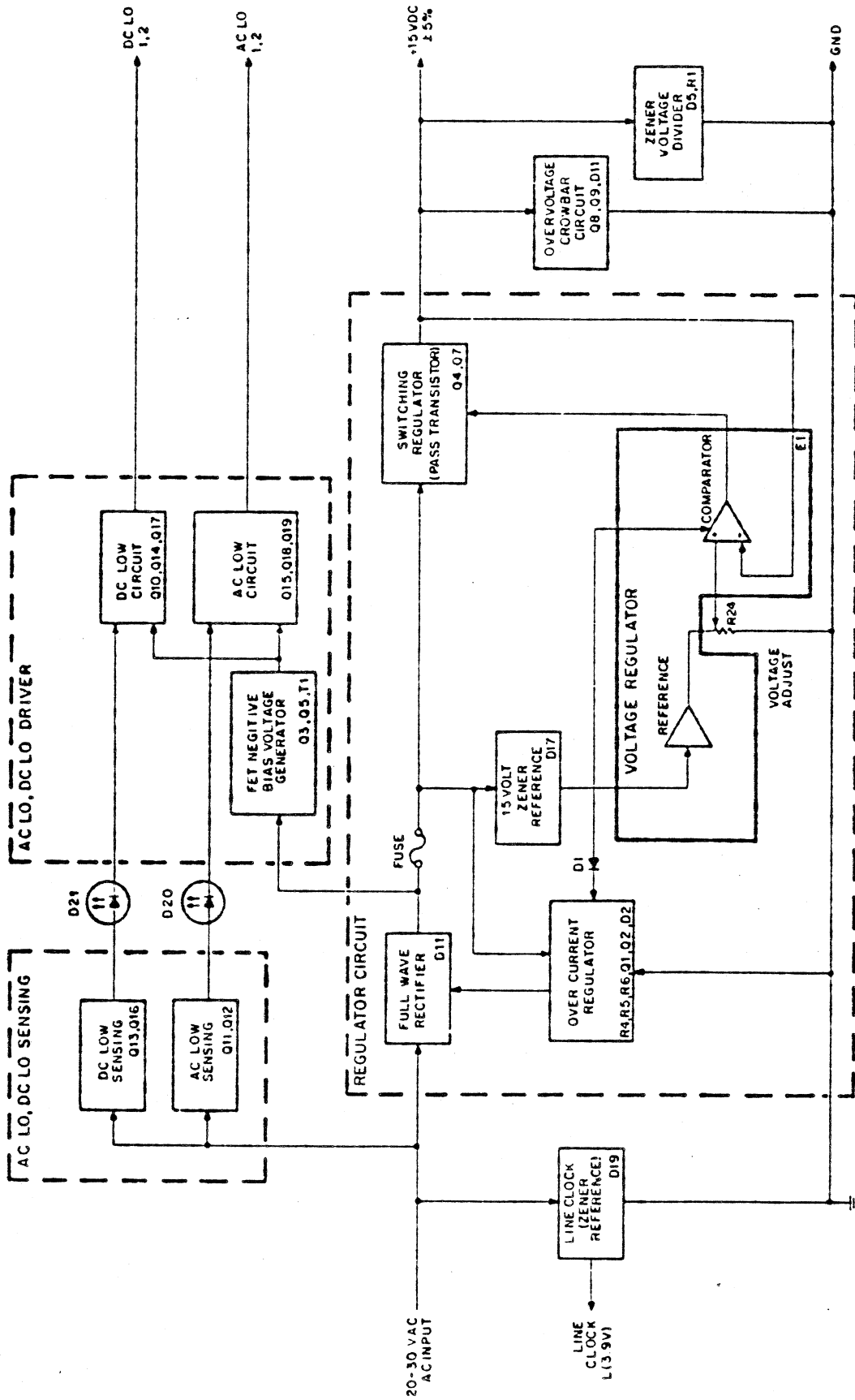
NOTE 4

NOTE 3 This regulator is present if there is no Battery Backup option.

NOTE 4 This regulator is inserted in regulator slot location #4 if a Battery Backup option is present. It supplies +15B; -15B; +5B & +5R to the bus bar for MOS memory.

NOTE 1 +5B bus bar. Available on the 54-10864-YA Distribution Panel only. It was designed for a Battery Backup option.

NOTE 2 This jumper must be installed in the CPU backplane if a Battery Backup option is not present. It places +5 Volts on the +5B bus bar for distribution to backplane modules.



11-2708

Figure 3-6 5411086 Block Diagram

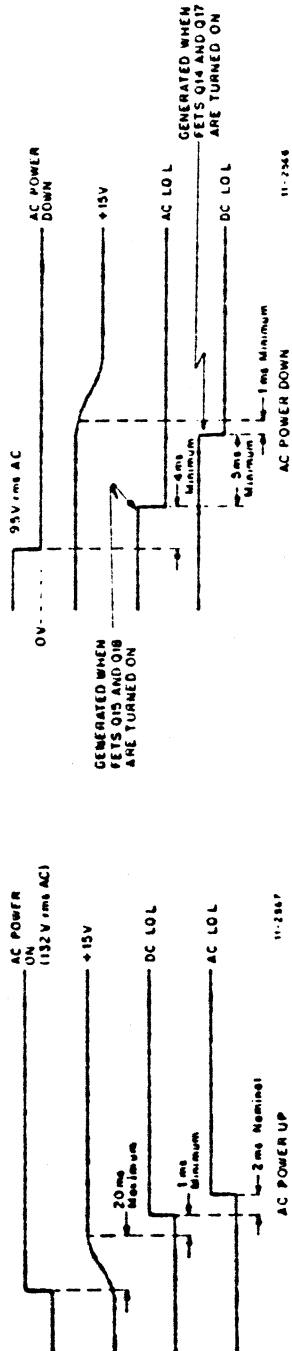


Figure 3-8 S411086 Power Up and Power Down

The +25 Vdc to +45 Vdc from rectifier D11 is applied to T1, Q3, and Q5. Q3 and Q5 due to their switching action creates a pulsating dc which is applied to the primary of transformer T1. The output from the secondary of T1 (approximately 15 V) is rectified by D6, D7, D8, and D9, producing -10 Vdc to -15 Vdc. The -10 Vdc to -15 Vdc is negative bias used to gate OFF J FETs Q15, Q18, Q14, and Q17 via Q19 and Q10. Unlike most transistors the negative bias is used to turn off the J FETs. The J FETs are turned on when there is zero volts between gate (G) and source (S) terminals.

AC LO and DC LO Indicators - Light-emitting diodes D20 and D21 are normally lit. When AC LO L and DC LO L are asserted, the light-emitting diodes go off, indicating that this regulator is the source of AC LO L or DC LO L on the Unibus.

BA 11 K:

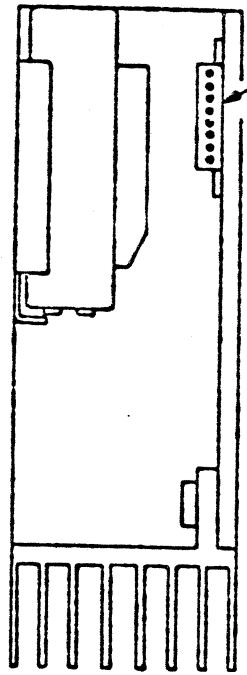
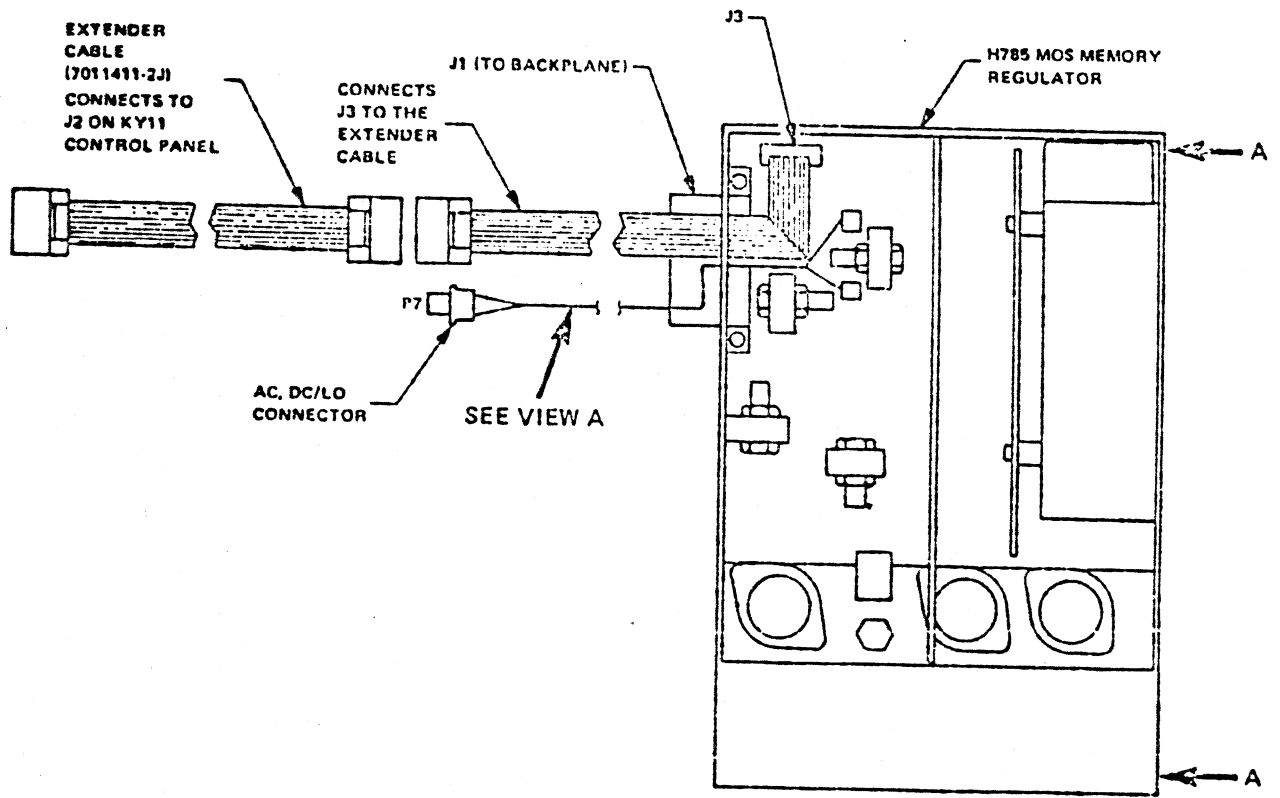
Table 4-2
Regulator Specifications

Regulator	Voltage and Regulation at Backplane	Maximum Voltage at Regulator (Note 1) (Vdc)	Maximum Output Current (A)	Maximum Peak-to-Peak Ripple
H744	+5 Vdc ± 250 mV	5.5	25	200 mV
H745	-15 Vdc ± 750 mV	16	10	450 mV
H754	+20 Vdc ± 1 V	21.5	8	5% } (Note 2)
(Note 4)	-5 Vdc ± 250 mV	5.5	1-8 (Note 3)	5% }
5411086	+15 Vdc ± 10%		4	3%

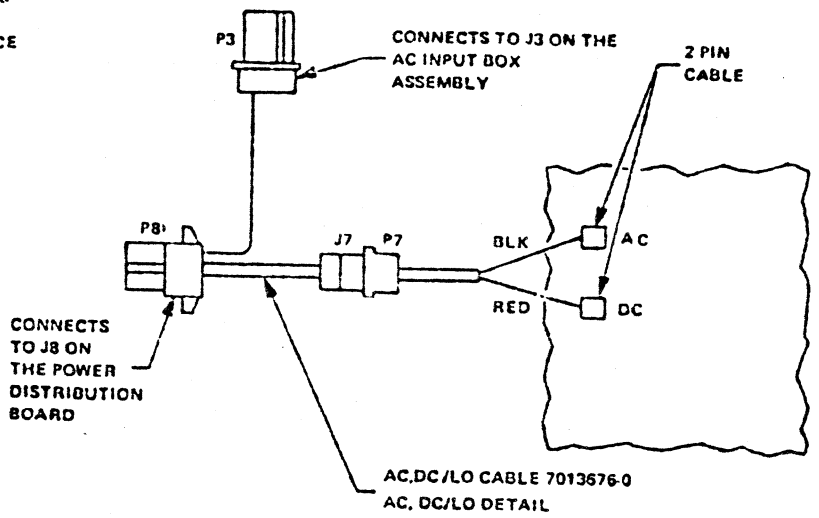
- Notes:**
1. Do not adjust the regulator to these voltages. They represent the maximum regulator voltage prior to crowbar.
 2. At backplane. Typical ripple ≈ ±3%.
 3. Maximum -5 V current is dependent upon +20 V current. It is equal to 1 A plus the current of the +20 V supply up to a total of 8 A.
 4. When adjusting the output of H754, adjust +20 Vdc first, then -5 Vdc (Paragraph 3.4.6).

H 785: + 5V 4A
 +15V 2A
 -15V 0,2A

BA 11 L:	MOS Regulator (5411601)	+15B	±450 mV	0-2 A	
		-15 B	±450 mV	0-2 A	
		+15 V	-200 mV max at +15B Output	0-1A	
		-15 V	-200 mV max at -15B Output	0-1 A	
		+5B	+100 mV -150	0-4 A	
	Core Regulator (5411599)	+20 V	±500 mV	0-6 A	
		-5 V	+100 mV -150	0-4 A	
		5 V Regulator (7011073)	+5 V	+100 mV -150	0-25 A
		or +5 V Regulator (7012909)	+5 V	+100 mV -150	0-32 A



VIEW A-A



VIEW A

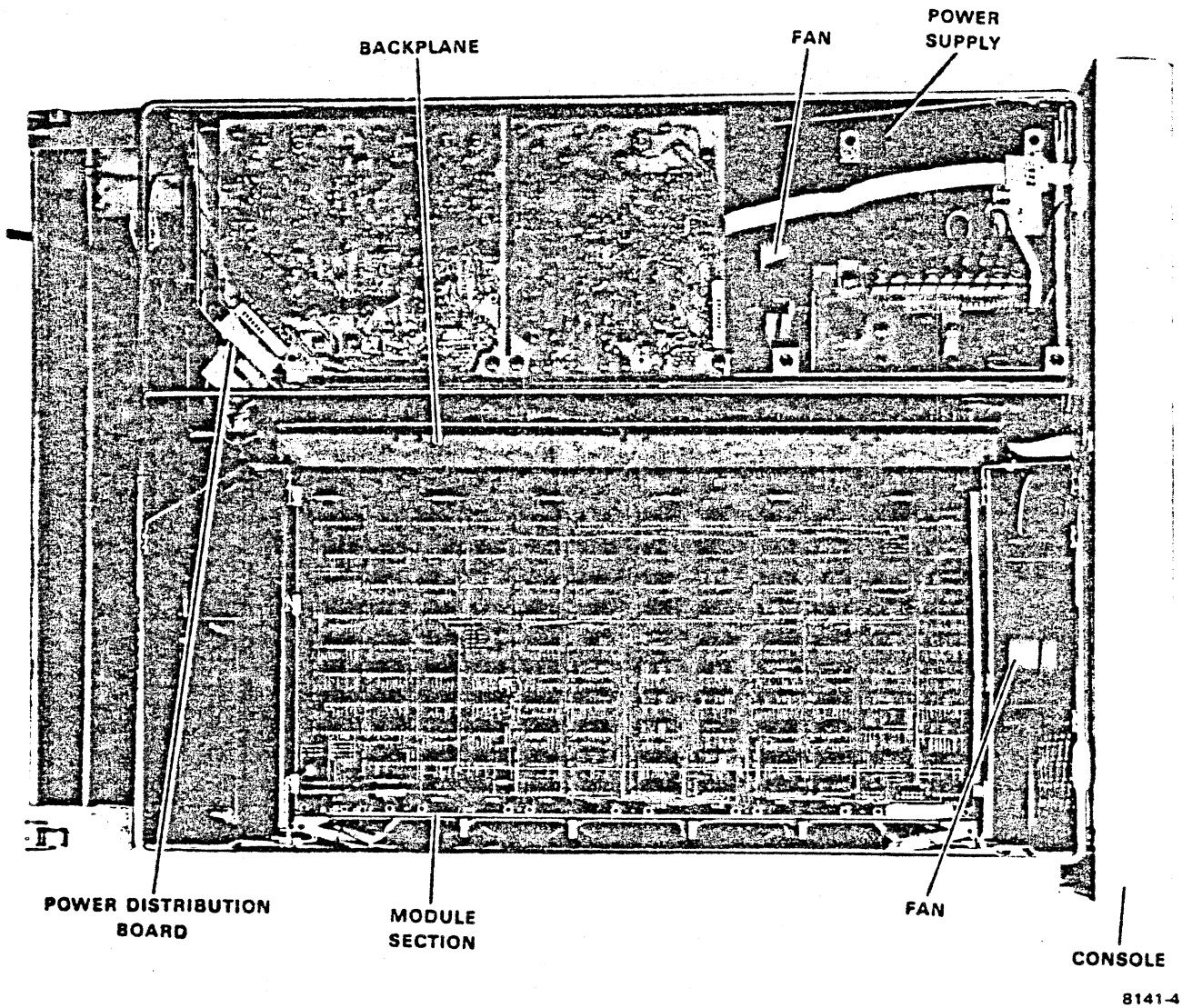
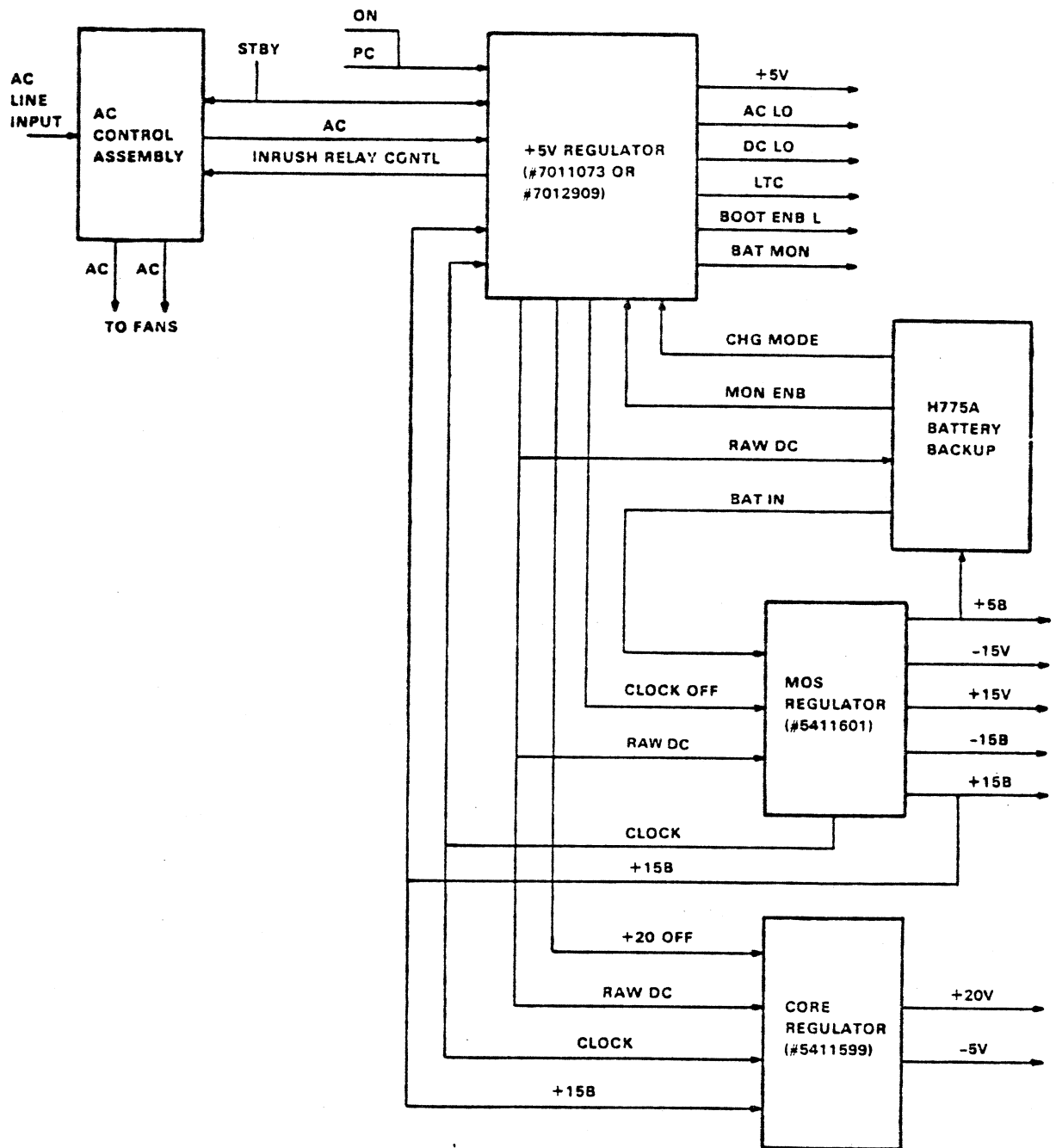
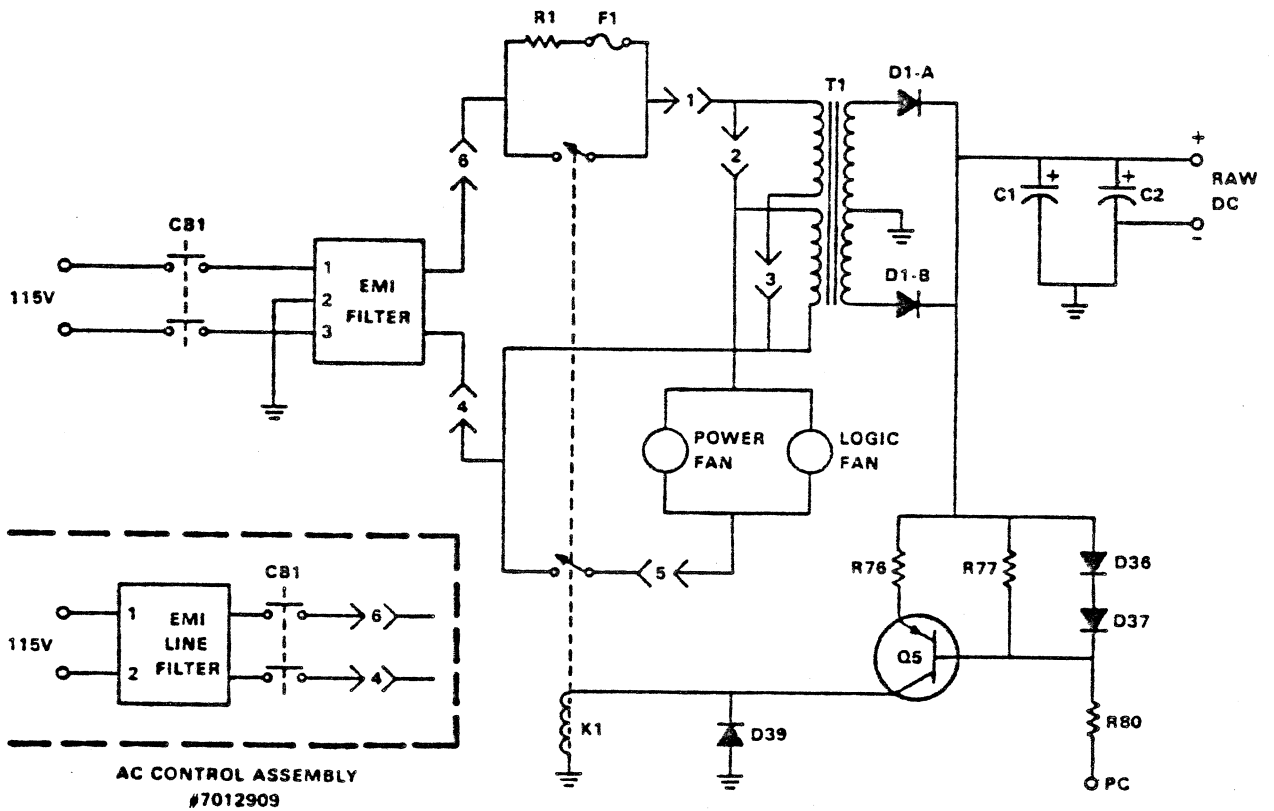


Figure 1-1 BA11-L Mounting Box



MA-0007

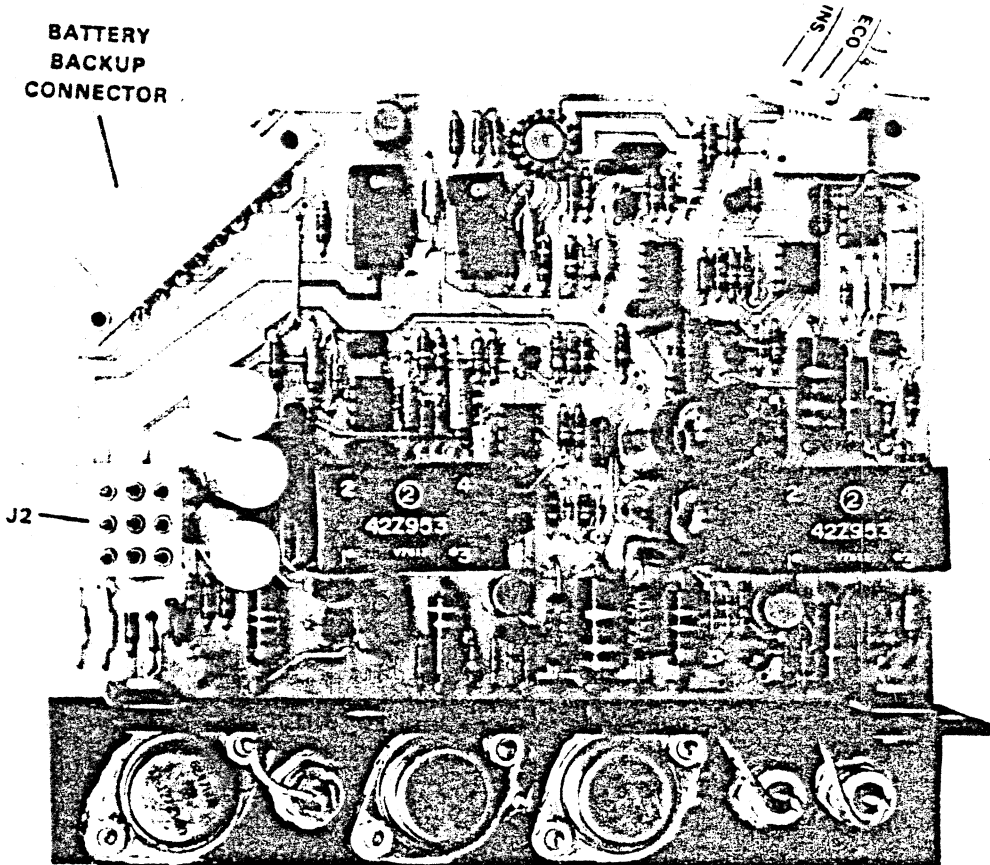
Figure 3-2 H777 Block Diagram



NOTE: CONNECTIONS SHOWN ARE TO TB2
IN THE AC CONTROL ASSEMBLY

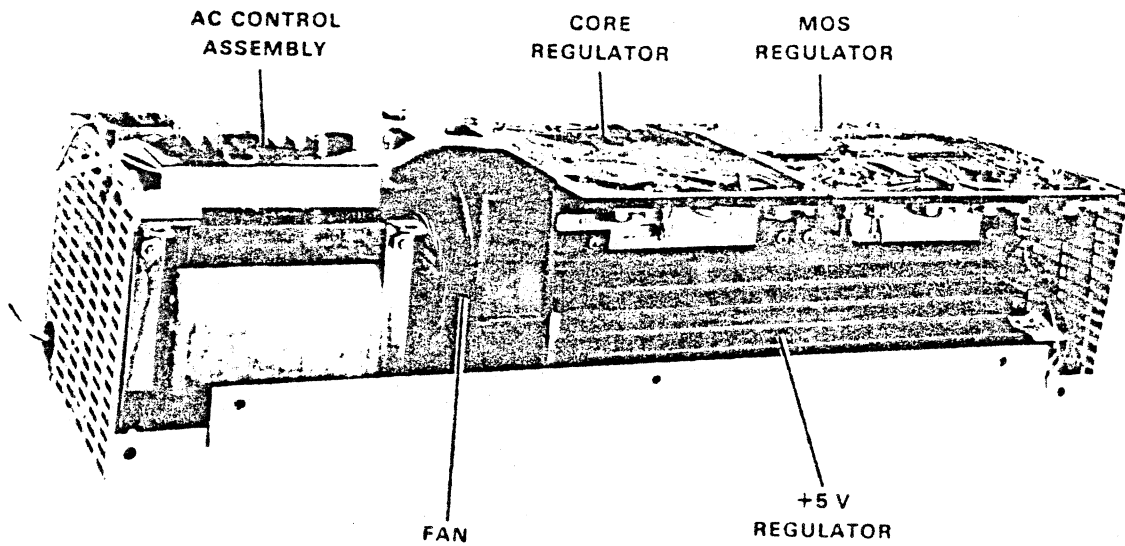
MA-0011

Figure 3-3 Raw DC Circuit



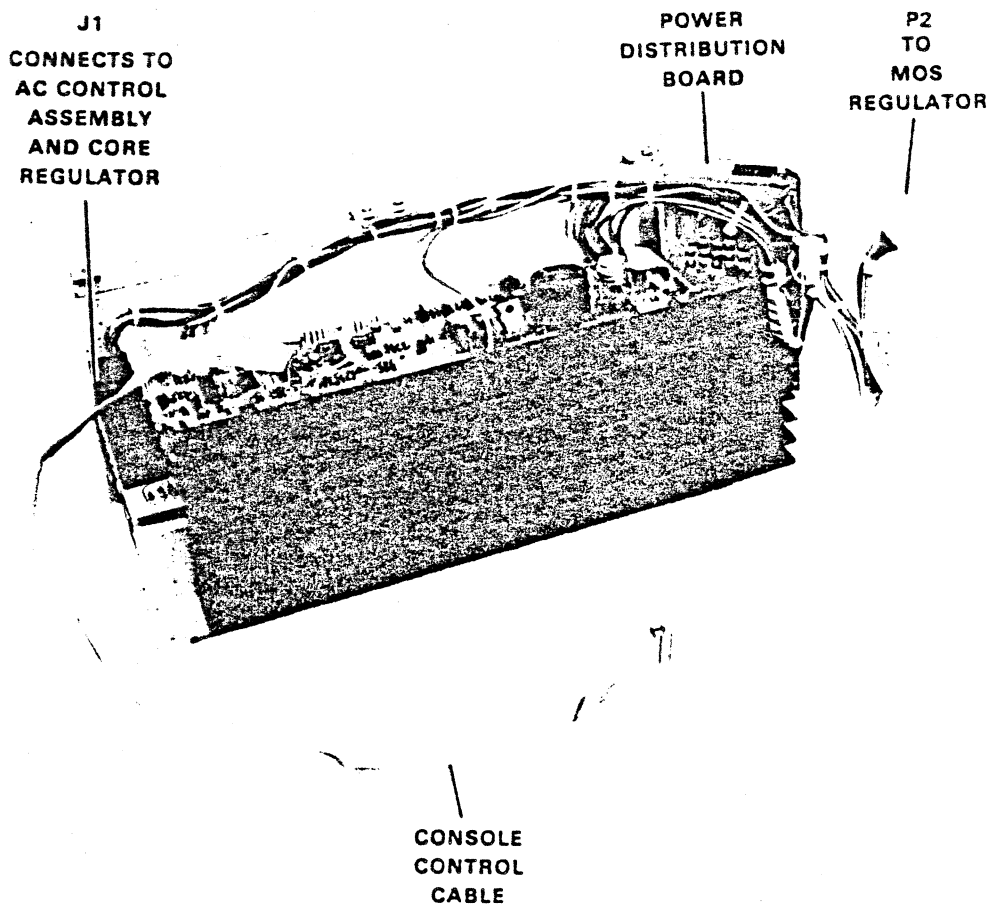
8141-19

Figure 3-6 MOS Regulator Board

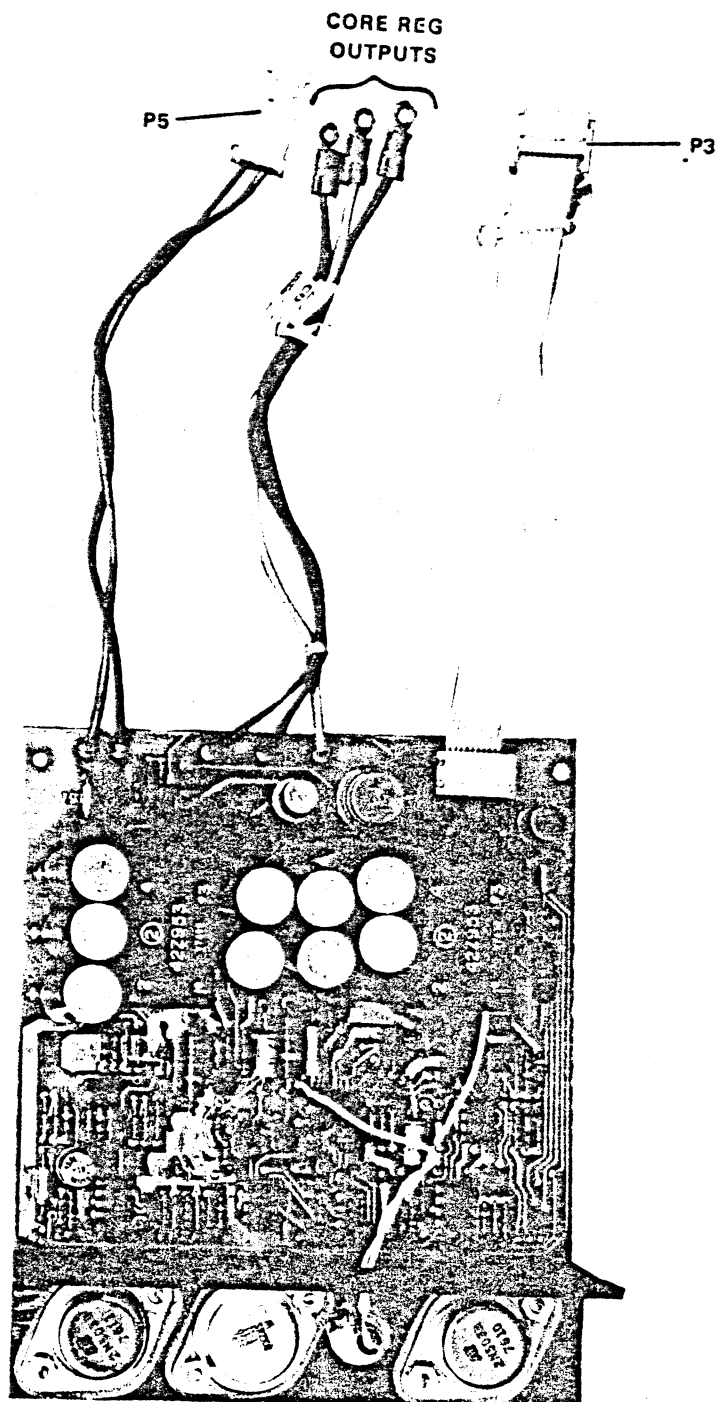


8141-13

Figure 1-3 H777 Power Supply

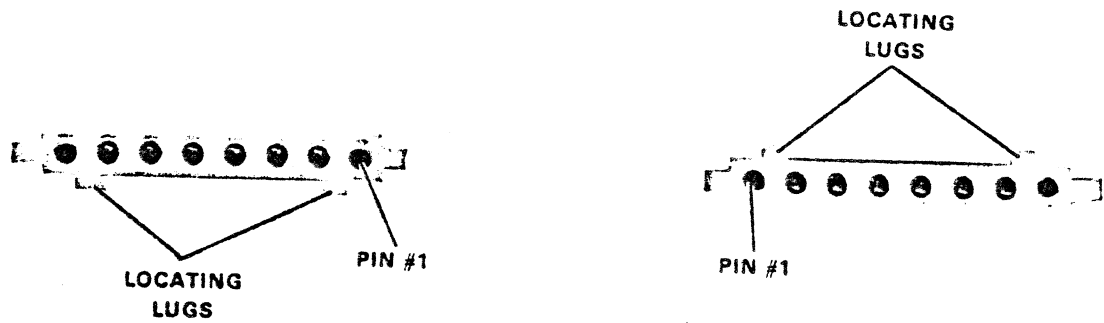


8141-9



8141-18

Figure 3-17 Core Regulator Board

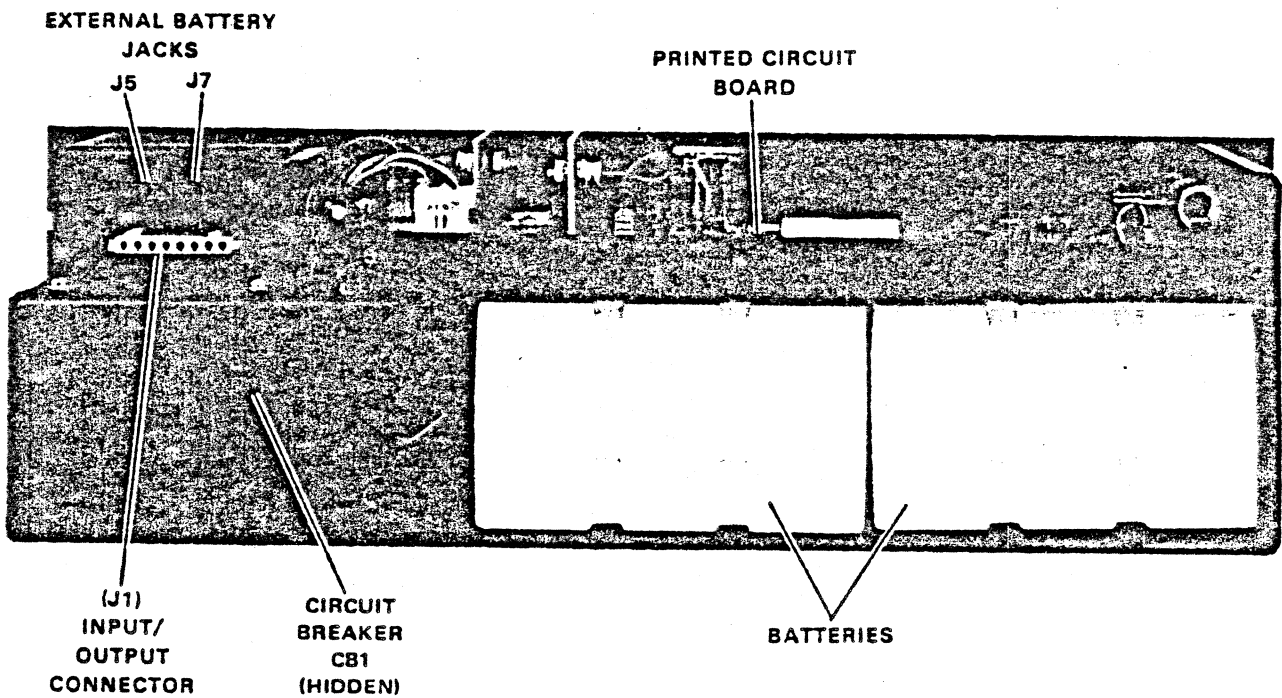


a. Battery Backup Connector
H777

b. Battery Backup (J1)
H775A

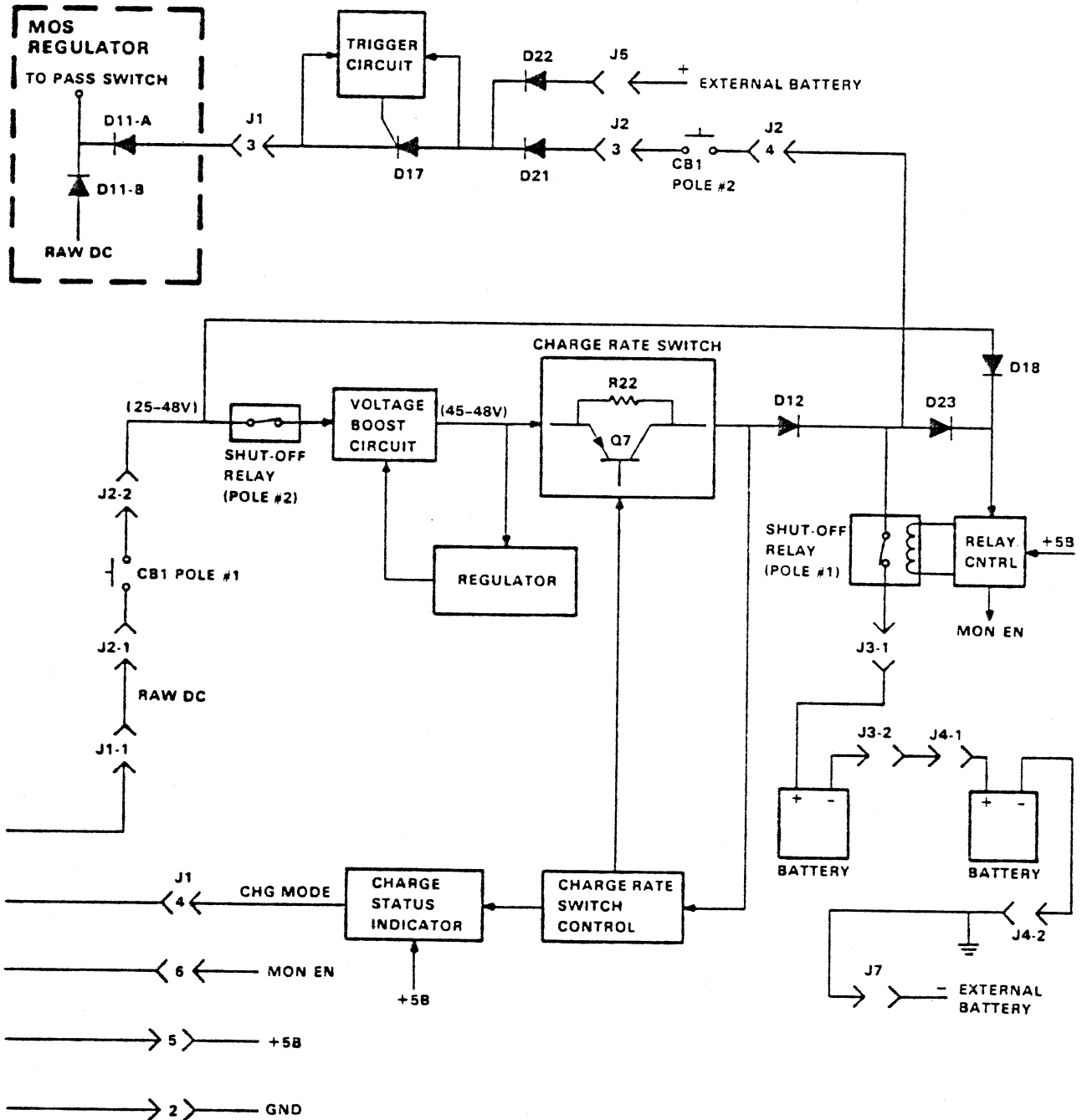
8141-17

Figure 5-10 H775A Input/Output Connectors



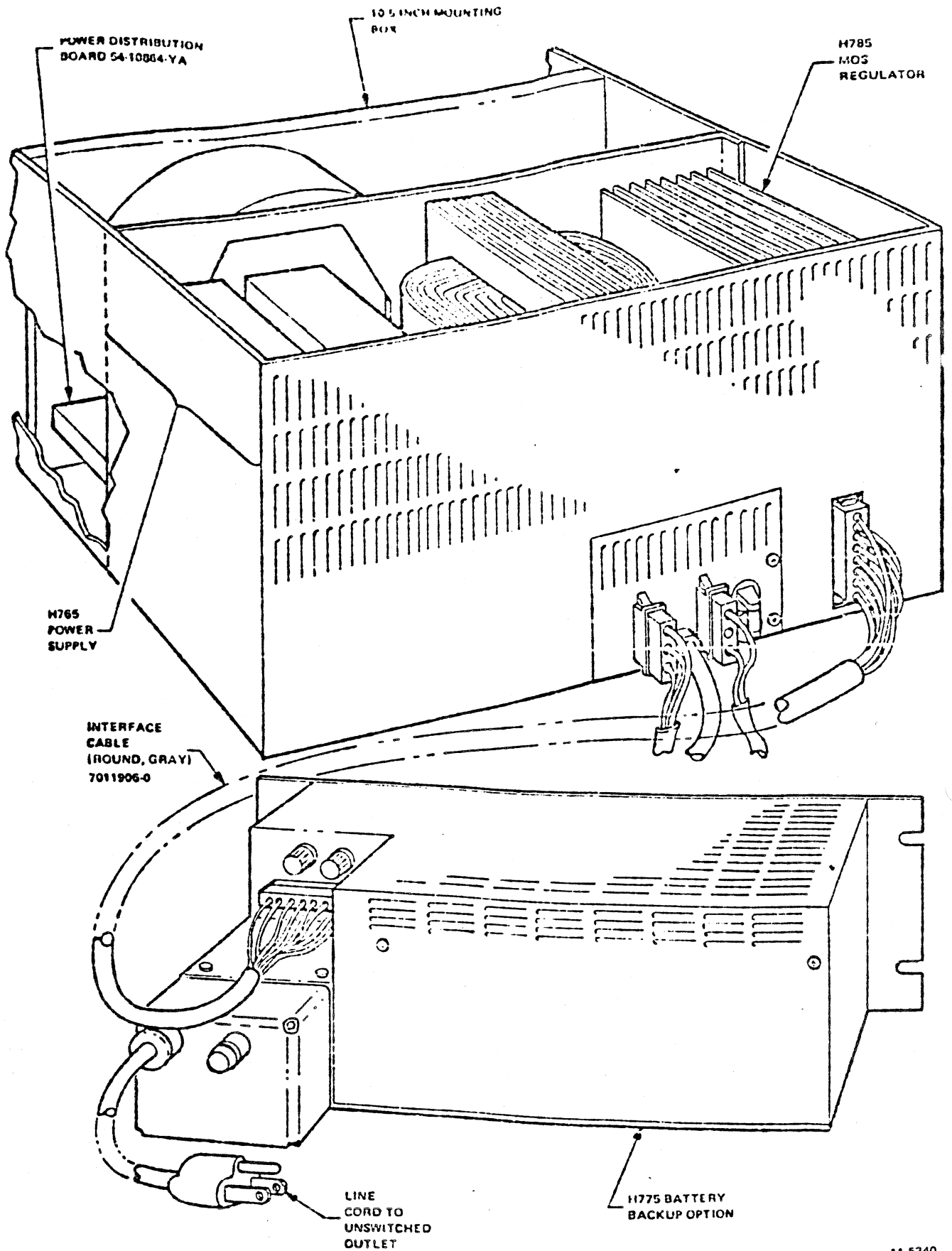
7883-4

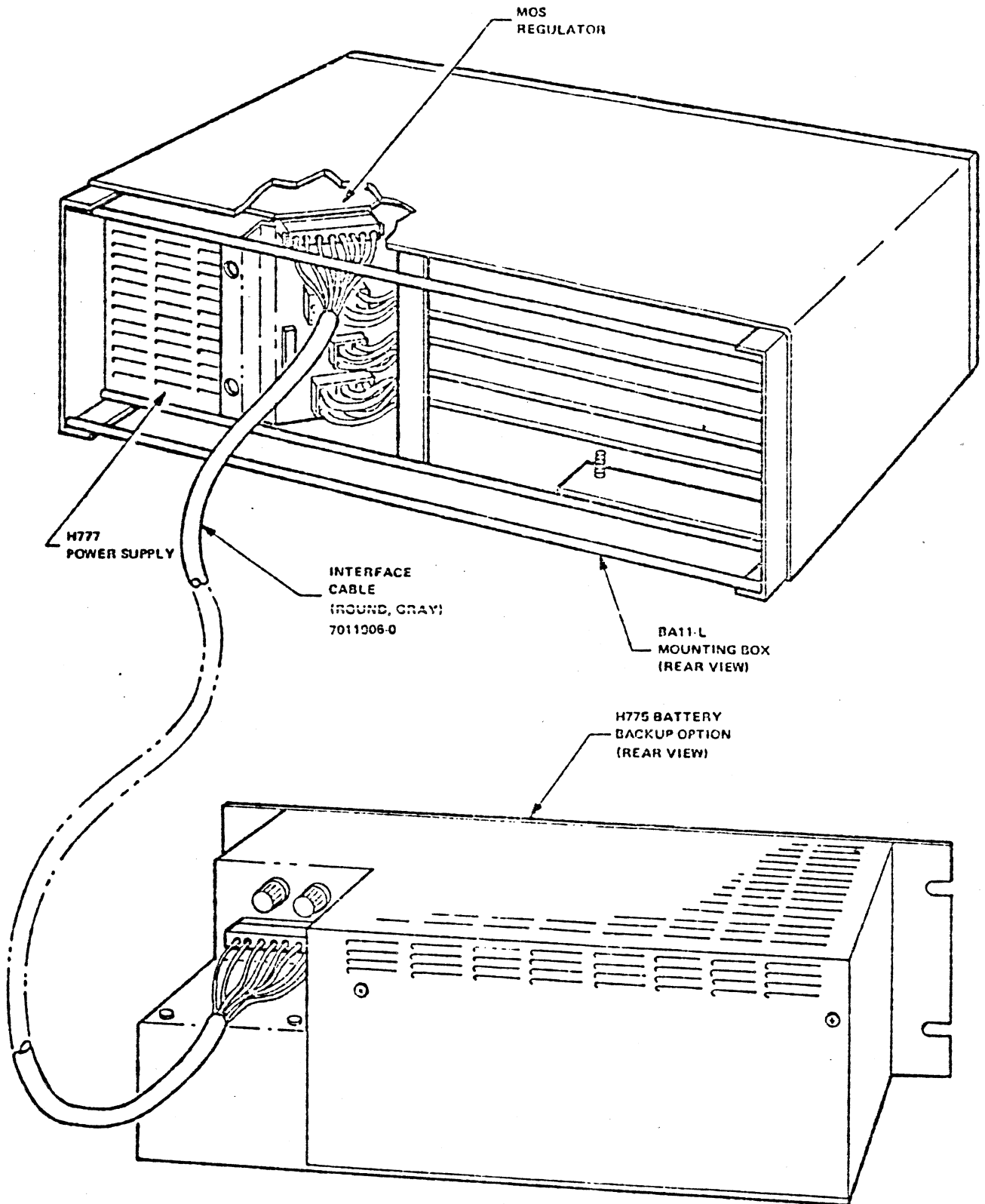
Figure 4-1 H775A Battery Backup Unit (Rear View)

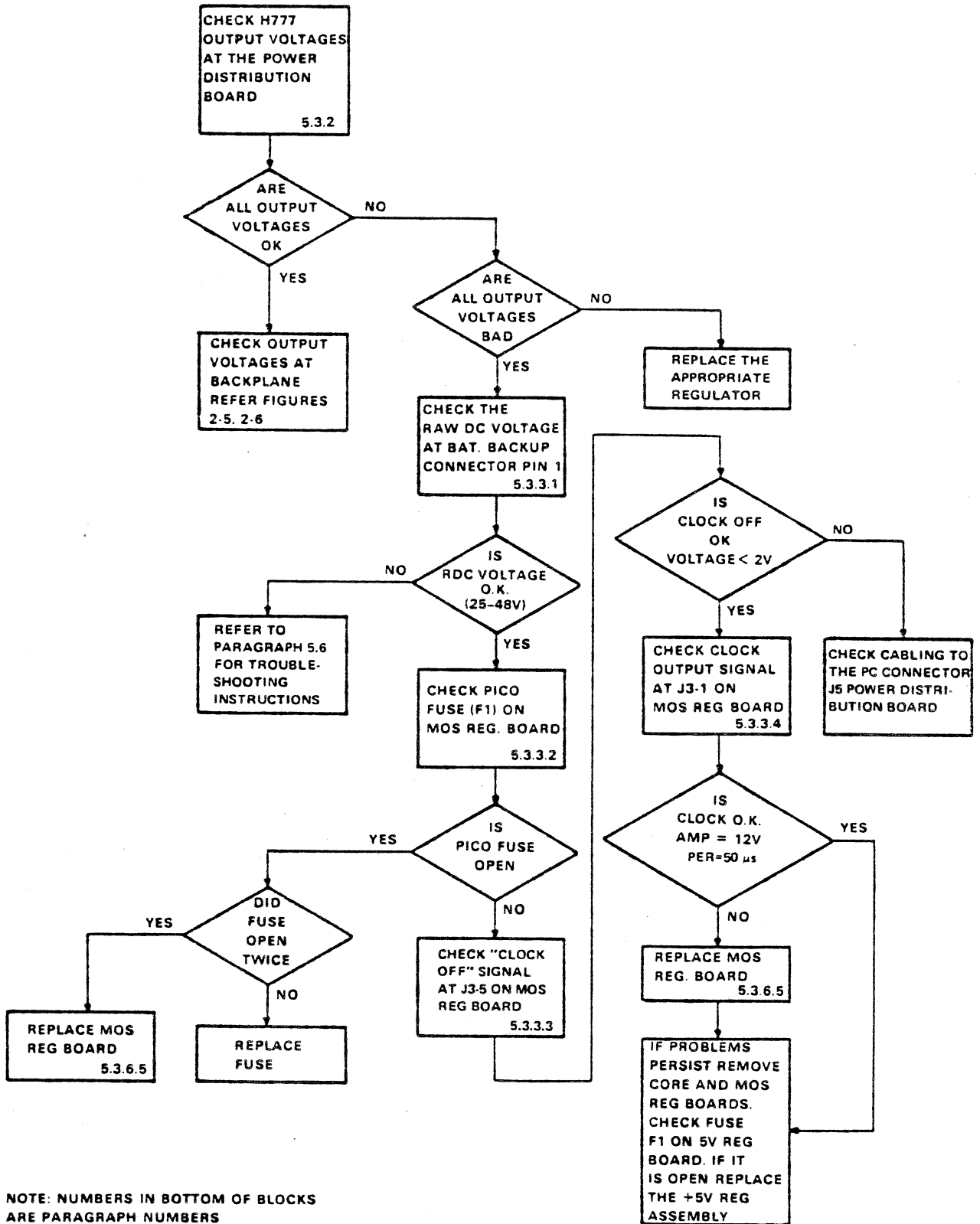


MA 0040

Figure 4-4 H775A Block Diagram







NOTE: NUMBERS IN BOTTOM OF BLOCKS
ARE PARAGRAPH NUMBERS

MA-0002

CHECK PICO FUSE
F2 ON MOS
REG BOARD.
5.3.7.4

CHECK INPUT/
OUTPUT CABLE
FOR CONTINUITY
5.3.7.1

CHECK BATTERY
VOLTAGE ACROSS
J3-1 AND J4-2
(J4-2 IS GND)
5.3.7.2

CHECK RELAY
CIRCUIT WITH
H777 POWER -
ON AND OFF
5.3.7.3

CHECK
DISCHARGE
CIRCUIT
5.3.7.5

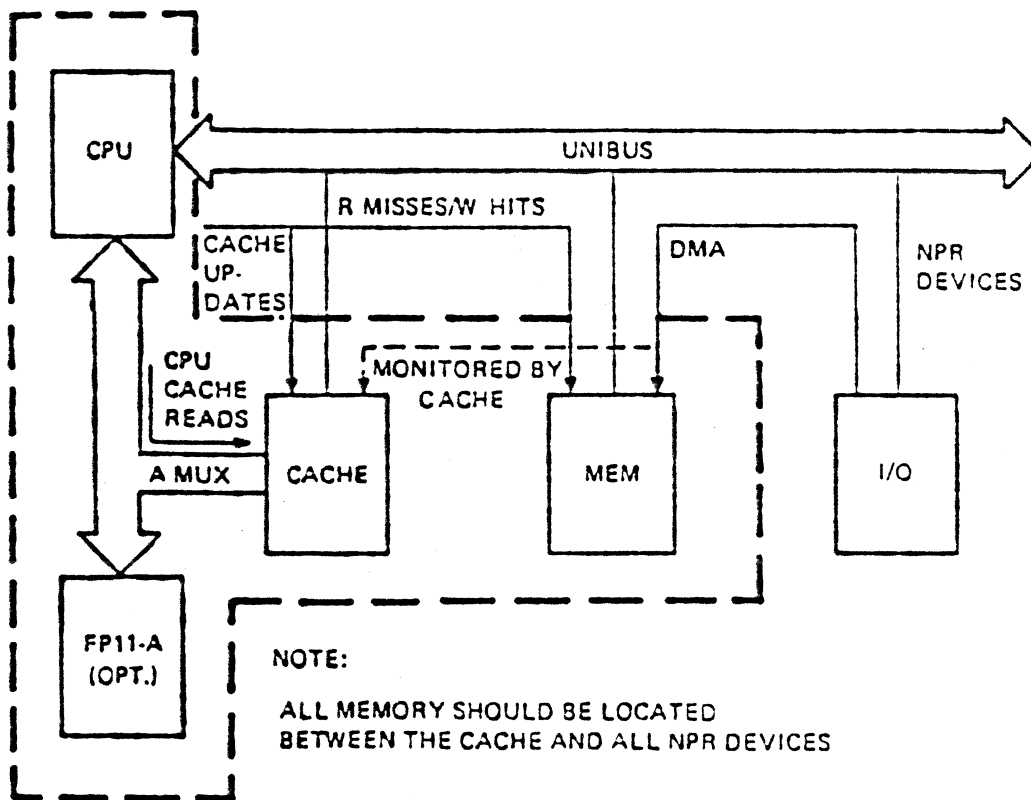
CHECK CHARGING
CIRCUITRY
(VOLTAGE BOOST,
REGULATOR,
CHARGE RATE
SWITCH AND
CONTROL)
5.3.7.6

IF A PROBLEM
STILL EXISTS
SUSPECT A
FAULTY BATTERY

NOTE: NUMBERS IN
BOTTOM OF BLOCKS
REFER TO A PARAGRAPH
FOR ADDED INFORMATION

MA.0016

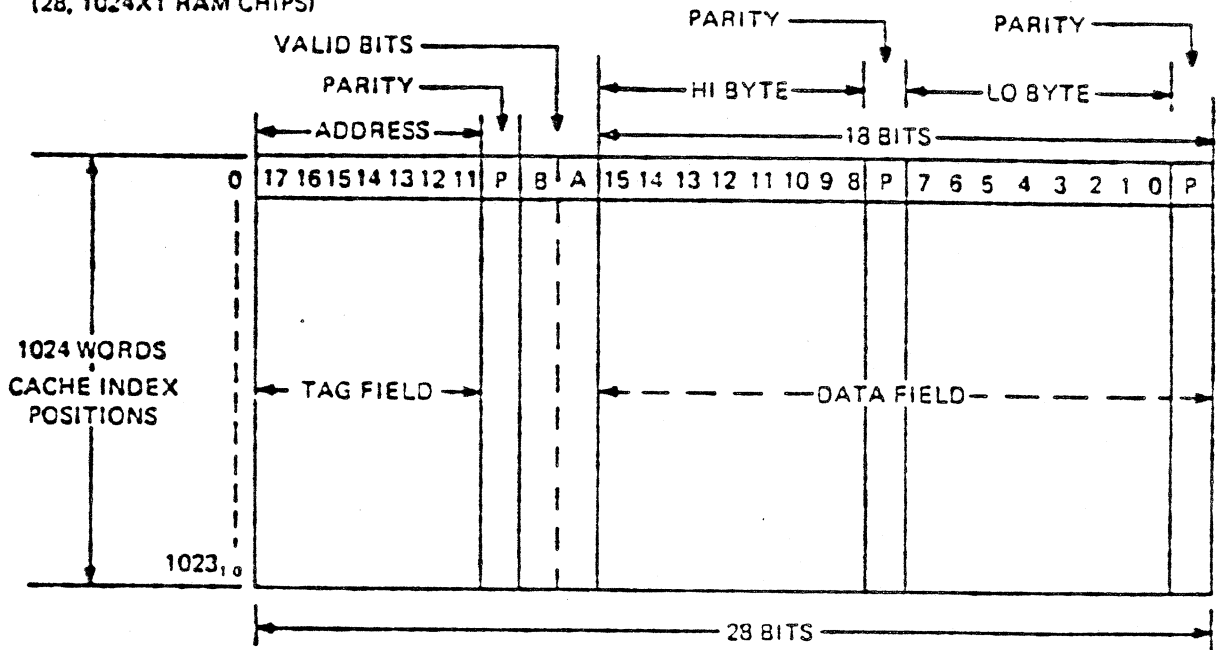
Figure 5-9 H775A Troubleshooting Flowchart



MA-1896

General System Architecture

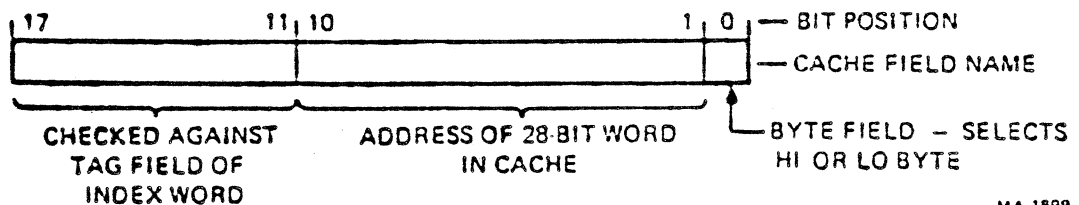
(28, 1024X1 RAM CHIPS)



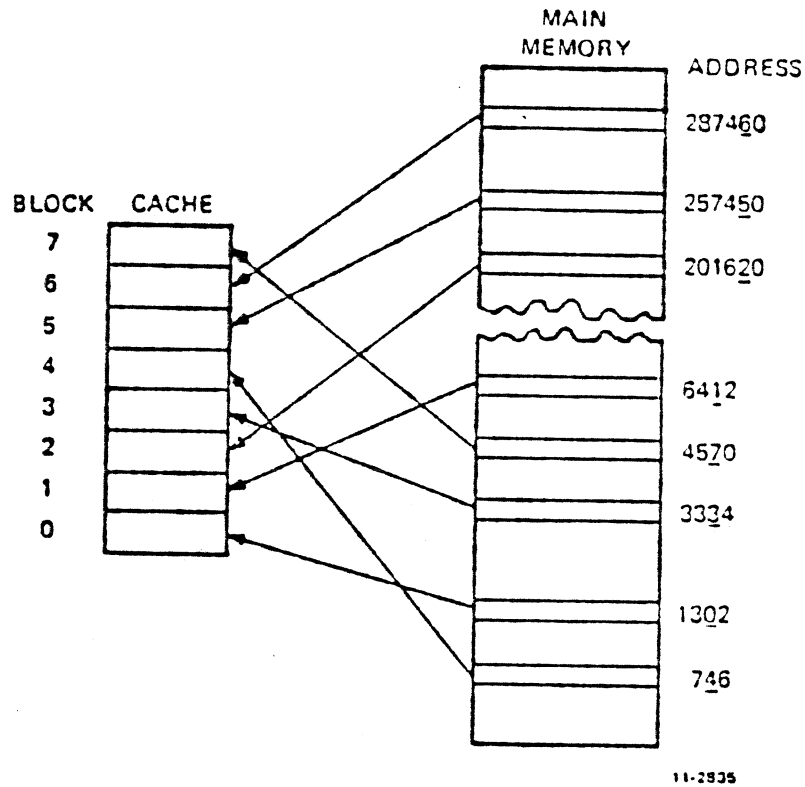
BLOCK SIZE OF 1
SET SIZE OF 1
VALID BITS = TWO SETS:
SET OF 1024 A BITS
SET OF 1024 B BITS

MA-1900

Cache Memory Format



MA-1899



Direct Mapping Cache Memory System

Table 1-1 Cache Responses to Hit/Miss Operations

Mode	DMA Miss†	DMA Hit†	CPU Hit	CPU Miss
<u>Read</u> Bypass	Not Affected	Not Affected	Cache Read	Write Data Write Tag Write Valid
Read Bypass	Not Affected	Invalidate (UCB)*	Invalidate	Not Affected
Write Bypass	Not Affected	Invalidate (UCB)*	Invalidate	Not Affected
<u>Write</u> Bypass	Not Affected	Invalidate	Write Data Write Valid	Not Affected

**Cache Memory Error Register Bits
(Address = 77744)**

Bit	Name	Function
15	CPU Abort	Set if an error occurs that caused the processor to abort a cycle. The errors that cause this action are: Unibus memory parity error; cache parity error if the cache parity error abort bit (7) of the cache control register (CCR) is set.
7 6 5	Parity Error High Byte Parity Error Low Byte Tag Parity Error	Set for parity errors in the high and low bytes of cache memory data or the tag field if the cycle is aborted. If the cycle is not aborted (CCR bit 7 is cleared and backing store references occur), all bits (5 to 7) are set upon an error to maintain compatibility to the PDP-11/70 cache. If a cache parity error occurs, the disable cache parity interrupt bit (0) of the CCR should be set to prevent the operating system from looping in the service trap state.

Cache Memory Error Register Bits
(Address = 77744)

Bit	Name	Function
15	CPU Abort	Set if an error occurs that caused the processor to abort a cycle. The errors that cause this action are: Unibus memory parity error; cache parity error if the cache parity error abort bit (7) of the cache control register (CCR) is set.
7 6 5	Parity Error High Byte Parity Error Low Byte Tag Parity Error	Set for parity errors in the high and low bytes of cache memory data or the tag field if the cycle is aborted. If the cycle is not aborted (CCR bit 7 is cleared and backing store references occur), all bits (5 to 7) are set upon an error to maintain compatibility to the PDP-11/70 cache. If a cache parity error occurs, the disable cache parity interrupt bit (0) of the CCR should be set to prevent the operating system from looping in the service trap state.

Cache Control Register Bits
(Address = 77746)

Bit	Name	Function
13	Valid Store In Use (VSIU) Read-only and is complemented each time that the cache is flushed.	Indicates which set of valid bits is currently being used to determine the validity of the contents of the tag store memory. When cleared, valid bit A is in use. When-set, valid bit B is in use.
12	Valid Clear In Progress (VCIP) Read-only bit	Set to indicate that the cache is currently in the process of clearing a valid store set. The clear cycle occurs on power-up and when the Flush Cache bit is set.

NOTE

The hardware clear cycle will take approximately 100 μ s to be accomplished. While a valid store set is being cleared, the other set is in use, allowing the cache to continue functioning.

10	Write Wrong Parity Tag Read/write bit	Indicates that the wrong parity will be written in tag store during the next CPU read. Used for diagnostic purposes only.
9	Unconditional Cache Bypass (UCB) Read/write bit	When set, all references to memory by the CPU and by NPR devices will be forced to go to main memory. Read or write hits will result in invalidation of those locations in cache and misses will not change the cache contents.
8	Flush Cache (FC) Write-only bit	Always read as 0. Writing a 1 into it will cause the entire contents of the cache to be declared invalid. Writing a 0 will have no effect. The flush is implemented by switching to the set of valid bits that is not currently in use and has been previously cleared. The valid store set which had been in use is then cleared. If a second flush command is received while a prior flush is in progress, then the cache will be turned off until the second valid store has been cleared, at which time cache operation will resume.
7	Parity Error Abort (PEA) Read/Write bit	Controls the response of the cache to a parity error. When set, a cache parity error will cause a force miss and an abort to occur (asserts Unibus signal PB L). When cleared, this bit inhibits the abort and enables an interrupt to location 114 (memory parity errors service trap, vector address) on parity errors. All cache parity errors result in forced misses.

Cache Control Register Bits (Cont)
(Address = 777746)

Bit	Name	Function
6	Write Wrong Parity Data (WWP) Read/write bit	When set, causes all parity bits to be written with incorrect parity on all update cycles (CPU read MISSES and all write HITS). This will cause a cache parity error to occur on the next access of that location. Wrong parity will be written under the following conditions if the appropriate WWP bit is set: <ul style="list-style-type: none"> • CPU read misses - tag store and data parity will be written with wrong parity. • CPU write hit - data parity only will be written wrong. • DMA write hit - data parity only will be written wrong.
3	Force Miss High (FMHI) Read/write bit	When set, causes forced misses to occur on CPU reads of addresses where address bit 10 is a one.
2	Force Miss Low (FMLO) Read/write bit	When set, causes forced misses to occur on CPU reads of addresses where address bit 10 is a zero.

NOTE

Setting both bits 3 and 2 causes all CPU reads to be forced misses.

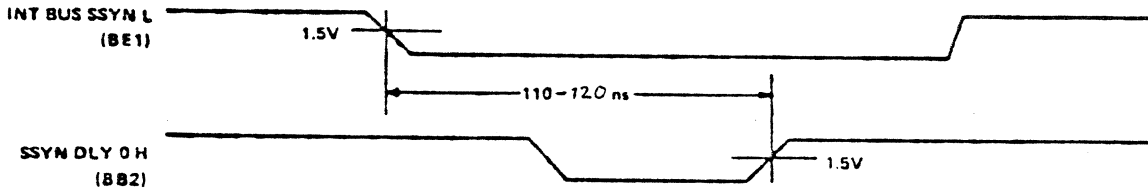
0	Disable Cache Parity Interrupt (DCPI) Read/write bit	When set, overrides the cleared condition of the parity error abort bit, disabling the interrupt to location 114.												
		<table border="1"> <thead> <tr> <th>CCR 7</th> <th>CCR 0</th> <th>Result of Cache Parity Error</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Interrupt to 114 and force miss</td> </tr> <tr> <td>0</td> <td>1</td> <td>Force miss only</td> </tr> <tr> <td>1</td> <td>X</td> <td>Abort and force miss</td> </tr> </tbody> </table>	CCR 7	CCR 0	Result of Cache Parity Error	0	0	Interrupt to 114 and force miss	0	1	Force miss only	1	X	Abort and force miss
CCR 7	CCR 0	Result of Cache Parity Error												
0	0	Interrupt to 114 and force miss												
0	1	Force miss only												
1	X	Abort and force miss												
		X = Don't care.												

Cache Maintenance Register Bit 0
 (Address = 77750)

Bit	Name	Function
0	Write Tag All Ones (WTA!) Read/write bit	When set, causes all updates of the tag store to be written with all 1s. A subsequent read of that location results in a miss. Cleared by PROC INIT.

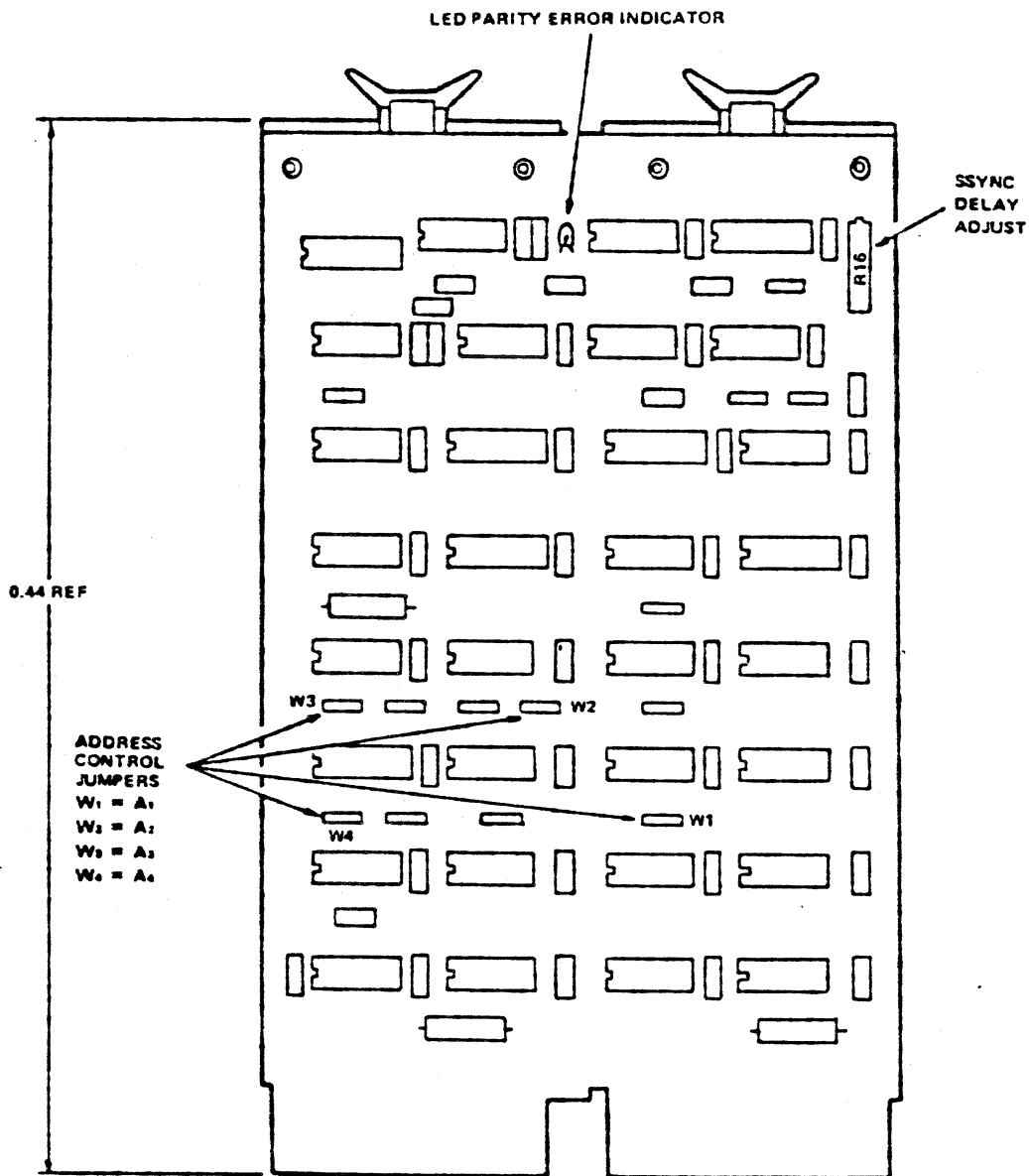
Table 4-4 Cache Hit Register Bits
 (Address = 77752)

Bit	Name	Function
(15:9)	Tag Address Read-only field	Contains the seven bits of the tag store memory of the last valid access. Primarily to be used by a diagnostic to check that all tag store bits are writable and readable. Contains the tag field of the last access in which the valid bit was set.
(5:0)	Hit Register Read-only field	Shows the number of cache hits on the last six CPU accesses to non-I/O page memory. The bits flow from the LSB to the MSB of the field with a 1 indicating a hit and a 0 indicating a miss.



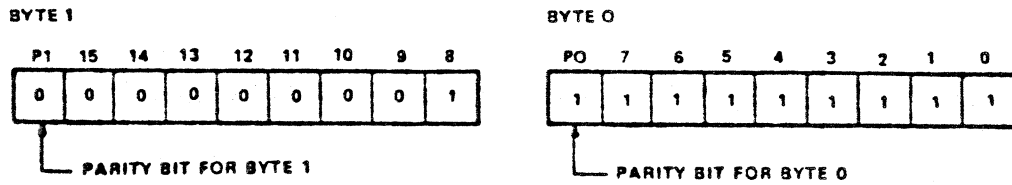
CP 2845

Figure 4-2 Timing Adjust



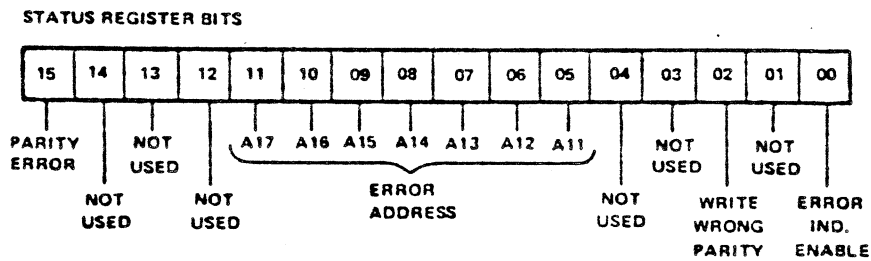
CP 2843

Figure 1-3 Physical Layout of M7850



CP-2841

Figure 1-1 Parity Byte Assignment

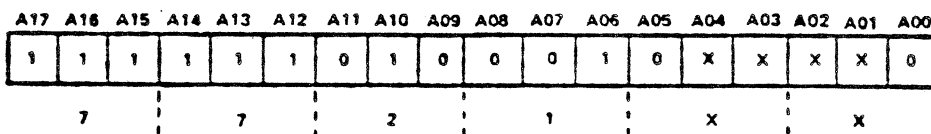


CP 2847

Figure 2-7 Control and Status Register Bit Allocation

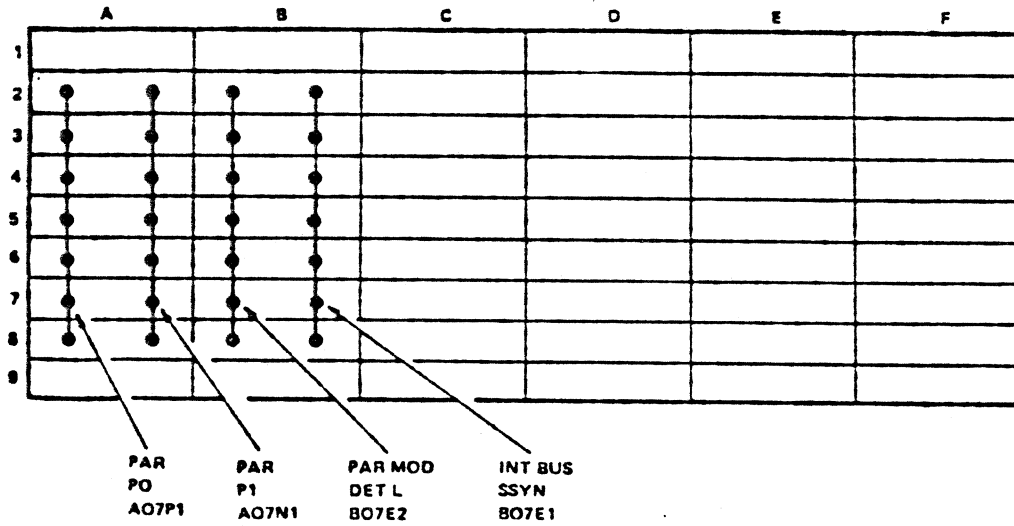
NOTE

The CSR address has NO relevance to either the number or addresses of the memory modules that are controlled by an M7850 parity controller.

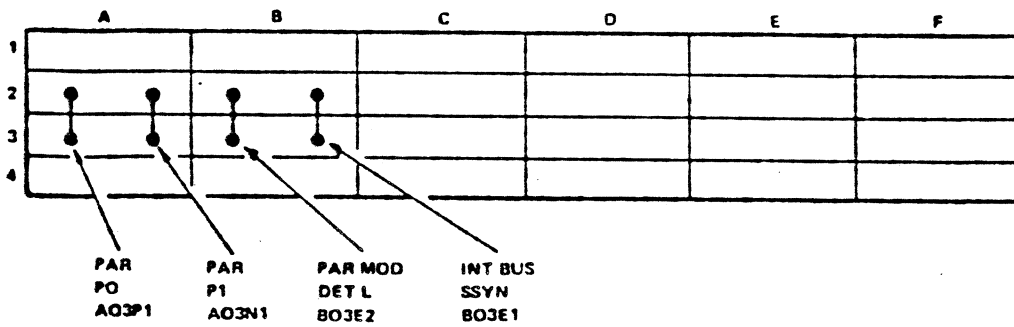


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Figure 2-8 CSR Address Bits



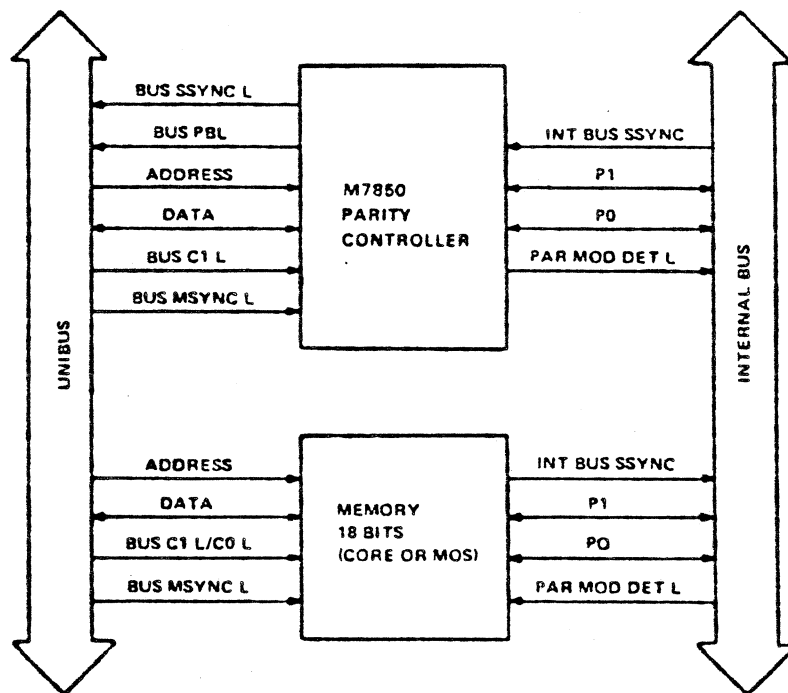
INTERNAL BUS ON 9 SLOT BACK PLANE (DD11-D or DD11-P)



INTERNAL BUS ON 4 SLOT BACKPLANE

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Figure 2-2 Internal Bus Physical Location



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Figure 2-1 Unibus/Internal Bus Connections

digital

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