FIELD MAINTENANCE PRINT SET

TABLE OF CONTENTS

UNIT VARIATIONS COVERED BY THIS PRINT SET
REV11-A
REV11-C
REV11-J

REVII VOL.I

Field Maintenance Print Set

Digital Equipment Corporation

PRINT SET ORDER NO.
MPØØØ73

REVISIONS	REV.	CHG. NO	DATE

EN-0124-18-NES-(2)

DRB 124

USED ON OPTION/MODEL	
LSI11	

SHEET I OF 1

DRN.	D. HEALY	DATE 1/20/76
CHK'D	D. HEALY	DATE 1/20/76
PROJ. ENG.		DATE 3/17/76
FIELD SERV.		DATE 3/19/76

digital

TITLE:

FIELD MAINTENANCE PRINT SET
REV11 - VOLUME NO. 1

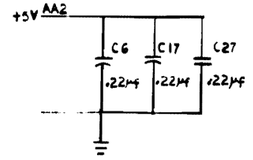
SIZE	CODE	NUMBER	REV.
B	TC	REV11-Ø-1	

DIST.

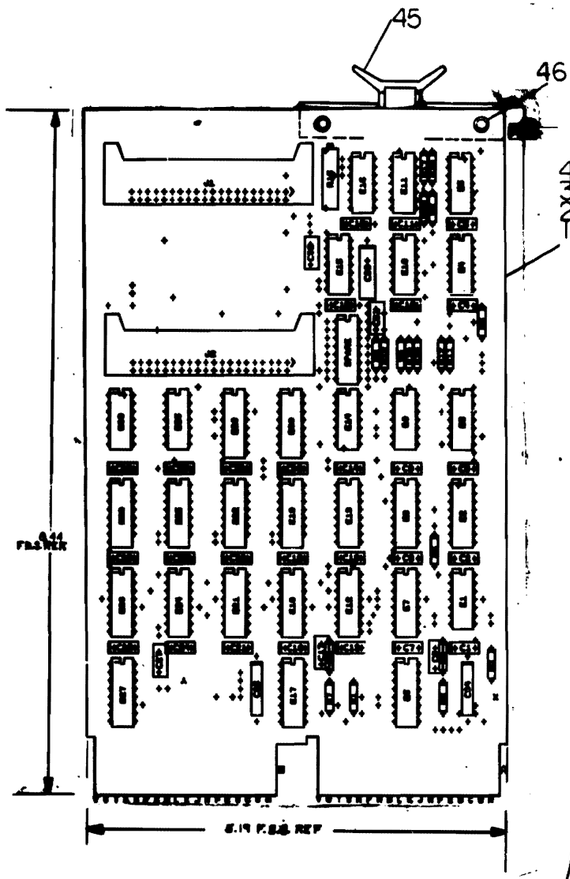
NOTES:

1. BD INIT L AND BD INIT H ARE SIGNALS GENERATED BY THIS MODULE THAT ARE USED ON THIS MODULE.
2. A STANDARD ROM STARTING LOCATION FOR THE FOLLOWING BOOTSTRAPS HAVE BEEN ESTABLISHED. ALL FUTURE REV 11-X's THAT INCLUDE ANY OF THESE BOOTSTRAPS SHOULD USE THE SAME STARTING LOCATIONS. IF A NEW BOOTSTRAP IS ESTABLISHED, PLEASE ECO THIS NOTE TO INCLUDE THE DEVICE AND STARTING LOCATION.

BOOTSTRAP	STARTING LOCATION
* .RXØI	165242
* .ABSOLUTE LOADER	165406
* .RKØ5	165650
* .CPU DIAGNOSTIC (MEMORY ADDIFYING)	173302
* .CPU DIAGNOSTIC (NON-MEMORY MODIFYING)	173000
* .MEMORY DIAGNOSTIC	173626
* .ODT	
** .REMOTE-11	173000
** .REMOTE-11 SECONDARY DOWNLINE LOAD	173006
** .RXOI	173700



* PERTAINS TO REV 11-A,C AND J ONLY
** PERTAINS TO REV 11-H,K AND L ONLY



REF	REF	REF	REF	REF	REF	REF	REF	REF	REF			
REF	REF	REF	REF	REF	REF	REF	REF	REF	REF		X-Y COORDINATE HOLE LOCATION	K-CO-M9400-0-4
REF	REF	REF	REF	REF	REF	REF	REF	REF	REF		ASSY/INSTALLING HOLE LAYOUT	B-MM-M9400-0-5
REF	REF	REF	REF	REF	REF	REF	REF	REF	REF		MODULE ECO HISTORY	B-MM-M9400-0-6
1	1	1	1	1	1	1	1	1	1		ETCHED CIRCUIT BOARD	9011988
27	27	27	27	27			27		27	C1 THRU C5, C7 THRU C16, C18 THRU C26, C28, C29, C30	CAPACITOR, .01uf, 50V	1691610-01
3		3	3	3	3			3	3	C6, C17, C27	CAPACITOR, .22uf, 50V	1816274
1	1	1	1	1			1		1	C31	CAPACITOR, 680pf, 100V	1800628
1	1	1	1	1			1		1	C32	CAPACITOR, 22pf, 100V	1805020
1	1	1	1	1			1		1	C33	CAPACITOR, .01uf, 100V	1806784
2	2	2	2	2	2	2	2	2	2	C34, C35	CAPACITOR, 30uf, 10V, 10%	1808076
2		2			2	2				J1, J2	CONNECTOR	1200641-02
1	1	1	1	1			1		1	R1	RESISTOR, 75 OHM, 1/4W, 5%	1302379
4	4	4	4	4			4		4	R4, R8, R11, R13	RESISTOR, 330 OHM, 1/4W, 5%	1300295
4	4	4	4	4			4		4	R6 R7, R12, R14	RESISTOR, 680 OHM, 1/4W, 5%	1301424
4	4	4	4	4			4		4	R5, R9, R10, R15	RESISTOR, 1K, 1/4W, 5%	1300365
1	1	1	1	1			1		1	R16	RESISTOR, 50K, 3/4 W, 20%	1309143-13
1	1	1	1	1			1		1	R17	RESISTOR, 4.7K, 1/4W, 5%	1300447
1	1	1	1	1			1		1	R18	RESISTOR, 5.6K, 1/4W, 5%	1301674
1	1	1	1	1			1		1	C10	I.C. DEC 9464	1909606
1	1	1	1	1			1		1	E9	I.C. DEC 7400	1910155
4	4	4	4	4			4		4	E3, E5, E10, E20	I.C. DEC 7474	1905547
1	1	1	1	1			1		1	E1	I.C. DEC 8881	1909705
1	1	1	1	1			1		1	E14	I.C. DEC 7402	1909804
1	1	1	1	1			1		1	E11	I.C. DEC 7427	1910878
2	2	2	2	2			2		2	E4, E30	I.C. DEC 7400	1901575
6	6	6	6	6			6		6	E7, E12, E18, E21, E24, E28	I.C. DEC 8641	1911579
1	1	1	1	1			1		1	E15	I.C. DEC 4024	1911838
2	2	2	2	2			2		2	E29, E23	I.C. DEC 8M 8686	1912951
1	1	1	1	1			1		1	E2	I.C. DEC#36	1912395
2	2	2	2	2			2		2	E6, E13	I.C. DEC 74174	1910652
		1					1		1	E19	I.C. DEC 1M8824	23874A9-8M
		1					1		1	E22	I.C. DEC 1M8824	23875A9-8M
		1					1		1	E25	I.C. DEC 1M8824	23876A9-8M
		1					1		1	E26	I.C. DEC 1M8824	23877A9-8M
			3	3				3	3	E8, E17, E27	RESISTOR PAK	1311803-01
3		3			3					E9, E16, E22	RESISTOR PAK	1311803-02
					1	1		1		W1	INSULATED JUMPER	9009185
2	2	2	2	2			2		2	W2, W4	INSULATED JUMPER	9009185
1	1	1	1	1	1	1	1	1	1	W3	INSULATED JUMPER	9009185
1	2	1	2	2	1	1	2	2	2		HANDLE, FLIP CHIP MAGENTA	9000337-06
4	4	4	4	4	4	4	4	4	4		EYELET	9000732
1	1	1	1	1	1	1	1	1	1		SPLIT LUG	9004735
1		1			1	1					SPACER	9009781
M9400-YL	M9400-YK	M9400-YJ	M9400-YH	M9400-YF	M9400-YE	M9400-YD	M9400-YC	M9400-YB	M9400-YA			

(CONTINUED ON SH 2)

QTY	REF. DESIGNATION	DESCRIPTION	PART NO.	ITEM NO.

PARTS LIST

ETCH BOARD REV. G

FIRST USED ON OPTION MODEL

IC 8624	8	16	
IC 8136	8	16	
IC 74174	8	16	
IC 8556	8	16	
IC 8641	8	16	
IC TYPE	GND	+5V	

GND AND 5V ARE USUALLY PIN 7 AND 14 RESPECTIVELY EXCEPTIONS ARE STATED ABOVE

IC PIN LOCATIONS

REV.	REVISIONS	ORIGINATOR NO.	DATE
F	M9400-00005	R. LEVANDER	2-MAR-77
E	M9400-00004	M.E. LEWANDOWSKI	20-JAN-76
D	M9400-00003	M.E. LEWANDOWSKI	9-JUNE-75
C	M9400-00002	M.E. LEWANDOWSKI	11-MAY-75
B	M9400-00001	M.E. LEWANDOWSKI	4-2-75

DEC NO.	EIA NO.	DEC NO.	EIA NO.

SEMICONDUCTOR CONVERSION CHART

DRN.		DATE
CHK'D.		DATE
ENGR.		DATE 10-15-75
PROJ. ENGR.		DATE 10-15-75
MFG. ENGR.		DATE 10-15-75
NEXT HIGHER ASSY		
SCALE		
SHEET 1 OF 6		

digital

TITLE LSI REF. BOOT CABLE CONN.

SIZE	CODE	NUMBER	REV.
D	CS	M9400-0-1	H

DIST.

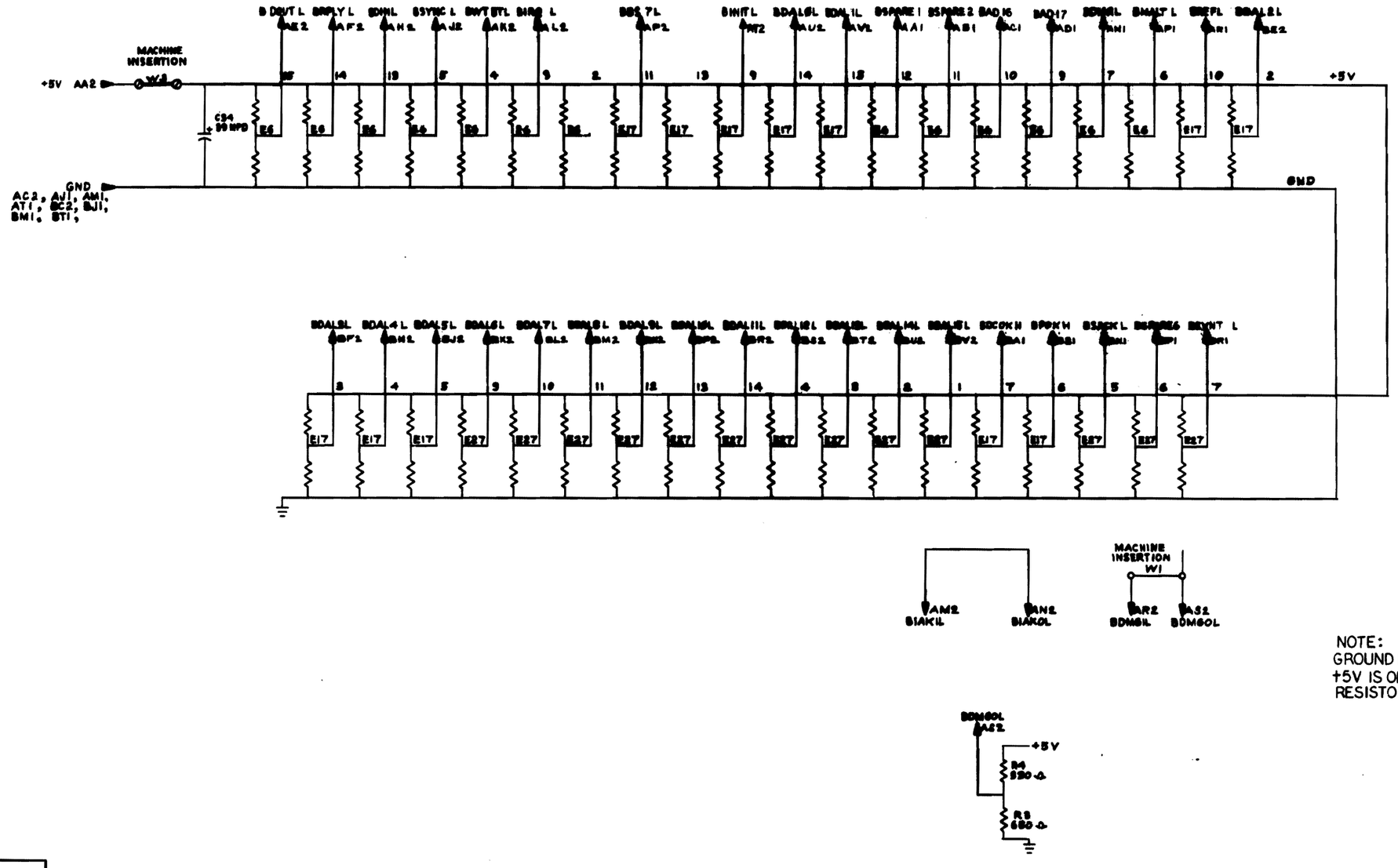
DCS M9400-0-1 H

QTY & VARIATION										REF. DESIGNATION	DESCRIPTION	PART NO.	ITEM NO.
M9400-YL	M9400-YK	M9400-YJ	M9400-YH	M9400-YF	M9400-YE	M9400-YD	M9400-YC	M9400-YB	M9400-YA				
1	1		1							E19	I.C. DEC IM6624	23-41 8A9-00	50
1	1		1							E22	I.C. DEC IM6624	23-41 4A9-00	51
1	1		1							E26	I.C. DEC IM6624	23-41 2A9-00	52
1	1		1							E29	I.C. DEC IM6624	23-41 3A9-00	53

REVISIONS		
CHK	CHANGE NO.	REV.

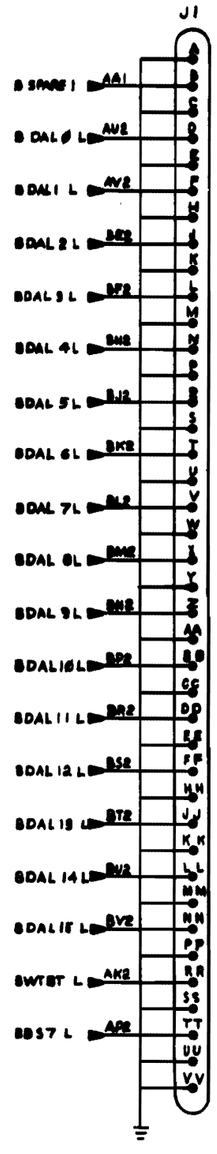
TITLE: LSI REF BOOT CABLE CONN
SCALE: —/—/— SHEET 2 OF 6
SIZE: D
CODE IDENT NO.: DCS
NUMBER: M9400-0-1
REV: H

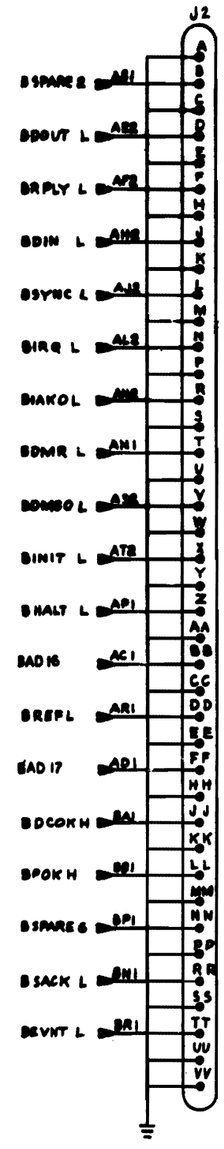
DCS M9400-0-1 H



REVISIONS		
CHK	CHANGE NO.	REV.

TITLE	SIZE	NUMBER	REV.
LSI REF BOOT CABLE CONN	D	CS M9400-0-1	H
SCALE —	SHEET 3 OF 6	DIST.	





REVISIONS		
CHK	CHANGE NO.	REV.

8	7	6	5	4	3	2	1	TITLE: LSI REF BOOT CABLE CONN	SIZE/CODE: D CS	NUMBER: M9400-Ø-1	REV: H
								SCALE: -/-	SHEET 4 OF 6	DIST.	

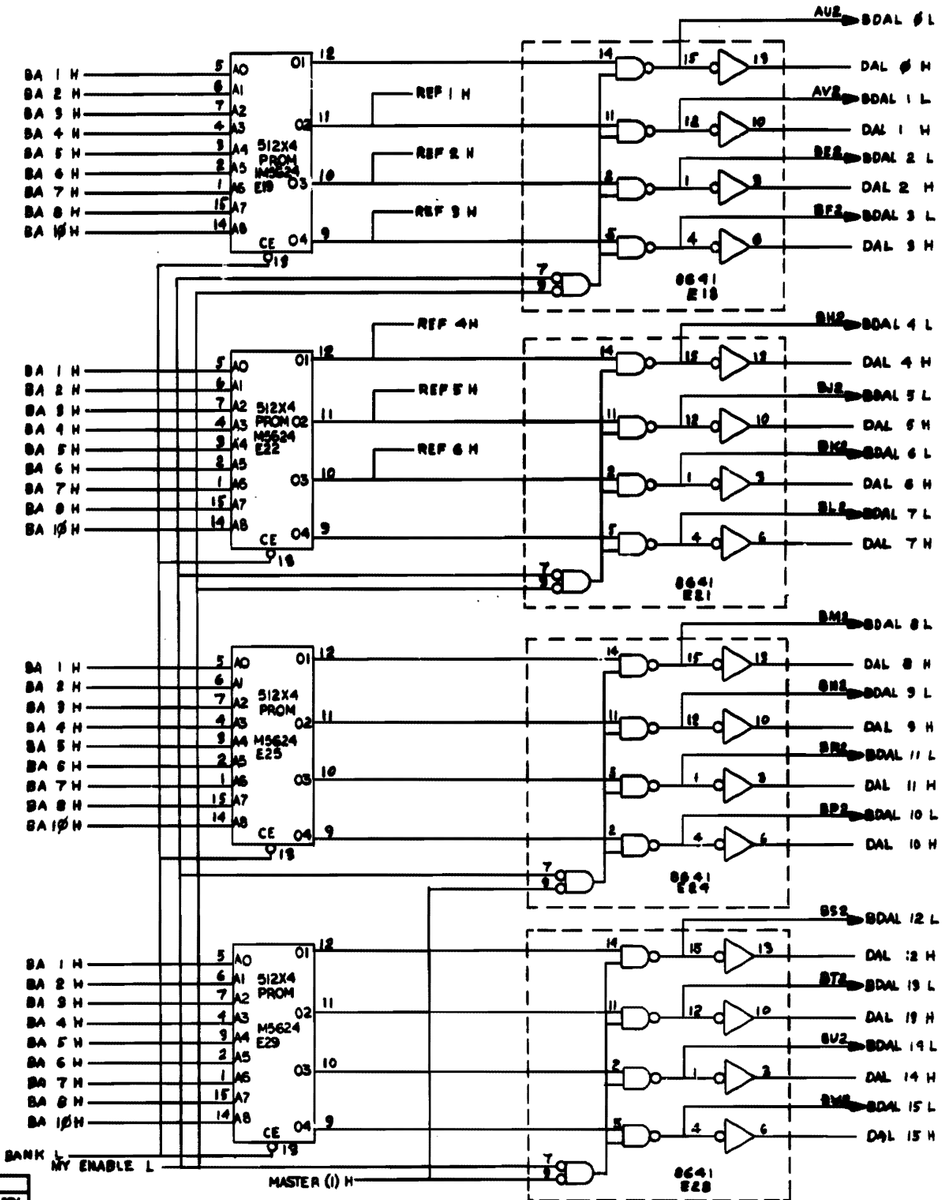
D CS M9400-Ø-1 H

MACHINE INSERTION
W2
R10 1K
+5V
GRAB BUS L
7427 E11
REQ H
7474 E8
+5V
10 ARI
8881 E1
BDMR L
R PENDING (0)H
BD INIT H
7400 E14
SACK (1)H
+5V
7474 E8
DMG R H
SACK (0) H
R CLR L
7404 E16
7404 E16
R9 75Ω
C21 680 PF
BDMR H
8881 E1
ASR
BDMGO L
SACK (1) H
DMG DLYD H
7400 E36
+5V
7474 E8A
MASTER (1) H
MASTER (0) H
7427 E11
R RLY H
SYNC H
BD INIT H
7402 E14
R SCLR L
R PENDING (1) H
DONE (0) H
7427 E11
+5V
7474 E8A
B(0) H
DONE (0) H
MASTER SYNC (1) H
MASTER SYNC H
8881 E1
ARI
SRPF L
MSPARE A
MSPARE B
+5V
R17 4.7K
R16 6.6K
C28 .01 uF
7404 E15
+5V
7404 E16
GRAB BUS H
GRAB BUS L
8641 E12
A12
B SACK L
BD INIT H
A (0) H
7400 E14
RPLY (0)H
7400 E4
MASTER SYNC (1)H
7400 E4
B (0) H
SCLK H
7474 E10
A (1) H
A (0) H
MASTER (1)H
B (1) H
RPLY (1)H
7400 E4
A (1) H
SCLK H
7474 E8B
B (1) H
B (0) H
BD INIT L
+5V
7474 E8B
MASTER (1) H
MASTER SYNC (1) H
MASTER (0) H
SCLK H
BD INIT L
+5V
7474 E8B
RPLY H
SCLK H
R RPLY (1) H
R RPLY (0) H
PRE SYNC H
A (0) H
B (0) H
7400 E9
7400 E9
BD INIT L
MASTER SYNC (0) H
8881 E1
A12
B SYNC L
MASTER (0) H
7400 E14
MY ENABLE L
GRAB BUS H
GRAB BUS L
7404 E16
MY BANK H
DIN H
7400 E9
A (1) H
B (1) H
7400 E9
8641 E7
+5V
R8 330Ω
R7 680Ω
A12
BDMG I L
DMGR H
BAI
BDCOK (1)
7404 E16
BD INIT H
BD INIT L
A12
BRPLY L
RPLY H
A12
B DIN L
DIN H
8641 E12
A12
B SYNC L
SYNC H
+5V
+5V
R12 330Ω
R11 330Ω
+5V
R14 680Ω
R13 680Ω
MASTER (0) H
DM8556 E23
I/O D
I/O C
I/O B
I/O A
OD
CLK
LOAD
CE
RESET
REF 6 H
REF 5 H
BD INIT H
MASTER (0) H
DM8556 E20
MAX COUNT
I/O D
I/O C
I/O B
I/O A
OD
CLK
LOAD
CE
RESET
REF 4 H
REF 3 H
REF 2 H
REF 1 H
BD INIT H
MASTER (1) H
RPLY (1) H
7400 E20
+3V

REVISIONS		
CHK	CHANGE NO.	REV.

TITLE	SIZE	CODE	NUMBER	REV.
LSI REF BOOT CABLE CONN	D	DCS	M9400-0-1	H
SCALE —	SHEET 5 OF 6	DIST.		

DCSM9400-0-1



REVISIONS		
CHK	CHANGE NO.	REV.

TITLE	SIZE	CODE	NUMBER	REV.
LSI REF BOOT CABLE CONN	D	CS	M9400-0-1	H
SCALE	SHEET 6 OF 6		DIST.	

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY D. HEALY	CHECKED D. HEALY	SECTION 1
DATE 1/20/76	DATE 1/20/76	
ENG Tom Whitaker	PROD D. DeRose	ISSUED SECT. 1
DATE 3/11/76	DATE 3-15-76	

ITEM NO.	DWG NO. / PART NO.	DESCRIPTION	QUANTITY/VARIATION REV11-A	REV11-C	REV11-H	REV11-J	REVII-K	REVII-L
	D-CS-M94ØØ-YA-1	BUS TERMINATOR/REFRESH & BOOT #1	1	-	-	-	-	-
	D-CS-M94ØØ-YC-1	REFRESH & BOOT #1	-	1	-	-	-	-
	D-CS-M94ØØ-YH-1	BUS TERMINATOR/REFRESH & BOOT #2	-	-	1	-	-	-
	D-CS-M94ØØ-YJ-1	REV11-A CABLE CONNECTORS	-	-	-	1	-	-
	D-CS-M94ØØ-YK-1	REFRESH & BOOT #2	-	-	-	-	1	-
	D-CS-M94ØØ-YL-1	REVII-H & CABLE CONNECTORS	-	-	-	-	-	1
	A-PS-9905622-0-0	BOX, FOLDING, REVERSE TUCK	1	1	1	1	1	1

TITLE LSI-11 REFRESH/BOOT/TERM-REV11	ASSY NO. NONE	SIZE A	CODE PL	NUMBER REV11-Ø-Ø	REV. B	ECO NO. REVII-00003
	SHEET 1 OF 1	DIST.				

DEC FORM DEC 16-(325)-1031-N870
DRA 110

M94ØØ TABLE OF CONTENTS

FIRST USED ON OPTION MODEL	QTY.	DESCRIPTION	PART NO.	ITEM NO.
LSI11		PARTS LIST		

DRN. D. Healy	DATE 3 MAR 76	digital EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS	
CHK'D. D. Healy	DATE 4 MAR 76	TITLE LSI11 ROM LIST/BOOT NO. 1	
ENG. Tom Hitchcock	DATE 3/11/76		
PROJ. ENG. M.E. Kenney-Shaw	DATE 3/12/76		
PROD.	DATE 3-15-76		
NEXT HIGHER ASSEMBLY B-DD-REV11-Ø		SIZE K / CODE CS / NUMBER REV11-Ø-3	REV.
SCALE			
SHEET 1 OF 26		DIST.	

REVISIONS

REV.	CHANGE NO.	CHK

DEC FORM NO. DRB 109

SH #2

```
                        .SBTTL  DEFINITIONS
000000          L.CKSH  =       %0
000000          R0      =       %0
000001          L.ADR   =       %1
000001          R1      =       %1
000002          L.BC    =       %2
000002          R2      =       %2
000003          L.BYT   =       %3
000003          R3      =       %3
000004          R4      =       %4
000005          L.PTR   =       %5
000005          R5      =       %5
000006          SP      =       %6
000007          PC      =       %7

177560          TKS     =       177560  ;KEYBOARD STATUS REGISTER
177562          TKB     =       177562  ;KEYBOARD BUFFER REGISTER
177564          TPS     =       177564  ;CONSOLE PRINTER STATUS REGISTER
177566          TPB     =       177566  ;CONSOLE PRINTER BUFFER REGISTER

000015          CR      =       15      ;CARRIAGE RETURN
000012          LF      =       12      ;LINE FEED

177170          RXCS    =       177170  ;FLOPPY DISK COMMAND STATUS REGISTER

177550          PCCS    =       177550  ;PC11 COMMAND STATUS REGISTER

177404          RKCS    =       177404  ;WORD COUNT REGISTER FOR RK11


002000          BIT10   =       002000  ;BIT 10 MASK

100000          BIT15   =       100000  ;BIT 15 MASK

020040          BIT5,13 =       020040  ;BIT 5 & 13 MASK
```

SH#4

```
                                .ENABLE ABS


                                .IIF NDF GONOGO, GONOGO = 173000

                                .SBTTL  ROM AREA 173000 - 173777
                                ;*************************************************
                                ;*THIS AREA OF ROM CONTAINS THE GO-NOGO CPU
                                ;*AND MEMORY TESTS
                                ;*************************************************

          173000                .       =       GONOGO
                                ;*************************************************
                                ;*THE GO-NOGO CPU INSTRUCTION TEST1 THRU TEST6
                                ;*DO NOT MODIFY MEMORY
                                ;*************************************************


                                ;*************************************************
                                ;*TEST1:
                                ;*CHECK ALL SINGLE OPERAND INSTRUCTIONS
                                ;*WITH DESTINATION MODE ZERO
                                ;*************************************************

173000  012706  177777  TEST1:  MOV     #177777,SP      ;INITIALIZE SP TO CAUSE A DOUBLE
                                                        ; BUS ERROR ON A TRAP
173004  012700  000340          MOV     #340,R0         ;HIGHEST PRIORITY
173010  106400                  MTPS    R0              ;DISABLE INTERRUPTS
                                                        ;SHOWN ARE THE CONTENTS OF THE REGISTER AND
                                                        ;CONDITION CODES THAT APPEAR AFTER THE
                                                        ;EXECUTION OF THE INSTRUCTION
                                                        ;  REG      NZVC
                                                        ; -----    ------
173012  005001                  CLR     R1              ;000000     0100
173014  005101                  COM     R1              ;177777     1001
173016  005401                  NEG     R1              ;000001     0001
173020  006001                  ROR     R1              ;100000     1000
173022  005501                  ADC     R1              ;100001     1000
173024  000261                  SEC                     ;100001     1001
173026  006101                  ROL     R1              ;000003     0011
173030  006201                  ASR     R1              ;000001     0011
173032  005601                  SBC     R1              ;000000     0100
173034  006301                  ASL     R1              ;000000     0100
173036  005201                  INC     R1              ;000001     0000
173040  005301                  DEC     R1              ;000000     0100
173042  001377                  BNE     .
```


SH#4

```
                                ;*************************************************
                                ;*TEST2:
                                ;*CHECK ALL BYTE SINGLE OPERAND INSTRUCTIONS
                                ;*WITH DESTINATION MODE ZERO
                                ;*************************************************

173044  112702  000377  TEST2:  MOVB    #000377,R2      ;177777     1000
173050  105002                  CLRB    R2              ;177400     0100
173052  105102                  COMB    R2              ;177777     1001
173054  105602                  SBCB    R2              ;177776     1000
173056  105202                  INCB    R2              ;177777     1000
173060  105402                  NEGB    R2              ;177401     0001
173062  105302                  DECB    R2              ;177400     0101
173064  000302                  SWAB    R2              ;000377     1000
173066  106302                  ASLB    R2              ;000376     1001
173070  106002                  RORB    R2              ;000377     1010
173072  106202                  ASRB    R2              ;000377     1001
173074  106102                  ROLB    R2              ;000377     1001
173076  105502                  ADCB    R2              ;000000     0101
173100  105702                  TSTB    R2              ;000000     0100
173102  001377                  BNE     .
```

SH#5

```
                                ;**************************************************
                                ;*TEST3:
                                ;*CHECK ALL SOURCE MODES FOR DOUBLE OPERAND
                                ;*WORD INSTRUCTIONS WITH DESTINATION MODE ZERO
                                ;*THE SOURCE MODE BEING EXECUTED IS SHOWN AS
                                ;*(SMX) IN THE COMMENTS
                                ;**************************************************

173104  012702  173264      TEST3:  MOV     #T3DATA,R2      ;MOVE DATA ADDRESS TO R2
173110  011201                  MOV     (R2),R1         ;MOVE TO (T3DATA) TO R1, (SM1)
173112  022231                  CMP     (R2)+,R1        ;CHECK DATA, (SM2)
173114  001377                  BNE     .               ;LOOP IF INCORRECT DATA
173116  063201                  ADD     @(R2)+,R1       ;ADD T3DATA TO R1, (SM3)
173120  165201                  SUB     @-(R2),R1       ;SUBTRACT T3ATA FROM R1, (SM5)
173122  044201                  BIC     -(R2),R1        ;CLEAR R1 BY NAND WITH ITSELF, (SM4)
173124  056201  000004          BIS     4(R2),R1        ;INSERT ALL 1'S IN R1, (SM6)
173130  037201  000006          BIT     @6(R2),R1       ;TEST ANY BITS SET, (SM7)
173134  001777                  BEQ     .               ;LOOP IF NOT
173136  074101                  XOR     R1,R1           ;CLEAR R1 BY XOR WITH SELF
173140  001377                  BNE     .               ;LOOP IF NOT ZERO



                                ;**************************************************
                                ;*TEST4:
                                ;*CHECK JUMP INSTRUCTION DESTINATION MODES - 1,3,6
                                ;*THE DESTINATION MODE BEING EXECUTED IS SHOWN AS
                                ;*(DMX) IN THE COMMENTS
                                ;**************************************************

173142  012701  173152      TEST4:  MOV     #JMP1,R1        ;LOAD ADDRESS FOR JUMP
173146  000111                  JMP     (R1)            ;JUMP TO JMP1, (DM1)
173150  000777                  BR      .               ;LOOP IF JUMP FAILS
173152  022121              JMP1:   CMP     (R1)+,(R1)+     ;ADJUST POINTER FOR JMP3 ADDRESS
173154  000131                  JMP     @(R1)+          ;GET ADDR OF ADDR FOR JUMP TO JMP3, (DM3)
173156  173160                  .WORD   JMP3            ;ADDRESS MODE 3 JUMP
173160  000161  000006      JMP3:   JMP     6(R1)           ;JUMP AHEAD BY 4 TO JMP6, (DM6)
173164  000777                  BR      .               ;LOOP IF JUMP FAILED
173166
```


SH #6

```
                                ;**************************************************
                                ;*TEST5:
                                ;*CHECK "TSTB" & "TST", DESTINATION MODES - 1,2,4,6
                                ;*THE DESTINATION MODE BEING EXECUTED IS SHOWN AS
                                ;*(DMX) FOR WORD OR (DMBX) FOR BYTE INSTRUCTIONS
                                ;**************************************************

173166  012701  173274      TEST5:  MOV     #T5DATA,R1      ;LOAD TEST DATA ADDRESS
173172  005767  000076              TST     T5DATA          ;SHOULD BE 100000, (DM6)
173176  100377                  BPL     .               ;LOOP IF NOT MINUS
173200  105767  000070              TSTB    T5DATA          ;SHOULD BE ZERO, (DMB6)
173204  001377                  BNE     .               ;LOOP IF NOT ZERO
173206  105721                  TSTB    (R1)+           ;TEST LOW ORDER BYTE = 0, (DMB2)
173210  001377                  BNE     .               ;LOOP IF NOT ZERO
173212  105711                  TSTB    (R1)            ;TEST HI ORDER BYTE = 200, (DMB1)
173214  100377                  BPL     .               ;LOOP IF NOT MINUS
173216  105741                  TSTB    -(R1)           ;TEST LOW ORDER BYTE = 0, (DMB4)
173220  001377                  BNE     .               ;LOOP IF NOT ZERO
173222  005721                  TST     (R1)+           ;TEST (T5DATA) = 100000, (DM2)
173224  100377                  BPL     .               ;LOOP IF NOT MINUS
173226  005711                  TST     (R1)            ;TEST (T5DATA+2) = 0, (DM1)
173230  001377                  BNE     .               ;LOOP IF NOT ZERO
173232  005741                  TST     -(R1)           ;TEST (T5DATA) = 100000, (DM4)
173234  100377                  BPL     .               ;LOOP IF NOT MINUS



                                ;**************************************************
                                ;*TEST6:
                                ;*CHECK BYTE DOUBLE OPERAND INSTRUCTIONS WITH
                                ;*DESTINATION MODE ZERO
                                ;**************************************************

173236  012701  173300      TEST6:  MOV     #T6DATA,R1      ;LOAD DATA ADDRESS
173242  112102                  MOVB    (R1)+,R2        ;LOAD 377 IN R2
173244  141102                  BICB    (R1),R2         ;COMPLEMENT BITS 0,3,5,7 IN R2
173246  131102                  BITB    (R1),R2         ;TEST BITS 0,3,5,7 = 0
173250  001377                  BNE     .               ;LOOP IF SET
173252  151102                  BISB    (R1),R2         ;SET BITS 0,3,5,7
173254  124102                  CMPB    -(R1),R2        ;TEST R2 = 377
173256  001377                  BNE     .               ;LOOP IF NOT EQUAL

173260  000167  171522              JMP     KBDS            ;GO TO KEYBOARD ROUTINE

173264  173264      T3DATA: .WORD   T3DATA          ;WARNING - THIS DATA IS POSITION
173266  173264              .WORD   T3DATA          ;   DEPENDANT, DO NOT INSERT DATA
173270  177777      T3DAT4: .WORD   177777          ;  WITHIN THE LIST
173272  173270              .WORD   T3DAT4
173274  100000      T5DATA: .WORD   100000
173276  000000              .WORD   0
173300  125377      T6DATA: .WORD   125377
```

SH#7

```
                                        ;*****************************************************
                                        ;*THE FOLLOWING CPU INSTRUCTION TESTS MODIFY MEMORY
                                        ;*LOCATIONS 500 & 502 AS NOTED IN THE COMMENT FIELDS
                                        ;*****************************************************

                                        ;*****************************************************
                                        ;*TEST7:
                                        ;*CHECK WORD INSTRUCTIONS WITH DESTINATION
                                        ;*MODES NOT ZERO
                                        ;*
                                        ;*CHECK "MOV" INSTRUCTION WITH DESTINATION MODES =1,2,3,4
                                        ;*
                                        ;*ALL DESTINATION MODES ARE CHECKED & A LIST OF INSTRUCTIONS
                                        ;*AND DESTINATION MODES [IN PARENTHESIS] USED TO PERFORM
                                        ;*THIS CHECK IS GIVEN HERE FOR REFERENCE
                                        ;*    CLR(1,6),COM(1),INC(7),DEC(3,5)
                                        ;*    NEG(4),ASR(1),ASL(5),ROR(3)
                                        ;*    ROL(6),SUB(1),BIT(6),BIC(2),BIS(3)
                                        ;*****************************************************

                                                                        ;                    CONTENTS AFTER EXECUTION
                                                                        ;                          500
                                                                        ;                        ------
173302  012702  173436          TEST7:  MOV     #T7DATA,R2              ;LOAD TEST DATA ADDRESS
173306  016203  000002                  MOV     2(R2),R3                ;LOAD 500 IN R3
173312  012213                          MOV     (R2)+,(R3)              ;WRITE -1 IN LOCATION 500       177777
173314  024223                          CMP     -(R2),(R3)+             ;CHECK DATA
173316  001046                          BNE     T7ERR                   ;ERROR, IF NOT EQUAL

173320  005063  177776                  CLR     -2(R3)                  ;CLEAR 500                      000000
173324  012232                          MOV     (R2)+,@(R2)+            ;LOAD -1 IN LOCATION 500        177777
173326  062243                          ADD     (R2)+,-(R3)             ;ADD 1 TO LOCATION 500          000000
173330  164213                          SUB     -(R2),(R3)              ;SUBTRACT 1 FROM LOCATION 500   177777
173332  005272  177776                  INC     @-2(R2)                 ;INCREMENT LOCATION 500         000000
173336  005352                          DEC     @-(R2)                  ;DECREMENT LOCATION 500         177777
173340  044223                          BIC     -(R2),(R3)+             ;ZERO 500 BY COMPLEMENTING ALL BITS 000000
173342  001034                          BNE     T7ERR                   ;ERROR, IF NOT ZERO

                                                                        ;                          502
                                                                        ;                        ------
173344  012223                          MOV     (R2)+,(R3)+             ;LOAD -1 INTO LOCATION 502      177777
173346  005443                          NEG     -(R3)                   ;NEGATE LOCATION 502            000001
173350  031362  000002                  BIT     (R3),2(R2)              ;TEST FOR BIT 0 ON
173354  001427                          BEQ     T7ERR                   ;ERROR, IF NOT SET

173356  006213                          ASR     (R3)                    ;SHIFT RIGHT LOCATION 502       000000
173360  116213  000002                  MOVB    2(R2),(R3)              ;LOAD +1 IN LOCATION 502        000001
173364  005623                          SBC     (R3)+                   ;SUBTRACT CARRY(=1) FROM LOCATION 502 000000
173366  006163  177776                  ROL     -2(R3)                  ;ROTATE LEFT LOCATION 502       000000
173372  001020                          BNE     T7ERR                   ;ERROR, IF NOT ZERO
```


SH#8

```
                                                                        ;                          500
                                                                        ;                        ------
173374  056232  000002                  BIS     2(R2),@(R2)+            ;SET BIT 0 IN LOCATION 500      000001
173400  006352                          ASL     @-(R2)                  ;SHIFT LEFT LOCATION 500        000002
173402  006032                          ROR     @(R2)+                  ;ROTATE RIGHT LOCATION 500      000001
173404  000261                          SEC                             ;SET CARRY
173406  005552                          ADC     @-(R2)                  ;ADD CARRY TO LOCATION 500      000002
173410  005332                          DEC     @(R2)+                  ;DECREMENT LOCATION 503         000001
173412  021252                          CMP     (R2),@-(R2)             ;COMPARE LOCATION 500 TO +1
173414  001007                          BNE     T7ERR                   ;ERROR, IF NOT EQUAL

                                                                        ;                          502
                                                                        ;                        ------
173416  016243  000002                  MOV     2(R2),-(R3)             ;LOAD +1 IN LOCATION 502        000001
173422  005013                          CLR     (R3)                    ;CLEAR LOCATION 502             000000
173424  005113                          COM     (R3)                    ;COMPLEMENT LOCATION 502        177777
173426  021362  177776                  CMP     (R3),-2(R2)             ;COMPARE LOCATION 502 TO -1
173432  001404                          BEQ     TEST8                   ;ERROR, IF NOT EQUAL
173434  000000          T7ERR:  HALT                                    ;HALT

                                                                        ;WARNING -
                                                                        ;THE ORDER OF THIS DATA IS POSITION DEPENDANT
173436  177777          T7DATA: .WORD   177777                          ;-1
173440  000500                  .WORD   @#500                           ;DEFERRED ADDRESS
173442  000001                  .WORD   @#1                             ;+1
```

SH#9

```
                                ;**************************************************
                                ;*TEST8:
                                ;*CHECK ALL BYTE DESTINATION MODES WHILE EXECUTING
                                ;*ALL BYTE INSTRUCTIONS FOR DESTINATION MODES NOT ZERO
                                ;*DESTINATION MODES FOR EACH BYTE INSTRUCTION IS
                                ;*SHOWN AS (DMBX) IN THE COMMENT FIELDS
                                ;**************************************************


                                                        ;CONTENTS AFTER INSTRUCTION EXECUTION
                                                        ;  500          NZVC
                                                        ; -----        ------

173444  011203          TEST8:  MOV     (R2),R3         ;LOAD 500 INTO R3
173446  016213  177776          MOV     -2(R2),(R3)     ;177777
173452  105013                  CLRB    (R3)            ;177400 (DMB1)  0100
173454  105123                  COMB    (R3)+           ;177777 (DMB2)  1000
173456  105632                  SBCB    @(R2)+          ;177776 (DMB3)  1001
173460  105243                  INCB    -(R3)           ;177777 (DMB4)  1000
173462  105452                  NEGB    @-(R2)          ;177401 (DMB5)  0001
173464  105323                  DECB    (R3)+           ;177400 (DMB2)  0101
173466  000363  177777          SWAB    -1(R3)          ;000377 (DMB6)  1000
173472  106332                  ASLB    @(R2)+          ;000376 (DMB3)  1010
173474  106072  177776          RORB    @-2(R2)         ;000377 (DMB7)  1010
173500  106243                  ASRB    -(R3)           ;000377 (DMB4)  1001
173502  106113                  ROLB    (R3)            ;000377 (DMB1)  1001
173504  105523                  ADCB    (R3)+           ;000000 (DMB2)  0101
173506  121343                  CMPB    (R3),-(R3)      ;000000 (DMB4)  0101
173510  001007                  BNE     T8ERR           ;BR, IF LOCATION IS NOT ZERO

173512  156252  177774          BISB    -4(R2),@-(R2)   ;000377 (DMB5)  1001
173516  146223  177776          BICB    -2(R2),(R3)+    ;000000 (DMB2)  0101
173522  136243  177776          BITB    -2(R2),-(R3)    ;000000 (DMB4)  0101
173526  001401                  BEQ     TEST9           ;BR, IF LOC. 500 IS ZERO
173530  000000          T8ERR:  HALT                    ;ERROR OCURRED IN TEST8
```


SH#10

```
                                ;**************************************************
                                ;*TEST9:
                                ;*CHECK "JSR" INSTRUCTION WITH DESTINATION MODE = 7
                                ;*USE R1 AND THEN PC AS THE LINKAGE REGISTER
                                ;**************************************************

173532  012702  173620  TEST9:  MOV     #TJSR,R2        ;INITIALIZE R2 WITH DATA ADDRESS
173536  010306                  MOV     R3,SP           ;SET SP = 500
173540  005726                  TST     (SP)+           ;INCREMENT SP TO 502
173542  011203                  MOV     (R2),R3         ;SET R1 = 177777
173544  004372  000002          JSR     R3,@2(R2)       ;PERFORM JSR TO JSR7, (DM7)
173550  000000                  HALT                    ;JSR DID NOT WORK
173552  004772  000002          JSR     PC,@2(R2)       ;PERFORM JSR TO JSR7P
173556  000000          T9ERR:  HALT                    ;JSR FAILED
173560  022704  173302          CMP     #TEST7,R4       ;WAS IT A DIAG COMMAND
173564  001020                  BNE     MEM             ;BR TO MEM TEST IF BOOT COMMAND
173566  000167  171214  KBJMP:  JMP     KBD8            ;RESTART KEYBOARD DISPATCH ROUTINE
173572  005723          JSR7:   TST     (R3)+           ;INCREMENT RETURN PAST HALT AND
173574  001370                  BNE     T9ERR           ;BR IF A HALT WAS NOT IN THE RETURN LOCATION

173576  021622                  CMP     (SP),(R2)+      ;TEST FOR AN ALL 1'S WORD ON THE STACK
173600  001366                  BNE     T9ERR           ;ERROR IF NOT
173602  000203                  RTS     R3              ;RETURN
173604  000000                  HALT                    ;"RTS" RETURN FAILED
173606  005736          JSR7P:  TST     @(SP)+          ;TEST THAT THE RETURN LOCATION IS A HALT
173610  001362                  BNE     T9ERR           ;ERROR IF NOT ZERO
173612  062746  000002          ADD     #2,-(SP)        ;INCREMENT RETURN ADDRESS PAST HALT
173616  000207                  RTS     PC              ;RETURN

                                                        ;WARNING -
173620  177777          TJSR:   .WORD   177777          ;THE ORDER OF THIS DATA IS POSITION DEPENDANT
173622  173572                  .WORD   JSR7
173624  173606          TJSRP:  .WORD   JSR7P
```

SH #11

```
                                        .SBTTL  MEMORY DIAGNOSTICS
                                        ;*****************************************************
                                        ;*MEMORY TEST:
                                        ;*THIS TEST CHECKS THE UPPER 4K OF MEMORY AND THEN
                                        ;*CHECKS THE REMAINDER OF THE MEMORY UP TO 28K
                                        ;*****************************************************

                                        ;*CHECK UPPER 4K OF MEMORY

173626  005026                  MEM:    CLR     SP              ;STARTING ADDRESS FOR TEST
173630  012705  017776                  MOV     #17776,R5       ;UPPER BOUNDARY FOR 4K
173634  005003                          CLR     R3              ;SET DATA = 0
173636  010701                          MOV     PC,R1           ;SUBROUTINE CALL
173640  000424                          BR      MEMDO           ;GO WRITE MEMORY, (UPPER 4K)

                                        ;*NOW SIZE THE REMAINDER OF MEMORY

173642  012705  160000          MEMSIZ: MOV     #160000,R5      ;SET MAX ADDRESS
173646  012702  000006                  MOV     #6,R2           ;SET POINTER FOR TIMEOUT
173652  012712  000340                  MOV     #340,(R2)       ;KEEP PRIORITY AT 7
173656  010742                          MOV     PC,-(R2)        ;STORE PC FOR TIMEOUT TRAP
173660  012706  000502                  MOV     #502,SP         ;RESET STACK POINTER
173664  005045                          CLR     -(R5)           ;CHECK FOR HIGHEST WRITABLE MEMORY

                                        ;*RESTORE TRAPS CATCHER

173666  010701                          MOV     PC,R1           ;SUBROUTINE CALL
173670  000167  171254                  JMP     TRAPS           ;SET UP TRAP HALTS

                                        ;*CHECK REMAINDER OF MEMORY

173674  010701                          MOV     PC,R1           ;SUBROUTINE CALL
173676  000405                          BR      MEMDO           ;GO WRITE REMAINDER OF MEMORY
173700  022704  173626                  CMP     #MEM,R4         ;WAS IT A DIAG COMMAND
173704  001730                          BEQ     KBJMP           ;BR TO KEYBOARD ROUTINE IF YES
173706  000167  171332                  JMP     BTSTP           ;GO DO BOOT
```


SH #12

```
                                        ;*****************************************************
                                        ;*SUBROUTINE TO WRITE, READ & VERIFY MEMORY
                                        ;*
                                        ;*CALLING SEQUENCE
                                        ;*      SET R3=0
                                        ;*      SET SP TO LOW ADDRESS FOR VERIFICATION
                                        ;*      SET R5 TO HIGH ADDRESS FOR VERIFICATION
                                        ;*      MOV PC,R1
                                        ;*      BR MEMDO
                                        ;*
                                        ;*SUBROUTINE ONLY RETURNS IF NO ERROR IS DETECTED
                                        ;*THE CONTENTS OF R2 ARE LOST.
                                        ;*THE TEST CONSISTS OF A MEMORY ADDRESS & DATA STORAGE TEST
                                        ;*****************************************************

                                        ;*****************************************************
                                        ;*DUAL MEMORY ADDRESS TEST:
                                        ;*THIS TEST WRITES ALL MEMORY WITH ITS ADDRESS AND
                                        ;*THEN READS AND VERIFIES ALL MEMORY
                                        ;*****************************************************

173712  010602          MEMDO:  MOV     SP,R2           ;COPY STARTING ADDRESS
173714  010222          ADDRT:  MOV     R2,(R2)+        ;STORE ADDRESS AT ADDRESS
173716  020205                  CMP     R2,R5           ;FINISHED WITH ADDRESSES?
173720  101775                  BLOS    ADDRT           ;NO CONTINUE
173722  024202          CHECK:  CMP     -(R2),R2        ;YES, CHECK DATA
173724  001402                  BEQ     ADCONT          ;BR IF NO COMPARISION ERROR
173726  010203                  MOV     R2,R3           ;STORE EXPECTED DATA IN R3
173730  000000          MEMERA: HALT                    ;MEMORY ADDRESS ERROR, EXPECTED DATA IS IN R3
                                                        ;   BAD DATA IS POINTED TO BY ADDRESS IN R2
                                                        ;   TYPE "P" TO CONTINUE TEST
173732  020206          ADCONT: CMP     R2,SP           ;FINISHED CHECK?
173734  001372                  BNE     CHECK           ;BR IF NOT FINISHED
```

SH#13

```
                                        ;*****************************************************
                                        ;*DATA STORAGE TEST:
                                        ;*THE STEPS OF THIS TEST ARE:
                                        ;*    1. FILL MEMORY WITH ZEROES
                                        ;*    2. WALK AN ALL 1'S WORD THRU MEMORY & VERIFY EACH LOCATION
                                        ;*    3. FILL MEMORY WITH ONES
                                        ;*    4. WALK AN ALL 0'S WORD THRU MEMORY & VERIFY EACH LOCATION
                                        ;*BY PERFORMING THESE STEPS ALL BIT POSITIONS ARE CHECK FOR 0/1 STORAGE
                                        ;*AND THE SENSE AMPS ARE STRESSED IN SEMICONDUCTOR MEMORIES
                                        ;*****************************************************

173736  010322          MEMT:   MOV     R3,(R2)+        ;MOVE BACKGROUND DATA TO MEMORY
173740  020205                  CMP     R2,R5           ;DONE?
173742  101775                  BLOS    MEMT            ;BR, IF MEMORY NOT FILLED
173744  005103                  COM     R3              ;COMP. TEST DATA
173746  010342          WALK:   MOV     R3,-(R2)        ;LOAD TEST DATA IN MEMORY LOCATION @(R2 - 2)
173750  020312                  CMP     R3,(R2)         ;CHECK FOR CORRECT DATA
173752  001401                  BEQ     DCONT           ;BR, IF DATA GOOD
173754  000000          MEMERD: HALT                    ;HALT, BAD DATA, EXPECTED DATA IS IN R3
                                                        ;   BAD DATA IS POINTED TO BY ADDRESS IN R2
                                                        ;   TYPE "P" TO CONTINUE TEST
173756  005103          DCONT:  COM     R3              ;COMP. TEST DATA TO GET PREVIOUS BACKGROUND DATA
173760  010312                  MOV     R3,(R2)         ;RESTORE BACKGROUND DATA FOR PRESENT MEMORY LOCATION
173762  005103                  COM     R3              ;RESTORE TEST DATA FOR THIS PASS
173764  020206                  CMP     R2,SP           ;DONE?
173766  001367                  BNE     WALK            ;BR, IF TEST IS NOT COMPLETED FOR ENTIRE MEMORY
173770  005703                  TST     R3              ;DONE WALKING 1'S & 0'S ? (0'S ARE DONE LAST)
173772  001361                  BNE     MEMT            ;BR, IF WALKING 0'S HAS NOT BEEN DONE
173774  000161  0F0002          JMP     2(R1)           ;RETURN TO CALLER
```


SH#14

```
                                        .SBTTL  ROM AREA 165000 - 165777
                                        .IIF NDF $BOOTS, $BOOTS=165000
                                        ;*****************************************************
                                        ;*THIS AREA OF ROM CONTAINS THE KEYBOARD DISPATCH
                                        ;*ROUTINE AND THE LOADER PROGRAMS
                                        ;*****************************************************
165000                          .       $BOOTS

                                        .SBTTL  KEYBOARD DISPATCH ROUTINE
                                        ;*****************************************************
                                        ;*KEYBOARD DISPATCH ROUTINE:
                                        ;*THIS ROUTINE OUTPUTS THE PROMPT CHARACTERS AND
                                        ;*INTERPRETS AND EXECUTES THE COMMAND STRINGS
                                        ;*****************************************************

165000  012700  165734  KBDQ:   MOV     #MSGQ,R0        ;OUTPUT => <?><LF>
165004  000402                  BR      PRINT           ;BRANCH TO INDICATE A BAD COMMAND
165006  012700  165736  KBDS:   MOV     #MSG,R0         ;OUTPUT => <CR><LF><^S><@>

165012  112002          PRINT:  MOVB    (R0)+,R2        ;PRINT A CHARACTER
165014  010703                  MOV     PC,R3           ;COPY PC FOR RETURN
165016  000440                  BR      PUTCHR          ;PRINT CHARACTER
165020  001374                  BNE     PRINT           ;BR IF MORE TO PRINT

165022  013701  177562          MOV     @#TKB,R1        ;CLEAR KEYBOARD RBUF
165026  010703          READ:   MOV     PC,R3           ;COPY PC FOR RETURN
165030  000425                  BR      GETCHR          ;GET AND ECHO CHAR
165032  000302                  SWAB    R2              ;ROTATE CHAR
165034  001774                  BEQ     READ            ;BR IF 2ND CHAR NOT READ

165036  042702  020040          BIC     #BIT5,13,R2     ;CLEAR BITS 5 & 13 OF COMMAND
                                                        ; (ALWAYS MAKES COMMAND UPPER CASE ASCII)
165042  012004          SEARCH: MOV     (R0)+,R4        ;COPY => FUNCTION ADDRESS
165044  001755                  BEQ     KBDQ            ;IF END OF LIST, BR & PRINT<?><LF>
                                                        ;   TO INDICATE A BAD COMMAND
165046  020220                  CMP     R2,(R0)+        ;SEARCH FOR MATCHING COMMAND
165050  001374                  BNE     SEARCH          ;BR IF NO MATCH MADE
165052  005710                  TST     (R0)            ;IF R0 IS ZERO, THEN THE PRESENT COMMAND
165054  001410                  BEQ     DOIT            ;   IS "DD" & TRAPS ARE NOT SET UP
165056  010701                  MOV     PC,R1           ;COPY PC FOR RETURN
165060  000445                  BR      GETNUM          ;GET OPTIONAL VALUE FOR CMD
                                                        ;INITIALIZE TRAPS
165062  010701                  MOV     PC,R1           ;SUBROUTINE CALL
165064  000167  000060          JMP     TRAPS           ;GO SET TRAPS HALTS
165070  032704  002000          BIT     #BIT10,R4       ;TEST BIT 10 TO DISTINGUISH A BOOT
                                                        ;ADDRESS FROM A DIAGNOSTIC ADDRESS
165074  001401                  BEQ     BTCOMM          ;BR IF BOOT
165076  000114          DOIT:   JMP     (R4)            ;PERFORM DIAGNOSTIC OR "DD" COMMAND
165100  000167  006176  BTCOMM: JMP     TEST7           ;DO DIAGNOSTIC (CPU & MEMORY) TESTS BEFORE BOOT
```

SH#15

```
                                        .SBTTL  GETCHR  - GET & ECHO CHARACTER
                                        ;*********************************************
                                        ;*SUBROUTINE TO READ & ECHO A CHARACTER
                                        ;*THE CHARACTER IS RETURNED IN R2
                                        ;*THE CALLING SEQUENCE IS:
                                        ;*      MOV     PC,R3
                                        ;*      BR      GETCHR
                                        ;*TO JUST OUTPUT A CHARACTER ENTER AT "PUTCHR"
                                        ;*********************************************
165104  105737  177560        GETCHR: TSTB    @#TKS           ;CHAR READY
165110  100375                        BPL     GETCHR          ;BR IF NOT
165112  105002                        CLRB    R2              ;CLEAR FOR TRANSFER
165114  153702  177562                BISB    @#TKB,R2        ;TRANSFER CHAR
165120  105737  177564        PUTCHR: TSTB    @#TPS           ;PRINTER READY
165124  100375                        BPL     PUTCHR          ;BR IF NOT
165126  110237  177566                MOVB    R2,@#TPB        ;PRINT CHAR
165132  022323                        CMP     (R3)+,(R3)+     ;INDEX POINTER TO BR + 4
165134  142702  000200                BICB    #200,R2         ;CLEAR PARITY BIT
165140  000163  177776                JMP     -2(R3)          ;RETURN TO BR + 2


                                        ;*********************************************
                                        ;*RETURN INSTRUCTIONS FOR SUBROUTINES ENTERED BY
                                        ;*      MOV     PC,R1
                                        ;*      BR      XXXXX
                                        ;*********************************************

165144  005721                X1RTN:  TST     (R1)+           ;SET POINTER TO RTN TO BRANCH+2
165146  000111                        JMP     (R1)            ;RETURN


                                        ;*********************************************
                                        ;*SUBROUTINE TO SET UP TRAP & DEVICE INTERRUPT HALTS
                                        ;*
                                        ;* CALLING SEQUENCE
                                        ;*      MOV  PC,R1
                                        ;*      JMP  TRAPS
                                        ;*
                                        ;*THE CONTENTS OF R2 IS LOST, R2 RETURNS WITH ZERO
                                        ;*********************************************

165150  012706  000500        TRAPS:  MOV     #500,SP         ;INITIALIZE STACK POINTER
165154  012702  000400                MOV     #400,R2         ;POINT R2 TO THE TOP OF THE VECTOR AREA
165160  005042                TCONT:  CLR     -(R2)           ;PUT HALT IN LOCATION AFTER TRAP VECTOR
165162  010242                        MOV     R2,-(R2)        ;POINT TRAP VECTOR TO HALT
165164  005702                        TST     R2              ;IF R2=0 TRAPS ARE ALL DONE
165166  001374                        BNE     TCONT           ;BR IF NOT DONE
165170  000161  000004                JMP     4(R1)           ;RETURN TO CALLER
```


SH#16

```
                                        .SBTTL  GETNUM  - GET OCTAL NUMBER INTO R0
                                        ;*********************************************
                                        ;*THIS SUBROUTINE READS A CHARACTER, VERIFIES THAT IT
                                        ;*IS A VALID OCTAL NUMBER, AND STORES IT IN R0
                                        ;*THE CALLING SEQUENCE IS:
                                        ;*      MOV     PC,R1
                                        ;*      BR      GETNUM
                                        ;*THE CONTENTS OF R2 & R3 ARE LOST
                                        ;*********************************************

165174  005000                GETNUM: CLR     R0              ;INITIALIZE RESULT
165176  005002                2$:     CLR     R2              ;CLEAR FOR BYTE XFER
165200  010703                        MOV     PC,R3           ;COPY PC FOR RETURN
165202  000740                        BR      GETCHR          ;GET & ECHO CHAR
165204  120227  000015                CMPB    R2,#CR          ;TERMINATED VIA CR?
165210  001755                        BEQ     X1RTN           ;RETURN IF SO
165212  162702  000060                SUB     #'0,R2          ;CHECK FOR OCTIT
165216  062702  000010                ADD     #'0-'8,R2       ;       "
165222  103366                        BCC     KBDQ            ;BR IF NOT
165224  006300                        ASL     R0              ;MAKE ROOM FOR IT IN RESULT
165226  006300                        ASL     R0              ;       "
165230  006300                        ASL     R0              ;       "
165232  050200                        BIS     R2,R0           ;PUT IT IN RESULT
165234  000760                        BR      2$


                                        .SBTTL  OD      - HALT FOR MICRO-ODT FUNCTIONS
                                        ;*********************************************
                                        ;*HALT FOR ODT OPERATIONS
                                        ;*HIT "P" TO RETURN TO KEYBOARD DISPATCH ROUTINE
                                        ;*PROVIDED PC("R7") IS UNALTERED
                                        ;*********************************************

165236  000000                OD:     HALT                    ;LET THE MICRO-CODE TAKE OVER
165240  000662                        BR      KEDS            ;RETURN TO KEYBOARD DISPLAY ROUTINE
```

SH#17

```
                                        ;*****************************************************
                                        ;*STARTING LOCATION FOR DOING BOOT WITHOUT DIAGNOSTICS
                                        ;*  BEFORE STARTING, LOAD:
                                        ;*       R4 = ADDRESS OF BOOT ROUTINE
                                        ;*       R5 = HIGHEST AVAILABLE MEMORY LOCATION
                                        ;*                (R5-ONLY REQUIRED FOR ABSOLUTE LOADER)
                                        ;*BOOT DEFAULTS TO UNIT ZERO AT THIS ENTRY POINT
                                        ;*****************************************************

165242  005000            BOOT:   CLR     R0              ;DEFAULT TO UNIT ZERO

                                        ;*****************************************************
                                        ;*NORMAL BOOT ENTRY AFTER PERFORMING DIAGNOSTICS
                                        ;*****************************************************

165244  012703  000004    BTSTP:  MOV     #4,R3           ;SET TIMEOUT VECTOR TO RETURN TO
165250  012713  165006            MOV     #KBCS,(R3)      ;  KEYBOARD DISPATCH ROUTINE
165254  012401                    MOV     (R4)+,R1        ;COPY COMMAND STATUS REG &
                                                        ;POINT R4 TO BEGINNING OF BOOT ROUTINE
165256  010506                    MOV     R5,SP           ;SET TO TOP OF MEMORY
                                                        ;  (THE MEMORY TEST LEAVES R5 POINTING
                                                        ;    TO THE TOP OF MEMORY)
165260  000005                    RESET
165262  000114                    JMP     (R4)            ;PERFORM BOOT
```


SH#19

```
                                        .SBTTL  RXV11   - FLOPPY DISK BOOTSTRAP
                                        ;*****************************************************
                                        ;*THIS ROUTINE PERFORMS A BOOT FROM THE RX01 FLOPPY DRIVE
                                        ;*UPON ENTERING THIS ROUTINE :
                                        ;*       R0 = DEVICE NUMBER
                                        ;*       R1 = COMMAND/STATUS REGISTER ADDRESS
                                        ;*
                                        ;*ENTRY IS MADE AT (RX11 + 2)
                                        ;*THE CONTENTS OF R2,R3,R4 ARE LOST
                                        ;*****************************************************

                                        .ENABLE LSB
165264  177170            RX11:   .WORD   RXCS            ;RX11 CONTROL/STATUS REGISTER
165266  012704                    MOV     (PC)+,R4        ;COPY COMMAND/STATUS BITS
                                        .BYTE   200!40!20!6!1   ;TR, DONE, UNIT 1, READ, GO
165271      247                 .BYTE   200!40!00!6!1   ;TR, DONE, UNIT 0, READ, GO
165272  131700                BITB    (PC),R0         ;WHICH UNIT?
                                                        ;LOW BYTE OF NEXT MUST BE 00 000 001
165274  001001                BNE     12$             ;BR IF UNIT 1, R4 IS OK
165276  000304                SWAB    R4              ;SELECT UNIT 0, MOVE HIGH BYTE TO LOW
165300  005002            12$:    CLR     R2              ;CLEAR TIMING REGISTER
165302  105711            12$:    TSTB    (R1)            ;'TR' OR 'DONE' SET?
165304  001005                    BNE     13$             ;BR IF DONE
165306  005202                    INC     R2              ;INCREMENT TIMING COUNTER
165310  005702                    TST     R2              ;THIS IS TO INCREASE THE TIME OF LOOP
165312  001373                    BNE     12$             ;BR IF TIME HAS NOT EXPIRED
165314  000000                    HALT                    ;HALT, "DONE" NOT SET --> TIMEOUT
165316  000552                    BR      KBJMP2          ;RETURN TO KEYBOARD DISPATCH ROUTINE("S")
165320  012703  000003        13$:    MOV     #3,R3           ;SET READ SEQUENCING BITS
165324  000261                    SEC                     ;SET FOR READ SEQUENCE
165326  110411            14$:    MOVB    R4,(R1)         ;COMMAND: "READ" THEN "EMPTY BUFFER"
165330  141704                    BICB    (PC),R4         ;CHANGE "READ(6)" TO "EMPTY BUFFER(2)"
                                                        ;LOW BYTE OF NEXT MUST BE 0X 000 100
165332  031104            16$:    BIT     (R1),R4         ;'ERR', 'TR', OR 'DONE' SET?
165334  001776                    BEQ     16$
165336  100414                    BMI     20$             ;BR IF BOOT ERROR
165340  103405                    BCS     16$             ;BR IF READ SEQUENCE
165342  131104                    BITB    (R1),R4         ;'TR' OR 'DONE' SET?
165344  100011                    BPL     2$:8            ;DONE, GO TEST FOR 240 AT 0
165346  116123  000002            MOVB    2(R1),(R3)+     ;STORE DATA
165352  000767                    BR      16$             ;GO WAIT FOR 'TR' OR 'DONE'
165354  006203            18$:    ASR     R3              ;READ COMMAND SEQUENCE:
                                                        ; 1ST - R3=1, CARRY =1
                                                        ; 2ND - R3=0, CARRY=1
                                                        ; 3RD - R3=0, CARRY=0
165356  103363                    BCC     14$             ;3RD TIME LOAD EMPTY BUFFER COMMAND
165360  112761  000001  000002    MOVB    #1,2(R1)        ; 1ST TIME LOAD SECTOR # 1
                                                        ; 2ND TIME LOAD TRACK # 1
165366  000761                    BR      16$             ;CONTINUE READ SEQUENCE
165370  005721            20$:    TST     (R1)+           ;ANY ERRORS?
165372  100522                    BMI     BTERR           ;BR IF ERROR
165374  122737  000240  000000    CMPB    #240,@#0        ;240 MUST BE AT ZERO
165402  001116                    BNE     BTERR           ;BR IF ERROR
165404  005007                    CLR     PC              ;START SECONDARY BOOT
```

SH#19

```
                                        .DSABLE LSB
```


SH#20

```
                                        .SBTTL  ABSLDR  - ABSOLUTE BINARY LOADER -- V007A
                                        ;*************************************************************
                                        ;*
                                        ;*   INPUT FORMAT --
                                        ;*      FRAME   -1   001
                                        ;*              -2   000
                                        ;*              -3   BYTE COUNT - LOWER ORDER
                                        ;*              -4   BYTE COUNT - HIGHER ORDER
                                        ;*              -5   LOAD ADDRESS - LOWER ORDER
                                        ;*              -6   LOAD ADDRESS - HIGHER ORDER
                                        ;*                        ,       DATA
                                        ;*                        ,          PLACED
                                        ;*                        ,             HERE
                                        ;*               CKSM - LAST FRAME CONTAINS THE CHECKSUM
                                        ;*
                                        ;* IF THE BYTE COUNT IS EQUAL TO 6, THE LOAD ADDRESS
                                        ;*  SPECIFIED WILL BE CONSIDERED TO BE THE DESIRED JUMP
                                        ;*  ADDRESS, IF THIS ADDRESS IS ODD, THE LOADER WILL HALT.
                                        ;*
                                        ;*  IF THE BYTE COUNT IS > 6, DATA WILL BE LOADED INTO MEMORY.
                                        ;*
                                        ;*  PROGRAMMING CONSIDERATIONS AND CAUTIONS = THE TOP THREE WORDS
                                        ;*  OF MEMORY ARE USED FOR THE LOADER SP STACK
                                        ;*
                                        ;*ALL GENERAL REGISTERS ARE USED
                                        ;*************************************************************

165406  177560          AR:   .WORD   TKS             ;DL11 COMMAND STATUS REGISTER
165410  000000                HALT                    ;ENTER SWR SETTINGS INTO R4 USING MICRO-ODT
                                                      ;   THEN TYPE "P" TO PROCEED
165412  000402                BR      DEVNUM          ;BR TO CHECK FOR OPTIONAL CSR
165414  177560          AL:   .WORD   TKS             ;DL11 COMMAND STATUS REGISTER
165416  005004                CLR     R4              ;PSEUDO SWITCH REGISTER CLEARED
165420  005700          DEVNUM: TST     R0              ;CHECK FOR OPTIONAL CSR
165422  001401                BEQ     ABSL            ;IF NONE, GO TO ABSOLUTE LOADER WITH R1=CSR=177560
165424  010001                MOV     R0,R1           ;LOAD OPTIONAL CSR INTO R1

                              ;*MEMORY SIZE - THE "BTSTP" ROUTINE HAS ALREADY  POINTED SP TO
                              ;*THE HIGHEST WRITABLE MEMORY ADDRESS

165426  010116          ABSL:   MOV     R1,(SP)         ;-> READER CSR

165430  011646          L.LOAD: MOV     (SP),-(SP)      ;MAKE 2 COPIES FOR L.READ
```

SH#21

```
                        L.LD1:  MOV     #L.READ,L.PTR   ;-> READ ROUTINE
                                CLR     L.ADR           ;CLEAR THE ROAD ADDRESS
                        L.LD1B: MOV     R4,-(SP)                ;PICK UP THE CONTENT OF
                                                        ;THE SOFTWARE SWITCH REGISTER
                                ROR     @SP             ;CHECK RELOCATION FACTOR
                                BCS     L.LD1C          ;JUMP IF SOME RELOCATION NEEDED
                                CLR     @SP             ;USE ADDRESS SPECIFIED ON THE TAPE
                                BR      L.LD2           ;GO DO LOAD
                        L.LD1C: ASL     @SP             ;CHECK FOR NON-ZERO
                                BNE     L.LD2           ;JUMP IF LOAD ADDRESS SPECIFIED
                                MOV     L.ADR,@SP       ;OTHERWISE CONTINUE LOADING FROM LAST LOAD

                        ;* LOOK FOR THE BEGINNING OF A BLOCK

                        L.LD2:  CLR     L.CKSM          ;INITIALIZE CHECKSUM
                                JSR     PC,@L.PTR       ;READ A FRAME
                                DECB    L.BYT           ;CHECK FOR +1 (START OF A BLOCK)
                                BNE     L.LD2           ;LOOP UNTIL +1 IS FOUND
                                JSR     PC,@L.PTR       ;READ ANOTHER FRAME

                        ;*
                        ;* INPUT AND SAVE BYTE COUNT, IF BYTE COUNT IS EQUAL TO 6
                        ;*  GO TO PROCEED JUMP
                        ;*

                                JSR     PC,L.GWRD       ;GET FULL BYTE COUNT
                                MOV     R4,L.BC         ;
                                ADD     #-4,L.BC        ;SUBTRACT 4 TO MAKE BYTE COUNT CORRECT
                                CMP     #2,L.BC         ;WAS BYTE COUNT EQUAL TO 6?
                                BEQ     L.JMP           ;JUMP IF NO DATA (E.G. - JUMP BLOCK)
                                JSR     PC,L.GWRD       ;GET LOAD ADDRESS
                                ADD     @SP,R4          ;GENERATE ACTUAL ADDRESS
                                MOV     R4,L.ADR                ;AND PUT IT INTO THE PROPER CELL

                        ;*
                        ;* READ IN REMAINDER OF DATA
                        ;*  IF THE LOADER HALTS AT L.BAD, A CHECKSUM ERROR
                        ;*  HAS OCCURED,  R3 WILL CONTAIN THE EXPECTED CHECKSUM,
                        ;*  AND R0 WILL CONTAIN THE DEVIATION FROM THE EXPECTED
                        ;*  CHECKSUM,
                        ;*
                        L.LD3:  JSR     PC,@L.PTR       ;READ A FRAME
                                BGE     L.LD4           ;BRANCH IF MORE DATA REMAINS
                                TSTB    L.CKSM          ;IF CHECKSUM IS
                                BEQ     L.LD2           ;CORRECT, THEN CONTINUE
                        L.BAD:  HALT                    ;CHECKSUM ERROR
                                BR      L.LD2           ;PRESS CONTINUE TO IGNORE CHECKSUM
                        L.LD4:  MOVB    L.BYT,(L.ADR)+  ;STORE 8 BITS AT A TIME
                                BR      L.LD3           ;     THE RE-LOOP
```


SH#22

```
                        ;*
                        ;* INPUT A FRAME, DECREMENT BYTE COUNT, AND ACCUMULATE CHECKSUM
                        ;*
                        L.READ: MOV     6(SP),L.BYT     ;DEVICE ADDRESS TO L.BYT
                                INCB    @L.BYT          ;SELECT READER
                        L.R1:   TSTB    @L.BYT          ;DONE?
                                BPL     L.R1            ;NO
                                MOVB    2(L.BYT),L.BYT  ;GET CHARACTER
                                BIC     #177400,L.BYT   ;CLEAR GARBAGE BITS
                                ADD     L.BYT,L.CKSM    ;ADD TO CHECKSUM
                                DEC     L.BC            ;DECREMENT BYTE COUNT BY ONE
                                RTS     PC

                        ;*
                        ;* ASSEMBLE ONE FULL WORD OF DATA
                        ;*
                        L.GWRD: JSR     PC,@L.PTR       ;GET ONE CHARACTER
                                MOV     L.BYT,R4        ;SAVE R3 IN TEMPORARY
                                JSR     PC,@L.PTR       ;GET ANOTHER FRAME
                                SWAB    L.BYT           ;PLACE ANOTHER FRAME
                                BIS     L.BYT,R4        ;ASSEMBLE BOTH FRAMES INTO A COMPLETE WORD
                                RTS     PC              ;RETURN

                        ;*
                        ;* CHECK CORRECTNESS OF JUMP ADDRESS
                        ;* HALT IF ADDRESS IS ODD, JUMP TO PROGRAM IF ADDRESS IS EVEN
                        ;*
                        L.JMP:  JSR     PC,L.GWRD       ;GET POSSIBLE TRANSFER ADDRESS
                                JSR     PC,@L.PTR       ;GET CHECKSUM
                                TSTB    L.CKSM          ;IF INCORRECT
                                BNE     L.BAD           ; GO TO CHECKSUM HALT ADDRESS
                                ASR     R4              ;GET LOW ORDER BIT
                                BCC     L.JMP1          ;SKIP IF ADDRESS IS EVEN
                                HALT                    ;OTHERWISE HALT
                                BR      L.LD1B          ;RETURN TO START OF LOADING LOOP
                        L.JMP1: ASL     R4              ;RESTORE REGISTER
                                ADD     @SP,R4
                                JMP     @R4             ;JUMP TO USER


                        ;*************************************************
                        ;*BOOT ERROR:
                        ;*A HALT HERE INDICATES A BOOT ERROR HAS OCCURRED
                        ;*
                        ;*HIT "P" TO RETURN TO THE KEYBOARD ROUTINE,
                        ;*  PROVIDED THE PC IS UNALTERED
                        ;*************************************************

                        BTERR1: TST     -(R1)           ;POINT R1 AT ERROR REGISTER FOR RK11
                        BTERR:  MOV     (R1),R2         ;MOVE CONTENTS OF ERROR REG TO R2
                                HALT
                        K3JMP2: JMP     KBDS            ;RETURN TO KEYBOARD DISPLAY ROUTINE
```

SH#23

```
                                        .ENABLE LSB

                                .SBTTL  RK11    - DISK DRIVE BOOTSTRAP
                                ;*****************************************************
                                ;*THIS ROUTINE PERFORMS A BOOT FROM THE RK05 DISK DRIVE
                                ;*UPON ENTERING THE ROUTINE:
                                ;*      R0 = DEVICE NUMBER
                                ;*      R1 = COMMAND/STATUS REGISTER ADDRESS
                                ;*
                                ;*ENTRY IS MADE AT (RK11 + 2)
                                ;*THE CONTENTS OF R3 IS LOST
                                ;*****************************************************

165650  177404          RK11:   .WORD   RKCS            ;<> CONTROL/STATUS REG.
165652  052700  000010          BIS     #10,R0          ;SHIFT UNIT # TO BITS 15 - 13
165656  006300          2$:     ASL     R0              ;       "
165660  103376          BCC     2$              ;       "
165662  010061  000006          MOV     R0,6(R1)        ;MOVE IN TO RKDA REG.
165666  005000          CLR     R0              ;CLEAR UNIT #
165670  062700  000005  DSKRD:  ADD     #5,R0           ;LOAD DISK READ COMM
165674  000400          BR      OTHER           ;UNNECESSARY INSTRUCTION
```


SH#24

```
165676  012761  177000  000002  OTHER:  MOV     #-256.,2(R1)    ;LOAD WORD COUNT OR BYTE COUNT
165704  010011                  MOV     R0,(R1)         ;LOAD READ FUNCTION & GO
165706  005003                  CLR     R3              ;CLEAR REG FOR TIMING INTERFACE TIMEOUT
165710  105711          TDONE:  TSTB    (R1)            ;TEST FOR DONE
165712  100405                  BMI     DONE            ;BR IF DONE
165714  005203                  INC     R3              ;INCREMENT COUNTER
165716  005703                  TST     R3              ;THIS IS TO INCREASE TIME OF LOOP
165720  001373                  BNE     TDONE           ;TEST FOR TIMEOUT
165722  000000                  HALT                    ;HALT, "DONE" NOT SET --> TIMEOUT
165724  000747                  BR      KBJMP2          ;RETURN TO KEYBOARD DISPATCH ROUTINE("S")
165726  005711          DONE:   TST     (R1)            ;ERRORS ?
165730  100742                  BMI     BTERR1          ;BR IF ERROR
165732  005007                  CLR     PC              ;START SECONDARY BOOT

                                .DSABLE LSB
```

SH#25

```
                                ;**************************************************
                                ;*OUTPUT PROMPT STRINGS
                                ;**************************************************

165734  005077          MSGQ:   .ASCII  <'?><LF>        ;ERRONEOUS COMMAND INDICATOR
165736  005015  000044  MSG:    .ASCII  <CR><LF><'S><0> ;READY PROMPT OUTPUT


                                ;**************************************************
                                ;*COMMAND DEFINITION TABLE
                                ;**************************************************

165742  173626          CTABLE: MEM
                                .ASCII  /XM/            ;COMMAND TO DO JUST MEMORY TEST
165744  046530                  AR
165746  165406                  .ASCII  /AR/            ;COMMAND TO DO CPU & MEMORY TESTS AND
165750  051101                                          ;THE ABSOLUTE LOADER WITH A RELOCATABLE PROGRAM

165752  165414                  AL
165754  046101                  .ASCII  /AL/            ;SAME COMMAND AS "AR",EXCEPT NO RELOCATION DESIRED
165756  165264                  RX11
165760  054104                  .ASCII  /DX/            ;SAME AS "AR",EXCEPT THE FLOPPY BOOT IS
                                                        ;EXECUTED IN PLACE OF THE ABSOLUTE LOADER

165762  165650                  RK11
165764  045504                  .ASCII  /DK/            ;SAME AS "AR", EXCEPT THE DISK DRIVE BOOT
                                                        ;IS EXECUTED IN PLACE OF THE ABSOLUTE LOADER

165766  173302                  TEST7
165770  041530                  .ASCII  /XC/            ;COMMAND TO DO JUST THE CPU TEST
165772  165236                  OD
165774  042117                  .ASCII  /OD/            ;COMMAND TO HALT FOR ODT OPERATION
                                                        ;WARNING -
                                                        ;THE "OD" COMMAND MUST BE THE LAST COMMAND IN THE LIST

165776  000000                  0                       ;INDICATION OF END OF TABLE

        000001                  .END
```


SH#26

```
ABSL    165426          ADCONT  173732          ADDRT   173714          AL      165414
AR      165406          BIT10 = 002000          BIT15 = 100000          BIT5.1= 020040
BOOT    165242          BTCOMM  165100          BTERR   165640          BTERR1  165636
BTSTP   165244          CHECK   173722          CR    = 000015          CTABLE  165742
DCONT   173756          DEVNUM  165420          DOIT    165076          DONE    165726
DSKRD   165670          GETCHR  165104          GETNUM  165174          GONOGO= 173000
JMP1    173152          JMP3    173160          JSR7    173572          JSR7P   173606
KBDQ    165000          KBDS    165006          KBJMP   173566          KBJMP2  165644
LF    = 000012          L.ADR =%000001          L.BAD   165532          L.BC  =%000002
L.BYT =%000003          L.CKSM=%000000          L.GWRD  165572          L.JMP   165606
L.JMP1  165630          L.LD1   165432          L.LD1B  165440          L.LD1C  165452
L.LD2   165460          L.LD3   165522          L.LD4   165536          L.LOAD  165430
L.PTR =%000005          L.READ  165542          L.R1    165550          MEM     173626
MEMDD   173712          MEMERA  173730          MEMERD  173754          MEMSIZ  173642
MEMT    173736          MSG     165736          MSGQ    165734          OD      165236
OTHER   165676          PC    =%000007          PCCS  = 177550          PRINT   165012
PUTCHR  165120          READ    165026          RKCS  = 177404          RK11    165650
RXCS  = 177170          RX11    165264          R0    =%000000          R1    =%000001
R2    =%000002          R3    =%000003          R4    =%000004          R5    =%000005
SEARCH  165042          SP    =%000006          TCONT   165160          TDONE   165710
TEST1   173000          TEST2   173044          TEST3   173104          TEST4   173142
TEST5   173166          TEST6   173236          TEST7   173302          TEST8   173444
TEST9   173532          TJSR    173620          TJSRP   173624          TKB   = 177562
TKS   = 177560          TPB   = 177566          TPS   = 177564          TRAPS   165150
T3DATA  173264          T3DAT4  173270          T5DATA  173274          T6DATA  173300
T7DATA  173436          T7ERR   173434          T8ERR   173530          T9ERR   173556
WALK    173746          XIRTN   165144          $BOOTS= 165000          .     = 166000
```

```
ERRORS DETECTED:  0

*M9400,M9400=RM9400/DS:ERFZ
RUN-TIME:  3  6  0 SECONDS
CORE USED:  4K
```

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

PARTS LIST

MADE BY D. HEALY	CHECKED D. HEALY	SECTION 1
DATE 26 FEB 76	DATE 26 FEB 76	
ENG Tom Hildreth	PROD [redacted]	ISSUED SECT. 1
DATE 3/11/76	DATE 3-15-76	

ITEM NO.	DWG NO./PART NO.	DESCRIPTION	QUANTITY/VARIATION REV11-A	REV11-C	REV11-J	REVII-H	REVII-K	REVII-L
1	MPØØØ73	REV11 VOLUME NO. 1 PRINT SET	1	1	1	-	-	-
2	DEC-11-DZM9A-C-D	REV11 DIAGNOSTIC LISTING	*	*	*	*	*	*
3	DEC-11-DZM9A-C-PB	REV11 DIAGNOSTIC PAPER TAPE	*	*	*	*	*	*
4	MPØØ331	REVII VOLUME NO.2 PRINT SET	-	-	-	1	1	1

*NOTE: THESE ITEMS ARE ONLY TO BE SHIPPED WITH FIRST SHIP TO CUSTOMER.

TITLE	ASSY NO.	SIZE	CODE	NUMBER	REV.	ECO NO.
REV11 SHIPPING LIST	NONE	A	PL	REV11-Ø-2	A	REVII-00002
	SHEET 1 OF 1	DIST.				

DEC FORM DEC 16-(325)-1031--N870
DRA 110