

REVISION HISTORY			VARIATIONS FOR THIS ASSY.		FIRST USED ON: M9312		DIGITAL EQUIPMENT CORPORATION MAYNARD, MASSACHUSETTS			
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					MADE BY: B CRAMM		DATE: 1 AUG 78		ROM LISTING BOOTSTRAP	
					CHECKED: N POLLITT		DATE: 17 AUG 78			
					DSN.ENG.: B GIST		DATE: 1 AUG 78			
					PROD.: D PETERSON		DATE: 3 AUG 78		SIZE: K CODE: SP DOCUMENT NUMBER: M9312-0-7 REV: A	
					RESP.ENG.: E CROCKER		DATE: 1 AUG 78		ASSY. #: EDIT NO: 11	
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M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE PC11 OPTION(S)

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y34.
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y36.
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL TTY BOOT
 .SBTTL ;PC, DL BOOT

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000000 050122
000002 000026
000004 000261
000006 012700 000000
000012 012701 177550
000016 010704
000020 103064
000022 000412
000024 173000
000026 000340
000030 052124
000032 000146
000034 000261
000036 012700 000000
000042 012701 177560
000046 000763
000050 012705 160000
000054 012703 000004
000060 010723
000062 005013
000064 012706 000502
000070 010145
000072 042705 000032
000076 012725 016701
000102 012725 000026
000106 012725 012702
000112 012725 000352
000116 012725 005211
000122 012725 105711
000126 012725 100376
000132 012725 116162
000136 012725 000002
000142 010515
000144 105025
000146 005205

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HSR:  .ASCII  "RP"          ;HIGH SPEED READER BOOT.
      .WORD   <HSRE-.+2>    ;OFFSET TO NEXT BOOT.
      SEC
      MOV     #0,R0         ;ENTRY POINT TO NO DIAG.
HSRM:  MOV     #HSRCR,R1    ;LOAD CSR ADDR. INTO R1.
CFUDGE: MOV     PC,R4       ;ENTRY POINT
      BCC     BDIAG        ;GO DO DIAG.
      BR      LOAD
      .WORD   MRESERVED
HSRE:  .WORD   RESERVED
TT:    .ASCII  "TT"        ;LOW SPEED READER.
      .WORD   <TTE-.+2>    ;OFFSET TO NEXT BOOT.
      SEC
      MOV     #0,R0
TTM:   MOV     #TTCR,R1    ;LOAD CSR ADDR. INTO R1.
      BR      CFUDGE
LOAD:  MOV     #160000,R5
      MOV     #4,R3        ;PUT ERRVEC INTO R3
      MOV     PC,(R3)+     ;PUT RETURN ADDR IN ERRVEC
      CLR     (R3)
1$:    MOV     #502,SP
      MOV     R1,-(R5)     ;TIMES OUT UNTIL RIGHT ADDR!
      BIC     #32,R5
      MOV     #16701,(5)+
      MOV     #26,(5)+
      MOV     #12702,(5)+
      MOV     #352,(5)+
      MOV     #5211,(5)+
      MOV     #105711,(5)+
      MOV     #100376,(5)+
      MOV     #116162,(5)+
      MOV     #2,(5)+
      MOV     R5,(5)
      CLRB    (5)+
      INC     R5

```

000150	012725	005267	MOV	#5267,(5)+	
000154	012725	177756	MOV	#177756,(5)+	
000160	012725	000765	MOV	#765,(5)+	
000164	010115		MOV	R1,(5)	
000166	000165	177746	JMP	-32(R5)	;GO DO BOOT ADDR.=X7744
000172	000137	165564	BDIAG: JMP	@BDIAG	
000176	154747		TTE: .WORD	154747	;CRC WORD FOR LAST 63. WORDS.
	000001		.END		

SYMBOL TABLE

BDIAG	000172	BIT8	= 000400	BIT9	= 001000	CFUDGE	000016
CRCWD	= 000000	DIAG	= 165564	HSR	000000	HSRCR	= 177550
HSRE	000026	HSRM	000012	INITSW	= 173024	LOAD	000050
MRESER	= 173000	PC	= %000007	RESERV	= 000340	RK05CR	= 177404
RK06CR	= 177440	RL01CR	= 174400	RP03CR	= 176714	RP04CR	= 176700
RS03CR	= 172040	RS04CR	= 172040	RX01CR	= 177170	RX02CR	= 177170
R0	= %000000	R1	= %000001	R2	= %000002	R3	= %000003
R4	= %000004	R5	= %000005	R6	= %000006	R7	= %000007
SP	= %000006	TT	000030	TTCR	= 177560	TTE	000176
TTM	000042	TU10CR	= 172522	TU16CR	= 172440	TU56CR	= 177342
.	= 000200						

.TITLE M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RK05 TU56 OPTION(S).

.SBTTL RK05 BOOT

TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL TU56 BOOT

THIS ROM WILL BOOT THE TU56 OPTION(S).
TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y34.
TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y36.
THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL ;RK05, TU56 BOOT
;CMNDS "DK", "DT"

;RK05 BOOT. THIS BOOT READS DISK ADDR. 0,0 ON ERROR I.E. DRIVE
; NOT READY,NO DISK,ETC, A SYSTEM INIT. IS ISSUED AND
; THE BOOT IS RETRIED UNTIL A GOOD BOOT OCCURS
; OR THE BOOT IS HALTED.

;TU56 BOOT. THIS BOOT READS BLOCK 0 FROM THE DEC TAPE ON ERROR
; WE ISSUE A A SYSTEM INIT. THEN TRY TO REBOOT.
; THIS RETRY WILL OCCUR UNTIL WE SUCCESSFULLY BOOT,
; OR THE BOOT IS HALTED.
;

000000 042113
000002 000026
000004 000261
000006 012700 000000
000012 012701 177404
000016 010704
000020 103057
000022 000426
000024 173000
000026 000340
000030 042124
000032 000146
000034 000261
000036 012700 000000
000042 012701 177342

RK05: .ASCII "KD" ;CMND "DK" RK05 BOOT.
.WORD <RK05E-.+2> ;OFFSET TO NEXT DEVICE BOOT.
SEC ;UNIT 0, NO DIAG. ENTRY POINT.
MOV #0,R0 ;UNIT 0, RUN DIAG. ENTRY POINT
RK05M: MOV #RK05CR,R1 ;LOAD CSR ADDR. INTO R1.
MOV PC,R4 ;ENTRY FROM CONSOLE EMULATOR.
BCC BDIAG ;EXERCISE DIAG. IF C=0
BR RK05B ;GOTO RK05 BOOT.
.WORD MRESERVED
RK05E: .WORD RESERVED
TU56: .ASCII "TD" ;CMND "DT" TU56 BOOT.
.WORD <TU56E-.+2> ;OFFSET TO NEXT DEVICE BOOT.
SEC ;UNIT 0, NO DIAG. ENTRY POINT.
MOV #R0,R0 ;UNIT 0, RUN DIAG. ENTRY POINT.
TU56M: MOV #TU56CR,R1 ;LOAD CSR ADDR. INTO R1

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000046 010704      MOV      PC,R4      ;ENTRY FROM CONSOLE EMULATOR.
000050 103043      BCC      BDIAG      ;EXERCISE DIAG. IF C=0
000052 010003      MOV      R0,R3      ;FIX UNIT NUMBER IN R3
000054 000303      SWAB      R3      ;TU56 BOOT.
000056 010311      MOV      R3,(R1)    ;FIX UNIT NUMBER IN DEVICE.
000060 052711 004003      BIS      #4003,(R1) ;SET REWIND
000064 005711      1$:      TST      (R1)    ;WAIT FOR END ZONE ERROR
000066 100376      BPL      1$
000070 005761 177776      TST      -2(R1)    ;LOOK FOR ERROR.
000074 010311      MOV      R3,(R1)    ;CLEAR DEVICE.
000076 000410      BR       CBOOT      ;GOTO COMMON BOOT.
000100 010003      RK05B:  MOV      R0,R3
000102 000241      CLC
000104 006003      ROR      R3      ;FIX UNIT NUMBER FOR DEVICE.
000106 006003      ROR      R3
000110 006003      ROR      R3
000112 006003      ROR      R3
000114 010361 000006      MOV      R3,6(R1)    ;SET UNIT NUMBER IN DEVICE
000120 012761 177000 000002 CBOOT:  MOV      #-512.,2(R1) ;COMMON BOOT, SET WORD COUNT.
000126 052703 000005      BIS      #5,R3      ;PICK UP READ WORD.
000132 010311      MOV      R3,(1)    ;SET INTO DEVICE CSR.
000134 105711      1$:      TSTB     (R1)    ;WAIT FOR DEVICE DONE.
000136 100376      BPL      1$
000140 005711      TST      (R1)    ;TEST FOR DEVICE ERROR
000142 100003      BPL      GBOOT
000144 000005      ERROR:  RESET     ;ON ERROR, INITIALIZE SYSTEM
000146 000164 000002      JMP      2(R4)    ;RETURN TO START OF BOOT.
000152 042711 000377      GBOOT:  BIC      #377,(R1) ;NO ERROR, CLEAR DEVICE
000156 005007      CLR      R7      ;GOTO SECONDARY MONITOR ADDR. OR
000160 000137 165564      BDIAG:  JMP      @#DIAG    ;GOTO DIAGNOSTIC IF C=0
                                ;RETURNS BASED ON ADDR. IN R4
                                ;*****
                                ;ENTRY POINT FOR RK05 UNIT #2,NO DIAGS RUN.
                                ;*****
000164 000261      SEC

                                ;*****
                                ;ENTRY POINT FOR RK05 UNIT #2, RUN DIAGS.
                                ;*****

000166 012700 000002      RK052:  MOV      #2,R0      ;ENTRY POINT FOR RK05 BOOT UNIT 2
000172 000707      BR       RK05M
                                .=176
000176 124650      TU56E:  .WORD    124650    ;CRC WORD FOR LAST 63. WORDS.
                                .END
000001

```


SYMBOL TABLE

BDIAG	000160	BIT8	= 000400	BIT9	= 001000	CBOOT	000120
CRCWD	= 000000	DIAG	= 165564	ERROR	000144	GBOOT	000152
HSRCR	= 177550	INITSW	= 173024	MRESER	= 173000	PC	= %000007
RESERV	= 000340	RK05	000000	RK05B	000100	RK05CR	= 177404
RK05E	000026	RK05M	000012	RK052	000166	RK06CR	= 177440
RL01CR	= 174400	RP03CR	= 176714	RP04CR	= 176700	RS03CR	= 172040
RS04CR	= 172040	RX01CR	= 177170	RX02CR	= 177170	R0	= %000000
R1	= %000001	R2	= %000002	R3	= %000003	R4	= %000004
R5	= %000005	R6	= %000006	R7	= %000007	SP	= %000006
TTCR	= 177560	TU10CR	= 172522	TU16CR	= 172440	TU56	000030
TU56CR	= 177342	TU56E	000176	TU56M	000042	.	= 000200

M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RK06/RK07 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL RK06/RK07 BOOT

;RK06 BOOT. THIS BOOT BOOTS EITHER THE RK06 OR RK07 DRIVES.
 ; IT FIRST TRIES TO BOOT SELECTED DRIVE AS A RK06.
 ; IF WE GET A DRIVE TYPE ERROR AS A RESULT OF THAT TRY,
 ; WE SET THE RK07 DRIVE TYPE IN THE RK611 CSR. AND TRY
 ; TO BOOT THE SELECTED DRIVE AS A RK07.
 ;
 ; NOTE: DRIVE TYPE IS LEFT IN THE
 ; CSR WHEN WE LEAVE THIS BOOT.

.SBTTL ;RK06/RK07
 ;CMND = "DM"

000000	042115		RK06:	.ASCII	"MD"		;ID OF RK06,RK07 BOOT.
000002	000176			.WORD	<RK06E-.+2>		;OFFSET TO NEXT DEVICE BOOT.
000004	000261			SEC			
000006	012700	000000		MOV	#0,R0		
000012	012701	177440	RK06M:	MOV	#RK06CR,R1		;LOAD DEVICE ADDR. INTO R1.
000016	010704			MOV	PC,R4		
000020	103055			BCC	BDIAG		
000022	000402			BR	RK06B		
000024	173000			.WORD	MRESERVED		
000026	000340			.WORD	RESERVED		
000030	010061	000010	RK06B:	MOV	R0,10(R1)		
000034	012711	000003		MOV	#3,(R1)		
000040	105711		1\$:	TSTB	(R1)		
000042	100376			BPL	1\$		
000044	005711			TST	(R1)		
000046	100015			BPL	3\$		;NO ERROR-THEN PROCEED.
000050	032761	000040 000014		BIT	#40,14(R1)		;THERE WAS AN ERROR,PUT DRIVE TYPE?
000056	001426			BEQ	ERROR		;NO,INIT AND TRY AGAIN.
000060	000005			RESET			;YES INIT AND TRY RK07 TYPE DRIVE.
000062	010061	000010		MOV	R0,10(R1)		;SET DRIVE NUMBER.
000066	012711	002003		MOV	#002003,(R1)		;SELECT RK07,PAC.
000072	105711		2\$:	TSTB	(R1)		;WAIT FOR READY.
000074	100376			BPL	2\$		
000076	005711			TST	(R1)		;LOOK FOR AN ERROR
000100	100415			BMI	ERROR		;IF ERROR INIT TRY AGAIN.
000102			3\$:				;REGISTER INTO ITSELF.
000102	012761	177000 000002	CBOOT:	MOV	#-512.,2(R1)		;LOAD WORD COUNT
000110	011103			MOV	(R1),R3		;READ DEVICE
000112	042703	000377		BIC	#377,R3		;STRIP.

000116	052703	000021		BIS	#21,R3	;ADD READ CODE
000122	010311			MOV	R3,(R1)	;START DEVICE
000124	105711		1\$:	TSTB	(R1)	;WAIT FOR READY
000126	100376			BPL	1\$	
000130	005711			TST	(1)	;ANY ERROR?
000132	100003			BPL	GBOOT	;NO ERROR, EXIT
000134	000005		ERROR:	RESET		;INITIALIZE SYSTEM
000136	000164	000002		JMP	2(4)	;RETRY BOOT.
000142			GBOOT:			
000142	005007		START:	CLR	PC	;STARTS LOADED CODE.
;*****						
;ENTRY POINT FOR RK06,RK07 UNIT #1, NO DIAG.						
;*****						
000144	000261			SEC		
;*****						
;ENTRY POINT FOR RK06,RK07 UNIT #1, RUN DIAG.						
;*****						
000146	012700	000001		MOV	#1,R0	
000152	000717			BR	RK06M	
000154	000137	165564	BDIAG:	JMP	@#DIAG	
	000176			.	=176	
000176	077161		RK06E:	.WORD	077161	;CRC WORD FOR LAST 63. WORDS.
	000001			.END		

SYMBOL TABLE

BDIAG	000154	BIT8	= 000400	BIT9	= 001000	CBOOT	000102
CRCWD	= 000000	DIAG	= 165564	ERROR	000134	GBOOT	000142
HSRCR	= 177550	INITSW	= 173024	MRESER	= 173000	PC	=%000007
RESERV	= 000340	RK05CR	= 177404	RK06	000000	RK06B	000030
RK06CR	= 177440	RK06E	000176	RK06M	000012	RL01CR	= 174400
RP03CR	= 176714	RP04CR	= 176700	RS03CR	= 172040	RS04CR	= 172040
RX01CR	= 177170	RX02CR	= 177170	R0	=%000000	R1	=%000001
R2	=%000002	R3	=%000003	R4	=%000004	R5	=%000005
R6	=%000006	R7	=%000007	SP	=%000006	START	000142
TTCR	= 177560	TU10CR	= 172522	TU16CR	= 172440	TU56CR	= 177342
.	= 000200						

M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RL01 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL RL01 BOOT
 ;CMND = "DL"

000000	042114		RL01:	.ASCII	"LD"		;ID OF RL11/RL01 BOOT.
000002	000176			.WORD	<RL01E-.,+2>		;OFFSET TO NEXT DEVICE BOOT.
000004	000261			SEC			;UNIT 0, NO DIAG. ENTRY POINT
000006	012700	000000		MOV	#0,R0		;UNIT 0, RUN DIAG. ENTRY POINT.
000012	012701	174400	RL01M:	MOV	#RL01CR,R1		;LOAD CSR ADDR. INTO R1
000016	010704			MOV	PC,R4		;ENTRY POINT FROM CONSOLE EMULATOR.
000020	103064			BCC	BDIAG		;EXERCISE DIAG. FC=0
000022	000402			BR	1\$		
000024	173000			.WORD	MRESERVED		
000026	000340			.WORD	RESERVED		
000030	010003		1\$:	MOV	R0,R3		
000032	000303			SWAB	R3		;ASSUME SYSTEM INIT ON ENTRY.
000034	010311			MOV	R3,(R1)		;SET UNIT NUMBER.
000036	012761	000013	000004	MOV	#13,4(R1)		;CLEAR DRIVE ERROR.
000044	052703	000004		BIS	#4,R3		
000050	010311			MOV	R3,(R1)		;ISSUE GET STATUS.
000052	105711		2\$:	TSTB	(R1)		;WAIT TILL DONE.
000054	100376			BPL	2\$		
000056	105003			CLRB	R3		
000060	052703	000010		BIS	#10,R3		;ISSUE A READ HEADER.
000064	010311			MOV	R3,(R1)		
000066	105711		3\$:	TSTB	(R1)		;WAIT TILL DONE.
000070	100376			BPL	3\$		
000072	016102	000006		MOV	6(R1),R2		;GET HEADER.
000076	042702	000077		BIC	#77,R2		;CLEAR SECTOR.
000102	005202			INC	R2		
000104	010261	000004		MOV	R2,4(R1)		;SET SEEK TO ZERO.
000110	105003			CLRB	R3		
000112	052703	000006		BIS	#6,R3		
000116	010311			MOV	R3,(R1)		;DO SEEK.
000120	105711		4\$:	TSTB	(R1)		;WAIT TILL DONE.
000122	100376			BPL	4\$		
000124	005061	000004		CLR	4(R1)		;CLEAR DISK ADDR.
000130	012761	177000	000006	MOV	#-512.,6(R1)		;SET WORD COUNT.
000136	105003			CLRB	R3		
000140	052703	000014		BIS	#14,R3		;READ DATA CMND.
000144	010311			MOV	R3,(R1)		;ISSUE READ CMND.
000146	105711		5\$:	TSTB	(R1)		;WAIT TILL DONE.
000150	100376			BPL	5\$		
000152	005711			TST	(R1)		;LOOK FOR ERRORS.

000154	100003		BPL	GBOOT	
000156	000005		ERROR: RESET		;SYSTEM INITIALIZE.
000160	000164	000002	JMP	2(R4)	
000164	042711	000377	GBOOT: BIC	#377,(R1)	;CLEAR RL01.
000170	005007		CLR	R7	;GOTO SECONDARY BOOT.
000172	000137	165564	BDIAG: JMP	@#DIAG	
	000176		.	=176	
000176	174540		RL01E: .WORD	174540	;CRC WORD FOR LAST 63.WORDS.
	000001		.	END	

SYMBOL TABLE

BDIAG	000172	BIT8	= 000400	BIT9	= 001000	CRCWD	= 000000
DIAG	= 165564	ERROR	000156	GBOOT	000164	HSRCR	= 177550
INITSW	= 173024	MRESER	= 173000	PC	= %000007	RESERV	= 000340
RK05CR	= 177404	RK06CR	= 177440	RL01	000000	RL01CR	= 174400
RL01E	000176	RL01M	000012	RP03CR	= 176714	RP04CR	= 176700
RS03CR	= 172040	RS04CR	= 172040	RX01CR	= 177170	RX02CR	= 177170
R0	= %000000	R1	= %000001	R2	= %000002	R3	= %000003
R4	= %000004	R5	= %000005	R6	= %000006	R7	= %000007
SP	= %000006	TTCR	= 177560	TU10CR	= 172522	TU16CR	= 172440
TU56CR	= 177342	.	= 000200				

M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RS03 OPTION(S).

TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

				.SBTTL	RS03 BOOT		
				;CMND	DS		
000000	042123			RS03:	.ASCII 'SD'		;IDENTIFIER 'DS' FOR RS03 BOOT.
000002	000176				.WORD <RS03E-.+2>		;OFFSET TO NEXT ROM.
000004	000261				SEC		;ENTRY FOR UNIT 0,NO CPU DIAG RUN.
000006	012700	000000			MOV #0,R0		;ENTRY FOR UNIT 0,RUN CPU DIAG.
000012	012701	172040		RS03M:	MOV #RS03CR,R1		;PUT ADDR. OF CSR INTO R1.
000016	010704				MOV PC,R4		;GET RETURN ADDR.,
000020	103026				BCC BDIAG		;GOTO DIAG IF ENABLED(C=0).
000022	000402				BR 1\$		
000024	173000				.WORD MRESERVED		
000026	000340				.WORD RESERVED		
000030	010003			1\$:	MOV R0,R3		
000032	010361	000010		RS03B:	MOV R3,10(R1)		;SET UNIT NUMBER
000036	016161	000016	000016		MOV 16(R1),16(R1)		;WRITE ATTENTION FLAGS.
000044	012761	177000	000002		MOV #-512.,2(R1)		;SET WORD COUNT.
000052	012711	000071			MOV #71,(R1)		;SET COMMAND READ.
000056	105711			1\$:	TSTB (R1)		;WAIT TILL READY.
000060	100376				BPL 1\$		
000062	005711				TST (R1)		;LOOK FOR ERRORS.,
000064	100401				BMI ERROR		;IF ERROR,TAKE CARE OF IT.
000066	005007				CLR R7		;ELSE EXIT TO LOADED CODE.,
000070	000005			ERROR:	RESET		;INIT SYSTEM.
000072	000164	000002			JMP 2(R4)		
000076	000137	165564		BDIAG:	JMP @#DIAG		;GOTO DIAGNOSTICS
							;RETURN MADE THROU ADDR. IN R4.
000176	126075			RS03E:	.WORD 126075		;CRC16 WORD FOR LAST 63. WORDS.
000001					.END		

SYMBOL TABLE

BDIAG	000076	BIT8	= 000400	BIT9	= 001000	CRCWD	= 000000
DIAG	165564	ERROR	000070	HSRCR	= 177550	INITSW	= 173024
MRESER	= 173000	PC	= %000007	RESERV	= 000340	RK05CR	= 177404
RK06CR	= 177440	RL01CR	= 174400	RP03CR	= 176714	RP04CR	= 176700
RS03	000000	RS03B	000032	RS03CR	= 172040	RS03E	000176
RS03M	000012	RS04CR	= 172040	RX01CR	= 177170	RX02CR	= 177170
R0	= %000000	R1	= %000001	R2	= %000002	R3	= %000003
R4	= %000004	R5	= %000005	R6	= %000006	R7	= %000007
SP	= %000006	TTCH	= 177560	TU10CR	= 172522	TU16CR	= 172440
TU56CR	= 177342	.	= 000200				

M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RX01 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL RX01 BOOT
 ;CMND "DX"

; THIS BOOT READ TRACK 1, SECTOR 1 OFF DISK. IT CAN ONLY LOOK AT
 ; DRIVE 0 OR DRIVE 1.
 ; IF ANY ERROR IS ENCONTERED I.E. DRIVE OFF LINE, NO DISK, ETC,
 ; A SYSTEM INIT. IS ISSUED AND WE TRY AGAIN TO REBOOT THE DISK.

```

000000 042130
000002 000176
000004 000261
000006 012700 000000
000012
000012 012701 177170
000016 010704
000020 103056
000022 000402
000024 173000
000026 000340
000030 000241
000032 012703 001407
000036 132700 000001
000042 001402
000044 012703 011427
000050 132711 100040

000054 001775
000056 110311
000060 111105
000062 100376
000064 112761 000001 000002
000072 106003
000074 102771
000076 032711 100040
000102 001775
000104 100412
000106 000303
000110 110311
000112 005003
000114 105711
000116 100376
000120 116123 000002

```

```

RX01: .ASCII "XD" ;CMND "DX" RX01 BOOT.
      .WORD <RX01E-.+2> ;OFFSET TO NEXT DEVICE BOOT.
      SEC ;UNIT 0, NO DIAG
      MOV #0,R0 ;UNIT 0 RUN
RX01M: ;ENTRY FROM CONSOLE EMULATOR
      MOV #RX01CR,R1 ;GET CSR ADDR TO R1
      MOV PC,R4
      BCC BDIAG ;EXERCISE DIAG. IF C=D
      BR 1$
      .WORD MRESERVED ;
      .WORD RESERVED ;
1$: CLC
RX01B: MOV #1407,R3
      BITB #1,R0
      BEQ 1$
      MOV #11427,R3
1$: BITB #100040,(R1) ;IS DONE BIT SET?
      ;
      BEQ 1$
      MOVB R3,(R1) ;LOAD READ CMND.
2$: MOVB (R1),R5 ;IS 'TR' BIT SET?
      BPL 2$
      MOVB #1,2(R1) ;LOAD TRACK,SECTOR ADDR.
      RORB R3
      BVS 2$
3$: BIT #100040,(R1) ;WAIT FOR ERROR OR DONE.
      BEQ 3$
      BMI ERROR
      SWAB R3
      MOVB R3,(R1)
      CLR R3
4$: TSTB (R1)
      BPL 4$
      MOVB 2(R1),(R3)+

```

000124	105703			TSTB	R3			;ALL DONE READS?
000126	100372			BPL	4\$			;NO GET NEXT BYTE
000130	005007			CLR	PC			;START CODE
000132	000005			RESET				
000134	000140	012700	000001	ERROR: M1:	MOV	#1,R0		;ENTER HERE TO BOOT
								;UNIT #1 WITHOUT DIAG.
000144	000261							
000146	000721			SEC				
000150	012700	000001		M2: BR	RX01M			
								;ENTER HERE TO BOOT
000154	000716							;UNIT #1 WITH DIAG. RUN.
000156	000137	165564		BDIAG: MOV	#1,R0			
000176	105572			RX01E: BR	RX01M			
	000001							
					JMP	@#DIAG		
					.WORD	105572		
				.END				

SYMBOL TABLE

BDIAG	000156	BIT8	= 000400	BIT9	= 001000	CRCWD	= 000000
DIAG	= 165564	ERROR	000132	HSRCR	= 177550	INITSW	= 173024
MRESER	= 173000	M1	000140	M2	000150	PC	= %000007
RESERV	= 000340	RK05CR	= 177404	RK06CR	= 177440	RL01CR	= 174400
RP03CR	= 176714	RP04CR	= 176700	RS03CR	= 172040	RS04CR	= 172040
RX01	000000	RX01B	000032	RX01CR	= 177170	RX01E	000176
RX01M	000012	RX02CR	= 177170	R0	= %000000	R1	= %000001
R2	= %000002	R3	= %000003	R4	= %000004	R5	= %000005
R6	= %000006	R7	= %000007	SP	= %000006	TTCR	= 177560
TU10CR	= 172522	TU16CR	= 172440	TU56CR	= 177342	.	= 000200


```
.TITLE M9312 BOOTSTRAP ROM LISTING
.REM %
```

```
COPYRIGHT (C) 1977,1978
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MAYNARD, MASS. 01754
```

```
PROGRAM BY EDWARD C. BADGER
```

```
;THIS BOOT BOOTS THE RX02 FLOOPY DISK FORM COMMAND "DY"
;
;THE SECOUNDAY BOOT MUST BE IN DISK TRACK 1
;SECTORS 1,3,5, AND 7 IF ANY SECTOR IS UNUSED,IT STILL WILL BE READ.
;NOTE : SINGLE DENSITY WILL BOOT 256 WORDS STARTING AT
; LOC 0
;
; DOUBLE DENSITY WILL BOOT 1000 WORDS,STARTING
; LOC 0.
;
```

```
THIS ROM WILL BOOT THE RX02 OPTION(S).
TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.
```

```
.SBTTL RX02 BOOT
```

```
;
;
;ASCII "YD" ;ASSCI IDENTIFIER FOR THIS BOOT "DY"
;WORD <RX02E-.+2> ;OFFSET TO NEXT DEVICE BOOT.
SEC ;ENTRY POINT FOR NOT DIAG RUN.
MOV #0,R0 ;ENTRY POINT TO RUN DIAG.
MOV #RX02CR,R1 ;PUT CSR ADDR. IN R1
L6: MOV PC,R4 ;RECORD BOOT ADDR.
BCC BDIAG ;IF ENABLED ,RUN DIAG.
BR 1$ ;CONTINUE PAST POWER UP RESERVED LCO
;WORD MRESERVED ;POWER UP HERE FOR NEW PC.
;WORD RESERVED ;POWER UP HERE FOR NOW STATUS WORD
1$:
L62: COM R3 ;CHANGE STATE OF DENSITY BIT.
RESET ;SYSTEM INITAILIZE.
MOV #401,R4 ;TRACK,SECTOR INFO.
L7: CLR R2 ;START ADDR. 0
MOV #200,R5 ;IF ALREADY SET,CLEAR IT.
BIC #~C<BIT8>,R3 ;CLEAR OUT ALL BUT DENSITY INFORMATION.
BNE LL6 ;IF SET,DOUBLE DENSITY.
ASR R5 ;IF CLEAR, IT WAS SINGLE DENSITY,MUST
;HALF THE WORD COUNT.
LL6:
LL:
BIS PC,R0 ;R0 WILL CONTAIN EITHER A ZERO OR A ONE.
;BY ADDING THE PC AND THE NEXT OFFSET,WE
;COME UP WITH THHE ADDRESS OF THE BYTE THAT
;CONTAINS THE START CODE FOR EITHER UNIT 0
```

000000	042131	
000002	000176	
000004	000261	
000006	012700	000000
000012	012701	177170
000016	010704	
000020	103064	
000022	000402	
000024	173000	
000026	000340	
000030		
000030	005103	
000032	000005	
000034	012704	000401
000040	005002	
000042	012705	000200
000046	042703	177377
000052	001001	
000054	006205	
000056		
000056		
000056	050700	

000060	156003	000036	BISB	READ-.(R0),R3	;OR UNIT ONE.
000064	040700		BIC	PC,R0	;READ EITHER "007" FOR UNIT 0 OR "027" FOR UNIT 1.
000066	010706		MOV	PC,R6	;RESTORE R0 TO UNIT NUMBER.
000070	000423		BR	WAIT	;RECORD WHERE WE ARE FOR RETURN.
000072	000432		BR	RDDY	;WAIT UNIT UNIT IS READY.
000074	000416		BR	WAITS	;SET READ SECTOR
000076	000415		BR	WAITS	;GIVE SECOTR INFORMATION.
000100	000425		BR	EMPTY	;GIVE TRACK INFORMATION.
000102	000430		BR	WAITD	
000104	000407		BR	WAITD2	;GIVE WORD COUNT
000106	060502		ADD	R5,R2	;GIVE CURRENT ADDR.
000110	060502		ADD	R5,R2	;UPDATE CUURRENT ADDR.
000112	122424		CMPB	(R4)+,(R4)+	
000114	120427		CMPB	R4,(PC)+	;UPDATE SECTOR NUMBER.
					;IF THE LAST SECTOR IS #7,READ
					;ONE MORE SECTOR. IF GREATOR (OCTAL 11) THEN
					;THEN WE'LL EXIT.
					;THE #7 IN LOWER BYTE FOR LAST INSTR. AND
					;THESE LOCATIONS ALSO USED BY PREVIOUS
					;INSTR. AS DATA FOR UNIT 1 OR UNIT 2
					;READ SECTOR WITH UNIT NUMBER.
					;READS SECTORS 1,3,5,7
					;EXIT TO LOC ZERO
					;LOAD CURRENT ADDR.
000116	007	027	READ:	.BYTE 7,27	
					;LOAD TRACK OR SECTOR INFO.
000120	003756		BLE	LL	
000122	005007		CLR	R7	
000124	010261	000002	WAITD2:	MOV R2,2(R1)	
000130	000403		BR	WAIT	
000132	110461	000002	WAITS:	MOVB R4,2(R1)	
000136	000304		SWAB	R4	
000140	032711	100240	WAIT:	BIT #100240,(R1)	
000144	001775		BEQ	WAIT	
000146	100730		BMI	L62	
000150	005726		TST	(6)+	
000152	000116		JMP	(6)	
000154	042703	000004	EMPTY:	BIC #4,R3	
000160	010311		RDDY:	MOV R3,(R1)	
000162	000766		BR	WAIT	
000164	110561	000002	WAITD:	MOVB R5,2(R1)	
000170	000763		BR	WAIT	
000172	000137	165564	BDIAG:	JMP @#DIAG	
000176	057141		RX02E:	.WORD 057141	
	000001		.END		

SYMBOL TABLE

BDIAG	000172	BIT8	= 000400	BIT9	= 001000	CRCWD	= 000000
DIAG	= 165564	EMPTY	000154	HSRCR	= 177550	INITSW	= 173024
LL	000056	LL6	000056	L6	000016	L62	000030
L7	000040	MRESER	= 173000	PC	= %000007	RDDY	000160
READ	000116	RESERV	= 000340	RK05CR	= 177404	RK06CR	= 177440
RL01CR	= 174400	RP03CR	= 176714	RP04CR	= 176700	RS03CR	= 172040
RS04CR	= 172040	RX01CR	= 177170	RX02CR	= 177170	RX02E	000176
R0	= %000000	R1	= %000001	R2	= %000002	R3	= %000003
R4	= %000004	R5	= %000005	R6	= %000006	R7	= %000007
SP	= %000006	TTCR	= 177560	TU10CR	= 172522	TU16CR	= 172440
TU56CR	= 177342	WAIT	000140	WAITD	000164	WAITD2	000124
WAITS	000132	.	= 000200				

M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE TU10 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

%

.SBTTL ;TU10 BOOT BOOTS UNITS 0,1,OR 2
 ;CMND = MT WITH OR WITHOUT DIAGNOSTICS

000000	046524		TU10:	.ASCII	"TM"		;TM11/TU10 BOOT
000002	000176			.WORD	<TU10E-.+2>		;OFFSET TO NEXT DEVICE BOOT.
000004	000261			SEC			;ENTRY POINT TO UNIT 0 NO DIAG.
000006	012700	000000		MOV	#0,R0		;ENTRY POINT TO DIAGNOSTICS
000012	012701	172522	TU10M:	MOV	#TU10CR,R1		;LOAD CSR ADDR INTO R1.
000016	010704			MOV	PC,R4		;ENTRY POINT
000020	103054			BCC	BDIAG		
000022	000411			BR	1\$		;GOTO BOOT.
000024	173000			.WORD	MRESERVED		
000026	000340			.WORD	RESERVED		
000030	012700	000001		MOV	#1,R0		;START UNIT #1 DIAGNOSTICS
000034	000766			BR	TU10M		
000036	012700	000001		MOV	#1,R0		;START UNIT #1 NO DIAGNOSTICS
000042	000261			SEC			
000044	000762			BR	TU10M		
000046	010003		1\$:	MOV	R0,R3		
000050	000303		TU10B:	SWAB	R3		
000052	010311			MOV	R3,(R1)		;FIX UNIT #
000054	006061	177776	1\$:	ROR	-2(R1)		;SEE IF THE SELECTED DRIVE IS ON LINE
000060	103375			BCC	1\$		;WAIT IF NOT.
000062	052711	060017	2\$:	BIS	#60017,(R1)		;REWIND, 800 BPI 9 CHANNEL
000066	105711		3\$:	TSTB	(R1)		;WAIT TILL DONE
000070	100376			BPL	3\$		
000072	012761	177777		MOV	#-1,2(R1)		;SET RECORD COUNTER TO SKIP ONE RECORD
000100	112711	000011		MOVB	#11,(R1)		;SPACE FORWARD CMND.
000104	105711		4\$:	TSTB	(R1)		;WAIT FOR ERROR OR READY
000106	100376			BPL	4\$		
000110	005711			TST	(R1)		;SEE IF ERROR
000112	100415			BMI	ERROR		
000114	012761	177000	CB00T:	MOV	#-512.,2(R1)		;LOAD WORD COUNT
000122	011103			MOV	(R1),R3		;SET READ
000124	042703	000377		BIC	#377,R3		
000130	152703	000003		BISB	#3,R3		
000134	010311			MOV	R3,(R1)		
000136	105711		1\$:	TSTB	(1)		;WAIT TILL DONE
000140	100376			BPL	1\$		
000142	005711			TST	(R1)		;TEST FOR ERRORS.
000144	100004			BPL	GB00T		;NO - ERROR - EXIT.

000146	000005	ERROR:	RESET		
000150	000720		BR	TU10M	
000152	000137	165564	BDIAG:	JMP	@#DIAG
000156	042711	000377	GBOOT:	BIC	#377,(R1)
000162	005007			CLR	PC
	000176			.=176	
000176	021526	TU10E:	.WORD	021526	
	000001		.END		

;ELSE, INITIALIZE, TRY AGAIN.

;CLEAR CONTROLLER.

;GO TO SECONDARY BOOT.

SYMBOL TABLE

BDIAG	000152	BIT8	= 000400	BIT9	= 001000	CBOOT	000114
CRCWD	= 000000	DIAG	= 165564	ERROR	000146	GBOOT	000156
HSRCR	= 177550	INITSW	= 173024	MRESER	= 173000	PC	= %000007
RESERV	= 000340	RK05CR	= 177404	RK06CR	= 177440	RL01CR	= 174400
RP03CR	= 176714	RP04CR	= 176700	RS03CR	= 172040	RS04CR	= 172040
RX01CR	= 177170	RX02CR	= 177170	R0	= %000000	R1	= %000001
R2	= %000002	R3	= %000003	R4	= %000004	R5	= %000005
R6	= %000006	R7	= %000007	SP	= %000006	TTCR	= 177560
TU10	000000	TU10B	000050	TU10CR	= 172522	TU10E	000176
TU10M	000012	TU16CR	= 172440	TU56CR	= 177342	.	= 000200

M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE TU16/TU77 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

%

.SBTTL ;TU16/TU77 BOOT
 ;CMND = "MM"

000000	046515			TU16:	.ASCII	"MM"		;TU16 BOOT.
000002	000176				.WORD	<TU16E-.+2>		;OFFSET TO NEXT DEVICE BOOT.
000004	000261				SEC			;UNIT ZERO ENTRY
000006	012700	000000			MOV	#0,R0		
000012	012701	172440		TU16M:	MOV	#TU16CR,R1		;LOAD CSR ADDR. INTO R1
000016	010704				MOV	PC,R4		
000020	103064				BCC	BDIAG		
000022	000402				BR	TU16B		
000024	173000				.WORD	MRESERVED		
000026	000340				.WORD	RESERVED		
000030				TU16B:				
000030	000005			TU16ER:	RESET			
000032	010003				MOV	R0,R3		
000034	052703	001300			BIS	#1300,R3		;800 BPI AND FORMAT
000040	010361	000032			MOV	R3,32(R1)		
000044	032761	010000	000012	1\$:	BIT	#10000,12(R1)		
000052	001774				BEQ	1\$		
000054	112711	000007			MOVB	#7,(R1)		;REWIND COMMAND
000060	105761	000012		2\$:	TSTB	12(R1)		
000064	100375				BPL	2\$		
000066	112711	000011			MOVB	#11,(R1)		;DRIVE CLEAR CMND.
000072	105761	000012		3\$:	TSTB	12(R1)		
000076	100375				BPL	3\$		
000100	012761	177777	000006		MOV	#-1,6(R1)		
000106	112711	000031			MOVB	#31,(R1)		;SPACE FORWARD CMND.
000112	105761	000012		4\$:	TSTB	12(R1)		
000116	100375				BPL	4\$		
000120	016161	000016	000016		MOV	16(R1),16(R1)		
000126	012761	177000	000002	CMM\$GO:	MOV	#-512.,2(R1)		
000134	011103				MOV	(R1),R3		
000136	042703	000377			BIC	#377,R3		
000142	152703	000071			BISB	#71,R3		;READ CMND
000146	010311				MOV	R3,(R1)		
000150	105711			1\$:	TSTB	(R1)		
000152	100376				BPL	1\$		
000154	005711				TST	(R1)		
000156	100004				BPL	CLCRS		
000160	022761	001000	000014		CMP	#1000,14(R1)		;PATTERN TO TEST FRAME ERROR BIT
000166	001320				BNE	TU16ER		

000170	005007		CLCRS:	CLR	PC
000172	000137	165564	BDIAG:	JMP	@#DIAG
	000176			.=176	
000176	162556		TU16E:	.WORD	162556
	000001			.END	

SYMBOL TABLE

BDIAG	000172	BIT8	= 000400	BIT9	= 001000	CLCRS	000170
CMM\$GO	000126	CRCWD	= 000000	DIAG	= 165564	HSRCR	= 177550
INITSW=	173024	MRESER=	173000	PC	=%000007	RESERV=	000340
RK05CR=	177404	RK06CR=	177440	RL01CR=	174400	RP03CR=	176714
RP04CR=	176700	RS03CR=	172040	RS04CR=	172040	RX01CR=	177170
RX02CR=	177170	R0	=%000000	R1	=%000001	R2	=%000002
R3	=%000003	R4	=%000004	R5	=%000005	R6	=%000006
R7	=%000007	SP	=%000006	TTCR	= 177560	TU10CR=	172522
TU16	000000	TU16B	000030	TU16CR=	172440	TU16E	000176
TU16ER	000030	TU16M	000012	TU56CR=	177342	.	= 000200

M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE TU60 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

%

.SBTTL ;THIS TA-11, TU60 CASSETTE BOOT.
 ;CMMD = CT

```

000000 041524
000002 000176
000004 000261
000006 012700 000000
000012 012701 177500
000016 010704
000020 103042
000022 000402
000024 173000
000026 000340
000030 010003
000032 042703 177776
000036 000303
000040 010311
000042 010405
000044 042705 000177
000050 062705 000132
000054 012702 000375
000060 112503
000062 112511
000064 100407
000066 130311
000070 001776
000072 105202
000074 100772
000076 116112 000002
000102 000771
000104 005711
000106 100404
000110 005002
000112 120312
000114 001001
000116 005007
000120 000005
000122 000164 000002
000126 000137 165564
000132 240 037
005 024 224

```

```

TA11:  .ASCII  "TC"          ;TU60 BOOT ID "CT"
        .WORD  <TA11E-.+2>    ;OFFSET TO NEXT DEVICE BOOT.
        SEC
        MOV    #0,R0          ;UNIT #0 ENTRY, NO DIAG
TA11M:  MOV    #177500,R1      ;UNIT #0 ENTRY, RUN DIAG
        MOV    PC,R4          ;LOAD CSR ADDR IN R1
        BCC    BDIAG         ;RETURN ADDR.
        BR     1$            ;GOT DIAG. IF ENABLED.
        .WORD  MRESERVED
        .WORD  RESERVED
1$:     MOV    R0,R3
TA11B:  BIC    #177776,R3      ;STRIP JUNK, ONLY UNIT 0 OR 1.
        SWAB   R3            ;PUT IN CORRECT POS.
        MOV    R3,(R1)        ;LOAD UNIT #
        MOV    R4,R5
        BIC    #177,R5
        ADD    #TABLE,R5
        MOV    #375,R2        ;XFERR COUNT.
        MOVB   (R5)+,R3       ;SET COMPARITOR.
LOOP1:  MOVB   (R5)+,(R1)      ;LEAD COMMAND.
        BMI    DONE           ;WATCH FOR LAST COMMAND.
LOOP2:  BITB   R3,(R1)        ;LOOK FOR DONE BIT
        BEQ    LOOP2
        INCB   R2
        BMI    LOOP1
        MOVB   2(R1),(R2)
        BR     LOOP2
DONE:   TST    (R1)           ;ANY ERRORS?
        BMI    ERROR
        CLR    R2
        CMPB   R3,(R2)        ;CORRECT CODE IN LOC 0?
        BNE    ERROR
        CLR    PC
ERROR:  RESET
        JMP    2(R4)
BDIAG:  JMP    @#DIAG
015    TABLE: .BYTE 240,37,15,5,24,224
        .EVEN

```

000176 022763
000001

TA11E: .WORD 022763
.END

SYMBOL TABLE

BDIAG 000126	BIT8 = 000400	BIT9 = 001000	CRCWD = 000000
DIAG = 165564	DONE 000104	ERROR 000120	HSRCR = 177550
INITSW= 173024	LOOP1 000062	LOOP2 000066	MRESER= 173000
PC =%000007	RESERV= 000340	RK05CR= 177404	RK06CR= 177440
RL01CR= 174400	RP03CR= 176714	RP04CR= 176700	RS03CR= 172040
RS04CR= 172040	RX01CR= 177170	RX02CR= 177170	R0 =%000000
R1 =%000001	R2 =%000002	R3 =%000003	R4 =%000004
R5 =%000005	R6 =%000006	R7 =%000007	SP =%000006
TABLE 000132	TA11 000000	TA11B 000032	TA11E 000176
TA11M 000012	TTCR = 177560	TU10CR= 172522	TU16CR= 172440
TU56CR= 177342	. = 000200		

M9312 BOOTSTRAP ROM LISTING

THIS ROM WILL BOOT THE RP02/RP03 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y04.
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y06.
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

THIS ROM WILL BOOT THE RP04/RP05 OPTION(S).

TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS, THE START ADDR IS 173Y46.
 TO BOOT UNIT 0 AND RUN CPU DIAGNOSTICS, THE START ADDR IS 173Y50.
 THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
 IF THIS ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
 IF THIS ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX.
 IF THIS ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX.
 IF THIS ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX.

.SBTTL ;BOOT FOR RP02, RP03, RP04, RP05
 ;CMND = "DP" CMND = "DB"

000000 042120
 000002 000042
 000004 000261
 000006 012700 000000
 000012 012701 176714
 000016 010704
 000020 103060
 000022 000402
 000024 173000
 000026 000340
 000030 010003
 000032 000303
 000034 010311
 000036 012702 000005
 000042 000425

000044 042102
 000046 000132
 000050 000261
 000052 012700 000000
 000056 012701 176700
 000062 010704
 000064 103036
 000066 010061 000010
 000072 012702 000071
 000076 012711 000021
 000102 012761 014000 000032
 000110 016161 000016 000016
 000116 012761 177000 000002

RP03: .ASCII "PD" ;ID OF RP02, RP03 BOOT.
 .WORD <RP03E-.+2> ;OFFSET TO NEXT DEVICE BOOT.
 SEC ;UNIT 0, NO DIAG ENTRY POINT.
 MOV #0,R0 ;UNIT 0, RUN DIAG ENTRY POINT.
 RP03M: MOV #RP03CR,R1 ;LOAD CSR ADDR. INTO R1.
 MOV PC,R4 ;ENTRY FROM CONSOLE EMULATOR.
 BCC BDIAG ;EXERCISE DIAG. IF C=0.
 BR 1\$
 .WORD MRESERVED
 .WORD RESERVED
 1\$: MOV R0,R3
 SWAB R3
 MOV R3,(R1) ;LOAD UNIT #.
 MOV #5,R2 ;CODE FOR READ.
 RP03E: BR CM\$GO ;GOTO COMMON BOOT CODE.
 ;NEW HEADER BLOCK BEGINS HERE
 RP04: .ASCII "BD" ;ID OF RP04, RP05 BOOT.
 .WORD <REND-.+2> ;OFFSET TO NEXT DEVICE BOOT.
 SEC ;UNIT 0, NO DIAG. ENTRY POINT.
 MOV #0,R0 ;UNIT 0, RUN DIAG. ENTRY POINT.
 RP04M: MOV #RP04CR,R1 ;LOAD CSR ADDR. INTO R1.
 MOV PC,R4 ;ENTRY FROM CONSOLE EMULATOR.
 BCC BDIAG ;EXERCISE DIAG IF C=0.
 MOV R0,10(R1) ;SET UNIT NUMBER.
 MOV #71,R2 ;CODE FOR READ.
 MOV #21,(R1) ;ISSUE READ IN PRESET CMND.
 MOV #14000,32(R1) ;SET FMT22 AND ECC INHIBIT BITS
 MOV 16(R1),16(R1) ;WRITE ATTENTION SUMMARY REG.
 ;INTO ITSELF.
 CM\$GO: MOV #-512.,2(R1) ;LOAD WORD COUNT.

```
000124 011103      MOV      (R1),R3      ;GET CSR CONTENTS.
000126 042703 000377 BIC      #377,R3
000132 050203      BIS      R2,R3      ;SET NEW COMMAND.
000134 010311      MOV      R3,(R1)
000136 105711      1$:      TSTB     (R1)      ;WAIT FOR READY.
000140 100376      BPL      1$
000142 005711      TST      (R1)      ;LOOK FOR ERRORS.
000144 100003      BPL      CLRGO      ;NONE - CONTINUE
000146 000005      ERROR:  RESET      ;IF ERROR, INITIALIZE SYSTEM
000150 000164 000002 JMP      2(4)
000154 042711 000377 CLRGO:  BIC      #377,(R1)      ;CLEAR DEVICE (LOW BYTE)
000160 005007      CLR      R7      ;AWAY WE GO TO THE NEWLY LOADED CODE!
000162 000137 165564 BDIAG:  JMP      @#DIAG      ;GOTO DIAGNOSTICS.
;*****
;RP02,RP03 ENTRY FOR UNIT #1, NO DIAG
;*****
000166 000261      SEC
;*****
;RP02,RP03 ENTRY FOR UNIT #1, RUN DIAG.
;*****
000170 012700 000001 MOV      #1,R0
000174 000706      BR      RP03M
000176 000176      .=176
000176 111612      REND:  .WORD    111612
000001 000001      .END
```

SYMBOL TABLE

BDIAG	000162	BIT8	= 000400	BIT9	= 001000	CLRGO	000154
CM\$GO	000116	CRCWD	= 000000	DIAG	= 165564	ERROR	000146
HSRCR	= 177550	INITSW	= 173024	MRESER	= 173000	PC	= %000007
REND	000176	RESERV	= 000340	RK05CR	= 177404	RK06CR	= 177440
RL01CR	= 174400	RP03	000000	RP03CR	= 176714	RP03E	000042
RP03M	000012	RP04	000044	RP04CR	= 176700	RP04M	000056
RS03CR	= 172040	RS04CR	= 172040	RX01CR	= 177170	RX02CR	= 177170
R0	= %000000	R1	= %000001	R2	= %000002	R3	= %000003
R4	= %000004	R5	= %000005	R6	= %000006	R7	= %000007
SP	= %000006	TTCR	= 177560	TU10CR	= 172522	TU16CR	= 172440
TU56CR	= 177342	.	= 000200				


```

1      00100  ;<11-UTILITIES>TSBOOT.P11.145,  8-NOV-78 12:53:44, EDIT BY KINZELMAN
2      00200  .TITLE  TSBOOT - TS04 M9312 BOOTSTRAP CODE (ROM PART # 23-764A9)
3      00300  .REM    !      BY PAUL KINZELMAN
4      00400                ML1-3 E63
5      00500                3-2473
6      00600                27-JUN-78
7      00700
8      00800  THIS IS THE M9312 BOOTSTRAP CODE FOR THE TS04 MAG TAPE DRIVE, WRITTEN
9      00900  TO CONFORM TO SPEC # ECB1-77-001-00-U BY ED BADGER (10 OCT 77).
10     01000
11     01100  THIS BOOTSTRAP MUST BE LOCATED IN THE 1ST 32K AREA OF THE ADDRESS SPACE.
12     01200
13     01300  THE MAGTAPE MUST HAVE A SINGLE RECORD OR FILE MARK BEFORE THE DESIRED
14     01400  BOOTSTRAP RECORD, AND THE BOOTSTRAP RECORD MUST BE 512(10) BYTES LONG.
15     01500
16     01600  THE BOOTSTRAP DOES THE FOLLOWING OPERATIONS:
17     01700      OP          IF OK, DO      IF ERR, DO
18     01800  1      SET CHAR      2          2
19     01900  2      REWIND        3          1
20     02000  3      RD FWD (TP MK) 4          1
21     02100  4      READ FWD      EXIT        5
22     02200  5      RD PREV REV RTY EXIT      1
23     02300
24     02400  ENTER BOOT IN THE STANDARD WAY (R0 = UNIT #, R1 = TSSR BUS ADR).
25     02500  SINCE THE TS04 HAS 1 UNIT PER ADDRESS, THE UNIT # IS ROTATED LEFT 2 PLACES
26     02600  AND ADDED TO THE BUS ADR IN R1:
27     02700      MS#      TSSR ADR
28     02800      (DEFAULT) 172522
29     02900      0        172522
30     03000      1        172526
31     03100      2        172532      (ETC.)
32     03200      3        172536
33     03300
34     03400  UPON EXIT FROM THE BOOT, R1 CONTAINS THE ADDRESS OF THE TSSR REG,
35     03500  R2 CONTAINS THE TSBA REG, AND R0 LO BYTE CONTAINS THE UNIT NUMBER.
36     03600  IF YOU SUBTRACT 20 FROM R4, R4 WILL POINT TO THE ASCII ID OF THE DEVICE.
37     03700  THEREBY YOU CAN FIGURE OUT FROM WHAT MTA TYPE YOU WERE BOOTED FROM.
38     03800
39     03900  FOR THOSE OF YOU WHO KNOW NOTHING ABOUT THE TS04, HERE IS A CHEAT-SHEET.
40     04000  THE TSSR REG CONTAINS THE SSR (SUBSYSTEM RDY) BIT INDICATING THAT THE
41     04100  DRIVE IS RDY FOR THE NEXT COMMAND. THE TSSR ALSO CONTAINS THE SC (SPECIAL
42     04200  CONDITION) BIT INDICATING THAT SOMETHING ABNORMAL (USUALLY ERROR) HAPPENED
43     04300  DURING THE LAST OPERATION. TO DO AN OPERATION, WE WAIT FOR THE SSR BIT
44     04400  TO COME TRUE. WE THEN WRITE THE ADDRESS OF THE COMMAND PACKET WE WISH
45     04500  TO PERFORM INTO THE TSBA. WHEN SSR COMES TRUE AGAIN, WE CHECK
46     04600  THE SC BIT TO TELL US WHETHER ANYTHING UNUSUAL HAPPENED.
47     04700
48     04800  THE ADDRESS OF THE COMMAND PACKET MUST BE ON AN EVEN 4 WORD BOUNDARY (THE
49     04900  LO ORDER 2 BITS ARE 0). BIT 17 OF THE PACKET ADR IS MOVED TO BIT 1 OF
50     05000  THE POINTER AS WRITTEN INTO THE TSBA AND BIT 16 OF THE PACKET ADR IS
51     05100  MOVED TO BIT 0 OF THE POINTER.
52     05200  AND A FREE DINNER TO THE FIRST ONE TO COME UP WITH A SHORTER BOOTSTRAP
53     05300  THAN THIS ONE THAT DOES THE EQUIVALENT OPERATIONS!
54
55     000000  00100      .ASECT

```

```

56      00200      .ENABL ABS
57      00300
58      172522      TS04SR= 172522      ;FIRST TS04 STATUS REG (TSBA IS PREV WD)
59      165564      DIAG= 165564
60      022000      .#22000      ;FOR NOW
61      00700
62      022000 046523      TS04: .ASCII "SM"      ;ASCII CODE (BACKWARDS)
63      022002 000176      .WORD <CRCWD-.+2>      ;OFFSET TO NEXT DEVICE
64      022004 000261      SEC      ;ENTRY POINT TO UNIT 0 NO DIAG
65      022006 012700 000000      MOV #0,R0      ;ENTRY POINT TO DIAGNOSTICS
66      022012 012701 172522      TS04M: MOV #TS04SR,R1      ;GET THE 1ST TSSR ADR IN R1
67      022016 010704      MOV PC,R4      ;ENTRY POINT, SAVE RTN PC
68      022020 103063      BCC BDIAG      ;BR TO RUN DIAGNOSTICS
69      022022 000411      BR RSTRT      ;BR OVER RESERVED WORDS
70      022024 173000      .WORD 173000      ;THE VOICE FROM ABOVE SAID THESE
71      022026 000340      .WORD 340      ;WORDS HAD TO BE HERE
72      01800      ;(XXX24 IS EXCEPTION ADDRESS)
73      01900      ;MOVE THE FOLLOWING TO 1000:
74      022030 142010      CMPRWD: 142010      ;REWIND (1 WD)
75      022032 000000      0      ;LO 16 BITS ADR
76      022034 000000      0      ;HI 2 BITS ADR
77      022036 001000      256.*2      ;SIZE OF RECORD (512(10) BYTES)
78      02400
79      022040 140004      CMPSCH: 140004      ;SET CHARACTERISTICS CMD (4 WDS)
80      022042 001012      1012      ;LO 16 BITS OF MSG BUFF POINTER (= .)
81      022044 000000      0      ;HI 2 BITS
82      02800
83      02900      ;THE FOLLOWING MUST NOT BE MOVED AWAY FROM THE END OF THE CMD LIST
84      03000      ;THE FOLLOWING IS ALSO TAKEN AS THE MSG
85      03100      ;BUFFER POINTER SIZE AND MBF SIZE:
86      022046 010003      RSTRT: MOV R0,R3      ;COPY THE UNIT #
87      03300      ;THE FOLLOWING IS TAKEN AS THE DRV CHAR-
88      03400      ;ACTERISTICS WORD:
89      022050 010702      MOV PC,R2      ;GET WHERE WE ARE
90      022052 012705 001022      MOV #1022,R5      ;END OF COMMAND LST IN CORE
91      022056 014245      1$: MOV -(R2),-(R5)      ;MOVE IN THE COMMAND LIST
92      022060 105705      TSTB R5      ;ARE WE DONE YET?
93      022062 001375      BNE 1$      ;LOOP FOR ALL WDS (EXIT WITH R5 = 1000)
94      022064 006303      ASL R3      ;ROTATE INTO PLACE
95      022066 006303      ASL R3      ;SO WE CAN ADD IT TO THE ADR
96      04200      ;NOTE: THE FOLLOWING ASSUMES THE USER TYPED A REASONABLE NUMBER FOR
97      04300      ;THE UNIT. IF NOT, WE WILL PROBABLY GET A BUSS TIMEOUT.
98      022070 060301      ADD R3,R1      ;ADD IN TO THE BUS ADR
99      022072 010102      MOV R1,R2      ;COPY THE TS STATUS REG
100     022074 005742      TST -(R2)      ;POINT R2 TO THE TSBA
101     022076 105711      2$: TSTB (R1)      ;AND CHK FOR SSR
102     022100 100376      BPL 2$      ;BR IF SSR NOT UP YET
103
104     05000      ;THE FOLLOWING MAY BE REMOVED IF WE NEED THE SPACE:
105     022102 005037 000000      CLR #0      ;CLR OUT LOC 0 IN CASE BOOT FAILED WE'LL HALT
106
107     022106 012712 001010      3$: MOV #1010,(R2)      ;DO THE SET CHARACTERISTICS
108     022112 111103      MOVB (R1),R3      ;TST SSR BIT (INIT R3 BYTE TO NEG WHEN RDY)
109     022114 100376      BPL 3$      ;BR IF NOT RDY YET
110     00400      ;DON'T NEED TO CHK ERRS BECAUSE IF IT FAILED,

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111          00500          ;THE NEXT COMMAND WILL CERTAINLY FAIL ANYWAY
112          00600
113 022116 010512          00700 LP1:  MOV    R5,(R2)      ;DO THE REWIND OR RD FWD OVER TAPE MARK
114 022120 105711          00800 4$:  TSTB   (R1)        ;TST SSR BIT
115 022122 100376          00900      BPL    4$          ;BR IF NOT RDY YET
116 022124 032711 000012  01000      BIT    #12,(R1)      ;ALLOW TERM CLASS 0 AND 4, CHK FOR OTHERS
117 022130 001346          01100      BNE    RSTRT        ;BR IF ERROR, TRY AGN
118 022132 012715 140001  01200      MOV    #140001,(R5)   ;CODE FOR RD FWD AS NEXT OPERATION
119 022136 105103          01300      COMB   R3           ;INVERT OUR FLG
120 022140 100366          01400      BPL    LP1          ;BR BACK TO DO THE RD OVER TAPE MARK
121          01500
122 022142 010512          01600 LP2:  MOV    R5,(R2)      ;DO RD FWD THE BOOT RECORD (R5=1000)
123 022144 105711          01700 6$:  TSTB   (R1)        ;TST SSR BIT
124 022146 100376          01800      BPL    6$          ;BR IF NOT RDY YET
125 022150 005711          01900      TST    (R1)        ;TST SC BIT
126 022152 100401          02000      BMI    RDBAD        ;BR IF ERROR, DO RETRY
127 022154 005007          02100      CLR    PC           ;JMP TO LOC 0
128          02200
129 022156 012715 161001  02300 RDBAD: MOV    #161001,(R5)   ;CODE FOR RD PREV REV RETRY
130 022162 105103          02400      COMB   R3           ;INVERT OUR FLG
131 022164 100366          02500      BPL    LP2          ;LOOP BACK FOR RD RETRY
132 022166 000727          02600      BR     RSTRT        ;BR TO TRY WHOLE THING AGN
133          02700
134 022170 000137 165564  02800 BDIAG: JMP     @#DIAG  ;LINK TO DIAGNOSTICS
135 022174 000000          02900      HALT                    ;THIS IS A SPARE LOCATION
136          001          03000 .IF LT 176-<.&376>
137          000          03100 .ERROR .      ;BOOTSTRAP CODE OVERFLOW
138          000          03200 .ENDC
139 022176 140726          03300 CRCWD: 140726      ;CRC FOR BOOTSTRAP
140 000001          03400      .END

BDIAG 022170          CRCWD 022176          LP2 022142          TS04 022000          . = 022200
CMPRWD 022030          DIAG = 165564          RDBAD 022156          TS04M 022012
CMPSCH 022040          LP1 022116          RSTRT 022046          TS04SR= 172522
. ABS. 022200          000

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```

1      ;M9312 BOOTSTRAP ROM LISTING
2      ;
3      ;THIS ROM WILL BOOT THE TU58 OPTION
4      ;
5      ;TO BOOT UNIT 0, AND NOT RUN DIAGNOSTICS THE START ADDR IS 173Y04
6      ;TO BOOT UNIT 0, AND RUN CPU DIAGNOSTICS THE START ADDR IS 173Y06
7      ;THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WORD
8      ;IF THE ROM IS IN SLOT 1 THE Y COMPONENT IS 00 ADDR. 1730XX
9      ;IF THE ROM IS IN SLOT 2 THE Y COMPONENT IS 01 ADDR. 1732XX
10     ;IF THE ROM IS IN SLOT 3 THE Y COMPONENT IS 10 ADDR. 1734XX
11     ;IF THE ROM IS IN SLOT 4 THE Y COMPONENT IS 11 ADDR. 1736XX
12
13     .SBTTL TU58 BOOT
14
15     ;*****
16     ;*** NOTE: THIS BOOTSTRAP DOES NOT RETRY IF THE BOOT FAILS.
17     ;*** THIS IS NECESSARY BECAUSE RETRIES CAN DAMAGE THE
18     ;*** TAPE CARTRIDGE IF A HARDWARE FAILURE HAS OCCURRED.
19     ;*****
20     165564      DIAG= 165564
21     173000      MRESERVED      =173000
22     000340      RESERVED      =340
23     0125025     CRC      =125025
24     176500      TISCSR      =176500
25     176502      TISBFR      =176502
26     176504      TOSCSR      =176504
27     176506      TOSBFR      =176506
28     000000      042104      000000
29     000002      000176
30     000004      000261
31     000006      012700      000000
32     000012      012701      176500
33     000016      010704
34     000020      103054
35     000022      000402
36     000024      173000
37     000026      000340
38     000030      012706      002000
39     000034      005004
40     000036      012702      176504
41     000042      005212
42     000044      005003
43     000046      004767      000046
44     000052      005012
45     000054      005737      176502
46     000060      012703
47     000062      004      010
48     000064      004767      000034
49     000070      010003
50     000072      004767      000030
51     000076      005003
52     000100      105711

```

```

TU58:  .ASCII  "DD"      ;ASCII IDENTIFIER
        .WORD  <TU58E-.+2> ;OFFSET TO NEXT BOOT
        SEC      ;ENTRY POINT FOR UNIT 0 NO DIAGS
        MOV      #0,R0    ;ENTRY POINT FOR UNIT 0 WITH DIAGS
TU58M:  MOV      #TISCSR,R1 ;PUT DEVICE ADDRESS IN R1
        MOV      PC,R4    ;DIAGNOSTIC BOILER PLATE
        BCC      BDIAG
        BR       TBOOT
        .WORD    MRESERVED
        .WORD    RESERVED
TBOOT:  MOV      #2000,SP   ;SET STACK POINTER
        CLR      R4
        MOV      #TOSCSR,R2
        INC      @R2      ;SEND BREAK ON SERIAL LINE
        CLR      R3
        JSR      PC,SEND8  ;DELAY 7 CHARACTER TIMES
        CLR      @R2      ;REMOVE BREAK
        TST      @#TISBFR ;DUMP RECEIVE REGISTER
        MOV      (PC)+,R3  ;GET INIT, BOOT FLAGS
        .BYTE    4,10
        JSR      PC,SEND2  ;SEND FLAGS
        MOV      R0,R3
        JSR      PC,SEND1  ;SEND UNIT NUMBER
        CLR      R3      ;SET ADDRESS POINTER TO 0
RCVLOP: TSTB    @R1      ;WAIT FOR CHARACTER RECEIVED

```

53	000102	100376		BPL	RCVLOP		
54	000104	113723	176502	MOVB	@#TISBFR,(R3)+	;STORE CHARACTER IN MEMORY	
55	000110	022703	001000	CMP	#1000,R3	;512 BYTES RECEIVED?	
56	000114	101371		BHI	RCVLOP	;NO, LOOP	
57	000116	005007		CLR	PC	;YES, JUMP TO 0	
58	;SUBROUTINE TO OUTPUT CHARACTERS TO THE SERIAL LINE						
59							
60							
61	000120	004717		SEND8:	JSR	PC,@PC	;SEND 8 CHARACTERS
62	000122	004717			JSR	PC,@PC	;SEND 4 CHARACTERS
63	000124	004717		SEND2:	JSR	PC,@PC	;SEND 2 CHARACTERS
64	000126	105712		SEND1:	TSTB	@R2	;TEST TRANSMIT READY
65	000130	100376			BPL	SEND1	
66	000132	110337	176506		MOVB	R3,@#TOSBFR	;SEND CHARACTER
67	000136	000303			SWAB	R3	
68	000140	000207			RTS	PC	
69							
70	;ENTRY FOR UNIT 1						
71							
72	000142	000261		UNIT1:	SEC		;UNIT 1 NO DIAGS
73	000144	012700	000001	UNIT1D:	MOV	#1,R0	;UNIT 1 NO DIAGS
74	000150	000720			BR	TU58M	;
75							
76	000152	000137	165564	BDIAG:	JMP	@#DIAG	;LINK TO DIAGNOSTIC ADDRESS
77							
78		000176			.=	<TU58+176>	
79	000176	022540		TU58E:	.WORD	CRC	
80		000001			.END		
SYMBOL TABLE							
BDIAG	000152R		RCVLOP	000100R	SEND8	000120R	TOSBFR= 176506
CRC	= 022540		RESERV=	000340	TBOOT	000030R	TOSCSR= 176504
DIAG	= 165564		SEND1	000126R	TISBFR=	176502	TU58 000000R
MRESER=	173000		SEND2	000124R	TISCSR=	176500	TU58E 000176R
. ABS.	000000	000					
	000200	001					

```

1      .REM      %
2
3
4
5      IDENTIFICATION
6      -----
7
8      PRODUCT CODE:      XXXXXXXX-XX-XXXXX-X-X
9
10     PRODUCT NAME:      M9312 DECNET BOOT - DMC
11
12     PRODUCT DATE:      APRIL 1978
13
14     MAINTAINER:        DIAGNOSTIC ENGINEERING
15
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32     COPYRIGHT (C) 1978 DIGITAL EQUIPMENT CORPORATION
33     %

1      .REM      %
2      THIS ROM WILL BOOT THE DMC OPTION.
3      TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
4      TO BOOT UNIT 0,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
5      TO BOOT UNIT 1,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y30.
6      TO BOOT UNIT 1,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y32.
7      THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
8      IF ROM #1 IS IN SLOT 1 THE Y COMPONENT IS 00  ADDR. 1730XX
9      IF ROM #1 IS IN SLOT 2 THE Y COMPONENT IS 01  ADDR. 1732XX.
10     %

```



```
1          .TITLE  M9312 DECNET BOOT - DMC
2          ;      BASIC DEFINITIONS
3
4          000000      R0=%0
5          000001      R1=%1
6          000002      R2=%2
7          000003      R3=%3
8          000004      R4=%4
9          000005      R5=%5
10         000006      R6=%6
11         000007      R7=%7
12         000006      SP=%6
13         000007      PC=%7
14         000340      RESERVED=340
15         165564      DIAG=165564
16         173024      INITSW=173024
17         000000      CRCWD=0
18         173000      MRESERVED=173000
19         .NLIST  MC,MD
20         .LIST   ME
21
22
23
24
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26
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30
31
32
33
34
35
36
37
38 000000      .ENABL  ABS
39         020000      .=20000
```

```

1
2
3
4 020000      115      130      ;CMND      XM
5 020002      000576      DMCBGN: .ASCII 'MX'      ;IDENTIFIER 'XM' FOR DMC BOOT
6 020004      000261      .WORD      <DMCE-.+2>      ;OFFSET TO NEXT BOOT
7 020006      012700      000000      SEC      ;ENTRY FOR UNIT 0, NO CPU DIAG RUN
8 020012      012701      160010      DMC:  MOV      #0,R0      ;ENTRY FOR UNIT 0, RUN CPU DIAG
9 020016      010704      MOV      #160010,R1      ;PUT FLOATING BASE ADDR IN R1
10 020020      103015      MOV      PC,R4      ;GET RETURN ADDR
11 020022      000416      BCC      BDIAG      ;GO TO DIAG IF ENABLED (C=0)
12 020024      173000      BR      SETSTK
13 020026      000340      .WORD      MRESERVED
14 020030      000261      .WORD      RESERVED
15 020032      012700      000001      SEC      ;ENTRY FOR UNIT 1, NO CPU DIAG RUN
16 020036      000765      MOV      #1,R0      ;ENTRY FOR UNIT 1, RUN CPU DIAG
17      BR      DMC
18      ;*****
19      ;* FLOATING DEVICE INTERRUPT ROUTINE
20      ;*****
21 020040      005202      NODEV:  INC      R2      ;UPDATE R2 TO POINT TO NEXT DEV MODULO
22 020042      005303      DEC      R3      ;SUB ONE FROM R3
23 020044      100002      BPL      1$      ;IF CANT FIND DEVICE, HALT
24 020046      000000      2$:      HALT      ;
25 020050      000776      BR      2$      ;REVIEW FLOATING ADDRESS ASSIGNMENTS
26 020052      000002      1$:      RTI      ;RETURN
27      ;*****
28      ;* GO TO DIAG
29 020054      000137      165564      BDIAG:  JMP      @#DIAG      ;GO TO DIAG
30      ;RETURN MADE THROUGH ADDR IN R4
31      ;*****
32      ;* SET UP REQUEST SECONDARY BOOT MESSAGE AND STACK
33      ;*****
34 020060      012706      017776      SETSTK: MOV      #17776,SP      ;SET REQ SECOND BOOT MSG POINTER
35 020064      012716      000001      MOV      #1,(SP)      ;SET HIGH ORDER WORD OF MESSAGE
36 020070      012746      006010      MOV      #6010,-(SP)      ;SET LOW ORDER WORD OF MESSAGE
37      ;
38      ;*****NOTE***
39      ;BOOT MSG= 10,14,1,0
40      ;STACK POINTER IS SET AT 17774
41      ;*****
42      ;* FIND THE DEVICE IN FLOATING SPACE
43      ;* VERIFY THAT TWO EXTENSION ROMS ARE PROPERLY INSTALLED
44      ;*****
45 020074      010702      2$:      MOV      PC,R2      ;SET UP R2 WITH
46 020076      062702      000422      ADD      #DEV TAB-2$,R2      ;POINTER TO DEV TAB
47 020102      010704      3$:      MOV      PC,R4      ;SET UP R4 WITH
48 020104      062704      177734      ADD      #NODEV-3$-2,R4      ;POINTER TO TRAP ROUTINE
49      ;
50      ;*****NOTE***
51      ;THE NEXT FOUR INSTRUCTIONS VERIFY THAT
52      ;THE EXTENSION ROMS ARE PROPERLY INSTALLED.
53      ;IF NOT, THE BOOT WILL HALT
54 020110      011246      MOV      (R2),-(SP)      ;PUSH THE #7407 FROM ROM #3 ON THE STACK
55 020112      166416      000200      SUB      200(R4),(SP)      ;SUBTRACT FROM IT THE #2400 OFF ROM #2
56 020116      022726      005007      CMP      #5007,(SP)+      ;COMP IT WITH #5007
57 020122      001402      BEQ      4$      ;IF NOT EQUAL, HALT

```



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56 020124 000000          5$: HALT                ;      ***NOTE***
57 020126 000776          BR      5$                ;CHECK POS OF ROMS #2 AND #3
58 020130 012703 000004   4$: MOV      #4,R3        ;SET R3 TO DMC POS IN FLOAT -2
59 020134 010423          MOV      R4,(R3)+          ;SET TRAP ROUTINE ADDR IN LOC 4
60 020136 005013          CLR      (R3)              ;CLR NEW PSW. R3 NOW CONTAINS DMC POS(6)
61 020140 005711          FLOAT: TST      (R1)        ;TEST FOR DEVICE, MAYBE TRAP TO NODEV
62 020142 111204          MOV      (R2),R4           ;MODULO INCREMENT
63 020144 060401          ADD      R4,R1             ;UPDATE ADDRESS
64 020146 005201          INC      R1               ;BY MODULO
65 020150 040401          BIC      R4,R1             ;IN TABLE
66 020152 005703          TST      R3               ;IS THIS A DMC?
67 020154 001371          BNE      FLOAT             ;NOT YET
68                          ;*****
69                          ;* ADD UNIT DISPLACEMENT TO UNIT 0 CSR ADDR
70                          ;*****
71 020156 042700 177760   BIC      #177760,R0        ;PREVENT TRYING TO BOOT UNIT # > 15
72 020162 010046          MOV      R0,-(SP)          ;SAVE UNIT # FOR SECONDARY BOOT
73 020164 006300          ASL      R0                ;UNIT # TIMES 2
74 020166 006300          ASL      R0                ;UNIT # TIMES 4
75 020170 006300          ASL      R0                ;UNIT # TIMES 8
76 020172 060001          ADD      R0,R1             ;CSR ADDR + UNIT*8
77 020174 000402          BR      DMC               ;GO TO MAINLINE CODE
78 020176 161040          .WORD    161040           ;CRC16 WORD FOR ROM #1
79 020200 177776          .WORD    -2              ;HEADER WORD FOR ROM #2
80                          ;*****
81                          ;* DMC MAINLINE
82                          ;*****
83 020202 012704 000010   DMC:  MOV      #8.,R4        ;SET RETRY COUNT
84 020206 000005          RESET                     ;MASTER CLEAR DMC
85 020210 010702          MOV      PC,R2            ;RETURN ADDR
86 020212 000461          BR      DMCIN             ;INPUT TO DMC
87 020214 000043          .WORD    43              ;RQI + BASE REQUEST
88 020216 017370          .WORD    17370           ;BASE ADDR
89 020220 000000          .WORD    0               ;NO RESUME
90 020222 000402          BR      1$
91 020224 173000          .WORD    MRESERVED
92 020226 000340          .WORD    RESERVED
93 020230 010702          1$:  MOV      PC,R2        ;SET RETURN ADDRESS
94 020232 000451          BR      DMCIN             ;INPUT TO DMC
95 020234 000041          .WORD    41              ;RQI + CNTLI
96 020236 000000          .WORD    0               ;FILLER
97 020240 002400          .WORD    2400            ;MAINT MODE + HDX
98 020242 010702          DMCRCV: MOV      PC,R2    ;SET RETURN ADDR
99 020244 000444          BR      DMCIN             ;INPUT TO DMC
100 020246 000044          .WORD    44             ;RQI + BA.CC + RCV
101 020250 000000          .WORD    0             ;BUFFER ADDRESS
102 020252 007774          .WORD    4092.         ;SET SIZE TO MAX FOR CRC-16
103 020254 010705          MOV      PC,R5          ;SET NON-ZERO AS R5 FLAG (RCV PENDING)
104 020256 010702          DMCXMT: MOV      PC,R2  ;SET RETURN ADDR
105 020260 000436          BR      DMCIN           ;INPUT TO DMC
106 020262 000040          .WORD    40            ;RQI + BA/CC + XMIT
107 020264 017774          .WORD    17774         ;MESSAGE ADDR
108 020266 000004          .WORD    4             ;MESSAGE LENGTH
109 020270 012702 000017   MOV      #15.,R2        ;LARGE LOOP COUNTER

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110 020274 105761 000002      1$:  TSTB    2(R1)      ;TEST RDY0 SET
111 020300 100002              BPL      2$          ;NOT YET
112 020302 010703              MOV     PC,R3        ;SET RETURN ADDR
113 020304 000456              BR       DMCOUT      ;CHECK DMC REQUEST
114 020306 005705      2$:  TST      R5            ;IS RECEIVE STILL OUTSTANDING
115 020310 001754              BEQ      DMCRCV      ;NO, REISSUE ONE
116 020312 005300              DEC      R0          ;DECREMENT SHORT LOOP
117 020314 001367              BNE      1$          ;AGAIN
118 020316 005302              DEC      R2          ;DECREMENT LONG LOOP
119 020320 001365              BNE      1$          ;AGAIN
120 020322 005304              DEC      R4          ;DECREMENT RETRY COUNT
121 020324 001354              BNE      DMCXMT      ;SEND AGAIN
122 020326 010702              MOV     PC,R2        ;RETURN ADDR
123 020330 000412              BR       DMCIN      ;FORCE PROC ERR-SET BASE AGAIN-KILLS DTR
124 020332 000043              .WORD   43          ;RQI + BASE REQUEST
125 020334 017370              .WORD   17370       ;BASE ADDRESS AGAIN
126 020336 000000              .WORD   0           ;NO RESUME
127 020340 012703 000012      HNGLOP: MOV    #10.,R3      ;LONG LOOP COUNTER-HOLD DTR DOWN
128 020344 005300      1$:  DEC      R0          ;DECREMENT SHORT LOOP
129 020346 001376              BNE      1$          ;AGAIN
130 020350 005303              DEC      R3          ;DECREMENT LONG LOOP
131 020352 001374              BNE      1$          ;AGAIN
132 020354 000712              BR       DMC          ;HUNG UP LONG ENOUGH-ANSWER AGAIN
133
134      ;*****
135      ;* DMC REQUEST INPUT ROUTINE
136      ;*****
136 020356 005722      DMCIN:  TST      (R2)+        ;POINT TO FIRST PARAMETER WORD
137 020360 112211              MOV     (R2)+,(R1)      ;COMMAND TO DMC
138 020362 005202              INC      R2          ;TO NEXT PARAMETER WORD
139 020364 105711      DMCTST: TSTB    (R1)          ;IS RDYI SET?
140 020366 100411              BMI     RDYIOK      ;YES-OK
141 020370 105761 000002      TSTB    2(R1)          ;IS RDY0 SET?
142
143              ;          ****NOTE****
144              ;IF HUNG IN LOOP, IS SW7 OF SW PACK #2 ON?
144 020374 000402              BR       1$
145 020376 114076              .WORD   114076       ;CRC16 WORD FOR ROM #2
146 020400 177776              .WORD   -2          ;HEADER WORD FOR ROM #3
147 020402 100370      1$:  BPL      DMCTST      ;NO, WAIT
148 020404 010703              MOV     PC,R3        ;SET RETURN ADDR
149 020406 000415              BR       DMCOUT      ;CHECK DMC REQUEST
150 020410 000765              BR       DMCTST      ;WAIT TILL DMC IS READY
151
152      ;*****
153      ;* DMC LOAD INPUT ROUTINE
154      ;*****
154 020412 012261 000004      RDYIOK: MOV    (R2)+,4(R1)      ;TO FIRST HALF DMC PORT
155 020416 012261 000006              MOV    (R2)+,6(R1)      ;TO SECOND HALF DMC PORT
156 020422 000402              BR       2$
157 020424 173000              .WORD   MRESERVED
158 020426 000340              .WORD   RESERVED
159 020430 042711 000040      2$:  BIC     #40,(R1)      ;CLEAR RQI-GIVE TO DMC
160 020434 105711      1$:  TSTB    (R1)          ;TEST RDYI CLEAR
161 020436 100776              BMI     1$          ;NOT YET
162 020440 000112              JMP     (R2)          ;RETURN

```

```

163 ;*****
164 ;* DMC OUTPUT READY ROUTINE
165 ;*****
166 020442 132761 000003 000002 DMCOUT: BITB #3,2(R1) ;BA/CC OR CRL REQUEST
167 020450 001013 BNE 1$ ;CTL REQUEST
168 020452 132761 000004 000002 BITB #4,2(R1) ;XMIT OR RCV
169 020460 001413 BEQ 2$ ;XMIT COMPLETE
170 020462 005005 CLR R5 ;RECEIVE COMPLETE SET NON PENDING FLAG
171 020464 005715 TST (R5) ;CHECK FOR CODE 0,LOAD 0 AT LOC 0
172 020466 001010 BNE 2$ ;RECEIVED MESSAGE NO GOOD
173 020470 012600 MOV (SP)+,R0 ;RETURN UNIT # TO R0
174 020472 000005 RESET ;CLEAR DMC-11
175 020474 000137 000006 JMP @#6 ;AND JUMP TO LOADED PROGRAM
176 020500 032761 001730 000006 1$: BIT #1730,6(R1) ;FATAL ERROR?
177 020506 001314 BNE HNGLOP ;YES,START AGAIN AFTER TIME DELAY
178 020510 105061 000002 2$: CLRB 2(R1) ;CLEAR RDYO-THROW AWAY INFO
179 020514 000163 000002 JMP 2(R3) ;RETURN
180 ;*****
181 ;* FLOATING DEVICE MODULO TABLE
182 ;*****
183 020520 007 DEVTAB: .BYTE 7 ;DJ11 DEVICE MODULUS
184 020521 017 .BYTE 17 ;DH11
185 020522 007 .BYTE 7 ;DQ11
186 020523 007 .BYTE 7 ;DU11
187 020524 007 .BYTE 7 ;DUP11
188 020525 007 .BYTE 7 ;LK11-A
189 020526 007 .BYTE 7 ;DMC11
190 020527 000 .BYTE 0 ;FILLER
191 ; ***NOTE***
;THE NEXT 23 WORDS ARE ZERO FILLED
192 020576 060100 DMCE: .WORD 060100 ;CRC16 WORD FOR ROM #3
193 ;*****
194 ;* RELOCATION ROUTINE
195 ;*****
196 .=20600
197 020600 012702 020000 MOV #20000,R2
198 020604 012703 030000 MOV #30000,R3
199 020610 012223 2$: MOV (R2)+,(R3)+
200 020612 020227 020576 CMP R2,#20576
201 020616 001401 BEQ 1$
202 020620 000773 BR 2$
203 020622 000000 1$: HALT
204 000001 .END

```

SYMBOL TABLE

BDIAG	020054	DMCBGN	020000	DMCRCV	020242	INITSW=	173024	RESERV=	000340
CRCWD =	000000	DMCE	020576	DMCTST	020364	MRERES=	173000	R6	=000006
DEVTAB	020520	DMCIN	020356	DMCXMT	020256	NODEV	020040	R7	=000007
DIAG =	165564	DMCM	020012	FLOAT	020140	RDYIOK	020412	SETSTK	020060
DMC	020202	DMCOUT	020442	HNGLOP	020340				

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.REM 1

IDENTIFICATION

PRODUCT CODE: XXXXXX-XX-XXXXX-X-X
PRODUCT NAME: M9312 DECNET BOOT - DU11
PRODUCT DATE: APRIL 1978
MAINTAINER: DIAGNOSTIC ENGINEERING

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1

```
1      .REM      %
2          THIS ROM WILL BOOT THE DU OPTION.
3      TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
4      TO BOOT UNIT 0,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
5      TO BOOT UNIT 1,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y30.
6      TO BOOT UNIT 1,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y32.
7      THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
8      IF ROM #1 IS IN SLOT 1 THE Y COMPONENT IS 00  ADDR. 1730XX
9      IF ROM #1 IS IN SLOT 2 THE Y COMPONENT IS 01  ADDR. 1732XX.
10     %

1      .TITLE  M9312 DECNET BOOT - DU11
2      ;      BASIC DEFINITIONS
3
4      000000      R0=%0
5      000001      R1=%1
6      000002      R2=%2
7      000003      R3=%3
8      000004      R4=%4
9      000005      R5=%5
10     000006      R6=%6
11     000007      R7=%7
12     000006      SP=%6
13     000007      PC=%7
14     000340      RESERVED=340
15     165564      DIAG=165564
16     173024      INITSW=173024
17     000000      CRCWD=0
18     173000      MRESERVED=173000
19     000226      SSYN=226
20     000220      DLE=220
21     000337      ASYN=337
22     000201      SOH=201
23     000005      ENQ=005
24     120001      POLY=120001
25     .NLIST  MC,MD
26     .LIST   ME
27
37
38
44 000000      .ENABL  ABS
45     020000      .=20000
```

```

1          ;*****
2          ;* CMND XW (DU11)
3          ;*****
4 020000      125      130      DUBGN: .ASCII 'UX'      ;IDENTIFIER 'XU' FOR DU11 BOOT
5 020002      000576      .WORD <ENDB00-.+2>      ;OFFSET TO NEXT BOOT
6 020004      000261      SEC      ;ENTRY FOR DU11, NO CPU DIAG RUN
7 020006      012700      000000      MOV #0,R0      ;ENTRY FOR DU11, RUN CPU DIAG
8 020012      012701      160010      EMDU: MOV #160010,R1      ;PUT FLOATING BASE ADDR IN R1
9 020016      010704      MOV PC,R4      ;GET RETURN ADDR
10 020020      103015      BCC BDIAG      ;GO TO DIAG IF ENABLED (C=0)
11 020022      000416      BR SETSTK
12 020024      173000      .WORD MRESERVED
13 020026      000340      .WORD RESERVED
14 020030      000261      SEC      ;ENTRY FOR UNIT 1, NO CPU DIAG RUN
15 020032      012700      000001      MOV #1,R0      ;ENTRY FOR UNIT 1, RUN CPU DIAG
16 020036      000765      BR EMDU
17          ;*****
18          ;* FLOATING DEVICE INTERRUPT ROUTINE
19          ;*****
20 020040      005202      NODEV: INC R2      ;UPDATE R2 TO POINT TO NEXT DEV MODULO
21 020042      005303      DEC R3      ;SUB ONE FROM R3
22 020044      100002      BPL 1$      ;IF CANT FIND DEVICE, HALT
23 020046      000000      2$: HALT      ;
24 020050      000776      BR 2$      ;REVIEW FLOATING ADDRESS ASSIGNMENTS
25 020052      000002      1$: RTI      ;RETURN
26          ;*****
27          ;* GO TO DIAG
28          ;*****
29 020054      000137      165564      BDIAG: JMP @BDIAG      ;GO TO DIAG
30          ;RETURN MADE THROUGH ADDR IN R4
31          ;*****
32          ;* FIND THE DEVICE IN FLOATING SPACE
33          ;*****
34 020060      012706      017776      SETSTK: MOV #17776,SP      ;SET UP STACK
35 020064      042700      177760      BIC #177760,R0      ;PREVENT TRYING TO BOOT UNIT # > 15
36 020070      010016      MOV R0,(SP)      ;SAVE UNIT NUM AT 17776
37 020072      010702      2$: MOV PC,R2      ;SET UP R2 WITH
38 020074      062702      000466      ADD #DEV TAB-2$,R2      ;POINTER TO DEV TAB
39 020100      010704      3$: MOV PC,R4      ;SET UP R4 WITH
40 020102      062704      177736      ADD #NODEV-3$,R4      ;POINTER TO TRAP ROUTINE
41          ;
42          ;*****NOTE***
43          ;THE NEXT FOUR INSTRUCTIONS VERIFY THAT
44          ;THE EXTENSION ROMS ARE PROPERLY INSTALLED.
45 020106      011246      MOV (R2),-(SP)      ;IF NOT, THE BOOT WILL HALT
46 020110      166416      000202      SUB 202(R4),(SP)      ;PUSH THE #7407 FROM ROM #3 ON THE STACK
47 020114      022726      005412      CMP #5412,(SP)+      ;SUBTRACT FROM IT THE #1775 OFF ROM #2
48 020120      001402      BEQ 4$      ;COMP IT WITH #5412
49 020122      000000      5$: HALT      ;IF NOT EQUAL, HALT
50 020124      000776      BR 5$      ;
51 020126      012703      000006      4$: MOV #6,R3      ;*****NOTE***
52 020132      005013      CLP (R3)      ;CHECK POS OF ROMS #2 AND #3
53 020134      010443      MOV R4,-(R3)      ;TRAP PS ADDR
                    ;CLR NEW PSW
                    ;SET TRAP ROUTINE ADDR IN LOC 4

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54 020136 005303
55 020140 005711
56 020142 111204
57 020144 060401
58 020146 005201
59 020150 040401
60 020152 005703
61 020154 001371
62
63
64
65 020156 006300
66 020160 006300
67 020162 006300
68 020164 060001
69
70
71
72 020166 012706 017440
73 020172 010704
74 020174 000402
75 020176 025174
76 020200 177776
77 020202 062704 000344
78 020206 112403
79
80
81
82 020210 012711 000006
83 020214 012761 036226 000002
84 020222 000402
85 020224 173000
86 020226 000340
87 020230 032711 001000
88 020234 001775
89 020236 032711 020000
90 020242 001775
91 020244 022121
92 020246 052721 000030
93 020252 112411
94 020254 105761 177776
95 020260 100375
96 020262 005303
97 020264 001372
98
99
100
101 020266 042741 000020
102 020272 024141
103 020274 005004
104 020276 012703 000010
105 020302 004767 000052
106 020306 001327

FLOAT: DEC R3 ;R3 CONTAINS DU11 POS IN FLOAT SPACE
TST (R1) ;TEST FOR DEVICE, MAYBE TRAP TO NODEV
MOVB (R2),R4 ;MODULO INCREMENT
ADD R4,R1 ;UPDATE ADDRESS
INC R1 ;BY MODULO
BIC R4,R1 ;IN TABLE
TST R3 ;IS THIS A THE ONE?
BNE FLOAT ;NOT YET
;*****
;* ADD UNIT DISPLACEMENT TO UNIT 0 CSR ADDR
;*****
ASL R0 ;UNIT # TIMES 2
ASL R0 ;UNIT # TIMES 4
ASL R0 ;UNIT # TIMES 8
ADD R0,R1 ;CSR ADDR + UNIT*8
;*****
;* SETUP TO SEND MESSAGE
;*****
SNDREQ: MOV #17400+<8,*4>,SP ;SET STACK ADDR-17400+8 TIMES LOOP DEC.
SNDREQ1: MOV PC,R4 ;SET UP R4 WITH
BR 3$
.WORD 025174 ;CRC16 WORD FOR ROM #1
.WORD -2 ;HEADER WORD FOR ROM #2
3$: ADD #DUREQ-SNDREQ1-2,R4 ;POINTER TO DUREQ
MOVB (R4)+,R3 ;MESSAGE LENGTH + PAD
;*****
;* SEND A BLOCK ON THE LINK
;*****
MOV #6,(R1) ;SET DTR AND RTS
MOV #36000+SSYN,2(R1) ;SET FOR DU-11 (INT SYNCHRONOUS-8 BIT)
BR 2$
.WORD MRESERVED
.WORD RESERVED
2$: BIT #1000,(R1) ;TEST FOR DSR
BEQ 2$ ;NOT YET
1$: BIT #20000,(R1) ;TEST FOR CTS
BEQ 1$ ;NOT YET
CMP (R1)+,(R1)+ ;SET TO XMIT CSR
BIS #30,(R1)+ ;HDX AND SEND ON
SEND: MOVB (R4)+,(R1) ;MOVE TO DEVICE BUFFER
STEST: TSTB -2(R1) ;TEST FOR DONE
BPL STEST ;NOT YET
DEC R3 ;DECREMENT COUNT
BNE SEND ;MORE TO SEND
;*****
;* RECEIVE A MESSAGE FROM THE LINK
;*****
GETMSG: BIC #20,-(R1) ;DROP SEND
CMP -(R1),-(R1) ;RESET TO RCV CSR AND CLR RCV BUFFER
CLR R4 ;BUFFER ADDR
MOV #8.,R3 ;HEADER LENGTH
JSR PC,RCV1 ;GET THE HEADER
BNE SNDREQ ;NO GOOD CRC

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107 020310 122527 000220      CMPB    (R5)+,#DLE      ;IS IT A DLE MESSAGE(LOC 0)
108 020314 001324      BNE      SNDREQ      ;NO
109 020316 113703 000002      MOVB    @#2,R3      ;HIGH BYTE COUNT
110 020322 042703 177700      BIC      #177700,R3      ;CLEAR FLAGS AND OTHER BYTE
111 020326 000303      SWAB     R3      ;SWAP BYTES
112 020330 152503      BISB    (R5)+,R3      ;LOW BYTE COUNT(LOC 1)
113 020332 122323      CMPB    (R3)+,(R3)+      ;ADD TWO FOR CRC
114 020334 005004      CLR      R4      ;BUFFER ADDR
115 020336 004767 000026      JSR     PC,RECV      ;GET DATA FIELD
116 020342 001311      BNE      SNDREQ      ;NO GOOD
117 020344 005715      TST     (R5)      ;CHECK FOR CODE 0, LOAD 0 AT LOC 0
118 020346 001307      BNE      SNDREQ      ;NO
119 020350 013700 017776      MOV     @#17776,R0      ;SAVE UNIT NUM FOR SECONDARY BOOT
120 020354 000137 000006      JMP     @#6      ;TRANSFER TO IT
121
122
123
124 020360 042711 000024      RECV1:  BIC      #24,(R1)      ;CLEAR RTS AND SEARCH SYNC
125 020364 012711 000422      MOV     #422,(R1)      ;SET SEARCH,STRIP,DTR
126 020370 005005      RECV:   CLR      R5      ;INITIALIZE CRC
127 020372 000403      BR      RTEST
128 020374 000000      .WORD   0      ;FILLER
129 020376 056471      .WORD   056471      ;CRC16 WORD FOR ROM #2
130 020400 177776      .WORD   -2      ;HEADER WORD FOR ROM #3
131 020402 012702 000017      RTEST:  MOV     #15.,R2      ;LONG LOOP VALUE
132 020406 005046      CLR      -(SP)      ;SHORT LOOP
133 020410 105711      2$:      TSTB    (R1)      ;TEST FOR DEVICE DONE
134 020412 100421      BMI     RDONE      ;ALL DONE
135 020414 005316      DEC     (SP)      ;DECREMENT SHORT LOOP
136 020416 001374      BNE     2$      ;AGAIN
137 020420 005302      DEC     R2      ;DECREMENT LONG LOOP
138 020422 000402      BR      3$
139 020424 173000      .WORD   MRESERVED
140 020426 000340      .WORD   RESERVED
141 020430 001367      3$:      BNE     2$      ;KEEP GOING
142 020432 105706      TSTB    SP      ;CHECK STACK AT OR BELOW 17400
143 020434 003256      BGT     SNDRQ1      ;LOOP ONCE MOR(8 TIMES TOTAL)
144 020436 005011      CLR      (R1)      ;DROP DTR-HANG UP
145 020440 012703 000012      HNGLOP: MOV     #10.,R3      ;LONG LOOP COUNTER
146 020444 005302      4$:      DEC     R2      ;DECREMENT SHORT LOOP
147 020446 001376      BNE     4$      ;AGAIN
148 020450 005303      DEC     R3      ;DECREMENT LONG LOOP
149 020452 001374      BNE     4$      ;AGAIN
150 020454 000644      BR      SNDREQ      ;HUNG UP LONG ENOUGH-ANSWER AGAIN
151 020456 005726      RDONE:  TST     (SP)+      ;CLEAN UP STACK-LOOP CTR
152 020460 042711 000400      BIC     #400,(R1)      ;NO STRIP SYNC
153 020464 116114 000002      MOVB    2(R1),(R4)      ;STORE IT
154 020470 112446      1$:      MOVB    (R4)+,-(SP)      ;BYTE TO ADD
155 020472 012702 000010      MOV     #8.,R2      ;NUMBER BITS PER BYTE
156 020476 000241      CRCLOP: CLC      ;CLEAR CARRY
157 020500 006005      ROR     R5      ;LOW BIT PARTIAL TO CARRY
158 020502 006016      ROR     (SP)      ;CARRY TO BYTE AND BYTE TO CARRY
159 020504 102006      BVC     1$      ;XOR OF PARTIAL AND BYTE(LOW BITS)

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160 020506 012746 120001      MOV    #POLY,-(SP)      ;XOR POLY TO PARTIAL(4 INSTRUCTIONS)
161 020512 040516             BIC    R5,(SP)          ;NOT PARTIAL AND POLY
162 020514 042705 120001      BIC    #POLY,R5          ;NOT POLY AND PARTIAL
163 020520 052605             BIS    (SP)+,R5          ;POLY XOR PARTIAL
164 020522 005302      1$:    DEC    R2              ;DECREMENT BIT COUNT
165 020524 003364             BGT    CRCLOP            ;ONCE MORE
166 020526 005726             TST    (SP)+            ;CLEAN UP STACK-BYTE TO ADD
167 020530 005303             DEC    R3              ;DECREMENT BYTE COUNT
168 020532 003323             BGT    RTEST            ;ONCE MORE
169 020534 005705             TST    R5              ;SET CC
170 020536 000207             RTS    PC              ;RETURN
171                               ;*****
172                               ;* DECNET BOOT REQUEST
173                               ;*****
174 020540      024      226      226      DUREQ: .BYTE  20.,SSYN,SSYN,SSYN,DLE,4,300,0,0,1,021,120
      020543      226      220      004
      020546      300      000      000
      020551      001      021      120
175
176 020554      010      002      001      .BYTE  10,2,1,0,242,60      ;DUREQ REQUEST MESSAGE
      020557      000      242      060
177
178                               ;*****
179                               ;* FLOATING DEVICE MODULO
180                               ;*****
181 020562      007      DEVTAB: .BYTE  7              ;DJ11 DEVICE MODULUS
182 020563      017             .BYTE  17             ;DH11
183 020564      007             .BYTE  7              ;DQ11
184 020565      007             .BYTE  7              ;DU11
185
186                               ;      ***NOTE***
                               ;THE NEXT 4 WORDS ARE ZERO FILLED
187 020576 075042      ENDBOO: .WORD  075042          ;CRC16 WORD FOR ROM #3
188                               ;*****
189                               ;* RELOCATION ROUTINE
190                               ;*****
191                               ;.=20600
192 020600 012702 020000      MOV    #20000,R2
193 020604 012703 030000      MOV    #30000,R3
194 020610 012223      2$:    MOV    (R2)+,(R3)+
195 020612 020227 020576      CMP    R2,#20576
196 020616 001401             BEQ    1$
197 020620 000773             BR     2$
198 020622 000000      1$:    HALT
199 020622 000001             .END

```

SYMBOL TABLE

ASYN = 000337	DUBGN 020000	HNGLOP 020440	RECV1 020360	SETSTK 020060
BDIAG 020054	DUREQ 020540	INITSW= 173024	RESERV= 000340	SNDREQ 020166
CRCLOP 020476	EMDU 020012	MRESER= 173000	RTEST 020402	SNDRQ1 020172
CRCWD = 000000	ENDB00 020576	NODEV 020040	R6 = 0000006	SOH = 000201
DEVTAB 020562	ENQ = 000005	POLY = 120001	R7 = 0000007	SSYN = 000226
DIAG = 165564	FLOAT 020140	RDONE 020456	SEND 020252	STEST 020254
DLE = 000220	GETMSG 020266	RECV 020370		

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.REM %

IDENTIFICATION

PRODUCT CODE: XXXXXXXX-XX-XXXXX-X-X
PRODUCT NAME: M9312 DECNET BOOT - DUP11
PRODUCT DATE: APRIL 1978
MAINTAINER: DIAGNOSTIC ENGINEERING

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1      .REM      %
2          THIS ROM WILL BOOT THE DUP OPTION.
3      TO BOOT UNIT 0,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y04.
4      TO BOOT UNIT 0,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y06.
5      TO BOOT UNIT 1,AND NOT RUN DIAGNOSTICS,THE START ADDR IS 173Y30.
6      TO BOOT UNIT 1,AND RUN CPU DIAGNOSTICS,THE START ADDR IS 173Y32.
7      THE Y COMPONENT OF THE ADDRESS REPRESENTS BITS 7 AND 8 OF THE WHOLE WORD.
8      IF ROM #1 IS IN SLOT 1 THE Y COMPONENT IS 00  ADDR. 1730XX
9      IF ROM #1 IS IN SLOT 2 THE Y COMPONENT IS 01  ADDR. 1732XX.
10     %

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1      .TITLE  M9312 DECNET BOOT - DUP11
2      ;      BASIC DEFINITIONS
3
4      000000      R0=%0
5      000001      R1=%1
6      000002      R2=%2
7      000003      R3=%3
8      000004      R4=%4
9      000005      R5=%5
10     000006      R6=%6
11     000007      R7=%7
12     000006      SP=%6
13     000007      PC=%7
14     000340      RESERVED=340
15     165564      DIAG=165564
16     173024      INITSW=173024
17     000000      CRCWD=0
18     173000      MRESERVED=173000
19     000226      SSYN=226
20     000220      DLE=220
21     000337      ASYN=337
22     000201      SOH=201
23     000005      ENQ=005
24     120001      POLY=120001
25     .NLIST  MC,MD
26     .LIST   ME
27
37
38
44     000000      .ENABL  ABS
45     020000      .=20000

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1          ;*****
2          ;* CMND XW (DUP11)
3          ;*****
4 020000      127      130      DUPBGN: .ASCII 'WX'          ;IDENTIFIER 'XW' FOR DUP11 BOOT
5 020002      000576          .WORD <ENDB00-.,+2>          ;OFFSET TO NEXT BOOT
6 020004      000261          SEC          ;ENTRY FOR DUP11, NO CPU DIAG RUN
7 020006      012700      000000      MOV #0,R0          ;ENTRY FOR DUP11, RUN CPU DIAG
8 020012      012701      160010      EMDUP: MOV #160010,R1      ;PUT FLOATING BASE ADDR IN R1
9 020016      010704          MOV PC,R4          ;GET RETURN ADDR
10 020020      103015          BCC BDIAG          ;GO TO DIAG IF ENABLED (C=0)
11 020022      000416          BR SETSTK
12 020024      173000          .WORD MRESERVED
13 020026      000340          .WORD RESERVED
14 020030      000261          SEC          ;ENTRY FOR UNIT 1, NO CPU DIAG RUN
15 020032      012700      000001      MOV #1,R0          ;ENTRY FOR UNIT 1, RUN CPU DIAG
16 020036      000765          BR EMDUP
17          ;*****
18          ;* FLOATING DEVICE INTERRUPT ROUTINE
19          ;*****
20 020040      005202      NODEV: INC R2          ;UPDATE R2 TO POINT TO NEXT DEV MODULO
21 020042      005303          DEC R3          ;SUB ONE FROM R3
22 020044      100002          BPL 1$          ;IF CANT FIND DEVICE, HALT
23 020046      000000      2$: HALT          ; ***NOTE***
24 020050      000776          BR 2$          ;REVIEW FLOATING ADDRESS ASSIGNMENTS
25 020052      000002      1$: RTI          ;RETURN
26          ;*****
27          ;* GO TO DIAG
28          ;*****
29 020054      000137      165564      BDIAG: JMP @#DIAG          ;GO TO DIAG
30          ;RETURN MADE THROUGH ADDR IN R4
31          ;*****
32          ;* FIND THE DEVICE IN FLOATING SPACE
33          ;*****
34 020060      012706      017776      SETSTK: MOV #17776,SP          ;SET UP STACK
35 020064      042700      177760          BIC #177760,R0          ;PREVENT TRYING TO BOOT UNIT # > 15
36 020070      010016          MOV R0,(SP)          ;SAVE UNIT NUM AT 17776
37 020072      010702      2$: MOV PC,R2          ;SET UP R2 WITH
38 020074      062702      000474          ADD #DEVTAB-2$,R2      ;POINTER TO DEVTAB
39 020100      010704      3$: MOV PC,R4          ;SET UP R4 WITH
40 020102      062704      177736          ADD #NODEV-3$-2,R4      ;POINTER TO TRAP ROUTINE
41          ; ***NOTE***
42          ;THE NEXT FOUR INSTRUCTIONS VERIFY THAT
43          ;THE EXTENSION ROMS ARE PROPERLY INSTALLED.
44          ;IF NOT, THE BOOT WILL HALT
45 020106      011246          MOV (R2),-(SP)          ;PUSH THE #7407 FROM ROM #3 ON THE STACK
46 020110      166416      000202          SUB 202(R4),(SP)          ;SUBTRACT FROM IT THE #1775 OFF ROM #2
47 020114      022726      005412          CMP #5412,(SP)+          ;COMP IT WITH #5412
48 020120      001402          BEQ 4$          ;IF NOT EQUAL, HALT
49 020122      000000      5$: HALT          ; ***NOTE***
50 020124      000776          BR 5$          ;CHECK POS OF ROMS #2 AND #3
51 020126      012703      000006      4$: MOV #6,R3          ;TRAP PS ADDR
52 020132      005013          CLR (R3)          ;CLR NEW PSW
53 020134      010443          MOV R4,-(R3)          ;SET TRAP ROUTINE ADDR IN LOC 4

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54
55 020136 005711          FLOAT: TST      (R1)          ;R3 CONTAINS DUP11 POS IN FLOAT SPACE
56 020140 111204          MOV      (R2),R4          ;TEST FOR DEVICE, MAYBE TRAP TO NODEV
57 020142 060401          ADD      R4,R1            ;MODULO INCREMENT
58 020144 005201          INC      R1              ;UPDATE ADDRESS
59 020146 040401          BIC      R4,R1            ;BY MODULO
60 020150 005703          TST      R3              ;IN TABLE
61 020152 001371          BNE      FLOAT            ;IS THIS A THE ONE?
62                          ;*****
63                          ;* ADD UNIT DISPLACEMENT TO UNIT 0 CSR ADDR
64                          ;*****
65 020154 006300          ASL      R0              ;UNIT # TIMES 2
66 020156 006300          ASL      R0              ;UNIT # TIMES 4
67 020160 006300          ASL      R0              ;UNIT # TIMES 8
68 020162 060001          ADD      R0,R1            ;CSR ADDR + UNIT*8
69                          ;*****
70                          ;* SETUP TO SEND MESSAGE
71                          ;*****
72 020164 012706 017440  SNDREQ: MOV      #17400+<8,*4>,SP      ;SET STACK ADDR-17400+8 TIMES LOOP DEC.
73 020170 010704          SNDRQ1: MOV     PC,R4              ;SET UP R4 WITH
74 020172 000403          BR        3$
75 020174 000000          .WORD     0                    ;FILLER
76 020176 024572          .WORD     024572                ;CRC16 WORD FOR ROM #1
77 020200 177776          .WORD     -2                    ;HEADER WORD FOR ROM #2
78 020202 062704 000354  3$:  ADD      #DUPREQ-SNDRQ1-2,R4      ;POINTER TO DUPREQ
79 020206 112403          MOV      (R4)+,R3            ;MESSAGE LENGTH + PAD
80                          ;*****
81                          ;* SEND A BLOCK ON THE LINK
82                          ;*****
83 020210 012711 000006  MOV      #6,(R1)              ;SET DTR AND RTS
84 020214 012761 101226 000002 MOV      #101000+SSYN,2(R1)      ;SET FOR DUP-11 (DEC MODE-CRC INH)
85 020222 000402          BR        2$
86 020224 173000          .WORD     MRESERVED
87 020226 000340          .WORD     RESERVED
88 020230 032711 001000  2$:  BIT      #1000,(R1)          ;TEST FOR DSR
89 020234 001775          BEQ      2$                ;NOT YET
90 020236 032711 020000  1$:  BIT      #20000,(R1)         ;TEST FOR CTS
91 020242 001775          BEQ      1$                ;NOT YET
92 020244 022121          CMP      (R1)+,(R1)+        ;SET TO XMIT CSR
93 020246 052721 000030  BIS      #30,(R1)+        ;HDX AND SEND ON
94 020252 012711 000626  MOV      #400+SSYN,(R1)      ;START IT UP WITH TSOM
95 020256 000401          BR        STEST            ;TEST FOR DONE
96 020260 112411          SEND:  MOV      (R4)+,(R1)      ;MOVE TO DEVICE BUFFER
97 020262 105761 177776  STEST:  TSTB     -2(R1)          ;TEST FOR DONE
98 020266 100375          BPL      STEST            ;NOT YET
99 020270 005303          DEC      R3                ;DECREMENT COUNT
100 020272 001372          BNE      SEND             ;MORE TO SEND
101                          ;*****
102                          ;* RECEIVE A MESSAGE FROM THE LINK
103                          ;*****
104 020274 042741 000020  GETMSG: BIC      #20,-(R1)        ;DROP SEND
105 020300 024141          CMP      -(R1),-(R1)        ;RESET TO RCV CSR AND CLR RCV BUFFER
106 020302 005004          CLR      R4                ;BUFFER ADDR

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107 020304 012703 000010      MOV      #8.,R3      ;HEADER LENGTH
108 020310 004767 000052      JSR      PC,RECV1    ;GET THE HEADER
109 020314 001323              BNE      SNDREQ    ;NO GOOD CRC
110 020316 122527 000220      CMPB     (R5)+,#DLE    ;IS IT A DLE MESSAGE(LOC 0)
111 020322 001320              BNE      SNDREQ    ;NO
112 020324 113703 000002      MOVB     @#2,R3      ;HIGH BYTE COUNT
113 020330 042703 177700      BIC      #177700,R3    ;CLEAR FLAGS AND OTHER BYTE
114 020334 000303              SWAB     R3        ;SWAP BYTES
115 020336 152503              BISB     (R5)+,R3    ;LOW BYTE COUNT(LOC 1)
116 020340 122323              CMPB     (R3)+,(R3)+  ;ADD TWO FOR CRC
117 020342 005004              CLR      R4        ;BUFFER ADDR
118 020344 004767 000036      JSR      PC,RECV    ;GET DATA FIELD
119 020350 001305              BNE      SNDREQ    ;NO GOOD
120 020352 005715              TST      (R5)      ;CHECK FOR CODE 0, LOAD 0 AT LOC 0
121 020354 001303              BNE      SNDREQ    ;NO
122 020356 013700 017776      MOV      @#17776,R0   ;SAVE UNIT NUM FOR SECONDARY BOOT
123 020362 000137 000006      JMP      @#6       ;TRANSFER TO IT
124                          ;*****
125                          ;* RECEIVE A BLOCK FROM THE LINK
126                          ;*****
127 020366 042711 000024      RECV1:  BIC      #24,(R1)    ;CLEAR RTS AND SEARCH SYNC
128 020372 000403              BR       1$
129 020374 000000              .WORD    0          ;FILLER
130 020376 024437              .WORD    024437      ;CRC16 WORD FOR ROM #2
131 020400 177776              .WORD    -2         ;HEADER WORD FOR ROM #3
132 020402 012711 000422      1$:      MOV      #422,(R1)  ;SET SEARCH,STRIP,DTR
133 020406 005005              RECV:   CLR      R5        ;INITIALIZE CRC
134 020410 012702 000017      RTEST:  MOV      #15.,R2    ;LONG LOOP VALUE
135 020414 005046              CLR      -(SP)      ;SHORT LOOP
136 020416 105711              2$:      TSTB     (R1)      ;TEST FOR DEVICE DONE
137 020420 100421              BMI      RDONE    ;ALL DONE
138 020422 000402              BR       1$
139 020424 173000              .WORD    MRESERVED
140 020426 000340              .WORD    RESERVED
141 020430 005316              1$:      DEC      (SP)      ;DECREMENT SHORT LOOP
142 020432 001371              BNE      2$        ;AGAIN
143 020434 005302              DEC      R2        ;DECREMENT LONG LOOP
144 020436 001367              BNE      2$        ;KEEP GOING
145 020440 105706              TSTB     SP        ;CHECK STACK AT OR BELOW 17400
146 020442 003252              BGT      SNDRQ1    ;LOOP ONCE MOR(8 TIMES TOTAL)
147 020444 005011              CLR      (R1)      ;DROP DTR-HANG UP
148 020446 012703 000012      HNGLOP: MOV      #10.,R3    ;LONG LOOP COUNTER
149 020452 005302              4$:      DEC      R2        ;DECREMENT SHORT LOOP
150 020454 001376              BNE      4$        ;AGAIN
151 020456 005303              DEC      R3        ;DECREMENT LONG LOOP
152 020460 001374              BNE      4$        ;AGAIN
153 020462 000640              BR       SNDREQ    ;HUNG UP LONG ENOUGH-ANSWER AGAIN
154 020464 005726              RDONE:  TST      (SP)+    ;CLEAN UP STACK-LOOP CTR
155 020466 042711 000400              BIC      #400,(R1)    ;NO STRIP SYNC
156 020472 116114 000002              MOVB     2(R1),(R4)  ;STORE IT
157 020476 112446              1$:      MOVB     (R4)+,-(SP)  ;BYTE TO ADD
158 020500 012702 000010              MOV      #8.,R2    ;NUMBER BITS PER BYTE
159 020504 000241              CRCLOP: CLC      ;CLEAR CARRY

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160 020506 006005      ROR      R5      ;LOW BIT PARTIAL TO CARRY
161 020510 006016      ROR      (SP)    ;CARRY TO BYTE AND BYTE TO CARRY
162 020512 102006      BVC      1$      ;XOR OF PARTIAL AND BYTE(LOW BITS)
163 020514 012746 120001  MOV      #POLY,-(SP) ;XOR POLY TO PARTIAL(4 INSTRUCTIONS)
164 020520 040516      BIC      R5,(SP)  ;NOT PARTIAL AND POLY
165 020522 042705 120001  BIC      #POLY,R5 ;NOT POLY AND PARTIAL
166 020526 052605      BIS      (SP)+,R5 ;POLY XOR PARTIAL
167 020530 005302      1$: DEC      R2      ;DECREMENT BIT COUNT
168 020532 003364      BGT      CRCLOP   ;ONCE MORE
169 020534 005726      TST      (SP)+    ;CLEAN UP STACK-BYTE TO ADD
170 020536 005303      DEC      R3      ;DECREMENT BYTE COUNT
171 020540 003323      BGT      RTEST    ;ONCE MORE
172 020542 005705      TST      R5      ;SET CC
173 020544 000207      RTS      PC      ;RETURN
174                                     ;*****
175                                     ;* DECNET BOOT REQUEST
176                                     ;*****
177 020546      024      226      226  DUPREQ: .BYTE 20.,SSYN,SSYN,SSYN,DLE,4,300,0,0,1,021,120
      020551      226      220      004
      020554      300      000      000
      020557      001      021      120
178
179 020562      010      012      001      .BYTE 10,10.,1,0,43,362 ;DUPREQ REQUEST MESSAGE
      020565      000      043      362
180
181                                     ;*****
182                                     ;* FLOATING DEVICE MODULO
183                                     ;*****
184 020570      007      DEVTAB: .BYTE 7 ;DJ11 DEVICE MODULUS
185 020571      017      .BYTE 17 ;DH11
186 020572      007      .BYTE 7 ;DQ11
187 020573      007      .BYTE 7 ;DU11
188 020574      007      .BYTE 7 ;DUP11
189 020575      000      .BYTE 0 ;FILLER
190
191 020576 036074      ENDBOO: .WORD 036074 ;CRC16 WORD FOR ROM #3
192                                     ;*****
193                                     ;* RELOCATION ROUTINE
194                                     ;*****
195                                     .=20600
196 020600 012702 020000      MOV      #20000,R2
197 020604 012703 030000      MOV      #30000,R3
198 020610 012223      2$: MOV      (R2)+,(R3)+
199 020612 020227 020576      CMP      R2,#20576
200 020616 001401      BEQ      1$
201 020620 000773      BR      2$
202 020622 000000      1$: HALT
203 020623 000001      .END

```


SYMBOL TABLE

ASYN = 000337	DUPBGN 020000	HNGLOP 020446	RECV1 020366	SETSTK 020060
BDIAG 020054	DUPREQ 020546	INITSW= 173024	RESERV= 000340	SNDREQ 020164
CRCLOP 020504	EMDUP 020012	MRESER= 173000	RTEST 020410	SNDRO1 020170
CRCWD = 000000	ENDBOO 020576	NODEV 020040	R6 = 0000006	SOH = 000201
DEVTAB 020570	ENQ = 000005	POLY = 120001	R7 = 0000007	SSYN = 000226
DIAG = 165564	FLOAT 020136	RDONE 020464	SEND 020260	STEST 020262
DLE = 000220	GETMSG 020274	RECV 020406		