

ROM LOADER
MD-11-DDBMA-A

EP-DDBMA-A-DL-A
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DDMA MACY11 27:7321 22-SEP-75 14:43 PAGE 1
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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 2
DOBMA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DOBMA-A-D
PRODUCT NAME:	UNIVERSAL RESTART ROM LOADER
DATE RELEASED:	21 DECEMBER 1975
MAINTAINER:	DIAGNOSTIC GROUP

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1. ABSTRACT

THIS MAINDEC CONSISTS OF FOUR PROGRAMS. THE TWO MAIN PROGRAMS ARE PROGRAM ONE AND PROGRAM FOUR. THESE PROGRAMS WILL BE DISCUSSED LATER.

THE PURPOSE OF THIS DIAGNOSTIC IS TO VERIFY THE DATA IN THE ROM, MAKE SURE ALL ADDRESS WILL CAUSE A TIME OUT TRAP WHEN WRITTEN INTO (EXCEPT THE TRAP VECTORS: 173024, 173224) AND ALERT THE OPERATOR AS TO WHAT THE OFFSET ADDRESS WOULD BE IF A SELECTED BUTTON IS PUSHED.

THE SEDM SYSTEM HAS SPECIAL ROM DATA -- USES BM873YS -- WHICH MUST BE INPUTED TO THE PROGRAM BY THE USER FOR THE DIAGNOSTIC TO VERIFY THE BM873YS CONTENTS.

NOTE: FOR NORMAL CONFIGURATIONS, THE ONLY PROGRAMS NECESSARY FOR ACCEPTANCE OF THE BM873 ARE PROGRAMS ONE AND FOUR. PROGRAM TWO IS NECESSARY FOR "NON-STANDARD" SETUPS AND IS A MAINTAINCE TOOL. PROGRAM THREE IS ALSO JUST FOR MAINTAINCE AID.

2. REQUIRMENTS

2.1 EQUIPMENT

ANY PDP-11 FAMILY CPU
UNIVERSAL RESTART LOADER
TELETYPE OR EQUIVALENT (OPTIONAL)
LINE PRINTER (OPTIONAL)
AT LEAST 4K OF MEMORY.

2.2 STORAGE

THIS PROGRAM RESERVES THE RIGHT TO USE ALL OF THE FIRST 4K EXCEPT WHERE BOOTSTRAP LOADER AND ABSOLUTE LOADER RESIDE.

3. LOADING PROCEDURE

THE PROGRAM MAY BE LOADED LIKE ANY OTHER PROGRAM SUCH AS: PAPER TAPE, DECTAPE MAGTAPE, DISK, ETC. MOST COMMON WILL BE THROUGH PAPER TAPE BY THE USE OF ABSOLUTE LOADER.

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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 4
DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTINGS

SWITCH 01 CLEARED INDICATES ONLY FIRST 128
WORDS TO BE CHECKED.
SET INDICATES EXTENDED 128. WORDS
ARE TO BE CHECKED IN WHICH CASE
PROGRAM 2 MUST BE RUN FIRST.
WHEN RUNNING ON BM873YB, BM873YC, OR BM873YD, 256 WORDS
ARE AUTOMATICALLY CHECKED.

4.2 STARTING ADDRESS

STARTING ADDRESS 000200
RESTART ADDRESS 000210

4.3 OPERATOR ACTION

4.3.1 FOR NORMAL OPERATION (WITHOUT EXTENDED 128 WORDS)

EITHER A) ONLY IF THERE IS NO TTY-----

1. LOAD ADDRESS 000200
2. CLEAR CONSOLE SWITCHES
3. SET SW06=1, SW00=1
4. PRESS START

PROGRAM WILL HALT AT ADDRESS 010124 TO ENQUIRE
WHICH PROGRAM TO BE RUN

5. CLEAR CONSOLE SWITCHES
6. SET SW05=1, SW04=1
7. SET--- EITHER SW00=1 IF PROG 1 TO BE RUN
OR SW01=1 IF PROG 2 TO BE RUN
OR SW01=1, SW00=1 IF PROG 3 TO BE RUN
OR SW02=1 IF PROG 4 TO BE RUN

8. PRESS CONTINUE
9. NOW, AND ONLY NOW, SET SW15=1, SW11=1 (OPTIONAL)
AND SW06=1
OTHERS MAY STAY UP

IF THERE IS NO ERROR, PROG 1, 3 AND 4 WILL RUN FOR
APPROX. FIVE MINUTES; AT THE END OF WHICH THERE WILL
BE "5" (OCTAL) ON THE DISPLAY LIGHTS FOR
COUPLE OF SECONDS AND THEN PROG WILL HALT AT ADDRESS
252 FOR END OF PASS.
PRESS CONTINUE TO PROCEED WITH THIS PROGRAM.

PROGRAM 2 HAS NO END PASS; BUT WILL HALT AT COMPLETION.
HIT CONTINUE TO PROCEED IN THIS PROGRAM.

F01

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 5
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

PROGRAM WILL HALT AT ADDRESS 015556 IF THERE IS ANY ERROR
 IN ANY OF THE PROGRAMS.

TO DETERMINE TYPE OF ERROR:

OBSERVE CONTENTS OF TABLE STARTING AT LOCATION 017400.
 THERE ARE THREE DIFFERENT TYPES OF TABLES FOR FOUR
 DIFFERENT TYPES OF ERRORS.
 THEY ARE ARRANGED AS BELOW:

\$
 . THE FOLLOWING MESSAGE ADDRESSES ARE:
 016314 EMO
 016356 EM1
 016415 EM2
 016462 EM3

THIS TABLE IS FOR COMPARISON ERROR

017400	I	PC	I
	I		I
	I		I
017402	I	ADDR OF MSG	I
	I		I
	I		I
017404	I	ROM ADDR	I
	I		I
	I		I
017406	I	SOFT ADDR	I
	I		I
	I		I
017410	I	EXP DATA	I
	I		I
	I		I
017412	I	FOUND DATA	I
	I		I
	I		I

THIS TABLE IS FOR "WRITING ROM FAILED TO TRAP" AND "FATAL TRAP" TYPE OF ERROR

017400	I	PC	I
	I		I
	I		I
	I		I

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DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 6
 DDBMAA.P11 MAINDEC-11-DDDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

017402	I	ADDR OF MSG	I
	I		I
	I		I
017404	I	ROM ADDR	I
	I		I
	I		I
017406	I	0	I
	I		I
	I		I
017410	I	0	I
	I		I
	I		I
017412	I	0	I
	I		I
	I		I

;THIS TABLE IS FOR "UNEXPECTED TRAP" TYPE OF ERROR

017400	I	PC	I
	I		I
	I		I
017402	I	ADDRESS OF MESSAGE	I
	I		I
	I		I
017404	I	ROM ADDR	I
	I		I
	I		I
017406	I	PC OF TRAP	I
	I		I
	I		I
017410	I	0	I
	I		I
	I		I
017412	I	0	I
	I		I
	I		I

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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 7
DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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HOW TO LOOK IN TO THE TABLE:
10. LOAD ADDRESS 017400
11. PRESS EXAMINE
CONTENT OF THIS LOCATION IS---PC OF THE DETECTED ERROR.
12. PRESS EXAMINE
CONTENT IS ---ADDRESS OF MESSAGE
13. PRESS EXAMINE
CONTENT IS -- ROM ADDRESS
THEN CONTINUE LIKE ABOVE FOLLOWING THE TABLE

TO PROCEED WITH THE PROGRAM GO BACK TO STEP 1.

OR B) ----IF THERE IS A TTY :

1. LOAD STARTING ADDRESS (000200)
2. SET SWITCHES AS PER 5.1.1 (NORMAL ALL SWITCHES DOWN)
3. PRESS START SWITCH AND RELEASE.
4. DEVICE VERSION.
WHEN PROGRAM IS STARTED FOR THE FIRST TIME THE FOLLOWING
WILL BE PRINTED OUT:
"DEVICE VERSION
BM873-Y"
THE OPERATOR WILL THEN SPECIFY THE VERSION BEING RUN.
BM873-Y* IS ANY NON-STANDARD VERSION.
NOTE: PROGRAM TWO MUST BE RUN FIRST.
BM873-YA REPLACES M792-YA, M811-DB, M792-YH
BM873-YB MASSBUS
BM873-YC DOCHP BOOTSTRAP ROM
BM873-YD KL10 (PDP-11) 256 BOOTSTRAP ROM

5. THEN TYPE IN NUMBER OF PROGRAM TO BE RUN (NORMALLY PROGRAM 1 AND 4)
6. HITTING CONTROL "G" WHILE PROGRAM IS RUNNING WILL CAUSE A RESTART.
YOU MAY THEN INPUT DIFFERENT PROGRAM NUMBER.

NOTE: RESTARTS AT ADDRESS 200 WILL GO TO STEP 5 ABOVE.
RESTARTS AT ADDRESS 210 WILL GO TO STEP 3 ABOVE.

4.3.2 IF YOU WISH TO TEST THE EXTENDED 128. WORDS THIS IS THE
PROCEDURE:
(NOT NEEDED FOR NORMAL TESTING OF BM873YB, BM873YC, OR BM873YD)
1. LOAD STARTING ADD. 000200
2. SET SW01=1
3. SET HALT ENABLE SW AND SINGLE CYCLE SW UP
4. HIT START SWITCH AND RELEASE.
5. RUN PROGRAM 2 FOR ONE PASS.
6. NOW ANY PROGRAM MAY BE RUN.
NOTE: VISUAL INSPECTION OF EXTENDED DUMP
IS YOUR RESPONSIBILITY. THAT DATA WAS
PLACED INTO SOFTWARE TABLE FOR TEST COMPARISON.

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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 8
DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 9
DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

5. OPERATING PROCEDURE

5.1.1 SWITCH SETTINGS (APPLICABLE IN ALL PROGRAMS)

SW15 = 1 OR UP ... HALT ON ERROR

SW13 = 1 OR UP ... INHIBIT ERROR PRINT OUT

SW12 = 1 OR UP ... INHIBIT ALL PRINT OUT/ BELL ON ERROR.

SW11 = 1 OR UP ... INSTEAD OF EXERCISING EACH ADDRESS 10X DO IT 1X.

SW09 = 1 OR UP ... LOOP WITH CURRENT ADDRESS

SW08 = 1 OR UP ... GOTO BEGINNING OF CURRENT PROGRAM ON ERROR

SW06 = 1 OR UP ... HALT ON END OF PASS

6. ERRORS

6.1 ERROR PRINT OUT

ALL ERRORS WILL HAVE A PRINT OUT. IF IT WAS A COMPARISON ERROR; THE ROM ADDRESS, SOFT ADDRESS, EXPECTED DATA (FROM SOFTWARE MAP), AND THE FOUND DATA WILL BE PRINTED OUT. IF IT WAS A "NO TRAP WHEN WRITTEN" ERROR; THE ADDRESS WILL BE PRINTED OUT. IF IT WAS AN "UNEXPECTED TRAP " WHEN READING ROM THE ADDRESS WILL BE PRINTED .

ALSO INFORMATION RELATING TO ALL ERRORS ARE STORED IN CORE STARTING AT LOCATION 017400----
REFER TO SECTION 4.3.1

6.2 ERROR RECOVERY

1. ITS A GOOD IDEA TO LEAVE SW15=1 WHILE TEST RUNS TO PREVENT A RUN AWAY ERROR FROM GOING WILD IF YOU LEAVE THE CPU.
2. IN AN ERROR: SET SW09=1(LOOP ON THIS ADDR.) AND SET SW 13=1(DELETE ERROR PRINT OUT). IF CPU IS HALTED; HIT CONTINUE.
3. NOW THE PROGRAM IS RUNNING AND YOU MAY SCOPE IT.

7. RESTRICTIONS

7.1 STARTING RESTRICTIONS

SEE SECTION 4.

7.2 OPERATING RESTRICTIONS

- 7.2.1 IF OPERATING ON 11/45; AND JUMPER HAS BEEN CUT FOR A POWER FAIL TO GOTO ADDRESS 173200;
***** A POWER FAIL MUST NOT HAPPEN WHILE PRG IS RUNNING *****
- 7.2.2 IF YOU WISH PROGRAM TO TEST YOUR EXTENDED 128. WORDS; YOU MUST START AS PER SECTION 4 AND THEN
***** RUN PROGRAM 2 FIRST AND VISUALLY VERIFY DATA.****
(NOT APPLICABLE TO BM873YB, BM873YC, OR BM873YD)
- 7.2.3 YOU MAY NOT ALTER THE SOFTWARE MAP UNLESS--
***** YOU KNOW WHAT YOU ARE DOING *****
- 7.2.4 THE ROM ADDRESS MUST START AT 173000 AND BE AT LEAST 128 WORDS LONG. (256 FOR THE BM873YB, BM873YC, OR BM873YD)

8. MISCELLANEOUS

8.1 EXECUTION TIME

PROGRAM ONE WILL PASS AT APPROX. FIVE MINS.
 PROGRAM TWO HAS NO END PASS; BUT WILL HALT AT COMPLETEION
 HIT CONTINUE TO PROCEED IN THIS PROGRAM.
 PROGRAM THREE (RUN) WILL PASS APPROX. FIVE MINS.
 PROGRAM FOUR WILL PASS APPROX. FIVE MINS

DDBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 11
DDBMAA.P11 MAINDEC-11-DDBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

9. PROGRAM DESCRIPTION

9.1 PROGRAM 1

PROGRAM 1 WILL VERIFY THE DATA IN THE ROM AND THE VERIFY THAT WRITING THE ROM WILL TRAP OUT (EXCEPT THE VECTORS) EACH ADDRESS IS REFERENCED FIVE TIMES IN A ROW BEFORE UPDATING TO THE NEXT ADDRESS.
IF SW00 WAS UP WHEN START WAS HIT, THE EXTENDED 128 WORDS WILL BE CHECKED.
256 WORDS WILL BE CHECKED AUTOMATICALLY IF BM873YB, BM873YC, OR BM873YD IS TESTED.

9.2 PROGRAM 2

PROGRAM 2 WILL DUMP THE CONTENTS OF THE ROM ONTO THE TTY (OR LINE PRINTER IF SW07=1). NOTE NO VERIFICATION OF ANY KIND IS PERFORMED ON THE DATA. (AN ERROR WILL OCCUR IF A TRAP IS ENCOUNTERED WHILE READING) YOU MUST INSPECT THE DATA YOUR SELF. IF SW00 WAS UP WHEN START WAS HIT THE EXTENDED 128. WORDS WILL BE PRINTED.
256 WORDS WILL BE PRINTED IF BM873YB, BM873YC, OR BM873YD IS SELECTED
NOTE: IF SW 07=1 PRINTING WILL BE DONE ON THE LINE PRINTER IF IT EXISTS.

9.3 PROGRAM 3

PROGRAM 3 IS THE SAME AS PROGRAM ONE EXCEPT THAT THE USER HAS THE ABILITY TO ALTER THE SOFTWARE MAP, LIST OR PRINT THE SOFTWARE MAP, AND RUN THE PROGRAM.
NOTE THAT IF YOU ALTER THE MAP BE CAREFULL OF WHAT YOU CHANGE.
FOR THE COMMANDS TO BE USED SEE TOP OF PROGRAM 3 IN THIS LISTING

9.4 PROGRAM 4

PROGRAM 4 CHECKS THE OFFSET ADDRESS WHEN THE SIMULATED PUSHING OF A BUTTON IS DONE BY THE SOFTWARE. ON THE FIRST PASS THE OFFSET IS TYPED OUT FOR YOU TO VERIFY (NOTE: THE PROGRAM HAS NO WAY OF KNOWING WHAT THE OFFSET WILL BE). AFTER THE DATA IS TYPED OUT IT IS STORED AWAY IN CORE. WHEN THE FIRST PASS IS FINISHED THE PROCESS IS REPETED ONLY NO TYPE OUT IS PERFORMED, AND THE DATA IN CORE IS COMPARED TO THE DATA FOUND AT THE ROM.

DURING THIS TEST "WRITING" THE ROM IS PERFORMED. THE VECTORS (173024,173224) ARE "WRITTEN" AND ARE **NOT** EXPECTED TO TRAP. AN ERROR MESSAGE WILL BE REPORTED IF A TRAP IS DISCOVERED.

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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 12
DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

9.5 CONTROL "G"

HITTING CONTROL "G" WILL GO TO THE BEGINING OF THE PROGRAM AND ASK FOR PROGRAM NUMBER.

9.6 THIS PROGRAM IS "XXDP AND ACT-11" COMPATIBLE; AT PRESENT TIME IF IN CHAIN MODE UNDER ACT-11 OR XXDP THE PROGRAM AUTOMATICALLY DETERMINES IF THE ROM IS BM873YA OR YB, YC, OR YD BY COMPARING THE 1ST WORD IN ROM WITH THE EXPECTED WORD. THE DIAGNOSTIC THEN RUNS PROGRAM 1 AND PROGRAM 4 BEFORE ENTERING THE MONITOR.

9.7 ELECTRICAL PREQUISITES (HARDWARE)

9.7.1 THIS OPTION MUST BE ON THE CPU SIDE OF ANY BUS BUFFERS.

9.7.2 NPR CYCLES ARE NOT PERMITTED DURING THE POWER UP TRAP SEQUENCE.

9.7.3 ACLO AND DCLO MUST BE AVAILABLE AT BACKPLANE PINS "CV1" AND "CN1" RESPECTIVELY. THIS WIRING IS NOT PROVIDED ON THE "SPC" SLOTS OF THE 11/15, 11/20, 11/35, 11/40, AND THE DD11-A; IT IS PROVIDED ON THE 11/05, AND 11/45, ALSO ON THE DD11-B. IF FURTHER INFORMATION IS NEEDED CONSULT THE BM873 MANUAL FOR HELP. NOTE: THE DIAGNOSTIC RUNNING WITHOUT ANY INTERFERANCE FROM THE USER HAS NO WAY OF CHECKING THE PRESENTS OF THE "ACLO" AND "DCLO" SIGNALS ON THE OPTION.

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DDbMA MACY11 27(732) 22-SEP-76 14:43 PAGE 13
 DDBMAA.P11 MAINDEC-11-DDbMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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;BM873 YX
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;STARTING PROCEDURE
;LOAD PROGRAM
;LOAD ADDRESS 000200
;PRESS START
;PROGRAM WILL TYPE "DEVICE VERSION
;               BM873-Y "
;THE OPERATOR WILL THEN SPECIFY THE VERSION.
;AT THE END OF A PASS, PROGRAM WILL TYPE PASS COMPLETE MESSAGE
;AND THEN RESUME TESTING
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;SWITCH REGISTER OPTIONS

100000	SW15=100000	=1, HALT ON ERROR
040000	SW14=40000	
020000	SW13=20000	=1, INHIBIT ERROR PRINTOUT
010000	SW12=10000	=1, DELETE TYPEOUT/BELL ON ERROR.
004000	SW11=4000	=1 DO EACH ADDRESS 1 TIME INSTEAD OF 10 TIMES.
002000	SW10=2000	
001000	SW09=1000	=1, LOOP WITH CURRENT DATA
000400	SW08=400	=1 RETURN TO TOP OF CURRENT PROGRAM ON ERROR.
000100	SW06=100	
000040	SW05=40	
000020	SW04=20	
000010	SW03=10	
000004	SW02=4	
000002	SW01=2	
000001	SW00=1	=1 TEST THE EXPANDED 128 WORDS

008M2 MACY11 27(732) 22-SEP-76 14:43 PAGE 14
 008M2A.P11 MAINDEC-11-008MA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

;REGISTER DEFINITIONS

000000	R0=%0	; GENERAL REGISTER
000001	R1=%1	; GENERAL REGISTER
000002	R2=%2	; GENERAL REGISTER
000003	R3=%3	; GENERAL REGISTER
000004	R4=%4	; GENERAL REGISTER
000005	R5=%5	; GENERAL REGISTER
000006	SP=%6	; PROCESSOR STACK POINTER
000007	PC=%7	; PROGRAM COUNTER

;LOCATION EQUIVALENCIES

177570	SWR=177570	; CONSOLE SWITCH REGISTER
177570	LIGHTS=177570	; POP-11/45 DISPLAY REGISTER
177776	PS=177776	; PROCESSOR STATUS WORD
001200	STACK=1200	; START OF PROCESSOR STACK

;INSTRUCTION DEFINITIONS

005746	PUSH1SP=5746	; DECREMENT PROCESSOR STACK 1 WORD
005726	POP1SP=5726	; INCREMENT PROCESSOR STACK 1 WORD
010046	PUSHR0=10046	; SAVE R0 ON STACK
012600	POPR0=12600	; RESTORE R0 FROM STACK
024646	PUSH2SP=24646	; DECREMENT STACK TWICE
022626	POP.SP=22626	; INCREMENT STACK TWICE
	.EQUIV EMT,HLT	; BASIC DEFINITION OF ERROR CALL

100000	BIT15=100000
040000	BIT14=40000
020000	BIT13=20000
010000	BIT12=10000
004000	BIT11=4000
002000	BIT10=2000
001000	BIT9=1000
000400	BIT8=400
000200	BIT7=200
000100	BIT6=100
000040	BIT5=40
000020	BIT4=20
000010	BIT3=10
000004	BIT2=4
000002	BIT1=2
000001	BIT0=1

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580                                     ;TRAPCATCAER FOR ILLEGAL INTERRUPTS
581                                     .:=0
582 000000 000002 .+2 :UNEXPECTED TRAP TO THIS LOCATION
583 000002 000000 HALT :EXAMINE STACK TO FIND CAUSE
584 000004 000006 .+2 :UNEXPECTED TRAP TO THIS LOCATION
585 000006 000000 HALT :EXAMINE STACK TO FIND CAUSE
586 000010 000012 .+2 :UNEXPECTED TRAP TO THIS LOCATION
587 000012 000000 HALT :EXAMINE STACK TO FIND CAUSE
588 000014 000016 .+2 :UNEXPECTED TRAP TO THIS LOCATION
589 000016 000000 HALT :EXAMINE STACK TO FIND CAUSE
590 000020 000022 .+2 :UNEXPECTED TRAP TO THIS LOCATION
591 000022 000000 HALT :EXAMINE STACK TO FIND CAUSE
592 000024 000026 .+2 :UNEXPECTED TRAP TO THIS LOCATION
593 000026 000000 HALT :EXAMINE STACK TO FIND CAUSE
594 000030 000032 .+2 :UNEXPECTED TRAP TO THIS LOCATION
595 000032 000000 HALT :EXAMINE STACK TO FIND CAUSE
596 000034 000036 .+2 :UNEXPECTED TRAP TO THIS LOCATION
597 000036 000000 HALT :EXAMINE STACK TO FIND CAUSE
598 000040 000042 .+2 :UNEXPECTED TRAP TO THIS LOCATION
599 000042 000000 HALT :EXAMINE STACK TO FIND CAUSE
600 000044 000046 .+2 :UNEXPECTED TRAP TO THIS LOCATION
601 000046 000000 HALT :EXAMINE STACK TO FIND CAUSE
602 000050 000052 .+2 :UNEXPECTED TRAP TO THIS LOCATION
603 000052 000000 HALT :EXAMINE STACK TO FIND CAUSE
604 000054 000056 .+2 :UNEXPECTED TRAP TO THIS LOCATION
605 000056 000000 HALT :EXAMINE STACK TO FIND CAUSE
606 000060 000062 .+2 :UNEXPECTED TRAP TO THIS LOCATION
607 000062 000000 HALT :EXAMINE STACK TO FIND CAUSE
608 000064 000066 .+2 :UNEXPECTED TRAP TO THIS LOCATION
609 000066 000000 HALT :EXAMINE STACK TO FIND CAUSE
610 000070 000072 .+2 :UNEXPECTED TRAP TO THIS LOCATION
611 000072 000000 HALT :EXAMINE STACK TO FIND CAUSE
612 000074 000076 .+2 :UNEXPECTED TRAP TO THIS LOCATION
613 000076 000000 HALT :EXAMINE STACK TO FIND CAUSE
614 000100 000102 .+2 :UNEXPECTED TRAP TO THIS LOCATION
615 000102 000000 HALT :EXAMINE STACK TO FIND CAUSE
616 000104 000106 .+2 :UNEXPECTED TRAP TO THIS LOCATION
617 000106 000000 HALT :EXAMINE STACK TO FIND CAUSE
618 000110 000112 .+2 :UNEXPECTED TRAP TO THIS LOCATION
619 000112 000000 HALT :EXAMINE STACK TO FIND CAUSE
620 000114 000116 .+2 :UNEXPECTED TRAP TO THIS LOCATION
621 000116 000000 HALT :EXAMINE STACK TO FIND CAUSE
622 000120 000122 .+2 :UNEXPECTED TRAP TO THIS LOCATION
623 000122 000000 HALT :EXAMINE STACK TO FIND CAUSE
624 000124 000126 .+2 :UNEXPECTED TRAP TO THIS LOCATION
625 000126 000000 HALT :EXAMINE STACK TO FIND CAUSE
626 000130 000132 .+2 :UNEXPECTED TRAP TO THIS LOCATION
627 000132 000000 HALT :EXAMINE STACK TO FIND CAUSE
628 000134 000136 .+2 :UNEXPECTED TRAP TO THIS LOCATION
629 000136 000000 HALT :EXAMINE STACK TO FIND CAUSE
630 000140 000142 .+2 :UNEXPECTED TRAP TO THIS LOCATION
631 000142 000000 HALT :EXAMINE STACK TO FIND CAUSE
632 000144 000146 .+2 :UNEXPECTED TRAP TO THIS LOCATION
633 000146 000000 HALT :EXAMINE STACK TO FIND CAUSE
634 000150 000152 .+2 :UNEXPECTED TRAP TO THIS LOCATION
635 000152 000000 HALT :EXAMINE STACK TO FIND CAUSE

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DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 16
 DDBMA.P11 MAINDEC-11-DDDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

636	000154	000156	.+2	:UNEXPECTED TRAP TO THIS LOCATION
637	000156	000000	HALT	:EXAMINE STACK TO FIND CAUSE
638	000160	000162	.+2	:UNEXPECTED TRAP TO THIS LOCATION
639	000162	000000	HALT	:EXAMINE STACK TO FIND CAUSE
640	000164	000166	.+2	:UNEXPECTED TRAP TO THIS LOCATION
641	000166	000000	HALT	:EXAMINE STACK TO FIND CAUSE
642	000170	000172	.+2	:UNEXPECTED TRAP TO THIS LOCATION
643	000172	000000	HALT	:EXAMINE STACK TO FIND CAUSE
644	000174	000176	.+2	:UNEXPECTED TRAP TO THIS LOCATION
645	000176	000000	HALT	:EXAMINE STACK TO FIND CAUSE
646	000200	000202	.+2	:UNEXPECTED TRAP TO THIS LOCATION
647	000202	000000	HALT	:EXAMINE STACK TO FIND CAUSE
648	000204	000206	.+2	:UNEXPECTED TRAP TO THIS LOCATION
649	000206	000000	HALT	:EXAMINE STACK TO FIND CAUSE
650	000210	000212	.+2	:UNEXPECTED TRAP TO THIS LOCATION
651	000212	000000	HALT	:EXAMINE STACK TO FIND CAUSE
652	000214	000216	.+2	:UNEXPECTED TRAP TO THIS LOCATION
653	000216	000000	HALT	:EXAMINE STACK TO FIND CAUSE
654	000220	000222	.+2	:UNEXPECTED TRAP TO THIS LOCATION
655	000222	000000	HALT	:EXAMINE STACK TO FIND CAUSE
656	000224	000226	.+2	:UNEXPECTED TRAP TO THIS LOCATION
657	000226	000000	HALT	:EXAMINE STACK TO FIND CAUSE
658	000230	000232	.+2	:UNEXPECTED TRAP TO THIS LOCATION
659	000232	000000	HALT	:EXAMINE STACK TO FIND CAUSE
660	000234	000236	.+2	:UNEXPECTED TRAP TO THIS LOCATION
661	000236	000000	HALT	:EXAMINE STACK TO FIND CAUSE
662	000240	000242	.+2	:UNEXPECTED TRAP TO THIS LOCATION
663	000242	000000	HALT	:EXAMINE STACK TO FIND CAUSE
664	000244	000246	.+2	:UNEXPECTED TRAP TO THIS LOCATION
665	000246	000000	HALT	:EXAMINE STACK TO FIND CAUSE
666	000250	000252	.+2	:UNEXPECTED TRAP TO THIS LOCATION
667	000252	000000	HALT	:EXAMINE STACK TO FIND CAUSE
668	000254	000256	.+2	:UNEXPECTED TRAP TO THIS LOCATION
669	000256	000000	HALT	:EXAMINE STACK TO FIND CAUSE
670	000260	000262	.+2	:UNEXPECTED TRAP TO THIS LOCATION
671	000262	000000	HALT	:EXAMINE STACK TO FIND CAUSE
672	000264	000266	.+2	:UNEXPECTED TRAP TO THIS LOCATION
673	000266	000000	HALT	:EXAMINE STACK TO FIND CAUSE
674	000270	000272	.+2	:UNEXPECTED TRAP TO THIS LOCATION
675	000272	000000	HALT	:EXAMINE STACK TO FIND CAUSE
676	000274	000276	.+2	:UNEXPECTED TRAP TO THIS LOCATION
677	000276	000000	HALT	:EXAMINE STACK TO FIND CAUSE
678	000300	000302	.+2	:UNEXPECTED TRAP TO THIS LOCATION
679	000302	000000	HALT	:EXAMINE STACK TO FIND CAUSE
680	000304	000306	.+2	:UNEXPECTED TRAP TO THIS LOCATION
681	000306	000000	HALT	:EXAMINE STACK TO FIND CAUSE
682	000310	000312	.+2	:UNEXPECTED TRAP TO THIS LOCATION
683	000312	000000	HALT	:EXAMINE STACK TO FIND CAUSE
684	000314	000316	.+2	:UNEXPECTED TRAP TO THIS LOCATION
685	000316	000000	HALT	:EXAMINE STACK TO FIND CAUSE
686	000320	000322	.+2	:UNEXPECTED TRAP TO THIS LOCATION
687	000322	000000	HALT	:EXAMINE STACK TO FIND CAUSE
688	000324	000326	.+2	:UNEXPECTED TRAP TO THIS LOCATION
689	000326	000000	HALT	:EXAMINE STACK TO FIND CAUSE
690	000330	000332	.+2	:UNEXPECTED TRAP TO THIS LOCATION
691	000332	000000	HALT	:EXAMINE STACK TO FIND CAUSE

DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 17
 DDBMAA.P11 MAINDEC-11-DDBMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

692	000334	000336	.+2	:UNEXPECTED TRAP TO THIS LOCATION
693	000336	000000	HALT	:EXAMINE STACK TO FIND CAUSE
694	000340	000342	.+2	:UNEXPECTED TRAP TO THIS LOCATION
695	000342	000000	HALT	:EXAMINE STACK TO FIND CAUSE
696	000344	000346	.+2	:UNEXPECTED TRAP TO THIS LOCATION
697	000346	000000	HALT	:EXAMINE STACK TO FIND CAUSE
698	000350	000352	.+2	:UNEXPECTED TRAP TO THIS LOCATION
699	000352	000000	HALT	:EXAMINE STACK TO FIND CAUSE
700	000354	000356	.+2	:UNEXPECTED TRAP TO THIS LOCATION
701	000356	000000	HALT	:EXAMINE STACK TO FIND CAUSE
702	000360	000362	.+2	:UNEXPECTED TRAP TO THIS LOCATION
703	000362	000000	HALT	:EXAMINE STACK TO FIND CAUSE
704	000364	000366	.+2	:UNEXPECTED TRAP TO THIS LOCATION
705	000366	000000	HALT	:EXAMINE STACK TO FIND CAUSE
706	000370	000372	.+2	:UNEXPECTED TRAP TO THIS LOCATION
707	000372	000000	HALT	:EXAMINE STACK TO FIND CAUSE
708	000374	000376	.+2	:UNEXPECTED TRAP TO THIS LOCATION
709	000376	000000	HALT	:EXAMINE STACK TO FIND CAUSE
710	000402	000402	.+2	:UNEXPECTED TRAP TO THIS LOCATION
711	000402	000000	HALT	:EXAMINE STACK TO FIND CAUSE
712	000404	000406	.+2	:UNEXPECTED TRAP TO THIS LOCATION
713	000406	000000	HALT	:EXAMINE STACK TO FIND CAUSE
714	000410	000412	.+2	:UNEXPECTED TRAP TO THIS LOCATION
715	000412	000000	HALT	:EXAMINE STACK TO FIND CAUSE
716	000414	000416	.+2	:UNEXPECTED TRAP TO THIS LOCATION
717	000416	000000	HALT	:EXAMINE STACK TO FIND CAUSE
718	000420	000422	.+2	:UNEXPECTED TRAP TO THIS LOCATION
719	000422	000000	HALT	:EXAMINE STACK TO FIND CAUSE
720	000424	000426	.+2	:UNEXPECTED TRAP TO THIS LOCATION
721	000426	000000	HALT	:EXAMINE STACK TO FIND CAUSE
722	000430	000432	.+2	:UNEXPECTED TRAP TO THIS LOCATION
723	000432	000000	HALT	:EXAMINE STACK TO FIND CAUSE
724	000434	000436	.+2	:UNEXPECTED TRAP TO THIS LOCATION
725	000436	000000	HALT	:EXAMINE STACK TO FIND CAUSE
726	000440	000442	.+2	:UNEXPECTED TRAP TO THIS LOCATION
727	000442	000000	HALT	:EXAMINE STACK TO FIND CAUSE
728	000444	000446	.+2	:UNEXPECTED TRAP TO THIS LOCATION
729	000446	000000	HALT	:EXAMINE STACK TO FIND CAUSE
730	000450	000452	.+2	:UNEXPECTED TRAP TO THIS LOCATION
731	000452	000000	HALT	:EXAMINE STACK TO FIND CAUSE
732	000454	000456	.+2	:UNEXPECTED TRAP TO THIS LOCATION
733	000456	000000	HALT	:EXAMINE STACK TO FIND CAUSE
734	000460	000462	.+2	:UNEXPECTED TRAP TO THIS LOCATION
735	000462	000000	HALT	:EXAMINE STACK TO FIND CAUSE
736	000464	000466	.+2	:UNEXPECTED TRAP TO THIS LOCATION
737	000466	000000	HALT	:EXAMINE STACK TO FIND CAUSE
738	000470	000472	.+2	:UNEXPECTED TRAP TO THIS LOCATION
739	000472	000000	HALT	:EXAMINE STACK TO FIND CAUSE
740	000474	000476	.+2	:UNEXPECTED TRAP TO THIS LOCATION
741	000476	000000	HALT	:EXAMINE STACK TO FIND CAUSE
742	000500	000502	.+2	:UNEXPECTED TRAP TO THIS LOCATION
743	000502	000000	HALT	:EXAMINE STACK TO FIND CAUSE
744	000504	000506	.+2	:UNEXPECTED TRAP TO THIS LOCATION
745	000506	000000	HALT	:EXAMINE STACK TO FIND CAUSE
746	000510	000512	.+2	:UNEXPECTED TRAP TO THIS LOCATION
747	000512	000000	HALT	:EXAMINE STACK TO FIND CAUSE

F02

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 18
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

748	000514	000516	.+2	:UNEXPECTED TRAP TO THIS LOCATION
749	000516	000000	HALT	:EXAMINE STACK TO FIND CAUSE
750	000520	000522	.+2	:UNEXPECTED TRAP TO THIS LOCATION
751	000522	000000	HALT	:EXAMINE STACK TO FIND CAUSE
752	000524	000526	.+2	:UNEXPECTED TRAP TO THIS LOCATION
753	000526	000000	HALT	:EXAMINE STACK TO FIND CAUSE
754	000530	000532	.+2	:UNEXPECTED TRAP TO THIS LOCATION
755	000532	000000	HALT	:EXAMINE STACK TO FIND CAUSE
756	000534	000536	.+2	:UNEXPECTED TRAP TO THIS LOCATION
757	000536	000000	HALT	:EXAMINE STACK TO FIND CAUSE
758	000540	000542	.+2	:UNEXPECTED TRAP TO THIS LOCATION
759	000542	000000	HALT	:EXAMINE STACK TO FIND CAUSE
760	000544	000546	.+2	:UNEXPECTED TRAP TO THIS LOCATION
761	000546	000000	HALT	:EXAMINE STACK TO FIND CAUSE
762	000550	000552	.+2	:UNEXPECTED TRAP TO THIS LOCATION
763	000552	000000	HALT	:EXAMINE STACK TO FIND CAUSE
764	000554	000556	.+2	:UNEXPECTED TRAP TO THIS LOCATION
765	000556	000000	HALT	:EXAMINE STACK TO FIND CAUSE
766	000560	000562	.+2	:UNEXPECTED TRAP TO THIS LOCATION
767	000562	000000	HALT	:EXAMINE STACK TO FIND CAUSE
768	000564	000566	.+2	:UNEXPECTED TRAP TO THIS LOCATION
769	000566	000000	HALT	:EXAMINE STACK TO FIND CAUSE
770	000570	000572	.+2	:UNEXPECTED TRAP TO THIS LOCATION
771	000572	000000	HALT	:EXAMINE STACK TO FIND CAUSE
772	000574	000576	.+2	:UNEXPECTED TRAP TO THIS LOCATION
773	000576	000000	HALT	:EXAMINE STACK TO FIND CAUSE
774	000600	000602	.+2	:UNEXPECTED TRAP TO THIS LOCATION
775	000602	000000	HALT	:EXAMINE STACK TO FIND CAUSE
776	000604	000606	.+2	:UNEXPECTED TRAP TO THIS LOCATION
777	000606	000000	HALT	:EXAMINE STACK TO FIND CAUSE
778	000610	000612	.+2	:UNEXPECTED TRAP TO THIS LOCATION
779	000612	000000	HALT	:EXAMINE STACK TO FIND CAUSE
780	000614	000616	.+2	:UNEXPECTED TRAP TO THIS LOCATION
781	000616	000000	HALT	:EXAMINE STACK TO FIND CAUSE
782	000620	000622	.+2	:UNEXPECTED TRAP TO THIS LOCATION
783	000622	000000	HALT	:EXAMINE STACK TO FIND CAUSE
784	000624	000626	.+2	:UNEXPECTED TRAP TO THIS LOCATION
785	000626	000000	HALT	:EXAMINE STACK TO FIND CAUSE
786	000630	000632	.+2	:UNEXPECTED TRAP TO THIS LOCATION
787	000632	000000	HALT	:EXAMINE STACK TO FIND CAUSE
788	000634	000636	.+2	:UNEXPECTED TRAP TO THIS LOCATION
789	000636	000000	HALT	:EXAMINE STACK TO FIND CAUSE
790	000640	000642	.+2	:UNEXPECTED TRAP TO THIS LOCATION
791	000642	000000	HALT	:EXAMINE STACK TO FIND CAUSE
792	000644	000646	.+2	:UNEXPECTED TRAP TO THIS LOCATION
793	000646	000000	HALT	:EXAMINE STACK TO FIND CAUSE
794	000650	000652	.+2	:UNEXPECTED TRAP TO THIS LOCATION
795	000652	000000	HALT	:EXAMINE STACK TO FIND CAUSE
796	000654	000656	.+2	:UNEXPECTED TRAP TO THIS LOCATION
797	000656	000000	HALT	:EXAMINE STACK TO FIND CAUSE
798	000660	000662	.+2	:UNEXPECTED TRAP TO THIS LOCATION
799	000662	000000	HALT	:EXAMINE STACK TO FIND CAUSE
800	000664	000666	.+2	:UNEXPECTED TRAP TO THIS LOCATION
801	000666	000000	HALT	:EXAMINE STACK TO FIND CAUSE
802	000670	000672	.+2	:UNEXPECTED TRAP TO THIS LOCATION
803	000672	000000	HALT	:EXAMINE STACK TO FIND CAUSE

Address	Hex	Hex	Label	Comment
804	000674	000676	.+2	;UNEXPECTED TRAP TO THIS LOCATION
805	000676	000000	HALT	;EXAMINE STACK TO FIND CAUSE
806	000700	000702	.+2	;UNEXPECTED TRAP TO THIS LOCATION
807	000702	000000	HALT	;EXAMINE STACK TO FIND CAUSE
808	000704	000706	.+2	;UNEXPECTED TRAP TO THIS LOCATION
809	000706	000000	HALT	;EXAMINE STACK TO FIND CAUSE
810	000710	000712	.+2	;UNEXPECTED TRAP TO THIS LOCATION
811	000712	000000	HALT	;EXAMINE STACK TO FIND CAUSE
812	000714	000716	.+2	;UNEXPECTED TRAP TO THIS LOCATION
813	000716	000000	HALT	;EXAMINE STACK TO FIND CAUSE
814	000720	000722	.+2	;UNEXPECTED TRAP TO THIS LOCATION
815	000722	000000	HALT	;EXAMINE STACK TO FIND CAUSE
816	000724	000726	.+2	;UNEXPECTED TRAP TO THIS LOCATION
817	000726	000000	HALT	;EXAMINE STACK TO FIND CAUSE
818	000730	000732	.+2	;UNEXPECTED TRAP TO THIS LOCATION
819	000732	000000	HALT	;EXAMINE STACK TO FIND CAUSE
820	000734	000736	.+2	;UNEXPECTED TRAP TO THIS LOCATION
821	000736	000000	HALT	;EXAMINE STACK TO FIND CAUSE
822	000740	000742	.+2	;UNEXPECTED TRAP TO THIS LOCATION
823	000742	000000	HALT	;EXAMINE STACK TO FIND CAUSE
824	000744	000746	.+2	;UNEXPECTED TRAP TO THIS LOCATION
825	000746	000000	HALT	;EXAMINE STACK TO FIND CAUSE
826	000750	000752	.+2	;UNEXPECTED TRAP TO THIS LOCATION
827	000752	000000	HALT	;EXAMINE STACK TO FIND CAUSE
828	000754	000756	.+2	;UNEXPECTED TRAP TO THIS LOCATION
829	000756	000000	HALT	;EXAMINE STACK TO FIND CAUSE
830	000760	000762	.+2	;UNEXPECTED TRAP TO THIS LOCATION
831	000762	000000	HALT	;EXAMINE STACK TO FIND CAUSE
832	000764	000766	.+2	;UNEXPECTED TRAP TO THIS LOCATION
833	000766	000000	HALT	;EXAMINE STACK TO FIND CAUSE
834	000770	000772	.+2	;UNEXPECTED TRAP TO THIS LOCATION
835	000772	000000	HALT	;EXAMINE STACK TO FIND CAUSE
836	000774	000776	.+2	;UNEXPECTED TRAP TO THIS LOCATION
837	000776	000000	HALT	;EXAMINE STACK TO FIND CAUSE
838				
839		000024	.=24	
840	000024	014544	.PFAIL	
841	000026	000340	340	
842	000030	015200	.HLT	
843	000032	000000	0	
844	000034	016214	.TRPSR	
845	000036	000000	0	
846		000200	.=200	
847	000200	000137	007150	JMP START
848		000210	.=210	
849	000210	000137	007140	JMP RESTRT
850				
851				
852		000250	.=250	
853	000250	000000	EOPHLT: HALT	;THIS IS AN END OF PASS HALT
854				
855	000252	000207	RTS PC	;NOT AN ERROR HALT.THIS
856				;HAPPENS ONLY WHEN SW06 IS UP.
857				;PRESS CONTINUE TO CONTINUE
858		001200	.=1200	
859				

H02

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 20
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

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860                                     ;INDIRECT POINTERS TO TELETYPE VECTORS AND REGISTERS
861
862 001200 177514 LPTCSR: 177514
863 001202 177516 LPTDBR: 177516
864 001204 177560 TKCSR: 177560 ;TELETYPE KEYBOARD CONTROL REGISTER
865 001206 177562 TKDBR: 177562 ;TELETYPE KEYBOARD DATA BUFFER
866 001210 177564 TPCSR: 177564 ;TELEPRINTER CONTROL REGISTER
867 001212 177566 TPDBR: 177566 ;TELEPRINTER DATA BUFFER
868 001214 000060 TKVEC: 60 ;TELETYPE KEYBOARD VECTOR
869 001216 000200 TKLVL: 200 ;PRIORTIY =4
870 001220 000064 TPVEC: 64 ;TELETYPE PRINTER VECTOR
871 001222 000200 TPLVL: 200 ;PRIORITY =4
872
873                                     ;PROGRAM CONTROL PARAMETERS
874
875 001224 000000 RETURN: 0 ;SCOPE ADDRESS FOR LOOP ON TEST
876 001226 000000 NEXT: 0 ;ADDRESS OF NEXT TEST TO BE EXECUTED
877 001230 000000 LOCK: 0 ;ADDRESS FOR LOCK ON CURRENT DATA
878 001232 000000 ICOUNT: 0 ;NUMBER OF ITERATIONS THAT CURRENT TEST WILL BE EXECUTED
879 001234 000000 LPCNT: 0 ;NUMBER OF ITERATIONS COMPLETED
880 001236 000000 TSTNO: 0 ;NUMBER OF TEST IN PROGRESS
881 001240 000000 PASCNT: 0 ;NUMBER OF PASSES COMPLETED
882 001242 000000 ERRCNT: 0 ;TOTAL NUMBER OF ERRORS
883 001244 000000 LSTERR: 0 ;PC OF LAST ERROR CALL
884
885                                     ;PROGRAM VARIABLES
886
887 001246 000000 TEMP1: 0 ;TEMPORARY STORAGE
888 001250 000000 TEMP2: 0 ;TEMPORARY STORAGE
889 001252 000000 TEMP3: 0 ;TEMPORARY STORAGE
890 001254 000000 TEMP4: 0 ;TEMPORARY STORAGE
891 001256 000000 TEMP5: 0 ;TEMPORARY STORAGE
892 001260 000000 SAVR0: 0 ;R0 STORAGE
893 001262 000000 SAVR1: 0 ;R1 STORAGE
894 001264 010000 SAVR2: 0 ;R2 STORAGE
895 001266 010000 SAVR3: 0 ;R3 STORAGE
896 001270 010000 SAVR4: 0 ;R4 STORAGE
897 001272 010000 SAVR5: 0 ;R5 STORAGE
898 001274 000000 SAVSP: 0 ;STACK POINTER STORAGE
899 001276 000000 SAVPC: 0 ;PROGRAM COUNTER STORAGE

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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 21
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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900
901                ;PROGRAM CONTROL FLAGS
902
903 001300      000      INIFLG: .BYTE 0      ;PROGRAM INITIALIZATION FLAG
904 001301      000      STFLG:  .BYTE 0      ;TEST START FLAG
905 001302      000      ERRFLG: .BYTE 0      ;ERROR OCCURED FLAG
906 001303      000      LOKFLG: .BYTE 0      ;LOCK ON CURRENT TEST FLAG
907                SY=0
908
909                ;DEFINITIONS FOR TRAP SUBROUTINE CALLS
910                ;POINTERS TO SUBROUTINES CAN BE FOUND
911                ;IN THE TABLE IMMEDIATLY FOLLOWING THE DEFINITIONS
912
913                ;*****
914                ;*****
915 001304      TRPTAB:
916                SCOPI=TRAP+0      ;CALL TO LOOP ON CURRENT DATA HANDLER
917 001304      015022      .SCOPI
918                TYPE=TRAP+1      ;CALL TO TELETYPE OUTPUT ROUTINE
919 001306      015040      .TYPE
920                SAVOS=TRAP+2      ;CALL TO REGISTER SAVE ROUTINE
921 001310      016122      .SAVOS
922                RESOS=TRAP+3      ;CALL TO REGISTER RESTORE ROUTINE
923 001312      016162      .RESOS
924                CONVRT=TRAP+4      ;CALL TO DATA OUTPUT ROUTINE
925 001314      015616      .CONVRT
926                CNVRT=TRAP+5      ;CALL TO DATA OUTPUT ROUTINE WITHOUT CR/LF.
927 001316      015622      .CNVRT
928                KEY.TO.R2=TRAP+6      ;CALL TO GET CHAR, ECHO IT, PUT IT IN R2,CLR BIT 7
929 001320      014500      .KEY.TO.R2
930
931                ;*****
932                ;*****

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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 22
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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933
934      . = 1400
935 001400 MAP.YA:
936      ; THE FOLLOWING IS A REPRODUCTION
937      ; OF THE ROM PROGRAM FOR BM873YA.
938      ; IT IS HERE FOR COMPARISON TO
939      ; ACTUAL ROM AND FOR REFERENCE.
940      ; 173000 . = 173000      ; STARTING ADDRESS FOR BOOTSTRAP
941      ; THIS LOADER IS DESIGNED FOR THE RESTART MODULE M873.
942      ; IT FUNCTIONALLY REPLACES THE FOLLOWING ROMS:
943      ; M792-YA - PAPER TAPE BOOTSTRAP FOR PC11, KL11
944      ; MR11-DB   BULK STORAGE BOOTSTRAP ROM
945      ; M792-YH   TA11 CASSETTE BOOTSTRAP ROM
946      ;           000000      ; R0=      %0      ; REGISTER DEFINITIONS
947      ;           000001      ; R1=      %1
948      ;           000002      ; R2=      %2
949      ;           000003      ; R3=      %3
950      ;           000004      ; R4=      %4
951      ;           000005      ; R5=      %5
952      ;           000006      ; SP=      %6
953      ;           000007      ; PC=      %7
954      ;           177570      ; SR=      177570      ; PROCESSOR SWITCH REGISTER
955
956      ; STARTING LOCATION FOR RF11 DISK
957 001400 010702 ; 173000 010702 RF11: MOV PC,R2      ; SET POINTER TO PARAMETER LISTS
958 001402 000464 ; 173002 000464      BR OTHER      ; TRANSFER TO SERVICE ROUTINE
959 001404 177462 ; 173004 177462      .WORD 177462    ; DEVICE WORD COUNT ADDRESS
960 001406 000005 ; 173006 000005      .WORD 5          ; DEVICE READ INSTRUCTION
961
962      ; THIS IS THE STARTING LOCATION FOR THE RK11 CONTROLLER
963 001410 010702 ; 173010 010702 RK11: MOV PC,R2      ; SET POINTER TO PARAMETER LIST
964 001412 000460 ; 173012 000460      BR OTHER      ; TRANSFER TO SERVICE ROUTINE
965 001414 177406 ; 173014 177406      .WORD 177406    ; DEVICE WORD COUNT REGISTER
966 001416 000005 ; 173016 000005      .WORD 5          ; DEVICE READ INSTRUCTION
967
968      ; THIS IS A SPARE STARTING LOCATION. IT TRANSFERS TO ADDRESS
969      ; CONTAINED IN THE SWITCH REGISTER.
970 001420 013707 ; 173020 013707 TRANSR: MOV @SR,PC      ; GO TO INDICATED LOCATION
971 001422 177570 ; 173022 177570
972      ; NOTE 773024 AND 773224 ARE DEPENDENT ON OFFSET IN DIODES FOR LINE 1
973
974      ; THIS IS THE POWER UP VECTOR REQUIRED FOR DEVICE AND
975 001424 173000 ; 173024 173000 POWER: .WORD RF11      ; ADDRESS OF FIRST LOCATION IN ROM
976 001426 000340 ; 173026 000340      .WORD 340        ; PROCESSOR STATUS LEVEL 7
977
978      ; THIS IS THE STARTING ADDRESS FOR TC11 (DECTAPE) CONTROLLER.
979 001430 010702 ; 173030 010702 TC11: MOV PC,R2      ; SET UP POINTER TO PARAMETER LIST
980 001432 000426 ; 173032 000426      BR TAPES      ; AND TRANSFER TO FIRST ROUTINE
981 001434 177344 ; 173034 177344      .WORD 177344    ; DEVICE WORD COUNT ADDRESS
982 001436 004003 ; 173036 004003      .WORD 4003      ; FIND PREVIOUS BLOCK COMMAND
983 001440 100000 ; 173040 100000      .WORD 100000    ; USED AS DONE INDICATOR
984 001442 024000 ; 173042 024000      .WORD 24000    ; USED AS ERROR INDICATOR/TEST FLAG
985 001444 000445 ; 173044 000445      BR OTHERX      ; THEN TRANSFER TO NEXT ROUTINE
986 001446 000005 ; 173046 000005      .WORD 5          ; DEVICE READ COMMAND
987
988      ; THIS IS THE START LOCATION FOR TM11 MAGTAPE CONTROLLER

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K02

DDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 23
 DDBMAA.P11 MAINDEC-11-DDBMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

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989 001450 010702 :173050 010702 TM11: MOV PC,R2      ;SET POINTER TO PARAMETER LIST
990 001452 000416 :173052 000416      BR TAPES      ;AND TRANSFER TO FIRST ROUTINE
991 001454 172524 :173054 172524      .WORD 172524    ;DEVICE BYTE/RECORD COUNT REGISTER
992 001456 060017 :173056 060017      .WORD 60017     ;DEVICE REWIND COMMAND
993 001460 000200 :173060 000200      .WORD 200       ;DEVICE DONE FLAG
994 001462 100000 :173062 100000      .WORD 100000    ;DEVICE ERROR FLAG BIT
995 001464 000413 :173064 000413      BR TAPESX      ;THEN TRANSFER TO NEXT SERVICE RTN
996 001466 060011 :173066 060011      .WORD 60011     ;DEVICE FORWARD SPACE COMMAND
997 001470 000200 :173070 000200      .WORD 200       ;SAME AS ABOVE
998 001472 100000 :173072 100000      .WORD 100000    ;SAME AS ABOVE
999 001474 000431 :173074 000431      BR OTHERX      ;THEN TRANSFER TO READ/TRANSFER ROUTINE
1000 001476 060003 :173076 060003      .WORD 60003     ;DEVICE READ COMMAND
1001
1002
1003 001500 010702 :173100 010702 RP11: MOV PC,R2      ;SET POINTER TO PARAMETER LIST
1004 001502 000424 :173102 000424      BR OTHER      ;TRANSFER TO TRANSFER ROUTINE
1005 001504 176716 :173104 176716      .WORD 176716    ;DEVICE WORD COUNT REGISTER
1006 001506 000005 :173106 000005      .WORD 5         ;DEVICE READ COMMAND
1007
1008
1009 001510 010200 :173110 010200 TAPES: MOV R2,R0      ;GET ADDRESS OF PARAMETER LIST
1010 001512 005720 :173112 005720      TST (R0)+       ;SKIP TWO WORDS FIRST TIME
1011 001514 000005 :173114 000005 TAPESX: RESET        ;RESET ALL DEVICES
1012 001516 005720 :173116 005720      TST (R0)+       ;SKIP OVER BRANCH INSTRUCTION
1013 001520 016201 :173120 016201      MOV 2(R2),R1    ;THEN GET DEVICE WORD/BYTE COUNT ADDRESS
1014 001522 000002 :173122 000002
1015 001524 005311 :173124 005311      DEC 2R1        ;AND SET TO -1
1016 001526 012041 :173126 012041      MOV (R0)+,-(R1) ;AND THEN ISSUE COMMAND TO DEVICE
1017 001530 031011 :173130 031011 TAPWAT: BIT 2R0,2R1  ;WAIT FOR DEVICE COMPLETION
1018 001532 001776 :173132 001776      BEQ TAPWAT      ;BY HANGING IN LOOP
1019 001534 005720 :173134 005720      TST (R0)+       ;AND THEN SKIP DONE FLAG
1020 001536 032041 :173136 032041      BIT (R0)+,-(R1) ;THEN TEST FOR ERROR
1021 001540 001063 :173140 001063      BNE ERROR      ;THERE IS ONE
1022 001542 000110 :173142 000110      RETURN: JMP 2R0 ;AND TRANSFER TO FOLLOWING INSTRUCTION
1023
1024
1025 001544 010702 :173144 010702 RC11: MOV PC,R2      ;SET UP POINTER TO PARAMETER LIST
1026 001546 000402 :173146 000402      BR OTHER      ;TRANSFER TO SERVICE RTN
1027 001550 177450 :173150 177450      .WORD 177450    ;DEVICE WORD COUNT REGISTER
1028 001552 000005 :173152 000005      .WORD 5         ;DEVICE READ INSTRUCTION
1029
1030
1031 001554 010200 :173154 010200 OTHER: MOV R2,R0      ;SET POINTER TO LIST IN R0
1032 001556 005720 :173156 005720      TST (R0)+       ;SKIP TWO WORDS FIRST TIME.
1033 001560 005720 :173160 005720 OTHERX: TST (R0)+    ;SKIP PAST BR INSTRUCTION
1034 001562 000005 :173162 000005      RESET         ;RESET THE WORLD
1035 001564 016201 :173164 016201      MOV 2(R2),R1    ;OBTAIN DEVICE WORD COUNT ADDRESS
1036 001566 000002 :173166 000002
1037 001570 012711 :173170 012711      MOV #-1000,2R1 ;THEN OBTAIN LARGE WORD COUNT
1038 001572 177000 :173172 177000
1039 001574 011041 :173174 011041      MOV 2R0,-(R1)  ;AND PUT COMMAND TO DEVICE
1040 001576 105711 :173176 105711 OTHWAT: TSTB 2R1    ;WAIT FOR DONE FLAG
1041 001600 100376 :173200 100376      BPL OTHWAT      ;BY HANGING IN LOOP
1042 001602 005711 :173202 005711      TST 2R1        ;THEN TEST FOR ERROR
1043 001604 100441 :173204 100441      BMI ERROR      ;GOT PROBLEMS
1044 001606 005007 :173206 005007      CLR PC         ;AND TRANSFER TO ZERO

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L02

DDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 24

DDMAA.P11 MAINDEC-11-DDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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1045
1046
1047 001610 012704 ;173210 012704 ;THIS IS THE STARTING ADDRESS FOR THE PC11 PAPER TAPE CONTROLLER
1048 001612 177560 ;173212 177560 KL11: MOV #177560,R4 ;OBTAIN DEVICE ADDRESS
1049 001614 000440 ;173214 000440 BR CKDEV ;AND TRANSFER TO READER SERVICE ROUTINE
1050
1051
1052 ;THIS IS THE CASSETTE DEVICE COMMAND TABLE
1053 001616 017640 ;173216 240 TABLE: .BYTE 240 ;COMPARE WORD NOT A COMMAND
1054 ;173217 037 .BYTE 37 ;ILBS+RWD+GO
1055 001620 002415 ;173220 015 .BYTE 15 ;SPACE FORWARD BLOCK+GO
1056 ;173221 005 .BYTE 5 ;READ+GO
1057 001622 112024 ;173222 024 .BYTE 24 ;READ+ILBS
1058 ;173223 224 .BYTE 224 ;READ+ILBS+END FLAG
1059 ;NOTE 773024 AND 773224 ARE DEPENDENT ON OFFSET IN DIODES FOR LINE 1
1060
1061 ;THIS IS AN ADDITIONAL POWER VECTOR ADDRESS REQUIRED BY DEVICE
1062 001624 173000 ;173224 173000 POWER2: .WORD RF11 ;ADDRESS OF BEGINNING OF BOOTSTRAP
1063 001626 000340 ;173226 000340 .WORD 340 ;PRIORITY LEVEL 7
1064
1065 ;THIS IS THE STARTING ADDRESS FOR THE CASSETTE DEVICE #0
1066 001630 005004 ;173230 005004 CBOOT: CLR R4 ;LOAD DEVICE NUMBER 0 IN R4
1067 001632 012700 ;173232 012700 RESTX: MOV #177500,R0 ;GET DEVICE ADDRESS
1068 001634 177500 ;173234 177500
1069 001636 000005 ;173236 000005 RESTR: RESET ;ISSUE RESET INSTRUCTION
1070 001640 010410 ;173240 010410 MOV R4,R0 ;LOAD DEVICE WITH UNIT NUMBER
1071 001642 012701 ;173242 012701 MOV #TABLE,R1 ;GET FUNNY TABLE OF INSTRUCTIONS
1072 001644 173216 ;173244 173216
1073 001646 012702 ;173246 012702 MOV #375,R2 ;AND LOAD UP TRANSFER COUNTER
1074 001650 000375 ;173250 000375
1075 001652 112103 ;173252 112103 LOOP1: MOVB (R1)+,R3 ;THE LOAD UP COMPARATOR
1076 001654 112110 ;173254 112110 MOVB (R1)+,R0 ;LOAD DEVICE REGISTER WITH COMMAND
1077 001656 100407 ;173256 100407 BMI DONE
1078 001660 130310 ;173260 130310 LOOP2: BITB R3,R0 ;HAS COMMAND COMPLETED
1079 001662 001776 ;173262 001776 BEQ LOOP2 ;NO, WAIT
1080 001664 105202 ;173264 105202 INCB R2 ;THEN INCREMENT ADDRESS CTR
1081 001666 100772 ;173266 100772 BMI LOOP1 ;IF NEGATIVE, GET COMMAND
1082 001670 116012 ;173270 116012 MOVB 2(R0),R2 ;AND STORE DATA AWAY
1083 001672 000002 ;173272 000002
1084 001674 000771 ;173274 000771
1085 001676 005710 ;173276 005710 DONE: BR LOOP2 ;GO GET ANOTHER BYTE
1086 001700 100756 ;173300 100756 TST R0 ;ANY DEVICE ERRORS
1087 001702 005002 ;173302 005002 BMI RESTR ;YES, RETRY
1088 001704 120312 ;173304 120312 CLR R2 ;CLEAR COMPARE ADDRESS AND TRANSFER ADDRESS
1089 001706 001377 ;173306 001377 CMPB R3,R2 ;IT MUST BE 240
1090 001710 000112 ;173310 000112 BNE +0 ;NO, THERE WAS AN ERROR
1091 ERROR: JMP R2 ;NORMAL CASSETTE AND ERROR FOR BULK STORAGE
1092
1093 ;THIS IS THE STARTING LOCATION FOR THE PC11 CONTROLLER
1094 001712 012704 ;173312 012704 PC11: MOV #177550,R4 ;LOAD DEVICE ADDRESS
1095 001714 177550 ;173314 177550
1096 001716 000005 ;173316 000005 CKDEV: RESET ;KILL ALL DEVICE ACTION
1097 001720 012701 ;173320 012701 MOV #160000,R1 ;THEN SET UP MEMORY TEST LIMITS
1098 001722 160000 ;173322 160000
1099 001724 012702 ;173324 012702 MOV #6,R2 ;AND SET UP POINTER TO TIMEOUT LOCATION
1100 001726 000006 ;173326 000006
1101 001730 012712 ;173330 012712 MOV #340,R2 ;AND SET UP VECTOR TO RETURN TO NEXT

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M02

DDBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 25

DDBMAA.P11 MAINDEC-11-DDBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

1101	001732	000340	;173332	000340		
1102	001734	010742	;173334	010742	MOV PC, -(R2)	;SAVE THE PC
1103	001736	012706	;173336	012706	MOV #24, SP	;AND LOAD UP STACK POINTER
1104	001740	000024	;173340	000024		
1105	001742	010441	;173342	010441	MOV R4, -(R1)	;AND LOOK FOR END OF MEMORY
1106	001744	040601	;173344	040601	BIC SP, R1	;THEN DROP TO XX7752
1107	001746	010111	;173346	010111	MOV R1, R1	;AND STORE IN ITSELF
1108	001750	011102	;173350	011102	MOV R1, R2	;THEN LOAD ADDRESS FOR DATA INSERTION
1109	001752	005214	;173352	005214	INC R4	;AND START DEVICE
1110	001754	105714	;173354	105714	RDRWAT: TSTB R4	;THEN WAIT FOR CHARACTER AVAILABLE
1111	001756	100376	;173356	100376	BPL RDRWAT	;HANGING THERE IF NECESSARY
1112	001760	116412	;173360	116412	MOVB 2(R4), R2	;STORE AWAY DATA BYTE
1113	001762	000002	;173362	000002		
1114	001764	005211	;173364	005211	INC R1	
1115	001766	120227	;173366	120227	CMPB R2, #375	;HAS BRANCH OFFSET BEEN STORED
1116	001770	000375	;173370	000375		
1117	001772	001366	;173372	001366	BNE LOOP	;NO
1118	001774	105222	;173374	105222	INCB (R2)+	;YES, ALL DONE
1119	001776	END.YA:				
1120	001776	000142	;173376	000142	JMP -(R2)	;THEN TRANSFER TO RTN

N02

DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 26

DDDMAA.P11 MAINDEC-11-DDDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

1121 : BM873B BOOTSTRAP MACY11 27(655) 1-OCT-74 14:50 PAGE 1

1122 :
1123 : ;DATE: AUG 23, 1974

1124 002000 MAP.YB:
1125 : THE FOLLOWING IS A REPRODUCTION
1126 : OF THE ROM PROGRAM FOR BM873YB.
1127 : IT IS HERE FOR COMPARISON TO THE
1128 : ACTUAL ROM AND FOR REFERENCE

1129 :
1130 :
1131 :
1132 : THIS IS THE LOADER TO REPLACE THE FOLLOW
1133 : M792-YA PAPER TAPE BOOTSTRAP ROM
1134 : M711-DB BULK STORAGE BOOTSTRAP ROM
1135 : M792-YH TAII CASSETTE BOOTSTRAP ROM
1136 : RM873A COMBINATION OF ABOVE ROMS

1137 :
1138 : ;PREPHERIAL EXTERNAL PAGE REGISTERS ASSIGNMENTS:

1140	177462	RFWC=	177462	;WORD COUNT REG. FOR RF1
1141	177406	RKWC=	177406	;WORD COUNT REG. FOR RK1
1142	177344	TCWC=	177344	;WORD COUNT REG. FOR TC1
1143	172524	TMWC=	172524	;BYTE/RECORD COUNT FOR T
1144	176716	RPWC=	176716	;WORD COUNT REG. FOR RP1
1145	177450	RCWC=	177450	;WORD COUNT REG. FOR RC1
1146	177560	KLCS=	177560	;CONTROL REG. FOR KL11
1147	177500	TACS=	177500	;CONTROL REG. FOR TAI1 C
1148	177550	PCCS=	177550	;CONTROL REG. FOR P-11
1149	172440	TUCS=	172440	;CONTROL STATUS REG. 1
1150	172442	TUWC=	TUCS+2	;TU16 WORD COUNT REG.

1152	176300	RHCSA=	176300	;CONTROLLER REG. 1 FOR R
1153	176302	RHWCA=	RHCSA+2	
1154	172040	RSCSA=	172040	;CONTROLLER REG.1 FOR RH
1155	172042	RSWCA=	RSCSA+2	
1156	176700	RPCSA=	176700	;CONTROLLER REG. 1 FOR R
1157	176702	RPWCA=	RPCSA+2	

1158	;FUNCTION VALUE FOR PREPHERALS:			
1159	000005	RFREAD=	5	;READ FUNCTION
1160	004003	RNUM=	4003	;REVERSE AND IDENTIFY BL
1161	060017	TMRWD=	60017	;REWIND AND SET 800 BPI
1162	060011	TMFWD=	60011	;FORWARD RECORD COMMAND
1163	060003	TMREAD=	60003	;TM11 READ
1164	000011	DRCLR=	11	;DRIVE CLEAR
1165	000071	RHREAD=	71	;RH11 READ COMMAND
1166	000021	RHPRST=	21	;READ IN PRESET
1167	000031	TUSPAC=	31	;SPACE FORWARD COMMAND F
1168	040000	TUTAPE=	40000	;TAPE BIT IN RH11/RHDT R
1169	001300	TUMODE=	1300	;800 BPI NORMAL MODE FOR
1170	001000	FCE=	1000	;FRAME COUNT ERROR BIT

1171 : ;CONSOLE SWITCH REG.
1172 : CSW= 177570

1173 :
1174 :
1175 : ;ONLY THE LOW BYTE OF CONSOL SWITCH REGISTER IS
1176 : ;SELECT THE UNIT NUMBER OF THE DEVICE TO BOOT FR

B03

DDDMA MACY11 27.732 22-SEP-76 14:43 PAGE 27
 DDBMA.P11 MAINDEC-11-DDDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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1177      :
1178      :      173000  .=173000
1179      :
1180      :
1181      :      :THIS IS THE STARTING ADDRESS FOR RH11/RS03/04 D
1182 002000 000405 :173000 000405 RHSA: BR 1$ :ENTRY FOR SELECTING UNI
1183 002002 010703 :173002 010703 RHRSB: MOV PC,R3 :ENTRY TO SELECT UNITS
1184 002004 113737 :173004 113737 :MOV 2#CSW,2#RSCSA+10;LOAD UNIT # INS
1185 002006 177570 :173006 177570
1186 002010 172050 :173010 172050
1187 002012 000401 :173012 000401 BR 2$
1188 002014 010703 :173014 010703 1$: MOV PC,R3
1189 002016 012700 :173016 012700 2$: MOV #RSCSA,R0;SET CONTROL STATUS REG
1190 002020 172040 :173020 172040
1191 002022 000526 :173022 000526 BR RHCOMM
1192      :
1193      :      :THIS IS THE AUTO LOAD VECTOR
1194 002024 173000 :173024 173000 .WORD RHSA
1195 002026 000340 :173026 000340 .WORD 340
1196      :
1197      :      :THIS IS THE STARTING ADDRESS FOR RK11 CONTROLLE
1198 002030 000412 :173030 000412 RK11A: BR 2$ :ENTRY TO SELECT UNIT 0
1199 002032 010703 :173032 010703 RK11B: MOV PC,R3 :ENTRY TO SELECT ALL UNI
1200      :      :SAVE ERROR RETRY ADDRES
1201 002034 113705 :173034 113705 :MOV 2#CSW,R5;SET POINTER TO PARAMETE
1202 002036 177570 :173036 177570
1203 002040 052705 :173040 052705 BIS #10,R5 ;SET POSITION BIT
1204 002042 000010 :173042 000010
1205 002044 006105 :173044 006105 1$: ROL R5 ;SHIFT UNIT # TJ BIT 13-
1206 002046 103376 :173046 103376 BCC 1$ :KEEP GOING
1207 002050 010537 :173050 010537 MOV R5,2#RKWC+4;MOVE IN TO RKDA REGI
1208 002052 177412 :173052 177412
1209 002054 000401 :173054 000401 BR 3$ :SKIP NEXT INSTRUCTION
1210 002056 010703 :173056 010703 2$: MOV PC,R3 :SAVE ERROR RETRY ADDRES
1211 002060 010702 :173060 010702 3$: MOV PC,R2
1212 002062 000546 :173062 000546 BR OTHERA
1213 002064 177406 :173064 177406 .WORD RKWC
1214 002066 000005 :173066 000005 .WORD RFREAD
1215      :
1216      :      :THIS IS THE STARTING ADDRESS FOR TC11 (DECTAPE)
1217 002070 010703 :173070 010703 TC11: MOV PC,R3 ;SAVE ERROR RETRY ADDRES
1218 002072 010702 :173072 010702 MOV PC,R2
1219 002074 000570 :173074 000570 BR TAPES
1220 002076 177344 :173076 177344 .WORD TCWC
1221 002100 000005 :173100 000005 .WORD RFREAD
1222 002102 004003 :173102 004003 .WORD RNUM
1223 002104 100000 :173104 100000 .WORD 100000 ;DONE MASK
1224 002106 024000 :173106 024000 .WORD 24000 ;ERROR MASK
1225      :
1226      :
1227      :
1228      :      :TH11 STARTING ADDRESS
1229 002110 010703 :173110 010703 TH11: MOV PC,R3 ;SAVE ERROR RETRY ADDRES
1230 002112 012737 :173112 012737 MOV #THRWIND,2#TMWC-2;REWIND TAPE
1231 002114 060017 :173114 060017
1232 002116 172522 :173116 172522

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1233 002120 010702 :173120 010702      MOV      PC,R2
1234 002122 000555 :173122 000555      BR       TAPES
1235 002124 172524 :173124 172524      .WORD    TMWC
1236 002126 060003 :173126 060003      .WORD    TMREAD      ;TM11 READ COMMAND
1237 002130 060011 :173130 060011      .WORD    TMFWRD      ;TM11 FORWARD RECORD COM
1238 002132 000200 :173132 000200      .WORD    200         ;DONE MASK
1239 002134 100000 :173134 100000      .WORD    100000      ;ERROR MASK
1240
1241      :
1242      :THIS IS THE STARTING ADDRESS FOR RF11 CONTROLLE
1243 002136 010703 :173136 010703      RF11: MOV      PC,R3      ;SAVE ERROR RETRY ADDRES
1244 002140 010702 :173140 010702      MOV      PC,R2      ;SET POINTER TO PARAMETE
1245 002142 000516 :173142 000516      BR       OTHERA     ;GO TO COMMON SERVICE RO
1246      :
1247 002144 177462 :173144 177462      .WORD    RFWC        ;DEVICE WORD COUNT REGIS
1248 002146 000005 :173146 000005      .WORD    RFREAD     ;READ COMMAND
1249
1250      :THIS IS THE STARTING ADDRESS FOR RH/TU16/TM02
1251 002150 010703 :173150 010703      TU16: MOV      PC,R3      ;SAVE ERROR RETRY ADDRES
1252 002152 012700 :173152 012700      MOV      #TUCS,RO;GET CONTROL STATUS WORD
1253 002154 172440 :173154 172440
1254 002156 012710 :173156 012710      TU16RE: MOV     #RHPRST,(RO);REWIND TAPE CLEAR E
1255 002160 000021 :173160 000021
1256 002162 012760 :173162 012760      MOV      #TUMODE,32(RO);SET 800 BPI NORMA
1257 002164 001300 :173164 001300
1258 002166 000032 :173166 000032
1259 002170 012760 :173170 012760      MOV      #-1,6(RO);LOAD FRAME COUNT
1260 002172 177777 :173172 177777
1261 002174 000006 :173174 000006
1262 002176 012710 :173176 012710      MOV      #TUSPAC,(RO);SPACE FORWARD
1263 002200 000031 :173200 000031
1264 002202 105760 :173202 105760      IS:   TSTB      12(RO)
1265 002204 000012 :173204 000012
1266 002206 100375 :173206 100375      BPL      IS        ;KEEP LOOPING
1267 002210 000433 :173210 000433      BR       RHCOMM
1268
1269      :THIS IS THE STARTING ADDRESS FOR RC11 CONTROLLE
1270 002212 010703 :173212 010703      RC11: MOV      PC,R3
1271 002214 010702 :173214 010702      MOV      PC,R2      ;ASSUME UNIT 0
1272 002216 000470 :173216 000470      BR       OTHERA
1273 002220 177450 :173220 177450      .WORD    RCWC
1274 002222 000005 :173222 000005      .WORD    RFREAD
1275
1276      :THIS IS THE AUTO LOAD VECTOR
1277 002224 173000 :173224 173000      .WORD    RHRSR
1278 002226 000340 :173226 000340      .WORD    340
1279
1280      :THIS IS THE STARTING ADDRESS FOR RH11 DEVICE CO
1281
1282      :NOTE: IF TM02/TU16 SHOULD BE SELECTED. THE VAL
1283      :IN CONSOL SWITCH REGISTER IS THE POSITIO
1284      :ON THE RH11 INSTEAD OF THE UNIT # ON TUI
1285      :THE SLAVE UNIT # (# ON TU16) SHOULD STIL
1286 002230 000405 :173230 000405      RH11A: BR       IS        ;ENTRY TO SELECT UNIT 0
1287 002232 010703 :173232 010703      RH11B: MOV      PC,R3      ;ENTRY TO SELECT ALL UNI
1288 002234 113737 :173234 113737      MOV      #CSW,2#RHCSA+10;LOAD UNIT # INS
1289 002236 177570 :173236 177570

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D03

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 29
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

1289	002240	176310	:173240	176310			
1290	002242	000401	:173242	000401		BR	2\$
1291	002244	010703	:173244	010703	1\$:	MOV	PC,R3
1292	002246	012700	:173246	012700	2\$:	MOV	#RHCSA,R0
1293	002250	176300	:173250	176300			
1294	002252	032760	:173252	032760	RPCOMN:	BIT	#TUTAPE,26(R0);TAPE UNIT?
1295	002254	040000	:173254	040000			
1296	002256	000026	:173256	000026			
1297	002260	001336	:173260	001336		BNE	TU16RE ;YES. GO TO TAPE LOGIC
1298	002262	012710	:173262	012710		MOV	#RHPRST,(R0);RESET DRIVE
1299	002264	000021	:173264	000021			
1300	002266	012760	:173266	012760		MOV	#14000,32(R0);SET 16 BIT FORMAT
1301	002270	014000	:173270	014000			
1302	002272	000032	:173272	000032			
1303	002274	012710	:173274	012710		MOV	#DRCLR,(R0);CLEAR DRIVE ERROR
1304	002276	000011	:173276	000011			
1305							(GENERATED IF R503/04
1306	002300	005720	:173300	005720	RHCOMN:	TST	(R0)+ ;MOVE TO WORD COUNT ADDR
1307	002302	010037	:173302	010037		MOV	R0,#2 ;FAKE CALLING SEQUENCE
1308	002304	000002	:173304	000002			
1309	002306	012737	:173306	012737		MOV	#RHREAD,#4
1310	002310	000071	:173310	000071			
1311	002312	000004	:173312	000004			
1312	002314	005002	:173314	005002		CLR	R2 ;FOR FLAG AND POINTER TO
1313	002316	000430	:173316	000430		BR	OTHERA
1314					LSB		
1315							
1316							THIS IS THE STARTING ADDRESS FOR RH11/RP04 DISK
1317	002320	000405	:173320	000405	RHRPA:	BR	1\$;ENTRY FOR SELECT UNIT 0
1318	002322	010703	:173322	010703	RHRPB:	MOV	PC,R3 ;ENTRY TO SELECT ALL UNI
1319	002324	113737	:173324	113737		MOVB	#CSW,#RPCSA+10;LOAD UNIT # INS
1320	002326	177570	:173326	177570			
1321	002330	176710	:173330	176710			
1322	002332	000401	:173332	000401		BR	2\$
1323	002334	010703	:173334	010703	1\$:	MOV	PC,R3
1324	002336	012700	:173336	012700	2\$:	MOV	#RPCSA,R0
1325	002340	176700	:173340	176700			
1326	002342	000743	:173342	000743		BR	RPCOMN
1327							
1328							ENTRY TO BRANCH TO THE PC SELECTED BY CONSOL SW
1329	002344	013707	:173344	013707	CSRG0:	MOV	#CSW,PC
1330	002346	177570	:173346	177570			
1331							
1332							
1333							
1334							THIS IS THE STARTING ADDRESS FOR RP11 CONTROLLE
1335	002350	000405	:173350	000405	RP11A:	BR	1\$;ENTRY TO SELECT UNIT 0
1336	002352	010703	:173352	010703	RP11B:	MOV	PC,R3 ;ENTRY TO SELECT ALL UNI
1337	002354	113705	:173354	113705		MOVB	#CSW,R5
1338	002356	177570	:173356	177570			
1339	002360	000305	:173360	000305		SWAB	R5 ;GET UNIT # INTO HIGH BY
1340	002362	000402	:173362	000402		BR	3\$
1341	002364	010703	:173364	010703	1\$:	MOV	PC,R3
1342	002366	005005	:173366	005005		CLR	R5
1343	002370	010702	:173370	010702	3\$:	MOV	PC,R2
1344	002372	000403	:173372	000403		BR	OTHER

E03

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 30

DOBMA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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1345 002374 176716 :173374 176716 .WORD RPHC
1346 002376 000005 :173376 000005 .WORD RFREAD
1347
1348 002400 005005 :173400 005005 OTHERA: CLR R5 ;SET TO UNIT 0
1349 002402 010200 :173402 010200 OTHER: MOV R2,R0 ;RC POINT AT WORD COUNT
1350 002404 005720 :173404 005720 TST (R0)+ ;POINT TO PARAMETER LIST
1351 002406 012001 :173406 012001 MOV (R0)+,R1 ;MOVE WORD COUNT ADDRESS
1352 002410 012711 :173410 012711 MOV #-256,*2,(R1);LOAD WORD COUNT
1353 002412 177000 :173412 177000
1354 002414 051005 :173414 051005 BIS (R0),R5 ;COMBINE UNIT # WITH COM
1355 002416 010541 :173416 010541 MOV R5,-(R1);LOAD READ COMMAND
1356 002420 032711 :173420 032711 BIT #100200,(R1);CHECK FOR ERROR AND
1357 002422 100200 :173422 100200
1358 002424 001775 :173424 001775 BEQ -4 ;WAIT UNTIL COMPLETE
1359 002426 100012 :173426 100012 BPL IS ;NO ERROR
1360 002430 005702 :173430 005702 TST R2 ;WAS IT CALLED BY MASS B
1361 002432 001024 :173432 001024 BNE AGAIN ;NO ERROR
1362 002434 032761 :173434 032761 BIT #TUTAPE,26(R1);IS TU16?
1363 002436 040000 :173436 040000
1364 002440 000026 :173440 000026
1365 002442 001420 :173442 001420 BEQ AGAIN ;NO. ERROR
1366 002444 022761 :173444 022761 CMP #FCE,14(R1);ARE WE READ A SHORT
1367 002446 001000 :173446 001000
1368 002450 000014 :173450 000014
1369 002452 001014 :173452 001014 BNE AGAIN ;SOME OTHER ERROR
1370 002454 005007 :173454 005007 IS: CLR PC ;O.K.
1371
1372 ;
1373 002456 010200 :173456 010200 ;THIS IS THE TAPE DEVICE SERVICE ROUTINE
1374 002460 005720 :173460 005720 TAPES: MOV R2,R0 ;GET THE ADDRESS OF THE
1375 002462 012001 :173462 012001 TST (R0)+ ;STEP TO LAST COMMAND
1376 002464 005311 :173464 005311 MOV (R0)+,R1 ;GET THE WORD COUNT ADDR
1377 002466 005720 :173466 005720 DEC (R1) ;SET UP TO ADVANCE 1 REC
1378 002470 012041 :173470 012041 TST (R0)+ ;MOVE R0 TO FIRST COMMAND
1379 002472 031011 :173472 031011 MOV (R0)+,-(R1);LOAD COMMAND REG.
1380 002474 001776 :173474 001776 BIT (R0),(R1);DONE?
1381 002476 005720 :173476 005720 BEQ -2 ;NO. KEEP LOOPING
1382 002500 031041 :173500 031041 TST (R0)+ ;YES. CHECK FOR ERROR
1383 002502 001736 :173502 001736 BIT (R0)-,(R1);ANY ERROR?
1384 002504 000005 :173504 000005 BEQ OTHERA ;NO ERROR- TRY TO READ
1385
1386 002506 000113 :173506 000113 AGAIN: RESET
1387
1388 ;
1389 002510 012704 :173510 012704 JMP (R3) ;ERROR RETURN
1390 002512 177560 :173512 177560 ;THIS IS THE STARTING ADDRESS FOR PC11 PAPER TAP
1391 002514 000443 :173514 000443 KL11: MOV #KLCS,R4;OBTAIN CONTROL REG.
1392
1393 ;
1394 ;
1395 ;CASSETTE TAPE DEVICE COMMAND TABLE
1396 002516 .BYTE 240 :173516 240 TABLE: .BYTE 240 ;COMPARE WORD NOT A COMM
1397 002517 .BYTE 037 :173517 037 .BYTE 37 ;ILBS+RWD+GO
1398 002520 .BYTE 015 :173520 015 .BYTE 15 ;SPACE FORWARD BLOCK+GO
1399 002521 .BYTE 005 :173521 005 .BYTE 5 ;READ
1400 002522 .BYTE 024 :173522 024 .BYTE 24 ;READ +ILBS

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F03

COBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 31
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

```

1401 002523 .BYTE 224 ;173523      224      .BYTE 224      ;READ+ILBS+END FLAG
1402
1403 :
1404 002524 000404 ;173524 000404 CB00TA: BR 15 ;SELECT UNIT 0
1405 002526 113704 ;173526 113704 CB00TB: MOVB #CSW,R4;SELECT UNITS
1406 002530 177570 ;173530 177570
1407 002532 000304 ;173532 000304 SWAB R4
1408 002534 000401 ;173534 000401 BR RESETX
1409 002536 005004 ;173536 005004 15: CLR R4
1410 002540 012700 ;173540 012700 RESETX: MOV #TACS,R0;GET CONTROL REG.
1411 002542 177500 ;173542 177500
1412 002544 000005 ;173544 000005 RESTR: RESET
1413 002546 010410 ;173546 010410 MOV R4,(R0);SELECT UNIT
1414 002550 012701 ;173550 012701 MOV #TABLE,R1
1415 002552 173516 ;173552 173516
1416 002554 012702 ;173554 012702 MOV #375,R2 ;LOAD TRANSFER COUNTER
1417 002556 000375 ;173556 000375
1418 002560 112103 ;173560 112103 MOVB (R1)+,R3;LOAD COMPARATOR
1419 002562 112110 ;173562 112110 LOOP1: MOVB (R1)+,(R0);LOAD COMMAND
1420 002564 100407 ;173564 100407 BMI DONE
1421 002566 130310 ;173566 130310 LOOP2: BITB R3,(R0);COMMAND COMPLETE?
1422 002570 001776 ;173570 001776 BEQ LOOP2 ;NO. WAIT
1423 002572 105202 ;173572 105202 INCB R2 ;INCREMENT ADDRESS CTR.
1424 002574 100772 ;173574 100772 BMI LOOP1 ;IF (-) GET COMMAND
1425 002576 116012 ;173576 116012 MOVB 2(R0),(R2);STORE DATA
1426 002600 000002 ;173600 000002
1427 002602 000771 ;173602 000771
1428 002604 005710 ;173604 005710 DONE: BR LOOP2 ;GET ANOTHER BYTE
1429 002606 100756 ;173606 100756 TST (R0);ANY ERROR?
1430 002610 005002 ;173610 005002 BMI RESTR ;YES, RETRY
1431 002612 120312 ;173612 120312 CLR R2 ;CLEAR COMPARE ADDRESS
1432 002614 001377 ;173614 001377 CMPB R3,(R2);IT MUST BE 240
1433 002616 000112 ;173616 000112 ERROR: JNP (R2)
1434
1435 :
1436 002620 012704 ;173620 012704 :THIS IS THE STARTING ADDRESS FOR THE PC11 CONTR
1437 002622 177550 ;173622 177550 PC11: MOV #FCCS,R4
1438 002624 000005 ;173624 000005 CKDEV: RESET
1439 002626 012701 ;173626 012701 MOV #160000,R1;SET UP MEMORY TEST LI
1440 002630 160000 ;173630 160000
1441 002632 012702 ;173632 012702 MOV #6,R2 ;SET UP POINTER TO TIME0
1442 002634 000006 ;173634 000006
1443 002636 012712 ;173636 012712 MOV #340,(R2);SET UP VECTOR TO RETUR
1444 002640 000340 ;173640 000340
1445 002642 010742 ;173642 010742 MOV PC,-(R2);SAVE PC
1446 002644 012706 ;173644 012706 MOV #24,SP ;LOAD UP STACK POINTER
1447 002646 000024 ;173646 000024
1448 002650 010441 ;173650 010441 MOV R4,-(R1);LOOK FOR END OF MEMORY
1449 002652 040601 ;173652 040601 BIC SP,R1 ;THEN DROP TO XX752
1450 002654 010111 ;173654 010111 MOV R1,(R1);AND STORE IN ITSELF
1451 002656 011102 ;173656 011102 LOOP: MOV (R1),R2
1452 002660 005214 ;173660 005214 INC (R4);START DEVICE
1453 002662 105714 ;173662 105714 RDRWAT: TSTB (R4);WAIT
1454 002664 100376 ;173664 100376 BPL RDRWAT
1455 002666 116412 ;173666 116412 MOVB 2(R4),(R2);SAVE THE DATA
1456 002670 000002 ;173670 000002

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G03

DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 32
 DDBMAA.P11 MAINDEC-11-DDDMA-A PM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

1457	002672	005211	;173672	005211	INC	(R1)	
1458	002674	120227	;173674	120227	CMPB	R2,#375	
1459	002676	000375	;173676	000375			
1460	002700	001366	;173700	001366	BNE	LOOP	;NO
1461	002702	105222	;173702	105222	INCB	(R2)+	;YES
1462	002704	000142	;173704	000142	JMP	-(R2)	
1463	002706	000000	;173706	000000			; THIS AREA IS UNUSED
1464	002710	000000	;173710	000000			; THIS AREA IS UNUSED
1465	002712	000000	;173712	000000			; THIS AREA IS UNUSED
1466	002714	000000	;173714	000000			; THIS AREA IS UNUSED
1467	002716	000000	;173716	000000			; THIS AREA IS UNUSED
1468	002720	000000	;173720	000000			; THIS AREA IS UNUSED
1469	002722	000000	;173722	000000			; THIS AREA IS UNUSED
1470	002724	000000	;173724	000000			; THIS AREA IS UNUSED
1471	002726	000000	;173726	000000			; THIS AREA IS UNUSED
1472	002730	000000	;173730	000000			; THIS AREA IS UNUSED
1473	002732	000000	;173732	000000			; THIS AREA IS UNUSED
1474	002734	000000	;173734	000000			; THIS AREA IS UNUSED
1475	002736	000000	;173736	000000			; THIS AREA IS UNUSED
1476	002740	000000	;173740	000000			; THIS AREA IS UNUSED
1477	002742	000000	;173742	000000			; THIS AREA IS UNUSED
1478	002744	000000	;173744	000000			; THIS AREA IS UNUSED
1479	002746	000000	;173746	000000			; THIS AREA IS UNUSED
1480	002750	000000	;173750	000000			; THIS AREA IS UNUSED
1481	002752	000000	;173752	000000			; THIS AREA IS UNUSED
1482	002754	000000	;173754	000000			; THIS AREA IS UNUSED
1483	002756	000000	;173756	000000			; THIS AREA IS UNUSED
1484	002760	000000	;173760	000000			; THIS AREA IS UNUSED
1485	002762	000000	;173762	000000			; THIS AREA IS UNUSED
1486	002764	000000	;173764	000000			; THIS AREA IS UNUSED
1487	002766	000000	;173766	000000			; THIS AREA IS UNUSED
1488	002770	000000	;173770	000000			; THIS AREA IS UNUSED
1489	002772	000000	;173772	000000			; THIS AREA IS UNUSED
1490	002774	000000	;173774	000000			; THIS AREA IS UNUSED
1491	002776	END.YB:					
1492	002776	000000	;173776	000000			; THIS AREA IS UNUSED

H03

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 33
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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1493 003000 MAP.YC:
1494 :THE FOLLOWING 1000 LOCATIONS ARE
1495 :A REPRODUCTION OF THE ROM PROGRAM
1496 :FOR THE BM873YC. THE FIRST 400 LOCATIONS
1497 :ARE AN EXACT COPY OF THE BM873YA. THE
1498 :REMAINING 400 LOCATIONS ARE
1499 :THE DDCMP BOOTSTRAP ROM PROGRAM.
1500 :IT IS HERE FOR COMPARISON TO
1501 :ACTUAL ROM AND FOR REFERENCE.
1502 :173000 .=173000
1503 :STARTING ADDRESS FOR BOOTSTRAP
1504 :THIS LOADER IS DESIGNED FOR THE RESTART MODULE M873.
1505 :IT FUNCTIONALLY REPLACES THE FOLLOWING ROMS:
1506 :M792-YA - PAPER TAPE BOOTSTRAP FOR PC11,KL11
1507 :MR11-DB BULK STORAGE BOOTSTRAP ROM
1508 :M792-YH TA11 CASSETTE BOOTSTRAP ROM
1509 :REGISTER DEFINITIONS
1510 :
1511 :000000 R0= %0
1512 :000001 R1= %1
1513 :000002 R2= %2
1514 :000003 R3= %3
1515 :000004 R4= %4
1516 :000005 R5= %5
1517 :000006 SP= %6
1518 :000007 PC= %7
1519 :177570 SR= 177570 ;PROCESSOR SWITCH REGISTER
1520 :
1521 :STARTING LOCATION FOR RF11 DISK
1522 RF11: MOV PC,R2 ;SET POINTER TO PARAMETER LISTS
1523 :BR OTHER ;TRANSFER TO SERVICE ROUTINE
1524 :WORD 177462 ;DEVICE WORD COUNT ADDRESS
1525 :WORD 5 ;DEVICE READ INSTRUCTION
1526 :
1527 :THIS IS THE STARTING LOCATION FOR THE RK11 CONTROLLER
1528 RK11: MOV PC,R2 ;SET POINTER TO PARAMETER LIST
1529 :BR OTHER ;TRANSFER TO SERVICE ROUTINE
1530 :WORD 177406 ;DEVICE WORD COUNT REGISTER
1531 :WORD 5 ;DEVICE READ INSTRUCTION
1532 :
1533 :THIS IS A SPARE STARTING LOCATION. IT TRANSFERS TO ADDRESS
1534 :CONTAINED IN THE SWITCH REGISTER.
1535 TRANSR: MOV #SR,PC ;GO TO INDICATED LOCATION
1536 :
1537 :NOTE 773024 AND 773224 ARE DEPENDENT ON OFFSET IN DIODES FOR LINE 1
1538 :
1539 :THIS IS THE POWER UP VECTOR REQUIRED FOR DEVICE AND
1540 POWER: .WORD RF11 ;ADDRESS OF FIRST LOCATION IN ROM
1541 :WORD 340 ;PROCESSOR STATUS LEVEL 7
1542 :
1543 :THIS IS THE STARTING ADDRESS FOR TC11 (DECTAPE) CONTROLLER.
1544 TC11: MOV PC,R2 ;SET UP POINTER TO PARAMETER LIST
1545 :BR TAPES ;AND TRANSFER TO FIRST ROUTINE
1546 :WORD 177344 ;DEVICE WORD COUNT ADDRESS
1547 :WORD 4003 ;FIND PREVIOUS BLOCK COMMAND
1548 :WORD 100000 ;USED AS DONE INDICATOR
1549 :WORD 24000 ;USED AS ERROR INDICATOR/TEST FLAG
1550 :BR OTHERX ;THEN TRANSFER TO NEXT ROUTINE
1551 :WORD 5 ;DEVICE READ COMMAND

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DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 34
 DDBMAA.P11 MAINDEC-11-DDDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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1549
1550      ; THIS IS THE START LOCATION FOR TM11 MAGTAPE CONTROLLER
1551 003050 010702 ; 173050 010702 TM11: MOV PC,R2 ; SET POINTER TO PARAMETER LIST
1552 003052 000416 ; 173052 000416 BR TAPES ; AND TRANSFER TO FIRST ROUTINE
1553 003054 172524 ; 173054 172524 .WORD 172524 ; DEVICE BYTE/RECORD COUNT REGISTER
1554 003056 060017 ; 173056 060017 .WORD 60017 ; DEVICE REWIND COMMAND
1555 003060 000200 ; 173060 000200 .WORD 200 ; DEVICE DONE FLAG
1556 003062 100000 ; 173062 100000 .WORD 100000 ; DEVICE ERROR FLAG BIT
1557 003064 000413 ; 173064 000413 BR TAPESX ; THEN TRANSFER TO NEXT SERVICE RTN
1558 003066 060011 ; 173066 060011 .WORD 60011 ; DEVICE FORWARD SPACE COMMAND
1559 003070 000200 ; 173070 000200 .WORD 200 ; SAME AS ABOVE
1560 003072 100000 ; 173072 100000 .WORD 100000 ; SAME AS ABOVE
1561 003074 000431 ; 173074 000431 BR OTHERX ; THEN TRANSFER TO READ/TRANSFER ROUTINE
1562 003076 060003 ; 173076 060003 .WORD 60003 ; DEVICE READ COMMAND
1563
1564      ; THIS IS THE START LOCATION FOR THE RP11 CONTROLLER
1565 003100 010702 ; 173100 010702 RP11: MOV PC,R2 ; SET POINTER TO PARAMETER LIST
1566 003102 000424 ; 173102 000424 BR OTHER ; TRANSFER TO TRANSFER ROUTINE
1567 003104 176716 ; 173104 176716 .WORD 176716 ; DEVICE WORD COUNT REGISTER
1568 003106 000005 ; 173106 000005 .WORD 5 ; DEVICE READ COMMAND
1569
1570      ; THIS IS THE TAPE DEVICE SERVICE ROUTINE.
1571 003110 010200 ; 173110 010200 TAPES: MOV R2,R0 ; GET ADDRESS OF PARAMETER LIST
1572 003112 005720 ; 173112 005720 TST (R0)+ ; SKIP TWO WORDS FIRST TIME
1573 003114 000005 ; 173114 000005 TAPESX: RESET ; RESET ALL DEVICES
1574 003116 005720 ; 173116 005720 TST (R0)+ ; SKIP OVER BRANCH INSTRUCTION
1575 003120 016201 ; 173120 016201 MOV 2(R2),R1 ; THEN GET DEVICE WORD/BYTE COUNT ADDRESS
1576 003122 000002 ; 173122 000002
1577 003124 005311 ; 173124 005311 DEC 2R1 ; AND SET TO -1
1578 003126 012041 ; 173126 012041 MOV (R0)+,-(R1) ; AND THEN ISSUE COMMAND TO DEVICE
1579 003130 031011 ; 173130 031011 TAPWAT: BIT 2R0,2R1 ; WAIT FOR DEVICE COMPLETION
1580 003132 001776 ; 173132 001776 BEQ TAPWAT ; BY HANGING IN LOOP
1581 003134 005720 ; 173134 005720 TST (R0)+ ; AND THEN SKIP DONE FLAG
1582 003136 032041 ; 173136 032041 BIT (R0)+,-(R1) ; THEN TEST FOR ERROR
1583 003140 001063 ; 173140 001063 BNE ERROR ; THERE IS ONE
1584 003142 000110 ; 173142 000110 RETURN: JMP 2R0 ; AND TRANSFER TO FOLLOWING INSTRUCTION
1585
1586      ; THIS IS THE STARTING ADDRESS FOR RC11 DISK CONTROLLERS
1587 003144 010702 ; 173144 010702 RC11: MOV PC,R2 ; SET UP POINTER TO PARAMETER LIST
1588 003146 000402 ; 173146 000402 BR OTHER ; TRANSFER TO SERVICE RTN
1589 003150 177450 ; 173150 177450 .WORD 177450 ; DEVICE WORD COUNT REGISTER
1590 003152 000005 ; 173152 000005 .WORD 5 ; DEVICE READ INSTRUCTION
1591
1592      ; THIS ROUTINE PERFORMS THE ACTUAL TRANSFER TO MEMORY OF DATA
1593 003154 010200 ; 173154 010200 OTHER: MOV R2,R0 ; SET POINTER TO LIST IN R0
1594 003156 005720 ; 173156 005720 TST (R0)+ ; SKIP TWO WORDS FIRST TIME.
1595 003160 005720 ; 173160 005720 OTHERX: TST (R0)+ ; SKIP PAST BR INSTRUCTION
1596 003162 000005 ; 173162 000005 RESET ; REST THE WORLD
1597 003164 016201 ; 173164 016201 MOV 2(R2),R1 ; OBTAIN DEVICE WORD COUNT ADDRESS
1598 003166 000002 ; 173166 000002
1599 003170 012711 ; 173170 012711 MOV #-1000,2R1 ; THEN OBTAIN LARGE WORD COUNT
1600 003172 177000 ; 173172 177000
1601 003174 011041 ; 173174 011041 OTHWAT: MOV 2R0, -(R1) ; AND PUT COMMAND TO DEVICE
1602 003176 105711 ; 173176 105711 TSTB 2R1 ; WAIT FOR DONE FLAG
1603 003200 100376 ; 173200 100376 BPL OTHWAT ; BY HANGING IN LOOP
1604 003202 005711 ; 173202 005711 TST 2R1 ; THEN TEST FOR ERROR

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J03

DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 35
 DDBMAA.P11 MAINDEC-11-DDDMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

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1605 003204 100441 ;173204 100441 BMI ERROR ;GOT PROBLEMS
1606 003206 005007 ;173206 005007 CLR PC ;AND TRANSFER TO ZERO
1607
1608 ;THIS IS THE STARTING ADDRESS FOR THE PC11 PAPER TAPE CONTROLLER
1609 003210 012704 ;173210 012704 KL11: MOV #177560,R4 ;OBTAIN DEVICE ADDRESS
1610 003212 177560 ;173212 177560
1611 003214 000440 ;173214 000440 BR CKDEV ;AND TRANSFER TO READER SERVICE ROUTINE
1612
1613
1614 ;THIS IS THE CASSETTE DEVICE COMMAND TABLE
1615 003216 017640 ;173216 240 TABLE: .BYTE 240 ;COMPARE WORD NOT A COMMAND
1616 ;173217 037 .BYTE 37 ;ILBS+RWD+GO
1617 003220 002415 ;173220 015 .BYTE 15 ;SPACE FORWARD BLOCK+GO
1618 ;173221 005 .BYTE 5 ;READ+GO
1619 003222 112024 ;173222 024 .BYTE 24 ;READ+ILBS
1620 ;173223 224 .BYTE 224 ;READ+ILBS+END FLAG
1621 ;NOTE 773024 AND 773224 ARE DEPENDENT ON OFFSET IN DIODES FOR LINE 1
1622
1623 ;THIS IS AN ADDITIONAL POWER VECTOR ADDRESS REQUIRED BY DEVICE
1624 003224 173000 ;173224 173000 POWER2: .WORD RF11 ;ADDRESS OF BEGINNING OF BOOTSTRAP
1625 003226 000340 ;173226 000340 .WORD 340 ;PRIORITY LEVEL 7
1626
1627 ;THIS IS THE STARTING ADDRESS FOR THE CASSETTE DEVICE #0
1628 003230 005004 ;173230 005004 CBOOT: CLR R4 ;LOAD DEVICE NUMBER 0 IN R4
1629 003232 012700 ;173232 012700 RESTX: MOV #177500,R0 ;GET DEVICE ADDRESS
1630 003234 177500 ;173234 177500
1631 003236 000005 ;173236 000005 RESTART: RESET ;ISSUE RESET INSTRUCTION
1632 003240 010410 ;173240 010410 MOV R4,R0 ;LOAD DEVICE WITH UNIT NUMBER
1633 003242 012701 ;173242 012701 MOV #TABLE,R1 ;GET FUNNY TABLE OF INSTRUCTIONS
1634 003244 173216 ;173244 173216
1635 003246 012702 ;173246 012702 MOV #375,R2 ;AND LOAD UP TRANSFER COUNTER
1636 003250 000375 ;173250 000375
1637 003252 112103 ;173252 112103 LOOP1: MOVB (R1)+,R3 ;THE LOAD UP COMPARATOR
1638 003254 112110 ;173254 112110 MOVB (R1)+,R0 ;LOAD DEVICE REGISTER WITH COMMAND
1639 003256 100407 ;173256 100407 BMI DONE
1640 003260 130310 ;173260 130310 LOOP2: BITB R3,R0 ;HAS COMMAND COMPLETED
1641 003262 001776 ;173262 001776 BEQ LOOP2 ;NO, WAIT
1642 003264 105202 ;173264 105202 INCB R2 ;THEN INCREMENT ADDRESS CTR
1643 003266 100772 ;173266 100772 BMI LOOP1 ;IF NEGATIVE, GET COMMAND
1644 003270 116012 ;173270 116012 MOVB 2(R0),R2 ;AND STORE DATA AWAY
1645 003272 000002 ;173272 000002
1646 003274 000771 ;173274 000771 BR LJP2 ;GO GET ANOTHER BYTE
1647 003276 005710 ;173276 005710 DONE: TST R0 ;ANY DEVICE ERRORS
1648 003300 100756 ;173300 100756 BMI RESTART ;YES, RETRY
1649 003302 005002 ;173302 005002 CLR R2 ;CLEAR COMPARE ADDRESS AND TRANSFER ADDRESS
1650 003304 120312 ;173304 120312 CMPB R3,R2 ;IT MUST BE 240
1651 003306 001377 ;173306 001377 BNE +0 ;NO, THERE WAS AN ERROR
1652 003310 000112 ;173310 000112 ERROR: JMP R2 ;NORMAL CASSETTE AND ERROR FOR BULK STORAGE
1653
1654 ;THIS IS THE STARTING LOCATION FOR THE PC11 CONTROLLER
1655 003312 012704 ;173312 012704 PC11: MOV #177550,R4 ;LOAD DEVICE ADDRESS
1656 003314 177550 ;173314 177550
1657 003316 000005 ;173316 000005 CKDEV: RESET ;KILL ALL DEVICE ACTION
1658 003320 012701 ;173320 012701 MOV #160000,R1 ;THEN SET UP MEMORY TEST LIMITS
1659 003322 160000 ;173322 160000
1660 003324 012702 ;173324 012702 MOV #6,R2 ;AND SET UP POINTER TO TIMEOUT LOCATION
  
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K03

DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 36
 DDBMAA.P11 MAINDEC-11-DDDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

1661	003326	000006	:173326	000006		
1662	003330	012712	:173330	012712	MOV #340,R2	;AND SET UP VECTOR TO RETURN TO NEXT
1663	003332	000340	:173332	000340		
1664	003334	010742	:173334	010742	MOV PC, -(R2)	;SAVE THE PC
1665	003336	012706	:173336	012706	MOV #24,SP	;AND LOAD UP STACK POINTER
1666	003340	000024	:173340	000024		
1667	003342	010441	:173342	010441	MOV R4, -(R1)	;AND LOOK FOR END OF MEMORY
1668	003344	040601	:173344	040601	BIC SP,R1	;THEN DROP TO XX7752
1669	003346	010111	:173346	010111	MOV R1,R1	;AND STORE IN ITSELF
1670	003350	011102	:173350	011102	LOOP: MOV R1,R2	;THEN LOAD ADDRESS FOR DATA INSERTION
1671	003352	005214	:173352	005214	INC R4	;AND START DEVICE
1672	003354	105714	:173354	105714	RDRWAT: TSTB R4	;THEN WAIT FOR CHARACTER AVAILABLE
1673	003356	100376	:173356	100376	BPL RDRWAT	;HANGING THERE IF NECESSARY
1674	003360	116412	:173360	116412	MOVB 2(R4),R2	;STORE AWAY DATA BYTE
1675	003362	000002	:173362	000002		
1676	003364	005211	:173364	005211	INC R1	
1677	003366	120227	:173366	120227	CMPB R2,#375	;HAS BRANCH OFFSET BEEN STORED
1678	003370	000375	:173370	000375		
1679	003372	001366	:173372	001366	BNE LOOP	;NO
1680	003374	105222	:173374	105222	INCB (R2)+	;YES, ALL DONE
1681	003376	000142	:173376	000142	JMP -(R2)	;THEN TRANSFER TO RTN

;THE FOLLOWING 400 LOCATIONS ARE
 ;A REPRODUCTION OF THE DDCMP BOOT-
 ;STRAP ROM. IT IS HERE FOR COM-
 ;PARISON TO THE ACTUAL ROM AND
 ;FOR REFERENCE.

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VERSION 01

STUART WECKER 01/22/75

DIGITAL EQUIPMENT CORPORATION
 COMPUTER NETWORK FACILITIES
 DOWN-LINE LOADING PROGRAM

THIS PROGRAM LOADS COMPUTER MEMORY FROM DATA SENT OVER
 A DATA COMMUNICATIONS LINK. IT SENDS AND RECEIVES
 MESSAGES IN DDCMP BOOT FORMAT. THE PRIMARY BOOT ONLY

UNIVERSAL RESTART LOADER DIAGNOSTIC.

LOADS A SINGLE BLOCK, THE SECONDARY BOOT, WHICH
THEN REQUESTS AND LOADS THE DESIRED PROGRAM.

CURRENT VERSION DDCMP: 3.0 - MAY 7, 1974

THE BOOTSTRAP MESSAGES ARE OF THE FORM:

SYN, SYN, DLE, CNT, F, S, FILL, FILL, ADDR, CRC1, DATA, CRC2

ALL ITEMS ARE 8-BITS LONG UNLESS OTHERWISE SPECIFIED

SYN-THE SYNC CHARACTER-SYNC-226, ASYNC-377

DLE-THE BOOT HEADER CHARACTER-OCTAL 220

CNT-THE 14-BIT COUNT FIELD-LENGTH OF DATA FIELD

F-THE FINAL BIT-LINK CONTROL

S-THE SELECT BIT-LINK CONTROL

FILL-A FILL CHARACTER-OCTAL 000

ADDR-THE STATION ADDR-FOR PT. TO PT.=1

CRC1-THE 16-BIT CRC-16 COMPUTED ON DLE THROUGH ADDR

DATA-THE BOOT DATA AS FOLLOWS:

CODE, INFO

ONLY THE FOLLOWING CODES ARE USED BY THE
PRIMARY BOOT

CODE=10 REQUEST SECONDARY PROGRAM

INFO=DEVICE TYPE, STATION ADDRESS

DEVICE TYPE-DP=0, DU=2, DL=4, DQ=6

STATION ADDRESS=1

CODE=0 PROGRAM LOAD WITH TRANSFER ADDRESS

INFO=BLKNO, BLK LADDR, IMAGE DATA, TRANS ADDR

BLKNO=0

BLOCK LADDR=6

TRANS ADDR=6

HEADER COUNT > OR = TO 10.

ADDRESSES ARE 4 BYTES-32 BITS-LOW BIT FIRST

CRC2-THE 16-BIT CRC-16 COMPUTED ON THE DATA FIELD ONLY

OPTION SWITCHES:

DEVICE-DP11, DU11, DL11

CRC-KG11, SCRC

REGISTER DEFINITIONS

000000 R0=%0
000001 R1=%1
000002 R2=%2
000003 R3=%3
000004 R4=%4
000005 R5=%5
000006 SP=%6
000007 PC=%7

: BLOCK LOAD ADDR
: DEVICE CSR ADDRESS
: CRC CALC TEMP
: SOFTWARE CRC
: BLOCK CHAR COUNT
: CRC CALC TEMP
: STACK ADDR
: LOCATION COUNTER

LITERALS

M03

DDBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 38
DDBMAA.P11 MAINDEC-11-DDBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

```

1773      :      000001 $STADR=1      ;STATION ADDR
1774      :      177570 $SWR=177570   ;SWITCH REGISTER ADDR
1775      :      000226 $SYN=226     ;SYNC CHARACTER
1776      :      000220 $DLE=220     ;UDCMP DLE CHARACTER
1777      :      000400 $STRIP=400
1778
1779      :
1780      :      THE STACK IS USED AS FOLLOWS:
1781      :      STACK-2:FOR JSR TO GET ROUTINE
1782      :      STACK-4:TEMP FOR CRC CALCULATION
1783
1784      :      START OF BOOT PROGRAM
1785
1786      :      START1-DEVICE UNIT 0-NORMAL CONFIGURATION
1787      :      START2-USE SWITCH REG AS DEVICE DISPLACEMENT
1788      :      I.E. #0-0,#1-10,#2-20
1789      :
1790      003400 012700 :173400 012700 =173400
1791      003402 005000 :173402 005000 START1: MOV (PC)+,R0 ;NON ZERO VALUE TO R0
1792      003404 000005 :173404 000005 START2: CLR R0 ;CLEAR R0
1793      003406 012706 :173406 012706 RESET ;RESET SYS, MEM MGT, ETC...
1794      003410 017776 :173410 017776 MOV #17776,SP ;STACK AT 4K-2
1795
1796      :
1797      :      FIND THE DU-11 IN THE FLOATING ADDRESS SPACE
1798
1799      003412 010702 :173412 010702 MOV PC,R2 ;CURRENT PC
1800      003414 062702 :173414 062702 ADD #DEVTAB-.,R2 ;DEVICE TABLE ADDR
1801      003416 000360 :173416 000360
1802      003420 012703 :173420 012703 MOV #6,R3 ;TRAP PS ADDR
1803      003422 000006 :173422 000006
1804      003424 005013 :173424 005013 CLR (R3) ;CLEAR NEW PS
1805      003426 010243 :173426 010243 MOV R2,-(R3) ;TABLE ADDR TO LOC 4
1806      003430 160313 :173430 160313 SUB R3,(R3) ;SUB TO TRAP RTN
1807      003432 005303 :173432 005303 DEC R3 ;LEAVE CNT 3 FOR LOOP
1808      003434 012701 :173434 012701 MOV #160010,R1 ;START SEARCH ADDR
1809      003436 160010 :173436 160010
1810      003440 005711 :173440 005711 DEVLOP: TST (R1) ;IS DEVICE THERE
1811      003442 111204 :173442 111204 MOV#B (R2),R4 ;DEVICE INCREMENT TO R3
1812      003444 060401 :173444 060401 ADD R4,R1 ;UPDATE TO NEXT DEVICE
1813      003446 005201 :173446 005201 INC R1 ;INCREMENT MODULO
1814      003450 040401 :173450 040401 BIC R4,R1 ;CLEAR EXCESS
1815      003452 005703 :173452 005703 TST R3 ;TEST FOR DONE
1816      003454 001371 :173454 001371 BNE DEVLOP ;NOT YET
1817      003456 005700 :173456 005700 TST R0 ;TEST SWITCH REG USE
1818      003460 001002 :173460 001002 BNE $NDREQ ;NO SWITCH REG
1819      003462 063701 :173462 063701 ADD @#$SWR,R1 ;ADD SWR VALUE
1820      003464 177570 :173464 177570
1821
1822      :
1823      :      SET UP DEVICE FOR OUTPUT
1824
1825      003466 012711 :173466 012711 $NDREQ: MOV #6,(R1) ;DATA TERM RDY AND REQ TO SEND
1826      003470 000006 :173470 000006
1827      003472 012761 :173472 012761 MOV #36000+$SYN,2(R1) ;SET SYNC REGISTER
1828      003474 036226 :173474 036226
1829      003476 000002 :173476 000002

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DDBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 39
 DDBMAA.P11 MAINDEC-11-DDBMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

1829	003500	032711	;173500 032711	L3:	BIT	#20000,(R1)	;TEST CLEAR TO SEND
1830	003502	020000	;173502 020000				
1831	003504	001775	;173504 001775		BEQ	L3	;NOT YET
1832	003506	022121	;173506 022121		CMP	(R1)+(R1)+	;MOVE PTR TO XMIT TSR
1833	003510	052711	;173510 052711		BIS	#20,(R1)	;TURN SEND ON
1834	003512	000020	;173512 000020				
1835							
1836							
1837							
1838	003514	010700	;173514 010700		MOV	PC,R0	;CURRENT PC
1839	003516	062700	;173516 062700		ADD	#RQMSG-,R0	;REQUEST MSG ADDR
1840	003520	000230	;173520 000230				
1841	003522	012704	;173522 012704		MOV	#RQMSG-RQMSG,R4	;COUNT
1842	003524	000026	;173524 000026				
1843	003526	112061	;173526 112061	L4:	MOVB	(R0)+,2(R1)	;CHAR TO XMIT REGISTER
1844	003530	000002	;173530 000002				
1845	003532	105711	;173532 105711	L5:	TSTB	(R1)	;DONE YET ?
1846	003534	100376	;173534 100376		BPL	L5	;NO
1847	003536	005304	;173536 005304		DEC	R4	;DECREMENT COUNT
1848	003540	001372	;173540 001372		BNE	L4	;ONCE MORE
1849	003542	042711	;173542 042711		BIC	#20,(R1)	;DROP SEND
1850	003544	000020	;173544 000020				
1851	003546	024141	;173546 024141		CMP	-(R1),-(R1)	;RESET PTR TO RCV CSR
1852							
1853							
1854							
1855			;173550	GETPGM:			
1856	003550	042711	;173550 042711		BIC	#20,(R1)	;CLEAR SEARCH SYNC
1857	003552	000020	;173552 000020				
1858	003554	012711	;173554 012711		MOV	#422,(R1)	;SET FOR CLEAR AND STRIP SYNC
1859	003556	000422	;173556 000422				
1860	003560	005003	;173560 005003		CLR	R3	;CLEAR CRC VALUE
1861							
1862							
1863							
1864	003562	012700	;173562 012700		MOV	#1,R0	;LOAD HDR AT LOC. 1
1865	003564	000001	;173564 000001				
1866	003566	012704	;173566 012704		MOV	#8.,R4	;BLOCK COUNT
1867	003570	000010	;173570 000010				
1868	003572	004767	;173572 004767		JSR	PC,GET	;GET HEADER
1869	003574	000060	;173574 000060				
1870	003576	005703	;173576 005703		TST	R3	;CHECK HEADER CRC
1871	003600	001363	;173600 001363		BNE	GETPGM	;NO GOOD
1872	003602	123727	;173602 123727		CMPB	#6,#\$STADR	;CHECK FOR MY ADDR
1873	003604	000006	;173604 000006				
1874	003606	000001	;173606 000001				
1875	003610	001357	;173610 001357		BNE	GETPGM	;NOT MINE
1876	003612	123727	;173612 123727		CMPB	#1,#\$DLE	;IS THIS A DLE MSG
1877	003614	000001	;173614 000001				
1878	003616	000220	;173616 000220				
1879	003620	001322	;173620 001322		BNE	SNOREQ	;NO, ASK FOR ONE
1880							
1881							
1882							
1883	003622	013704	;173622 013704		GET DATA BLOCK		
1884	003624	000002	;173624 000002		MOV	#2,R4	;DATA FIELD LENGTH

DDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 40
 DDMA.P11 MAINDEC-11-DDMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

```

1895 003626 042704 :173626 042704 BIC #140000,R4 ;MASK OFF S,F BITS
1896 003630 140000 :173630 140000
1897 003632 122424 :173632 122424 CMPB (R4)+,(R4)+ ;ADD 2 FOR CRC
1898 003634 005000 :173634 005000 CLR R0 ;LOAD INTO LOCATION 0
1899 003636 004767 :173636 004767 JSR PC,GET1 ;GET DATA BLOCK
1900 003640 000014 :173640 000014
1901 003642 005703 :173642 005703 TST R3 ;CHECK DATA FIELD CRC
1902 003644 001310 :173644 001310 BNE SNDREQ ;NO GOOD
1903 003646 105713 :173646 105713 TSTB (R3) ;CHECK CODE IN LOC 0
1904 003650 001306 :173650 001306 BNE SNDREQ ;NOT PROGRAM LOAD
1905 003652 000137 :173652 000137 JMP #06 ;TRANSFER TO SECONDARY PGM
1906 003654 000006 :173654 000006
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GET A BLOCK AND COMPUTE CRC

```

GET:
GET1:
1900
1901
1902 003656 105711 :173656 105711 TSTB (R1) ;IS DEVICE DONE YET
1903 003660 100376 :173660 100376 BPL GET ;NOT YET
1904 003662 042711 :173662 042711 BIC #5STRIP,(R1) ;NO STRIP SYNC
1905 003664 000400 :173664 000400
1906 003666 116110 :173666 116110
1907 003670 000002 :173670 000002
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CRC CALCULATION ROUTINE

```

POLY=120001 ;CRC-16 POLYNOMIAL
MOV #8.,R5 ;BYTE LENGTH
MOVB (R0)+,R2 ;CHARACTER TO ADD TO CRC
CRCLOP: CLC ;CLEAR CARRY
ROR R3 ;SHIFT OLD PARTIAL
BCC L10 ;IF CLEAR CHECK CHAR
ROR R2 ;SHIFT CHARACTER
BCC L11 ;XOR POLY
BR L12 ;NEXT BIT
L10: ROR R2 ;SHIFT CHARACTER
BCC L12 ;NEXT BIT
L11: MOV #POLY,-(SP) ;POLY TO STACK
BIC R3,(SP) ;NOT PARTIAL AND POLY
BIC #POLY,R3 ;NOT POLY AND PARTIAL
L12: BIS (SP)+,R3 ;POLY XOR PARTIAL
DEC R5 ;DECREMENT BIT COUNT
BNE CRCLOP ;ONCE MORE
DEC R4 ;DECREMENT COUNT
BNE GET ;ONCE MORE
RTS PC ;RETURN
  
```

SECONDARY PROGRAM REQUEST MSG

```

ROMSG: .BYTE $SYN,$SYN,$SYN,$SYN
        .BYTE $DLE,4,0,0,0,1
  
```

C04

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 41
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

1941	003754	000000	:173754	000000		
1942	003756	000400	:173756	000400		
1943	003760	050055	:173760	050055	.BYTE	55,120
1944	003762	001010	:173762	001010	.BYTE	10
1945					.BYTE	2
1946	003764	000001	:173764	000001	.BYTE	\$STADR
1947					.BYTE	0
1948	003766	030242	:173766	030242	.BYTE	242,60
1949						
1950						
1951						
1952						
1953	003770	122243	:173770	122243	NODEV: .EVEN	
1954	003772	000002	:173772	000002	.CMPB	(R2)+,-(R3)
1955					.RTI	
1956						
1957	003774	007407	:173774	007407	RQMSGE:	
1958					DEV TAB:	
1959	003776	END.YC:			.BYTE	7
1960	003776	003407	:173776	003407	.BYTE	17
1961						
1962			:174000			
1963			173400		END:	
					.END	START1

NOTE: NODEV AND DEV TAB MUST BE IN THIS ORDER
DO NOT SEPARATE THEM

:REQ SEC PGM CODE
:DEVICE CODE
:STATION ADDR
:FILL
:FOR STADR=1
:INC PTR-DEC CNT
:RETURN FROM TRAP
:END OF MSG-USE JUNK AS PADS
:DJ-11
:DH-11
:DQ-11
:DU-11

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 42
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

1964 004000 MAP.YD:

1965 : THE FOLLOWING IS A REPRODUCTION
 1966 : OF THE ROM PROGRAM FOR BM873YD.
 1967 : IT IS HERE FOR COMPARISON TO THE
 1968 : ACTUAL ROM AND FOR REFERENCE
 1969 : BM873-YD - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17)
 1970 : BM873-YD.P11

MACY11 27(657) 18-DEC-74 11:59 PAGE 1

1971 : This code is to be blasted into pROMs or the BM873-YD board.
 1972 : Written by David M. Rosenberg October 1974
 1973 : REGISTER DEFINITIONS

1976 :	000000	R0=%0	: GENERAL PURPOSE REGISTER 0
1977 :	000001	R1=%1	: GENERAL PURPOSE REGISTER 1
1978 :	000002	R2=%2	: GENERAL PURPOSE REGISTER 2
1979 :	000003	R3=%3	: GENERAL PURPOSE REGISTER 3
1980 :	000004	R4=%4	: GENERAL PURPOSE REGISTER 4
1981 :	000005	R5=%5	: GENERAL PURPOSE REGISTER 5
1982 :	000006	SP=%6	: STACK POINTER (REGISTER R6)
1983 :	000007	PC=%7	: PROGRAM COUNTER (REGISTER R7)

1986 ;SYMBOL DEFINITIONS

1988 :	177776	PS=177776	: PROCESSOR STATUS REGISTER
1989 :	177570	SWR=177570	: FRONT PANEL SWITCH REGISTER
1990 :	000000	PR0=0*40	: PRIORITY LEVEL 0
1991 :	000040	PR1=1*40	: PRIORITY LEVEL 1
1992 :	000100	PR2=2*40	: PRIORITY LEVEL 2
1993 :	000140	PR3=3*40	: PRIORITY LEVEL 3
1994 :	000200	PR4=4*40	: PRIORITY LEVEL 4
1995 :	000240	PR5=5*40	: PRIORITY LEVEL 5
1996 :	000300	PR6=6*40	: PRIORITY LEVEL 6
1997 :	000340	PR7=7*40	: PRIORITY LEVEL 7
1998 :	000001	BIT0=000001	
1999 :	000002	BIT1=000002	
2000 :	000004	BIT2=000004	
2001 :	000010	BIT3=000010	
2002 :	000020	BIT4=000020	
2003 :	000040	BIT5=000040	
2004 :	000100	BIT6=000100	
2005 :	000200	BIT7=000200	
2006 :	000400	BIT8=000400	
2007 :	001000	BIT9=001000	
2008 :	002000	BIT10=002000	
2009 :	004000	BIT11=004000	
2010 :	010000	BIT12=010000	
2011 :	020000	BIT13=020000	
2012 :	040000	BIT14=040000	
2013 :	100000	BIT15=100000	

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DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 43
 DDBMAA.P11 MAINDEC-11-DDBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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2015      ;BM873-YD      - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17) MACY11 27(657) 18-DEC-74 11:59 PAGE 3
2016      ;BM873-YD.P11  BUTTON #1 - BOOTSTRAP USING THE PDP-11 SWITCH REGISTER
2017
2018
2019      ;      173000  ROMORG  =      173000      ;Set ROM origin to 773000
2020      ;      173000      . =ROMORG      ;BM873-YD occupies 773000-773777
2021
2022 004000 033727 ;173000 033727 BUTON1: BIT      @SWR,#BIT0      ;Is rightmost bit on?
2023 004002 177570 ;173002 177570
2024 004004 000001 ;173004 000001
2025 004006 001010 ;173006 001010      BNE      LOWBIT      ;If the bit is on, branch
2026 004010 013707 ;173010 013707      MOV      @SWR,PC      ;Jump to the address in the switch register
2027 004012 177570 ;173012 177570
2028
2029
2030 004014 111704 ;173014 111704 BUTON3: MOVB      (PC),R4      ;R4 = 1 indicates that button #3 was pressed
2031 004016 005001 ;173016 005001      CLR      R1      ;Set unit number to zero
2032 004020 005005 ;173020 005005      CLR      R5      ;Clear "logical switch register"
2033 004022 000424 ;173022 000424      BR      TCBOOT      ;Do a default boot strap from DECTape
2034
2035 004024 173000 ;173024 173000      .WORD      ROMORG,PR7
2036 004026 000340 ;173026 000340
2037
2038 004030 013701 ;173030 013701 LOWBIT: MOV      @SWR,R1      ;R1 is a copy of the switch register
2039 004032 177570 ;173032 177570
2040 004034 106301 ;173034 106301      ASLB      R1      ;Left-align speed field in right byte
2041 004036 122701 ;173036 122701      CMPB      #16*20,R1      ;Is the speed 16 or 17?
2042 004040 000340 ;173040 000340
2043 004042 101404 ;173042 101404      BLOS      UNITNO      ;If speed is 16 or 17, branch
2044 004044 122701 ;173044 122701      CMPB      #3*20,R1      ;Is the speed 0, 1, or 2?
2045 004046 000060 ;173046 000060
2046 004050 101001 ;173050 101001      BHI      UNITNO      ;If the speed is 0, 1, or 2, branch
2047 004052 005001 ;173052 005001      CLR      R1      ;Speed was 3-15; set unit number = 0
2048 004054 000301 ;173054 000301 UNITNO: SWAB      R1      ;Move unit number to bits 0-2
2049
2050      ; It is possible to manually set the desired bootstrap unit number
2051      ; into the rightmost three bits of R1, set the PDP-11 front panel
2052      ; switch register, and then jump into the ROM code at this point.
2053
2054 004056 042701 ;173056 042701      BIC      #7,R1      ;Isolate unit number in R1
2055 004060 177770 ;173060 177770
2056 004062 013705 ;173062 013705      MOV      @SWR,R5      ;R5 is now the "logical switch register"
2057 004064 177570 ;173064 177570
2058 004066 005004 ;173066 005004      CLR      R4      ;R4 = 0 indicates that button #1 was pressed
2059 004070 105705 ;173070 105705      TSTB      R5      ;Should we boot from DECTape or RH11/RP04?
2060 004072 100507 ;173072 100507      BMI      RPBOOT      ;If bit 7 was one, branch off to the RH11/RP04
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F04

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 44
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

2062 :BM873-YD - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17) MACY11 27(657) 18-DEC-74 11:59 PAGE 4
 2063 :BM873-YD.P11 DECTAPE BOOTSTRAP AND DUMP ROUTINES

```

2064
2065
2066 :      177344 TCWC      =      177344      ;TC11 DECTape word count register
2067 :      000001 TCGO      =      1          ;TC11 "GO" bit
2068 :      000002 TCRNUM     =      1*2        ;TC11 "read block number" function
2069 :      000004 TCREAD     =      2*2        ;TC11 "read data" function
2070 :      000014 TCWRIT     =      6*2        ;TC11 "write data" function
2071 :      004000 TCREV      =      4000       ;Move DECTape in reverse direction
2072
2073 :      : Bootstrap (from DECTape) Parameters
2074 :      000400 TCBWDC     =      10256      ;Word count for the secondary bootstrap
2075 :      000000 TCBEND     =      0          ;Which end of the DECTape (0 = front; 1 = back)
2076
2077 :      : Dump (to DECTape) Parameters
2078 :      070000 TCDWDC     =      1028672    ;Word count for the core dump to DECTape
2079 :      000001 TCDEND     =      1          ;Which end of the DECTape (0 = front; 1 = back)
2080
2081 :      : General (Bootstrap and Dump) DECTape Parameter
2082 :      000024 TCRTY      =      1020      ;Number of retries in case of error
2083
2084 004074 012700 :173074 012700 TCB00T: MOV      *(<TCBEND*TCREV>)!TCREAD!TCGO,R0 ;Set up data-transfer command
2085 004076 000005 :173076 000005      MOV      *-TCBWDC,R2      ;Set word count to 256 (512 bytes)
2086 004100 012702 :173100 012702      MOV      *(<<1-TCBEND>*TCREV>)!TCRNUM!TCGO,R3 ;Set up position command
2087 004102 177400 :173102 177400
2088 004104 012703 :173104 012703
2089 004106 004003 :173106 004003
2090 004110 000301 :173110 000301      SWAB      R1          ;Bring unit number into the left byte
2091 004112 050103 :173112 050103      BIS      R1,R3          ;Put unit number into positioning command
2092 004114 050100 :173114 050100      BIS      R1,R0          ;Put unit number into data-transfer command
2093 004116 012701 :173116 012701 TCB00T: MOV      *TCWC,R1          ;R1 now points to TC11 word count register
2094 004120 177344 :173120 177344
2095 004122 012706 :173122 012706 TCB00T: MOV      *TCRTY,SP      ;Initialize retry count in SP
2096 004124 000024 :173124 000024
2097 004126 005705 :173126 005705 TCBGIN: TST      RS          ;Test "indefinite retry" bit
2098 004130 100404 :173130 100404      BMI      TCRSET      ;Branch if "indefinite retry" is enabled
2099 004132 005306 :173132 005306      DEC      SP          ;Decrement retry count
2100 004134 100002 :173134 100002      BPL      TCRSET      ;Branch if retry count not exhausted
2101 004136 000000 :173136 000000 TCHALT: HALT          ;Retry count is exhausted for DECTape operation
2102 004140 000770 :173140 000770      BR      TCLOOP      ;He pressed "CONTINUE", so try again
2103 004142 000005 :173142 000005 TCRSET: RESET      ;Stop anything in progress, for next try
2104 004144 010341 :173144 010341      MOV      R3,-(R1)    ;Initiate DECTape positioning operation
2105 004146 005711 :173146 005711 TCHAIT: TST      (R1)      ;Test for an "ERROR"
2106 004150 100376 :173150 100376      BPL      TCWAIT      ;Loop until an "ERROR" is detected
2107 004152 005721 :173152 005721      TST      (R1)+      ;Make R1 point to the word count register
2108 004154 005761 :173154 005761      TST      -4(R1)      ;Is the error "ENDZONE"?
2109 004156 177774 :173156 177774
2110 004160 100362 :173160 100362      BPL      TCBGIN      ;If not, branch back to try again
2111 004162 010211 :173162 010211      MOV      R2,(R1)      ;Set up word count for data-transfer
2112 004164 010041 :173164 010041      MOV      R0,-(R1)    ;Initiate the data-transfer operation
2113 004166 105711 :173166 105711 TCDONE: TSTB      (R1)      ;Test for "DONE"
2114 004170 100376 :173170 100376      BPL      TCDONE      ;Loop until the "DONE" bit sets
2115 004172 005721 :173172 005721      TST      (R1)+      ;Was an "ERROR" detected?
2116 004174 100754 :173174 100754      BMI      TCBGIN      ;If so, branch back and try again
2117 004176 005741 :173176 005741      TST      -(R1)      ;Make R1 point to the command register

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G04

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 45
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

2118	004200	105011	:173200	105011	CLRB	(R1)	;Stop all DECtape motion
2119	004202	122700	:173202	122700	CMPB	#TCREAD!TCGO,RO	;Was this a "normal read" operation?
2120	004204	000005	:173204	000005			
2121	004206	001001	:173206	001001	BNE	TCSTOP	;If not, go stop
2122	004210	000137	:173210	000137	GOTO0: JMP	2(PC)+	;Jump to PDP-11 location zero
2123	004212	000000	:173212	000000	TCSTOP: HALT		;Successful completion of a "non-read" operation
2124	004214	000776	:173214	000776	BR	TCSTOP	;So that pressing "CONTINUE" won't go anywhere

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2125      ;BM873-YD      - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17)  MACY11 27(657) 18-DEC-74 11:59 PAGE 5
2126      ;BM873-YD.P11  DECTAPE BOOTSTRAP AND DUMP ROUTINES
2127
2128 004216 010037 ;173216 010037 TCDUMP: MOV      RO,2#ROTOR7      ;Save RO in PDP-11 memory location 40
2129 004220 000040 ;173220 000040
2130 004222 000402 ;173222 000402      BR      TCCONT      ;Branch around required interrupt vector
2131
2132 004224 173000 ;173224 173000      .WORD  ROMORG,PR7
2133 004226 000340 ;173226 000340
2134
2135 004230 010700 ;173230 010700 TCCONT: MOV      PC,RO      ;Use RO for a subroutine return address
2136 004232 000410 ;173232 000410      BR      REGSAV      ;Go to the "Register Saving" subroutine
2137 004234 012700 ;173234 012700      MOV      2(TCDEND*TCREV)!TCWRT!TCGO,RO ;Set up (write) transfer command
2138 004236 004015 ;173236 004015
2139 004240 012702 ;173240 012702      MOV      2-TCDWDC,R2      ;Set word-count to 28K words
2140 004242 110000 ;173242 110000
2141 004244 012703 ;173244 012703      MOV      2<<1-TCDEND>*TCREV)!TCRNUM!TCGO,R3      ;Set up position command
2142 004246 000003 ;173246 000003
2143 004250 005005 ;173250 005005      CLR      R5      ;Clear "indefinite retry" bit
2144 004252 000721 ;173252 000721      BR      TCSTRT      ;Branch into DECTape routine
2145
2146
2147
2148
2149      ; The following subroutine is used to save the PDP-11 general registers
2150      ; in PDP-11 memory locations 40-57.
2151
2152      ; The calling sequence is as follows:
2153      ;
2154      ;
2155      ;
2156      ;
2157 004254 010137 ;173254 010137 REGSAV: MOV      R1,2#ROTOR7+2      ;Save R1 in memory location 42
2158 004256 000042 ;173256 000042
2159 004260 012701 ;173260 012701      MOV      2#ROTOR7+4,R1      ;R1 now points to memory location 44
2160 004262 000044 ;173262 000044
2161 004264 010221 ;173264 010221      MOV      R2,(R1)+      ;Save R2 in memory location 44
2162 004266 010321 ;173266 010321      MOV      R3,(R1)+      ;Save R3 in memory location 46
2163 004270 010421 ;173270 010421      MOV      R4,(R1)+      ;Save R4 in memory location 50
2164 004272 010521 ;173272 010521      MOV      R5,(R1)+      ;Save R5 in memory location 52
2165 004274 010621 ;173274 010621      MOV      SP,(R1)+      ;Save SP in memory location 54
2166 004276 010021 ;173276 010021      MOV      RO,(R1)+      ;Save PC in memory location 56
2167 004300 000160 ;173300 000160      JMP      2(RO)      ;Return to the calling routine
2168 004302 000002 ;173302 000002
2169

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BM873-YD - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17) MACY11 27(657) 18-DEC-74 11:59 PAGE 6
 BM873-YD.P11 RH11/RP04 BOOTSTRAP AND DUMP ROUTINES

2170	:	176700	RPCS1	=	176700	:Address of RH11/RP04 Control & Status register 1
2171	:	000002	RPWC	=	2	:Offset to RH11/RP04 Word Count register
2172	:	000006	RPDA	=	6	:Offset to RH11/RP04 Track & Sector Address register
2173	:	000010	RPCS2	=	10	:Offset to RH11/RP04 Control & Status register 2
2174	:	000012	RPDS	=	12	:Offset to RH11/RP04 Drive Status register
2175	:	000032	RPOF	=	32	:Offset to RH11/RP04 Offset register (CONTAINING FMT22)
2176	:	000034	RPDC	=	34	:Offset to RH11/RP04 Desired Cylinder register
2177	:	040000	RPTRE	=	BIT14	: "Transfer Error" bit in RPCS1
2178	:	020000	RPMCPE	=	BIT13	: "Massbus Control Bus Parity Error" bit in RPCS1
2179	:	004000	RPOVA	=	BIT11	: "Drive Available" bit in RPCS1
2180	:	100000	RPATA	=	BIT15	: "Attention Active" bit in RPDS
2181	:	040000	RPEER	=	BIT14	: "Composite Error" bit in RPDS
2182	:	010000	RPFMT	=	BIT12	: "FMT22" (16-bit words) bit in RPOF
2183	:	000021	RPPRST	=	21	: Read-in Preset
2184	:	000061	RPWRIT	=	61	: Write Data
2185	:	000071	RPREAD	=	71	: Read Data
2186	:	000000	RPBFMT	=	0	: Bootstrap format (0 = 18-bit words; 2 = 16-bit words)
2187	:	000400	RPBWDC	=	↑D256	: Word count for the secondary bootstrap from the RP04
2188	:	000626	RPBCYL	=	↑D406	: Bootstrap cylinder number
2189	:	000000	RPBTRK	=	0	: Bootstrap track number
2190	:	000000	RPBSCT	=	0	: Bootstrap sector number
2191	:	000000	RPDFMT	=	0	: Dump format (0 = 18-bit words; 2 = 16-bit words)
2192	:	070000	RPDWDC	=	↑D28672	: Word count for the core dump to the RP04
2193	:	000631	RPDCYL	=	↑D409	: Dump cylinder number
2194	:	000015	RPDTRK	=	↑D18-((RPDWDC-1)/((↑D20+RPDFMT)*↑D256))	: The following two assignments put the dump at the very end of the cylinder
2195	:	000010	RPOSCT	=	↑D19+RPDFMT-((RPDWDC-1)/↑D256)-((↑D18-RPDTRK)*↑D20+RPDFMT))	: Dump track number
2208	004304	111704	:173304	111704	BUTON2: MOV	(PC),R4 ;R4 = 5 indicates that button #2 was pressed
2209	004306	005005	:173306	005005	CLR	R5 ;Clear "logical switch register"
2210	004310	005001	:173310	005001	CLR	R1 ;Set unit number to zero
2212	004312	012700	:173312	012700	RPBOOT: MOV	#(RPREAD*400)! (RPBSCT*10),R0
2213	004314	034400	:173314	034400		
2214	004316	012702	:173316	012702	MOV	#-RPBWDC,R2
2215	004320	177400	:173320	177400		
2216	004322	012703	:173322	012703	MOV	#(RPBFMT*40000)! (RPBTRK*2000)! RPBCYL,R3
2217	004324	000626	:173324	000626		
2218	004326	050100	:173326	050100	BIS	R1,R0 ;Put the unit number into R0
2219	004330	012701	:173330	012701	RPSTRT: MOV	#RPCS1,R1 ;Set R1 to the lowest address used by the RH11
2220	004332	176700	:173332	176700		

2221 ;BM873-YD - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17) MACY11 27(657) 18-DEC-74 11:59 PAGE 7
 2222 ;BM873-YD.P11 RH11/RP04 BOOTSTRAP AND DUMP ROUTINES
 2223
 2224 004334 000005 ;173334 000005 RPL00P: RESET ;Reset in case of retry
 2225 004336 010006 ;173336 010006 MOV R0,SP ;Get the unit number into SP
 2226 004340 042706 ;173340 042706 BIC #17,SP ;Isolate the unit number
 2227 004342 177770 ;173342 177770
 2228 004344 010661 ;173344 010661 MOV SP,RP04(R1) ;Tell the RH11 the unit number
 2229 004346 000010 ;173346 000010
 2230 004350 032711 ;173350 032711 BIT #RPDVA,(R1) ;Try to seize this RP04 unit
 2231 004352 004000 ;173352 004000
 2232 004354 001767 ;173354 001767 BEQ RPL00P ;Branch if we haven't seized it
 2233 004356 012721 ;173356 012721 MOV #RPPRST,(R1)+ ;Do a "Read-In Preset" function
 2234 004360 000021 ;173360 000021
 2235 004362 010306 ;173362 010306 MOV R3,SP ;Get the cylinder number into SP
 2236 004364 042706 ;173364 042706 BIC #1777,SP ;Isolate the cylinder number
 2237 004366 176000 ;173366 176000
 2238 004370 010661 ;173370 010661 MOV SP,RPDC-2(R1) ;Tell the RP04 the cylinder number
 2239 004372 000032 ;173372 000032
 2240 004374 010306 ;173374 010306 MOV R3,SP ;Get the format bit and track number into SP
 2241 004376 100003 ;173376 100003 BPL RP0CONT ;Branch if 20 sector (18-bit words) format
 2242 004400 012761 ;173400 012761 MOV #RPFMT,RP0F-2(R1) ;Establish 22 sector (16-bit words) format
 2243 004402 010000 ;173402 010000
 2244 004404 000030 ;173404 000030
 2245 004406 006206 ;173406 006206 RP0CONT: ASR SP ;Right align the track
 2246 004410 006206 ;173410 006206 ASR SP ; number in the left byte
 2247 004412 105006 ;173412 105006 CLR8 SP ;Clear the right byte
 2248 004414 150006 ;173414 150006 BIS8 R0,SP ;Put the sector number into the right byte
 2249 004416 106006 ;173416 106006 ROR8 SP ;Right align the
 2250 004420 106206 ;173420 106206 ASR8 SP ; sector number in
 2251 004422 106206 ;173422 106206 ASR8 SP ; the right byte
 2252 004424 010661 ;173424 010661 MOV SP,RPDA-2(R1) ;Tell the RH11 the track and sector numbers
 2253 004426 000004 ;173426 000004
 2254 004430 010211 ;173430 010211 MOV R2,(R1) ;Tell the RH11 the word count
 2255 004432 010006 ;173432 010006 MOV R0,SP ;Get the function code into SP
 2256 004434 105006 ;173434 105006 CLR8 SP ;Clear the right byte
 2257 004436 000306 ;173436 000306 SWAB SP ;Right align the function code
 2258 004440 010641 ;173440 010641 MOV SP,-(R1) ;Tell the RP04 the function code
 2259 004442 105711 ;173442 105711 RPDONE: TSTB (R1) ;Test for RH11 "ready"
 2260 004444 100376 ;173444 100376 BPL RPDONE ;Loop, waiting for RH11 "ready"
 2261 004446 032711 ;173446 032711 BIT #RPTRE!RPMCPE,(R1) ;Test for RH11 error bits
 2262 004450 060000 ;173450 060000
 2263 004452 001330 ;173452 001330 BNE RPL00P ;If error, branch back for retry
 2264 004454 032761 ;173454 032761 BIT #RPA!RPERR,RPDS(R1) ;Test for RP04 error bits
 2265 004456 140000 ;173456 140000
 2266 004460 000012 ;173460 000012
 2267 004462 001324 ;173462 001324 BNE RPL00P ;If error, branch back for retry
 2268 004464 022706 ;173464 022706 CMP #RPREAD,SP ;Was the function a "normal read"?
 2269 004466 000071 ;173466 000071
 2270 004470 001250 ;173470 001250 BNE TCSTOP ;If not, branch to a HALT instruction
 2271 004472 022737 ;173472 022737 CMP #000240,0 ;Was "000240" read into location zero?
 2272 004474 000240 ;173474 000240
 2273 004476 000000 ;173476 000000
 2274 004500 001643 ;173500 001643 BEQ GOT00 ;If so, branch to location zero
 2275 004502 000000 ;173502 000000 ;"000240" was not read into location zero
 2276 004504 000641 ;173504 000641 BR GOT00 ;Branch to location zero

K04

DDBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 49
 DDBMAA.P11 MAINDEC-11-DDBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

2277						
2278						
2279	004506	010037	:173506	010037	RPDUMP: MOV	RO,2#ROTOR7 ;SAVE RO IN PDP-11 MEMORY LOCATION "ROTOR7"
2280	004510	000040	:173510	000040		
2281	004512	010700	:173512	010700	MOV	PC,RO ;USE RO FOR A SUBROUTINE RETURN ADDRESS
2282	004514	000657	:173514	000657	BR	REGSAV ;GO TO THE "REGISTER SAVING" SUBROUTINE
2283	004516	012700	:173516	012700	MOV	#<RPWRIT*400>!<RPDSCT*10>,RO
2284	004520	030500	:173520	030500		
2285	004522	012702	:173522	012702	MOV	#-RPDWDC,R2
2286	004524	110000	:173524	110000		
2287	004526	012703	:173526	012703	MOV	#<RPDFMT*40000>!<RPDTRK*2000>!RPDCYL,R3
2288	004530	032631	:173530	032631		
2289	004532	000676	:173532	000676	BR	RPSTRT
2290						

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2291      :BM873-YD      - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17)  MACY11 27(657) 18-DEC-74 11:59 PAGE 8
2292      :BM873-YD.P11 DTE20 DEVICE REGISTER AND BIT DEFINITIONS
2293
2294
2295      :      174400 DTEBAS=174400      ;BASE OF (FIRST) DTE20 DEVICE REGISTER BLOCK
2296      :      000040 DTESIZ=000040      ;SPACING BETWEEN CONSECUTIVE DTE20'S
2297      :      000004 DTEMAX=4            ;MAXIMUM NUMBER OF DTE20'S ON ONE PDP-11
2298
2299
2300      :                                ;OFFSETS FROM THE BASE OF THE DTE20 DEVICE REGISTER BLOCK
2301      :                                ;TO SPECIFIC 10/11 INTERFACE RAM LOCATIONS AND REGISTERS.
2302
2303      ; THE FIRST 12 REGISTERS ARE NOT INITIALIZED BY "INIT" (BECAUSE THEY ARE IN RAMS
2304      :      000000 DLYCNT=00            ;DELAY COUNT (ADDRESS XXXX00)
2305      :      000002 DEXWD3=02            ;DEPOSIT OR EXAMINE WORD 3 (ADDRESS XXXX02)
2306      :      000004 DEXWD2=04            ;DEPOSIT OR EXAMINE WORD 2 (ADDRESS XXXX04)
2307      :      000006 DEXWD1=06            ;DEPOSIT OR EXAMINE WORD 1 (ADDRESS XXXX06)
2308      :      000010 TENAD1=10            ;10 ADDRESS WORD 1 FOR DEX (ADDRESS XXXX10)
2309      :      000012 TENAD2=12            ;10 ADDRESS WORD 2 FOR DEX (ADDRESS XXXX12)
2310      :      000014 T010BC=14            ;T010 BYTE COUNT (ADDRESS XXXX14)
2311      :      000016 T011BC=16            ;T011 BYTE COUNT (ADDRESS XXXX16)
2312      :      000020 T010AD=20            ;T010 PDP11 MEMORY ADDRESS (ADDRESS XXXX20)
2313      :      000022 T011AD=22            ;T011 PDP11 MEMORY ADDRESS (ADDRESS XXXX22)
2314      :      000024 T010DT=24            ;T010 PDP11 DATA WORD (ADDRESS XXXX24)
2315      :      000026 T011DT=26            ;T011 PDP11 DATA WORD (ADDRESS XXXX26)
2316
2317      ; THE LAST 4 REGISTERS ARE INITIALIZED BY "INIT" (BECAUSE THEY ARE IN FLIP-FLOPS
2318      :      000030 DIAG1=30            ;DIAGNOSTIC WORD 1 (ADDRESS XXXX30)
2319      :      000032 DIAG2=32            ;DIAGNOSTIC WORD 2 (ADDRESS XXXX32)
2320      :      000034 STATUS=34            ;10/11 INTERFACE STATUS WORD (ADDRESS XXXX34)
2321      :      000036 DIAG3=36            ;DIAGNOSTIC WORD 3 (ADDRESS XXXX36)
2322
2323      ; THE FOLLOWING ARE THE ADDRESSES OF THE DTE20 INTERRUPT VECTORS
2324
2325      :      000774 DTEIV1=774            ;INTERRUPT VECTOR FOR DTE20 #1
2326      :      000770 DTEIV2=770            ;INTERRUPT VECTOR FOR DTE20 #2
2327      :      000764 DTEIV3=764            ;INTERRUPT VECTOR FOR DTE20 #3
2328      :      000760 DTEIV4=760            ;INTERRUPT VECTOR FOR DTE20 #4
2329
2330      ; Bit assignments for various DTE20 registers used by this ROM code
2331
2332
2333      ;BIT ASSIGNMENTS FOR T010BC
2334
2335      :      100000 INT11=BIT15            ;SET DONE AND INTERRUPT BOTH 10 AND 11
2336
2337      ;BIT ASSIGNMENTS FOR T011BC
2338
2339      :      100000 INT10=BIT15            ;SET DONE AND INTERRUPT BOTH 10 AND 11
2340      :      040000 ZSTOP=BIT14            ;STOP ON NULL (ZERO) CHARACTER
2341      :      020000 T011BM=BIT13            ;Byte size for To-11 byte transfers
2342
2343
2344

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M04

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 51

DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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2345      ;BM973-YD      - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17)  MACY11 27(657) 18-DEC-74 11:59 PAGE 9
2346      ;BM873-YD.P11  DTE20 DEVICE REGISTER AND BIT DEFINITIONS
2347
2348      ;BIT ASSIGNMENTS FOR DIAG2 (WRITE)
2349      ;      000100  DRESET=BIT6      ;PERFORM DIAGNOSTIC CLEAR
2350
2351      ;BIT ASSIGNMENTS FOR DIAG3 (READ)
2352      ;      000020  DUPE=BIT4      ;DATO UNIBUS parity error
2353      ;      000004  DURE=BIT2      ;DATO UNIBUS receive error
2354      ;      000002  NUPE=BIT1      ;NPR UNIBUS parity error
2355
2356      ;BIT ASSIGNMENTS FOR DIAG3 (WRITE)
2357
2358      ;      000020  CDD=BIT4      ;Clear DUPE and DURE error flags
2359      ;      000002  CNUPE=BIT1    ;Clear NUPE error flag
2360      ;      000001  T010BM=BIT0   ;Byte size for To-10 Byte transfer
2361
2362      ;BIT ASSIGNMENTS FOR STATUS (WRITE)
2363
2364      ;      100000  DON10S=BIT15   ;SET T010 DONE
2365      ;      040000  DON10C=BIT14   ;CLEAR T010 DONE
2366      ;      020000  ERR10S=BIT13   ;SET T010 ERROR
2367      ;      010000  ERR10C=BIT12   ;CLEAR T010 ERROR
2368      ;      004000  INT11S=BIT11   ;Ring the PDP-11's doorbell (interrupts the -11)
2369      ;      002000  INT11C=BIT10   ;Stop ringing the PDP-11's doorbell
2370      ;      001000  PERCLR=BIT9    ;CLEAR -11 MEMORY PARITY ERROR
2371      ;      000400  INT10S=BIT8    ;Ring the PDP-10's doorbell (interrupts the -10)
2372      ;      000200  DON11S=BIT7    ;SET T011 DONE
2373      ;      000100  DON11C=BIT6    ;CLEAR T011 DONE
2374      ;      000040  INTRON=BIT5     ;Enable DTE20 interrupts to the -11
2375      ;      000020  EBUSPC=BIT4    ;Clear "EBUS parity error"
2376      ;      000010  INTROF=BIT3    ;Disable the PDP-11 interrupts
2377      ;      000004  EBUSPS=BIT2    ;SET "EBUS parity error"
2378      ;      000002  ERR11S=BIT1    ;SET T011 ERROR
2379      ;      000001  ERR11C=BIT0    ;CLEAR T011 ERROR
2380
2381      ;BIT ASSIGNMENTS FOR STATUS (READ)
2382
2383      ;      100000  T010DN=BIT15   ;T010 DONE
2384      ;      020000  T010ER=BIT13   ;TO 10 ERROR (NPR TIMEOUT OR BUS ERROR)
2385      ;      010000  RAMISO=BIT12   ;RAM word read is all zeros
2386      ;      004000  T011DB=BIT11   ;1 = the PDP11's doorbell is ringing
2387      ;      002000  DXWRD1=BIT10   ;DEPOSIT OR EXAMINE WORD ONE
2388      ;      001000  MPE11=BIT9     ;Parity error within PDP-11 memory
2389      ;      000400  T010DB=BIT8    ;1 = the PDP-10's doorbell is ringing
2390      ;      000200  T011DN=BIT7    ;T011 DONE
2391      ;      000100  EBSEL=BIT6     ;E BIJFFER SELECT
2392      ;      000040  NULSTP=BIT5    ;NULL STOP
2393      ;      000020  BPARER=BIT4    ;EBUS parity error
2394      ;      000010  RSTRCT=BIT3    ;This PDP-11 is "RESTRICTED"
2395      ;      000004  DEXDON=BIT2    ;DEPOSIT OR EXAMINE DONE
2396      ;      000002  T011ER=BIT1    ;TO 11 ERROR (NPR TIMEOUT OR BUS ERROR)
2397      ;      000001  INTSON=BIT0    ;DTE20 interrupts (to the -11) are enabled

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2398 ;BM873-YD - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17) MACY11 27(657) 18-DEC-74 11:59 PAGE 1
 2399 ;BM873-YD.P11 PROCEDURE BY WHICH THE PDP-10 BOOTSTRAPS AND/OR DUMPS THE PDP-11

The following is the procedure which the KL10 executes in order to dump and/or bootstrap the PDP-11 through the DTE20:

1. Clear the DTE20 and initiate a BM873 button #4 bootstrap operation
 - CONO [SR11B!CL11PT!CLT011!CLT010!PILDEN]
2. Wait to see PDP-11 power fail (AC LOW = true) - CONI [DEAD11] = 1
3. Wait to see PDP-11 power recover (AC LOW = false) - CONI [DEAD11] = 0
4. Wait at least another 150 milliseconds and then clear the reload -11 button
 - CONO [CR11B]
5. Set byte counter to a special code (1365 octal) - DATA0 [1365]
6. Ring PDP-11's doorbell - CONO [TO11DB]
7. Wait until "-10 ringing -11's doorbell" is turned off by the -11
 (i.e. until CONI [TO11DB] becomes zero).
8. Enable the DTE20 to use PI 0 interrupts
 (i.e. set CONO [PILDEN!PIOENB]).
9. Set up the To-10 byte pointer (in the EPT) for the first 3.5K.
10. Set up the byte counter for the first 3.5K, indicating
 "interrupt -10 only" - DATA0 [1000]
11. Wait for "TO-10 done" or "To-10 error" - CONI [TO10DN!TO10ER]
12. Note whether there was an error (CONI [TO10ER]) and then turn off
 TO10DN and TO10ER - CONO [CLT010]. If error, go to step 17.
13. If end of 28K, go to step 17.
14. Set up To-10 byte pointer (in the EPT) for the next 3.5K.
15. Set up the byte counter for the next 3.5K indicating
 "interrupt -10 only" (DATA0 [1000]), unless this is the
 last 3.5K (of 28K), in which case indicate "interrupt
 both processors" (DATA0 [TO10IB!1000]).
16. Go to step 11.

:BM873-YD - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17) MACY11 27(657) 18-DEC-74 11:59 PAGE 1
 :BM873-YD.P11 PROCEDURE BY WHICH THE PDP-10 BOOTSTRAPS AND/OR DUMPS THE PDP-11

17. Set up To-11 byte pointer (in the EPT) for "PDP-11 bootstrap".
 Note that the first word of this "PDP-11 bootstrap" must be the bit pattern 000240 (a PDP-11 NOP instruction).
18. Ring the PDP-11's doorbell - CONO [TO11DB]
19. Wait for either TO11DB to go off (CONI[TO11DB] = 0),
 or TO10DB to come on (CONI[TO10DB] = 1).
20. If no error was noted in step 12, TO11DB should go off
 (TO10DB coming on indicates a massive screwup).
 If an error was noted in step 12, TO11DB going off indicates
 that the error was "non-fatal" (non-ex-mem or -11 memory
 parity) and the -11 is proceeding. TO10DB coming on indicates
 that the error was "fatal" and the -11 is HALTED AT LOCATION 173714.
 In this latter case the -10 must restart from step 1.
21. If TO11DB went off, wait for "To-11 done" or "To-11 error"
 - CONI [TO11DN!TO11ER]
22. Note whether there was an error - CONI [TO11ER]
23. Turn off TO11DN and TO11ER and ring the PDP-11's doorbell
 - CONO [TO11DB!CLTO11]
24. Wait for either TO11DB to go off (CONI[TO11DB] = 0),
 or TO10DB to come on (CONI[TO10DB] = 1).
25. TO11DB going off indicates that the PDP-11 found no errors
 and is transferring control to the code which was just
 received from the -10. In this case the -10 should start
 following the protocol of this code.
26. TO10DB coming on indicates that the PDP-11 has found an
 error (or that the first word transmitted wasn't the
 bit pattern 000240), and the PDP-11 is HALTED AT LOCATION 173766.
 In this case the -10 must restart from step 1.

C05

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 54
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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2499      ;BM873-YD      - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17)  MACY11 27(657) 18-DEC-74 11:59 PAGE 1
2500      ;BM873-YD.P11  BUTTON #4 - BOOTSTRAP INITIATED BY THE PDP-10 (THROUGH DTE20)
2501
2502
2503      ;      000130 DTECOR =      130      ;Core address into which to store DTE20 regs.
2504      ;      000014 DTEREG =      12      ;Number of DTE20 registers to store
2505      ;      000400 DTEWDC =      256      ;Word count for secondary bootstrap from the -10
2506      ; ENTER HERE WHEN THE DTE20 PASSES BUTTON #4 (BOOTSTRAP INITIATED
2507      ; BY THE PDP-10, THROUGH THE DTE20)
2508 004534 010037 ;173534 010037 BUTON4: MOV      R0,R0TOR7      ;SAVE R0 IN PDP-11 MEMORY LOCATION "ROTOR7"
2509 004536 000040 ;173536 000040
2510 004540 010700 ;173540 010700      MOV      PC,R0      ;USE R0 FOR A SUBROUTINE RETURN ADDRESS
2511 004542 000644 ;173542 000644      BR      REGSAV      ;GO TO THE "REGISTER SAVING" SUBROUTINE
2512 004544 005005 ;173544 005005      CLR      R5      ;SET R5 = 0
2513 004546 012501 ;173546 012501      MOV      (R5)+,R1      ;SAVE LOCATION 0 IN R1
2514 004550 012503 ;173550 012503      MOV      (R5)+,R3      ;SAVE LOCATION 2 IN R3
2515 004552 012504 ;173552 012504      MOV      (R5)+,R4      ;SAVE LOCATION 4 IN R4
2516 004554 011500 ;173554 011500      MOV      (R5),R0      ;SAVE LOCATION 6 IN R0
2517 004556 012715 ;173556 012715      MOV      #PR7,(R5)      ;SET UP PRIORITY FOR NON-EX-MEM TRAP
2518 004560 000340 ;173560 000340
2519 004562 005745 ;173562 005745      TST      -(R5)      ;SET R5 = 4
2520 004564 012702 ;173564 012702 10$: MOV      #DTEBAS-DTESIZ,R2
2521 004566 174340 ;173566 174340
2522 004570 010715 ;173570 010715      MOV      PC,(R5)      ;STORE ADDRESS FOR NON-EX-MEM TRAP
2523 004572 010506 ;173572 010506      MOV      R5,SP      ;SET STACK POINTER = 4
2524 004574 062702 ;173574 062702 11$: ADD      #DTESIZ,R2      ;R2 POINTS TO THE NEXT DTE20
2525 004576 000040 ;173576 000040
2526 004600 105702 ;173600 105702      TSTB     R2
2527 004602 100770 ;173602 100770      BMI      10$      ;START LOOKING FROM THE BEGINNING AGAIN
2528 004604 032762 ;173604 032762      BIT      #T011DB,STATUS(R2)      ;Is this -10 ringing the -11's doorbell?
2529 004606 004000 ;173606 004000
2530 004610 000034 ;173610 000034
2531 004612 001770 ;173612 001770      BEQ      11$      ;If it is not, go look for another -10
2532 004614 026217 ;173614 026217      CMP      T010BC(R2),(PC)      ;CHECK FOR A CODE (1365) FROM THE PDP-10
2533 004616 000014 ;173616 000014
2534      ;INDICATING THAT IT WANTS TO BOOTSTRAP THE -11
2535 004620 001365 ;173620 001365      BNE      11$
2536      ; NOTE THAT AT THIS POINT R2 CONTAINS THE ADDRESS OF THE DEVICE REGISTER
2537      ; BLOCK FOR THIS DTE20, THAT R5 = 4, AND THAT SP = 4
2538 004622 005725 ;173622 005725      TST      (R5)+      ;SET R5 = 6
2539 004624 010015 ;173624 010015      MOV      R0,(R5)      ;RESTORE THE CONTENTS OF LOCATION 6
2540 004626 010445 ;173626 010445      MOV      R4,-(R5)      ;RESTORE THE CONTENTS OF LOCATION 4
2541 004630 010345 ;173630 010345      MOV      R3,-(R5)      ;RESTORE THE CONTENTS OF LOCATION 2
2542 004632 010145 ;173632 010145      MOV      R1,-(R5)      ;RESTORE THE CONTENTS OF LOCATION 0
2543      ; Note: At this time R5 = 0. This fact will be used later.
2544 004634 012700 ;173634 012700      MOV      #DTECOR,R0      ;R0 = core address for storing DTE20 registers
2545 004636 000130 ;173636 000130
2546 004640 010204 ;173640 010204
2547 004642 012420 ;173642 012420 7$: MOV      R2,R4      ;Save the next DTE20 register in core
2548 004644 022700 ;173644 022700      MOV      (R4)+,(R0)+      ;Have we finished yet?
2549 004646 000160 ;173646 000160      CMP      #<DTEREG*2>+DTECOR,R0
2550 004650 101374 ;173650 101374      BHI      7$      ;Loop until we have finished

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D05

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 55
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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2551      ;BM873-YD      - KL10 (PDP-11) 256 WORD BOOTSTRAP ROM VERSION 2(17)  MACY11 27(657) 18-DEC-74 11:59 PAGE 1
2552      ;BM873-YD.P11  BUTTON #4 - BOOTSTRAP INITIATED BY THE PDP-10 (THROUGH DTE20)
2553      ;
2554      004652 010201 ;173652 010201      MOV      R2,R1      ;R1 = DTE20 DEVICE REGISTER BLOCK
2555      004654 062701 ;173654 062701      ADD      #DIAG2,R1
2556      004656 000032 ;173656 000032
2557      004660 012721 ;173660 012721      MOV      #DRESET,(R1)+      ;DO A "DIAGNOSTIC CLEAR" OF THE DTE20,
2558      004662 000100 ;173662 000100
2559      ; The above operation is necessary to clear the "byte count loaded" flag
2560      ; and simultaneously to turn off "-10 ringing -11's doorbell".
2561      004664 005012 ;173664 005012      CLR      (R2)      ;SET DTE20 FOR NO DELAY
2562      004666 005062 ;173666 005062      CLR      T010AD(R2)      ;START WRITING -11 MEMORY INTO THE -10.
2563      004670 000020 ;173670 000020
2564      004672 032711 ;173672 032711      6S:      BIT      #T011DB,(R1)      ;HAS THE -10 RUNG THE -11'S DOORBELL?
2565      004674 004000 ;173674 004000
2566      004676 001775 ;173676 001775      BEQ      6S      ;LOOP UNTIL IT HAS.
2567      004700 032762 ;173700 032762      BIT      #DUPE!DURE!NUPE,DIAG3(R2)      ;"Fatal" error?
2568      004702 000026 ;173702 000026
2569      004704 000036 ;173704 000036
2570      004706 001403 ;173706 001403      BEQ      8S      ;Branch if no "fatal" error
2571      004710 012711 ;173710 012711      MOV      #T010DB,(R1)      ;Signal "fatal" error to the PDP-10
2572      004712 000400 ;173712 000400
2573      004714 000000 ;173714 000000      2S:      HALT      ;Halt due to "fatal" error
2574      004716 012762 ;173716 012762      8S:      MOV      #DRESET,DIAG2(R2)      ;Reset after possible PDP-11
2575      004720 000100 ;173720 000100
2576      004722 000032 ;173722 000032
2577      ; memory parity error or non-ex-mem error, and also turn off
2578      ; "-10 ringing -11's doorbell".
2579      004724 005062 ;173724 005062      3S:      CLR      T011AD(R2)      ;START INPUTTING AT LOCATION 0
2580      004726 000022 ;173726 000022
2581      004730 012762 ;173730 012762      MOV      #INT10!<<-DTEWDC>&7777>,T011BC(R2)      ;READ IN 256 WORDS
2582      004732 107400 ;173732 107400
2583      004734 000016 ;173734 000016
2584      004736 032711 ;173736 032711      1S:      BIT      #T011DB,(R1)      ;HAS THE -10 RUNG THE -11'S DOORBELL?
2585      004740 004000 ;173740 004000
2586      004742 001775 ;173742 001775      BEQ      1S      ;LOOP UNTIL IT HAS.
2587      004744 132711 ;173744 132711      4S:      BITB     #T011DN:T011ER,(R1)      ;IS THE TRANSMISSION FINISHED?
2588      004746 000202 ;173746 000202
2589      004750 001775 ;173750 001775      BEQ      4S      ;LOOP UNTIL IT IS FINISHED
2590      004752 100003 ;173752 100003      BPL      5S      ;If "T011DN" isn't on, "T011ER" must be on
2591      004754 022715 ;173754 022715      CMP      #000240,(R5)      ;Check for bit pattern in location zero
2592      004756 000240 ;173756 000240
2593      004760 001403 ;173760 001403      BEQ      9S      ;Unless there is a "NOP" it is an error
2594      004762 012711 ;173762 012711      5S:      MOV      #T010DB,(R1)      ;Signal the -10 that there was an error
2595      004764 000400 ;173764 000400
2596      004766 000000 ;173766 000000      12S:     HALT      ;This error halt is because either "T011ER"
2597      ; is on, or because the bit pattern read into location zero wasn't "000240".
2598      004770 012762 ;173770 012762      9S:      MOV      #DRESET,DIAG2(R2)      ;Signal the -10 that everything is OK
2599      004772 000100 ;173772 000100
2600      004774 000032 ;173774 000032
2601      004776 END.YD:
2602      004776 000115 ;173776 000115      JMP      (R5)      ;Jump to location zero
2603      ;      000001      .END
  
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E05

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 56
DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

2604	005000	000177	MAP.YE:	.BLKW	127.
2605	005376	000001	END.YE:	.BLKW	1
2606	005400	000127	MAP.YF:	.BLKW	127
2607	005656	000001	END.YF:	.BLKW	1
2608	005660	000127	MAP.YG:	.BLKW	127
2609	006136	000001	END.YG:	.BLKW	1
2610	006140	000177	MAP.Y:	.BLKW	127.
2611	006536	000001	END.Y:	.BLKW	1
2612	006540	000177	MAP.YX:	.BLKW	127.
2613	007136	000001	END.YX:	.BLKW	1

F05

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 57
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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2614
2615
2616
2617
2618
2619 007140 005037 010222
2620 007144 005037 010212
2621 007150 012706 001200
2622 007154 013737 177570 010210
2623 007162 005037 015176
2624 007166 005037 001244
2625 007172 005037 000000
2626 007176 012737 007150 014652
2627 007204 012737 000006 000004
2628 007212 005037 000006
2629 007216 005037 014076
2630 007222 005737 000042
2631 007226 001563
2632 007230 013746 000004
2633 007234 012737 010226 000004
2634 007242 005737 173000
2635 007246 000240
2636 007250 012637 000004
2637 007254 023737 001400 173000
2638 007262 001034
2639 007264 013746 000004
2640 007270 012737 007312 000004
2641 007276 005737 173400
2642 007302 000240
2643 007304 012637 000004
2644 007310 000421
2645 007312 022626 65$:
2646 007314 012637 000004
2647 007320 012737 001400 010212
2648 007326 012737 001776 010214
2649 007334 012737 173376 010224
2650 007342 012737 000101 015020
2651 007350 000137 010434
2652 007354
2653 007354 023737 002000 173000 64$:
2654 007362 001016
2655 007364 012737 002000 010212
2656 007372 012737 002776 010214
2657 007400 012737 173776 010224
2658 007406 012737 000102 015020
2659 007414 000137 010434
2660 007420
2661 007420 023737 003000 173000 69$:
2662 007426 001036
2663 007430 013746 000004
2664 007434 012737 007460 000004
2665 007442 023737 003400 173400
2666 007450 001004
2667 007452 012637 000004
2668 007456 000404
2669 007460 022626

*****
***** INITIALIZATION AND START UP OF PROGRAM.
*****
RESTART: CLR INITFG ; INITIALIZE TO ASK WHICH TYPE
          CLR TABLE ; INITIALIZE TO ASK WHICH TYPE
START:    MOV #STACK, SP ; SET THE STACK POINTER
          MOV SWR, SAVSR1 ; SAVE THE SWITH REGISTER
          CLR LPTFLG ; SET FOR NON- LINE PRINTER OUTPUT
          CLR LSTERR ; CLEAR ERROR FLG REPORT
          CLR J#0 ; SET FOR UNEXPECTED TRAP TO ADD 0
          MOV #START, PRG.NO ; GET READY FOR PWR FAIL BEFORE FIRST TEST.
          MOV #6, J#4 ; SET TIME OUT TRAP VECTOR
          CLR J#6 ; SET TIME OUT STATUS TO 0
          CLR FLAG4 ; CLEAR TEST 4 INITIAL FLAG
          TST J#42 ; AM I RUNNING UNDER ACT-11??
          BEQ CONT ; BR IF *NOT* UNDER ACT-11!!
          MOV J#4, -(SP) ; SAV TRAP POINTER
          MOV #NOROM, J#4 ; PUT IN A NEW ONE
          TST J#173000 ; TRY TO READ THE ROM
          NOP ; WAIT FOR POSSIBLE TRAP
          MOV (SP)+, J#4 ; IF NO TRAP RESTORE POINTER
          CMP MAP.YA, J#173000 ; DOES 1ST WORD COMPARE?
          BNE 64$ ; CHECK NEXT MAP
          MOV J#4, -(SP) ; SAVE LOC 4
          MOV #65$, J#4 ; SET FOR TIMEOUT
          TST J#173400 ; READ FROM 173400
          NOP ; IF NO TIMEOUT, NOT YA
          MOV (SP)+, J#4 ; RESTORE LOC 4
          BR 64$
65$:      CMP (SP)+, (SP)+ ; ADJUST STACK
          MOV (SP)+, J#4 ; RESTORE LOC 4
          MOV #MAP.YA, TABLE ; 1ST MAP ADDR
          MOV #END.YA, ALLEND ; LAST MAP ADDR
          MOV #173376, LASTA ; LAST ROM ADDR
          MOV #000101, VERNON ; SET ROM TYPE
          JMP PRG1 ; START TEST 1
64$:      CMP MAP.YB, J#173000 ; DOES 1ST WORD COMPARE?
          BNE 69$ ; CHECK NEXT MAP
          MOV #MAP.YB, TABLE ; 1ST MAP ADDR
          MOV #END.YB, ALLEND ; LAST MAP ADDR
          MOV #173776, LASTA ; LAST ROM ADDR
          MOV #000102, VERNON ; SET ROM TYPE
          JMP PRG1 ; START TEST 1
69$:      CMP MAP.YC, J#173000 ; DOES 1ST WORD COMPARE?
          BNE 74$ ; CHECK NEXT MAP
          MOV J#4, -(SP) ; SAVE LOC 4
          MOV #76$, J#4 ; SET FOR TIMEOUT
          CMP MAP.YC+400, J#173400 ; IS IT YC?
          BNE 77$ ; BR IF NOT YC
          MOV (SP)+, J#4 ; RESTORE LOC 4
          BR 76$ ; YES IT IS A YC
76$:      CMP (SP)+, (SP)+ ; ADJUST STACK

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G05

 DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 58
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

2670	007462	012637	000004		775:	MOV	(SP)+,2#4	;RESTORE LOC 4
2671	007466	000416				BR	745	;CHECK NEXT MAP
2672	007470				785:	MOV	#MAP.YC, TABLE	;1ST MAP ADDR
2673	007470	012737	003000	010212		MOV	#END.YC, ALLEND	;LAST MAP ADDR
2674	007476	012737	003776	010214		MOV	#173776, LASTA	;LAST ROM ADDR
2675	007504	012737	173776	010224		MOV	#000103, VERNON	;SET ROM TYPE
2676	007512	012737	000103	015020		MOV	PRG1	;START TEST 1
2677	007520	000137	010434			JMP		
2678	007524				745:	CMP	MAP.YD, 2#173000	;DOES 1ST WORD COMPARE?
2679	007524	023737	004000	173000		BNE	795	;CHECK NEXT MAP
2680	007532	001016				MOV	#MAP.YD, TABLE	;1ST MAP ADDR
2681	007534	012737	004000	010212		MOV	#END.YD, ALLEND	;LAST MAP ADDR
2682	007542	012737	004776	010214		MOV	#173776, LASTA	;LAST ROM ADDR
2683	007550	012737	173776	010224		MOV	#000104, VERNON	;SET ROM TYPE
2684	007556	012737	000104	015020		MOV	PRG1	;START TEST 1
2685	007564	000137	010434			JMP		
2686	007570				795:	TYPE	,NMATCH	;NOT BM873YA OR B OR C OR D
2687	007570	104401	010326			HALT		
2688	007574	000000			CONT:	TST	INITFG	;IS THIS THE FIRST TIME START UP?
2689	007576	005737	010222			BNE	35	;BR IF NOT FIRST TIME HERE.
2690	007602	001123				COM	INITFG	;SET THE FLAG
2691	007604	005137	010222			BIT	#SW00, SWR	
2692	007610	032737	000001	177570		BNE	15	
2693	007616	001023			25:	TYPE	,BM873X	;TYPE THE QUESTION.
2694	007620	104401	011016			TSTB	#TKCSR	;WAIT FOR KEY TO BE HIT
2695	007624	105777	171354			BPL	-4	;KEEP WAITING
2696	007630	100375				KEY.TO.R2		;ECHO AND STRIP BIT 7
2697	007632	104406				CMP	#52, R2	;WAS * HIT??
2698	007634	022702	000052			BNE	645	;BR IF NO
2699	007640	001011				MOV	#MAP.Y., TABLE	;SET FOR START OF TABLE
2700	007642	012737	006140	010212		MOV	#END.Y., ALLEND	;SET END OF TABLE
2701	007650	012737	006536	010214		MOV	#173376, LASTA	;SET LAST ROM ADDR
2702	007656	012737	173376	010224		MOV		
2703	007664				645:	BR	45	
2704	007664	000402			15:	MOV	SWR, R2	
2705	007666	013702	177570		45:	CMP	#101, R2	;WAS A HIT??
2706	007672					BNE	655	;BR IF NO
2707	007672	022702	000101			MOV	#MAP.YA, TABLE	;SET FOR START OF TABLE
2708	007676	001011				MOV	#END.YA, ALLEND	;SET END OF TABLE
2709	007700	012737	001400	010212		MOV	#173376, LASTA	;SET LAST ROM ADDR
2710	007706	012737	001776	010214		MOV		
2711	007714	012737	173376	010224		MOV		
2712	007722				655:	CMP	#102, R2	;WAS B HIT??
2713	007722	022702	000102			BNE	665	;BR IF NO
2714	007726	001011				MOV	#MAP.YB, TABLE	;SET FOR START OF TABLE
2715	007730	012737	002000	010212		MOV	#END.YB, ALLEND	;SET END OF TABLE
2716	007736	012737	002776	010214		MOV	#173776, LASTA	;SET LAST ROM ADDR
2717	007744	012737	173776	010224		MOV		
2718	007752				665:	CMP	#103, R2	;WAS C HIT??
2719	007752	022702	000103			BNE	675	;BR IF NO
2720	007756	001011				MOV	#MAP.YC, TABLE	;SET FOR START OF TABLE
2721	007760	012737	003000	010212		MOV	#END.YC, ALLEND	;SET END OF TABLE
2722	007766	012737	003776	010214		MOV	#173776, LASTA	;SET LAST ROM ADDR
2723	007774	012737	173776	010224		MOV		
2724	010002				675:	CMP	#104, R2	;WAS D HIT??
2725	010002	022702	000104					

H05

DDBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 59
 DDBMAA.P11 MAINDEC-11-DDBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

2726	010006	001011			BNE	685		;BR IF NO
2727	010010	012737	004000	010212	MOV	#MAP.YD, TABLE		;SET FOR START OF TABLE
2728	010016	012737	004776	010214	MOV	#END.YD, ALLEND		;SET END OF TABLE
2729	010024	012737	173776	010224	MOV	#173776, LASTA		;SET LAST ROM ADDR
2730	010032				685:			
2731	010032	010237	015020		MOV	R2, VERSION		;STORE VERSION TYPE..
2732	010036	005737	010212		TST	TABLE		;HAS A MAP BEEN SELECTED?
2733	010042	001003			BNE	35		;BR IF OK...
2734	010044	104401	011050		TYPE	, BM.ERR		;TYPE ERROR
2735	010050	000663			BR	25		;GO AND GET CORRECT MAP.
2736	010052	104401	014234		35:	TYPE	, MSG3	;TYPE MESSAGE FOR TEST NUMBER
2737	010056	012704	000002		MOV	#2, R4		;SET FOR MAX 2 INPUTS FROM TTY
2738	010062	005003			X.X.:	CLR	R3	;CLEAR CHAR STORAGE
2739	010064	032737	000001	177570	BIT	#SW00, SWR		
2740	010072	001013			BNE	65		
2741	010074	105777	171104		15:	TSTB	0TKCSR	;WAIT FOR THE TTY KEY TO BE HIT
2742	010100	100375			BPL	15		;KEEP WAITING.
2743	010102	104406			KEY.TO.R2			;GO ECHO IT ;STRIP BIT 7 FROM IT
2744	010104	022702	000015		CMP	#15, R2		;WAS IT A CR???
2745	010110	001407			BEQ	25		;BR IF CR
2746	010112	005304			DEC	R4		;ONE MORE CHAR TO GO BEFOR ERROR
2747	010114	001431			BEQ	35		;IF R4=0 THEN ERROR
2748	010116	010203			MOV	R2, R3		;MOV THE CHAR TO R3
2749	010120	000765			BR	15		;GO WAIT FOR ANOTHER CHAR
2750	010122	000000			65:	HALT		
2751	010124	013703	177570		MOV	SWR, R3		
2752	010130	022703	000061		25:	CMP	#61, R3	;WAS 1 HIT??
2753	010134	001002			BNE	, +6		;BR IF NO
2754	010136	000137	010434		JMP	PRG1		;GOTO PRG 1
2755	010142	022703	000062		CMP	#62, R3		;WAS 2 HIT??
2756	010146	001002			BNE	, +6		;BR IF NO
2757	010150	000137	011116		JMP	PRG2		;GOTO PRG 2
2758	010154	022703	000063		CMP	#63, R3		;WAS 3 HIT??
2759	010160	001002			BNE	, +6		;BR IF NO
2760	010162	000137	012152		JMP	PRG3		;GOTO PRG3
2761	010166	022703	000064		CMP	#64, R3		;WAS 4 HIT??
2762	010172	001002			BNE	, +6		;BR IF NO
2763	010174	000137	013410		JMP	PRG4		;GOTO PRG 4
2764	010200	104401	014466		35:	TYPE	, M.QM	;NEITHER 1 OR 2 OR 3 OR 4 WAS HIT
2765	010204	000137	007140		JMP	RESTR		;TYPE "???" GO TO THE BEGINING.
2766	010210	000000			SAVSRI:	0		;SAVE THE SWR HERE.
2767	010212	000000			TABLE:	0		
2768	010214	000000			ALLEND:	0		
2769	010216	006540			EXTMAP:	MAP.YX		
2770	010220	007136			EXTEND:	END.YX		
2771	010222	000000			INITFG:	0		
2772	010224	000000			LASTA:	0		
2773	010226	104401	010236		NOROM:	TYPE	, NOROMS	;TYPE CAN'T FIND A RESPONSE
2774	010232	000000			HALT			;NO LOADER INSTALLED?
2775	010234	000776			BR	, -2		
2776	010236	005015	051124	050101	NOROMS:	.ASCII	<15><12>/TRAP TO 4 ON 1ST READ OF 173000/	
	010277	015	044412	020123		.ASCIZ	<15><12>/IS LOADER INSTALLED?/	
	010326	005015	040503	023516	NMATCH:	.ASCII	<15><12>/CAN'T IDENTIFY LOADER AS YA, YB, YC, OR YD AFTER/	
	010406	005015	046503	020120		.ASCIZ	<15><12>/CMP WITH LOC 173000/	
					.EVEN			

DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 60
 DDBMAA.P11 MAINDEC-11-DDDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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2777      ;PROGRAM 1
2778      ;THE PURPOSE OF PROGRAM 1 IS TO READ THE ROM AND
2779      ;VERIFY THAT THE DATA IS CORRECT. ALL ADDRESSES
2780      ;ARE READ, EXCEPT THE TRAP VECTOR, FIVE TIMES.
2781
2782      ;THE SECOND PART OF THIS TEST VERIFIES THAT TRYING
2783      ;TO WRITE THE ROM RESULTS IN A TIME OUT TRAP.
2784      ;ALL ADDRESS ARE WRITTEN WITH A -1
2785      ;,AND ARE EXPECTED TO TRAP.
2786
2787      010434 012777 014500 170552 PRG1:  MOV    #.KEY.TO.R2,ATKVEC
2788      010442 012777 000100 170534      MOV    #100,ATKCSR      ;SET INTERRUPT ENABLE
2789      010450 012737 010434 014652      MOV    #PRG1,PRG.NO      ;SET FOR PWR FAIL
2790      010456 012737 000500 001232      MOV    #500,ICOUNT      ;DO THIS TEST 500(8) TIMES.
2791      010464 012737 014654 000004 PRG.1: MOV    #NO.TRAP,2#4      ;SET FOR UNEXPECTED TRAP.
2792      010472 012700 173000      MOV    #173000,R0      ;SET BEGGINING ADDRESS
2793      010476 012737 010522 001230      MOV    #2$,LOCK      ;IF SW09=1; GOTO 2$ WHEN SCOP1 IS HIT
2794      010504 013704 010212      MOV    TABLE,R4      ;SET START OF MAP
2795      010510 013737 010224 011014      MOV    LASTA,LAST      ;SET LAST ADDRESS
2796      010516 012703 000005      1$:  MOV    #5,R3      ;DO EACH ADDRESS 5 TIMES.
2797      010522 022700 173024      2$:  CMP     #173024,R0      ;DON'T DO THE VECTOR ADD.
2798      010526 001001      BNE     .+4      ;BR IF NOT THE VECTOR ADD.
2799      010530 022024      CMP     (R0)+,(R4)+      ;UPDATE TO NEXT ADDRESS
2800      010532 022700 173224      CMP     #173224,R0      ;DON'T DO THE TRAP VECTORS
2801      010536 001001      BNE     .+4      ;NO THIS ISN'T A TRAP VECTOR.
2802      010540 022024      CMP     (R0)+,(R4)+      ;UPDATE THE POINTERS..
2803      010542 011005      MOV     (R0),R5      ;READ THE ADDRESS
2804      010544 011401      MOV     (R4),R1      ;READ THE SOFTWARE ADDRESS
2805      010546 020105      CMP     R1,R5      ;DO THEY MATCH?
2806      010550 001401      BEQ     .+4      ;BR IF GOOD
2807      010552 104001      HLT     1      ;INCORRECT COMPARISON.
2808      010554 032737 004000 177570      BIT     #BIT11,SWR      ;QUICK PASS.?
2809      010562 001002      BNE     .+6      ;BR IF YES
2810      010564 005303      DEC     R3      ;HAS THAT ADD BEEN READ 5 TIMES?
2811      010566 001355      BNE     2$      ;BR IF NOT 5 TIMES
2812      010570 023700 011014      CMP     LAST,R0      ;WAS LAST ADDRESS CHECKED?
2813      010574 001403      BEQ     .+10      ;BR IF YES
2814      010576 104400      SCOP1      ;LOCK ON THIS ADDRESS?
2815      010600 022024      CMP     (R0)+,(R4)+      ;UPDATE THE POINTERS.
2816      010602 000745      BR     1$      ;CONTINUE THE TEST.
2817      010604 032737 000002 010210      BIT     #BIT1,SAVSR1      ;EXTENDED WORD TO BE CHECKED?
2818      010612 001413      BEQ     3$      ;BR IF NO CHECKING.
2819      010614 022737 173776 011014      CMP     #173776,LAST      ;IS ALL THE TEST DONE?
2820      010622 001407      BEQ     3$      ;BR IF YES.
2821      010624 012737 173776 011014      MOV     #173776,LAST      ;SET LAST ADDRESS.
2822      010632 013704 010216      MOV     EXTMAP,R4      ;SET EXTENDED MAP.
2823      010636 005720      TST     (R0)+      ;POP POINTER
2824      010640 000726      BR     1$      ;GO DO THE TEST.

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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 61
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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2825 ;TEST THAT WRITTING ROM RESULTS IN A TIME OUT
2826 ;TRAP.
2827
2828 010642 012737 010666 001230 3$: MOV #5$,LOCK ;IF SW09=1 GOTO 5$ WHEN SCOP1 IS HIT
2829 010650 012700 173000 MOV #173000,RO ;SET RO WITH BASE ADDRESS OF ROM
2830 010654 012737 010716 000004 MOV #6$,2#4 ;SET FOR TIME OUT TRAP
2831 010662 012703 000005 4$: MOV #5$,R3 ;DO EACH ADD 5 TIMES
2832 010666 022700 173024 5$: CMP #173024,RO ;CHECK FOR A TRAP VECTOR
2833 010672 001001 BNE .+4 ;BR IF NOT VECTOR
2834 010674 005720 TST (RO)+ ;UPDATE THE REGISTER POINTER
2835 010676 022700 173224 CMP #173224,RO ;CHECK FOR THE OTHER VECTOR
2836 010702 001001 BNE .+4 ;BR IF NOT THE VECTOR
2837 010704 005720 TST (RO)+ ;UPDATE THE POINTER
2838 010706 012710 177777 MOV #-1,(RO) ;WRITE ROM WITH A -1
2839 010712 000240 NOP ;WAIT ONE INSTR. TIME
2840 010714 104002 HLT 2 ;WRITING ROM DIDN'T TIME OUT.
2841 010716 012706 001200 6$: MOV #STACK,SP ;RESTORE STACK
2842 010722 032737 004000 177570 BIT #BIT11,SWR ;QUICK PASS?
2843 010730 001002 BNE .+6
2844 010732 005303 DEC R3 ;DO EACH ADD 5 TIMES
2845 010734 001354 BNE 5$ ;NOT DONE WITH THIS ONE YET.
2846 010736 032737 000002 010210 BIT #BIT1,SAVSR1 ;EXTENDED 128. WORDS TO BE CHECKED?
2847 010744 001404 BEQ .+12 ;BR IF NO
2848 010746 022700 173776 CMP #173776,RO ;HAVE ALL 256. WORDS BEEN CHECKED?
2849 010752 001407 BEQ 7$ ;BR IF ALL DONE
2850 010754 000403 BR .+10 ;KEEP GOING
2851 010756 023700 010224 CMP LASTA,RO ;ALL DONE??
2852 010762 001403 BEQ 7$ ;HAVE ALL 128. WORDS DONE?
2853 010764 104400 SCOP1 ;CHECK SW09 FOR FREEZE!!
2854 010766 005720 TST (RO)+ ;UPDATE TO NEXT ADDRESS
2855 010770 000734 BR 4$ ;GO DO IT AGAIN
2856 010772 005337 001232 7$: DEC ICOUNT ;ITERATION COUNT DONE?
2857 010776 001004 BNE 8$ ;BR IF NOT DONE.
2858 011000 004737 014714 JSR PC,EOP ;TYPE END MESSAGE
2859 011004 000137 010434 JMP PRG1 ;GO DO IT AGAIN.
2860 011010 000137 010464 8$: JMP PRG.1 ;GO RESTART.
2861 011014 000000 LAST: 0
2862
2863 011016 005015 042504 044526 BM273X: .ASCII <15><12>/DEVICE VERSION/
011036 005015 046502 033470 .ASCIIZ <15><12>/BM873-Y/
011050 005015 026052 026101 BM.ERR: .ASCIIZ <15><12>/*,A,B,C,D ONLY./
011072 020040 053040 051105 VERS: .ASCIIZ / VERSION: BM873-Y/
.EVEN

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DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 62
 DDBMAA.P11 MAINDEC-11-DDDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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2864
2865
2866      ;PROGRAM 2
2867      ;BLIND READ FROM ROM.
2868      ;THIS PROGRAM WILL DUMP THE CONTENTS OF THE ROM OUT
2869      ;PERFORMING NO CHECKING AT ALL.
2870      ;PLEASE NOTE: NO CHECKING IS DONE.
2871      ;NOTE: HITTING "CONTROL "C"" RESTARTS AT TOP OF PROG.
2872      ;NOTE: IF YOU LEAVE SW07=1: THE DUMP WILL
2873      ;BE MADE ON THE LINE PRINTER
2874      ;IF IT EXISTS.
2875
2876 011116 012737 011116 014652 PRG2: MOV      #PRG2,PRG.NO      ;SET FOR POWER FAIL
2877 011124 012737 014654 000004      MOV      #NO.TRAP,2#4      ;SET FOR UNEXPECTED TRAP TO 4
2878 011132 013737 010224 011014      MOV      LAST, LAST
2879 011140 062737 000002 011014      ADD      #2, LAST
2880 011146 105737 177570      TSTB     SWR
2881 011152 100004      BPL      .+12      ;IF SW07=1: OUTPUT TABLE ON LPT
2882 011154 012737 177777 015176      MOV      #-1,LPTFLG      ;IF IT EXISTS. BR IF SW07=0
2883 011162 000402      BR       .+6      ;SET THE LPT FLAG
2884 011164 005037 015176      CLR      LPTFLG      ;BR TO TEST
2885 011170 012700 173000      MOV      #173000,R0      ;CLEAR THE LPT FLAG
2886 011174 012777 011464 170012      MOV      #45,ATKVEC      ;SET R0 WITH THE STARTING ROM ADD.
2887 011202 012777 000100 167774      MOV      #100,ATKCSR      ;SET TTY VECTOR FOR CONTROL C
2888 011210 013703 010212      MOV      TABLE,R3      ;SET TTY KYBD INTERRUPT EN.
2889 011214 104401 011512      TYPE     ,DH.2      ;SET POINTER.
2890 011220 104401 011612      TYPE     ,DH.2B      ;TYPE MESSAGE
2891 011224 012737 000007 001256 1$: MOV      #7,TEMP5      ;TYPE THE HEADER
2892 011232 011001      MOV      (R0),R1      ;SET COUNTER
2893 011234 010037 001252      MOV      R0,TEMP3      ;READ THE ROM
2894 011240 010137 001254      MOV      R1,TEMP4      ;STORE R0
2895 011244 022737 006140 010212      CMP      #MAP.Y.,TABLE      ;STORE R1
2896 011252 001001      BNE      .+4      ;IF BM873.Y* SELECTED; FILL TABLE
2897 011254 011023      MOV      (R0),(R3)+      ;BR IF NOT BM873.Y*
2898 011256 005720      TST      (R0)+      ;FILL THE TABLE..
2899 011260 104404      CONVRT      DT.2      ;POP THE POINTER
2900 011262 012132      DT.2      ;TYPE AND CONVERT NUMBERS
2901 011264 011001      MOV      (R0),R1      ;IN DATA TABLE 2
2902 011266 010037 001252 7$: MOV      R0,TEMP3      ;STORE ROM DATA
2903 011272 010137 001254      MOV      R1,TEMP4      ;STORE ROM ADDRESS
2904 011276 022737 006140 010212      CMP      #MAP.Y.,TABLE      ;PREPARE DATA FOR TYPE OUT
2905 011304 001001      BNE      .+4      ;IS BM873.Y* SELECTED?
2906 011306 011023      MOV      (R0),(R3)+      ;BR IF NO.
2907 011310 005720      TST      (R0)+      ;FILL THE DATA TABLE
2908 011312 104405      CNVRT      DT.2A      ;POP THE POINTER
2909 011314 012144      DT.2A      ;TYPE OUT MAP
2910 011316 023700 011014      CMP      LAST,R0 ;HAS THE HIGHEST LIMIT BEEN HIT?
2911 011322 001404      BEQ      2$      ;USE DATA TABLE 2A
2912 011324 005337 001256      DEC      TEMP5      ;BR IF ALL DONE.
2913 011330 001355      BNE      7$      ;DECREASE COUNTER
2914 011332 000734      BR       1$      ;BR IF NOT 0: KEEP GOING
2915 011334 032737 000002 010210 2$: BIT      #BIT1,SAVSR1      ;GO TYPE ADDRESS NOW
2916 011342 001442      BEQ      3$      ;IS THE EXTENDED 128. WORDS TO BE CHECKED??
2917 011344 012700 173400      MOV      #173400,R0      ;BR IF NO.
2918 011350 013703 010216      MOV      EXTMAP,R3      ;RESET POINTER OF ROM
2919 011354 104401 011725      TYPE     ,DH.2A      ;SET SOFTWARE MAP POINTER
                                ;TYPE NEW HEADER

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2920	011360	104401	011612			TYPE	DH.2B	;TYPE ADDRESS AND +XX
2921	011364	012737	000007	001256	6\$:	MOV	#7,TEMP5	;SET TYPE OUT COUNTER
2922	011372	011001				MOV	(R0),R1	;READ THE ROM
2923	011374	010037	001252			MOV	R0,TEMP3	;STORE R0
2924	011400	010137	001254			MOV	R1,TEMP4	;STORE R1
2925	011404	012023				MOV	(R0)+,(R3)+	;STORE THE DATA IN SOFTWARE MAP
2926	011406	104404				CONVRT		;TYPE AND CONVERT NUMBERS
2927	011410	012132				DT.2		;IN DATA TABLE 2
2928	011412	011001			8\$:	MOV	(R0),R1	;SAVE THE ROM DATA
2929	011414	010037	001252			MOV	R0,TEMP3	;SAVE THE ROM ADDRESS
2930	011420	010137	001254			MOV	R1,TEMP4	;SET DATA FOR TYPE OUT
2931	011424	104405				CNVRT		;TYPE OUT THE TABLE.
2932	011426	012144				DT.2A		;FIND DATA THROUGH DATA TABLE 2A
2933	011430	012023				MOV	(R0)+,(R3)+	;STORE THE DATA IN SOFTWARE TABLE
2934	011432	022700	174000			CMP	#174000,R0	;HAS THE HIGHEST LIMIT BEEN HIT?
2935	011436	001404				BEQ	3\$	;BR IF ALL DONE.
2936	011440	005337	001256			DEC	TEMP5	;DEC TABLE COUNTER
2937	011444	001362				BNE	8\$	;BR TO JUST TYPE DATA
2938	011446	000746				BR	6\$	;BR TO TYPE ADDRESS
2939	011450	104401	014473		3\$:	TYPE	MCRLF	;DUMP LAST LINE FROM LPT.
2940	011454	005000				CLR	R0	;CLEAR DATA LIGHTS
2941	011456	000000				HALT		;HIT CONTINUE TO PROCEED.
2942	011460	000137	011116			JMP	PRG2	;GOTO PRG 2
2943							;ENTER BY KYBD INTERRUPT.	
2944	011464	104406			4\$:	KEY.TO.R2		;ECHO KEY
2945	011466	022702	000003			CMP	#3,R2	;WAS CONTROL C HIT
2946	011472	001006				BNE	5\$	;BR IF NO
2947	011474	005037	015176			CLR	LPTFLG	;STOP PRINTING ON LPT
2948	011500	104401	013362			TYPE	MC	;TYPE +C
2949	011504	012716	011116			MOV	#PRG2,(SP)	;SET FOR RETURN
2950	011510	000002			5\$:	RTI		;LEAVE THIS ROUTINE
2951								
2952	011512	006414	005012	016412	DH.2:	.ASCII	<14><15><12><12><12><35><37><177><177><177>/BLIND READ OF ROM/	
	011545	015	006412	077577		.ASCII2	<15><12><15><177><177>/NOTE: NO CHECKING IS PERFORMED./	
	011612	005015	040412	042104	DH.2B:	.ASCII	<15><12><12>/ADDRESS ADD+00 ADD+02 ADD+04/	
	011654	020040	042101	025504		.ASCII2	/ ADD+06 ADD+10 ADD+12 ADD+14 ADD+16/	
	011725	015	005012	054105	DH.2A:	.ASCII	<15><12><12>/EXTENDED 128. WORD ROM DUMP./	
	011764	005015	047503	052116		.ASCII	<15><12>/CONTENTS DUMPED IS PLACED IN THE SOFTWARE/	
	012037	015	046412	050101		.ASCII	<15><12>/MAP. VISUAL INSPECTION OF DATA IS/	
	012102	005015	047531	051125		.ASCII2	<15><12>/YOUR RESPONSIBILITY!!/	
					EVEN			
2953	012132	000002			DT.2:	2		
2954	012134	206	003			.BYTE	206,3	
2955	012136	001252				TEMP3		
2956	012140	006	002			.BYTE	6,2	
2957	012142	001254				TEMP4		
2958								
2959	012144	000001			DT.2A:	1		
2960	012146	006	002			.BYTE	6,2	
2961	012150	001254				TEMP4		

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DDBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 64
 DDBMAA.P11 MAINDEC-11-DDBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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012152	005037	015176	
012156	012737	012152	014652
012164	012777	012224	167022
012172	013701	010212	
012176	010137	013406	
012202	104401	014375	
012206	012777	000100	166770
012214	000001		
012216	000771		
012220	000001		
012222	000776		
012224	104406		
012226	104401	014473	
012232	022702	000114	
012236	001571		
012240	022702	000120	
012244	001563		
012246	022702	000104	
012252	001417		
012254	022702	000122	
012260	001002		
012262	000137	013010	
012266	022702	000101	
012272	001501		
012274	022702	000015	
012300	001001		
012302	000002		
012304	104401	014466	
012310	000002		
012312			
012312	012777	012344	166674
012320	013701	013406	
012324	010137	001254	
012330	104404		
012332	013366		
012334	005011		

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PROGRAM 3
PROGRAM 3 IS THE SAME AS PROGRAM 1 ONLY YOU THE
USER HAS THE CHANCE TO ALTER THE MAP WHICH IS
COMPARED TO THE DATA IN THE ROM ADDRESSES
NOTE THE FOLLOWING COMMANDS:

*D    DATA    INSERT DATA; HIT LINE FEED TO ESCAPE.
*R    RUN      RUN THE PROGRAM
*L    LIST     LIST THE SOFTWARE TABLE ON TTY.
*P    PRINT    PRINT LISTING OF SOFTWARE TABLE ON LINE PRINTER.
*A    ADDRESS  INPUT THE ADDRESS OF THE DATA YOU WANT TO ALTER.
LINE FEED    WHEN IN THE DATA INPUT MODE HIT LINE FEED TO
              ESCAPE TO COMMAND MODE
CR    CARRAGE  RETURN- WHEN IN THE DATA INPUT MODE A CARRAGE RETURN
              ZEROS NEXT ADDRESS AND WAITS FOR NEW DATA.

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PRG3:  CLR      LPTFLG      ;SET FOR TTY OUTPUT
        MOV      #PRG3,PRG.NO ;SET FOR POWER FAIL
        MOV      #ST.VEC,STKVEC ;SET FOR KEY BOARD INTERRUPT
        MOV      TABLE,R1    ;DEFAULT STARTING ADDRESS TO MAP
        MOV      R1,ADDRESS    ;SAVE THE SOFTWARE ADDRESS
XHOLD:  TYPE     ,MASTER      ;TYPE AN "*"
        MOV      #100,STKCSR   ;SET INTERRUPT ENABLE FOR TTY
        WAIT     ;HIT A KEY
        BR       XHOLD        ;GO BACK AN TYPE AN "*"
HOLD:   WAIT     ;HIT A KEY !!
        BR       HOLD        ;GO BACK AND HIT AGAIN !!
ST.VEC: KEY.TO.R2 ;ECHO CHAR AND STRIP BIT 7
        TYPE     ,MCRLF       ;TYPE A CARRAGE RETURN + LINE FEED
        CMP      #114,R2      ;WAS AN "L" (LIST) HIT?
        BEQ      SRV.L
        CMP      #120,R2      ;WAS A "P" (PRINT) HIT?
        BEQ      SRV.P
        CMP      #104,R2      ;WAS A "D" (DATA) HIT?
        BEQ      SRV.D
        CMP      #122,R2      ;WAS AN "R" (RUN) HIT?
        BNE      .+6
        JMP      SRV.R
        CMP      #101,R2      ;WAS AN "A" (ADDRESS) HIT?
        BEQ      SRV.A
        CMP      #15,R2       ;WAS CARRAGE RETURN HIT?
        BNE      .+4
        RTI      ;GO WAIT FOR VALID CHAR.
        TYPE     ,M.QM
        RTI      ;NEITHER A "L","P","D","R","A",OR CR WAS HIT.

SRV.D:  2$:      MOV      #4$,STKVEC ;SET VECTOR FOR DATA INPUT.
        MOV      ADDRESS,R1 ;RESET ADDRESS POINTER.
        MOV      R1,TEMP4    ;SET FOR TYPE OUT ROUTINE
        CONVRT   ;TYPE THE SOFTWARE ADDRESS
        DT.3A    ;FIND TABLE 3A
        CLR      (R1)        ;ZERO THE ADDRESS AND WAIT FOR DATA

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N05

DDBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 65
 DDBMAA.P11 MAINDEC-11-DDBMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

3018	012336	012716	012220		MUV	#HOLD, (SP)	;SET RETURN (NO "**")
3019	012342	000002			RTI		;GO BACK WAIT FOR KEY TO BE HIT
3020	012344	104406		4\$:	KEY.TO.R2		;ECHO CHAR AND STRIP BIT 7
3021	012346	022702	000015		CMP	#15,R2	;WAS CARRAGE RETURN HIT?
3022	012352	001016			BNE	5\$	;NO GO TO 5\$
3023	012354	104401	014476		TYPE	MLF	;TYPE A LINE FEED
3024	012360	005721			TST	(R1)+	;UPDATE THE SOFTWARE ADDRESS
3025	012362	023701	010220		CMP	EXTEND,R1	;IS THE LIMIT EXCEEDED
3026	012366	101440			BLOS	7\$	;INPUT LIMIT EXCEEDED!! ERROR.
3027	012370	005011			CLR	(R1)	;ZERO ADDRESS WAIT FOR DATA
3028	012372	010137	001254		MOV	R1,TEMP4	;SAVE THE ADDRESS.
3029	012376	104404			CONVRT		;TYPE THE ADDRESS
3030	012400	013366			DT.3A		;FROM DATA TABLE 3A
3031	012402	010137	013406		MOV	R1,ADDRESS	;SAVE THE ADDRESS FOR GOOD
3032	012406	000002			RTI		;LEAVE HERE.
3033	012410	022702	000012	5\$:	CMP	#12,R2	;WAS A LINE FEED HIT??
3034	012414	001006			BNE	6\$	;NO LINE FEED NOT HIT.
3035	012416	012777	012224	166570	MOV	#ST.VEC, @TKVEC	;SET THE KEYBOARD VECTOR
3036	012424	012716	012202		MOV	#XHOLD, (SP)	;WHEN I RETURN TYPE AN "**"
3037	012430	000002			RTI		;LEAVE HERE
3038	012432	032702	000110	6\$:	BIT	#110,R2	;WAS AN OCTAL CHAR HIT?
3039	012436	001014			BNE	7\$	;BR IF INVALID CHAR
3040	012440	042702	000260		BIC	#260,R2	;CLEAR ALL BUT LAST 3 BITS
3041	012444	000241			CLC		;CLEAR CPU CARRY BIT
3042	012446	006111			ROL	(R1)	;SHIFT DATA
3043	012450	103406			BCS	8\$	;ERROR ??
3044	012452	006111			ROL	(R1)	;SHIFT AGAIN.
3045	012454	103404			BCS	8\$	;ERROR ??
3046	012456	006111			ROL	(R1)	;SHIFT ONCE MORE
3047	012460	103402			BCS	8\$	;ERROR ??
3048	012462	050211			BIS	R2,(R1)	;SET NEW NUMBER IN ADDRESS
3049	012464	000002			RTI		;LEAVE HERE
3050	012466	005011		8\$:	CLR	(R1)	;CLEAR THE ADDRESS.
3051	012470	104401	014466	7\$:	TYPE	,M.QM	;TYPE A "?"
3052	012474	000002			RTI		
3053							
3054							
3055							
3056							
3057							
3058							
3059	012476	012777	012514	166510	SRV.A:	MOV	#15, @TKVEC
3060	012504	005003			CLR	R3	;SET KEY BOARD VECTOR
3061	012506	012716	012220		MOV	#HOLD, (SP)	;R3 WILL HOLD THE SOFTWARE ADDRESS
3062	012512	000002			RTI		;SET RETURN FOR NO "**"
3063	012514	104406		1\$:	KEY.TO.R2		;LEAVE HERE
3064	012516	022702	000015		CMP	#15,R2	;ECHO KEY AND CLEAR BIT 7
3065	012522	001416			BEQ	2\$	;CARRAGE RETURN ?
3066	012524	032702	000110		BIT	#110,R2	;BR IF YES
3067	012530	001023			BNE	3\$	;WAS AN OCTAL NUMBER HIT?
3068	012532	000241			CLC		;INVALID ANSWER
3069	012534	006103			ROL	R3	;CLEAR CPU CARRY BIT
3070	012536	103420			BCS	3\$	;SHIFT THE ADDRESS
3071	012540	006103			ROL	R3	;ERROR ??
3072	012542	103416			BCS	3\$	;SHIFT AGAIN
3073	012544	006103			ROL	R3	;ERROR ??
							;ONE LAST TIME

;YOU ARE HERE BECAUSE YOU HIT AN "A"
 ;YOU TOLD ME YOU WERE GOING TO INPUT AN ADDRESS.
 ;SO INPUT THE ADDRESS AND TERMINATE WITH A CARRAGE RETURN.
 ;OK??

DDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 66
 DDBMA.P11 MAINDEC-11-DDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

3074	012546	103414			BUS	35	:ERROR ??
3075	012550	042702	000260		BIC	#260,R2	:CLEAR UNWANTED BITS
3076	012554	050203			BIS	R2,R3	:PLACE DATA IN R3
3077	012556	000002			RTI		:LEAVE THIS ROUTINE
3078	012560	012716	012202	25:	MOV	#XHOLD,(SP)	:WHEN RETURNING TYPE AN "*"
3079	012564	012777	012224	166422	MOV	#ST.VEC,STKVEC	:SET INITIAL VECTOR
3080	012572	010337	013406		MOV	R3,ADDRESS	:SAVE GOOD ADDRESS FOR FUTURE USE
3081	012576	000002			RTI		:LEAVE HERE
3082	012600	005003		35:	CLR	R3	:ZERO BAD ADDRESS
3083	012602	104401	014473		TYPE	,MCRLF	:TYPE A CR LF
3084	012606	104401	014466		TYPE	,M.QM	:TYPE "??"
3085	012612	000002			RTI		:LEAVE !!
3086							
3087	012614	012737	177777	015176	SRV.P:	MOV	#-1,LPTFLG
3088							:YOU ENTERED HERE BECAUSE YOU HIT "L"
3089							:YOU TOLD ME YOU WANTED A LISTING OF THE SOFTWARE MAP
3090							:SO HERE IT IS.
3091							
3092							
3093	012622				SRV.L:		
3094	012622	013700	010212		MOV	TABLE,RO	:GET SOFTWARE MAP
3095	012626	013737	010214	013306	MOV	ALLEN,DEAD	:SET DEAD END POINTER
3096	012634	104401	014266		TYPE	,MSG4	:TYPE HEADER
3097	012640	104401	011612		TYPE	,DH.2B	:TYPE ADDRESS ADD+XX
3098	012644	012737	000007	001256	15:	MOV	#7,TEMP5
3099	012652	011001			MOV	(RO),R1	:SET COUNTER FOR ACROSS PAGE
3100	012654	010037	001252		MOV	RO,TEMP3	:GET DATA
3101	012660	010137	001254		MOV	R1,TEMP4	:GET ADDRESS
3102	012664	005720			TST	(RO)+	:SET DATA FOR TYPE OUT
3103	012666	104404			CONVRT		:UPDATE ADDRESS POINTER
3104	012670	013374			DT.3B		:TYPE ADDRESS ADD+XX
3105	012672	011001		25:	MOV	(RO),R1	:USE DATA TABLE 3B
3106	012674	010037	001252		MOV	RO,TEMP3	:GET DATA
3107	012700	010137	001254		MOV	R1,TEMP4	:GET ADDRESS
3108	012704	005720			TST	(RO)+	:SAVE DATA
3109	012706	104405			CONVRT		:UPDATE POINTER
3110	012710	012144			DT.2A		:TYPE DATA
3111	012712	013703	013006	35:	MOV	DEAD,R3	:USE DATA TABLE 2A
3112	012716	005723			TST	(R3)+	:UPDATE POINTER
3113	012720	020003			CMP	RO,R3	:LIMIT DONE ??
3114	012722	001404			BEQ	55	:BR IF YES
3115	012724	005337	001256	45:	DEC	TEMP5	:DEC DATA COUNTER
3116	012730	001360			BNE	25	:BR IF MORE DATA TO GO
3117	012732	000744			BR	15	:TYPE THE ADDRESS
3118	012734			55:			
3119	012734	032737	000002	010210	BIT	#BIT1,SAVSRI	:EXTENDED SOFTWARE DUMP?
3120	012742	001416			BEQ	65	:BR IF NO DUMP
3121	012744	005743			TST	-(R3)	:PUSH POINTER
3122	012746	023703	010220		CMP	EXTEND,R3	
3123	012752	001412			BEQ	65	:BR IF ALL DONE
3124	012754	104401	014332		TYPE	,MSG5	:TYPE EXTENDED MAP:
3125	012760	104401	011612		TYPE	,DH.2B	
3126	012764	13700	010216		MOV	EXTMAP,RO	:SET POINTER
3127	012770	13737	010220	013006	MOV	EXTEND,DEAD	:SET DEAD END POINTER
3128	012776	000722			BR	15	:DO IT AGAIN SAM.
3129	013000	005037	015176	65:	CLR	LPTFLG	:SET FOR TTY OUTPUT

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 67
 DOBMAA.P11 MAINDEC-11-DOBMA-A BMB73 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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3130 013004 003002          RTI          ;GO BACK HOME.
3131 013006 000000          DEAD:      0
3132
3133          .NOW YOU ARE HERE BECAUSE YOU WANT TO RUN THE PROGRAM
3134          ;REMEMBER NOW. YOU SET UP THE MAP.
3135          ;ARE YOU SURE YOU TYPED IN THE CORRECT DATA.???
3136          ;HERE WE GO
3137
3138 013010          SRV.R:
3139 013010 012777 014500 166176 RUN3:  MOV      #.KEY.TO.R2,ATKVEC
3140 013016 012777 000100 166160      MOV      #100,ATKCSR          ;SET KEYBOARD INTERRUPT ENABLE
3141 013024 012737 014654 000004      MOV      #NO.TRAP,2#4      ;GET READY FOR UNEXPECTED TRAP
3142 013032 012737 000500 001232      MOV      #500,ICOUNT      ;DO TEST 500(8) TIMES
3143 013040 012700 173000          RUN.3: MOV      #173000,R0      ;SET BEGGING ADDRESS
3144 013044 012737 013070 001230      MOV      #2$,LOCK          ;IF SW09=1; GOTO 2$ WHEN I HIT "SCOPI"
3145 013052 013704 010212          MOV      TABLE,R4          ;SET SOFTWARE RESUTS
3146 013056 013737 010224 011014      MOV      LAST, LAST      ;SET LAST ADDRESS
3147 013064 012703 000005          1$:  MOV      #5, R3          ;DO EACH ADDRESS 5 TIMES.
3148 013070 022700 173024          2$:  CMP      #173024,R0      ;DON'T DO THE VECTOR ADD.
3149 013074 001001          BNE      .+4          ;BR IF NOT THE VECTOR ADD.
3150 013076 022024          CMP      (R0)+,(R4)+      ;UPDATE TO NEXT ADDRESS
3151 013100 022700 173224          CMP      #173224,R0      ;IS THIS THE SECOND TRAP VECTOR??
3152 013104 001001          BNE      .+4          ;BR IF NOT VECTOR
3153 013106 022024          CMP      (R0)+,(R4)+      ;UPDATE THE POINTERS !!
3154 013110 011005          MOV      (R0),R5          ;READ THE ADDRESS
3155 013112 011401          MOV      (R4),R1          ;READ THE SOFTWARE ADDRESS
3156 013114 020105          CMP      R1,R5          ;DO THEY MATCH?
3157 013116 001401          BEQ      .+4          ;BRANCH IF OK
3158 013120 104001          HLT      1          ;INCORRECT COMPARISON.
3159 013122 032737 004000 177570      BIT      #BIT11,SWR      ;QUICK PASS.
3160 013130 001002          BNE      .+6          ;BR IF YES
3161 013132 005303          DEC      R3          ;HAS THAT ADD BEEN READ 10 TIMES?
3162 013134 001355          BNE      2$          ;BR IF NOT 10 TIMES
3163 013136 023700 011014          CMP      LAST,R0      ;HAS LAST ADDRESS CHECKED?
3164 013142 001403          BEQ      .+10          ;BR IF YES
3165 013144 104400          SCOP1          ;LOCK ON THIS ADDRESS?
3166 013146 022024          CMP      (R0)+,(R4)+      ;UPDATE THE POINTERS.
3167 013150 000745          BR      1$          ;CONTINUE THE TEST.
3168 013152 032737 000002 010210      BIT      #BIT1,SAVSRI      ;EXTENDED WORD TO BE CHECKED?
3169 013160 001413          BEQ      3$          ;BR IF NO CHECKING.
3170 013162 022737 173776 011014      CMP      #173776, LAST      ;IS ALL THE TEST DONE?
3171 013170 001407          BEQ      3$          ;BR IF YES.
3172 013172 012737 173776 011014      MOV      #173776, LAST      ;SET LAST ADDRESS.
3173 013200 013704 010216          MOV      EXTMAP,R4          ;SET EXTENDED MAP.
3174 013204 005720          TST      (R0)+          ;POP POINTER
3175 013206 000726          BR      1$          ;GO DO THE TEST.

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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 68
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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3176                                     :TEST THAT WRITING ROM RESULTS IN A TIME OUT
3177                                     :TRAP.
3178
3179 013210 012700 173000 3$: MOV #173000,R0 :SET BASE ADDRESS
3180 013214 012737 013234 001230 :MOV #5$,LOCK :IF SW09=1: GOTO 5$ AT SCOP1
3181 013222 012737 013264 000004 :MOV #6$,2#4 :TIME OUT TRAP: GOTO 6$
3182 013230 012703 000012 4$: MOV #10,R3 :DO EACH ADD 10 TIMES
3183 013234 022700 173024 5$: CMP #173024,R0 :IS THIS AT THE TRAP VECTOR
3184 013240 001001 :BNE .+4 :BR IF NO
3185 013242 005720 :TST (R0)+ :UPDATE POINTER
3186 013244 022700 173224 :CMP #173224,R0 :IS THIS AT THE SECOND TRAP VECTOR
3187 013250 001001 :BNE .+4 :BR IF NO
3188 013252 005720 :TST (R0)+ :UPDATE THE POINTER
3189 013254 012710 177777 :MOV #-1,(R0) :WRITE ROM WITH A -1
3190 013260 000240 :NOP :WAIT ONE INSTR. TIME
3191 013262 104000 :HLT :WRITING ROM DIDN'T TIME OUT.
3192 013264 012706 001200 6$: MOV #STACK,SP :RESTORE STACK
3193 013270 032737 004000 177570 :BIT #BIT11,SWR :QUICK PASS?
3194 013276 001002 :BNE .+6 :BR IF YES
3195 013300 005303 :DEC R3 :DO EACH ADD 10 TIMES
3196 013302 001354 :BNE 5$ :NOT DONE WITH THIS ONE YET.
3197 013304 032737 000002 010210 :BIT #BIT1,SAVSRI :IS THE EXTENDED 128. WORDS TO BE TESTED??
3198 013312 001404 :BEQ .+12 :BR IF NO
3199 013314 022700 173776 :CMP #173776,R0 :IS THE EXTENDED LIMIT BEEN TESTED?
3200 013320 001407 :BEQ 7$ :IF YES; GOTO 7$
3201 013322 000403 :BR .+10 :IF NO; KEEP GOING.
3202 013324 023700 010224 :CMP LASTA,R0 :ALL DONE??
3203 013330 001403 :BEQ 7$ :IF YES; GOTO 7$
3204 013332 104400 :SCOP1 :GO CHECK SW09: (FREEZE !!)
3205 013334 005720 :TST (R0)+ :UPDATE TO NEXT ADDRESS
3206 013336 000734 :BR 4$ :GO DO IT AGAIN
3207 013340 005337 001232 7$: DEC ICOUNT :CHECK ITERATION COUNT
3208 013344 001004 :BNE 8$ :MORE TO GO
3209 013346 004737 014714 :JSR PC,EOP :GO TO END OF PASS ROUTINE
3210 013352 000137 013010 :JMP RUN3 :GO DO TEST AGAIN
3211 013356 000137 013040 8$: JMP RUN.3 :
3212
3213 013362 041536 000 MC: .ASCIZ /IC/
3214 013366 .EVEN
3215 013366 000001 DT.3A: 1
3216 013370 006 002 .BYTE 6,2
3217 013372 001254 TEMP4
3218 013374 000002 DT.3B: 2
3219 013376 006 003 .BYTE 6,3
3220 013400 001252 TEMP3
3221 013402 006 002 .BYTE 6,2
3222 013404 001254 TEMP4
3223 013406 000000 ADDRESS: 0
3224

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3225
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3237
3238 013410 012777 014500 165576 PRG4: MOV #.KEY.TO.R2, @TKVEC
3239 013416 012777 000100 165560 MOV #100, @TKCSR
3240 013424 012737 013410 014652 MOV #PRG4, PRG.NO ; SET FOR POWER FAIL
3241 013432 005037 001244 CLR LSTERR ; PREPARE ERROR CONDITIONS
3242 013436 012706 001200 MOV #STACK, SP ; SET THE STACK POINTER
3243 013442 012737 020000 001232 MOV #20000, ICOUNT ; SET ITERATION COUNT TO 20000(8)
3244 013450 005737 014076 TST FLAG4 ; HAVE I BEEN HERE BEFOR??
3245 013454 001073 BNE TAG.A ; BR IF NOT FIRST TIME HERE.
3246 013456 005137 014076 COM FLAG4 ; SET THE FLAG
3247 013462 012705 000002 MOV #2, R5 ; SET R5 FOR SWITCH 1
3248 013466 012704 014066 MOV #LOC1, R4 ; SET STORAGE LOCATION
3249 013472 012737 014654 000004 MOV #NO.TRAP, @#4 ; SET FOR TIME OUT TRAP
3250 013500 012737 000001 001252 MOV #1, TEMP3 ; SET FOR MESSAGE ON CHANNEL NO.
3251 013506 104401 014100 1$: TYPE ,MCHAN ; TYPE MESSAGE ABOUT CHANNEL
3252 013512 104405 CNVRT ; GOTO TYPE AND CONVERT ROUTINE
3253 013514 014220 DT.4A ; CONVERT DATA TABLE 4A
3254 013516 104401 014114 TYPE ,MACTV ; TYPE REST OF MESSAGE
3255 013522 104401 014127 2$: TYPE ,MADD1 ; TYPE ADDRESS MESSAGE
3256 013526 012700 173024 MOV #173024, R0
3257 013532 005037 173024 CLR @#173024
3258 013536 010537 173024 MOV R5, @#173024 ; WRITE ROM WITH SWITCH
3259 013542 000240 NOP ; WAIT ONE INSTR. TIME
3260 013544 012706 001200 3$: MOV #STACK, SP ; SET THE STACK POINTER
3261 013550 012700 173024 MOV #173024, R0 ; SET FOR ERROR MESSAGE
3262 013554 012737 014654 000004 MOV #NO.TRAP, @#4 ; SET FOR NO MORE TRAPS
3263 013562 013737 173024 001254 MOV @#173024, TEMP4 ; READ THE ADDRESS
3264 013570 104405 CNVRT ; TYPE OUT AND CONVERT
3265 013572 014226 DT.4B ; DATA TABLE 4B
3266 013574 013724 173024 MOV @#173024, (R4)+ ; STORE THE INFORMATION FOUND
3267 013600 104401 014163 TYPE ,MADD2 ; TYPE THE SECOND ADDRESS MSG
3268 013604 012700 173224 MOV #173224, R0 ; SET FOR ERROR CONDITION.
3269 013610 013737 173224 001254 MOV @#173224, TEMP4 ; STORE ROM DATA
3270 013616 104405 CNVRT ; CONVERT AND TYPE
3271 013620 014226 DT.4B ; DATA TABLE 4B
3272 013622 005237 001252 INC TEMP3 ; GET READY FOR NEXT SWITCH SETTING
3273 013626 000241 CLC ; CLEAR THE CARRY BIT
3274 013630 006105 ROL R5 ; UPDATE R5
3275 013632 022705 000040 CMP #40, R5 ; ALL SIMULATED SWITCHS DONE?
3276 013636 001323 BNE 1$ ; BR IF NOT ALL DONE
3277 013640 000137 013410 JMP PRG4 ; JMP AND DO TEST AGAIN WITH OUT TYPE OUT
3278
3279 013644 012703 000002 TAG.A: MOV #2, R3 ; SIMULATE SWITCH 1
3280 013650 012704 014066 MOV #LOC1, R4 ; GET LOCATION WHERE DATA IS STORED

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F06

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 70
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

3281	013654	012737	014654	000004	15:	MOV	#NO.TRAP,0#4	;PREPARE FOR TIME OUT TRAP
3282	013662	005037	173024			CLR	0#173024	
3283	013666	010337	173024			MOV	R3,0#173024	;WRITE THE ROM
3284	013672	000240				NOP		;WAIT ONE INSTR. TIME
3285	013674	012706	001200		25:	MOV	#STACK,SP	;SET THE STACK POINTER.
3286	013700	012737	014654	000004		MOV	#NO.TRAP,0#4	;SET FOR NO MORE TRAPS.
3287	013706	012700	173024			MOV	0#173024,R0	;SET FOR ERROR MESSAGE
3288	013712	011401				MOV	(R4),R1	;SET FOR COMPARISON
3289	013714	013705	173024			MOV	0#173024,R5	;GET THE DATA FROM THE ROM
3290	013720	020105				CMP	R1,R5	;IS THE DATA THE SAME??
3291	013722	001401				BEQ	.+4	;BR IF GOOD DATA.
3292	013724	104001				HLT	1	;ERROR. DATA READ FIRST TIME NOT THE SAME
3293	013726	012700	173224			MOV	0#173224,R0	;SET FOR ERROR MESSAGE
3294	013732	013705	173224			MOV	0#173224,R5	;READ THE ROM
3295	013736	020105				CMP	R1,R5	;IS THE DATA THE SAME?
3296	013740	001401				BEQ	.+4	;BR IF GOOD DATA
3297	013742	104001				HLT	1	;ERROR. DATA NOT THE SAME AS BEFORE.
3298	013744	005724				TST	(R4)+	;UPDATE DATA POINTER.
3299	013746	000241				CLC		;CLEAR THE CARRY BIT
3300	013750	006103				ROL	R3	;UPDATE THE SIMULATED SWITCH SETTING
3301	013752	022703	000040			CMP	0#0,R3	;HAVE ALL SETTING BEEN DONE
3302	013756	001336				BNE	15	;BR IF NOT DONE
3303	013760	005337	001232			DEC	ICOUNT	;ITERATION COUNT DONE
3304	013764	001327				BNE	TAG.A	;BR IF NOT DONE
3305	013766	012737	177777	173224		MOV	0-1,0#173224	;WRITE SECOND TRAP VECTOR WITH -1
3306	013774	005037	173024			CLR	0#173024	;ZERO THE FIRST VECTOR
3307	014000	012700	173024			MOV	0#173024,R0	;SET FOR TYPE OUT IF ERROR
3308	014004	013701	014066			MOV	LOC1,R1	;SET FOR TYPE OUT ROUTINE
3309	014010	013705	173024			MOV	0#173024,R5	;SAME AS ABOVE
3310	014014	020105				CMP	R1,R5	;IS DEFAULT LINE SELECTED =TO LINE 1
3311	014016	001401				BEQ	.+4	;BR IF DEFAULT EQUALS LINE 1
3312	014020	104001				HLT	1	;DATA NOT EQUAL TO LINE 1
3313	014022	012737	177777	173024		MOV	0-1,0#173024	;WRITE A -1 TO FIRST VECTOR
3314	014030	005037	173224			CLR	0#173224	;ZERO SECOND VECTOR
3315	014034	012700	173224			MOV	0#173224,R0	;SET FOR TYPE OUT IF ERROR
3316	014040	013701	014066			MOV	LOC1,R1	;GET DATA
3317	014044	013705	173224			MOV	0#173224,R5	;READ ROM
3318	014050	020105				CMP	R1,R5	;IS LINE 1 DEFAULT LINE
3319	014052	001401				BEQ	.+4	;BR IF OK
3320	014054	104001				HLT	1	;ERROR LINE 1 NOT DEFAULT LINE
3321	014056	004737	014714			JSR	PC,EOP	;TYPE END MESSAGE.
3322	014062	000137	013410			JMP	PRG4	;GOTO PROGRAM 4 AGAIN
3323								
3324	014066	000000				LOC1:	0	
3325	014070	000000				LOC2:	0	
3326	014072	000000				LOC3:	0	
3327	014074	000000				LOC4:	0	
3328	014076	000000				FLAG4:	0	

G06

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 71
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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3329 014100 005015 041412 040510 MCHAN: .ASCIZ <15><12><12>/CHANNEL /
      014114 041501 044524 040526 MACTV: .ASCIZ/ACTIVATED./
      014127 015 040412 042104 MADD1: .ASCIZ <15><12>/ADDRESS 773024 CONTAINS: /
      014163 015 040412 042104 MADD2: .ASCIZ <15><12>/ADDRESS 773224 CONTAINS: /
      014220 .EVEN
3330 014220 000001 DT.4A: 1
3331 014222 002 002 .BYTE 2,2
3332 014224 001252 TEMP3
3333 014226 000001 DT.4B: 1
3334 014230 006 002 .BYTE 6,2
3335 014232 001254 TEMP4
3336
3337 014234 005015 051120 043517 MSG3: .ASCIZ <15><12>/PROGRAM NO. (1,2,3,4) /
      014266 006414 016412 077437 MSG4: .ASCIZ <14><15><12><35><37><177><177><177>/SOFTWARE MAP IS AS FOLLOWS:/
      014332 005015 020012 054105 MSG5: .ASCIZ <15><12><12>/ EXTENDED SOFTWARE MAP FOLLOWS./
      014375 015 025012 000 MASTER: .ASCIZ <15><12>*/
      014401 007 006407 042412 M.END: .ASCIZ <7><7><15><12>/END PASS BM873-Y/
      014426 MFAIL:
      014426 005015 053520 020122 .ASCII <15><12>/PWR UP AFTER/
      014444 005015 042522 046101 .ASCIZ <15><12>/REAL PWR FAIL/
      014464 000044 M.DOL: .ASCIZ /S/
      014466 005015 037477 000 M.QM: .ASCIZ <15><12>"/",
      014473 015 000012 MCRLF: .ASCIZ <15><12>
      014476 000012 MLF: .ASCIZ <12>
      .EVEN
3338 014500 .KEY.TO.R2:
3339 014500 017702 164502 MOV @TKDBR,R2 ;READ THE TTY KYBD BUFFER
3340 014504 105777 164500 TSTB @TPCSR ;PRINTER READY??
3341 014510 100375 BPL -4 ;BR IF NOT READY.
3342 014512 010277 164474 MOV R2,@TPDBR ;ECHO INPUTTED CHARACTER
3343 014516 042702 000200 BIC #BIT7,R2 ;CLEAR BIT 7 FOR A SEVEN BIT CHAR.
3344 014522 022702 000007 CMP #7,R2 ;WAS CNTR "G" HIT?
3345 014526 001005 BNE 1$ ;NO!
3346 014530 000005 RESET ;CLEAR THE WORL[
3347 014532 005037 177776 CLR PS
3348 014536 000137 007150 JMP START ;GO TO TEST
3349 014542 000002 1$: RTI ;LEAVE HERE
3350

```

3351	014544	005037	001244		.PFAIL: CLR	LSTERR	
3352	014550	013746	000004		MOV	#4, -(SP)	
3353	014554	012737	014604	000004	MOV	#15, #4	
3354	014562	005737	173000		TST	#173000	: IS THIS PF REAL?
3355	014566	000240			NOP		: TRAP IS CAUSED BY LOADER
3356	014570	012737	014614	000024	MOV	#PWR.UP, #24	: ITS REAL. PREPARE FOR PWR 'JP
3357	014576	012637	000004		MOV	(SP)+, #4	
3358	014602	000000			HALT		
3359	014604	022626			IS: POP.SP		
3360	014606	012637	000004		MOV	(SP)+, #4	
3361	014612	000000			HALT		: HARDWARE ERROR. BOOT DIDN'T FORCE
3362					: HIGH ADDR LINES		AND LOAD BUTTON WAS ACTIVATED
3363	014614	012737	014544	000024	PWR.UP: MOV	#PFAIL, #24	
3364	014622	012706	001200		MOV	#STACK, SP	
3365	014626	005000			CLR	RO	: SET DELAY
3366	014630	062700	000001		ADD	#1, RO	: WAIT FOR TTY
3367	014634	001375			BNE	.-4	
3368	014636	104401	014426		TYPE	MFAIL	: TYPE FAILED.
3369	014642	005037	177776		CLR	PS	: SET STATUS TO ZERO
3370	014646	000177	000000		JMP	#PRG.NO	
3371	014652	000000			PRG.NO: 0		
3372	014654				NO. TRAP:		
3373	014654	011637	014712		MOV	(SP), XSTORE	
3374	014660	032716	100000		BIT	#BIT15, (SP)	
3375	014664	001410			BEQ	15	
3376	014666	011600			MOV	(SP), RO	
3377	014670	104004			HLT	4	
3378	014672	012706	001200		MOV	#STACK, SP	
3379	014676	005037	177776		CLR	PS	
3380	014702	000177	177744		JMP	#PRG.NO	
3381	014706	104003			IS: HLT	3	
3382	014710	000002			RTI		
3383	014712	000000			XSTORE: 0		
3384							

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 73

DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

3385	014714	012700	000062	EOP:	MOV	#50.,R0
3386	014720	000005		23:	RESET	
3387	014722	005300			DEC	R0
3388	014724	001375			BNE	23
3389	014726	032737	000100 177570		BIT	#SW06,SWR
3390	014734	001402			BEQ	15
3391	014736	004737	000250		JSR	PC,EOPHLT
3392	014742	005037	001244	15:	CLR	LSTERR
3393	014746	005037	015176		CLR	LPTFLG
3394	014752	104401	014401		TYPE	,M.END
3395	014756	104401	015020		TYPE	,VERSION
3396	014762	013701	000042		MOV	#42,R1
3397	014766	001413			BEQ	X1
3398	014770	022737	010434 014652		CMP	#PRG1,PRG.NO
3399	014776	001002			BNE	.+6
3400	015000	000137	013410		JMP	PRG4
3401	015004	004711		LOGIC:	JSR	PC,(R1)
3402	015006	000240			NOP	
3403	015010	000240			NOP	
3404	015012	000240			NOP	
3405	015014	000240			NOP	
3406	015016	000207		X1:	RTS	PC
3407	015020	000101		VERSION:	101	

;SEVEN BIT ASCII FOR DEFAULT "A"

DOBMA MACY11 27 (732) 22-SEP-76 14:43 PAGE 74
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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3408
3409
3410 ;CHECK FOR FREEZE ON CURRENT DATA
3411
3412 015022 032737 001000 177570 .SCOP1: BIT      #SW09,SWR
3413 015030 001402          BEQ      1$
3414 015032 013716 001230          MOV      LOCK,(SP)
3415 015036 000002          1$:      RTI
3416
3417 ;TELETYPE OUTPUT ROUTINE
3418
3419 015040 013737 000004 001000 .TYPE:  MOV      @#4,@#1000
3420 015046 010537 001002          MOV      R5,@#1002
3421 015052 017605 000000          MOV      @ (SP),R5
3422 015056 062716 000002          ADD      #2,(SP)
3423 015062 032737 010000 177570 1$:  BIT      #SW12,SWR
3424 015070 001013          BNE      3$
3425 015072 105715          TSTB     (R5)
3426 015074 001411          BEQ      3$
3427 015076 005737 015176          TST      LPTFLG
3428 015102 001014          BNE      4$
3429 015104 105777 164100          2$:  TSTB     @TPCSR
3430 015110 100375          BPL      2$
3431 015112 112577 164074          MOVB     (R5)+,@TPDBR
3432 015116 000761          BR       1$
3433 015120 013737 001000 000004 3$:  MOV      @#1000,@#4
3434 015126 013705 001002          MOV      @#1002,R5
3435 015132 000002          RTI
3436 015134 012737 015152 000004 4$:  MOV      #5$,@#4
3437
3438 015142 005777 164032          TST      @LPTCSR
3439 015146 000240          NOP
3440 015150 000404          BR       6$
3441 015152 005037 015176          5$:  CLR      LPTFLG
3442 015156 022626          POP. SP
3443 015160 000740          BR       1$
3444 015162 105777 164012          6$:  TSTB     @LPTCSR
3445 015166 100375          BPL      6$
3446 015170 112577 164006          MOVB     (R5)+,@LPTDBR
3447 015174 000732          BR       1$
3448 015176 000000          LPTFLG: 0
3449
3450 ;ERROR HANDLER
3451
3452 015200 005037 015176          .HLT:  CLR      LPTFLG
3453 015204 032737 010000 177570          BIT      #SW12,SWR
3454 015212 001406          BEQ      XBX
3455 015214 105777 163770          TSTB     @TPCSR
3456 015220 100003          BPL      XBX
3457 015222 112777 000207 163762          MOVB     #207,@TPDBR
3458 015230 032737 020000 177570 XBX:  BIT      #SW13,SWR
3459 015236 001140          BNE      HALTS
3460 015240 021637 001244          CMP      (SP),LSTERR
3461 015244 001404          BEQ      1$
3462 015246 011637 001244          MOV      (SP),LSTERR
3463 015252 105037 001302          CLRB     ERRFLG

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K06

DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 75
 DDBMAA.P11 MAINDEC-11-DDBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

3464	015256	104402		15:	SAV05	
3465	015260	011605			MOV	(SP), R5
3466	015262	162705	000002		SUB	#2, R5
3467	015266	012702	017400		MOV	#ERRST, R2
3468	015272	010522			MOV	R5, (R2)+
3469	015274	011504			MOV	(R5), R4
3470	015276	011537	015614		MOV	(R5), TEMP6
3471	015302	006304			ASL	R4
3472	015304	061504			ADD	(R5), R4
3473	015306	006304			ASL	R4
3474	015310	042704	177001		BIC	#177001, R4
3475	015314	062704	016256		ADD	#.ERRTAB, R4
3476	015320	011422			MOV	(R4), (R2)+
3477	015322	012437	015416		MOV	(R4)+, ERRMSG
3478	015326	012437	015430		MOV	(R4)+, DATAHD
3479	015332	011437	015534		MOV	(R4), DATABP
3480	015336	105737	001302		TSTB	ERRFLG
3481	015342	001403			BEQ	TYPMSG
3482	015344	005737	015534		TST	DATABP
3483	015350	001030			BNE	TYPDAT
3484	015352	104401		TYPMSG:	TYPE	
3485	015354	016246			MERRPC	
3486	015356	104405			CNVRT	
3487	015360	015606			ERTABCI	
3488	015362	104401			TYPE	
3489	015364	011072			VERS	
3490	015366	105777	163616		TSTB	@TPCSR
3491	015372	100375			BPL	-4
3492	015374	113777	015020 163610		MOVB	VERSION, @TPDBR
3493	015402	104401			TYPE	
3494	015404	014473			MCRLF	
3495	015406	112737	177777 001302		MOVB	#-1, ERRFLG
3496	015414	104401			TYPE	
3497	015416	000000		ERRMSG:	0	
3498	015420	005737	015430		TST	DATAHD
3499	015424	001402			BEQ	TYPDAT
3500	015426	104401			TYPE	
3501	015430	000000		DATAHD:	0	
3502	015432	005737	015534		TYPDAT:	TST
3503	015436	001437			BEQ	DATABP
3504	015440	013722	001260		MOV	RESREG
3505	015444	022737	104002 015614		CMP	SAVR0, (R2)+
3506	015452	001424			BEQ	#104002, TEMP6
3507	015454	022737	104003 015614		CMP	65
3508	015462	001416			BEQ	#104003, TEMP6
3509	015464	013722	001270		BEQ	55
3510	015470	013722	001262		MOV	SAVR4, (R2)+
3511	015474	013722	001272		MOV	SAVR1, (R2)+
3512	015500	022737	104001 015614		MOV	SAVR5, (R2)+
3513	015506	001406			CMP	#104001, TEMP6
3514	015510	022737	104004 015614		BEQ	65
3515	015516	001402			CMP	#104004, TEMP6
3516	015520	013722	014712	55:	BEQ	65
3517	015524	005022		65:	MOV	XSTORE, (R2)+
3518	015526	005012			CLR	(R2)+
3519	015530				CLR	(R2)+

;STORE ADDR OF MESGE

;WRITING ROM TIME
 ;OUT ERROR?
 ;UNEXPECTED
 ;TRAP?

COBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 76
 DDBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

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3520 015532 104404          CONVRT
3521 015534 000000          DATABP: 0
3522 015536 104403          RESREG: RES05
3523 015540 005737 177570  HALTS: TST      SWR
3524 015544 100005          BPL      EXITER
3525 015546 010046          PUSHRO
3526 015550 016600 000002  MOV      2(SP),R0
3527 015554 000000          HALT
3528 015556 012600          POPRO
3529 015560 005237 001242  EXITER: INC      ERRCNT
3530 015564 032737 000400 177570 BIT      #BIT8,SWR
3531 015572 001404          BEQ      1$
3532 015574 012706 001200  MOV      #STACK,SP
3533 015600 000177 177046  JMP      @PRG.NO
3534 015604 000002          1$: RTI
3535 015606 000001          ERTAB0: 1
3536 015610 006          .BYTE 6,2
3537 015612 001276          SAVPC
3538 015614 000000          TEMP6: .WORD 0
3539
3540          ;CONVERT OCTAL NUMBER TO ASCII AND OUTPUT TO TELEPRINTER
3541
3542 015616 104401          .CONVR: TYPE
3543 015620 014473          MCRLF
3544 015622 017637 000000 001250 .CNVRT: MOV      @2(SP),TEMP2
3545 015630 013737 016720 001246 MOV      TEMP,TEMP1
3546 015636 062716 000002 ADD      #2,(SP)
3547 015642 010046 MOV      R0,-(SP)
3548 015644 010146 MOV      R1,-(SP)
3549 015646 010246 MOV      R2,-(SP)
3550 015650 010346 MOV      R3,-(SP)
3551 015652 010446 MOV      R4,-(SP)
3552 015654 010546 MOV      R5,-(SP)
3553 015656 013701 001250 MOV      TEMP2,R1
3554 015662 012137 016112 MOV      (R1)+,WRDCNT
3555 015666 112137 016114 1$: MOV      (R1)+,CHRCNT
3556 015672 112137 016115 MOV      (R1)+,SPACNT
3557 015676 013137 016116 MOV      @2(R1)+,BINWRD
3558 015702 105737 016114 TSTB     CHRCNT
3559 015706 100007 BPL      7$
3560 015710 042737 000200 016114 BIC      #BIT7,CHRCNT
3561 015716 012737 177777 016120 MOV      #-1,XFLAG
3562 015724 000402 BR      2$
3563 015726 005037 016120 7$: CLR      XFLAG
3564 015732 013704 016116 2$: MOV      BINWRD,R4
3565 015736 113705 016114 MOV      CHRCNT,R5
3566 015742 012700 016720 MOV      #TEMP,R0
3567 015746 010403 3$: MOV      R4,R3
3568 015750 042703 177770 BIC      #177770,R3
3569 015754 062703 000260 ADD      #260,R3
3570 015760 110320 MOV      R3,(R0)+
3571 015762 000241 CLC
3572 015764 006004 ROR      R4
3573 015766 000241 CLC
3574 015770 006004 ROR      R4
3575 015772 000241 CLC

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M06

DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 77
 DDBMAA.P11 MAINDEC-11-DDDMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

3576	015774	006004			RUR	R4
3577	015776	005305			DEC	R5
3578	016000	001362			BNE	3\$
3579	016002	012703	016762		MOV	#MDATA,R3
3580	016006	114023		4\$:	MOVB	-(R0),(R3)+
3581	016010	105337	016114		DECB	CHRCNT
3582	016014	001374			BNE	4\$
3583	016016	005737	016120		TST	XFLAG
3584	016022	001403			BEQ	.+10
3585	016024	052737	000006	016762	BIS	#6,MDATA
3586	016032	105737	016115		TSTB	SPACNT
3587	016036	001405			BEQ	6\$
3588	016040	112723	000240	5\$:	MOVB	#240,(R3)+
3589	016044	105337	016115		DECB	SPACNT
3590	016050	001373			BNE	5\$
3591	016052	105013		6\$:	CLRB	(R3)
3592	016054	104401			TYPE	
3593	016056	016762			MDATA	
3594	016060	005337	016112		DEC	WRDCNT
3595	016064	001300			BNE	1\$
3596	016066	013737	001246	016720	MOV	TEMP1,TEMP
3597	016074	012605			MOV	(SP)+,R5
3598	016076	012604			MOV	(SP)+,R4
3599	016100	012603			MOV	(SP)+,R3
3600	016102	012602			MOV	(SP)+,R2
3601	016104	012601			MOV	(SP)+,R1
3602	016106	012600			MOV	(SP)+,R0
3603	016110	000002			RTI	
3604	016112	000000			WRDCNT:	0
3605	016114	000000			CHRCNT:	0
3606		016115			SPACNT=	CHRCNT+1
3607	016116	000000			BINWRD:	0
3608	016120	000000			XFLAG:	0
3609						
3610						;SAVE PC OF TEST THAT FAILED AND R0-R5
3611						
3612	016122	016637	000004	001276	.SAV05:	MOV 4(SP),SAVPC
3613						
3614						;SAVE R0-R5
3615						
3616	016130	010537	001272		SV05:	MOV R5,SAVR5
3617	016134	010437	001270			MOV R4,SAVR4
3618	016140	010337	001266			MOV R3,SAVR3
3619	016144	010237	001264			MOV R2,SAVR2
3620	016150	010137	001262			MOV R1,SAVR1
3621	016154	010037	001260			MOV R0,SAVR0
3622	016160	000002				RTI
3623						
3624						;RESTORE R0-R5
3625						
3626	016162	013700	001260		.RES05:	MOV SAVR0,R0
3627	016166	013701	001262			MOV SAVR1,R1
3628	016172	013702	001264			MOV SAVR2,R2
3629	016176	013703	001266			MOV SAVR3,R3
3630	016202	013704	001270			MOV SAVR4,R4
3631	016206	013705	001272			MOV SAVR5,R5

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 78
 DOBMAA.P11 MAINDEC-11-DOBMA-A BM873

UNIVERSAL RESTART LOADER DIAGNOSTIC.

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3632 016212 000002      R/I
3633                      ;TRAP DISPATCH SERVICE
3634                      ;ARGUMENT OF TRAP IS EXTRACTED
3635                      ;AND USED AS OFFSET TO OBTAIN POINTER
3636                      ;TO SELECTED SUBROUTINE
3637
3638 016214 011646      .TRPSR: MOV      (SP),-(SP)      ;GET PC OF RETURN
3639 016216 162716 000002      SUB      #2,(SP)      ;=PC OF TRAP
3640 016222 017616 000000      MOV      @ (SP),(SP)      ;GET TRP
3641 016226 006316      TRPOK: ASL      (SP)      ;MULTIPLY TRAP ARG BY 2
3642 016230 042716 177001      BIC      #177001,(SP)      ;CLEAR UNWANTED BITS
3643 016234 062716 001304      ADD      #.TRPTAB,(SP)      ;POINTER TO SUBROUTINE ADDRESS
3644 016240 017616 000000      MOV      @ (SP),(SP)      ;SUBROUTINE ADDRESS
3645 016244 000136      JMP      @ (SP)+      ;GO TO SUBROUTINE
3646 016246 005015 041520 020072 MERRPC: .ASCIZ <15><12>/PC: /
3647 016254 000
3648 016256
3649 016256      .EVEN
3650 016256 000000      .ERRTAB:
3651 016260 000000      0
3652 016262 000000      0
3653 016264 016314      0
3654 016266 016522      EMO
3655 016270 016656      DHO
3656 016272 016356      DTO
3657 016274 016606      EM1
3658 016276 016700      DH1
3659 016300 016415      DT1
3660 016302 016621      EM2
3661 016304 016706      DH2
3662 016306 016462      DT2
3663 016310 016606      EM3
3664 016312 016700      DH1
3665 016314 005015 047522 020115 EMO: .ASCIZ <15><12>/ROM READ DATA COMPARISON ERROR./
      016356 005015 051127 052111 EM1: .ASCIZ <15><12>/WRITTING ROM FAILED TO TRAP./
      016415 015 052412 042516 EM2: .ASCIZ <15><12>/UNEXPECTED TRAP WHILE READING ROM./
      016462 005015 040506 040524 EM3: .ASCIZ <15><12>/FATAL TRAP. ROM PC ON STACK./
      016522 005015 051040 046517 DHO: .ASCIZ <15><12>/ ROM      SOFT/
      016541 015 040412 042104      .ASCIZ <15><12>/ADDRESS ADDRESS EXPECTED FOUND /
      016606 005015 042101 051104 DH1: .ASCIZ <15><12>/ADDRESS /
      016621 015 051012 046517 DH2: .ASCIZ <15><12>/ROM ADDRESS PC OF TRAP /
      016656
3666 016656 000004      .EVEN
3667 016660 006 003      DTO: 4
      .BYTE      6,3
3668 016662 001260      .BYT     SAVRO
3669 016664 006 004      .BYT     6,4
3670 016666 001270      SAVR4
3671 016670 206 003      .BYT     206,3
3672 016672 001262      SAVR1
3673 016674 006 002      .BYT     6,2
3674 016676 001272      SAVR5
3675
3676 016700 000001      DT1: 1
3677 016702 206 002      .BYT     206,2
3678 016704 001260      SAVRO
3679

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B07

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 79

DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

3680	C 6706	000002		DT2:	2	
3681	016710	206	002		.BYTE	206,2
3682	016712	001260			SAVR0	
3683	016714	006	010		.BYTE	6,8.
3684	016716	014712			XSTORE	
3685						
3686	016720	000000		TEMP:	0	
3687		016762			.+.40	
3688	016762	000000		MDATA:	0	
3689		017024			.+.40	
3690	017024			CORMAX:		

C07

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 80
DOBMAA.P11 MAINDEC-11-DOBMA-A BM873 UNIVERSAL RESTART LOADER DIAGNOSTIC.

3691		017400	.=017400
3692	017400	000020	ERRST: .BLKW 20
3693		000001	.END

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 83
DOBMAA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 84
DOBMAA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

DOBNA MACY11 27(732) 22-SEP-76 14:43 PAGE 85
 DOBNA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

DDMAA MACY11 27(732) 22-SEP-76 14:43 PAGE 86
DDMAA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

[illegible]

ADD	2879	3366	3422	3472	3475	3546	3569	3643							
ASL	3471	3473	3641												
BCS	3043	3045	3047	3070	3072	3074									
BEQ	2631	2745	2747	2806	2813	2818	2820	2847	2849	2852	2911	2916	2935	2996	2998
	3000	3005	3065	3114	3120	3123	3157	3164	3169	3171	3198	3200	3203	3291	3296
	3311	3319	3375	3390	3397	3413	3426	3454	3461	3481	3499	3503	3506	3508	3513
	3515	3531	3584	3587											
BIC	3040	3075	3343	3474	3560	3568	3642								
BIS	3048	3076	3585												
BIT	2692	2739	2808	2817	2842	2846	2915	3038	3066	3119	3159	3168	3193	3197	3374
	3389	3412	3423	3453	3458	3530									
BLCS	3026														
BNE	2638	2654	2662	2666	2680	2690	2693	2699	2708	2714	2720	2726	2733	2740	2753
	2756	2759	2762	2798	2801	2809	2811	2833	2836	2843	2845	2857	2896	2905	2913
	2937	2946	3002	3007	3022	3034	3039	3067	3116	3149	3152	3160	3162	3184	3187
	3194	3196	3208	3245	3276	3302	3304	3345	3367	3388	3399	3424	3428	3459	3483
	3572	3582	3590	3595											
BPL	2696	2742	2881	3341	3430	3445	3456	3491	3524	3559					
BR	2644	2668	2671	2704	2735	2749	2775	2816	2824	2950	2855	2883	2914	2938	2990
	2992	3117	3128	3167	3175	3201	3206	3432	3440	3443	3447	3562			
CLC	3041	3068	3273	3299	3571	3573	3575								
CLR	2619	2620	2623	2624	2625	2628	2629	2738	2884	2940	2947	2982	3017	3027	3050
	3060	3082	3129	3241	3257	3282	3306	3314	3347	3351	3365	3369	3379	3392	3393
	3441	3452	3517	3518	3519	3563									
CLRB	3463	3591													
CMP	2637	2645	2653	2661	2665	2669	2679	2698	2707	2713	2719	2725	2744	2752	2755
	2758	2761	2797	2799	2800	2802	2805	2812	2815	2819	2832	2835	2848	2851	2895
	2904	2910	2934	2945	2995	2997	2999	3001	3004	3006	3021	3025	3033	3064	3113
	3122	3148	3150	3151	3153	3156	3163	3166	3170	3183	3186	3199	3202	3275	3290
	3295	3301	3310	3318	3344	3398	3460	3505	3507	3512	3514				
COM	2691	3246													
DEC	2746	2810	2844	2856	2912	2936	3115	3161	3195	3207	3303	3387	3577	3594	
DECB	3581	3589													
EMT	559														
HALT	583	585	587	589	591	593	595	597	599	601	603	605	607	609	611
	613	615	617	619	621	622	625	627	629	631	633	635	637	639	641
	643	645	647	649	651	653	655	657	659	661	663	665	667	669	671
	673	675	677	679	681	683	685	687	689	691	693	695	697	699	701
	703	705	707	709	711	713	715	717	719	721	723	725	727	729	731
	733	735	737	739	741	743	745	747	749	751	753	755	757	759	761
	763	765	767	769	771	773	775	777	779	781	783	785	787	789	791
	793	795	797	799	801	803	805	807	809	811	813	815	817	819	821
	823	825	827	829	831	833	835	837	853	2688	2750	2774	2941	3358	3361
	3527														
INC	3272	3529													
JMP	847	849	2651	2659	2677	2685	2754	2757	2760	2763	2765	2859	2860	2942	3003
	3210	3211	3277	3322	3348	3370	3380	3400	3533	3645					
JSR	2858	3209	3321	3391	3401										
MOV	2621	2622	2626	2627	2632	2633	2636	2639	2640	2643	2646	2647	2648	2649	2650
	2655	2656	2657	2658	2663	2664	2667	2670	2673	2674	2675	2676	2681	2682	2683
	2684	2700	2701	2702	2705	2709	2710	2711	2715	2716	2717	2721	2722	2723	2727
	2728	2729	2731	2737	2748	2751	2787	2788	2789	2790	2791	2792	2793	2794	2795
	2796	2803	2804	2821	2822	2828	2829	2830	2831	2838	2841	2876	2877	2878	2882
	2885	2886	2887	2888	2891	2892	2893	2894	2897	2901	2902	2903	2906	2917	2918
	2921	2922	2923	2924	2925	2928	2929	2930	2933	2949	2983	2984	2985	2986	2988
	3012	3013	3014	3018	3028	3031	3035	3036	3059	3061	3078	3079	3080	3087	3094

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DDDMA MACY11 27(732) 22-SEP-76 14:43 PAGE 91
 DDBMAA.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

	3095	3098	3099	3100	3101	3105	3106	3107	3111	3126	3127	3139	3140	3141	3142
	3143	3144	3145	3146	3147	3154	3155	3172	3173	3179	3180	3181	3182	3189	3192
	3239	3239	3240	3242	3243	3247	3248	3249	3250	3256	3258	3260	3261	3262	3263
	3266	3268	3269	3279	3280	3281	3283	3285	3286	3287	3288	3289	3293	3294	3305
	3307	3308	3309	3313	3315	3316	3317	3339	3342	3352	3353	3356	3357	3360	3363
	3364	3373	3376	3378	3385	3396	3414	3419	3420	3421	3433	3434	3436	3462	3465
	3467	3468	3469	3470	3476	3477	3478	3479	3504	3509	3510	3511	3516	3526	3532
	3544	3545	3547	3548	3549	3550	3551	3552	3553	3554	3557	3561	3564	3566	3567
	3579	3596	3597	3598	3599	3600	3601	3602	3612	3616	3617	3618	3619	3620	3621
	3626	3627	3628	3629	3630	3631	3638	3640	3644						
MOV8	3431	3446	3457	3492	3495	3555	3556	3565	3570	3580	3588				
NOP	2635	2642	2839	3190	3259	3284	3355	3402	3403	3404	3405	3439			
RESET	3346	3386													
ROL	3042	3044	3046	3069	3071	3073	3274	3300							
ROR	3572	3574	3576												
RTI	2950	3008	3010	3019	3032	3037	3049	3052	3062	3077	3081	3085	3130	3349	3382
	3415	3435	3534	3603	3622	3632									
RTS	855	3406													
SUB	3466	3639													
TRAP	916	918	920	922	924	926	928								
TST	2630	2634	2641	2689	2732	2823	2834	2837	2854	2898	2907	3024	3102	3108	3112
	3121	3174	3185	3188	3205	3244	3298	3354	3427	3438	3482	3498	3502	3523	3583
TSTB	2695	2741	2880	3340	3425	3429	3444	3455	3480	3490	3558	3586			
WAIT	2989	2991													
.ASCII	2776	2863	2952	3337	3665										
.ASCIZ	2776	2863	2952	3213	3329	3337	3646	3665							
.BLKW	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	3692				
.BYTE	903	904	905	906	1396	1397	1398	1399	1400	1401	2954	2956	2960	3216	3219
	3221	3331	3334	3536	3667	3669	3671	3673	3677	3681	3683				
.ENABL	4	512													
.END	3693														
.ENDC	194	199	204	227	232	237	260	265	270	2647	2655	2663	2673	2681	3693
.EQUIV	559														
.EVEN	2776	2863	2952	3214	3329	3337	3648	3665							
.IF	189	194	199	222	227	232	255	260	265	2639	2647	2655	2663	2681	3693
.IRP	916	918	920	922	924	926	928								
.LIST	4	169	173	498	512	918	920	922	924	926	928	930	934	2604	2776
	2863	2952	3329	3337	3665	3693									
.MACRO	4	933													
.NLIST	4	169	173	498	512	918	920	922	924	926	928	930	934	2604	2776
	2863	2952	3329	3337	3665	3693									
.PAGE	50	101	326	362	410	498	531	580	900	1121	1493	1964	2015	2062	2125
	2170	2221	2291	2345	2398	2452	2499	2551	2614	2777	2825	3176	3329		
.REM	5	51	102	271	327	363	411	468	2405	2455					
.PEPT	582														
.SBTTL	4														
.TITLE	512														
.WORD	3538														

ERRORS DETECTED: 0
 DEFAULT GLOBALS GENERATED: 0

*,DDBMAA.SEO/SOL/CRF/PAGNUM=DDBMAA

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DOBMA MACY11 27(732) 22-SEP-76 14:43 PAGE 92
DOBMAA.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

RUN-TIME: 15 27 3 SECONDS
RUN-TIME RATIO: 153/46=3.2
CORE USED: 13K (25 PAGES)

[illegible]