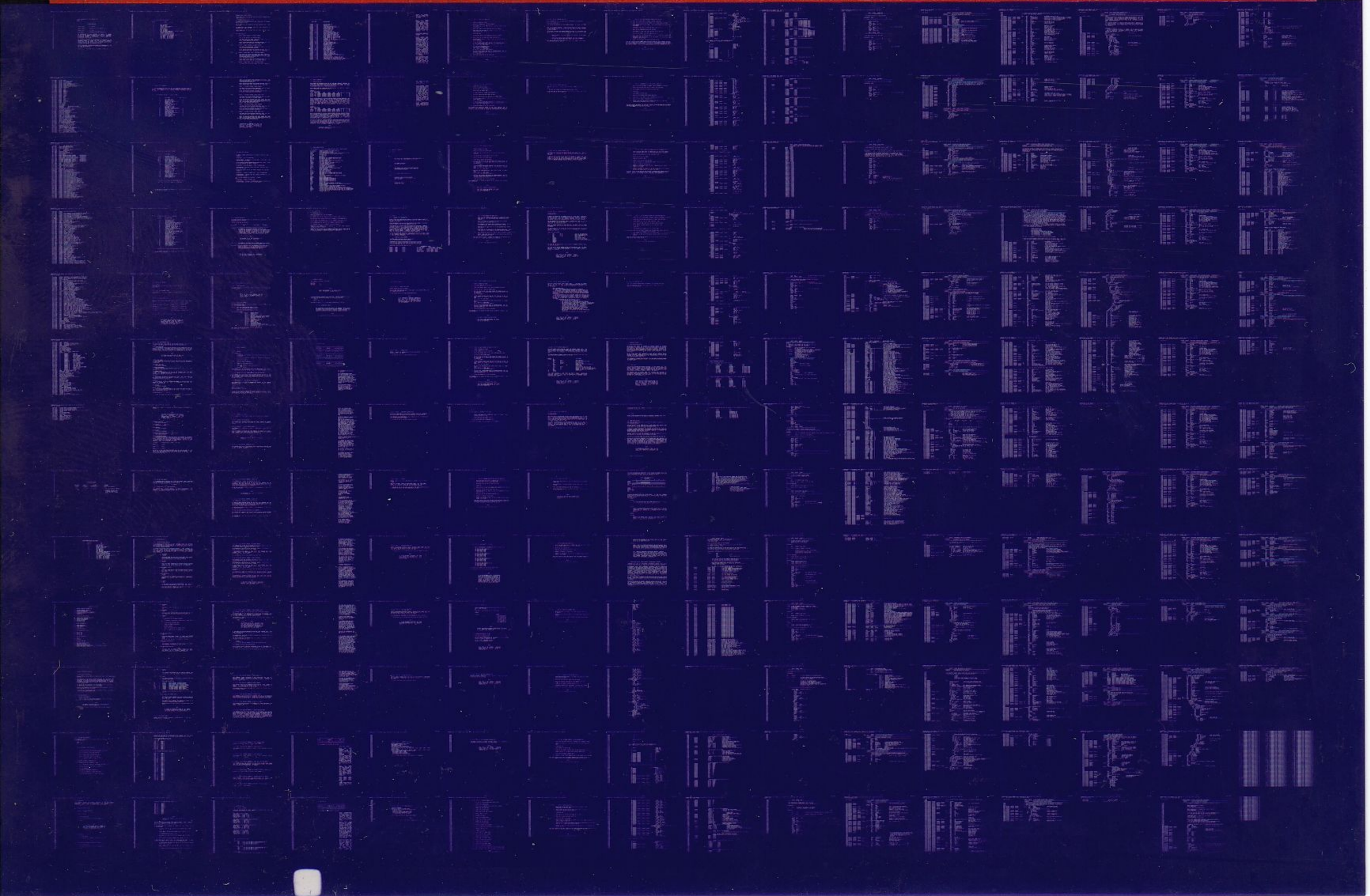
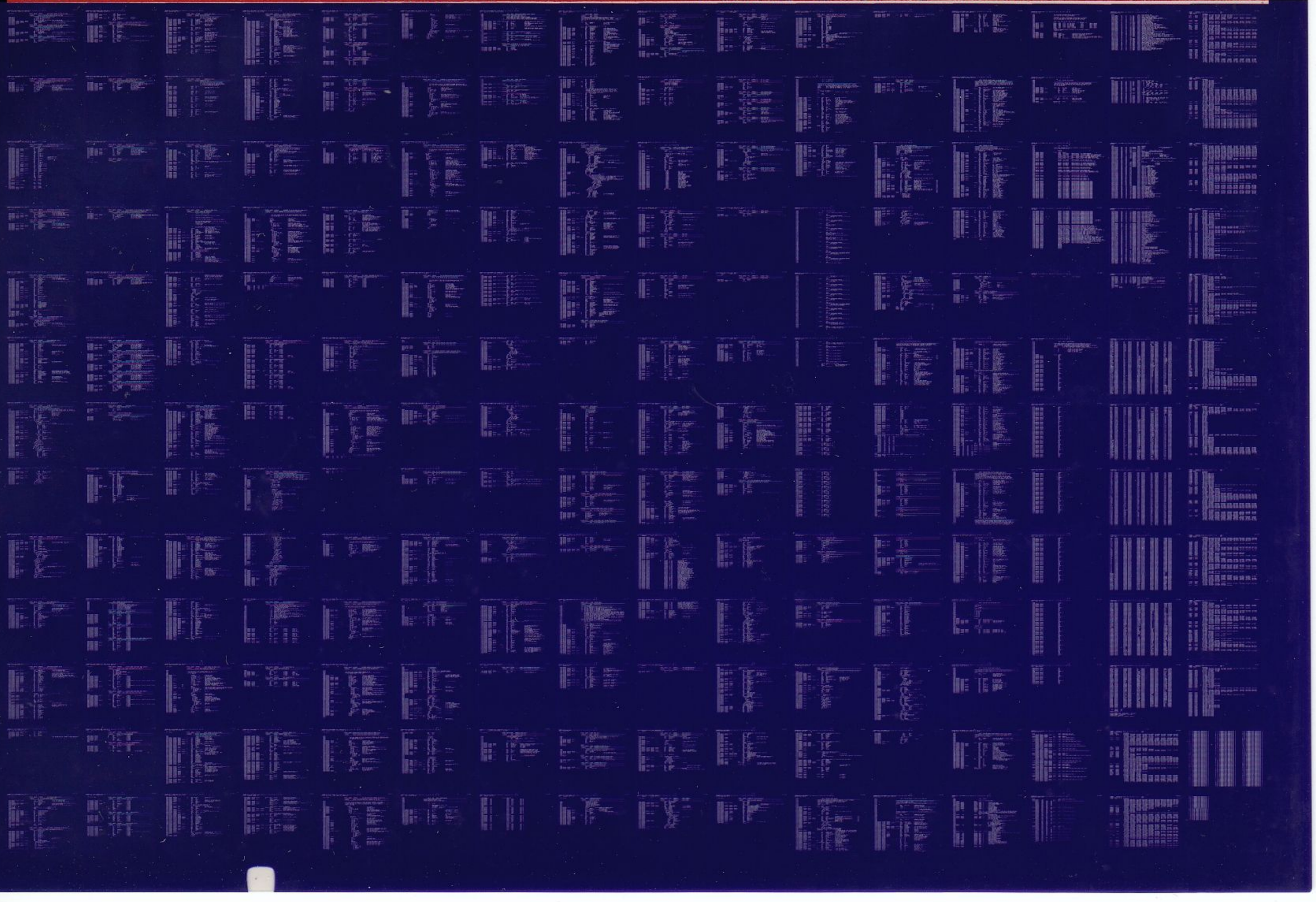
M8743,M7981 MS11-L/M/P MEM DIAG AH-T157B-MC SEP 1982
M8022 CZMSPB0 FICHE 1 OF 3
MADE IN USA



M8743,M7981 MS11-L/M/P MEM DIAG AH-T157B-MC SEP 1982
M8022 CZMSPB0 FICHE 2 OF 3
MADE IN USA



M8743,M7981 MS11-L/M/P MEM DIAG AH-T157B-MC SEP 1982
M8022 CZMSPB0 FICHE 3 OF 3 COPYRIGHT© 1982
MADE IN USA

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.TITLE  CZMSPB0 MS11-L/M/P MEMORY DIAG.
.NLIST TOC
.REM
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IDENTIFICATION

PRODUCT CODE: AC-T156B-MC

PRODUCT NAME: CZMSPB0 MS11-L/M/P MEMORY DIAG

PRODUCT DATE: JULY 1982

MAINTAINER: ELECTRONIC STORAGE DIAGNOSTICS

CZMSPB0 MS11-L/M/P MEMORY DIAG. MACRO M1113 06-JUL-82 10:35
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REVISION HISTORY

REVISION	DATE	AUTHOR	CHANGES
CZMSPA	1-JUN-82	IRA CHAVIS	NONE - NEW PROGRAM
CZMSPB	1-JULY-82	IRA CHAVIS	1-FIX FIELD SERVICE COMMAND 8 2-INCREASE TESTING LIMITS OF MT0044 FROM 16K TO EVERY 100 OCTAL ADDRESS IN 16K

```
                        OPERATIONAL SWITCH SETTINGS
                        SWITCH REGISTER DEFINITIONS
                        *
                        *       SWITCH                  USE
                        *       ------          --------------------
                        *         15            HALT ON ERROR
                        *         14            LOOP ON TEST
                        *         13            INHIBIT ERROR TYPEOUTS
                        *         12            INHIBIT RELOCATION
                        *         11            QUICK VERIFY
                        *         10            BELL ON ERROR
                        *          9            LOOP ON ERROR
                        *          8            HALT PROGRAM (UNRELOCATED  RESTORE LOADERS)
                        *          7            DETAILED ERROR REPORTS
                        *          6            INHIBIT CONFIGURATION MAP
                        *          5            LIMIT MAX ERRORS PER BANK
                        *          4            FAT TERMINAL (132 COLUMNS OR BETTER)
                        *          3            TEST MODE - SEE DOCUMENT
                        *          2            TEST MODE - SEE DOCUMENT
                        *          1            TEST MODE - SEE DOCUMENT
                        *          0            DETECT SINGLE BIT ERRORS
```

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1.0 GENERAL PROGRAM INFORMATION

1.1 PROGRAM PURPOSE (ABSTRACT)

A. INTENDED FOR USE ON ALL PDP-11/24/44'S WHICH MEET THE CONDITIONS IN 1.2.1.

B. THIS PROGRAM WILL BE USED BY SYSTEM MANAGERS AND OPERATORS TO DETERMINE THE CORRECT OPERATION OF MAIN MEMORY AND ALSO IT WILL BE PRIMARILY USED BY FIELD SERVICE AND MANUFACTURING TO ISOLATE FAILURES TO THE MEMORY AND TO ISOLATE FAILURES WITHIN THE MEMORY TO THE CORRECT CARD.

C. THE OBJECT OF THIS SOFTWARE IS TO FUNCTIONALLY TEST AND VERIFY ALL MAIN MEMORY FUNCTIONS AS FAST AS POSSIBLE.

D. THERE IS THE CAPABILITY OF TESTING MIXED CONFIGURATIONS (MS11-L, MS11-M AND MS11-P) ON THE SYSTEM.

E. IT HAS SPECIAL A MAINTENANCE MODE (FIELD SERVICE MODE) TO PROVIDE SPECIFIC FUNCTIONAL CAPABILITIES.

1.2 SYSTEM REQUIREMENTS

1.2.1 HARDWARE REQUIREMENTS -

PDP-11-24/44 CPU WITH 22 BIT ADDRESSING AND AT LEAST 64K (16 BIT WORDS) OF MEMORY AND MEMORY MANAGEMENT.

NOTE

1. LIKE MEMORY TYPES MUST BE ON 16K WORD BOUNDARIES STARTING AT PHYSICAL ADDRESS 0.

2. PDP-11 SERIES 16/18 BIT PROCESSORS ARE NOT SUPPORTED.

1.2.2 SOFTWARE REQUIREMENTS -

THIS PROGRAM IS DESIGNED TO RUN STAND ALONE OR UNDER ANY OF THE FOLLOWING MONITORS:

XXDP
ACT
APT

1.3 RELATED DOCUMENTS AND STANDARDS

1. PDP-11/04/24/34/44/70 PROCESSOR HANDBOOK (EB-19402)
2. PDP-11/44 USER'S GUIDE (EK-11044-UG)
3. MS11-M USER'S GUIDE (EK-MS11M-UG-001)
4. MS11-L USERS GUIDE (EK-MS11L-UG-001)
5. MS11-P TECHNICAL MANUAL (EK-MS11P-TM-001)

1.4 DIAGNOSTIC HIERARCHY PREREQUISITES

IF THE PROGRAM IN ANY WAY MISBEHAVES, THEN:

1. TRY IT AGAIN WITH CACHE OFF (REFERENCE SECTION 2.4.3.1)
2. INHIBIT RELOCATION (REFERENCE SECTION 2.4.1)
3. TRY CPU DIAGNOSTICS
4. TRY MEMORY MANAGEMENT DIAGNOSTICS
5. TRY CACHE DIAGNOSTICS (WHERE APPLICABLE)
6. TRY UNIBUS MAP DIAGNOSTICS (WHERE APPLICABLE)

1.5 ASSUMPTIONS

THIS PROGRAM ASSUMES THE CORRECT OPERATION OF THE CPU, MEMORY MANAGEMENT, CACHE, AND THE UNIBUS MAP. THIS PROGRAM OCCUPIES (INITIALLY) BANK 0 (0-16K). THE XXDP LOADERS ARE IN BANK 1.

2.0 OPERATING INSTRUCTIONS

2.1 LOADING STARTING PROCEDURES

2.1.1 QUICK STARTING -

1. LOAD ADDRESS 200
2. SET SWITCH REGISTER FOR OPTIONS (NORMALLY 0)
3. START

NOTE

IF ON AN 11/24 USING MS11-L MEMORY BE SURE THAT THE PERIPHERAL PAGE JUMPER IS IN PLACE; FAILURE TO DO SO SENDS THE DIAGNOSTIC TO NEVER-NEVER LAND.

2.1.2 STOPPING -

1. SET SW8, AND/OR
2. TYPE CONTROL "C" (REFERENCE SECTION 2.4.4.1).

2.1.3 RESTARTING (PRESERVE CONFIGURATION TABLE) -

1. LOAD ADDRESS 202
2. SET SWITCH REGISTER FOR OPTIONS (NORMALLY 0)
3. START

2.1.4 SWITCH REGISTER OPTIONS -

SWITCH	USE
15	HALT ON ERROR
14	LOOP ON TEST
13	INHIBIT ERROR TYPEOUTS
12	INHIBIT RELOCATION
11	QUICK VERIFY
10	BELL ON ERROR
9	LOOP ON ERROR
8	HALT PROGRAM (UNRELOCATE RESTORE LOADERS)
7	DETAILED ERROR REPORTS
6	INHIBIT CONFIGURATION MAP
5	LIMIT MAX ERRORS PER BANK
4	FAT TERMINAL (132 COLUMNS OR BETTER)
3	TEST MODE - SEE DOCUMENT
2	TEST MODE - SEE DOCUMENT
1	TEST MODE - SEE DOCUMENT
0	DETECT SINGLE BIT ERRORS

2.2 DEFAULT TEST SEQUENCE

THE FOLLOWING TWO LISTS GIVE THE TEST PROTOCOL FOR PARITY AND ECC MEMORY. TESTS MARKED WITH A "*" ARE NOT NORMALLY RUN EXCEPT UNDER ACT OR APT, OR THROUGH A FIELD SERVICE COMMAND (REFERENCE SECTION 2.4.4.8).

2.2.1 TEST PROTOCOL FOR MS11-L PARITY MEMORY -

	TEST	TEST NAME	TIME (SEC/16K)
	34	SOFT ERROR TEST	<1
	6	INITIAL DATA TEST	<1
	17	HOLDING 1'S AND 0'S TEST	<1
	7	ADDRESS BIT TEST	<1
	1	ADDRESS TEST	<1
	2	COMPLEMENT ADDRESS TEST	<1
	3	3 XOR 9 TEST	1
	4	ROTATING 0'S TEST	1
	5	ROTATING 1'S TEST	1
	21	MARCHING 1'S AND 0'S TEST	1
	35	WORST CASE NOISE PARITY TEST	N/A
*	22	REFRESH TEST	10
*	23	SHIFTING DIAGONAL TEST	10
	26	RANDOM DATA TEST	<1
*	24	FAST GALLOPING PATTERN TEST	20
*	31	SOB-A-LONG TEST	3
*	32	WRITE RECOVERY TEST	<1
*	33	BRANCH GOBBLE TEST	35
	34	SOFT ERROR TEST	<1

2.2.2 TEST PROTOCOL FOR MS11-M ECC MEMORY -

TEST	TEST NAME	TIME (SEC/16K)
5	ROTATING 1'S TEST	1
@ 25	INTERRUPT ENABLE TEST	<1
+@ 11	SINGLE BIT ERROR TEST	<2
+@ 12	WRITE BYTE CLEARS SBE TEST	<1
+@ 13	CREATE DOUBLE BIT ERROR TEST	1
+@ 15	WRITE INHIBIT OF BYTE W/DBE TEST	1
+@ 16	WRITE INHIBIT OF WORD W/DBE TEST	<1
34	SOFT ERROR TEST	<1
6	INITIAL DATA TEST	<1
10	BYTE ADDRESS TEST	<1
17	HOLDING 1'S AND 0'S TEST	<1
7	ADDRESS BIT TEST	<1
1	ADDRESS TEST	<1
2	COMPLEMENT ADDRESS TEST	<1
4	ROTATING 0'S TEST	1
5	ROTATING 1'S TEST	1
21	MARCHING 0'S AND 1'S TEST	1
* 22	REFRESH TEST	10
26	RANDOM DATA TEST	<1
* 24	FAST GALLOPING PATTERN TEST	20
* 31	SOB-A-LONG TEST	3
* 32	WRITE RECOVERY TEST	<1
* 33	BRANCH GOBBLE TEST	35
34	SOFT ERROR TEST	<1

@ - RUN ONLY ON THE FIRST PASS WHEN UNDER ACT OR APT

+ - RUN TWICE FOR EACH 16K BANK IF INTERLEAVED

AT THE END OF EACH PASS THE PROGRAM WILL RUN CLEANUP PATTERNS #30, AND #27 FOR ALL BANKS.

2.2.3 TEST PROTOCOL FOR MS11-P ECC MEMEORY

PATTERN	PATTERN NAME	TIME (SEC/16K)
5	ROTATING 1'S TEST	1
34	SOFT ERROR TEST	<1
6	INITIAL DATA TEST	<1
44	SHIFTING CHECK BITS THRU THE CSR	5
14	BASIC DOUBLE BIT ERROR TEST	<1
45	SYNDROMES IN CSR ON DBE TEST	<1
36	CORRECTION CODE TEST	1
20	SYNDROMES IN CSR ON SBE TEST	1
37	CHECK ECC DISABLE TEST	<1
41	ADDRESS TO CSR ON DBE TEST	1
42	EXTENDED ADDRESS TO CSR TEST	<1
43	BYTE WRITE TEST	<1
46	CHECK SBE WITH ECC DISABLE TEST	<1
47	NO CSR UPDATE ON SBE WITH DBE TEST	<1
10	BYTE ADDRESS TEST	<1
17	HOLDING 1'S AND 0'S TEST	<1
7	ADDRESS BIT TEST	<1
1	ADDRESS TEST	<1
2	COMPLEMENT ADDRESS TEST	<1
4	ROTATING 0'S TEST	1
5	ROTATING 1'S TEST	1
21	MARCHING 0'S AND 1'S TEST	1
* 22	REFRESH TEST	10
26	RANDOM DATA TEST	<1
* 24	FAST GALLOPING PATTERN TEST	20
* 31	SOB-A-LONG TEST	3
* 32	WRITE RECOVERY TEST	<1
* 33	BRANCH GOBBLE TEST	35
34	SOFT ERROR TEST	<1

@ - RUN ONLY ON THE FIRST PASS WHEN UNDER ACT OR APT

AT THE END OF EACH PASS THE PROGRAM WILL RUN CLEANUP PATTERNS #30, AND #27 FOR ALL BANKS.

2.3 SPECIAL EP RONMENTS

2.3.1 XXDP -

THE FIRST PASS WILL BE A QUICK VERIFY PASS IF AND ONLY IF IT IS IN CHAIN MODE.

2.3.2 ACT APT AUTOMATIC MODE -

THE PROGRAM WILL NOT CREATE DOUBLE BIT ERRORS (DBE'S) AFTER THE 1ST PASS.

2.3.2.1 APT EXECUTION TIMES -

HERE ARE SOME MEASURED EXECUTION TIMES FOR AN 11/44 WITH CACHE UNDER APT

	1ST QV PASS	2ND PASS ONWARD
128K MS11-M (NON-INTERLEAVED)	10 MIN 5 SEC	7 MIN 40 SEC
128K MS11-L	9 MIN 50 SEC	7 MIN 30 SEC
256K MS11-M (INTERLEAVED)	19 MIN 50 SEC	14 MIN 45 SEC
512K MS11-P	NOT ESTABLISHED AT RELEASE TIME	

THE FIRST PASS WILL BE A QUICK VERIFY PASS

NOTE

EVEN THOUGH THE FIRST PASS IS A QV PASS IT TAKES LONGER THAN THE SUBSEQUENT NON-QV PASSES DUE TO THE FACT THAT IT IS RUNNING MORE PATTERNS, SOME OF WHICH (PATTERNS #24 AND #33 FOR EXAMPLE) CAN BE EXTREMEMLY TIME CONSUMING.

2.3.2.2 APT ENVIRONMENT TABLE -

THE FOLLOWING TABLE GIVES SOME OF THE STANDARD SETTINGS FOR THE APT E-TABLE. THEY MAY BE MODIFIED AS NOTED AS THE USER SEES FIT.

FIRST PASS RUN TIME:
THIS PARAMETER SHOULD BE SET ACCORDING TO THE AMOUNT AND TYPE OF MEMORY TO BE TESTED. THE ABOVE TABLE (APT EXECUTION TIMES) GIVES SOME MEASURED TIMES. FOR ANY PATTERNS DELETED (THROUGH USE OF THE DEVICE DESCRIPTOR WORDS) REFERENCE SECTION 2.2 FOR INDIVIDUAL PATTERN TIMES.

NOTE

THE TIMES GIVEN IN SECTION 2.2 ARE FOR
16K CHUNKS OF MEMORY, NOT 128K BOARDS!

LONGEST TEST TIME:
THIS PARAMETER SHOULD BE SET TO THE EXECUTION TIME OF THE LONGEST PATTERN BEING RUN. FOR THE DEFAULT CASE THIS IS 35 SECONDS FOR PATTERN #33.

ADDITIONAL RUN TIME:
NOT USED BY PROGRAM.

SOFTWARE ENVIRONMENT:
FOR APT AUTO MODE THIS PARAMETER SHOULD BE SET TO A "1". FOR DUMP MODE SET THIS TO A "0".

ENVIRONMENT MODE:
WHEN THIS PARAMETER IS SET TO A "0" THE PROGRAM DOES IT'S OWN SIZING. IF THE USERS SETS BIT #7 HOWEVER, HE MUST SPECIFY THE TYPES AND AMOUNTS OF MEMORY TO BE TESTED.

SWITCH 1:
THE DEFAULT SETTING OF THIS SWITCH IS "101". APT USES THIS AS THE SWITCH REGISTER FOR THE PROGRAM. REFERENCE SECTION 2.4.1 FOR MORE INFORMATION ON SWITCH SETTINGS.

SWITCH 2:
THIS SWITCH, IF SET TO ANY NON-ZERO NUMBER, IS USED TO LIMIT THE AMOUNT OF PASSES APT WILL MAKE. THE PROGRAM WILL HANG AFTER THIS COUNT HAS BEEN REACHED.

CPU OPTIONS:
NOT USED BY PROGRAM.

MEMORY TYPE N (N=1 TO 4)
IF BIT #7 OF ENVIRONMENT MODE IS SET THESE FOUR WORDS ARE USED TO LOG THE DIFFERENT TYPES OF MEMORY TO BE TESTED. IF BIT #7 IS NOT SET THESE LOCATION ARE NOT USED.

MAXIMUM ADDRESS N (N=1 TO 4)

THESE FOUR WORDS ARE USED IN CONJUNTION WITH THE CORRESPONDING

MEMORY TYPE WORDS TO INDICATE THE HIGHEST ADDRESS THAT MEMORY TYPE OCCUPIES.

NOTE

THE ABOVE TWO PARAMETERS DO NOT ACTUALLY HAVE TO REPRESENT AN ACCURATE CONFIGURATION OF MEMORY. ALL THE PROGRAM LOOKS FOR IS AN ACCURATE TALLY OF MEMORY AMOUNT!

INTERRUPT VECTOR N (N=1 TO 2)
NOT USED BY PROGRAM.

BUS PRIORITY N (N=1 TO 2)
NOT USED BY PROGRAM.

BASE ADDRESS:
NOT USED BY PROGRAM.

DEVICE MAP:
NOT USED BY PROGRAM.

CONTROLLER DESCRIPTOR CODE N (N=1 TO 2)
NOT USED BY PROGRAM.

DEVICE DESCRIPTOR CODES:
THE DEVICE DESCRIPTOR CODES ARE USED BY THE PROGRAM TO DETERMINE WHICH PATTERNS IT WILL RUN. THE DEFAULT VALUES OF THESE WORDS ARE ALL "1"S, INDICATING THAT ALL OF THE PATTERNS SHOWN IN SECTION 2.2 ARE EXECUTED (SAVE FOR EXCEPTIONS AS NOTED THERE). EACH SET OF WORDS CONTROLS A TABLE IN THE PROGRAM AS FOLLOWS:

DD WORDS	PROGRAM TABLE (SYMBOLIC LOCATION)
WORDS 0-1	MKCSRT
WORDS 2-3	MKPAT
WORDS 4-5	MJPAT

BIT #0 SET IN THE FIRST WORD INDICATES THAT THE FIRST PATTERN IN THE TABLE WILL BE EXECUTED, BIT #1 THE SECOND, BIT #2 THE THIRD,... BIT #0 OF THE SECOND WORD INDICATES THAT THE 17TH ENTRY IN THE TABLE WILL BE EXECUTED, AND SO ON.

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2.3.3 NO SBE FREE BANKS -

IF THE PROGRAM CANNOT FIND ANY SBE (SINGLE BIT ERROR) FREE LOCATIONS (IN NON-PROTECTED ECC MEMORY) IT WILL PRINT OUT AN ERROR MESSAGE AND CONTINUE TESTING BY-PASSING THE ECC LOGIC TESTS.

2.3.4 MIXED PARITY ECC CONFIGURATIONS -

THE PROGRAM WILL FUNCTION NORMALLY IN MIXED ENVIRONMENTS. THE SEQUENCE OF TESTING MAY SEEM STRANGE DUE TO THE RECURSIVE TEST MODE ALGORITHM (REFERENCE SECTIONS 2.4.1.1, 2.4.1.2, 2.4.1.3).

2.4 PROGRAM OPTIONS

2.4.1 SWITCH REGISTER DETAILS -

IF A HARDWARE SWITCH REGISTER IS NOT AVAILABLE THEN THE SOFTWARE SWITCH REGISTER IS IN LOCATION 176. IF UNDER APT IF BIT7 IS SET IN THE E-TABLE SYMBOLIC LOCATION "$ENVM" THE APT SOFTWARE SWITCH REGISTER WILL BE USED (LOCATION $SWREG).

TO CHANGE THE SOFTWARE SWITCH REGISTER CONTENTS: TYPE "CONTROL G". THIS WILL CAUSE DISPLAY THE CURRENT VALUE OF THE SWR AND PROMPT FOR THE OCTAL INPUT OF THE NEW SWR VALUE FROM THE TERMINAL. THIS ROUTINE WILL IGNORE YOU (NOT RESPOND TO CONTROL "G") IF YOU HAVE A HARDWARE SWITCH REGISTER.

SW15 = HALT ON ERROR
(100000)

CONTINUING FROM THIS HALT WILL FIRST CHECK FOR A CHANGE IN THE SOFTWARE SWITCH REGISTER ("CONTROL G" IN THE TTY INPUT BUFFER) THEN IT WILL CONTINUE TESTING.

SW14 = LOOP ON TEST
(40000)

THIS WILL CAUSE LOOPING ON THE PRESENT TEST OR PATTERN (BACK TO LAST SCOPE TRAP). IF IN A PATTERN THEN THE LOOPING WILL BE FOR AN ENTIRE BANK OF 16K ADDRESSES.

SW13 = INHIBIT ERROR TYPEOUTS
(20000)

THIS WILL CAUSE RETURNS FROM THE ERROR ROUTINE WITHOUT THE TYPED MESSAGES. OTHER ON ERROR FUNCTIONS ARE NOT AFFECTED.

SW12 = INHIBIT RELOCATION
(10000)

THIS PREVENTS THE PROGRAM FROM MOVING AND CONSEQUENTLY PREVENTS THE PROGRAM FROM TESTING AT LEAST 32K OF MEMORY.

SW11 = QUICK VERIFY
(4000)

IF THIS SWITCH IS SELECTED APPROXIMATELY ONE 64TH OF THE POSSIBLE COMBINATIONS OF SBE'S DBE'S ARE TESTED.

EACH PASS COMPLETE TYPEOUT WILL INDICATE THIS MODE BY PRECEDING THE PASS NUMBER WITH "QV".

```
                        SW10    = BELL ON ERROR
                                (2000)

                                THIS CAUSES A BELL (OR BEEP OR CLICK) ON EACH ERROR
                                TRAP

                        SW9     = LOOP ON ERROR
                                (1000)

                                THIS WILL CAUSE LOOPING FROM FAILURE POINT BACK TO THE
                                LAST CORRECTLY INITIALIZED AREA OF THE CURRENT TEST.

                        SW8     = HALT PROGRAM
                                (400)

                                THIS INITIATES THE FOLLOWING SEQUENCE:

                                1.  IF PROGRAM IS RELOCATED IT MOVES BACK TO BANK ZERO.

                                2.  FLUSH OUT ALL POSSIBLE DBE'S.

                                3.  TURNS OFF MEMORY MANAGEMENT.

                                4.  RESTORE LOADERS.

                                5.  UNMAP THE UNIBUS MAP (IF THERE IS ONE).

                                6.  HALT IF UNDER APT OR ACT BRANCH SEL.


                        SW7     = DETAILED ERROR REPORTS
                                (200)

                                AFTER ANY NORMAL ERROR REPORT IS TYPED THIS OPTION
                                CAUSES THE CONTENTS OF THE FOLLOWING REGISTERS TO BE
                                TYPED:
                                R0, R1, R2, R3, R4, R5, SP, "CONTROL", "CPUERR"

                        SW6     = INHIBIT CONFIGURATION MAP
                                (100)

                                THIS INHIBITS THE PRINTING OF A MAP SHOWING THE MEMORY
                                CONFIGURATION - REFERENCE SECTION 7.3

                        SW5     = LIMIT MAX ERRORS PER BANK
                                (40)

                                THIS WILL LIMIT THE NUMBER OF ERROR TYPEOUTS PER BANK.
                                THE DEFAULT IS 10. DECIMAL, HOWEVER THIS CAN BE
                                CHANGED BY CHANGING LOCATION "ERRMAX" MANUALLY.
```

SW4 = FAT TERMINAL
(20)

THIS INFORMS THE PROGRAM THAT THE CONSOLE TERMINAL HAS A WIDTH OF AT LEAST 132 COLUMNS (LA36 WITH WIDE PAPER).

SW3-1 = TEST MODE

TEST MODES DETERMINE THE RECURSION ALGORITHM TO BE USED DURING PATTERN TESTS.

MODE NAME DESCRIPTION

(0)	0	BAFPAF	BANKS FORWARD, PATTERNS FORWARD
(2)	1	BAFPAR	BANKS FORWARD, PATTERNS REVERSE
(4)	2	BAWPAF	BANKS WORST FIRST, PATTERNS FORWARD.
(6)	3	BAWPAR	BANKS WORST FIRST, PATTERNS REVERSE.
(10)	4	PAFBAF	PATTERNS FORWARD, BANKS FORWARD
(12)	5	PAFBAW	PATTERNS FORWARD, BANKS WORST FIRST
(14)	6	PARBAF	PATTERNS REVERSE, BANKS FORWARD
(16)	7	PARBAW	PATTERNS REVERSE, BANKS WORST FIRST.

FOR MORE DETAILS REFERENCE SECTION 2.4.1.1, 2.4.1.2 AND 2.4.1.3.

SW0 = DETECT SINGLE BIT ERRORS (SBI'S)
(1)

FOR MANUFACTURING PURPOSES THIS SWITCH SHOULD ALWAYS BE ON. FOR FIELD SERVICE PURPOSES THIS SWITCH SHOULD ALWAYS BE OFF.

THIS SWITCH WILL ALLOW ALL ECC SINGLE BIT ERRORS TO BE REPORTED BY DISABLING ERROR CORRECTION.

ERROR PRINTOUTS OF SBE'S ARE NOT DISTINGUISHABLE FROM DBE'S.

NOTE

IF DOUBLE BIT ERRORS ARE FOUND IN THE MEMORY, THIS SWITCH SHOULD BE SET TO MAKE SURE THAT NEW DATA CAN BE WRITTEN TO THE DBE LOCATIONS.

2.4.1.1 TEST MODE EXAMPLE -

EXAMPLE ANALYSIS OF MODE 5 "PAFBAW". ASSUME BANKS 0 1 ARE MS11-L AND BANKS 2,3,4, 5 ARE MS11-M.

```
                        ASSUME ALSO THAT BANK 3 IS KNOWN BAD BY THE  PROGRAM  VIA  THE  SIZING
                        ROUTINE OR PREVIOUS RUNS THE TESTING SEQUENCE WOULD BE AS FOLLOWS:

                        ;TEST MS11-M MEMORY TYPES FIRST
                        ;TEST KNOWN BAD MEMORY (BANK 3)

                        TEST 17.     BANK 3
                        TEST  7.     BANK 3
                        TEST  1.     BANK 3
                        TEST  2.     BANK 3
                        TEST  4.     BANK 3
                        TEST  5.     BANK 3
                        TEST 21.     BANK 3
                        TEST 20.     BANK 3
                        TEST 22.     BANK 3
                        TEST 26.     BANK 3

                        ;TEST PRESUMED GOOD MEMORY (BANKS 2,4,5)

                        TEST 17.     BANK 2
                        TEST  7.     BANK 2
                        TEST  1.     BANK 2
                        TEST  2.     BANK 2
                        TEST  4.     BANK 2
                        TEST  5.     BANK 2
                        TEST 21.     BANK 2
                        TEST 20.     BANK 2
                        TEST 22.     BANK 2
                        TEST 26.     BANK 2
                        TEST 17.     BANK 4
                        TEST  7.     BANK 4
                        TEST  1.     BANK 4
                        TEST  2.     BANK 4
                        TEST  4.     BANK 4
                        TEST  5.     BANK 4
                        TEST 21.     BANK 4
                        TEST 20.     BANK 4
                        TEST 22.     BANK 4
                        TEST 26.     BANK 4
                        TEST 17.     BANK 5
                        TEST  7.     BANK 5
                        TEST  1.     BANK 5
                        TEST  2.     BANK 5
                        TEST  4.     BANK 5
                        TEST  5.     BANK 5
                        TEST 21.     BANK 5
                        TEST 20.     BANK 5
                        TEST 22.     BANK 5
                        TEST 26.     BANK 5
```

```
847
848                     ;RELOCATE  TEST PROGRAM SPACE (BANK 0 & 1)
849
850                     TEST  1,     BANK 0
851                     TEST  2,     BANK 0
852                     TEST  3,     BANK 0
853                     TEST  4,     BANK 0
854                     TEST  5,     BANK 0
855                     TEST 26,     BANK 0
856                     TEST  1,     BANK 1
857                     TEST  2,     BANK 1
858                     TEST  3,     BANK 1
859                     TEST  4,     BANK 1
860                     TEST  5,     BANK 1
861                     TEST 26,     BANK 1
862
863
864                                          NOTE
865
866                               THIS IS  AN  EXAMPLE    NOT  AN  ACTUAL
867                               SEQUENCE.
868
869
870                     THE TEST SEQUENCE WAS FORWARD (THE SIMPLE PATTERNS  FIRST,  COMPLEX
871                     TESTS  LAST)  SEQUENCE OF PATTERNS (MS11-M = 17, 7, 1, 2, 4, 5, 21,
872                     20, 22, 26)(MS11-L = 1, 2, 3, 4, 5, 26).
873
874                     IF THE BANK SELECTION IS FORWARD THE  BANKS  WILL  BE  TESTED  IN  THE
875                     FOLLOWING ORDER:
876
877                          1.  ECC BANKS THAT ARE NOT PROTECTED OR PROGRAM SPACE (FROM 0  TO
878                              167).
879
880                          2.  PARITY BANKS THAT ARE NOT PROGRAM SPACE (FROM 0 TO 167).
881
882                          3.  THE PROGRAM NOW RELOCATES  TESTS:
883
884                          4.  ECC BANKS THAT WERE PROTECTED OR PROGRAM  SPACE  (FROM  0  TO
885                              167).
886
887                          5.  PARITY BANKS THAT WERE PROGRAM SPACE (FROM 0 TO 167).
888
889                     IF BANK SELECTION IS WORST  FIRST  THE  CONFIGURATION  TABLE  WILL  BE
890                     CONSULTED AND BANKS WILL BE TESTED IN THE FOLLOWING ORDER.
891
892                          1.  ECC BANKS THAT ARE KNOWN BAD AND ARE NOT PROTECTED OR PROGRAM
893                              SPACE (FROM 0 TO 167).
894
895                          2.  PARITY BANKS THAT ARE KNOWN BAD AND  ARE  NOT  PROGRAM  SPACE
896                              (FROM 0 TO 167).
897
898                          3.  ECC BANKS THAT ARE PRESUMED GOOD AND  ARE  NOT  PROTECTED  OR
```

```
900
901                                 PROGRAM SPACE (FROM 0 TO 167).
902
903                             4.  PARITY BANKS THAT ARE PRESUMED GOOD AND ARE NOT PROGRAM SPACE
904                                 (FROM 0 TO 167).
905
906                             5.  THE PROGRAM NOW RELOCATES  TESTS:
907
908                             6.  ECC BANKS THAT ARE KNOWN BAD AND WERE  PROTECTED  OR  PROGRAM
909                                 SPACE (FROM 0 TO 167).
910
911                             7.  PARITY BANKS THAT ARE KNOWN BAD AND WERE PROGRAM SPACE  (FROM
912                                 0 TO 167).
913
914                             8.  ECC BANKS THAT  ARE  PRESUMED  GOOD  AND  WERE  PROTECTED  OR
915                                 PROGRAM SPACE (FROM 0 TO 167).
916
917                             9.  PARITY BANKS THAT ARE PRESUMED GOOD AND  WERE  PROGRAM  SPACE
918                                 (FROM 0 TO 167).
919
920
921                     2.4.1.2  TEST MODE DETAILS -
922
923                     MODE 0      = 'BAFPAF'' BANKS FORWARD, PATTERNS FORWARD
924
925                                     THIS IS THE DEFAULT AND SIMPLEST MODE.
926
927                                     THIS MODE TESTS EACH BANK  COMPLETELY  FROM  0  TO  167
928                                     EXCEPT THOSE REQUIRING RELOCATION*.
929
930                                     WHILE TESTING EACH BANK THE PATTERNS ARE RUN  WITH  THE
931                                     SIMPLE ONES FIRST BUILDING TO THE MORE COMPLEX.
932
933                     MODE 1      = 'BAFPAR'' = BANKS FORWARD, PATTERNS REVERSE
934
935                                     THIS MODE TESTS EACH BANK  COMPLETELY  FROM  0  TO  167
936                                     EXCEPT THOSE REQUIRING RELOCATION*.
937
938                                     WHILE TESTING EACH BANK THE PATTERNS ARE RUN  WITH  THE
939                                     MOST COMPLEX ONES FIRST, WORKING TO THE SIMPLE ONES.
940
941                     MODE 2      = 'BAWPAF'' = BANKS WORST FIRST, PATTERNS FORWARD
942
943                                     THIS MODE FIRST TESTS EACH KNOWN  BAD  BANK  COMPLETELY
944                                     FROM  0 TO 167 EXCEPT THOSE REQUIRING RELOCATION*, THEN
945                                     PRESUMED GOOD BANKS ARE TESTED FROM  0  TO  167  EXCEPT
946                                     THOSE REQUIRING RELOCATION*.
947
948                                     WHILE TESTING EACH BANK THE PATTERNS ARE RUN  WITH  THE
949                                     SIMPLE ONES FIRST, BUILDING TO THE MORE COMPLEX.
950
951                     MODE 3      = 'BAWPAR'' = BANKS WORST FIRST, PATTERNS REVERSE
952
953                                     THIS MODE FIRST TESTS EACH KNOWN  BAD  BANK  COMPLETELY
```

```
                                        FROM  0 TO 167 EXCEPT THOSE REQUIRING RELOCATION*, THEN
                                        PRESUMED GOOD BANKS ARE TESTED FROM  0  TO  167  EXCEPT
                                        THOSE REQUIRING RELOCATION*.

                                        WHILE TESTING EACH BANK THE PATTERNS ARE RUN  WITH  THE
                                        MOST COMPLEX ONES FIRST, WORKING TO THE SIMPLE ONES.

                    MODE 4      = ''PAFBAF'' = PATTERNS FORWARD, BANKS FORWARD

                                        THIS MODE TESTS EACH PATTERN COMPLETELY WITH THE SIMPLE
                                        ONES FIRST, BUILDING TO THE MORE COMPLEX.

                                        WHILE TESTING EACH PATTERN THE BANKS ARE RUN FROM 0  TO
                                        167 EXCEPT THOSE REQUIRING RELOCATION*.


                    MODE 5      = ''PAFBAW'' = PATTERNS FORWARD, BANKS WORST FIRST

                                        THIS MODE TESTS EACH PATTERN COMPLETELY WITH THE SIMPLE
                                        ONES FIRST, BUILDING TO THE MORE COMPLEX.

                                        WHILE TESTING EACH PATTERN FIRST EACH  KNOWN  BAD  BANK
                                        FROM  0  TO  167  EXCEPT THOSE REQUIRING RELOCATION* IS
                                        RUN, THEN PRESUMED GOOD BANKS ARE RUN  FROM  0  TO  167
                                        EXCEPT THOSE REQUIRING RELOCATION*.

                    MODE 6      = ''PARBAF'' = PATTERNS REVERSE, BANKS FORWARD

                                        THIS MODE TESTS EACH PATTERN COMPLETELY WITH  THE  MOST
                                        COMPLEX ONES FIRST, WORKING TO THE SIMPLE ONES.

                                        WHILE TESTING EACH PATTERN THE BANKS ARE RUN FROM 0  TO
                                        167 EXCEPT THOSE REQUIRING RELOCATION*.

                    MODE 7      = ''PARBAW'' = PATTERNS REVERSE, BANKS WORST FIRST

                                        THIS MODE TESTS EACH PATTERN COMPLETELY WITH  THE  MOST
                                        COMPLEX ONES FIRST, WORKING TO THE SIMPLE ONES.

                                        WHILE TESTING EACH PATTERN FIRST EACH  KNOWN  BAD  BANK
                                        FROM  0 TO 167 EXCEPT THOSE THAT REQUIRE RELOCATION* IS
                                        RUN, THEN PRESUMED GOOD BANKS ARE RUN  FROM  0  TO  167
                                        EXCEPT THOSE REQUIRING RELOCATION*.


                                                        NOTE

                                        * RELOCATION IS  REQUIRED  TO  TEST  THE
                                        BANK(S)  IN  PROGRAM  SPACE  AND ALSO TO
                                        TEST  ANY   ECC   BANKS   PROTECTED   BY
                                        DIAGNOSTIC  CHECKMODE  WITH  THE INHIBIT
                                        MODE POINTER OFF (ZERO)!
```

2.4.1.3 TEST MODE APPLICATIONS -

1. TO VERIFY CORRECT OPERATION OF THE MEMORY SYSTEM USE MODE 0 'BAFPAF".

   ADVANTAGES: EASY TO UNDERSTAND.

   DISADVANTAGES: IN CASE OF A FAILING BANK, IT MAY TAKE A LONG TIME TO FIND THE FAILURE.

2. TO GET DETAILED ERROR INFORMATION ON KNOWN BAD BANKS (FOUND BY SIZING ROUTINE) USE MODE 2 'BAWPAF".

   ADVANTAGES: SEEKS BAD BANKS. EASY TO UNDERSTAND.

   DISADVANTAGES: FAILURES OTHER THAN ZEROS ONES MAY TAKE A LONG TIME TO FIND.

3. TO GET GOOD ERROR INFO ON ANY MEMORY PROBLEM FAST USE MODE 4 'PAFBAF".

   ADVANTAGES: COVERS ALL BANKS FAST. EASY TO UNDERSTAND.

   DISADVANTAGES: FAILURES FROM ONLY COMPLEX PATTERNS MAY TAKE A LONG TIME TO FIND.

4. TO FIND ANY PROBLEM FAST USE MODE 7 'PARBAW".

   ADVANTAGES: COVERS ALL BANKS FAST.

   DISADVANTAGES: DIFFICULT TO UNDERSTAND FAILURES REPORTED ARE NOT NECESSARILY THE MOST BASIC FAILURE MODES.

2.4.2 DISPLAY REGISTER -

A SOFTWARE DISPLAY REGISTER EXISTS IN LOCATION 174 IN ADDITION TO ANY HARDWARE DISPLAY EXISTENCE.

DISPLAY FIELDS ARE AS FOLLOWS:

```
       15 ! 14  13  12  11  10   9   8 ! 7   6   5 ! 4   3   2   1
RELOCATED !          BANK  #           ! NOT USED   !    PATTERN #
          !                            !            !
==========================================================================
```

PATTERN # = THE NUMBER OF THE PATTERN PRESENTLY BEING RUN. ALL PATTERNS ARE DESCRIBED IN SECTION 6.2. ANY PATTERN CAN BE FOUND IN THE DIAGNOSTIC BY LOOKING UP THE SYMBOLIC TAGS 'MT0NN'' AND 'MTPNN'' - WHERE 'NN'' IS THE TEST NUMBER. MT0NN REFERS TO THE ROUTINE THAT SETS UP FOR THE TEST PATTERN WHEREAS MTPNN IS THE ACTUAL PATTERN ITSELF.

NOTE

THE PATTERN # IS NOT NECESSARILY AN INDICATION OF DEGREE OF DIFFICULTY.

BANK = THE NUMBER OF THE BANK (16K) OF MEMORY UNDER TEST (0-167). THESE BITS DIRECTLY MAP TO PHYSICAL ADDRESS BITS (21:15).

RELOCATED = THIS BIT INDICATES THAT THE PROGRAM IS RELOCATED AND NO LONGER IN BANK 0. IT WILL BE RELOCATED TO THE FIRST KNOWN GOOD NON-PROTECTED MEMORY BANK INDICATED ON THE CONFIGURATION MAP (REFERENCE SECTION 7.3).

NOTE

ANOTHER WAY TO OBTAIN THIS INFORMATION IS TO TYPE A CONTROL/T AT THE CONSOLE (REFERENCE SECTION 2.4.4.5).

2.4.3 SPECIAL MEMORY LOCATIONS -

2.4.3.1 CACHE CONSTANT -

THE CACHE CONSTANT IS LOCATED AT SYMBOLIC LOCATION ''CACHK'' AND IS USED TO ENABLE CACHE.

NOTE

BIT 0 IN THE CACHE CONSTANT HAS NO EFFECT SINCE IT IS UNCONDITIONALLY SET BY THE PROGRAM WHENEVER IT TRIES TO ENABLE CACHE.

2.4.3.2 CONFIGURATION TABLE

THE CONFIGURATION TABLE IS LOCATED AT SYMBOLIC LOCATION ''CONFIG'' AND HAS THE FOLLOWING FORMAT:

```
CONFIG:  FIRST 16K CONFIGURATION WORDS (2 EACH)
         2ND   16K CONFIGURATION WORDS (2 EACH)
         .....................
         200TH 16K CONFIGURATION WORDS (2 EACH)
```

CONFIGURATION WORDS:

LOW:	BIT 0	ERRORS PRESENT
	BIT 1	MEMORY EXISTS
	BIT 2-4	RESERVED
	BIT 5	SKIP ECC LOGIC TESTS FLAG (1=SKIP)
	BIT 6	PROTECTED REGION OF AN ECC MEMORY
	BIT 7	PROTECTED (PROGRAM SPACE)
	BIT 8-11	CSR CODE
	BIT 12-15	INTERLEAVED CSR CODE
MED:	BIT 0-7	NUMBER OF ERRORS
	BIT 8-10	MEMORY TYPE
	BIT 11	CSR TESTED OK
	BIT 12	INTERLEAVE ENABLED
	BIT 13	''BACKGROUND PATTERN VALID'' FLAG
	BIT 14	BANK SELECTED FOR TEST BY FIELD SERVICE MODE
	BIT 15	LOADERS HOME BANK

THIS TABLE IS USED AS THE SOURCE FOR THE CONFIGURATION MAP (REFERENCE. SECTION 7.3).

2.4.4 TERMINAL COMMANDS -

2.4.4.1 CONTROL ''C''

THIS COMMAND WILL:

1. IF SWITCH 8 (HALT PROGRAM) IN THE SWITCH REGISTER IS SET HALT THE PROGRAM.
2. IF SWITCH 8 IS NOT SET, UNRELOCATE IF PROGRAM WAS RELOCATED.
3. FLUSH OUT ANY DBE'S.
4. TURN OFF MEMORY MANAGEMENT.
5. ATTEMPT TO BOOT RK05 DRIVE 0.
6. FAILING 4, ATTEMPT TO BOOT RK04 DRIVE 1.
7. FAILING 5, GO TO 4.

THIS COMMAND WILL ONLY BE RECOGNIZED AT THE COMPLETION OF THE CURRENT TEST OR PATTERN, OR AT THE END OF A LINE OF AN ERROR MESSAGE.

2.4.4.2 CONTROL ''K'' (KILL ERROR PRINTOUT AND SKIP PATTERN)

THIS COMMAND WILL ALLOW YOU TO STOP AN ERROR PRINTOUT AND SKIP TO THE NEXT PATTERN. THIS IS HANDY, FOR EXAMPLE, WHEN YOU HAVE A WHOLE BANK FULL OF ERRORS, HAVE GOTTEN ENOUGH INFORMATION, AND WISH TO SKIP TO THE NEXT PATTERN.

2.4.4.3 CONTROL ''T'' (TELL ME WHAT'S HAPPENING)

THIS COMMAND WILL PRINT OUT THE INFORMATION ENCODED IN THE DISPLAY REGISTER. THIS IS MAINLY INTENDED FOR CPU'S WITHOUT A HARDWARE DISPLAY REGISTER.

EXAMPLE:

```
BANK = 17 TEST = 46
RELOCATED BANK= 0  PAT= 26
```

BY USE OF FIELD SERVICE COMMAND 17 ''TRACE'' CAN BE SET SO THAT IT WILL AUTOMATICALLY TYPE OUT THE BANK AND PATTERN NUMBERS AS EACH PATTERN IS RUN. (REFERENCE SECTION 2.4.4.8.18).

2.4.4.4 CONTROL "S" (STOP)

THIS COMMAND WILL STOP TYPEOUT (SOON) AND WILL WAIT FOR A CONTROL "Q".

2.4.4.5 CONTROL "Q" (QUINTINUE)

THIS COMMAND WILL CONTINUE TYPING THAT HAS BEEN STOPPED BY CONTROL "S". IF THERE HAS BEEN NO CONTROL "S" TYPED THEN THIS COMMAND IS IGNORED.

2.4.4.6 CONTROL "F" (FIELD SERVICE MODE)

THIS COMMAND WILL CAUSE YOU TO ENTER A MODE WHICH LOOKS FOR SUB COMMANDS.

WHEN THE PROGRAM IS LOOKING FOR A SUB COMMAND ANY NUMBER THAT IS NOT A LEGAL COMMAND WILL CAUSE A MINI HELP MESSAGE TO BE TYPED. THEREFORE WHEN IN DOUBT TYPE 99 (CR) AND YOU WILL GET HELP.

NOTE

TYPING JUST CARRIAGE RETURN IS A DEFAULT COMMAND 0.

2.4.4.7.1 FIELD SERVICE COMMAND 0 (EXIT)

THIS COMMAND WILL EXIT FIELD SERVICES MODE AND RETURN TO WHATEVER TASK IT WAS IN PRIOR TO TYPING CONTROL "F". NOTE TYPING JUST CARRIAGE RETURN IS A DEFAULT COMMAND 0.

2.4.4.7.2 FIELD SERVICE COMMAND 1 (READ CSR)

THIS COMMAND WILL TYPEOUT THE CONTENTS OF THE CSR.

IF THERE IS MORE THAN ONE CSR ON THE CPU (OR IF THE PROGRAM HAS NOT DETERMINED THE CSR STATUS YET), IT WILL ASK YOU 'WHICH CSR(0-F)'' TO WHICH YOU MUST RESPOND WITH AN HEXIDECIMAL NUMBER FROM 0 TO F. NOTE TYPING JUST CARRIAGE RETURN IS A DEFAULT 0.

IF THE CSR YOU SELECT CAUSES A TRAP TO 4 THE PROGRAM WILL TYPE ''THIS CSR DOES NOT EXIST''.

NOTE

CSR REFERENCES ARE DONE IN ACCORDANCE WITH SECTION 5.0.

2.4.4.7.3 FIELD SERVICE COMMAND 2 (LOAD CSR)

THIS COMMAND WILL ENABLE YOU TO LOAD THE CSR.

IF THERE IS MORE THAN ONE CSR ON THE CPU (OR IF THE PROGRAM HAS NOT YET DETERMINED THE CSR STATUS YET) IT WILL ASK YOU 'WHICH CSR(0-F)'' TO WHICH YOU MUST RESPOND WITH AN HEXIDECIMAL NUMBER FROM 0 TO F. NOTE TYPING JUST CARRIAGE RETURN IS A DEFAULT 0.

IF THE CSR YOU SELECT CAUSES A TRAP TO 4 THE PROGRAM WILL TYPE ''THIS CSR DOES NOT EXIST''.

THE CSR WILL BE READ AND DISPLAYED AS IN COMMAND 1.

THE PROGRAM WILL THEN ASK YOU FOR THE ''CSR?'' TO WHICH YOU MUST RESPOND WITH AN OCTAL NUMBER. NOTE TYPING JUST CARRIAGE RETURN IS A DEFAULT 0.

THE PROGRAM WILL THEN LOAD THE CSR AND READ IT AGAIN DISPLAYING ITS NEW CONTENTS.

2.4.4.7.4 FIELD SERVICE COMMAND 3 (EXAMINE MEMORY)

THIS COMMAND WILL ALLOW YOU TO EXAMINE ANY PHYSICAL ADDRESS AND DOES THE NECESSARY MEMORY MANAGEMENT MAPPING FOR YOU.

THE PROGRAM WILL ASK YOU FOR THE "PHYSICAL ADDRESS (0-17757776)" TO WHICH YOU MUST RESPOND WITH AN OCTAL NUMBER.

IF THE ADDRESS ACCESS CAUSES A TRAP TO 4 THE PROGRAM WILL TYPE "TIMEOUT TRAP". IF THE ADDRESS ACCESS CAUSES A TRAP TO 114 THE PROGRAM WILL TYPE "PARITY ABORT".

THE CONTENTS OF YOUR PHYSICAL ADDRESS WILL BE TYPED.

2.4.4.7.5 FIELD SERVICE COMMAND 4 (MODIFY MEMORY)

THIS COMMAND ALLOWS YOU TO MODIFY ANY PHYSICAL ADDRESS AND DOES THE NECESSARY MEMORY MANAGEMENT MAPPING FOR YOU.

THE PROGRAM WILL ASK YOU FOR THE "PHYSICAL ADDRESS (0-17757776)" TO WHICH YOU MUST RESPOND WITH AN OCTAL NUMBER.

IF THE ADDRESS ACCESS CAUSES A TRAP TO 4 THE PROGRAM WILL TYPE "TIMEOUT TRAP". IF THE ADDRESS ACCESS CAUSES A TRAP TO 114 THE PROGRAM WILL TYPE "PARITY ABORT".

THE PROGRAM WILL TYPE "OLD DATA WAS" AND THE CONTENTS OF YOUR PHYSICAL ADDRESS.

THE PROGRAM WILL THEN TYPE "INPUT NEW DATA" TO WHICH YOU MUST RESPOND WITH AN OCTAL NUMBER. NOTE TYPING JUST CARRIAGE RETURN IS A DEFAULT 0.

THE PROGRAM WILL ATTEMPT TO WRITE THIS NEW DATA INTO YOUR PHYSICAL ADDRESS AFTER WHICH IT WILL READ IT AGAIN AND TYPE "DATA IS NOW" AND THE NEW CONTENTS OF YOUR PHYSICAL ADDRESS.

NOTE

IF YOU CAN'T CHANGE THE DATA, THAT WOULD INDICATE THAT YOU HAVE A DOUBLE BIT ERROR IN THAT DOUBLE WORD PAIR.

2.4.4.7.6 FIELD SERVICE COMMAND 5 (SELECT BANK TEST)

THIS COMMAND ALLOWS YOU TO RUN ANY BANK WITH ANY PATTERN FOREVER.

THE PROGRAM WILL ASK YOU "BANK(0-167)" TO WHICH YOU MUST RESPOND WITH AN OCTAL NUMBER. IF THE BANK IS NOT ACCESSIBLE. THE PROGRAM WILL TYPE "BANK NOT ACCESSIBLE" AND ASK QUESTION OVER.

THE PROGRAM WILL THEN ASK "TEST (0-47)" TO WHICH YOU MUST RESPOND WITH AN OCTAL NUMBER.

NOTE

ANY PATTERN CAN BE RUN INCLUDING THOSE THAT ARE NOT PART OF THE APT E-TABLE DEFAULTS (REFERENCE SECTION 6.2.1). IF YOU SELECT PATTERN 0, THE PROGRAM WILL ASK "TEST 0 DATA IS?" TO WHICH YOU MUST RESPOND WITH AN OCTAL NUMBER.

IF THE BANK YOU SELECTED REQUIRES RELOCATION THE PROGRAM WILL TYPE "BANK REQUIRES RELOCATION" AND EXIT THIS COMMAND. NOTE NORMALLY THIS IS TRUE FOR BANK 0.

THE PROGRAM WILL THEN ARM THE CONSOLE KEYBOARD FOR INTERRUPTS AND TYPE "TO ESCAPE TYPE ANY KEY!".

THE TEST PATTERN WILL BE ENTERED AND RUN UNTIL A CONSOLE KEY IS DEPRESSED TO ESCAPE THIS LOOP.

2.4.4.7.7 FIELD SERVICE COMMAND 6 (TYPE CONFIGURATION MAP)

THIS COMMAND TYPES THE CONFIGURATION MAP.

THIS IS USEFUL AFTER A LONG RUN (OVERNIGHT) TO SEE ALL THE BANKS THAT ARE MARKED AS BAD. (ESPECIALLY IF YOUR CONSOLE IS A VIDEO TERMINAL).

FOR A DETAILED EXPLANATION OF THE MAP REFERENCE SECTION 7.3.

2.4.4.7.8 FIELD SERVICE COMMAND 7 (SOB-A-LONG TEST)

THIS COMMAND ALLOWS EXECUTION OF THE SOB-A-LONG TEST ON ALL NON-PROTECTED BANKS REFERENCE SECTION 6.2.2.26. OPERATION IS IDENTICAL TO COMMAND 5 EXCEPT THAT NO PATTERN OR BANK IS ENTERED AND EACH PASS CAUSES A BELL.

2.4.4.7.9 FIELD SERVICE COMMAND 8 (ERROR SUMMARY)

THIS COMMAND TYPES OUT THE NUMBER OF PASSES AND THE TOTAL NUMBER OF ERRORS. IF THERE WERE ANY ERRORS IT WILL TYPE OUT THE BANKS AND THE NUMBER OF ERRORS PER BANK UP TO 255 DECIMAL.

THIS BECOMES USEFUL AFTER LONG RUNS (ALL NIGHT) ON SYSTEMS WITH A VIDEO CONSOLE TERMINAL.

2.4.4.7.10 FIELD SERVICE COMMAND 9 (REFRESH TEST)

THIS COMMAND ALLOWS EXECUTION OF THE REFRESH TEST ON ALL NON-PROTECTED BANKS REFERENCE SECTION 6.2.2.19. OPERATION IS IDENTICAL TO COMMAND 5 EXCEPT THAT NO PATTERN OR BANK IS ENTERED AND EACH PASS CAUSES A BELL.

2.4.4.7.11 FIELD SERVICE COMMAND 10 (SET FILL COUNT)

THIS COMMAND ALLOWS SETTING OF THE TERMINAL FILL COUNT (NECESSARY FOR LA30'S, ASR33'S, AND VT05'S). IT IS NORMALLY SET TO ZERO FOR LA36'S, VT52'S, VT100'S, ETC.

2.4.4.7.12 FIELD SERVICE COMMAND 11 (ENTER KAMIKAZE MODE)

THIS COMMAND ALLOWS YOU TO RUN PATTERNS THAT ARE NORMALLY NOT EXECUTED UNLESS UNDER APT OR ACT. THEY ARE USUALLY VERY TIME CONSUMING AND CAN RESULT IN FAILURES THAT ARE FATAL TO THE PROGRAM. IN EFFECT YOU ARE TRYING TO FIND A HARDWARE FAILURE REGARDLESS OF THE CONSEQUENCES. NOTE THAT MOST CRASHES DO NOT WIPE OUT THE DISPLAY INFORMATION WHICH IS TELLING YOU WHAT THE PROGRAM WAS DOING JUST PRIOR TO FAILURE. THERE ARE TWO WAYS TO DIE HERE - IMPATIENCE AND CRASHES.

2.4.4.7.13 FIELD SERVICE COMMAND 12 (EXIT KAMIKAZE MODE)

RETURN TO THE DEFAULT MODE OF TESTING (UNDO COMMAND 12).

2.4.4.7.14 FIELD SERVICE COMMAND 13 (TURN CACHE OFF)

THIS CHANGES THE CACHE CONSTANT TO BYPASS CACHE (REFERENCE SECTION 2.4.3.1).

2.4.4.8.15 FIELD SERVICE COMMAND 14 (TURN CACHE ON)

THIS CHANGES THE CACHE CONSTANT TO USE CACHE (REFERENCE SECTION 2.4.3.1).

2.4.4.7.16 FIELD SERVICE COMMAND 15 (TEST ONLY SELECTED BANKS)

THIS COMMAND ALLOWS YOU TO CENTER THE TEST EFFORT ON ONLY THOSE BANKS THAT YOU ARE TROUBLESHOOTING. YOU MAY ALSO TEST BANKS THAT REQUIRE RELOCATION AND WERE INACCESSABLE VIA COMMAND 5.

2.4.4.7.17 FIELD SERVICE COMMAND 16 (RESUME TESTING ALL BANKS)

RETURN TO THE DEFAULT MODE OF TESTING (UNDO COMMAND 15).

2.4.4.7.18 FIELD SERVICE COMMAND 17 (RESUME TESTING ALL BANKS)

ENABLE "TRACE". AFTER EXITING FIELD SERVICE MODE, THE PROGRAM WILL TYPE OUT THE BANK AND PATTERN NUMBERS AS EACH PATTERN IS RUN.

2.4.4.7.19 FIELD SERVICE COMMAND 18 (RESUME TESTING ALL BANKS)

DISABLE "TRACE". (UNDO COMMAND 17).

2.5 EXECUTION TIMES

2.5.1 TYPICAL (SYSTEM) -

EXECUTION TIME DEPENDS ON MANY VARIABLES; HOWEVER HERE ARE SOME MEASURED TIMES ON AN 11/44 WITH CACHE:

128K WORDS OF MS11-L MEMORY

NORMAL PASS	0 MIN 50 SEC
QUICK VERIFY	0 MIN 50 SEC
KAMIKAZE MODE	10 MIN 5 SEC
KAMIKAZE QV	10 MIN 5 SEC

128K WORDS OF MS11-M MEMORY (NON-INTERLEAVED)

NORMAL PASS	2 MIN 25 SEC
QUICK VERIFY	1 MIN 0 SEC
KAMIKAZE MODE	11 MIN 0 SEC
KAMIKAZE QV	10 MIN 30 SEC

128K WORDS OF MS11-M MEMORY (INTERLEAVED)

NORMAL PASS	3 MIN 55 SEC
QUICK VERIFY	1 MIN 50 SEC
KAMIKAZE MODE	22 MIN 0 SEC
KAMIKAZE QV	20 MIN 5 SEC

512K WORDS OF MS11-P MEMORY

NORMAL PASS	4 MIN 50 SEC
QUICK VERIFY	4 MIN 25 SEC
KAMIKAZE MODE	44 MIN 0 SEC
KAMIKAZE QV	39 MIN 0 SEC

2.5.2 CALCULATIONS (SYSTEM)

NORMAL PASS

ADD	18 SEC PER 16K BANK OF NON-INTEREAVED MS11-M
ADD	15 SEC PER 16K BANK OF INTERLEAVED MS11-M
ADD	6 SEC PER 16K BANK OF MS11-L
ADD	37 SEC PER 64K BANK OF MS11-P

QUICK VERIFY PASS

ADD	8 SEC PER 16K BANK OF NON-INTERLEAVED MS11-M
ADD	7 SEC PER 16K BANK OF INTERLEAVED MS11-M
ADD	6 SEC PER 16K BANK OF MS11-L
ADD	33 SEC PER 64K BANK OF MS11-P

KAMIKAZE MODE

ADD 10 MIN. PER 128K WORDS FOR APPROXIMATE PASS TIMES.

2.5.3 TYPICAL (TESTS)

TEST	TIME	DESCRIPTION
MT0000	:<1 SEC	DATA PATTERN TEST
MT0001	:<1 SEC	ADDRESS TEST
MT0002	:<1 SEC	COMPLEMENT ADDRESS TEST
MT0003	: 1 SEC	3 XOR 9 WORST CASE NOISE TEST
MT0004	: 1 SEC	ROTATING ZEROS TEST
MT0005	: 1 SEC	ROTATING ONES TEST
MT0006	:<1 SEC	INITIAL DATA TEST
MT0007	:<1 SEC	ADDRESS BIT TEST
MT0010	:<1 SEC	BYTE ADDRESSING TEST
MT0011	:<2 SEC	CREATE SINGLE BIT ERROR TEST
MT0012	:<1 SEC	WRITE BYTE CLEARS SBE TEST
MT0013	: 1 SEC	CREATE DOUBLE BIT ERROR TEST
MT0014	: 1 SEC	BASIC DOUBLE BIT ERROR TEST
MT00'5	: 1 SEC	WRITE INHIBIT OF BYTE WITH DBE
MT0016	:<1 SEC	WRITE INHIBIT OF WORD WITH DBE
MT0017	:<1 SEC	HOLDING 1'S 0'S TEST
MT0020	: 1 SEC	SYNDROMES TO CSR ON SINGLE BIT ERROR TEST
MT0021	: 1 SEC	MARCHING 0'S 1'S TEST
MT0022	:10 SEC	REFRESH TEST
MT0023	:10 SEC	SHIFTING DIAGONAL TEST
MT0024	:20 SEC	FAST GALLOPING PATTERN TEST
MT0025	:<1 SEC	INTERRUPT ENABLE TEST
MT0026	:<1 SEC	RANDOM DATA TEST
MT0027	: 1 SEC	UNIQUE BANK TEST
MT0030	: 1 SEC	FLUSH OUT DBE'S TEST
MT0031	: 3 SEC	SOB-A-LONG TEST
MT0032	:<1 SEC	WRITE RECOVERY TEST
MT0033	:35 SEC	BRANCH GOBBLE TEST
MT0034	:<1 SEC	SOFT ERROR TEST
MT0035	:<1 SEC	WORST CASE PARITY TEST
MT0036	: 1 SEC	CORRECTION CODE TEST
MT0037	:<1 SEC	CHECK ECC DISABLE TEST
MT0041	: 1 SEC	ADDRESS TO CSR ON DBC TEST
MT0042	:<1 SEC	EXTENDED ADDRESS TO CSR ON ERROR TEST
MT0043	:<1 SEC	WRITE BYTE TEST
MT0044	: 5 SEC	SHIFTING CHECKBITS THROUGH CSR TEST
MT0045	:<1 SEC	SYNDROME BITS TO THE CSR ON A DBE TEST
MT0046	. 1 SEC	CHECK SINGLE BIT ERRORS WITH ECC DISABLED TEST
MT0047	:<1 SEC	NO CSR UPDATE WITH EXISTING DBE TEST

3.0 ERROR INFORMATION

3.1 ERROR REPORTING

MOST ERRORS ARE REPORTED USING THE EMT TRAP AND HANDLER PROVIDED BY SYSMAC.SML. MOST ERRORS WILL BE OF THE 'MEMORY DATA ERROR' TYPE WHICH WILL BE DESCRIBED HERE. MEMORY DATA ERRORS WILL ALSO CAUSE THE BANK TO BE MARKED AS BAD IN THE CONFIGURATION TABLE.

OTHER ERRORS ARE BEST EXPLAINED BY REFERENCING THE SPECIFIC TYPEOUT AND IF NECESSARY THE PROGRAM LISTING.

EXAMPLE 1:

MEMORY DATA ERROR

PC	BANK	VADD	PADD	GOOD	BAD	XOR	CSR	MTYP	INT	PAT
022132	37	060006	03700006	000000	000100	000100	0		-	06
022132	37	060006	03700006	000000	000100	000100	0		-	06
022132	37	060006	03700006	000000	000100	000100	0		-	06
022132	37	060006	03700006	000000	000100	000100	0		-	06

WHILE TESTING BANK 37 AT VIRTUAL ADDRESS 60006 (VIRTUAL ADDRESSES ARE ALWAYS BETWEEN 60000 AND 157776 FOR MAPPING PURPOSES), PHYSICAL ADDRESS 3700006 (THAT'S BANK 37 PHYSICAL 6 WITHIN THE BANK) WITH PATTERN 6 (INITIAL DATA TEST), THE GOOD DATA EXPECTED WAS 0 BUT THE DATA ACTUALLY READ (BAD) WAS 100, THE EXCLUSIVE OR AT GOOD BAD YIELDS 100 WHICH INDICATES ONLY FAILING BIT(S) (BIT 6). IT IS AN MS11-P (ECC) MEMORY AND IT'S NOT INTERLEAVED. THE CSR IS LOCATED AT 172000.

EXAMPLE 2:

MEMORY DATA ERROR

PC	BANK	VADD	PADD	GOOD	BAD	XOR	CSR	MTYP	INT	PAT
022132	35	060000	03500000	000000	000001	000001	0	M	1	06
022132	35	060002	03500002	000000	000100	000100	0	M	1	06
022132	35	060006	03500006	000000	000100	000100	0	M	1	06

WHILE TESTING BANK 35, VIRTUAL ADDRESS 60000, PHYSICAL ADDRESS 3700000 WITH PATTERN 6 (INITIAL DATA TEST), THE GOOD DATA EXPECTED WAS 0 BUT THE DATA ACTUALLY READ (BAD) WAS 1, THE EXCLUSIVE OR AT GOOD BAD YIELDS 1 WHICH INDICATES ONLY FAILING BIT(S) (BIT 0). IT IS AN MS11-M (ECC) MEMORY AND IT'S INTERLEAVED; SO SINCE ADDRESS BIT 1 WAS NOT ASSERTED, THE CSR IS LOCATED AT 172000.

WHILE ALSO IN BANK 35, VIRTUAL ADDRESSES 60002 AND 60006 WERE EXPECTED TO HAVE 0, BUT THE DATA READ WAS 100, THE EXCLUSIVE OR OF GOOD BAD YIELDS 100 WHICH INDICATES ONE FAILING BIT (BIT 6). SINCE IT IS INTERLEAVED MS11-M MEMORY, AND ADDRESS BIT 1 IS ASSERTED, THE CSR IS LOCATED AT 172102 (CSR NUMBER 1 UNDER THE INT COLUMN)

NOTE

SUBSEQUENT ERRORS OF THE SAME TEST DO NOT TYPE A NEW HEADING.

3.2 ERROR ABBREVIATIONS

THE FOLLOWING IS A LIST OF ALL ABBREVIATIONS USED IN ERROR REPORTS.

# OF ERRORS	NUMBER OF ERRORS THAT WERE DETECTED.
1ST ADD	FIRST ADDRESS THAT FAILED.
ARRAY	THE ARRAY NUMBER THAT WAS LOCKED UP IN THE MS11-M CSR.
APT#	THE # OF CPU'S APT EXPECTS ON THE SYSTEM.
APTCORE	APT CORE SIZE.
APTMOS	APT MOS SIZE.
BAD	BAD DATA.
BAD-WD1	BAD WORD #1 OF A DOUBLE WORD DATA VALUE.
BAD-WD2	BAD WORD #2 OF A DOUBLE WORD DATA VALUE.
BAD-CHK	BAD CHECK CODE BITS.
BANK	THE BANK NUMBER. BANKS ARE 16K WORDS LONG.
BD-CC	BAD CHECK CODE BITS.
CHKBITS	THE 7 BIT VALUE OF THE CHECK CODE BITS.
CONTRL	THE CACHE CONTROL REGISTER.
CPUERR	CPU ERROR REGISTER.
CSR	CONTROL AND STATUS REGISTER.
CSRNO	CSR NUMBER (0-F HEXIDECIMAL).
DATARG	THE CACHE DATA REGISTER.
DBE	DOUBLE BIT ERROR (UNCORRECTABLE ERROR).
DEV ADD	DEVICE ADDRESS.
ECC	ERROR CORRECTABLE CODE.
GD-CC	GOOD CHECK CODE BITS.
GD-CHK	GOOD CHECK CODE BITS.
GD-WD1	GOOD WORD #1 OF A DOUBLE WORD DATA VALUE.
GD-WD2	GOOD WORD #2 OF A DOUBLE WORD DATA VALUE.
GOOD	GOOD DATA.
INT	INTERLEAVED (ADDRESS BIT 1 ASSERTED) CSR NUMBER.
LSIZE	MS11-L SIZE.
MEMERR	MEMORY ERROR REGISTER.
MMR0	MEMORY MANAGEMENT REGISTER #0.
MMR1	MEMORY MANAGEMENT REGISTER #1.
MMR2	MEMORY MANAGEMENT REGISTER #2.
MMR3	MEMORY MANAGEMENT REGISTER #3.
MSIZE	MS11-M SIZE.
MTYP	MEMORY TYPE (MS11-L,MS11-M, OR MS11-P).
PADD	PHYSICAL ADDRESS (ASSERTED BY THE PROGRAM AFTER MAPPING).
PAT	PATTERN NUMBER.
PC	PROGRAM COUNTER AT THE TIME THE ERROR OCCURRED.
SBE	SINGLE BIT ERROR (CORRECTABLE ERROR).
VADD	VIRTUAL ADDRESS (ASSERTED BY THE PROGRAM BEFORE MAPPING).
WROTE1	THE DATA THAT WAS WRITTEN INTO THE 1ST HALF OF A DOUBLE WORD.
WROTE2	THE DATA THAT WAS WRITTEN INTO THE 2ND HALF OF A DOUBLE WORD.
XOR	EXCLUSIVE OR OF THE GOOD AND BAD DATA. SHOWS THE BAD BITS.
AUT	ADDRESS UNDER TEST

```
1745
1746
1747                    3.3  ERROR HALTS
1748
1749                    THERE ARE SEVERAL HALTS IN THE PROGRAM.
1750
1751                    ALL UNUSED TRAP VECTORS CONTAIN A TRAP CATCHER (.WORD .+2,HALT).
1752
1753                    AN UNDEFINED TRAP INSTRUCTION HALTS AT SYMBOLIC LOCATION ''$HALT2''.
1754
1755                    THE APT DOWN LOAD SEQUENCE WILL HALT AT SYMBOLIC LOCATION ''APTHLT''.
1756
1757                    HALT ON ERROR OPTION (SW15 SET) AT SYMBOLIC LOCATION ''$HALT''.
1758
1759                    HALT PROGRAM (SW8 SET) AT SYMBOLIC LOCATION ''$EXHALT''.
1760
1761                    POWER FAIL WILL NORMALLY HALT AT THE END OF  THE  SHUT  DOWN  SEQUENCE
1762                    (SYMBOLIC LOCATION ''$DOWN'').
1763
1764                    POWER FAIL HAS A FATAL HALT AT SYMBOLIC LOCATION ''$ILLUP'' WHICH CAN BE
1765                    CAUSED  BY  POWER UP OCCURRING BEFORE POWER DOWN SEQUENCE COMPLETED OR
1766                    BY POWER DOWN BEFORE A POWER UP SEQUENCE IS COMPLETED.
1767
1768
```

```
1770
1771
1772
1773                    4.0  PROGRESS REPORTS
1774
1775                    PASS COMPLETE TYPEOUTS AS FOLLOWS:
1776
1777                    END PASS        #       0
1778                    END PASS        #       1
1779                    END PASS        #QV     2
1780
1781
1782
1783                                        NOTE
1784
1785                              PASS 2 WAS FLAGGED  AS  A  QUICK  VERIFY
1786                              PASS.  (BECAUSE OF A CHANGE IN SW5)
1787
1788
1789
1790
1791
1792                    TO OBTAIN PROGRESS REPORTS WHILE EXECUTING, TYPING A CONTROL "T"  WILL
1793                    PRINT OUT THE INFORMATION ENCODED IN THE DISPLAY REGISTER.
1794                         EXAMPLE:
1795
1796                         BANK= 2 TEST= 34
1797
1798                    REFERENCE SECTION 2.4.4.7.18 FOR MORE INFORMATION ON TRACING.
1799
1800
1801                          5.0  CSR INFORMATION TABLES
1802
1803
1804                          THE FOLLOWING IS A PICTURE VIEW OF THE CURRENT CONTROL STATUS
1805                          REGISTERS  WHICH CAN BE TESTED BY THIS PROGRAM.  IT SHOWS BIT
1806                          ASSIGNMENTS AND DEFINITIONS TO PROVIDE A HANDY REFERENCE, AND
1807                          SHOWS THE SIMILARITIES AND DIFFERENCES BETWEEN EACH ONE:
1808
1809
1810                                              NOTE
1811
1812                              ALL UNUSED BITS IN EACH CSR ARE EQUAL TO ZERO.
1813
1814
1815
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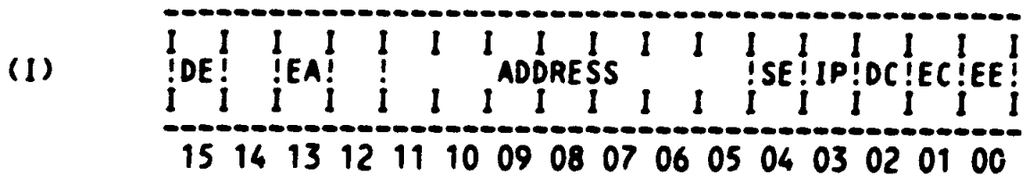
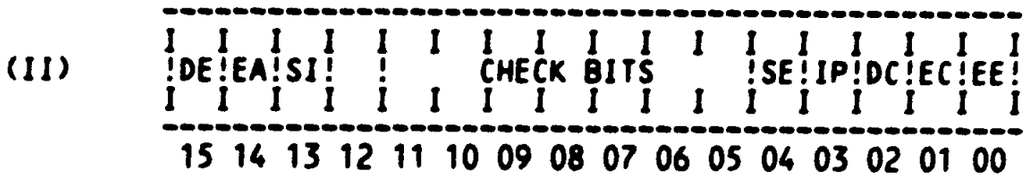
1819
1820
1821
```

5.1 MS11-P CSR

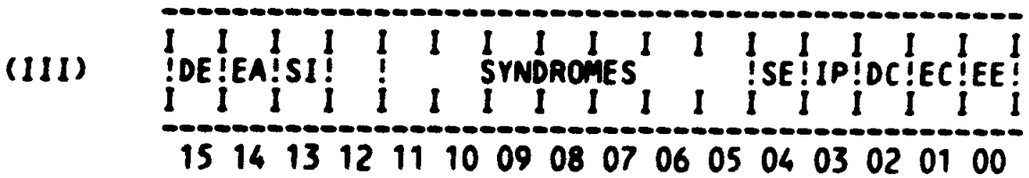
(I)



(II)



(III)



BIT ASSIGNMENTS ARE DEFINED
AS FOLLOWS:

BIT15 UNCORRECTABLE ERROR
ON A READ TO MEMORY (ECC DISABLE
BIT = 0), THIS BIT IS SET IF
A DOUBLE ERROR OCCURS. THE
ERROR ADDRESS IS STORED IN THE
CSR. SETTING THIS BIT ALSO
TURNS ON A RED LED AT THE REAR OF
THE CARD FOR A VISUAL INDICATION.
THIS BIT IS ALSO SET IN ECC
DISABLE MODE IF A SERR OR DERR
OCCURS.

BIT14 EUB ERROR ADDRESS
WITH BIT 14 = 1, A READ TO THE CSR
WILL FETCH ADDRESS A21
THROUGH A18. WHEN BIT 14 = 1,
DIAGNOSTIC DATA MAY NOT BE
LOADED INTO THE SYNDROME
REGISTER.

```
1878
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1931
```

BIT13 SET INHIBIT MODE
WHEN THIS BIT IS SET TO
A "1", IT ENABLES THE INHIBIT
MODE POINTER TO INHIBIT
EITHER THE FIRST OR SECOND
16K FROM EVER GOING INTO THE
DIAG CHECK OR ECC DISABLE
MODE.

BITS05-10 CHECK BIT STORAGE (CSR II)
CHECK BIT STORAGE (DIAG CK
BIT 2 = 1)
WHEN IN THE DIAGNOSTIC CHECK
MODE THESE BITS ARE USED TO STORE
THE CHECK BITS TO BE WRITTEN
INTO MEMORY OR THE CHECK BITS
READ FROM MEMORY. IF A DOUBLE
ERROR OR SINGLE ERROR OCCURS
WHEN IN THE DIAGNOSTIC CHECK
MODE AND ECC DISABLE BIT 1 = 0,
THEN THE CHECK BITS ARE STORED
IN THE CSR TOGETHER WITH
THE DOUBLE OR SINGLE ERROR
BIT. THESE BITS ARE WRITEABLE
IN DIAGNOSTIC MODE. A "1"
IS STORED IN BIT 11 IF CSR
02, CSR 13, AND CSR 14 ARE
SET TO INDICATE THAT THE
MEMORY UNDER TEST IS A MS11-P.

BITS05-11 UNIBUS ADDRESS STORAGE (CSR I)
(DIAG CK BITS 2 = 0, ECC
DISABLE BIT 1 = 0)

IF A DOUBLE OR SINGLE ERROR
OCCURS ON A READ CYCLE, THEN
ADDRESS BITS ALL THROUGH
A17 ARE STORED IN THESE BITS
THESE BITS ARE READ ONLY ON
THE CONDITION THAT SERR (CSR 4)
OR DERR (CSR 15) IS SET BUT
CSR 14 IS NOT SET.

EUB ADDRESS STORAGE (DIAG CK
BIT 2 = 0), ECC DISABLE BIT
1 = 0 OR 1).

IF A DOUBLE OR SINGLE ERROR
OCCURS ON A READ CYCLE,
ADDRESS BITS A17 THROUGH
A11 ARE STORED IN CSR BITS
11 THROUGH 5 AND ADDRESS
BITS A21 THROUGH A18 ARE

```
1933
1934
1935
1936
1937
1938
1939
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1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
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1954
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1969
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1985
1986
```

STORED IN A BACKUP REGISTER.
THE EUB ERROR ADDRESS
RETRIEVAL BIT (CSR 14) IS
USED TO OBTAIN THE TOTAL
ERROR ADDRESS AS FOLLOWS:

WITH CSR BIT 14 = 0 A READ TO
THE CSR WILL OBTAIN A17
THROUGH A11 FROM CSR BITS 11
THROUGH 5.

CSR BIT 14 CAN THEN BE SET
TO A "1" AND A READ TO THE
CSR WILL THEN READ A21
THROUGH A18 FROM CSR BITS 8
THROUGH 5 AND 0'S FROM CSR
BITS 11 THROUGH 9.

ADDRESS BITS A21 THROUGH
A11 ARE OBTAINED
TO LOCATE THE DOUBLE
ERROR TO A 1K SEGMENT OF
MEMORY.

THE EUB ADDRESS A21
THROUGH A18 IS READ ONLY
WHENEVER CSR 14 = 1.

BIT05-10 SYNDROME STORAGE (CSR III)
IF A DOUBLE OR SINGLE ERROR
OCCURS ON A READ OR WRITE
BYTE CYCLE, AND IF CSR BIT
2 IS SET TO A "0" SYNDROME
BITS X, 0, 1, 2, 4 AND 8
AND STORED IN CSR BITS 5
THROUGH 10. TO READ THE
SYNDROME BITS FROM CSR, BIT
YOU MUST READ THE ERROR
ADDRESS, THEN SET 2 OF
THE CSR MUST BE ST TO
A "1" (DIAGNOSTIC MODE) AND
THE CSR READ AGAIN. THIS OPERATION
WILL ALLOW SYNDROME BITS
FOR A SINGLE OR DOUBLE
FAILURE TO BE READ INSTEAD
OF THE ADDRESS BITS NORMALLY
READ WHEN CSR 02 IS SET TO "0".

BIT04 SINGLE ERROR
IF ON A READ TO MEMORY A
SBE OCCURS, THE ERROR
ADDRESS A21-A11 AND
THE ERROR SYNDROMES WILL

```
1988
1989
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1992
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1996
1997
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1999
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2001
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2003
2004
2005
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```

BE LOGGED IN CSR BITS 5-11
UNLESS THE UNCORRECTABLE ERROR
CSR 15 IS SET. THE ERROR
ADDRESS WILL BE LOGGED
UNCONDITIONALLY IN THE ECC
DISABLE MODE. THIS BIT IS NOT
SET IF INHIBIT MODE (BIT
13 = 1) IS SET AND DIAGNOSTIC
MODE (BIT 02 = 1) IS SET.

BIT03 INHIBIT MODE POINTER
THIS BIT WORKS IN CONJUNCTION
WITH THE SET INHIBIT MODE
(BIT 13). WHEN BIT 13 IS SET
TO A 1, A 16K PORTION OF
MEMORY IS INHIBITED FROM
OPERATING IN THE ECC DISABLE
MODE OR DIAGNOSTIC CHECK MODE.

THE INHIBIT MODE POINTER
INDICATES WHICH 16K IS BEING
INHIBITED, I.E., BIT 3 = 0
THE FIRST 16K OF MEMORY IS
INHIBITED, BIT 3 = 1, THE
SECOND 16K OF MEMORY IS
INHIBITED.

WITH BIT 13 SET TO A 0, BIT
3 BECOMES INOPERATIVE.

BIT03, IN CONJUNCTION WITH
BIT 13, THEREFORE ALLOWS A 16K
CHUNK OF MEMORY TO ALWAYS HAVE
ECC COVERAGE. THE SYSTEMS
DIAGNOSTIC CAN THEREFORE
RESIDE IN THIS PROTECTED
PORTION OF MEMORY AND CAN
DISABLE ECC AND/OR RUN THE
DIAGNOSTIC CHECK MODE IN THE
REST OF MEMORY WITHOUT ITSELF
BECOMING VULNERABLE TO SINGLE
ERRORS. THIS BIT IS A READ/WRITE
BIT RESET BY POWER UP AND BUS
INIT.

BIT02 DIAGNOSTIC CHECK MODE
THIS MODE ALLOWS A MEANS OF
FORCING A SINGLE OR DOUBLE
ERROR IN A DESIRED LOCATION.
IT ALSO PROVIDES A MEANS OF
EXAMINING THE CHECK BITS AND
THE SYNDROME IN A GIVEN
LOCATION.

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2042
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2054
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2092
2093
2094
```

THE CHECK BITS DESIRED FOR A
GIVEN DATA PATTERN ARE WRITTEN
INTO BITS 5 THROUGH 11 OF
THE CSR. A WORD OR WRITE BYTE
MEMORY WILL WRITE THE CHECK BITS
FROM THE CSR TO THE MOS ARRAY
(CSR 2 = 1) INSTEAD OF THE CHECK
BITS GENERATED ON THE DATA
TO BE WRITTEN. SINGLE ERRORS
ON THE READ PORTION OF THE DATOB
CYCLE ARE CORRECTED.

A READ TO THE MEMORY WILL
READ THE CHECK BITS STORED IN
MEMORY AND CLOCK THEM INTO
THE CSR.

IF A DOUBLE ERROR OR SINGLE
ERROR OCCURS THE DERR OR
SERR BIT IN THE CSR IS SET
AND THE ERROR SYNDROME BITS
READ FROM ECC ARE STORED IN
CSR BITS 10-5 AS WELL AS THE
ADDRESS BITS. IN DIAGNOSTIC
CHECK MODE THE ERROR SYNDROME
BITS WILL BE READ WHEN CSR
BITS 10-5 ARE READ.

THIS BIT IS A READ/WRITE BIT
AND IS RESET ON POWER UP AND
BUS INIT.

BIT01 DISABLE CORRECTION MODE
IF THIS BIT IS SET, NO SINGLE
ERRORS WILL BE CORRECTED. A
SINGLE ERROR WILL SET CSR 4
AND CSR 15 OR A DOUBLE ERROR
WILL SET CSR 15 AND ASSERT
BUS PBL IF CSR 00 IS ASSERTED.
THE 1K BLOCK OF ADDRESS WHERE
THE ERROR OCCURS WILL ALSO
BE STORED IN THE CSR. THE
PRIORITY OF A SERR AND DERR
WILL BE THE SAME, I.E., THE
LAST ERROR INFORMATION WILL
ALWAYS BE STORED UNLESS A DERR
PRECEDES A SERR. IF A DOUBLE
ERROR OCCURS DURING A WRITE BYTE
CYCLE, THE WRITE PORTION OF
THE CYCLE WILL NOT BE ABORTED.
THE CHECK BITS WRITTEN WILL

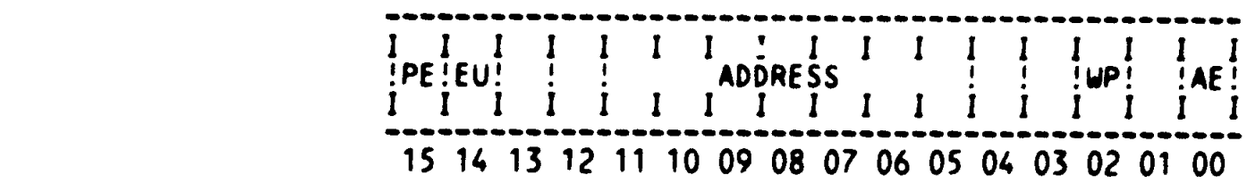
```
2096
2097
2098
2099
2100
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
```

HAVE BEEN GENERATED ON THE
DATA WRITTEN. THIS MEANS THAT
IF A SINGLE OR DOUBLE ERROR
EXISTED IN THE LOCATION ACCESSED,
IT WOULD BE CLEARED (UNLESS THE
ERRORS WERE HARD).

THIS BIT IS A DIAGNOSTIC AID
TO ALLOW WRITING AND READING
DATA FROM MEMORY WITHOUT
INTERFERENCE FROM THE ERROR
CORRECTION LOGIC.

BIT00 UNCORRECTABLE ERROR
INDICATION ENABLE
IF A DOUBLE ERROR OCCURS WITH
ECC ENABLED OR A SINGLE ERROR
OR DOUBLE ERROR WITH ECC
DISABLED, ON A READ CYCLE TO THE
MEMORY AND THIS BIT IS SET,
THEN BUS PBL WILL BE ASSERTED.

5.2 MS11-L CSR



BIT ASSIGNMENTS ARE DEFINED AS FOLLOWS:

BIT15 PARITY ERROR

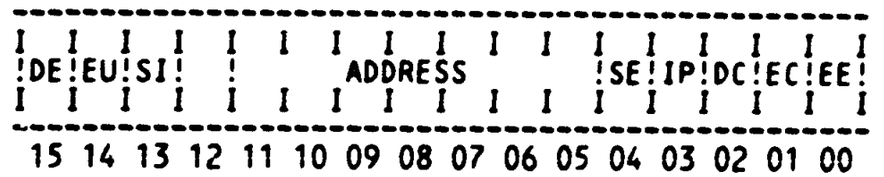
BIT14 EUB ERROR RETRIEVAL IF THE MEMORY IS ON AN EXTENDED UNIBUS, WHEN BIT14 IS ZERO, THE LOW ORDER FAILING ADDRESSES ARE AVAILABLE (BITS 11-17); WHEN BIT14 IS ONE, THE HIGH ORDER FAILING ADDRESSES ARE AVAILABLE (BITS 18-21 OF ADDRESS). IF THE MEMORY IS ON A UNIBUS, A JUMPER DISABLES THIS BIT SO THAT IT IS READ ONLY, AND EQUAL TO ZERO.

BITS 11-5 ERROR ADDRESS WITH BIT14 SET, THEY CONTAIN THE HIGH ORDER PARITY ERROR ADDRESS (BITS 21-18 OF ADDRESS); WITH BIT14 CLEARED, THEY CONTAIN THE LOW ORDER PARITY ERROR ADDRESS (BITS 17-11 OF ADDRESS).

BIT02 WRITE WRONG PARITY NORMAL PARITY (ODD) WHEN CLEAR; OTHER PARITY (EVEN) WHEN SET.

BIT00 ACTION ENABLE NO ACTION WHEN CLEAR; TRAP TO VECTOR 114 WHEN SET.

5.3 MS11-M CSR



BIT ASSIGNMENTS ARE DEFINED AS FOLLOWS:

BIT15 UNCORRECTABLE ERROR THIS BIT IS SET IF A DBE OCCURS, AND THE ERROR ADDRESS IS STORED IN THE CSR. THIS BIT IS ALSO SET IN THE ECC DISABLE MODE IF AN SBE OR DBE OCCURS.

BIT14 EUB ERROR RETRIEVAL IF THE MEMORY IS ON AN EXTENDED UNIBUS, WHEN BIT14 IS ZERO AND EITHER BIT4 OR BIT 15 IS A ONE, THE LOW ORDER FAILING ADDRESSES ARE AVAILABLE (BITS 11-17); WHEN BIT14 IS ONE, THE HIGH ORDER FAILING ADDRESSES ARE AVAILABLE (BITS 18-21 OF ADDRESS). IF THE MEMORY IS ON A UNIBUS, A JUMPER DISABLES THIS BIT SO THAT IT IS READ ONLY, AND EQUAL TO ZERO.

BIT13 SET INHIBIT MODE WHEN THIS BIT IS SET TO A 1, IT ENABLES THE INH MODE POINTER TO INHIBIT EITHER THE FIRST OR SECOND 16K FROM EVER GOING INTO THE DIAG. CHECK OR ECC DISABLE MODE. WHEN THIS BIT IS SET TO A 0, IT ALLOWS THE DIAG. CHECK MODE

```
2232
2233
2234
2235
2236
2237
2238
2239
2240
2241
2242
2243
2244
2245
2246
2247
2248
2249
2250
2251
2252
2253
2254
2255
2256
2257
2258
2259
2260
2261
2262
2263
2264
2265
2266
2267
2268
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2270
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2272
2273
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2285
```

AND/OR ECC DISABLE MODE TO OPERATE OVER THE ENTIRE MEMORY ON THE BOARD.

BITS 11-5 ERROR ADDRESS WITH BIT02 CLEARED AND BIT14 SET, THEY CONTAIN THE HIGH ORDER ERROR ADDRESS (BITS 21-18); WHEN BIT02 AND BIT14 ARE CLEARED, THEY CONTAIN THE LOW ORDER ERROR ADDRESS (BITS 17-11); WHEN BIT02 IS SET THEY CONTAINS CHECK BITS FOR ECC.

BIT04 SINGLE ERROR SET WHENEVER SINGLE ERROR OCCURS.

BIT03 INHIBIT MODE POINTER THE INHIBIT MODE POINTER WORKS IN CONJUNCTION WITH THE SET INHIBIT MODE BIT. WHEN BIT13 IS SET TO A 1, A 16K PORTION OF MEMORY IS INHIBITTED FROM OPERATING IN THE ECC DISABLE MODE OR DIAGNOSTIC CHECK MODE. THE INHIBIT MODE POINTER INDICATES WHICH 16K IS BEING INHIBITED; E.G.-IF BIT3 =1, THE SECOND 16K OF MEMORY IS INHIBITTED. WHEN BIT13 IS SET TO A 0, BIT3 BECOMES INOPERATIVE.

BIT02 DIAGNOSTIC CHECK MODE WHEN SET ENABLES READ-WRITE OF CHECK BITS(SEE BITS 11-5). IF A DBE OCCURS IN THIS MODE (WITH BIT1=0), BIT15 IS SET, BUT THE CHECK BITS READ

```
2287
2288
2289
2290
2291
2292
2293
2294
2295
2296
2297
2298
2299
2300
2301
2302
2303
2304
2305
2306
2307
2308
2309
2310
2311
2312
2313
2314
2315
2316
2317
```

ARE STORED IN BITS 11-5, NOT THE DBE ADDRESS BITS.

BIT01 DISABLE ERROR CORRECTION WHEN SET NO SINGLE ERROR CORRECTION TAKES PLACE. A SINGLE BIT ERROR WILL SET BIT04 AND BIT15 AND ASSERT BUS PBL L IF BIT00 IS ASSERTED; A DOUBLE ERROR WILL SET SET BIT15 AND ASSERT BUS PBL L IF BIT00 IS ASSERTED. THE ERROR ADDRESS IS STORED IN THE CSR, AND CORRECT CHECK BITS ARE GENERATED AND STORED ON A WRITE.

BIT00 UNCORRECTABLE ERROR ENABLE WHEN SET ENABLES TRAP TO VECTOR 114 ON UNCORRECTABLE ERROR.

```
2319
2320
2321
2322
2323
2324                    6.0  SUB-TEST SUMMARIES
2325
2326                    6.1  TESTS
2327
2328
2329
2330
2331                    TEST     1
2332
2333                             BIT TEST OF ALL CSR'S/MATCH ALL CSR'S WITH MEMORY
2334                             (CSR ACCESS MAY CAUSE WRONG TYPE OF TRAPS)
2335
2336                    TEST     2
2337
2338                             TEST BANK 0 ACCESSES
2339                             FAILURES ARE FATAL.
2340
2341                    TEST     3
2342
2343                             TEST BANKS 1-167 (OCTAL) FOR ZEROS AND ONES
2344                             ERRORS ARE NOT TYPED HERE - ONLY LOGGED IN
2345                             THE CONFIGURATION TABLE
2346
2347                    TEST     4
2348
2349                             ECC INHIBIT MODE POINTER TEST
2350
2351                    TEST     5
2352
2353                             DIAGNOSTIC MODE DISPATCH ROUTINE
2354                             THIS TEST RUNS ALL THE PATTERNS IN THE
2355                             MODE SELECTED.
2356
2357                    TEST     6
2358
2359                             UNIQUE BANK TEST
2360                             PATTERN 27 IS RUN
2361
2362
2363
```

6.2 TESTS

6.2.1 GENERAL TEST INFORMATION

ACTUAL TESTS ARE IDENTIFIED BY SYMBOLIC LOCATIONS 'MTPXYY'' WHERE X MAY BE ANY SUB PROGPAM INDICATOR (A,B,C,ETC) OR 0 AND YY WILL BE THE NUMBER OF THE TEST.

SETUP PROCEDURES FOR EACH TEST ARE IDENTIFIED BY SYMBOLIC LOCATIONS 'MTOOYY'' WHERE YY WILL BE THE NUMBER OF THE TEST.

TESTS RESIDE IN 4 SCRIPTS THAT ARE SCANNED FOR EXECUTION. SYMBOLIC LOCATION 'MKCSRT'' IS A TABLE OF TESTS THAT CAN RUN ONCE FOR EACH ECC BANK (TWICE FOR INTERLEAVED MS11-M'S). SYMBOLIC LOCATION 'MKPAT'' IS A TABLE OF TESTS THAT CAN RUN ON EACH BANK OF ECC MEMORY. SYMBOLIC LOCATION 'MJPAT'' IS A TABLE OF TESTS THAT CAN RUN ON EACH BANK OF PARITY MEMORY. SYMBOLIC LOCATION ''FSPAT'' IS A TABLE OF TESTS THAT CAN BE RUN IN FIELD SERVICE MODE (COMMAND 5).

THE 1ST 3 SCRIPTS ARE COMPLETELY CONTROLLED BY THE APT E-TABLE (EVEN IF NOT RUNNING UNDER APT). MODIFICATIONS TO THIS TABLE CAN BE MADE (1) WITH APT, OR (2) MANUALLY.

EXAMPLE E-TABLE SEGMENT:

```
;THE FOLLOWING LOCATIONS SPECIFY WHICH TESTS
;ARE TO BE RUN FOR PARTICULAR MEMORIES
;
;REFERENCE THE TABLE LISTED BELOW TO RELATE BITS TO TESTS.
;BIT0 SET WILL RUN THE FIRST ENTRY IN THE TABLE, BIT0 SET
;IN THE SECOND WORD WILL RUN THE 17TH ENTRY IN THE TABLE...
;
;NOTE**NULL TESTS DO NOT TAKE ANY TIME
;                                                    RECOMMENDED VALUE
$DDW0:   .WORD       177777          ;ECC CSR TESTS       177777 TABLE = MKCSRT:
$DDW1:   .WORD       177777          ;ECC CSR TESTS       177777 TABLE = MKCSRT:
$DDW2:   .WORD       177777          ;ECC TESTS           103777 TABLE = MKPAT:
$DDW3:   .WORD       177777          ;ECC TESTS           177777 TABLE = MKPAT:
$DDW4:   .WORD       177777          ;PARITY TESTS        003777 TABLE = MJPAT:
$DDW5:   .WORD       177777          ;PARITY TESTS        177774 TABLE = MJPAT:
```

6.2.2 SPECIFIC TESTS

6.2.2.1 TEST 0 BASIC DATA TEST

WRITES READS R2 INTO A 16K BANK.

THIS IS USED FOR ZEROS AND ONES TESTING AND IN FIELD SERVICE MODE FOR ANY CONSOLE SELECTED TEST.

IT CAN EXECUTE OUT OF THE USER INSTRUCTION PAR'S.

NOTE

IT IS FREQUENTLY MODIFIED DYNAMICALLY SUCH THAT (1) IT RETURNS AFTER WRITING ONLY (THE 1ST NOP IS REPLACED WITH A RETURN) OR (2) IT ONLY COUNTS ERRORS (THE CODE PERR02 AND NOP ARE REPLACED WITH INC @#PATERR).

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6.2.2.2 TEST 1 ADDRESS TEST

WRITES READS AN INCREMENTING PATTERN EQUIVALENT TO PHYSICAL ADDRESSED INTO A 16K BANK.

IT CAN EXECUTE OUT OF THE USER INSTRUCTION PAR'S.

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2467                    6.2.2.3  TEST 2    COMPLEMENT ADDRESS TEST
2468
2469                    WRITES THE COMPLEMENT OF THE PHYSICAL ADDRESS FROM HIGH  ADDRESSES  TO
2470                    LOW (WRITE DOWN) AND READS FROM LOW ADDRESSES TO HIGH (READ UP).
2471
2472                    THIS PROVIDES THE COMPLEMENT OF THE COVERAGE OF TEST 1 IN BOTH DATA
2473                    PATTERN AND ADDRESSING SEQUENCE.
2474
2475                    IT CAN EXECUTE OUT OF THE USER INSTRUCTION PAR'S.
```

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2477
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2483                    6.2.2.4  TEST 3    3 XOR 9
2484
2485                    WRITES  READS A TEST THAT COMPLEMENTS AS  ADDRESS  BITS  3  AND  9
2486                    CHANGE.
2487
2488                    THIS TEST IS RUN 4 TIMES (1) WITH ZEROS  ONES,  (2)  WITH  ONES
2489                    ZEROS,  (3)  WITH 401  ONES, AND (4) WITH ONES  401.  THE TEST OF
2490                    THE 401 IS TO FORCE A THE PARITY BITS TO BECOME INVOLVED.
2491
2492                    IT CAN EXECUTE OUT OF THE USER DATA PDR'S, THE USER INSTRUCTION PAR'S,
2493                    THE KERNEL DATA PAR'S AND THE SUPERVISOR DATA PAR'S.
2494
```

6.2.2.5 TEST 4 ROTATING ZEROS TEST

WRITES A BACKGROUND PATTERN OF ONES. ROTATES A ZERO CARRY BIT LEFT THRU EACH PAR OF BYTES (18 TIMES) AND THEN CHECKS THAT THE CARRY IS ZERO AND THE WORD (2 BYTES) IS STILL ALL ONES.

IT CAN EXECUTE OUT OF THE USER DATA PAR'S AND THE KERNEL DATA PAR'S.

NOTE

IT IS NOT UNCOMMON TO OBSERVE THE GOOD DATA EQUAL TO THE BAD DATA. THIS INDICATES THAT THE CARRY WAS NOT CLEAR AFTER 18 ROLB'S.

6.2.2.6 TEST 5 ROTATING ONES TEST

WRITES A BACKGROUND PATTERN OF ZEROS. ROTATES A ONE CARRY BIT LEFT THRU EACH PAIR OF BYTES (18 TIMES) AND THEN CHECKS THAT THE CARRY IS A ONE AND THE WORD (2 BYTES) IS STILL ALL ZEROS.

THIS PROVIDES THE COMPLEMENT OF THE COVERAGE OF TEST 4 IN DATA.

IT CAN EXECUTE OUT OF THE USER DATA PAR'S AND THE KERNEL DATA PAR'S.

NOTE

IT IS NOT UNCOMMON TO OBSERVE THE GOOD DATA EQUAL THE BAD DATA. THIS INDICATES THAT THE CARRY WAS NOT SET AFTER 18 ROLB'S.

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2553                    6.2.2.7  TEST 6    INITIAL DATA TEST
2554
2555                    WRITES  READS A DOUBLE WORD FIRST WITH ALL BITS 0 EXCEPT 1 (FOR EVERY
2556                    BIT  POSITION),  SECOND  WITH  ALL  BITS  1  EXCEPT  1  (FOR EVERY BIT
2557                    POSITION).
2558
2559                    THIS IS A VERY QUICK CHECK OF THE DATA PATHS.
2560
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2569                    6.2.2.8  TEST 7    ADDRESS BIT TEST
2570
2571                    WRITES A BACKGROUND OF ALL ZEROS.
2572                    READ ADDRESS 1 FOR A 0 BYTE.
2573                    COMPLEMENT ADDRESS 1.
2574                    READ ADDRESS 1 FOR A NON 0 BYTE.
2575                    FOR EACH ADDRESS BIT POSITION FROM BIT 1:
2576                    VIRTUAL (2, 4, 10, 20, 40, 100, 200, 400,  1000,  2000,  4000,  10000,
2577                    60000, 20000)
2578                    PHYSICAL (60002, 60004, 60010,  60020,  60040,  60100,  60200,  60400,
2579                    61000, 62000, 64000, 70000, 140000, 100000)
2580                      READ ADDRESS FOR A 0 WORD.
2581                      COMPLEMENT ADDRESS CONTENTS.
2582                      READ ADDRESS FOR A NON-ZERO WORD.
2583
2584                    THIS IS A VERY QUICK CHECK OF THE ADDRESS BIT UNIQUENESS.
2585
2586
```

6.2.2.9 TEST 10 BYTE ADDRESSING TEST

WITH ECC DISABLED.
WRITES ALL ONES TO A DOUBLE WORD.
FOR EACH OF THE 4 BYTES IN THE DOUBLE WORD.
  CLEARS ONE BYTE.
  READS ALL 4 BYTES FROM DOUBLE WORD.
  CHECKS FOR ONLY PROPER BYTE CLEAR.
  ALL OTHER BYTES SET TO ALL ONES.

THIS IS ONLY DONE ON ONE DOUBLE WORD ADDRESS.

NOTE

THIS IS RUN FOR ECC MEMORY ONLY

6.2.2.10 TEST 11 SINGLE BIT ERROR TEST

1. CREATE A SINGLE BIT ERROR.
2. READ DATA UNCORRECTED (WITH ECC DISABLE).
3. CHECK THAT SBE AND DBE FLAGS ARE SET, AND THE ERROR ADDRESS IS LATCHED.
4. READ FIRST WORD OF DATA CORRECTED (WITH ECC ENABLED)
5. CHECK THAT THE CSR SINGLE BIT ERROR FLAG WAS SET, AND THE ERROR ADDRESS WAS LATCHED.
6. CLEAR SBE FLAG.
7. READ SECOND WORD OF DATA CORRECTED (WITH ECC ENABLED).
8. CHECK THAT THE CSR SINGLE BIT ERROR FLAG WAS SET.
9. DO (1-7) FOR A SINGLE BIT ERROR IN EACH OF 32 POSITIONS OF A DOUBLE WORD.
   I.E. (32 TIMES)
10. IF NOT IN QUICK VERIFY MODE THEN DO (1-8) FOR DATA CONSISTING OF 1 BIT SET IN EACH OF 32 POSITIONS OF A DOUBLE WORD.
    I.E. (32 X 32 = 1024 TIMES)
11. DO (1-9) FOR COMPLEMENTED DATA (1 BIT CLEAR IN EACH OF 32 POSITIONS OF A DOUBLE WORD).
    I.E. (1024 X 2 = 2048 TIMES)
    OR (32 X 2 = 64 TIMES (QUICK VERIFY))
12. DO (1-7) FOR A DOUBLE WORD EQUAL TO (000000,000000), AND ALL POSSIBLE SINGLE BIT ERROR COMBINATIONS FORCED INTO THE CHECK BITS (CSR BITS 5-11).
13. CLEAR ANY ERRORS OUT OF TEST LOCATIONS.

THIS INSURES THAT ALL SINGLE BIT ERRORS CAN BE CORRECTED AND DETECTED.

NOTE

THIS TEST IS RUN FOR MS11-M MEMORY ONLY

6.2.2.11 TEST 12 WRITE BYTE CLEARS SBE TEST

1. CREATE A SINGLE BIT ERROR.
2. WRITE A BYTE OF DOUBLE WORD TO ONES.
3. READ A BYTE OF DOUBLE WORD.
4. IF THIS IS MS11-M, THE SBE FLAG SHOULD BE SET.
5. THE BYTE SHOULD HAVE BEEN EQUAL TO ONES.
6. DO (1-5) FOR EACH OF THE 4 BYTES OF THE DOUBLE WORD
7. DO (1-6) FOR A SINGLE BIT ERROR IN EACH OF 32 POSITIONS OF A DOUBLE WORD
   I.E. (32 TIMES)
8. IF NOT IN QUICK VERIFY MODE THEN DO (1-7) FOR DATA CONSISTING OF 1 BIT SET IN EACH OF 32 POSITIONS OF A DOUBLE WORD.
   I.E. (32 X 32 = 1024 TIMES)
9. CLEAR ANY ERRORS OUT OF TEST LOCATIONS.

THIS INSURES THAT SINGLE BIT ERRORS IN THE DATA PORTION (NOT IN CHECKBITS) CAN BE CLEARED BY WRITING THE CORRESPONDING BYTE AND THAT WRITING ANY OTHER BYTE DOES NOT CHANGE THE EXISTING SINGLE BIT ERROR.

NOTE

THIS TEST IS RUN FOR MS11-M MEMORY ONLY.

6.2.2.12 TEST 13 CREATE DOUBLE BIT ERROR TEST

1. CREATE A DOUBLE BIT ERROR.
2. ACCESS THE DATA (TST INSTRUCTION).
3. CHECK THAT THE CSR DBE FLAG IS SET, AND THE ERROR ADDRESS IS LATCHED.
4. INITIALIZE CSR TO ALLOW PARITY TRAPS ON DBE'S.
5. ACCESS THE DATA (TST INSTRUCTION).
6. CHECK THAT A PARITY TRAP OCCURRED.
7. DO (1-6) FOR THE 2ND BIT OF EACH DOUBLE BIT ERROR IN EACH OF 32 POSITIONS OF A DOUBLE WORD LESS THE ONE POSITION OF THE 1ST BAD BIT.
   I.E. (31 TIMES)
8. IF NOT IN QUICK VERIFY MODE THEN DO (1-7) FOR THE 1ST BIT OF EACH OF DOUBLE BIT ERROR IN EACH OF 32 POSITIONS OF A DOUBLE WORD.
   I.E. (31 X 32 = 992 TIMES)
9. DO (1-8) FOR COMPLEMENTED DATA (ONES VERSUS ZEROS IN DOUBLE WORD)
   I.E. (992 X 2 = 1984 TIMES)
   OR (31 X 2 = 62 TIMES (QUICK VERIFY))
10. DO (1-6) FOR A DOUBLE WORD EQUAL TO (000000,000000), AND ALL POSSIBLE DOUBLE BIT ERROR COMBINATIONS FORCED INTO EACH OF THE CHECK BITS (CSR BITS 5-11).
11. CLEAR ANY ERRORS OUT OF TEST LOCATIONS.

THIS INSURES THAT ALL DOUBLE BIT ERRORS CAN BE CREATED AND DETECTED AND CAUSE TRAPS.

NOTE

1) THIS TEST IS RUN ON THE MS11-M ONLY.

2) THIS TEST IS ONLY RUN DURING THE FIRST (QV) PASS WHEN UNDER ACT OR APT, AND IS RUN FOR ECC MEMORY ONLY.

6.2.2.13 TEST 14 BASIC DOUBLE BIT ERROR TEST

1. WRITE THE CSR TO ENABLE DIAG MODE WITH A DOUBLE BIT ERROR CHECK BITS OF 110011 AND UNCORRECTABLE ERROR INDICATION ENABLED.

2. WRITE FIRST AUT IN A 16K BANK WITH DATA OF ALL ZERO'S. THIS WILL WRITE THE CHECK BITS IN (1)

3. READ ADDRESS, THIS SHOULD CAUSE A DOUBLE BIT ERROR. BUS PBL IS ASSERTED AND WE CHECK FOR A PARITY TRAP TO OCCUR.

4. READ THE CSR FOR CHECK BITS IN (1) AND UNCORRECTABLE ERROR INDICATOR.

5. WRITE ONES TO THE HIGH BYTE OF THE ADDRESS UNDER TEST. SINCE A DBE EXSISTS AT THIS ADDRESS THE WRITE SHOULD BE ABORTED.

6. READ ADDRESS AND CHECK FOR A PARITY TRAP TO OCCUR AS A RESULT OF (5)

7. REPEAT 5 AND 6 FOR DATA OF ONES IN THE LOW BYTE AND CHECK FOR WRITE ABORT AND PARITY TRAP.

THIS TEST CHECKS TO SEE IF A DOUBLE BIT ERROR WILL BE ABORTED AND A BYTE WRITE OF A DOUBLE BIT ERROR WILL BE ABORTED.

NOTE

THIS TEST IS ONLY RUN FOR THE MS11-P

6.2.2.14 TEST 15 WRITE INHIBIT OF BYTE WITH DBE

1. CREATE A DOUBLE BIT ERROR.
2. DO A MOVB IMMEDIATE TO TEST BYTE.
3. CHECK THAT DOUBLE WORD IS STILL BAD (UNCHANGED-WITH DBE).
4. DO (2-3) ON ALL 4 BYTES OF DOUBLE WORD.
5. DO (1-4) FOR THE 2ND BIT OF EACH DOUBLE BIT ERROR IN EACH OF 32 POSITIONS OF A DOUBLE WORD LESS THE ONE POSITION OF THE 1ST BAD BIT.
   I.E. (31 TIMES)
6. IF NOT IN QUICK VERIFY MODE THEN DO (1-5) FOR THE 1ST BIT OF EACH DOUBLE BIT ERROR IN EACH OF 32 POSITIONS OF A DOUBLE WORD.
   I.E. (31 X 32 = 922 TIMES)
7. DO (1-6) FOR COMPLEMENTED DATA (ONES VERSUS ZEROS IN DOUBLE WORD).
   I.E. (992 X 2 = 1984 TIMES)
   OR (31 X 2 = 62 TIMES (QUICK VERIFY))
8. DO (1-4) FOR A DOUBLE WORD EQUAL TO (000000,000000), AND ALL POSSIBLE DOUBLE BIT ERROR COMBINATIONS FORCED INTO THE CHECK BITS (CSR BITS 5-11).
9. CLEAR ANY ERRORS OUT OF TEST LOCATIONS.

THIS INSURES THAT NO DOUBLE BIT ERROR CAN BE CLEARED BY A MOVB TO ANY AFFECTED BYTE.

NOTE

1) THIS TEST IS RUN ON THE MS11-M ONLY.

2) THIS TEST IS ONLY RUN DURING THE FIRST (QV) PASS WHEN UNDER ACT OR APT, AND IS RUN FOR ECC MEMRY ONLY.

6.2.2.15 TEST 16 WRITE INHIBIT OF WORD WITH DBE TEST

1. CREATE A DOUBLE BIT ERROR.
2. DO MOV IMMEDIATE ON TEST LOCATION.
3. CHECK THAT DOUBLE WORD IS STILL BAD (UNCHANGED-WITH DBE).
4. DO (2-3) ON BOTH DOUBLE WORDS.
5. DO (1-4) FOR THE 2ND BIT OF EACH DOUBLE BIT ERROR IN EACH OF 32 POSITIONS OF A DOUBLE WORD LESS THE ONE POSITION OF THE 1ST BAD BIT.
   I.E. (31 TIMES)
6. IF NOT IN QUICK VERIFY MODE THEN DO (1-5) FOR THE 1ST BIT OF EACH DOUBLE BIT ERROR IN EACH OF 32 POSITIONS OF A DOUBLE WORD.
   I.E. (32 X 32 = 992 TIMES)
7. DO (1-6) FOR COMPLEMENTED DATA (ONES VERSUS ZEROS IN DOUBLE WORD).
   I.E. (992 X 2 = 1984 TIMES)
   OR (31 X 2 = 62 TIMES (QUICK VERIFY))
8. DO (1-4) FOR A DOUBLE WORD EQUAL TO (000000,000000), AND ALL POSSIBLE DOUBLE BIT ERROR COMBINATIONS FORCED INTO THE CHECK BITS (CSR BITS 5-11).
9. CLEAR ANY ERRORS OUT OF TEST LOCATIONS.

THIS INSURES THAT NO DOUBLE BIT ERROR CAN BE CLEARED BY A MOV TO ANY AFFECTED WORD.

NOTE

1) THIS TEST IS RUN ON THE MS11-M ONLY

2) THIS TEST IS ONLY RUN DURING THE FIRST (QV) PASS WHEN UNDER ACT OR APT, AND IS RUN FOR ECC MEMORY ONLY.

6.2.2.16 TEST 17 HOLDING 1'S 0'S TEST

1. WRITE A 16K BANK WITH ALTERNATING BYTES OF ZEROS ONES WRITING A BYTE AT A TIME.
2. READ EACH WORD FOR CORRECT TEST.
3. DO (1-2) AGAIN FOR A COMPLEMENT TEST.

THIS CHECKS THE MEMORY FOR THE CAPABILITY OF HOLDING 0'S 1'S.

6.2.2.17 TEST 20 SYNDROME BITS TO THE CSR ON A SBE TEST

1. WRITE CSR WITH CHECK BITS TO CORRECT BIT 0 OF THE FIRST AUT 16K BANK FROM A 0 TO A 1 WITH DIAG MODE.
2. WRITE AUT WITH DATA OF 0'S CREATING A SBE.
3. CLEAR CSR.
4. READ THE AUT TO CLOCK THE ADDRESS AND SYNDROMES INTO THE CSR.
5. READ THE CSR FOR THE SBE INDICATOR, BIT 4.
6. WRITE THE CSR TO DIAG MODE TO CLOCK THE SYNDROME BITS INTO CSR BITS 5-11.
7. READ THE CSR FOR THE PROPER SYNDROME BITS.
8. REPEAT 1-7 FOR ALL 16 DATA BITS.
9. REPEAT 1-8 FOR DATA OF ONES SO THAT A CORRECTION WILL OCCUR FROM A 1 TO A ZERO.

THIS TEST CHECKS TO SEE THAT THE EDC CHIP CAN DETECT SINGLE BIT ERRORS FOR ALL 16 DATA BITS BY CHECKING FOR CSR BIT#4 AND THAT THE PROPER SYNDROME BITS ARE PLACED IN THE CSR.

NOTE

THIS TEST IS ONLY RUN FOR THE MS11-P

6.2.2.18 TEST 21 MARCHING 0'S 1'S TEST

1. WRITE A BACKGROUND OF ALTERNATING BYTES OF ZEROS ONES

2. FOR THE 16K BANK ADDRESSING DOWN
   (A) READ CHECK A WORD
   (B) BYTE SWAP A WORD
   (C) READ CHECK A WORD

3. FOR THE 16K BANK ADDRESSING UP
   (A) READ CHECK A WORD
   (B) BYTE SWAP A WORD
   (C) READ CHECK A WORD

4. FOR THE 16K BANK ADDRESSING UP
   (A) READ CHECK A WORD
   (B) BYTE SWAP A WORD
   (C) READ CHECK A WORD

5. FOR THE 16K BANK ADDRESSING DOWN
   (A) READ CHECK A WORD
   (B) BYTE SWAP A WORD
   (C) READ CHECK A WORD

THIS CHECKS THE INTEGRITY OF THE 32 BIT DOUBLE WORDS.

IT CAN EXECUTE OUT OF THE USER DATA PAR'S.

NOTE

IT IS NOT UNCOMMON TO SEE A MISLEADING ERROR TYPEOUT BECAUSE THE SECOND TEST IN EACH CASE IS BASED UPON A BYTESWAP OF THE FIRST TEST WHICH MAY OR MAY NOT HAVE FAILED. IF THE ERROR REPORT INDICATES ERRORS IN PAIRS WITH THE BAD BIT IN THE SECOND REPORT BEING THE SAME BIT POSITION RELATIVE TO A BYTE THEN YOU SHOULD IGNORE THE SECOND ERROR REPORT.

6.2.2.19 TEST 22 REFRESH TEST

1. WRITE A DIAGONAL TEST OF ONES ON EVERY KDIAG(TH) STRIPE
   WRITE ZEROS ELSEWHERE.

   THIS TEST IS ON ADDRESSES NOT BIT POSITIONS.

   EXAMPLE:

ADDRESS	MSB'S
LSB'S	0 0 0 1 0 0 0 1
	0 0 1 0 0 0 1 0
	0 1 0 0 0 1 0 0
	1 0 0 0 1 0 0 0
	0 0 0 1 0 0 0 1
	0 0 1 0 0 0 1 0
	0 1 0 0 0 1 0 0
	1 0 0 0 1 0 0 0

NOTE

EXAMPLE USES KDIAG OF VALUE 4 MORE TYPICAL IS A VALUE OF 8. CONSULT THE SYMBOLIC DEFINITION OF "KDIAG" IN THE PROGRAM LISTING TO BE SURE.

2. DISTURB EACH ROW FOR > 3.2MS

3. READ CHECK DIAGONAL PATTERN

4. DO (1-3) KDIAG TIMES MOVING THE PLACEMENT OF THE DIAGONAL STRIPE TO COVER ALL ADDRESS POSITIONS.

5. DO (1-4) FOR A COMPLEMENT PATTERN
   (ZEROS IN A BACKGROUND OF ONES)

NOTE

THIS TEST IS NOT NORMALLY EXECUTED EXCEPT UNDER APT OR ACT. IT MAY BE INVOKED VIA FIELD SERVICE COMMAND 13 (KAMIKAZE MODE).

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6.2.2.20 TEST 23 SHIFTING DIAGONAL TEST

SIMILAR IN OVERALL OPERATION TO TEST 22 EXCEPT IT DOES NOT DELAY FOR REFRESH AND DISTURB ROWS.

NOTE

THIS TEST IS NOT NORMALLY EXECUTED EXCEPT UNDER APT OR ACT. IT MAY BE INVOKED VIA FIELD SERVICE COMMAND 13 (KAMIKAZE MODE).

6.2.2.21 TEST 24 FAST GALLOPING PATTERN TEST

THIS DOES A CLASSICAL GALLOPING PATTERN EXCEPT THAT ADDRESSING IS INCREMENTED BY 400 OCTAL (EVERY 64TH DOUBLE WORD)

NOTE

THIS TEST IS NOT NORMALLY EXECUTED EXCEPT UNDER APT OR ACT. IT MAY BE INVOKED VIA FIELD SERVICE COMMAND 13 (KAMIKAZE MODE).

6.2.2.22 TEST 25 INTERRUPT ENABLE TEST

1. SET CSR TO ALLOW UNCORRECTABLE ERROR TRAPS.
2. ACCESS TEST DOUBLE WORDS.
3. CHECK THAT NO UNCORRECTABLE ERROR TRAP OCCURRED.
4. ENABLE CSR FOR SBE TRAPS.
5. ACCESS TEST DOUBLE WORDS.
6. CHECK THAT NO SBE TRAP OCCURRED.
7. WRITE A SBE IN 1 BYTE.
8. DISABLE CSR TRAPS.
9. ACCESS TEST DOUBLE WORDS.
10. CHECK THAT NO TRAPS OCCURRED.
11. ENABLE CSR FOR SBE TRAPS.
12. ACCESS TEST DOUBLE WORDS.
13. CHECK TO INSURE TRAP OCCURRED.
14. DO (7-13) FOR THE 3 OTHER BYTES IN THE DOUBLE WORD.
15. CREATE A DBE IN 1 BYTE.
16. DISABLE CSR TRAPS.
17. ACCESS THE TEST DOUBLE WORD.
18. CHECK THAT NO TRAPS OCCURRED.
19. ENABLE CSR FOR DBE TRAPS.
20. ACCESS THE TEST DOUBLE WORD.
21. CHECK TO INSURE TRAP OCCURRED.
22. ENABLE CSR FOR SBE TRAPS.
23. ACCESS THE TEST DOUBLE WORD.
24. CHECK TO INSURE TRAP OCCURRED.
25. DO (15-24) FOR THE 3 OTHER BYTES IN THE DOUBLE WORD.

THIS INSURES THAT SBE'S DBE'S GIVE THE CORRECT TYPE OF TRAPS.

NOTE
THIS TEST IS RUN FOR MS11-M MEMORY ONLY.

6.2.2.23 TEST 26 RANDOM DATA TEST

WRITE RANDOM DATA IN A 16K BANK WHILE INCREMENTING THE ADDRESSES.

READ CHECK RANDOM DATA.

THIS ROUTINE REGENERATES THE SAME RANDOM NUMBERS BY USING THE SAME

SEED AS THE WRITE SEQUENCE. AFTER THE READ CHECK THE SEED IS UPDATED SO THAT THE NEXT USE OF THIS PATTERN WILL NOT INVOKE THE SAME SEQUENCE OF RANDOM NUMBERS.

IF YOU WISH TO CHANGE THE RANDOM SEQUENCE SO THAT IT IS DIFFERENT THAN ANY OTHER RUN IN THE SAME CONFIGURATION THEN THERE ARE 2 WAYS OF DOING SO.

1. MODIFY SYMBOLIC LOCATIONS "SEEDHI" AND "SEEDLO" TO ANY NUMBER YOU LIKE.

2. ENTER FIELD SERVICE MODE AND EXECUTE THIS TEST (COMMAND 5) ON SOME (ANY GOOD) BANK FOR A SHORT TIME (30 SEC OR SO).

THIS CAN EXECUTE OUT OF THE USER DATA PAR'S, THE KERNEL DATA PAR'S, AND THE SUPERVISOR DATA PAR'S.

6.2.2.24 TEST 27 UNIQUE BANK TEST

THIS TEST USES TEST 0 TO WRITE READ THE BANK NUMBER IN EACH BANK.

IT DOES NOT TEST BANKS THAT REQUIRE RELOCATION TO TEST.

IT DOES NOT RUN AS PART OF ANY SCRIPT BUT RATHER IS ALWAYS RUN AFTER NORMAL PATTERN TESTS ARE COMPLETE.

6.2.2.25 TEST 30 FLUSH OUT DBE'S TEST

THIS READS EACH LOCATION THEN MOVES THE OLD VALUE BACK IN. THIS IS DONE WITH ECC DISABLED AND THEREFORE CORRECTS ANY DBE'S OR SBE'S (IF POSSIBLE).

IT DOES NOT RUN AS PART OF ANY SCRIPT BUT RATHER IS ALWAYS RUN JUST PRIOR TO THE END OF PASS CODE, AS PART OF A CONTROL "C" (BOOT) COMMAND, AS PART OF END OF PASS SHUTDOWN FOR ACT OR XXDP CHAIN MODE, AS PART OF HANGING SEQUENCE AFTER AN ERROR IF UNDER ACT OR APT, AND AS PART OF A SHUTDOWN SEQUENCE DIRECTED BY SWITCH 8 (HALT PROGRAM).

6.2.2.26 TEST 31 SOB-A-LONG TEST

RATIONALIZATION

IN ORDER TO CONCENTRATE THE MEMORY CYCLES OF A TEST INTO A PARTICULAR ADDRESS, WE MUST CUT THE OVERHEAD CYCLES TO A MINIMUM. FREQUENTLY, THE INSTRUCTION ITSELF MAY PROVIDE ADEQUATE DATA OR SET UP A BACKGROUND IN WHICH ANY COMPLEMENTED BIT MAY FIND IT HARD TO SURVIVE.

THE SOB INSTRUCTION IS THE ONLY PDP-11 INSTRUCTION THAT IS (1) A SINGLE OPERAND, (2) CAN BE REPEATEDLY EXECUTED AT THE SAME PC AND, (3) CAN ESCAPE THIS REPETITIOUS LOOP.

HENCE, IT CAN BE POSSIBLE TO SOB A MOS CELL TO DEATH (OR AT LEAST BRAIN WASH HIM), AND TO SOB A CORE INTO OVER-HEATING (OR AT LEAST WARM DISCOMFORT).

THE SOB ROUTINE WILL BE LOADED AND CALLED WITH R0 SET EQUAL TO THE SOB CONSTANT "SOBK", R1 SET EQUAL TO THE COMPLEMENT OF A "SOB R0,." INSTRUCTION "100776".

SIMPLIFIED SOB EXAMPLE:

```
1$:     SOB         R0,1$                   ;SOB TILL R0 UNDERFLOWS
        MOV         R1,1$                   ;WRITE COMPLEMENT OF SOB
        CMP         R1,1$                   ;READ  CHECK NOT SOB
        BEQ           2$                    ;SKIP IF OK
        SOBFAIL                             ;TRAP  REPORT ERROR
2$:     SOBMOV1                             ;CODE TO GET SELF MOVED
        SOBMOV2                             ;FORWARD 1 WORD AND RUN AGAIN
        SOBMOV3
        SOBMOV4
        SOBMOV...
```

THE VALUE OF THE SOB CONSTANT CAN BE FOUND AT SYMBOLIC LOCATION "SOBK" (TYPICAL 25 DECIMAL).

THIS TEST IS NOT IN THE NORMAL SCRIPT OF EXECUTION BUT MAY BE ADDED VIA THE APT E-TABLE, REFERENCE SYMBOLIC LOCATIONS "MKPAT", "MJPAT", "$DDW2-5". FIELD SERVICE MODE COMMAND 8 IS THE NORMAL METHOD OF RUNNING THIS PATTERN.

NOTE

THIS TEST IS NOT NORMALLY EXECUTED EXCEPT UNDER APT OR ACT. IT MAY BE INVOKED VIA FIELD SERVICE COMMAND 13 (KAMIKAZE MODE).

6.2.2.27 TEST 32 WRITE RECOVERY TEST

THIS TEST CAUSES A WRITE, READ, WRITE, READ, ... TO OCCUR IN MEMORY AND IF THE 1ST, 3RD, 5TH, ...READ IS BAD THE PROGRAM MAY BOMB OR IF THE 2ND, 4TH, 6TH, ... READ IS BAD THE PROGRAM WILL GRACEFULLY TYPE OUT THE ERROR.

WRITE RECOVERY TEST
THIS TEST DIFFERS FROM OTHER TESTS IN THAT IT CONSISTS
OF A SMALL TEST PROGRAM ACTUALLY RUNNING IN THE BANK UNDER TEST.
THE PROGRAM IS SELF MODIFYING AND MAY BE DIFFICULT TO DEBUG.
TO AID IN THE DEBUG, REMEMBER THAT THE BANK AND MARGIN ARE BEING
DISPLAYED. THIS WILL ALLOW THE USER TO AT LEAST SEE WHICH MEMORY
BANK FAILED.
THE TEST CONSISTS OF 1/2 OF THE BANK STORED WITH 'MOV R2,-(PC)''
AND THE OTHER 1/2 CONTAINING ''177667''. ''177667'' IS THE COMPLEMENT
OF ''JMP (R0)'' INSTRUCTION. R2 CONTAINS ''COM -(R1)'' INSTRUCTION
ON ENTRY TO THE BANK AND R1 CONTAINS THE HIGHEST TEST ADDRESS IN
THAT BANK.
IF YOU UNDERSTAND THIS SO FAR THE REST IS EASY.
THE TEST EXECUTION IS AS FOLLOWS:

1. THE 'MOV R2,-(PC)'' INSTRUCTION EXECUTES STORING
   THE CONTENTS OF R2 IN THE ADDRESS IT VACATED (DUE TO -(PC).
2. SINCE R2 CONTAINS A ''COM -(R1)'' INSTRUCTION IT COMPLEMENTS
   THE HIGHEST ADDRESS UNDER TEST. THIS ADDRESS CONTAINED
   ''177667'' SO AFTER THE COM -(R1) IT EQUALS 110
   CLEVERLY THIS IS THE ''JMP (R0)'' INSTRUCTION.
3. THIS SEQUENCE CONTINUES UNTIL THE 'MOV R2,-(PC)''
   INSTRUCTIONS REACH THE MIDDLE OF THE TEST BANK.
   THEN THE ''JMP (R0)'' INSTRUCTION IS MET
   AND EXECUTED. R0 CONTAINED THE RETURN ADDRESS BACK
   TO TEST 13.
4. THESE STEPS ARE REPEATED FOR EACH BANK UNDER TEST.

NOTE

THIS TEST IS NOT NORMALLY EXECUTED
EXCEPT UNDER APT OR ACT. IT MAY BE
INVOKED VIA FIELD SERVICE COMMAND 13
(KAMIKAZE MODE).

6.2.2.28 TEST 33 BRANCH GOBBLE TEST

THIS TEST LOADS A SMALL ROUTINE INTO THE MEMORY UNDER TEST. THE ROUTINE MOVES ITSELF ALONG IN MEMORY ONE WORD AFTER EACH PASS SO THAT WHEN IT REACHES THE END EVERY INSTRUCTION HAS EXECUTED FROM EVERY LOCATION WITH THE EXCEPTION OF THE BEGINNING AND END OF EACH TEST AREA.

THE BRANCH GOBBLE'S GENERAL FORMAT AFTER YOU ELIMINATE SETUP CODE AND CODE TO MOVE THE PROGRAM ALONG IS AS FOLLOWS.

```
BGTEST: 0                                       ;TEST WORD
BRGOBB: SEC
        ADCB        BGTEST                      ;INC LOW BYTE
        BMI         1$                          ;END LOOP AFTER 128 TIMES
        INCB        BGTEST+1                   ;INC HIGH BYTE
        BR          BRGOBB                      ;LOOP 128 TIMES
1$:     BVS         2$                          ;BRANCH IF V-BIT SET (SHOULD BE)
        ERROR                                   ;ERROR TRAP
2$:     CLV                                     ;CLEAR V-BIT
        INCB        BGTEST                      ;INC HIGH BYTE ONE LAST TIME
        BCS         3$                          ;BRANCH IF C-BIT SET (SHOULD NOT BE)
        BVC         3$                          ;BRANCH IF V-BIT CLEAR (SHOULD NOT BE)
        BMI         4$                          ;BRANCH IF N-BIT SET (SHOULD BE)
3$:     ERROR                                   ;ERROR TRAP
4$:     RETURN
```

THIS CODE ORIGIONALLY CAME FROM THE PDP-11 FAMILY INSTRUCTION EXERCISER DZQKA-A. THE FIRST MOS MEMORYS FELL SUCCEPTABLE TO THIS SECTION OF THAT DIAGNOSTIC AND IT HAS BEEN AN IMPORTANT MEMORY EXERCISER EVER SINCE.

NOTE

THIS TEST IS NOT NORMALLY EXECUTED EXCEPT UNDER APT OR ACT. IT MAY BE INVOKED VIA FIELD SERVICE COMMAND 13 (KAMIKAZE MODE).

6.2.2.29 TEST 34 SOFT ERROR TEST

RATIONALIZATION

MOS CHIPS HAVE A FAILURE MODE IN WHICH THEY CAN RANDOMLY PICK OR DROP BITS. THIS IS CAUSED BY ALPHA PARTICLES BOMBARDING THE CELL. IF THE CELL IS VERY SMALL (AND THEY ARE) THEN THE ELECTRONS DISPLACED BY THE ALPHA PARTICLE ARE SUFFICIENT TO CAUSE THE CELL TO CHANGE FROM A ONE TO A ZERO OR FROM A ZERO TO A ONE.

THIS TEST IS CONTROLLED BY THE MAIN PROGRAM SO THAT IT IS USED TO CREATE A TEST OF 125252 AND 52525 ON ALTERNATE PASSES OF THE PROGRAM. THE CONFIGURATION TABLE IS USED TO FLAG BANKS THAT HAVE THE TEST INVALIDATED BECAUSE ANOTHER TEST WAS WRITTEN OVER THIS BACKGROUND.

THIS TEST IS NOTHING MORE THAN A CLEVER USE OF TEST 0.

6.2.2.30 TEST 35 WORST CASE PARITY TEST

1. FORCE WRITE WRONG PARITY IN EACH 1K WORD BLOCK OF THE MEMORY UNDER TEST.
2. READ WITH PARITY TRAPPING ENABLED, MAKING SURE THAT A TRAP OCCURRS.
3. MAKE SURE ERROR ADDRESS BITS ARE SET CORRECTLY.
4. WRITE GOOD PARITY WITHOUT TRAPPING, AND MAKE SURE NO TRAP OCCURRS WHEN READ.

NOTE

THIS TEST IS RUN FOR PARITY MEMORY WHICH
IS NOT CONTROLLED BY THE SAME CSR AS THE
PROGRAM.

6.2.2.31 TEST 36 CORRECTION CODE TEST

1. WRITE CSR WITH CHECK BITS TO CORRECT BIT 0 OF THE FIRST ADDRESS IN A 16K BANK FROM A 0 TO A 1 WITH DIAG MODE.
2. WRITE AUT WITH DATA OF 0'S.
3. READ AUT FOR CORRECTION OF BIT 0 FROM A 0 TO A 1.
4. REPEAT 1-3 FOR ALL 16 DATA BITS.
5. REPEAT 1-4 FOR DATA OF ONES SO THAT A CORRECTION WILL OCCUR FROM A 1 TO A ZERO.

THIS TEST CHECKS TO SEE THAT THE EDC CHIP CAN CORRECT SINGLE BIT ERRORS FOR ALL 16K DATA BITS FROM A 1 TO A 0 AND VISA VERSA.

NOTE

THIS TEST IS ONLY RUN FOR THE MS11-P

6.2.2.32 TEST 37 CHECK ECC DISABLE TEST

1. WRITE CSR WITH ECC DISABLE, DIAG MODE, AND SBE CHECK BITS OF 000010.
2. WRITE AUT WITH DATA OF ZERO'S. THIS SHOULD WRITE CHECK BITS TO MEMORY.
3. READ AUT FOR DATA OF ZEROS INSURING NO CORRECTION WAS MADE.

NOTE

THIS TEST IS RUN ON THE MS11-P ONLY.

3503
3504
3505
3506
3507
3508
3509 6.2.2.33 TEST 41 ADDRESS TO CSR ON DBE TEST
3510
3511 1. WRITE CSR WITH ECC DISABLE, DIAG MODE, AND DOUBLE BIT ERROR
3512 CHECK BITS OF 010011
3513
3514 2. WRITE AUT WITH DATA OF ZEROS CREATING A DBE.
3515
3516 3. READ AUT TO DETECT DBE AND TO CLOCK ADDRESS INTO CSR
3517
3518 4. READ CSR FOR CORRECT ADDRESS IN BITS 5-11.
3519
3520 5. INCREMENT ADDRESS BY 1K AND REPEAT 1-4 UNTIL 16K IS DONE.
3521
3522 THIS TEST INSURES THAT THE CORRECT ADDRESS APPEARS IN CSR BITS 5-11 ON A DBE
3523
3524
3525 NOTE
3526
3527 THIS TEST IS RUN ON A MS11-P ONLY.
3528
3529
3530

6.2.2.34 TEST 42 EXTENDED ADDRESS TO CSR ON ERROR TEST

1. WRITE CSR WITH SBE CHECK BITS OF 000010 WITH DIAGNOSTIC MODE.
2. WRITE LOW ADDRESS IN A 16K BANK WITH DATA OF ZEROS CREATING A SBE.
3. CLEAR THE CSR.
4. READ ADDRESS TO DETECT SBE.
5. READ CSR FOR CORRECT ADDRESS AND THE SBE INDICATOR BIT #4.
6. ENABLE CSR BIT 14 TO CHECK THE EXTENDED ADDRESS BITS.
7. READ CSR FOR CORRECT ADDRESS BITS
8. REPEAT 1-7 WITH A TEST ADDRESS THAT IS THE HIGHEST IN A 16K BANK.

THIS TEST CHECKS TO SEE THAT THE CORRECT ADDRESS BITS APPPEAR IN THE CSR.
THIS IS ALSO REPEATED FOR THE EXTENDED ADDRESS FUNCTION IN THE CSR.

NOTE

THIS TEST IS ONLY RUN FOR THE MS11-P

6.2.2.35 TEST 43 WRITE BYTE TEST

1. WRITE CSR TO DIAG MODE WITH CHECK BITS OF 001100. THESE CORRESPOND TO DATA OF ZEROS.
2. WRITE FIRST AUT WITH DATA OF ONE IN BIT ZERO. THE WRITE EFFECTIVELY CREATES A SBE IN BYTE 0.
3. CLEAR THE CSR
4. WRITE BYTE 1 OF THE AUT WITH DATA OF ALL ONES.
5. READ CSR TO CHECK FOR SBE INDICATION.
6. WRITE THE CSR TO DIAG MODE.
7. READ THE AUT TO CHECK FOR THE CORRECT DATA -- ALL ONES IN HIGH BYTE AND ALL ZEROS IN LOW BYTE.
8. READ THE CSR TO CHECK FOR CORRECT CHECK BITS CORRESONDING TO THE DATA READ IN (7). THESE CHECK BITS ARE 000110.
9. REPEAT (1)-(8) THIS TIME CREATING AN ERROR IN BYTE 1 (2) AND WRITING BYTE 0 IN (4).

THIS TEST CHECKS TO SEE THAT A SBE WILL BE CORRECTED DURING THE READ PORTION OF THE BYTE WRITE AND THAT CORRECT CHECKBITS WILL BE GENERATED ON THE WRITE.

NOTE

THIS TEST IS ONLY RUN FOR THE MS11-P

6.2.2.36 TEST 44 SHIFTING CHECKBITS THROUGH THE CSR TEST

1. WRITE CSR TO DIAG MODE TO ENABLE CHECKBIT REGISTER.
2. WRITE CSR WITH CHECK BITS OF 000001, ECC DISABLE AND DIAG MODE.
3. WRITE MEMORY WITH DATA OF ZEROS. THIS SHOULD WERITE THE CHECK BITS INTO MEMORY.
4. COMPLEMENT CHECK BITS PATTERN AND WRITE CSR AS IN (2).
5. READ CSR FOR COMPLEMENT CHECK BIT PATTERN.
6. READ MEMORY TO READ CHECK BITS WRITTEN IN (2) INTO CSR.
7. READ CSR FOR CORRET CHECK BITS WRITTEN IN (2).
8. SHIFT CHECK BIT PATTERN AND REPEAT (1-7) TILL CSR BITS 5-10 ARE DONE.
9. COMPLEMENT CHECK BIT PATTERN IN (2) AND REPEAT (1-8) SHIFTING A ZERO THROUGH A FIELD OF ONES.
10. REPEAT 1-9 FOR EVERY 100 OCTAL LOCATIONS IN 16K

THIS TEST CHECKS THE ABILITY TO READ CHECK BITS FROM THE CSR TO MEMORY AND BACK. THE TEST IS DONE TWICE. ONCE SHIFTING A FIELD OF A ONE THROUGH A FIELD OF ZEROS AND A ZERO THROUGH A FIELD OF ONES. THIS TESTS THE CHECKBIT/SYNDROME BIT REGISTER AND CHECK BIT RAM'S. THIS TEST IS DONE FOR EVERY 100 OCTAL LOCATIONS IN 16K.

NOTE

THIS TEST IS ONLY RUN FOR THE MS11-P

6.2.2.37 TEST 45 SYNDROME BITS TO THE CSR ON A DBE TEST

1. WRITE CSR WITH DIAG MODE TO ENABLE CHECK/SYNDROME BIT REGISTER.
2. WRITE CSR WITH DBE CHECK BITS OF 110011 WITH DIAG MODE.
3. WRITE MEMORY WITH DATA OF ZEROS CREATING A DBE.
4. CLEAR CSR.
5. READ MEMORY TO DETECT DBE.
6. READ CSR FOR UNCORRECTABLE ERROR INDICATOR.
7. WRITE CSR TO DIAG MODE TO READ SYNDROME BITS INTO CSR.
8. READ CSR FOR CORRECT SYNDROME BITS OF 111111.
9. REPEAT (1-8) WITH MULIPLE BIT ERROR CHECK BITS OF 111100 AND CORRESPONDING SYNDROME BITS OF 110000.

THIS TEST CHECKS THE ABILITY OF THE CSR TO DETECT A DBE AND READ FOR THE PROPER SYNDROME BITS GENERATED BY THE EDC CHIP. THIS TEST IS THEN REPEATED WITH CHECK BITS CORRESPONDING TO A MULTIPLE BIT ERROR.

NOTE

THIS TEST IS ONLY RUN FOR THE MS11-P

6.2.2.38 TEST 46 CHECK SINGLE BIT ERRORS WITH ECC DISABLED TEST

1. WRITE CSR WITH CHECK BITS TO CORRECT BIT 0 OF THE FIRST ADDRESS IN A 16K BANK FROM A 0 TO A 1 WITH DIAG MODE AND ECC DISABLED.
2. WRITE AUT WITH DATA OF 0'S THUS CREATING A SBE.
3. WRITE THE CSR TO ECC DISABLE.
4. READ AUT TO DETECT SBE.
5. CHECK TO SEE THAT NO TRAP OCCURED.
6. READ CSR TO SEE THAT UNCORRECTABLE ERROR (CSR15) IS SET.
7. REPEAT 1-6 FOR ALL 16 DATA BITS.
8. REPEAT 1-7 FOR DATA OF ONES SO THAT A CORRECTION WILL OCCUR FROM A 1 TO A ZERO.
9. REPEAT 1-8 EXCEPT IN STEPS (3) THE CSR IS WRITTEN TO ECC DISABLE AND BUS PBL ENABLE AND (5) WE CHECK FOR TRAPS.

THIS TEST CHECKS TO SEE THAT SBE ARE TREATED A UNCORRECTABLE ERRORS WITH ECC DISABLE. THE TEST IS REPEATED 2 TIMES, ONCE WITH TRAPS DISABLED AND AGAIN WITH IT ENABLED. THIS IS DONE FOR ALL 16 POSSIBLE SBE CONDITIONS.

NOTE

THIS TEST IS ONLY RUN FOR THE MS11-P

6.2.2.39 TEST 47 NO CSR UPDATE ON SBE WITH EXSISTING DBE TEST

1. WRITE THE CSR TO DIAG MODE TO ENABLE CHECKBIT/SYNDROME BIT REGISTER.
2. WRITE THE CSR WITH DBE CHECK BITS OF 110011 AND DIAG MODE.
3. WRITE MEMORY WITH DATA OF ZEROS CREATING A DBE.
4. WRITE CSR WITH SBE CHECK BITS OF 000010 AND DIAG MODE.
5. WRITE MEMORY 4K ABOVE ADDRESS IN (3) CREATING A SBE.
6. CLEAR CSR.
7. READ MEMORY WITH ADDRESS IN (3) TO DETECT DBE.
8. READ CSR FOR CORRECT ADDRESS AND UNCORRECTABLE ERROR INDICATOR
9. READ MEMORY WITH ADDRESS IN (5) TO DETECT SBE.
10. READ CSR FOR SBE INDICATOR AND NO CHANGE IN DBE STATUS IN CSR IN (8)

THIS TEST CHECKS TO SEE THAT NO UPDATE WILL OCCUR IN THE CSR WITH A SBE IN MEMORY WHEN A DBE ALREADY EXISTS.

NOTE

THIS TEST IS ONLY RUN FOR THE MS11-P

```
3764
3765
3766
3767
3768
3769
3770                    6.2.2.40  TEST 999 NULL TEST
3771
3772                    THIS IS AN INSTANT RETURN ADDED TO PRESERVE THE SOFTWARE STRUCTURE.
3773
3774                    THIS TEST REPLACES ANY REAL TESTS WHEN THE APT E-TABLE DOES  NOT
3775                    SPECIFY A TEST TO BE RUN.
3776
```

7.0 PROGRAM FEATURES

7.1 FAST DATA ACCESS RATES

ONE OF THE MAIN AREAS OF CONCERN IN TESTING MEMORY IN SYSTEMS ENVIRONMENTS IS SPEED. ONE OF THE PRIME REASONS THAT SYSTEM PROGRAMS LIKE RSTS,IAS AND RUMPS CAN CRASH DUE TO MEMORY FAILURES NOT DETECTABLE BY MEMORY DIAGNOSTICS (0-124K,0-2 MEG,ETC.) IS BECAUSE OF MULTIPLE NPR DEVICES CONTENDING FOR THE BUS. AFTER SOME DELAY A NPR DEVICE BECOMES BUS MASTER AND DOES SEVERAL MEMORY TRANSFERS AT MEMORY DATA RATES.

ON THE OTHER HAND MOST DIAGNOSTICS WHEN WRITING READING AND/OR CHECKING PATTERNS SPEND MOST OF THEIR TIME FETCHING INSTRUCTIONS AND OPERANDS OUT OF THEIR PROGRAM SPACE AND PROPORTIONALLY LITTLE TIME ACCESSING THE MEMORY UNDER TEST.

THIS DIAGNOSTIC'S ERROR DETECTING ABILITIES HAVE BEEN OPTIMIZED AROUND THE PRIMARY DESIGN CRITERIA OF SPEED. TO THIS END THE FOLLOWING STEPS HAVE BEEN TAKEN.

7.1.1 FAST CITY

UTILIZATION OF MEMORY MANAGEMENT REGISTERS AS NON MEMORY BUS, NON UNIBUS, BIPOLAR MEMORY. SINCE USER MODE IS ONLY USED FOR RELOCATION AND DATA SPACE IS NEVER USED, THEN SUBROUTINES CAN BE EXECUTED FROM THE UIPAR'S, UDPAR'S, KDPAR'S, SDPAR'S AND WITH SOME BIT PATTERN RESTRICTIONS THE UIPDR'S, UDPDR'S, KDPDR'S, AND SDPDR'S.

THE PROGRAM RUNS IN KERNEL MODE AND PATTERNS ARE EXECUTED IN SUPERVISOR MODE FOR MAPPING PURPOSES. ALL CORE PATTERNS AND SOME MOS PATTERNS ARE SUBROUTINES THAT ARE MOVED TO THIS BIPOLAR REGION REFERRED TO IN THE PROGRAM AS FAST CITY.

NOTE

18-BIT PDP-11'S CANNOT EXECUTE FROM THE PAR'S BECAUSE THEIR PAR'S ARE ONLY 12 BITS WIDE; THEY ALSO HAVE NO SUPERVISOR MODE. THEREFORE, ALL PATTERNS ARE EXECUTED IN MEMORY, USING USER MODE (REFERENCE SECTION 7.5).

7.1.2 SOB'S

UTILIZATION OF THE FULL PDP-11 INSTRUCTION SET TO SPEED PATTERN ALGORITHMS (PRINCIPALLY THE SOB).

7.1.3 CACHE

CACHE IS USED BETWEEN PATTERN TESTS TO DECREASE PROGRAM PASS TIMES. CACHE CAN BE DEFEATED BY THE OPERATOR (REFERENCE SECTION 2.4.3.1).

7.2 BANK ZERO TESTING

BANK ZERO HAS BEEN TRADITIONALLY NEGLECTED BY MEMORY DIAGNOSTICS FOR THE FOLLOWING REASON.

THE VECTOR SPACE EXISTS THERE AND ALL TRAPS MUST NOT ACCESS TEST PATTERN DATA. IF THE AREA IS TESTED THE DIAGNOSTIC MUST NOT USE ANY TRAPS, AND IT IS AGAINST THE RULES FOR POWER TO FAIL.

SYSTEMS WITH MEMORY MANAGEMENT CAN OVERCOME THIS BECAUSE ALL TRAPS ARE TO KERNEL VIRTUAL SPACE EVEN IF THE POWER SHOULD FAIL (CAUTION MUST BE OBSERVED BECAUSE POWER UP GOES TO PHYSICAL ADDRESS 24 (BECAUSE THE MEMORY MANAGEMENT UNIT COMES UP OFF)).

HOWEVER, CATCH 22 IS THAT THE DIAGNOSTIC IS NOT APT COMPATIBLE IN THIS MODE BECAUSE APT ACCESSES PHYSICAL MEMORY LOCATIONS.

THE PDP-11/44 CAN OVER COME THIS BECAUSE THE UNIBUS MAP CAN FOOL APT.

BECAUSE OF THE PREVIOUS ARGUMENTS THIS PROGRAM DOES NOT RELOCATE IN THE TRUE SINCE OF THE WORD (I.E. NO POSITION INDEPENDENT CODE WAS WRITTEN (AT LEAST NOT ON PURPOSE)), BUT RATHER THIS PROGRAM MOVES AND REMAPS (HEREAFTER REFERRED TO AS RELOCATES). THIS ENABLES THE COMPLETE TESTING OF BANK ZERO OR ANY OTHER PROGRAM SPACE OR PRIVILEGED SPACE EXACTLY AS ALL OTHER BANKS ARE TESTED. (THE CONDITIONAL TEST TO SEE IF A BANK IS PROTECTED IS COMPLEMENTED WHEN RELOCATED).

NOTE

THE PROGRAM WILL RELOCATE ONLY IN THE FIRST PASS UNDER APT; AFTER THIS, THE PROGRAM WILL REMAIN FIXED IN BANKS 0 AND 1.

7.3 MEMORY CONFIGURATION MAP

```
3888                    THIS MAP IS PRINTED OUT IMMEDIATELY AFTER SIZING THE MEMORY UNLESS SW6
3889                    IS SET (REFERENCE SECTION 2.4.1).  IT CAN ALSO BE PRINTED AT ANY LATER
3890                    TIME IN FIELD SERVICE MODE (REFERENCE SECTION 2.4.4.8.7)
3891
3892                    EXAMPLE:
3893                                            MEMORY CONFIGURATION MAP
3894                                                  16K BANKS
3895                                  1         2         3         4         5         6         7
3896                            01234567012345670123456701234567012345670123456701234567012345670123
3897                    ERRORS                XX
3898                    INTRLV  ----------------333333333333333----------------------------------
3899                    MEMTYPE LLLLLLLLMMMMMMMMMMMMMMMMMMMMMMMMPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPPP
3900                    CSR     0000000011111111222222222222222244444444444444444444444444444444
3901                    PROTECT PP      I       I       P       I
3902                              0         1         2         3         4         5         6
3903                            45670123456701234567012345670123456701234567012345670123456701234567
3904                    ERRORS
3905                    INTRLV  ----
3906                    MEMTYPE PPPP
3907                    CSR     4444
3908                    PROTECT
3909
3910
3911                    DISPLAYED ARE BANKS 0-73 OCTAL (2 MEG WORDS).   IF  THE  FAT  TERMINAL
3912                    SWITCH  WAS SET (REFERENCE SECTION 2.4.1) THEN ALL BANKS (0-167) WOULD
3913                    BE SHOWN.  IF THIS WAS AN 18-BIT PDP-11 (EG - 11/34), ONLY  BANKS  0-7
3914                    WOULD BE PRINTED.
3915                    THE FIELDS:
3916
3917                    ERRORS:
3918
3919                         THE SIZING ROUTINE COULD NOT WRITE ZEROS AND ONES  IN  BANKS
3920                         10  11, HENCE THEY ARE MARKED AS BAD WITH X'S.
3921
3922
3923
3924                    INTRLV:
3925
3926                         THERE IS INTERLEAVING ON BANKS 20-37, WITH  CSR  2  (172104)
3927                         CONTROLLING  THE  ADDRESS  BIT 1 NON-ASSERTED ADDRESSES, AND
3928                         CSR 3  (172106)  CONTROLLING  THE  ADDRESS  BIT  1  ASSERTED
3929                         ADDRESSES.
3930
3931                    ERRORS:
3932
3933                    MEMTYPE:
3934
3935                         BANKS 0-7 ARE MEMORY TYPE L (MS-11L), AND  BANKS  10-37  ARE
3936                         MEMORY  TYPE  M  (MS11-M)  AND BANKS 40-77 ARE MEMORY TYPE
3937                         P(MS11-P).  BANKS 100-167 DO NOT EXIST.
3938
3939                    CSR:
3940
```

```
3942
3943                                    BANKS 0-7 ARE ASSIGNED TO CSR 172100, 10-17 TO  CSR  172102,
3944                                    AND 20-37 TO INTERLEAVED CSR'S 172104 AND 172106 AND BANKS
3945                                    40-77 ARE ASSIGNED CSR 17210.
3946
3947                                PROTECT:
3948
3949                                    BANKS 0 AND 1 ARE PROTECTED BECAUSE THEY ARE PROGRAM  SPACE.
3950                                    BANK  0  AND 1 CAN ALSO BE PROTECTED BECAUSE THEY ARE IN THE
3951                                    BOTTOM 16K OF AN MS11-M CSR.  THE PROTECTION IS HIERARCHICAL
3952                                    AND  PROGRAM  SPACE  OVERSHADOWS MS11-M PROTECTION.  BANKS 0
3953                                    AND 1 WILL NOT BE TESTED UNTIL THE  PROGRAM  RELOCATES.   IF
3954
3955
3956                                    ANY   BANK IS  PROTECTED  BY MS11-M  AND NOT   BECAUSE
3957                                    IT IS IN PROGRAM SPACE IT WILL HAVE AN ''I''  TYPED IN  THIS
3958                                    ROW.   THIS  IS TO POINT OUT WHERE THE PROTECTED BANKS START
3959                                    FOR EACH ECC CSR.  NOTE THE ''P'' AT BANK 30;  THIS POINTS OUT
3960                                    THE  ''SHADOW''  PROTECTION  WHICH  OCCURRS  WHEN  TWO  MS11-M
3961                                    MEMORIES ARE INTERLEAVED.  THEREFORE, BANK 30  WILL  NOT  BE
3962                                    TESTED UNTIL THE PROGRAM HAS RELOCATED.
3963
3964
3965
3966
3967                            7.4  EVERYTHING YOU'VE ALWAYS WANTED TO KNOW ABOUT SUPERMAC ...
3968
3969                            SUPER-MAC IS A  SET  OF  STRUCTURED  PROGRAMMING  MACROS  THAT  ALLOWS
3970                            PROGRAMS TO BE WRITTEN IN A HIGH LEVEL, EASILY UNDERSTOOD LANGUAGE.
3971
3972                            AS A GENERAL  RULE,  MOST  SUPER-MAC  STATEMENTS  CAN  BE  SINGLE-LINE
3973                            STATEMENTS  OR MULTIPLE-LINE (NESTED) BLOCK STATEMENTS.  A SINGLE-LINE
3974                            STATEMENT MUST BE COMPLETED ON ONE SOURCE LINE;  NO CONTINUATION LINES
3975                            ARE  ALLOWED.  SINGLE-LINE STATEMENTS SHOULD BE AS SHORT AND SIMPLE AS
3976                            POSSIBLE.  COMMENTS MAY ALSO BE INCLUDED ON A SOURCE  LINE.   ALL  THE
3977                            GENERAL  RULES,  CONDITIONS,  ETC.,  THAT  GOVERN MACRO-11 ALSO GOVERN
3978                            SUPER-MAC.  SPACING ON A SOURCE LNE IS VERY IMPORTANT.   THE  ELEMENTS
3979                            SHOULD  BE SEPARATED BY A COMMA OR A SPACE.  TABS SHOULD NEVER BE USED
3980                            FOR  SPACING.   FOR  EXAMPLE:   THE  EXPRESSION  A+B  IS   INTERPRETED
3981                            DIFFERENT THAN A + B.
3982
3983                            ALL THE CONDITIONAL STATEMENTS CAN BE WRITTEN AS MULTIPLE-LINE  NESTED
3984                            BLOCKS.   EACH LEVEL OF NESTING WITHIN A BLOCK MUST BE TERMINATED WITH
3985                            AN ASSOCIATED END STATEMENT.  EACH LEVEL OF NESTING SHOULD BE INDENTED
3986                            TWO SPACES.
3987
3988                            USER WRITTEN MACROS OR ASSEMBLY LANGUAGE INSTRUCTIONS MAY BE  INCLUDED
3989                            IN  A  PROGRAM IF DESIRED.  AS A DEBUGGING AID, IF THE SYMBOL LST$$ IS
3990                            DEFINED, IT WILL CAUSE GENERATED CODE AND LABELS TO  BE  LISTED.   ALL
3991                            PROGRAMS MUST BEGIN WITH THE MACRO CALL SMACIT.  THIS CALL INITIALIZES
3992                            SUPER-MAC.  ALL LEGAL PDP-11 SOURCE AND DESTINATION OPERANDS ARE LEGAL
3993                            IN SUPER-MAC.
```

```
                        7.4.1  SAMPLE SOURCE FILE -
                               .ENABL ABS
                               .ENABL AMA
                               .MCALL .SUPER
                               .SUPER
                               ;LST$$=0
                               BIT5=40
                        A:     0
                        B:     0
                        C:     0
                        D:     0
                        E:     0
                        F:     0
                        G:     0
                        H:     0
                        I:     0
                        J:     0
                               .PAGE
                        ;LET EXAMPLES
                               LET R0 := A
                               LET B := C + D
                               LET E := F +  1
                               LET G := H +  2
                               LET J := J +  01
                               LET A :B= B
                        ;IF EXAMPLES
                               IF A IS TRUE
                                 MOV    23,D
                               END ;OF IF A
                               IF B IS FALSE
                                 MOV    34,E
                               END ;OF IF B
                               IF A EQ B THEN LET C := D
                               IF A LT B
                                 MOV   C,D
                               ELSE
                                 MOV   E,D
                               END ;OF IF A
                               IF A EQ B AND C NE D
                                 MOV   F,G
                               END ;OF IF A
                               IF A EQ B OR C NE D
                                 MOV   F,G
                               END ;OF IF A
                               IFB A EQ B AND C EQ  1
                                 MOV   H,J
                               ELSE
                                 MOV   E,J
                               END ;OF IFB A
                               IFB A EQ B ANDB C EQ  1
                                 MOV   H,J
                               ELSE
                                 MOV   E,J
```

```
4050                                    END ;OF IFB A
4051                                    IF RESULT IS EQ
4052                                      MOV   A,B
4053                                    END ;OF IF RESULT
4054                                    IF  BIT5 SET.IN A
4055                                      MOV   B,C
4056                                    END ;OF IF  BIT5
4057                                    IF  BIT5 OFF.IN A
4058                                      MOV   C,D
4059                                    END ;OF IF  BIT5
4060                            ;ON.ERROR IS LIKE AN IF STATEMENT ON THE C-BIT
4061                            ;ON.ERROR EXAMPLES
4062                                    ON.ERROR
4063                                      MOV   A,B
4064                                    ELSE
4065                                      MOV   C,B
4066                                    END ;OF ON.ERROR
4067                                    ON.NOERROR
4068
4069
4070                                      MOV   C,B
4071                                    ELSE
4072                                      MOV   A,B
4073                                    END ;OF ON.NOERROR
4074                                    ON.ERROR THEN LET A :B= B
4075                            ;FOR EXAMPLES
4076                                    FOR I :=  -5 TO  23
4077                                      INC   A
4078                                    END ;OF FOR I
4079                                    FOR R0 :=  0 TO  140 BY  4
4080                                      DEC   A(R0)
4081                                    END ;OF FOR R0
4082                                    FOR I :=  133 DOWNTO  3 BY  2
4083                                      ADD   A,B
4084                                    END ;OF FOR I
4085                            ;BEGIN EXAMPLES
4086                                    BEGIN ALPHA
4087                                      FOR R0 :=  0 TO  167
4088                                        MOVB        A(R0),B
4089                                        IF B LT  0 THEN LEAVE ALPHA
4090                                      END ;OF FOR R0
4091                                      FOR R0 :=  400 TO  567
4092                                        IF B GE  0 THEN LEAVE ALPHA
4093                                      END ;OF FOR R0
4094                                    END ALPHA
4095                            ;$RETURN EXAMPLES
4096                                    $RETURN
4097                                    $RETURN ERROR
4098                                    $RETURN NOERROR
4099                            ;CASE EXAMPLES
4100                                    MOV     A,R0
4101                                    CASE R0
4102                                      A
```

```
                        B
                        C
                        D
                        E
                        F
                    END ;OF CASE R0

                    .END


7.4.2  SAMPLE LISTING FILE (WITH NO EXPANDED MACROS) - -
.MAIN.  MACRO M1111  01-APR-79 16:41  PAGE 2

      1 000000                                          .ENABL ABS
      2                                                 .ENABL AMA
      3                                                 .MCALL .SUPER
      4 000000                                          .SUPER
      5                                                 ;LST$$=0
      6             000040                              BIT5=40
      7 000000  000000                            A:    0
      8 000002  000000                            B:    0
      9 000004  000000                            C:    0
     10 000006  000000                            D:    0
     11 000010  000000                            E:    0
     12 000012  000000                            F:    0
     13 000014  000000                            G:    0
     14 000016  000000                            H:    0
     15 000020  000000                            I:    0
     16 000022  000000                            J:    0


.MAIN.  MACRO M1111  01-APR-79 16:41  PAGE 3

     18                                             ;LET EXAMPLES
     19 000024                                             LET R0 := A
     20 000030                                             LET B := C + D
     21 000044                                             LET E := F +  1
     22 000056                                             LET G := H +  2
     23 000072                                             LET J := J +  01
     24 000100                                             LET A :B= B
     25                                             ;IF EXAMPLES
     26 000106                                             IF A IS TRUE
     27 000114  012737  000023  000006                       MOV    23,D
     28 000122                                             END ;OF IF A
     29 000122                                             IF B IS FALSE
     30 000130  012737  000034  000010                       MOV    34,E
     31 000136                                             END ;OF IF B
     32 000136                                             IF A EQ B THEN LET C := D
     33 000154                                             IF A LT B
     34 000164  013737  000004  000006                       MOV   C,D
     35 000172                                             ELSE
```

```
                                        36 000174  013737  000010  000006          MOV   E,D
                                        37 000202                               END ;OF IF A
                                        38 000202                               IF A EQ B AND C NE D
                                        39 000222  013737  000012  000014          MOV   F,G
                                        40 000230                               END ;OF IF A
                                        41 000230                               IF A EQ B OR C NE D
                                        42 000250  013737  000012  000014          MOV   F,G
                                        43 000256                               END ;OF IF A
                                        44 000256                               IFB A EQ B AND C EQ  1
                                        45 000276  013737  000016  000022          MOV   H,J
                                        46 000304                               ELSE
                                        47 000306  013737  000010  000022          MOV   E,J
                                        48 000314                               END ;OF IFB A
                                        49 000314                               IFB A EQ B ANDB C EQ  1
                                        50 000334  013737  000016  000022          MOV   H,J
                                        51 000342                               ELSE
                                        52 000344  013737  000010  000022          MOV   E,J
                                        53 000352                               END ;OF IFB A
                                        54 000352                               IF RESULT IS EQ
                                        55 000354  013737  000000  000002          MOV   A,B
                                        56 000362                               END ;OF IF RESULT
                                        57 000362                               IF  BIT5 SET.IN A
                                        58 000372  013737  000002  000004          MOV   B,C
                                        59 000400                               END ;OF IF  BIT5
                                        60 000400                               IF  BIT5 OFF.IN A
                                        61 000410  013737  000004  000006          MOV   C,D
                                        62 000416                               END ;OF IF  BIT5
                                        63                      ;ON.ERROR IS LIKE AN IF STATEMENT ON THE C-BIT
                                        64                      ;ON.ERROR EXAMPLES
                                        65 000416                               ON.ERROR
                                        66 000420  013737  000000  000002          MOV   A,B
                                        67 000426                               ELSE
                                        68 000430  013737  000004  000002          MOV   C,B
                                        69 000436                               END ;OF ON.ERROR
                                        70 000436                               ON.NOERROR
                                        71 000440  013737  000004  000002          MOV   C,B
                                        72 000446                               ELSE
                                        73 000450  013737  000000  000002          MOV   A,B
                                        74 000456                               END ;OF ON.NOERROR


.MAIN.  MACRO M1111  01-APR-79 16:41  PAGE 3-1


                                        75 000456                               ON.ERROR THEN LET A :B= B
                                        76                      ;FOR EXAMPLES
                                        77 000466                               FOR I :=  -5 TO  23
                                        78 000474  005237  000000                  INC   A
                                        79 000500                               END ;OF FOR I
                                        80 000514                               FOR R0 :=  0 TO  140 BY  4
                                        81 000516  005360  000000                  DEC   A(R0)
                                        82 000522                               END ;OF FOR R0
                                        83 000534                               FOR I :=  133 DOWNTO  3 BY  2
```

```
                                 84 000542  063737  000000  000002          ADD    A,B
                                 85 000550                                END ;OF FOR I
                                 86                             ;BEGIN EXAMPLES
                                 87 000566                                BEGIN ALPHA
                                 88 000566                                  FOR R0 :=  0 TO  167
                                 89 000570  116037  000000  000002              MOVB        A(R0),B
                                 90 000576                                    IF B LT  0 THEN LEAVE ALPHA
                                 91 000604                                  END ;OF FOR R0
                                 92 000614                                  FOR R0 :=  400 TO  567
                                 93 000620                                    IF B GE  0 THEN LEAVE ALPHA
                                 94 000626                                  END ;OF FOR R0
                                 95 000636                                END ALPHA
                                 96                             ;$RETURN EXAMPLES
                                 97 000636                                $RETURN
                                 98 000640                                $RETURN ERROR
                                 99 000644                                $RETURN NOERROR
                                100                             ;CASE EXAMPLES
                                101 000650  013700  000000                MOV     A,R0
                                102 000654                                CASE R0
                                103 000664  000000                          A
                                104 000666  000002                          B
                                105 000670  000004                          C
                                106 000672  000006                          D
                                107 000674  000010                          E
                                108 000676  000012                          F
                                109 000700                                END ;OF CASE R0
                                110
                                111         000001                        .END
```

7.4.3 SAMPLE LISTING FILE (WITH EXPANDED MACROS) - -

.MAIN. MACRO M1111 01-APR-79 16:10 PAGE 2

```
                                  1 000000                                .ENABL ABS
                                  2                                       .ENABL AMA
                                  3                                       .MCALL .SUPER
                                  4 000000                                .SUPER
                                  5         000000                        LST$$=0
                                  6         000040                        BIT5=40
                                  7 000000  000000                  A:    0
                                  8 000002  000000                  B:    0
                                  9 000004  000000                  C:    0
                                 10 000006  000000                  D:    0
                                 11 000010  000000                  E:    0
                                 12 000012  000000                  F:    0
                                 13 000014  000000                  G:    0
                                 14 000016  000000                  H:    0
                                 15 000020  000000                  I:    0
                                 16 000022  000000                  J:    0
```

.MAIN. MACRO M1111 01-APR-79 16:10 PAGE 3

```
                                                ;LET EXAMPLES
                                                        LET R0 := A
000024  013700  000000                                  MOV A,R0
                                                        LET B := C + D
000030  013737  000004  000002                          MOV C,B
000036  063737  000006  000002                          ADD D,B
                                                        LET E := F +  1
000044  013737  000012  000010                          MOV F,E
000052  005237  000010                                  INC E
                                                        LET G := H +  2
000056  013737  000016  000014                          MOV H,G
000064  062737  000002  000014                          ADD  2,G
                                                        LET J := J +  01
000072  062737  000001  000022                          ADD  01,J
                                                        LET A :B= B
000100  113737  000002  000000                          MOVB B,A
                                                ;IF EXAMPLES
                                                        IF A IS TRUE
000106  005737  000000                                  TST A
000112  001403                                          BEQ L0
000114  012737  000023  000006                            MOV    23,D
                                                        END ;OF IF A
                                                L0:
                                                        IF B IS FALSE
000122  005737  000002                                  TST B
000126  001003                                          BNE L1
000130  012737  000034  000010                            MOV    34,E
                                                        END ;OF IF B
                                                L1:
                                                        IF A EQ B THEN LET C := D
000136  023737  000000  000002                          CMP A,B
000144  001003                                          BNE L2
000146  013737  000006  000004                          MOV D,C
                                                L2:
                                                        IF A LT B
000154  023737  000000  000002                          CMP A,B
000162  002004                                          BGE L3
000164  013737  000004  000006                            MOV   C,D
                                                        ELSE
000172  000403                                          BR L4
                                                L3:
000174  013737  000010  000006                            MOV   E,D
                                                        END ;OF IF A
                                                L4:
                                                        IF A EQ B AND C NE D
000202  023737  000000  000002                          CMP A,B
000210  001007                                          BNE L5
000212  023737  000004  000006                          CMP C,D
000220  001403                                          BEQ L5
000222  013737  000012  000014                            MOV   F,G
                                                        END ;OF IF A
```

```
4317                                    000230                                  L5:
4318                                 41 000230
4319                                    000230  023737  000000  000002          IF A EQ B OR C NE D
4320                                    000230  023737  000000  000002          CMP A,B
4321                                    000236  001404                          BEQ L6
4322                                    000240  023737  000004  000006          CMP C,D
4323                                    000246  001403                          BEQ L7
4324
4325                            .MAIN.  MACRO M1111  01-APR-79 16:10  PAGE 3-1
4326
4327
4328                                    000250                                  L6:
4329                                 42 000250  013737  000012  000014            MOV   F,G
4330                                 43 000256                                  END ;OF IF A
4331                                    000256                                  L7:
4332                                 44 000256                                  IFB A EQ B AND C EQ  1
4333                                    000256  123737  000000  000002          CMPB A,B
4334                                    000264  001010                          BNE L10
4335                                    000266  023727  000004  000001          CMP C, 1
4336                                    000274  001004                          BNE L10
4337                                 45 000276  013737  000016  000022            MOV   H,J
4338                                 46 000304                                  ELSE
4339                                    000304  000403                          BR L11
4340                                    000306                                  L10:
4341                                 47 000306  013737  000010  000022            MOV   E,J
4342                                 48 000314                                  END ;OF IFB A
4343                                    000314                                  L11:
4344                                 49 000314                                  IFB A EQ B ANDB C EQ  1
4345                                    000314  123737  000000  000002          CMPB A,B
4346                                    000322  001010                          BNE L12
4347                                    000324  123727  000004  000001          CMPB C, 1
4348                                    000332  001004                          BNE L12
4349                                 50 000334  013737  000016  000022            MOV   H,J
4350                                 51 000342                                  ELSE
4351                                    000342  000403                          BR L13
4352                                    000344                                  L12:
4353                                 52 000344  013737  000010  000022            MOV   E,J
4354                                 53 000352                                  END ;OF IFB A
4355                                    000352                                  L13:
4356                                 54 000352                                  IF RESULT IS EQ
4357                                    000352  001003                          BNE L14
4358                                 55 000354  013737  000000  000002            MOV   A,B
4359                                 56 000362                                  END ;OF IF RESULT
4360                                    000362                                  L14:
4361                                 57 000362                                  IF  BIT5 SET.IN A
4362                                    000362  032737  000040  000000          BIT  BIT5,A
4363                                    000370  001403                          BEQ L15
4364                                 58 000372  013737  000002  000004            MOV   B,C
4365                                 59 000400                                  END ;OF IF  BIT5
4366                                    000400                                  L15:
4367                                 60 000400                                  IF  BIT5 OFF.IN A
4368
4369                                    000400  032737  000040  000000          BIT  BIT5,A
```

```
                        61 000410  013737  000004  000006          MOV   C,D

                        62 000416                                 END ;OF IF  BIT5
                           000416                           L16:
                        63                                  ;ON.ERROR IS LIKE AN IF STATEMENT ON THE C-BIT
                        64                                  ;ON.ERROR EXAMPLES
                        65 000416                                 ON.ERROR
                           000416  103004                        BCC L17
                        66 000420  013737  000000  000002          MOV   A,B
                        67 000426                                 ELSE
                           000426  000403                        BR L20
                           000430                           L17:

                        68 000430  013737  000004  000002          MOV   C,B

                        69 000436                                 END ;OF ON.ERROR
                           000436                           L20:
                        70 000436                                 ON.NOERROR


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                           000436  103404                        BCS L21
                        71 000440  013737  000004  000002          MOV   C,B
                        72 000446                                 ELSE
                           000446  000403                        BR L22
                           000450                           L21:
                        73 000450  013737  000000  000002          MOV   A,B
                        74 000456                                 END ;OF ON.NOERROR
                           000456                           L22:
                        75 000456                                 ON.ERROR THEN LET A :B= B
                           000456  103003                        BCC L23
                           000460  113737  000002  000000        MOVB B,A
                           000466                           L23:
                        76                                  ;FOR EXAMPLES
                        77 000466                                 FOR I :=  -5 TO  23
                           000466  012737  177773  000020        MOV  -5,I
                           000474                           B0:
                        78 000474  005237  000000                INC   A
                        79 000500                                 END ;OF FOR I
                           000500  005237  000020                INC I
                           000504  023727  000020  000023        CMP I, 23
                           000512  003770                        BLE B0
                           000514                           E0:
                        80 000514                                 FOR R0 :=  0 TO  140 BY  4
                           000514  005000                        CLR R0
                           000516                           B1:
                        81 000516  005360  000000                DEC   A(R0)
                        82 000522                                 END ;OF FOR R0
                           000522  062700  000004                ADD  4,R0
                           000526  020027  000140                CMP R0, 140
```

```
                        000532  003771                          BLE B1
                        000534                          E1:
                    83  000534                                  FOR I :=  133 DOWNTO  3 BY  2
                        000534  012737  000133  000020          MOV  133,I
                        000542                          B2:
                    84  000542  063737  000000  000002            ADD   A,B
                    85  000550                                  END ;OF FOR I
                        000550  162737  000002  000020          SUB  2,I
                        000556  023727  000020  000003          CMP I, 3
                        000564  002366                          BGE B2
                        000566                          E2:
                    86                                  ;BEGIN EXAMPLES
                    87  000566                                  BEGIN ALPHA
                        000566                          B3:
                    88  000566                                    FOR R0 :=  0 TO  167
                        000566  005000                          CLR R0
                        000570                          B4:
                    89  000570  116037  000000  000002            MOVB        A(R0),B
                    90  000576                                    IF B LT  0 THEN LEAVE ALPHA
                        000576  005737  000002                    TST B
                        000602  002415                          BLT E3
                    91  000604                                    END ;OF FOR R0
                        000604  005200                          INC R0
                        000606  020027  000167                  CMP R0, 167
                        000612  003766                          BLE B4
                        000614                          E4:
                    92  000614                                    FOR R0 :=  400 TO  567
                        000614  012700  000400                  MOV  400,R0
```



```
                        000620                          B5:
                    93  000620                                      IF B GE  0 THEN LEAVE ALPHA
                        000620  005737  000002                  TST B
                        000624  002004                          BGE E3
                    94  000626                                    END ;OF FOR R0
                        000626  005200                          INC R0
                        000630  020027  000567                  CMP R0, 567
                        000634  003771                          BLE B5
                        000636                          E5:
                    95  000636                                  END ALPHA
                        000636                          E3:
                    96                                  ;$RETURN EXAMPLES
                    97  000636                                  $RETURN
                        000636  000207                          RTS PC
                    98  000640                                  $RETURN ERROR
                        000640  000261                          SEC
                        000642  000207                          RTS PC
                    99  000644                                  $RETURN NOERROR
                        000644  000241                          CLC
                        000646  000207                          RTS PC
```

```
                        100
                        101 000650  013700  000000          ;CASE EXAMPLES
                        102 000654                                MOV     A,R0
                            000654  010046                        CASE R0
                            000656  006316                        MOV R0,-(SP)
                            000660  004737  000700                ASL @SP
                        103 000664  000000                        JSR PC,L24
                        104 000666  000002                          A
                        105 000670  000004                          B
                        106 000672  000006                          C
                        107 000674  000010                          D
                        108 000676  000012                          E
                        109 000700                                  F
                            000700                                END ;OF CASE R0
                            000700                          L24:
                            000700  062616                        ADD (SP)+,@SP
                            000702  013646                        MOV @(SP)+,-(SP)
                            000704  004736                        JSR PC,@(SP)+
                        110
                        111         000001                      .END
```

7.5 MEMORY MANAGEMENT MAPPING

7.5.1 MEMORY MANAGEMENT MAPPING FOR THE 11/44 -

PAR	SUPERVISOR	KERNEL	USER
0	PROGRAM	PROGRAM	DST BK/FST MEM
1	PROGRAM	PROGRAM	SRC BK/FST MEM
2	PROGRAM	PROGRAM	SRC BK/FST MEM
3	TEST AREA	PROGRAM	SRC BK/FST MEM
4	TEST AREA	PROGRAM	DST BK/FST MEM
5	TEST AREA	PROGRAM	DST BK/FST MEM
6	TEST AREA	MAP TO CSR'S	DST BK/FST MEM
7	PERIF PAGE	PERIF PAGE	DST BK/FST MEM

7.5.2 MEMORY MANAGEMENT MAPPING FOR UNIBUS-11'S WITH SUPERVISOR MODE (EG 11/45) -

PAR	SUPERVISOR	KERNEL	USER
0	PROGRAM	PROGRAM	DST BK
1	PROGRAM	PROGRAM	SRC BK
2	PROGRAM	PROGRAM	SRC BK
3	TEST AREA	PROGRAM	SRC BK
4	TEST AREA	PROGRAM	DST BK
5	TEST AREA	PROGRAM	DST BK
6	TEST AREA	MAP TO CSR'S	DST BK
7	PERIF PAGE	PERIF PAGE	DST BK

```
4529
4530                    7.5.3  MEMORY MANAGEMENT MAPPING FOR UNIBUS-11'S W/O SUPERVISOR MODE (EG 11/34) -
4531
4532                    PAR             KERNEL                  USER
4533                    ---             ------                  ----
4534                    0               PROGRAM                 PROGRAM/DST BK
4535                    1               PROGRAM                 PROGRAM/SRC BK
4536                    2               PROGRAM                 PROGRAM/SRC BK
4537                    3               PROGRAM                 TEST AREA/SRC BK
4538                    4               PROGRAM                 TEST AREA/DST BK
4539                    5               PROGRAM                 TEST AREA/DST BK
4540                    6               MAP TO CSR'S            TEST AREA/DST BK
4541                    7               PERIF PAGE              PERIF PAGE/DST BK
```

```
                                        .LIST   TOC
000000                                  .ENABL  ABS
                                        .ENABL  AMA
                                        .DSABL  GBL
                                        ;NOTE:  CZMSDC.SML IS THE SUPER.MAC SOURCE AND IS RELEASED WITH
                                        ;THIS PROGRAM.  ALL THESE .MCALL STATEMENTS REFERENCE THAT FILE.
                                        .MCALL  SMACIT,,PUSH,,POP,,TAG,,BRAN,,EMIT,,EMITN,,EMITL,,EMITR
                                        .MCALL  .IFOPR,.IS,.GENBR,,OPADD,,OPSUB,CLEAR,SET,CLEARB,SETB
                                        .MCALL  RNE,REQ,RLT,RGE,RGT,RLE,RPL,RMI,RHI,RLOS,RHIS,RLO,RCS,RCC
                                        .MCALL  IF,,OR,,IFARI,,LEAVE,,GOTO,OR,AND,THEN,ELSE,WHILE,CASE
                                        .MCALL  FOR,TO,DOWNTO,REPEAT,UNTIL,THRU,END,BEGIN
                                        .MCALL  $$END,LEAVE,JUMPTO,GOTO,PUSH,POP,LET
                                        .MCALL  .SIMPLE,,ARITH,ORB,ANDB,IFB,UNTILB,WHILEB,ON.ERROR,ON.NOERROR
                                        .MCALL  $CALL,$RETURN

                                        .NLIST  TTM                     ;I WANT FAT PAPER!
                                        .LIST   MC,SYM                  ;LIST MACRO CALLS, SYMBOL TABLE
                                        .NLIST  MD,CND,ME               ;DON'T LIST MACRO DEFS & CONDITIONALS & EXPANSIONS
                                ;       LST$$=  0                       ;DEFINED TO LIST SUPERMAC EXPANSIONS
        163000                          $SWR=   163000                  ;USE THESE SYSMAC SWITCHES
        000001                          $TN=    1                       ;FIRST TEST NUMBER TO ONE(1)
000000                                  SMACIT
```

```
                                .SBTTL  DEFINE  TRAPS
                        ;ALL ENTRIES HERE MUST HAVE A CORRESPONDING ENTRY IN THE
                        ;TRAP TABLE "$TRPAD" (NEAR END OF PROGRAM).
                        ;*TRAP DEFINITIONS
                        ;
                        ;HERE IS HOW TRAPS WORK IN THIS PROGRAM
                        ;
                        ;ALL TRAPS EXECUTE A "TRAP" INSTRUCTION WHICH TAKES THE PROGRAM
                        ;TO SYMBOLIC LOCATION "$TRAP"
                        ;
                        ;AT $TRAP THE PROGRAM PICKS UP THE RIGHT BYTE OF THE TRAP INSTRUCTION
                        ;AND INDEXES INTO A TABLE AT LOCATION "$TRPAD" WHICH SENDS THE PROGRAM TO
                        ;THE SPECIFIC ROUTINE TO HANDLE THAT SPECIFIC TRAPS TASK.
                        ;
                        ;THE ULTIMATE DESTINATION OF A TRAP INSTRUCTION CAN BE GUESSED AT AS FOLLOWS
                        ;
                        ;EXAMPLE:       NOP
                        ;               NOP
                        ;               NOP
                        ;               KERNEL                  ;ENTER KERNEL MODE
                        ;               NOP
                        ;
                        ;       ADD A DOLLAR SIGN TO THE SYMBOLIC NAME AND CHECK THE CRF FOR SOMETHING CLOSE
                        ;       IN THIS CASE THE CRF HAS $KERNE LISTED AS 032546
                        ;       AT LOCATION 32546 YOU FIND THE ROUTINE $KERNEL
                        ;
                        ;       NOTE THAT CRF SYMBOLS ARE TRUCNATED TO 6 CHARACTERS
                        ;       SYMBOLIC NAMES GREATER THAT 6 CHARACTERS ARE USED SO I CAN
                        ;       REMEMBER WHAT THEY MEAN!
                        ;
                        ;       ALL GOOD TRAP ROUTINES RETURN VIA AN "RTI" INSTRUCTION
104401                  TYPEIT= 104401          ;;TTY TYPEOUT ROUTINE
104402                  TYPOC=  104402          ;;TYPE OCTAL NUMBER (WITH LEADING ZEROS)
104403                  TYPOS=  104403          ;;TYPE OCTAL NUMBER (NO LEADING ZEROS)
                        ;TYPON= 104404          ;;TYPE OCTAL NUMBER (AS PER LAST CALL)
104405                  TYPDS=  104405          ;;TYPE DECIMAL NUMBER (WITH SIGN)
                        ;TYPBN= 104406          ;;TYPE BINARY (ASCII) NUMBER

104407                  GTSWR=  104407          ;;GET SOFT-SWR SETTING
104410                  CKSWR=  104410          ;;TEST FOR CHANGE IN SOFT-SWR

104411                  RDCHR=  104411          ;;TTY TYPEIN CHARACTER ROUTINE
104412                  RDLIN=  104412          ;;TTY TYPEIN STRING ROUTINE
104413                  RDOCT=  104413          ;;READ AN OCTAL NUMBER FROM TTY
104414                  RDDEC=  104414          ;;READ A DECIMAL NUMBER FROM TTY

104415                  SAVREG= 104415          ;;SAVE R0-R5 ROUTINE
104416                  RESREG= 104416          ;;RESTORE R0-R5 ROUTINE

104417                  KERNEL= 104417          ;ENTER KERNEL MODE

104420                  ENERGIZE=104420         ;TURN ON MEMORY MANAGEMENT & TRAPS
104421                  DEENERGIZE=104421       ;TURN OFF MEMORY MANAGEMENT & TRAPS
104422                  KMAP=   104422          ;MAP KERNEL 1 TO 1

104423                  CACHON= 104423          ;TURN ON CACHE
104424                  CACHOFF=104424          ;TURN OFF CACHE
```

```
4626
4627          104425          LOADCSR=104425          ;LOAD CORRECT CSR
4628          104426          READCSR=104426          ;READ CORRECT CSR
4629
4630          104427          PERR01= 104427          ;PROGRAM DETECTED ERROR
4631          104430          PERR02= 104430          ;PROGRAM DETECTED ERROR
4632          104431          PERR03= 104431          ;PROGRAM DETECTED ERROR
4633          104432          PERR04= 104432          ;PROGRAM DETECTED ERROR
4634          104433          PERR07= 104433          ;PROGRAM DETECTED ERROR
4635          104434          PERR10= 104434          ;PROGRAM DETECTED ERROR
4636          104435          PERR11= 104435          ;PROGRAM DETECTED ERROR
4637          104436          PERR12= 104436          ;PROGRAM DETECTED ERROR
4638          104437          PERR13= 104437          ;PROGRAM DETECTED ERROR
4639          104440          PERR14= 104440          ;PROGRAM DETECTED ERROR
4640          104441          PERR15= 104441          ;PROGRAM DETECTED ERROR
4641          104442          PERR16= 104442          ;PROGRAM DETECTED ERROR
4642          104443          PERR17= 104443          ;PROGRAM DETECTED ERROR
4643          104444          PERR20= 104444          ;PROGRAM DETECTED ERROR
4644          104445          PERR21= 104445          ;PROGRAM DETECTED ERROR
4645          104446          PERR22= 104446          ;PROGRAM DETECTED ERROR
4646          104447          PERR23= 104447          ;PROGRAM DETECTED ERROR
4647          104450          PERR24= 104450          ;PROGRAM DETECTED ERROR
4648          104451          PERR25= 104451          ;PROGRAM DETECTED ERROR
4649          104452          PERR26= 104452          ;PROGRAM DETECTED ERROR
4650          104453          PERR27= 104453          ;PROGRAM DETECTED ERROR
4651          104454          PERR30= 104454          ;PROGRAM DETECTED ERROR
4652          104455          PERR31= 104455          ;PROGRAM DETECTED ERROR
4653          104456          PERR32= 104456          ;PROGRAM DETECTED ERROR
4654          104457          PERR33= 104457          ;PROGRAM DETECTED ERROR
4655          104460          PERR34= 104460          ;PROGRAM DETECTED ERROR
4656          104461          PERR35= 104461          ;PROGRAM DETECTED ERROR
4657          104462          PERR36= 104462          ;PROGRAM DETECTED ERROR
4658          104463          PERR37= 104463          ;PROGRAM DETECTED ERROR
4659          104464          PERR40= 104464          ;PROGRAM DETECTED ERROR
4660          104465          PERR41= 104465          ;PROGRAM DETECTED ERROR
4661          104466          PERR42= 104466          ;PROGRAM DETECTED ERROR
4662          104467          PERR43= 104467          ;PROGRAM DETECTED ERROR
4663
4664          104470          ECCDIS= 104470          ;DISABLE ECC ON ALL CSR'S
4665          104471          ECC1DIS=104471          ;DISABLE ECC ON 1 SELECTED CSR
4666          104472          ECCINIT=104472          ;INITIALIZE ALL ECC CSR'S
4667          104473          ECC1INIT=104473         ;INITIALIZE 1 SELECTED ECC CSR
4668          104474          CBCSR=  104474          ;WRITE GENERATED CHECKBITS IN ALL CSR'S
4669          104475          CB1CSR= 104475          ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
4670          104476          WASSBE= 104476          ;WAS THERE A SBE ON ANY CSR?
4671          104477          WAS1SBE=104477          ;WAS THERE A SBE ON 1 SELECTED CSR?
4672          104500          WASDBE= 104500          ;WAS THERE A DBE ON ANY CSR?
4673          104501          WAS1DBE=104501          ;WAS THERE A DBE ON 1 SELECTED CSR?
4674          104502          CLRCSR= 104502          ;CLEAR ALL CSR'S
4675          104503          CLR1CSR=104503          ;CLEAR 1 SELECTED CSR
4676          104504          CHKDIS= 104504          ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'S
4677          104505          CHK1DIS=104505          ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
4678          104506          ENASBE= 104506          ;ENABLE TRAPS ON SBE'S FROM ALL CSR'S
4679          104507          ENA1SBE=104507          ;ENABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
4680          104510          TSTREAD=104510          ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
4681          104511          INVALID=104511          ;INVALIDATE BACKGROUND PATTERN ON 'BANK''
4682          104512          ERRGEN =104512          ;CHECK ERROR ADDRESS
```

DEFINE TRAPS

```
4683            104513                  CBREG  =104513          ;ENABLES CHECK/SYNDROME BIT REGISTER
```

```
                                .SBTTL  DEFINE  BASIC PDP11 STUFF

                        ;*INITIAL ADDRESS OF THE STACK POINTER
002000                  STACK=  2000            ;;FIRST ADDRESS OF THE STACK
002000                  KERSTK= STACK           ;;KERNEL STACK
000740                  SUPSTK= 740             ;;SUPERVISOR STACK
000700                  USESTK= 700             ;;USER STACK
104000                  ERROR=EMT               ;;BASIC DEFINITION OF ERROR CALL
000004                  SCOPE=IOT               ;;BASIC DEFINITION OF SCOPE CALL
177776                  PSW=    177776          ;;PROCESSOR STATUS WORD
                        ;STKLMT=177774          ;;STACK LIMIT REGISTER
                        ;PIRQ=  177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
177570                  DSWR=   177570          ;;HARDWARE SWITCH REGISTER
177570                  DDISP=  177570          ;;HARDWARE DISPLAY REGISTER
177546                  LKS=    177546          ;;LINE CLOCK (KW11-L) STATUS REGISTER

                        ;*MISCELLANEOUS DEFINITIONS
000011                  HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                  LF=     12              ;;CODE LINE FEED
000015                  CR=     15              ;;CODE CARRIAGE RETURN
000200                  CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
000007                  MFPT=   7               ;;CODE FOR PROCESSOR TYPE INSTRUCTION

                        ;*GENERAL PURPOSE REGISTER DEFINITIONS
                        ;SP=R6                 ;;STACK POINTER
                        ;KSP=SP                ;;KERNEL STACK POINTER
000006                  SSP=SP                  ;;SUPERVISOR STACK POINTER
000006                  USP=SP                  ;;USER STACK POINTER
                        ;PC=R7                 ;;PROGRAM COUNTER

                        ;*''SWITCH REGISTER'' SWITCH DEFINITIONS
100000                  SW15=   100000
040000                  SW14=   40000
020000                  SW13=   20000
010000                  SW12=   10000
004000                  SW11=   4000
002000                  SW10=   2000
001000                  SW9=    1000
000400                  SW8=    400
000200                  SW7=    200
000100                  SW6=    100
000040                  SW5=    40
000020                  SW4=    20
000010                  SW3=    10
000004                  SW2=    4
000002                  SW1=    2
000001                  SW0=    1

                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                  BIT15=  100000
040000                  BIT14=  40000
020000                  BIT13=  20000
010000                  BIT12=  10000
004000                  BIT11=  4000
002000                  BIT10=  2000
001000                  BIT9=   1000
000400                  BIT8=   400
```

```
4742          000200                BIT7=   200
4743          000100                BIT6=   100
4744          000040                BIT5=   40
4745          000020                BIT4=   20
4746          000010                BIT3=   10
4747          000004                BIT2=   4
4748          000002                BIT1=   2
4749          000001                BIT0=   1
4750
4751                                ;*BASIC "CPU" TRAP VECTOR ADDRESSES
4752          000004                ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
4753          000010                RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
4754                                ;TBITVEC=14             ;;"T" BIT
4755                                ;TRTVEC=        14              ;;TRACE TRAP
4756                                ;BPTVEC=        14              ;;BREAKPOINT TRAP (BPT)
4757          000020                IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
4758          000024                PWRVEC= 24              ;;POWER FAIL
4759          000030                EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
4760          000034                TRAPVEC=34              ;;"TRAP" TRAP
4761          000060                TKVEC=  60              ;;TTY KEYBOARD VECTOR
4762                                ;TPVEC= 64              ;;TTY PRINTER VECTOR
4763                                ;LKVEC= 100             ;;LINE CLOCK (KW11-L) VECTER
4764          000114                CACHVEC=114             ;;CACHE ERROR INTERRUPT VECTOR
4765          000114                PARVEC=CACHVEC
4766                                ;PIRQVEC=240            ;;PROGRAM INTERRUPT REQUEST VECTOR
4767          000250                MMVEC=  250             ;;MEMORY MANAGEMENT VECTOR
4768                                        .SBTTL  DEFINE  CACHE REGISTERS
4769                                ;MEMERR = 177744                ;;CACHE ERROR REGISTER
4770          177746                CONTRL = 177746                 ;;MEMORY CONTROL REGISTER
4771          177750                MAINT  = 177750                 ;;MEMORY MAINTENENCE REGISTER
4772                                ;HITMIS = 177752                ;;HIT MISS REGISTER "1" IMPLIES HIT IN CACHE
4773          177754                DATARG  = 177754                ;;DATA REGISTER
4774
4775                                        .SBTTL  DEFINE  CPU REGISTERS
4776          177766                CPUERR = 177766         ;;CPU ERROR REGISTER HOLDS CONDITION THAT CAUSED
4777
4778                                        .SBTTL  DEFINE  MEMORY MANAGEMENT REGISTERS
4779                                        ;*MEMORY MANAGEMENT STATUS REGISTER ADDRESSES
4780          177572                MMR0=   177572
4781          177574                MMR1=   177574
4782          177576                MMR2=   177576
4783          172516                MMR3=   172516
4784
4785                                        ;*USER "I" PAGE DESCRIPTOR REGISTERS
4786          177600                UIPDR0= 177600
4787                                ;UIPDR1=        177602
4788                                ;UIPDR2=        177604
4789                                ;UIPDR3=        177606
4790                                ;UIPDR4=        177610
4791                                ;UIPDR5=        177612
4792                                ;UIPDR6=        177614
4793                                ;UIPDR7=        177616
4794
4795                                        ;*USER "D" PAGE DESCRIPTOR REGISTORS
4796                                ;UDPDR0=        177620
4797                                ;UDPDR1=        177622
4798                                ;UDPDR2=        177624
```

```
                                ;UDPDR3=        177626
                                ;UDPDR4=        177630
                                ;UDPDR5=        177632
                                ;UDPDR6=        177634
                                ;UDPDR7=        177636

                                        ;*USER "I" PAGE ADDRESS REGISTERS
        177640                  FASTCITY=UIPAR0
        177640                  UIPAR0= 177640          ;PATTERN PROGRAM SPACE
        177642                  UIPAR1= 177642          ;PATTERN PROGRAM SPACE
        177644                  UIPAR2= 177644          ;PATTERN PROGRAM SPACE
        177646                  UIPAR3= 177646          ;PATTERN PROGRAM SPACE
        177650                  UIPAR4= 177650          ;PATTERN PROGRAM SPACE
        177652                  UIPAR5= 177652          ;PATTERN PROGRAM SPACE
        177654                  UIPAR6= 177654          ;PATTERN PROGRAM SPACE
                                ;UIPAR7=        177656          ;PATTERN PROGRAM SPACE

                                        ;*USER "D" PAGE ADDRESS REGISTERS
        177660                  UDPAR0= 177660          ;PATTERN PROGRAM SPACE
                                ;UDPAR1=        177662          ;PATTERN PROGRAM SPACE
                                ;UDPAR2=        177664          ;PATTERN PROGRAM SPACE
                                ;UDPAR3=        177666          ;PATTERN PROGRAM SPACE
                                ;UDPAR4=        177670          ;PATTERN PROGRAM SPACE
                                ;UDPAR5=        177672          ;PATTERN PROGRAM SPACE
                                ;UDPAR6=        177674          ;PATTERN PROGRAM SPACE
        177676                  UDPAR7= 177676          ;PATTERN PROGRAM SPACE

                                        ;*SUPERVISOR "I" PAGE DESCRIPTOR REGISTERS
        172200                  SIPDR0= 172200
                                ;SIPDR1=        172202
                                ;SIPDR2=        172204
                                ;SIPDR3=        172206
                                ;SIPDR4=        172210
                                ;SIPDR5=        172212
                                ;SIPDR6=        172214
                                ;SIPDR7=        172216

                                        ;*SUPERVISOR "D" PAGE DESCRIPTOR REGISTERS
                                ;SDPDR0=        172220
                                ;SDPDR1=        172222
                                ;SDPDR2=        172224
                                ;SDPDR3=        172226
                                ;SDPDR4=        172230
                                ;SDPDR5=        172232
                                ;SDPDR6=        172234
                                ;SDPDR7=        172236

                                        ;*SUPERVISOR "I" PAGE ADDRESS REGISTERS
        172240                  SIPAR0= 172240
                                ;SIPAR1=        172242
                                ;SIPAR2=        172244
        172246                  SIPAR3= 172246          ;TEST AREA
                                ;SIPAR4=        172250          ;TEST AREA
        172252                  SIPAR5= 172252          ;TEST AREA
        172254                  SIPAR6= 172254          ;TEST AREA
                                ;SIPAR7=        172256
```

```
                                        ;*SUPERVISOR "D" PAGE ADDRESS REGISTERS
        172260                  SDPAR0= 172260
                                ;SDPAR1=        172262
                                ;SDPAR2=        172264
                                ;SDPAR3=        172266
                                ;SDPAR4=        172270
        172272                  SDPAR5= 172272
        172274                  SDPAR6= 172274
        172276                  SDPAR7= 172276

                                        ;*KERNEL "I" PAGE DESCRIPTOR REGISTERS
        172300                  KIPDR0= 172300
                                ;KIPDR1=        172302
                                ;KIPDR2=        172304
                                ;KIPDR3=        172306
                                ;KIPDR4=        172310
                                ;KIPDR5=        172312
                                ;KIPDR6=        172314
                                ;KIPDR7=        172316

                                        ;*KERNEL "D" PAGE DESCRIPTOR REGISTERS
                                ;KDPDR0=        172320
                                ;KDPDR1=        172322
                                ;KDPDR2=        172324
                                ;KDPDR3=        172326
                                ;KDPDR4=        172330
                                ;KDPDR5=        172332
                                ;KDPDR6=        172334
                                ;KDPDR7=        172336

                                        ;*KERNEL "I" PAGE ADDRESS REGISTERS
        172340                  KIPAR0= 172340
                                ;KIPAR1=        172342
                                ;KIPAR2=        172344
                                ;KIPAR3=        172346
        172350                  KIPAR4= 172350
        172352                  KIPAR5= 172352
        172354                  KIPAR6= 172354
                                ;KIPAR7=        172356

                                        ;*KERNEL "D" PAGE ADDRESS REGISTERS
        172360                  KDPAR0= 172360
                                ;KDPAR1=        172362
                                ;KDPAR2=        172364
                                ;KDPAR3=        172366
                                ;KDPAR4=        172370
                                ;KDPAR5=        172372
        172374                  KDPAR6= 172374
        172376                  KDPAR7= 172376
```

```
                                        .SBTTL  DEFINE  UNIBUS MAP REGISTERS
                                        ;*THE LOWER 16 BITS OF THE MAP REGISTERS ARE LABELED 'MAPLXX'
                                        ;*THE UPPER 6 BITS OF THE MAP REGISTERS ARE LABELED 'MAPHXX'
170200                          MAPL0 = 170200
170202                          MAPH0 = 170202
170204                          MAPL1 = 170204
                                ;MAPH1 = 170206
                                ;MAPL2 = 170210
                                ;MAPH2 = 170212
                                ;MAPL3 = 170214
                                ;MAPH3 = 170216
                                ;MAPL4 = 170220
                                ;MAPH4 = 170222
                                ;MAPL5 = 170224
                                ;MAPH5 = 170226
                                ;MAPL6 = 170230
                                ;MAPH6 = 170232
                                ;MAPL7 = 170234
                                ;MAPH7 = 170236
                                ;MAPL10 = 170240
                                ;MAPH10 = 170242
                                ;MAPL11 = 170244
                                ;MAPH11 = 170246
                                ;MAPL12 = 170250
                                ;MAPH12 = 170252
                                ;MAPL13 = 170254
                                ;MAPH13 = 170256
                                ;MAPL14 = 170260
                                ;MAPH14 = 170262
                                ;MAPL15 = 170264
                                ;MAPH15 = 170266
                                ;MAPL16 = 170270
                                ;MAPH16 = 170272
                                ;MAPL17 = 170274
                                ;MAPH17 = 170276
                                ;MAPL20 = 170300
                                ;MAPH20 = 170302
                                ;MAPL21 = 170304
                                ;MAPH21 = 170306
                                ;MAPL22 = 170310
                                ;MAPH22 = 170312
                                ;MAPL23 = 170314
                                ;MAPH23 = 170316
                                ;MAPL24 = 170320
                                ;MAPH24 = 170320
                                ;MAPL25 = 170324
                                ;MAPH25 = 170326
                                ;MAPL26 = 170330
                                ;MAPH26 = 170332
                                ;MAPL27 = 170334
                                ;MAPH27 = 170336
                                ;MAPL30 = 170340
                                ;MAPH30 = 170342
                                ;MAPL31 = 170344
                                ;MAPH31 = 170346
                                ;MAPL32 = 170350
                                ;MAPH32 = 170352
```

```
                                ;MAPL33 = 170354
                                ;MAPH33 = 170356
                                ;MAPL34 = 170360
                                ;MAPH34 = 170362
                                ;MAPL35 = 170364
                                ;MAPH35 = 170366
                                ;MAPL36 = 170370
                                ;MAPH36 = 170372
                                ;MAPL37 = 170374
                                ;MAPH37 = 170376

                                        .SBTTL  DEFINE  SOFTWARE SWITCH & DISPLAY REGISTERS
000174                          DISPREG=174
000176                          SWREG=  176

                                        .SBTTL  DEFINE  CONTROL STATUS REGISTERS
172100                          CSRADD=172100

                                        .SBTTL  DEFINE  PARAMETERS
060000                          FIRST=60000             ;START OF THE 16K TEST PATTERN AREA
157776                          LAST=157776             ;END OF THE 16K TEST PATTERN AREA
040000                          SIZE=40000              ;SIZE OF THE 16K TEST PATTERN AREA (FOR SOB INSTRUCTIONS)
```

```
                        .LIST   MD                      ;BE NICE TO SEE MY DEFINITIONS
                        .SBTTL  MACRO   FATAL
                ;********************** FATAL ****************************
                ;
                ;FATAL IS USED TO REPORT FATAL ERRORS (ERRORS THAT PREVENT
                ;       THE PROGRAM FROM CONTINUING).
                ;
                ;*********************************************************
                        .MACRO  FATAL   ARG             ;***MACRO***MACRO***MACRO***
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        INC     FATAL$                  ;SET FATAL INDICATOR
                        ERROR   +ARG
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   FATAL

                        .SBTTL  MACRO   TYPE
                        .MACRO  TYPE    ARG
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        .IF B ARG
                        TYPEIT
                        .IFF
                        TYPEIT  ,ARG
                        .ENDC
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TYPE
```

```
5028                                    .SBTTL  MACRO   NEWTST
5029                            ;********************** NEWTST ***********************
5030                            ;NEWTST IS USED AS THE FIRST INSTRUCTION OF A TEST.
5031                            ;IT WILL:
5032                            ;1)  GENERATE A TEST NUMBER FOR THE LABEL OF THIS TEST
5033                            ;2)  PUT STARS BEFORE AND AFTER A MESSAGE
5034                            ;ARGUMENTS
5035                            ;1)  ASCII  --  THIS IS THE MESSAGE THAT WILL APPEAR
5036                            ;               ON THE LISTING
5037                            ;2)  ICOUNT --  IF NON-BLANK AND BIT 11 OF $SWR = 1 IT WILL BE
5038                            ;               THE NUMBER OF ITERATIONS TO MAKE ON THIS TEST
5039                            ;3)  RETURN --  IF NON-BLANK WILL BE THE ADDRESS TO
5040                            ;               WHICH THE NEXT SCOPE STATEMENT WILL
5041                            ;               LOOP BACK TO.
5042                            ;4)  COMAND --  IF NON-BLANK WILL BE THE FIRST
5043                            ;               INSTRUCTION OF THE TEST
5044                            ;               IF BLANK SCOPE WILL BE THE
5045                            ;               FIRST INSTRUCTION
5046                            ;*****************************************************
5047                                    .MACRO  NEWTST  ASCII,ICOUNT,RETURN,COMAND
5048                                    $STN=1
5049                                    $NWTST=0
5050                                    .NLIST  MC
5051                                    .IF B <COMAND>
5052                                    $$NEWTEST       \$TN,<ASCII>,SCOPE
5053                                    .IFF
5054                                    $$NEWTEST       \$TN,<ASCII>,<COMAND>
5055                                    .ENDC
5056                                    .NLIST
5057                                    .LIST   ME
5058                                    .LIST
5059                                    .IF NE 4000&$SWR
5060                                    .IF NB ICOUNT
5061                                    .IF LE <ICOUNT-1>
5062                                    MOV     #1,$TIMES       ;;DO 1 ITERATION
5063                                    .IFF
5064                                    MOV     #ICOUNT,$TIMES  ;;DO ICOUNT ITERATIONS
5065                                    .ENDC
5066                                    .ENDC
5067                                    .IF NB RETURN
5068                                    MOV     #RETURN,$LPADR  ;;SET SCOPE LOOP ADDRESS
5069                                    .ENDC
5070                                    .ENDC
5071                                    .NLIST
5072                                    .LIST   MC
5073                                    .LIST
5074                                    .NLIST  ME
5075                                    .ENDM   NEWTST
```

```
                        .SBTTL  MACRO   $$NEWTEST
                        .MACRO  $$NEWTEST       A,ASC,COMND
                        .IRP    ASCI,<ASC>
                        .IF EQ $NWTST
                        $NWTST=1
                        .SBTTL  T'A'    ASCI
                        .NLIST
                        .LIST   ME
                        .LIST
                ;*******************************************************************************
                ;*TEST A         ASCI
                        .IFF
                        ASCI
                        .ENDC
                        .ENDM
                ;*******************************************************************************
                TST'A:  COMND
                        .NLIST  ME
                        $TN=$TN+1
                        .ENDM   $$NEWTEST

                        .SBTTL  MACRO   SUBTST
                ;*************** SUBTST ********************************
                ;
                ;THIS MACRO WILL FORMAT A SUBTEST HEADING WITH STARS
                ;A .SBTTL WILL BE FORCED & .NLISTED FOR THE TABLE OF CONTENTS.
                ;
                ;ARGUMENT:
                ;1) TXT --      THIS IS THE MESSAGE THAT WILL APPEAR IN THE TABLE OF CONTENTS & LISTING.
                ;
                ;EXAMPLE:       SUBTST  <<THIS IS A FUN SUBTST>>
                ;
                ;*************************************************************

                        .MACRO  SUBTST  ASCII
                        .NLIST  MC
                        $SUBTST <ASCII>
                        .LIST   MC
                        .ENDM   SUBTST

                        .SBTTL  MACRO   $SUBTST
                        .MACRO  $SUBTST ASC
                        .IRP    ASCI,<ASC>
                        .SBTTL  ASCI
                        .NLIST
                        .LIST   ME
                        .LIST
                ;*******************************************************************************
                ;*SUBTEST        ASCI
                        .ENDM
                ;*******************************************************************************
                        .NLIST  ME
                        .ENDM   $SUBTST
```

```
                        .SBTTL  MACRO   TYPOCT
                ;******************** TYPOCT ********************
                ;
                ;TYPOCT IS USED TO CHANGE A BINARY NUMBER
                ;       TO A 6 DIGIT OCTAL NUMBER AND TYPE IT
                ;
                ;ARGUMENTS:
                ;
                ;1)     NUM     THE NUMBER TO BE TYPED
                ;
                ;2)     REMARK  ALLOWS A COMMENT TO BE MADE
                ;
                ;ROUTINES REQUIRED
                ;
                ;1)     CONVERT BINARY TO OCTAL AND TYPE (.$TYPOCT)
                ;
                ;2)     TYPE AN ASCIZ STRING (.$TYPE)
                ;
                ;EXAMPLES:
                ;
                ;1)     TYPOCT  HILMT,<TYPES THE CONTENTS OF HILMT>
                ;2)     TYPOCT  #5,<TYPES ' 000005'>
                ;
                ;*****************************************************************

                        .MACRO  TYPOCT  NUM,REMARK
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     NUM,-(SP)       ;;SAVE NUM FOR TYPEOUT
                        .IIF NB <REMARK>,                       ;;REMARK
                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TYPOCT
```

```
                        .SBTTL  MACRO   TYPOCS
                ;******************** TYPOCS ********************
                ;
                ;TYPOCS IS USED TO CHANGE A BINARY NUMBER TO AN OCTAL
                ;       NUMBER AND TYPE 1 TO 6 DIGITS
                ;       WITH OR WITHOUT LEADING ZEROS.
                ;
                ;ARGUMENTS:
                ;
                ;1)     NUM     NUMBER TO BE TYPED
                ;
                ;2)     REMARK  ALLOWS A COMMENT TO BE MADE
                ;
                ;3)     N       NUMBER OF DIGITS (1 TO 6) TO BE TYPED
                ;
                ;4)     Z       BLANK=SUPPRESS LEADING ZEROS (TYPES SPACES)
                ;               NON-BLANK=TYPE LEADING ZEROS
                ;
                ;ROUTINES REQUIRED
                ;
                ;1)     CONVERT BINARY TO OCTAL AND TYPE (.$TYPOCT)
                ;
                ;2)     TYPE AN ASCIZ STRING (.$TYPE)
                ;
                ;EXAMPLES:
                ;1)     TYPOCS  #12345,<TYPES "5">,1
                ;2)     TYPOCS  #004,<TYPES "04">,2,X
                ;3)     TYPOCS  #004,<TYPES " 4">,2
                ;
                ;*****************************************************************

                        .MACRO  TYPOCS  NUM,REMARK,N,Z
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                MOV     NUM,-(SP)       ;;SAVE NUM FOR TYPEOUT
                        .IIF NB <REMARK>,
                                                        ;;REMARK
                TYPOS                   ;;GO TYPE--OCTAL ASCII
                        .IF NB N
                        .BYTE   N               ;;TYPE N DIGIT(S)
                        .IFF
                        .BYTE   6               ;;TYPE 6 DIGITS
                        .ENDC
                        .IF NB Z
                        .BYTE   1               ;;TYPE LEADING ZEROS
                        .IFF
                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
                        .ENDC
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TYPOCS
```

```
                        .SBTTL  MACRO   TYPDEC
                ;********************* TYPDEC *********************
                ;
                ;TYPDEC IS USE TO CHANGE A BINARY NUMBER TO A SIGNED
                ;       DECIMAL NUMBER AND TYPE IT REPLACING LEADING ZERO
                ;       WITH SPACES.
                ;NOTE:  IF THE NUMBER IS NEGATIVE A
                ;       MINUS SIGN WILL BE TYPED.
                ;
                ;ARGUMENTS:
                ;
                ;1)     NUM     NUMBER TO BE TYPED
                ;
                ;2)     REMARK ALLOWS A COMMENT TO BE MADE
                ;
                ;ROUTINES REQUIRED
                ;
                ;1)     CONVERT BINARY TO DECIMAL AND TYPE (.$TYPDEC)
                ;
                ;2)     TYPE AN ASCIZ STRING (.$TYPE)
                ;
                ;EXAMPLES
                ;
                ;1)     TYPDEC  SIZE,<TYPE THE CONTENTS OF SIZE>
                ;2)     TYPDEC  #-10.,<TYPE A MINUS TEN>
                ;
                ;*****************************************************************

                .MACRO  TYPDEC  NUM,REMARK
                .NLIST
                .DSABL  CRF
                .IIF DF LST$$ .LIST  ME
                .ENABL  CRF
                .LIST
                MOV     NUM,-(SP)       ;;SAVE NUM FOR TYPEOUT
                .IIF NB <REMARK>,
                                                ;;REMARK
                TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                .DSABL  CRF
                .IIF DF LST$$ .NLIST  ME
                .ENABL  CRF
                .ENDM   TYPDEC
```

```
                        .SBTTL  MACRO   BMOV
                ;****************** BMOV ****************************
                ;
                ; THIS MACRO MOVES A BLOCK OF DATA.
                ;
                ;ARGUEMENTS:
                ;
                ;1)     FROMHERE        THE FIRST ADDRESS OF THE SOURCE BLOCK.
                ;
                ;2)     TOHERE          THE FIRST ADDRESS OF THE DESTINATION BLOCK.
                ;                       IF BLANK THE 1ST ADDRESS OF THE USER INSTRUCTION
                ;                       PAR'S IS USED (FASTCITY).
                ;
                ;3)     SIZE            THE SIZE OF THE SOURCE BLOCK.
                ;                       IF BLANK A 16 WORD TRANSFER IS ASSUMED.
                ;                       "WHY DEFAULT TO 16 WORDS?" YOU ASK!
                ;                       "BECAUSE THAT'S HOW MANY WORDS TO THE USER PAR
                ;                       REGISTERS & THAT'S WHERE I INTEND TO MOVE LOTS
                ;                       OF STUFF." I REPLY!
                ;
                ;*****************************************************

                .MACRO  BMOV    FROMHERE,TOHERE,SIZE
                  .IF B TOHERE
                    .NLIST
                    .DSABL      CRF
                    .IIF DF LST$$ .LIST  ME
                    .ENABL      CRF
                    .LIST
                    JSR R5,BLOCK1
                    FROMHERE
                    .DSABL      CRF
                    .IIF DF LST$$ .NLIST  ME
                    .ENABL      CRF
                    .MEXIT
                  .ENDC
                  .IF B SIZE
                    .NLIST
                    .DSABL      CRF
                    .IIF DF LST$$ .LIST  ME
                    .ENABL      CRF
                    .LIST
                    JSR R5,BLOCK2
                    TOHERE
                    FROMHERE
                    .DSABL      CRF
                    .IIF DF LST$$ .NLIST  ME
                    .ENABL      CRF
                    .MEXIT
                  .IFF
                    .NLIST
                    .DSABL      CRF
                    .IIF DF LST$$ .LIST  ME
                    .ENABL      CRF
                    .LIST
                    JSR R5,BLOCK3
                    SIZE
```

```
                                        TOHERE
                                        FROMHERE
                                        .DSABL      CRF
                                        .IIF DF LST$$ .NLIST  ME
                                        .ENABL      CRF
                                    .ENDC
                                .ENDM   BMOV
```

```
5337                                    .SBTTL  MACRO   MAP
5338                            ;****************** MAP ****************************
5339                            ;
5340                            ; THIS MACRO MAPS A MEMORY BANK (16K) INTO THE
5341                            ; TEST PATTERN AREA (SUPERVISOR VIRTUAL (60000-157777)).
5342                            ;
5343                            ;ARGUEMENTS:
5344                            ;
5345                            ;1)     BANK    THE BANK OF 16K WORDS TO BE MAPPED.
5346                            ;               THERE ARE 120 BANKS OF 16K WORDS
5347                            ;
5348                            ;EXAMPLES
5349                            ;
5350                            ;       MAP     LOC             ;LOCATION "LOC" CONTAINS THE # OF THE BANK TO MAP
5351                            ;
5352                            ;       MAP     #28.            ;BANK 34 (OCTAL) WILL BE MAPPED
5353                            ;
5354                            ;***************************************************
5355
5356                                    .MACRO  MAP     BANK
5357                                    PUSH    R3
5358                                    .NLIST
5359                                    .DSABL  CRF
5360                                    .IIF DF LST$$ .LIST  ME
5361                                    .ENABL  CRF
5362                                    .LIST
5363                                    .IF B BANK
5364                                    MOV     #120.,R3
5365                                    .IFF
5366                                    MOV     BANK,R3
5367                                    .ENDC
5368                                    CALL    MAPPER
5369                                    .DSABL  CRF
5370                                    .IIF DF LST$$ .NLIST  ME
5371                                    .ENABL  CRF
5372                                    POP     R3
5373                                    .ENDM   MAP
```

```
                        .SBTTL  MACRO   SUPERVISOR
                ;****************** SUPERVISOR **********************
                ;
                ; THIS MACRO SWITCHES TO SUPERVISOR MODE.
                ;
                ;ARGUEMENTS: NONE.
                ;
                ;*****************************************************

                        .MACRO  SUPERVISOR
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        BIS     #BIT14,PSW                      ;GO TO SUPERVISOR MODE
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   SUPERVISOR

                        .SBTTL  MACRO   USER
                ;********************* USER *************************
                ;
                ; THIS MACRO SWITCHES TO USER MODE.
                ;
                ;ARGUEMENTS: NONE.
                ;
                ;*****************************************************

                        .MACRO  USER
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        BIS     #BIT15!BIT14,PSW                ;GO TO USER MODE
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   USER
```

```
                        .SBTTL  MACRO   TESTAREA
                ;****************** TESTAREA ************************
                ;
                ; THIS MACRO SWITCHES TO THE SPECIFIED TEST MODE.
                ;
                ;ARGUEMENTS: NONE.
                ;
                ;*****************************************************

                        .MACRO  TESTAREA
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        BIS     TESTMODE,PSW                    ;GC TO SYSTEM TEST MODE
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TESTAREA
```

```
                        .SBTTL  MACRO   SET4 & RES4
                ;****************** SET4 & RES4 ********************
                ;
                ; THESE MACROS SET & RESTORE VECTOR 4(TIMEOUT TRAP)
                ;
                ; IN IT'S RESTORED MODE TRAPS ARE REPORTED AS SUCH.
                ;
                ;ARGUEMENTS:    LOC     ;THE LOCATION TO VECTOR TO (ONLY USED IN "SET4" NOT "RES4")
                ;
                ;I USE THE SET4 AND RES4 MACROS AROUND CODE THAT I EXPECT TO TRAP TO 4
                ;LIKE LOOKING FOR ALL POSSIBLE CSR'S AND ETC.  WHENEVER CODE IS NOT
                ;SURROUNDED BY SET4 AND RES4 THEN ANY TRAPS TO 4 WILL CAUSE AN ERROR
                ;PRINTOUT THAT SAYS "UNEXPECTED TRAP TO 4" AND ALL THE ASSOCIATED REGISTER JUNK
                ;*****************************************************

                        .MACRO  SET4    ARG
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     ARG,4
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   SET4

                        .MACRO  RES4
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     #TIMEOUT,4
                        CMP     #1,PROTYP       ;IS THIS AN 11/44?
                        BNE     101$            ;BRANCH IF NOT
                        CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                101$:
                                                ;THAT A EXPECTED TRAP COULD HAVE SET
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   RES4
```

```
5486                                    .SBTTL  MACRO   DLEFT
5487                                ;***************** DLEFT ***************************
5488                                ;
5489                                ; THIS MACRO DOES A DOUBLE WORD LEFT SHIFT
5490                                ;
5491                                ;ARGUEMENTS:    LOC     ;THE LOCATION TO BE SHIFTED LEFT (CARRY TO LOC+2)
5492                                ;
5493                                ;***************************************************
5494
5495                                        .MACRO  DLEFT   ARG
5496                                        .NLIST
5497                                        .DSABL  CRF
5498                                        .IIF DF LST$$ .LIST  ME
5499                                        .ENABL  CRF
5500                                        .LIST
5501                                        ROL     ARG
5502                                        ROL     ARG+2
5503                                        .DSABL  CRF
5504                                        .IIF DF LST$$ .NLIST  ME
5505                                        .ENABL  CRF
5506                                        .ENDM   DLEFT
5507                                        .NLIST  MD              ;DON'T NEED TO SEE THEM ANY MORE
```

```
                                        .SBTTL  TRAP CATCHER
                 000000                 .=0
000000  000000  000000                  .WORD   0,0
                 000177                 .REPT   177                     ;.WORD  .+2,HALT
                                        .SBTTL  ACT11 HOOKS
                                ;*THE HOOKS REQUIRED BY ACT11 ARE DEFINED AND SETUP BELOW:
                                ;*      DEFINITIONS:
                                ;*                      1)LOC.46        "END-OF-PASS" HOOK
                                ;*                              =ADDRESS OF END OF PASS ROUTINE
                                ;*                               MODIFIED BY ACT11.
                                ;*                      2)LOC.52        PROGRAM NEEDS HOOK
                                ;*                              BIT 15=1 PROGRAM SHOULD BE POWER
                                ;*                                       FAILED WHILE RUNNING
                                ;*                                     =0 NO POWER FAIL
                                ;*                              BIT 14=1 PROGRAM MEMORY SIZE DEPENDENT
                                ;*                                     =0 NOT MEMORY SIZE DEPENDENT
                                ;*                              BIT 13=1 PROGRAM REQUIRES MANUAL INTERVENTION
                                ;*                                     =0  MANUAL INTERVENTION NOT REQUIRED
                                ;*                              BITS 12-0  MUST BE ZERO'S
                 000046                 .=46
000046  015234                  $ENDAD                          ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                 000052                 .=52
000052  000020                  .WORD   BIT4                    ;;2)SET LOC.52 TO INDICATE MEMORY SIZE DEPENDANT
                                        .SBTTL  APT11 HOOKS
                 000024                 .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024  000200                  200     ;;FOR APT START UP
                 000042                 .=42
000042  002000                  STACK                           ;SO RT11 CAN START WITH RUN COMMAND
                 000044                 .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044  066004                  $APTHDR ;;POINT TO APT HEADER BLOCK
                 000200                 .=200
000200  000437          START3: BR      START1                  ;"NORMAL" START
000202  000442                  BR      START2                  ;RESTART (SAVE ERROR ACCOUNTING)
                 000300                 .=300
000300  005037  002614  START1: CLR     RESTART
000304  000137  003656          JMP     START
000310                  START2: SET     RESTART
000316  000137  003656          JMP     START
                 002000                 .=STACK
```

```
5555                                            .SBTTL  VARIABLES       INITIALIZED TO ZERO
5556                                    ;*THIS TABLE CONTAINS VARIOUS COMMON STORAGE LOCATIONS
5557                                    ;*USED IN THE PROGRAM.
5558 002000                             $CMTAG:                         ;;START OF COMMON TAGS
5559 002000  000000                     SELONLY:0                       ;SELECT ONLY BANKS MARKED BY FIELD SERVICE MODE FLAG
5560 002002  000000                     DIAGFLAG:0                      ;SET FOR SHIFTING DIAGONAL TEST
5561 002004  000000                     KAMIKAZE:0                      ;SET FOR KAMIKAZE MODE TESTING
5562 002006  000000                     SKIPKAMI:0                      ;USED TO SKIP RESTORING KAMIKAZE MODE WHEN MODIFIED
5563                                    ;NEXT TWO BYTES ARE DISPLAYED IN THE DISPLAY REGISTER
5564 002010     000                     $PATMAR:.BYTE   0               ;PATTERN NUMBER
5565 002011     000                     $BANK:  .BYTE   0               ;BANK & SIGN
5566 002012     000                     $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
5567 002013     000                     $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
5568 002014  000000                     LASTERROR:.WORD 0               ;NUMBER OF ERRORS ON LAST PASS
5569 002016  000000                     ERRPC:  .WORD   0               ;CONTAINS PC OF ERROR FOR TYPEOUT
5570 002020  000000                     BADPC:  .WORD   0               ;CONTAINS PC OF ERROR
5571 002022  000000                     ERRSP:  .WORD   0               ;CONTAINS SP OF ERROR FOR TYPEOUT
5572 002024  000000                     BADSP:  .WORD   0               ;CONTAINS SP OF ERROR
5573 002026  000000                     ERRPSW: .WORD   0               ;CONTAINS PSW OF ERROR FOR TYPEOUT
5574 002030  000000                     BADPSW: .WORD   0               ;CONTAINS PSW OF ERROR
5575 002032  000000                     ADDRESS:.WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
5576 002034  000000                     PADDRESS:.WORD  0               ;ADDRESS OF PARITY ERROR
5577 002036  000000  000000             PHYADD: .WORD   0,0             ;22 BIT PHYSICAL ADDRESS
5578 002042  000000                     GOOD:   .WORD   0               ;;CONTAINS 'GOOD' DATA
5579 002044  000000                     GOOD2:  .WORD   0               ;;CONTAINS 'GOOD2' DATA
5580 002046  000000                     GOOD3:  .WORD   0               ;;CONTAINS 'GOOD3' DATA
5581 002050  000000                     BAD:    .WORD   0               ;;CONTAINS 'BAD' DATA
5582 002052  000000                     BAD2:   .WORD   0               ;;CONTAINS 'BAD2' DATA
5583 002054  000000                     BAD3:   .WORD   0               ;;CONTAINS 'BAD3' DATA
5584 002056  000000                     BADXOR: .WORD   0               ;XOR OF GOOD & BAD = BAD BITS!
5585 002060  000000                     $AUTO:  .WORD   0               ;;AUTOMATIC MODE INDICATOR FOR APT,ACT, & XXDP
5586 002062  000000                     FATAL$: .WORD   0               ;FATAL ERROR INDICATOR
5587 002064  000000                     SKPERR: .WORD   0               ;USED TO SKIP ERROR MESSAGE IN "$ERRGEN"
5588 002066  000000                     NEMCNT: 0                       ;NON-EXISTANT MEMORY COUNTER (HOLES)
5589 002070  000000                     PARCNT: 0                       ;PARITY ERROR COUNTER
5590 002072  000000                     PATERR: 0                       ;PATTERN ERROR COUNTER
5591 002074  000000                     NOPAR:  0                       ;NO PARITY ERROR MODE INDICATOR
5592 002076  000000                     NONEM:  0                       ;NO NON-EXISTANT MEMORY (HOLES) MODE INDICATOR
5593 002100  000000                     BANK:   0                       ;MEMORY BANK UNDER TEST
5594 002102  000000                     BANKINDEX:0                     ;USED TO INDEX INTO CONFIG TABLE
5595 002104  000000                     CPUBIT: 0                       ;CONTAINS 1 BIT TO IDENTIFY CPU TO CONFIGURATION TABLE
5596 002106  000000                     MUT:    0                       ;MEMORY UNDER TEST FLAG
5597 002110  000000                     PATTERN:0                       ;PATTERN NUMBER UNDER TEST
5598 002112  000000                     KPFLAG: .WORD   0               ;BANK IS PROTECTED REGION OF ECC
5599 002114  000000                     ACFLAG: .WORD   0               ;BANK CAN BE ACCESSED BY THIS CPU
5600 002116  000000                     MKFLAG: .WORD   0               ;IF SET INDICATES MS11-M OR MF11S-K UNDER TEST
5601 002120  000000                     PFLAG:  .WORD   0               ;BANK IS IN PROGRAM SPACE
5602 002122  000000                     RRFLAG: .WORD   0               ;BANK IS WHERE PROGRAM RELOCATION IS REQUIRED TO TEST
5603 002124  000000                     RLFLAG: .WORD   0               ;PROGRAM IS RELOCATED FLAG
5604 002126  000000                     BMFLAG: .WORD   0               ;"BANK IS IDENTIFIED AS BAD MEMORY" FLAG
5605 002130  000000                     EUFLAG: .WORD   0               ;"BANK HAS EUB MEMORY" FLAG
5606 002132  000000                     TMFLAG: .WORD   0               ;"TYPE OF MEMORY TO TEST" FLAG; 0 = PARITY, 1 = ECC
5607 002134  000000                     INTFLAG:.WORD   0               ;"BANK IS INTERLEAVED" FLAG
5608 002136  000000                     INT64K: .WORD   0               ;"BANK IS 64K INTERLEAVED" FLAG
5609 002140  000000                     PMEMFLG:.WORD   0               ;"MEMORY UNDER TEST IS A MS11-P" FLAG
5610 002142  000000                     ABORTFLAG:.WORD 0               ;"ABORT OCCURED" FLAG
5611 002144  000000                     CTLKVEC:.WORD   0               ;HOLDS OLD KERNAL STACK POINTER IN CASE OF CNTL/K
```

VARIABLES INITIALIZED TO ZERO

```
5612 002146  000000                CSR:    .WORD   0               ;DATA TO OR FROM CSR
5613 002150  000000                CSRNO:  0                       ;CSR ADDRESS NUMBER (4 LSB'S)
5614 002152  000000                SAVCSR: .WORD   0               ;LOCATION TO SAVE CSRNO DURING FS COMMAND
5615 002154  000000                OLDCSR: .WORD   0               ;OLD CSR NUMBER(USED IN INH PTR TEST)
5616                                       ;THESE LOCATIONS STORE GPR'S DURING SUPERVISOR TESTS
5617 002156  000000                SUPDR0: 0
5618 002160  000000                SUPDR1: 0
5619 002162  000000                SUPDR2: 0
5620 002164  000000                SUPDR3: 0
5621 002166  000000                SUPDR4: 0
5622 002170  000000                SUPDR5: 0
5623 002172  000000                SUPDR6: 0
5624 002174  000000                DUMMY:  0                       ;DUMMY LOCATION FOR ADDRESS PASSING
5625                                ;THESE LOCATIONS STORE GPR'S & PSW DURING DETAILED ERROR PRINTOUTS
5626 002176  000000                DETR0:  0
5627 002200  000000                DETR1:  0
5628 002202  000000                DETR2:  0
5629 002204  000000                DETR3:  0
5630 002206  000000                DETR4:  0
5631 002210  000000                DETR5:  0
5632 002212  000000                DETSP:  0
5633 002214  000000                DETPSW: 0
5634 002216  000000                DETFLAG:0                       ;DETAILED REPORT FLAG
5635 002220  000000                CONTFLAG:0                      ;CSR'S HAVE BEEN TESTED FLAG
5636 002222  000000                TOTCSRS:.WORD   0               ;1 BIT PER EXISTING CSR, EG-
5637                                                               ;CSR 0 REPRESENTED BY BIT 15, ETC.
5638 002224  000000                CSRFIRST:.WORD  0               ;FIRST ADDRESS UNDER CONTROL OF THIS CSR
5639 002226  000000                CSRLAST: .WORD  0               ;
5640 002230  000000                CSRFBANK:.WORD  0               ;
5641 002232  000000                CSRLBANK:.WORD  0               ;
5642 002234  000000                CSRINT:  .WORD  0               ;
5643 002236  000000                SPLTCSR: .WORD  0               ;
5644 002240  000000  000000        DATBUF: .WORD   0,0             ;TWO WORD DATA BUFFER
5645 002244  000000  000000        TSTDAT: .WORD   0,0             ;TWO WORD TEST DATA
5646 002250  000000  000000        SBEMSK: .WORD   0,0             ;TWO WORD SINGLE BIT ERROR MASK
5647 002254  000000  000000        DBEMSK: .WORD   0,0             ;TWO WORD DOUBLE BIT ERROR MASK
5648 002260  000000                SUPDOADD:.WORD  0               ;ADDRESS OF SUBROUTINE TO EXECUTE IN SUPERVISOR MODE
5649 002262      000               PASFLG: .BYTE   0               ;LOCAL LOOP PASS CONTROL
5650 002263      000               UPPFLG: .BYTE   0               ;LOCAL LOOP PASS CONTROL
5651 002264  000000                PASSNO: .WORD   0               ;LOCAL LOOP PASS CONTROL
5652 002266  000000                SAV4:   .WORD   0               ;USED TO SAVE KERNAL PAR 5                      ;;I.L.C.;REV
5653 002270  000000                SAVPAR: .WORD   0               ;USED TO SAVE KERNAL PAR 5
5654 002272  000000                SAVMON: .WORD   0               ;XXDP MONITOR RETURN ADDRESS
5655 002274  000000                MONFLG: .WORD   0               ;RETURN TO MONITOR FLAG
5656 002276  000000                REALPAT:.WORD   0               ;REAL PATTERN UNDER TEST
5657 002300  000000                OLDCACHE:.WORD  0               ;BACKED UP VALUE OF CACHE CONTROL REGISTER
5658 002302  000000                PARTHERE:.WORD  0               ;PARITY TRAPS SOMETIMES GO TO ADDRESS STORED HERE
5659 002304  000000                FSSTACK:.WORD   0               ;STACK SAVED HERE IF IN FIELD SERVICE MODE
5660 002306  000000                NEWBANK:.WORD   0               ;USED FOR RELOCATION TO A NEW BANK
5661 002310  000000                SOURCE: .WORD   0               ;SOURCE OF DATA WORDS FOR CHECKBIT GENERATION SUBROUTINE
5662 002312  000000                CHECK:  .WORD   0               ;CHECKBITS TO BE LOADED INTO CSR
5663 002314  000000                CBITS:  .WORD   0               ;CHECK BITS TO BE WRITTEN
5664 002316  000000                MASK:   .WORD   0               ;BIT MASK FOR CSR
5665 002320  000000                CSR1S:  .WORD   0               ;CSR ALL 1'S PATTERN
5666 002322  000000                BITNO:  .WORD   0               ;BIT POINTER
5667 002324  000000                PCBUMP: .WORD   0               ;VALUE TO BUMP THE PC BY TO RECOVER AFTER A PARITY TRAP
5668 002326  000000                CSRINC: .WORD   0               ;VALUE TO INCREMENT ADDRESS BY TO REMAIN IN THE SAME CSR
```

VARIABLES INITIALIZED TO ZERO

```
5669 002330  000000                CSRLOOP:.WORD   0               ;LOOP CONTROL FOR CSR TESTING
5670 002332  000000                SUCCESS:.WORD   0               ;FLAG SET BY SUCCESSFULL TASK OR SUBROUTINE
5671 002334  000000                ZEROS:  .WORD   0               ;FOR AID IN "MOV" INSTRUCTIONS
5672 002336  000000                TIME:   .WORD   0               ;SECONDS THAT BATTERIES SHOULD LAST
5673 002340  000000                SKIPMK: .WORD   0               ;FLAG TO SKIP MKCONTROL SUBROUTINE
5674 002342  000000                NULLFLAG:.WORD  0               ;SET WHEN RUNNING NULL PATTERNS
5675 002344  000000                QVFLAG: 0                       ;FLAGS QUICK VERIFY PASS UNDER APT, ACT, OR XXDP CHAIN MODE
5676 002346  000000                ACTFLAG:0                       ;FLAGS ACT AUTOMATIC MODE PROGRAMMING RULES
5677 002350  000000                APTFLAG:0                       ;FLAGS APT AUTOMATIC MODE PROGRAMMING RULES
5678 002352  000000                XXDPCHAIN:0                     ;FLAGS XXDP CHAIN MODE PROGRAMMING RULES
5679                               ;NOTE: THESE TWO BYTES MUST STAY TOGETHER
5680 002354     000                $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
5681 002355     000                $FILLS: .BYTE   0               ;CONTAINS # OF FILL CHARACTERS
5682 002356     000                $TPFLG: .BYTE   0               ;;"TERMINAL NOT AVAILABLE" FLAG
5683                                        .EVEN
5684 002360  000000                $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
5685 002362  000000                EVEN:   0                       ;USED FOR ALTERNATE DATA PATTERNS
5686 002364  000000                STRIPES:0                       ;COUNTS DIAGONAL STRIPES
5687 002366  000000                COUNT:  0                       ;BACKED UP COPY OF STRIPES
5688 002370  000000                NOTAB:  0                       ;NO TABLE BEING PRINTED - NOW
5689 002372  000000                BSIZE:  0                       ;SIZE OF 11/45 MOS MEMORY IN K WORDS
5690 002374  000000                KSIZE:  0                       ;SIZE OF MF11S-K MEMORY IN K WORDS
5691 002376  000000                LSIZE:  0                       ;SIZE OF MS11-L MEMORY IN K WORDS
5692 002400  000000                MSIZE:  0                       ;SIZE OF MS11-M MEMORY IN K WORDS
5693 002402  000000                PSIZE:  0                       ;SIZE OF UNIBUS PARITY MEMORY IN K WORDS
5694 002404  000000                TOOMANY:0                       ;FLAGS WHEN TOO MANY ERRORS HAVE BEEN PRINTED FOR A BANK
5695 002406  000000                READONLY:0                      ;FLAG TO PATTERNS TO READ ONLY
5696 002410  000000  000000        TESTADD:0,0                     ;THE ADDRESS TO RUN CSR TESTS ON
5697 002414  000000                UNITOP: 0                       ;HIGHEST ACCESSABLE BANK OF MEMORY THRU UNIBUS MAP
5698 002416  000000                STOPOK: 0                       ;FLAG TO ALLOW STOPPING WITH SWITCH REGISTER
5699 002420  000000                APTPAR: .WORD   0               ;AMOUNT OF PARITY MEMORY ACCORDING TO APT
5700 002422  000000                APTECC: .WORD   0               ;AMOUNT OF ECC MEMORY ACCORDING TO APT
5701 002424  000000                NOFSMODE:0                      ;FLAG TO DISABLE FIELD SERVICE MODE
5702 002426  000000                NOERROR:0                       ;"THIS IS NOT AN ERROR" FLAG
5703 002430  000000                LOADBANK:0                      ;BANK LOADERS ARE RELOCATED TO
5704 002432  000000                TEMP:   0                       ;USED FOR JUNK
5705 002434  000000                QUICK:  0                       ;QUICK STOP FLAG FOR APT POWER FAIL
5706 002436  000000                NOSCOPE:0                       ;"NO SCOPE LOOP ALLOWED" FLAG
5707 002440  000000                FSINFLAG:0                      ;"FIELD SERVICE - NO INTERNAL INTERLEAVE" FLAG
5708 002442  000000                APTSIZE:0                       ;APT SIZING INFO FLAG
5709 002444  000000                FS7FLAG:0                       ;TRUE WHEN IN FIELD SERVICE COMMAND 7
5710 002446  000000                CONFGERROR:0                    ;CONFIGURATION ERROR FLAG
5711 002450  000000                I:      0                       ;USED FOR GENERAL PURPOSE INDEXING
5712 002452  000000                NO22BIT:0                       ;NO 22-BIT MODE FLAG
5713 002454  000000                NOSUPER:0                       ;NO SUPERVISOR MODE FLAG
5714 002456  000000                ERRADD: .WORD   0               ;HOLDS THE CSR'S ERROR ADDRESS
5715 002460  000000  000000  000000 CSRINFO:0,0,0,0,0,0,0,0        ;USED TO STORE INFORMATION ABOUT THE 16
     002466  000000  000000  000000
     002474  000000  000000
5716 002500  000000  000000  000000         0,0,0,0,0,0,0,0        ;POSSIBLE CSR'S
     002506  000000  000000  000000
     002514  000000  000000
5717 002520  000000                LINK1:  0                       ;USED TO HOLD LINKS TO PATTERNS WHICH
5718 002522  000000                LINK2:  0                       ;CAN EXECUTE IN THE PAR/PDR'S OR NOT
5719 002524  000000                CSRHOLD:0                       ;USED TO STORE CSR VALUES FOR CSR TESTS
5720 002526  000000                KFLAG:  0                       ;USED TO FLAG MF11S-K MEMORY TO TESTS
5721 002530  000000  000000        PGMCSR: .WORD   0,0             ;POINTS TO PROGRAM CSR
```

VARIABLES INITIALIZED TO ZERO

```
   5722 002534  000000                INHECC: .WORD   0               ;FLAGS INHIBIT ECC TESTS ON RELOCATION
   5723 002536  000000                INHBANK:.WORD   0               ;
   5724 002540  000000                FULLREL:.WORD   0               ;
   5725 002542                        $CMTGE: ;*END OF COMMON TAGS
```

```
5728                                                    .SBTTL  VARIABLES       INITIALIZED TO NON ZERO
5729 002542  000001  000000          CACHKN: 1,0                               ;CACHE CONSTANT (MOVED TO CONTRL TO TURN ON CACHE)
5730 002546  001415                  CACHKF: 1415                              ;CACHE CONSTANT (MOVED TO CONTRL TO TURN OFF CACHE)
5731 002550  040000                  TESTMODE:40000                            ;USED TO SELECT THE PROPER TEST MODE FOR A PATTERN RUN
5732 002552  000012                  ERRMAX: 10.                               ;MAX # OF ERRORS PER BANK WITH SW11
5733 002554  000167                  LASTBANK:167                              ;HIGHEST BANK OF MEMORY
5734 002556  170000                  LASTBLOCK:170000                          ;HIGHEST BANK OF MEMORY+1 (IN PAR FORMAT)
5735 002560  000031                  SOBK:   25.                               ;SOB CONSTANT
5736 002562  002000                  KSTACK: STACK                             ;STACK BEGINNING
5737 002564  000001                  LOADHOME:1                                ;HOME BANK OF LOADERS
5738 002566  177777                  WORST:  177777                            ;SET IF TESTING BANKS IN WORST FIRST MODE(1ST PASS)
5739 002570  176543                  SEEDHI: 176543                            ;WORKING SEED HI (USED FOR RANDOM NUMBER GENERATOR)
5740 002572  123456                  SEEDLO: 123456                            ;WORKING SEED LO (USED FOR RANDOM NUMBER GENERATOR)
5741 002574  176543                  MSEEDH: 176543                            ;MASTER SEED HI (USED FOR RANDOM NUMBER GENERATOR)
5742 002576  123456                  MSEEDL: 123456                            ;MASTER SEED LO (USED FOR RANDOM NUMBER GENERATOR)
5743 002600  177777                  HEADER: 177777                            ;USED TO PRINT HEADINGS ONLY ONCE
5744 002602  177777                  ONES:   177777                            ;FOR AID IN 'MOV'' INSTRUCTIONS
5745 002604  000003                  FLIPLOC:3                                 ;COUNTER FOR FLIPING DATA ON WORST CASE NOISE TEST
5746 002606  052525                  SOFTPAT:52525                             ;PATTERN FOR SOFT ERROR BACKGROUND TESTS
5747 002610  000000                  $LPADR: .WORD   0                         ;;CONTAINS SCOPE LOOP ADDRESS
5748 002612  000000                  $LPERR: .WORD   0                         ;;CONTAINS SCOPE RETURN FOR ERRORS
5749 002614  000000                  RESTART:0                                 ;RESTART (START ADD 202) FLAG
5750 002616  000000                  $ERTTL: .WORD   0                         ;;CONTAINS TOTAL ERRORS
5751
5752                                  ;************************ NOTE THESE TWO LOCATIONS MUST STAY TOGETHER ************
5753 002620  000377                  BAKPAT: .WORD   377                       ;BACKGROUND PATTERN                              *
5754 002622  177400                  SWAPAT: .WORD   177400                    ;SWAPPED BAKPAT                                  *
5755                                  ;*********************************************************************************************
5756
5757 002624  177570                  SWR:    .WORD   DSWR                      ;;ADDRESS OF SWITCH REGISTER
5758 002626  177570                  DISPLAY: .WORD  DDISP                     ;;ADDRESS OF DISPLAY REGISTER
5759 002630  177560                  $TKS:   177560                            ;;TTY KBD STATUS
5760 002632  177562                  $TKB:   177562                            ;;TTY KBD BUFFER
5761 002634  177564                  $TPS:   177564                            ;;TTY PRINTER STATUS REG. ADDRESS
5762 002636  177566                  $TPB:   177566                            ;;TTY PRINTER BUFFER REG. ADDRESS
5763 002640     012                  $FILLC: .BYTE   12                        ;;INSERT FILL CHARS. AFTER A 'LINE FEED''
5764 002641     207      377     377 $BELL:  .ASCIZ  <207><377><377>           ;;CODE FOR BELL
     002644     000
5765 002645     077                  $QUES:  .ASCII  /?/                       ;;QUESTION MARK
5766 002646     015                  $CRLF:  .ASCII  <15>                      ;;CARRIAGE RETURN
5767 002647     012      000         $LF:    .ASCIZ  <12>                      ;;LINE FEED
5768                                          .EVEN
```

CONFIGURATION TABLE

```
                                        .SBTTL  CONFIGURATION TABLE
                                ;CONFIG:FIRST 16K CONFIGURATION WORDS (2 EACH)
                                ;       2ND     16K CONFIGURATION WORDS (2 EACH)
                                ;       .......................
                                ;       200TH   16K CONFIGURATION WORDS (2 EACH)
                                ;
                                ;CONFIGURATION WORDS:
                                ;                       LOW:    BIT 0     ERRORS PRESENT
                                ;                               BIT 1     MEMORY SUCESSFULLY ACCESSED
                                ;                               BIT 2-4   RESERVED
                                ;                               BIT 5     SKIP ECC LOGIC TESTS FLAG (1=SKIP)
                                ;                               BIT 6     PROTECTED REGION OF ECC MEMORY
                                ;                               BIT 7     PROTECTED (PROGRAM SPACE)
                                ;                               BIT 8-11  CSR CODE
                                ;                               BIT 12-15 INTERLEAVED CSR CODE
                                ;                       HIGH:   BIT 0-7   NUMBER OF ERRORS
                                ;                               BIT 8-10  MEMORY TYPE
                                ;                               BIT 11    INTERLEAVED BOARD TYPE (0=128K, 1=64K)
                                ;                               BIT 12    INTERLEAVE ENABLED
                                ;                               BIT 13    "BACKGROUND PATTERN VALID" FLAG
                                ;                               BIT 14    BANK SELECTED FOR TEST BY FIELD SERVICE MODE
                                ;                               BIT 15    LOADERS HOME BANK
002652  000201                 CONFIG: .REPT   201
003656                          CONFIEND:
```

```
                                                        .SBTTL  ********** MAIN **********
003656                                          START:  SUBTST  <<INITIALIZE VARIABLES TO ZERO>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        INITIALIZE VARIABLES TO ZERO
                                                ;*****************************************************************************
003656  105737  065724                                  TSTB    $ENV
003662  001001                                          BNE     NORES
003664  000005                                          RESET
003666                                          NORES:  CLEAR   MONFLG          ;;CLEAR RETURN TO MONITOR FLAG
003672  010637  002272                                  MOV     SP,SAVMON       ;;SAVE XXDP MONITOR RESTART ADDRESS
003676  013706  002562                                  MOV     KSTACK,SP       ;;SETUP THE STACK POINTER
003702  012700  002000                                  MOV     #$CMTAG,R0      ;;FIRST LOCATION TO BE CLEARED
003706  005020                                  1$:     CLR     (R0)+           ;;CLEAR MEMORY LOCATION
003710  022700  002542                                  CMP     #$CMTGE,R0      ;;DONE?
003714  001374                                          BNE     1$              ;LOOP BACK IF NO
003716  012737  000167  002554                          MOV     #167,LASTBANK   ;RESTORE LASTBANK (THIS MUST BE DONE PRIOR TO SYSTEM SIZING)
003724                                                  SUBTST  <<CLEAR NON-PROGRAM SPACE>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        CLEAR NON-PROGRAM SPACE
                                                ;*****************************************************************************
                                                        ;THIS ATTEMPS TO GET RID OF ANY PARITY ERRORS BY WRITING INTO
                                                        ;EVERY LOCATION THAT IS NOT LOADED INTO BY THE PROGRAM OR ALLOCATED
                                                        ;TO THE XXDP LOADERS
003724  012737  000001  002074                          MOV     #1,NOPAR                ;PARITY ACTION = COUNT & IGNORE
003732  005000                                          CLR     R0
003734  000241                                  2$:     CLC
003736  005520                                          ADC     (R0)+
003740  020027  160000                                  CMP     R0,#160000
003744  103773                                          BLO     2$
003746  005037  002074                                  CLR     NOPAR                   ;RESTORE DEFAULT PARITY ACTION
```

```
5824 003752                                     SUBTST  <<TYPE OF SYSTEM SIZER>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       TYPE OF SYSTEM SIZER
                                        ;*****************************************************************************
5825 003752  000401                             BR      SYSSIZ                  ;SKIP OVER VARIABLE LOCATION
5826 003754  000000                     PROTYP: .WORD   0
5827 003756                             SYSSIZ: SET4    #4$
5828 003764  005737  177746                        TST     CONTRL                  ;SEE IF CACHE REGISTER RESPONDS
5829 003770                                        SET4    #9$                     ;YES - DO WE HAVE 11/44 TYPE CACHE
5830 003776  005737  177750                        TST     MAINT                   ;OR 11/60 TYPE CACHE?
5831 004002  000411                                BR      5$                      ;BRANCH IF 11/44 TYPE CACHE
5832 004004  012737  000014  002546          9$:   MOV     #14,CACHKF              ;TURN OFF CONSTANT FOR 11/60 CACHE
5833 004012  000405                                BR      5$                      ;
5834 004014  005037  002542                  4$:   CLR     CACHKN                  ;NO CACHE ON SYSTEM
5835 004020  012737  002334  067374                MOV     #ZEROS,DT14             ;DO NOT PRINT CONTRL ERROR MESSAGES
5836 004026                                 5$:   SET4    #6$
5837 004034  005737  172516                        TST     MMR3                    ;DO WE HAVE AN MMR3?
5838 004040  005037  172516                        CLR     MMR3                    ;YES WE DO
5839 004044  052737  000020  172516                BIS     #BIT4,MMR3              ;SEE IF THERE IS 22-BIT MODE
5840 004052  032737  000020  172516                BIT     #BIT4,MMR3
5841 004060  001026                                BNE     10$                     ;BRANCH IF 22-BIT RELOCATION
5842 004062  000413                                BR      7$                      ;BRANCH IF MMR3 BUT NO 22-BIT RELOC.
5843                                    ;* 11/34 TYPE MACHINES ENTER HERE
5844 004064  012737  140000  002550          6$:   MOV     #140000,TESTMODE        ;MAKE TESTMODE USER
5845 004072  005237  002454                        INC     NOSUPER                 ;
5846 004076  005037  067244                        CLR     DT5+10                  ;
5847 004102  005037  067404                        CLR     DT14+10                 ;
5848 004106  005237  002452                        INC     NO22BIT                 ;
5849                                    ;* 11/45 TYPE MACHINES ENTER HERE
5850 004112  005237  002452                  7$:   INC     NO22BIT                 ;
5851 004116  012737  000007  002554                MOV     #7,LASTBANK             ;
5852 004124  005037  067246                        CLR     DT5+12                  ;
5853 004130  005037  067406                        CLR     DT14+12                 ;
5854 004134  000417                                BR      8$                      ;
5855 004136                                 10$:  SET4    #8$
5856 004144  000007                               MFPT                            ;TYPE OF PROCESSOR TEST: THIS INSTRUCTION
5857                                                                               ; (AVAILABLE ON NEWER PROCESSORS ONLY) PLACES
5858                                                                               ; A CODE IN THE LOWER BYTE OF R0 THAT
5859                                                                               ; INDICATES THE  PROCESSOR TYPE. 1=11/44
5860                                                                               ; 3=11/24
5861 004146  110037  003754                       MOVB    R0,PROTYP               ;MOV THE CODE TO PROTYP
5862 004152  022737  000003  003754               CMP     #3,PROTYP               ;IS THIS AN 11/24?
5863 004160  001005                               BNE     8$                      ;BRANCH IF NOT - WE HAVE AN 11/44
5864 004162  005237  002454                       INC     NOSUPER                 ;NO SUPERVISOR MODE
5865 004 66  012737  140000  002550               MOV     #140000,TESTMODE        ;MAKE TEST MODE USER
5866
5867 004174                                 8$:   SET4    #11$                    ;TRAPS GO TO 11$                    ;R-C
5868 004202  005037  061366                       CLR     CPERRF                  ;CLEAR THE FLAG                     ;R-C
5869 004206  005737  177766                       TST     @#177766                ;IS THERE A CPU ERROR REGISTER?     ;R-C
5870 004212  012737  177777  061366               MOV     #-1,CPERRF              ;YES-TRAPPED
5871 004220                                 11$:  RES4                                                                ;R-C
```

```
5874 004242                                    SUBTST  <<INITIALIZE VARIABLES TO NON ZERO>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       INITIALIZE VARIABLES TO NON ZERO
                                       ;*****************************************************************************
5875 004242                                    SET     WORST
5876 004250  012737  000003  002604            MOV     #3,FLIPLOC
5877 004256                                    SET     HEADER
5878 004264  012737  176543  002574            MOV     #176543,MSEEDH
5879 004272  012737  123456  002576            MOV     #123456,MSEEDL
5880 004300  013737  002574  002570            MOV     MSEEDH,SEEDHI   ;PRIME THE RANDOM NUMBER GENERATOR
5881 004306  013737  002576  002572            MOV     MSEEDL,SEEDLO   ;BOTH HIGH AND LOW WORDS
5882 004314  012737  000377  002620            MOV     #377,BAKPAT
5883 004322  012737  177400  002622            MOV     #177400,SWAPAT
5884 004330                                    SUBTST  <<INITIALIZE VECTORS>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       INITIALIZE VECTORS
                                       ;*****************************************************************************
5885 004330  012737  060232  000020            MOV     #$SCOPE,IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
5886 004336  012737  000340  000022            MOV     #340,IOTVEC+2   ;;LEVEL 7
5887 004344  012737  060566  000030            MOV     #$ERROR,EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
5888 004352  012737  000340  000032            MOV     #340,EMTVEC+2   ;;LEVEL 7
5889 004360  012737  066020  000034            MOV     #$TRAP,TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
5890 004366  012737  000340  000036            MOV     #340,TRAPVEC+2;LEVEL 7
5891 004374  012737  054412  000024            MOV     #$PWRDN,PWRVEC ;;POWER FAILURE VECTOR
5892 004402  012737  000340  000026            MOV     #340,PWRVEC+2   ;;LEVEL 7
5893 004410  012737  042420  000114            MOV     #PARITY,PARVEC;GET READY FOR PARITY ERRORS
5894 004416  012737  000340  000116            MOV     #340,PARVEC+2
5895 004424  012737  042614  000010            MOV     #PDP1105,RESVEC;RESERVED INSTRUCTION TRAP
5896 004432  012737  000340  000012            MOV     #340,RESVEC+2
5897 004440  012737  042570  000004            MOV     #TIMEOUT,ERRVEC;SETUP TIMEOUT ERRORS
5898 004446  012737  000340  000006            MOV     #340,ERRVEC+2   ;SET PRIORITY OF ERROR TRAPS
5899 004454  012737  042602  000250            MOV     #MMTRAP,MMVEC   ;VECTOR FOR MEMORY MANAGEMENT
5900 004462  012737  000340  000252            MOV     #340,MMVEC+2
5901 004470  104423                            CACHON                  ;TURN CACHE ON
```

```
5904 004472                                     SUBTST  <<INITIALIZE PATTERNS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        INITIALIZE PATTERNS
                                        ;*****************************************************************************
5905                                            ;THE APT E-TABLE DETERMINES WHICH PATTERNS ARE GOING TO BE RUN.
5906                                            ;EACH BIT SET REPRESENTS A PATTERN TABLE ENTRY THAT IS TO BE LEFT
5907                                            ;ALONE (TO BE RUN).  EACH BIT CLEARED REPRESENTS A PATTERN TABLE ENTRY
5908                                            ;THAT IS TO BE OVERLAYED WITH THE ADDRESS OF A NULL PATTERN.
5909 004472  012700  065770                    MOV     #$DDW0,R0
5910 004476  012001                            MOV     (R0)+,R1
5911 004500  012703  020206                    MOV     #MKCSRT,R3
5912 004504  012702  000020                    MOV     #16.,R2
5913 004510  004737  004610                    CALL    PATPLUG
5914 004514  012001                            MOV     (R0)+,R1
5915 004516  012702  000010                    MOV     #8.,R2
5916 004522  004737  004610                    CALL    PATPLUG
5917 004526  012001                            MOV     (R0)+,R1
5918 004530  012703  020436                    MOV     #MKPAT,R3
5919 004534  012702  000020                    MOV     #16.,R2
5920 004540  004737  004610                    CALL    PATPLUG
5921 004544  012001                            MOV     (R0)+,R1
5922 004546  012702  000010                    MOV     #8.,R2
5923 004552  004737  004610                    CALL    PATPLUG
5924 004556  012001                            MOV     (R0)+,R1
5925 004560  012703  020622                    MOV     #MJPAT,R3
5926 004564  012702  000020                    MOV     #16.,R2
5927 004570  004737  004610                    CALL    PATPLUG
5928 004574  012001                            MOV     (R0)+,R1
5929 004576  012702  000010                    MOV     #8.,R2
5930 004602  004737  004610                    CALL    PATPLUG
5931 004606  000417                            BR      SUBAAA
5932
5933 004610                             PATPLUG:SUBTST  <<SUBR  PLUG IN NULL PATTERNS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    PLUG IN NULL PATTERNS
                                        ;*****************************************************************************
5934 004610                                     FOR I := #1 TO R2
5935 004616  006001                                   ROR   R1
5936 004620                                           ON.NOERROR            ;IF CARRY CLEAR
5937 004622  012713  026764                              MOV #MT0999,(R3)
5938 004626                                           END ;OF ON.ERROR
5939 004626  062703  000002                           ADD #2,R3
5940 004632                                     END ;OF FOR
5941 004644  000207                             RETURN
```

```
5944 004646                                     SUBAAA: SUBTST  <<CLEAR THE CONFIGURATION TABLE>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       CLEAR THE CONFIGURATION TABLE
                                                ;*****************************************************************************
5945                                                    ;THIS ZEROS (UNLESS WE STARTED AT ADDRESS 202) THE CONFIG TABLE
5946                                                    ;WHICH IS FULLY DISCRIBED AT LOCATION "CONFIG".
5947                                                    .ENABLE LSB
5948 004646                                             IF RESTART IS FALSE
5949 004654  012700  002652                               MOV   #CONFIG,R0
5950 004660  005020                             1$:       CLR   (R0)+
5951 004662  022700  003656                               CMP   #CONFIEND,R0
5952 004666  001374                                       BNE   1$
5953 004670                                             END :OF IF RESTART
5954                                                    .DSABL  LSB
5955 004670  012737  000002  002104                     MOV     #BIT1,CPUBIT            ;SET ID BIT
5956 004676                                             SUBTST  <<SIZE FOR A HARDWARE SWITCH REGISTER>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       SIZE FOR A HARDWARE SWITCH REGISTER
                                                ;*****************************************************************************
5957                                                    ;;IF NOT FOUND OR IT IS
5958                                                    ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
5959                                                    .ENABL  LSB
5960 004676                                             SET4    #3$                     ;TRAPS TO 4 GOTO 3$
5961 004704  012737  177570  002624                     MOV     #DSWR,SWR               ;;SETUP FOR A HARDWARE SWITCH REGISTER
5962 004712  012737  177570  002626                     MOV     #DDISP,DISPLAY          ;;AND A HARDWARE DISPLAY REGISTER
5963 004720                                             IF #-1 EQ @SWR                  ;IF NO TRAP FROM REFERENCE TO @SWR AND @SWR = #-1
5964 004730  000403                                       BR    2$                      ;;BRANCH IF NO TIMEOUT
5965 004732  012716  004740                     3$:       MOV   #2$,(SP)                ;;SET UP FOR TRAP RETURN
5966 004736  000002                                       RTI
5967 004740                                     2$:       RES4                          ;RESET TRAPS TO 4 TO DEFAULT
5968 004762  012737  000176  002624                       MOV   #SWREG,SWR            ;;POINT TO SOFTWARE SWR
5969 004770  012737  000174  002626                       MOV   #DISPREG,DISPLAY
5970 004776                                             END :OF IF #-1
5971                                                    .DSABL  LSB
```

```
 5974 004776                            SUBAAB: SUBTST  <<SETUP ACT, APT, & XXDP>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SETUP ACT, APT, & XXDP
                                        ;*****************************************************************************
 5975                                           ;THIS SETS UP A BUNCH OF FLAGS TO TELL THE PROGRAM EVERYTHING
 5976                                           ;IT CARES TO KNOW ABOUT APT, ACT, & XXDP.
 5977 004776  005037  065712                    CLR     $PASS           ;CLEAR PASS COUNT
 5978 005002                                    IFB #BIT5 SET.IN $ENVM
 5979 005012                                      SET   $TPFLG          ;INDICATE NO TERMINAL
 5980 005020                                    END ;OF IFB #BIT5
 5981 005020                                    IFB #BIT7 SET.IN $ENVM
 5982 005030                                      SET   APTSIZE
 5983 005036                                    END ;OF IFB #BIT7
 5984 005036                                    IFB $ENV EQ #1
 5985 005046                                      SET   APTFLAG,QVFLAG,$AUTO,QUICK
 5986 005076  012737  047760  000024              MOV   #APTDOWN,PWRVEC
 5987 005104  012737  065726  002624              MOV   #$SWREG,SWR     ;USE APT SWR
 5988 005112                                    ELSE
 5989 005114                                      IF 42 NE #STACK AND 42 NE #0
 5990 005132                                        SET QVFLAG,$AUTO
 5991 005144                                        IF 42 EQ #$ENDAD
 5992 005150                                          SET       ACTFLAG
 5993 005164                                        ELSE
 5994 005166                                          SET       XXDPCHAIN
 5995 005174                                        END ;OF IF 42
 5996 005174                                      END ;OF IF 42
 5997 005174                                    END ;OF IFB $ENV
```

```
5999 005174                                     SUBTST  <<PROTECT PROGRAM & LOADERS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       PROTECT PROGRAM & LOADERS
                                        ;*****************************************************************************
6000 005174  052737  000200  002652            BIS     #BIT7,CONFIG            ;PROTECT PROGRAM SPACE (BANK 0)
6001 005202  052737  000200  002656            BIS     #BIT7,CONFIG+4          ;PROTECT LOADER SPACE (BANK 1)
6002 005210                                     IF #$ENDAD NE 42                ;NOT ACT-11?
6003 005220                                       IF NO22BIT NE #0              ;
6004 005226                                         SET     MONFLG              ;RETURN TO XXDP MONITOR
6005 005234  104064                                 ERROR +64                   ;ILLEGAL PROCESSOR
6006 005236                                       ELSE                          ;
6007 005240                                         TYPE    MSG000              ;TYPE PROGRAM TITLE
6008 005244                                       END                           ;
6009 005244                                     END ;OF IF #$ENDAD
6010
6011 005244                                     SUBTST  <<CHECK SYSTEM FOR CACHE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       CHECK SYSTEM FOR CACHE
                                        ;*****************************************************************************
6012                                            ;* THIS FIGURES OUT IF THERE IS A CACHE ON THE SYSTEM,
6013                                            ;* WHAT TYPE OF SYSTEM IT IS, AND WHETHER IT IS ENABLED
6014                                            ;* OR DISABLED.
6015 005244                                     SET4    #3$
6016 005252  005737  177746                     TST     CONTRL                  ;IS THERE A CONTROL REGISTER?
6017 005256                                     SET4    #2$
6018 005264  005737  177750                     TST     MAINT                   ;IS THERE A MAINTENANCE REGISTER?
6019 005270                                     SET4    #1$
6020 005276  005737  177754                     TST     DATARG                  ;IS THERE A DATA REGISTER?
6021 005302                                     TYPE    MSG117                  ; 11/44
6022 005306  000410                             BR      4$
6023 005310                             1$:     SET     MONFLG                  ; 11/34
6024 005316  104064                             ERROR   +64                     ;
6025                                                                            ;PROCESSOR NOT SUPPORTED BY THIS DIAGNOSTIC
6026 005320                             2$:     SET     MONFLG                  ; 11/60
6027 005326  104064                             ERROR   +64                     ;
6028                                                                            ;PROCESSOR NOT SUPPORTED BY THIS DIAGNOSTIC
6029 005330  052737  000014  177746     4$:     BIS     #BIT2!BIT3,CONTRL       ;SET CACHE DISABLE BITS
6030 005336  042737  000014  177746             BIC     #BIT2!BIT3,CONTRL       ;CLEAR CACHE DISABLE BITS
6031 005344  032737  000004  177746             BIT     #BIT2,CONTRL            ;IS THE BIT SET?
6032 005352  001004                             BNE     7$                      ;BRANCH IF THE BIT IS SET
6033 005354  032737  000010  177746             BIT     #BIT3,CONTRL            ;IS THE BIT SET?
6034 005362  001413                             BEQ     6$                      ;BRANCH IF THE BIT IS SET
6035 005364                             7$:     TYPE    MSG121                  ; CACHE BYPASSED
6036 005370  104424                             CACHOFF
6037 005372  013737  002542  002544             MOV     CACHKN,CACHKN+2         ;SAVE INFO ABOUT CACHE
6038 005400  005037  002542                     CLR     CACHKN                  ;CACHE CANNOT BE USED - IT'S BYPASSED
6039 005404  000404                             BR      8$                      ;
6040 005406                             3$:     TYPE    MSG119                  ;       NO
6041 005412                             6$:     TYPE    MSG120                  ;CACHE AVAILABLE
```

CHECK SYSTEM FOR CACHE

```
                                        SUBTST  <<SETUP USER & SUPERVISOR STACK>>
                                ;*******************************************************************************
                                ;*SUBTEST        SETUP USER & SUPERVISOR STACK
                                ;*******************************************************************************
                                8$:     DEENERGIZE              ;TURN OFF MEMORY MANAGEMENT
                                        TST     NOSUPER         ;IS THERE A SUPERVISOR MODE?
                                        BNE     5$              ;NO-SKIP SUPERVISOR SETUP.

                                        ;SET PREVIOUS MODE TO SUPERVISOR
                                        BIC     #BIT13!BIT12,PSW
                                        BIS     #BIT12,PSW

                                        PUSH    #SUPSTK
                                        MTPI    SSP

                                        ;SET PREVIOUS MODE TO USER
                                5$:     BIS     #BIT13!BIT12,PSW

                                        PUSH    #USESTK
                                        MTPI    USP

                                        SUBTST  <<GET SOFTWARE SWITCH REGISTER IF NECESSARY>>
                                ;*******************************************************************************
                                ;*SUBTEST        GET SOFTWARE SWITCH REGISTER IF NECESSARY
                                ;*******************************************************************************
                                        IF $AUTO IS FALSE                       ;IF NOT(APT OR ACT)
                                          IF SWR EQ #SWREG              ;IF SOFTWARE SWITCH REG SELECTED
                                            GTSWR                               ;;GET SOFT-SWR SETTINGS
                                          END ;OF IF SWR
                                        END ;OF IF $AUTO

                                        SUBTST  <<GET MEMORY MANAGEMENT READY>>
                                ;*******************************************************************************
                                ;*SUBTEST        GET MEMORY MANAGEMENT READY
                                ;*******************************************************************************
                                        KMAP                    ;MAP KERNEL SPACE 1 TO 1
                                        MAP                     ;MAP SUPERVISOR SPACE (TEST AREA) 1 TO 1
                                        ENERGIZE                ;TURN ON MEMORY MANAGEMENT
```

```
                                        NEWTST  <<BIT TEST OF ALL CSR'S>>
                                ;*****************************************************************************
                                ;*TEST 1         BIT TEST OF ALL CSR'S
                                ;*****************************************************************************
 005524  000004                 TST1:   SCOPE
                                ;* THE FIRST PART OF THE CONFIGURATION ANALYSIS DOES THE FOLLOWING:
                                ;*      1) FINDS WHICH CSR'S RESPOND, AND PUTS THEM INTO THE CSR INFORMATION
                                ;*         TABLE, AND STORES ANOTHER BIT FOR "TOTCSRS".
                                ;*      2) TESTS THE CSR BITS COMMON TO ALL CSR'S.
                                ;*      3) FIGURES OUT IF THE MODULE IS A ECC OR PARITY MEMORY
                                ;*      4) TESTS THE BITS PARTICULAR TO THAT TYPE OF CSR.
                                ;*      5) IF ANY BITS TEST BAD IN THE CSR UNDER TEST, THE CSR OK BIT IN THE
                                ;*            CSR INFORMATION TABLE IS CLEARED.
                                ;* THE INFORMATION BITS ONE THROUGH THREE FORM A CODE WHICH GIVES THE TYPE
                                ;* OF CSR:
                                ;*                      NOT USED      ECC TYPE       ECC
                                ;*        TYPE            BIT2          BIT1         BIT0          CODE TOTALS
                                ;*
                                ;*      MS11-L            0             0            0               0
                                ;*      MS11-M            0             0            1               1
                                ;*      MS11-P            0             1            1               3
                                ;*
                                ;* THIS MEMORY CODE WILL BE USED IN THE SECOND PART OF THIS ANALYSIS
                                ;*
 005526  005005                         CLR     R5              ;R5 IS THE TOTAL CSR NUMBER
 005530  005000                         CLR     R0              ;R0 IS A TABLE INDEX
 005532  012703  172100                 MOV     #CSRADD,R3      ;R3 HAS THE CSR ADDRESS
 005536  012737  000001  002074         MOV     #1,NOPAR        ;IGNORE PARITY ERRORS
 005544                                 SET4    #NXTCSR
 005552                                 REPEAT
 005552  005713                            TST (R3)             ;DOES THIS CSR RESPOND???
 005554  052705  000001                    BIS  #1,R5           ;MARK IT IN CSR MAP
 005560  005004                            CLR  R4              ;CLEAR THE LAST CSR INDICATOR
 005562  042760  000004  002460            BIC  #4,CSRINFO(R0)  ;CLEAR UNUSED BITS
 005570  052760  000030  002460            BIS  #BIT4!BIT3,CSRINFO(R0) ;YES-MARK IT IN CSR INFORMATION TABLE
 005576  005013                            CLR  (R3)            ;CLEAR THE CSR UNDER TEST
 005600                                    LET (R3) := #BIT13   ;IS THIS AN ECC MEMORY???
 005604                                    IF #BIT13 SET.IN (R3) ;IS BIT 13 SET FOR ECC MEMORY???
 005612  004737  005716                       CALL ECCTYPE      ;FIGURE OUT WHAT KIND OF ECC MEMORY WE HAVE
 005616                                    END                  ;
 005616  005013                            CLR (R3)             ;CLEAR CSR UNDER TEST
 005620  004737  006210                    CALL RWCSR           ;BIT TEST OF ALL BITS IN CSR'S
 005624                                    IF CSRINFO(R0) MI #30 ;DO WE HAVE A LEGAL CONFIGURATION?
 005634  016037  002460  002050               MOV CSRINFO(R0),BAD ;MOVE IN BAD DATA
 005642  104021                               ERROR +21         ;
 005644                                    END                  ;
 005644  062700  000002         NXTCSR:    ADD #2,R0            ;GO TO NEXT CSR
 005650  062703  000002                    ADD #2,R3            ;GO TO NEXT CSR
 005654  006305                            ASL  R5              ;SHIFT CSR MAP
 005656                                    ON.ERROR             ;IS THERE A CSR 0
 005660  005204                              INC R4             ;YES-SET CSR PRESENT FLAG
 005662                                    END                  ;
 005662                                 UNTIL R0 EQ #40         ;UNTIL ALL CSR'S ARE DONE
 005670  006005                         ROR     R5              ;RESYNC R5
 005672  005704                         TST     R4              ;WAS THERE A CSR 0?
 005674                                 RNE     22$             ;BRANCH IF NOT EQUAL
 005676  052705  100000                 BIS     #BIT15,R5       ;YES SET IT IN CSR TABLE
```

T1 BIT TEST OF ALL CSR'S

```
 6127 005702                            22$:   LET TOTCSRS := R5       ;STORE CSR MAP IN TOTCSRS
 6128 005706  004737  005776                  CALL CSRMAP             ;PRINT CSR MAP
 6129 005712                                  JUMPTO  CTEST           ;
```

```
                                        SUBTST  <<DETERMINE TYPE OF ECC MEMORY>>
                                ;*****************************************************************************
                                ;*SUBTEST       DETERMINE TYPE OF ECC MEMORY
                                ;*****************************************************************************
                                ;
                                ;       THIS ROUTINE WILL DETERMINE IF THE ECC MEMORY UNDER TEST IS
                                ;       A MS11-M OR A MS11-P
                                ;
                                ECCTYPE:
005716  052760  000001  002460          BIS #BIT0,CSRINFO(R0)   ;MARK IT IN THE TABLE AS BEING A ECC MEMORY
005724                                  LET (R3) := #60004      ;IS THIS A MS11-P???
005730                                  IF #BIT11 SET.IN (R3)   ;IS BIT 11 SET???
005736  005013                             CLR (R3)             ;CLEAR CSR
005740                                     LET (R3) := #20004   ;ENABLE CHECK/SYNDROME BIT REGISTER
005744                                     LET (R3) := #27744   ;IT IS BUT MAKE SURE AGAIN
005750                                     IF (R3) EQ #23744    ;DO WE HAVE 6 OR 7 CHECK BITS IN CSR
005756  052760  000002  002460                BIS #BIT1,CSRINFO(R0) ;6 CHECK BITS-MARK IT A MS11-P
005764                                     END                  ;
005764                                  ELSE                    ;IT IS A MS11-M
005766  042760  000002  002460             BIC #BIT1,CSRINFO(R0) ;MARK IT IN THE TABLE
005774                                  END                     ;
005774  000207                          RETURN
```

```
6151 005776                                CSRMAP: SUBTST  <<PRINT CSR REGISTER MAP>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       PRINT CSR REGISTER MAP
                                           ;*****************************************************************************
6152 005776  005000                               CLR     R0                  ;CLEAR CSR INFO POINTER
6153 006000                                       TYPE    MSG008              ;PRINT TITLE
6154 006004                                       TYPE    MSG016              ;PRINT CSR NUMBERS
6155 006010  005001                               CLR     R1                  ;
6156 006012                                       REPEAT                      ;
6157 006012  010102                                  MOV  R1,R2               ;
6158 006014  022702  000011                          CMP  #9.,R2              ;
6159 006020  100002                                  BPL  1$                  ;JUMP AROUND NEXT INSTRUCTION
6160 006022  062702  000007                          ADD  #7,R2               ;
6161 006026  062702  000060             1$:          ADD  #60,R2              ;MAKE IT ASCII
6162 006032  110237  074750                          MOVB R2,MSG015           ;
6163 006036                                          TYPE MSG015              ;
6164 006042                                          TYPE MSG014              ;TYPE SINGLE SPACE
6165 006046  005201                                  INC  R1                  ;
6166 006050                                       UNTIL R1 EQ #16.            ;
6167 006056                                       TYPE  MSG009                ;TYPE MEMTYPE
6168 006062                                       REPEAT                      ;
6169 006062                                          IF CSRINFO(R0) NE #0     ;IS CSR NONEXSISTANT????
6170 006070                                             IF #BIT0 SET.IN CSRINFO(R0)
6171 006100                                                IF #BIT1 SET.IN CSRINFO(R0)
6172 006110  112737  000120  074750                          MOVB  #'P,MSG015 ;IT IS A MS11-P
6173 006116                                                ELSE
6174 006120  112737  000115  074750                          MOVB  #'M,MSG015 ;IT IS A MS11-M
6175 006126                                                END
6176 006126                                             END
6177 006126                                             IF #BIT1!BIT0 OFF.IN CSRINFO(R0)
6178 006136  112737  000114  074750                          MOVB  #'L,MSG015 ;IT IS A MS11-L
6179 006144                                             END
6180 006144                                          ELSE
6181 006146  112737  000040  074750                       MOVB #' ,MSG015
6182 006154                                          END
6183 006154                                          TYPE MSG015                    ;TYPE MEMORY TYPE
6184 006160                                          TYPE MSG014                    ;TYPE SPACE
6185 006164  000240                                  NOP                            ;
6186 006166  062700  000002                          ADD  #2,R0                     ;POINT TO NEXT ENTRY
6187 006172                                       UNTIL R0 EQ #40                   ;
6188 006200                                       TYPE   MSG129                     ;
6189 006204  000207                               RETURN                            ;
6190 006206  000000                     TRACE:    .WORD   0
```

```
6192 006210                                     SUBTST  <<READ AND WRITE ALL CSR BITS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       READ AND WRITE ALL CSR BITS
                                        ;*****************************************************************************
6193                                    ;
6194                                    ; THIS ROUTINE "RWCSR" CHECK TO SEE THAT THE CSR CAN BEWRITTEN ON CORRECTLY
6195                                    ; BY WRITING AND CHECKING FOR THE FOLLOWING PATTERNS:
6196                                    ;
6197                                    ;               1-ZEROS
6198                                    ;               2-ONES
6199                                    ;               3-SHIFTING A ONE THROUGH A FIELD OF ZEROS
6200                                    ;               4-SHIFTING A ZEROS THROUGH A FIELD OF ONES
6201                                    ;
6202 006210                            RWCSR:
6203 006210                                     PUSH R4,R5,UIPAR0       ;SAVE R4,R5, AND UIPAR0 ON STACK
6204 006220                                     LET R5 := R0            ;GET CSR NUMBER FOR POSSIBLE ERROR
6205 006222  006205                             ASR R5                  ;
6206 006224                                     LET CSRNO := R5         ;
6207 006230                                     LET ADDRESS := R3       ;GET ADDRESS FOR POSSIBLE ERROR
6208 006234                                     IF #BIT0 SET.IN CSRINFO(R0) ;WHAT KIND OF MEMORY IS THIS???     ;GET BIT MASKS FOR D
6209 006244                                        LET R5 := #17740     ;MASK FOR MS11-M/P
6210 006250                                     ELSE                    ;IT IS A MS11-L
6211 006252                                        LET R5 := #70032     ;MASK FOR MS11-L
6212 006256                                     END                     ;
6213 006256                                     LET CSR1S := #177777    ;SET CSR1S TO ALL ONES
6214 006264  040537  002320                    BIC R5,CSR1S            ;CLEAR BITS FOR GOOD DATA
6215 006270                                     LET (R3) := #0          ;0----->CSR
6216 006272                                     LET R4 := (R3)          ;MASK OUT UNWANTED BITS
6217 006274  040504                             BIC R5,R4               ;
6218 006276                                     IF R4 NE #0             ;DO WE HAVE A CORRECT READ
6219 006302                                       LET GOOD := #0        ;GOOD DATA=0'S
6220 006306                                       LET CSR := R4         ;BAD DATA=CSR
6221 006312  104035                               ERROR +35             ;BIT SET ERROR
6222 006314  042760  000010  002460               BIC #BIT3,CSRINFO(R0) ;CLEAR CSR OK BIT
6223 006322                                     END
6224 006322                                     LET (R3) := CSR1S       ;ONES--->(R3)
6225 006326                                     LET R4 := (R3)          ;MASK OUT CORRECT FIELD
6226 006330  005013                             CLR     (R3)            ;CLEAR OUT CSR
6227 006332  040504                             BIC R5,R4               ;
6228 006334                                     IF R4 NE CSR1S          ;WAS PATTERN WRITTEN CORRECTLY?
6229 006342                                        LET GOOD := CSR1S    ;GOOD DATA = ALL LEGAL BITS SET IN CSR
6230 006350                                        LET CSR := R4        ;BAD DATA=CSR
6231 006354  104010                               ERROR +10             ;BIT CLEAR ERROR
6232 006356  042760  000010  002460               BIC #BIT3,CSRINFO(R0) ;CLEAR CSR OK BIT
6233 006364                                     END                     ;
6234 006364                                     LET PASFLG := #0        ;SET UP LOOP COUNTER
6235 006370                                     REPEAT                  ;REPEAT WITH A FIELD OF 1'S THROUGH 0'S
6236                                    ;                                                       0'S THROUGH 1'S
6237 006370  005237  002262                       INC PASFLG            ;INCREMENT LOOP COUNTER
6238 006374                                       LET UIPAR0 := #-1     ;USE USER PAR FOR BIT COUNTER
6239 006402                                       IF PASFLG EQ #1       ;PASS 1
6240 006412                                         LET R2 := #1        ;1----->FIELD OF ZEROS
6241 006416                                       ELSE                  ;PASS 2
6242 006420                                         LET R2 := #177776   ;0----->FIELD OF ONES
6243 006424                                       END                   ;
6244 006424                                       REPEAT                ;DO BITS 0-4 AND 13-15
6245 006424  005237  177640                         INC UIPAR0          ;INCREMENT BIT POINTER
```

```
6246 006430
6247 006450  042702  040004                    IF PASFLG EQ #2 AND #BIT0 OFF.IN CSRINFO(R0) ;
6248 006454                                       BIC #BIT14!BIT2,R2  ;IF THIS IS PASS 2 ON A MS11-L, CLEAR EUB BIT AND WRITE
6249 006454                                    END                   ;
6250 006456                                    LET (R3) := R2        ;WRITE DATA
6251 006460  040501                            LET R1 := R2          ;GET GOOD DATA AND MASK IT OUT
6252 006462                                    BIC R5,R1             ;GET GOOD DATA
6253 006464  040504                            LET R4 := (R3)        ;GET DATA THAT IS READ
6254 006466                                    BIC R5,R4             ;MASK OUT CSR BITS
6255 006472                                    IF R1 NE R4           ;IS DATA CORRECT???
6256 006476                                       LET BAD := R4      ;BAD DATA = CSR CONTENTS
6257 006502                                       LET CSR := R1      ;GET GOOD DATA
6258 006512  104035                               IF PASFLG EQ #1    ;SELECT ERROR DEPENDING ON PASS
6259 006514                                         ERROR +35        ;BIT SET ERROR
6260 006516  104010                               ELSE               ;PASS 2
6261 006520                                         ERROR +10        ;BIT CLEAR ERROR
6262 006520  042760  000010  002460                 END
6263 006526                                       BIC #BIT3,CSRINFO(R0) ;CLEAR CSR OK BIT
6264 006526                                    END                   ;
6265 006536  006302                            IF PASFLG EQ #1       ;GET DATA FOR NEXT LOOP
6266 006540                                       ASL  R2            ;SHIFT 1 ACROSS 0'S
6267 006542  000261                            ELSE                  ;
6268 006544  006102                               SEC                ;SET CARRY
6269 006546                                       ROL R2             ;ROTATE A 0 ACROSS A FIELD OF ONES
6270 006546                                    END                   ;
6271 006556                                 UNTIL UIPAR0 EQ #15.     ;UNTIL ALL BITS ARE DONE
6272 006566                              UNTIL PASFLG EQ #2          ;DONE WITH 2 PASSES
6273 006602                              IF #BIT0 SET.IN CSRINFO(R0) THEN JUMPTO DONE ;IF MS11-L DO ONE LAST WRITE
6274 006606                              LET (R3) := #140005         ;WRITE ONES TO CSR WITH EUB BIT ENABLED
6275 006610  042702  037772              LET R2 := (R3)              ;READ CSR FOR CORRECT BITS
6276 006614                              BIC #37772,R2               ;CLEAR UNWANTED BITS
6277 006622                              IF R2 NE #140005            ;WAS WRITE CORRECT
6278 006630                                 LET GOOD := #140005       ;GOOD DATA
6279 006634  104010                        LET CSR := R2             ;BAD DATA
6280 006636  042760  000010  002460        ERROR +10                 ;BIT CLEAR ERROR
6281 006644                                 BIC #BIT3,CSRINFO(R0)     ;CLEAR CSR OK BIT!
6282 006644                              END                         ;
6283 006646                    DONE:     LET (R3) := #0              ;CLEAR OUT CSR
6284 006656  000207                      POP UIPAR0,R5,R4            ;RESTORE UIPAR0,R4, AND R5
6285                                      RETURN
```

```
                                        ;THE FOLLOWING ROUTINE DETERMINES WHICH CSR CONTROLS PROGRAM SPACE
                                        ;
006660  104424                  CTEST:  CACHOFF
006662  012737  177777  002530          MOV     #177777,PGMCSR
006670  012737  002000  172350          MOV     #2000,KIPAR4            ;SET UP MAP REGISTER
006676  012701  002410                  MOV     #TESTADD,R1
006702  012737  100000  002410          MOV     #100000,TESTADD
006710  012737  100002  002412          MOV     #100002,TESTADD+2
006716  005000                          CLR     R0                      ;CLEAR CSR COUNTER
006720  005037  002150                  CLR     CSRNO
006724  013703  002222                  MOV     TOTCSRS,R3              ;OBTAIN CSR MAP
006730  000240                          NOP                             ;DEBUG AID
006732  006303                  4$:     ASL     R3                      ;PUT HIGH ORDER BIT INTO C BIT
006734  103407                          BCS     2$                      ;BRANCH IF CSR EXISTS
006736  062700  000002          1$:     ADD     #2,R0                   ;UPDATE CSR COUNTER
006742  010037  002150                  MOV     R0,CSRNO
006746  005703                          TST     R3                      ;IS MAP EMPTY?
006750  001474                          BEQ     3$                      ;BRANCH IF SO
006752  000767                          BR      4$
006754  000240                  2$:     NOP                             ;DEBUG AID
006756  000241                          CLC                             ;CLEAR CARRY
006760  032760  000003  002460          BIT     #BIT1!BIT0,CSRINFO(R0)  ;IS THIS PARITY MEMORY?
006766  001014                          BNE     5$                      ;BRACH IF NOT
006770  052760  000004  172100          BIS     #BIT2,CSRADD(R0)        ;SET WRITE WRONG PARITY
006776  012771  123456  000000          MOV     #123456,@(R1)           ;WRITE DATA
007004  012771  123456  000002          MOV     #123456,@2(R1)
007012  005060  172100                  CLR     CSRADD(R0)              ;RESTORE CSR
007016  000414                          BR      6$
007020  012760  000000  172100  5$:     MOV     #0,CSRADD(R0)           ;CLEAR THE CSR UNDER TEST
007026  012771  123456  000000          MOV     #123456,@(R1)           ;WRITE DATA
007034  012771  123456  000002          MOV     #123456,@2(R1)
007042  012760  020006  172100          MOV     #20006,CSRADD(R0)       ;SET DIAG CHECK MODE
007050  005771  000000          6$:     TST     @(R1)                   ;WRITE CHECKBITS TO CSR
007054  016004  172100                  MOV     CSRADD(R0),R4           ;WRITE CSR TO R4
007060  032760  000003  002460          BIT     #BIT1!BIT0,CSRINFO(R0)  ;PARITY MEMORY?
007066  001003                          BNE     7$                      ;BRANCH IF NOT
007070  005704                          TST     R4                      ;PARITY ERROR?
007072  100421                          BMI     8$                      ;BRACH IF SO
007074  000720                          BR      1$                      ;TRY NEXT CSR
007076  000240                  7$:     NOP                             ;DEBUG AID
007100  072427  177773                  ASH     #-5,R4
007104  042704  177600                  BIC     #^C177,R4
007110  032760  000002  002460          BIT     #BIT1,CSRINFO(R0)       ;WHAT KIND OF ECC MEMORY IS THIS
007116  001003                          BNE     10$                     ;BRANCH IF MS11-P
007120  012702  000157                  MOV     #157,R2                 ;LOAD IN CORRECT CHECK BITS FOR MS11-M
007124  000402                          BR      11$
007126  012702  000040          10$:    MOV     #40,R2                  ;CORRECT CHECK BITS FOR MS11-P
007132  020204                  11$:    CMP     R2,R4                   ;CORRECT CHECKBITS?
007134  001300                          BNE     1$                      ;BRANCH IF NOT
007136  010037  002530          8$:     MOV     R0,PGMCSR
007142  000240                  3$:     NOP                             ;DEBUG AID
007144  104502                          CLRCSR                          ;CLEAR ALL CSR'S
007146  012771  000000  000000          MOV     #0,@(R1)                ;RESTORE TEST LOCATIONS
007154  012771  000000  000002          MOV     #0,@2(R1)
007162  023727  002530  177777          CMP     PGMCSR,#177777
007170  001402                          BEQ     FINT                    ;IF PROGRAM CSR NOT FOUND GO TO FINT
007172  000137  007644                  JMP     CLRMEM                  ;GO TO SIZING ROUTINE IF FOUND
```

```
                                                ;
                                                ; IF PGMCSR WAS NOT FOUND BY THE PRECEEDING ROUTINE, THIS ROUTINE TRIES
                                                ;TO FIND IT FOR INTERLEAVED MEMORIES
                                                ;
007176                                  FINT:   SET4    #2$                     ;NE MEMORY TRAPS GO TO 2$
007204  012771  123456  000000        1$:     MOV     #123456,@(R1)           ;WRITE DATA AT FIRST LOCATION OF BANK 2 IN BOARD
007212  012771  123456  000002                MOV     #123456,@2(R1)          ;WRITE DATA AT SECOND LOCATION OF BANK 2 IN BOARD
007220  062737  010000  172350                ADD     #10000,KIPAR4           ;UPDATE PAR4 TO POINT TO UPPER BOARDS
007226  000766                                BR      1$                      ;KEEP GOING TILL NO MORE MEMORY
007230  012700  177776                2$:     MOV     #-2,R0
007234  013703  002222                        MOV     TOTCSRS,R3              ;PUT CSR MAP IN R3
007240  062700  000002                3$:     ADD     #2,R0                   ;UPDATE CSR COUNTER
007244  010037  002150                        MOV     R0,CSRNO                ;UPDATE CSRNO
007250  006303                                ASL     R3
007252  103403                                BCS     4$                      ;BRANCH IF CSR EXISTS
007254  005703                                TST     R3                      ;ANY CSR'S LEFT?
007256  001405                                BEQ     5$                      ;BRANCH IF NOT
007260  000767                                BR      3$                      ;LOOK FOR NEXT CSR
007262  012760  020006  172100        4$:     MOV     #20006,CSRADD(R0)       ;SET DIAGNOSTIC CHECK MODE IN CSR
007270  000763                                BR      3$                      ;LOOK FOR NEXT CSR
007272                                  5$:     SET4    #6$                     ;NE MEMORY TRAPS NOW GO TO 6$
007300  012700  177776                        MOV     #-2,R0                  ;RESET CSR POINTER
007304  012737  002000  172350                MOV     #2000,KIPAR4            ;REMAP PAR4 TO POINT TO BANK 2
007312  005771  000000                        TST     @(R1)                   ;TEST NONASSERTED LOCATIONS
007316  062700  000002                6$:     ADD     #2,R0                   ;UPDTAE CSR POINTER
007322  010037  002150                        MOV     R0,CSRNO
007326  022700  000040                        CMP     #40,R0                  ;NOT FOUND?
007332  001535                                BEQ     10$                     ;BRANCH IF NOT
007334  032760  000002  002460                BIT     #BIT1,CSRINFO(R0)       ;GET TYPE OF ECC MEMORY
007342  001003                                BNE     55$                     ;BRANCH IF MS11-P
007344  012702  000157                        MOV     #157,R2                 ;MS11-M CHECK BITS
007350  000402                                BR      56$
007352  012702  000040                55$:    MOV     #40,R2                  ;MS11-P CHECK BITS
007356  016004  172100                56$:    MOV     CSRADD(R0),R4           ;GET CSR CONTENTS
007362  072427  177773                        ASH     #-5,R4
007366  042704  177600                        BIC     #^C177,R4               ;CLEAR ALL BUT CHECKBITS
007372  020204                                CMP     R2,R4                   ;PROPER CHECKBITS?
007374  001401                                BEQ     7$                      ;BRANCH IF SO
007376  000747                                BR      6$                      ;TRY NEXT CSR IF NOT
007400  110037  002530                7$:     MOVB    R0,PGMCSR               ;WRITE NON-ASSERTED CSR # IN PGMCSR
007404                                        SET4    #8$                     ;NE TRAPS GO TO 8$
007412  012700  177776                        MOV     #-2,R0
007416  013703  002222                        MOV     TOTCSRS,R3              ;PUT CSR MAP IN R3
007422  062700  000002                23$:    ADD     #2,R0                   ;UPDATE CSR COUNTER
007426  010037  002150                        MOV     R0,CSRNO                ;UPDATE CSRNO
007432  006303                                ASL     R3
007434  103403                                BCS     24$                     ;BRANCH IF CSR EXISTS
007436  005703                                TST     R3                      ;ANY CSR'S LEFT?
007440  001405                                BEQ     25$                     ;BRANCH IF NOT
007442  000767                                BR      23$                     ;LOOK FOR NEXT CSR
007444  012760  020006  172100        24$:    MOV     #20006,CSRADD(R0)       ;SET DIAGNOSTIC CHECK MODE IN CSR
007452  000763                                BR      23$                     ;LOOK FOR NEXT CSR
007454  012700  177776                25$:    MOV     #-2,R0
007460  005771  000002                        TST     @2(R1)                  ;TEST ASSERTED LOCATIONS
007464  062700  000002                8$:     ADD     #2,R0
007470  010037  002150                        MOV     R0,CSRNO
007474  022700  000040                        CMP     #40,R0
```

```
6403 007500  001452                        BEQ     10$
6404 007502  032760  000002  002460        BIT     #BIT1,CSRINFO(R0)       ;CHECK FOR TYPE OF ECC MEMORY
6405 007510  001003                        BNE     76$                     ;BRANCH IF MS11-P
6406 007512  012702  000157                MOV     #157,R2                 ;CHECK BITS FOR MS11-M
6407 007516  000402                        BR      77$
6408 007520  012702  000040          76$:  MOV     #40,R2                  ;CHECK BITS FOR MS11-P
6409 007524  016004  172100          77$:  MOV     CSRADD(R0),R4
6410 007530  072427  177773                ASH     #-5,R4
6411 007534  042704  177600                BIC     #^C177,R4
6412 007540  020204                        CMP     R2,R4                   ;PROPER CHECKBITS?
6413 007542  001401                        BEQ     9$                      ;BRANCH IF SO
6414 007544  000747                        BR      8$                      ;TRY NEXT CSR IF NOT
6415 007546  110037  002531          9$:   MOVB    R0,PGMCSR+1             ;WRITE ASSERTED CSR # IN PGMCSR
6416 007552  052737  100000  002530        BIS     #BIT15,PGMCSR           ;SET INTERLEAVED INDICATOR IN PGMCSR
6417 007560  104502                        CLRCSR
6418 007562  012737  002000  172350        MOV     #2000,KIPAR4
6419 007570                                SET4    #12$                    ;NE MEMORY TRAPS GO TO 12$
6420 007576  012771  000000  000000  11$:  MOV     #0,@(R1)                ;WRITE DATA AT FIRST LOCATION OF BANK 2 IN BOARD
6421 007604  012771  000000  000002        MOV     #0,@2(R1)               ;WRITE DATA AT SECOND LOCATION OF BANK 2 IN BOARD
6422 007612  062737  010000  172350        ADD     #10000,KIPAR4           ;UPDATE PAR4 TO POINT TO UPPER BOARDS
6423 007620  000766                        BR      11$
6424 007622  104423                12$:    CACHON
6425 007624  000407                        BR      CLRMEM
6426 007626  012737  001000  172350  10$:  MOV     #1000,KIPAR4            ;
6427 007634                                TYPE    MSG126                  ;ERROR - PROGRAM CSR NOT FOUND!
6428 007640  005037  002530                CLR     PGMCSR                  ;SET TO DEFAULT OF 0
```

```
                                        SUBTST  <<CLEAR ALL MEMORY SPACE FROM BANK 2 ON>>
                                ;*****************************************************************
                                ;*SUBTEST        CLEAR ALL MEMORY SPACE FROM BANK 2 ON
                                ;*****************************************************************
                                ;
                                ;THIS ROUTINE CLEARS ALL MEMORY SPACE BEGINNING AT ADDRESS 200,000 AND
                                ;CONTINUES UNTIL THERE IS NO MEMORY LEFT. IT SHOULD CLEAR ANY PARITY ERRORS
                                ;CREATED BY THE LAST ROUTINE, AND CLEAN UP ANY JUNK LEFT HANGING AROUND IN
                                ;HIGHER MEMORY.
                                ;
007644                  CLRMEM: SET4    #CLREX          ;NONEM TRAPS GO TO CLREX
007652  005037  006206          CLR     TRACE
007656  012737  000001  002074  MOV     #1,NOPAR        ;IGNORE PARITY ERRORS
007664  012737  002000  172350  MOV     #2000,KIPAR4    ;SET UP MAP TO START AT BANK 2
007672  012701  100000          MOV     #100000,R1      ;R1 MAPS TO KIPAR4
007676  020127  117776  1$:     CMP     R1,#117776      ;WHOLE 16K BANK DONE?
007702  001003                  BNE     2$              ;KEEP GOING IF NOT
007704  012737  177777  006206  MOV     #-1,TRACE       ;USE TRACE FLAG TO FLAG END OF BANK
007712  005021          2$:     CLR     (R1)+           ;CLEAR CONTENTS & INCREMENT
007714  005737  006206          TST     TRACE           ;EOB FLAG SET?
007720  001001                  BNE     3$              ;GO TO NEXT BANK IF SO
007722  000765                  BR      1$
007724  062737  000200  172350  3$:     ADD     #200,KIPAR4     ;SET MAP FOR NEXT BANK
007732  022737  170000  172350          CMP     #170000,KIPAR4  ;ARE WE AT THE PERPHERIAL PAGE
007740  001405                  BEQ     CLREX           ;YES-GO ON
007742  005037  006206          CLR     TRACE           ;RESET FLAG
007746  012701  100000          MOV     #100000,R1      ;RESET R1
007752  000751                  BR      1$              ;CLEAR NEXT BANK
007754  000240          CLREX:  NOP
007756  005037  006206          CLR     TRACE
007762                          RES4
```

```
 6460 010004                            ANA2:   SUBTST  <<MATCH ALL CSR'S WITH MEMORY>>
                                        ;*********************************************************************
                                        ;*SUBTEST       MATCH ALL CSR'S WITH MEMORY
                                        ;*********************************************************************
 6461                                   ;* THE SECOND PART OF THE ANALYSIS MATCHES UP THE CSR'S WITH THE MEMORY, AND
 6462                                   ;* INSTALLS ALL THE INFORMATION FOUND IN THE CONFIGURATION TABLE.  FOR ECC,
 6463                                   ;* THIS IS DONE BY TAKING EACH CSR FOUND IN THE PREVIOUS SECTION SEQUENTIALLY
 6464                                   ;* AND CHECKING THROUGH ALL OF MEMORY, ONE BANK AT AT TIME, TO SEE WHICH BANKS
 6465                                   ;* RESPOND TO THE CSR IN QUESTION. THE FIRST DOUBLE WORD PAIR IN EACH BANK ARE
 6466                                   ;* WRITTEN WITH DATA AND DIAGNOSTIC CHECK MODE SET IN THE CSR IN ORDER TO AC-
 6467                                   ;* COMPLISH THIS. ALL POSSIBLE CONFIGURATIONS OF DOUBLE WORD PAIRS (NON-INTER-
 6468                                   ;* LEAVED, 64K INTERLEAVED, OR 128K INTERLEAVED) ARE CHECKED FOR EACH BANK
 6469                                   ;* THROUGH USE OF TESTADD AND KERNEL INSTRUCTION PAGE ADDRESS REGISTERS 4 AND
 6470                                   ;* 5. IF WE GET THE PROPER CHECKBITS BACK, WE HAVE A MATCH. IF NOT, THE ROUT-
 6471                                   ;* INE CHECKS FOR SINGLE OR DOUBLE BIT ERRORS.
 6472                                   ;*                 IF ONE OR THE OTHER IS FOUND, THE ERROR ADDRESS IS CHECKED
 6473                                   ;* TO SEE IF IT IS THAT BANK.  IF IT IS, WE HAVE A MATCH.  AT THE END OF EACH
 6474                                   ;* BANK PASS, FOR EACH CSR PASS, THE PROGRAM COMES UP WITH A NUMBER, STORED IN
 6475                                   ;* "I", WHICH DENOTES THE FOLLOWING:
 6476                                   ;*
 6477                                   ;*       I        MEMORY DESCRIPTION
 6478                                   ;*       -        ------------------
 6479                                   ;*       0        NON-EXISTANT MEMORY
 6480                                   ;*       1        NON-INTERLEAVED MEMORY MS11-L,MS11-P
 6481                                   ;*       2        64K INTERLEAVED, A1 NOT ASSERTED MEMORY
 6482                                   ;*       3        128K INTERLEAVED, A1 NOT ASSERTED MEMORY
 6483                                   ;*       4        64K INTERLEAVED, A1 ASSERTED MEMORY
 6484                                   ;*       5        128K INTERLEAVED, A1 ASSERTED MEMORY
 6485                                   ;*
 6486                                   ;*  NOTE - I=2 THROUGH I=5 CAN ONLY OCCUR WITH MS11-M MEMORY.
 6487                                   ;*
 6488                                   ;* NOTE THAT PARITY MEMORY WRITES WRONG PARITY TO THE DOUBLE WORDS, THEN LOOKS
 6489                                   ;* FOR THE PARITY ERROR BIT TO BE SET.  IF THE BIT IS SET, WE HAVE A MATCH.
 6490                                   ;*
 6491 010004                                    SET4    #100$                   ;NE MEMORY TRAPS GO TO 100$
 6492 010012  005037  002312                    CLR     CHECK                   ;CLEAR CHECK
 6493 010016  012701  002410                    MOV     #TESTADD,R1             ;SET UP THE VIRTUAL ADDR. POINTER
 6494 010022  013703  002222                    MOV     TOTCSRS,R3              ;MOVE CSR MAP INTO R3
 6495 010026  005000                            CLR     R0                      ;CLEAR THE CSR POINTER
 6496 010030  005005                            CLR     R5                      ;CLEAR THE PROGRAM CSR STATUS POINTER
 6497 010032  005737  002452                    TST     NO22BIT                 ;IS THIS AN 11/44 OR 11/24?
 6498 010036  001403                            BEQ     7$                      ;BRANCH IF IT IS
 6499 010040  005037  002556                    CLR     LASTBLOCK               ;ADJUST LASTBLOCK INDICATOR FOR 124K MACHINE
 6500 010044  000413                            BR      1$                      ;BRANCH OVER NEXT PIECE OF CODE
 6501 010046  022737  000167  002554  7$:      CMP     #167,LASTBANK           ;IS THERE UNIBUS MEMORY ABOVE 17000000?
 6502 010054  001407                            BEQ     1$                      ;BRANCH IF NOT
 6503 010056  013702  002554                    MOV     LASTBANK,R2             ;SET UP A NEW LAST BLOCK INDICATOR
 6504 010062  005202                            INC     R2
 6505 010064  072227  000011                    ASH     #9.,R2
 6506 010070  010237  002556                    MOV     R2,LASTBLOCK
 6507 010074  012702  000004            1$:     MOV     #4,R2                   ;R2 IS INDEX FOR CONFIG TABLE
 6508 010100  012737  001000  172350            MOV     #1000,KIPAR4            ;SET KIPAR4 FOR BANK 1
 6509 010106  012737  001000  172352            MOV     #1000,KIPAR5            ;SET KIPAR5 FOR BANK 1
 6510 010114  006303                    2$:     ASL     R3                      ;DOES THIS CSR EXIST?
 6511 010116  103420                            BCS     3$                      ;BRANCH IF IT DOES EXIST
 6512 010120  062700  000002                    ADD     #2,R0                   ;INCREMENT THE CSR POINTER
 6513 010124  010037  002150                    MOV     R0,CSRNO                ;STORE IT IN CSRNO ALSO
```

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6514 010130  005703                          TST     R3                      ;ARE THERE ANY MORE CSR'S TO DO?
6515 010132  001370                          BNE     2$                      ;BRANCH IF ALL CSRS NOT DONE
6516 010134  012737  001000  172350          MOV     #1000,KIPAR4            ;RESTORE KIPAR4
6517 010142  012737  001200  172352          MOV     #1200,KIPAR5            ;RESTORE KIPAR5
6518 010150  013706  002562                  MOV     KSTACK,SP               ;RESTORE STACK
6519 010154  000137  011402                  JMP     SUBAAS                  ;JUMP TO SUBAAS IF ALL CSR'S ARE DONE
6520 010160  010037  002150          3$:     MOV     R0,CSRNO                ;MAKE SURE CSRNO IS UPDATED
6521 010164  104424                  13$:    CACHOFF                         ;TURN THE CACHE OFF
6522 010166  000240                          NOP
6523 010170  012737  100000  002410  45$:    MOV     #100000,TESTADD         ;SET UP VIRTUAL ADDRESS TO KIPAR4
6524 010176  012737  120002  002412          MOV     #120002,TESTADD+2       ;SET UP VIRTUAL ADDRESS TO KIPAR5
6525 010204  032762  000040  002652          BIT     #BIT5,CONFIG(R2)        ;IS THIS A BANK TO SKIP?
6526 010212  001402                          BEQ     43$                     ;NO - BRANCH AROUND NEXT INSTRUCTION
6527 010214  000137  011316                  JMP     6$                      ;YES - GO TO END OF BANK
6528 010220  005037  002450          43$:    CLR     I                       ;CLEAR THE MEMORY CONFIGURATION COUNTER
6529 010224  005771  000000          4$:     TST     @(R1)                   ;TEST TO SEE THAT THERE IS MEMORY PRESENT
6530 010230  005237  002450                  INC     I
6531 010234                                  PUSH    @(R1),@2(R1)            ;SAVE THE LOCATIONS UNDER TEST
6532 010244  032760  0000 ?  002460          BIT     #BIT1!BIT0,CSRINFO(R0)  ;IS THIS PARITY MEMORY?
6533 010252  001014                          BNE     34$                     ;NO - BRANCH
6534 010254  052760  000004  ?? ??          BIS     #BIT2,CSRADD(R0)        ;SET WRITE WRONG PARITY
6535 010262  012771  12 -    ?? ??          MOV     #123456,@(R1)           ;SET THE FIRST LOCATION UNDER TEST
6536 010270  012771  1?-??   ??002          MOV     #123456,@2(R1)          ;SET THE SECOND LUT
6537 010276  005060      C-                  CLR     CSRADD(R0)              ;CLEAR THE CSR
6538 010302  000411                          BR      41$                     ;TEST LOCATIONS
6539 010304  012771  123456  000000  34$:    MOV     #123456,@(R1)           ;SET THE FIRST LOCATION UNDER TEST
6540 010312  012771  123456  000002          MOV     #123456,@2(R1)          ;SET THE SECOND LUT
6541 010320  104503                          CLR1CSR                         ;RESET CSR
6542 010322  104475                          CB1CSR                          ;SET DIAG. CHECK MODE IN CSR UNDER TEST
6543 010324  000240                          NOP                             ;DEBUG AID
6544 010326  005771  000000          41$:    TST     @(R1)                   ;READ THE FIRST LUT TO WRITE CKBITS. INTO CSR
6545 010332  104426                          READCSR                         ;READ THE CSR UNDER TEST
6546 010334  000240                          NOP                             ;DEBUG AID
6547 010336  013704  002146                  MOV     CSR,R4                  ;GET THE CHECKBITS FROM THE CSR
6548 010342  000240                          NOP                             ;DEBUG AID
6549 010344  010437  002432                  MOV     R4,TEMP                 ;SAVE IN TEMP FOR LATER
6550 010350  104503                          CLR1CSR                         ;RESET CSR
6551 010352                                  POP     @2(R1),@(R1)            ;RESTORE LOCATIONS UNDER TEST
6552 010362  032760  000003  002460          BIT     #BIT1!BIT0,CSRINFO(R0)  ;IS THIS PARITY MEMORY?
6553 010370  001004                          BNE     42$                     ;NO - BRANCH
6554 010372  005704                          TST     R4                      ;DID WE GET A PARITY ERROR?
6555 010374  100431                          BMI     25$                     ;YES - FILL IN CONFIG TABLE
6556 010376  000137  011316                  JMP     6$                      ;NO - JUMP TO END OF BANK
6557 010402  072427  177773          42$:    ASH     #-5,R4                  ;MANIPULATE THE CSR BITS
6558 010406  042704  177600                  BIC     #^C177,R4               ;INTO A USABLE FORM.
6559 010412  032760  000002  002460          BIT     #BIT1,CSRINFO(R0)       ;WHAT KIND OF ECC MEMORY IS THIS??
6560 010420  001005                          BNE     76$                     ;BRANCH IF MS11-P
6561 010422  012737  000157  002314          MOV     #157,CBITS              ;MS11-M CHECK BITS
6562 010430  000240                          NOP                             ;DEBBUG AIDE
6563 010432  000404                          BR      77$                     ;
6564 010434  012737  000040  002314  76$:    MOV     #40,CBITS               ;MS11-P CHECK BITS
6565 010442  000240                          NOP                             ;DEBBUGGING AIDE
6566 010444  023704  002314          77$:    CMP     CBITS,R4                ;DO THE CHECKBITS COMPARE TO WHAT WAS WRITTEN?
6567 010450  000240                          NOP                             ;DEBBUG AIDE
6568 010452  001402                          BEQ     25$                     ;BRANCH IF THERE IS A MATCH
6569 010454  000137  011004                  JMP     22$                     ;ELSE BRANCH IF NOT THE SAME
6570                                          ;*
```

```
6571                                                    ;* WE COME HERE IF THERE IS A MATCH
6572                                                    ;*
6573 010460  010004                          25$:       MOV     R0,R4                   ;GET THE CSR NUMBER
6574 010462  000240                                     NOP                             ;
6575 010464  006204                                     ASR     R4                      ;SET IT UP FOR USE IN THE
6576 010466  000304                                     SWAB    R4                      ;CONFIGURATION TABLE.
6577 010470  042704  170377                            BIC     #170377,R4              ;CLEAR OFF EXTRANEOUS BITS
6578 010474  032737  000004  002450                    BIT     #BIT2,I                 ;INTERLEAVED A1 ASSERTED MEMORY FOUND?
6579 010502  001402                                     BEQ     15$                     ;BRANCH IF NOT
6580 010504  072427  000004                            ASH     #4,R4                   ;PUT CSR NUMBER IN INTERLEAVED CSR SLOT
6581 010510  050462  002652                  15$:       BIS     R4,CONFIG(R2)           ;PUT CSR NUMBER IN CONFIG. TABLE
6582 010514  016004  002460                            MOV     CSRINFO(R0),R4          ;GET MEMORY TYPE
6583 010520  042704  177770                            BIC     #^C7,R4                 ;CLEAR OFF THE EXTRANEOUS BITS
6584 010524  000304                                     SWAB    R4                      ;MOVE INTO PROPER POSITION
6585 010526  050462  002654                            BIS     R4,CONFIG+2(R2)         ;SET IT INTO THE CONFIG TABLE
6586 010532  022737  000001  002450                    CMP     #1,I                    ;WAS THIS NON-INTERLEAVED MEMORY?
6587 010540  001431                                     BEQ     24$                     ;BRANCH IF IT WAS
6588 010542  052762  010000  002654                    BIS     #BIT12,CONFIG+2(R2)     ;SET THE INTERLEAVED BIT
6589 010550  010204                                     MOV     R2,R4                   ;SAVE THE CURRENT BANK INDEX
6590 010552  032737  000001  002450                    BIT     #BIT0,I                 ;WAS THIS 128K INTERLEAVED?
6591 010560  001006                                     BNE     5$                      ;BRANCH IF TRUE
6592 010562  052762  004000  002654                    BIS     #BIT11,CONFIG+2(R2)     ;SET 64K INTERLEAVED FLAG IN CONFIG
6593 010570  062704  000020                            ADD     #20,R4                  ;SET NEW BANK POINTER TO 4 BANKS AHEAD
6594 010574  000402                                     BR      16$                     ;JUMP OVER NEXT INSTRUCTION
6595 010576  062704  000040                  5$:        ADD     #40,R4                  ;SET NEW BANK POINTER 8 BANKS AHEAD
6596 010602  052764  000040  002652          16$:       BIS     #BIT5,CONFIG(R4)        ;SET SKIP ECC LOGIC TESTS FLAG
6597 010610  056264  002652  002652                    BIS     CONFIG(R2),CONFIG(R4)   ;SET OTHER INFO INTO THAT BANK
6598 010616  056264  002654  002654                    BIS     CONFIG+2(R2),CONFIG+2(R4)
6599                                                    ;*
6600                                                    ;* THIS SECTION IS EXECUTED ONLY WHEN THE BANK=1
6601                                                    ;*
6602 010624  022737  001000  172350          24$:       CMP     #1000,KIPAR4            ;IS THIS BANK 1 ?
6603 010632  001402                                     BEQ     30$                     ;BRANCH IF TRUE
6604 010634  000137  011156                            JMP     33$                     ;ELSE JUMP TO END OF THIS BANK
6605 010640  032737  100020  002432          30$:       BIT     #BIT15!BIT4,TEMP        ;WAS THERE A SBE OR DBE?
6606 010646  001417                                     BEQ     10$                     ;BRANCH IF NOT
6607 010650  013704  002432                            MOV     TEMP,R4                 ;GET CSR CONTENTS
6608 010654  072427  177767                            ASH     #-9.,R4                 ;MAKE ERROR ADDRESS INTO BANK #
6609 010660  022704  000001                            CMP     #1,R4                   ;ERROR IN BANKS 0 OR 1?
6610 010664  003010                                     BGT     10$                     ;BRANCH IF NOT
6611 010666  052762  000001  002652                    BIS     #BIT0,CONFIG(R2)        ;SET ERROR FLAG IN CONFIG TABLE
6612 010674  105262  002654                            INCB    CONFIG+2(R2)            ;ADD ONE TO BANK ERROR COUNT
6613 010700                                             SET     CONFGERROR              ;PRINT CONFIG TABLE
6614 010706  053737  002656  002652          10$:       BIS     CONFIG+4,CONFIG         ;SET UP INFORMATION IN BANK ZERO
6615 010714  053737  002660  002654                    BIS     CONFIG+6,CONFIG+2
6616 010722  000240                                     NOP                             ;DEBUG AID
6617 010724  022737  000001  002450                    CMP     #1,I                    ;WAS THIS NON-INTERLEAVED MEMORY
6618 010732  001002                                     BNE     46$                     ;NO - BRANCH OVER NEXT STMT.
6619 010734  000137  011316                            JMP     6$                      ;YES - JUMP TO END OF THIS BANK
6620 010740  012704  000020                  46$:       MOV     #20,R4                  ;SET UP COUNTER FOR 64K INTERLEAVED
6621 010744  032737  000001  002450                    BIT     #BIT0,I                 ;WAS IT 128K INTERLEAVED?
6622 010752  001402                                     BEQ     26$                     ;BRANCH IF NOT
6623 010754  062704  000020                            ADD     #20,R4                  ;SET UP COUNTER FOR 128K INTERLEAVED
6624 010760  053764  002652  002652          26$:       BIS     CONFIG,CONFIG(R4)       ;SET OTHER BANK WITH SAME INFORMATION
6625 010766  053764  002654  002654                    BIS     CONFIG+2,CONFIG+2(R4)   ;AS IN BANK 0
6626 010774  052764  000040  002652                    BIS     #BIT5,CONFIG(R4)        ;SET SKIP ECC LOGIC TESTS FLAG
6627 011002  000465                                     BR      33$                     ;BRANCH
```

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6628                                                    ;*
6629                                                    ;* IF CHECKBITS DID NOT MATCH, WE COME HERE
6630                                                    ;*
6631 011004  032737  100020  002146  22$:    BIT     #BIT15!BIT4,CSR         ;SBE OR DBE FLAGS SET?
6632 011012  001001                          BNE     8$                      ;BRANCH IF TRUE
6633 011014  000460                          BR      33$                     ;CHECK TO SEE IF IT IS MS11-M
6634 011016  013704  002150          8$:     MOV     CSRNO,R4                ;GET CSRNO
6635 011022  042764  000006  172100          BIC     #6,CSRADD(R4)           ;TURN OFF DIAG CHECK & ECC DISABLE
6636 011030                                   PUSH    R0,R1                   ;SAVE R0 & R1
6637 011034  016401  172100                   MOV     CSRADD(R4),R1           ;GET CSR INFORMATION
6638 011040  072127  177773                   ASH     #-5,R1                  ;SET UP ERROR ADDRESS
6639 011044  042701  177600                   BIC     #^C177,R1
6640 011050  052764  040000  172100          BIS     #BIT14,CSRADD(R4)       ;GET EXTENDED ERROR ADDRESS BITS
6641 011056  016400  172100                   MOV     CSRADD(R4),R0           ;READ FROM CSR
6642 011062  042764  040000  172100          BIC     #BIT14,CSRADD(R4)       ;TURN OFF EUB BIT
6643 011070  042700  177037                   BIC     #^C740,R0               ;SET UP EXTENDED BITS
6644 011074  006300                          ASL     R0
6645 011076  006300                          ASL     R0
6646 011100  060001                          ADD     R0,R1                   ;SET UP TOTAL ERROR ADDRESS
6647 011102  010104          27$:     MOV     R1,R4                   ;SAVE IN R4
6648 011104                                   POP     R1,R0                   ;RESTORE R0 & R1
6649 011110  072427  000005                   ASH     #5,R4                   ;SET ERROR ADDRESS UP IN PAR NOTATION
6650 011114  020437  172350                   CMP     R4,KIPAR4               ;DOES IT EQUAL KIPAR4?
6651 011120  001001                          BNE     28$                     ;BRANCH IF FALSE
6652 011122  000403                          BR      35$                     ;YES - MARK INFO IN CONFIG TABLE
6653 011124  020437  172352          28$:     CMP     R4,KIPAR5               ;DOES IT EQUAL KIPAR5?
6654 011130  001012                          BNE     33$                     ;BRANCH IF FALSE
6655 011132  052762  000001  002652  35$:     BIS     #BIT0,CONFIG(R2)        ;SET BANK ERROR FLAG
6656 011140  105262  002654                   INCB    CONFIG+2(R2)            ;INCREMENT BANK ERROR COUNTER
6657 011144                                   SET     CONFGERROR              ;PRINT CONFIG TABLE
6658 011152  000137  010460                   JMP     25$                     ;YES - MARK INFO IN CONFIG TABLE
6659                                                    ;*
6660                                                    ;* THIS SECTION SETS UP ALL THE POSSIBLE CONFIGURATIONS OF
6661                                                    ;* MS11-M MEMORY.
6662                                                    ;*
6663 011156  032760  000001  002460  33$:     BIT     #BIT0,CSRINFO(R0)       ;IS THIS MS11-M MEMORY?
6664 011164  001454                          BEQ     6$                      ;NO - GO TO END OF BANK
6665 011166  032760  000002  002460          BIT     #BIT1,CSRINFO(R0)
6666 011174  001050                          BNE     6$
6667 011176  022737  000001  002450          CMP     #1,I                    ;IS THIS 1ST TIME THROUGH?
6668 011204  103410                          BLO     18$                     ;BRANCH IF NOT
6669 011206  162737  000002  002412          SUB     #2,TESTADD+2            ;TRY AS 64K INTERLEAVED
6670 011214  062737  004000  172352          ADD     #4000,KIPAR5            ;A1 NON-ASSERTED MEMORY
6671 011222  000137  010224                   JMP     4$                      ;TRY TO MATCH AGAIN
6672 011226  022737  000004  002450  18$:     CMP     #4,I                    ;4TH TIME THROUGH?
6673 011234  001404                          BEQ     20$                     ;YES - BRANCH
6674 011236  022737  000002  002450          CMP     #2,I                    ;2ND TIME THROUGH
6675 011244  103405                          BLO     12$                     ;NO - BRANCH
6676 011246  062737  004000  172352  20$:     ADD     #4000,KIPAR5            ;TRY AS 128K INTERLEAVED
6677 011254  000137  010224                   JMP     4$                      ;TRY TO MATCH AGAIN
6678 011260  022737  000003  002450  12$:     CMP     #3,I                    ;THIRD TIME THROUGH?
6679 011266  103413                          BLO     6$                      ;NO - BRANCH
6680 011270  062737  000002  002410          ADD     #2,TESTADD              ;TRY TESTING THE BANK
6681 011276  062737  000002  002412          ADD     #2,TESTADD+2            ;AS A1 ASSERTED
6682 011304  162737  004000  172352          SUB     #4000,KIPAR5            ;64K INTERLEAVED MEMORY
6683 011312  000137  010224                   JMP     4$                      ;TRY TO MATCH AGAIN
6684                                                    ;*
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6685                                                    ;*END OF BANK ROUTINE
6686                                                    ;*
6687 011316  104503                            6$:      CLR1CSR                 ;CLEAR THE CSR UNDER TEST
6688 011320  062702  000004                             ADD     #4,R2           ;UPDATE CONFIGURATION POINTER
6689 011324  062737  001000  172350                     ADD     #1000,KIPAR4    ;UPDATE KIPAR4 TO NEXT BANK
6690 011332  013737  172350  172352                     MOV     KIPAR4,KIPAR5   ;AND UPDATE KIPAR5
6691 011340  000240                                     NOP                     ;DEBUG AID
6692 011342  023737  002556  172350                     CMP     LASTBLOCK,KIPAR4 ;HAVE WE DONE THE WHOLE MEMORY SPACE?
6693 011350  101402                                     BLOS    19$             ;BRANCH IF DONE                 ;R-C
6694 011352  000137  010170                             JMP     45$             ;JUMP IF NOT DONE
6695 011356  062700  000002            19$:     ADD     #2,R0                   ;INCREMENT CSR POINTER
6696 011362  000240                                     NOP                     ;DEBUG AID
6697 011364  104423                                     CACHON                  ;TURN ON THE CACHE
6698 011366  000137  010074                             JMP     1$              ;JUMP TO TRY NEXT CSR
6699                                                    ;
6700 011372  062706  000004            100$:    ADD     #4,SP                   ;RESTORE STACK                  ;R-C
6701 011376  000137  011316                             JMP     6$              ;GO TO END OF BANK ROUTINE      ;R-C
```

```
 6703 011402  104423                SUBAAS: CACHON          ;MAKE SURE THE CACHE IS ON
 6704 011404  104472                        ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
 6705 011406                                NEWTST  <<TEST BANK 0 ACCESSES>>
                                    ;*****************************************************************************
                                    ;*TEST 2        TEST BANK 0 ACCESSES
                                    ;*****************************************************************************
      011406  000004                TST2:   SCOPE
 6706
 6707                                       ;THIS DOES A "TST" INSTRUCTION ON EVERY LOCATION IN BANK #0 TO SEE
 6708                                       ;IF IT GETS ANY PARITY TRAPS.
 6709                                       ;SINCE EVERY LOCATION IS EITHER LOADED OR WRITTEN INTO BY THE PROGRAM
 6710                                       ;PRIOR TO THIS POINT - THEN A PARITY ERROR IMPLIES THAT THERE IS A
 6711                                       ;HARDWARE FAILURE IN THE MEMORY.
 6712 011410  005037  002070                ;THESE ERRORS ARE COUNTED AND A FATAL ACTION IS TAKEN
                                            CLR     PARCNT                  ;CLEAR PARITY ERROR COUNTER
 6713 011414  012737  000001  002074        MOV     #1,NOPAR                ;SET THE NO PARITY ERROR FLAG
 6714 011422  005037  002066                CLR     NEMCNT                  ;CLEAR NON-EXISTANT MEMORY ERROR COUNTER
 6715 011426  012737  000001  002076        MOV     #1,NONEM                ;SET THE NON-EXISTANT MEMORY ERROR MODE TO COUNT
 6716 011434                                SET4    #NONEXIST               ;TRAPS TO 4 GOTO NONEXIST
 6717 011442  005000                        CLR     R0
 6718 011444  012701  040000                MOV     #SIZE,R1
 6719 011450  104424                        CACHOFF                         ;TURN CACHE OFF
 6720 011452  005720                1$:     TST     (R0)+                   ;SEE IF I CAN DO A READ ACCESS WITHOUT A PARITY TRAP
 6721 011454  077102                        SOB     R1,1$
 6722 011456  104423                        CACHON                          ;TURN CACHE ON
 6723                                       ;SEE IF ANY FAILURES
 6724 011460  005737  002070                TST     PARCNT                  ;ANY PARITY ERRORS?
 6725 011464  001403                        BEQ     2$                      ;NO - SKIP
 6726 011466                                FATAL   3
 6727 011474  005737  002066        2$:     TST     NEMCNT                  ;ANY NON-EXISTANT MEMORY (HOLES)?
 6728 011500  001406                        BEQ     3$                      ;SKIP IF EQUAL
 6729 011502  162737  000002  002032        SUB     #2,ADDRESS              ;UPDATE 1ST ADDRESS FAILURE FROM AUTO INCREMENT #
 6730 011510                                FATAL   4
 6731 011516  053737  002104  002652  3$:   BIS     CPUBIT,CONFIG           ;SET CORRECT ACCESSED BIT ON BANK 0
 6732 011524                                RES4                            ;RESET TRAPS TO 4 TO DEFAULT
 6733
 6734 011546                                SUBTST  <<ENABLE ECC FOR CORRECT TRAPS>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       ENABLE ECC FOR CORRECT TRAPS
                                    ;*****************************************************************************
 6735 011546                                IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
 6736 011564  104506                          ENASBE                        ;TRAP ON SINGLE BIT ERRORS
 6737 011566                                ELSE
 6738 011570  104472                          ECCINIT                       ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
 6739 011572                                END ;OF IF #SW0
```

```
 6742 011572                                    NEWTST  <<TEST BANKS 1-200 (OCTAL) FOR ZEROS & ONES>>
                                        ;*********************************************************************
                                        ;*TEST 3        TEST BANKS 1-200 (OCTAL) FOR ZEROS & ONES
                                        ;*********************************************************************
     011572  000004                     TST3:   SCOPE
 6743                                           ;EACH BANK IS TESTED FOR EXISTANCE AND IF IT EXISTS
 6744                                           ;THEN IS IS TESTED FOR ZEROS & ONES.
 6745                                           ;EXCEPT -
 6746                                           ;       PROTECTED BANKS (WHERE THE PROGRAM IS) ARE ONLY TESTED BY
 6747                                           ;       "TST" INSTRUCTIONS LIKE BANK #0
 6748                                           ;ANY BAD BANKS ARE LOGGED IN THE CONFIGURATION TABLE.
 6749                                           ;THIS ROUTINE IS ONLY DOING A SMART SIZE - NOT ACTUAL TESTING!
 6750 011574  005037  002100                   CLR     BANK
 6751 011600  012737  000001  002074           MOV     #1,NOPAR                ;SET NO PARITY ERROR FLAG
 6752 011606  012737  000002  002076           MOV     #2,NONEM                ;SET NON-EXISTANT MEMORY MODE TO EXIT TEST LOOP
 6753 011614                                    SET4    #NONEXIST               ;TRAPS TO 4 GOTO NONEXIST
 6754 011622  022737  000001  003754           CMP     #1,PROTYP               ;IS THIS AN 11/44?
 6755 011630  001407                           BEQ     1$                      ;BRANCH IF TRUE
 6756 011632  012737  012430  002520           MOV     #MTST3+4,LINK1          ;SET UP LINKS
 6757 011640  012737  012432  002522           MOV     #MTST3+6,LINK2
 6758 011646  000411                           BR      TAG9$
 6759 011650                            1$:     BMOV    MTST3                   ;PUT IN FAST MEMORY
 6760 011656  012737  177644  002520           MOV     #UIPAR2,LINK1           ;SET UP LINKS
 6761 011664  012737  177646  002522           MOV     #UIPAR3,LINK2
 6762 011672  005237  002100            TAG9$: INC     BANK
 6763 011676  023737  002554  002100           CMP     LASTBANK,BANK           ;DONE?
 6764 011704  103457                           BLO     TAG2$                   ;YES - SKIP TO NEXT TEST
 6765 011706  013701  002100                   MOV     BANK,R1
 6766 011712  006301                           ASL     R1
 6767 011714  006301                           ASL     R1                      ;BANK * 4
 6768 011716  010137  002102                   MOV     R1,BANKINDEX
 6769 011722  005037  002072                   CLR     PATERR                  ;CLEAR PATTERN ERROR COUNTER
 6770 011726  005037  002070                   CLR     PARCNT                  ;CLEAR PARITY ERROR COUNTER
 6771 011732  005037  002066                   CLR     NEMCNT                  ;CLEAR NON-EXISTANT MEMORY COUNTER (HOLES)
 6772 011736                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
 6773 011752  105761  002652                   TSTB    CONFIG(R1)              ;IS THIS BANK PROTECTED?
 6774 011756  100555                           BMI     TSTBANK                 ;YES - GO TEST BANK SPECIAL
 6775 011760  012777  000207  170532   WARN1: MOV     #207,@LINK1             ;PUT "RETURN" INSTRUCTION AFTER WRITE ROUTINE
 6776 011766  012700  060000                   MOV     #FIRST,R0
 6777 011772  010004                           MOV     R0,R4
 6778 011774  012701  040000                   MOV     #SIZE,R1
 6779 012000  010103                           MOV     R1,R3
 6780 012002  005002                           CLR     R2                      ;DATA IS ZEROS
 6781 012004  104424                           CACHOFF                         ;TURN CACHE OFF
 6782 012006                                    TESTAREA                        ;ENTER SUPERVISOR MODE
 6783 012014  022737  000001  003754           CMP     #1,PROTYP               ;IS THIS AN 11/44?
 6784 012022  001403                           BEQ     1$                      ;BRANCH IF TRUE
 6785 012024  004737  012424                   CALL    MTST3
 6786 012030  000402                           BR      2$
 6787 012032  004737  177640           1$:     CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
 6788 012036  104417                    2$:     KERNEL                          ;ENTER KERNEL MODE
 6789 012040  104423                           CACHON                          ;TURN CACHE ON
 6790 012042  000416                           BR      TAG3$                   ;SKIP NEXT INSTRUCTION
 6791 012044  005037  002100            TAG2$: CLR     BANK
 6792 012050                                    RES4                            ;RESET TRAPS TO 4 TO DEFAULT
 6793 012072  005037  002074                   CLR     NOPAR                   ;INDICATE DEFAULT PARITY ACTION
 6794 012076  000564                           BR      SUBAAI
```

```
6795 012100  005737  002066          TAG3$:  TST     NEMCNT          ;ANY TRAPS?
6796 012104  001401                          BEQ     1$              ;NO - SKIP
6797 012106  000671                          BR      TAG9$           ;NOW - TRY NEXT BANK
6798 012110  104424                  1$:     CACHOFF                 ;TURN CACHE OFF
6799 012112                                  TESTAREA                ;ENTER SUPERVISOR MODE
6800 012120  004777  170376                  CALL    @LINK2          ;FINISH PATTERN
6801 012124  104417                          KERNEL                  ;ENTER KERNEL MODE
6802 012126  104423                          CACHON                  ;TURN CACHE ON
6803 012130  005737  002072                  TST     PATERR          ;ANY PATTERN ERRORS
6804 012134  001040                          BNE     2$              ;YES - SKIP
6805 012136  005737  002070                  TST     PARCNT          ;ANY PARITY ERRORS
6806 012142  001035                          BNE     2$              ;YES - SKIP
6807 012144  005737  002066                  TST     NEMCNT          ;ANY NON EXISTANT MEMORY
6808 012150  001032                          BNE     2$              ;YES - SKIP
6809 012152  012700  060000                  MOV     #FIRST,R0
6810 012156  010004                          MOV     R0,R4
6811 012160  012701  040000                  MOV     #SIZE,R1
6812 012164  010103                          MOV     R1,R3
6813 012166  013702  002602                  MOV     ONES,R2         ;DATA IS ONES
6814 012172  012777  000240  170320          MOV     #000240,@LINK1  ;PUT 'NOP" INSTRUCTION BACK IN SUBROUTINE
6815 012200  104424                          CACHOFF                 ;TURN CACHE OFF
6816 012202                                  TESTAREA                ;ENTER TEST MODE
6817 012210  022737  000001  003754          CMP     #1,PROTYP       ;IS THIS AN 11/44?
6818 012216  001403                          BEQ     5$              ;BRANCH IF IT IS
6819 012220  004737  012424                  CALL    MTST3           ;DO IN MEMORY IF NOT
6820 012224  000402                          BR      6$              ;JUMP OVER NEXT INSTRUCTION
6821 012226  004737  177640          5$:     CALL    FASTCITY        ;CALL TO THE USER INSTRUCTION PAR'S
6822 012232  104417                  6$:     KERNEL                  ;ENTER KERNEL MODE
6823 012234  104423                          CACHON                  ;TURN CACHE ON
6824 012236  013700  002102          2$:     MOV     BANKINDEX,R0
6825 012242  005737  002072                  TST     PATERR          ;ANY PATTERN ERRORS?
6826 012246  001006                          BNE     3$              ;YES - SKIP
6827 012250  005737  002070                  TST     PARCNT          ;ANY PARITY ERRORS?
6828 012254  001003                          BNE     3$              ;YES - SKIP
6829 012256  005737  002066                  TST     NEMCNT          ;ANY HOLES?
6830 012262  001406                          BEQ     4$              ;NONE - SKIP
6831 012264  052760  000001  002652  3$:     BIS     #BIT0,CONFIG(R0) ;SET ERROR BIT IN THIS BANK
6832 012272                                  SET     CONFGERROR      ;FORCE PRINTING OF CONFIGURATION TABLE
6833 012300  053760  002104  002652  4$:     BIS     CPUBIT,CONFIG(R0) ;SET ACCESSED BIT
6834 012306  000137  011672                  JMP     TAG9$
6835
6836                                         ;TEST A PROTECTED BANK
6837 012312                          TSTBANK:PUSH    R1
6838 012314  012737  000001  002076          MOV     #1,NONEM        ;SET NON-EXISTANT MEMORY TO COUNT
6839 012322  012700  060000                  MOV     #FIRST,R0
6840 012326  012701  020000                  MOV     #20000,R1
6841 012332  104424                          CACHOFF                 ;TURN CACHE OFF
6842 012334                                  TESTAREA                ;ENTER TEST MODE
6843 012342  005720                  4$:     TST     (R0)+
6844 012344  077102                          SOB     R1,4$
6845 012346  104417                          KERNEL                  ;ENTER KERNEL MODE
6846 012350  104423                          CACHON                  ;TURN CACHE ON
6847 012352  012737  000002  002076          MOV     #2,NONEM        ;RESET NON-EXISTANT MEMORY TO EXIT TEST LOOP
6848 012360                                  POP     R1
6849 012362                                  IF PARCNT NE #0
6850 012370  052761  000001  002652            BIS   #BIT0,CONFIG(R1) ;ERROR BANK
6851 012376                                    SET   CONFGERROR
```

```
6852 012404                                        END ;OF IF PARCNT
6853 012404                                        IF NEMCNT EQ #0
6854 012412  053761  002104  002652                  BIS   CPUBIT,CONFIG(R1)      ;ACCESSED BANK
6855 012420                                        END ;OF IF NEMCNT
6856 012420  000137  011672                        JMP   TAG9$
6857 012424  010220                    MTST3:      MOV   R2,(R0)+               ;V177640
6858 012426  077102                                SOB   R1,MTST3               ;V177642
6859 012430  000240                                NOP                          ;V177644
6860 012432  012401                    2$:         MOV   (R4)+,R1               ;V177646
6861 012434  020102                                CMP   R1,R2                  ;V177650
6862 012436  001402                                BEQ   3$                     ;V177652
6863 012440  005237  002072                        INC   PATERR                 ;V177654
6864 012444  077306                    3$:         SOB   R3,2$                  ;V177660
6865 012446  000207                                RETURN                       ;V177662
```

```
                                        SUBAAI: SUBTST  <<FIND SHADOW INHIBIT MODE POINTERS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       FIND SHADOW INHIBIT MODE POINTERS
                                        ;*****************************************************************************
                                        ;* THIS SECTION LOOKS FOR INTERLEAVED MS11-M MEMORIES AND FIGURES OUT
                                        ;* WHERE THE SHADOW INHIBIT MODE POINTERS ARE LOCATED.  THESE AREAS
                                        ;* ARE THEN MARKED AS PROGRAM SPACE.
012450  005037  002100                          CLR     BANK                    ;RESET BANK TO ZERO
012454  004737  047032              SHADL1: CALL    EXBANK                  ;SET BANK PARAMETERS
012460  013700  002102                      MOV     BANKINDEX,R0
012464                                      IF ACFLAG IS TRUE AND INTFLAG IS TRUE
012500                                        IF INT64K IS TRUE
012506  062700  000020                          ADD #20,R0                  ;POINT TO BANKINDEX + 4
012512  062737  000010  002100                  ADD #10,BANK                ;POINT TO BANK + 8
012520                                        ELSE
012522  062702  000040                          ADD #40,R2                  ;POINT TO BANKINDEX + 8
012526  062737  000020  002100                  ADD #20,BANK                ;POINT TO BANK + 16
012534                                        END; OF IF INT64K
012534  052760  000200  002652                BIS   #BIT7,CONFIG(R0)      ;MAKE NEW BANK PROGRAM SPACE
012542                                      ELSE
012544  005237  002100                        INC   BANK                  ;GO TO NEXT BANK
012550                                      END; OF IF ACFLAG
012550  023737  002554  002100              CMP     LASTBANK,BANK           ;HAVE WE DONE ALL THE BANKS?
012556  002336                              BGE     SHADL1                  ;BRANCH IF NOT
```

```
                                        NEWTST  <<ECC INHIBIT MODE POINTER TEST>>
                                ;*******************************************************************************
                                ;*TEST 4         ECC INHIBIT MODE POINTER TEST
                                ;*******************************************************************************
     012560  000004             TST4:   SCOPE
                                        ;THE MS11-M OR MF11S-K INHIBIT ECC DISABLE AND DIAGNOSTIC CHECK MODE
                                        ;ON THE BOTTOM  FIRST OR SECOND 16K WORDS CONTROLLED BY A CSR.  THIS
                                        ;IS CONSIDERED  TO BE A  PROTECTED BANK  BY THE  PROGRAM.  IT MAY BE
                                        ;QUITE  COMPLEX TO DETERMINE ON A  GIVEN SYSTEM  CONFIGURATION WHICH
                                        ;BANKS CAN BE PROTECTED;
                                        ;SO
                                        ;THIS ROUTINE ATTEMPS TO  CREATE A DOUBLE BIT ERROR IN ADDRESS 0 & 2
                                        ;OF  EVERY ECC BANK.  ECC HARDWARE WILL PREVENT THIS  FROM HAPPENING
                                        ;IN  PROTECTED BANKS  WHICH SHOULD ALWAYS  INCLUDE BANK ZERO - WHERE
                                        ;THE PROGRAM IS.
                                        ;
                                        ;
                                        ;WARNING:!!!!!!!!!!
                                        ;  IN CASE OF HARDWARE FAILURE IT IS COMMON  THAT A DOUBLE BIT ERROR
                                        ;  WILL BE  CREATED ON  THE KERNEL  STACK & "CRASH"  THE  DIAGNOSTIC
                                        ;DURING  THIS ROUTINE.  YOUR ONLY CLUE IS THAT YOU CAN GET AS FAR AS
                                        ;THIS ROUTINE BUT NOT PAST IT!
 012562  104424                         CACHOFF                                 ;TURN CACHE OFF
 012564  012737  177777  002154         MOV     #-1,OLDCSR
 012572                                 FOR BANK := #0 TO LASTBANK
 012576  012701  060000                   MOV   #FIRST,R1                       ;SET UP VIRT ADDR POINTER
 012602  004737  047032                   CALL  EXBANK
 012606  013700  002102                   MOV   BANKINDEX,R0
 012612                                   IF ACFLAG IS TRUE
 012620                                     IF MKFLAG IS TRUE
 012626                                     IF SKIPMK IS FALSE
 012634                                       IF INTFLAG IS TRUE
 012642  012703  040000                         MOV     #40000,R3               ;SET INDEX COUNTER
 012646  012737  000001  002236                 MOV     #1,SPLTCSR              ;MAP AS INTERLEAVED BANK
 012654                                       ELSE
 012656  012703  000002                         MOV     #2,R3                   ;SET INDEX COUNTER
 012662                                       END; OF IF INTFLAG
 012662  116002  002653                       MOVB    CONFIG+1(R0),R2
 012666  006302                               ASL     R2
 012670  042702  177741                       BIC     #^C36,R2
 012674  010237  002150                       MOV     R2,CSRNO
 012700                                       IF CSRNO NE OLDCSR
 012710  013737  002150  002154                 MOV     CSRNO,OLDCSR
 012716                                         IF PFLAG IS FALSE
 012724  052760  000100  002652                   BIS   #BIT6,CONFIG(R0)
 012732                                         END; OF IF PFLAG
 012732  004737  013066                         CALL    IMPTEST
```

```
 6934 012736                                                    IF INTFLAG IS TRUE
 6935 012744  116002  002653                                     MOVB  CONFIG+1(R0),R2
 6936 012750  072227  177775                                     ASH   #-3,R2
 6937 012754  042702  177741                                     BIC   #^C36,R2
 6938 012760  010237  002150                                     MOV   R2,CSRNO
 6939 012764  062701  000002                                     ADD   #2,R1             ;FIX POINTER FOR A1 ASSERTED HALF
 6940 012770  004737  013066                                     CALL  IMPTEST
 6941 012774  005037  002236                                     CLR   SPLTCSR
 6942 013000                                                    END; OF IF INTFLAG
 6943 013000                                                  END; OF IF CSRNO
 6944 013000                                                END; OF IF SKIPMK
 6945 013000                                                END; OF IF MKFLAG
 6946 013000                                              END; OF IF ACFLAG
 6947 013000                                            END; OF FOR BANK
 6948 013014                                            MAP                             ;MAP TEST SPACE TO BANK 0
 6949 013030  005037  002100                            CLR     BANK
 6950 013034                                            IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
 6951 013052  104506                                      ENASBE                        ;TRAP ON SINGLE BIT ERRORS
 6952 013054                                            ELSE
 6953 013056  104472                                      ECCINIT                       ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
 6954 013060                                            END; OF IF #SW0
 6955 013060  104423                                    CACHON                          ;TURN THE CACHE BACK ON
 6956 013062  000137  013374                            JMP     SUBAAR                  ;JUMP OVER THE SUBROUTINE
```

```
6958 013066  005004                    IMPTEST:CLR     R4
6959 013070                                    MAP BANK                        ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
6960 013104  005005                            CLR     R5
6961 013106  012737  020000  002146            MOV     #BIT13,CSR
6962 013114                                    TESTAREA                        ;ENTER TEST MODE
6963 013122                                    PUSH    (R1)                    ;SAVE TEST LOCATION
6964 013124  060301                            ADD     R3,R1                ;INDEX TO NEXT LOCATION
6965 013126                                    PUSH    (R1)                 ;SAVE TEST LOCATION
6966 013130  104505                            CHK1DIS                      ;DISABLE ECC & WRITE CHECKBITS FOR 1 CSR
6967 013132  010411                            MOV     R4,(R1)              ;WRITE CHECKBITS (ALL ZEROS)
6968 013134  160301                            SUB     R3,R1
6969 013136  010411                            MOV     R4,(R1)
6970 013140  104503                            CLR1CSR                         ;CLEAR CSR
6971 013142  005711                            TST     (R1)                    ;READ CHECKBITS INTO REAL CSR
6972 013144  104501                            WAS1DBE                         ;WAS THERE A DOUBLE BIT ERROR
6973
6974                                           ;THIS MAKES SURE THAT SBE'S DON'T LOOK LIKE PROTECTED AREAS
6975
6976 013146                                    ON.NOERROR ;1
6977 013150  012737  020000  002146              MOV   #BIT13,CSR
6978 013156  104505                              CHK1DIS                       ;DISABLE ECC & WRITE CHECKBITS FOR 1 CSR
6979 013160  013711  002602                      MOV   ONES,(R1)
6980 013164  060301                              ADD   R3,R1
6981 013166  013711  002602                      MOV   ONES,(R1)
6982 013172  160301                              SUB   R3,R1
6983 013174  104503                              CLR1CSR                       ;CLEAR CSR
6984 013176  005711                              TST   (R1)
6985 013200  104501                              WAS1DBE                       ;WAS THERE A DOUBLE BIT ERROR
6986 013202                                      ON.NOERROR ;2
6987 013204                                        IF #BIT9 SET.IN CONFIG+2(R0) ;IS THIS A MS11-P
6988 013214  104513                                   CBREG                  ;ENABLE CHECK/SYNDROME BIT REGISTER
6989 013216  012737  023140  002146                  MOV #23140,CSR         ;WRITE DBE'S IN CSR
6990 013224                                        ELSE                      ;OR A MS11-M
6991 013226  012737  027400  002146                  MOV #27400,CSR         ;WRITE DBE'S IN CSR
6992 013234                                        END                       ;
6993 013234  104505                                CHK1DIS                   ;DISABLE ECC & WRITE CHECKBITS FOR 1 CSR
6994 013236  010411                                MOV R4,(R1)
6995 013240  060301                                ADD R3,R1                 ;ADD INDEX TO GET TO SECOND WORD
6996 013242  010411                                MOV R4,(R1)
6997 013244  160301                                SUB R3,R1                 ;SUBTRACT INDEX TO FIRST WORD
6998 013246  104503                                CLR1CSR                      ;CLEAR CSR
6999 013250  005711                                TST (R1)
7000 013252  104501                                WAS1DBE                      ;WAS THERE A DOUBLE BIT ERROR
7001 013254                                        ON.NOERROR ;3
7002 013256                                          IF #BIT9 SET.IN CONFIG+2(R0)    ;IS THIS A MS11-P
7003 013266  104513                                     CBREG                 ;ENABLE CHECK/SYNDROME BIT REGISTER
7004 013270  012737  023604  002146                    MOV #23604,CSR        ;WRITE DBE'S IN CSR
7005 013276                                          ELSE                     ;IS IT A MS11-P
7006 013300  012737  074000  002146                    MOV #74000,CSR        ;WRITE DBE'S IN CSR
7007 013306                                          END                      ;
7008 013306  104505                                  CHK1DIS                  ;DISABLE ECC & WRITE CHECKBITS FOR 1 CSR
7009 013310  010411                                  MOV     R4,(R1)
7010 013312  060301                                  ADD     R3,R1            ;INDEX TO SECOND WORD
7011 013314  010411                                  MOV     R4,(R1)
7012 013316  104503                                  CLR1CSR                     ;CLEAR CSR
7013 013320  160301                                  SUB     R3,R1            ;GO BACK TO FIRST WORD
7014 013322  005711                                  TST     (R1)
```

```
7015 013324  104501                                WAS1DBE                         ;WAS THERE A DOUBLE BIT ERROR
7016 013326                                       END ;OF ON.NOERROR ;3
7017 013326                                     END ;OF ON.NOERROR ;2
7018 013326                                   END ;OF ON.NOERROR ;1
7019 013326                                   ON.ERROR
7020 013330  005205                             INC   R5                          ;IDENTIFY AS BAD BANK
7021 013332                                   END ;OF ON.ERROR
7022 013332  104471                           ECC1DIS                           ;DISABLE ERROR CORRECTION
7023 013334  010411                           MOV     R4,(R1)                 ;CLEAR OUT DOUBLE BIT ERROR!
7024 013336  060301                           ADD     R3,R1                   ;INDEX TO SECOND WORD
7025 013340  010411                           MOV     R4,(R1)                 ;CLEAR OUT DOUBLE BIT ERROR!
7026 013342  104503                           CLR1CSR
7027 013344  005705                           TST     R5
7028 013346  001405                           BEQ     1$
7029 013350  050560  002652                   BIS     R5,CONFIG(R0)
7030 013354  105260  002654                   INCB    CONFIG+2(R0)
7031 013360  104036                           ERROR   +36
7032 013362                          1$:      POP     (R1)                    ;RESTORE TEST LOCATION (2ND WORD)
7033 013364  160301                           SUB     R3,R1                   ;GO BACK TO FIRST WORD
7034 013366                                   POP     (R1)                    ;RESTORE TEST LOCATION (1ST WORD)
7035 013370  104417                           KERNEL
7036 013372  000207                           RETURN
7037
7038 013374                          SUBAAR:  SET     STOPOK          ;PROGRAM CAN NOW BE HALTED
```

```
7047 013402                                             SUBTST  <<LEGAL CONFIGURATION CHECK>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        LEGAL CONFIGURATION CHECK
                                                ;*****************************************************************************
7048 013402  012700  000020                             MOV     #16.,R0
7049 013406  012701  002460                             MOV     #CSRINFO,R1
7050 013412  005021                             1$:     CLR     (R1)+
7051 013414  077002                                     SOB     R0,1$
7052 013416                                               FOR BANK := #0 TO LASTBANK
7053 013422  004737  047032                                 CALL        EXBANK
7054 013426  013700  002102                                 MOV BANKINDEX,R0
7055
7056 013432                                                 IF ACFLAG IS TRUE
7057 013440  116003  002653                                   MOVB      CONFIG+1(R0),R3
7058 013444  042703  177760                                   BIC       #^C17,R3
7059 013450  006303                                           ASL       R3
7060 013452  005263  002460                                   INC       CSRINFO(R3)
7061 013456                                                   IF MKFLAG IS TRUE
7062                                                          ;MAKE SURE THAT EACH BANK HAS NO MORE THAN 2 CSRS
7063 013464                                                     BEGIN   LEGALCSR
7064 013464                                                       IF INTFLAG IS TRUE
7065 013472  116003  002653                                         MOVB        CONFIG+1(R0),R3
7066 013476  010304                                               MOV R3,R4
7067 013500  042703  177760                                       BIC #^C17,R3
7068 013504  072427  177774                                       ASH #-4,R4
7069 013510  042704  177760                                       BIC #^C17,R4
7070 013514                                                       IF R3 EQ R4
7071 013520  042760  014000  002654                                 BIC       #BIT11!BIT12,CONFIG+2(R0)
7072 013526  042760  170000  002652                                 BIC       #170000,CONFIG(R0)
7073 013534                                                         LEAVE LEGALCSR
7074 013536                                                       END; OF IF R3
7075 013536                                                     ELSE
7076 013540                                                       LEAVE       LEGALCSR
7077 013542                                                     END; OF IF INTFLAG
7078 013542                                                   SET     CONFGERROR
7079 013550                                                   END     LEGALCSR
7080 013550                                                 END ;OF IF MKFLAG
7081 013550                                               END ;OF IF ACFLAG
7082 013550                                             END; OF FOR BANK
7083 013564                                     PUSH    R5,R0                   ;SAVE CONTENTS OF R5, R0
7084 013570  005000                             CLR     R0                      ;CLEAR REGISTERS
7085 013572  005001                             CLR     R1
7086 013574  005005                             CLR     R5
7087 013576  005037  014004                     CLR     MBERR                   ;CLEAR ERROR INDICATOR
7088 013602  022761  000040  002460  2$:       CMP     #40,CSRINFO(R1)         ;IS CURRENT CSR <= 40
7089 013610  002043                             BGE     5$                      ;BRANCH IF SO
7090 013612  022761  000010  002460             CMP     #10,CSRINFO(R1)         ;IS CURRENT CSR < 10
7091 013620  002003                             BGE     3$                      ;BRANCH IF SO
7092 013622  004737  014126                     CALL    ILLCSR                  ;CALL ERROR ROUTINE
7093 013626  000434                             BR      5$                      ;TRY NEXT CSR
7094 013630  016005  002652             3$:     MOV     CONFIG(R0),R5           ;MOVE LOW WORD TO R5
7095 013634  032705  000002                     BIT     #BIT1,R5                ;DOES MEMORY EXIST HERE?
7096 013640  001415                             BEQ     4$                      ;BRANCH IF NOT
7097 013642  042705  170377                     BIC     #^C7400,R5              ;ISOLATE CSR NUMBER IN
7098 013646  072527  177771                     ASH     #-7,R5                  ;REGISTER 5
7099 013652  020501                             CMP     R5,R1                   ;IS IT THE CURRENT CSR?
7100 013654  001007                             BNE     4$                      ;TRY NEXT WORD OF CONFIG IF NOT
```

```
7101 013656  032760  010000  002654          BIT     #BIT12,CONFIG+2(R0)          ;IS IT INTERLEAVED?
7102 013664  001003                           BNE     4$                           ;BRANCH IF SO
7103 013666  012737  000001  014004          MOV     #1,MBERR                     ;SET ERROR INDICATOR
7104 013674  062700  000004            4$:   ADD     #4,R0                        ;UPDATE CONFIG COUNTER
7105 013700  022700  000340                  CMP     #340,R0                      ;CONFIG TABLE ALL DONE?
7106 013704  001351                           BNE     3$                           ;BRANCH IF NOT
7107 013706  005737  014004                  TST     MBERR                        ;ERRORS FOUND?
7108 013712  001402                           BEQ     5$                           ;TRY NEXT CSR IF NOT
7109 013714  004737  014126                  CALL    ILLCSR                       ;CALL ERROR ROUTINE
7110 013720  005000            5$:   CLR     R0                           ;REINITIALIZE CONFIG COUNTER
7111 013722  005037  014004                  CLR     MBERR                        ;CLEAR ERROR INDICATOR
7112 013726  062701  000002                  ADD     #2,R1                        ;UPDATE CSR COUNTER
7113 013732  022701  000040                  CMP     #40,R1                       ;ALL CSR'S DONE?
7114 013736  001321                           BNE     2$                           ;BRANCH IF NOT
7115 013740                                    POP     R0,R5                        ;RESTORE REGISTERS
7116 013744  005037  014004                  CLR     MBERR                        ;RESET ERROR INDICATOR
7117 013750  012700  000734                  MOV     #734,R0              ;INDEX TO TOP OF CONFIG TABLE   ;R-C
7118 013754  032760  000002  002652    6$:   BIT     #BIT1,CONFIG(R0)     ;MEMORY PRESENT?                ;R-C
7119 013762  001003                           BNE     7$                   ;BRANCH IF SO                   ;R-C
7120 013764  162700  000004                  SUB     #4,R0                ;TRY NEXT LOWER ENTRY IN CONFIG TABLE   ;R-C
7121 013770  000771                           BR      6$                                                   ;R-C
7122 013772  006200            7$:   ASR     R0                                                           ;R-C
7123 01..74  006200                  ASR     R0                           ;DIVIDE INDEX BY 4 TO GET BANK #;R-C
7124 013776  010037  002554                  MOV     R0,LASTBANK          ;STORE IN LASTBANK              ;R-C
7125 014002  000402                           BR      SKUJ
7126 014004  000000            MBERR: .WORD 0                              ;SAVE SPACE FOR ERROR INDICATOR
7127 014006  000000            PHEBE: .WORD 0                              ;SAVE SPACE FOR ODD BOUNDARY INTERLEAVED INDICATOR
7128 014010  005000            SKUJ:  CLR     R0                           ;CLEAR CONFIG COUNTER
7129 014012  005037  014006                  CLR     PHEBE                        ;CLEAR COUNTER
7130 014016  032760  000002  002652    1$:   BIT     #BIT1,CONFIG(R0)             ;IS THERE MEMORY PRESENT?
7131 014024  001431                           BEQ     3$                           ;BRANCH IF NOT
7132 014026  032760  010000  002654          BIT     #BIT12,CONFIG+2(R0)          ;IS IT INTERLEAVED?
7133 014034  001005                           BNE     2$                           ;BRANCH IF SO
7134 014036  005237  014006                  INC     PHEBE                        ;INCREMENT COUNTER
7135 014042  062700  000004                  ADD     #4,R0                        ;INCREMENT CONFIG COUNTER
7136 014046  000763                           BR      1$                           ;TRY NEXT BANK
7137 014050  023727  014006  000010    2$:   CMP     PHEBE,#10                    ;IS THE COUNTER EQUAL TO...
7138 014056  001417                           BEQ     4$                           ;ONE OF THE SPECIAL VALUES.
7139 014060  023727  014006  000030          CMP     PHEBE,#30                    ;IF IT IS...
7140 014066  001413                           BEQ     4$                           ;BRANCH TO 4$
7141 014070  023727  014006  000050          CMP     PHEBE,#50
7142 014076  001407                           BEQ     4$
7143 014100  023727  014006  000070          CMP     PHEBE,#70
7144 014106  001403                           BEQ     4$
7145 014110  005037  014006            3$:   CLR     PHEBE                        ;CLEAR INDICATOR
7146 014114  000403                           BR      5$
7147 014116  012737  000001  014006    4$:   MOV     #1,PHEBE                     ;SET INDICATOR
7148 014124  000421            5$:   BR      SUBAAP               ;BRANCH TO NEXT SUBTEST
7149 014126  010102            ILLCSR: MOV   R1,R2                ;R2 HAS CSR NUMBER
7150 014130  006202                    ASR     R2                   ;MAKE ACCEPTABLE FOR PRINTING
7151 014132  022702  000012                  CMP     #10.,R2
7152 014136  100002                           BPL     1$
7153 014140  062702  000007                  ADD     #7,R2
7154 014144  062702  000060            1$:   ADD     #60,R2
7155 014150  110237  100060                  MOVB    R2,MSGA122           ;PUT NUMBER INTO ERROR MESSAGE
7156 014154                                    TYPE    MSG122
7157 014160                                    SET     CONFGERROR
```

```
   7158 014166  000207                        RETURN
```

```
7161 014170                                SUBAAP: SUBTST  <<PRINT CONFIGURATION DETAILS>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       PRINT CONFIGURATION DETAILS
                                           ;*****************************************************************************
7162 014170                                        CLEAR   LSIZE,MSIZE,PSIZE
7163 014204  013702  002554                        MOV     LASTBANK,R2
7164 014210  006302                                ASL     R2
7165 014212  006302                                ASL     R2
7166 014214                                        FOR R1 := #0 TO R2 BY #4
7167 014216                                         IF CPUBIT SET.IN CONFIG(R1)
7168 014226                                           IF #BIT8 SET.IN CONFIG+2(R1)
7169 014236                                             IF #BIT9 SET.IN CONFIG+2(R1)
7170 014246                                                 LET PSIZE := PSIZE + #1
7171 014252                                             ELSE
7172 014254                                                 LET MSIZE := MSIZE + #1
7173 014260                                             END;IF BIT9
7174 014260                                           ELSE
7175 014262                                             LET LSIZE := LSIZE + #1
7176 014266                                           END;IF BIT8
7177 014266                                         END; OF IF CPUBIT
7178 014266                                        END ;OF FOR ALL BANKS IN TABLE
7179
7180 014276  005037  002450                        CLR     I
7181 014302                                        FOR R1 := #0 TO #10 BY #2
7182 014304  006361  002372                          ASL   BSIZE(R1)
7183 014310  006361  002372                          ASL   BSIZE(R1)
7184 014314  006361  002372                          ASL   BSIZE(R1)
7185 014320  006361  002372                          ASL   BSIZE(R1)                ;BSIZE(R1) := BSIZE(R1) * 16.
7186 014324  066137  002372  002450                  ADD   BSIZE(R1),I              ;I <- I + BSIZE(R1)
7187 014332                                        END; FOR R1
7188 014344                                        FOR R1 := #0 TO #200 BY #4
7189 014346                                           IF CPUBIT SET.IN CONFIG(R1)
7190 014356                                             LET UNITOP := UNITOP + #1
7191 014362                                           END; OF IF CPUBIT
7192 014362                                        END; OF FOR R1
7193 014374  006337  002414                        ASL     UNITOP
7194 014400  006337  002414                        ASL     UNITOP
7195 014404  006337  002414                        ASL     UNITOP
7196 014410  006337  002414                        ASL     UNITOP                 ;UNITOP := UNITOP * 16.
7197 014414                                        IF I LT UNITOP THEN LET I := UNITOP
7198 014432                                        TYPE    $CRLF
7199 014436  005737  002376            2$:       TST     LSIZE
7200 014442  001405                               BEQ     3$
7201 014444                                       TYPDEC  LSIZE
7202 014452                                       TYPE    MSG112
7203 014456  005737  002400            3$:       TST     MSIZE
7204 014462  001405                               BEQ     4$
7205 014464                                       TYPDEC  MSIZE
7206 014472                                       TYPE    MSG113
7207 014476  005737  002402            4$:       TST     PSIZE
7208 014502  001405                               BEQ     5$
7209 014504                                       TYPDEC  PSIZE
7210 014512                                       TYPE    MSG114
7211 014516                            5$:        TYPDEC  I
7212 014524                                       TYPE    MSG070
7213 014530                                       IF #SW6 OFF.IN @SWR
7214 014540  004737  041364                         CALL  PCONFIG
```

```
7215 014544                    END; OF IF #SW6
```

```
7218 014544                                     SUBTST  <<CHECK APT SIZING>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       CHECK APT SIZING
                                        ;*****************************************************************************
7219 014544                                     IF APTFLAG IS TRUE AND APTSIZE IS TRUE
7220 014560  005037  002432                       CLR    TEMP
7221 014564  012700  065734                       MOV    #$MAMS1,R0
7222 014570                                       FOR R2 := #0 TO #4
7223 014572                                         IFB 1(R0) NE #0
7224 014600  111001                                  MOVB       (R0),R1
7225 014602  042701  177400                          BIC        #177400,R1
7226 014606                                          IF 2(R0) LT #0
7227 014614  000261                                    SEC
7228 014616                                          ELSE
7229 014620  000241                                    CLC
7230 014622                                          END ;OF IF 2(R0)
7231 014622  006101                                  ROL        R1
7232 014624  005201                                  INC        R1                ;TO COMPENSATE FOR 4 BANKS BEING (0-3)
7233 014626  006301                                  ASL        R1
7234 014630  006301                                  ASL        R1
7235 014632  006301                                  ASL        R1
7236 014634  006301                                  ASL        R1
7237 014636  163701  002432                          SUB        TEMP,R1
7238 014642  010137  002432                          MOV        R1,TEMP
7239 014646                                          IFB 1(R0) EQ #3
7240 014656  060137  002420                            ADD      R1,APTPAR
7241 014662                                          END ;OF IFB 1(R0)
7242 014662                                          IFB 1(R0) EQ #4
7243 014672  060137  002422                            ADD      R1,APTECC
7244 014676                                          END ;OF IFB 1(R0)
7245 014676  062700  000004                          ADD        #4,R0
7246 014702                                        END ;OF IFB 1(R0)
7247 014702                                      END ;OF FOR R2
7248 014712                                      IF APTPAR NE LSIZE OR APTECC NE MSIZE OR APTECC NE PSIZE
7249 014742  104046                                ERROR      +46
7250 014744                                      END ;OF IF APTPAR
7251 014744                                  END ;OF IF APTFLAG
```

```
 7253 014744                        LOOP:   NEWTST  <<DIAGNOSTIC MODE DISPATCH ROUTINE>>
                                    ;*****************************************************************************
                                    ;*TEST 5         DIAGNOSTIC MODE DISPATCH ROUTINE
                                    ;*****************************************************************************
      014744  000004                TST5:   SCOPE
 7254 014746  005037  002220                CLR     CONTFLAG
 7255 014752  017700  165646                MOV     @SWR,R0         ;GET SWITCHES
 7256 014756  042700  177761                BIC     #^C16,R0        ;MASK TO ONLY MODE BITS
 7257 014762  004770  014772                CALL    @DISPTBL(R0)    ;DISPATCH TO ROUTINE THROUGH NEXT TABLE
 7258 014766  000137  015012                JMP     MEMDONE         ;GO TO NEXT TEST
 7259 014772  015454                DISPTBL:BAFPAF  ;MODE 0;BANKS FORWARD, PATTERNS FORWARD
 7260 014774  015562                        BAFPAR  ;MODE 1;BANKS FORWARD, PATTERNS REVERSE
 7261 014776  015670                        BAWPAF  ;MODE 2;BANKS WORST FIRST, PATTERNS FORWARD
 7262 015000  016020                        BAWPAR  ;MODE 3;BANKS WORST FIRST, PATTERNS REVERSE
 7263 015002  016150                        PAFBAF  ;MODE 4;PATTERNS FORWARD, BANKS FORWARD
 7264 015004  016300                        PAFBAW  ;MODE 5;PATTERNS FORWARD, BANKS WORST FIRST
 7265 015006  016452                        PARBAF  ;MODE 6;PATTERNS REVERSE, BANKS FORWARD
 7266 015010  016602                        PARBAW  ;MODE 7;PATTERNS REVERSE, BANKS WORST FIRST
 7267
 7268 015012  004737  015354        MEMDONE:CALL    DOBACK                          ;CHECK BACKGROUND PATTERN
 7269
 7270 015016                                NEWTST<<UNIQUE BANK TEST>>
                                    ;*****************************************************************************
                                    ;*TEST 6         UNIQUE BANK TEST
                                    ;*****************************************************************************
      015016  000004                TST6:   SCOPE
 7271                                       ;MAKE SURE THAT EACH BANK CAN HAVE UNIQUE DATA
 7272                                       ;WRITE AND READ THE BANK NUMBER IN EACH BANK (EXCEPT WHERE THE PROGRAM IS)
 7273 015020                                IF SELONLY IS FALSE
 7274 015026                                  SET   HEADER,MUT
 7275 015042  004737  024104                  CALL  MT0027
 7276 015046                                  SET   HEADER
 7277 015054  005037  002106                  CLR   MUT
 7278 015060                                END ;OF IF SELONLY
 7279 015060  004737  015354                CALL    DOBACK          ;RESTORE BACKROUND PATTERN
 7283
 7284 015064                        FLUSH:  SUBTST  <<FLUSH OUT DBE'S>>
                                    ;*****************************************************************************
                                    ;*SUBTEST        FLUSH OUT DBE'S
                                    ;*****************************************************************************
 7285 015064  004737  024570                CALL    MT0030
```

```
                                        .SBTTL  END OF PASS ROUTINE
                                ;*******************************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*INDICATE END-OF-PROGRAM AFTER EACH PASSES THRU THE PROGRAM
                                ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO LOOP
015070  005037  002440        $EOP:   CLR     FSINFLAG
015074  012700  002654                MOV     #CONFIG+2,R0    ;MOVE 2ND WORD OF CONFIG TO R0
015100  042710  020000        1$:     BIC     #BIT13,(R0)     ;CLEAR BACKGROUND VALID BIT
015104  062700  000004                ADD     #4,R0           ;INCREMENT TO NEXT BANK
015110  020027  003620                CMP     R0,#3620        ;DONE?
015114  003771                        BLE     1$              ;NO - BRANCH
015116  013737  002616  002014        MOV     $ERTTL,LASTERROR
015124  005237  065712                INC     $PASS           ;;INCREMENT THE PASS NUMBER
015130  042737  100000  065712        BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
015136                                TYPE    MSG077          ;;TYPE "END PASS #"
015142                                IF #SW11 SET,IN @SWR OR QVFLAG IS TRUE OR $PASS EQ #1
015170                                  TYPE  MSG035          ;QV
015174  005037  002344                  CLR   QVFLAG
015200                                END ;OF IF SW11
015200                                TYPDEC  $PASS
015206  013700  000042                MOV     42,R0           ;;GET MONITOR ADDRESS
015212  001456                        BEQ     $DOAGAIN        ;;BRANCH IF NO MONITOR
015214  022700  002000        $ZAP42: CMP     #STACK,R0       ;ARE WE UNDER RT11
015220  001453                        BEQ     $DOAGAIN        ;YES - BRANCH
015222                                ;WE ARE UNDER (HEAVEN HELP US) XXDP!
015224  004737  047676                PUSH    R0
015230                                CALL    SHUTUP
015232  000005                        POP     R0
015234  004710                        RESET                   ;;CLEAR THE WORLD
015236  000240                $SENDAD: CALL   (R0)            ;;GO TO MONITOR
015240  000240                        NOP                     ;;SAVE ROOM
015242  000240                        NOP                     ;;FOR
015244                                NOP                     ;;ACT11
                                $DOAGN: ;UNDO SHUTUP STUFF
                                        ;       RESTORE STACK
                                        ;       ENERGIZE UNIBUS MAP & 22 BIT ADDRESSING
                                        ;       ENERGIZE MEMORY MANAGEMENT
                                        ;       PUT LOADERS BACK HOME
015244  013706  002562                MOV     KSTACK,SP
015250  005737  002452                TST     N022BIT                 ;IS THIS AN 11/44 OR 11/24?
015254  001003                        BNE     1$
015256  052737  000060  172516        BIS     #BIT5!BIT4,MMR3
015264  104420                1$:     ENERGIZE                        ;TURN ON MEMORY MANAGEMENT
015266  013700  002564                MOV     LOADHOME,R0             ;DESTINATION BANK
015272  012701  000001                MOV     #1,R1                   ;SOURCE BANK
015276  004737  046422                CALL    BANKMOV
015302                                IF APTFLAG IS TRUE
015310                                  IF $USWR EQ $PASS
015320  012701  000050        APTHANG:    MOV #50,R1
015324  077001                2$:         SOB R0,2$
015326  062737  000001  065714            ADD #1,$DEVCT
015334  005537  065716                    ADC $UNIT
015340  077107                            SOB R1,2$
015342  005237  065712                    INC $PASS
015346  000764                            BR  APTHANG
```

```
 7345 015350                                        END ;OF IF $USWR
 7346 015350                                      END ;OF IF APTFLAG
 7347 015350  000137  014744          $DOAGAIN: JMP   LOOP              ;RETURN
```

END OF PASS ROUTINE

```
 7350 015354                            DOBACK: SUBTST  <<WRITE BACKGROUND PATTERNS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       WRITE BACKGROUND PATTERNS
                                        ;*****************************************************************************
 7351 015354  005037  002110                    CLR     PATTERN
 7352 015360                                    FOR BANK := #0 TO LASTBANK
 7353 015364  004737  047032                      CALL  EXBANK
 7354 015370                                      IF ACFLAG IS TRUE AND RRFLAG IS FALSE
 7355 015404                                        SET         HEADER,MUT
 7356 015420  004737  020276                        CALL        MKTEST          ;CALL   MJTEST WOULD ALSO WORK
 7357 015424  005037  002106                        CLR         MUT
 7358 015430                                        SET         HEADER
 7359 015436                                      END ;OF IF ACFLAG
 7360 015436                                    END ;OF FOR BANK
 7361 015452  000207                            RETURN
```

```
                                        .SBTTL  MTEST MODES

                                BAFPAF: SUBTST  <<BANKS FORWARD,PATTERNS FORWARD      **RECURSIVE**>>
                                ;*****************************************************************************
                                ;*SUBTEST        BANKS FORWARD,PATTERNS FORWARD      **RECURSIVE**
                                ;*****************************************************************************
                                        CLR     BANK                ;SET BANK TO 0
                                        ;START OF BANK LOOP
                                1$:     CALL    EXBANK              ;EXAMINE BANK
                                        TST     ACFLAG              ;CAN WE ACCESS THIS BANK?
                                        BEQ     4$                  ;NO - GO TO BANK LOOP TERMINATION
                                        TST     RRFLAG              ;RELOCATION REQUIRED?
                                        BNE     4$                  ;YES - GO TO BANK LOOP TERMINATION
                                        CLR     PATTERN             ;SET PATTERN TO 0
                                        ;START OF PATTERN LOOP
                                2$:     CALL    MTEST               ;GO TEST CORRECT MEMORY
                                        ;TERMINATION OF PATTERN LOOP
                                        CALL    INCPAT              ;GO SEE IF THIS IS THE LAST PATTERN
                                        BNE     2$                  ;NO - LOOP ON THIS PATTERN
                                        ;TERMINATION OF BANK LOOP
                                4$:     CLR     CONTFLAG
                                        CALL    INCBNK              ;NEXT HIGHER BANK
                                        BGE     1$                  ;IF NOT DONE - LOOP ON THIS BANK
                                        ;END OF LOOPS
                                        TST     RLFLAG              ;HAVE WE BEEN RELOCATED?
                                        BEQ     5$                  ;NO - SKIP
                                        RETURN                      ;YES - RETURN
                                5$:     CALL    RELOCATE            ;MOVE & MAP PROGRAM
                                        ON.ERROR THEN $RETURN
                                        ;**NOTE** RECURSIVE CALL
                                        CALL    BAFPAF              ;CALL SELF
                                        CALL    UNRELOCATE          ;UNMOVE & UNMAP PROGRAM
                                        RETURN
```

```
7396 015562                          BAFPAR: SUBTST  <<BANKS FORWARD,PATTERNS REVERSE      **RECURSIVE**>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       BANKS FORWARD,PATTERNS REVERSE      **RECURSIVE**
                                     ;*****************************************************************************
7397 015562  005037  002100                 CLR     BANK                ;SET BANK TO 0
7398                                        ;START OF BANK LOOP
7399 015566  004737  047032          1$:    CALL    EXBANK              ;EXAMINE BANK
7400 015572  005737  002114                 TST     ACFLAG              ;CAN WE ACCESS THIS BANK?
7401 015576  001412                        BEQ     4$                  ;NO - GO TO BANK LOOP TERMINATION
7402 015600  005737  002122                 TST     RRFLAG              ;RELOCATION REQUIRED?
7403 015604  001007                        BNE     4$                  ;YES - GO TO BANK LOOP TERMINATION
7404 015606  004737  047512                 CALL    SETPAT              ;SET HIGH PATTERN FOR CORRECT MEMORY
7405                                        ;START OF PATTERN LOOP
7406 015612  004737  016754          2$:    CALL    MTEST               ;GO TEST CORRECT MEMORY
7407                                        ;TERMINATION OF PATTERN LOOP
7408 015616  005337  002110                 DEC     PATTERN             ;IS THIS THE LAST PATTERN?
7409 015622  100373                        BPL     2$                  ;NO - LOOP ON THIS PATTERN
7410                                        ;TERMINATION OF BANK LOOP
7411 015624  005037  002220          4$:    CLR     CONTFLAG
7412 015630  004737  047522                 CALL    INCBNK              ;NEXT HIGHER BANK
7413 015634  002354                        BGE     1$                  ;IF NOT DONE - LOOP ON THIS BANK
7414                                        ;END OF LOOPS
7415 015636  005737  002124                 TST     RLFLAG              ;HAVE WE BEEN RELOCATED?
7416 015642  001401                        BEQ     5$                  ;NO - SKIP
7417 015644  000207                        RETURN                      ;YES - RETURN
7418 015646  004737  045204          5$:    CALL    RELOCATE            ;MOVE & MAP PROGRAM
7419 015652                                 ON.ERROR THEN $RETURN
7420                                        ;**NOTE** RECURSIVE CALL
7421 015656  004737  015562                 CALL    BAFPAR              ;CALL SELF
7422 015662  004737  046070                 CALL    UNRELOCATE          ;UNMOVE & UNMAP PROGRAM
7423 015666  000207                        RETURN
```

```
7426 015670                                BAWPAF: SUBTST  <<BANKS WORST FIRST,PATTERNS FORWARD  **RECURSIVE**>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       BANKS WORST FIRST,PATTERNS FORWARD  **RECURSIVE**
                                           ;*****************************************************************************
7427 015670  005037  002100                        CLR     BANK            ;SET BANK TO 0
7428                                               ;START OF BANK LOOP
7429 015674  004737  047032                1$:     CALL    EXBANK          ;EXAMINE BANK
7430 015700  005737  002114                        TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
7431 015704  001415                               BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
7432 015706  005737  002126                        TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)?
7433 015712  001412                               BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
7434 015714  005737  002122                        TST     RRFLAG          ;RELOCATION REQUIRED?
7435 015720  001007                               BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
7436 015722  005037  002110                        CLR     PATTERN         ;SET PATTERN TO 0
7437                                               ;START OF PATTERN LOOP
7438 015726  004737  016754                2$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
7439                                               ;TERMINATION OF PATTERN LOOP
7440 015732  004737  047476                        CALL    INCPAT          ;GO SEE IF THIS IS THE LAST PATTERN
7441 015736  001373                               BNE     2$              ;NO - LOOP ON THIS PATTERN
7442                                               ;TERMINATION OF BANK LOOP
7443 015740  005037  002220                4$:     CLR     CONTFLAG
7444 015744  004737  047522                        CALL    INCBNK          ;NEXT HIGHER BANK
7445 015750  002351                               BGE     1$              ;IF NOT DONE - LOOP ON THIS BANK
7446                                               ;END OF LOOPS
7447 015752  005137  002566                        COM     WORST           ;IS THIS AN EVEN NUMBERED PASS?
7448 015756  001003                               BNE     5$              ;YES - SKIP
7449                                               ;**NOTE** RECURSIVE CALL
7450 015760  004737  015670                        CALL    BAWPAF          ;CALL SELF
7451 015764  000207                               RETURN
7452 015766  005737  002124                5$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
7453 015772  001401                               BEQ     6$              ;NO - SKIP
7454 015774  000207                               RETURN                  ;YES - RETURN
7455 015776  004737  045204                6$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
7456 016002                                        ON.ERROR THEN $RETURN
7457                                               ;**NOTE** RECURSIVE CALL
7458 016006  004737  015670                        CALL    BAWPAF          ;CALL SELF
7459 016012  004737  046070                        CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
7460 016016  000207                               RETURN
```

```
7463 016020

                                        BAWPAR: SUBTST  <<BANKS WORST FIRST,PATTERNS REVERSE  **RECURSIVE**>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       BANKS WORST FIRST,PATTERNS REVERSE  **RECURSIVE**
                                        ;*****************************************************************************
7464 016020  005037  002100                    CLR     BANK            ;SET BANK TO 0
7465                                           ;START OF BANK LOOP
7466 016024  004737  047032            1$:     CALL    EXBANK          ;EXAMINE BANK
7467 016030  005737  002114                    TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
7468 016034  001415                            BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
7469 016036  005737  002126                    TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)
7470 016042  001412                            BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
7471 016044  005737  002122                    TST     RRFLAG          ;RELOCATION REQUIRED?
7472 016050  001007                            BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
7473 016052  004737  047512                    CALL    SETPAT          ;SET HIGH PATTERN FOR CORRECT MEMORY
7474                                           ;START OF PATTERN LOOP
7475 016056  004737  016754            2$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
7476                                           ;TERMINATION OF PATTERN LOOP
7477 016062  005337  002110                    DEC     PATTERN         ;IS THIS THE LAST PATTERN?
7478 016066  100373                            BPL     2$              ;NO - LOOP ON THIS PATTERN
7479                                           ;TERMINATION OF BANK LOOP
7480 016070  005037  002220            4$:     CLR     CONTFLAG
7481 016074  004737  047522                    CALL    INCBNK          ;NEXT HIGHER BANK
7482 016100  002351                            BGE     1$              ;IF NOT DONE - LOOP ON THIS BANK
7483                                           ;END OF LOOPS
7484 016102  005137  002566                    COM     WORST           ;IS THIS AN EVEN NUMBERED PASS?
7485 016106  001003                            BNE     5$              ;YES - SKIP
7486                                           ;**NOTE** RECURSIVE CALL
7487 016110  004737  016020                    CALL    BAWPAR          ;CALL SELF
7488 016114  000207                            RETURN
7489 016116  005737  002124            5$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
7490 016122  001401                            BEQ     6$              ;NO - SKIP
7491 016124  000207                            RETURN                  ;YES - RETURN
7492 016126  004737  045204            6$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
7493 016132                                    ON.ERROR THEN $RETURN
7494                                           ;**NOTE** RECURSIVE CALL
7495 016136  004737  016020                    CALL    BAWPAR          ;CALL SELF
7496 016142  004737  046070                    CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
7497 016146  000207                            RETURN
```

```
7500 016150                                PAFBAF: SUBTST  <<PATTERNS FORWARD,BANKS FORWARD      **RECURSIVE**>>
                                           ;*************************************************************************
                                           ;*SUBTEST       PATTERNS FORWARD,BANKS FORWARD      **RECURSIVE**
                                           ;*************************************************************************
7501 016150  005037  002110                        CLR     PATTERN          ;SET PATTERN TO 0
7502                                               ;START OF PATTERN LOOP
7503 016154  005037  002100                1$:     CLR     BANK             ;SET BANK TO 0
7504                                               ;START OF BANK LOOP
7505 016160  004737  047032                2$:     CALL    EXBANK           ;EXAMINE BANK
7506 016164  004737  047460                        CALL    BANKOK           ;CORRECT MEMORY FOR THIS BANK?
7507 016170  001010                                BNE     4$               ;NO - GO TO BANK LOOP TERMINATOR
7508 016172  005737  002114                        TST     ACFLAG           ;CAN WE ACCESS THIS BANK?
7509 016176  001405                                BEQ     4$               ;NO - GO TO BANK LOOP TERMINATION
7510 016200  005737  002122                        TST     RRFLAG           ;RELOCATION REQUIRED?
7511 016204  001002                                BNE     4$               ;YES - GO TO BANK LOOP TERMINATION
7512 016206  004737  016754                        CALL    MTEST            ;GO TEST CORRECT MEMORY
7513                                               ;TERMINATION OF BANK LOOP
7514 016212  005037  002220                4$:     CLR     CONTFLAG
7515 016216  004737  047522                        CALL    INCBNK           ;NEXT HIGHER BANK
7516 016222  002356                                BGE     2$               ;IF NOT DONE - LOOP ON THIS BANK
7517                                               ;TERMINATION OF PATTERN LOOP
7518 016224  004737  047476                        CALL    INCRPT           ;NEXT HIGHER PATTERN
7519 016230  001351                                BNE     1$               ;OK - LOOP; ELSE CONTINUE
7520                                               ;END OF LOOPS
7521 016232  005137  002132                        COM     TMFLAG           ;COMPLEMENT TYPE OF MEMORY
7522                                                                        ;IS THIS AN EVEN NUMBER PASS?
7523 016236  001403                                BEQ     5$               ;YES - SKIP
7524                                               ;**NOTE** RECURSIVE CALL
7525 016240  004737  016150                        CALL    PAFBAF           ;CALL SELF
7526 016244  000207                                RETURN
7527 016246  005737  002124                5$:     TST     RLFLAG           ;HAVE WE BEEN RELOCATED?
7528 016252  001401                                BEQ     6$               ;NO - SKIP
7529 016254  000207                                RETURN                   ;YES - RETURN
7530 016256  004737  045204                6$:     CALL    RELOCATE         ;MOVE & MAP PROGRAM
7531 016262                                        ON.ERROR THEN $RETURN
7532                                               ;**NOTE** RECURSIVE CALL
7533 016266  004737  016150                        CALL    PAFBAF           ;CALL SELF
7534 016272  004737  046070                        CALL    UNRELOCATE       ;UNMOVE & UNMAP PROGRAM
7535 016276  000207                                RETURN
```

```
 7538 016300                            PAFBAW: SUBTST  <<PATTERNS FORWARD,BANKS WORST FIRST  **RECURSIVE**>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       PATTERNS FORWARD,BANKS WORST FIRST  **RECURSIVE**
                                        ;*****************************************************************************
 7539 016300  005037  002110                    CLR     PATTERN         ;SET PATTERN TO 0
 7540                                           ;START OF PATTERN LOOP
 7541 016304  005037  002100            1$:     CLR     BANK            ;SET BANK TO 0
 7542                                           ;START OF BANK LOOP
 7543 016310  004737  047032            2$:     CALL    EXBANK          ;EXAMINE BANK
 7544 016314  004737  047460                    CALL    BANKOK          ;CORRECT MEMORY FOR THIS BANK?
 7545 016320  001013                            BNE     4$              ;NO - GO TO BANK LOOP TERMINATOR
 7546 016322  005737  002114                    TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 7547 016326  001410                            BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 7548 016330  005737  002126                    TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)
 7549 016334  001405                            BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 7550 016336  005737  002122                    TST     RRFLAG          ;RELOCATION REQUIRED?
 7551 016342  001002                            BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 7552 016344  004737  016754                    CALL    MTEST           ;GO TEST CORRECT MEMORY
 7553                                           ;TERMINATION OF BANK LOOP
 7554 016350  005037  002220            4$:     CLR     CONTFLAG
 7555 016354  004737  047522                    CALL    INCBNK          ;NEXT HIGHER BANK
 7556 016360  002353                            BGE     2$              ;IF NOT DONE - LOOP ON THIS BANK
 7557                                           ;TERMINATION OF PATTERN LOOP
 7558 016362  004737  047476                    CALL    INCRPT          ;NEXT HIGHER PATTERN
 7559 016366  001346                            BNE     1$              ;OK - LOOP; ELSE CONTINUE
 7560                                           ;END OF LOOPS
 7561 016370  005137  002132                    COM     TMFLAG          ;COMPLEMENT TYPE OF MEMORY
 7562                                                                   ;IS THIS AN EVEN NUMBER PASS?
 7563 016374  001403                            BEQ     5$              ;YES - SKIP
 7564                                           ;**NOTE** RECURSIVE CALL
 7565 016376  004737  016300                    CALL    PAFBAW          ;CALL SELF
 7566 016402  000207                            RETURN
 7567 016404  005137  002566            5$:     COM     WORST           ;4TH PASS?
 7568 016410  001003                            BNE     6$              ;YES - SKIP
 7569                                           ;**NOTE** RECURSIVE CALL
 7570 016412  004737  016300                    CALL    PAFBAW          ;CALL SELF
 7571 016416  000207                            RETURN
 7572 016420  005737  002124            6$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 7573 016424  001401                            BEQ     7$              ;NO - SKIP
 7574 016426  000207                            RETURN                  ;YES - RETURN
 7575 016430  004737  045204            7$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 7576 016434                                    ON.ERROR THEN $RETURN
 7577                                           ;**NOTE** RECURSIVE CALL
 7578 016440  004737  016300                    CALL    PAFBAW          ;CALL SELF
 7579 016444  004737  046070                    CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 7580 016450  000207                            RETURN
```

```
7583 016452                             PARBAF: SUBTST  <<PATTERNS REVERSE,BANKS FORWARD      **RECURSIVE**>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       PATTERNS REVERSE,BANKS FORWARD      **RECURSIVE**
                                        ;*****************************************************************************
7584 016452  004737  047512                     CALL    HIPAT           ;SET HIGHTEST PATTERNS
7585                                            ;START OF PATTERN LOOP
7586 016456  005037  002100             1$:     CLR     BANK            ;SET BANK TO 0
7587                                            ;START OF BANK LOOP
7588 016462  004737  047032             2$:     CALL    EXBANK          ;EXAMINE BANK
7589 016466  004737  047460                     CALL    BANKOK          ;CORRECT MEMORY FOR THIS BANK?
7590 016472  001010                             BNE     4$              ;NO - GO TO BANK LOOP TERMINATOR
7591 016474  005737  002114                     TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
7592 016500  001405                             BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
7593 016502  005737  002122                     TST     RRFLAG          ;RELOCATION REQUIRED?
7594 016506  001002                             BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
7595 016510  004737  016754                     CALL    MTEST           ;GO TEST CORRECT MEMORY
7596                                            ;TERMINATION OF BANK LOOP
7597 016514  005037  002220             4$:     CLR     CONTFLAG
7598 016520  004737  047522                     CALL    INCBNK          ;NEXT HIGHER BANK
7599 016524  002356                             BGE     2$              ;IF NOT DONE - LOOP ON THIS BANK
7600                                            ;TERMINATION OF PATTERN LOOP
7601 016526  005337  002110                     DEC     PATTERN         ;NEXT LOWER PATTERN
7602 016532  100351                             BPL     1$              ;OK - LOOP; ELSE CONTINUE
7603                                            ;END OF LOOPS
7604 016534  005137  002132                     COM     TMFLAG          ;COMPLEMENT TYPE OF MEMORY
7605                                                                    ;IS THIS AN EVEN NUMBER PASS?
7606 016540  001403                             BEQ     5$              ;YES - SKIP
7607                                            ;**NOTE** RECURSIVE CALL
7608 016542  004737  016452                     CALL    PARBAF          ;CALL SELF
7609 016546  000207                             RETURN
7610 016550  005737  002124             5$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
7611 016554  001401                             BEQ     6$              ;NO - SKIP
7612 016556  000207                             RETURN                  ;YES - RETURN
7613 016560  004737  045204             6$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
7614 016564                                     ON.ERROR THEN $RETURN
7615                                            ;**NOTE** RECURSIVE CALL
7616 016570  004737  016452                     CALL    PARBAF          ;CALL SELF
7617 016574  004737  046070                     CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
7618 016600  000207                             RETURN
```

```
 7621 016602                            PARBAW: SUBTST  <<PATTERNS REVERSE,BANKS WORST FIRST  **RECURSIVE**>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       PATTERNS REVERSE,BANKS WORST FIRST  **RECURSIVE**
                                        ;*****************************************************************************
 7622 016602  004737  047512                    CALL    HIPAT           ;SET HIGHTEST PATTERN
 7623                                           ;START OF PATTERN LOOP
 7624 016606  005037  002100            1$:     CLR     BANK            ;SET BANK TO 0
 7625                                           ;START OF BANK LOOP
 7626 016612  004737  047032            2$:     CALL    EXBANK          ;EXAMINE BANK
 7627 016616  004737  047460                    CALL    BANKOK          ;CORRECT MEMORY FOR THIS BANK?
 7628 016622  001013                            BNE     4$              ;NO - GO TO BANK LOOP TERMINATOR
 7629 016624  005737  002114                    TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 7630 016630  001410                            BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 7631 016632  005737  002126                    TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)
 7632 016636  001405                            BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 7633 016640  005737  002122                    TST     RRFLAG          ;RELOCATION REQUIRED?
 7634 016644  001002                            BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 7635 016646  004737  016754                    CALL    MTEST           ;GO TEST CORRECT MEMORY
 7636                                           ;TERMINATION OF BANK LOOP
 7637 016652  005037  002220            4$:     CLR CONTFLAG
 7638 016656  004737  047522                    CALL    INCBNK          ;NEXT HIGHER BANK
 7639 016662  002353                            BGE     2$              ;IF NOT DONE - LOOP ON THIS BANK
 7640                                           ;TERMINATION OF PATTERN LOOP
 7641 016664  005337  002110                    DEC     PATTERN         ;NEXT LOWER PATTERN
 7642 016670  100346                            BPL     1$              ;OK - LOOP; ELSE CONTINUE
 7643                                           ;END OF LOOPS
 7644 016672  005137  002132                    COM     TMFLAG          ;COMPLEMENT TYPE OF MEMORY
 7645                                           ;IS THIS AN EVEN NUMBER PASS?
 7646 016676  001403                            BEQ     5$              ;YES - SKIP
 7647                                           ;**NOTE** RECURSIVE CALL
 7648 016700  004737  016602                    CALL    PARBAW          ;CALL SELF
 7649 016704  000207                            RETURN
 7650 016706  005137  002566            5$:     COM     WORST           ;4TH PASS?
 7651 016712  001003                            BNE     6$              ;YES - SKIP
 7652                                           ;**NOTE** RECURSIVE CALL
 7653 016714  004737  016602                    CALL    PARBAW          ;CALL SELF
 7654 016720  000207                            RETURN
 7655 016722  005737  002124            6$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 7656 016726  001401                            BEQ     7$              ;NO - SKIP
 7657 016730  000207                            RETURN                  ;YES - RETURN
 7658 016732  004737  045204            7$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 7659 016736                                    ON.ERROR THEN $RETURN
 7660                                           ;**NOTE** RECURSIVE CALL
 7661 016742  004737  016602                    CALL    PARBAW          ;CALL SELF
 7662 016746  004737  046070                    CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 7663 016752  000207                            RETURN
```

```
7666 016754                                 MTEST:  SUBTST  <<SUBR  SETUP MEMORY TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        SUBR    SETUP MEMORY TEST
                                            ;*****************************************************************************
7667 016754                                         SET     HEADER                  ;INITIALIZE HEADER MESSAGE TYPEOUT
7668 016762                                         SET     MUT                     ;INDICATE THERE IS A MEMORY UNDER TEST
7669 016770  005037  002262                         CLR     PASFLG
7670 016774  005737  002116                         TST     MKFLAG                  ;ECC?
7671 017000  001413                                 BEQ     MT1                     ;NO - SKIP
7672 017002                                         BEGIN   HOLDLOOP
7673 017002                                           IF CONTFLAG IS TRUE THEN LEAVE HOLDLOOP
7674 017010                                           IF SKIPMK IS FALSE
7675 017016  004737  017050                             CALL        MKCONTROL
7676 017022                                           END; OF IF SKIPMK
7677 017022                                         END     HOLDLOOP
7678 017022  004737  020276                         CALL    MKTEST                  ;YES - DO ECC TESTS
7679 017026  000402                                 BR      MT2
7680 017030  004737  020516                 MT1:    CALL    MJTEST                  ;DO PARITY TESTS
7681 017034  005037  002106                 MT2:    CLR     MUT                     ;NOW - NO MEMORY UNDER TEST
7682 017040                                         SET     HEADER                  ;ALLOW HEADERS NORMAL
7683 017046  000207                                 RETURN
```

```
 7686 017050                                    MKCONTROL:SUBTST        <<SUBR  TEST ECC CSR LOGIC DISPATCH>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       SUBR    TEST ECC CSR LOGIC DISPATCH
                                                ;*****************************************************************************
 7687                                                   ;THE NEXT TWO MODULES SOLVE THE PROBLEM OF
 7688                                                   ;HOW TO RUN THE CSR TESTS ON EACH ECC MEMORY
 7689                                                   ;
 7690 017050                                            IF SELONLY IS TRUE THEN $RETURN
 7691 017060                                            IF INHECC IS TRUE THEN $RETURN
 7692 017070                                            PUSH    BANK,R0,R1,R2,R3
 7693 017104  012737  060000  002230                    MOV     #FIRST,CSRFBANK         ;SET FIRST TEST ADDRESS TO FIRST ADDR.
 7694 017112  012737  157776  002232                    MOV     #LAST,CSRLBANK
 7695 017120  005037  002234                            CLR     CSRINT
 7696 017124  005037  002236                            CLR     SPLTCSR
 7697 017130  005037  002330                            CLR     CSRLOOP                 ; AND ZERO THE LOOP COUNTER
 7698 017134  013700  002102                            MOV     BANKINDEX,R0            ;GET THE BANK INDEX
 7699 017140  016001  002652                            MOV     CONFIG(R0),R1           ;GET CSR NUMBER
 7700 017144  000301                                    SWAB    R1
 7701 017146  042701  177760                            BIC     #^C17,R1
 7702 017152  006301                                    ASL     R1
 7703 017154  010137  002524                            MOV     R1,CSRHOLD              ;STORE IN THE LOW BYTE
 7704 017160  005737  002134                            TST     INTFLAG                 ;IS THIS BANK INTERLEAVED?
 7705 017164  001421                                    BEQ     1$                      ;BRANCH IF NOT INTERLEAVED
 7706 017166  005237  002236                            INC     SPLTCSR
 7707 017172  012737  120000  002232                    MOV     #120000,CSRLBANK
 7708 017200  005237  002330                            INC     CSRLOOP                 ;WE MUST LOOP TWICE FOR AN INTERLEAVED BANK
 7709 017204  005237  002234                            INC     CSRINT
 7710 017210  016001  002652                            MOV     CONFIG(R0),R1           ;GET THE INTERLEAVE CSR NUMBER
 7711 017214  072127  177775                            ASH     #-3,R1
 7712 017220  042701  160777                            BIC     #^C17000,R1
 7713 017224  050137  002524                            BIS     R1,CSRHOLD              ;STORE IT IN CSRHOLD'S UPPER BYTE
 7714 017230  005003                            1$:     CLR     R3
 7715 017232  116337  002524  002150        MKLOOP:     MOVB    CSRHOLD(R3),CSRNO
 7716 017240  042737  177741  002150                    BIC     #^C36,CSRNO             ;CLEAR ANY UNNECESSARY BITS
 7717 017246                                              FOR MKCNT := #0 TO CSRINT
 7718 017252                                                FOR CSRFIRST := CSRFBANK TO CSRLBANK BY #4000
 7719 017260                                                MAP BANK                    ;MAP TEST SPACE TO BANK
 7720 017274  104511                                        INVALIDATE                  ;INVALIDATE BACKROUND PATTERN
 7721 017276                                                  BEGIN CSRSTUFF
 7722 017276  005037  002332                                  CLR       SUCCESS
 7723 017302                                                    IF ACFLAG IS TRUE AND RRFLAG IS FALSE
 7724 017316  013737  002224  002226                            MOV   CSRFIRST,CSRLAST
 7725 017324  062737  004000  002226                            ADD   #4000,CSRLAST
 7726 017332                                                      FOR TESTADD := CSRFIRST TO CSRLAST BY #4
 7727 017340  013737  002410  002412                              MOV       TESTADD,TESTADD+2
 7728 017346  005737  002236                                    TST       SPLTCSR
 7729 017352  001404                                            BEQ       1$
 7730 017354  062737  040000  002412                            ADD       #40000,TESTADD+2
 7731 017362  000403                                            BR        2$
 7732 017364  062737  000002  002412                      1$:   ADD       #2,TESTADD+2
 7733 017372  004737  017672                              2$:   CALL      SBETEST
 7734 017376                                                    ON.NOERROR
 7735 017400  104424                                              CACHOFF                 ;TURN CACHE OFF
 7736 017402  005037  002074                                      CLR     NOPAR           ;INDICATE PARITY ACTION
 7737 017406                                                      FOR I := #0 TO #27
 7738 017412                                                        SET   HEADER
 7739 017420  005037  002262                                        CLR   PASFLG
```

```
 7740 017424                                                    LET R0 := I
 7741 017430                                                    PUSH  R3                ;SAVE LOOP COUNTER
 7742 017432  U10637  002144                                    MOV   SP,CTLKVEC        ;SAVE VECTOR IN CSR OF ^K
 7743 017436  162737  000002  002144                           SUB   #2,CTLKVEC
 7744 017444  004737  020176                                    CALL CSRCASE
 7745 017450                                                    POP   R3                ;RESTORE LOOP COUNTER
 7746 017452                                                  END ;OF FOR I
 7747 017466  104423                                          CACHON                    ;TURN CACHE ON
 7748 017470                                                  SET     SUCCESS
 7749 017476                                                  LEAVE CSRSTUFF
 7750 017500                                                END ;OF ON.NOERROR
 7751 017500                                              END ;OF FOR TESTADD
 7752 017516                                            END ;OF IF
 7753 017516                                          END CSRSTUFF
 7754 017516                                          IF SUCCESS IS FALSE
 7755 017524                                            TYPE    MSGA34
 7756 017530                                            TYPOCS  BANK,<TYPES BANK NUMBER>,3
 7757 017540                                            TYPE    MSGB34
 7758 017544  004737  057532                            CALL    PERBNK
 7759 017550                                          END ;OF IF SUCCESS
 7760 017550                                        END; OF FOR CSRFIRST
 7761 017566  005237  002236                        INC  SPLTCSR
 7762 017572                                      END; OF FOR MKCNT
 7763 017606  062737  000002  002230        ADD     #2,CSRFBANK
 7764 017614  012737  000001  002236        MOV     #1,SPLTCSR
 7765 017622  005203                        INC     R3
 7766 017624  020337  002330                CMP     R3,CSRLOOP
 7767 017630  003002                        BGT     1$
 7768 017632  000137  017232                JMP     MKLOOP
 7769 017636  104472                1$:     ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
 7770 017640                                SET     CONTFLAG
 7771 017646  005037  002236                CLR     SPLTCSR
 7772 017652                                POP     R3,R2,R1,R0,BANK
 7773 017666  000207                        RETURN
 7774 017670  000000                MKCNT:  .WORD   0                       ;COUNTER FOR MKLOOP
```

```
   7777 017672                          SBETEST:SUBTST  <<CHECK FOR SBE FREE LOCATIONS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       CHECK FOR SBE FREE LOCATIONS
                                        ;*****************************************************************************
   7778                                         ;IN ORDER TO DETERMINE IF A LOCATION IS SBE FREE I DO THIS
   7779                                         ;
   7780                                         ;WRITE ZEROS WITH ECC DISABLE
   7781                                         ;READ ZEROS BACK
   7782                                         ;IF NOT ZEROS THEN RETURN ERROR
   7783                                         ;
   7784                                         ;WRITE ZEROS WITH ECC ENABLED BUT TRAPS DISABLED
   7785                                         ;READ ZEROS BACK
   7786                                         ;IF NOT ZEROS THEN RETURN ERROR
   7787                                         ;
   7788                                         ;TEST THE LOCATION FROM THE PAR'S (WITH NO PROGRAM FETCHES)
   7789                                         ;IF THERE WERE ANY SBE'S OR DBE'S THEN RETURN ERROR
   7790                                         ;
   7791                                         ;COMPLIMENT ZEROS TO ONES WITH ECC DISABLE
   7792                                         ;READ ONES BACK
   7793                                         ;IF NOT ONES THEN RETURN ERROR
   7794                                         ;
   7795                                         ;WRITE 100,,100000,00000 (CHECKBITS COMPLIMENT OF BEFORE)
   7796                                         ;  WITH ECC ENABLED BUT TRAPS DISABLED
   7797                                         ;TEST THE LOCATION FROM THE PAR'S (WITH NO PROGRAM FETCHES)
   7798                                         ;IF THERE WERE ANY SBE'S OR DBE'S THEN RETURN ERROR
   7799                                         ;
   7800                                         ;IF NONE OF THE ABOVE FORCES A RETURN ERROR THEN RETURN NO.ERROR
   7801                                         .ENABL  LSB
   7802 017672                          PUSH    R0,R1,R4                ;PUSH R0,R1,R4 ONTO STACK
   7803 017700  013701  002410          MOV     TESTADD,R1
   7804 017704  013704  002412          MOV     TESTADD+2,R4
   7805 017710                          TESTAREA                        ;ENTER TEST MODE
   7806 017716  104424                  CACHOFF                         ;TURN CACHE OFF
   7807 017720  104471                  ECC1DIS                         ;DISABLE ECC ON 1 SELECTED CSR
   7808 017722                          CLEAR   (R1),(R4)
   7809 017726  005711                  TST     (R1)
   7810 017730  001107                  BNE     SBENT
   7811 017732  005714                  TST     (R4)
   7812 017734  001105                  BNE     SBENT
   7813
   7814 017736  104503                  CLR1CSR                         ;CLEAR 1 SELECTED CSR
   7815 017740                          CLEAR   (R1),(R4)
   7816 017744  005711                  TST     (R1)
   7817 017746  001100                  BNE     SBENT
   7818 017750  005714                  TST     (R4)
   7819 017752  001076                  BNE     SBENT
   7820
   7821 017754  104510                  TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
   7822 017756                          IF #BIT15!BIT4 SET.IN CSR
   7823 017766                            SET SKPERR                    ;DISABLE ERRGEN'S ERROR PRINTOUT
   7824 017774  104512                    ERRGEN
   7825 017776  013700  002456            MOV   ERRADD,R0
   7826 020002  072027  177774            ASH   #-4,R0
   7827 020006  042700  177600            BIC   #^C177,R0
   7828 020012                            IF BANK EQ R0 THEN GOTO SBENT
   7829 020020                          END: OF IF #BIT15
   7830 020020  104471                  ECC1DIS                         ;DISABLE ECC ON 1 SELECTED CSR
```

```
7831 020022  005111                        COM     (R1)
7832 020024  005114                        COM     (R4)
7833 020026  023711  002602                CMP     ONES,(R1)
7834 020032  001046                        BNE     SBENT
7835 020034  023714  002602                CMP     ONES,(R4)
7836 020040  001043                        BNE     SBENT
7837
7838 020042  104503                        CLR1CSR                         ;CLEAR 1 SELECTED CSR
7839 020044  005011                        CLR     (R1)
7840 020046  012714  100000                MOV     #BIT15,(R4)
7841 020052  005711                        TST     (R1)
7842 020054  001035                        BNE     SBENT
7843 020056  022714  100000                CMP     #BIT15,(R4)
7844 020062  001032                        BNE     SBENT
7845
7846 020064  104510                        TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
7847 020066                                IF #BIT15!BIT4 SET.IN CSR
7848 020076                                  SET SKPERR                    ;DISABLE ERRGEN'S ERROR PRINTOUT
7849 020104  104512                          ERRGEN
7850 020106  013700  002456                  MOV   ERRADD,R0
7851 020112  072027  177774                  ASH   #-4,R0
7852 020116  042700  177600                  BIC   #^C177,R0
7853 020122                                  IF BANK EQ R0 THEN GOTO SBENT
7854 020130                                END; OF IF #BIT15
7855
7856 020130  104417                        KERNEL                          ;ENTER KERNEL MODE
7857 020132  104473                        ECC1INIT                        ;INITIALIZE 1 SELECTED CSR
7858 020134  104423                        CACHON                          ;TURN CACHE ON
7859 020136                                POP     R4,R1,R0                ;POP R0,R1 & R4 FROM STACK
7860 020144                                $RETURN NOERROR
7861
7862 020150  104503              SBENT:    CLR1CSR                         ;CLEAR 1 SELECTED CSR
7863 020152                                CLEAR   (R1),(R4)
7864 020156  104417                        KERNEL                          ;ENTER KERNEL MODE
7865 020160  104473                        ECC1INIT                        ;INITIALIZE 1 SELECTED CSR
7866 020162  104423                        CACHON                          ;TURN CACHE ON
7867 020164                                POP     R4,R1,R0                ;POP R0,R1 & R4 FROM STACK
7868 020172                                $RETURN ERROR
7869                                       .DSABL  LSB
```

```
                                CSRCASE:SUBTST  <<CSR PATTERN CASE STATEMENT>>
                                ;*****************************************************************************
                                ;*SUBTEST        CSR PATTERN CASE STATEMENT
                                ;*****************************************************************************
                                        CASE R0
                                          ;WARNING IF YOU CHANGE THIS TABLE ALSO
                                          ;CHANGE "$DDW0" - "$DDW5" (THE PATTERN BIT MAP)

                                          ;PAT          TIME            DESCRIPTION
                                MKCSRT:   MT0006        ;<1 SEC         INITIAL DATA TEST

                                          ;
                                          ;             MS11-P ECC TESTS
                                          ;
                                          MT0044        ; 5 SEC         SHIFTING 1/0'S THROUGH CHECK BITS
                                          MT0014        ; 1 SEC         BASIC DOUBLE ERROR TEST
                                          MT0045        ;<1 SEC         SYNDROMES TO CSR ON DOUBLE BIT ERROR TEST
                                          MT0036        ; 1 SEC         CORRECTION CODE TEST
                                          MT0020        ; 1 SEC         SYNDROMES TO CSR ON SINGLE BIT ERROR TEST
                                          MT0037        ;<1 SEC         ECC DISABLE TEST
                                          MT0041        ; 1 SEC         ADDRESS TO CSR ON DOUBLE BIT ERROR
                                          MT0042        ;<1 SEC         EXTENDED ADDRESS TO CSR ON ERROR TEST
                                          MT0043        ;<1 SEC         WRITE BYTE CLEARS SBE TEST
                                          MT0046        ; 1 SEC         CHECK SINGLE BIT ERRORS WITH ECC DISABLED TEST
                                          MT0047        ;<1 SEC         NO CSR UPDATE ON SBE WITH EXSISTING DBE

                                          MT0010        ;<1 SEC         BYTE ADDRESSING TEST

                                          ;
                                          ;             MS11-M ECC TESTS
                                          ;
                                          MT0025        ;<1 SEC         INTERRUPT ENABLE TEST
                                          MT0011        ;<2 SEC         CREATE SINGLE BIT ERROR TEST
                                          MT0012        ;<1 SEC         WRITE BYTE CLEARS SBE TEST
                                          MT0013        ; 1 SEC         CREATE DOUBLE BIT ERROR TEST
                                          MT0015        ; 1 SEC         WRITE INHIBIT OF BYTE WITH DBE
                                          MT0016        ;<1 SEC         WRITE INHIBIT OF WORD WITH DBE


                                          MT0999        ; 0 SEC         NULL TEST
                                          MT0999        ; 0 SEC         NULL TEST
                                          MT0999        ; 0 SEC         NULL TEST
                                          MT0999        ; 0 SEC         NULL TEST
                                          MT0999        ; 0 SEC         NULL TEST
                                END ;OF CASE R0
                                RETURN
```

```
 7918 020276                                MKTEST: SUBTST  <<SUBR  ECC TEST DISPATCH>>
                                            ;*****************************************.*****************************
                                            ;*SUBTEST       SUBR    ECC TEST DISPATCH
                                            ;*****************************************************************************
 7919 020276                                        IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
 7920 020314  104470                                  ECCDIS                        ;DISABLE ERROR CORRECTION
 7921 020316                                        ELSE
 7922 020320  104502                                  CLRCSR                        ;CLEAR ALL CSR'S
 7923 020322                                        END ;OF IF
 7924 020322  012737  000002  002074                MOV     #2,NOPAR              ;INDICATE PARITY ACTION
 7925 020330  012737  000002  002324                MOV     #2,PCBUMP             ;TRAPS ADD 2 TO PC
 7926 020336  013700  002110                        MOV     PATTERN,R0            ;GET PATTERN NUMBER
 7927 020342  006300                                ASL     R0                    ;MAKE IT A WORD ADDRESS
 7928 020344                                        IF MKPAT(R0) NE #MT0034 AND MKPAT(R0) NE #MT0999
 7929 020364  104511                                  INVALIDATE                  ;INVALIDATE BACKGROUND PATTERN ON 'BANK"
 7930 020366                                        END ;OF IF MKPAT(R0)
 7931 020366  010637  002144                        MOV     SP,CTLKVEC            ;SAVE VECTOR IN CASE OF ^K
 7932 020372  162737  000002  002144                SUB     #2,CTLKVEC
 7933 020400  004770  020436                        CALL    @MKPAT(R0)            ;INDEX OFF TABLE
 7934 020404                                        IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
 7935 020422  104506                                  ENASBE                      ;TRAP ON SINGLE BIT ERRORS
 7936 020424                                        ELSE
 7937 020426  104472                                  ECCINIT                     ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
 7938 020430                                        END ;OF IF #SW0
 7939 020430  005037  002074                        CLR     NOPAR                 ;INDICATE PARITY ACTION
 7940 020434  000207                                RETURN
 7941
 7942                                               ;WARNING IF YOU CHANGE THIS TABLE ALSO
 7943                                               ;CHANGE '$DDW0" - "$DDW5" (THE PATTERN BIT MAP)
 7944                                               ;PAT    TIME                  DISCRIPTION
 7945 020436                                MKPAT:  ;NOTE MT0034 MUST BE FIRST & LAST
 7946 020436  026002                                MT0034  ;<1 SEC               ;SOFT ERROR - BACKGROUND PATTERN TEST
 7947 020440  022576                                MT0017  ;<1 SEC               ;HOLDING 1'S & 0'S TEST
 7948 020442  022006                                MT0007  ;<1 SEC               ;ADDRESS BIT TEST
 7949 020444  020762                                MT0001  ;<1 SEC               ;ADDRESS TEST
 7950 020446  021102                                MT0002  ;<1 SEC               ;COMPLEMENT ADDRESS TEST
 7951 020450  021474                                MT0004  ; 1 SEC               ;ROTATING ZEROS TEST
 7952 020452  021616                                MT0005  ; 1 SEC               ;ROTATING ONES TEST
 7953 020454  022710                                MT0021  ; 1 SEC               ;MARCHING 0'S & 1'S TEST
 7954 020456  023162                                MT0022  ;10 SEC               ;REFRESH & SHIFTING DIAGONAL  TEST
 7955 020460  023602                                MT0026  ;<1 SEC               ;RANDOM DATA TEST
 7956 020462  023260                                MT0024  ;20 SEC               ;FAST GALLOPING PATTERN TEST
 7957 020464  025072                                MT0031  ; 3 SEC               ;SOB-A-LONG TEST
 7958 020466  025262                                MT0032  ;<1 SEC               ;WRITE RECOVERY TEST
 7959 020470  025614                                MT0033  ;35 SEC               ;BRANCH GOBBLE TEST
 7960 020472  026002                                MT0034  ;<1 SEC               ;SOFT ERROR - BACKGROUND PATTERN TEST
 7961                                               ;NOTE MT0034 MUST BE FIRST & LAST
 7962 020474  026764                                MT0999  ; 0 SEC               ;NULL TEST
 7963 020476  026764                                MT0999  ; 0 SEC               ;NULL TEST
 7964 020500  026764                                MT0999  ; 0 SEC               ;NULL TEST
 7965 020502  026764                                MT0999  ; 0 SEC               ;NULL TEST
 7966 020504  026764                                MT0999  ; 0 SEC               ;NULL TEST
 7967 020506  026764                                MT0999  ; 0 SEC               ;NULL TEST
 7968 020510  026764                                MT0999  ; 0 SEC               ;NULL TEST
 7969 020512  026764                                MT0999  ; 0 SEC               ;NULL TEST
 7970 020514  026764                                MT0999  ; 0 SEC               ;NULL TEST
```

```
 7973 020516                                MJTEST: SUBTST  <<SUBR  PARITY TEST DISPATCH>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       SUBR    PARITY TEST DISPATCH
                                            ;*****************************************************************************
 7974 020516  012737  000002  002074              MOV     #2,NOPAR                ;INDICATE PARITY ACTION
 7975 020524  012737  000002  002324              MOV     #2,PCBUMP               ;TRAPS ADD 2 TO PC
 7976 020532  012737  060000  002410              MOV     #FIRST,TESTADD
 7977 020540  012737  060002  002412              MOV     #FIRST+2,TESTADD+2
 7978 020546  013700  002110                      MOV     PATTERN,R0              ;GET PATTERN NUMBER
 7979 020552  006300                              ASL     R0                      ;MAKE IT A WORD ADDRESS
 7980 020554                                      IF MJPAT(R0) NE #MT0034 AND MJPAT(R0) NE #MT0999
 7981 020574  104511                                INVALIDATE                    ;INVALIDATE BACKGROUND PATTERN ON 'BANK''
 7982 020576                                      END ;OF IF MJPAT(R0)
 7983 020576  010637  002144                      MOV     SP,CTLKVEC              ;SAVE VECTOR IN CASE OF ^K
 7984 020602  162737  000002  002144              SUB     #2,CTLKVEC
 7985 020610  004770  020622                      CALL    @MJPAT(R0)              ;INDEX OFF TABLE
 7986 020614  005037  002074                      CLR     NOPAR                   ;INDICATE PARITY ACTION
 7987 020620  000207                              RETURN
 7988
 7989                                            ;WARNING IF YOU CHANGE THIS TABLE ALSO
 7990                                            ;CHANGE ''$DDW0'' - ''$DDW5'' (THE PATTERN BIT MAP)
 7991
 7992                                            ;PAT    TIME            DISCRIPTION
 7993 020622                                MJPAT:  ;NOTE MT0034 MUST BE FIRST & LAST
 7994 020622  026002                              MT0034  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
 7995 020624  021752                              MT0006  ;<1 SEC         ;INITIAL DATA TEST
 7996 020626  022576                              MT0017  ;<1 SEC         ;HOLDING 1'S & 0'S TEST
 7997 020630  022006                              MT0007  ;<1 SEC         ;ADDRESS BIT TEST
 7998 020632  020762                              MT0001  ;<1 SEC         ;ADDRESS TEST
 7999 020634  021102                              MT0002  ;<1 SEC         ;COMPLEMENT ADDRESS TEST
 8000 020636  021242                              MT0003  ; 1 SEC         ;3 XOR 9 WORST CASE NOISE TEST
 8001 020640  021474                              MT0004  ; 1 SEC         ;ROTATING ZEROS TEST
 8002 020642  021616                              MT0005  ; 1 SEC         ;ROTATING ONES TEST
 8003 020644  022710                              MT0021  ; 1 SEC         ;MARCHING 0'S & 1'S TEST
 8004 020646  026154                              MT0035  ;<1 SEC         ;WORSE CASE NOISE PARITY TEST
 8005 020650  023162                              MT0022  ;10 SEC         ;REFRESH TEST
 8006 020652  023214                              MT0023  ;10 SEC         ;SHIFTING DIAGONAL  TEST
 8007 020654  023602                              MT0026  ;<1 SEC         ;RANDOM DATA TEST
 8008 020656  023260                              MT0024  ;20 SEC         ;FAST GALLOPING PATTERN TEST
 8009 020660  025072                              MT0031  ; 3 SEC         ;SOB-A-LONG TEST
 8010 020662  025262                              MT0032  ;<1 SEC         ;WRITE RECOVERY TEST
 8011 020664  025614                              MT0033  ;35 SEC         ;BRANCH GOBBLE TEST
 8012 020666  026002                              MT0034  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
 8013                                            ;NOTE MT0034 MUST BE FIRST & LAST
 8014 020670  026764                              MT0999  ; 0 SEC         ;NULL TEST
 8015 020672  026764                              MT0999  ; 0 SEC         ;NULL TEST
 8016 020674  026764                              MT0999  ; 0 SEC         ;NULL TEST
 8017 020676  026764                              MT0999  ; 0 SEC         ;NULL TEST
 8018 020700  026764                              MT0999  ; 0 SEC         ;NULL TEST
```

```
                                        .SBTTL  PATTERNS

                                        .SBTTL  MEMORY TEST SETUP ROUTINES
                                MT0000: SUBTST  <<MT0000        SETUP DATA PATTERN TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0000  SETUP DATA PATTERN TEST
                                ;*****************************************************************************
                                        CLR     REALPAT                 ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
                                        MOV     #FIRST,R0
                                        MOV     #SIZE,R1
                                        CALL    REGCOPY
                                        CMP     #1,PROTYP               ;ARE WE ON AN 11/44?
                                        BEQ     1$                      ;BRANCH IF YES
                                        MOV         000,SUPDOADD        ;ELSE DO PATTERN IN MAIN MEMORY
                                        CALL        ?
                                        RETURN
                                1$:     BMOV    .... 000
                                        CALL    SUPD01                  ;DO IT IN SUPERVISOR MODE
                                        RETURN
                                MT0001: SUBTST  <<MT0001        SETUP ADDRESS TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0001  SETUP ADDRESS TEST
                                ;*****************************************************************************
                                        MOV     #1,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
                                        MOV     #FIRST,R0
                                        MOV     #SIZE,R1
                                        TST     NOSUPER
                                        BNE     2$
                                        CMP     SIPAR5,SIPAR6
                                        BNE     4$
                                        BR      3$
                                2$:     CMP     UIPAR5,UIPAR6
                                        BNE     4$
                                3$:     MOV     #30000,R1
                                4$:     CLR     R2
                                        CALL    REGCOPY
                                        CMP     #1,PROTYP               ;IS THIS AN 11/44?
                                        BEQ     1$                      ;BRANCH IF IT IS
                                        MOV     #MTP001,SUPDOADD        ;SET UP CALLING ADDRESS
                                        CALL    SUPD03
                                        RETURN
                                1$:     BMOV    MTP001
                                        CALL    SUPD01                  ;DO IT IN SUPERVISOR MODE
                                        RETURN
                                MT0002: SUBTST  <<MT0002        SETUP COMPLEMENT ADDRESS TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0002  SETUP COMPLEMENT ADDRESS TEST
                                ;*****************************************************************************
                                        MOV     #2,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
                                        MOV     #LAST+2,R0
                                        MOV     #SIZE,R1
                                        MOV     #FIRST,R4
                                        MOV     #100001,R5
                                        TST     NOSUPER
                                        BNE     2$
                                        CMP     SIPAR5,SIPAR6
                                        BNE     4$
```

```
 8068 021146  000404                          BR      3$
 8069 021150  023737  177652  177654  2$:     CMP     UIPAR5,UIPAR6
 8070 021156  001006                          BNE     4$
 8071 021160  012701  030000          3$:     MOV     #30000,R1
 8072 021164  012700  140000                  MOV     #140000,R0
 8073 021170  012705  120001                  MOV     #120001,R5
 8074 021174  012702  000001          4$:     MOV     #1,R2
 8075 021200  010103                          MOV     R1,R3
 8076 021202  022737  000001  003754          CMP     #1,PROTYP               ;IS THIS AN 11/44?
 8077 021210  001406                          BEQ     1$                      ;BRANCH IF TRUE
 8078 021212  012737  027462  002260          MOV     #MTP002,SUPDOADD        ;SET UP CALLING ADDRESS
 8079 021220  004737  027212                  CALL    SUPD03
 8080 021224  000207                          RETURN
 8081 021226                          1$:     BMOV    MTP002
 8082 021234  004737  027034                  CALL    SUPD01
 8083 021240  000207                          RETURN
```

```
8086 021242                                    MT0003: SUBTST  <<MT0003        SETUP 3 XOR 9 WORST CASE NOISE TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        MT0003  SETUP 3 XOR 9 WORST CASE NOISE TEST
                                                ;*****************************************************************************
8087 021242                                             IF EUFLAG IS TRUE THEN $RETURN
8088 021252  012737  000003  002276                      MOV     #3,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8089 021260  005037  002324                      CLR     PCBUMP                  ;TRAPS DO NOT ADD TO PC
8090 021264  004737  041106              1$:     CALL    FLIPWARN                ;SETUP WARNING CONSTANTS & R2
8091 021270  012701  060000              2$:     MOV     #FIRST,R1               ;R1 <-- STARTING ADDRESS
8092 021274  012703  020000                      MOV     #20000,R3
8093 021300  072327  177770                      ASH     #-8.,R3                 ;R3 <-- R3 / 256.
8094 021304  012702  000004                      MOV     #4,R2                   ;SMALL LOOP SIZE
8095 021310  012705  000100                      MOV     #64.,R5                 ;MEDIUM LOOP SIZE
8096 021314  022737  000001  003754              CMP     #1,PROTYP               ;IS THIS AN 11/44?
8097 021322  001415                              BEQ     3$                      ;BRANCH IF IT IS
8098 021324  104415                              SAVREG
8099 021326  012737  027514  002260              MOV     #MTPA03,SUPDOADD
8100 021334  004737  027212                      CALL    SUPD03                  ;DO IT IN MAIN MEMORY
8101 021340  104416                              RESREG
8102 021342  012737  027554  002260              MOV     #MTPB03,SUPDOADD
8103 021350  004737  027226                      CALL    SUPD04
8104 021354  000442                              BR      4$
8105 021356                              3$:     BMOV    MTPA03
8106 021364  104415                              SAVREG
8107 021366  004737  027034                      CALL    SUPD01
8108 021372                                      BMOV    MTPB03
8109 021400                                      BMOV    MTPC03,KDPAR0,8.
8110 021412                                      BMOV    MTPD03,SDPAR0,8.
8111 021424  012737  172360  177642              MOV     #KDPAR0,UIPAR1          ;SET UP PAR LINKS
8112 021432  012737  172260  172374              MOV     #SDPAR0,KDPAR6
8113 021440  012737  177644  172276              MOV     #UIPAR2,SDPAR7
8114 021446  012737  001032  172272              MOV     #1032,SDPAR5            ;CHANGE INST TO BR .+56 (BR TO KDPAR1)
8115 021454  104416                              RESREG
8116 021456  004737  027050                      CALL    SUPD02
8117 021462  022737  000003  002604      4$:     CMP     #3,FLIPLOC              ;DONE WITH 4 PATTERNS
8118                                                                             ;[(0,177777);(177777,0);(401,177777);(177777,401)]?
8119 021470  001275                              BNE     1$                      ;NO - LOOP
8120 021472  000207                              RETURN
8121
8122 021474                                    MT0004: SUBTST  <<MT0004        SETUP ROTATING ZEROS TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        MT0004  SETUP ROTATING ZEROS TEST
                                                ;*****************************************************************************
8123 021474  012737  000004  002276              MOV     #4,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8124 021502  012737  000004  002324              MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
8125 021510  013702  002602                      MOV     ONES,R2
8126 021514  004737  041236                      CALL    BACKGND                 ;WRITE BACKGROUND OF ONES
8127 021520  012700  060000                      MOV     #FIRST,R0
8128 021524  012701  040000                      MOV     #SIZE,R1
8129 021530  022737  000001  003754              CMP     #1,PROTYP               ;IS THIS AN 11/44?
8130 021536  001406                              BEQ     1$                      ;BRANCH IF IT IS
8131 021540  012737  027652  002260              MOV     #MTPA04,SUPDOADD        ;SET UP LINKS
8132 021546  004737  027226                      CALL    SUPD04
8133 021552  000207                              RETURN
8134 021554                              1$:     BMOV    MTPA04
8135 021562                                      BMOV    MTPB04,KDPAR0,8.
8136 021574  012737  172360  177652              MOV     #KDPAR0,UIPAR5
```

```
 8137 021602  012737  177654  172376          MOV     #UIPAR6,KDPAR7
 8138 021610  004737  027050                  CALL    SUPD02
 8139 021614  000207                          RETURN
 8140 021616                          MT0005: SUBTST  <<MT0005         SETUP ROTATING ONES TEST>>
                                      ;*****************************************************************************
                                      ;*SUBTEST        MT0005  SETUP ROTATING ONES TEST
                                      ;*****************************************************************************
 8141 021616  012737  000005  002276          MOV     #5,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 8142 021624  012737  000004  002324          MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
 8143 021632  005002                          CLR     R2
 8144 021634  004737  041236                  CALL    BACKGND                 ;WRITE BACKGROUND OF ZEROS
 8145 021640  012700  060000                  MOV     #FIRST,R0
 8146 021644  012701  040000                  MOV     #SIZE,R1
 8147 021650  022737  000001  003754          CMP     #1,PROTYP               ;IS THIS AN 11/44?
 8148 021656  001414                          BEQ     1$                      ;BRANCH IF IT IS
 8149 021660  012737  027726  002260          MOV     #MTP005,SUPD0ADD        ;SET UP LINKS
 8150 021666  012737  027742  027724          MOV     #MTP005+14,MTPB04+16
 8151 021674  004737  027226                  CALL    SUPD04
 8152 021700  012737  027666  027724          MOV     #MTPA04+14,MTPB04+16    ;RESET TEST'S ORIGINAL VALUE
 8153 021706  000207                          RETURN
 8154 021710                          1$:     BMOV    MTP005
 8155 021716                                  BMOV    MTPB04,KDPAR0,8.
 8156 021730  012737  172360  177652          MOV     #KDPAR0,UIPAR5
 8157 021736  012737  177654  172376          MOV     #UIPAR6,KDPAR7
 8158 021744  004737  027050                  CALL    SUPD02
 8159 021750  000207                          RETURN
```

```
 8162 021752                                    MT0006: SUBTST  <<MT0006        SETUP INITIAL DATA TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        MT0006  SETUP INITIAL DATA TEST
                                                ;*****************************************************************************
 8163 021752  012737  000006  002276                   MOV     #6,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 8164 021760  012737  000004  002324                   MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
 8165 021766  012701  002410                            MOV     #TESTADD,R1
 8166 021772  012737  027762  002260                   MOV     #MTP006,SUPDOADD
 8167 022000  004737  027212                            CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 8168 022004  000207                                    RETURN
 8169 022006                                    MT0007: SUBTST  <<MT0007        SETUP ADDRESS BIT TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        MT0007  SETUP ADDRESS BIT TEST
                                                ;*****************************************************************************
 8170 022006  012737  000007  002276                   MOV     #7,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 8171 022014  005002                                    CLR     R2
 8172 022016  004737  041236                            CALL    BACKGND                 ;OF ZEROS
 8173 022022  012701  060000                            MOV     #FIRST,R1
 8174 022026  012702  000001                            MOV     #1,R2
 8175 022032  050201                                    BIS     R2,R1
 8176 022034  012737  030162  002260                   MOV     #MTP007,SUPDOADD
 8177 022042  004737  027212                            CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 8178 022046  000207                                    RETURN
 8179 022050                                    MT0010: SUBTST  <<MT0010        SETUP BYTE ADDRESSING TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        MT0010  SETUP BYTE ADDRESSING TEST
                                                ;*****************************************************************************
 8180 022050  012737  000010  002276                   MOV     #10,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 8181 022056  012737  000004  002324                   MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
 8182 022064  013704  002410                            MOV     TESTADD,R4
 8183 022070  012737  030262  002260                   MOV     #MTP010,SUPDOADD
 8184 022076  004737  027212                            CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 8185 022102  000207                                    RETURN
```

```
 8188 022104                                    MT0011: SUBTST  <<MT0011        SETUP CREATE SINGLE BIT ERROR TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       MT0011  SETUP CREATE SINGLE BIT ERROR TEST
                                                ;*****************************************************************************
 8189 022104                                            IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
 8190 022120                                              IF $PASS NE #0 THEN $RETURN
 8191 022130                                            END; OF IF ACTFLAG
 8192 022130                                            IF PMEMFLG IS TRUE THEN $RETURN ;EXIT IF NOT MS11-M
 8193 022140  012737  000011  002276                    MOV     #11,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOJT & DISPLAY
 8194 022146  012737  030370  002260                    MOV     #MTP011,SUPDOADD
 8195 022154  004737  027212                            CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 8196 022160  000207                                    RETURN
 8197 022162                                    MT0012: SUBTST  <<MT0012        SETUP WRITE BYTE CLEARS SBE TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       MT0012  SETUP WRITE BYTE CLEARS SBE TEST
                                                ;*****************************************************************************
 8198 022162                                            IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
 8199 022176                                              IF $PASS NE #0 THEN $RETURN
 8200 022206                                            END; OF IF ACTFLAG
 8201 022206                                            IF PMEMFLG IS TRUE THEN $RETURN ;IS THIS A MS11-M?
 8202 022216  012737  000012  002276                    MOV     #12,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 8203 022224  013700  002102                            MOV     BANKINDEX,R0
 8204 022230                                            IF #BIT12 SET.IN CONFIG+2(R0)
 8205 022240  012705  040000                              MOV   #40000,R5
 8206 022244                                            ELSE
 8207 022246  012705  000002                              MOV   #2,R5
 8208 022252                                            END; OF IF #BIT12
 8209 022252  012737  031166  002260                    MOV     #MTP012,SUPDOADD
 8210 022260  004737  027212                            CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 8211 022264  000207                                    RETURN
 8212 022266                                    MT0013: SUBTST  <<MT0013        SETUP CREATE DOUBLE BIT ERROR TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       MT0013  SETUP CREATE DOUBLE BIT ERROR TEST
                                                ;*****************************************************************************
 8213 022266                                            IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
 8214 022302                                              IF $PASS NE #0 THEN $RETURN
 8215 022312                                            END; OF IF ACTFLAG
 8216 022312                                            IF PMEMFLG IS TRUE THEN $RETURN ;EXIT IF NOT MS11-M
 8217 022322  012737  000013  002276                    MOV     #13,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 8218 022330  012737  031554  002260                    MOV     #MTP013,SUPDOADD
 8219 022336  012737  000003  002074                    MOV     #3,NOPAR                ;INDICATE PARITY ACRION
 8220 022344  004737  027212                            CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 8221 022350  000207                                    RETURN
```

```
 8223 022352                                MT0014: SUBTST  <<MT0014        SETUP BASIC DOUBLE BIT ERROR TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MT0014  SETUP BASIC DOUBLE BIT ERROR TEST
                                            ;*****************************************************************************
 8224 022352                                        IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
 8225 022366                                          IF $PASS NE #0 THEN $RETURN
 8226 022376                                        END; OF IF ACTFLAG
 8227 022376                                        IF PMEMFLG IS FALSE THEN $RETURN ;EXIT IF NOT MS11-P
 8228 022406  012737  000014  002276               MOV     #14,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 8229 022414  004737  046720                        CALL  MAPKERNAL                 ;MAP KERNAL SPACE
 8230 022420                                        LET R1 := #100000               ;SETUP TEST ADDRESS
 8231 022424  004737  041336                        CALL GETCSR                     ;GET CSR INFO FROM CONFIGURATION TABLE
 8232 022430  004737  032270                        CALL MTP014                     ;DO BASIC DOUBLE BIT ERROR TEST
 8233 022434  004737  047006                        CALL  UNMAP                     ;UNMAP KERNAL SPACE
 8234 022440  000207                                RETURN
```

```
                                MT0015: SUBTST  <<MT0015        SETUP WRITE INHIBIT OF BYTE WITH DBE>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0015  SETUP WRITE INHIBIT OF BYTE WITH DBE
                                ;*****************************************************************************
                                        IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
                                          IF $PASS NE #0 THEN $RETURN
                                        END ;OF IF ACTFLAG
                                        IF PMEMFLG IS TRUE THEN $RETURN ;EXIT IF NOT MS11-M
                                        MOV     #15,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
                                        MOV     #MTP015,SUPDOADD
                                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
                                        RETURN
                                MT0016: SUBTST  <<MT0016        SETUP WRITE INHIBIT OF WORD WITH DBE>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0016  SETUP WRITE INHIBIT OF WORD WITH DBE
                                ;*****************************************************************************
                                        IF PMEMFLG IS TRUE THEN $RETURN ;EXIT IF NOT MS11-M
                                        IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
                                          IF $PASS NE #0 THEN $RETURN
                                        END ;OF IF ACTFLAG
                                        MOV     #16,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
                                        MOV     #MTP016,SUPDOADD
                                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
                                        RETURN
                                MT0017: SUBTST  <<MT0017        SETUP HOLDING 1'S & 0'S>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0017  SETUP HOLDING 1'S & 0'S
                                ;*****************************************************************************
                                        MOV     #17,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
                                        MOV     #MTP017,SUPDOADD
                                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
                                        RETURN
```

8237	022442				
8238	022442				
8239	022456				
8240	022466				
8241	022466				
8242	022476	012737	000015	002276	
8243	022504	012737	032514	002260	
8244	022512	004737	027212		
8245	022516	000207			
8246	022520				
8247	022520				
8248	022530				
8249	022544				
8250	022554				
8251	022554	012737	000016	002276	
8252	022562	012737	033260	002260	
8253	022570	004737	027212		
8254	022574	000207			
8255	022576				
8256	022576	012737	000017	002276	
8257	022604	012737	034042	002260	
8258	022612	004737	027212		
8259	022616	000207			

```
8262 022620                          MT0020: SUBTST  <<MT0020        SETUP SYNDROMES TO CSR ON SINGLE BIT ERROR>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MT0020  SETUP SYNDROMES TO CSR ON SINGLE BIT ERROR
                                     ;*****************************************************************************
8263 022620                                  IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
8264 022634                                    IF $PASS NE #0 THEN $RETURN
8265 022644                                  END; OF IF ACTFLAG
8266 022644  012737  000020  002276          MOV     #20,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8267 022652                                  IF PMEMFLG IS FALSE THEN $RETURN ;EXIT IF NOT MS11-P
8268 022662  004737  046720                  CALL  MAPKERNAL                 ;MAP KERNAL SPACE
8269 022666                                  LET R1 := #100000               ;SETUP TEST ADDRESS
8270 022672  004737  041336                  CALL GETCSR                     ;GET CSR INFO FROM CONFIGURATION TABLE
8271 022676  004737  034120                  CALL MTP020                     ;DO SYNDROMES TO CSR ON SINGLE ERROR TEST
8272 022702  004737  047006                  CALL  UNMAP                     ;UNMAP KERNAL SPACE
8273 022706  000207                         RETURN
```

```
8275 022710                                MT0021: SUBTST  <<MT0021        SETUP MARCHING 0'S & 1'S TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MT0021  SETUP MARCHING 0'S & 1'S TEST
                                           ;*****************************************************************************
8276 022710                                        SET NOSCOPE
8277 022716  012737  000021  002276               MOV     #21,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8278 022724  013702  002620                        MOV     BAKPAT,R2
8279 022730  004737  041236                        CALL    BACKGND
8280 022734  010203                                MOV     R2,R3
8281 022736  000303                                SWAB    R3
8282 022740  012701  160000                        MOV     #LAST+2,R1
8283 022744  010105                                MOV     R1,R5
8284 022746  012704  060000                        MOV     #FIRST,R4
8285 022752  022737  000001  003754               CMP     #1,PROTYP       ;IS THIS AN 11/44?
8286 022760  001441                               BEQ     1$              ;BRANCH IF IT IS
8287 022762  022737  000003  003754               CMP     #3,PROTYP       ;IS THIS AN 11/24?
8288 022770  001407                               BEQ     3$              ;BRANCH IF SO
8289 022772  022737  000007  002100               CMP     #7,BANK
8290 023000  001003                               BNE     3$
8291 023002  012701  140000                        MOV     #140000,R1
8292 023006  010105                                MOV     R1,R5
8293 023010  012737  034434  002260  3$:          MOV     #MTPA21,SUPDOADD
8294 023016  004737  027212                        CALL    SUPDO3
8295 023022  012737  034464  002260               MOV     #MTPB21,SUPDOADD
8296 023030  004737  027226                        CALL    SUPDO4
8297 023034  010401                                MOV     R4,R1
8298 023036  012737  034520  002260               MOV     #MTPC21,SUPDOADD
8299 023044  004737  027226                        CALL    SUPDO4
8300 023050  012737  034554  002260               MOV     #MTPD21,SUPDOADD
8301 023056  004737  027226                        CALL    SUPDO4
8302 023062  000434                               BR      2$
8303 023064  022737  000177  002100  1$:          CMP     #177,BANK
8304 023072  001003                               BNE     4$
8305 023074  012701  140000                        MOV     #140000,R1
8306 023100  010105                                MOV     R1,R5
8307 023102                             4$:        BMOV    MTPA21
8308 023110  004737  027034                        CALL    SUPDO1
8309
8310 023114                                        BMOV    MTPB21
8311 023122  004737  027050                        CALL    SUPDO2
8312
8313 023126  010401                                MOV     R4,R1
8314 023130                                        BMOV    MTPC21
8315 023136  004737  027050                        CALL    SUPDO2
8316
8317 023142                                        BMOV    MTPD21
8318 023150  004737  027050                        CALL    SUPDO2
8319 023154  005037  002436             2$:        CLR     NOSCOPE
8320 023160  000207                               RETURN
```

```
8322 023162                                MT0022: SUBTST  <<MT0022        SETUP REFRESH & SHIFTING DIAGONAL TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MT0022  SETUP REFRESH & SHIFTING DIAGONAL TEST
                                           ;*****************************************************************************
8323 023162  004737  027000                        CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
8324 023166                                        ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
8325 023172  012737  000022  002276                MOV     #22,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8326 023200  012737  034604  002260                MOV     #MTP022,SUPDOADD
8327 023206  004737  027212                        CALL    SUPDO3                  ;DO IT IN SUPERVISOR MODE
8328 023212  000207                               RETURN
8329
8330 023214                                MT0023: SUBTST  <<MT0023        SHIFTING DIAGONAL TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MT0023  SHIFTING DIAGONAL TEST
                                           ;*****************************************************************************
8331 023214  004737  027000                        CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
8332 023220                                        ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
8333 023224  012737  000023  002276                MOV     #23,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8334 023232  012737  034604  002260                MOV     #MTP022,SUPDOADD
8335 023240                                        SET     DIAGFLAG                ;IDENTIFY DIAGONAL TEST TO MTP022
8336 023246  004737  027212                        CALL    SUPDO3                  ;DO IT IN SUPERVISOR MODE
8337 023252  005037  002002                        CLR     DIAGFLAG
8338 023256  000207                               RETURN
```

```
                                        MT0024: SUBTST  <<MT0024        SETUP FAST GALLOPING PATTERN TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0024  SETUP FAST GALLOPING PATTERN TEST
                                        ;*****************************************************************************
8341 023260  004737  027000             CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
8342 023264                             ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
8343 023270                             SET     NOSCOPE
8344 023276  012737  000024  002276     MOV     #24,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8345 023304  013702  002620             MOV     BAKPAT,R2
8346 023310  004737  041236             CALL    BACKGND
8347 023314  010203                     MOV     R2,R3
8348 023316  010304                     MOV     R3,R4
8349 023320  000304                     SWAB    R4
8350 023322  012701  060000             MOV     #FIRST,R1
8351 023326  012705  157776             MOV     #LAST,R5
8352 023332  022737  000001  003754     CMP     #1,PROTYP
8353 023340  001417                     BEQ     1$
8354 023342  022737  000003  003754     CMP     #3,PROTYP
8355 023350  001406                     BEQ     3$
8356 023352  022737  000007  002100     CMP     #7,BANK
8357 023360  001002                     BNE     3$
8358 023362  012705  137776             MOV     #137776,R5
8359 023366  104415              3$:    SAVREG
8360 023370  012737  035320  002260     MOV     #MTPB24,SUPDOADD
8361 023376  000440                     BR      2$
8362 023400  022737  000177  002554 1$: CMP     #177,LASTBANK
8363 023406  001002                     BNE     4$
8364 023410  012705  137776             MOV     #137776,R5
8365 023414  104415              4$:    SAVREG
8366 023416                             BMOV    MTPA24
8367 023424                             BMOV    MTPB24,SDPAR0,8.
8368 023436                             BMOV    MTPC24,KDPAR0,8.
8369 023450  012737  172260  002260     MOV     #SDPAR0,SUPDOADD
8370 023456  012737  172260  177676     MOV     #SDPAR0,UDPAR7          ;SET UP PAR LINKS
8371 023464  012737  172360  172272     MOV     #KDPAR0,SDPAR5
8372 023472  012737  177660  172374     MOV     #UDPAR0,KDPAR6
8373 023500  004737  027226         2$: CALL    SUPD04
8374
8375                                    ;DO IT AGAIN FOR COMPLEMENT DATA
8376 023504  104416                     RESREG
8377 023506  000302                     SWAB    R2
8378 023510  000303                     SWAB    R3
8379 023512  004737  027226             CALL    SUPD04
8380 023516  005037  002436             CLR     NOSCOPE
8381 023522  000207                     RETURN
8382 023524                         MT0025: SUBTST  <<MT0025        SETUP INTERRUPT ENABLE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0025  SETUP INTERRUPT ENABLE TEST
                                        ;*****************************************************************************
8383 023524                             IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
8384 023540                               IF $PASS NE #0 THEN $RETURN
8385 023550                             END ;OF IF ACTFLAG
8386 023550                             IF PMEMFLG IS TRUE THEN $RETURN ;EXIT IF NOT MS11-P
8387 023560  012737  000025  002276     MOV     #25,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8388 023566  012737  035352  002260     MOV     #MTP025,SUPDOADD
8389 023574  004737  027212             CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
8390 023600  000207                     RETURN
```

```
 8393 023602                                MT0026: SUBTST  <<MT0026        SETUP RANDOM DATA TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MT0026  SETUP RANDOM DATA TEST
                                            ;*****************************************************************************
 8394 023602  012737  000026  002276               MOV     #26,REALPAT
 8395 023610  005037  002324                       CLR     PCBUMP                  ;TRAPS DO NOT ADD TO THE PC
 8396 023614  013703  002572                       MOV     SEEDLO,R3               ;INITIALIZE RANDOM NUMBERS
 8397 023620  013702  002570                       MOV     SEEDHI,R2
 8398 023624  010305                               MOV     R3,R5
 8399 023626  010204                               MOV     R2,R4
 8400 023630  012701  060000                       MOV     #FIRST,R1
 8401 023634  012700  020000                       MOV     #SIZE/2,R0
 8402 023640  022737  000001  003754               CMP     #1,PROTYP               ;DO WE HAVE AN 11/44?
 8403 023646  001437                               BEQ     1$                      ;BRANCH IF WE DO
 8404 023650  022737  000003  003754               CMP     #3,PROTYP               ;11/24?
 8405 023656  001406                               BEQ     3$                      ;BRANCH IF SO
 8406 023660  022737  000007  002100               CMP     #7,BANK
 8407 023666  001002                               BNE     3$
 8408 023670  012700  014000                       MOV     #14000,R0
 8409 023674  104415                      3$:      SAVREG
 8410 023676  012737  036024  036124               MOV     #MTPA26+4,MTPD26+14
 8411 023704  012737  036020  002260               MOV     #MTPA26,SUPDOADD
 8412 023712  004737  027212                       CALL    SUPD03
 8413 023716  005037  036050                       CLR     RANODD                  ;FOR ERROR REPORTING
 8414 023722  012737  036040  036124               MOV     #MTPB26+4,MTPD26+14     ;SET UP NEXT LINK
 8415 023730  012737  036034  002260               MOV     #MTPB26,SUPDOADD
 8416 023736  104416                               RESREG
 8417 023740  004737  027212                       CALL    SUPD03
 8418 023744  000452                               BR      2$
 8419 023746  022737  000177  002100      1$:      CMP     #177,BANK
 8420 023754  001002                               BNE     4$
 8421 023756  012700  014000                       MOV     #14000,R0
 8422 023762  104415                      4$:      SAVREG
 8423 023764                                       BMOV    MTPA26                  ;WRITE ROUTINE TO FAST MEMORY
 8424 023772                                       BMOV    MTPC26,KDPAR0,8.        ;RANDOM SUBPROGRAM TO FAST MEMORY
 8425 024004  012737  000730  172376               MOV     #730,KDPAR7             ;WRITES 'BR .-116'' IN (BR SDPAR0)
 8426 024012                                       BMOV    MTPD26,SDPAR0,8.        ;RANDOM SUBSUBPROGRAM TO FAST MEMORY
 8427 024024  012737  172360  177642               MOV     #KDPAR0,UIPAR1
 8428 024032  012737  177644  172274               MOV     #UIPAR2,SDPAR6
 8429 024040  004737  027034                       CALL    SUPD01                  ;WRITE RANDOM DATA
 8430 024044  005037  036050                       CLR     RANODD                  ;FOR ERROR REPORTING
 8431 024050                                       BMOV    MTPB26                  ;READ ROUTINE TO FAST MEMORY
 8432 024056  012737  172360  177642               MOV     #KDPAR0,UIPAR1          ;SET UP PAR LINK
 8433 024064  104416                               RESREG
 8434 024066  004737  027034                       CALL    SUPD01                  ;READ RANDOM DATA
 8435 024072  010337  002572              2$:      MOV     R3,SEEDLO               ;UPDATE FOR NEW RANDOM NUMBERS
 8436 024076  010237  002570                       MOV     R2,SEEDHI
 8437 024102  000207                               RETURN
```

```
8440 024104                                 MT0027: SUBTST  <<MT0027        UNIQUE BANK TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MT0027  UNIQUE BANK TEST
                                            ;*****************************************************************************
8441                                                ;MAKE SURE THAT EACH BANK CAN HAVE UNIQUE DATA
8442                                                ;WRITE AND READ THE BANK NUMBER IN EACH BANK (EXCEPT WHERE THE PROGRAM IS)
8443 024104  012737  000027  002276                 MOV     #27,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8444 024112  104502                                 CLRCSR                  ;CLEAR CSRS
8445 024114  022737  000001  003754                 CMP     #1,PROTYP               ;IS THIS AN 11/44?
8446 024122  001404                                 BEQ     1$                      ;BRANCH IF TRUE
8447 024124  012737  027212  002520                 MOV     #SUPD03,LINK1           ;SET UP LINK
8448 024132  000414                                 BR      STAR27                  ;BRANCH TO RUN
8449 024134                                 1$:     BMOV    MTP034
8450 024142  012737  177646  002260         WARN7:  MOV     #UIPAR3,SUPDOADD
8451 024150  012737  027034  002520                 MOV     #SUPD01,LINK1           ;SET UP LINK
8452 024156                                         SET NOFSMODE
8453 024164                                 STAR27: FOR I := #1 TO #2
8454 024172                                           FOR BANK := #0 TO LASTBANK
8455 024176  004737  047032                             CALL EXBANK
8456 024202                                             IF ACFLAG IS TRUE AND RRFLAG IS FALSE
8457 024216  104511                                       INVALIDATE            ;INVALIDATE BACKGROUND PATTERN ON 'BANK''
8458 024220                                               LET R2 := BANK
8459 024224  012700  060000                               MOV       #FIRST,R0
8460 024230  010004                                       MOV       R0,R4
8461 024232  012701  040000                               MOV       #SIZE,R1
8462 024236  010103                                       MOV       R1,R3
8463 024240                                               IF I EQ #1
8464 024250  022737  000001  003754                         CMP     #1,PROTYP
8465 024256  001403                                         BEQ     2$
8466 024260  012737  036344  002260                         MOV     #MTP034,SUPDOADD
8467 024266  004777  156226                           2$: CALL    @LINK1
8468 024272                                             END ;OF IF
8469 024272                                             IF I EQ #2
8470 024302  022737  000001  003754                       CMP     #1,PROTYP
8471 024310  001403                                       BEQ     3$
8472 024312  012737  036352  002260                       MOV     #MTP034+6,SUPDOADD
8473 024320  004737  027212                           3$: CALL    SUPD03
8474 024324                                             END ;OF IF
8475 024324                                           END ;OF IF
8476 024324                                         END ;OF FOR BANK
8477 024340                                       END ;OF FOR I
8478 024354                                       IF FS7FLAG IS TRUE
8479 024362  005037  002424                         CLR   NOFSMODE
8480 024366  000207                                 RETURN
8481 024370                                       END ;OF IF FS7FLAG
8482 024370                                       FOR I := #1 TO #2
8483 024376                                         FOR BANK := LASTBANK DOWNTO #0
8484 024404  004737  047032                           CALL EXBANK
8485 024410                                           IF ACFLAG IS TRUE AND RRFLAG IS FALSE
8486 024424                                             LET R2 := BANK
8487 024430  005102                                     COM       R2
8488 024432  012700  060000                             MOV       #FIRST,R0
8489 024436  010004                                     MOV       R0,R4
8490 024440  012701  040000                             MOV       #SIZE,R1
8491 024444  010103                                     MOV       R1,R3
8492 024446                                             IF I EQ #1
8493 024456  022737  000001  003754                       CMP     #1,PROTYP
```

```
8494 024464  001403                                  BEQ     4$
8495 024466  012737  036344  002260                  MOV     #MTP034,SUPDOADD
8496 024474  004777  156020                        4$: CALL    @LINK1
8497 024500                                        END ;OF IF
8498 024500                                        IF I EQ #2
8499 024510  022737  000001  003754                  CMP     #1,PROTYP
8500 024516  001403                                  BEQ     5$
8501 024520  012737  036352  002260                  MOV     #MTP034+6,SUPDOADD
8502 024526  004737  027212                        5$: CALL    SUPD03
8503 024532                                        END ;OF IF
8504 024532                                      END ;OF IF
8505 024532                                    END ;OF FOR BANK
8506 024546                                  END ;OF FOR I
8507 024562  005037  002424                  CLR     NOFSMODE
8508 024566  000207                        RETURN
```

```
8511 024570                          MT0030: SUBTST  <<MT0030        SETUP FLUSH OUT DBE'S TEST>>
                                     ;*************************************************************************
                                     ;*SUBTEST        MT0030  SETUP FLUSH OUT DBE'S TEST
                                     ;*************************************************************************
8512 024570  005037  002262                  CLR     PASFLG
8513 024574                                  SET     FULLREL
8514 024602  012737  000030  002276  MTA030: MOV     #30,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8515 024610  012737  000001  002074          MOV     #1,NOPAR                ;INDICATE COUNT PARITY ERRORS
8516 024616  022737  000001  003754          CMP     #1,PROTYP
8517 024624  001007                          BNE     4$
8518 024626                                  BMOV    MTP030
8519 024634  012737  027034  002520          MOV     #SUPD01,LINK1
8520 024642  000406                          BR      1$
8521 024644  012737  027212  002520  4$:     MOV     #SUPD03,LINK1
8522 024652  012737  036126  002260          MOV     #MTP030,SUPDOADD
8523 024660  104470                  1$:     ECCDIS                          ;DISABLE ERROR CORRECTION
8524 024662                                  SET     NOFSMODE,NOSCOPE
8525 024676                                  FOR BANK := #0 TO LASTBANK
8526 024702  004737  047032                    CALL  EXBANK
8527 024706                                    IF MKFLAG IS TRUE
8528 024714                                      IF ACFLAG IS TRUE AND RRFLAG IS FALSE
8529 024730  012701  040000                        MOV       #SIZE,R1
8530 024734  012700  060000                        MOV       #FIRST,R0
8531 024740  004777  155554                        CALL      @LINK1
8532 024744                                      END ;OF IF ACFLAG
8533 024744                                    END ;OF IF MKFLAG
8534 024744                                  END ;OF FOR
8535 024760                                  IF PASFLG IS FALSE
8536 024766                                    SET PASFLG
8537 024774  104502                          CLRCSR                          ;CLEAR CSRS
8538 024776  004737  045204                  CALL  RELOCATE
8539 025002                                  ON.ERROR
8540 025004  104472                            ECCINIT                 ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
8541 025006                                    CLEAR       NOFSMODE,NOSCOPE,FULLREL
8542 025022  000207                            RETURN
8543 025024                                  END ;OF ON.ERROR
8544 025024  013737  002306  002100          MOV   NEWBANK,BANK
8545 025032  004737  047032                  CALL  EXBANK
8546 025036  004737  024602                  CALL  MTA030
8547 025042  104472                          ECCINIT                 ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
8548 025044  004737  046070                  CALL  UNRELOCATE
8549 025050  000207                          RETURN
8550 025052                                END ;OF IF PASFLG
8551 025052  104472                        ECCINIT                 ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
8552 025054                                CLEAR   NOFSMODE,NOSCOPE,FULLREL
8553 025070  000207                        RETURN
```

```
8556 025072                                MT0031: SUBTST  <<MT0031        SETUP SOB-A-LONG TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MT0031  SETUP SOB-A-LONG TEST
                                           ;*****************************************************************************
8557 025072  004737  027000                        CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
8558 025076                                        ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
8559 025102                                        SET     NOSCOPE
8560 025110  012737  000031  002276                MOV     #31,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8561 025116  005037  002074                        CLR     NOPAR                   ;SETUP PARITY ACTION
8562 025122                                        MAP     BANK                    ;MAP FIRST SO BLOCK MOVE WORKS
8563 025136                                        TESTAREA                        ;ENTER TEST MODE
8564 025144                                        BMOV    MTP031,FIRST,SOBLENGTH/2
8565 025156  104417                                KERNEL                          ;ENTER KERNEL MODE
8566 025160  013702  002560                        MOV     SOBK,R2
8567 025164  010200                                MOV     R2,R0
8568 025166  012701  100776                        MOV     #100776,R1              ;COMPLEMENT OF INSTRUCTION "SOB R0,DOT"
8569 025172  012705  060056                        MOV     #FIRST+SOBLENGTH,R5
8570 025176  012737  060002  002260                MOV     #FIRST+2,SUPDOADD
8571 025204  012737  160000  002520                MOV     #LAST+2,LINK1
8572 025212  005737  002454                        TST     NOSUPER
8573 025216  001005                                BNE     1$
8574 025220  023737  172252  172254                CMP     SIPAR5,SIPAR6
8575 025226  001405                                BEQ     2$
8576 025230  000407                                BR      3$
8577 025232  023737  177652  177654  1$:           CMP     UIPAR5,UIPAR6
8578 025240  001003                                BNE     3$
8579 025242  012737  140000  002520  2$:           MOV     #140000,LINK1
8580 025250  004737  027226          3$:           CALL    SUPD04
8581 025254  005037  002436                        CLR     NOSCOPE
8582 025260  000207                                RETURN
```

```
8585 025262                                    MT0032: SUBTST  <<MT0032        SETUP WRITE RECOVERY TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       MT0032  SETUP WRITE RECOVERY TEST
                                                ;*****************************************************************************
8586 025262  004737  027000                            CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
8587 025266                                            ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
8588 025272                                            SET     NOSCOPE
8589 025300  012737  000032  002276                    MOV     #32,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8590 025306  005037  002074                            CLR     NOPAR                   ;SETUP PARITY ACTION
8591 025312                                            MAP     BANK                    ;MAP FIRST SO THAT THE BLOCK MOVE WORKS
8592 025326  012700  010247                            MOV     #10247,R0               ;OP CODE OF INSTRUCTION 'MOV    R2,-(PC)''
8593 025332  012701  177667                            MOV     #177667,R1              ;OP CODE OF COMPLEMENT OF INSTRUCTION ''JMP (R0)''
8594 025336  012702  020000                            MOV     #SIZE/2,R2              ;USED FOR 1/2 BANK LOOP
8595 025342  010237  002520                            MOV     R2,LINK1
8596 025346  012703  060000                            MOV     #FIRST,R3
8597 025352  012704  160000                            MOV     #LAST+2,R4
8598 025356  005037  002522                            CLR     LINK2
8599 025362  005737  002454                            TST     NOSUPER
8600 025366  001005                                    BNE     1$
8601 025370  023737  172252  172254                    CMP     SIPAR5,SIPAR6
8602 025376  001405                                    BEQ     2$
8603 025400  000415                                    BR      3$
8604 025402  023737  177652  177654  1$:               CMP     UIPAR5,UIPAR6
8605 025410  001011                                    BNE     3$
8606 025412  012704  140000          2$:               MOV     #140000,R4
8607 025416  012702  014000                            MOV     #14000,R2
8608 025422  010237  002520                            MOV     R2,LINK1
8609 025426  012737  000001  002522                    MOV     #1,LINK2
8610
8611 025434                                    3$:     TESTAREA                        ;ENTER TEST MODE
8612                                                    ;MOVE TEST TO MEMORY UNDER TEST
8613 025442  010023                            4$:     MOV     R0,(R3)+
8614 025444  010144                                    MOV     R1,-(R4)
8615 025446  077203                                    SOB     R2,4$
8616
8617 025450  022737  000001  003754                    CMP     #1,PROTYP
8618 025456  001003                                    BNE     5$
8619                                                    ;MOVE LAST PART OF TEST TO FASTCITY
8620 025460                                            BMOV    MTP032
8621 025466  104417                            5$:     KERNEL                          ;ENTER KERNEL MODE
8622
8623 025470  012702  005141                            MOV     #5141,R2                ;OP CODE OF INSTRUCTION ''COM    -(R1)''
8624 025474  012700  025612                            MOV     #10$,R0                 ;ADDRESS TO RETURN TO IN R0
8625 025500  012701  160000                            MOV     #LAST+2,R1              ;TOP OF BANK
8626 025504  012737  060000  002260                    MOV     #FIRST,SUPDOADD
8627 025512  005737  002522                            TST     LINK2
8628 025516  001402                                    BEQ     6$
8629 025520  012701  140000                            MOV     #140000,R1
8630 025524  004737  027226                    6$:     CALL    SUPD04
8631 025530  012703  020000                            MOV     #SIZE/2,R3
8632 025534  012705  000110                            MOV     #110,R5
8633 025540  012704  060000                            MOV     #FIRST,R4
8634 025544  005737  002522                            TST     LINK2
8635 025550  001402                                    BEQ     7$
8636 025552  012703  014000                            MOV     #14000,R3
8637 025556  022737  000001  003754    7$:             CMP     #1,PROTYP
8638 025564  001406                                    BEQ     8$
```

```
8639 025566  012737  036214  002260          MOV     #MTP032,SUPDOADD
8640 025574  004737  027226                  CALL    SUPD04
8641 025600  000402                          BR      9$
8642 025602  004737  027050          8$:     CALL    SUPD02
8643 025606  005037  002436          9$:     CLR     NOSCOPE
8644 025612  000207                  10$:    RETURN                  ;THIS RETURN ACTS AS A NORMAL RETURN FROM MT0032
8645                                                                 ;ALSO A RETURN FROM THE ''CALL   SUPD04'' ABOVE
8646
```

```
8649 025614                                MT0033: SUBTST  <<MT0033        SETUP BRANCH GOBBLE TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MT0033  SETUP BRANCH GOBBLE TEST
                                           ;*****************************************************************************
8650 025614  004737  027000                        CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
8651 025620                                        ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
8652 025624                                        SET     NOSCOPE
8653 025632  012737  000033  002276                MOV     #33,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
8654 025640  005037  002074                        CLR     NOPAR                   ;SETUP PARITY ACTION
8655 025644                                        MAP     BANK                    ;MAP FIRST SO THAT BLOCK MOVE WORKS
8656
8657 025660                                        TESTAREA                ;ENTER TEST MODE
8658 025666                                        BMOV    MTP033,FIRST,GBLENGTH/2
8659 025700  104417                                KERNEL                  ;ENTER KERNEL MODE
8660
8661 025702  012705  060076                        MOV     #FIRST+GBLENGTH,R5
8662 025706  012737  060004  002260                MOV     #FIRST+4,SUPDOADD
8663 025714  012701  060002                        MOV     #FIRST+2,R1
8664 025720  012702  060003                        MOV     #FIRST+3,R2
8665 025724  012737  160000  002520                MOV     #LAST+2,LINK1
8666 025732  005737  002454                        TST     NOSUPER
8667 025736  001005                                BNE     1$
8668 025740  023737  172252  172254                CMP     SIPAR5,SIPAR0
8669 025746  001405                                BEQ     2$
8670 025750  000407                                BR      3$
8671 025752  023737  177652  177654  1$:           CMP     UIPAR5,UIPAR6
8672 025760  001003                                BNE     3$
8673 025762  012737  140000  002520  2$:           MOV     #140000,LINK1
8674
8675 025770  004737  027226          3$:           CALL    SUPD04
8676 025774  005037  002436                        CLR     NOSCOPE
8677 026000  000207                                RETURN
8678
8679 026002                                MT0034: SUBTST  <<MT0034        SOFT ERROR - BACKGROUND PATTERN TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MT0034  SOFT ERROR - BACKGROUND PATTERN TEST
                                           ;*****************************************************************************
8680 026002  012737  000034  002276                MOV     #34,REALPAT
8681 026010  012700  060000                        MOV     #FIRST,R0
8682 026014  012701  040000                        MOV     #SIZE,R1
8683 026020  013702  002606                        MOV     SOFTPAT,R2
8684 026024  010103                                MOV     R1,R3
8685 026026  013705  002102                        MOV     BANKINDEX,R5
8686 026032  010004                                MOV     R0,R4
8687 026034  022737  000001  003754                CMP     #1,PROTYP               ;IS THIS AN 11/44?
8688 026042  001006                                BNE     1$                      ;BRANCH IF NOT
8689 026044                                        BMOV    MTP034
8690 026052  012737  177646  002260                MOV     #UIPAR3,SUPDOADD
8691 026060                                1$:     IF #BIT13 SET.IN CONFIG+2(R5)
8692                                                  ;BACKGROUND PATTERN IS VALID
8693 026070  022737  000001  003754                  CMP   #1,PROTYP
8694 026076  001403                                  BEQ   2$
8695 026100  012737  036352  002260                  MOV   #MTP034+6,SUPDOADD
8696 026106  004737  027212          2$:             CALL  SUPD03                  ;READ IT
8697 026112                                        ELSE
8698                                                  ;BACKGROUND PATTERN HAS BEEN INVALIDATED
8699 026114  022737  000001  003754                  CMP   #1,PROTYP
```

```
8700 026122  001406                          BEQ   3$
8701 026124  012737  036344  002260          MOV   #MTP034,SUPDOADD
8702 026132  004737  027212                  CALL  SUPDO3
8703 026136  000402                          BR    4$
8704 026140  004737  027034          3$:     CALL  SUPDO1                    ;WRITE IT
8705 026144  052765  020000  002654  4$:     BIS   #BIT13,CONFIG+2(R5)       ;VALIDATE IT
8706 026152                                 END :OF IF #BIT13
8707 026152  000207                         RETURN
8708
8709 026154                                 MT0035: SUBTST  <<MT0035        SETUP WORST CASE NOISE PARITY TEST>>
                                            ;*****************************************************************
                                            ;*SUBTEST       MT0035  SETUP WORST CASE NOISE PARITY TEST
                                            ;*****************************************************************
8710 026154  012737  000035  002276          MOV     #35,REALPAT             ;SET UP TEST NUMBER FOR DISPLAY
8711 026162  013703  002102                  MOV     BANKINDEX,R3
8712 026166  016301  002652                  MOV     CONFIG(R3),R1
8713 026172  000301                          SWAB    R1
8714 026174  042701  177760                  BIC     #^C17,R1
8715 026200  006301                          ASL     R1
8716 026202  010137  002150                  MOV     R1,CSRNO
8717 026206  023737  002150  002530          CMP     CSRNO,PGMCSR
8718 026214  001001                          BNE     1$
8719 026216  000207                          RETURN
8720 026220  012702  052524          1$:     MOV     #52524,R2
8721 026224  004737  041236                  CALL    BACKGND                 ;WRITE BACKROUND OF ALMOST ALT. 1'S AND 0'S
8722 026230  012737  036370  002260          MOV     #MTP035,SUPDOADD
8723 026236  004737  027212                  CALL    SUPDO3
8724 026242                                  IF QVFLAG IS TRUE THEN $RETURN
8725 026252  005102                          COM     R2
8726 026254  004737  041236                  CALL    BACKGND                 ;WRITE COMPLEMENT PATTERN INTO MUT
8727 026260  004737  027226                  CALL    SUPDO4
8728 026264  000207                         RETURN
```

```
 8730 026266                                MT0036: SUBTST  <<MT0036        SETUP CORRECTION CODE TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MT0036  SETUP CORRECTION CODE TEST
                                            ;*****************************************************************************
 8731 026266                                        IF PMEMFLG IS FALSE THEN $RETURN ;IF NOT MS11-P THEN EXIT
 8732 026276  012737  000036  002276                MOV     #36,REALPAT             ;SET UP TEST NUMBER FOR TYPEOUT AND DISPLAY
 8733 026304  004737  041336                        CALL    GETCSR                  ;GET CSR INFO FROM CONFIG TABLE
 8734 026310  005037  002262                        CLR     PASFLG                  ;CLEAR LOOP COUNTER
 8735 026314  005000                                CLR     R0                      ;GET TEST DATA
 8736 026316  012701  100000                        MOV     #100000,R1              ;GET FIRST ADDRESS IN BANK
 8737 026322  004737  046720                        CALL    MAPKERNAL               ;MAP KIPARS AND 6 TO BANK
 8738 026326  004737  036532                        CALL    MTP036                  ;EXECUTE TEST
 8739 026332  004737  047006                        CALL    UNMAP                   ;REMAP KERNAL SPACE
 8740 026336  000207                                RETURN
```

```
8742 026340                          MT0037: SUBTST  <<MT0037        SETUP ECC DISABLE TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MT0037  SETUP ECC DISABLE TEST
                                     ;*****************************************************************************
8743 026340                                  IF PMEMFLG IS FALSE THEN $RETURN ;RETURN IF NOT A MS11-P
8744 026350  012737  000037  002276          MOV     #37,REALPAT             ;SETUP PATTERN AND NUMBER FOR TYPEOUT AND DISPLAY
8745 026356  012701  100000                  MOV     #100000,R1              ;SET UP TEST ADDRESS
8746 026362  005000                          CLR     R0                      ;CLEAR DATA TO BE WRITTEN
8747 026364  004737  046720                  CALL    MAPKERNAL               ;MAP THIS TEST TO KERNEL SPACE
8748 026370  004737  041336                  CALL    GETCSR                  ;GET CSRINFO FROM CONFIG TABLE
8749 026374  004737  036756                  CALL    MTP037                  ;CHECK ECC DISABLE
8750 026400  004737  047006                  CALL    UNMAP                   ;REMAP KERNEL SPACE
8751 026404  000207                          RETURN
8752
8753
8754 026406                          MT0040: SUBTST  <<MT0040        >>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MT0040
                                     ;*****************************************************************************
8755 026406  000207                          RETURN                          ;
```

```
 8757 026410                            MT0041: SUBTST  <<MT0041        SETUP ADDRESS TO CSR ON DOUBLE BIT ERROR TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0041  SETUP ADDRESS TO CSR ON DOUBLE BIT ERROR TEST
                                        ;*****************************************************************************
 8758 026410                                    IF PMEMFLG IS FALSE THEN $RETURN ;EXIT IF NOT MS11-P
 8759 026420  012737  000041  002276            MOV     #41,REALPAT             ;SETUP PATTERN AND NUMBER FOR TYPEOUT AND DISPLAY
 8760 026426  004737  041336                    CALL    GETCSR                  ;GET CSR NUMBER AND ADDRESS FROM CONFIGURATION TABLE
 8761 026432                                    LET SUPDOADD := #MTP041         ;SET UP TEST ADDRESS
 8762 026440                                    LET R1 := #FIRST                ;SET UP FIRST ADDRESS
 8763 026444  004737  027212                    CALL SUPD03                     ;EXECUTE ADDDRESS TO CSR TEST IN SUPVISIOR MODE
 8764 026450  000207                            RETURN                          ;
```

```
 8766 026452                                    MT0042: SUBTST  <<MT0042        SETUP EXTENDED UNIBUS ADDRESS TO CSR TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       MT0042  SETUP EXTENDED UNIBUS ADDRESS TO CSR TEST
                                                ;*****************************************************************************
 8767 026452                                            IF P%EMFLG IS FALSE THEN $RETURN ;EXIT IF NOT MS11-P
 8768 026462  012737  000042  002276                    MOV     #42,REALPAT             ;SETUP PATTERN AND NUMBER FOR TYPEOUT AND DISPLAY
 8769 026470  012701  100000                            MOV     #100000,R1              ;SET UP TEST ADDRESS
 8770 026474  004737  046720                            CALL    MAPKERNAL               ;MAP TO KERNEL SPACE
 8771 026500  004737  041336                            CALL    GETCSR                  ;SET UP CSRINFO FROM CONFIGURATION TABLE
 8772 026504  004737  037202                            CALL    MTP042                  ;CHECK EXTENDED UNIBUS ADDRESS TO CSR
 8773 026510  004737  047006                            CALL    UNMAP                   ;REMAP KERNEL SPACE
 8774 026514  000207                                    RETURN
```

```
8776 026516                            MT0043: SUBTST  <<MT0043        SETUP WRITE BYTE CLEARS SBE TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MT0043  SETUP WRITE BYTE CLEARS SBE TEST
                                       ;*****************************************************************************
8777 026516                                    IF PMEMFLG IS FALSE THEN $RETURN ;EXIT IF NOT MS11-P
8778 026526  012737  000043  002276            MOV     #43,REALPAT             ;SET UP TEST NUMBER FOR TYPEOUT AND DISPLAY
8779 026534  004737  046720                    CALL    MAPKERNAL               ;MAP TO KERNEL SPACE
8780 026540                                    LET R1 := #100000               ;SET UP TEST ADDRESS
8781 026544  004737  037436                    CALL MTP043                     ;PERFORM WRITE BYTE TEST
8782 026550  004737  047006                    CALL UNMAP                      ;REMAP KERNEL SPACE
8783 026554  000207                           RETURN
8784 026556                            MT0044: SUBTST  <<MT0044        SETUP SHIFTING 1/0'S THROUGH THE CHECK BITS TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MT0044  SETUP SHIFTING 1/0'S THROUGH THE CHECK BITS TEST
                                       ;*****************************************************************************
8785 026556                                    IF PMEMFLG IS FALSE THEN $RETURN ;EXIT IF NOT MS11-P
8786 026566  012737  000044  002276            MOV     #44,REALPAT             ;SET UP TEST NUMBER FOR TYPEOUT AND DISPLAY
8787 026574  004737  041336                    CALL    GETCSR                  ;GET CSR NUMBER AND ADDRESS FROM CONFIGURATION TABLE
8788 026600                                    LET SUPDOADD := #MTP044         ;SET UP TEST ADDRESS                            ;;IL
8789 026606                                    LET R1 := #FIRST                ;SET UP FIRST ADDRESS                           ;;IL
8790 026612  004737  027212                    CALL SUPD03                     ;EXECUTE ADDDRESS TO CSR TEST IN SUPVISIOR MODE
8791 026616  000207                           RETURN
8792 026620                            MT0045: SUBTST  <<MT0045        SETUP SYNDROMES TO CSR ON DOUBLE BIT ERROR>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MT0045  SETUP SYNDROMES TO CSR ON DOUBLE BIT ERROR
                                       ;*****************************************************************************
8793 026620                                    IF PMEMFLG IS FALSE THEN $RETURN ;EXIT IF NOT MS11-P
8794 026630  012737  000045  002276            MOV     #45,REALPAT             ;SET UP TEST NUMBER FOR TYPEOUT AND DISPLAY
8795 026636  004737  046720                    CALL    MAPKERNAL               ;MAP TO KERNEL SPACE
8796 026642                                    LET R1 := #100000               ;SET UP TEST ADDRESS
8797 026646  004737  040154                    CALL MTP045                     ;PERFORM SYNDROMES TO CSR ON DOUBLE BIT ERROR
8798 026652  004737  047006                    CALL UNMAP                      ;REMAP KERNEL SPACE
8799 026656  000207                           RETURN
8800 026660                            MT0046: SUBTST  <<MT0046        SETUP CHECK SINGLE BIT ERRORS WITH ECC DISABLED TET>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MT0046  SETUP CHECK SINGLE BIT ERRORS WITH ECC DISABLED TET
                                       ;*****************************************************************************
8801 026660                                    IF PMEMFLG IS FALSE THEN $RETURN ;EXIT IF NOT MS11-P
8802 026670  012737  000046  002276            MOV     #46,REALPAT             ;SET UP TEST NUMBER FOR TYPEOUT AND DISPLAY
8803 026676  004737  046720                    CALL    MAPKERNAL               ;MAP TO KERNEL SPACE
8804 026702                                    LET R1 := #100000               ;SET UP TEST ADDRESS
8805 026706  004737  040342                    CALL MTP046                     ;PERFORM TRAPS DECTECTED ON SBE WITH ECC DISABLED TE
8806 026712  004737  047006                    CALL UNMAP                      ;REMAP KERNEL SPACE
8807 026716  000207                           RETURN
8808 026720                            MT0047: SUBTST  <<MT0047        SETUP NO CSR UPDATE ON SBE WITH EXSISTING DBE TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MT0047  SETUP NO CSR UPDATE ON SBE WITH EXSISTING DBE TEST
                                       ;*****************************************************************************
8809 026720                                    IF PMEMFLG IS FALSE THEN $RETURN ;EXIT IF NOT MS11-P
8810 026730  012737  000047  002276            MOV     #47,REALPAT             ;SET UP TEST NUMBER FOR TYPEOUT AND DISPLAY
8811 026736  004737  046720                    CALL    MAPKERNAL               ;MAP TO KERNEL SPACE
8812 026742                                    LET R1 := #100000               ;SET UP TEST ADDRESS
8813 026746                                    LET R2 := #120000               ;  "   " SECOND  TEST ADDRESS
8814 026752  004737  040702                    CALL MTP047                     ;PERFORM NC UPDATE TO CSR ON SBE WITH DBE
8815 026756  004737  047006                    CALL UNMAP                      ;REMAP KERNEL SPACE
8816 026762  000207                           RETURN
```

```
 8819 026764                            MT0999: SUBTST  <<MT0999        SETUP NULL TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0999  SETUP NULL TEST
                                        ;*****************************************************************************

 8820 026764  005037  002276                       CLR     REALPAT
 8821 026770                                       SET     NULLFLAG
 8822 026776  000207                               RETURN
 8823
 8824 027000                            KAMITEST:SUBTST <<CHECK FOR KAMIKAZE MODE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       CHECK FOR KAMIKAZE MODE
                                        ;*****************************************************************************

 8825 027000                                       IF KAMIKAZE IS TRUE OR ACTFLAG IS TRUE OR APTFLAG IS TRUE
 8826 027022                                         $RETURN NOERROR                ;RUN THE TEST
 8827 027026                                       ELSE
 8828 027030                                         $RETURN ERROR                  ;DON'T RUN THE TEST
 8829 027034                                       END ;OF IF KAMIKAZE
```

CHECK FOR KAMIKAZE MODE

```
                                        SUPD01: SUBTST  <<SUBR  EXECUTE PATTERN IN SUPERVISOR>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    EXECUTE PATTERN IN SUPERVISOR
                                        ;*****************************************************************************
                                                MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
8834 02705C  004737  060514             SUPD02: CALL    GETDIS
8835 02705.                                     PUSH    $LPERR,$LPADR
8836 027064  010037  002156                     MOV     R0,SUPDR0
8837 027070  012700  002160                     MOV     #SUPDR1,R0
8838 027074  010120                             MOV     R1,(R0)+
8839 027076  010220                             MOV     R2,(R0)+
8840 027100  010320                             MOV     R3,(R0)+
8841 027102  010420                             MOV     R4,(R0)+
8842 027104  010520                             MOV     R5,(R0)+
8843 027106  010620                             MOV     SP,(R0)+
8844 027110  013700  002156                     MOV     SUPDR0,R0
8845 027114  012737  027130  002610             MOV     #TAG4$,$LPADR
8846 027122  013737  002610  002612             MOV     $LPADR,$LPERR
8847 027130  012700  002174             TAG4$:  MOV     #SUPDR6+2,R0
8848 027134  014006                             MOV     -(R0),SP
8849 027136  014005                             MOV     -(R0),R5
8850 027140  014004                             MOV     -(R0),R4
8851 027142  014003                             MOV     -(R0),R3
8852 027144  014002                             MOV     -(R0),R2
8853 027146  014001                             MOV     -(R0),R1
8854 027150  014000                             MOV     -(R0),R0
8855 027152                                     SUPERVISOR              ;ENTER SUPERVISOR MODE
8856 027160  012706  000740                     MOV     #SUPSTK,SSP
8857 027164  104424                             CACHOFF                 ;TURN CACHE OFF
8858 027166  004737  177640                     CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
8859 027172  104423                             CACHON                  ;TURN CACHE ON
8860 027174  104417                             KERNEL                  ;ENTER KERNEL MODE
8861 027176  000004                             SCOPE
8862 027200                                     POP     $LPADR,$LPERR
8863 027210  000207                             RETURN
```

```
8866 027212                          SUPD03: MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
8867 027226  004737  060514          SUPD04: CALL    GETDIS
8868 027232                                  PUSH    $LPERR,$LPADR
8869 027242  010037  002156                  MOV     R0,SUPDR0
8870 027246  012700  002160                  MOV     #SUPDR1,R0
8871 027252  010120                          MOV     R1,(R0)+
8872 027254  010220                          MOV     R2,(R0)+
8873 027256  010320                          MOV     R3,(R0)+
8874 027260  010420                          MOV     R4,(R0)+
8875 027262  010520                          MOV     R5,(R0)+
8876 027264  010620                          MOV     SP,(R0)+
8877 027266  013700  002156                  MOV     SUPDR0,R0
8878 027272  012737  027306  002610          MOV     #TBG4$,$LPADR
8879 027300  013737  002610  002612          MOV     $LPADR,$LPERR
8880 027306  012700  002174          TBG4$:  MOV     #SUPDR6+2,R0
8881 027312  014006                          MOV     -(R0),SP
8882 027314  014005                          MOV     -(R0),R5
8883 027316  014004                          MOV     -(R0),R4
8884 027320  014003                          MOV     -(R0),R3
8885 027322  014002                          MOV     -(R0),R2
8886 027324  014001                          MOV     -(R0),R1
8887 027326  014000                          MOV     -(R0),R0
8888 027330                                  TESTAREA                        ;ENTER SUPERVISOR MODE
8889 027336  005737  002454                  TST     NOSUPER
8890 027342  001403                          BEQ     1$
8891 027344  012706  000700                  MOV     #USESTK,USP
8892 027350  000402                          BR      2$
8893 027352  012706  000740          1$:     MOV     #SUPSTK,SSP
8894 027356  104424                  2$:     CACHOFF                         ;TURN CACHE OFF
8895 027360  004777  152674                  CALL    @SUPDOADD
8896 027364  104423                          CACHON                          ;TURN CACHE ON
8897 027366  104417                          KERNEL                          ;ENTER KERNEL MODE
8898 027370  000004                          SCOPE
8899 027372                                  POP     $LPADR,$LPERR
8900 027402  000207                          RETURN
```

```
                                        .SBTTL  MEMORY TEST PATTERN ROUTINES
                                ;*******************************************************************************
                                ; PATTERN REGISTER CONVENTIONS
                                ;       R0      FIRST ADDRESS OF PATTERN (FIRST,LAST+2,ETC)
                                ;       R1      NUMBER OF ADDRESSES IN PATTERN (SIZE)
                                ;       R2      DATA FOR PATTERN (ONES,52525,ETC)
                                ;       R3      COPY OF R1 (IF NECESSARY)
                                ;       R4      COPY OF R0 (IF NECESSARY)
                                ;       R5      COPY OF R2 (IF NECESSARY)
                                ;*******************************************************************************
8913 027404                     MTP000: SUBTST  <<MTP000        BASIC DATA TEST>>
                                ;*******************************************************************************
                                ;*SUBTEST       MTP000  BASIC DATA TEST
                                ;*******************************************************************************
8914 027404  010220             1$:     MOV     R2,(R0)+        ;V177640
8915 027406  077102                     SOB     R1,MTP000       ;V177642
8916 027410  000240                     NOP                     ;V177644
8917 027412  012401             2$:     MOV     (R4)+,R1        ;V177646
8918 027414  020102                     CMP     R1,R2           ;V177650
8919 027416  001402                     BEQ     3$              ;V177652
8920 027420  104430                     PERR02                  ;V177654
8921 027422  000240                     NOP                     ;V177656
8922 027424  077306             3$:     SOB     R3,2$           ;V177660
8923 027426  000207                     RETURN                  ;V177662
8924 027430                     MTP001: SUBTST  <<MTP001        ADDRESS TEST>>
                                ;*******************************************************************************
                                ;*SUBTEST       MTP001  ADDRESS TEST
                                ;*******************************************************************************
8925 027430  010220             3$:     MOV     R2,(R0)+        ;V177640
8926 027432  062702  000002             ADD     #2,R2           ;V177642
8927 027436  077104                     SOB     R1,3$           ;V177646
8928 027440  000240                     NOP                     ;V177650
8929 027442  012400             1$:     MOV     (R4)+,R0        ;V177652
8930 027444  020005                     CMP     R0,R5           ;V177654
8931 027446  001401                     BEQ     2$              ;V177656
8932 027450  104427                     PERR01                  ;V177660
8933 027452  062705  000002     2$:     ADD     #2,R5           ;V177662
8934 027456  077307                     SOB     R3,1$           ;V177666
8935 027460  000207                     RETURN                  ;V177672
8936 027462                     MTP002: SUBTST  <<MTP002        COMPLEMENT ADDRESS TEST (WRITE DOWN, READ UP)>>
                                ;*******************************************************************************
                                ;*SUBTEST       MTP002  COMPLEMENT ADDRESS TEST (WRITE DOWN, READ UP)
                                ;*******************************************************************************
8937 027462  010540             3$:     MOV     R5,-(R0)        ;V177640
8938 027464  062705  000002             ADD     #2,R5           ;V177642
8939 027470  077104                     SOB     R1,3$           ;V177646
8940 027472  000240                     NOP                     ;V177650
8941 027474  162702  000002     1$:     SUB     #2,R2           ;V177652
8942 027500  012401                     MOV     (R4)+,R1        ;V177656
8943 027502  020102                     CMP     R1,R2           ;V177660
8944 027504  001401                     BEQ     2$              ;V177662
8945 027506  104430                     PERR02                  ;V177664
8946 027510  077307             2$:     SOB     R3,1$           ;V177666
8947 027512  000207                     RETURN                  ;V177670
```

```
8950 027514                            MTPA03: SUBTST  <<MTPA03        3 XOR 9 WORST CASE NOISE TEST (WRITE)>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MTPA03  3 XOR 9 WORST CASE NOISE TEST (WRITE)
                                       ;*****************************************************************************
8951                                           ;R1 = ADDRESS
8952                                           ;R2 = SMALL LOOP CONSTANT
8953                                           ;R3 = NUM OF ADD TO TEST (LARGE LOOP)
8954                                           ;R4 = GOOD DATA
8955                                           ;R5 = MEDIUM LOOP CONSTANT
8956                                           .ENABL  LSB
8957 027514  010421                    1$:     MOV     R4,(R1)+        ;V177640
8958 027516  010421                            MOV     R4,(R1)+        ;V177642
8959 027520  077203                            SOB     R2,1$           ;V177644
8960 027522  005104                            COM     R4              ;V177646
8961 027524  052704                            BIS     (PC)+,R4        ;V177650
8962 027526  000401                    WARN2:  401                     ;V177652 WARNING LOCATION IS MODIFIED BEFORE LOADING
8963 027530  012702  000004                    MOV     #4,R2           ;V177654
8964 027534  077511                            SOB     R5,1$           ;V177660
8965 027536  005104                            COM     R4              ;V177662
8966 027540  052704                            BIS     (PC)+,R4        ;V177664
8967 027542  000401                    WARN3:  401                     ;V177666 WARNING LOCATION IS MODIFIED BEFORE LOADING
8968 027544  012705  000100                    MOV     #64.,R5         ;V177670
8969 027550  077317                            SOB     R3,1$           ;V177674
8970 027552  000207                            RETURN                  ;V177676
8971                                           .DSABL  LSB
8972
8973 027554                            MTPB03: SUBTST  <<MTPB03        3 XOR 9 WORST CASE NOISE TEST (READ)>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MTPB03  3 XOR 9 WORST CASE NOISE TEST (READ)
                                       ;*****************************************************************************
8974                                           .ENABL  LSB
8975 027554  000137  027614            1$:     JMP     @#MTPC03        ;V177640        GO TO V172360
8976 027560  077203                            SOB     R2,1$           ;V177644
8977 027562  005104                            COM     R4              ;V177646
8978 027564  052704                            BIS     (PC)+,R4        ;V177650
8979 027566  000401                    WARN4:  401                     ;V177652 WARNING LOCATION IS MODIFIED BEFORE LOADING
8980 027570  012702  000004                    MOV     #4,R2           ;V177654
8981 027574  077511                            SOB     R5,1$           ;V177660
8982 027576  005104                            COM     R4              ;V177662
8983 027600  052704                            BIS     (PC)+,R4        ;V177664
8984 027602  000401                    WARN5:  401                     ;V177666 WARNING LOCATION IS MODIFIED BEFORE LOADING
8985 027604  012705  000100                    MOV     #64.,R5         ;V177670
8986 027610  077317                            SOB     R3,1$           ;V177674
8987 027612  000207                            RETURN                  ;V177676
8988                                           .DSABL  LSB
```

```
 8991 027614                            MTPC03: SUBTST  <<MTPC03        TEST DATA SUBPROGRAM>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTPC03  TEST DATA SUBPROGRAM
                                        ;*****************************************************************************
 8992 027614  020421                            CMP     R4,(R1)+        ;V172360
 8993 027616  001401                            BEQ     1$              ;V172362
 8994 027620  104431                            PERR03                  ;V172364
 8995 027622  005141                    1$:     COM     -(R1)           ;V172366
 8996 027624  005111                            COM     (R1)            ;V172370
 8997 027626  000137  027632                    JMP     @#MTPD03        ;V172372        GO TO V172260
 8998
 8999 027632                            MTPD03: SUBTST  <<MTPD03        TEST DATA SUBSUBPROGRAM>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTPD03  TEST DATA SUBSUBPROGRAM
                                        ;*****************************************************************************
 9000 027632  020421                            CMP     R4,(R1)+        ;V172260
 9001 027634  001401                            BEQ     1$              ;V172262
 9002 027636  104431                            PERR03                  ;V172264
 9003 027640  005127                    1$:     COM     (PC)+           ;V172266
 9004 027642  000000                            0                       ;V172270
 9005 027644  001363                            BNE     MTPC03          ;V172272        GO TO V172360
 9006 027646  000137  027560                    JMP     @#MTPB03+4      ;V172274        GO TO V177644
```

```
 9009 027652                            MTPA04: SUBTST  <<MTPA04         ROTATING ZEROS TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTPA04  ROTATING ZEROS TEST
                                        ;*****************************************************************************
 9010 027652  012705  000010            1$:     MOV     #8.,R5           ;V177640
 9011 027656  010504                            MOV     R5,R4            ;V177644
 9012 027660  000241                            CLC                      ;V177646
 9013 027662  000137  027706                    JMP     @#MTPB04         ;V177650
 9014 027666  016004  177776                    MOV     -2(R0),R4        ;V177654
 9015 027672  103402                            BCS     2$               ;V177660
 9016 027674  020204                            CMP     R2,R4            ;V177662
 9017 027676  001401                            BEQ     3$               ;V177664
 9018 027700  104432                    2$:     PERR04                   ;V177666
 9019 027702  077115                    3$:     SOB     R1,1$            ;V177670
 9020 027704  000207                            RETURN                   ;V177672
 9021
 9022 027706                            MTPB04: SUBTST  <<MTPB04         SUBR    ROTATING BIT>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTPB04  SUBR    ROTATING BIT
                                        ;*****************************************************************************
 9023 027706  106110                    1$:     ROLB    (R0)             ;V172360
 9024 027710  077502                            SOB     R5,1$            ;V172362
 9025 027712  106120                            ROLB    (R0)+            ;V172364
 9026 027714  106110                    2$:     ROLB    (R0)             ;V172366
 9027 027716  077402                            SOB     R4,2$            ;V172370
 9028 027720  106120                            ROLB    (R0)+            ;V172372
 9029 027722  000137  027666                    JMP     @#MTPA04+14      ;V172374
 9030
 9031 027726                            MTP005: SUBTST  <<MTP005         ROTATION ONES TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTP005  ROTATION ONES TEST
                                        ;*****************************************************************************
 9032 027726  012705  000010            1$:     MOV     #8.,R5           ;V177640
 9033 027732  010504                            MOV     R5,R4            ;V177644
 9034 027734  000261                            SEC                      ;V177646
 9035 027736  000137  027706                    JMP     @#MTPB04         ;V177650
 9036 027742  016004  177776                    MOV     -2(R0),R4        ;V177654
 9037 027746  103002                            BCC     2$               ;V177660 IF THIS HAPPENS THE GOOD & BAD MATCH
 9038 027750  020204                            CMP     R2,R4            ;V177662
 9039 027752  001401                            BEQ     3$               ;V177664
 9040 027754  104432                    2$:     PERR04                   ;V177666
 9041 027756  077115                    3$:     SOB     R1,1$            ;V177670
 9042 027760  000207                            RETURN                   ;V177672
```

```
9045 027762                                 MTP006: SUBTST  <<MTP006         INITIAL DATA TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MTP006  INITIAL DATA TEST
                                            ;*****************************************************************************
9046                                                        ;       THIS TEST CHECKS THE DI/DO LINES BY
9047                                                        ;       SHIFTING A 1 THROUGH THE WORD.
9048 027762  012737  000001  002240          MOV     #1,DATBUF          ;SET THE FIRST TEST BIT
9049 027770  005037  002242                  CLR     DATBUF+2           ;CLEAR 2ND WORD
9050 027774  013771  002240  000000  1$:     MOV     DATBUF,@(R1)       ;WRITE TEST WORD 1
9051 030002  013771  002242  000002          MOV     DATBUF+2,@2(R1)    ;AND TEST WORD 2
9052 030010  017102  000000                  MOV     @(R1),R2
9053 030014  023702  002240                  CMP     DATBUF,R2          ;NOW READ THEM
9054 030020  001401                          BEQ     2$                 ;BR IF FIRST 16 OK
9055 030022  104433                          PERR07                     ;ERROR TRAP
9056
9057 030024  017102  000002          2$:     MOV     @2(R1),R2
9058 030030  023702  002242                  CMP     DATBUF+2,R2        ;NOW READ SECOND WORD
9059 030034  001401                          BEQ     3$                 ;BR IF OK
9060 030036  104434                          PERR10                     ;ERROR TRAP
9061
9062 030040  005737  002242          3$:     TST     DATBUF+2           ;HAS LAST BIT BEEN TESTED ?
9063 030044  100405                          BMI     4$                 ;MINUS MEANS BIT 31
9064 030046                                  DLEFT   DATBUF             ;NO, SHIFT TEST BIT LEFT
9065 030056  000746                          BR      1$                 ;GO WRITE NEW TEST DATA
9066                                                                    ;NOW GOING TO SHIFT A 0 IN DATA DIRECTION
9067 030060  012737  177776  002240  4$:     MOV     #177776,DATBUF     ;PUT A 0 IN BIT 0
9068 030066  012737  177777  002242          MOV     #-1, DATBUF+2      ;AND 1'S IN ALL OTHERS
9069 030074  013771  002240  000000  5$:     MOV     DATBUF,@(R1)       ;WRITE THE DATA
9070 030102  013771  002242  000002          MOV     DATBUF+2,@2(R1)    ;2 WORDS WORTH
9071 030110  017102  000000                  MOV     @(R1),R2
9072 030114  023702  002240                  CMP     DATBUF,R2          ;NOW READ FIRST WORD
9073 030120  001401                          BEQ     6$                 ;BR IF OK
9074 030122  104433                          PERR07
9075
9076 030124  017102  000002          6$:     MOV     @2(R1),R2
9077 030130  023702  002242                  CMP     DATBUF+2,R2        ;NOW, READ SECOND WORD
9078 030134  001401                          BEQ     7$                 ;BR IF OK
9079 030136  104434                          PERR10
9080
9081 030140  005737  002242          7$:     TST     DATBUF+2           ;TESTED BIT 31 YET?
9082 030144  100005                          BPL     8$                 ;BR IF YES, WE'RE DONE
9083 030146                                  DLEFT   DATBUF
9084 030156  000746                          BR      5$                 ;KEEP GOING
9085 030160  000207                  8$:     RETURN
```

```
                                MTP007: SUBTST  <<MTP007        ADDRESS BIT TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MTP007  ADDRESS BIT TEST
                                ;*****************************************************************************
                                        ;       THIS TEST CHECKS TO SEE THAT EACH ADDRESS
                                        ;       BIT IN EACH 16K BANK CAN BE ASSERTED UNIQUELY.
                                        ;       IT CHECKS FOR ADDRESS BITS THAT MAY BE STUCK
                                        ;       HIGH, STUCK LOW OR STUCK TOGETHER.
030162  111100                  MOVB    (R1),R0
030164  105700                  TSTB    R0              ;READ AND COMPARE FOR ZEROS
030166  001401                  BEQ     1$              ;BR IF OK
030170  104435                  PERR11
030172  105111          1$:     COMB    (R1)            ;COMPLEMENT THE BYTE
030174  111100                  MOVB    (R1),R0
030176  105700                  TSTB    R0              ;READ FOR NON ZEROS
030200  001001                  BNE     2$              ;BR IF OK
030202  104436                  PERR12
030204  040201          2$:     BIC     R2,R1           ;MASK OFF THE ASSERTED BIT
030206  006302                  ASL     R2              ;SHIFT R2 FOR NEXT BIT
030210  050201                  BIS     R2,R1           ;SET THE NEW BIT INTO R1
030212  011100                  MOV     (R1),R0
030214  005700                  TST     R0              ;READ THE NEW ADDRESS
030216  001401                  BEQ     3$              ;READ FOR ZEROS
030220  104437                  PERR13
030222  005111          3$:     COM     (R1)            ;COMPL THE WORD
030224  011100                  MOV     (R1),R0
030226  005700                  TST     R0              ;READ IT AGAIN
030230  001001                  BNE     4$
030232  104440                  PERR14
030234  022702  100000  4$:     CMP     #100000,R2
030240  001407                  BEQ     5$
030242  022702  010000          CMP     #10000,R2       ;CHECK FOR MSB IN 4K BANK
030246  001356                  BNE     2$              ;NOT LAST BIT, BRANCH
030250  006302                  ASL     R2
030252  012701  160000          MOV     #160000,R1
030256  000752                  BR      2$
030260  000207          5$:     RETURN
```

```
                                MTP010: SUBTST  <<MTP010        BYTE ADDRESSING TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MTP010  BYTE ADDRESSING TEST
                                ;*****************************************************************************
                                                ;TEST 3 THIS TEST CHECKS FOR PROPER
                                                ;       BYTE ADDRESSING WITH ECC DISABLED
030262  010402                          MOV     R4,R2           ;R4 HAS LOWEST ADDRESS
030264  010403                          MOV     R4,R3           ;PUT IT IN R3 ALSO
030266  062702  000004                  ADD     #4,R2           ;POINT R2 TO LAST BYTE +1
030272  012713  177777                  MOV     #-1,(R3)        ;WRITE ALL ONES IN
030276  012763  177777  000002          MOV     #-1,2(R3)       ;THE 4 TEST BYTES
030304  105013                  1$:     CLRB    (R3)            ;CLEAR A BYTE
030306  010401                          MOV     R4,R1           ;INITIALIZE R1 FOR EACH PASS
030310  020201                  2$:     CMP     R2,R1           ;IF EQUAL, JUST READ LAST BYTE
030312  001420                          BEQ     6$              ;BR IF EQUAL
030314  020301                          CMP     R3,R1           ;IS THIS THE BYTE OF ZEROS
030316  001007                          BNE     4$              ;BR IF NOT
030320  111100                          MOVB    (R1),R0
                                        ;WARNING IF YOU OPTOMIZE CHANGE THE PCBUMP FOR THIS ERROR INCASE OF TRAPS
030322  022700  000000                  CMP     #0,R0           ;IT IS, COMPARE FOR ZEROS
030326  001401                          BEQ     3$
030330  104435                          PERR11

030332  005201                  3$:     INC     R1              ;NEXT BYTE
030334  000765                          BR      2$              ;RETURN
030336  111100                  4$:     MOVB    (R1),R0
030340  122700  177777                  CMPB    #-1,R0          ;ITS NOT THE BYTE OF 0'S, READ 1'S
030344  001401                          BEQ     5$
030346  104436                          PERR12

030350  005201                  5$:     INC     R1              ;MOVE TO NEXT BYTE
030352  000756                          BR      2$
030354  112713  177777          6$:     MOVB    #-1,(R3)        ;RESTORE 1'S TO BYTE JUST TESTED
030360  005203                          INC     R3              ;INC TO NEXT BYTE
030362  020302                          CMP     R3,R2           ;WAS THAT JUST THE LAST ONE?
030364  001347                          BNE     1$              ;BR IF NO
030366  000207                          RETURN
```

```
 9164 030370                            MTP011: SUBTST  <<MTP011        SINGLE BIT ERROR TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST       MTP011  SINGLE BIT ERROR TEST
                                        ;*********************************************************************
 9165                                           ;(1)    CREATE A SINGLE BIT ERROR
 9166                                           ;
 9167                                           ;(2)    READ BACK SBE UNCORRECTED (WITH ECC DISABLE)
 9168                                           ;
 9169                                           ;(3)    ENABLE ECC & READ CORRECTED DATA
 9170                                           ;
 9171                                           ;(4)    CHECK THAT THE SBE FLAG WAS SET FROM THE LAST READ
 9172                                           ;
 9173                                           ;(5)    DO (1-4) FOR DATA CONSISTING OF 1 BIT SET IN EACH OF 32
 9174                                           ;       POSITIONS OF A DOUBLE WORD
 9175                                           ;       THEN DO IT AGAIN FOR 1 BIT CLEARED IN EACH OF 32 POSITIONS OF
 9176                                           ;       A DOUBLE WORD
 9177                                           ;       IE (64 TIMES)
 9178                                           ;
 9179                                           ;(6)    DO (1-5) FOR A SBE IN EACH OF 32 BIT POSITIONS
 9180                                           ;       IE (RUN TEST 64 * 32 = 2048 TIMES)
 9181 030370  104503                           CLR1CSR                 ;CLEAR 1 SELECTED CSR
 9182 030372  005737  014006                   TST     PHEBE           ;TEST SPECIAL CASE INDICATOR
 9183 030376  001407                           BEQ     MTLA11          ;BRANCH IF NOT SET
 9184 030400  013702  172246                   MOV     SIPAR3,R2       ;SAVE CONTENTS OF SIPAR #3
 9185 030404  013737  172252  172246           MOV     SIPAR5,@#SIPAR3 ;COPY CONTENTS OF #5 INTO #3
 9186 030412  010237  172252                   MOV     R2,@#SIPAR5     ;COPY CONTENTS OF #3 INTO #5
 9187                                          ;BIG LOOP
 9188 030416  012737  000001  002240  MTLA11:  MOV     #1,DATBUF       ;INITIAL DATA
 9189 030424  005037  002242                   CLR     DATBUF+2        ;32 BITS WORTH
 9190                                          ;MEDIUM LOOP
 9191 030430  012737  000001  002250  MTLB11:  MOV     #1,SBEMSK       ;INITIAL ERROR MASK
 9192 030436  005037  002252                   CLR     SBEMSK+2        ;32 BITS WORTH
 9193                                          ;LITTLE LOOP
 9194 030442  013737  002240  002244  MTLC11:  MOV     DATBUF,TSTDAT   ;
 9195 030450  013737  002242  002246           MOV     DATBUF+2,TSTDAT+2;TO SAVE ORIG DATA
 9196 030456  105737  002262                   TSTB    PASFLG  ;COMP DATA ON SECOND PASSONLY
 9197 030462  001404                           BEQ     4$              ;BR IF FIRST PASS
 9198 030464  005137  002244                   COM     TSTDAT          ;SECOND PASS, COMP BOTH WORDS
 9199 030470  005137  002246                   COM     TSTDAT+2
 9200 030474  013702  002244           4$:     MOV     TSTDAT,R2
 9201 030500  013703  002246                   MOV     TSTDAT+2,R3
 9202 030504  012737  002244  002310           MOV     #TSTDAT,SOURCE  ;SET UP ADDRESS FOR CHKGEN
 9203 030512  004737  044400                   CALL    CHKGEN          ;GEN CHECKBITS ON TSTDAT
 9204                                          ;*******************************
 9205                                          ;** CREATE A SINGLE BIT ERROR **
 9206                                          ;*******************************
 9207 030516  013701  002250                   MOV     SBEMSK,R1
 9208 030522  074137  002244                   XOR     R1,TSTDAT
 9209 030526  013701  002252                   MOV     SBEMSK+2,R1
 9210 030532  074137  002246                   XOR     R1,TSTDAT+2
 9211 030536  013701  002410           MTLD11: MOV     TESTADD,R1      ;FIRST TEST ADDRESS
 9212 030542  013705  002412                   MOV     TESTADD+2,R5    ;SECOND TEST ADDRESS
 9213 030546  104471                           ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 9214 030550  013711  002244                   MOV     TSTDAT,(R1)     ;WRITE FIRST 16 BITS
 9215 030554  104475                           CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 9216 030556  013715  002246                   MOV     TSTDAT+2,(R5)   ;WRITE SECOND 16 BITS AND
 9217                                                                  ;CHECK BITS. WE NOW HAVE CHECKBITS
```

```
                                                        ;GENERATED ON DATBUF AND DATA WITH
                                                        ;ONE BIT IN ERROR (AS PER SBEMSK).
030562  104471                  ECC1DIS               ;DISABLE ECC ON 1 SELECTED CSR
030564  011100                  MOV     (R1),R0
030566  020037  002244          CMP     R0,TSTDAT     ;READ THE LOW WORD (UNCORRECTED)
030572  001403                  BEQ     6$            ;BR IF OK
030574  010137  002032          MOV     R1,ADDRESS
030600  104455                  PERR31
030602  011500          6$:     MOV     (R5),R0
030604  020037  002246          CMP     R0,TSTDAT+2   ;READ THE HIGH WORD (UNCORRECTED)
030610  001403                  BEQ     7$            ;BR IF OK
030612  010537  002032          MOV     R5,ADDRESS
030616  104455                  PERR31
030620          7$:     IF KFLAG IS FALSE
030626  104426                    READCSR
030630                            IF #BIT4 OFF.IN CSR OR #BIT15 OFF.IN CSR
030650  104045                      ERROR       +45
030652                            END; OF IF #BIT4
030652                  END; OF IF KFLAG
030652  005737  014006          TST     PHEBE
030656  001001                  BNE     17$
030660  104512                  ERRGEN
030662  104503          17$:    CLR1CSR               ;CLEAR 1 SELECTED CSR
030664  011100                  MOV     (R1),R0
030666  020002                  CMP     R0,R2         ;SEE IF ITS BEEN CORRECTED
030670  001401                  BEQ     8$            ;IT SHOULD HAVE BEEN
030672  104456                  PERR32
030674  104510          8$:     TSTREAD               ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
030676  103411                  BCS     9$            ;BR IF IT IS SET
030700                          SET     HEADER        ;ENABLE PRINTING OF ERROR HEADER INFO
030706  010137  002032          MOV     R1,ADDRESS
030712  104460                  PERR34
030714                          SET     HEADER        ;ENABLE PRINTING OF ERROR HEADER INFO
030722  104503          9$:     CLR1CSR               ;CLEAR 1 SELECTED CSR
030724  011500                  MOV     (R5),R0
030726  020003                  CMP     R0,R3         ;SEE IF ITS BEEN CORRECTED
030730  001401                  BEQ     10$           ;BR IF OK
030732  104456                  PERR32
030734  104510          10$:    TSTREAD               ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
030736  103411                  BCS     11$           ;BR IF YES
030740                          SET     HEADER        ;ENABLE PRINTING OF ERROR HEADER INFO
030746  010137  002032          MOV     R1,ADDRESS
030752  104460                  PERR34
030754                          SET     HEADER        ;ENABLE PRINTING OF ERROR HEADER INFO
030762  104512          11$:    ERRGEN                ;TEST ERROR ADDRESS
030764  105737  002262          TSTB    PASFLG
030770  100452                  BMI     15$
030772  005737  002252          TST     SBEMSK+2      ;TEST FOR LAST MASK BIT
030776  100405                  BMI     12$           ;MINUS MEANS BIT 31
031000                          DLEFT   SBEMSK
031010  000614                  BR      MTLC11
031012          12$:    IF #SW11 SET.IN @SWR THEN GOTO 13$
```

```
9275 031022                                        IF QVFLAG IS TRUE THEN GOTO 13$
9276 031030  005737  002242                        TST     DATBUF+2        ;LAST DATA BIT ?
9277 031034  100406                                BMI     13$             ;WHICH IS BIT 31
9278 031036                                        DLEFT   DATBUF
9279 031046  000137  030430                        JMP     MTLB11
9280 031052  105737  002262          13$:          TSTB    PASFLG  ;FIRST OR SECOND PASS ?
9281 031056  001004                                BNE     14$             ;NON ZERO MEANS WE'RE DONE
9282 031060  105237  002262                        INCB    PASFLG  ;NOT DONE, GO DO SECOND PASS
9283 031064  000137  030416                        JMP     MTLA11
9284 031070  052737  000200  002262  14$:          BIS     #BIT7,PASFLG
9285 031076  005002                                CLR     R2
9286 031100  005003                                CLR     R3
9287 031102  005037  002244                        CLR     TSTDAT
9288 031106  005037  002246                        CLR     TSTDAT+2
9289 031112  012704  000040                        MOV     #40,R4
9290 031116  012737  003740  002312  15$:          MOV     #3740,CHECK
9291 031124  074437  002312                        XOR     R4,CHECK
9292 031130  006304                                ASL     R4
9293 031132  032704  020000                        BIT     #BIT13,R4
9294 031136  001002                                BNE     16$
9295 031140  000137  030536                        JMP     MTLD11
9296                                               ;CLEAR OUT ANY DBE'S OR SBE'S
9297 031144  104471                    16$:        ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
9298 031146  013701  002410                        MOV     TESTADD,R1
9299 031152  013705  002412                        MOV     TESTADD+2,R5
9300 031156                                        CLEAR   (R1),(R5)
9301 031162  104503                                CLR1CSR                 ;CLEAR 1 SELECTED CSR
9302 031164  000207                                RETURN
```

```
                                        MTP012: SUBTST  <<MTP012        WRITE BYTE CLEARS SBE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTP012  WRITE BYTE CLEARS SBE TEST
                                        ;*****************************************************************************
                                                        ;SINGLE BIT ERROR TEST TO INSURE THAT A WRITE
                                                        ;BYTE CLEARS SINGLE BIT ERRORS.
                                            CLR1CSR                     ;CLEAR 1 SELECTED CSR
 9309 031170  012737  000001  002240        MOV     #1,DATBUF           ;INITIAL DATA
 9310 031176  005037  002242                CLR     DATBUF+2            ;32 BITS WORTH
 9311 031202  012737  000001  002250  1$:   MOV     #1,SBEMSK           ;INITIAL ERROR MASK
 9312 031210  005037  002252                CLR     SBEMSK+2            ;32 BITS WORTH
 9313 031214  013737  002240  002244  2$:   MOV     DATBUF,TSTDAT       ;SAVE ORIGINAL DATA
 9314 031222  013737  002242  002246        MOV     DATBUF+2,TSTDAT+2   ;BOTH WORDS
 9315 031230  012737  002244  002310        MOV     #TSTDAT,SOURCE      ;NEED ADDRESS FOR CHKGEN
 9316 031236  004737  044400                CALL    CHKGEN              ;GENERATE CHECK BITS
 9317 031242  013701  002250                MOV     SBEMSK,R1
 9318 031246  074137  002244                XOR     R1,TSTDAT
 9319 031252  013701  002252                MOV     SBEMSK+2,R1
 9320 031256  074137  002246                XOR     R1,TSTDAT+2
 9321 031262  013704  002410                MOV     TESTADD,R4          ;FIRST TEST ADDRESS
 9322 031266  010401                        MOV     R4,R1               ;PUT IT IN R1 ALSO
 9323 031270  104471                        ECC1DIS                     ;DISABLE ECC ON 1 SELECTED CSR
 9324 031272  013711  002244                MOV     TSTDAT,(R1)         ;WRITE 16 BITS
 9325 031276  104475                        CB1CSR                      ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 9326 031300  060501                        ADD     R5,R1               ;INDEX UP TO SECOND WORD
 9327 031302  013711  002246                MOV     TSTDAT+2,(R1)       ;WRITE HIGH WORD+CHECKBITS
 9328 031306  104503                        CLR1CSR                     ;CLEAR 1 SELECTED CSR
 9329                                                                    ;IT'S DANGEROUS IF WE DON'T
 9330 031310  012702  002250                MOV     #SBEMSK,R2          ;ADDRESS OF ERROR MASK
 9331 031314  160501                        SUB     R5,R1               ;RETURN TO FIRST WORD
 9332 031316  112711  177777        3$:     MOVB    #-1,(R1)            ;WRITE A BYTE OF 1'S
 9333 031322  005737  002526                TST     KFLAG               ;IS THIS MF11S-K
 9334 031326  001403                        BEQ     4$                  ;BRANCH IF NOT - IT'S MS11-M
 9335 031330  132712  177777                BITB    #-1,(R2)            ;DID THIS BYTE HAVE THE BAD BIT IN IT?
 9336 031334  001420                        BEQ     6$                  ;NO - BRANCH
 9337 031336  104510                4$:     TSTREAD                     ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
 9338 031340  103011                        BCC     5$                  ;NO - SKIP
 9339 031342                                SET     HEADER              ;ENABLE PRINTING OF ERROR HEADER INFO
 9340 031350  010137  002032                MOV     R1,ADDRESS
 9341 031354  104017                        ERROR   +17
 9342 031356                                SET     HEADER              ;ENABLE PRINTING OF ERROR HEADER INFO
 9343
 9344 031364  111100                5$:     MOVB    (R1),R0
 9345 031366  122700  177777                CMPB    #-1,R0              ;CHECK DATA
 9346 031372  001414                        BEQ     7$                  ;BR IF OK
 9347 031374  104457                        PERR33
 9348
 9349 031376  104510                6$:     TSTREAD                     ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
 9350                                                                    ;READ THE BYTE
 9351                                                                    ;SBE ERROR BIT ONLY SET ?
 9352 031400  103771                        BCS     5$                  ;SHOULD BE SET, BR IF OK
 9353 031402                                SET     HEADER              ;ENABLE PRINTING OF ERROR HEADER INFO
 9354 031410  010137  002032                MOV     R1,ADDRESS
 9355 031414  104460                        PERR34
 9356 031416                                SET     HEADER              ;ENABLE PRINTING OF ERROR HEADER INFO
 9357
 9358 031424  132712  177777        7$:     BITB    #-1,(R2)            ;CHECK FOR LAST BYTE
```

```
 9359 031430  001012                          BNE     8$                ;
 9360 031432  005202                          INC     R2
 9361 031434  005201                          INC     R1                ;MOVE TO NEXT BYTE
 9362 031436  013704  002410                  MOV     TESTADD,R4        ;FIRST TEST ADDRESS
 9363 031442  032701  000002                  BIT     #2,R1             ;TEST FOR LOWER WORD
 9364 031446  001723                          BEQ     3$                ;BR IF IT'S LOW 16 BITS
 9365 031450  062704  000002                  ADD     #2,R4             ;ADJUST POINTER FOR ERROR REPT.
 9366 031454  000720                          BR      3$
 9367 031456  005737  002252          8$:     TST     SBEMSK+2          ;LAST ERROR BIT ?
 9368 031462  100405                          BMI     9$                ;MINUS MEANS BIT 31
 9369 031464                                  DLEFT   SBEMSK
 9370 031474  000647                          BR      2$
 9371 031476                          9$:     IF #SW11 SET.IN @SWR THEN GOTO 10$
 9372 031506                                  IF QVFLAG IS TRUE THEN GOTO 10$
 9373 031514  005737  002242                  TST     DATBUF+2          ;LAST DATA BIT?
 9374 031520  100405                          BMI     10$               ;MINUS = BIT 31
 9375 031522                                  DLEFT   DATBUF
 9376 031532  000623                          BR      1$
 9377                                         ;CLEAR OUT ANY DBE'S OR SBE'S
 9378 031534  104471                  10$:    ECC1DIS                   ;DISABLE ECC ON 1 SELECTED CSR
 9379 031536  013701  002410                  MOV     TESTADD,R1
 9380 031542  005011                          CLR     (R1)
 9381 031544  060501                          ADD     R5,R1
 9382 031546  005011                          CLR     (R1)
 9383 031550  104503                          CLR1CSR                   ;CLEAR 1 SELECTED CSR
 9384 031552  000207                          RETURN
```

```
 9387 031554                                MTP013: SUBTST  <<MTP013        CREATE DOUBLE BIT ERROR TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MTP013  CREATE DOUBLE BIT ERROR TEST
                                            ;*****************************************************************************
 9388                                                       ;DOUBLE BIT ERROR FORCE TO CHECK DOUBLE ERROR LOGIC
 9389 031554  104503                               CLR1CSR                 ;CLEAR 1 SELECTED CSR
 9390 031556  012701  002410                       MOV     #TESTADD,R1
 9391 031562  005037  002240                1$:    CLR     DATBUF          ;MAKE INITIAL DATA
 9392 031566  005037  002242                       CLR     DATBUF+2        ;ALL ZEROS
 9393 031572  012737  000001  002250        2$:    MOV     #1,SBEMSK       ;INITIAL SINGLE ERROR MASK
 9394 031600  005037  002252                       CLR     SBEMSK+2        ;SECOND WORD
 9395 031604  012737  000001  002254        3$:    MOV     #1,DBEMSK       ;INITIAL DOUBLE ERROR MASK
 9396 031612  005037  002256                       CLR     DBEMSK+2        ;32 BITS HERE ALSO
 9397 031616  013737  002240  002244        4$:    MOV     DATBUF,TSTDAT   ;
 9398 031624  013737  002242  002246               MOV     DATBUF+2,TSTDAT+2
 9399 031632  105737  002262                       TSTB    PASFLG  ;NO COMPLEMENTING FIRST PASS
 9400 031636  001404                               BEQ     5$
 9401 031640  005137  002244                       COM     TSTDAT          ;COMP FIRST WORD
 9402 031644  005137  002246                       COM     TSTDAT+2        ;SECOND WORD
 9403 031650  104503                        5$:    CLR1CSR                 ;CLEAR 1 SELECTED CSR
 9404 031652  023737  002250  002254               CMP     SBEMSK,DBEMSK   ;CAN'T HAVE THE SAME ERROR BIT SET
 9405 031660  001004                               BNE     6$              ;IN BOTH MASKS
 9406 031662  023737  002252  002256               CMP     SBEMSK+2,DBEMSK+2;COULD BE EQUAL IN SECOND WORD
 9407 031670  001460                               BEQ     13$             ;GO MAKE THEM NOT EQUAL
 9408 031672  012737  002244  002310  6$:    MOV     #TSTDAT,SOURCE  ;SOURCE ADDRESS FOR CHKGEN
 9409 031700  004737  044400                       CALL    CHKGEN          ;GO GENERATE CHECK BITS
 9410 031704  013702  002250                       MOV     SBEMSK,R2
 9411 031710  074237  002244                       XOR     R2,TSTDAT
 9412 031714  013702  002252                       MOV     SBEMSK+2,R2
 9413 031720  074237  002246                       XOR     R2,TSTDAT+2
 9414 031724  013702  002254                       MOV     DBEMSK,R2
 9415 031730  074237  002244                       XOR     R2,TSTDAT
 9416 031734  013702  002256                       MOV     DBEMSK+2,R2
 9417 031740  074237  002246                       XOR     R2,TSTDAT+2
 9418 031744  104471                        16$:   ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 9419 031746  013731  002244                       MOV     TSTDAT,@(R1)+   ;WRITE 16 BITS
 9420 031752  104475                               CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 9421 031754  013771  002246  000000               MOV     TSTDAT+2,@(R1)  ;WRITE HIGH WORD
 9422 031762  104503                               CLR1CSR                 ;CLEAR 1 SELECTED CSR
 9423 031764  162701  000002                       SUB     #2,R1           ;ADJUST TEST ADDRESS
 9424 031770  005771  000000                       TST     @(R1)           ;READ THE LOCATION
 9425 031774  104501                               WAS1DBE                 ;WAS THERE ANY DOUBLE BIT ERRORS ON 1 SELECTED CSR
 9426 031776  103411                               BCS     9$              ;IT SHOULD BE SET
 9427 032000                                       SET     HEADER
 9428 032006  011137  002032                       MOV     (R1),ADDRESS
 9429 032012  104030                               ERROR   +30
 9430 032014                                       SET     HEADER
```

```
9433 032022  104512                    9$:     ERRGEN
9434 032024  105737  002262                    TSTB    PASFLG
9435 032030  100452                    14$:    BMI     14$
9436 032032  005737  002256            13$:    TST     DBEMSK+2        ;CHECK MASK FOR LAST BIT
9437 032036  100405                    10$:    BMI     10$             ;MINUS = BIT31
9438 032040                                    DLEFT   DBEMSK
9439 032050  000662                    4$:     BR      4$
9440 032052                            10$:    IF #SW11 SET.IN @SWR THEN GOTO 11$
9441 032062                                    IF QVFLAG IS TRUE THEN GOTO 11$
9442 032070  005737  002252                    TST     SBEMSK+2        ;CHECK SINGLE ERROR MASK TOO
9443 032074  100405                    11$:    BMI     11$             ;BR IF DONE
9444 032076                                    DLEFT   SBEMSK
9445 032106  000636                    3$:     BR      3$
9446 032110  105737  002262            11$:    TSTB    PASFLG  ;FIRST PASS
9447 032114  001003                    12$:    BNE     12$             ;NON ZERO MEANS WE'RE DONE
9448 032116  105237  002262                    INCB    PASFLG  ;FIRST PASS, NOT DONE
9449                                           ;CLEAR OUT ANY DBE'S OR SBE'S
9450 032122  000617                    1$:     BR      1$              ;KEEP GOING
9451 032124  052737  000200  002262    12$:    BIS     #BIT7,PASFLG    ;SET UP FOR CHECK BIT TEST
9452 032132  005037  002244                    CLR     TSTDAT
9453 032136  005037  002246                    CLR     TSTDAT+2
9454 032142  012737  000040  002250            MOV     #40,SBEMSK
9455 032150  012737  000100  002254            MOV     #100,DBEMSK
9456 032156  012737  003740  002312    14$:    MOV     #3740,CHECK
9457 032164  013702  002250                    MOV     SBEMSK,R2
9458 032170  074237  002312                    XOR     R2,CHECK
9459 032174  013702  002254                    MOV     DBEMSK,R2
9460 032200  074237  002312                    XOR     R2,CHECK
9461 032204  006337  002254                    ASL     DBEMSK
9462 032210  032737  020000  002254            BIT     #BIT13,DBEMSK
9463 032216  001652                    16$:    BEQ     16$
9464 032220  006337  002250                    ASL     SBEMSK
9465 032224  032737  004000  002250            BIT     #BIT11,SBEMSK
9466 032232  001006                    15$:    BNE     15$
9467 032234  013737  002250  002254            MOV     SBEMSK,DBEMSK
9468 032242  006337  002254                    ASL     DBEMSK
9469 032246  000743                    2$:     BR      14$
9470 032250  104471                    15$:    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
9471 032252  012701  002410                    MOV     #TESTADD,R1
9472 032256                                    CLEAR   @(R1)+,@(R1)
9473 032264  104503                    17$:    CLR1CSR                 ;CLEAR 1 SELECTED CSR
9474 032266  000207                    18$:    RETURN
```

```
9478 032270                        MTP014: SUBTST  <<MTP014        BASIC DOUBLE BIT ERROR TEST>>
                                   ;*****************************************************************************
                                   ;*SUBTEST       MTP014  BASIC DOUBLE BIT ERROR TEST
                                   ;*****************************************************************************
9479                               ;
9480                               ; THIS TEST CHECKS THAT A DOUBLE ERROR WILL BE DETECTED
9481                               ; A BYTE WRITE WITH A DOUBLE ERROR ON A MS11-P
9482                               ; WILL BE ABORTED.
9483                               ;
9484 032270  104424                        CACHOFF                 ;TURN OFF CACHE
9485 032272                                LET PARCNT := #0        ;CLEAR PARCNT
9486 032276                                LET NOPAR := #1         ;SET PARITY ACTION
9487 032304                                LET ADDRESS := #TRAP    ;SET ADDRESS FOR ERROR REPORT
9488 032312  104513                        CBREG                   ;ENABLE CHECK/SYNDROME BIT REGISTER
9489 032314                                LET CSR := #3145        ;DBE CHECK BITS FOR CSR
9490 032322  104425                        LOADCSR                 ;WRITE DBE CHECK BITS TO CSR
9491 032324                                LET GOOD := #103145     ;GOOD DATA
9492 032332                                LET (R1) := #0          ;WRITE ZEROS AND DBL ERROR CHK BITS A=0
9493 032334  005711                        TST (R1)                ;READ A=0 TO GET DOUBLE BIT ERROR
9494 032336                                IF PARCNT NE #1         ;WAS BUSPBL ASSERTED????
9495 032346  104055                           ERROR +55            ;ERROR CALL ;;MISSED EXPECTED TRAP
9496 032350                                END                     ;
9497 032350  104426                        READCSR                 ;READ CSR FOR CORRECT CHECK BITS AND DBE INDICATOR
9498 032352  042737  020000  002146        BIC #BIT13,CSR          ;CLEAR INHIBIT MODE POINTER FROM DATA IF IT EXSISTS1
9499 032360                                IF CSR NE GOOD THEN     ;CHECK IF DOUBLE ERROR BIT IS SET
9500 032370                                   SET HEADER           ;
9501 032376                                   LET BAD := CSR       ;BAD DATA
9502 032404  104065                           ERROR +65            ;
9503 032406                                END                     ;
9504 032406  104473                        ECC1INIT                ;ENABLE BUSPBL
9505 032410  005037  002264                CLR PASSNO              ;CLEAR LOOP COUNTER
9506 032414                                REPEAT                  ;
9507 032414  104473                          ECC1INIT              ;ENABLE BUSPBL
9508 032416  005237  002264                  INC PASSNO            ;INCREMENT LOOP COUNTER
9509 032422  005037  002070                  CLR PARCNT            ;CLEAR PARITY ACTION COUNTER
9510 032426                                  LET (R1) :B= #377     ;WRITE BYTE SHOULD BE ABORTED
9511 032432  105711                          TSTB (R1)             ;READ R1 TO SEE IF IT IS STILL 0
9512 032434                                  IF PARCNT NE #1       ;WAS WRITE ABORTED???
9513 032444                                     SET HEADER         ;
9514 032452                                     LET GOOD := #0     ;GOOD DATA
9515 032456                                     LET BAD := #377    ;BAD DATA
9516 032464  104056                             ERROR +56          ;
9517 032466                                  END                   ;
9518 032466  005201                          INC   R1              ;AND REPEAT ON HIGH BYTE
9519 032470                                UNTIL PASSNO EQ #2      ;
9520 032500  005041                        CLR     -(R1)           ;CLEAR LUT
9521 032502  104503                        CLR1CSR                 ;CLEAR CSR
9522 032504  005037  002070                CLR     PARCNT          ;CLEAR PARITY TRAP COUNTER
9523 032510  104423                        CACHON                  ;TURN ON CACHE
9524 032512  000207                        RETURN                  ;
```

```
 9526 032514                                MTP015: SUBTST  <<MTP015        WRITE INHIBIT OF BYTE WITH DBE>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MTP015  WRITE INHIBIT OF BYTE WITH DBE
                                            ;*****************************************************************************
 9527                                                       ;CHECK FOR WRITE INHIBIT DURING A WRITE BYTE.
 9528                                                       ;CHECKS FOR UNCORRECTED DATA.
 9529 032514  005037  002240          1$:      CLR     DATBUF          ;INITIAL DATA
 9530 032520  005037  002242                   CLR     DATBUF+2        ;32 BITS WORTH
 9531 032524  012737  000001  002250  2$:      MOV     #1,SBEMSK       ;SINGLE ERROR MASK
 9532 032532  005037  002252                   CLR     SBEMSK+2        ;
 9533 032536  012737  000001  002254  3$:      MOV     #1,DBEMSK       ;DOUBLE ERROR MASK
 9534 032544  005037  002256                   CLR     DBEMSK+2        ;
 9535 032550  013737  002240  002244  4$:      MOV     DATBUF,TSTDAT   ;PRESERVE ORIG DATA
 9536 032556  013737  002242  002246           MOV     DATBUF+2,TSTDAT+2
 9537 032564  105737  002262                   TSTB    PASFLG          ;WHICH PASS ?
 9538 032570  001404                           BEQ     5$              ;FIRST PASS, NO COMPLEMENTING
 9539 032572  005137  002244                   COM     TSTDAT
 9540 032576  005137  002246                   COM     TSTDAT+2        ;SECOND PASS, COMPLEMENT TSTDAT
 9541 032602  104503                  5$:      CLR1CSR                 ;CLEAR 1 SELECTED CSR
 9542 032604  023737  002250  002254           CMP     SBEMSK,DBEMSK   ;CHECK FOR SAME MASKS
 9543 032612  001004                           BNE     6$              ;BR IF NOT EQUAL
 9544 032614  023737  002252  002256           CMP     SBEMSK+2,DBEMSK+2       ;SECOND WORD ALSO
 9545 032622  001474                           BEQ     11$             ;BR TO MAKE THEM NOT EQUAL
 9546 032624  012737  002244  002310  6$:      MOV     #TSTDAT,SOURCE  ;ADDRESS FOR CHKGEN
 9547 032632  004737  044400                   CALL    CHKGEN          ;GO GENERATE CHECK BITS
 9548 032636  013701  002250                   MOV     SBEMSK,R1
 9549 032642  074137  002244                   XOR     R1,TSTDAT
 9550 032646  013701  002252                   MOV     SBEMSK+2,R1
 9551 032652  074137  002246                   XOR     R1,TSTDAT+2
 9552 032656  013701  002254                   MOV     DBEMSK,R1
 9553 032662  074137  002244                   XOR     R1,TSTDAT
 9554 032666  013701  002256                   MOV     DBEMSK+2,R1
 9555 032672  074137  002246                   XOR     R1,TSTDAT+2
 9556 032676  012701  002410          7$:      MOV     #TESTADD,R1     ;TEST LOCATION
 9557 032702  104471                           ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 9558 032704  013731  002244                   MOV     TSTDAT,@(R1)+   ;WRITE FIRST 16 BITS
 9559                                           ;LOAD CSR WITH IMAGE FROM R2
 9560 032710  104475                           CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 9561 032712  013771  002246  000000           MOV     TSTDAT+2,@(R1)  ;WRITE SECOND 16 BITS + CHECKBITS
 9562 032720  104503                           CLR1CSR                 ;CLEAR 1 SELECTED CSR
 9563 032722  013702  002410                   MOV     TESTADD,R2      ;GET ADDRESS OF TEST LOC
 9564 032726  010203                           MOV     R2,R3           ;R2 DESIGNATES FIRST BYTE
 9565 032730  062703  000003                   ADD     #3,R3           ;R3 DESIGNATES LAST BYTE
 9566 032734  112722  000360          8$:      MOVB    #360,(R2)+      ;TRY WRITING A BYTE
 9567 032740  012701  002410                   MOV     #TESTADD,R1
 9568 032744  017100  000000                   MOV     @(R1),R0
 9569 032750  023700  002244                   CMP     TSTDAT,R0       ;CHECK FOR UNCHANGED DATA
 9570 032754  001404                           BEQ     9$              ;BR IF OK
 9571 032756  017137  000000  002032           MOV     @(R1),ADDRESS
 9572 032764  104455                           PERR31
 9573
 9574 032766  017100  000002          9$:      MOV     @2(R1),R0
 9575 032772  023700  002246                   CMP     TSTDAT+2,R0     ;READ SECOND WORD
 9576 032776  001404                           BEQ     10$             ;BR IF UNCHANGED
 9577 033000  017137  000002  002032           MOV     @2(R1),ADDRESS
 9578 033006  104455                           PERR31
 9579
```

```
9580 033010  020203                  10$:   CMP     R2,R3            ;TESTED LAST BYTE ?
9581 033012  001350                         BNE     8$               ;BR IF NO
9582 033014  105737  002262          11$:   TSTB    PASFLG
9583 033020  100452                         BMI     15$              ;BRANCH IF TESTING CHECK BITS
9584 033022  005737  002256                 TST     DBEMSK+2         ;CHECKING FOR LAST ERROR BIT
9585 033026  100405                         BMI     12$              ;BR IF DONE HERE
9586 033030                                 DLEFT   DBEMSK
9587 033040  000643                         BR      4$
9588 033042                          12$:   IF #SW11 SET.IN @SWR THEN GOTO 13$
9589 033052                                 IF QVFLAG IS TRUE THEN GOTO 13$
9590 033060  005737  002252                 TST     SBEMSK+2         ;LAST SBE MASK
9591 033064  100405                         BMI     13$              ;BR IF DONE WITH THIS PASS
9592 033066                                 DLEFT   SBEMSK
9593 033076  000617                         BR      3$
9594 033100  105737  002262          13$:   TSTB    PASFLG  ;TEST PASS FLAG
9595 033104  001003                         BNE     14$              ;NON ZERO MEANS WE'RE DONE
9596 033106  105237  002262                 INCB    PASFLG  ;NOT DONR
9597 033112  000600                         BR      1$
9598 033114  052737  000200  002262  14$:   BIS     #BIT7,PASFLG
9599 033122  005037  002244                 CLR     TSTDAT
9600 033126  005037  002246                 CLR     TSTDAT+2
9601 033132  012737  000040  002250         MOV     #40,SBEMSK
9602 033140  012737  000100  002254         MOV     #100,DBEMSK
9603 033146  012737  003740  002312  15$:   MOV     #3740,CHECK
9604 033154  013702  002250                 MOV     SBEMSK,R2
9605 033160  074237  002312                 XOR     R2,CHECK
9606 033164  013702  002254                 MOV     DBEMSK,R2
9607 033170  074237  002312                 XOR     R2,CHECK
9608 033174  006337  002254                 ASL     DBEMSK
9609 033200  032737  020000  002254         BIT     #BIT13,DBEMSK
9610 033206  001633                         BEQ     7$
9611 033210  006337  002250                 ASL     SBEMSK
9612 033214  032737  004000  002250         BIT     #BIT11,SBEMSK
9613 033222  001006                         BNE     16$
9614 033224  013737  002250  002254         MOV     SBEMSK,DBEMSK
9615 033232  006337  002254                 ASL     DBEMSK
9616 033236  000743                         BR      15$
9617 033240  104471                  16$:   ECC1DIS                  ;DISABLE ECC ON 1 SELECTED CSR
9618 033242  012701  002410                 MOV     #TESTADD,R1      ;TEST LOCATION
9619 033246                                 CLEAR   @(R1)+,@(R1)     ;TO ERASE ANY DBE'S FROM TESTING
9620                                        ;RESTORE CSR
9621 033254  104503                        CLR1CSR                  ;CLEAR 1 SELECTED CSR
9622 033256  000207                        RETURN
```

```
 9625 033260                                MTP016: SUBTST  <<MTP016        WRITE INHIBIT OF WORD WITH DBE>>
                                            ;*********************************************************************
                                            ;*SUBTEST       MTP016  WRITE INHIBIT OF WORD WITH DBE
                                            ;*********************************************************************
 9626                                               ;DOUBLE BIT ERROR WRITE CANCEL WITH
 9627                                               ;WORD WRITE.
 9628                                               ;CHECKS WRITE INHIBIT WITH WORD WRITES TO
 9629                                               ;WORD WITH DOUBLE ERROR.
 9630 033260  005037  002240          T12A:   CLR     DATBUF          ;BACKGROUND FOR DOUBLE ERRORS
 9631 033264  005037  002242                  CLR     DATBUF+2        ;2 WORDS WORTH
 9632 033270  012737  000001  002250          MOV     #1,SBEMSK       ;SINGLE ERROR MASK
 9633 033276  005037  002252                  CLR     SBEMSK+2        ;
 9634 033302  012737  000001  002254  T12B:   MOV     #1,DBEMSK       ;DOUBLE ERROR MASK
 9635 033310  005037  002256                  CLR     DBEMSK+2
 9636 033314  013737  002240  002244  1$:     MOV     DATBUF,TSTDAT   ;DATA FOR TEST
 9637 033322  013737  002242  002246          MOV     DATBUF+2,TSTDAT+2;BOTH WORDS
 9638 033330  105737  002262                  TSTB    PASFLG  ;COMP DATA ON SECOND PASS ONLY
 9639 033334  001404                          BEQ     2$              ;BR IF FIRST PASS
 9640 033336  005137  002244                  COM     TSTDAT          ;COMP FIRST WORD
 9641 033342  005137  002246                  COM     TSTDAT+2        ;NOW SECOND WORD
 9642 033346  023737  002250  002254  2$:     CMP     SBEMSK,DBEMSK   ;CHECK FOR IDENTICAL MASKS
 9643 033354  001004                          BNE     3$              ;BR IF DIFFERENT
 9644 033356  023737  002252  002256          CMP     SBEMSK+2,DBEMSK+2;UPPER WORD TOO
 9645 033364  001502                          BEQ     8$              ;BR TO MAKE THEM NOT EQUAL
 9646 033366  012737  002244  002310  3$:     MOV     #TSTDAT,SOURCE  ;NEED ADDR OF DATA FOR CHKGEN
 9647 033374  004737  044400                  CALL    CHKGEN          ;GO GENERATE CHECK BITS
 9648 033400  013701  002250                  MOV     SBEMSK,R1
 9649 033404  074137  002244                  XOR     R1,TSTDAT
 9650 033410  013701  002252                  MOV     SBEMSK+2,R1
 9651 033414  074137  002246                  XOR     R1,TSTDAT+2
 9652 033420  013701  002254                  MOV     DBEMSK,R1
 9653 033424  074137  002244                  XOR     R1,TSTDAT
 9654 033430  013701  002256                  MOV     DBEMSK+2,R1
 9655 033434  074137  002246                  XOR     R1,TSTDAT+2
 9656 033440  012701  002410          4$:     MOV     #TESTADD,R1     ;FIRST TEST ADRRESS
 9657 033444  104471                          ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 9658 033446  013731  002244                  MOV     TSTDAT,@(R1)+   ;WRITE FIRST 16 BITS
 9659 033452  104475                          CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 9660 033454  013771  002246  000000          MOV     TSTDAT+2,@(R1)  ;WRITE SECOND 16 BITS + CHECKBITS
 9661 033462  105037  002263                  CLRB    UPPFLG          ;SET FOR 2 LOOPS
 9662 033466  162701  000002                  SUB     #2,R1           ;POINT TO LOW WORD
 9663 033472  104503                  5$:     CLR1CSR                 ;CLEAR 1 SELECTED CSR
 9664 033474  012771  177400  000000          MOV     #177400,@(R1)   ;TRY WRITING LOCATION
 9665 033502  012701  002410                  MOV     #TESTADD,R1
 9666 033506  017100  000000                  MOV     @(R1),R0
 9667 033512  023700  002244                  CMP     TSTDAT,R0       ;CHECK FOR ORIGINAL DATA
 9668 033516  001404                          BEQ     6$              ;SHOULD BE UNCHANGED
 9669 033520  017137  000000  002032          MOV     @(R1),ADDRESS
 9670 033526  104455                          PERR31
 9671
 9672 033530  062701  000002          6$:     ADD     #2,R1
 9673 033534  017100  000000                  MOV     @(R1),R0
 9674 033540  023700  002246                  CMP     TSTDAT+2,R0     ;THIS SHOULD BE UNCHANGED ALSO
 9675 033544  001404                          BEQ     7$
 9676 033546  017137  000000  0020'2          MOV     @(R1),ADDRESS
 9677 033554  104455                          PERR31
```

```
9680 033556  105737  002267          7$:     TSTB    UPPFLG          ;WHICH LOOP ?
9681 033562  001003                          BNE     8$              ;SECOND, BR OUT
9682 033564  105237  002263                  INCB    UPPFLG          ;FIRST, KEEP GOING
9683 033570  000740                          BR      5$
9684 033572  105737  002262          8$:     TSTB    PASFLG
9685 033576  100454                          BMI     12$
9686 033600  005737  002256                  TST     DBEMSK+2        ;LAST BIT ?
9687 033604  100405                          BMI     9$              ;MINUS = BIT 31
9688 033606                                  DLEFT   DBEMSK
9689 033616  000636                          BR      1$
9690 033620                          9$:     IF #SW11 SET.IN @SWR THEN GOTO 10$
9691 033630                                  IF QVFLAG IS TRUE THEN GOTO 10$
9692 033636  005737  002252                  TST     SBEMSK+2        ;LAST BIT IN THIS MASK ?
9693 033642  100406                          BMI     10$             ;BR IF LAST BIT
9694 033644                                  DLEFT   SBEMSK
9695 033654  000137  033302                  JMP     T12B
9696 033660  105737  002262          10$:    TSTB    PASFLG  ;FIRST PASS ?
9697 033664  001004                          BNE     11$             ;BR IF SECOND
9698 033666  105237  002262                  INCB    PASFLG  ;INDICATE SECOND PASS COMING
9699 033672  000137  033260                  JMP     T12A
9700 033676  052737  000200  002262  11$:    BIS     #BIT7,PASFLG
9701 033704  005037  002244                  CLR     TSTDAT
9702 033710  005037  002246                  CLR     TSTDAT+2
9703 033714  012737  000040  002250          MOV     #40,SBEMSK
9704 033722  012737  000100  002254          MOV     #100,DBEMSK
9705 033730  012737  003740  002312  12$:    MOV     #3740,CHECK
9706 033736  013702  002250                  MOV     SBEMSK,R2
9707 033742  074237  002312                  XOR     R2,CHECK
9708 033746  013702  002254                  MOV     DBEMSK,R2
9709 033752  074237  002312                  XOR     R2,CHECK
9710 033756  006337  002254                  ASL     DBEMSK
9711 033762  032737  020000  002254          BIT     #BIT13,DBEMSK
9712 033770  001623                          BEQ     4$
9713 033772  006337  002250                  ASL     SBEMSK
9714 033776  032737  004000  002250          BIT     #BIT11,SBEMSK
9715 034004  001006                          BNE     13$
9716 034006  013737  002250  002254          MOV     SBEMSK,DBEMSK
9717 034014  006337  002254                  ASL     DBEMSK
9718 034020  000743                          BR      12$
9719 034022  104471                  13$:    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
9720 034024  012701  002410                  MOV     #TESTADD,R1     ;RESTORE TEST ADDRESS
9721 034030  005031                          CLR     @(R1)+          ;CLEAR ANY DBE'S FROM TEST
9722 034032  005071  000000                  CLR     @(R1)
9723 034036  104503                          CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
9724 034040  000207                          RETURN
```

```
 9727 034042                            MTP017: SUBTST  <<MTP017        HOLDING 1'S & 0'S TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTP017  HOLDING 1'S & 0'S TEST
                                        ;*****************************************************************************
 9728                                           ;*(1)    THIS TEST CHECKS THE MEMORY FOR THE CAPABILITY
 9729                                           ;*       OF HOLDING 1'S AND 0'S BY WRITING A BACKGROUND
 9730                                           ;*       OF 000377 AND READING IT
 9731                                           ;*(2)    MEMORY IS WRITTEN USING A BYTE AT A TIME
 9732                                           ;*(3)    STEPS 1 & 2 ARE REPEATED WITH A SWAPPED BACKGROUND PATTERN
 9733                                           ;NOTE:   THIS TEST WRITES BYTES & READS WORDS
 9734 034042  012701  060000                   MOV      #FIRST,R1
 9735 034046  010104                           MOV      R1,R4
 9736 034050  012705  160000                   MOV      #LAST+2,R5
 9737 034054  012700  000377                   MOV      #377,R0         ;GET THE PATTERN INTO R0
 9738 034060  010003                           MOV      R0,R3
 9739 034062  000303                           SWAB     R3
 9740 034064  110021                    1$:    MOVB     R0,(R1)+        ;WRITE A BYTE
 9741 034066  110321                           MOVB     R3,(R1)+        ;WRITE THE MEMORY WITH THE BYTE STORED IN BAKPAT+1
 9742 034070  020105                           CMP      R1,R5           ;COMPARE TEST LOC TO TOP + 2
 9743 034072  103774                           BLO      1$              ;BRANCH IF LOWER
 9744
 9745 034074  014102                    2$:    MOV      -(R1),R2
 9746 034076  020002                           CMP      R0,R2           ;TEST THE MEMORY TO SEE IF IT CONTAINS
 9747                                                                   ;THE WORD STORED IN BAKPAT
 9748 034100  001401                           BEQ      3$
 9749 034102  104446                           PERR22
 9750
 9751 034104  020104                    3$:    CMP      R1,R4           ;KEEP ON TESTING THE MEMORY UNTIL
 9752 034106  101372                           BHI      2$              ;R1 EQUALS THE LOWEST ADDRESS
 9753 034110  000303                           SWAB     R3              ;CHANGE THE DATA PATTERN
 9754 034112  000300                           SWAB     R0
 9755 034114  001763                           BEQ      1$              ;IF THE DATA PATTERN DOES NOT HAVE LOW
 9756                                                                   ; BYTE =0 THEN FALL THRU
 9757 034116  000207                           RETURN
```

```
9761 034120                          MTP020: SUBTST  <<MTP020        SYNDROMES TO CSR ON SINGLE BIT ERROR TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MTP020  SYNDROMES TO CSR ON SINGLE BIT ERROR TEST
                                     ;*****************************************************************************
9762                                 ;
9763                                 ;  THIS TEST CHECKS TO SEE IF THE SINGLE BIT ERRORS CAUSE THE SBE
9764                                 ;  BIT IN THE CSR TO BE SET AND CORRECT SYNDROME BITS ARE GENERATED FOR
9765                                 ;  ALL 16 DATA BITS.
9766                                 ;
9767 034120  104424                 CACHOFF                          ;TURN OFF CACHE
9768 034122  005000                 CLR  R0                          ;CLEAR DATA
9769 034124  105037  002262         CLRB PASFLG                      ;CLEAR PASFLG
9770 034130  104513                 CBREG                            ;ENABLE CHECK/SYNDROME BIT REGISTER
9771 034132                         REPEAT                           ;
9772 034132                           LET PASFLG :B= PASFLG + #1      ;INCREMENT LOOP COUNTER
9773 034136                           LET R4  := #-1                 ;INDEX TO SINGLE BIT ERROR TABLE
9774 034142                           LET BITNO := #0                ;CLEAR INNER LOOP COUNTER
9775 034146                           IFB PASFLG EQ #1               ;SELECT DATA TO BE CORRECTED BY PASSNO
9776 034156                             LET R5 := #1                 ;DATA=0;BIT TO BE CORRECTED IS A ONE
9777 034162                           ELSE                           ;
9778 034164                             LET R5 := #177776            ;DATA=177776;BIT TO BE CORRECTED IS A ZERO
9779 034170                           END                            ;
9780 034170                           REPEA'                         ;
9781 034170  005237  002322           INC BITNO                      ;INCREMENT BIT POINTER
9782 034174                           LET R4 := R4 + #1              ;POINT TO NEXT SET OF CHECK BITS
9783 034176                           LET R2 :B= PTABLE(R4)          ;GET NEXT SET OF CHECK BITS
9784 034202  072227  000005           ASH #5,R2                      ;SHIFT TO LINE UP IN CSR
9785 034206  052702  000004           BIS #BIT2,R2                   ;ENABLE DIAG MODE
9786 034212                           LET CSR := R2                  ;GET CHECK BITS TO BE WRITTEN
9787 034216  104425                   LOADCSR                        ;LOAD CSR WITH DATA
9788 034220                           LET (R1) := R0                 ;WRITE DATA TO TEST ADDRESS
9789 034222  104503                   CLR1CSR                        ;CLEAR CSR
9790 034224  005711                   TST (R1)                       ;CORRECT SBE
9791 034226  104426                   READCSR                        ;READ CSR FOR CORRECT SBE BIT AND SYNDROMES
9792 034230  042737  177757  002146   BIC #^C20,CSR                  ;CLEAR ALL BUT SBE INDICATOR
9793 034236                           IF CSR NE #20                  ;WAS DATA CORRECTED???
9794 034246                             LET GOOD := #20              ;
9795 034254                             LET BAD := CSR               ;
9796 034262  104060                     ERRJR +60                    ;NO ERROR
9797 034264                           END                            ;
9798 034264  104513                   CBREG                          ;ENABLE SYNDROME BIT REGISTER
9799 034266  104426                   READCSR                        ;GET SYNDROMES FROM CSR
9800 034270  042737  174033  002146   BIC #^C3744,CSR                ;MASK SYNDROME BITS
9801 034276                           LET R3 :B= SBESYN(R4)          ;GET GOOD SYNDROMES
9802 034302  072327  000005           ASH #5,R3                      ;SHIFT INTO POSITION
9803 034306  052703  000004           BIS #BIT2,R3                   ;SET DIAG MODE IN DATA
9804 034312                           IF R3 NE CSR                   ;DO SYNDROME BITS AGREE
9805 034320                             SET HEADER                   ;
9806 034326                             LET GOOD := R3               ;
9807 034332                             LET BAD := CSR               ;
9808 034340  104042                     ERROR +42                    ;
9809 034342                           END                            ;
9810 034342  005011                   CLR (R1)                       ;CLEAR LUT
9811 034344                           IFB PASFLG EQ #1               ;SHIFT NEW DATA DEPENDING ON PASFLG
9812 034354  006305                     ASL  R5                      ;SHIFT BITNO TO THE LEFT
9813 034356                           ELSE                           ;
9814 034360  000261                     SEC                          ;SET CARRY BIT AND.....
```

```
 9815 034362  006105                                ROL    R5                ;ROTATE LEFT
 9816 034364                                      ENL                         ;
 9817 034364                                    UNTIL BITNO EQ #16.           ;UNTIL ALL BITS ARE DONE
 9818 034374  005100                              COM R0                      ;COMPLEMENT DATA AND REPEAT
 9819 034376                                    UNTILB PASFLG EQ #2           ;UNTIL 2 PASSES ARE COMPLETE!
 9820 034406  104503                            CLR1CSR                       ;CLEAR CSR
 9821 034410  104423                            CACHON                        ;TURN CACHE
 9822 034412  000207                            RETURN
 9823                                ;
 9824                                ;       MS11-P SINGLE BIT ERROR SYNDROME BIT TABLE
 9825                                ;
 9826 034414     016     013     023  SBESYN: .BYTE   16,13,23,25,26,31,32,34,43,45,46,51,52,54,61,64
      034417     025     026     031
      034422     032     034     043
      034425     045     046     051
      034430     052     054     061
      034433     064
 9827
```

```
9829 034434                     MTPA21: SUBTST  <<MTPA21        MARCHING 1'S & 0'S PATTERN TEST>>
                                ;*****************************************************************
                                ;*SUBTEST        MTPA21  MARCHING 1'S & 0'S PATTERN TEST
                                ;*****************************************************************
9830                                    ;READ,BYTESWAP-MODIFY,READ,DOWN
9831 034434  014100            1$:      MOV     -(R1),R0;V177640
9832 034436  020200                     CMP     R2,R0   ;V177642
9833 034440  001401                     BEQ     2$      ;V177644
9834 034442  104443                     PERR17          ;V177646
9835
9836 034444  000311            2$:      SWAB    (R1)    ;V177650
9837 034446  011100                     MOV     (R1),R0 ;V177652
9838 034450  020300                     CMP     R3,R0   ;V177654
9839 034452  001401                     BEQ     3$      ;V177656
9840 034454  104444                     PERR20          ;V177660
9841
9842 034456  020401            3$:      CMP     R4,R1   ;V177662        ;DONE?
9843 034460  001365                     BNE     1$      ;V177664        ;NO - LOOP
9844 034462  000207                     RETURN          ;V177666        ;YES - RETURN
9845
9846 034464                     MTPB21: ;READ,BYTESWAP-MODIFY,READ,UP
9847 034464  011100            1$:      MOV     (R1),R0 ;V177640
9848 034466  020300                     CMP     R3,R0   ;V177642
9849 034470  001401                     BEQ     2$      ;V177644
9850 034472  104444                     PERR20          ;V177646
9851
9852 034474  000311            2$:      SWAB    (R1)    ;V177650
9853 034476  011100                     MOV     (R1),R0 ;V177652
9854 034500  020200                     CMP     R2,R0   ;V177654
9855 034502  001401                     BEQ     3$      ;V177656
9856 034504  104443                     PERR17          ;V177660
9857
9858 034506  062701  000002      3$:      ADD     #2,R1   ;V177662
9859 034512  020501                     CMP     R5,R1   ;V177666        ;DONE?
9860 034514  001363                     BNE     1$      ;V177670        ;NO - LOOP
9861 034516  000207                     RETURN          ;V177672        ;YES - RETURN
9862
9863 034520                     MTPC21: ;READ,BYTESWAP-MODIFY,READ,UP
9864 034520  011100            1$:      MOV     (R1),R0 ;V177640
9865 034522  020200                     CMP     R2,R0   ;V177642
9866 034524  001401                     BEQ     2$      ;V177644
9867 034526  104443                     PERR17          ;V177646
9868
9869 034530  000311            2$:      SWAB    (R1)    ;V177650
9870 034532  011100                     MOV     (R1),R0 ;V177652
9871 034534  020300                     CMP     R3,R0   ;V177654
9872 034536  001401                     BEQ     3$      ;V177656
9873 034540  104444                     PERR20          ;V177660
9874
9875 034542  062701  000002      3$:      ADD     #2,R1   ;V177662
9876 034546  020501                     CMP     R5,R1   ;V177666        ;DONE?
9877 034550  001363                     BNE     1$      ;V177670        ;NO - LOOP
9878 034552  000207                     RETURN          ;V177672        ;YES - RETURN
```

```
 9881 034554                    MTPD21: ;READ,BYTESWAP-MODIFY,READ,DOWN
 9882 034554  014100            1$:     MOV     -(R1),R0;V177640
 9883 034556  020300                    CMP     R3,R0   ;V177642
 9884 034560  001401                    BEQ     2$      ;V177644
 9885 034562  104444                    PERR20          ;V177646
 9886
 9887 034564  000311            2$:     SWAB    (R1)    ;V177650
 9888 034566  011100                    MOV     (R1),R0 ;V177652
 9889 034570  020200                    CMP     R2,R0   ;V177654
 9890 034572  001401                    BEQ     3$      ;V177656
 9891 034574  104443                    PERR17          ;V177660
 9892
 9893 034576  020401            3$:     CMP     R4,R1   ;V177662        ;DONE?
 9894 034600  001365                    BNE     1$      ;V177664        ;NO - LOOP
 9895 034602  000207                    RETURN          ;V177666        ;YES - RETURN
 9896
```

```
 9899 034604                        MTP022: SUBTST  <<MTP022        REFRESH & SHIFTING DIAGONAL TEST>>
                                    ;*********************************************************************
                                    ;*SUBTEST        MTP022  REFRESH & SHIFTING DIAGONAL TEST
                                    ;*********************************************************************
 9900                                       ;(1)    WE WRITE A DIAGONAL PATTERN IN MEMORY (WITH CACHE ON).
 9901                                       ;(2)    IF A REFRESH TEST WE DISTURB ALL ROWS FOR > 2 MS (WITH CACHE ON).
 9902                                       ;(3)    WE READ & CHECK FOR CORRECTNESS THE DIAGONAL PATTERN
 9903                                       ;       (WITH CACHE OFF).
 9904          000010                KDIAG=8.                ;HOW OFTEN A DIAGONAL STRIPE OCCURS (MUST BE A POWER OF 2)
 9905 034604                              FOR EVEN := #1 TO #2                      ;FOR DATA & COMPLEMENT DATA
 9906 034612                                IF EVEN EQ #1
 9907 034622                                  LET R2 := ZEROS
 9908 034626                                  LET R3 := ONES
 9909 034632                                ELSE
 9910 034634                                  LET R2 := ONES
 9911 034640                                  LET R3 := ZEROS
 9912 034644                                END ;OF IF EVEN
 9913 034644                                FOR STRIPES := #0 TO #KDIAG-1          ;FOR THE NUMBER OF STRIPES
 9914
 9915                                         ;WRITE LOOP
 9916 034650  104423                         CACHON                          ;TURN CACHE ON
 9917 034652                                  LET COUNT := STRIPES
 9918 034660                                  LET R1 := #FIRST
 9919 034664                                  WHILE R1 LOS #LAST
 9920 034672                                    IF COUNT LT #0 THEN LET COUNT := #KDIAG-1
 9921 034706                                    IF #374 OFF.IN R1 THEN LET COUNT := COUNT - #1
 9922 034720                                    IF COUNT NE #0
 9923 034726                                      LET (R1) := R2
 9924 034730                                      LET 2(R1) := R2
 9925 034734                                    ELSE
 9926 034736                                      LET (R1) := R3
 9927 034740                                      LET 2(R1) := R3
 9928 034744                                    END ;OF IF COUNT
 9929 034744                                    LET COUNT := COUNT - #1
 9930 034750                                    LET R1 := R1 + #4
 9931 034754                                  END ;OF WHILE
 9932                                         ;END OF WRITE LOOP
 9933
 9934 034756                                  IF DIAGFLAG IS FALSE THEN $CALL REFRESH
 9935                                         ;READ LOOP
 9936 034770                                  LET COUNT := STRIPES
 9937 034776                                  LET R1 := #FIRST
 9938 035002  104424                         CACHOFF                         ;TURN CACHE OFF
```

```
9940 035004                                             WHILE R1 LOS #LAST
9941 035012                                               IF COUNT LT #0 THEN LET COUNT := #KDIAG-1
9942 035026                                               IF #374 OFF.IN R1 THEN LET COUNT := COUNT - #1
9943 035040                                               IF COUNT NE #0
9944 035046                                                 LET R0 := (R1)
9945 035050                                                 IF R2 NE R0
9946 035054  104443                                          PERR17
9947 035056                                                 END ;OF IF R2
9948 035056                                                 LET R0 := 2(R1)
9949 035062                                                 IF R2 NE R0
9950 035066  104443                                          PERR17
9951 035070                                                 END ;OF IF R2
9952 035070                                               ELSE
9953 035072                                                 LET R0 := (R1)
9954 035074                                                 IF R3 NE R0
9955 035100  104444                                          PERR20
9956 035102                                                 END ;OF IF R3
9957 035102                                                 LET R0 := 2(R1)
9958 035106                                                 IF R3 NE R0
9959 035112  104444                                          PERR20
9960 035114                                                 END ;OF IF R3
9961 035114                                               END ;OF IF COUNT
9962 035114                                               LET COUNT := COUNT - #1
9963 035120                                               LET R1 := R1 + #4
9964 035124                                             END ;OF WHILE
9965                                                     ;END OF READ LOOP
9966
9967 035126                                           END ;OF FOR STRIPES
9968 035142                                         END ;OF FOR EVEN
9969 035156  000207                                 RETURN
9970
9971 035160                                         REFRESH:SUBTST  <<SUBR  REFRESH DELAY>>
                                                    ;*****************************************************************************
                                                    ;*SUBTEST        SUBR    REFRESH DELAY
                                                    ;*****************************************************************************
9972                                                ;DISTURB EACH ROW FOR > 3.2 MS
9973 035160                                         FOR R0 := #FIRST TO #FIRST+374 BY #4
9974 035164  004737  035230                           CALL REFSUB
9975 035170                                         END ;OF FOR R0
9976 035202                                         LET R0 := #FIRST+BIT14
9977 035206                                         WHILE R0 LOS #LAST+BIT14+374
9978 035214  004737  035230                           CALL REFSUB
9979 035220                                           LET R0 := R0 + #4
9980 035224                                         END ;OF WHILE
9981 035226  000207                                 RETURN
9982 035230  012704  000640                 REFSUB: MOV     #640,R4                 ;TIME FOR A > 3.2 MS LOOP
9983 035234  062700  000002                         ADD     #2,R0
9984 035240  005140                         1$:     COM     -(R0)
9985 035242  005120                                 COM     (R0)+
9986 035244  005110                                 COM     (R0)
9987 035246  005110                                 COM     (R0)
9988 035250  077405                                 SOB     R4,1$
9989 035252  162700  000002                         SUB     #2,R0
9990 035256  000207                                 RETURN
```

```
 9993 035260                    MTPA24: SUBTST  <<MTPA24        FAST GALLOPING PATTERN TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MTPA24  FAST GALLOPING PATTERN TEST
                                ;*****************************************************************************
 9994                                   ;THE TOTAL TEST (INCLUDING SETUP) IS AS FOLLOWS
 9995                                   ;*(1)   THIS TEST WRITES THE MEMORY WITH A BACK GROUND PATTERN
 9996                                   ;*      STORED AT LOCATION BAKPAT
 9997                                   ;*(2)   TEST BEGINS AT LOWEST LOCATION BEING TESTED
 9998                                   ;*      (LETS NAME IT 'A')
 9999                                   ;*(3)   LETS NAME THE 1ST LOCATION IN THE ROW/COLUMN UNDER TEST AS 'B'.
10000                                   ;*(4)   SWAPS BYTES FOR LOCATION 'A'.
10001                                   ;*(5)   READS 'A', READS 'B'
10002                                   ;*(6)   'B' = 'B'+400   (ADDS 64 DOUBLE WORDS TO 'B')
10003                                   ;*(7)   REPEATS STEPS 5 AND 6 UNTIL 'B' IS GREATER THAN THE
10004                                   ;*(8)   END OF THE BANK  A+2
10005                                   ;*(9)   REPEATS  STEPS 3-8 UNTILL 'A' REACHES THE END OF THE BANK
10006                                   ;*(10)  AFTER EXECUTING THE TEST  DATA IS COMPLEMENTED
10007                                   ;*      AND STEPS 1-9 ARE REPEATED
10008                                   ;REGISTERS ARE USED AS FOLLOWS
10009                                   ;R0     TEST DATA
10010                                   ;R1     'A'
10011                                   ;R2     'B'
10012                                   ;R3     BAKPAT
10013                                   ;R4     SWAPAT
10014                                   ;R5     LAST
10015
10016                                   ;NOTE THE PATTERN STARTS AT MTPB24!!!!!!!!!!!!!!!
10017
10018                                   ;UIPAR'S
10019 035260  011100           1$:     MOV     (R1),R0         ;V177640        ;READ 'A'
10020 035262  020004                   CMP     R0,R4           ;V177642        ;CHECK 'A'
10021 035264  001401                   BEQ     2$              ;V177644        ;BR IF OK
10022 035266  104447                   PERR23                  ;V177646        ;REPORT ERROR
10023
10024 035270  011200           2$:     MOV     (R2),R0         ;V177650        ;READ 'B'
10025 035272  020003                   CMP     R0,R3           ;V177652        ;CHECK 'B'
10026 035274  001401                   BEQ     3$              ;V177654        ;BR IF OK
10027 035276  104450                   PERR24                  ;V177656        ;REPORT ERROR
10028
10029 035300  062702  000400     3$:     ADD     #400,R2         ;V177660        ;BUMP 'B'
10030 035304  020205                   CMP     R2,R5           ;V177664        ;AT END YET?
10031 035306  101764                   BLOS    1$              ;V177666        ;BR IF NO
10032
10033 035310  062701  000002           ADD     #2,R1           ;V177670        ;BUMP 'A'
10034 035314  000137  035320           JMP     @#MTPB24        ;V177674        ;GOTO V177260
```

```
10037 035320                          MTPB24: SUBTST  <<MTPB24         FAST GALLOP PART B>>
                                      ;*********************************************************************
                                      ;*SUBTEST        MTPB24  FAST GALLOP PART B
                                      ;*********************************************************************
10038                                         ;SDPAR'S
10039 035320  010411                          MOV     R4,(R1)          ;V172260        ;WRITE 'A'
10040 035322  020105                          CMP     R1,R5            ;V172262        ;DONE?
10041 035324  001001                          BNE     1$               ;V172264        ;BR IF NO
10042 035326  000207                          RETURN                   ;V172266        ;YES - RETURN
10043 035330  000137  035334    1$:           JMP     a#MTPC24         ;V172270        ;GOTO V172360
10044
10045 035334                          MTPC24: SUBTST  <<MTPC24         FAST GALLOP PART C>>
                                      ;*********************************************************************
                                      ;*SUBTEST        MTPC24  FAST GALLOP PART C
                                      ;*********************************************************************
10046                                         ;KDPAR'S
10047 035334  010102                          MOV     R1,R2            ;V172360        ;RESET 'B' <--- 'A'
10048 035336  011100                          MOV     (R1),R0          ;V172362        ;READ 'A'
10049 035340  020004                          CMP     R0,R4            ;V172364        ;CHECK 'A'
10050 035342  001401                          BEQ     1$               ;V172366        ;BR IF OK
10051 035344  104447                          PERR23                   ;V172370        ;REPORT ERROR
10052 035346  000137  035300    1$:           JMP     a#MTPA24+20      ;V172372        ;GOTO V177660
```

```
10055 035352                                    MTP025: SUBTST  <<MTP025         INTERRUPT ENABLE TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        MTP025  INTERRUPT ENABLE TEST
                                                ;*****************************************************************************
10056 035352  005037  002244                            CLR     TSTDAT          ;GENERATE CHECKBITS ON 0,,0
10057 035356  005037  002246                            CLR     TSTDAT+2
10058 035362  012737  002244  002310                    MOV     #TSTDAT,SOURCE
10059 035370  004737  044400                            CALL    CHKGEN
10060 035374  012737  000003  002074                    MOV     #3,NOPAR                ;SETUP PARITY ACTION
10061 035402  012701  002410                            MOV     #TESTADD,R1     ;FIRST TEST ADDRESS
10062 035406  012737  035446  002302                    MOV     #1$,PARTHERE    ;SETUP TRAP DESTINATION
10063 035414  004737  035670                            CALL    MTPA25          ;WRITE DATA & CHECKBITS
10064 035420  104473                                    ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
10065 035422  005771  000000                            TST     @(R1)           ;ACCESS LOCATIONS FOR DBE TRAPS
10066 035426  005771  000002                            TST     @2(R1)
10067                                                   ;NONE - GOOD - ACCESS FOR SBE TRAPS
10068 035432  104507                                    ENA1SBE                 ;DISABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
10069 035434  005771  000000                            TST     @(R1)
10070 035440  005771  000002                            TST     @2(R1)
10071 035444  000404                                    BR      2$              ;NONE - GOOD - SKIP
10072 035446  104426                                1$:     READCSR
10073 035450                                            FATAL   27
10074 035456  005237  002244                        2$:     INC     TSTDAT          ;CHECK FOR CORRECT ACTION ON SBE'S
10075 035462  004737  035616                            CALL    MTPD25          ;IN ALL 4 BYTES
10076 035466  012737  000400  002244                    MOV     #400,TSTDAT
10077 035474  004737  035616                            CALL    MTPD25
10078 035500  005037  002244                            CLR     TSTDAT
10079 035504  005237  002246                            INC     TSTDAT+2
10080 035510  004737  035616                            CALL    MTPD25
10081 035514  012737  000400  002246                    MOV     #400,TSTDAT+2
10082 035522  004737  035616                            CALL    MTPD25
10083
10084 035526  005037  002246                            CLR     TSTDAT+2        ;CHECK FOR CORRECT ACTION ON DBE'S
10085 035532  012737  000003  002244                    MOV     #3,TSTDAT       ;IN ALL 4 BYTES
10086 035540  004737  035640                            CALL    MTPE25
10087 035544  012737  001400  002244                    MOV     #1400,TSTDAT
10088 035552  004737  035640                            CALL    MTPE25
10089 035556  005037  002244                            CLR     TSTDAT
10090 035562  012737  000003  002246                    MOV     #3,TSTDAT+2
10091 035570  004737  035640                            CALL    MTPE25
10092 035574  012737  001400  002246                    MOV     #1400,TSTDAT+2
10093 035602  004737  035640                            CALL    MTPE25
10094 035606  104503                                    CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
10095 035610  005037  002074                            CLR     NOPAR           ;INDICATE PARITY ACTION
10096 035614  000207                                    RETURN
10097
10098 035616  004737  035670                MTPD25:     CALL    MTPA25          ;WRITE DATA & CHECKBITS
10099 035622  104471                                    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
10100 035624  004737  035712                            CALL    MTPB25          ;CHECK FOR NO TRAPS
10101 035630  104507                                    ENA1SBE                 ;DISABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
10102 035632  004737  035752                            CALL    MTPC25          ;CHECK FOR EXPECTED TRAP
10103 035636  000207                                    RETURN
```

```
10106 035640  004737  035670          MTPE25: CALL    MTPA25          ;WRITE DATA & CHECKBITS
10107 035644  104471                          ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
10108 035646  004737  035712                  CALL    MTPB25          ;CHECK FOR NO TRAPS
10109                                         ;ENABLE DBE TRAPS
10110 035652  104473                          ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
10111 035654  004737  035752                  CALL    MTPC25          ;CHECK FOR EXPECTED TRAP
10112 035660  104507                          ENA1SBE                 ;DISABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
10113 035662  004737  035752                  CALL    MTPC25          ;CHECK FOR EXPECTED TRAP
10114 035666  000207                          RETURN
10115
10116                                         ;WRITE TSTDAT & TSTDAT+2 & CHECKBITS
10117 035670  104471                  MTPA25: ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
10118 035672  013771  002244  000000          MOV     TSTDAT,@(R1)    ;WRITE FIRST 16 BITS
10119 035700  104475                          CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
10120 035702  013771  002246  000002          MOV     TSTDAT+2,@2(R1) ;WRITE 2ND 16 BITS & CHECKBITS
10121 035710  000207                          RETURN
10122
10123                                         ;CHECK FOR NO TRAP OCCURING CONDITION
10124 035712  012737  035732  002302  MTPB25: MOV     #1$,PARTHERE    ;SETUP TRAP DESTINATION
10125 035720  005771  000000                  TST     @(R1)           ;ACCESS LOCATIONS
10126 035724  005771  000002                  TST     @2(R1)
10127 035730  000207                          RETURN                  ;NO TRAP - GOOD - RETURN
10128
10129 035732  104426                  1$:     READCSR
10130 035734  011137  002032                  MOV     (R1),ADDRESS    ;SAVE VIRTUAL ADDRESS
10131 035740  104024                          ERROR   +24
10132 035742                                  SET     HEADER
10133 035750  000207                          RETURN
10134
10135                                         ;TRAP SHOULD OCCURE TEST
10136 035752  012737  035766  002302  MTPC25: MOV     #1$,PARTHERE    ;SETUP TRAP DESTINATION
10137 035760  005771  000000                  TST     @(R1)           ;ACCESS 1ST LOCATION
10138 035764  000405                          BR      2$              ;NO TRAP - BAD NEWS - SKIP
10139 035766  012737  036016  002302  1$:     MOV     #3$,PARTHERE    ;SETUP TRAP DESTINATION
10140 035774  005771  000002                  TST     @2(R1)          ;ACCESS 2ND LOCATION
10141 036000  104426                  2$:     READCSR                 ;NO TRAP - BAD NEWS
10142 036002  011137  002032                  MOV     (R1),ADDRESS    ;SAVE VIRTUAL ADDRESS
10143 036006  104025                          ERROR   +25
10144 036010                                  SET     HEADER
10145 036016  000207                  3$:     RETURN
10146
```

```
10149 036020                          MTPA26: SUBTST  <<MTPA26        RANDOM DATA (WRITE)>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       MTPA26  RANDOM DATA (WRITE)
                                      ;*****************************************************************************
10150 036020  000137  036070          1$:     JMP     @#MTPC26        ;V177640        GOTO V172360
10151 036024  010221                          MOV     R2,(R1)+        ;V177644
10152 036026  010321                          MOV     R3,(R1)+        ;V177646
10153 036030  077005                          SOB     R0,1$           ;V177650
10154 036032  000207                          RETURN                  ;V177652
10155
10156 036034                          MTPB26: SUBTST  <<MTPB26        RANDOM DATA (READ)>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       MTPB26  RANDOM DATA (READ)
                                      ;*****************************************************************************
10157                                         .DSABL  AMA
10158                                         .ENABL  LSB
10159 036034  000137  036070          1$:     JMP     @#MTPC26        ;V177640        GOTO V172360
10160 036040  020221                          CMP     R2,(R1)+        ;V177644
10161 036042  001401                          BEQ     2$              ;V177646
10162 036044  104451                          PERR25                  ;V177650
10163 036046  005127                  2$:     COM     (PC)+           ;V177652
10164 036050  000000                  RANODD: 0                       ;V177654        FOR ERROR REPORTING
10165 036052  020321                          CMP     R3,(R1)+        ;V177656
10166 036054  001401                          BEQ     3$              ;V177660
10167 036056  104451                          PERR25                  ;V177662
10168 036060  005167  177764          3$:     COM     RANODD          ;V177664
10169 036064  077015                          SOB     R0,1$           ;V177670
10170 036066  000207                          RETURN                  ;V177672
10171                                         .DSABL  LSB
10172                                         .ENABL  AMA
10173
10174 036070                          MTPC26: SUBTST  <<RANDOM NUMBER SUBPROGRAM>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       RANDOM NUMBER SUBPROGRAM
                                      ;*****************************************************************************
10175                                         ;CALLER MUST SETUP
10176                                         ;       MOV     SEEDLO,R3
10177                                         ;       MOV     SEEDHI,R2
10178                                         ;       MOV     R3,R5
10179                                         ;       MOV     R2,R4
10180 036070  073427  000007                  ASHC    #7,R4           ;V172360
10181 036074  060305                          ADD     R3,R5           ;V172364
10182 036076  005504                          ADC     R4              ;V172366
10183 036100  060204                          ADD     R2,R4           ;V172370
10184 036102  062705  001057                  ADD     #1057,R5        ;V172372
10185 036106  000240                          NOP                     ;V172376        GOTO V172260
10186
10187 036110                          MTPD26: SUBTST  <<RANDOM NUMBER SUBSUBPROGRAM>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       RANDOM NUMBER SUBSUBPROGRAM
                                      ;*****************************************************************************
10188 036110  005504                          ADC     R4              ;V172260
10189 036112  062704  047401                  ADD     #47401,R4       ;V172262
10190 036116  010503                          MOV     R5,R3           ;V172266
10191 036120  010402                          MOV     R4,R2           ;V172270
10192 036122  000137  036024                  JMP     @#MTPA26+4      ;V172272        GOTO V177644
```

```
10195 036126                          MTP030: SUBTST  <<MT0030        FLUSH OUT DBE'S>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       MT0030  FLUSH OUT DBE'S
                                      ;*****************************************************************************
10196 036126  011002                  1$:     MOV     (R0),R2         ;V177640
10197 036130  010220                          MOV     R2,(R0)+        ;V177642
10198 036132  077103                          SOB     R1,1$           ;V177644
10199 036134  000207                          RETURN                  ;V177646
10200
10201 036136                          MTP031: SUBTST  <<MTP031        SOB-A-LONG TEST>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       MTP031  SOB-A-LONG TEST
                                      ;*****************************************************************************
10202                                         .DSABL  AMA
10203 036136  000000                          0                       ;MOVE TERMINATOR
10204 036140  077001                  1$:     SOB     R0,1$           ;SOB TILL R0 UNDERFLOWS
10205 036142  005167  177772                  COM     1$              ;WRITE COMPLEMENT OF SOB
10206 036146  020167  177766                  CMP     R1,1$           ;READ & CHECK FOR NOT ''SOB R0,DOT''
10207 036152  001403                          BEQ     2$              ;OK - SKIP
10208 036154  104454                          PERR30
10209 036156  010167  177756                  MOV     R1,1$
10210 036162  005167  177752          2$:     COM     1$              ;CORRECT SOB INSTRUCTION
10211 036166  010200                          MOV     R2,R0           ;REINITIALIZE SOB CONSTANT
10212                                         ;UPDATE MOVE REGISTERS
10213 036170  010503                          MOV     R5,R3
10214 036172  005725                          TST     (R5)+           ;BUMP (SAFELY) BY 2
10215 036174  010504                          MOV     R5,R4
10216 036176  020537  002520                  CMP     R5,@#LINK1      ;DONE?
10217 036202  001001                          BNE     3$              ;NO - SKIP
10218 036204  000207                          RETURN                  ;YES
10219
10220 036206  014344                  3$:     MOV     -(R3),-(R4)
10221 036210  001376                          BNE     3$
10222 036212  000752                          BR      1$
10223         000056                  SOBLENGTH=.-MTP031
10224                                         .ENABL  AMA
```

```
 10252 036214                           MTP032: SUBTST  <<MTP032        WRITE RECOVERY TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTP032  WRITE RECOVERY TEST
                                        ;*****************************************************************************
 10253                                          ;THE TEST ACTUALLY EXECUTED ALREADY IN THE MEMORY UNDER TEST.
 10254                                          ;THIS CODE INSURES THAT IT CHANGED MEMORY TO HAVE
 10255                                          ;1/2 BANK OF #5141      WHICH IS A "COM -(R1)" INSTRUCTION AND
 10256                                          ;1/2 BANK OF #110       WHICH IS A "JMP (R0)"   INSTRUCTION.
 10257
 10258 036214  012401                   1$:     MOV     (R4)+,R1        ;V177640        ;GET DATA FROM LOWER 1/2 BANK
 10259 036216  020102                           CMP     R1,R2           ;V177642        ;IS IT #5141?
 10260 036220  001401                           BEQ     2$              ;V177644        ;YES - SKIP
 10261 036222  104430                           PERR02                  ;V177646        ;NO - TAKE ERROR TRAP
 10262 036224  077305                   2$:     SOB     R3,1$           ;V177650        ;LOOP FOR 1/2 BANK
 10263 036226  013703  002520                   MOV     @#LINK1,R3      ;V177652        ;RESTORE LOOP SIZE
 10264 036232  012400                   3$:     MOV     (R4)+,R0        ;V177656        ;GET DATA FROM UPPER 1/2 BANK
 10265 036234  020005                           CMP     R0,R5           ;V177660        ;IS IT #110?
 10266 036236  001401                           BEQ     4$              ;V177662        ;YES - SKIP
 10267 036240  104427                           PERR01                  ;V177664        ;NO- TAKE ERROR TRAP
 10268 036242  077305                   4$:     SOB     R3,3$           ;V177666        ;LOOP FOR 1/2 BANK
 10269 036244  000207                           RETURN
```

```
10272 036246                          MTP033: SUBTST  <<MTP033        BRANCH GOBBLE TEST>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       MTP033  BRANCH GOBBLE TEST
                                      ;*****************************************************************************
10273                                         .DSABL  AMA
10274 036246  000000                  0                               ;MOVE TERMINATOR
10275 036250  000000                  BGTEST: 0                       ;TEST WORD (TWO BYTES)
10276 036252  000261                  BRGOBB: SEC                     ;SET CARRY (TO BE ADDED TO 'BGTEST')
10277 036254  105511                          ADCB    (R1)            ;INCREMENT LOW BYTE OF 'BGTEST'
10278 036256  100402                          BMI     1$              ;BRANCH WHEN BIT7 IS SET
10279 036260  105212                          INCB    (R2)            ;INCREMENT HIGH BYTE OF 'BGTEST'
10280 036262  000773                          BR      BRGOBB          ;LOOP 128 TIMES
10281
10282                                         ;NOW CHECK FOR CORRECT CONDITION CODES
10283 036264  102401                  1$:     BVS     2$              ;BR IF V-BIT SET (SHOULD BE)
10284 036266  104461                          PERR35                  ;NO - REPORT ERROR AND ABORT TEST
10285                                                                 ;COND CODES NOT EQUAL TO 1010
10286 036270  000242                  2$:     CLV                     ;CLEAR V-BIT
10287 036272  105212                          INCB    (R2)            ;INCREMENT HIGH BYTE OF 'BGTEST' ONCE MORE
10288 036274  103402                          BCS     3$              ;BR IF C-BIT SET (SHOULD NOT BE)
10289 036276  102001                          BVC     3$              ;BR IF V-BIT CLEAR (SHOULD NOT BE)
10290 036300  100401                          BMI     4$              ;BR IF N-BIT SET (SHOULD BE)
10291 036302  104461                  3$:     PERR35                  ;NO - REPORT ERROR AND ABORT TEST
10292                                                                 ;COND CODES NOT EQUAL TO 1010
10293
10294                                         ;UPDATE TEST POINTERS
10295 036304  010701                  4$:     MOV     PC,R1
10296 036306  162701  000036          5$:     SUB     #5$-BGTEST,R1
10297 036312  010102                          MOV     R1,R2
10298 036314  005202                          INC     R2
10299
10300                                         ;UPDATE MOVE REGISTERS
10301 036316  010503                          MOV     R5,R3
10302 036320  005725                          TST     (R5)+           ;BUMP (SAFELY) BY 2
10303 036322  010504                          MOV     R5,R4
10304
10305                                         ;DONE?
10306 036324  020537  002520                  CMP     R5,@#LINK1      ;DONE?
10307 036330  001001                          BNE     6$              ;NO - SKIP
10308 036332  000207                          RETURN                  ;YES - RETURN
10309
10310                                         ;MOVE CODE 1 LOCATION
10311 036334  014344                  6$:     MOV     -(R3),-(R4)
10312 036336  001376                          BNE     6$
10313 036340  005011                          CLR     (R1)            ;CLEAR TEST WORD 'BGTEST'
10314 036342  000743                          BR      BRGOBB          ;RUN MOVED CODE AGAIN
10315         000076                  GBLENGTH=.-MTP033
10316                                         .ENABL  AMA
```

```
 10318 036344                          MTP034: SUBTST  <<MTP034        SOFT ERROR - BACKROUND PATTERN TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MTP034  SOFT ERROR - BACKROUND PATTERN TEST
                                       ;*****************************************************************************
 10319 036344  010220                  1$:     MOV     R2,(R0)+        ;V177640
 10320 036346  077102                          SOB     R1,MTP034       ;V177642
 10321 036350  000207                          RETURN                  ;V177644
 10322 036352  012401                  2$:     MOV     (R4)+,R1        ;V177646
 10323 036354  020102                          CMP     R1,R2           ;V177650
 10324 036356  001402                          BEQ     3$              ;V177652
 10325 036360  104430                          PERR02                  ;V177654
 10326 036362  000240                          NOP                     ;V177656
 10327 036364  077306                  3$:     SOB     R3,2$           ;V177660
 10328 036366  000207                          RETURN                  ;V177662
```

```
10330 036370                                MTP035:SUBTST   <<MTP035        WORST CASE NOISE PARITY TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MTP035  WORST CASE NOISE PARITY TEST
                                            ;*****************************************************************************
10331 036370  012737  000003  002074              MOV     #3,NOPAR        ;SET PARITY TRAPS TO RETURN TO "PARTHERE"
10332
10333 036376                                      FOR R0 := #FIRST TO #LAST BY #4000
10334 036402  012737  000005  002146                MOV   #BIT2!BIT0,CSR  ;SET WRITE WRONG PARITY & PAR. TRAPS INTO CSR
10335 036410  104425                                LOADCSR
10336 036412  012737  036446  002302                MOV   #1$,PARTHERE
10337 036420  011010                                MOV   (R0),(R0)       ;WWP TEST LOCATION
10338 036422  005710                                TST   (R0)
10339 036424  010037  002032                        MOV   R0,ADDRESS
10340 036430  104050                                ERROR +50
10341 036432  004737  057532                        CALL  PERBNK
10342 036436  032763  002000  002654                BIT   #BIT10,CONFIG+2(R3)
10343 036444  001002                                BNE   2$
10344 036446  104426                          1$:   READCSR
10345 036450  104512                                ERRGEN
10346
10347 036452  104503                          2$:   CLR1CSR
10348 036454  011010                                MOV   (R0),(R0)       ;CLEAR WRONG PARITY IN MEMORY
10349 036456  012737  000001  002146                MOV   #BIT0,CSR
10350 036464  104425                                LOADCSR
10351 036466  012737  036500  002302                MOV   #3$,PARTHERE
10352 036474  005710                                TST   (R0)
10353 036476  000405                                BR    4$
10354 036500  010037  002032                    3$:   MOV   R0,ADDRESS
10355 036504  104050                                ERROR +50
10356 036506  004737  057532                        CALL  PERBNK
10357 036512                                    4$:   END; OF FOR
10358
10359 036524  005037  002074                    CLR     NOPAR           ;RESET PARITY TRAP ACTION
10360 036530  000207                            RETURN
```

```
10362 036532                            MTP036: SUBTST          <<MTP036        CORRECTION CODE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTP036  CORRECTION CODE TEST
                                        ;*****************************************************************************
10363                                           ;
10364                                           ; THIS TEST CHECKS TO SEE THAT EACH BIT OF A DATA WORD
10365                                           ; CAN BE CORRECTED INDIVIDUALLY FROM A ZERO TO A ONE AND
10366                                           ; VISA VERSA.
10367 036532  104424                            CACHOFF                         ;TURN OFF CACHE
10368 036534  105037  002262                    CLRB PASFLG                     ;CLEAR PASFLG
10369 036540  104513                            CBREG                           ;ENABLE CHECK/SYNDROME BIT REGISTER
10370 036542                                    REPEAT                          ;
10371 036542                                      LET PASFLG :B= PASFLG + #1    ;INCREMENT LOOP COUNTER
10372 036546                                      LET R4  := #-1                ;INDEX TO SINGLE BIT ERROR TABLE
10373 036552                                      LET BITNO := #0               ;CLEAR INNER LOOP COUNTER
10374 036556                                      IFB PASFLG EQ #1              ;SELECT DATA TO BE CORRECTED BY PASSNO
10375 036566                                         LET R5 := #1               ;DATA=0;BIT TO BE CORRECTED IS A ONE
10376 036572                                      ELSE                          ;
10377 036574                                         LET R5 := #177776          ;DATA=177776;BIT TO BE CORRECTED IS A ZERO
10378 036600                                      END                           ;
10379 036600                                      REPEAT                        ;
10380
10381 036600  005237  002322                       INC BITNO                  ;INCREMENT BIT POINTER
10382 036604                                       LET R4 := R4 + #1          ;POINT TO NEXT SET OF CHECK BITS
10383 036606                                       LET R2 :B= PTABLE(R4)      ;GET NEXT SET OF CHECK BITS
10384 036612  072227  000005                       ASH #5,R2                  ;SHIFT TO LINE UP IN CSR
10385 036616  052702  000004                       BIS #BIT2,R2               ;ENABLE DIAG MODE
10386 036622                                       LET CSR := R2              ;GET CHECK BITS TO BE WRITTEN
10387 036626  104425                               LOADCSR                    ;LOAD CSR WITH DATA
10388 036630                                       LET (R1) := R0             ;WRITE DATA TO TEST ADDRESS
10389 036632  005711                               TST (R1)                   ;CORRECT SBE
10390 036634                                       IF (R1) NE R5              ;WAS DATA CORRECTED???
10391 036640                                          LET ADDRESS := #60000   ;MOV ERROR INFORMATION IN
10392 036646                                          LET CHECK := R2         ;
10393 036652                                          LET TSTDAT := R5        ;
10394 036656                                          LET TSTDAT+2 := (R1)    ;
10395 036662  104052                                  ERROR +52               ;NO ERROR
10396 036664                                       END                        ;
10397 036664  005011                               CLR (R1)                   ;CLEAR LUT
10398 036666                                       IFB PASFLG EQ #1           ;SHIFT NEW DATA DEPENDING ON PASFLG
10399 036676  006305                                  ASL  R5                 ;SHIFT BITNO TO THE LEFT
10400 036700                                       ELSE                       ;
10401 036702  000261                                  SEC                     ;SET CARRY BIT AND......
10402 036704  006105                                  ROL   R5                ;ROTATE LEFT
10403 036706                                       END                        ;
10404 036706                                     UNTIL BITNO EQ #16.          ;UNTIL ALL BITS ARE DONE
10405 036716  005100                             COM R0                       ;COMPLEMENT DATA AND REPEAT
10406 036720                                   UNTILB PASFLG EQ #2            ;UNTIL 2 PASSES ARE COMPLETE!
10407 036730  104503                           CLR1CSR                        ;CLEAR CSR
10408 036732  104423                           CACHON                         ;TURN CACHE
10409 036734  000207                           RETURN                         ;
10410                                   ;
10411                                   ;                MS11-P SINGLE BIT ERROR CHECK BIT TABLE
10412                                   ;
10413 036736     002     007     037  PTABLE: .BYTE   2,7,37,31,32,25,26,20,57,51,52,45,46,40,75,70
      036741     031     032     025
      036744     026     020     057
```

MTP036 CORRECTION CODE TEST

```
        036747      051      052      045
        036752      046      040      075
        036755      070
```

```
10415 036756                    MTP037: SUBTST  <<MTP037        CHECK ECC DISABLE TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST       MTP037  CHECK ECC DISABLE TEST
                                ;*****************************************************************************
10416                                   ;
10417                                   ; THIS TEST CHECKS THAT ECC CAN BE DISABLED AND THAT
10418                                   ; NO CORRECTION TAKES PLACE WITH ECC DISABLED.
10419                                   ;
10420 036756  104424                    CACHOFF                 ;TURN OFF CACHE
10421 036760                            LET GOOD := #0          ;GOOD DATA FOR ERROR PRINT OUT
10422 036764                            LET CHECK := #0         ;CLEAR CHECK BIT FIELD
10423 036770  104475                    CB1CSR                  ;ENABLE SYNDROME/CHECK BIT REGISTER
10424 036772                            LET CHECK := #100       ;SBE CHECK BITS
10425 037000  104475                    CB1CSR                  ;WRITE CHECK BITS TO CB REGISTER
10426 037002                            LET (R1) := #0          ;WRITE CHECK BITS TO MEMORY
10427 037004                            IF (R1) NE #0           ;WAS CORRECTION MADE????
10428 037010                               LET BAD := (R1)      ;YES IT WAS.....ERROR
10429 037014                               LET ADDRESS := #60000 ;
10430 037022  104037                       ERROR +37            ;
10431 037024                            END                     ;
10432 037024  104423                    CACHON                  ;TURN ON CACHE
10433 037026  000207                    RETURN                  ;
```

```
10436 037030                                MTP041: SUBTST  <<MTP041        ADDRESS TO CSR ON DOUBLE BIT ERROR TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MTP041  ADDRESS TO CSR ON DOUBLE BIT ERROR TEST
                                            ;*****************************************************************************
10437                                       ;
10438                                       ; THIS TEST CHECKS TO SEE IF THE CORRECT ADDRESS APPEARS
10439                                       ; IN CSR BITS 5-11 ON A DOUBLE ERROR.
10440                                       ;
10441 037030                                      LET R4 := BANK            ;GET STARTING BANK NUMBER
10442 037034  072427  000011                      ASH #9.,R4                ;SHIFT INTO POSTION TO MATCH ADDRESS IN CSR
10443 037040  042704  170037                      BIC #^C7740,R4            ;CLEAR OFF EXTRANEOUS BITS
10444 037044                                      LET R0 := #-40            ;INIT CSR ADDRESS TO 0 - 1K (BIT 5 = 1K ADD.)
10445 037050                                      LET R1 := #FIRST - #4000  ;GET LOW ADDRESS IN BANK
10446 037060                                      LET PASFLG :B= #0         ;INIT PASFLG
10447 037064  005037  002312                      CLR CHECK                 ;CLEAR CHECK BIT FIELD TO BE LOADED
10448 037070  104475                              CB1CSR                    ;ENABLE CHECK/SYNDROME BIT REGISTER
10449 037072                                      REPEAT
10450 037072  105237  002262                        INCB  PASFLG            ;INC LOOP COUNTER
10451 037076                                        LET R0 := R0 + #40      ;INC CSR ADDRESS TO BE EXPECTED
10452 037102                                        LET R1 := R1 + #4000                                          ;
10453 037106                                        LET CHECK := #1340      ;DOUBLE ERROR CHECK BITS
10454 037114  104475                                CB1CSR                  ;WRITE DOUBLE ERROR CHECK BITS
10455 037116                                        LET (R1) := #0          ;WRITE DATA AND D.E. CHK BITS AT A=0
10456 037120  104503                                CLR1CSR                 ;CLEAR CSR
10457 037122  005711                                TST (R1)                ;READ ADDRESS TO GET DOUBLE ERROR
10458 037124  104426                                READCSR                 ;READ CSR FOR CORRECT ADDRESS
10459 037126                                        LET R5 := CSR           ;
10460 037132  042705  170037                        BIC #^C7740,R5          ;
10461 037136                                        LET R2 := R0            ;GET CORRECT ADDRESS
10462 037140  060402                                ADD R4,R2               ;ADD STARTING BANK TO DOUBLE BIT ADDRESS
10463 037142  000240                                NOP                     ;DEBUG AIDE
10464 037144                                        IF R2 NE R5             ;DO ADDRESSES AGREE?
10465 037150                                           LET BAD := R2        ;
10466 037154                                           LET GOOD := R5       ;
10467 037160  104455                                   PERR31               ;NO ERROR
10468 037162                                        END                     ;
10469 037162                                        LET (R1) := #0          ;
10470 037164  104475                                CB1CSR                  ;ENABLE CHECK/SYNDROME BIT REGISTER
10471 037166                                    UNTILB PASFLG EQ #16.       ;DO 16K AT A TIME
10472 037176  104503                            CLR1CSR                     ;
10473 037200  000207                            RETURN                      ;
10474
```

```
10477 037202                                MTP042: SUBTST  <<MTP042        EXTENDED ADDRESS TO CSR ON ERROR TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MTP042  EXTENDED ADDRESS TO CSR ON ERROR TEST
                                            ;*****************************************************************************
10478                                       ;
10479                                       ; THIS TESTS THE EXTENDED UNIBUS ADDRESS IN THE
10480                                       ; CSR BY CAUSING A SINGLE ERROR, ENABLING BIT # 14, THEN CHECKING
10481                                       ; FOR THE PROPER ADDRESS IN THE CSR.
10482                                       ;
10483 037202  104424                            CACHOFF                 ;TURN OFF CACHE MEMORY
10484 037204                                    LET R4 := BANK          ;GET BANK NUMBER TO FIGURE OUT EXTENDED ADDRESS
10485 037210  042704  177607                    BIC #^C170,R4           ;CLEAR OFF LOWER BITS
10486 037214  072427  000002                    ASH #2,R4               ;SHIFT TO LINE UP WITH CSR
10487 037220  052704  040000                    BIS #BIT14,R4           ;SET EXTENDED ADDRESS BIT
10488 037224  062737  000400  172352            ADD #400,KIPAR5         ;SET UP PAR TO POINT TO TOP OF A BANK
10489 037232                                    LET PASFLG :B= #0       ;INIT LOOP COUNTER
10490 037236                                    LET R5 := BANK          ;R5 GETS THE BANK NUMBER
10491 037242  042705  177770                    BIC #^C7,R5             ;CLEAR ALL BUT THE LOWER BITS
10492 037246  072527  000011                    ASH #9.,R5              ;ROTATE INTO POSTION
10493 037252  052705  000020                    BIS #BIT4,R5            ;SET UP SBE INDICATOR ;;DATA TO BE EXPECTED
10494 037256  104513                            CBREG                   ;ENABLE CHECK/SYNDROME BIT REGISTER
10495 037260                                    REPEAT
10496 037260  105237  002262                        INCB PASFLG         ;INCR LOOP COUNTER
10497 037264                                        LET CSR := #104     ;WRITE CHECK BITS TO CSR WITH DIAG MODE
10498 037272  104425                                LOADCSR             ;LOAD CSR WITH DATA
10499 037274                                        LET (R1) := #0      ;WRT ZEROS AT A=0 AND SINGLE ERROR BITS
10500 037276  104503                                CLR1CSR             ;CLEAR CSR
10501 037300  005711                                TST (R1)            ;READ A=0;DATA BIT 0 SHOULD BE CORRECTED TO A 1
10502 037302  104426                                READCSR             ;READ CSR FOR DATA
10503 037304  042737  020000  002146                BIC #BIT13,CSR      ;CLEAR POSSIBLE INHIBIT MODE IN DATA "CSR"
10504 037312                                        IF CSR NE R5 THEN   ;HAS SINGLE ERROR BITS SET IN CSR?
10505 037320                                           LET BAD := CSR   ;
10506 037326                                           LET GOOD := R5   ;
10507 037332  104023                                   ERROR +23        ;
10508 037334                                        END                 ;
10509 037334                                        LET CSR := #40000   ;WRITE EUB BIT TO CSR
10510 037342  104425                                LOADCSR             ;
10511 037344  104426                                READCSR             ;READ FOR CORRECT EXTENDED UNIBUS ADDRESS
10512 037346  042737  020000  002146                BIC #BIT13,CSR      ;CLEAR INHIBIT MODE POINTER IN DATA
10513 037354                                        IF CSR NE R4 THEN   ;READ EUB ADDRESS
10514 037362                                           LET BAD := CSR   ;
10515 037370                                           LET GOOD := R4   ;
10516 037374                                           SET HEADER       ;
10517 037402  104023                                   ERROR +23        ;
10518 037404                                        END                 ;
10519 037404                                        LET (R1) := #0      ;CLEAR LUT
10520 037406                                        LET R1 := #137776   ;SET UP NEW ADDRESS
10521 037412  062705  000740                        ADD #740,R5         ;ADD TO GET NEW ADDRESS
10522 037416  104513                                CBREG               ;ENABLE CHECK/SYNDROME BIT REGISTER
10523 037420                                    UNTILB PASFLG EQ #2     ;LOOP 2 TIMES
10524 037430  104503                            CLR1CSR                 ;CLEAR CSR
10525 037432  104423                            CACHON                  ;TURN  ON CACHE
10526 037434  000207                            RETURN
10527
10528
```

```
10530 037436                          MTP043: SUBTST <<MTP043 WRITE BYTE CLEARS SINGLE BIT ERROR TEST>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       MTP043  WRITE BYTE CLEARS SINGLE BIT ERROR TEST
                                      ;*****************************************************************************
10531                                         ;
10532                                         ; THIS TEST CHECKS TO SEE IF A SINGLE BIT ERROR WILL BE CORRECTED DURING
10533                                         ; THE READ PORTION OF A WRITE BYTE AND THAT THE CORRECT CHECK BITS WILL
10534                                         ; BE GENERATED ON A WRITE.
10535                                         ;
10536 037436  104424                        CACHOFF                 ;TURN OFF CACHE
10537 037440  104513                        CBREG                   ;ENABLE CHECK/SYNDROME BIT REGISTER
10538 037442  105037  002262                CLRB PASFLG             ;CLEAR LOOP COUNTER
10539 037446                                LET R2 := R1 + #1       ;R2 POINTS TO HIGH BYTE
10540 037452                                LET R4 := #1            ;INITIAL DATA = 1
10541 037456                                REPEAT                  ;
10542 037456  105237  002262                   INCB PASFLG          ;INCREMENT LOOP COUNTER
10543 037462                                   LET CSR := #604      ;WRITE CHECK BITS CORRESPONDING TO DATA OF 0
10544 037470  104425                           LOADCSR              ;WRITE CSR
10545 037472                                   LET (R1) := R4       ;WRITE DATA OF 1 CREATING A SINGLE BIT ERROR
10546 037474  104503                           CLR1CSR              ;WRITE CSR TO NORMAL MODE
10547 037476                                   LET (R2) :B= #377    ;WRITE BYTE OF WORD
10548 037502  104426                           READCSR              ;READ CSR
10549 037504  042737  177757  002146           BIC #^C20,CSR        ;SEE IF SBE INDICATOR IS SET
10550 037512                                   IF CSR NE #20        ;IS SBE SET?????
10551 037522                                      LET GOOD := #20   ;
10552 037530                                      LET BAD := CSR    ;
10553 037536  104060                              ERROR +60         ;
10554 037540                                   END                  ;
10555 037540  104513                           CBREG                ;WRITE CSR TO DIAG MODE
10556 037542  005711                           TST (R1)             ;READ SA0 FOR CORRECT CHECK BITS
10557 037544  104426                           READCSR              ;READ CSR
10558 037546  042737  174037  002146           BIC #^C3740,CSR      ;MASK OUT CHECK BIT FIELD
10559 037554                                   IF CSR NE #300       ;WERE CORRECT CHECK BITS GENERATED?????
10560 037564                                      SET HEADER        ;
10561 037572                                      LET GOOD := #300  ;
10562 037600                                      LET BAD := CSR    ;
10563 037606  104061                              ERROR +61         ;
10564 037610                                   END                  ;
10565 037610  005302                           DEC R2               ;POINT TO HIGH BYTE AND REPEAT
10566 037612                                   LET R4 := #400       ;BIT 0 OF HIGH BYTE
10567 037616                                UNTILB PASFLG EQ #2     ;DO HIGH AND LOW BYTE
10568 037626  104423                        CACHON                  ;TURN ON CACHE
10569 037630  000207                        RETURN                  ;
```

```
10571 037632                            MTP044: SUBTST  <<MTP044        SHIFTING CHECK BITS THROUGH THE CSR TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTP044  SHIFTING CHECK BITS THROUGH THE CSR TEST
                                        ;*****************************************************************************
10572                                   ;
10573                                   ; THIS TEST CHECKS THE ABILITY TO READ AND WRITE CHECKBITS INTO MEMORY
10574                                   ; BY SHIFTING A ONE BIT THROUGH A FIELD OF ZEROS. THE CSR IS READ FOR THE
10575                                   ; CORRECT PATTERNS. THE TEST IS THEN REPEATED ON A ZERO BIT THROUGH A
10576                                   ; FIELD OF ALL ONES.
10577                                   ;
10578 037632                                REPEAT                                  ;ILC;;REV B
10579 037632  104424                        CACHOFF                                 ;TURN OFF CACHE
10580 037634                                LET PASFLG :B= #0                       ;INIT PASFLG
10581 037640                                LET R5 := #174037                       ;CHECK BIT MASK FOR CSR
10582 037644  104475                        CB1CSR                                  ;ENABLE CHECK/SYNDROME BIT REGISTER
10583 037646                                LET R2 := #46                           ;SET UP INITIAL CSR DATA
10584 037652                                REPEAT
10585 037652                                   LET PASFLG :B= PASFLG + #1           ;INC LOOP COUNTER
10586                                                                               ;CHK BITS = 1
10587                                                                               ;DISABLE ECC;DIAG CHK SET
10588 037656                                   LET PASSNO := #0                     ;INIT PASSNO(INNER LOOP COUNTER)
10589 037662                                   REPEAT
10590 037662                                      LET PASSNO := PASSNO + #1         ;INC LOOP COUNTER
10591 037666                                      LET R4 := R2                      ;COPY R2 TO R4
10592 037670                                      LET CSR := R2                     ;GET CSR DATA TO BE WRITTEN
10593 037674  104425                              LOADCSR                           ;WRITE SBE CHECK BITS TO CSR
10594 037676                                      LET (R1) := #0                    ;WRITE DATA AND CHECK BITS AT A=0
10595 037700  005105                              COM R5                            ;COMPLEMENT MASK
10596 037702  010546                              MOV R5,-(SP)                      ;SAVE R5 ON STACK
10597 037704  040416                              BIC R4,(SP)                       ;CREATE AN XOR FUNCTION
10598 037706  040504                              BIC R5,R4                         ;
10599 037710  052604                              BIS (SP)+,R4                      ;
10600 037712                                      LET CSR := R4                     ;
10601 037716  104425                              LOADCSR                           ;LOAD CSR WITH COMPLEMENT CHECK BITS
10602 037720  104426                              READCSR                           ;READ CSR FOR COMPLEMENT CHECK BITS
10603 037722                                      LET R3 := CSR                     ;COPY CSR DATA TO R3
10604 037726  042703  020000                      BIC #BIT13,R3                     ;CLEAR ANY POSSIBLE INHIBIT MODE POINTER
10605 037732                                      IF R3 NE R4 THEN                  ;READ CSR FOR PROPER CHECK BITS
10606 037736                                         LET ADDRESS := R1              ;
10607 037742                                         LET GOOD := R4                 ;
10608 037746                                         LET BAD := R3                  ;
10609 037752                                         SET HEADER                     ;
10610 037760  104463                                 PERR37                         ;ERROR CALL                    ;;ILC;;REVB
10611 037762                                      END
10612 037762  005105                              COM R5                            ;COMPLEMENT MASK
10613 037764  005711                              TST (R1)                          ;READ CHECK BITS AT A=0 INTO CSR
10614 037766  000240                              NOP                               ;
10615 037770  104426                              READCSR                           ;READ CSR FOR CORRECT CHECK BITS
10616 037772  040537  002146                      BIC R5,CSR                        ;MASK OUT CHECK BIT FIELD
10617 037776                                      LET R4 := R2                      ;GET CHECK BITS THAT WERE WRITTEN
10618 040000  040504                              BIC R5,R4                         ;MASK OUT CHECK BIT FIELD
10619 040002                                      IF R4 NE CSR                      ;ARE CHECK BITS THE SAME?
10620 040010                                         LET GOOD := R4                 ;
10621 040014                                         LET BAD := CSR                 ;
10622 040022                                         LET ADDRESS := R1              ;
10623 040026                                         SET HEADER                     ;
10624 040034  104464                                 PERR40                         ;ERROR CALL                    ;;ILC;;REVB
```

```
10625 040036
10626 040036  040502                                    END
10627 040040                                            BIC R5,R2                ;SHIFT CHECK BITS AND CREATE NEW DATA FOR CSR
10628                                                   IFB PASFLG EQ #1         ;SELECT FUNCTION
10629 040050  006302                                      ASL R2                 ;DO A FIELD OF ZEROS--->ONES
10630 040052                                            ELSE                     ;SHIFT CHECK BITS
10631 040054  005105                                      COM R5                 ;DO A FIELD OF ONES --->ZEROS
10632 040056  010546                                      MOV R5,-(SP)           ;
10633 040060  040216                                      BIC R2,(SP)            ;TAKE OUT CHECK BIT FIELD
10634 040062  040502                                      BIC R5,R2              ;
10635 040064  052602                                      BIS (SP)+,R2           ;
10636 040066  006302                                      ASL R2                 ;SHIFT CHECK BITS
10637 040070  010546                                      MOV R5,-(SP)           ;PUT BACK CHECK BIT FIELD
10638 040072  040216                                      BIC R2,(SP)            ;
10639 040074  040502                                      BIC R5,R2              ;
10640 040076  052602                                      BIS (SP)+,R2           ;
10641 040100  005105                                      COM R5                 ;COMPLEMENENT DATA PATTERN
10642 040102                                            END
10643 040102                                            LET R2 := R2 + #6        ;ADD 6 SO THAT WRITE ON CSR WILL ENABLE DIAG MODE
10644 040106                                          UNTILB PASSNO EQ #6        ;DO ALL CHECK BITS
10645 040116                                          LET R2 := #3706            ;REPEAT WITH FIELD OF ONES
10646 040122                                        UNTILB PASFLG EQ #2
10647 040132  104503                                CLR1CSR                      ;
10648 040134  005011                                CLR (R1)
10649 040136  062701  000100                        ADD #100,R1                  ;ALL 256 TO ADDRESS              ;ILC;;REVB
10650 040142                                      UNTIL R1 EQ #LAST+2            ;                                ;ILC;;REVB
10651 040150  104423                              CACHON                         ;TURN ON CACHE
10652 040152  000207                              RETURN                         ;
```

```
10654 040154                          MTP045: SUBTST  <<MTP045        SYNDROMES TO CSR ON DOUBLE BIT ERROR TEST>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       MTP045  SYNDROMES TO CSR ON DOUBLE BIT ERROR TEST
                                      ;*****************************************************************************
10655                                         ;
10656                                         ;  THIS TEST CHECKS TO SEE IF THE DOUBLE BIT ERROR INDICATOR IS SET
10657                                         ;  ON A DOUBLE BIT ERROR AND THE CORRECT SYNDROMES ARE LATCHED INTO THE
10658                                         ;  CSR.  THIS TEST IS THEN REPEATED WITH MULTIPLE ERROR CHECK/SYNDROME BITS
10659                                         ;
10660 040154  104424                        CACHOFF                 ;TURN OFF CACHE
10661 040156  104513                        CBREG                   ;ENABLE CHECK/SYNDROME BIT REGISTER
10662 040160                                LET PASSNO := #0        ;CLEAR LOOP COUNTER
10663 040164                                LET GOOD := #3744       ;GOOD DATA
10664 040172                                LET CSR := #3144        ;DBE CHECK BITS FOR CSR
10665 040200                                REPEAT                  ;
10666 040200  005237  002264                  INC PASSNO            ;
10667 040204  104425                          LOADCSR               ;WRITE DBE CHECK BITS TO CSR
10668 040206                                  LET (R1) := #0        ;WRITE ZEROS AND DBL ERROR CHK BITS A=0
10669 040210  104503                          CLR1CSR               ;CLEAR CSR OUT
10670 040212  005711                          TST (R1)              ;READ A=0 TO GET DOUBLE BIT ERROR
10671 040214  104426                          READCSR               ;WAS UNCORRECABLE ERROR BIT SET???
10672 040216                                  IF #BIT15 OFF.IN CSR  ;
10673 040226                                     SET HEADER         ;
10674 040234                                     LET BAD := CSR     ;
10675 040242  104063                             ERROR +63          ;BIT NOT SET
10676 040244                                  END                   ;
10677 040244  104513                          CBREG                 ;ENABLE SYNDROME BIT REGISTER
10678 040246  104426                          READCSR               ;READ CSR FOR CORRECT SYNDROME BITS
10679 040250  000240                          NOP                   ;DEBUG AIDE
10680 040252  042737  174033  002146          BIC #^C3744,CSR       ;MASK SYNDROMES OUT
10681 040260                                  IF CSR NE GOOD THEN   ;CHECK IF DOUBLE ERROR BIT IS SET
10682 040270                                     LET BAD := CSR     ;BAD DATA
10683 040276                                     SET HEADER         ;
10684 040304  104042                             ERROR +42          ;
10685 040306                                  END                   ;
10686 040306  005011                          CLR (R1)              ;CLEAR LUT
10687 040310                                  LET GOOD := #3604     ;REPEAT WITH MULTIPLE ERROR SYNDROMES
10688 040316                                  LET CSR := #3004      ;MULTIPLE ERROR CHECK BITS
10689 040324                                UNTIL PASSNO EQ #2      ;
10690 040334  104503                        CLR1CSR                 ;
10691 040336  104423                        CACHON                  ;
10692 040340  000207                        RETURN
```

```
10694 040342                        MTP046: SUBTST  <<MTP046        CHECK SINGLE BIT ERRORS WITH ECC DISABLED>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       MTP046  CHECK SINGLE BIT ERRORS WITH ECC DISABLED
                                    ;*****************************************************************************
10695                                       ;
10696                                       ; THIS TEST CHECKS TO SEE THAT FOR EACH BIT OF A DATA WORD THAT A SBE
10697                                       ; IS TREATED LIKE A UNCORRECTABLE ERROR WITH ECC DISABLED AND TRAPS
10698                                       ; ARE DETECTED.
10699                                       ;
10700 040342  005037  002264          CLR  PASSNO                         ;CLEAR OUTER LOOP COUNTER
10701 040346  104424                  CACHOFF                             ;TURN OFF CACHE
10702 040350                           REPEAT                              ;
10703 040350                           LET PASSNO := PASSNO + #1           ;
10704 040354  005000                   CLR  R0                             ;CLEAR DATA
10705 040356  105037  002262           CLRB PASFLG                         ;CLEAR PASFLG
10706 040362  104513                   CBREG                               ;ENABLE CHECK/SYNDROME BIT REGISTER
10707 040364                           REPEAT                              ;
10708 040364                                LET PASFLG :B= PASFLG + #1     ;INCREMENT LOOP COUNTER
10709 040370                                LET R4  := #-1                 ;INDEX TO SINGLE BIT ERROR TABLE
10710 040374                                LET NOPAR := #1                ;ENABLE PARITY ACTION
10711 040402                                LET BITNO := #0                ;CLEAR INNER LOOP COUNTER
10712 040406                                IFB PASFLG EQ #1               ;SELECT DATA TO BE CORRECTED BY PASSNO
10713 040416                                   LET R5 := #1                ;DATA=0;BIT TO BE CORRECTED IS A ONE
10714 040422                                ELSE                           ;
10715 040424                                   LET R5 := #177776           ;DATA=177776;BIT TO BE CORRECTED IS A ZERO
10716 040430                                END                            ;
10717 040430                           REPEAT                              ;
10718 040430                             LET PARCNT := #0                  ;CLEAR PARITY COUNTER
10719 040434  005237  002322             INC BITNO                       ;INCREMENT BIT POINTER
10720 040440                             LET R4 := R4 + #1                 ;POINT TO NEXT SET OF CHECK BITS
10721 040442                             LET R2 :B= PTABLE(R4)             ;GET NEXT SET OF CHECK BITS
10722 040446  072227  000005             ASH #5,R2                       ;SHIFT TO LINE UP IN CSR
10723 040452  052702  000006             BIS #BIT2!BIT1,R2               ;ENABLE DIAG MODE
10724 040456                             LET CSR := R2                     ;GET CHECK BITS TO BE WRITTEN
10725 040462  104425                     LOADCSR                         ;LOAD CSR WITH DATA
10726 040464                             LET (R1) := R0                    ;WRITE DATA TO TEST ADDRESS
10727 040466                             IF PASSNO EQ #1                 ;WRITE CSR
10728 040476  104471                        ECC1DIS                      ;FIRST PASS  ;ECC DISABLE,NO PBL
10729 040500                             ELSE                            ;
10730 040502  104507                        ENA1SBE                      ;SECOND PASS ;ECC DISABLE,PBL ENABLED
10731 040504                             END                             ;
10732 040504  005711                     TST (R1)                        ;CORRECT SBE
10733 040506  004737  040626             CALL CHKTRP                     ;CHECK FOR CORRECT TRAP
10734 040512  104426                     READCSR                         ;READ THE CSR FOR UNCORRECTABLE ERROR
10735 040514                             IF #BIT15 OFF.IN CSR            ;IS UNCORRECTABLE ERROR BIT SET????
10736 040524                                LET BAD := CSR               ;
10737 040532                                SET HEADER                   ;
10738 040540  104045                        ERROR +45                    ;
10739 040542                             END                             ;
10740 040542  104503                     CLR1CSR                         ;
10741 040544  005011                     CLR (R1)                        ;CLEAR LUT
10742 040546                             IFB PASFLG EQ #1                ;SHIFT NEW DATA DEPENDING ON PASFLG
10743 040556  006305                        ASL  R5                      ;SHIFT BITNO TO THE LEFT
10744 040560                             ELSE                            ;
10745 040562  000261                        SEC                          ;SET CARRY BIT AND......
10746 040564  006105                        ROL   R5                     ;ROTATE LEFT
10747 040566                             END                             ;
```

```
10748 040566                                    UNTIL BITNO EQ #16.          ;UNTIL ALL BITS ARE DONE
10749 040576  005100                            COM R0                       ;COMPLEMENT DATA AND REPEAT
10750 040600                                  UNTILB PASFLG EQ #2            ;UNTIL 2 PASSES ARE COMPLETE!
10751 040610                                 UNTIL PASSNO EQ #2              ;
10752 040620  104503                         CLR1CSR                         ;
10753 040622  104423                         CACHON                          ;TURN CACHE
10754 040624  000207                         RETURN                          ;
10755
10756
10757 040626                           CHKTRP: IF PASSNO EQ #1               ;PASS 1 CHECK FOR NO TRAP
10758 040636                                      IF PARCNT EQ #1            ;
10759 040646                                         SET HEADER              ;
10760 040654  104057                                 ERROR +57               ;
10761 040656                                      END                        ;
10762 040656                                    ELSE                         ;
10763 040660                                      IF PARCNT NE #1            ;
10764 040670                                         SET HEADER              ;
10765 040676  104062                                 ERROR +62               ;
10766 040700                                      END                        ;
10767 040700                                    END                          ;
10768 040700  000207                            RETURN                       ;
```

```
10770 040702                                MTP047: SUBTST  <<MTP047        NO CSR UPDATE ON SBE WITH EXSISTING DBE>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       MTP047  NO CSR UPDATE ON SBE WITH EXSISTING DBE
                                            ;*****************************************************************************
10771                                               ;
10772                                               ;  THIS TEST CHECKS TO SEE THAT THE CSR CONTENTS WILL NOT CHANGE
10773                                               ;  WITH A SINGLE BIT ERROR WHEN A DOUBLE BIT ERROR ALREADY
10774                                               ;  EXISTS.
10775                                               ;
10776 040702  104424                              CACHOFF                         ;TURN OFF CACHE
10777 040704                                      LET R4 := BANK                  ;GET BANK NUMBER
10778 040710  072427  000011                      ASH #9.,R4                      ;SHIFT INTO PLACE
10779 040714  042704  170037                      BIC #^C7740,R4                  ;MASK OUT UNWANTED BITS
10780 040720  052704  100000                      BIS #BIT15,R4                   ;SET UP GOOD DATA
10781 040724  104513                              CBREG                           ;ENABLE CHECK/SYNDROME BIT REGISTER
10782 040726                                      LET CSR := #3144                ;CHECK BITS FOR DOUBLE BIT ERROR
10783 040734  104425                              LOADCSR                         ;
10784 040736                                      LET (R1) := #0                  ;WRITE DBE CHECK BITS
10785 040740                                      LET CSR := #104                 ;WRITE SBE CHECK BITS
10786 040746  104425                              LOADCSR                         ;
10787 040750                                      LET (R2) := #0                  ;WRITE SBE CHECK BITS AT ADDRESS + 4K
10788 040752  104503                              CLR1CSR                         ;CLEAR CSR
10789 040754  005711                              TST (R1)                        ;READ DBE LOCATION
10790 040756  104426                              READCSR                         ;READ FOR CSR DBE INDICATOR
10791 040760  042737  020000  002146              BIC #BIT13,CSR                  ;CLEAR INHIBIT MODE POINTER
10792 040766                                      IF CSR NE R4                    ;
10793 040774                                         LET BAD := CSR               ;
10794 041002                                         LET GOOD := R4               ;
10795 041006                                         SET HEADER                   ;
10796 041014  104063                                 ERROR +63                    ;
10797 041016                                      END                             ;
10798 041016  052704  000020                      BIS #20,R4                      ;SET BIT IN GOOD DATA
10799 041022  005712                              TST (R2)                        ;READ SBE
10800 041024  104426                              READCSR                         ;READ CSR FOR NO CHANGE
10801 041026  042737  020000  002146              BIC #BIT13,CSR                  ;CLEAR INHIBIT MODE POINTER
10802 041034                                      IF CSR NE R4                    ;
10803 041042                                         LET BAD := CSR               ;
10804 041050                                         LET GOOD := R4               ;
10805 041054                                         SET HEADER                   ;
10806 041062  104051                                 ERROR +51                    ;
10807 041064                                      END                             ;
10808 041064  104503                              CLR1CSR                         ;CLEAR 1 CSR
10809 041066  005011                              CLR (R1)                        ;
10810 041070  005012                              CLR (R2)                        ;
10811 041072  104423                              CACHON                          ;TURN ON CACHE
10812 041074  000207                              RETURN
```

```
                                        .SBTTL  MISC SUBROUTINES

041076                          REGCOPY:SUBTST  <<SUBR  COPY R0 TO R4,R1 TO R3, & R2 TO R5>>
                                ;*****************************************************************
                                ;*SUBTEST        SUBR    COPY R0 TO R4,R1 TO R3, & R2 TO R5
                                ;*****************************************************************
041076  010004                          MOV     R0,R4
041100  010103                          MOV     R1,R3
041102  010205                          MOV     R2,R5
041104  000207                          RETURN

041106                          FLIPWARN:SUBTST <<FLIP WARNING CONSTANTS IN WORST CASE NOISE TESTS>>
                                ;*****************************************************************
                                ;*SUBTEST        FLIP WARNING CONSTANTS IN WORST CASE NOISE TESTS
                                ;*****************************************************************
041106                                  PUSH    R0
041110  005237  002604                  INC     FLIPLOC
041114  042737  177774  002604          BIC     #^C3,FLIPLOC
041122  022737  000001  002604          CMP     #1,FLIPLOC
041130  001414                          BEQ     1$
041132  022737  000002  002604          CMP     #2,FLIPLOC
041140  001413                          BEQ     2$
041142  022737  000003  002604          CMP     #3,FLIPLOC
041150  001414                          BEQ     3$
041152  005000                          CLR     R0
041154  013704  002602                  MOV     ONES,R4
041160  000414                          BR      4$
041162                          1$:     CLEAR   R0,R4
041166  000411                          BR      4$
041170  012700  000401          2$:     MOV     #401,R0
041174  013704  002602                  MOV     ONES,R4
041200  000404                          BR      4$
041202  012700  000401          3$:     MOV     #401,R0
041206  012704  000401                  MOV     #401,R4
041212  010037  027526          4$:     MOV     R0,WARN2
041216  010037  027542                  MOV     R0,WARN3
041222  010037  027566                  MOV     R0,WARN4
041226  010037  027602                  MOV     R0,WARN5
041232                                  POP     R0
041234  000207                          RETURN
```

```
10849 041236                                BACKGND:SUBTST  <<SUBR  WRITE BACKGROUND>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        SUBR    WRITE BACKGROUND
                                            ;*****************************************************************************
10850                                               ;WRITES DATA FROM R2
10851 041236  104415                                SAVREG
10852 041240  012700  060000                        MOV     #FIRST,R0
10853 041244  012701  040000                        MOV     #SIZE,R1
10854 041250  022737  000001  003754                CMP     #1,PROTYP
10855 041256  001415                                BEQ     WARN6B
10856 041260  012737  000207  027410  WARN6A:       MOV     #207,MTP000+4           ;WARNING PUTTING 'RETURN' AFTER WRITE
10857 041266  012737  027404  002260                MOV     #MTP000,SUPDOADD
10858 041274  004737  027212                        CALL    SUPD03
10859 041300  012737  000240  027410                MOV     #240,MTP000+4           ;RESTORE 'NOP' AFTER WRITE
10860 041306  104416                                RESREG
10861 041310  000207                                RETURN
10862 041312                                WARN6B: BMOV    MTP000
10863 041320  012737  000207  177644  WARN6:       MOV     #207,UIPAR2             ;WARNING PUTTING 'RETURN' INSTRUCTION AFTER WRITE
10864 041326  004737  027034                        CALL    SUPD01
10865 041332  104416                                RESREG
10866 041334  000207                                RETURN
```

```
10868 041336                          GETCSR: SUBTST  <<SUBR  GET CSR INFORMATION FROM CONFIGURATION TABLE>>
                                      ;*****************************************************************************
                                      ;*SUBTEST        SUBR    GET CSR INFORMATION FROM CONFIGURATION TABLE
                                      ;*****************************************************************************
10869                                         ;INPUTS : NONE
10870                                         ;
10871                                         ;OUTPUT : CSRNO = CSR NUMBER
10872                                         ;
10873 041336  013702  002102                  MOV     BANKINDEX,R2            ;GET INDEX INTO CONFIG TABLE
10874 041342  016203  002652                  MOV     CONFIG(R2),R3           ;MOV IT INTO R3
10875 041346  000303                          SWAB    R3                      ;
10876 041350  006303                          ASL     R3                      ;
10877 041352  042703  177741                  BIC     #^C36,R3                ;CLEAR OFF SOME BITS
10878 041356  010337  002150                  MOV     R3,CSRNO                ;SAVE CSR NUMBER
10879 041362  000207                          RETURN
```

```
10882 041364                                    PCONFIG:SUBTST  <<SUBR  PRINT CONFIGURATION MAP>>
                                                ;*****************************************************************
                                                ;*SUBTEST        SUBR    PRINT CONFIGURATION MAP
                                                ;*****************************************************************
10883 041364                                            PUSH    TKVEC,TKVEC+2,R0
10884 041376  010637  041664                            MOV     SP,PCONFS               ;SAVE LAST GOOD SP
10885 041402  012737  041632  000060                      MOV     #PCONF2,TKVEC
10886 041410  012737  000340  000062                      MOV     #340,TKVEC+2
10887 041416  017700  141210                            MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
10888 041422  042737  000200  177776                      BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
10889 041430  052777  000100  141172                      BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
10890
10891 041436                                            TYPE    MSG001
10892 041442                                            TYPE    MSG002
10893 041446                                            TYPE    MSG003
10894 041452  022737  000060  002554                      CMP     #60,LASTBANK
10895 041460  002006                                    BGE     NOOJ
10896                                                   ;IF FAT PAPER ON TERMINAL GOTO 1$
10897 041462                                            IF #SW4 SET.IN @SWR THEN JUMPTO PCONF1
10898 041476  012700  000074                    NOOJ:   MOV     #60.,R0
10899 041502  010004                                    MOV     R0,R4
10900 041504                                            CLEAR   R1,R3
10901 041510                                            TYPE    MSG004
10902 041514  004737  041666                            CALL    TCONFIG                 ;GO TYPE CONFIGURATION (1ST HALF)
10903 041520  022737  000060  002554                      CMP     #60,LASTBANK
10904 041526  002041                                    BGE     PCONF2
10905 041530                                            TYPE    $CRLF
10906 041534                                            TYPE    MSG017                  ;PRINT SPACE(S)
10907 041540                                            TYPE    MSG011
10908 041544                                            TYPE    $CRLF
10909 041550                                            TYPE    MSG017                  ;PRINT SPACE(S)
10910 041554                                            TYPE    MSG012
10911 041560  012701  000360                            MOV     #60.*2*2,R1
10912 041564  010103                                    MOV     R1,R3
10913 041566  004737  041666                            CALL    TCONFIG
10914 041572  000417                                    BR      PCONF2
10915
10916 041574  012700  000170                    PCONF1: MOV     #120.,R0
10917 041600  010004                                    MOV     R0,R4
10918 041602                                            CLEAR   R1,R3
10919 041606                                            TYPE    MSG014                  ;SPACE
10920 041612                                            TYPE    MSG011
10921 041616                                            TYPE    MSG004
10922 041622                                            TYPE    MSG012
10923 041626  004737  041666                            CALL    TCONFIG
10924
10925 041632  013706  041664                    PCONF2: MOV     PCONFS,SP               ;RESTORE STACK
10926 041636  042777  000100  140764                    BIC     #BIT6,@$TKS
10927 041644  117700  140762                            MOVB    @$TKB,R0                ;READ CHAR TO KILL FLAG
10928 041650                                            POP     R0,TKVEC+2,TKVEC
10929 041662  000207                                    RETURN
10930
10931 041664  000000                            PCONFS: 0                               ;STACK SAVED HERE!
```

```
10934 041666                                    SUBTST  <<SUBR  TYPE CONFIGURATION>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    TYPE CONFIGURATION
                                        ;*****************************************************************************
                                        ;*****************************************************************************
10935                                   ;CALL:  MOV     #N,R0           ;N=NUMBER OF CHARACTERS
10936                                   ;       MOV     R0,R4           ;BACKUP
10937                                   ;       MOV     #K,R1           ;INDEX CONSTANT
10938                                   ;       MOV     R1,R3           ;BACKUP
10939                                   ;       CALL    TCONFIG         ;ACTUAL CALL
10940                                   ;       RETURN                  ;ONLY RETURN
10941                                   ;*****************************************************************************
10942
10943
10944                                           ;************
10945                                           ;** ERROR **
10946                                           ;************
10947 041666  012737  000340  177776  TCONFIG:MOV     #340,PSW        ;DISABLE INTERUPTS
10948 041674                                   TYPE    MSG005
10949 041700  032761  000001  002652  1$:     BIT     #BIT0,CONFIG(R1)        ;ERROR ON THIS BANK?
10950 041706  001403                          BEQ     2$                      ;NO - SKIP
10951 041710                                   TYPE    MSG013                  ;PRINT "X"
10952 041714  000402                          BR      3$
10953 041716                           2$:     TYPE    MSG014                  ;PRINT SPACE
10954 041722  062701  000004          3$:     ADD     #4,R1                   ;BUMP POINTER
10955 041726  077014                          SOB     R0,1$                   ;LOOP UNTIL DONE
10956 041730  010400                          MOV     R4,R0
10957 041732  010301                          MOV     R3,R1
```

```
10960                                                   ;*****************
10961                                                   ;** INTERLEAVE **
10962                                                   ;*****************
10963 041734                                            TYPE    MSG007
10964                                                   ;THIS IS AN ENTRY POINT FROM ERROR REPORTS
10965 041740  012737  000340  177776  TCFIG1: MOV     #340,PSW        ;DISABLE INTERUPTS
10966 041746  032761  010000  002654          BIT     #BIT12,CONFIG+2(R1)
10967 041754  001014                          BNE     1$
10968 041756  032761  000002  002652          BIT     #BIT1,CONFIG(R1)        ;IS THERE ANY MEMORY HERE?
10969 041764  001004                          BNE     18$                     ;BRANCH IF MEMORY PRESENT.
10970 041766  112737  000040  074750          MOVB    #' ,MSG015              ;MOVE A BLANK IN TO BE PRINTED
10971 041774  000424                          BR      16$                     ;BRANCH TO TYPE ROUTINE
10972 041776  112737  000055  074750  18$:    MOVB    #'-,MSG015
10973 042004  000420                          BR      16$
10974 042006  016105  002652          1$:     MOV     CONFIG(R1),R5
10975 042012  042705  007777                  BIC     #^C170000,R5            ;GET CSR INTERLEAVE
10976 042016  000305                          SWAB    R5
10977 042020  072527  177774                  ASH     #-4,R5
10978 042024  022705  000011                  CMP     #9.,R5
10979 042030  100002                          BPL     2$
10980 042032  062705  000007                  ADD     #7,R5
10981 042036  062705  000060          2$:     ADD     #60,R5                  ;MAKE ASCII
10982 042042  110537  074750                  MOVB    R5,MSG015               ;PLUG INTO MEMORY
10983 042046                          16$:    TYPE    MSG015
10984 042052                                  IF NOTAB NE #0 THEN $RETURN
10985 042062  062701  000004                  ADD     #4,R1                   ;BUMP POINTER
10986 042066  077054                          SOB     R0,TCFIG1               ;LOOP UNTIL DONE
10987 042070  010400                          MOV     R4,R0
10988 042072  010301                          MOV     R3,R1
10989
10990                                                   ;*****************
10991                                                   ;** MEMORY TYPE **
10992                                                   ;*****************
10993                                                   .ENABL  LSB
10994 042074                                            TYPE    MSG009
10995 042100  033761  002104  002652  TCFIG2: BIT     CPUBIT,CONFIG(R1)
10996 042106  001432                          BEQ     17$
10997 042110  016105  002654                  MOV     CONFIG+2(R1),R5
10998 042114  000305                          SWAB    R5                      ;GET MEMORY TYPE
10999 042116  042705  177770                  BIC     #^C7,R5                 ;CLEAR NON INTERESTING BITS
11000 042122  020527  000003                  CMP     R5,#3                   ;IS IT A LEGAL MEMORY TYPE
11001 042126  003022                          BGT     17$                     ;IF IF SO BRANCH!!!!!!!
11002 042130                                  IF #BIT0 SET.IN R5              ;IS IT AN ECC MEMORY????
11003 042136                                    IF #BIT1 SET.IN R5            ;IS IT A MS11-P OR A MS11-M???
11004 042144  112737  000120  074750                MOVB        #'P,MSG015  ;IT IS A MS11-P
11005 042152                                    ELSE                        ;
11006 042154  112737  000115  074750                MOVB        #'M,MSG015  ;IT IS A MS11-M
11007 042162                                    END                         ;
11008 042162                                  ELSE                          ;
11009 042164  112737  000114  074750              MOVB          #'L,MSG015  ;IT IS A MS11-L
11010 042172                                  END                           ;
11011 042172  000403                          BR      8$
11012 042174  112737  000040  074750  17$:    MOVB    #' ,MSG015
11013 042202                          8$:     TYPE    MSG015
11014 042206                                  IF NOTAB NE #0 THEN $RETURN
11015 042216  062701  000004                  ADD     #4,R1                   ;BUMP POINTER
11016 042222  077052                          SOB     R0,TCFIG2               ;LOOP UNTIL DONE
```

```
11017 042224  010400                          MOV     R4,R0
11018 042226  010301                          MOV     R3,R1
11019                                         .DSABL  LSB
11020
11021                                         ;*********
11022                                         ;** CSR **
11023                                         ;*********
11024 042230                                  TYPE    MSG016
11025 042234  112737  000040  074750  TCFIG3: MOVB    #' ,MSG015
11026 042242  016105  002652                  MOV     CONFIG(R1),R5
11027 042246  032705  000002                  BIT     #BIT1,R5
11028 042252  001414                          BEQ     16$
11029 042254  042705  170377                  BIC     #^C7400,R5
11030 042260  000305                          SWAB    R5
11031 042262  022705  000011                  CMP     #9.,R5
11032 042266  100002                          BPL     10$
11033 042270  062705  000007                  ADD     #7,R5
11034 042274  062705  000060          10$:    ADD     #60,R5                  ;MAKE ASCII
11035 042300  110537  074750                  MOVB    R5,MSG015               ;PLUG INTO MEMORY
11036 042304                          16$:    TYPE    MSG015
11037 042310                                  IF NOTAB NE #0 THEN $RETURN
11038 042320  062701  0000(4                  ADD     #4,R1                   ;BUMP POINTER
11039 042324  077035                          SOB     R0,TCFIG3
11040 042326  010400                          MOV     R4,R0
11041 042330  010301                          MOV     R3,R1
11042
11043                                         ;****************
11044                                         ;** PROTECTED **
11045                                         ;****************
11046 042332                                  TYPE    MSG010
11047 042336  105761  002652          11$:    TSTB    CONFIG(R1)              ;BANK PROTECTED?
11048 042342  100004                          BPL     12$                     ;NO - SKIP
11049 042344  112737  000120  074750          MOVB    #'P,MSG015
11050 042352  000407                          BR      13$
11051 042354  032761  000100  002652  12$:    BIT     #BIT6,CONFIG(R1)        ;PROTECTED REGION OF ECC?
11052 042362  001406                          BEQ     14$                     ;NO - SKIP
11053 042364  112737  000111  074750          MOVB    #'I,MSG015
11054 042372                          13$:    TYPE    MSG015
11055 042376  000402                          BR      15$
11056 042400                          14$:    TYPE    MSG014                  ;PRINT SPACE
11057 042404  062701  000004          15$:    ADD     #4,R1                   ;BUMP POINTER
11058 042410  077026                          SOB     R0,11$                  ;LOOP UNTIL DONE
11059 042412  010400                          MOV     R4,R0
11060 042414  010301                          MOV     R3,R1
11061 042416  000207                          RETURN
```

```
                                        .SBTTL  TRAP    PARITY ERROR HANDLER
                                ;*******************************************************************************
                                ;VECTOR TO HERE FROM TRAPS TO 114
                                ;IGNORE ERRORS BUT COUNT IF NOPAR FLAG = 1.
                                ;*******************************************************************************
                                ;
                                ;       CODE    ACTION
                                ;
                                ;       --0--   PRINT UNEXPECTED PARITY TRAP
                                ;         1     COUNT ERROR
                                ;         2     SET "ABORT" / SETUP 'BADPC" / RETURN VIA PCBUMP
                                ;         3     RETURN VIA "PARTHERE"
                                ;
042420  022737  000001  002074  PARITY: CMP     #1,NOPAR                ;COUNTING PARITY ERRORS?
042426  001003                          BNE     1$                      ;NO - SKIP
042430  005237  002070                  INC     PARCNT                  ;PARITY ERROR COUNTER + 1
042434  000002                          RTI
042436  022737  000002  002074  1$:     CMP     #2,NOPAR                ;ACTION CODE = 2 ?
042444  001013                          BNE     2$                      ;NO - SKIP
042446                                  SET     ABORTFLAG               ;YES
042454  004737  042626                  CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
042460  063716  002324                  ADD     PCBUMP,(SP)             ;UPDATE RETURN PC
042464  042766  000004  000002          BIC     #BIT2,2(SP)             ;SHOW FAILURE BY .NE.
042472  000002                          RTI
042474  022737  000003  002074  2$:     CMP     #3,NOPAR                ;ACTION CODE = 3 ?
042502  001003                          BNE     3$                      ;NO - SKIP
042504  013716  002302                  MOV     PARTHERE,(SP)
042510  000002                          RTI
042512  004737  042626          3$:     CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
042516                                  FATAL   32
```

```
11096                                                   .SBTTL  TRAP    NON-EXISTANT MEMORY (HOLES) HANDLER
11097                                                   ;*************************************************************************
11098                                                   ;VECTOR TO HERE (SOMETIMES) FROM TRAPS TO 4
11099                                                   ;       CODE IN NONEM DETERMINES ACTION AS FOLLOWS:
11100                                                   ; 1)    IGNORE ERRORS BUT COUNT IF NONEM (NO NON-EXISTANT MEMORY) FLAG = 1.
11101                                                   ; 2)    TO EXIT PATTERN 0 DURING SIZING IF NON-EXIST MEM ERROR
11102                                                   ;*************************************************************************
11103
11104 042524  022737  000001  002076  NONEXIST:CMP     #1,NONEM                ;COUNTING NON-EXISTANT MEMORY ERRORS?
11105 042532  001011                          BNE     2$                      ;NO - SKIP
11106 042534  005237  002066                  INC     NEMCNT                  ;BUMP NON-EXISTANT MEMORY COUNTER
11107 042540  022737  000001  002066          CMP     #1,NEMCNT               ;FIRST ERROR?
11108 042546  001002                          BNE     1$                      ;NO - SKIP
11109 042550  010037  002032                  MOV     R0,ADDRESS              ;ASSUME R0 CONTAINS THE ADDRESS ACCESSED
11110 042554  000002                  1$:     RTI
11111 042556  005237  002066          2$:     INC     NEMCNT                  ;BUMP NON-EXISTANT MEMORY COUNTER
11112 042562  012701  000001                  MOV     #1,R1                   ;DUMMY UP R1 FOR A FORCED SOB EXIT
11113 042566  000002                          RTI
11114
11115                                                   ;*************************************************************************
11116                                                   .SBTTL  TRAP    TIMEOUT (TRAP TO 4) HANDLER
11117 042570  004737  042626          TIMEOUT:CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
11118 042574                                  FATAL   6
11119                                                   ;*************************************************************************
11120                                                   .SBTTL  TRAP    MEMORY MANAGEMENT (TRAP TO 250) HANDLER
11121 042602  004737  042626          MMTRAP: CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
11122 042606                                  FATAL   7
11123                                                   .SBTTL  TRAP    RESERVED INSTRUCTION HANDLER
11124 042614  004737  042626          PDP1105:CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
11125 042620                                  FATAL   5
11126
11132
11133 042626                          BADSTACK:SUBTST <<FIND BAD SP, PC, & PSW FROM STACK>>
                                                        ;*************************************************************************
                                                        ;*SUBTEST       FIND BAD SP, PC, & PSW FROM STACK
                                                        ;*************************************************************************
11134 042626  010637  002024                  MOV     SP,BADSP
11135 042632  062737  000002  002024          ADD     #2,BADSP
11136 042640  016637  000002  002020          MOV     2(SP),BADPC
11137 042646  016637  000004  002030          MOV     4(SP),BADPSW
11138 042654  000207                          RETURN
```

```
                                        .SBTTL  TRAP    KERNEL TRAP HANDLER
                                ;*******************************************************************************
                                ;KERNEL IS A TRAP THAT COMES HERE
                                ;*******************************************************************************
042656  042766  140000  000002  $KERNEL:        BIC     #140000,2(SP)
042664  000002                  RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    ENERGIZE TRAP HANDLER
042666  052737  000001  177572  $ENERGIZE:BIS   #BIT0,MMR0
042674  000002                  RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    DEENERGIZE TRAP HANDLER
042676  042737  000001  177572  $DEENERGIZE:BIC #BIT0,MMR0
042704  000002                  RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    CACHON TRAP HANDLER
042706  005737  002542          $CACHN: TST     CACHKN          ;IS THERE A CACHE
042712  001406                  BEQ     1$              ;NO - RETURN
042714  013737  002542  177746  MOV     CACHKN,CONTRL   ;SETUP CACHE AS PER CONSTANT (USUALLY 1 = FULLY ON)
042722  052737  000001  177746  BIS     #BIT0,CONTRL    ;DISABLE TRAPS (BUT NOT ABORTS)
042730  000002                  1$:     RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    CACHOFF TRAP HANDLER
042732  005737  002542          $CACHF: TST     CACHKN          ;IS THERE A CACHE?
042736  001403                  BEQ     1$              ;NO - RETURN
                                ;DISABLE TRAPS (NOT ABORTS), FORCE MISSES, FLUSH, BYPASS
042740  053737  002546  177746  BIS     CACHKF,CONTRL
042746  000002                  1$:     RTI
```

```
                                                        .SBTTL  TRAP    LOAD CSR TRAP HANDLER
                                                        ;LOAD CORRECT CSR WITH DATA IN CSR
                                                        ;PROGRAM CSR'S ASSERT INHIBIT MODE POINTER WHEN LOADED
11175 042750                                    $LOADC: PUSH    R0,R1                   ;SAVE REGISTERS
11176 042754  013700  002150                      MOV     CSRNO,R0                ;CREATE CSR ADDRESS
11177 042760                                      IF INHECC IS TRUE THEN GOTO 3$  ;DON'T WANT INH. MODE POINTER ON
11178 042766  005737  002530                      TST     PGMCSR                  ;PROGRAM IN INTERLEAVED SPACE?
11179 042772  100007                            BPL     1$                      ;BRANCH IF NOT
11180 042774  113701  002531                    MOVB    PGMCSR+1,R1             ;CHECK SECOND CSR
11181 043000  042701  177740                    BIC     #^C37,R1                ;CLEAR UNNECESSARY BITS
11182 043004  020137  002150                    CMP     R1,CSRNO                ;IS THIS THE CURRENT CSR?
11183 043010  001404                            BEQ     2$                      ;BRANCH IF IT IS
11184 043012  123737  002530  002150  1$:       CMPB    PGMCSR,CSRNO            ;IS THIS THE CURRENT CSR?
11185 043020  001003                            BNE     3$                      ;BRANCH IF NOT
11186 043022  052737  020000  002146  2$:       BIS     #BIT13,CSR              ;SET THE INHIBIT MODE POINTER TO  1ST 16K
11187 043030  013760  002146  172100  3$:       MOV     CSR,CSRADD(R0)          ;LOAD THE CSR
11188 043036                                    POP     R1,R0                   ;RESTORE REGISTERS
11189 043042  000002                            RTI
11190
11191                                                   .SBTTL  TRAP    READ CSR TRAP HANDLER
11192                                                   ;READ THE CORRECT CSR INTO LOCATIONS CSR
11193 043044                                    $READC: PUSH    R0
11194 043046  013700  002150                      MOV     CSRNO,R0
11195 043052  016037  172100  002146              MOV     CSRADD(R0),CSR          ;READ IT
11196 043060                                    POP     R0
11197 043062  000002                            RTI
```

```
11199                                                   .SBTTL  TRAP    TEST (R1) & READ CSR CAREFULLY
11200 043064                                    $TSTRD: PUSH    R0,R2,R3
11201 043072  012700  172100                            MOV     #CSRADD,R0              :CREATE CSR ADDRESS
11202 043076  063700  002150                            ADD     CSRNO,R0
11203 043102  005002                                    CLR     R2
11204 043104  005737  002530                            TST     PGMCSR
11205 043110  100007                                    BPL     1$
11206 043112  113703  002531                            MOVB    PGMCSR+1,R3
11207 043116  042703  000200                            BIC     #BIT7,R3
11208 043122  020337  002150                            CMP     R3,CSRNO
11209 043126  001404                                    BEQ     2$
11210 043130  123737  002530  002150  1$:               CMPB    PGMCSR,CSRNO
11211 043136  001002                                    BNE     3$
11212 043140  012702  020000          2$:               MOV     #BIT13,R2
11213 043144  022737  000001  003754  3$:               CMP     #1,PROTYP       ;IS THIS AN 11/44?
11214 043152  001403                                    BEQ     4$              ;BRANCH IF IT IS
11215 043154  004737  043242                            CALL    TSTRD1
11216 043160  000405                                    BR      5$
11217 043162                                    4$:     BMOV    TSTRD1
11218 043170  004737  177640                            CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
11219                                                   ;IF SINGLE BIT ERROR ONLY - SET CARRY BIT
11220 043174                                    5$:     POP     R3,R2,R0
11221 043202                                            IF #BIT4 SET.IN CSR AND #BIT15 OFF.IN CSR
11222 043222  052766  000001  000002                      BIS   #BIT0,2(SP)
11223 043230                                            ELSE
11224 043232  042766  000001  000002                      BIC   #BIT0,2(SP)
11225 043240                                            END ;OF IF #BIT4
11226 043240  000002                                    RTI
11227
11228 043242  010210                            TSTRD1: MOV     R2,(R0)                 :V177640
11229 043244                                            TESTAREA                        :V177642 ;ENTER SUPERVISOR MODE
11230 043252  105711                                    TSTB    (R1)                    :V177646
11231 043254  042737  140000  177776                    BIC     #BIT15!BIT14,PSW        :V177650
11232 043262  011037  002146                            MOV     (R0),CSR                :V177656
11233 043266  000207                                    RETURN                          :V177662
```

```
11236                                                   .SBTTL  TRAP    ECC DISABLE ALL CSR'S TRAP HANDLER
11237 043270  012737  000002  002146  $ECCDIS:MOV       #BIT1,CSR
11238 043276  004737  044014                  CALL      CSROUT
11239 043302  000002                          RTI
11240                                                   .SBTTL  TRAP    ECC DISABLE OF 1 SELECTED CSR TRAP HANDLER
11241 043304  012737  000002  002146  $ECC1DIS:MOV      #BIT1,CSR
11242 043312  104425                          LOADCSR
11243 043314  000002                          RTI
11244                                                   .SBTTL  TRAP    INITIALIZE ALL CSR'S TRAP HANDLER
11245 043316  012737  000001  002146  $ECCINIT:MOV      #BIT0,CSR
11246 043324  004737  044014                  CALL      CSROUT
11247 043330  000002                          RTI
11248                                                   .SBTTL  TRAP    INITIALIZE 1 SELECTED CSR TRAP HANDLER
11249 043332  012737  000001  002146  $ECC1INIT:MOV     #BIT0,CSR
11250 043340  104425                          LOADCSR
11251 043342  000002                          RTI
11252                                                   .SBTTL  TRAP    ENABLE SBE PARITY TRAPS ON ALL CSR'S
11253 043344  012737  000003  002146  $ENASBE:MOV       #BIT0!BIT1,CSR
11254 043352  004737  044014                  CALL      CSROUT
11255 043356  000002                          RTI
11256                                                   .SBTTL  TRAP    ENABLE SBE PARITY TRAPS ON 1 SELECTED CSR
11257 043360  012737  000003  002146  $ENA1SBE:MOV      #BIT0!BIT1,CSR
11258 043366  104425                          LOADCSR
11259 043370  000002                          RTI
11260                                                   .SBTTL  TRAP    WRITE CHECKBITS THRU ALL CSR'S TRAP HANDLER
11261 043372  013737  002312  002146  $CBCSR: MOV       CHECK,CSR                       ;BITS 11-5
11262 043400  052737  000006  002146          BIS       #BIT1!BIT2,CSR                  ;CHECK MODE
11263 043406  004737  044014                  CALL CSROUT
11264 043412  000002                          RTI
11265                                                   .SBTTL  TRAP    WRITE CHECKBITS THRU 1 SELECTED CSR TRAP HANDLER
11266 043414  013737  002312  002146  $CB1CSR:MOV       CHECK,CSR                       ;BITS 11-5
11267 043422  052737  000006  002146          BIS       #BIT1!BIT2,CSR                  ;CHECK MODE
11268 043430  104425                          LOADCSR
11269 043432  000002                          RTI
```

```
11272                                           .SBTTL  TRAP    WAS THERE A SBE ON ANY CSR TRAP HANDLER
11273 043434                            $WASSBE:PUSH    R1,R4
11274 043440  013701  002222                      MOV     TOTCSRS,R1      ;GET CSR'S BYTE
11275 043444  005004                              CLR     R4
11276 043446                                      BEGIN LWSBE
11277 043446                                        FOR CSRNO := #0 TO #36 BY #2
11278 043452  006301                                  ASL         R1
11279 043454                                          ON.ERROR
11280 043456  104426                                    READCSR
11281 043460                                            IF #BIT4 SET.IN CSR
11282 043470                                              SET     R4
11283 043474                                              LEAVE LWSBE
11284 043476                                            END ;OF IF #BIT4
11285 043476                                          END ;OF ON.ERROR
11286 043476                                          IF R1 EQ #0 THEN LEAVE LWSBE
11287 043502                                        END ;OF FOR CSRNO
11288 043520                                      END LWSBE
11289 043520  006004                              ROR     R4              ;SET C BIT FOR ERROR
11290 043522                                      POP     R4,R1
11291 043526                                      ON.ERROR
11292 043530  052766  000001  000002                BIS   #BIT0,2(SP)
11293 043536                                      ELSE
11294 043540  042766  000001  000002                BIC   #BIT0,2(SP)
11295 043546                                      END ;OF ON.ERROR
11296 043546  000002                              RTI
11297                                           .SBTTL  TRAP    WAS THERE A SBE IN 1 SELECTED CSR TRAP HANDLER
11298                                           ;ON RETURN IF CARRY IS SET THERE WAS A SBE
11299 043550  104426                    $WAS1SBE:READCSR
11300 043552  042766  000001  000002              BIC     #BIT0,2(SP)     ;CLR C BIT ON STACK
11301 043560  032737  000020  002146              BIT     #BIT4,CSR
11302 043566  001403                              BEQ     1$
11303 043570  052766  000001  000002              BIS     #BIT0,2(SP)     ;SET C BIT ON STACK
11304 043576  000002                      1$:     RTI
```

TRAP WAS THERE A DBE ON ANY CSR TRAP HANDLER

```
11307                                           .SBTTL  TRAP    WAS THERE A DBE ON ANY CSR TRAP HANDLER
11308 043600                                $WASDBE:PUSH    R1,R4
11309 043604  013701  002222                      MOV     TOTCSRS,R1      ;GET CSR'S BYTE
11310 043610  005004                              CLR     R4
11311 043612                                      BEGIN LWDBE
11312 043612                                        FOR CSRNO := #0 TO #36 BY #2
11313 043616  006301                                  ASL         R1
11314 043620                                          ON.ERROR
11315 043622  104426                                    READCSR
11316 043624                                            IF #BIT15 SET.IN CSR
11317 043634                                              SET     R4
11318 043640                                              LEAVE LWDBE
11319 043642                                            END ;OF IF #BIT4
11320 043642                                          END ;OF ON.ERROR
11321 043642                                        IF R1 EQ #0 THEN LEAVE LWDBE
11322 043646                                        END ;OF FOR CSRNO
11323 043664                                      END LWDBE
11324 043664  006004                              ROR     R4              ;SET C BIT FOR ERROR
11325 043666                                      POP     R4,R1
11326 043672                                      ON.ERROR
11327 043674  052766  000001  000002                BIS   #BIT0,2(SP)
11328 043702                                      ELSE
11329 043704  042766  000001  000002                BIC   #BIT0,2(SP)
11330 043712                                      END ;OF ON.ERROR
11331 043712  000002                              RTI
11332                                           .SBTTL  TRAP    WAS THERE A DBE ON 1 SELECTED CSR TRAP HANDLER
11333                                           ;ON RETURN IF CARRY IS SET THERE WAS A DBE
11334 043714  104426                        $WAS1DBE:READCSR
11335 043716  005737  002146                      TST     CSR             ;DBE?
11336 043722  100004                              BPL     3$              ;NO - SKIP
11337 043724  052766  000001  000002              BIS     #BIT0,2(SP)     ;SET C BIT ON STACK
11338 043732  000002                              RTI
11339 043734  042766  000001  000002  3$:         BIC     #BIT0,2(SP)     ;CLR C BIT ON STACK
11340 043742  000002                              RTI
```

```
11343                                                   .SBTTL  TRAP    CLEAR ALL ECC CSR'S TRAP HANDLER
11344 043744                                    $CLRCSR:CLEAR   CSR
11345 043750  004737  044014                            CALL    CSROUT
11346 043754  000002                                    RTI
11347                                                   .SBTTL  TRAP    CLEAR 1 SELECTED CSR TRAP HANDLER
11348 043756                                    $CLR1CSR:CLEAR  CSR
11349 043762  104425                                    LOADCSR
11350 043764  000002                                    RTI
11351                                                   .SBTTL  TRAP    ECC DISABLE, CHECK MODE, & WRITE CHECKBITS IN ALL CSR'S TRAP HANDLER
11352                                                   ;CHECKBITS ALREADY IN LOC ''CSR''
11353 043766  052737  000006  002146  $CHKDIS:BIS     #BIT1!BIT2,CSR          ;ECC DISABLE & DIAG CHECK MODE
11354 043774  004737  044014                            CALL    CSROUT
11355 044000  000002                                    RTI
11356                                                   .SBTTL  TRAP    ECC DISABLE, CHECK MODE, & WRITE CHECKBITS IN 1 SELECTED CSR
11357                                                   ;CHECKBITS ALREADY IN LOC ''CSR''
11358 044002  052737  000006  002146  $CHK1DIS:BIS    #BIT1!BIT2,CSR          ;ECC DISABLE & DIAG CHECK MODE
11359 044010  104425                                    LOADCSR
11360 044012  000002                                    RTI
```

```
11363 044014                                CSROUT: SUBTST  <<SUBR  WRITE IN ALL CSR'S>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        SUBR    WRITE IN ALL CSR'S
                                            ;*****************************************************************************
11364 044014                                        PUSH    R1
11365 044016  013701  002222                        MOV     TOTCSRS,R1      ;GET CSR'S BYTE
11366 044022                                        BEGIN LCSROUT
11367 044022                                          FOR CSRNO := #0 TO #36 BY #2
11368 044026  006301                                    ASL         R1
11369 044030                                            ON.ERROR
11370 044032  104425                                        LOADCSR
11371 044034                                            END ;OF ON.ERROR
11372 044034                                          IF R1 EQ #0 THEN LEAVE LCSROUT
11373 044040                                          END ;OF FOR CSRNO
11374 044056                                        END LCSROUT
11375 044056                                        POP     R1
11376 044060  000207                                RETURN
11377
11378 044062                                $INVALID:       SUBTST  <<TRAP  INVALIDATE BACKGROUND PATTERN>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        TRAP    INVALIDATE BACKGROUND PATTERN
                                            ;*****************************************************************************
11379 044062                                        PUSH    R0,R1
11380 044066  013701  002100                        MOV     BANK,R1
11381 044072  006301                                ASL     R1
11382 044074  006301                                ASL     R1
11383 044076  042761  020000  002654                BIC     #BIT13,CONFIG+2(R1)
11384 044104                                        POP     R1,R0
11385 044110  000002                                RTI
```

```
11387 044112                                    SERRGEN:        SUBTST<<TRAP    GENERATE AND TEST ERROR ADDRESS>>
                                                ;*****************************************************************
                                                ;*SUBTEST        TRAP    GENERATE AN. TEST ERROR ADDRESS
                                                ;*****************************************************************
11388 044112                                            PUSH    R0,R1,R2,R3
11389 044122  013703  002102                      MOV     BANKINDEX,R3
11390 044126  005737  002454                      TST     NOSUPER
11391 044132  001003                              BNE     6$
11392 044134  013700  172246                      MOV     SIPAR3,R0               ;GENERATE WHAT ERROR ADDR SHOULD BE
11393 044140  000402                              BR      7$
11394 044142  013700  177646             6$:      MOV     UIPAR3,R0
11395 044146  072027  177773             7$:      ASH     #-5,R0
11396 044152  005737  002130                      TST     EUFLAG
11397 044156  001002                              BNE     1$
11398 044160  042700  177600                      BIC     #^C177,R0
11399 044164  000301                      1$:     SWAB    R1                      ;GET CURRENT ADDRESS BITS 11 AND 12
11400 044166  006201                              ASR     R1
11401 044170  006201                              ASR     R1
11402 044172  006201                              ASR     R1
11403 044174  042701  177775                      BIC     #^C2,R1
11404 044200  060100                              ADD     R1,R0                   ;ADD THEM TO THE ADJUSTED PAR VALUE
11405                                             ;GET ERROR ADDRESS FROM CSR UNDER TEST
11406 044202  013701  002146                      MOV     CSR,R1
11407 044206  072127  177773                      ASH     #-5,R1
11408 044212  042701  177600                      BIC     #^C177,R1
11409 044216  005737  002452                      TST     NO22BIT                 ;IS THIS AN 11/44 OR 11/24?
11410 044222  001024                              BNE     2$                      ;BRANCH IF NOT NECESSARY
11411 044224  005737  002130                      TST     EUFLAG                  ;IS IT EUB?
11412 044230  001421                              BEQ     2$                      ;BRANCH IF NOT
11413 044232                                      PUSH    R0                      ;SAVE GENERATED ERROR ADDRESS
11414 044234  013702  002150                      MOV     CSRNO,R2                ;GET CSR NUMBER
11415 044240  052762  040000  172100              BIS     #BIT14,CSRADD(R2)       ;TURN ON EUB BIT CAREFULLY
11416 044246  016200  172100                      MOV     CSRADD(R2),R0           ;GET CSR CONTENTS
11417 044252  042762  040000  172100              BIC     #BIT14,CSRADD(R2)       ;TURN OFF EUB BIT CAREFULLY
11418 044260  042700  177037                      BIC     #^C740,R0               ;CLEAR EVERYTHING BUT ERROR ADDR
11419 044264  006300                              ASL     R0
11420 044266  006300                              ASL     R0                      ;SHIFT ADDR BITS 18-21 INTO POSITION
11421 044270  060001                              ADD     R0,R1                   ;ADD TO CURRENT ERROR ADDRESS
11422 044272                                      POP     R0
11423 044274  020001                      2$:     CMP     R0,R1                   ;COMPARE REAL AND GENERATED ERR. ADDR.
11424 044276  001420                              BEQ     5$                      ;BRANCH IF THEY ARE THE SAME
11425 044300  005737  002134                      TST     INTFLAG                 ;INTERLEAVED?
11426 044304  001411                              BEQ     3$                      ;NO - WE HAVE AN ERROR
11427 044306  062700  000100                      ADD     #100,R0
11428 044312  005737  002136                      TST     INT64K                  ;64K INTERLEAVED MEMORY?
11429 044316  001002                              BNE     4$
11430 044320  062700  000100                      ADD     #100,R0
11431 044324  020001                      4$:     CMP     R0,R1
11432 044326  001404                              BEQ     5$
11433 044330  005737  002064                      TST     SKPERR                  ;ARE WE SUPPOSED TO SKIP ERROR P.O.?
11434 044334  001001                              BNE     5$                      ;YES - SKIP ERROR PRINTOUT
11435 044336  104462                              PERR36                          ;ELSE PRINT ERROR ADDRESS ERROR
11436 044340  010137  002456             5$:      MOV     R1,ERRADD               ;SAVE CSR'S ERROR ADDRESS
11437 044344  005037  002064                      CLR     SKPERR                  ;ENABLE THE ERROR PRINTOUT AGAIN
11438 044350                                      POP     R3,R2,R1,R0             ;RESTORE REGISTERS
11439 044360  000002                              RTI
11440
```

```
11441 044362                          $CBREG: SUBTST  <<TRAP          ENABLE CHECK/SYNDROME BIT REGISTER>>
                                      ;*********************************************************************
                                      ;*SUBTEST       TRAP            ENABLE CHECK/SYNDROME BIT REGISTER
                                      ;*********************************************************************
11442 044362  005037  002146                   CLR     CSR                     ;
11443 044366  052737  000004  002146           BIS     #BIT2,CSR               ;ENABLE DIAGNOSTIC MODE
11444 044374  104425                          LOADCSR                         ;LOAD CSR REGISTER
11445 044376  000002                          RTI                             ;
```

```
 11448 044400                           CHKGEN: SUBTST<<SUBR    GENERATE CHECK BITS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    GENERATE CHECK BITS
                                        ;*****************************************************************************
 11449                                          ;CHECK BIT GENERATOR ROUTINE
 11450                                          ;CALLING SEQUENCE IS:
 11451                                          ;       MOV     #WORD1,SOURCE   ;SOURCE = ADDRESS OF DATA
 11452                                          ;       CALL    CHKGEN
 11453                                          ;
 11454                                          ;CHECK BITS RETURNED IN BITS 11-5 OF LOCATION CHECK
 11455                                          ;
 11456 044400                                   PUSH    R0,R1,R2,R3,R4,R5
 11457 044414  012702  000077                   MOV     #77,R2          ;DEFAULT CHECKBITS FOR DOUBLE WORD OF ZEROS
 11458 044420  012703  044506                   MOV     #CHKTAB,R3      ;ADDRESS OF CHECKBIT TABLE
 11459 044424  013705  002310                   MOV     SOURCE,R5       ;GET SOURCE ADDRESS
 11460 044430  012501                           MOV     (R5)+,R1        ;GET LSB'S
 11461 044432  011500                           MOV     (R5),R0         ;GET MSB'S
 11462
 11463 044434  006704                   1$:     SXT     R4              ;EXTEND SIGN OF DOUBLE WORD TO R4
 11464 044436  142304                           BICB    (R3)+,R4        ;ELIMINATE BITS THAT DON'T COUNT
 11465 044440  074402                           XOR     R4,R2           ;COMPLEMENT MASKED BITS IN CHECKBITS
 11466 044442  073027  000001                   ASHC    #1,R0           ;DOUBLE PRECISION LEFT SHIFT R0,,R1
 11467 044446  001372                           BNE     1$              ;LOOP TILL ALL BITS ARE CHECKED
 11468
 11469 044450  042702  177600                   BIC     #^C177,R2               ;KILL ALL JUNK BITS
 11470 044454  000302                           SWAB    R2              ;POSITION CHECKBITS IN BITS 11-5
 11471 044456  006202                           ASR     R2
 11472 044460  006202                           ASR     R2
 11473 044462  006202                           ASR     R2
 11474 044464  010237  002312                   MOV     R2,CHECK
 11475 044470                                   POP     R5,R4,R3,R2,R1,R0
 11476 044504  000207                           RETURN
```

```
11479 044506                    CHKTAB: ;BYTE #3
11480 044506 200                        .BYTE   ^C177           ;BIT 31
11481 044507 301                        .BYTE   ^C076           ;BIT 30
11482 044510 302                        .BYTE   ^C075           ;BIT 29
11483 044511 203                        .BYTE   ^C174           ;BIT 28
11484 044512 304                        .BYTE   ^C073           ;BIT 27
11485 044513 205                        .BYTE   ^C172           ;BIT 26
11486 044514 206                        .BYTE   ^C171           ;BIT 25
11487 044515 307                        .BYTE   ^C070           ;BIT 24
11488                                   ;BYTE #2
11489 044516 310                        .BYTE   ^C067           ;BIT 23
11490 044517 211                        .BYTE   ^C166           ;BIT 22
11491 044520 212                        .BYTE   ^C165           ;BIT 21
11492 044521 313                        .BYTE   ^C064           ;BIT 20
11493 044522 214                        .BYTE   ^C163           ;BIT 19
11494 044523 315                        .BYTE   ^C062           ;BIT 18
11495 044524 316                        .BYTE   ^C061           ;BIT 17
11496 044525 217                        .BYTE   ^C160           ;BIT 16
11497                                   ;BYTE #1
11498 044526 320                        .BYTE   ^C057           ;BIT 15
11499 044527 221                        .BYTE   ^C156           ;BIT 14
11500 044530 222                        .BYTE   ^C155           ;BIT 13
11501 044531 323                        .BYTE   ^C054           ;BIT 12
11502 044532 224                        .BYTE   ^C153           ;BIT 11
11503 044533 325                        .BYTE   ^C052           ;BIT 10
11504 044534 326                        .BYTE   ^C051           ;BIT  9
11505 044535 227                        .BYTE   ^C150           ;BIT  8
11506                                   ;BYTE #0
11507 044536 340                        .BYTE   ^C037           ;BIT  7
11508 044537 241                        .BYTE   ^C136           ;BIT  6
11509 044540 242                        .BYTE   ^C135           ;BIT  5
11510 044541 343                        .BYTE   ^C034           ;BIT  4
11511 044542 244                        .BYTE   ^C133           ;BIT  3
11512 044543 345                        .BYTE   ^C032           ;BIT  2
11513 044544 346                        .BYTE   ^C031           ;BIT  1
11514 044545 247                        .BYTE   ^C130           ;BIT  0
```

```
11517 044546                                    SUBTST<<SUBR    MAPPER>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    MAPPER
                                        ;*****************************************************************************
11518                                   ;THIS SUBROUTINE MAPS THE MEMORY BANK (16K WORDS = 1 BANK)
11519                                   ;IN R3 TO THE TEST PATTERN AREA (SUPERVISOR VIRTUAL (60000 - 157777) FOR
11520                                   ;THE 11/44 AND 11/45-55; USER VIRTUAL (60000 - 157777) FOR ALL OTHER
11521                                   ;PDP-11'S).
11522                                   ;
11523                                   ;CALL   MOV     BANKNO,R3               ;SET UP BANK ARGUEMENT
11524                                   ;       CALL    MAPPER                  ;ACTUAL CALL
11525                                   ;       RETURN                          ;ONLY RETURN
11526
11527                                           ;SET SUPERVISOR/USER UP FOR 1 TO 1 MAP
11528 044546                            MAPPER: PUSH    R0,R1,R2,R4,R5
11529 044560  012700  172340                    MOV     #KIPAR0,R0              ;FIRST AREA TO MAP TO
11530 044564  012701  172240                    MOV     #SIPAR0,R1              ;FIRST ADDRESS REGISTER
11531 044570  012704  172200                    MOV     #SIPDR0,R4              ;FIRST DESCRIPTOR REGISTER
11532 044574  005737  002454                    TST     NOSUPER                 ;CAN WE USE SUPERVISOR MODE?
11533 044600  001404                           BEQ     4$                      ;YES, BRANCH
11534 044602  012701  177640                    MOV     #UIPAR0,R1              ;FIRST ADDRESS REGISTER
11535 044606  012704  177600                    MOV     #UIPDR0,R4              ;FIRST DESCRIPTOR REGISTER
11536 044612  012702  077406            4$:     MOV     #77406,R2               ;CONSTANT FOR 4K PAGE, UP, R/W
11537 044616  012705  000010                    MOV     #8.,R5                  ;COUNTER
11538 044622  012021                    1$:     MOV     (R0)+,(R1)+             ;PUT IN SUPERVISOR ADDRESS
11539 044624  010224                           MOV     R2,(R4)+                ;PUT IN SUPERVISOR DESCRIPTOR
11540 044626  077503                           SOB     R5,1$                   ;LOOP TILL DONE
11541 044630  012741  177600                    MOV     #177600,-(R1)           ;CORRECT LAST FIELD FOR PERIPHERALS PAGE
11542
11543                                           ;SET UP SUPERVISOR/USER FOR TEST AREA
11544 044634  022703  000170                    CMP     #120.,R3                ;MAP NOTHING (1 TO 1)?
11545 044640  001516                           BEQ     3$                      ;YES - SKIP
11546 044642  072327  000011                    ASH     #9.,R3                  ;BANK 1 STARTS AT 100,000 LESS 6 LSB'S
11547                                                                           ;FOR MEMORY MANAGEMENT = 1000
11548 044646  012701  172246                    MOV     #SIPAR3,R1              ;SETUP FOR AUTO INCREMENTING
11549 044652  005737  002454                    TST     NOSUPER                 ;DO WE HAVE SUPERVISOR MODE?
11550 044656  001402                           BEQ     5$                      ;YES - BRANCH
11551 044660  012701  177646                    MOV     #UIPAR3,R1              ;SETUP FOR AUTO INCREMENTING
11552 044664  012702  000004            5$:     MOV     #4,R2                   ;COUNTER
11553 044670  010321                    2$:     MOV     R3,(R1)+                ;PLUG IN PAR INFO
11554 044672  062703  000200                    ADD     #200,R3                 ;BUMP ADDRESS 4K
11555 044676  077204                           SOB     R2,2$                   ;LOOP TILL DONE
11556 044700  005737  002236                    TST     SPLTCSR
11557 044704  001442                           BEQ     9$
11558 044706  162701  000010                    SUB     #10,R1
11559 044712  010102                           MOV     R1,R2
11560 044714  062702  000004                    ADD     #4,R2
11561 044720  022737  000001  002236            CMP     #1,SPLTCSR
11562 044726  001403                           BEQ     10$
11563 044730  010200                           MOV     R2,R0
11564 044732  010102                           MOV     R1,R2
11565 044734  010001                           MOV     R0,R1
11566 044736  012122                    10$:    MOV     (R1)+,(R2)+
11567 044740  011112                           MOV     (R1),(R2)
11568 044742  013700  002102                    MOV     BANKINDEX,R0
11569 044746  005737  002136                    TST     INT64K
11570 044752  001403                           BEQ     11$
```

```
11571 044754 012700 004000            MOV     #4000,R0
11572 044760 000402                   BR      12$
11573 044762 012700 010000      11$:  MOV     #10000,R0
11574 044766 005737 002454      12$:  TST     NOSUPER
11575 044772 001403                   BEQ     13$
11576 044774 012701 177652            MOV     #UIPAR5,R1
11577 045000 000402                   BR      14$
11578 045002 012701 172252      13$:  MOV     #SIPAR5,R1
11579 045006 060021             14$   ADD     R0,(R1)+
11580 045010 060011                   ADD     R0,(R1)
11581                                 ;IF WE ONLY HAVE AN 124K SYSTEM, WE DON'T WANT TO TEST THE
11582                                 ;LAST 4K, WHERE THE UNIBUS DEVICE PAGE IS. INSTEAD, THE
11583                                 ;PROGRAM WILL REMAP THE LAST 4K TO 8-12K. ALSO, IF THERE
11584                                 ;IS A BANK 177 ON AN 11/44, THE PROGRAM WILL REMAP THE LAST
11585                                 ;4K TO 8-12K FOR THE SAME REASON.
11586 045012 022737 000007 002554 9$: CMP     #7,LASTBANK
11587 045020 001010                   BNE     7$
11588 045022 005737 002452            TST     NO22BIT                 ;11/44 OR 24?
11589 045026 001423                   BEQ     3$                      ;BRANCH IF SO
11590 045030 022737 000007 002100     CMP     #7,BANK                 ;BANK 7?
11591 045036 001017                   BNE     3$                      ;NO - BRANCH
11592 045040 000404                   BR      8$
11593 045042 022737 000177 002554 7$: CMP     #177,LASTBANK
11594 045050 001012                   BNE     3$
11595 045052 005737 002454      8$:   TST     NOSUPER
11596 045056 001404                   BEQ     6$
11597 045060 013737 177652 177654     MOV     UIPAR5,UIPAR6
11598 045066 000403                   BR      3$
11599 045070 013737 172252 172254 6$: MOV     SIPAR5,SIPAR6
11600 045076                    3$:   POP     R5,R4,R2,R1,R0
11601 045110 000207                   RETURN
11602                                 .SBTTL  TRAP    MAP KERNEL (ALMOST 1 TO 1) TRAP HANDLER
11603 045112                    $KMAP: PUSH   R0,R1,R2,R3,R4
11604 045124 005000                   CLR     R0                      ;1ST AREA TO MAP TO
11605 045126 012701 172340            MOV     #KIPAR0,R1              ;FIRST ADDRESS
11606 045132 012702 077406            MOV     #77406,R2               ;CONSTANT FOR 4K PAGE,UP,R/W
11607 045136 012703 172300            MOV     #KIPDR0,R3              ;1ST PAGE DESCRIPTOR REGISTER
11608 045142 012704 000010            MOV     #8.,R4                  ;COUNTER
11609 045146 010021             1$:   MOV     R0,(R1)+                ;PUT IN KERNEL ADDRESS
11610 045150 010223                   MOV     R2,(R3)+                ;PUT IN KERNEL DISCRIPTOR
11611 045152 062700 000200            ADD     #200,R0                 ;ADD ADDRESS CONSTANT FOR 4K CHANGE
11612 045156 077405                   SOB     R4,1$                   ;LOOP TILL DONE
11613 045160 012741 177600            MOV     #177600,-(R1)           ;THE PERIPHERALS PAGE TO KIPAR7
11614 045164 012741 177400            MOV     #177400,-(R1)           ;AND NEXT LOWER PAGE TO KIPAR6
11621 045170                          POP     R4,R3,R2,R1,R0
11622 045202 000002                   RTI
```

```
11625 045204                                RELOCATE:SUBTST <<RELOCATE PROGRAM>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       RELOCATE PROGRAM
                                            ;*****************************************************************************
11626 045204                                        IF #SW12 SET.IN @SWR THEN $RETURN ERROR
11627 045220                                        IF APTFLAG IS TRUE OR ACTFLAG IS TRUE
11628 045234                                          IF $PASS NE #0 THEN $RETURN ERROR
11629 045246                                        END; OF IF APTFLAG
11630 045246                                        BEGIN LOADERBANK
11631 045246                                          FOR BANK := #1 TO LASTBANK
11632 045254  004737  047032                            CALL EXBANK
11633 045260                                            IF ACFLAG IS TRUE AND PFLAG IS FALSE AND BMFLAG IS FALSE
11634 045302  013700  002100                              MOV       BANK,R0
11635 045306  010037  002430                              MOV       R0,LOADBANK
11636 045312  013701  002564                              MOV       LOADHOME,R1
11637 045316  004737  046422                              CALL      BANKMOV
11638 045322  004737  046754                              CALL      NEWLOAD          ;MAP NEW LOADER BANK IN KERNEL
11639 045326  013701  002102                              MOV       BANKINDEX,R1
11640 045332  052761  100000  002654                      BIS       #BIT15,CONFIG+2(R1)      ;MARK LOADER
11641 045340  042761  020000  002654                      BIC       #BIT13,CONFIG+2(R1)      ;INVALIDATE BACKGROUND PATTERN
11642 045346                                              LEAVE LOADERBANK
11643 045350                                            END ;OF IF ACFLAG
11644 045350                                          END ;OF FOR BANK
11645 045364                                          IF #SW13 OFF.IN @SWR
11646 045374                                            TYPE        MSG075         ;RELOCATION NOT POSSIBLE
11647 045400                                          END ;OF IF #SW13
11648 045400                                          $RETURN ERROR
11649 045404                                        END LOADERBANK
11650 045404                                        BEGIN FINDBANK
11651 045404  013702  002554                        MOV     LASTBANK,R2
11652 045410  006302                                ASL     R2
11653 045412  006302                                ASL     R2                  ;R2 <- R2 * 4
11654 045414                                          FOR R1 := #2*2 TO R2 BY #4
11655 045420                                            IF #BIT7!BIT0 OFF.IN CONFIG(R1) ;IF NO ERRORS & NOT PROGRAM SPACE
11656 045430                                              IF #BIT15 OFF.IN CONFIG+2(R1) ;IF NOT LOADER BANK
11657 045440                                                IF CPUBIT SET.IN CONFIG(R1) ;IF ACCESSABLE
11658 045450                                                  IF #BIT8 OFF.IN CONFIG+2(R1) THEN LEAVE FINDBANK ;IF PARITY
11659 045460                                                    IF #BIT6 SET.IN CONFIG(R1) AND #BIT7 OFF.IN CONFIG(R1)
11660                                                             ;IF 1ST PROTECTABLE ECC BANK
11661 045500                                                    LEAVE FINDBANK
11662 045502                                                  END ;OF IF #BIT6
11663 045502                                                  IF INHECC IS FALSE
11664 045510                                                    SET   INHECC
11665 045516  010137  002536                                  MOV   R1,INHBANK
11666 045522                                                  END: OF IF INHECC
11667 045522                                                END ;OF IF CPUBIT
11668 045522                                              END ;OF IF #BIT15
11669 045522                                            END ;OF IF #BIT7
11670 045522                                          END ;OF FOR
11671 045532                                          IF FULLREL IS FALSE
11672 045540                                            IF INHECC IS TRUE
11673 045546  013701  002536                              MOV     INHBANK,R1
11674 045552  023727  002276  000030                      CMP     REALPAT,#30      ;IS THIS PATTERN 30?
11675 045560  001421                                      BEQ     RELENT1          ;YES - SKIP MESSAGE
11676 045562  000420                                      BR      RELENT1
11677 045564                                            END; OF IF INHECC
11678 045564                                          END; OF IF FULLREL
```

```
11679 045564  005037  002534                        CLR     INHECC                  ;MAKE SURE FLAG IS TURNED OFF!
11680 045570                                        IF #SW13 OFF.IN @SWR
11681 045600  023727  002276  000030                  CMP           REALPAT,#30     ;IS THIS PATTERN 30?
11682 045606  001402                                  BEQ           SKUB            ;YES - SKIP MESSAGE
11683 045610                                          TYPE          MSG075          ;RELOCATION NOT POSSIBLE
11684 045614                                        END ;OF IF #SW13
11685 045614                              SKUB:     $RETURN ERROR
11686 045620                                      END FINDBANK
11687 045620                                      CLEAR   INHECC                  ;IF WE RELOCATED PROPERLY, THIS SHOULD BE OFF!
11688 045624  042761  020000  002654    RELENT1: BIC     #BIT13,CONFIG+2(R1)      ;INVALIDATE BACKGROUND PATTERN
11689 045632  005000                              CLR     R0
11690 045634  071027  000004                      DIV     #4,R0
11691 045640                              RELOC1: LET NEWBANK := R0
11692 045644  013737  002530  002532              MOV     PGMCSR,PGMCSR+2         ;SAVE CURRENT PGM. CSR
11693 045652  004737  046570                      CALL    USERMAP                 ;MAP NEWBANK TO USER PAR
11694 045656                                      USER                            ;ENTER USER MODE
11695 045664                                      BMOV    0,100000,SIZE           ;MOVE PROGRAM
11696 045676  104417                              KERNEL                          ;ENTER KERNEL MODE
11697 045700  022737  000001  003754              CMP     #1,PROTYP               ;IS THIS AN 11/44 ?
11698 045706  001021                              BNE     JMPRL1                  ;JUMP IF NOT
11699 045710  042737  000040  172516              BIC     #BIT5,MMR3              ;TURN OFF UNIBUS MAP
11700 045716  013700  002306                      MOV     NEWBANK,R0
11701 045722  006200                              ASR     R0
11702 045724                                      ON.ERROR
11703 045726  012737  100000  170200                MOV   #BIT15,MAPL0
11704 045734                                      END ;OF ON.ERROR
11705 045734  010037  170202                      MOV     R0,MAPH0
11706 045740  004737  046356                      CALL    LOWMAP                  ;SETUP LOWER 16K IN UNIBUS MAP
11707 045744  052737  000040  172516              BIS     #BIT5,MMR3              ;ENERGIZE UNIBUS MAP
11708 045752  042737  000001  177572  JMPRL1:     BIC     #BIT0,MMR0              ;DEENERGIZE MEMORY MANAGEMENT
11709 045760  004737  046652                      CALL    NEWKERNEL
11710 045764  013700  002306                      MOV     NEWBANK,R0
11711 045770  006300                              ASL     R0
11712 045772  006300                              ASL     R0                      ;R0 <- R0 * 4
11713 045774  016002  002652                      MOV     CONFIG(R0),R2
11714 046000  000302                              SWAB    R2
11715 046002  042702  177760                      BIC     #^C17,R2
11716 046006  006302                              ASL     R2
11717 046010  052737  000001  177572              BIS     #BIT0,MMR0              ;ENERGIZE MEMORY MANAGEMENT
11718 046016  010237  002530                      MOV     R2,PGMCSR               ;PUT NEW PGM. CSR INTO PGMCSR
11719 046022  032760  010000  002654              BIT     #BIT12,CONFIG+2(R0)     ;IS THE NEW BANK INTERLEAVED?
11720 046030  001412                              BEQ     1$                      ;BRANCH IF NOT INTERLEAVED
11721 046032  016002  002652                      MOV     CONFIG(R0),R2
11722 046036  042702  007777                      BIC     #^C170000,R2
11723 046042  072227  177775                      ASH     #-3,R2
11724 046046  052702  100000                      BIS     #BIT15,R2
11725 046052  050237  002530                      BIS     R2,PGMCSR
11726 046056                              1$:     SET     RLFLAG
11727 046064                                      $RETURN NOERROR
```

```
11730 046070                          UNRELOCATE:SUBTST       <<UNRELOCATE PROGRAM>>
                                      ;*************************************************************************
                                      ;*SUBTEST       UNRELOCATE PROGRAM
                                      ;*************************************************************************
11731
11732 046070                                  ;RESTORE LOADERS
                                              PUSH    R0
11733 046072  013701  002430                    MOV     LOADBANK,R1
11734 046076  013700  002564                    MOV     LOADHOME,R0
11735 046102  004737  046422                    CALL    BANKMOV
11736 046106  004737  046754                    CALL    NEWLOAD                 ;MAP NEW LOADER BANK IN KERNEL SPACE
11737 046112                                    PUSH    BANK
11738 046116  013737  002430  002100            MOV     LOADBANK,BANK
11739 046124  004737  047032                    CALL    EXBANK
11740 046130  013701  002102                    MOV     BANKINDEX,R1
11741 046134  042761  100000  002654            BIC     #BIT15,CONFIG+2(R1)     ;CLEAR LOADER FLAG
11742 046142  013737  002564  002100            MOV     LOADHOME,BANK
11743 046150  004737  047032                    CALL    EXBANK
11744 046154  013701  002102                    MOV     BANKINDEX,R1
11745 046160  042761  020000  002654            BIC     #BIT13,CONFIG+2(R1)     ;INVALIDATE BACKGROUND PATTERN
11746 046166                                    POP     BANK
11747 046172                                    CLEAR   INHECC                  ;MAKE SURE ECC TESTS ARE NOT INHIBITED!
11748
11749                                         ;RESTORE BANK 0
11750 046176  042737  020000  002654            BIC     #BIT13,CONFIG+2         ;INVALIDATE BACKGROUND PATTERN
11751 046204                                    LET NEWBANK := #0
11752 046210  004737  046570                    CALL    USERMAP                 ;MAP NEWBANK TO USER PAR
11753 046214                                    USER                            ;ENTER USER MODE
11754 046222                                    BMOV    0,100000,SIZE           ;MOVE PROGRAM
11755 046234  104417                            KERNEL                          ;ENTER KERNEL MODE
11756 046236  042737  000001  177572            BIC     #BIT0,MMR0              ;DEENERGIZE MEMORY MANAGEMENT
11757 046244  004737  046652                    CALL    NEWKERNEL
11758 046250  013737  002532  002530            MOV     PGMCSR+2,PGMCSR         ;RESTORE PREVIOUS PGM. CSR
11759 046256  052737  000001  177572            BIS     #BIT0,MMR0              ;ENERGIZE MEMORY MANAGEMENT
11760 046264  005037  002124                    CLR     RLFLAG
11761 046270  022737  000001  003754            CMP     #1,PROTYP               ;IS THIS AN 11/44 ?
11762 046276  001014                            BNE     1$
11763 046300  042737  000040  172516            BIC     #BIT5,MMR3              ;TURN OFF UNIBUS MAP
11764 046306                                    CLEAR   MAPL0,MAPH0
11765 046316  004737  046356                    CALL    LOWMAP                  ;SETUP LOWER 16K OF UNIBUS MAP
11766 046322  052737  000040  172516            BIS     #BIT5,MMR3              ;ENERGIZE UNIBUS MAP
11767 046330  012700  002654          1$:       MOV     #CONFIG+2,R0    ;MOVE 2ND WORD OF CONFIG TO R0
11768 046334  042710  020000          2$:       BIC     #BIT13,(R0)     ;CLEAR BACKGROUND VALID BIT
11769 046340  062700  000004                    ADD     #4,R0           ;INCREMENT TO NEXT BANK
11770 046344  020027  003620                    CMP     R0,#3620        ;DONE?
11771 046350  003771                            BLE     2$              ;NO - BRANCH
11772 046352                                    POP     R0
11773 046354  000207                            RETURN
11774
11775 046356                          LOWMAP: SUBTST  <<SETUP LOWER 16K OF UNIBUS MAP>>
                                      ;*************************************************************************
                                      ;*SUBTEST       SETUP LOWER 16K OF UNIBUS MAP
                                      ;*************************************************************************
11776 046356                                    PUSH    R0,R1,R2
11777 046364  012700  170200                    MOV     #MAPL0,R0
11778 046370  012701  170204                    MOV     #MAPL1,R1
11779 046374  012702  000003                    MOV     #3,R2
11780 046400  012011                    1$:     MOV     (R0)+,(R1)
```

SETUP LOWER 16K OF UNIBUS MAP

```
11781 046402  062721  020000                ADD     #BIT13,(R1)+
11782 046406  012021                        MOV     (R0)+,(R1)+
11783 046410  077205                        SOB     R2,1$
11784 046412                                POP     R2,R1,R0
11785 046420  000207                        RETURN
```

```
11788 046422                          BANKMOV:SUBTST  <<MOVE BANKS>>
                                      ;*****************************************************************************
                                      ;*SUBTEST        MOVE BANKS
                                      ;*****************************************************************************
11789                                         ;MOVE 3/4 OF A BANK
11790                                         ;CALLING SEQUENCE
11791                                         ;R0 = DESTINATION BANK
11792                                         ;R1 = SOURCE BANK
11793 046422  104415                        SAVREG
11794 046424  004737  046570                CALL    USERMAP
11795 046430  104416                        RESREG
11796 046432  104415                        SAVREG
11797 046434  072027  000011                ASH     #9.,R0
11798 046440  072127  000011                ASH     #9.,R1
11799 046444  012702  177650                MOV     #UIPAR4,R2
11800 046450  012703  000200                MOV     #200,R3
11801
11802 046454  010122                        MOV     R1,(R2)+                ;MAP 1ST HALF BANK
11803 046456  060301                        ADD     R3,R1                   ;BUMP BY 4K
11804 046460  010122                        MOV     R1,(R2)+
11805 046462  060301                        ADD     R3,R1
11806
11807 046464  010022                        MOV     R0,(R2)+
11808 046466  060300                        ADD     R3,R0
11809 046470  010022                        MOV     R0,(R2)+
11810 046472  060300                        ADD     R3,R0
11811
11812 046474                                USER
11813 046502                                BMOV    100000,140000,SIZE/2    ;MOV 1ST HALF BANK
11814 046514  104417                        KERNEL                  ;ENTER KERNEL MODE
11815
11816 046516  012702  177650                MOV     #UIPAR4,R2
11817
11818 046522  010122                        MOV     R1,(R2)+                ;MAP 2ND HALF BANK
11819 046524  060301                        ADD     R3,R1                   ;BUMP BY 4K
11820 046526  010122                        MOV     R1,(R2)+
11821 046530  060301                        ADD     R3,R1
11822
11823 046532  010022                        MOV     R0,(R2)+
11824 046534  060300                        ADD     R3,R0
11825 046536  010022                        MOV     R0,(R2)+
11826 046540  060300                        ADD     R3,R0
11827
11828 046542                                USER
11829 046550                                BMOV    100000,140000,SIZE/4    ;MOV 3ND FOURTH OF BANK
11830 046562  104417                        KERNEL                  ;ENTER KERNEL MODE
11831
11832 046564  104416                        RESREG
11833 046566  000207                        RETURN
```

```
11836 046570                            USERMAP:SUBTST  <<SUBR  MAP USER TO NEW BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    MAP USER TO NEW BANK
                                        ;*****************************************************************************
11837 046570  012701  177640                    MOV     #UIPAR0,R1              ;COPY KERNEL PAR'S & PDR'S (0-3)
11838 046574  012702  172340                    MOV     #KIPAR0,R2
11839 046600  012703  177600                    MOV     #UIPDR0,R3
11840 046604  012704  172300                    MOV     #KIPDR0,R4
11841 046610  012705  000004                    MOV     #4,R5
11842 046614  012221              1$:           MOV     (R2)+,(R1)+
11843 046616  011423                            MOV     (R4),(R3)+
11844 046620  077503                            SOB     R5,1$
11845
11846 046622  013700  002306                    MOV     NEWBANK,R0
11847 046626  072027  000011                    ASH     #9.,R0                  ;BANK 1 STARTS AT 100,000 LESS 6 LSB'S
11848                                                                           ;FOR MEMORY MANAGEMENT = 1000
11849 046632  012705  000004                    MOV     #4,R5
11850 046636  010021              2$:           MOV     R0,(R1)+                ;SETUP UIPAR(4-7)
11851 046640  062700  000200                    ADD     #200,R0                 ;BUMP ADDRESS 4K
11852 046644  011423                            MOV     (R4),(R3)+              ;SETUP UIPDR(4-7)
11853 046646  077505                            SOB     R5,2$
11854 046650  000207                            RETURN
11855
11856 046652                            NEWKERNEL:SUBTST        <<SUBR  SETUP KERNEL PAR'S FOR NEW BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    SETUP KERNEL PAR'S FOR NEW BANK
                                        ;*****************************************************************************
11857 046652                            NEWKERNEL:      PUSH    R0,R1,R5
11858 046660  012700  172340                    MOV     #KIPAR0,R0
11859 046664  013701  002306                    MOV     NEWBANK,R1
11860 046670  072127  000011                    ASH     #9.,R1                  ;BANK 1 STARTS AT 100,000 LESS 6 LSB'S
11861                                                                           ;FOR MEMORY MANAGEMENT = 1000
11862 046674  012705  000004                    MOV     #4,R5
11863 046700  010120              1$:           MOV     R1,(R0)+                ;SETUP KIPAR(0-3)
11864 046702  062701  000200                    ADD     #200,R1
11865 046706  077504                            SOB     R5,1$
11866 046710                                    POP     R5,R1,R0
11867 046716  000207                            RETURN
11868
11869 046720                            MAPKERNAL:SUBTST <<SUBR MAP KERNAL PARS 4 AND 5 TO A BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    MAP KERNAL PARS 4 AND 5 TO A BANK
                                        ;*****************************************************************************
11870
11871 046720  013705  002100                    MOV BANK,R5             ;MOV BANK NUMBER TO R5
11872 046724  072527  000011                    ASH #9.,R5              ;R5 ENTERS 100000 LESS SHIFT TO CREATE MAPPING
11873 046730  013737  172350  002270            MOV KIPAR4,SAVPAR       ;SAVE OLD PAR
11874 046736  010537  172350                    MOV R5,KIPAR4           ;GET NEW PAR'S
11875 046742  062705  000200                    ADD #200,R5             ;
11876 046746  010537  172352                    MOV R5,KIPAR5           ;
11877 046752  000207                            RETURN                  ;
11878
11879 046754                            NEWLOAD:SUBTST  <<SUBR  SETUP KERNEL PAR'S FOR NEW LOADER BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    SETUP KERNEL PAR'S FOR NEW LOADER BANK
                                        ;*****************************************************************************
11880                                           ;R0 CONTAINS THE DESTINATION BANK
```

```
 11881 046754                                   PUSH    R0,R1
 11882 046760  012701  172350                  MOV     #KIPAR4,R1
 11883 046764  072027  000011                  ASH     #9.,R0                  ;BANK 1 STARTS AT 100000 LESS 6 LSB'S (1000)
 11884 046770  010021                          MOV     R0,(R1)+                ;SETUP KIPAR4
 11885 046772  062700  000200                  ADD     #200,R0
 11886 046776  010021                          MOV     R0,(R1)+                ;SETUP KIPAR5
 11887 047000                                   POP     R1,R0
 11888 047004  000207                          RETURN
 11889
 11890 047006                           UNMAP:  SUBTST  <<SUBR  UNMAP KERNAL PAR'S 4 AND 5>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    UNMAP KERNAL PAR'S 4 AND 5
                                        ;*****************************************************************************
 11891 047006  013737  002270  172350          MOV     SAVPAR,KIPAR4           ;RESTORE KIPAR4
 11892 047014  062737  000200  002270          ADD     #200,SAVPAR             ;ADD 200 FOR NEXT PAR
 11893 047022  013737  002270  172352          MOV     SAVPAR,KIPAR5           ;RESTORE KIPAR5
 11894 047030  000207                          RETURN                          ;
```

```
 11897 047032                    EXBANK: SUBTST  <<SUBR  EXAMINE BANK>>
                                 ;*****************************************************************************
                                 ;*SUBTEST        SUBR    EXAMINE BANK
                                 ;*****************************************************************************
 11898                           ;DOES THE FOLLOWING:
 11899                           ;(1)   SETS UP "BANKINDEX" AND R1 BASED ON VALUE OF "BANK".
 11900                           ;(2)   SETS THE "MKFLAG" IF THE BANK IS ECC.
 11901                           ;(3)   SETS THE "KPFLAG" IF THE BANK IS THE PROTECTED REGION OF ECC MEMORY.
 11902                           ;(4)   SETS THE "ACFLAG" IF THE BANK CAN BE ACCESSED BY THIS CPU.
 11903                           ;(5)   SETS THE "PFLAG" IF THE BANK IS IN PROGRAM SPACE.
 11904                           ;(6)   SETS THE  "RRFLAG" IF RELOCATION IS REQUIRED TO TEST THIS BANK; HOWEVER,
 11905                           ;      IT COMPLEMENTS THIS FLAG IF THE RELOCATION FLAG "RLFLAG" IS SET (THIS IS
 11906                           ;      NECESSARY FOR THE USE OF THE RECURSIVE "MODE" SUBROUTINES). THE "RRFLAG"
 11907                           ;      IS ALWAYS SET TO DISABLE TESTING IF FIELD SERVICE MODE  "SELECTED BANKS"
 11908                           ;      ARE BEING TESTED AND THIS BANK IS NOT SELECTED.
 11909                           ;(7)   SETS THE "BMFLAG" IF THE BANK IS A BAD MEMORY;  HOWEVER, IT  COMPLEMENTS
 11910                           ;      THIS FLAG IF THE "WORST" FLAG IS NOT SET   THIS IS NECESSARY FOR THE USE
 11911                           ;      OF THE RECURSIVE "MODE" SUBROUTINES).
 11912                           ;(8) SETS THE "INTFLAG" IF THE BANK IS INTERLEAVED.
 11913                           ;(9) SETS THE "INT64K" FLAG IF THE BANK IS INTERLEAVED ON 64K WORD BOUNDS.
 11914                           ;(10) SETS THE "SKIPMK" FLAG IF THIS BANK IS INTERLEAVED, AND HAS ALREADY
 11915                           ;      BEEN TESTED.
 11916                           ;
 11917                           ;(11) SETS THE "PMEMFLG" IF THE ECC MEMORY UNDER TEST IS A MS11-P
 11918 047032                            PUSH    R0,R1,R2
 11919 047040                            CLEAR   MKFLAG,KPFLAG,PMEMFLAG
 11920 047054                            SET     ACFLAG
 11921 047062                            CLEAR   PFLAG,RRFLAG,BMFLAG
 11922 047076                            CLEAR   INTFLAG,INT64K,SKIPMK
 11923 047112  013701  002100              MOV     BANK,R1
 11924 047116  006301                      ASL     R1
 11925 047120  006301                      ASL     R1                      ;R1 <- R1 * 4
 11926 047122  010137  002102              MOV     R1,BANKINDEX
 11927 047126  032761  000100  002652      BIT     #BIT6,CONFIG(R1)        ;PROTECTED REGION OF ECC MEMORY?
 11928 047134  001403                      BEQ     1$                      ;NO - SKIP
 11929 047136                              SET     KPFLAG
 11930 047144  012700  000002        1$:   MOV     #BIT1,R0
 11931 047150                            IF R0 SET.IN CPUBIT AND R0 OFF.IN CONFIG(R1)
 11932 047164  005037  002114              CLR     ACFLAG
 11933 047170                            END ;OF IF R0
 11934 047170  005737  002114              TST     ACFLAG                  ;ACTIVE MEMORY?
 11935 047174  001415                      BEQ     2$                      ;BRANCH IF NOT
 11936 047176  016102  002654              MOV     CONFIG+2(R1),R2
 11937 047202  000302                      SWAB    R2
 11938 047204  042702  177770              BIC     #^C7,R2                 ;ISOLATE MEM TYPE BITS
 11939 047210  020227  000003              CMP     R2,#3                   ;IS THIS AN ILLEGAL MEM TYPE?
 11940 047214  003405                      BLE     2$                      ;BRANCH IF NOT
 11941 047216                              SET     BMFLAG                ;SET BAD BANK FLAG
 11942 047224  000137  047450              JMP     ENEXBK                  ;JUMP OVER REST OF FLAG TESTS
 11943 047230  032761  000400  002654  2$: BIT     #BIT8,CONFIG+2(R1)      ;IS THERE ECC THERE?
 11944 047236  001412                      BEQ     3$                      ;NO - SKIP
 11945 047240                              SET     MKFLAG                  ;YES - SET MKFLAG
 11946 047246  032761  001000  002654      BIT     #BIT9,CONFIG+2(R1)      ;IS IT A MS11-P????
 11947 047254  001403                      BEQ     3$                      ;NO SKIP!!!!
 11948 047256                              SET     PMEMFLG                 ;SET MS11-P FLAG
 11949 047264  032761  000200  002652  3$: BIT     #BIT7,CONFIG(R1)        ;BANK = PROGRAM SPACE?
 11950 047272  001406                      BEQ     5$                      ;NO - SKIP
```

```
11951 047274                                        SET     PFLAG,RRFLAG
11952 047310  005737  002124           5$:          TST     RLFLAG                  ;IS PROGRAM RELOCATED?
11953 047314  001402                               BEQ     6$                      ;NO - SKIP
11954 047316  005137  002122                       COM     RRFLAG                  ;YES - COMPLEMENT RELOCATION REQUIRED FLAG
11955 047322  032761  000001  002652   6$:         BIT     #BIT0,CONFIG(R1)        ;ERRORS PRESENT IN THIS BANK?
11956 047330  001403                               BEQ     8$                      ;NO - SKIP
11957 047332                                        SET     BMFLAG
11958 047340  005737  002566           8$:         TST     WORST                   ;IS THIS A WORST FIRST PASS?
11959 047344  001002                               BNE     9$                      ;YES - SKIP
11960 047346  005137  002126                       COM     BMFLAG                  ;NO - COMPLEMENT BAD MEMORY FLAG
11961 047352                           9$:          IF SELONLY IS TRUE AND #BIT14 OFF.IN CONFIG+2(R1)
11962 047370                                          SET   RRFLAG
11963 047376                                        END ;OF IF SELONLY
11964 047376  032761  010000  002654                BIT     #BIT12,CONFIG+2(R1)     ;IS THIS BANK INTERLEAVED?
11965 047404  001421                               BEQ     ENEXBK                  ;BRANCH IF IT IS NOT
11966 047406                                        SET     INTFLAG
11967 047414  032761  004000  002654                BIT     #BIT11,CONFIG+2(R1)     ;IS THIS BANK INTERLEAVED WITH 64K BOARDS?
11968 047422  001403                               BEQ     10$                     ;BRANCH IF IT IS NOT
11969 047424                                        SET     INT64K
11970 047432  032761  000040  002652   10$:        BIT     #BIT5,CONFIG(R1)        ;SHOULD THIS BANK BE TESTED?
11971 047440  001403                               BEQ     ENEXBK                  ;BRANCH IF IT SHOULD
11972 047442                                        SET     SKIPMK
11973 047450                           ENEXBK:      POP     R2,R1,R0                ;RESTORE REGISTERS
11974 047456  000207                               RETURN
```

```
 11977 047460                           BANKOK: SUBTST  <<SUBR  BANK OK?>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    BANK OK?
                                        ;*****************************************************************************
 11978                                          ;TEST TO INSURE THAT THE TYPE OF MEMORY IN THE PRESENT BANK
 11979                                          ;IS OF THE TYPE WE ARE TESTING "TMFLAG".
 11980                                          ;RESULT IS RETURNED IN THE CONDITION CODES (OK = (=0)).
 11981 047460  013700  002132                  MOV     TMFLAG,R0
 11982 047464  005100                          COM     R0
 11983 047466  013701  002116                  MOV     MKFLAG,R1
 11984 047472  074001                          XOR     R0,R1
 11985 047474  000207                          RETURN                                  ;OK = (=OK)
 11986
 11987 047476                           INCRPT:
 11988 047476                           INCPAT: SUBTST  <<SUBR  INCREMENT PATTERN TESTING >>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    INCREMENT PATTERN TESTING
                                        ;*****************************************************************************
 11989                                          ;INCREMENT THE PATTERN & SET UP THE CONDITION CODES
 11990                                          ;RESULT ~ Z BIT SET INDICATES OVERFLOW
 11991 047476  005237  002110                  INC     PATTERN
 11992 047502  022737  000030  002110          CMP     #30,PATTERN                     ;SET UP CONDITION CODES
 11993 047510  000207                          RETURN                                  ;NOT EQUAL TO ZERO IS GOOD (NO OVERFLOW)
 11994
 11995 047512                           SETPAT:
 11996 047512                           HIPAT:  SUBTST  <<SUBR  SET HIGHEST PATTERN TESTING TYPE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    SET HIGHEST PATTERN TESTING TYPE
                                        ;*****************************************************************************
 11997 047512  012737  000027  002110          MOV     #27,PATTERN                     ;SET HIGHEST PATTERN
 11998 047520  000207                          RETURN
 11999
 12000 047522                           INCBNK: SUBTST  <<SUBR  INCREMENT BANK & TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    INCREMENT BANK & TEST
                                        ;*****************************************************************************
 12001                                          ;RESULTS RETURNED IN CONDITION CODES
 12002 047522  005237  002100                  INC     BANK
 12003 047526  023737  002554  002100          CMP     LASTBANK,BANK                   ;TOO FAR?
 12004 047534  000207                          RETURN
```

```
12007 047536                                BOOT:   SUBTST  <<BOOTSTRAP ROUTINE>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       BOOTSTRAP ROUTINE
                                            ;*****************************************************************************
12008                                               ;INITIALIZE ALL CSR'S
12009                                               ;UNRELOCATE IF NECESSARY
12010                                               ;FLUSH OUT ANY DBE'S
12011                                               ;TURN OFF MEMORY MANAGEMENT
12012                                               ;TURN OFF THE UNIBUS MAP
12013                                               ;BOOT RK0 OR RK1
12014 047536  104472                                ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
12015 047540                                        SET4    #BOOT1          ;TRAPS TO 4 GOES TO BOOT1
12016 047546                                        IF RLFLAG IS TRUE THEN $CALL UNRELOCATE
12017 047560  004737  024570                        CALL    MT0030          ;FLUSH OUT DBE'S
12018 047564  104421                                DEENERGIZE              ;TURN OFF MEMORY MANAGEMENT
12019 047566  005737  002452                        TST     N022BIT                 ;IS THIS AN 11/44 OR 11/24?
12020 047572  001003                                BNE     BOOT1
12021 047574  042737  000040  172516                BIC     #BIT5,MMR3                      ;TURN OFF THE UNIBUS MAP
12022 047602  005001                      BOOT1:    CLR     R1
12023 047604  000005                      1$:       RESET
12024 047606  012700  177406                        MOV     #177406,R0
12025 047612  010160  000004                        MOV     R1,4(R0)
12026 047616  012710  177400                        MOV     #177400,(R0)
12027 047622  012740  000005                        MOV     #5,-(R0)
12028 047626  105710                      2$:       TSTB    (R0)
12029 047630  100376                              BPL     2$
12030 047632  062701  020000                      ADD     #BIT13,R1
12031 047636  005710                            TST     (R0)
12032 047640  100761                            BMI     1$
12033 047642  005007                            CLR     PC
```

```
12036 047644                                    EXIT:   SUBTST  <<HALT PROGRAM>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       HALT PROGRAM
                                                ;*****************************************************************************
12037 047644  004737  047676                            CALL    SHUTUP
12038 047650                                    EXIT2:  IF APTFLAG IS TRUE OR ACTFLAG IS TRUE
12039 047664  000777                                        BR      .
12040 047666                                            ELSE
12041 047670  000000                            $EXHALT:    HALT
12042 047672  000137  003656                              JMP     START
12043 047676                                            END ;OF IF APTFLAG
12044
12045 047676                                    SHUTUP: SUBTST  <<SHUTDOWN DIAGNOSTIC>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       SHUTDOWN DIAGNOSTIC
                                                ;*****************************************************************************
12046                                                   ;INITIALIZE ALL CSR'S
12047                                                   ;UNRELOCATE
12048                                                   ;FLUSH OUT DBE'S
12049                                                   ;RESTORE LOADERS
12050                                                   ;TURN OFF MEMORY MANAGEMENT
12051                                                   ;UNMAP THE UNIBUS MAP
12055 047676  104472                                    ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
12056 047700                                            IF RLFLAG IS TRUE THEN $CALL UNRELOCATE
12057 047712                                            IF QUICK IS FALSE
12058 047720  004737  024570                              CALL  MT0030          ;FLUSH OUT DBE'S
12059 047724                                            END ;OF IF QUICK
12060 047724  012700  000001                            MOV     #1,R0           ;DESTINATION BANK
12061 047730  013701  002564                            MOV     LOADHOME,R1     ;SOURCE BANK
12062 047734  004737  046422                            CALL    BANKMOV
12063 047740  104421                                    DEENERGIZE              ;TURN OFF MEMORY MANAGEMENT
12064 047742  005737  002452                            TST     NO22BIT         ;DOES THIS PDP-11 HAVE 22-BIT ADDR?
12065 047746  001003                                    BNE     1$              ;BRANCH IF NOT
12066 047750  042737  000040  172516                    BIC     #BIT5,MMR3              ;TURN OFF UNIBUS MAP
12070 047756  000207                            1$:     RETURN
12071
12072 047760                                    APTDOWN:SUBTST  <<APT SHUTDOWN SEQUENCE>>
                                                ;*****************************************************************************
                                                ;*SUBTEST       APT SHUTDOWN SEQUENCE
                                                ;*****************************************************************************
12073 047760                                            MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
12074 047774                                            TESTAREA                ;ENTER TEST MODE
12075 050002  012737  047760  060024                    MOV     #APTDOWN,FIRST+24
12076 050010  012737  000340  060026                    MOV     #340,FIRST+26
12077 050016  012737  000000  127760                    MOV     #0,FIRST+APTDOWN
12078 050024  104417                                    KERNEL                  ;ENTER KERNEL MODE
12079 050026  000000                            APTHLT: HALT
```

```
 12082 050030                                   SUBTST  <<BLOCK MOVE SUBROUTINE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       BLOCK MOVE SUBROUTINE
                                        ;*****************************************************************************
 12083                                          ;BLOCK3 HAS 3 ARGUEMENTS
 12084                                          ;BLOCK2 HAS 2 ARGUEMENTS
 12085                                          ;BLOCK1 HAS 1 ARGUEMENTS
 12086                                          ;
 12087                                          ;ALL ARE CALLED BY THE BMOV MACRO
 12088                                          .ENABL  LSB
 12089 050030                           BLOCK1: PUSH    R0,R1,R2
 12090 050036  012702  177640                   MOV     #FASTCITY,R2
 12091 050042  012701  000020                   MOV     #16.,R1
 12092 050046  000413                           BR      3$
 12093
 12094 050050                           BLOCK2: PUSH    R0,R1,R2
 12095 050056  012701  000020                   MOV     #16.,R1
 12096 050062  000404                           BR      2$
 12097
 12098 050064                           BLOCK3: PUSH    R0,R1,R2
 12099 050072  012501                           MOV     (R5)+,R1
 12100 050074  012502                   2$:     MOV     (R5)+,R2
 12101 050076  012500                   3$:     MOV     (R5)+,R0
 12102
 12103 050100  012022                   1$:     MOV     (R0)+,(R2)+
 12104 050102  077102                           SOB     R1,1$
 12105 050104                                   POP     R2,R1,R0
 12106 050112  000205                           RTS     R5
 12107                                          .DSABL  LSB
```

```
12109                                           .SBTTL  FIELD SERVICE MODE
12110
12111 050114                                FIELDSERVICE:SUBTST     <<SUBR  FIELD SERVICE COMMAND MODE>>
                                            ;*********************************************************************
                                            ;*SUBTEST       SUBR    FIELD SERVICE COMMAND MODE
                                            ;*********************************************************************
12112 050114  104415                            SAVREG
12113 050116                                    TYPE    MSG020          ;FIELD SERVICE COMMAND MODE
12114
12115 050122                                    IF RLFLAG IS TRUE OR NOFSMODE IS TRUE
12116 050136                                      TYPE  MSG048          ;NOT AVAILABLE NOW - TRY LATER!
12117 050142  104416                              RESREG
12118 050144  000207                              RETURN
12119 050146                                    END ;OF IF RLFLAG
12120 050146  005737  002542                    TST     CACHKN
12121 050152  001402                            BEQ     1$
12122 050154                                    PUSH    CONTRL          ;SAVE CACHE STATUS
12123 050160                                1$: PUSH    CSRNO,KAMIKAZE  ;SAVE CSR & KAMIKAZE STATUS
12124 050170  104424                            CACHOFF                 ;TURN CACHE OFF
12125 050172                                    SET     KAMIKAZE
12126 050200                                FS1: TYPE   MSG026          ;COMMAND:
12127 050204  104414                            RDDEC                   ;READ A DECIMAL NUMBER
12128 050206                                    POP     R0              ;COMMAND --> R0
12129 050210  020027  000022                    CMP     R0,#18.
12130 050214  101403                            BLOS    1$
12131 050216                                    TYPE    MSG021
12132 050222  000766                            BR      FS1
12133 050224                                1$: CASE R0
12134 050234  050312                              FSCMD0                ;EXIT FIELD SERVICE COMMANDS
12135 050236  050414                              FSCMD1                ;READ CSR
12136 050240  050524                              FSCMD2                ;LOAD CSR
12137 050242  050672                              FSCMD3                ;EXAMINE MEMORY
12138 050244  051146                              FSCMD4                ;MODIFY MEMORY
12139 050246  051466                              FSCMD5                ;SELECT BANK & PATTERN
12140 050250  052404                              FSCMD6                ;TYPE CONFIGURATION MAP
12141 050252  052412                              FSCMD7                ;SOB-A-LONG TEST
12142 050254  052704                              FSCMD8                ;ERROR SUMMARY
12143 050256  053132                              FSCMD9                ;REFRESH TEST
12144 050260  053424                              FCMD10                ;SET FILL COUNT
12145 050262  053452                              FCMD11                ;ENTER KAMIKAZE MODE
12146 050264  053474                              FCMD12                ;EXIT KAMIKAZE MODE
12147 050266  053514                              FCMD13                ;TURN CACHE OFF
12148 050270  053536                              FCMD14                ;TURN CACHE ON
12149 050272  053554                              FCMD15                ;TEST ONLY SELECTED BANKS
12150 050274  053640                              FCMD16                ;RESUME TESTING ALL BANKS
12151 050276  053702                              FCMD17                ;ENABLE TRACE
12152 050300  053716                              FCMD18                ;DISABLE TRACE
12153 050302                                    END ;OF CASE
12154 050310  000733                            BR      FS1
```

```
12157 050312                          FSCMD0: SUBTST  <<COMMAND 0     EXIT>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       COMMAND 0       EXIT
                                      ;*****************************************************************************
12158 050312                                  TYPE    MSG103          ;LEAVING FIELD SERVICE MODE
12159 050316  062706  000002                    ADD     #2,SP
12160 050322                                  IF SKIPKAMI IS TRUE
12161 050330  062706  000002                    ADD   #2,SP                     ;THROW AWAY OLD KAMIKAZE FLAG
12162 050334  005037  002006                    CLR   SKIPKAMI
12163 050340                                  ELSE
12164 050342                                    POP   KAMIKAZE                  ;RESTORE OLD KAMIKAZE FLAG
12165 050346                                  END ;OF IF SKIPKAMI
12166 050346                                  POP     CSRNO
12167 050352  005737  002542                  TST     CACHKN
12168 050356  001414                          BEQ     RES0
12169 050360                                  IF CACHKN EQ CACHKF             ;IF CACHE IS OFF
12170 050370  062706  000002                    ADD   #2,SP                     ;THROW AWAY CACHE STATUS
12171 050374                                  ELSE
12172 050376  005737  002542                    TST   CACHKN
12173 050402  001402                            BEQ   RES0
12174 050404                                    POP   CONTRL                    ;RESTORE CACHE STATUS
12175 050410                                  END ;OF IF CACHKN
12176 050410  104416                    RES0: RESREG
12177 050412  000207                          RETURN
12178
12179 050414                          FSCMD1: SUBTST  <<FS    COMMAND 1       READ CSR>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       FS      COMMAND 1       READ CSR
                                      ;*****************************************************************************
12180 050414  004737  053730                  CALL    WHICHCSR
12181 050420  010637  002304                  MOV     SP,FSSTACK
12182 050424                                  SET4    #RES1           ;TRAPS TO 4 GOTO RES1
12183 050432  104426                          READCSR
12184 050434                                  SET     NOERROR
12185 050442  104026                          ERROR   +26             ;USE ERROR ROUTINE FOR PRINTOUT
12186 050444                                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT
12187 050466  000207                          RETURN
12188 050470                          RES1:   TYPE    MSG025          ;THIS CSR DOES NOT EXIST
12189 050474  013706  002304                  MOV     FSSTACK,SP
12190 050500                                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT
12191 050522  000207                          RETURN
```

```
12194 050524                          FSCMD2: SUBTST  <<FS    COMMAND 2       LOAD CSR>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       FS      COMMAND 2       LOAD CSR
                                      ;*****************************************************************************
12195 050524  004737  053730                  CALL    WHICHCSR
12196 050530  010637  002304                  MOV     SP,FSSTACK
12197 050534                                  SET4    #RES2           ;TRAPS TO 4 GOTO RES2
12198 050542  104426                          READCSR
12199 050544                                  TYPE    MSG027
12200 050550                                  SET     NOERROR
12201 050556  104026                          ERROR   +26             ;USE ERROR ROUTINE FOR PRINTOUT
12202 050560                                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT
12203 050602                                  TYPE    MSG023          ;FIRST CSR WORD
12204 050606  104413                          RDOCT                   ;READ AN OCTAL NUMBER
12205 050610                                  POP     CSR             ;PUT IN IN LOC "CSR"
12206 050614  104425                          LOADCSR
12207 050616  104426                          READCSR
12208 050620                                  TYPE    MSG028
12209 050624                                  SET     NOERROR
12210 050632  104026                          ERROR   +26             ;USE FOR PRINTOUT - NOT AN ERROR
12211 050634  000207                          RETURN
12212 050636                          RES2:   TYPE    MSG025          ;THIS CSR DOES NOT EXIST
12213 050642  013706  002304                  MOV     FSSTACK,SP
12214 050646                                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT
12215 050670  000207                          RETURN
```

```
12218 050672                                FSCMD3: SUBTST  <<FS    COMMAND 3       EXAMINE MEMORY>>
                                            ;*********************************************************************
                                            ;*SUBTEST       FS      COMMAND 3       EXAMINE MEMORY
                                            ;*********************************************************************
12219 050672                                        PUSH    BANK,NOPAR,PARTHERE,4
12220 050702  012737  000002  002074                MOV     #2,NOPAR            ;INDICATE PARITY ACTION
12221 050720                                        TYPE    MSG029              ;EXAMINE MEMORY
12222 050724                                1$:     TYPE    MSG031              ;PHYSICAL ADDRESS (0-17775776)??
12223 050730  104413                                RDOCT                       ;READ OCTAL NUMBER ONTO STACK & $HIOCT
12224 050732  013737  065204  002100                MOV     $HIOCT,BANK         ;PUT MSB'S IN BANK
12225 050740                                        POP     R0                  ;PUT LSB'S IN R0
12226 050742  000241                                CLC
12227 050744  006100                                ROL     R0
12228 050746  006137  002100                        ROL     BANK
12229 050752  000241                                CLC
12230 050754  006000                                ROR     R0
12231 050756  023737  002100  002554                CMP     BANK,LASTBANK       ;CHECK FOR BANK TOO HIGH
12232 050764  003357                                BGT     1$                  ;BRANCH IF TRUE
12233 050766  062700  060000                        ADD     #FIRST,R0
12234 050772  032700  000001                        BIT     #BIT0,R0            ;CHECK FOR ODD ADDRESS
12235 050776  001352                                BNE     1$                  ;BRANCH IF ODD ADDRESS
12236 051000  020027  157776                        CMP     R0,#LAST            ;CHECK FOR ADDRESS OVER 16K
12237 051004  101347                                BHI     1$                  ;BRANCH IF OVER 16K
12238 051006  012737  051060  002302                MOV     #3$,PARTHERE        ;INCASE OF ABORTS
12239 051014                                        SET4    #4$                 ;TRAPS TO 4 GOTO 4$
12240 051022                                        MAP     BANK                        ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
12241 051036                                        TESTAREA                    ;ENTER TEST MODE
12242 051044  011001                                MOV     (R0),R1
12243 051046  104417                                KERNEL                      ;ENTER KERNEL MODE
12244 051050                                        TYPOCS  R1
12245 051056  000410                                BR      EXCMD3
12246
12247 051060                                3$:     TYPE    MSG032                      ;PARITY ABORT
12248 051064  000405                                BR      EXCMD3
12249
12250 051066  062706  000004                4$:     ADD     #4,SP                       ;FIX STACK
12251 051072                                        TYPE    MSG033                      ;TIMEOUT TRAP
12252 051076  000400                                BR      EXCMD3
12253
12254 051100  104417                        EXCMD3: KERNEL                      ;ENTER KERNEL MODE
12255 051102                                        POP     4,PARTHERE,NOPAR,BANK
12256 051122                                        RES4                        ;RESET TRAPS TO 4 TO DEFAULT
12257 051144  000207                                RETURN
```

```
12260 051146                                FSCMD4: SUBTST  <<FS    COMMAND 4       MODIFY MEMORY>>
                                                    ;*****************************************************************
                                                    ;*SUBTEST        FS      COMMAND 4       MODIFY MEMORY
                                                    ;*****************************************************************
12261 051146                                        PUSH    BANK,NOPAR,PARTHERE,4
12262 051166  012737  000003  002074                MOV     #3,NOPAR                ;INDICATE PARITY ACTION
12263 051174                                        TYPE    MSG036                  ;MODIFY MEMORY
12264 051200                                1$:     TYPE    MSG031          ;PHYSICAL ADDRESS (0-17775776)??
12265 051204  104413                              RDOCT                   ;READ OCTAL NUMBER ONTO STACK & $HIOCT
12266 051206  013737  065204  002100              MOV     $HIOCT,BANK     ;PUT MSB'S IN BANK
12267 051214                                      POP     R0              ;PUT LSB'S IN R0
12268 051216  000241                              CLC
12269 051220  006100                              ROL     R0
12270 051222  006137  002100                      ROL     BANK
12271 051226  000241                              CLC
12272 051230  006000                              ROR     R0
12273 051232                                      IF BANK GT LAST BANK THEN GOTO 1$  ;CHECK FOR BANK TOO HIGH
12274 051242  062700  060000                      ADD     #FIRST,R0
12275 051246                                      IF #BIT0 SET.IN R0 THEN GOTO 1$ ;CHECK FOR ODD ADDRESS
12276 051254                                      IF R0 HI #LAST THEN GOTO 1$     ;CHECK FOR ADDRESS OVER 16K
12277 051262  012737  051330  002302              MOV     #3$,PARTHERE            ;INCASE OF ABORTS
12278 051270                                      SET4    #4$             ;TRAPS TO 4 GOTO 4$
12279 051276                                      MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
12280 051312  104511                              INVALIDATE
12281 051314                                      TESTAREA                ;ENTER TEST MODE
12282 051322  011001                              MOV     (R0),R1
12283                                             ;GETTING HERE MEANS WE GOT LUCKY - NO TRAPS
12284 051324  104417                              KERNEL                  ;ENTER KERNEL MODE
12285 051326  000410                              BR      5$
12286
12287 051330                                3$:     TYPE    MSG032                  ;PARITY ABORT
12288 051334  000431                              BR      EXCMD4                  ;EXIT
12289
12290 051336  062706  000004                4$:     ADD     #4,SP           ;FIX STACK
12291 051342                                      TYPE    MSG033          ;TIMEOUT TRAP
12292 051346  000424                              BR      EXCMD4                  ;EXIT
12293
12294 051350                                5$:     TYPE    MSG037                  ;OLD DATA WAS
12295 051354                                      TYPOCS  R1                      ;PRINT IT
12296 051362                                      TYPE    MSG039                  ;INPUT NEW DATA
12297 051366  104413                              RDOCT                           ;READ ON OCTAL NUMBER ONTO THE STACK
12298 051370                                      POP     R1                      ;GET NEW NUMBER
12299 051372                                      TESTAREA                ;ENTER TEST MODE
12300 051400  010110                              MOV     R1,(R0)                 ;PUT IT IN MEMORY
12301 051402  011001                              MOV     (R0),R1                 ;READ IT AGAIN
12302 051404  104417                              KERNEL                  ;ENTER KERNEL MODE
12303 051406                                      TYPE    MSG038                  ;DATA IS NOW
12304 051412                                      TYPOCS  R1                      ;PRINT IT
12305
12306 051420  104417                        EXCMD4: KERNEL                  ;ENTER KERNEL MODE
12307 051422                                      POP     4,PARTHERE,NOPAR,BANK
12308 051442                                      RES4                    ;RESET TRAPS TO 4 TO DEFAULT
12309 051464  000207                              RETURN
```

```
12312 051466                                FSCMD5: SUBTST  <<FS    COMMAND 5       SELECT BANK & PATTERN>>
                                                ;*****************************************************************
                                                ;*SUBTEST       FS      COMMAND 5       SELECT BANK & PATTERN
                                                ;*****************************************************************
12313 051466                                        PUSH    BANK,PATTERN,TESTADD,PCBUMP,TKVEC,TKVEC+2
12314 051516  010637  002304                      MOV     SP,FSSTACK                  ;SAVE LAST GOOD STACK POINTER
12315 051522                                      TYPE    MSG040                      ;SELECT BANK & PATTERN TEST
12316 051526                                1$:   TYPE    MSG030                      ;BANK(0-177)?
12317 051532  104413                              RDOCT                             ;READ AN OCTAL NUMBER ONTO THE STACK
12318 051534                                      POP     BANK                        ;PUT IT IN BANK
12319 051540                                      IF BANK GT LASTBANK THEN GOTO 1$  ;CHECK FOR BANK TOO HIGH
12320
12321 051550  013701  002100                      MOV     BANK,R1
12322 051554  006301                              ASL     R1
12323 051556  006301                              ASL     R1
12324 051560                                      IF CPUBIT OFF.IN CONFIG(R1)
12325 051570                                        TYPE  MSG041                    ;BANK NOT ACCESSABLE
12326 051574                                        GOTO 1$
12327 051576                                      END ;OF IF
12328
12329 051576                                2$:   TYPE    MSG042                      ;PATTERN(0-45)?
12330 051602  104413                              RDOCT                             ;READ AN OCTAL NUMBER ONTO THE STACK
12331 051604                                      POP     PATTERN                     ;PUT IT IN PATTERN
12332 051610                                      IF PATTERN GT #47 THEN GOTO 2$    ;CHECK FOR PATTERN TO HIGH
12333 051620                                      IF PATTERN EQ #0
12334 051626                                        TYPE  MSG043                    ;PATTERN 0 DATA IS?
12335 051632  104413                                RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
12336 051634                                        POP   R2                        ;PUT IT IN R2
12337 051636                                      END ;OF IF
12338
12339
12340 051636                                      MAP     BANK                        ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
12341 051652  104511                              INVALIDATE
12342 051654  004737  047032                      CALL    EXBANK                      ;SET NEW MARGINS
12343 051660                                      IF RRFLAG IS TRUE
12344 051666                                        TYPE  MSG049                    ;BANK REQUIRES RELOCATION
12345 051672  000137  052306                        JMP CMD5C
12346 051676                                      END ;OF IF RRFLAG
12347 051676                                      TYPE    MSG046              ;TO ESCAPE TYPE ANY KEY!
12348 051702  013737  002150  002152              MOV     CSRNO,SAVCSR        ;SAVE OLD CSR NUMBER
12349 051710  013702  002100                      MOV     BANK,R2             ;
12350 051714  072227  000002                      ASH     #2,R2               ;GENERATE INDEX INTO CONFIGURATION TABLE
12351 051720  016203  002652                      MOV     CONFIG(R2),R3       ;R3 = LOW WORD OF CONFIGURATION TABLE FOR THIS BANK
12352 051724  072327  177770                      ASH     #-10,R3             ;POSITION CSR CODE IN BITS 0-3
12353 051730  042703  177760                      BIC     #^C17,R3            ;CLEAR ALL BUT THE CSR CODE
12354 051734  006303                              ASL     R3                  ;ADJUST CSR NUMBER
12355 051736  010337  002150                      MOV     R3,CSRNO            ;
12356 051742  012737  052306  000060              MOV     #CMD5C,TKVEC
12357 051750  012737  000340  000062              MOV     #340,TKVEC+2
12358 051756  017700  130650                      MOV     @$TKB,R0                    ;KILL ANY OLD INTERRUPT
12359 051762  042737  000200  177776              BIC     #BIT7,PSW                   ;LOWER CPU PRIORITY TO 140
12360 051770  052777  000100  130632              BIS     #BIT6,@$TKS                 ;ENABLE KEYBOARD INTERRUPTS
12361
12362
12363 051776                                      SET     HEADER,MUT
12364 052012  013701  002100            CMD5B:    MOV     BANK,R1
12365 052016  006301                              ASL     R1
```

```
12366 052020  006301                          ASL     R1
12367 052022  005037  002236                  CLR     SPLTCSR
12368 052026  005037  002262                  CLR     PASFLG
12369 052032  012737  060000  002410          MOV     #FIRST,TESTADD
12370 052040  012737  060002  002412          MOV     #FIRST+2,TESTADD+2
12371 052046                                  IF #BIT12 SET.IN CONFIG+2(R1)
12372 052056  005237  002236                    INC   SPLTCSR
12373 052062                                    MAP   BANK
12374 052076  012737  120000  002412            MOV   #120000,TESTADD+2
12375 052104                                  END; OF IF #BIT12
12376 052104                                  IF #SW0 SET.IN @SWR
12377 052114  104470                            ECCDIS                      ;DISABLE ERROR CORRECTION
12378 052116                                  ELSE
12379 052120                                    PUSH  CSRNO
12380 052124  104502                            CLRCSR                      ;CLEAR CSRS
12381 052126                                    POP   CSRNO
12382 052132                                  END ;OF IF
12383 052132  012737  000002  002074          MOV     #2,NOPAR              ;PARITY ACTION
12384 052140  012737  000002  002324          MOV     #2,PCBUMP             ;TRAPS ADD 2 TO PC
12385 052146  013700  002110                  MOV     PATTERN,R0
12386 052152  006300                          ASL     R0
12387 052154  004770  052166                  CALL    @FSPAT(R0)
12388 052160  005037  002074                  CLR     NOPAR
12389 052164  000712                          BR      CMD5B                 ;LOOP TILL KEYBOARD INTERRUPT
12390
12391 052166  020702                  FSPAT:  MT0000  ;<1 SEC       DATA PATTERN TEST
12392 052170  020762                          MT0001  ;<1 SEC       ADDRESS TEST
12393 052172  021102                          MT0002  ;<1 SEC       COMPLEMENT ADDRESS TEST
12394 052174  021242                          MT0003  ; 1 SEC       3 XOR 9 WORST CASE NOISE TEST
12395 052176  021474                          MT0004  ; 1 SEC       ROTATING ZEROS TEST
12396 052200  021616                          MT0005  ; 1 SEC       ROTATING ONES TEST
12397 052202  021752                          MT0006  ;<1 SEC       INITIAL DATA TEST
12398 052204  022006                          MT0007  ;<1 SEC       ADDRESS BIT TEST
12399 052206  022050                          MT0010  ;<1 SEC       BYTE ADDRESSING TEST
12400 052210  022104                          MT0011  ;<2 SEC       CREATE SINGLE BIT ERROR TEST
12401 052212  022162                          MT0012  ;<1 SEC       WRITE BYTE CLEARS SBE TEST
12402 052214  022266                          MT0013  ; 1 SEC       CREATE DOUBLE BIT ERROR TEST
12403 052216  022352                          MT0014  ; 1 SEC       BASIC DOUBLE BIT ERROR TEST
12404 052220  022442                          MT0015  ; 1 SEC       WRITE INHIBIT OF BYTE WITH DBE
12405 052222  022520                          MT0016  ;<1 SEC       WRITE INHIBIT OF WORD WITH DBE
12406 052224  022576                          MT0017  ;<1 SEC       HOLDING 1'S & 0'S TEST
12407 052226  022620                          MT0020  ; 1 SEC       SYNDROMES TO CSR ON SBE TEST
12408 052230  02271C                          MT0021  ; 1 SEC       MARCHING 0'S & 1'S TEST
12409 052232  023162                          MT0022  ;10 SEC       REFRESH & SHIFTING DIAGONAL TEST
12410 052234  023214                          MT0023  ;10 SEC       SHIFTING DIAGONAL TEST
12411 052236  023260                          MT0024  ;20 SEC       FAST GALLOPING PATTERN TEST
12412 052240  023524                          MT0025  ;<1 SEC       INTERRUPT ENABLE TEST
12413 052242  023602                          MT0026  ;<1 SEC       RANDOM DATA TEST
12414 052244  024104                          MT0027  ; 1 SEC       UNIQUE BANK TEST
12415 052246  024570                          MT0030  ; 1 SEC       FLUSH OUT DBE'S TEST
12416 052250  025072                          MT0031  ; 3 SEC       SOB-A-LONG TEST
12417 052252  025262                          MT0032  ;<1 SEC       WRITE RECOVERY TEST
12418 052254  025614                          MT0033  ;35 SEC       BRANCH GOBBLE TEST
12419 052256  026002                          MT0034  ; 1 SEC       SOFT ERROR TEST
12420 052260  026154                          MT0035  ;<1 SEC       WORST CASE NOISE PARITY TEST
12421 052262  026266                          MT0036  ; 1 SEC       CORRECTION CODE TEST
12422 052264  026340                          MT0037  ;<1 SEC       ECC DISABLE TEST
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12423 052266  026406                          MT0040  ; 1 SEC          NO WRITE ABORT WITH ECC DISABLED TEST
12424 052270  026410                          MT0041  ; 1 SEC          ADDRESS TO CSR ON DOUBLE BIT ERROR TEST
12425 052272  026452                          MT0042  ;<1 SEC          EXTENDED UNIBUS ADDRESS TEST
12426 052274  026516                          MT0043  ; 1 SEC          WRITE BYTE CLEARS SBE TEST
12427 052276  026556                          MT0044  ; 5 SEC          SHIFTING 1/0'S THROUGH THE CHECK BITS                    ;;IL
12428 052300  026620                          MT0045  ; 1 SEC          SYNDROMES TO CSR ON DBE TEST
12429 052302  026660                          MT0046  ; 1 SEC          CHECK SINGLE BIT ERROR WITH ECC DISABLED TEST
12430 052304  026720                          MT0047  ;<1 SEC          NO CSR UPDATE WITH SBE ON DBE TEST
12431
12432 052306  013706  002304          CMD5C:  MOV     FSSTACK,SP               ;RECOVER OLD STACK POINTER
12433 052312  042777  000100  130310          BIC     #BIT6,@$TKS
12434 052320                                  POP     TKVEC+2,TKVEC
12435 052330  117700  130276                  MOVB    @$TKB,R0                 ;GET CHARACTER TO GET RID OF FLAG
12436 052334                                  POP     PCBUMP,TESTADD
12437 052344                                  POP     PATTERN,BANK
12438 052354                                  MAP     BANK                     ;REMAP OLD BANK
12439 052370  004737  047032                  CALL    EXBANK
12440 052374  013737  002152  002150          MOV     SAVCSR,CSRNO             ;RESTORE CSRNO.
12441 052402  000207                          RETURN
```

```
12443 052404                          FSCMD6: SUBTST  <<FS    COMMAND 6       TYPE CONFIGURATION MAP>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       FS      COMMAND 6       TYPE CONFIGURATION MAP
                                      ;*****************************************************************************
12444 052404  004737  041364                  CALL    PCONFIG
12445 052410  000207                          RETURN
12446
```

```
12449 052412                                FSCMD7: SUBTST  <<FS    COMMAND 7       SOB-A-LONG TEST>>
                                                    ;*****************************************************************************
                                                    ;*SUBTEST        FS      COMMAND 7       SOB-A-LONG TEST
                                                    ;*****************************************************************************
12450 052412                                        PUSH    BANK,PATTERN,TKVEC,TKVEC+2,NOPAR
12451 052436  010637  002304                        MOV     SP,FSSTACK                      ;SAVE LAST GOOD STACK POINTER
12452 052442                                        TYPE    MSG055                          ;SOB-A-LONG TEST
12453
12454 052446                                        IF #SW0 SET.IN @SWR
12455 052456  104470                                  ECCDIS                                ;DISABLE ERROR CORRECTION
12456 052460                                        ELSE
12457 052462  104502                                  CLRCSR                                ;CLEAR CSRS
12458 052464                                        END ;OF IF
12459 052464                                        TYPE    MSG056                          ;BELL = EACH PASS COMPLETE
12460
12461 052470                                        TYPE    MSG046                          ;TO ESCAPE TYPE ANY KEY!
12462 052474  012737  052620  000060                MOV     #CMD7C,TKVEC
12463 052502  012737  000340  000062                MOV     #340,TKVEC+2
12464 052510  017700  130116                        MOV     @$TKB,R0                        ;KILL ANY OLD INTERRUPT
12465 052514  042737  000200  177776                BIC     #BIT7,PSW                       ;LOWER CPU PRIORITY TO 140
12466 052522  052777  000100  130100                BIS     #BIT6,@$TKS                     ;ENABLE KEYBOARD INTERRUPTS
12467
12468
12469 052530                                        SET     HEADER,MUT
12470
12471 052544                                CMD7B:  FOR BANK := #0 TO LASTBANK
12472 052550  004737  047032                            CALL EXBANK
12473 052554                                            IF ACFLAG IS TRUE AND RRFLAG IS FALSE
12474 052570  104511                                        INVALIDATE
12475 052572  004737  025072                              CALL MT0031
12476 052576                                            END ;OF IF ACFLAG
12477 052576                                        END ;OF FOR BANK
12478 052612                                        TYPE    $BELL                           ;RING BELL
12479 052616                                        GOTO    CMD7B
12480
12481 052620  013706  002304          CMD7C:        MOV     FSSTACK,SP                              ;RECOVER OLD STACK POINTER
12482 052624  042777  000100  127776                BIC     #BIT6,@$TKS
12483 052632  117700  127774                        MOVB    @$TKB,R0                                ;READ CHAR TO KILL FLAG
12484 052636                                        POP     NOPAR,TKVEC+2,TKVEC,PATTERN,BANK
12485 052662                                        MAP     BANK                            ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
12486 052676  004737  047032                        CALL    EXBANK
12487 052702  000207                                RETURN
```

```
12490 052704                                FSCMD8: SUBTST  <<FS    COMMAND 8       ERROR SUMMARY>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       FS      COMMAND 8       ERROR SUMMARY
                                            ;*****************************************************************************
12491 052704                                        PUSH    R0,R2,R3,BANK
12492 052716  013737  065712  002432          MOV     $PASS,TEMP
12493 052724  005337  002432                  DEC     TEMP
12494 052730                                  TYPDEC  TEMP
12495 052736  013737  172350  002266          MOV     KIPAR4,SAV4             ;;;I.L.C.;REV B
12496 052744  012737  001000  172350          MOV     #1000,KIPAR4            ;;;I.L.C.;REV B
12497 052752                                  TYPE    MSG125                  ;PASSES COMPLETED
12498 052756                                  TYPDEC  $ERTTL
12499 052764                                  TYPE    MSG079                  ;ERROR(S) DETECTED
12500 052770                                  IF $ERTTL NE #0
12501 052776  005037  002332                    CLR   SUCCESS
12502 053002                                    FOR BANK := #0 TO LASTBANK
12503 053006  013703  002100                      MOV BANK,R3
12504 053012  070327  000004                      MUL #4,R3
12505 053016                                      IFB CONFIG+2(R3) NE #0
12506 053024                                        IF SUCCESS IS FALSE
12507 053032                                          TYPE    MSG076          ;BANK  ERRORS
12508 053036                                          SET SUCCESS
12509 053044                                        END ;OF IF SUCCESS
12510 053044                                        TYPOCS    BANK,3
12511 053054  116300  002654                      MOVB      CONFIG+2(R3),R0
12512 053060  042700  177400                      BIC       #^C377,R0
12513 053064                                      TYPDEC    R0
12514 053070                                      TYPE      $CRLF
12515 053074                                    END ;OF IFB CONFIG(R3)
12516 053074                                  END ;OF FOR BANK
12517 053110                                END ;OF IF $ERTTL
12518 053110  013737  002266  172350          MOV     SAV4,KIPAR4             ;;I.L.C.;;;REV B
12519 053116                                  POP     BANK,R3,R2,R0
12520 053130  000207                          RETURN
```

```
12523 053132                                FSCMD9: SUBTST  <<FS    COMMAND 9       REFRESH TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       FS      COMMAND 9       REFRESH TEST
                                            ;*****************************************************************************
12524 053132                                        PUSH    BANK,PATTERN,TKVEC,TKVEC+2,NOPAR
12525 053156  010637  002304                  MOV     SP,FSSTACK                  ;SAVE LAST GOOD STACK POINTER
12526 053162                                        TYPE    MSG073                  ;REFRESH TEST
12527
12528 053166                                        IF #SW0 SET.IN @SWR
12529 053176  104470                                  ECCDIS                        ;DISABLE ERROR CORRECTION
12530 053200                                        ELSE
12531 053202  104502                                  CLRCSR                        ;CLEAR CSRS
12532 053204                                        END ;OF IF
12533 053204                                        TYPE    MSG056                  ;BELL = EACH PASS COMPLETE
12534
12535 053210                                        TYPE    MSG046                  ;TO ESCAPE TYPE ANY KEY!
12536 053214  012737  053340  000060              MOV     #CMD9C,TKVEC
12537 053222  012737  000340  000062              MOV     #340,TKVEC+2
12538 053230  017700  127376                      MOV     @$TKB,R0                ;KILL ANY OLD INTERRUP
12539 053234  042737  000200  177776              BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
12540 053242  052777  000100  127360              BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
12541
12542 053250                                        SET     HEADER,MUT
12543
12544 053264                                CMD9B:  FOR BANK := #0 TO LASTBANK
12545 053270  004737  047032                          CALL EXBANK
12546 053274                                          IF ACFLAG IS TRUE AND RRFLAG IS FALSE
12547 053310  104511                                    INVALIDATE
12548 053312  004737  023162                          CALL MT0022
12549 053316                                          END ;OF IF ACFLAG
12550 053316                                        END ;OF FOR BANK
12551 053332                                        TYPE    $BELL                   ;RING BELL
12552 053336                                        GOTO    CMD9B
12553
12554 053340  013706  002304          CMD9C:        MOV     FSSTACK,SP              ;RECOVER OLD STACK POINTER
12555 053344  042777  000100  127256                BIC     #BIT6,@$TKS
12556 053352  117700  127254                      MOVB    @$TKB,R0                ;READ CHAR TO KILL FLAG
12557 053356                                        POP     NOPAR,TKVEC+2,TKVEC,PATTERN,BANK
12558 053402                                        MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
12559 053416  004737  047032                      CALL    EXBANK
12560 053422  000207                              RETURN
12561
```

```
CZMSPB0 MS11-L/M/P MEMORY DIAG. MACRO M1113  06-JUL-82 10:35  PAGE 399
FS      COMMAND 9       REFRESH TEST

  12564 053424                          FCMD10: SUBTST  <<FS     COMMAND 10      SET FILL COUNT>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       FS      COMMAND 10      SET FILL COUNT
                                        ;*****************************************************************************
  12565 053424                                  PUSH    R0
  12566 053426                                  TYPE    MSG085                  ;FILL COUNT(OCTAL)?
  12567 053432  104413                          RDOCT
  12568 053434                                  POP     R0
  12569 053436  042700  177760                  BIC     #^C17,R0
  12570 053442  110037  002355                  MOVB    R0,$FILLS
  12571 053446                                  POP     R0
  12572 053450  000207                          RETURN
  12573
  12574 053452                          FCMD11: SUBTST  <<FS     COMMAND 11      ENTER KAMIKAZE MODE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       FS      COMMAND 11      ENTER KAMIKAZE MODE
                                        ;*****************************************************************************
  12575 053452                                  TYPE    MSG101          ;ENTERING KAMIKAZE MODE
  12576 053456                                  SET     KAMIKAZE,SKIPKAMI
  12577 053472  000207                          RETURN
  12578
  12579 053474                          FCMD12: SUBTST  <<FS     COMMAND 12      EXIT KAMIKAZE MODE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       FS      COMMAND 12      EXIT KAMIKAZE MODE
                                        ;*****************************************************************************
  12580 053474                                  TYPE    MSG102          ;LEAVING KAMIKAZE MODE
  12581 053500  005037  002004                  CLR     KAMIKAZE
  12582 053504                                  SET     SKIPKAMI
  12583 053512  000207                          RETURN
  12584
  12585 053514                          FCMD13: SUBTST  <<FS     COMMAND 13      TURN CACHE OFF>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       FS      COMMAND 13      TURN CACHE OFF
                                        ;*****************************************************************************
  12586 053514                                  TYPE    MSG106                  ;CACHE IS OFF
  12587 053520  104424                          CACHOFF                         ;TURN CACHE OFF
  12588 053522  013737  002542  002544          MOV     CACHKN,CACHKN+2         ;SAVE OLD CACHE ON STATE
  12589 053530  005037  002542                  CLR     CACHKN                  ;KEEP CACHE OFF
  12590 053534  000207                          RETURN
  12591
  12592 053536                          FCMD14: SUBTST  <<FS     COMMAND 14      TURN CACHE ON>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       FS      COMMAND 14      TURN CACHE ON
                                        ;*****************************************************************************
  12593 053536                                  TYPE    MSG107                  ;CACHE IS ON (EXCEPT DURING ACTUAL PATTERNS)
  12594 053542  013737  002544  002542          MOV     CACHKN+2,CACHKN         ;RESTORE OLD CACHE ON STATE
  12595 053550  104423                          CACHON                          ;TURN CACHE ON
  12596 053552  000207                          RETURN
  12597
```

```
12610
12611 053554                          FCMD15: SUBTST  <<FS    COMMAND 15      TEST ONLY SELECTED BANKS>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       FS      COMMAND 15      TEST ONLY SELECTED BANKS
                                      ;*****************************************************************************
12612 053554                                  TYPE    MSG105          ;ENTER BANKS IN OCTAL - USE NUMBER OUTSIDE RANGE TO TERMINAT
12613 053560  004737  053650                  CALL    CMD16A          ;ERASE OLD SELECTIONS
12614 053564                                  BEGIN CMD16LOOP
12615 053564                                    REPEAT
12616 053564                                      TYPE        MSG030          ;BANK(0-177)?
12617 053570  104413                              RDOCT                       ;READ AN OCTAL NUMBER ONTO THE STACK
12618 053572                                      POP R1                      ;PUT IT IN R1
12619 053574                                      IF R1 GT #177 OR R1 LT #0
12620 053606                                        LEAVE CMD16LOOP
12621 053610                                      END ;OF IF R1
12622 053610  006301                              ASL  R1
12623 053612  006301                              ASL  R1                     ;R1 <- R1 * 4
12624 053614  052761  040000  002654              BIS #BIT14,CONFIG+2(R1)
12625 053622                                    END ;OF REPEAT
12626 053624                                  END CMD16LOOP
12627 053624                                  TYPE    MSG110                  ;ONLY SELECTED BANKS WILL BE TESTED
12628 053630                                  SET     SELONLY
12629 053636  000207                          RETURN
12630
12631 053640                          FCMD16: SUBTST  <<FS    COMMAND 16      RESUME TESTING ALL BANKS>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       FS      COMMAND 16      RESUME TESTING ALL BANKS
                                      ;*****************************************************************************
12632 053640                                  TYPE    MSG111                  ;ALL BANKS WILL BE TESTED
12633 053644  005037  002000                  CLR     SELONLY
12634
12635                                         ;ENTRY POINT FROM CMD15
12636 053650  013702  002554          CMD16A: MOV     LASTBANK,R2
12637 053654  006302                          ASL     R2
12638 053656  006302                          ASL     R2
12639 053660                                  FOR R1 := #0 TO R2 BY #4
12640 053662  042761  040000  002654            BIC   #BIT14,CONFIG+2(R1)
12641 053670                                  END ;OF FOR R1
12642 053700  000207                          RETURN
```

```
12645 053702                          FCMD17: SUBTST  <<FS    COMMAND 17      ENABLE TRACE>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       FS      COMMAND 17      ENABLE TRACE
                                      ;*****************************************************************************
12646 053702                                  TYPE    MSG127
12647 053706  012737  177777  006206          MOV     #-1,TRACE
12648 053714  000207                          RETURN
```

```
12651 053716                            FCMD18: SUBTST  <<FS    COMMAND 18      DISABLE TRACE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        FS      COMMAND 18      DISABLE TRACE
                                        ;*****************************************************************************
12652 053716                                    TYPE    MSG128
12653 053722  005037  006206                      CLR     TRACE
12654 053726  000207                              RETURN
```

```
12657 053730                            WHICHCSR:SUBTST <<SUBR  DETERMINE CORRECT CSR>>
                                        ;*****************************************************************
                                        ;*SUBTEST       SUBR    DETERMINE CORRECT CSR
                                        ;*****************************************************************
12658 053730  013700  002222                  MOV     TOTCSRS,R0      ;GET CSR'S FLAG
12659 053734  022700  100000                  CMP     #BIT15,R0       ;CSR 0?
12660 053740  001003                          BNE     1$              ;NO - SKIP
12661 053742  005037  002150                  CLR     CSRNO           ;YES - SET IT UP
12662 053746  000207                          RETURN
12663
12664 053750                            1$:   TYPE    MSG022          ;WHICH CSR(0-F)
12665 053754  104412                          RDLIN                   ;GET CHARACTER
12666 053756                                  POP     R0              ;PUT IN R0
12667 053760  011000                          MOV     (R0),R0         ;PUT CHAR IN R0
12668 053762  020027  000106                  CMP     R0,#106         ;CHECK LIMIT
12669 053766  101370                          BHI     1$              ;IF BAD LOOP TILL HE TYPES IT RIGHT
12670 053770  022700  000101                  CMP     #'A,R0
12671 053774  103002                          BHIS    2$
12672 053776  162700  000007                  SUB     #7,R0
12673 054002  162700  000060            2$:   SUB     #60,R0
12674 054006  006300                          ASL     R0
12675 054010  010037  002150                  MOV     R0,CSRNO
12676 054014  000207                          RETURN
```

```
13225
13226 054016                            .SBTTL  ERROR DATA (SUPERVISOR) SETUP STUFF
13227 054030                    $PER25: LET ADDRESS := R1 - #2
13228 054036                            IF ABORTFLAG IS FALSE
13229 054044                              TESTAREA              ;ENTER TEST MODE
13230 054052  104417                      LET BAD := -2(R1)
13231 054054                              KERNEL                ;ENTER KERNEL MODE
13232 054054                            END ;OF IF ABORTFLAG
13233 054062                            IF 177654 EQ #0
13234 054066                              LET GOOD := R2
13235 054070                            ELSE
13236 054074                              LET GOOD := R3
13237 054074  000137  057276              JMP     PERRAW
13238
13239 054100                    PERRA3: SUBTST  <<DATA WAS 3 WORDS>>
                                ;*************************************************************************
                                ;*SUBTEST       DATA WAS 3 WORDS
                                ;*************************************************************************
13240 054100                            IF BADPC EQ #0 THEN $CALL BADSTACK
13241 054112                            PUSH    R0
13242 054114  005037  002146            CLR     CSR             ;MAKE SURE CSR BIT HOLDER IS CLEAR
13243 054120  104505                    CHK1DIS                 ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
13244 054122                            TESTAREA
13245 054130  005711                    TST     (R1)            ;READ LOCATION TO READ CHECKBITS INTO CSR
13246 054132  104417                    KERNEL
13247 054134  104426                    READCSR                 ;GET CSR CONTENTS
13248 054136  013700  002146            MOV     CSR,R0          ;SAVE CSR CONTENTS IN R0
13249 054142  104503                    CLR1CSR                 ;RETURN CSR TO NORMAL MODE
13250 054144  072027  177773            ASH     #-5,R0          ;MOVE CHECK BITS TO BOTTOM OF WORD
13251 054150  042700  177600            BIC     #^C177,R0       ;CLEAR OFF EXTRANEOUS GARBAGE
13252 054154                            LET ADDRESS := R1       ;SAVE VIRTUAL ADDRESS FOR PRINTOUT
13253 054160  005037  002042            CLR     GOOD            ;FIRST TEST WORD WRITTEN SHOULD ALWAYS BE ZERO
13254 054164                            TESTAREA                ;ENTER TEST MODE
13255 054172  011137  002050            MOV     (R1),BAD        ;GET BAD DATA FROM MUT - FIRST WORD
13256 054176  011437  002052            MOV     (R4),BAD2       ;AND SECOND WORD
13257 054202  104417                    KERNEL                  ;ENTER KERNEL MODE
13258 054204  110037  002054            MOVB    R0,BAD3         ;MOVE BAD CHECKBITS FOR PRINTOUT
13259 054210  105037  002055            CLRB    BAD3+1          ;CLEAR OFF THE OTHER UNUSED BITS
13260 054214  004737  057532            CALL    PERBNK          ;MARK BANK AS BAD IN CONFIG TABLE
13261 054220  104033                    ERROR   +33
13262 054222                            POP     R0              ;RESTORE R0
13263 054224                            IF #SW0 SET.IN @SWR
13264 054234  104506                      ENASBE                ;TRAP ON SINGLE BIT ERRORS
13265 054236                            ELSE
13266 054240  104472                      ECCINIT               ;TRAP ON UNCORRECTABLE ERRORS
13267 054242                            END; OF IF #SW0
13268 054242  000002                    RTI
```

DATA WAS 3 WORDS

```
13271 054244                          $PER30: LET GOOD := R1
13272 054250                                  LET ADDRESS := (SP) - 16
13273 054262                                  IF ABORTFLAG IS FALSE
13274 054270                                    TESTAREA              ;ENTER TEST MODE
13275 054276                                    LET BAD := @ADDRESS
13276 054304  104417                            KERNEL                ;ENTER KERNEL MODE
13277 054306                                  END ;OF IF ABORTFLAG
13278 054306  000137  057276                    JMP PERRAW
13279
13280 054312                          GETDATA:SUBTST  <<GET DATA FROM ABORTED AREA IF POSSIBLE>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       GET DATA FROM ABORTED AREA IF POSSIBLE
                                      ;*****************************************************************************
13281 054312                                  PUSH    R0,4,114
13282 054324  010637  054410                  MOV     SP,GETDA1
13283 054330  012737  054370  000004          MOV     #1$,4
13284 054336  012737  054370  000114          MOV     #1$,114
13285 054344  013700  002032                  MOV     ADDRESS,R0
13286 054350                                  TESTAREA
13287 054356  011037  002050                  MOV     (R0),BAD
13288 054362  104417                          KERNEL
13289 054364  005037  002142                  CLR     ABORTFLAG
13290 054370  013706  054410          1$:     MOV     GETDA1,SP             ;RESTORE KNOWN GOOD STACK POINTER
13291 054374                                  POP     114,4,R0
13292 054406  000207                          RETURN
13293 054410  000000                  GETDA1: 0
```

```
13296                                           .SBTTL  POWER FAIL AUTO RESTART
13297                                           .SBTTL  ROUTINE POWER DOWN AND UP
13298                                   ;*****************************************************************************
13299                                   ;POWER DOWN ROUTINE
13300 054412                            $PWRDN:
13308                                           ;SAVE CACHE STATUS
13309 054412  005737  002542                    TST     CACHKN
13310 054416  001403                            BEQ     5$
13311 054420                                    PUSH    CONTRL
13312 054424  104423                            CACHON                          ;TURN CACHE ON
13313 054426  012737  055364  000024  5$:       MOV     #$ILLUP,PWRVEC ;;SET FOR FAST UP
13314 054434  012737  000340  000026            MOV     #340,PWRVEC+2   ;;PRIO:7
13315 054442                                    PUSH    R0,R1,R2,R3,R4,R5,CSRNO
13316                                           ;SAVE USER PAR'S & PDR7
13317 054462  012700  177700                    MOV     #177700,R0
13318 054466  012701  000021                    MOV     #17.,R1
13319 054472                            1$:     PUSH    -(R0)
13320 054474  077102                            SOB     R1,1$
13321                                           ;SAVE SUPERVISOR PAR'S
13322 054476  005737  002454                    TST     NOSUPER
13323 054502  001013                            BNE     PD1
13324 054504  012700  172300                    MOV     #172300,R0
13325 054510  012701  000020                    MOV     #16.,R1
13326 054514                            2$:     PUSH    -(R0)
13327 054516  077102                            SOB     R1,2$
13328 054520                                    IF RLFLAG IS TRUE THEN $CALL WOOPS
13329                                           ;COPY KERNEL MAP TO USER & SUPERVISOR
13330 054532  012700  172300            PD1:    MOV     #KIPDR0,R0
13331 054536  012701  177600                    MOV     #UIPDR0,R1
13332 054542  012702  172200                    MOV     #SIPDR0,R2
13333 054546  012703  000040                    MOV     #32.,R3
13334 054552  011021                    3$:     MOV     (R0),(R1)+
13335 054554  012022                            MOV     (R0)+,(R2)+
13336 054556  077303                            SOB     R3,3$
```

```
13338                                          ;SAVE USER & SUPERVISOR STACK POINTERS
13339 054560                                   USER
13340 054566  010600                           MOV     USP,R0
13341 054570  104417                           KERNEL                  ;ENTER KERNEL MODE
13342 054572                                   PUSH    R0
13343 054574  005737  002454                   TST     NOSUPER
13344 054600  001006                           BNE     7$
13345 054602                                   SUPERVISOR              ;ENTER SUPERVISOR MODE
13346 054610  010600                           MOV     SSP,R0
13347 054612  104417                           KERNEL                  ;ENTER KERNEL MODE
13348 054614                                   PUSH    R0
13349                                          ;SAVE ECC REGISTERS
13350 054616  013701  002222          7$:      MOV     TOTCSRS,R1      ;GET CSR'S
13351 054622                                   BEGIN   LCSRSAVE
13352 054622                                     FOR CSRNO := #0 TO #36 BY #2
13353 054626  006301                                 ASL       R1
13354 054630                                         ON.ERROR
13355 054632  104426                                   READCSR
13356 054634                                           PUSH      CSR
13357 054640                                         END ;OF ON.ERROR
13358 054640                                       IF R1 EQ #0 THEN LEAVE LCSRSAVE
13359 054644                                       END ;OF FOR CSRNO
13360 054662                                   END LCSRSAVE
13361                                          ;SAVE MMR0,1,2,3
13362 054662                                   PUSH    MMR0,MMR1,MMR2
13363 054676  005737  002454                   TST     NOSUPER
13364 054702  001002                           BNE     8$
13365 054704                                   PUSH    MMR3
13366                                          ;SAVE KERNEL PAR'S
13367 054710  012700  172400          8$:      MOV     #172400,R0
13368 054714  012701  000020                   MOV     #16.,R1
13369 054720                          4$:      PUSH    -(R0)
13370 054722  077102                           SOB     R1,4$
13371                                          ;SAVE UNIBUS MAP REGISTERS
13372 054724  022737  000001  003754           CMP     #1,PROTYP               ;IS THIS AN 11/44?
13373 054732  001004                           BNE     9$                      ;BRANCH IF NOT
13374 054734                                   PUSH    MAPH0,MAPL0
13375                                          ;SAVE POSSIBLE SOFTWARE SWITCH REGISTER
13376 054744                          9$:      PUSH    @SWR
13377                                          ;SAVE STACK POINTER
13378 054750  010637  055370                   MOV     SP,$SAVR6       ;;SAVE SP
13379                                          ;NOW SET UP REAL VECTOR
13380 054754  012737  054766  000024           MOV     #$PWRUP,PWRVEC  ;;SET UP VECTOR
13381 054762  000000                  $DOWN:   HALT
13382 054764  000776                           BR      $DOWN           ;;HANG UP
```

```
13385                                   ;*****************************************************************************
13386                                   ;POWER UP ROUTINE
13387 054766                            $PWRUP:
13391 054766  012737  055364  000024              MOV     #$ILLUP,PWRVEC ;;SET FOR FAST DOWN
13392                                   ;RESTORE STACK POINTER
13393 054774  013706  055370              MOV     $SAVR6,SP       ;;GET SP
13394 055000  005037  055370              CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
13395 055004  005237  055370        1$:   INC     $SAVR6          ;;WAIT FOR THE INC
13396 055010  001375                      BNE     1$              ;;OF A WORD
13397                                   ;RESTORE POSSIBLE SOFTWARE SWITCH REGISTER
13398 055012                              POP     @SWR
13399                                   ;RESTORE UNIBUS MAP
13400 055016  022737  000001  003754      CMP     #1,PROTYP               ;IS THIS AN 11/44?
13401 055024  001006                      BNE     10$
13402 055026                              POP     MAPLO,MAPHO
13403 055036  004737  046356              CALL    LOWMAP          ;SETUP LOWER 16K OF UNIBUS MAP
13404                                   ;RESTORE KERNEL PAR'S & PDR'S
13405 055042  012700  172340        10$:  MOV     #172340,R0
13406 055046  012702  172300              MOV     #KIPDR0,R2
13407 055052  012701  000020              MOV     #16.,R1
13408 055056                        6$:   POP     (R0)+
13409 055060  012722  077406              MOV     #77406,(R2)+
13410 055064  077104                      SOB     R1,6$
13411                                   ;RESTORE MMR3,2,1,0
13412 055066  005737  002454              TST     NOSUPER
13413 055072  001002                      BNE     11$
13414 055074                              POP     MMR3
13415 055100                        11$:  POP     MMR2,MMR1,MMR0
13416                                   ;RESTORE ECC REGISTERS
13417 055114  013701  002222              MOV     TOTCSRS,R1      ;GET CSR'S
13418 055120  042701  177400              BIC     #177400,R1
13419 055124                              BEGIN LCSRRESTORE
13420 055124                                FOR CSRNO := #36 DOWNTO #0 BY #2
13421 055132  006201                          ASR         R1
13422 055134                                  ON.ERROR
13423 055136                                    POP       CSR
13424 055142  104425                            LOADCSR
13425 055144                                  END ;OF ON.ERROR
13426 055144                                IF R1 EQ #0 THEN LEAVE LCSRRESTORE
13427 055150                                END ;OF FOR CSRNO
13428 055166                              END LCSRRESTORE
13429                                   ;COPY KERNEL MAP TO USER & SUPERVISOR
13430 055166  012700  172300              MOV     #KIPDR0,R0
13431 055172  012701  177600              MOV     #UIPDR0,R1
13432 055176  012702  172200              MOV     #SIPDR0,R2
13433 055202  012703  000040              MOV     #32.,R3
13434 055206  011021                3$:   MOV     (R0),(R1)+
13435 055210  012022                      MOV     (R0)+,(R2)+
13436 055212  077303                      SOB     R3,3$
```

```
13438
13439 055214  005737  002454                    ;RESTORE SUPERVISOR & USER STACK POINTERS
13440 055220  001006                            TST     NOSUPER
13441 055222                                    BNE     13$
13442 055224                                    POP     R0
13443 055232  010006                            SUPERVISOR              ;ENTER SUPERVISOR MODE
13444 055234  104417                            MOV     R0,SSP
13445 055236                              13$:  KERNEL                  ;ENTER KERNEL MODE
13446 055240                                    POP     R0
13447 055246  010006                            USER
13448 055250  104417                            MOV     R0,USP
13449                                           KERNEL                  ;ENTER KERNEL MODE
13450 055252  012700  172240                    ;RESTORE SUPERVISOR PAR'S
13451 055256  012701  000020                    MOV     #172240,R0
13452 055262                              7$:   MOV     #16.,R1
13453 055264  077102                            POP     (R0)+
13454                                           SOB     R1,7$
13455 055266  012700  177636                    ;RESTORE USER PAR'S & PDR7
13456 055272  012701  000021                    MOV     #177636,R0
13457 055276                              8$:   MOV     #17.,R1
13458 055300  077102                            POP     (R0)+
13459                                           SOB     R1,8$
13460 055302  013777  002010  125316            ;RESTORE POSSIBLE SOFTWARE DISPLAY REGISTER
13461 055310  013737  002010  000174            MOV     $PATMAR,@DISPLAY
13462 055316                                    MOV     $PATMAR,DISPREG
13463 055336  012737  054412  000024            POP     CSRNO,R5,R4,R3,R2,R1,R0
13464 055344                                    MOV     #$PWRDN,PWRVEC  ;;SET UP THE POWER DOWN VECTOR
13465                                           TYPE    MSG051          ;REPORT THE POWER FAILURE
13466 055350  005737  002542                    ;RESTORE CACHE STATUS
13467 055354  001402                            TST     CACHKN
13468 055356                                    BEQ     9$
13469 055362  000002                            POP     CONTRL
13470 055364  000000                      9$:   RTI
13471 055366  000776                      $ILLUP: HALT                  ;;THE POWER UP SEQUENCE WAS STARTED
13472 055370  000000                            BR      $ILLUP          ;; BEFORE THE POWER DOWN WAS COMPLETE
13473                                     $SAVR6: 0                     ;;PUT THE SP HERE
                                                .EVEN
```

```
13485 055372                                    WOOPS:  SUBTST  <<POWER FAIL WHILE RELOCATED>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        POWER FAIL WHILE RELOCATED
                                                ;*****************************************************************************
13486 055372                                            PUSH    BANK
13487 055376  005037  002100                            CLR     BANK
13488 055402                                            MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
13489 055416                                            SUPERVISOR              ;ENTER SUPERVISOR MODE
13490 055424  013737  060024  055770                    MOV     FIRST+PWRVEC,WOOPSAV
13491 055432  013737  060026  055772                    MOV     FIRST+PWRVEC+2,WOOPSAV+2
13492 055440                                            BMOV    FIRST+WOOPUP,WOOPSAV+4,WOOPEND-WOOPUP/2+12.
13493 055452  012737  055556  060024                    MOV     #WOOPUP,FIRST+PWRVEC
13494 055460  012737  000340  060026                    MOV     #340,FIRST+PWRVEC+2
13495 055466                                            BMOV    WOOPUP,FIRST+WOOPUP,WOOPEND-WOOPUP/2
13496 055500  012700  172340                            MOV     #KIPAR0,R0
13497 055504  012701  135740                            MOV     #FIRST+WOOPEND,R1
13498 055510  012702  000010                            MOV     #8.,R2
13499 055514  012021                            1$:     MOV     (R0)+,(R1)+
13500 055516  077202                                    SOB     R2,1$
13501 055520  005737  002454                            TST     NOSUPER
13502 055524  001002                                    BNE     2$
13503 055526  013721  172516                            MOV     MMR3,(R1)+
13504 055532  013721  177576                    2$:     MOV     MMR2,(R1)+
13505 055536  013721  177574                            MOV     MMR1,(R1)+
13506 055542  013721  177572                            MOV     MMR0,(R1)+
13507 055546  104417                                    KERNEL                  ;ENTER KERNEL MODE
13508 055550                                            POP     BANK
13509 055554  000207                                    RETURN
```

```
13512 055556                                WOOPUP: SUBTST  <<POWER UP FROM BANK 0 TO RELOCATION>>
                                            ;*****************************************************************
                                            ;*SUBTEST       POWER UP FROM BANK 0 TO RELOCATION
                                            ;*****************************************************************
13513 055556  012700  055740                        MOV     #WOOPEND,R0
13514 055562  012701  172340                        MOV     #KIPAR0,R1
13515 055566  012703  172300                        MOV     #KIPDR0,R3
13516 055572  012702  000010                        MOV     #8.,R2
13517 055576  012021                        1$:     MOV     (R0)+,(R1)+
13518 055600  012723  077406                        MOV     #77406,(R3)+
13519 055604  077204                                SOB     R2,1$
13520 055606  005737  002454                        TST     NOSUPER
13521 055612  001002                                BNE     3$
13522 055614  012037  172516                        MOV     (R0)+,MMR3
13523 055620  012037  177576                3$:     MOV     (R0)+,MMR2
13524 055624  012037  177574                        MOV     (R0)+,MMR1
13525 055630  012037  177572                        MOV     (R0)+,MMR0
13526 055634  013706  055370                        MOV     $SAVR6,SP
13527 055640                                        PUSH    BANK
13528 055644  005037  002100                        CLR     BANK
13529 055650                                        MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
13530 055664                                        SUPERVISOR                      ;ENTER SUPERVISOR MODE
13531 055672  013737  055770  060024                MOV     WOOPSAV,FIRST+PWRVEC
13532 055700  013737  055772  060026                MOV     WOOPSAV+2,FIRST+PWRVEC+2
13533                                               ;SIMULATE THE FOLLOWING BLOCK MOV BUT WITH NO STACK ACCESSES
13534                                               ;BMOV   WOOPSAV+4,FIRST+WOOPUP,WOOPEND-WOOPUP/2+12.
13535 055706  012700  055774                        MOV     #WOOPSAV+4,R0
13536 055712  012701  000105                        MOV     #WOOPEND-WOOPUP/2+12.,R1
13537 055716  012702  135556                        MOV     #FIRST+WOOPUP,R2
13538 055722  012022                        2$:     MOV     (R0)+,(R2)+
13539 055724  077102                                SOB     R1,2$
13540
13541 055726  104417                                KERNEL                          ;ENTER KERNEL MODE
13542 055730                                        POP     BANK
13543 055734  000137  054766                        JMP     $PWRUP
13544 055740  000014                  WOOPEND:.REPT 12.
13547 055770  000107                  WOOPSAV:.REPT WOOPEND-WOOPUP/2+12.+2
```

```
13552                                           .SBTTL  IO SUBROUTINES
13553
13554                                           .SBTTL  ROUTINE TYPE
13555
13556                                   ;*******************************************************************************
13557                                   ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
13558                                   ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
13559                                   ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
13560                                   ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
13561                                   ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
13562                                   ;*
13563                                   ;*CALL:
13564                                   ;*1) USING A TRAP INSTRUCTION
13565                                   ;*      TYPE    MESADR          ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
13566                                   ;*OR
13567                                   ;*      TYPE
13568                                   ;*      MESADR
13569                                   ;*
13570
13571 056206  105737  002356   $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
13572 056212  100407                   BMI     6$              ;BR IF NO
13573 056214  010046           1$:     MOV     R0,-(SP)        ;;SAVE R0
13574 056216  017600  000002           MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
13575 056222  112046           4$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
13576 056224  001005                   BNE     7$              ;;BR IF IT ISN'T THE TERMINATOR
13577 056226  005726                   TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
13578 056230  012600           5$:     MOV     (SP)+,R0        ;;RESTORE R0
13579 056232  062716  000002   6$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
13580 056236  000002                   RTI                     ;;RETURN
13581 056240  122716  000011   7$:     CMPB    #HT,(SP)        ;BRANCH IF NOT <HT>
13582 056244  001002                   BNE     11$
13583 056246  112716  000040           MOVB    #' ,(SP)        ;REPLACE TAB WITH SPACE
13584 056252  122716  000200   11$:    CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
13585 056256  001006                   BNE     8$
13586 056260  005726                   TST     (SP)+           ;;POP  <CR><LF> EQUIV
13587 056262                           TYPE                    ;;TYPE A CR AND LF
13588 056264  002646                   $CRLF
13589 056266  105037  056520           CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
13590 056272  000753                   BR      4$              ;;GET NEXT CHARACTER
13591 056274  004737  056334   8$:     CALL    $TYPEC          ;;GO TYPE THIS CHARACTER
13592 056300  123726  002640   9$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
13593 056304  001346                   BNE     4$              ;;IF NO GO GET NEXT CHAR.
13594 056306  013746  002354           MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
13595                                                          ;;AND THE NULL CHAR.
13596 056312  105366  000001   10$:    DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
13597 056316  002770                   BLT     9$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
13598 056320  004737  056334           CALL    $TYPEC          ;;GO TYPE A NULL
13599 056324  105337  056520           DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
13600 056330  000770                   BR      10$             ;;LOOP
13601 056332  000000   XOCHAR: .WORD 0
13602 056334           $TYPEC: PUSH    R1
13603 056336  116601  000004           MOVB    4(SP),R1
13604 056342  005737  002542           TST     CACHKN
13605 056346  001402                   BEQ     2$
13606 056350                           PUSH    CONTRL
13607 056354           2$:     PUSH    R0
13608 056356  104424                   CACHOFF                 ;TURN CACHE OFF
```

```
13633 056360  105777  124250          3$:       TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
13634 056364  100375                            BPL     3$
13635 056366  005037  056332                    CLR     XOCHAR
13636 056372  105777  124232                    TSTB    @$TKS           ;;CHECK FOR XOFF
13637 056376  100032                            BPL     NC              ;;SKIP IF NO CHARACTER
13638 056400  117737  124226  056332            MOVB    @$TKB,XOCHAR    ;;SAVE THE CHARACTER
13639 056406  042737  177600  056332            BIC     #^C177,XOCHAR   ;;STRIP OFF ASCII
13640 056414  023727  056332  000023            CMP     XOCHAR,#023     ;;WAS IT A CONTROL S?
13641 056422  001020                            BNE     NC              ;;BRANCH IF NOT
13642 056424  105777  124200          CONTS3:   TSTB    @$TKS           ;;WAIT FOR CHARACTER
13643 056430  100375                            BPL     CONTS3
13644 056432  117737  124174  056332            MOVB    @$TKB,XOCHAR    ;;GET CHARACTER
13645 056440  042737  177600  056332            BIC     #^C177,XOCHAR   ;;STRIP OFF ASCII
13646 056446                                    IF XOCHAR EQ #21        ;; IF IT IS A ^Q
13647 056456  000402                              BR    NC
13648 056460                                    ELSE
13649 056462  000760                              BR    CONTS3
13650 056464                                    END :OF IF XOCHAR
13651 056464  110177  124146          NC:       MOVB    R1,@$TPB        ;;LOAD CHAR TO BE TYPED INTO DATA REG.
13655 056470  122766  000015  000002            CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
13656 056476  001003                            BNE     1$              ;;BRANCH IF NO
13657 056500  105037  056520                    CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
13658 056504  000406                            BR      $TYPEX          ;;EXIT
13659 056506  122766  000012  000002  1$:       CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
13660 056514  001402                            BEQ     $TYPEX          ;;BRANCH IF YES
13661 056516  105227                            INCB    (PC)+           ;;COUNT THE CHARACTER
13662 056520  000000          $CHARCNT:.WORD    0                       ;;CHARACTER COUNT STORAGE
13663 056522                  $TYPEX:   POP     R0
13664 056524  005737  002542                    TST     CACHKN          ;IS THERE A CACHE?
13665 056530  001402                            BEQ     2$              ;BRANCH IF NOT
13666 056532                                    POP     CONTRL          ;POP CACHE STATUS
13667 056536                  2$:       POP     R1
13668 056540  000207                            RETURN
13669 056542  SUPLIMIT:;!!!!!!!!!!!!!THIS IS THE LIMIT ON SUPERVISOR MAPPED TO MUT SPACE
```

```
14347                                   .SBTTL  ERROR DATA SETUP
14348                           ;
14349                           ;       USE THIS        IF THIS CONDITION DISCRIBES THE ERROR
14350                           ;
14351                           ;       PERR01          TRAP
14352                           ;                       BAD DATA IN R0 UNLESS ABORTED
14353                           ;                               THEN BAD DATA IS POINTED TO BY -(R4)
14354                           ;                       GOOD DATA IN R5
14355                           ;
14356                           ;       PERR02          TRAP
14357                           ;                       BAD DATA IN R1 UNLESS ABORTED
14358                           ;                               THEN BAD DATA IS POINTED TO BY -(R4)
14359                           ;                       GOOD DATA IN R2
14360                           ;
14361                           ;       PERR03          TRAP
14362                           ;                       BAD DATA IS POINTED TO BY -(R1)
14363                           ;                       GOOD DATA IN R4
14364                           ;
14365                           ;       PERR04          TRAP
14366                           ;                       BAD DATA IN R4 UNLESS ABORTED
14367                           ;                               THEN BAD DATA IS POINTED TO BY -2(R0)
14368                           ;                       GOOD DATA IN R2
14369                           ;
14370                           ;       PERR05          JSR     PC
14371                           ;                       BAD DATA IS POINTED TO BY -(R0)
14372                           ;                       GOOD DATA IN R2
14373                           ;                       RETURN AFTER SETTING UP GOOD,BAD,ADDRESS
14374                           ;
14375                           ;       PERR06          JSR     PC
14376                           ;                       BAD DATA IS POINTED TO BY -(R0)
14377                           ;                       GOOD DATA IS ZERO
14378                           ;                       RETURN AFTER SETTING UP GOOD,BAD,ADDRESS
14379                           ;
14380                           ;       PERR07          TRAP
14381                           ;                       BAD DATA IN R2 UNLESS ABORTED
14382                           ;                               THEN BAD DATA IS POINTED TO BY (R1)
14383                           ;                       GOOD DATA IN DATBUF
14384                           ;
14385                           ;       PERR10          TRAP
14386                           ;                       BAD DATA IN R2 UNLESS ABORTED
14387                           ;                               THEN BAD DATA IS POINTED TO BY 2(R1)
14388                           ;                       GOOD DATA IN DATBUF+2
14389                           ;
14390                           ;       PERR11          TRAP
14391                           ;                       BYTE TEST
14392                           ;                       BAD DATA IN RIGHT BYTE OF R0 UNLESS ABORTED
14393                           ;                               THEN BAD DATA IS POINTED TO BY (R1)
14394                           ;                       GOOD DATA IS A ZERO BYTE
14395                           ;
14396                           ;       PERR12          TRAP
14397                           ;                       BYTE TEST
14398                           ;                       BAD DATA IN RIGHT BYTE OF R0 UNLESS ABORTED
14399                           ;                               THEN BAD DATA IS POINTED TO BY (R1)
14400                           ;                       GOOD DATA IS A BYTE OF ONES
14401                           ;
14402                           ;       PERR13          TRAP
14403                           ;                       BAD DATA IN R0 UNLESS ABORTED
```

```
14404                                   ;                       THEN BAD DATA IS POINTED TO BY (R1)
14405                                   ;               GOOD DATA IS ZERO
14406                                   ;
14407                                   ; PERR14      TRAP
14408                                   ;               BAD DATA IN R0 UNLESS ABORTED
14409                                   ;                       THEN BAD DATA IS POINTED TO BY (R1)
14410                                   ;               GOOD DATA IS ONES
14411                                   ;
14412                                   ; PERR15      TRAP
14413                                   ;               BAD DATA IN R0 UNLESS ABORTED
14414                                   ;                       THEN BAD DATA IS POINTED TO BY (R1)
14415                                   ;               GOOD DATA IN TSTDAT
14416                                   ;
14417                                   ; PERR16      TRAP
14418                                   ;               BAD DATA IN R0 UNLESS ABORTED
14419                                   ;                       THEN BAD DATA IS POINTED TO BY (R1)
14420                                   ;               GOOD DATA IN TSTDAT+2
14421                                   ;
14422                                   ; PERR17      TRAP
14423                                   ;               BAD DATA IN R0 UNLESS ABORTED
14424                                   ;                       THEN BAD DATA IS POINTED TO BY (R1)
14425                                   ;               GOOD DATA IN R2
14426                                   ;
14427                                   ; PERR20      TRAP
14428                                   ;               BAD DATA IN R0 UNLESS ABORTED
14429                                   ;                       THEN BAD DATA IS POINTED TO BY (R1)
14430                                   ;               GOOD DATA IN R3
14431                                   ;
14432                                   ; PERR21      TRAP
14433                                   ;               7 BIT BYTE TEST
14434                                   ;               BAD DATA IN RIGHT BYTE OF R0 UNLESS ABORTED
14435                                   ;                       THEN BAD DATA IS POINTED TO BY (R1)
14436                                   ;               GOOD DATA IS A 7 BIT BYTE ON ONES
14437                                   ;
14438                                   ; PERR22      TRAP
14439                                   ;               BAD DATA IN R2 UNLESS ABORTED
14440                                   ;                       THEN BAD DATA IS POINTED TO BY (R1)
14441                                   ;               GOOD DATA IN R0
14442                                   ;
14443                                   ; PERR23      TRAP
14444                                   ;               BAD DATA IN R0 UNLESS ABORTED
14445                                   ;                       THEN BAD DATA IS POINTED TO BY (R1)
14446                                   ;               GOOD DATA IN R4
14447                                   ;
14448                                   ; PERR24      TRAP
14449                                   ;               BAD DATA IN R0 UNLESS ABORTED
14450                                   ;                       THEN BAD DATA IS POINTED TO BY (R2)
14451                                   ;               GOOD DATA IN R3
14452                                   ;
14453                                   ; PERR25      TRAP
14454                                   ;               BAD DATA POINTED TO BY -(R1)
14455                                   ;               GOOD DATA IN R2 UNLESS LOC V177654 IS SET
14456                                   ;                       THEN GOOD DATA IS IN R3
14457                                   ;
14458                                   ; PERR26      TRAP
14459                                   ;               BAD DATA IS DOUBLE WORD POINTED TO BY R1 AND IN LOW 7 BITS OF R0
14460                                   ;               GOOD DATA IS 000000,,100000,,100
```

```
14461
14462                           ;  PERR27        TRAP
14463                           ;                BAD DATA IS DOUBLE WORD POINTED TO BY R1 AND IN LOW 7 BITS OF R0
14464                           ;                GOOD DATA IS 000000,,000000,,077
14465                           ;
14466                           ;  PERR30        TRAP
14467                           ;                BAD DATA IS POINTED TO BY -16(SP)
14468                           ;                GOOD DATA IS IN R1
14469                           ;
14470                           ;  PERR31        TRAP
14471                           ;                SPECIAL ECC FAILURE HANDLER
14472                           ;
14473                           ;  PERR32        TRAP
14474                           ;                SPECIAL ECC FAILURE HANDLER
14475                           ;
14476                           ;  PERR33        TRAP
14477                           ;                SPECIAL ECC FAILURE HANDLER
14478                           ;
14479                           ;  PERR34        TRAP
14480                           ;                SPECIAL ECC FAILURE HANDLER
14481                           ;
14482                           ;  PERR35        TRAP
14483                           ;                SPECIAL BRANCH GOBBLE FAILURE HANDLER
14484                           ;
14485                           ;       CALLING SEQUENCE FOR TRAP TYPES
14486                           ;       BEQ     2$              ;NO - ERROR,BRANCH FOR CARD
14487                           ;       PERRXX                  ;TRAP TO ERROR ROUTINE
14488                           ;2$:    NEXT    INSTRUCTION     ;CONTINUE TESTING
```

ERROR DATA SETUP

```
14491 056542  010437  002032          $PER01: MOV     R4,ADDRESS
14492 056546  162737  000002  002032          SUB     #2,ADDRESS
14493 056554  010037  002050                  MOV     R0,BAD
14494 056560  010537  002042                  MOV     R5,GOOD
14495 056564  000137  057276                  JMP PERRAW
 4496
14497 056570  010437  002032          $PER02: MOV     R4,ADDRESS
14498 056574  162737  000002  002032          SUB     #2,ADDRESS
14499 056602  010137  002050                  MOV     R1,BAD
14500 056606  010237  002042                  MOV     R2,GOOD
14501 056612  000137  057276                  JMP PERRAW
14502
14503 056616  010137  002032          $PER03: MOV     R1,ADDRESS
14504 056622  162737  000002  002032          SUB     #2,ADDRESS
14505 056630  010437  002042                  MOV     R4,GOOD
14506 056634  016137  177776  002050          MOV     -2(R1),BAD
14507 056642  000137  057276                  JMP PERRAW
14508
14509 056646  010037  002032          $PER04: MOV     R0,ADDRESS
14510 056652  162737  000002  002032          SUB     #2,ADDRESS
14511 056660  010437  002050                  MOV     R4,BAD
14512 056664  010237  002042                  MOV     R2,GOOD
14513 056670  000137  057276                  JMP     PERRAW
14514
14515 056674  010237  002042          PERR05: MOV     R2,GOOD
14516 056700  014037  002050          PERA05: MOV     -(R0),BAD
14517 056704  010037  002032                  MOV     R0,ADDRESS
14518 056710  062700  000002                  ADD     #2,R0           ;RESTORE R0
14519 056714  004737  042626                  CALL    BADSTACK
14520 056720  000207                          RETURN
14521
14522 056722  005037  002042          PERR06: CLR     GOOD
14523 056726  000764                          BR      PERA05
14524
14525 056730  010137  002032          $PER07: MOV     R1,ADDRESS
14526 056734  010237  002050                  MOV     R2,BAD
14527 056740  013737  002240  002042          MOV     DATBUF,GOOD
14528 056746  000137  057276                  JMP     PERRAW
14529
14530 056752                          $PER10: LET ADDRESS := R1 + #2
14531 056764                                  LET BAD := R2
14532 056770                                  LET GOOD := DATBUF+2
14533 056776  000137  057276                  JMP     PERRAW
14534
14535 057002                          $PER11: LET ADDRESS := R1
14536 057006                                  LET BAD := R0
14537 057012                                  LET GOOD := #0
14538 057016  000137  057350                  JMP     PERRAB
14539
14540 057022                          $PER12: LET ADDRESS := R1
14541 057026                                  LET BAD := R0
14542 057032                                  LET GOOD := #377
14543 057040  000137  057350                  JMP     PERRAB
```

```
14546 057044                            $PER13: LET ADDRESS := R1
14547 057050                                    LET BAD := R0
14548 057054                                    LET GOOD := #0
14549 057060  000137  057276                    JMP     PERRAW
14550
14551 057064                            $PER14: LET ADDRESS := R1
14552 057070                                    LET BAD := R0
14553 057074                                    LET GOOD := ONES
14554 057102  000137  057276                    JMP     PERRAW
14555
14556 057106                            $PER15: LET ADDRESS := R1
14557 057112                                    LET BAD := R0
14558 057116                                    LET GOOD := TSTDAT
14559 057124  000137  057276                    JMP     PERRAW
14560
14561 057130                            $PER16: LET ADDRESS := R1
14562 057134                                    LET BAD := R0
14563 057140                                    LET GOOD := TSTDAT+2
14564 057146  000453                            BR      PERRAW
14565
14566 057150                            $PER17: LET ADDRESS := R1
14567 057154                                    LET BAD := R0
14568 057160                                    LET GOOD := R2
14569 057164  000444                            BR      PERRAW
14570
14571 057166                            $PER20: LET ADDRESS := R1
14572 057172                                    LET BAD := R0
14573 057176                                    LET GOOD := R3
14574 057202  000435                            BR      PERRAW
14575
14576 057204                            $PER21: LET ADDRESS := R1
14577 057210                                    LET BAD := R0
14578 057214                                    LET GOOD := #177
14579 057222  000477                            BR      PERRA7
14580
14581 057224                            $PER22: LET ADDRESS := R1
14582 057230                                    LET BAD := R2
14583 057234                                    LET GOOD := R0
14584 057240  000416                            BR      PERRAW
14585
14586 057242                            $PER23: LET ADDRESS := R1
14587 057246                                    LET BAD := R0
14588 057252                                    LET GOOD := R4
14589 057256  000407                            BR      PERRAW
14590
14591 057260                            $PER24: LET ADDRESS := R2
14592 057264                                    LET BAD := R0
14593 057270                                    LET GOOD := R3
14594 057274  000400                            BR      PERRAW
```

ERROR DATA SETUP

```
14596 057276                            PERRAW: SUBTST  <<DATA WAS A WORD>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       DATA WAS A WORD
                                        ;*****************************************************************************
14597 057276  004737  057532                      CALL    PERBNK
14598 057302                                      IF ABORTFLAG IS TRUE THEN $CALL GETDATA
14599 057314                                      IF BADPC EQ #0 THEN $CALL BADSTACK
14600 057326  004737  057506                      CALL    PERXOR
14601 057332                                      IF ABORTFLAG IS FALSE
14602 057340  104011                                ERROR +11
14603 057342                                      ELSE
14604 057344  104012                                ERROR +12
14605 057346                                      END ;OF IF ABORTFLAG
14606 057346  000002                              RTI
14607
14608 057350                            PERRAB: SUBTST  <<DATA WAS A BYTE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       DATA WAS A BYTE
                                        ;*****************************************************************************
14609 057350  004737  057532                      CALL    PERBNK
14610 057354                                      IF ABORTFLAG IS TRUE THEN $CALL GETDATA
14611 057366                                      IF BADPC EQ #0 THEN $CALL BADSTACK
14612 057400  004737  057506                      CALL    PERXOR
14613 057404                                      IF ABORTFLAG IS FALSE
14614 057412  104014                                ERROR +14
14615 057414                                      ELSE
14616 057416  104015                                ERROR +15
14617 057420                                      END ;OF IF ABORTFLAG
14618 057420  000002                              RTI
```

```
14621 057422                            PERRA7: SUBTST  <<DATA WAS A 7 BIT BYTE>>
                                        ;*************************************************************************
                                        ;*SUBTEST       DATA WAS A 7 BIT BYTE
                                        ;*************************************************************************
14622 057422                                    IF BADPC EQ #0 THEN $CALL BADSTACK
14623 057434  004737  057506                      CALL    PERXOR
14624 057440  004737  057532                      CALL    PERBNK
14625 057444  104022                              ERROR   +22
14626 057446  000002                              RTI
14627
14628 057450                            $PER26: LET GOOD2 := #100000
14629 057456                                    LET GOOD3 := #100
14630 057464  000137  054100                     JMP PERRA3
14631
14632 057470  005037  002044            $PER27: CLR     GOOD2
14633 057474                                    LET GOOD3 := #077
14634 057502  000137  054100                     JMP PERRA3
14635
14636 057506                            PERXOR: SUBTST  <<DETERMINE XOR OF GOOD & BAD>>
                                        ;*************************************************************************
                                        ;*SUBTEST       DETERMINE XOR OF GOOD & BAD
                                        ;*************************************************************************
14637 057506                                    PUSH    R0
14638 057510  013700  002042                     MOV     GOOD,R0
14639 057514  013737  002050  002056             MOV     BAD,BADXOR
14640 057522  074037  002056                     XOR     R0,BADXOR
14641 057526                                    POP     R0
14642 057530  000207                              RETURN
```

DETERMINE XOR OF GOOD & BAD

```
14645 057532                                PERBNK: SUBTST<<LOG ERROR ON BAD BANK>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       LOG ERROR ON BAD BANK
                                            ;*****************************************************************************
14646                                               ;WHILE WE'RE HERE LET'S MARK THE BAD BANK IN THE CONFIGURATION TABLE
14647 057532                                        PUSH    R0,R1
14648 057536  013701  002100                        MOV     BANK,R1
14649 057542  006301                                ASL     R1
14650 057544  006301                                ASL     R1
14651 057546  052761  000001  002652                BIS     #BIT0,CONFIG(R1)
14652 057554  105261  002654                        INCB    CONFIG+2(R1)            ;BUMP BANK COUNTER
14653 057560  001002                                BNE     12$                     ;NO OVERFLOW - SKIP
14654 057562  105361  002654                        DECB    CONFIG+2(R1)            ;SET BACK TO 255.
14655 057566  126137  002654  002552  12$:        CMPB    CONFIG+2(R1),ERRMAX     ;IS IT PAST MAX?
14656 057574  101403                                BLOS    11$                     ;NO - SKIP
14657 057576                                        SET     TOOMANY                 ;YES
14658 057604                                11$:    POP     R1,R0
14659 057610  000207                                RETURN
14660
14661 057612  010037  002050                PERECC: MOV     R0,BAD
14662 057616                                        IF ADDRESS EQ TESTADD
14663 057626  013737  002244  002042                  MOV TSTDAT,GOOD
14664 057634                                        ELSE
14665 057636  013737  002246  002042                  MOV   TSTDAT+2,GOOD
14666 057644                                        END ;OF IF (R1)
14667 057644  004737  057506                        CALL    PERXOR
14668 057650                                        SET     HEADER
14669 057656  000207                                RETURN
14670
14671 057660                                $PER31: IF REALPAT EQ #41
14672 057670  104023                                   ERROR +23
14673 057672                                        END
14674 057672                                        IF BADPC EQ #0 THEN $CALL BADSTACK
14675 057704  004737  057612                        CALL    PERECC
14676 057710                                        IF REALPAT EQ #11
14677 057720  104037                                  ERROR +37
14678 057722                                        END ;OF IF REALPAT
14679 057722                                        IF REALPAT EQ #15
14680 057732  104043                                  ERROR +43
14681 057734                                        END ;OF IF REALPAT
14682 057734                                        IF REALPAT EQ #16
14683 057744  104044                                  ERROR +44
14684 057746                                        END ;OF IF REALPAT
14685 057746                                        SET HEADER
14686 057754  000002                                RTI
```

LOG ERROR ON BAD BANK

```
14689 057756                                $PER32: IF BADPC EQ #0 THEN $CALL BADSTACK
14690 057770  010137  002032                        MOV     R1,ADDRESS
14691 057774  010037  002050                        MOV     R0,BAD
14692 060000  010237  002042                        MOV     R2,GOOD
14693 060004                                        SET     HEADER
14694 060012  104040                                ERROR   +40
14695 060014                                        SET     HEADER
14696 060022  000002                                RTI
14697
14698 060024                                $PER33: IF BADPC EQ #0 THEN $CALL BADSTACK
14699 060036  010137  002032                        MOV     R1,ADDRESS
14700 060042  010037  002050                        MOV     R0,BAD
14701 060046  105037  002051                        CLRB    BAD+1
14702 060052  012737  000377  002042                MOV     #377,GOOD
14703 060060  004737  057?                           CALL    PERXOR
14704 060064                                        SET     HEADER
14705 060072  104041                                ERROR   +41
14706 060074                                        SET     HEADER
14707 060102  000002                                RTI
14708
14709 060104                                $PER34:IF BADPC EQ #0 THEN $CALL BADSTACK
14710 060116                                        IF #BIT15!BIT4 OFF.IN CSR
14711 060126  104016                                  ERROR +16                     ;NO SBE OR DBE
14712 060130                                        ELSE
14713 060132  104001                                  ERROR +1                      ;EXPECTED SBE SO DBE MUST HAVE GOTTEN SET
14714 060134                                        END ;OF IF #BIT15!BIT4
14715 060134  000002                                RTI
14716
14717                                               ;DURING BRANCH GOBBLE THE CONDITION CODES WERE WRONG
14718 060136  004737  057532                $PER35: CALL    PERBNK
14719 060142  004737  042626                        CALL    BADSTACK
14720 060146  013737  002030  002050                MOV     BADPSW,BAD
14721 060154  012737  000012  002042                MOV     #12,GOOD
14722 060162  104047                                ERROR   +47
14723 060164  062706  000004                        ADD     #4,SP                 ;FIX STACK FROM TRAP
14724 060170  000207                                RETURN                        ;ABORTING TEST
14725
14726 060172  010037  002042          $PER36:       MOV     R0,GOOD
14727 060176  010137  002050                        MOV     R1,BAD
14728 060202                                        SET     HEADER
14729 060210  104023                                ERROR   +23
14730 060212                                        SET     HEADER
14731 060220  000002                                RTI
14732
14733 060222  104053                $PER37:       ERROR   +53                   ;ILC;;REV B
14734 060224  000002                                RTI                           ;ILC;;REV B
14735
14736 060226  104054                $PER40:       ERROR   +54                   ;ILC;;REV B
14737 060230  000002                                RTI                           ;ILC;;REV B
```

```
                                        .SBTTL  ROUTINE SCOPE HANDLER
                                ;*******************************************************************************
                                ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                                ;*AND LOAD THE DISPLAY DATA INTO THE DISPLAY REGISTER
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW14=1         LOOP ON TEST
                                ;*SW9=1 LOOP ON ERROR
                                ;*CALL
                                ;*      SCOPE           ;;SCOPE=IOT
060232  005237  065714         $SCOPE: INC     $DEVCT          ;TELL APT WE ARE ALIVE
060236                                 IF RESULT IS LT
060240  005037  065714                   CLR   $DEVCT
060244  105237  065716                   INCB  $UNIT
060250                                 END ;OF IF RESULT
060250  104410                         CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
060252  005737  006206                 TST     TRACE
060256  001402                         BEQ     NOTRCE
060260  004737  064210                 CALL    CONTT           ;TRACE
060264                                 NOTRCE:
060264  005737  061366                 TST     CPERRF          ;IS THERE A CPU ERROR REGISTER?         ;R-C
060270  001410                         BEQ     SKJ             ;BRANCH IF NOT                          ;R-C
060272  013737  177766  061364         MOV     @#177766,CPSAVE ;GET CONTENTS OF ERROR REGISTER         ;R-C
060300  032737  000001  061364         BIT     #BIT0,CPSAVE    ;IS THE POWER FAIL MONITOR BIT SET?     ;R-C
060306  001401                         BEQ     SKJ             ;BRANCH IF NOT                          ;R-C
060310  104177                         ERROR   +177            ;REPORT IF SO                           ;R-C
060312                                 SKJ:    IF STOPOK IS TRUE AND #SW8 SET.IN @SWR                  ;R-C
060330  005037  002416                   CLR   STOPOK
060334  000137  047644                   JMP   EXIT
060340                                 END ;OF IF STOPOK
060340                                 IF NOSCOPE IS TRUE
060346  000002                           RTI
060350                                 END ;OF IF NOSCOPE
060350                                 1$:     IF #SW14 SET.IN @SWR THEN GOTO $OVER
                                ;#####START OF CODE FOR THE XOR TESTER#####
060360  000425                 $XTSTR: BR      2$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                               ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
060362  013746  000004                 MOV     ERRVEC,-(SP)    ;;SAVE THE CONTENTS OF THE ERROR VECTOR
060366  012737  060406  000004         MOV     #1$,ERRVEC      ;;SET FOR TIMEOUT
060374  005737  177060                 TST     177060  ;;TIME OUT ON XOR?
060400  012637  000004                 MOV     (SP)+,ERRVEC    ;;RESTORE THE ERROR VECTOR
060404  000430                         BR      $SVLAD          ;;GO TO THE NEXT TEST
060406  062706  000004         1$:     ADD     #4,SP           ;FIX STACK FROM TRAP
060412  022737  000001  003754         CMP     #1,PROTYP       ;IS THIS AN 11/44?
060420  001002                         BNE     6$              ;BRANCH IF NOT
060422  005037  177766                 CLR     CPUERR          ;RESET CPU ERROR REGISTER
060426  012637  000004         6$:     MOV     (SP)+,ERRVEC    ;;RESTORE THE ERROR VECTOR
060432  000407                         BR      4$              ;;LOOP ON THE PRESENT TEST
060434                                 2$:;#####END OF CODE FOR THE XOR TESTER#####
060434  105737  002012         3$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
060440  001412                         BEQ     $SVLAD          ;;BR IF NO
060442  032777  001000  122154         BIT     #SW9,@SWR       ;;LOOP ON ERROR?
060450  001404                         BEQ     5$              ;;BR IF NO
060452  013737  002612  002610 4$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
060460  000410                         BR      $OVER
060462  105037  002012         5$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
060466  011637  002610         $SVLAD: MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
060472  011637  002612                 MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
```

```
 14805 060476  005037  002360                    CLR     $ESCAPE          ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
 14806 060502  004737  060514          $OVER:    CALL    GETDIS
 14807 060506  013716  002610                    MOV     $LPADR,(SP)      ;;FUDGE RETURN ADDRESS
 14808 060512  000002                            RTI                      ;;FIXES PS
```

```
 14810 060514                           GETDIS: SUBTST  <<SUBR  DISPLAY>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    DISPLAY
                                        ;*****************************************************************************
 14811 060514  113737  002100  002011          MOVB    BANK,$BANK
 14812 060522  113737  002276  002010          MOVB    REALPAT,$PATMAR
 14813 060530                                  PUSH    R0
 14814 060532  005737  002124                  TST     RLFLAG                  ;ARE WE RELOCATED?
 14815 060536  001403                          BEQ     1$                      ;NO - SKIP
 14816 060540  052737  100000  002010          BIS     #BIT15,$PATMAR          ;YES - SET MSB
 14817 060546                           1$:
 14821 060546  013777  002010  122052          MOV     $PATMAR,@DISPLAY
 14822 060554  013737  002010  000174          MOV     $PATMAR,DISPREG         ;SOFTWARE DISPLAY REGISTER
 14823 060562                                  POP     R0
 14824 060564  000207                          RETURN
```

```
14827                                           .SBTTL  ROUTINE ERROR HANDLER
14828                                   ;*******************************************************************************
14829                                   ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
14830                                   ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
14831                                   ;*AND GO TO $ERRTYP ON ERROR
14832                                   ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE.
14833                                   ;*SW15=1         HALT ON ERROR
14834                                   ;*SW13=1         INHIBIT ERROR TYPEOUTS
14835                                   ;*SW10=1         BELL ON ERROR
14836                                   ;*SW9=1 LOOP ON ERROR
14837                                   ;*CALL
14838                                   ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
14839
14840                                           .ENABL  LSB
14841 060566  105037  061362      $ERROR: CLRB    IBSAVE                                          ;R-C
14842 060572                              IF NOERROR IS FALSE
14843 060600  104410                        CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
14844 060602                              BACK:                                                   ;R-C
14845 060602  105237  002012              1$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
14846 060606  001775                              BEQ     1$              ;;DON'T LET THE FLAG GO TO ZERO
14847 060610  004737  060514                      CALL    GETDIS          ;SETUP DISPLAY STUFF
14848 060614  013737  002010  065710              MOV     $PATMAR,$TESTN  ;FOR APT
14849 060622  032777  002000  121774              BIT     #SW10,@SWR      ;;BELL ON ERROR?
14850 060630  001404                              BEQ     2$              ;;NO - SKIP
14851 060632                                      TYPE    $BELL           ;;RING BELL
14852 060636                                      TYPE    MSG014          ;CONTROL Z
14853 060642  005237  002616              2$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
14854 060646                                      IF RESULT IS MI
14855 060650  012737  077777  002616                MOV #77777,$ERTTL
14856 060656                                      END ;OF IF RESULT
14857 060656                              END ;OF IF NOERROR
14858 060656  011637  002016              MOV     (SP),ERRPC      ;;GET ADDRESS OF ERROR INSTRUCTION
14859 060662  162737  000002  002016      SUB     #2,ERRPC
14860 060670  010637  002022              MOV     SP,ERRSP
14861 060674  016637  000002  002026      MOV     2(SP),ERRPSW
14862 060702  117737  121110  002013      MOVB    @ERRPC,$ITEMB   ;;STRIP AND SAVE THE ERROR ITEM CODE
14863
14864 060710  122737  000177  002013      CMPB    #177,$ITEMB     ;IS THIS THE POWER FAIL CALL?           ;R-C
14865 060716  001431                      BEQ     1001$           ;BRANCH IF SO                           ;R-C
14866 060720  105737  061362              TSTB    IBSAVE          ;2ND ERROR CALL?                        ;R-C
14867 060724  001024                      BNE     1000$           ;BRANCH IF SO                           ;R-C
14868 060726  005737  061366              TST     CPERRF          ;IS THERE A CPU ERROR REGISTER?         ;R-C
14869 060732  001423                      BEQ     1001$           ;BRANCH IF NOT                          ;R-C
14870 060734  013737  177766  061364      MOV     177766,CPSAVE   ;SAVE CONTENTS                          ;R-C
14871 060742  032737  000001  061364      BIT     #BIT0,CPSAVE    ;POWER MONITOR BIT SET?                 ;R-C
14872 060750  001414                      BEQ     1001$           ;BRANCH IF NOT                          ;R-C
14873 060752  042737  000001  177766      BIC     #BIT0,177766    ;CLEAR THE BIT                          ;R-C
14874 060760  112737  002013  061362      MOVB    #$ITEMB,IBSAVE  ;MAKE IBSAVE NON-ZERO FOR DUAL CALL     ;R-C
14875 060766  112737  000177  002013      MOVB    #177,$ITEMB     ;SET $ITEMB TO POWER FAIL POINTER       ;R-C
14876 060774  000402                      BR      1001$                                                   ;R-C
14877 060776  105037  061362      1000$:  CLRB    IBSAVE                                                  ;R-C
14878 061002                      1001$:                                                                  ;R-C
14879 061002                              IF NOERROR IS FALSE
14880 061010                                IF BADPC NE #0
14881 061016  013737  002020  002016          MOV BADPC,ERRPC
14882 061024  162737  000002  002016          SUB #2,ERRPC
14883 061032  013737  002024  002022          MOV BADSP,ERRSP
```

```
14884 061040  013737  002030  002026              MOV BADPSW,ERRPSW
14885 061046  005037  002020                      CLR BADPC
14886 061052                                    END ;IF
14887 061052  013737  002016  065706            MOV   ERRPC,$FATAL     ;FOR APT
14888 061060  004737  057532                    CALL PERBNK            ;;LOG ERROR ON BANK
14889 061064                                    IF #SW13 SET.IN @SWR
14890 061074  000420                              BR  3$
14891 061076                                    END ;OF IF #SW13
14892 061076                                    IF #SW5 SET.IN @SWR AND TOOMANY IS TRUE
14893 061114                                      GOTO 3$
14894 061116                                    END ;OF IF #SW5
14895 061116                                  END ;OF IF NOERROR
14896 061116  004737  061370                  CALL    $ERRTYP          ;;GO TO USER ERROR ROUTINE
14897 061122                                  IF MONFLG IS TRUE        ;;SHOULD WE RETURN TO XXDP MONITOR???
14898 061130  013706  002272                    MOV  SAVMON,SP         ;;GET MONITOR ADDRESS
14899 061134  000207                            RTS  PC                ;;GO TO MONITOR
14900 061136                                  END                      ;;
```

```
14902 061136                                    3$:     IF NOERROR IS FALSE
14903 061144  005777  121454                              TST   @SWR              ;;HALT ON ERROR
14904 061150  100002                                      BPL   7$                ;;SKIP IF CONTINUE
14905 061152  000000                            $HALT:    HALT                    ;;HALT ON ERROR!
14906 061154  104410                                      CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
14907 061156                                    7$:       IF NOSCOPE IS FALSE AND #SW9 SET.IN @SWR
14908 061174  013716  00<612                                MOV $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
14909 061200                                              END ;OF IF NOSCOPE
14910 061200  005737  002360                              TST   $ESCAPE           ;;CHECK FOR AN ESCAPE ADDRESS
14911 061204  001402                                      BEQ   9$                ;;BR IF NONE
14912 061206  013716  002360                              MOV   $ESCAPE,(SP)      ;;FUDGE RETURN ADDRESS FOR ESCAPE
14913 061212                                    9$:       IF DETFLAG IS FALSE
14914 061220  022737  000001  003754                        CMP #1,PROTYP                 ;IS THIS AN 11/44?
14915 061226  001002                                        BNE 11$
14916 061230  005037  177766                                CLR CPUERR
14917 061234                                          11$: IF ACTFLAG IS TRUE OR APTFLAG IS TRUE OR FATAL$ IS TRUE
14918 061256  012737  000001  065704                          MOV       #1,$MSGTY       ;FOR APT
14919 061264  000137  047644                                JMP       EXIT
14920 061270                                              END ;OF IF ACTFLAG
14921 061270                                              IF XXDPCHAIN IS TRUE AND $ERTTL HI #20
14922 061306                                                TYPE      MSG066          ;ERROR COUNT EXCEEDED 20 - ABORTING FOR XXDP CHAIN
14923 061312  013700  000042                                MOV       42,R0
14924 061316  005037  000042                                CLR       42
14925 061322  000137  015214                                JMP       $ZAP42
14926 061326                                              END ;OF IF XXDPCHAIN
14927 061326                                            END ;OF IF DETFLAG
14928 061326                                          ELSE
14929 061330                                            SET   HEADER
14930 061336                                    3$:     END ;OF IF NOERROR
14931 061336                                    10$:    CLEAR   TOOMANY,NOERROR
14932 061346  105737  061362                            TSTB    IBSAVE                ;POWER FAIL ERROR CALL? ;R-C
14933 061352  001402                                    BEQ     213$                  ;                       ;R-C
14934 061354  000137  060602                            JMP     BACK                  ;JUMP IF SO             ;R-C
14935 061360  000002                            213$:   RTI                     ;;RETURN
14936 061362  000000                            IBSAVE: .WORD 0                                               ;R-C
14937 061364  000000                            CPSAVE: .WORD 0                                               ;R-C
14938 061366  000000                            CPERRF: .WORD 0                                               ;R-C
14939                                                   .DSABL  LSB
```

```
                                        .SBTTL  ROUTINE ERROR MESSAGE TYPEOUT

                                ;*********************************************************************
                                ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
                                ;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE" ($ERRTB),
                                ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.

061370  104415                  $ERRTYP:SAVREG
061372                                  TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
061376  005000                          CLR     R0              ;;PICKUP THE ITEM INDEX
061400  153700  002013                  BISB    $ITEMB,R0
061404  001004                          BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                                ;;TYPE THE PC OF THE ERROR
061406                                  TYPOCT  ERRPC,<ERROR ADDRESS>
061414  000511                          BR      11$             ;;GET OUT
061416  122700  000177          1$:     CMPB    #177,R0         ;POWER MONITOR CALL?                    ;R-C
061422  001003                          BNE     100$            ;BRANCH IF NOT                          ;R-C
061424  012700  061700                  MOV     #PFECWS,R0      ;MOV ADDRESS OF PFE BIT ERROR TO R0     ;R-C
061430  000406                          BR      110$                                                    ;R-C
061432  005300                  100$:   DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL      ;R-C
061434  006300                          ASL     R0              ;;      WORK FOR THE ERROR TABLE
061436  006300                          ASL     R0
061440  006300                          ASL     R0
061442  062700  066326                  ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
061446  012037  061504          110$:   MOV     (R0)+,3$        ;;PICKUP "ERROR MESSAGE" POINTER        ;R-C
061452  001417                          BEQ     4$              ;;SKIP TYPEOUT IF NO POINTER
061454  005737  002426                  TST     NOERROR         ;IS THIS REALLY AN ERROR?
061460  001003                          BNE     12$             ;YES - SKIP
061462  005737  002                     TST     HEADER          ;TYPE HEADER?
061466  100011                          BPL     4$              ;NO - SKIP
061470  005737  002062          12$:    TST     FATAL$          ;WAS IT A FATAL ERROR?
061474  001402                          BEQ     2$              ;NO - SKIP
061476                                  TYPE    MSG067          ;FATAL
061502                          2$:     TYPE                    ;;TYPE THE "ERROR MESSAGE"
061504  000000                  3$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
061506                                  TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
061512  012037  061536          4$:     MOV     (R0)+,5$        ;;PICKUP "DATA HEADER" POINTER
061516  001412                          BEQ     6$              ;;SKIP TYPEOUT IF 0
061520  005737  002426                  TST     NOERROR         ;IS THIS REALLY AN ERROR?
061524  001003                          BNE     13$             ;YES - SKIP
061526  005737  002600                  TST     HEADER          ;TYPE HEADER?
061532  100004                          BPL     6$              ;NO - SKIP
061534                          13$:    TYPE                    ;;TYPE THE "DATA HEADER"
061536  000000                  5$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
061540                                  TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
061544  012001                  6$:     MOV     (R0)+,R1        ;;PICKUP "DATA TABLE" POINTER
061546  001427                          BEQ     10$             ;;BR IF NO DATA TO BE TYPED
061550  012002                          MOV     (R0)+,R2        ;;PICKUP "DATA FORMAT" POINTER
```

```
14992 061552  112203                  7$:     MOVB    (R2)+,R3
14993 061554  006303                          ASL     R3              ;MAKE IT A WORD ADDRESS
14994 061556  004773  061564                    CALL    @8$(R3)
14995 061562  000412                          BR      9$
14996 061564  062010                  8$:     TAG70$
14997 061566  062020                          TAG71$
14998 061570  062030                          TAG72$
14999 061572  062100                          TAG73$
15000 061574  062140                          TAG74$
15001 061576  062152                          TAG75$
15002 061600  062164                          TAG76$
15003 061602  062230                          TAG77$
15004 061604  062236                          TAG78$
15005 061606  062316                          TAG79$
15010 061610  062701  000002            9$:     ADD     #2,R1           ;UPDATE DATA TABLE POINTER
15011 061614  005711                          TST     (R1)            ;;IS THERE ANOTHER NUMBER?
15012 061616  001403                          BEQ     10$             ;;BR IF NO
15013 061620                                  TYPE    MSG018          ;TYPE 2 SPACES
15014 061624  000752                          BR      7$              ;;LOOP
15015
15016 061626  005737  002106            10$:    TST     MUT             ;IS THERE A MEMORY UNDER TEST
15017 061632  001402                          BEQ     11$             ;NO - SKIP
15018 061634  005237  002600                    INC     HEADER          ;YES - BUMP HEADER FLAG
15019 061640  104416                  11$:    RESREG
15020 061642                                  IF #SW7 SET.IN @SWR AND DETFLAG IS FALSE AND NOERROR IS FALSE
15021 061666  004737  062340                      CALL  DETAIL
15022 061672                                  END ;OF IF #SW7
15023 061672                                  TYPE    MSG104          ;CONTROL Z
15024 061676  000207                          RETURN
15025                                         .EVEN                                   ;R-C
15026 061700  061710  061744  061774  PFECWS: .WORD   PFECEM,PFECDH,PFECDT,PFECDF     ;R-C
      061706  062004
15027 061710    120     117     127   PFECEM: .ASCIZ  'POWER MONITOR BIT FOUND SET'   ;R-C
      061713    105     122     040
      061716    115     117     116
      061721    111     124     117
      061724    122     040     102
      061727    111     124     040
      061732    106     117     125
      061735    116     104     040
      061740    123     105     124
      061743    000
15028 061744    124     105     123   PFECDH: .ASCIZ  "TESTNO  ERR PC  CPUERR"        ;R-C
      061747    124     116     117
      061752    040     040     105
      061755    122     122     040
      061760    120     103     040
      061763    040     103     120
      061766    125     105     122
      061771    122     000
15029                                         .EVEN                                   ;R-C
15030 061774  065710  002016  061364  PFECDT: .WORD   $TESTN,ERRPC,CPSAVE,0           ;R-C
      062002  000000
15031 062004    000     000     000   PFECDF: .BYTE   0,0,0,0                         ;R-C
      062007    000
15032
```

```
15035                                   ;*****************************************************************************
15036                                   ;*** OCTAL ***
15037                                   ;*****************************************************************************
15038 062010                            TAG70$: TYPOCT  @(R1)           ;;TYPE AN OCTAL NUMBER
15039 062016  000207                            RETURN
15040
15041                                   ;*****************************************************************************
15042                                   ;*** DECIMAL ***
15043                                   ;*****************************************************************************
15044 062020                            TAG71$: TYPDEC  @(R1)           ;;TYPE A DECIMAL NUMBER
15045 062026  000207                            RETURN
15046
15047                                   ;*****************************************************************************
15048                                   ;*** INTERLEAVE ***
15049                                   ;*****************************************************************************
15050 062030                            TAG72$: PUSH    R1,R5
15051 062034  013701  002100                    MOV     BANK,R1
15052 062040  070127  000004                    MUL     #4,R1
15053 062044                                    SET     NOTAB                   ;INDICATE NO TABLE TO BE PRINTED - NOW
15054 062052                                    TYPE    MSG014
15055 062056  004737  041740                    CALL    TCFIG1
15056 062062  005037  002370                    CLR     NOTAB
15057 062066                                    POP     R5,R1
15058 062072                                    TYPE    MSG014                  ;1 SPACE
15059 062076  000207                            RETURN
15060
15061                                   ;*****************************************************************************
15062                                   ;*** CSR ***
15063                                   ;*****************************************************************************
15064 062100                            TAG73$: PUSH    R1,R5
15065 062104  013701  002100                    MOV     BANK,R1
15066 062110  070127  000004                    MUL     #4,R1
15067 062114                                    SET     NOTAB
15068 062122  004737  042234                    CALL    TCFIG3
15069 062126  005037  002370                    CLR     NOTAB
15070 062132                                    POP     R5,R1
15071 062136  000207                            RETURN
15072
15073                                   ;*****************************************************************************
15074                                   ;*** PATTERN ***
15075                                   ;*****************************************************************************
15076 062140                            TAG74$: TYPOCS  REALPAT,<TYPE (0-77)>,2,Z
15077 062150  000207                            RETURN
15078
15079                                   ;*****************************************************************************
15080                                   ;*** BANK ***
15081                                   ;*****************************************************************************
15082 062152                            TAG75$: TYPOCS  BANK,<TYPE (0-167)>,3
15083 062162  000207                            RETURN
```

```
15085                                   ;*****************************************************************************
15086                                   ;*** MTYPE ***
15087                                   ;*****************************************************************************
15088 062164                            TAG76$: PUSH    R1,R5
15089 062170  013701  002100                    MOV     BANK,R1
15090 062174  070127  000004                    MUL     #4,R1
15091 062200                                    SET     NOTAB
15092 062206                                    TYPE    MSG019
15093 062212  004737  042100                    CALL    TCFIG2
15094 062216  005037  002370                    CLR     NOTAB
15095 062222                                    POP     R5,R1
15096 062226  000207                            RETURN
15097
15098                                   ;*****************************************************************************
15099                                   ;*** UNKNOWN DATA ***
15100                                   ;*****************************************************************************
15101 062230                            TAG77$: TYPE    MSG061
15102 062234  000207                            RETURN
15103
15104                                   ;*****************************************************************************
15105                                   ;*** PHYSICAL ADDRESS ***
15106                                   ;*****************************************************************************
15107 062236  013737  002032  002036  TAG78$: MOV     ADDRESS,PHYADD
15108 062244  162737  060000  002036          SUB     #FIRST,PHYADD
15109 062252  013737  002100  002040          MOV     BANK,PHYADD+2
15110 062260  006237  002040                  ASR     PHYADD+2
15111 062264  103003                          BCC     1$
15112 062266  052737  100000  002036          BIS     #BIT15,PHYADD
15113 062274  012746  002036          1$:     MOV     #PHYADD,-(SP)           ;POINTER TO DOUBLE WORD ON STACK
15114 062300  004737  065564                  CALL    $DB2O                   ;CALL DOUBLE PRECISION CONVERSION ROUTINE
15115 062304  062706  000002                  ADD     #2,SP                   ;FIX STACK
15116 062310                                    TYPE    $OCT8
15117 062314  000207                            RETURN
15118
15119                                   ;*****************************************************************************
15120                                   ;*** OCTAL BYTE ***
15121                                   ;*****************************************************************************
15122 062316                            TAG79$: TYPE    MSG018          ;2 SPACES
15123 062322                                    TYPOCS  @(R1),<TYPE BYTE>,3,Z
15124 062332                                    TYPE    MSG014          ;SPACE
15125 062336  000207                            RETURN
```

```
15169 062340                            DETAIL: SUBTST  <<SUBR  DETAILED ERROR REPORT>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    DETAILED ERROR REPORT
                                        ;*****************************************************************************
15170 062340  005237  002216                      INC     DETFLAG
15171 062344  022737  000003  002216              CMP     #3,DETFLAG
15172 062352  101473                              BLOS    4$
15173 062354  022737  000002  002216              CMP     #2,DETFLAG
15174 062362  001435                              BEQ     2$
15175 062364                                      PUSH    HEADER,MUT
15176 062374                                      SET     HEADER
15177 062402  005037  002106                      CLR     MUT
15178 062406  010037  002176                      MOV     R0,DETR0
15179 062412  012700  002200                      MOV     #DETR1,R0
15180 062416  010120                              MOV     R1,(R0)+
15181 062420  010220                              MOV     R2,(R0)+
15182 062422  010320                              MOV     R3,(R0)+
15183 062424  010420                              MOV     R4,(R0)+
15184 062426  010520                              MOV     R5,(R0)+
15185 062430  013720  002022                      MOV     ERRSP,(R0)+
15186 062434  013720  002026                      MOV     ERRPSW,(R0)+
15187 062440  013700  002176                      MOV     DETR0,R0
15188 062444                                      SET     NOERROR
15189 062452  104013                              ERROR   +13
15190 062454  000423                              BR      1$
15191 062456                            2$:       PUSH    HEADER,MUT
15192 062466                                      SET     HEADER
15193 062474  005037  002106                      CLR     MUT
15194 062500                                      SET     NOERROR
15195 062506  104031                              ERROR   +31
15196 062510  022737  000001  003754              CMP     #1,PROTYP               ;IS THIS AN 11/44?
15197 062516  001002                              BNE     1$
15198 062520  005037  177766                      CLR     CPUERR
15199 062524                            1$:       POP     MUT,HEADER
15200                                             ;WARNING RECURSIVE
15201 062534  004737  062340                      CALL    DETAIL
15202 062540  000207                              RETURN
```

```
15205
15206 062542  004737  064210          4$:     CALL    CONTT                   ;DISPLAY 'DISPLAY'' INFO
15207
15208                                         ;TYPE CONTENTS OF ALL CSR'S
15209 062546                                  PUSH    CSR,CSRNO,R1
15210 062560                                  TYPE    MSG058
15211 062564                                  TYPE    $CRLF
15212 062570  013701  002222                  MOV     TOTCSRS,R1
15213 062574                                  BEGIN DUMPCSRLOOP
15214 062574                                    FOR CSRNO := #0 TO #36 BY #2
15215 062600  006301                              ASL         R1
15216 062602                                      ON.ERROR
15217 062604  104426                                READCSR
15218 062606                                        TYPOCT    CSR
15219 062614                                        TYPE      MSG018            ;2 SPACES
15220 062620                                      END ;OF ON.ERROR
15221 062620                                      IF R1 EQ #0 THEN LEAVE DUMPCSRLOOP
15222 062624                                    END ;OF FOR CSRNO
15223 062642                                  END DUMPCSRLOOP
15224 062642                                  POP     R1,CSRNO,CSR
15225
15226                                         ;TYPE STACKS
15227 062654                                  PUSH    R0,R1
15228 062660                                  TYPE    MSG088              ;KERNEL STACK
15229 062664  013701  002562                  MOV     KSTACK,R1
15230 062670  162701  000002                  SUB     #2,R1
15231 062674                                  FOR     R0 := SP TO R1 BY #2
15232 062676                                    TYPE  $CRLF
15233 062702                                    TYPOCT        R0
15234 062706                                    TYPE          MSG018            ;2 SPACES
15235 062712                                    TYPOCT        (R0)
15236 062716                                  END ;OF FOR R0
15237                                         ;SET PREVIOUS MODE TO SUPERVISOR
15238 062726  005737  002454                  TST     NOSUPER
15239 062732  001036                         BNE     DET1
15240 062734  042737  030000  177776          BIC     #BIT13!BIT12,PSW
15241 062742  052737  010000  177776          BIS     #BIT12,PSW
15242 062750  006506                         MFPI    SSP
15243 062752                                  POP     R1,R0
15244 062756                                  TYPE    MSG089              ;SUPERVISOR STACK
15245 062762                                  IF R0 LT #SUPSTK
15246 062770                                    FOR R0 := R0 TO #SUPSTK-2 BY #2
15247 062770                                      TYPE        $CRLF
15248 062774                                      TYPOCT      R0
15249 063000                                      TYPE        MSG018            ;2 SPACES
15250 063004                                      TYPOCT      (R0)
15251 063010                                    END ;OF FOR R0
15252 063022                                  ELSE
15253 063024                                    TYPE  MSG091              ;IS EMPTY
15254 063030                                  END ;OF IF R0
15255                                         ;SET PREVIOUS MODE TO USER
15256 063030  052737  030000  177776  DET1:   BIS     #BIT13!BIT12,PSW
15257 063036  006506                         MFPI    USP
15258 063040                                  POP     R0
15259 063042                                  TYPE    MSG090              ;USER STACK
15260 063046                                  IF R0 LT #USESTK
15261 063054                                    FOR R0 := R0 TO #USESTK-2 BY #2
```

```
15262 063054                                        TYPE        $CRLF
15263 063060                                        TYPOCT      R0
15264 063064                                        TYPE        MSG018          ;2 SPACES
15265 063070                                        TYPOCT      (R0)
15266 063074                                      END ;OF FOR R0
15267 063106                                    ELSE
15268 063110                                      TYPE  MSG091          ;IS EMPTY
15269 063114                                    END ;OF IF R0
15270 063114                                    TYPE    $CRLF
15271 063120  005037  002216                      CLR     DETFLAG
15272 063124                                    POP     R0
15273 063126  000207                            RETURN
```

```
                                        .SBTTL  ROUTINE BINARY TO OCTAL (ASCII) AND TYPE

                                ;**********************************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                                ;*OCTAL (ASCII) NUMBER AND TYPE IT.
                                ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOS                   ;;CALL FOR TYPEOUT
                                ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                ;*      .BYTE   M               ;;M=1 OR 0
                                ;*                                      ;;1=TYPE LEADING ZEROS
                                ;*                                      ;;0=SUPPRESS LEADING ZEROS
                                ;*
                                ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                ;*$TYPOS OR $TYPOC
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPON                   ;;CALL FOR TYPEOUT
                                ;*
                                ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOC                   ;;CALL FOR TYPEOUT

063130  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
063134  116637  000001  063353          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
063142  112637  063355                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
063146  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
063152  000406                          BR      $TYPON
063154  112737  000001  063353  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
063162  112737  000006  063355          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
063170  112737  000005  063352  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
063176  010346                          MOV     R3,-(SP)        ;;SAVE R3
063200  010446                          MOV     R4,-(SP)        ;;SAVE R4
063202  010546                          MOV     R5,-(SP)        ;;SAVE R5
063204  113704  063355                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
063210  005404                          NEG     R4
063212  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
063216  110437  063354                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
063222  113704  063353                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
063226  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
063232  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
063234  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
063236  000404                          BR      3$              ;;GO DO MSB
063240  006105                  2$:     ROL     R5              ;;FORM THIS D GIT
063242  006105                          ROL     R5
063244  006105                          ROL     R5
063246  010503                          MOV     R5,R3
063250  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
063252  105337  063354                  DECB    $OMODE          ;;TYPE THIS DIGIT?
063256  100016                          BPL     6$              ;;BR IF NO
063260  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
063264  001002                          BNE     4$              ;;TEST FOR 0
063266  005704                          TST     R4              ;;SUPPRESS THIS 0?
063270  001403                          BEQ     5$              ;;BR IF YES
063272  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
```

```
15368 063274  052703  000060              BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
15369 063300  052703  000040        5$:   BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
15370 063304  110337  063350              MOVB    R3,8$           ;;SAVE FOR TYPING
15371 063310                              TYPE    8$              ;;GO TYPE THIS DIGIT
15372 063314  105337  063352        6$:   DECB    $OCNT           ;;COUNT BY 1
15373 063320  003347                      BGT     2$              ;;BR IF MORE TO DO
15374 063322  002402                      BLT     7$              ;;BR IF DONE
15375 063324  005204                      INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
15376 063326  000744                      BR      2$              ;;GO DO THE LAST DIGIT
15377 063330  012605                7$:   MOV     (SP)+,R5        ;;RESTORE R5
15378 063332  012604                      MOV     (SP)+,R4        ;;RESTORE R4
15379 063334  012603                      MOV     (SP)+,R3        ;;RESTORE R3
15380 063336  016666  000002  000004      MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
15381 063344  012616                      MOV     (SP)+,(SP)
15382 063346  000002                      RTI                     ;;RETURN
15383 063350     000                8$:   .BYTE   0               ;;STORAGE FOR ASCII DIGIT
15384 063351     000                      .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
15385 063352     000                $OCNT: .BYTE   0              ;;OCTAL DIGIT COUNTER
15386 063353     000                $OFILL: .BYTE  0              ;;ZERO FILL SWITCH
15387 063354  000000                $OMODE: .WORD  0              ;;NUMBER OF DIGITS TO TYPE
```

```
15389                                           .SBTTL  ROUTINE CONVERT BINARY TO DECIMAL AND TYPE
15390                                   ;*******************************************************************************
15391                                   ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
15392                                   ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
15393                                   ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
15394                                   ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
15395                                   ;*REPLACED WITH SPACES.
15396                                   ;*CALL:
15397                                   ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
15398                                   ;*      TYPDS                   ;;GO TO THE ROUTINE
15399 063356                           $TYPDS: PUSH    R0,R1,R2,R3,R5
15400 063370  012746  020200                   MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
15401 063374  016605  000020                   MOV     20(SP),R5       ;;GET THE INPUT NUMBER
15402 063400  100004                           BPL     1$              ;;BR IF INPUT IS POS.
15403 063402  005405                           NEG     R5              ;;MAKE THE BINARY NUMBER POS.
15404 063404  112766  000055  000001           MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
15405 063412  005000                   1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
15406 063414  012703  063572                   MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
15407 063420  112723  000040                   MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
15408 063424  005002                   2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
15409 063426  016001  063562                   MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
15410 063432  160105                   3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
15411 063434  002402                           BLT     4$              ;;BR IF DONE
15412 063436  005202                           INC     R2              ;;INCREASE THE BCD DIGIT BY 1
15413 063440  000774                           BR      3$
15414 063442  060105                   4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
15415 063444  005702                           TST     R2              ;;CHECK IF BCD DIGIT=0
15416 063446  001002                           BNE     5$              ;;FALL THROUGH IF 0
15417 063450  105716                           TSTB    (SP)            ;;STILL DOING LEADING 0'S?
15418 063452  100407                           BMI     7$              ;;BR IF YES
15419 063454  106316                   5$:     ASLB    (SP)            ;;MSD?
15420 063456  103003                           BCC     6$              ;;BR IF NO
15421 063460  116663  000001  177777           MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
15422 063466  052702  000060           6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
15423 063472  052702  000040           7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
15424 063476  110223                           MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
15425 063500  005720                           TST     (R0)+           ;;JUST INCREMENTING
15426 063502  020027  000010                   CMP     R0,#10          ;;CHECK THE TABLE INDEX
15427 063506  002746                           BLT     2$              ;;GO DO THE NEXT DIGIT
15428 063510  003002                           BGT     8$              ;;GO TO EXIT
15429 063512  010502                           MOV     R5,R2           ;;GET THE LSD
15430 063514  000764                           BR      6$              ;;GO CHANGE TO ASCII
15431 063516  105726                   8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
15432 063520  100003                           BPL     9$              ;;BR IF NO
15433 063522  116663  177777  177776           MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
15434 063530  105013                   9$:     CLRB    (R3)            ;;SET THE TERMINATOR
15435 063532                                   POP     R5,R3,R2,R1,R0
15436 063544                                   TYPE    $DBLK           ;;NOW TYPE THE NUMBER
15437 063550  016666  000002  000004           MOV     2(SP),4(SP)     ;;ADJUST THE STACK
15438 063556  012616                           MOV     (SP)+,(SP)
15439 063560  000002                           RTI                     ;;RETURN TO USER
15440 063562  023420                   $DTBL:  10000.
15441 063564  001750                           1000.
15442 063566  000144                           100.
15443 063570  000012                           10.
15444 063572  000000  000000  000000   $DBLK:  .WORD   0,0,0,0
      063600  000000
```

```
15446                                           .SBTTL  ROUTINE TTY INPUT
15447                                   ;*********************************************************************
15448                                   ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
15449                                   ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
15450                                   ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
15451                                   ;*WHEN OPERATING IN TTY FLAG MODE.
15452                                           .ENABLE LSB
15453 063602                           $CKSWR:
15459 063602  005737  056332                    TST     XOCHAR          ;;SOMETHING THERE?
15460 063606  001406                            BEQ     NOCH            ;; GO ON IF NOT
15461 063610  013746  056332                    MOV     XOCHAR,-(SP)    ;; USE IT
15462 063614  005037  056332                    CLR     XOCHAR
15463 063620  000137  063642                    JMP     CONTS1
15464 063624  105777  117000           NOCH:    TSTB    @$TKS           ;;CHAR THERE?
15465 063630  100130                            BPL     12$             ;;IF NO, DON'T WAIT AROUND
15466 063632  117746  116774                    MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
15467 063636  042716  177600                    BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
15468 063642  022716  000006           CONTS1:  CMP     #6,(SP)         ;IS IT CONTROL F?
15469 063646  001002                            BNE     1$              ;NO SKIP
15470 063650  004737  050114                    CALL    FIELDSERVICE
15471 063654  022716  000024           1$:      CMP     #24,(SP)        ;IS IT CONTROL T?
15472 063660  001002                            BNE     16$             ;NO - SKIP
15473 063662  004737  064210                    CALL    CONTT           ;YES - CALL CONTROL T ROUTINE
15474 063666  022716  000003           16$:     CMP     #3,(SP)         ;IS IT CONTROL C?
15475 063672  001454                            BEQ     5$              ;YES EXIT *****NOTE***** STACK IS SCREWED UP!
15476 063674  022716  000023           2$:      CMP     #23,(SP)        ;IS IT CONTROL S?
15477 063700  001002                            BNE     17$             ;NO - SKIP
15478 063702  004737  064264                    CALL    CONTS           ;YES - CALL CONTROL S ROUTINE
15479 063706  022716  000013           17$:     CMP     #13,(SP)        ;IS IT CONTROL K?
15480 063712  001005                            BNE     6$              ;NO - SKIP
15481 063714                                    TYPE    $CNTLK          ;TYPE A ^K
15482 063720  013706  002144                    MOV     CTLKVEC,SP      ;RESET KSP TO AFTER PATTERN EXEC ROUTINE
15483 063724  000207                            RETURN                  ;RETURN TO PATTERN EXEC ROUTINE
15484 063726  022737  000176  002624   6$:      CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
15485 063734  001067                            BNE     CKEND           ;;BRANCH IF NO
15486 063736  022716  000007                    CMP     #7,(SP)         ;;IS IT A CONTROL G?
15487 063742  001064                            BNE     CKEND           ;;NO, RETURN TO USER
15488 063744  005737  002060                    TST     $AUTO           ;ARE WE RUNNING IN AUTO-MODE?
15489 063750  001061                            BNE     CKEND           ;BRANCH IF YES
15490 063752                                    TYPE    $CNTLG          ;;ECHO THE CONTROL-G (^G)
15491 063756                           $GTSWR:  TYPE    $MSWR           ;;TYPE CURRENT CONTENTS
15492 063762                                    TYPOCT  @SWR            ;;OF THE SWR
15493 063770                                    TYPE    $MNEW           ;;PROMPT FOR NEW SWR
15494 063774  005046                   3$:      CLR     -(SP)           ;;CLEAR COUNTER
15495 063776  005046                            CLR     -(SP)           ;;THE NEW SWR
15496 064000  105777  116624           4$:      TSTB    @$TKS           ;;CHAR THERE?
15497 064004  100375                            BPL     4$              ;;IF NOT TRY AGAIN
15498 064006  117746  116620                    MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
15499 064012  042716  177600                    BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
15500 064016  021627  000003                    CMP     (SP),#3         ;;IS IT A CONTROL-C?
15501 064022  001006                            BNE     7$              ;;BRANCH IF NOT
15502 064024                           5$:      TYPE    $CNTLC          ;;YES, ECHO CONTROL-C (^C)
15503 064030  062706  000006                    ADD     #6,SP           ;;CLEAN UP STACK
15504 064034  000137  047536                    JMP     BOOT            ;;CONTROL-C RESTART
15505 064040  021627  000025           7$:      CMP     (SP),#25        ;;IS IT A CONTROL-U?
15506 064044  001005                            BNE     9$              ;;BRANCH IF NOT
15507 064046                                    TYPE    $CNTLU          ;;YES, ECHO CONTROL-U (^U)
```

```
15508 064052  062706  000006          8$:     ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
15509 064056  000746                  9$:     BR      3$              ;;LET'S TRY IT AGAIN
15510 064060  021627  000015                  CMP     (SP),#15        ;;IS IT A <CR>?
15511 064064  001016                          BNE     13$             ;;BRANCH IF NO
15512 064066  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
15513 064072  001403                          BEQ     10$             ;;BRANCH IF YES
15514 064074  016677  000002  116522          MOV     2(SP),@SWR      ;;SAVE NEW SWR
15515 064102  062706  000006          10$:    ADD     #6,SP           ;;CLEAR UP STACK
15516 064106                                  TYPE    $CRLF           ;;ECHO <CR> AND <LF>
15517 064112  000002                  12$:    RTI                     ;;RETURN
15518 064114  062706  000002          CKEND:  ADD     #2,SP           ;FIX STACK
15519 064120  000002                          RTI                     ;RETURN
15520 064122  004737  056334          13$:    CALL    $TYPEC          ;;ECHO CHAR
15521 064126  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
15522 064132  002420                          BLT     15$             ;;BRANCH IF YES
15523 064134  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
15524 064140  003015                          BGT     15$             ;;BRANCH IF YES
15525 064142  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
15526 064146  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
15527 064152  001403                          BEQ     14$             ;;BRANCH IF YES
15528 064154  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
15529 064156  006316                          ASL     (SP)            ;;    CHAR OVER TO MAKE
15530 064160  006316                          ASL     (SP)            ;;    ROOM FOR NEW ONE.
15531 064162  005266  000002          14$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
15532 064166  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
15533 064172  000702                          BR      4$              ;;GET THE NEXT ONE
15534 064174                          15$:    TYPE    $QUES           ;;TYPE ?<CR><LF>
15535 064200  000724                          BR      8$              ;;SIMULATE CONTROL-U
15536 064202     136     113     015  $CNTLK: .ASCIZ   /^K/<15><12>    ;CONTROL K ASCII STRING
      064205     012     000
15537                                 .EVEN
15538                                 .DSABL  LSB
```

```
 15541 064210                           CONTT:  SUBTST  <<CONTROL T>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       CONTROL T
                                        ;*****************************************************************************
 15542 064210                                   PUSH    R0
 15543 064212                                   TYPE    $CRLF
 15553 064216                                     IF RLFLAG IS TRUE
 15554 064224                                       TYPE        MSG092          ;RELOCATED
 15555 064230                                     END ;OF IF RLFLAG
 15556 064230                                     TYPE  MSG093                   ;BANK=
 15557 064234                                     TYPOCS        BANK,,3          ;TYPE 3 DIGITS
 15558 064244                                     TYPE  MSG095                   ;PAT=
 15559 064250                                     TYPOCS        REALPAT,,2       ;TYPE 2 DIGITS
 15563 064260                                   POP     R0
 15564 064262  000207                           RETURN
 15565
 15566 064264                           CONTS:  SUBTST  <<CONTROL S & CONTROL Q>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       CONTROL S & CONTROL Q
                                        ;*****************************************************************************
 15567 064264                                   POP     R0              ;GET RID OF RETURN ADDRESS FROM STACK
 15568 064266  105777  116336           CONTS2: TSTB    @$TKS           ;WAIT FOR CHARACTER
 15569 064272  100375                           BPL     CONTS2
 15570 064274  117716  116332                   MOVB    @$TKB,(SP)      ;REPLACE OVER OLD CHARACTER ON STACK
 15571 064300  042716  177600                   BIC     #^C177,(SP)     ;STRIP ALL BUT ASCII
 15572 064304                                   IF (SP) EQ #21          ;IF IT IS A CONTROL Q
 15573 064312  000137  063642                     JMP   CONTS1
 15574 064316                                   ELSE
 15575 064320  000762                             BR    CONTS2
 15576 064322                                   END ;OF IF (SP)
```

```
15578                                   ;*********************************************************************
15579                                   ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
15580                                   ;*CALL:
15581                                   ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
15582                                   ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
15583                                   ;*                              ;;WITH PARITY BIT STRIPPED OFF
15584                                   ;
15585
15586 064322  011646                   $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
15587 064324  016666  000004  000002            MOV     4(SP),2(SP)     ;;SAVE THE PS
15588 064332  105777  116272            1$:     TSTB    @$TKS           ;;WAIT FOR
15589 064336  100375                            BPL     1$              ;;A CHARACTER
15590 064340  117766  116266  000004            MOVB    @$TKB,4(SP)     ;;READ THE TTY
15591 064346  042766  177600  000004            BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
15592 064354  026627  000004  000023            CMP     4(SP),#23       ;;IS IT A CONTROL-S?
15593 064362  001013                            BNE     3$              ;;BRANCH IF NO
15594 064364  105777  116240            2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
15595 064370  100375                            BPL     2$              ;;LOOP UNTIL ITS THERE
15596 064372  117746  116234                    MOVB    @$TKB,-(SP)     ;;GET CHARACTER
15597 064376  042716  177600                    BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
15598 064402  022627  000021                    CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
15599 064406  001366                            BNE     2$              ;;IF NOT DISCARD IT
15600 064410  000750                            BR      1$              ;;YES, RESUME
15601 064412  026627  000004  000021    3$:     CMP     4(SP),#21       ;;IS IT A RANDOM CONTROL-Q?     ;R-C
15602 064420  001744                            BEQ     1$              ;;BRANCH BACK IF SO             ;R-C
15603 064422  026627  000004  000140            CMP     4(SP),#140      ;;IS IT UPPER CASE?
15604 064430  002407                            BLT     4$              ;;BRANCH IF YES
15605 064432  026627  000004  000175            CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
15606 064440  003003                            BGT     4$              ;;BRANCH IF YES
15607 064442  042766  000040  000004            BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
15608 064450  000002                    4$:     RTI                     ;;GO BACK TO USER
15609                                   ;*********************************************************************
15610                                   ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
15611                                   ;*CALL:
15612                                   ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
15613                                   ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
15614                                   ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
15615 064452  010346                   $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
15616 064454  005046                            CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
15617 064456  012703  064750            1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
15618 064462  022703  064774            2$:     CMP     #$TTYIN+20.,R3  ;;BUFFER FULL?
15619 064466  101477                            BLOS    8$              ;;BR IF YES
15620 064470  104411                            RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
15621 064472  112613                            MOVB    (SP)+,(R3)      ;;GET CHARACTER
15622 064474  122713  000003                    CMPB    #3,(R3)         ;;IS IT A CONTROL-C?
15623 064500  001016                            BNE     3$              ;;BRANCH IF NO
15624 064502                                    TYPE    $CNTLC          ;;TYPE A CONTROL-C (^C)
15625 064506  005726                            TST     (SP)+           ;;CLEAN RUBOUT KEY OFF OF THE STACK
15626 064510  012603                            MOV     (SP)+,R3        ;;RESTORE R3
15627 064512  032777  000400  116104            BIT     #BIT8,@SWR      ;;IS THERE A HALT FLAG SET IN THE SWR?
15628 064520  001404                            BEQ     11$             ;;BRANCH IF NOT TO BOOT ROUTINE
15629 064522  005037  002416                    CLR     STOPOK          ;;GET READY TO HALT PROGRAM
15630 064526  000137  047644                    JMP     EXIT            ;;GO HALT PROGRAM
15631 064532  000137  047536            11$:    JMP     BOOT            ;;GOTO CONTROL-C RESTART
15632 064536  122713  000177            3$:     CMPB    #177,(R3)       ;;IS IT A RUBOUT
15633 064542  001022                            BNE     5$              ;;BR IF NO
15634 064544  005716                            TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
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15635 064546  001007                      BNE     4$              ;;BR IF NO
15636 064550  112737  000134  064746      MOVB    #'\,10$         ;;TYPE A BACK SLASH
15637 064556                              TYPE    10$
15638 064562  012716  177777              MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
15639 064566  005303                4$:   DEC     R3              ;;BACKUP BY ONE
15640 064570  020327  064750              CMP     R3,#STTYIN      ;;STACK EMPTY?
15641 064574  103434                      BLO     8$              ;;BR IF YES
15642 064576  111337  064746              MOVB    (R3),10$                ;;SETUP TO TYPEOUT THE DELETED CHAR.
15643 064602                              TYPE    10$             ;;GO TYPE
15644 064606  000725                      BR      2$              ;;GO READ ANOTHER CHAR.
15645 064610  005716                5$:   TST     (SP)            ;;RUBOUT KEY SET?
15646 064612  001406                      BEQ     6$              ;;BR IF NO
15647 064614  112737  000134  064746      MOVB    #'\,10$         ;;TYPE A BACK SLASH
15648 064622                              TYPE    10$
15649 064626  005016                      CLR     (SP)            ;;CLEAR THE RUBOUT KEY
15650 064630  122713  000025          6$: CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
15651 064634  001003                      BNE     7$              ;;BR IF NO
15652 064636                              TYPE    $CNTLU          ;;TYPE A CONTROL 'U''
15653 064642  000705                      BR      1$              ;;GO START OVER
15654 064644  122713  000022          7$: CMPB    #22,(R3)        ;;IS CHARACTER A ''^R''?
15655 064650  001011                      BNE     9$              ;;BRANCH IF NO
15656 064652  105013                      CLRB    (R3)            ;;CLEAR THE CHARACTER
15657 064654                              TYPE    $CRLF           ;;TYPE A ''CR'' & ''LF''
15658 064660                              TYPE    $TTYIN          ;;TYPE THE INPUT STRING
15659 064664  000676                      BR      2$              ;;GO PICKUP ANOTHER CHACTER
15660 064666                          8$: TYPE    $QUES           ;;TYPE A '?'
15661 064672  000671                      BR      1$              ;;CLEAR THE BUFFER AND LOOP
15662 064674  111337  064746          9$: MOVB    (R3),10$                ;;ECHO THE CHARACTER
15663 064700                              TYPE    10$
15664 064704  122723  000015              CMPB    #15,(R3)+       ;;CHECK FOR RETURN
15665 064710  001264                      BNE     2$              ;;LOOP IF NOT RETURN
15666 064712  105063  177777              CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
15667 064716                              TYPE    $LF             ;;TYPE A LINE FEED
15668 064722  005726                      TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
15669 064724  012603                      MOV     (SP)+,R3        ;;RESTORE R3
15670 064726  011646                      MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
15671 064730  016666  000004  000002      MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
15672 064736  012766  064750  000004      MOV     #STTYIN,4(SP)
15673 064744  000002                      RTI                     ;;RETURN
15674 064746     000                10$: .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
15675 064747     000                     .BYTE   0               ;;TERMINATOR
15676 064750  000024              $TTYIN: .REPT   20.             ;;RESERVE SIZE BYTES FOR TTY INPUT
15679 064774     136     103      015 $CNTLC: .ASCIZ  /^C/<15><12>    ;;CONTROL ''C''
      064777     012     000
15680 065001     136     125      015 $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL 'U''
      065004     012     000
15681 065006     136     107      015 $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL ''G''
      065011     012     000
15682 065013     015     012      123 $MSWR:  .ASCIZ  <15><12>/SWR = /
      065016     127     122      040
      065021     075     040      000
15683 065024     040     040      116 $MNEW:  .ASCIZ  /  NEW = /
      065027     105     127      040
      065032     075     040      000
15684                                   .EVEN
```

```
                                        .SBTTL  ROUTINE READ AN OCTAL NUMBER FROM THE TTY
                                ;*****************************************************************
                                ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                                ;*CHANGE IT TO BINARY.
                                ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
                                ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
                                ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
                                ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
                                ;*CALL:
                                ;*      RDOCT                   ;;READ AN OCTAL NUMBER
                                ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT
065036  011646                  $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
065040  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
065046                                  PUSH    R0,R1,R2
065054  104412                  1$:     RDLIN                   ;;READ AN ASCIZ LINE
065056  012600                          MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
065060  010037  065164                  MOV     R0,5$           ;;AND SAVE IT
065064  005001                          CLR     R1              ;;CLEAR DATA WORD
065066  005002                          CLR     R2
065070  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
065072  001420                          BEQ     3$              ;;IF ZERO GET OUT
065074  122716  000060                  CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
065100  003026                          BGT     4$              ;;IS AN OCTAL DIGIT
065102  122716  000067                  CMPB    #'7,(SP)
065106  002423                          BLT     4$
065110  006301                          ASL     R1              ;;*2
065112  006102                          ROL     R2
065114  006301                          ASL     R1              ;;*4
065116  006102                          ROL     R2
065120  006301                          ASL     R1              ;;*8
065122  006102                          ROL     R2
065124  042716  177770                  BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
065130  062601                          ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
065132  000756                          BR      2$              ;;LOOP
065134  005726                  3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
065136  010166  000012                  MOV     R1,12(SP)       ;;SAVE THE RESULT
065142  010237  065204                  MOV     R2,$HIOCT
065146                                  POP     R2,R1,R0
065154  000002                          RTI                     ;;RETURN
065156  005726                  4$:     TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
065160  105010                          CLRB    (R0)            ;;SET A TERMINATOR
065162                                  TYPE                    ;;TYPE UP THRU THE BAD CHAR.
065164  000000                  5$:     .WORD   0
065166                                  TYPE    MSG062          ;INPUT MUST BE A
065172                                  TYPE    MSG063          ;N OCTAL
065176                                  TYPE    MSG064          ;NUMBER
065202  000724                          BR      1$              ;;TRY AGAIN
065204  000000                  $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
                                        .SBTTL  ROUTINE READ A DECIMAL NUMBER FROM THE TTY


                                ;*****************************************************************
                                ;*THIS ROUTINE WILL READ A DECIMAL (ASCII) NUMBER FROM THE TTY AND
                                ;*CHANGE IT TO BINARY. IF TOO MANY CHARACTERS OR ANY ILLEGAL CHARACTERS
                                ;*ARE READ A "?" FOLLOWED BY A CARRIAGE RETURN-LINE FEED WILL BE TYPED.
                                ;*THE COMPLETE NUMBER MUST BE RETYPED. THE INPUT IS TERMINATED BY THE
                                ;*USER TYPING A CARRIAGE RETURN. THE RANGE OF THE INPUT NUMBER IS
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15743                                   ;*POSITIVE 32767 TO NEGATIVE 32768.
15744                                   ;*CALL:
15745                                   ;*      RDDEC                   ;;READ A DECIMAL NUMBER
15746                                   ;*      RETURN HERE             ;;NUMBER IS ON TOP OF THE STACK
15747                                   ;
15748
15749 065206  011646                   $RDDEC: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR
15750 065210  016666  000004  000002           MOV     4(SP),2(SP)     ;;THE INPUT NUMBER
15751 065216                                   PUSH    R0,R1,R2
15752 065224  104412                   1$:     RDLIN                   ;;READ AN ASCIZ LINE
15753 065226  012600                           MOV     (SP)+,R0        ;;ADDRESS OF 1ST CHAR.
15754 065230  010037  065354                   MOV     R0,6$           ;;SAVE INCASE OF BAD INPUT
15755 065234  005046                           CLR     -(SP)           ;;CLEAR DATA WORD
15756 065236  005002                           CLR     R2              ;;SIGN SET POSITIVE
15757 065240  122710  000055                   CMPB    #'-,(R0)        ;;SEE IF A MINUS SIGN WAS TYPED
15758 065244  001001                           BNE     2$              ;;BR IF NO MINUS SIGN
15759 065246  112002                           MOVB    (R0)+,R2        ;;SAVE FOR LATER USE
15760 065250  112001                   2$:     MOVB    (R0)+,R1        ;;PICKUP THIS CHARACTER
15761 065252  001424                           BEQ     3$              ;;GET OUT IF ZERO
15762 065254  122701  000060                   CMPB    #'0,R1          ;;MAKE SURE THIS CHARACTER
15763 065260  003032                           BGT     5$              ;;IS A DIGIT BETWEEN 0 & 9
15764 065262  122701  000071                   CMPB    #'9,R1
15765 065266  002427                           BLT     5$
15766 065270  032716  170000                   BIT     #^C7777,(SP)    ;;DON'T LET NUMBER GET TO BIG
15767 065274  001024                           BNE     5$              ;;BR IF NUMBER WOULD OVERFLOW
15768 065276  006316                           ASL     (SP)            ;;*2
15769 065300  011646                           MOV     (SP),-(SP)      ;;SAVE FOR LATER
15770 065302  006316                           ASL     (SP)            ;;*4
15771 065304  006316                           ASL     (SP)            ;;*8.
15772 065306  062616                           ADD     (SP)+,(SP)      ;;*10.
15773 065310  102416                           BVS     5$              ;;OVERFLOW ISN'T ALLOWED
15774 065312  162701  000060                   SUB     #'0,R1          ;;STRIP AWAY THE ASCII JUNK
15775 065316  060116                           ADD     R1,(SP)         ;;ADD IN THIS DIGIT
15776 065320  102412                           BVS     5$              ;;OVERFLOW ISN'T ALLOWED
15777 065322  000752                           BR      2$              ;;LOOP
15778 065324  005702                   3$:     TST     R2              ;;CHECK IF NUMBER IS NEG
15779 065326  001401                           BEQ     4$              ;;BR IF NO
15780 065330  005416                           NEG     (SP)            ;;YES--NEGATE THE NUMBER
15781 065332  012666  000012           4$:     MOV     (SP)+,12(SP)    ;;SAVE THE RESULT
15782 065336                                   POP     R2,R1,R0
15783 065344  000002                           RTI                     ;;RETURN
15784
15785 065346  005726                   5$:     TST     (SP)+           ;;CLEAN PARTIAL NUMBER FROM STACK
15786 065350  105010                           CLRB    (R0)            ;;SET A TERMINATOR
15787 065352                                   TYPE                    ;;TYPE THE INPUT UP TO BAD CHAR.
15788 065354  000000                   6$:     .WORD   0               ;;POINTER GOES HERE
15789 065356                                   TYPE    MSG062          ;INPUT MUSST BE A
15790 065362                                   TYPE    MSG065          ;DECIMAL
15791 065366                                   TYPE    MSG064          ;NUMBER
15792 065372  000714                           BR      1$              ;;TRY AGAIN
```

```
                                        .SBTTL  ROUTINE SAVE AND RESTORE R0-R5

                                ;*********************************************************************************
                                ;*SAVE R0-R5
                                ;*CALL:
                                ;*      SAVREG
                                ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                                ;*
                                ;*TOP---(+16)
                                ;* +2---(+18)
                                ;* +4---R5
                                ;* +6---R4
                                ;* +8---R3
                                ;*+10---R2
                                ;*+12---R1
                                ;*+14---R0

065374                          $SAVREG:
065374                                  PUSH    R0,R1,R2,R3,R4,R5
065410  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
065414  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
065420  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
065424  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
065430  000002                          RTI

                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG
065432                          $RESREG:
065432  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
065436  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
065442  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
065446  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
065452                                  POP     R5,R4,R3,R2,R1,R0
065466  000002                          RTI
```

```
15830                                                   .SBTTL  ROUTINE RANDOM NUMBER GENERATOR
15831
15832                                                   ;**********************************************************************
15833                                                   ;*THIS ROUTINE IS A DOUBLE PRECISION PSEUDO RANDOM NUMBER GENERATOR
15834                                                   ;*WITH A RANGE OF 0 TO 2**(+33)-1.
15835                                                   ;*CALL:
15836                                                   ;*      CALL    $RAND           ;;CALL THE ROUTINE
15837                                                   ;*      RETURN                  ;;RETURN HERE THE RANDOM
15838                                                   ;*                              ;;NUMBER WILL BE IN
15839                                                   ;*                              ;;$HINUM,$LONUM
15840
15841 065470                                           $RAND:  PUSH    R0,R1,R2
15842 065476  013700  002572                                   MOV     SEEDLO,R0       ;SET R0 WITH LOW
15843 065502  013701  002570                                   MOV     SEEDHI,R1       ;SET R1 WITH HIGH
15844 065506  012702  000007                                   MOV     #7,R2           ;SET SHIFT COUNT
15845 065512  006300                                   1$:     ASL     R0              ;;SHIFT R0 LEFT AND
15846 065514  006101                                           ROL     R1              ;;ROTATE CARRY INTO R1 AND
15847 065516  077203                                           SOB     R2,1$
15848 065520  063700  002572                                   ADD     SEEDLO,R0       ;ADD NUMBER TO MAKE X 129
15849 065524  005501                                           ADC     R1              ;;PROPOGATE CARRY
15850 065526  063701  002570                                   ADD     SEEDHI,R1       ;ADD NUMBER TO MAKE X 129
15851 065532  062700  001057                                   ADD     #1057,R0        ;;ADD LOW CONSTANT
15852 065536  005501                                           ADC     R1              ;;PROPOGATE CARRY
15853 065540  062701  047401                                   ADD     #47401,R1       ;;ADD HIGH CONSTANT
15854 065544  010037  002572                                   MOV     R0,SEEDLO       ;SAVE R0
15855 065550  010137  002570                                   MOV     R1,SEEDHI       ;SAVE R1
15856 065554                                                   POP     R2,R1,R0
15857 065562  000207                                           RETURN
```

```
                                        .SBTTL  ROUTINE DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT
                                ;*******************************************************************************
                                ;*THIS ROUTINE WILL CONVERT A 32-BIT UNSIGNED BINARY NUMBER TO AN
                                ;*UNSIGNED OCTAL ASCIZ NUMBER.
                                ;*CALL
                                ;*      MOV     #PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
                                ;*      CALL    $DB20           ;;CALL THE ROUTINE
                                ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK
                                
065564  104415          $DB20:  SAVREG                  ;;SAVE ALL REGISTERS
065566  016601  000002          MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
065572  012705  065703          MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
065576  012704  000014          MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
065602  012703  177770          MOV     #^C7,R3         ;;MASK
065606  012100                  MOV     (R1)+,R0        ;;LOWER WORD
065610  012101                  MOV     (R1)+,R1        ;;HIGH WORD
065612  005002                  CLR     R2              ;;TERMINATOR
065614  110245          1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
065616  010002                  MOV     R0,R2           ;;GET THIS DIGIT
065620  005304                  DEC     R4              ;;COUNT THIS CHARACTER
065622  003007                  BGT     3$              ;;BR IF NOT THE LAST DIGIT
065624  001405                  BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
065626  005205                  INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
065630  010566  000002          MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
065634  104416                  RESREG                  ;;RESTORE ALL REGISTERS
065636  000207                  RETURN                  ;;RETURN TO USER
065640  006203          2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
065642  006001          3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
065644  006000                  ROR     R0              ;;      THE NEXT OCTAL DIGIT
065646  006001                  RCR     R1
065650  006000                  ROR     R0
065652  006001                  ROR     R1
065654  006000                  ROR     R0
065656  040302                  BIC     R3,R2           ;;MASK OUT ALL JUNK
065660  062702  000060          ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
065664  000753                  BR      1$              ;;GO PUT IT IN THE DATA TABLE
065666  000016          $OCTVL: .REPT   14.             ;;RESERVE DATA TABLE
065672                  $OCT8=$OCTVL+4                  ;POINTER TO 11 DIGIT NUMBER
```

```
15902                                           .SBTTL  TABLES
15903
15904                                           .SBTTL  APT MAILBOX-ETABLE
15905 065704                            $MAIL:
15906 065704  000000                    $MSGTY: .WORD   0       ;;MESSAGE TYPE CODE
15907 065706  000000                    $FATAL: .WORD   0       ;;FATAL ERROR NUMBER (ERROR PC)
15908 065710  000000                    $TESTN: .WORD   0       ;;TEST PATTERN NUMBER
15909 065712  000000                    $PASS:  .WORD   0       ;;PASS COUNT
15910 065714  000000                    $DEVCT: .WORD   0       ;;DEVICE COUNT
15911 065716  000000                    $UNIT:  .WORD   0       ;;I/O UNIT NUMBER
15912 065720  000000                    $MSGAD: .WORD   0       ;;MESSAGE ADDRESS
15913 065722  000000                    $MSGLG: .WORD   0       ;;MESSAGE LENGTH
15914 065724                            $ETABLE:                ;;APT ENVIRONMENT TABLE
15915 065724     000                    $ENV:   .BYTE   0       ;;ENVIRONMENT BYTE      ;SET TO A 1 FOR APT AUTO MODE
15916                                   ;NOTE:  IF BIT #7 IS SET IN $ENVM THE TABLE BELOW (BEGINNING AT $MAMS1 AND
15917                                   ;       ENDING AT $MADR4) MUST BE FILLED IN TO INDICATE THE PROPER AMOUNT OF
15918                                   ;       EACH TYPE OF MEMORY.
15919 065725     000                    $ENVM:  .BYTE   0       ;ENVIRONMENT MODE
15920                                                           ;BIT7(200)=USE APT SIZE INFO ;BIT5(40)=NO CONSOLE
15921 065726  000101                    $SWREG: .WORD   101     ;;APT SWITCH REGISTER
15922 065730  000000                    $USWR:  .WORD   0       ;USED TO LIMIT THE NUMBER OF PASSES
15923 065732  000000                    $CPUOP: .WORD   0       ;;CPU TYPE,OPTIONS
15924                                                           BITS 15-11=CPU TYPE
15925                                   ;*                              11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
15926                                   ;*                              11/70=06,PDQ=07,Q=10
15927                                   ;*                      BIT 10=REAL TIME CLOCK
15928                                   ;*                      BIT  9=FLOATING POINT PROCESSOR
15929                                   ;*                      BIT  8=MEMORY MANAGEMENT
15930 065734     001                    $MAMS1: .BYTE   1       ;;HIGH ADDRESS,M.S. BYTE ;DEFAULT - 64K
15931 065735     004                    $MTYP1: .BYTE   4       ;;MEM. TYPE,BLK#1
15932                                   ;*                      MEM.TYPE BYTE   --  (HIGH BYTE)
15933                                   ;*                              900 NSEC CORE=001
15934                                   ;*                              300 NSEC BIPOLAR=002
15935                                   ;*                              PARITY MOS=003
15936                                   ;*                              ERROR CORRECTING MOS=004
15937 065736  177776                    $MADR1: .WORD   177776  ;;HIGH ADDRESS,BLK#1
15938                                   ;*                        MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF ''TYPE'' ABOVE
15939 065740     000                    $MAMS2: .BYTE   0       ;;HIGH ADDRESS,M.S. BYTE
15940 065741     000                    $MTYP2: .BYTE   0       ;;MEM.TYPE,BLK#2
15941 065742  000000                    $MADR2: .WORD   0       ;;MEM.LAST ADDRESS,BLK#2
15942 065744     000                    $MAMS3: .BYTE   0       ;;HIGH ADDRESS,M.S.BYTE
15943 065745     000                    $MTYP3: .BYTE   0       ;;MEM.TYPE,BLK#3
15944 065746  000000                    $MADR3: .WORD   0       ;;MEM.LAST ADDRESS,BLK#3
15945 065750     000                    $MAMS4: .BYTE   0       ;;HIGH ADDRESS,M.S.BYTE
15946 065751     000                    $MTYP4: .BYTE   0       ;;MEM.TYPE,BLK#4
15947 065752  000000                    $MADR4: .WORD   0       ;;MEM.LAST ADDRESS,BLK#4
15948 065754  000000                    $VECT1: .WORD   0       ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
15949 065756  000000                    $VECT2: .WORD   0       ;;INTERRUPT VECTOR#2BUS PRIORITY#2
15950 065760  000000                    $BASE:  .WORD   0       ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
15951 065762  000000                    $DEVM:  .WORD   0       ;;DEVICE MAP
15952
15953 065764  000000                    $CDW1:  .WORD   0
15954 065766  000000                    $CDW2:  .WORD   0
```

```
15956                                   ;THE FOLLOWING LOCATIONS SPECIFY WHICH PATTERNS
15957                                   ;ARE TO BE RUN FOR PARTICULAR MEMORIES
15958                                   ;
15959                                   ;REFERENCE THE TABLE LISTED BELOW TO RELATE BITS TO PATTERNS.
15960                                   ;BIT0 SET WILL RUN THE FIRST ENTRY IN THE TABLE, BIT0 SET
15961                                   ;IN THE SECOND WORD WILL RUN THE 17TH ENTRY IN THE TABLE ...
15962                                   ;
15963                                   ;NOTE** NULL TESTS DO NOT TAKE ANY TIME
15964                                   ;                                       ;FIELD SERVICE VALUE
15965 065770  177777                   $DDW0:  .WORD   177777  ;ECC CSR TESTS           177777          TABLE = MKCSRT:
15966 065772  177777                   $DDW1:  .WORD   177777  ;ECC CSR TESTS           177777          TABLE = MKCSRT:
15967 065774  177777                   $DDW2:  .WORD   177777  ;ECC PATTERNS            103777          TABLE = MKPAT:
15968 065776  177777                   $DDW3:  .WORD   177777  ;ECC PATTERNS            177777          TABLE = MKPAT:
15969 066000  177777                   $DDW4:  .WORD   177777  ;PARITY PATTERNS         003777          TABLE = MJPAT:
15970 066002  177777                   $DDW5:  .WORD   177777  ;PARITY PATTERNS         177774          TABLE = MJPAT:
15974 066004                           $ETEND:
15975                                   ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
15976                                   ;INTERFACE SPEC.
15977
15978 066004                           $APTHD:
15979 066004  000000                   $HIBTS: .WORD   0               ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
15980 066006  065704                   $MBADR: .WORD   $MAIL           ;;ADDRESS OF APT MAILBOX (BITS 0-15)
15981 066010  000043                   $TSTM:  .WORD   35.             ;;RUN TIM OF LONGEST TEST
15982 066012  001274                   $PASTM: .WORD   700.            ;;RUN TIME IN SECS. OF 1ST PASS ON 128K (QUICK VERIFY)
15983 066014  000000                   $UNITM: .WORD   0.              ;;EXTRA RUN TIME OF A PASS FOR EACH ADDITIONAL 128K (QV)
15984 066016  000040                           .WORD   $ETEND-$MAIL/2  ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
                                        .SBTTL  ROUTINE TRAP DECODER

                                ;*********************************************************************************
                                ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
                                ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                ;*GO TO THAT ROUTINE.

066020  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
066022  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
066026  005740                          TST     -(R0)           ;;BACKUP BY 2
066030  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
066032  006300                          ASL     R0              ;;POSITION FOR INDEXING
066034  016000  066062                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
066040  000200                          RTS     R0              ;;GO TO ROUTINE


                                ;;THIS IS USE TO HANDLE THE "GETPRI" MACRO

066042  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
066044  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
066052  000002                          RTI                     ;;RESTORE THE PSW

066054                          $NOTRAP:TYPE    MSG006          ;UNDEFINED TRAP INSTRUCTION
066060  000000                  $HALT2: HALT
```

```
16013                                           .SBTTL  TRAP TABLE
16014
16015                                   ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
16016                                   ;*BY THE "TRAP" INSTRUCTION.
16017
16018                                   ;       ROUTINE
16019                                   ;       -------
16020 066062  066042                    $TRPAD: .WORD   $TRAP2
16021 066064  056206                            $TYPE   ;CALL=TYPEIT    TRAP+1(104401)  TTY TYPEOUT ROUTINE
16022 066066  063154                            $TYPOC  ;CALL=TYPOC     TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
16023 066070  063130                            $TYPOS  ;CALL=TYPOS     TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
16024 066072  066054                            $NOTRAP;$TYPON  ;CALL=TYPON     TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
16025 066074  063356                            $TYPDS  ;CALL=TYPDS     TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
16026 066076  066054                            $NOTRAP;$TYPBN  ;CALL=TYPBN     TRAP+6(104406)  TYPE BINARY (ASCII) NUMBER
16027
16028 066100  063756                            $GTSWR  ;CALL=GTSWR     TRAP+7(104407)  GET SOFT-SWR SETTING
16029 066102  063602                            $CKSWR  ;CALL=CKSWR     TRAP+10(104410) TEST FOR CHANGE IN SOFT-SWR
16030
16031 066104  064322                            $RDCHR  ;CALL=RDCHR     TRAP+11(104411) TTY TYPEIN CHARACTER ROUTINE
16032 066106  064452                            $RDLIN  ;CALL=RDLIN     TRAP+12(104412) TTY TYPEIN STRING ROUTINE
16033 066110  065036                            $RDOCT  ;CALL=RDOCT     TRAP+13(104413) READ AN OCTAL NUMBER FROM TTY
16034 066112  065206                            $RDDEC  ;CALL=RDDEC     TRAP+14(104414) READ A DECIMAL NUMBER FROM TTY
16035
16036 066114  065374                            $SAVREG ;CALL=SAVREG    TRAP+15(104415) SAVE R0-R5 ROUTINE
16037 066116  065432                            $RESREG ;CALL=RESREG    TRAP+16(104406) RESTORE R0-R5 ROUTINE
16038
16039 066120  042656                            $KERNEL  ;CALL=KERNEL   TRAP+17(104417) ENTER KERNEL MODE
16040 066122  042666                            $ENERGIZE;CALL=ENERGIZETRAP+20(104420) TURN ON MEMORY MANAGEMENT & TRAPS
16041 066124  042676                            $DEENERGI;CALL=DEENERGITRAP+21(104421) TURN OFF MEMORY MENAGEMENT & TRAPS
16042
16043 066126  045112                            $KMAP    ;CALL=KMAP     TRAP+22(104422) MAP KERNEL 1 TO 1
16044
16045 066130  042706                            $CACHN  ;CALL=CACHON    TRAP+23(104423) TURN CACHE ON
16046 066132  042732                            $CACHF  ;CALL=CACHOFF   TRAP+24(104424) TURN CACHE OFF
16047
16048 066134  042750                            $LOADC  ;CALL=LOADCSR   TRAP+25(104425) LOAD CORRECT CSR
16049 066136  043044                            $READC  ;CALL=READCSR   TRAP+26(104426) READ CORRECT CSR
16050
16051 066140  056542                            $PER01  ;CALL=PERR01    TRAP+27(104427) PROGRAM DETECTED ERROR
16052 066142  056570                            $PER02  ;CALL=PERR02    TRAP+30(104430) PROGRAM DETECTED ERROR
16053 066144  056616                            $PER03  ;CALL=PERR03    TRAP+31(104431) PROGRAM DETECTED ERROR
16054 066146  056646                            $PER04  ;CALL=PERR04    TRAP+32(104432) PROGRAM DETECTED ERROR
16055 066150  056730                            $PER07  ;CALL=PERR07    TRAP+33(104433) PROGRAM DETECTED ERROR
16056 066152  056752                            $PER10  ;CALL=PERR10    TRAP+34(104434) PROGRAM DETECTED ERROR
16057 066154  057002                            $PER11  ;CALL=PERR11    TRAP+35(104435) PROGRAM DETECTED ERROR
16058 066156  057022                            $PER12  ;CALL=PERR12    TRAP+36(104436) PROGRAM DETECTED ERROR
16059 066160  057044                            $PER13  ;CALL=PERR13    TRAP+37(104437) PROGRAM DETECTED ERROR
16060 066162  057064                            $PER14  ;CALL=PERR14    TRAP+40(104440) PROGRAM DETECTED ERROR
16061 066164  057106                            $PER15  ;CALL=PERR15    TRAP+41(104441) PROGRAM DETECTED ERROR
16062 066166  057130                            $PER16  ;CALL=PERR16    TRAP+42(104442) PROGRAM DETECTED ERROR
16063 066170  057150                            $PER17  ;CALL=PERR17    TRAP+43(104443) PROGRAM DETECTED ERROR
16064 066172  057166                            $PER20  ;CALL=PERR20    TRAP+44(104444) PROGRAM DETECTED ERROR
16065 066174  057204                            $PER21  ;CALL=PERR21    TRAP+45(104445) PROGRAM DETECTED ERROR
16066 066176  057224                            $PER22  ;CALL=PERR22    TRAP+46(104446) PROGRAM DETECTED ERROR
16067 066200  057242                            $PER23  ;CALL=PERR23    TRAP+47(104447) PROGRAM DETECTED ERROR
16068 066202  057260                            $PER24  ;CALL=PERR24    TRAP+50(104450) PROGRAM DETECTED ERROR
16069 066204  054016                            $PER25  ;CALL=PERR25    TRAP+51(104451) PROGRAM DETECTED ERROR
```

TRAP TABLE

```
16070 066206  057450          $PER26  ;CALL=PERR26     TRAP+52(104452) PROGRAM DETECTED ERROR
16071 066210  057470          $PER27  ;CALL=PERR27     TRAP+53(104453) PROGRAM DETECTED ERROR
16072 066212  054244          $PER30  ;CALL=PERR30     TRAP+54(104454) PROGRAM DETECTED ERROR
16073 066214  057660          $PER31  ;CALL=PERR31     TRAP+55(104455) PROGRAM DETECTED ERROR
16074 066216  057756          $PER32  ;CALL=PERR32     TRAP+56(104456) PROGRAM DETECTED ERROR
16075 066220  060024          $PER33  ;CALL=PERR33     TRAP+57(104457) PROGRAM DETECTED ERROR
16076 066222  060104          $PER34  ;CALL=PERR34     TRAP+60(104460) PROGRAM DETECTED ERROR
16077 066224  060136          $PER35  ;CALL=PERR35     TRAP+61(104461) PROGRAM DETECTED ERROR
16078 066226  060172          $PER36  ;CALL=PERR36     TRAP+62(104462) PROGRAM DETECTED ERROR
16079 066230  060222          $PER37  ;CALL=PERR37     TRAP+63(104463) PROGRAM DETECTED ERROR   ;;ILC;REV B
16080 066232  060226          $PER40  ;CALL=PERR40     TRAP+64(104464) PROGRAM DETECTED ERROR   ;;ILC;REV B
16081 066234  066054          $NOTRAP ;CALL=PERR41     TRAP+65(104465) PROGRAM DETECTED ERROR
16082 066236  066054          $NOTRAP ;CALL=PERR42     TRAP+66(104466) PROGRAM DETECTED ERROR
16083 066240  066054          $NOTRAP ;CALL=PERR43     TRAP+67(104467) PROGRAM DETECTED ERROR
16084
16085 066242  043270          $ECCDIS :CALL=ECCDIS     TRAP+70(104470) DISABLE ECC ON ALL CSR'S
16086 066244  043304          $ECC1DIS;CALL=ECC1DIS    TRAP+71(104471) DISABLE ECC ON 1 SELECTED CSR
16087 066246  043316          $ECCINIT;CALL=ECCINIT    TRAP+72(104472) INITIALIZE ALL MK11 CSR'S
16088 066250  043332          $ECC1INIT;CALL=ECC1INIT  TRAP+73(104473) INITIALIZE 1 SELECTED MK11 CSR
16089 066252  043372          $CBCSR  ;CALL=CBCSR      TRAP+74(104474) WRITE GENERATED CHECKBITS IN ALL CSR'S
16090 066254  043414          $CB1CSR ;CALL=CB1CSR     TRAP+75(104475) WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
16091 066256  043434          $WASSBE ;CALL=WASSBE     TRAP+76(104476) WAS THERE A SBE ON ANY CSR?
16092 066260  043550          $WAS1SBE;CALL=WAS1SBE    TRAP+77(104477) WAS THERE A SBE ON 1 SELECTED CSR?
16093 066262  043600          $WASDBE ;CALL=WASDBE     TRAP+100(104500)WAS THERE A DBE ON ANY CSR?
16094 066264  043714          $WAS1DBE;CALL=WAS1DBE    TRAP+101(104501)WAS THERE A DBE ON 1 SELECTED CSR?
16095 066266  043744          $CLRCSR ;CALL=CLRCSR     TRAP+102(104502)CLEAR ALL CSR'S
16096 066270  043756          $CLR1CSR;CALL=CLR1CSR    TRAP+103(104503)CLEAR 1 SELECTED CSR
16097 066272  043766          $CHKDIS ;CALL=CHKDIS     TRAP+104(104504)DISABLE ECC & WRITE CKBITS FROM ALL CSR'S
16098 066274  044002          $CHK1DIS;CALL=CHK1DIS    TRAP+105(104505)DISABLE ECC & WRITE CKBITS FROM 1 CSR
16099 066276  043344          $ENASBE ;CALL=ENASBE     TRAP+106(104506)ENABLE TRAPS ON SBE'S FROM ALL CSR'S
16100 066300  043360          $ENA1SBE;CALL=ENA1SBE    TRAP+107(104507)ENABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
16101 066302  043064          $TSTRD  ;CALL=TSTREAD    TRAP+110(104510)TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES
16102 066304  044062          $INVALID;CALL=INVALID    TRAP+111(104511)INVALIDATE BACKGROUND PATTERN ON BANK
16103 066306  044112          $ERRGEN ;CALL=ERRGEN     TRAP+112(104512)TEST ERROR ADDRESS
16104 066310  044362          $CBREG  ;CALL=CBREG      TRAP+112(104513)ENABLE CHECK/SYNDROME BIT REGISTER
16105 066312  066054          $NOTRAP
16106 066314  066054          $NOTRAP
16107 066316  066054          $NOTRAP
16108 066320  066054          $NOTRAP
16109 066322  066054          $NOTRAP
16110 066324  066054          $NOTRAP
```

```
 16113          177776                    ST      =       177776          ;STATUS REGISTER
```

```
16116                                           .SBTTL  TABLE   ERROR POINTER
16117
16118                                   ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
16119                                   ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
16120                                   ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
16121                                   ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS (ERRPC).
16122                                   ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:
16123
16124                                   ;*      EM              ;;POINTS TO THE ERROR MESSAGE
16125                                   ;*      DH              ;;POINTS TO THE DATA HEADER
16126                                   ;*      DT              ;;POINTS TO THE DATA
16127                                   ;*      DF              ;;POINTS TO THE DATA FORMAT
16128
16129
16130 066326                            $ERRTB: ;ERROR  1
16131 066326  071014                            EM24
16132 066330  073151                            DH13
16133 066332  067352                            DT13
16134 066334  067733                            DF11
16135                                           ;ERROR  2
16136 066336  070001                            EM2
16137 066340  072460                            DH1
16138 066342  067176                            DT1
16139 066344  067611                            DF2
16140                                           ;ERROR  3
16141 066346  070037                            EM3
16142 066350  072540                            DH3
16143 066352  067214                            DT3
16144 066354  067726                            DF9
16145                                           ;ERROR  4
16146 066356  070071                            EM4
16147 066360  072540                            DH3
16148 066362  067224                            DT4
16149 066364  067726                            DF9
16150                                           ;ERROR  5
16151 066366  070137                            EM5
16152 066370  072574                            DH5
16153 066372  067234                            DT5
16154 066374  067611                            DF2
16155                                           ;ERROR  6
16156 066376  070214                            EM6
16157 066400  072574                            DH5
16158 066402  067234                            DT5
16159 066404  067611                            DF2
16160                                           ;ERROR  7
16161 066406  070241                            EM7
16162 066410  072574                            DH5
16163 066412  067234                            DT5
16164 066414  067611                            DF2
16165                                           ;ERROR  10
16166 066416  072225                            EM53
16167 066420  073673                            DH25
16168 066422  067530                            DT25
16169 066424  067611                            DF2
```

TABLE ERROR POINTER

```
16172                                   ;ERROR  11
16173 066426  070301                    EM11
16174 066430  072720                    DH7
16175 066432  067266                    DT7
16176 066434  067635                    DF3
16177                                   ;ERROR  12
16178 066436  070301                    EM11
16179 066440  072720                    DH7
16180 066442  067266                    DT7
16181 066444  067650                    DF4
16182                                   ;ERROR  13
16183 066446  070323                    EM12
16184 066450  073030                    DH10
16185 066452  067316                    DT10
16186 066454  067611                    DF2
16187                                   ;ERROR  14
16188 066456  070301                    EM11
16189 066460  072720                    DH7
16190 066462  067266                    DT7
16191 066464  067663                    DF5
16192                                   ;ERROR  15
16193 066466  070301                    EM11
16194 066470  072720                    DH7
16195 066472  067266                    DT7
16196 066474  067676                    DF6
16197                                   ;ERROR  16
16198 066476  070347                    EM13
16199 066500  073151                    DH13
16200 066502  067352                    DT13
16201 066504  067733                    DF11
16202                                   ;ERROR  17
16203 066506  070401                    EM14
16204 066510  073151                    DH13
16205 066512  067352                    DT13
16206 066514  067733                    DF11
16207                                   ;ERROR  20
16208 066516  070445                    EM15
16209 066520  073151                    DH13
16210 066522  067352                    DT13
16211 066524  067733                    DF11
16212                                   ;ERROR  21
16213 066526  072254                    EM55
16214 066530  073731                    DH26
16215 066532  067542                    DT26
16216 066534  067611                    DF2
16217                                   ;ERROR  22
16218 066536  070513                    EM17
16219 066540  072720                    DH7
16220 066542  067266                    DT7
16221 066544  067663                    DF5
16222                                   ;ERROR  23
16223 066546  072074                    EM50
16224 066550  073545                    DH23
16225 066552  067466                    DT23
16226 066554  067744                    DF13
```

```
16229                                           ;ERROR  24
16230 066556  070553                            EM19
16231 066560  073151                            DH13
16232 066562  067352                            DT13
16233 066564  067733                            DF11
16234                                           ;ERROR  25
16235 066566  070625                            EM20
16236 066570  073151                            DH13
16237 066572  067352                            DT13
16238 066574  067733                            DF11
16239                                           ;ERROR  26
16240 066576  000000                            0               ;NO MESSAGE
16241 066600  073144                            DH12
16242 066602  067346                            DT12
16243 066604  067611                            DF2
16244                                           ;ERROR  27
16245 066606  070704                            EM21
16246 066610  073126                            DH11
16247 066612  067340                            DT11
16248 066614  067611                            DF2
16249                                           ;ERROR  30
16250 066616  070740                            EM22
16251 066620  073151                            DH13
16252 066622  067352                            DT13
16253 066624  067733                            DF11
16254                                           ;ERROR  31
16255 066626  000000                            0               ;NO MESSAGE
16256 066630  073246                            DH14
16257 066632  067374                            DT14
16258 066634  067611                            DF2
16259                                           ;ERROR  32
16260 066636  070765                            EM23
16261 066640  072574                            DH5
16262 066642  067234                            DT5
16263 066644  067611                            DF2
16264                                           ;ERROR  33
16265 066646  071073                            EM25
16266 066650  073325                            DH15
16267 066652  067412                            DT16
16268 066654  067711                            DF7
16269                                           ;ERROR  34
16270 066656  071120                            EM26
16271 066660  073444                            DH16
16272 066662  067442                            DT17
16273 066664  067635                            DF3
```

```
16276                                           ;ERROR  35
16277 066666  072200                            EM52
16278 066670  073673                            DH25
16279 066672  067530                            DT25
16280 066674  067611                            DF2
16281                                           ;ERROR  36
16282 066676  071171                            EM27
16283 066700  073444                            DH16
16284 066702  067442                            DT17
16285 066704  067724                            DF8
16286                                           ;ERROR  37
16287 066706  071666                            EM35
16288 066710  072720                            DH7
16289 066712  067266                            DT7
16290 066714  067635                            DF3
16291                                           ;ERROR  40
16292 066716  071261                            EM29
16293 066720  072720                            DH7
16294 066722  067266                            DT7
16295 066724  067635                            DF3
16296                                           ;ERROR  41
16297 066726  071343                            EM30
16298 066730  072720                            DH7
16299 066732  067266                            DT7
16300 066734  067663                            DF5
16301                                           ;ERROR  42
16302 066736  072375                            EM60
16303 066740  073466                            DH20
16304 066742  067466                            DT23
16305 066744  067744                            DF13
16306                                           ;ERROR  43
16307 066746  071453                            EM32
16308 066750  072720                            DH7
16309 066752  067266                            DT7
16310 066754  067635                            DF3
16311                                           ;ERROR  44
16312 066756  071560                            EM33
16313 066760  072720                            DH7
16314 066762  067266                            DT7
16315 066764  067635                            DF3
16316                                           ;ERROR  45
16317 066766  072130                            EM51
16318 066770  073624                            DH24
16319 066772  067510                            DT24
16320 066774  067754                            DF14
16321                                           ;ERROR  46
16322 066776  071753                            EM36
16323 067000  072653                            DH6
16324 067002  067252                            DT6
16325 067004  067611                            DF2
```

```
16328                                           ;ERROR  47
16329 067006  072022                            EM40
16330 067010  072515                            DH2
16331 067012  067450                            DT20
16332 067014  067611                            DF2
16333                                           ;ERROR  50
16334 067016  072275                            EM56
16335 067020  073747                            DH27
16336 067022  067550                            DT27
16337 067024  067610                            DF1
16338                                           ;ERROR  51
16339 067026  072437                            EM61
16340 067030  073624                            DH24
16341 067032  067510                            DT24
16342 067034  067754                            DF14
16343                                           ;ERROR  52
16344 067036  071261                            EM29
16345 067040  073151                            DH13
16346 067042  067352                            DT13
16347 067044  067733                            DF11
16348                                           ;ERROR  53
16349 067046  071073                            EM25
16350 067050  074023                            DH30
16351 067052  067570                            DT30
16352 067054  067772                            DF16
16353                                           ;ERROR  54
16354 067056  072327                            EM57
16355 067060  074023                            DH30
16356 067062  067570                            DT30
16357 067064  067772                            DF16
16358                                           ;ERROR  55
16359 067066  070625                            EM20
16360 067070  073624                            DH24
16361 067072  067510                            DT24
16362 067074  067754                            DF14
16363                                           ;ERROR  56
16364 067076  070625                            EM20
16365 067100  074023                            DH30
16366 067102  067570                            DT30
16367 067104  067772                            DF16
16368                                           ;ERROR  57
16369 067106  070553                            EM19
16370 067110  073624                            DH24
16371 067112  067510                            DT24
16372 067114  067754                            DF14
16373                                           ;ERROR  60
16374 067116  070347                            EM13
16375 067120  073466                            DH20
16376 067122  067466                            DT23
16377 067124  067744                            DF13
16378                                           ;ERROR  61
16379 067126  071343                            EM30
16380 067130  073466                            DH20
16381 067132  067466                            DT23
16382 067134  067744                            DF13
16383                                           ;ERROR  62
16384 067136  070625                            EM20
```

TABLE   ERROR POINTER

```
16385 067140  073624                    DH24
16386 067142  067510                    DT24
16387 067144  067754                    DF14
16388                                   ;ERROR  63
16389 067146  070740                    EM22
16390 067150  073624                    DH24
16391 067152  067510                    DT24
16392 067154  067754                    DF14
16393                                   ;ERROR  64
16394 067156  100344                    EM62
16395 067160  072574                    DH5
16396 067162  067234                    DT5
16397 067164  067611                    DF2
16398                                   ;ERROR  65
16399 067166  070740                    EM22
16400 067170  073466                    DH20
16401 067172  067466                    DT23
16402 067174  067744                    DF13
```

ERROR DATA TAGS (DT)

```
                                                        .SBTTL  ERROR DATA TAGS (DT)
16405 067176  002016  002032  002042  DT1:    .WORD   ERRPC,ADDRESS,GOOD,BAD,0
      067204  002050  000000
16406 067210  002016  000000          DT2:    .WORD   ERRPC,0
16407 067214  002016  002034  002070  DT3:    .WORD   ERRPC,PADDRESS,PARCNT,0
      067222  000000
16408 067224  002016  002032  002066  DT4:    .WORD   ERRPC,ADDRESS,NEMCNT,0
      067232  000000
16409 067234  002016  177572  177574  DT5:    .WORD   ERRPC,MMR0,MMR1,MMR2,MMR3,CPUERR,0
      067242  177576  172516  177766
      067250  000000
16410 067252  002016  002420  002376  DT6:    .WORD   ERRPC,APTPAR,LSIZE,APTECC,MSIZE,0
      067260  002422  002400  000000
16411 067266  002016  002174  002032  DT7:    .WORD   ERRPC,DUMMY,ADDRESS,DUMMY,GOOD,BAD,BADXOR
      067274  002174  002042  002050
      067302  002056
16412 067304  002174  002174  002174          .WORD   DUMMY,DUMMY,DUMMY,DUMMY,0
      067312  002174  000000
16413 067316  002176  002200  002202  DT10:   .WORD   DETR0,DETR1,DETR2,DETR3,DETR4,DETR5,DETSP,DETPSW,0
      067324  002204  002206  002210
      067332  002212  002214  000000
16414 067340  002016  002146  000000  DT11:   .WORD   ERRPC,CSR,0
16415 067346  002146  000000          DT12:   .WORD   CSR,0
16416 067352  002016  002174  002032  DT13:   .WORD   ERRPC,DUMMY,ADDRESS,DUMMY,TSTDAT,TSTDAT+2,CHECK,CSR,0
      067360  002174  002244  002246
      067366  002312  002146  000000
16417 067374  177746  177572  177574  DT14:   .WORD   CONTRL,MMR0,MMR1,MMR2,MMR3,CPUERR,0
      067402  177576  172516  177766
      067410  000000
16418 067412  002016  002174  002174  DT16:   .WORD   ERRPC,DUMMY,DUMMY,GOOD,GOOD2,GOOD3
      067420  002042  002044  002046
16419 067426  002050  002052  002054          .WORD   BAD,BAD2,BAD3,DUMMY,DUMMY,0
      067434  002174  002174  000000
16420 067442  002016  002174  000000  DT17:   .WORD   ERRPC,DUMMY,0
16421 067450  002016  002042  002050  DT20:   .WORD   ERRPC,GOOD,BAD,0
      067456  000000
16422 067460  002016  002174  000000  DT22:   .WORD   ERRPC,DUMMY,0
16423 067466  002016  002174  002042  DT23:   .WORD   ERRPC,DUMMY,GOOD,BAD,DUMMY,DUMMY,DUMMY,DUMMY,0
      067474  002050  002174  002174
      067502  002174  002174  000000
16424 067510  002016  002174  002146  DT24:   .WORD   ERRPC,DUMMY,CSR,DUMMY,DUMMY,DUMMY,DUMMY,0
      067516  002174  002174  002174
      067524  002174  000000
16425 067530  002016  002042  002146  DT25:   .WORD   ERRPC,GOOD,CSR,CSRNO,0
      067536  002150  000000
16426 067542  002016  002050  000000  DT26:   .WORD   ERRPC,BAD,0
16427 067550  002016  002174  002032  DT27:   .WORD   ERRPC,DUMMY,ADDRESS,DUMMY,DUMMY,DUMMY,DUMMY,0
      067556  002174  002174  002174
      067564  002174  000000
16428 067570  002016  002174  002174  DT30:   .WORD   ERRPC,DUMMY,DUMMY,GOOD,BAD,CSR,DUMMY,0
      067576  002042  002050  002146
      067604  002174  000000
```

```
16431                                                   .SBTTL  ERROR DATA FORMATS (DF)
16432 067610      000                           DF1:    .BYTE   0
16433 067611      000       000       000       DF2:    .BYTE   0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
      067614      000       000       000
      067617      000       000       000
      067622      000       000       000
      067625      000       000       000
      067630      000       000       000
      067633      000       000
16434 067635      000       005       000       DF3:    .BYTE   0,5,0,8.,0,0,0,3,6,2,4
      067640      010       000       000
      067643      000       003       006
      067646      002       004
16435 067650      000       005       000       DF4:    .BYTE   0,5,0,8.,0,8.,8.,3,6,2,4
      067653      010       000       010
      067656      010       003       006
      067661      002       004
16436 067663      000       005       000       DF5:    .BYTE   0,5,0,8.,9.,9.,9.,3,6,2,4
      067666      010       011       011
      067671      011       003       006
      067674      002       004
16437 067676      000       005       000       DF6:    .BYTE   0,5,0,8.,9.,8.,8.,3,6,2,4
      067701      010       011       010
      067704      010       003       006
      067707      002       004
16438 067711      000       005       010       DF7:    .BYTE   0,5,8.,0,0,9.,0,0,9.,2,4
      067714      000       000       011
      067717      000       000       011
      067722      002       004
16439 067724      000       005                 DF8:    .BYTE   0,5
16440 067726      000       001       001       DF9:    .BYTE   0,1,1,1,1
      067731      001       001
16441 067733      000       005       000       DF11:   .BYTE   0,5,0,8.,0,0,0,0,0
      067736      010       000       000
      067741      000       000       000
16442 067744      000       005       000       DF13:   .BYTE   0,5,0,0,3,6,2,4
      067747      000       003       006
      067752      002       004
16443 067754      000       005       000       DF14:   .BYTE   0,5,0,3,6,2,4
      067757      003       006       002
      067762      004
16444 067763      000       005       000       DF15:   .BYTE   0,5,0,8.,3,6,4
      067766      010       003       006
      067771      004
16445 067772      000       005       010       DF16:   .BYTE   0,5,8.,0,0,3,4
      067775      000       000       003
      070000      004
```

```
16448                                           .SBTTL  ERROR MESSAGES (EM)
16454 070001    103     101     116  EM2:       .ASCIZ  /CAN'T SET 22 BIT MODE IN MMR3/
16455 070037    120     101     122  EM3:       .ASCIZ  /PARITY ERROR(S) IN BANK 0/
16456 070071    116     117     116  EM4:       .ASCIZ  /NON-EXISTANT MEMORY (HOLES) IN BANK 0/
16457 070137    111     114     114  EM5:       .ASCIZ  /ILLEGAL OR RESERVED INSTRUCTION (TRAP TO 10)/
16458 070214    125     116     105  EM6:       .ASCIZ  /UNEXPECTED TRAP TO 4/
16459 070241    115     105     115  EM7:       .ASCIZ  /MEMORY MANAGEMENT (TRAP TO 250)/
16460 070301    115     105     115  EM11:      .ASCIZ  /MEMORY DATA ERROR/
16461 070323    104     105     124  EM12:      .ASCIZ  /DETAILED ERROR DUMP/
16462 070347    115     111     123  EM13:      .ASCIZ  /MISSING EXPECTED SBE FLAG/
16463 070401    127     122     111  EM14:      .ASCIZ  /WRITE BYTE FAILED TO CLEAR SBE FLAG/
16464 070445    106     101     111  EM15:      .ASCIZ  /FAILED TO GET INTERRUPT WITH DBE FLAG/
16465 070513    115     105     115  EM17:      .ASCIZ  /MEMORY DATA ERROR IN CHECK BITS/
16466 070553    123     102     105  EM19:      .ASCIZ  /SBE-DBE CAUSED PARITY TRAP WHEN INHIBITED/
16467 070625    123     102     105  EM20:      .ASCIZ  /SBE-DBE DID NOT CAUSE PARITY TRAP WHEN ENABLED/
16468 070704    123     102     105  EM21:      .ASCIZ  /SBE-DBE ON MASTER TEST WORD/
16469 070740    115     111     123  EM22:      .ASCIZ  /MISSING EXPECTED DBE/
16470 070765    125     116     105  EM23:      .ASCIZ  /UNEXPECTED PARITY TRAP/
16471 071014    122     105     103  EM24:      .ASCIZ  /RECEIVED DBE FLAG WHEN EXPECTING ONLY SBE FLAG/
16472 071073    103     110     105  EM25:      .ASCIZ  /CHECK BIT DATA ERROR/
16473 071120    101     104     104  EM26:      .ASCIZ  /ADDRESS PARITY ERROR DID NOT CAUSE ABORT/
16474 071171    105     103     103  EM27:      .ASCIZ  /ECC INHIBIT MODE POINTER FAILURE - DID NOT PROTECT BANK/
16475 071261    103     117     122  EM29:      .ASCIZ  /CORRECTION FAILURE WITH ECC ENABLED ON FORCED SBE/
16476 071343    127     122     111  EM30:      .ASCII  /WRITE BYTE WITH ECC ENABLED FAILED TO CLEAR DATA AT/<CRLF>
16477 071427    106     117     122                .ASCIZ  /FORCED SBE LOCATION/
16478 071453    115     117     126  EM32:      .ASCIZ  /MOVB #360,(R2)+ WITH ECC ENABLED CHANGED DATA AT FORCED DBE LOCATION/
16479 071560    115     117     126  EM33:      .ASCIZ  /MOV #177400,(R1) WITH ECC ENABLED CHANGED DATA AT FORCED DBE LOCATION/
16480 071666    125     116     105  EM35:      .ASCIZ  /UNEXPECTED CORRECTION WITH ECC DISABLE ON FORCED SBE/
16481 071753    101     120     124  EM36:      .ASCIZ  /APT SIZE DISAGREES WITH PROGRAM SIZING/
16482 072022    102     122     101  EM40:      .ASCIZ  /BRANCH GOBBLE FAILED CONDITION CODES TEST/
16483 072074    102     101     104  EM50:      .ASCIZ  /BAD ERROR ADDRESS GENERATED/
16484 072130    106     114     101  EM51:      .ASCIZ  /FLAGS NOT SET ON FORCED UNCORRECTED SBE/
16485 072200    102     111     124  EM52:      .ASCIZ  /BIT SET ERROR IN CSR/
16486 072225    102     111     124  EM53:      .ASCIZ  /BIT CLEAR ERROR IN CSR/
16487 072254    111     114     114  EM55:      .ASCIZ  /ILLEGAL CSR TYPE/
16488 072275    102     101     104  EM56:      .ASCIZ  /BAD PARITY TRAP GENERATED/
16489 072327    127     122     117  EM57:      .ASCIZ  /WRONG CHECK BIT READ BACK FROM MEMORY/
16490 072375    127     122     117  EM60.      .ASCIZ  /WRONG SYNDROME BITS READ INTO CSR/
16491 072437    103     123     122  EM61:      .ASCIZ  /CSR UPDATE ERROR/
```

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16494                                          .SBTTL  ERROR DATA HEADERS (DH)
16495 072460      040       040       120  DH1:    .ASCIZ  /  PC    DEV ADD    GOOD     BAD/
16496 072515      040       040       120  DH2:    .ASCIZ  /  PC    GD-CC BD-CC/
16497 072540      040       040       120  DH3:    .ASCIZ  /  PC    1ST ADD  # OF ERRORS/
16498 072574      040       040       120  DH5:    .ASCIZ  /  PC      MMR0     MMR1     MMR2     MMR3    CPUERR/
16499 072653      040       040       120  DH6:    .ASCIZ  /  PC    APTPAR    LSIZE   APTECC   MSIZE/
16500 072720      040       040       120  DH7:    .ASCII  /  PC     BANK  VADD      PADD      GOOD/
16501 072764      040       040       040          .ASCIZ  /      BAD      XOR  CSR  MTYP INT PAT/
16502 073030      040       040       122  DH10:   .ASCIZ  /  R0       R1       R2       R3       R4       R5       SP       PSW/
16503 073126      040       040       120  DH11:   .ASCIZ  /  PC       CSR/
16504 073144      040       103       123  DH12:   .ASCIZ  / CSR/
16505 073151      040       040       120  DH13:   .ASCII  /  PC     BANK  VADD      PADD     WROTE1   WROTE2/
16506 073226      040       103       110          .ASCIZ  / CHKBITS     CSR/
16507 073246      103       117       116  DH14:   .ASCIZ  /CONTRL    MMR0     MMR1     MMR2     MMR3    CPUERR/
16508 073325      040       040       120  DH15:   .ASCII  /  PC     BANK     PADD    GD-WD1   GD-WD2   GD-CHK/
16509 073402      040       102       101          .ASCIZ  / BAD-WD1 BAD-WD2  BAD-CHK INT PAT/
16510 073444      040       040       120  DH16:   .ASCIZ  /  PC     BANK/
16511 073461      040       040       120  DH19:   .ASCIZ  /  PC/
16512 073466      040       040       120  DH20:   .ASCIZ  /  PC     BANK GD-CSR  (CSR)  CSR  MTYP INT  PAT/
16513 073545      040       040       120  DH23:   .ASCIZ  /  PC     BANK GD-ERR BAD-ERR CSR  MTYP INT  PAT/
16514 073624      040       040       120  DH24:   .ASCIZ  /  PC     BANK  (CSR) CSR  MTYP INT  PAT/
16515 073673      040       040       120  DH25:   .ASCIZ  /  PC     GD-DAT  (CSR)   CSRNO/
16516 073731      040       040       120  DH26:   .ASCIZ  /  PC   BADCODE/
16517 073747      040       040       120  DH27:   .ASCIZ  /  PC     BANK  VADD      PADD   CSR  MTYP PAT/
16518 074023      040       040       120  DH30:   .ASCIZ  /  PC     BANK   PADD    WROTE    READ  CSR  PAT/
```

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16521                                           .SBTTL  MESSAGES
16522 074102  200   040   040  MSG001: .ASCIZ  <CRLF>/                                MEMORY CONFIGURATION MAP/
16523 074164  200   040   040  MSG002: .ASCIZ  <CRLF>/                                    16K WORD BANKS/
16524 074241  200   040   040  MSG003: .ASCII  <CRLF>/                        1       2       3/
16525 074303  040   040   040          .ASCIZ  /       4       5       6       7  /
16526 074346  200   040   040  MSG004: .ASCII  <CRLF>/       01234567012345670123456701234567/
16527 074407  060   061   062          .ASCIZ  /01234567012345670123456701234567012345670123/
16528 074454  200   105   122  MSG005: .ASCIZ  <CRLF>/ERRORS  /
16529 074466  200   125   116  MSG006: .ASCIZ  <CRLF>/UNDEFINED TRAP INSTRUCTION/<32>
16530 074523  200   111   116  MSG007: .ASCIZ  <CRLF>/INTRLV  /                       ;INTERLEAVED CSR #
16531 074535  200   115   105  MSG009: .ASCIZ  <CRLF>/MEMTYPE /                       ;MEMORY TYPE
16532 074547  200   120   122  MSG010: .ASCIZ  <CRLF>/PROTECT /                       ;MEMORY PROTECTED
16533 074561  040   040   040  MSG011: .ASCIZ  /    0       1       2       3       4       5       6/
16534 074647  064   065   066  MSG012: .ASCIZ  /45670123456701234567012345670123456701234567012345670123456701234567/
16535 074744  130   000        MSG013: .ASCIZ  /X/
16536 074746  040   000        MSG014: .ASCIZ  / /                     ;SPACE
16537 074750  000   000        MSG015: .BYTE   0,0                     ;FOR SINGLE ASCII CHARACTERS & TERMINATOR
16538 074752  200   103   123  MSG016: .ASCIZ  <CRLF>/CSR     /
16539 074764  040   040   040  MSG017: .ASCIZ  /       /                       ;8 SPACES
16540 074775  040   040   000  MSG018: .ASCIZ  /  /                            ;2 SPACES
16541 075000  040   040   040  MSG019: .ASCIZ  /   /                           ;3 SPACES
16542 075004  200   106   123  MSG020: .ASCIZ  <CRLF>/FS COMMAND MODE/
16543 075025  200   103   117  MSG021: .ASCII  <CRLF>/COMMANDS AVAILABLE:/
16544 075051  200   060   040          .ASCII  <CRLF>/0 = EXIT/
16545 075062  200   061   040          .ASCII  <CRLF>/1 = READ CSR/
16546 075077  200   062   040          .ASCII  <CRLF>/2 = LOAD CSR/
16547 075114  200   063   040          .ASCII  <CRLF>/3 = EXAMINE MEMORY/
16548 075137  200   064   040          .ASCII  <CRLF>/4 = MODIFY MEMORY/
16549 075161  200   065   040          .ASCII  <CRLF>/5 = SELECT BANK & TEST/
16550 075210  200   066   040          .ASCII  <CRLF>/6 = TYPE CONFIG MAP/
16551 075234  200   067   040          .ASCII  <CRLF>/7 = SOB-A-LONG TEST/
16552 075260  200   070   040          .ASCII  <CRLF>/8 = ERROR SUMMARY/
16553 075302  200   071   075          .ASCII  <CRLF>/9=  REFRESH TEST/
16554 075323  200   061   060          .ASCII  <CRLF>/10= SET FILL COUNT/
16555 075346  200   061   061          .ASCII  <CRLF>/11= ENTER KAMIKAZE MODE/
16556 075376  200   061   062          .ASCII  <CRLF>/12= EXIT KAMIKAZE MODE/
16557 075425  200   061   063          .ASCII  <CRLF>/13= TURN CACHE OFF/
16558 075450  200   061   064          .ASCII  <CRLF>/14= TURN CACHE ON/
16559 075472  200   061   065          .ASCII  <CRLF>/15= TEST SELECTED BANKS/
16560 075522  200   061   066          .ASCII  <CRLF>/16= TEST ALL BANKS/
16561 075545  200   061   067          .ASCII  <CRLF>/17= ENABLE TRACE/
16562 075566  200   061   070          .ASCII  <CRLF>/18= DISABLE TRACE/
16563 075610  015   012   000          .BYTE   15,12,0
16564 075613  200   127   110  MSG022: .ASCIZ  <CRLF>/WHICH CSR(0-F)? /
16565 075635  200   103   123  MSG023: .ASCIZ  <CRLF>/CSR WORD? /
16566 075651  200   103   123  MSG025: .ASCIZ  <CRLF>/CSR DOES NOT EXIST/
16567 075675  200   103   117  MSG026: .ASCIZ  <CRLF>/COMMAND:/
16568 075707  200   117   114  MSG027: .ASCIZ  <CRLF>/OLD CSR WAS/
16569 075724  200   103   123  MSG028: .ASCIZ  <CRLF>/CSR IS NOW/
16570 075740  200   105   130  MSG029: .ASCIZ  <CRLF>/EXAMINE MEMORY/
16571 075760  200   102   101  MSG030: .ASCIZ  <CRLF>/BANK(0-167)? /
16572 075777  200   120   110  MSG031: .ASCIZ  <CRLF>/PHYSICAL ADDRESS(0-17757776)? /
16573 076037  200   120   101  MSG032: .ASCIZ  <CRLF>/PARITY ABORT/<32>
16574 076056  200   124   111  MSG033: .ASCIZ  <CRLF>/TIMEOUT TRAP/<32>
16575 076075  200   102   131  MSGA34: .ASCIZ  <CRLF>/BYPASSING ECC TESTS ON BANK /
16576 076133  040   104   125  MSGB34: .ASCIZ  / DUE TO SBE LOCATIONS/
16577 076161  121   126   000  MSG035: .ASCIZ  /QV/
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MESSAGES

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16578 076164  200  115  117  MSG036: .ASCIZ  <CRLF>/MODIFY MEMORY/
16579 076203  200  117  114  MSG037: .ASCIZ  <CRLF>/OLD DATA WAS /
16580 076222  200  104  101  MSG038: .ASCIZ  <CRLF>/DATA IS NOW /
16581 076240  200  111  116  MSG039: .ASCIZ  <CRLF>/INPUT NEW DATA? /
16582 076262  200  123  105  MSG040: .ASCIZ  <CRLF>/SELECT BANK & TEST/
16583 076306  200  102  101  MSG041: .ASCIZ  <CRLF>/BANK NOT ACCESSABLE/
16584 076333  200  124  105  MSG042: .ASCIZ  <CRLF>/TEST(0-47)? /
16585 076351  200  124  105  MSG043: .ASCIZ  <CRLF>/TEST 0 DATA IS? /
16586 076373  200  124  117  MSG046: .ASCIZ  <CRLF>/TO ESCAPE TYPE ANY KEY/<CRLF><12><12>
16587 076426  200  124  105  MSG047: .ASCIZ  <CRLF>/TEST COMPLETE/
16588 076445  040  116  117  MSG048: .ASCIZ  / NOT AVAILABLE NOW - TRY LATER!/
16589 076505  200  102  101  MSG049: .ASCIZ  <CRLF>/BANK REQUIRES RELOCATION/
16590                          .EVEN
16591 076540  120  117  127  MSG051: .ASCIZ  /POWER RECOVERY/
16592 076557  200  123  117  MSG055: .ASCIZ  <CRLF>/SOB-A-LONG TEST/
16593 076600  200  102  105  MSG056: .ASCIZ  <CRLF>/BELL = EACH PASS COMPLETE/
16594 076633  200  040  040  MSG058: .ASCIZ  <CRLF>/  CSR    CSR .../
16595 076655  077  077  077  MSG061: .ASCIZ  /??????/
16596 076664  111  116  120  MSG062: .ASCIZ  /INPUT MUST BE A/
16597 076704  116  040  117  MSG063: .ASCIZ  /N OCTAL /
16598 076715  116  125  115  MSG064: .ASCIZ  /NUMBER/<CRLF>
16599 076725  040  104  105  MSG065: .ASCIZ  / DECIMAL /
16600 076737  200  105  122  MSG066: .ASCIZ  <CRLF>/ERRORS > 20 - ABORTING FOR XXDP CHAIN/
16601 077006  106  101  124  MSG067: .ASCIZ  /FATAL /
16602 077015  113  040  127  MSG070: .ASCIZ  /K WORDS OF MEMORY TOTAL/<CRLF>
16603 077046  200  122  105  MSG073: .ASCIZ  <CRLF>/REFRESH TEST/
16604 077064  200  122  105  MSG075: .ASCIZ  <CRLF>/RELOCATION NOT POSSIBLE/<32>
16605 077116  200  040  040  MSG076: .ASCIZ  <CRLF>/  BANK  ERRORS/<CRLF>
16606 077137  200  105  116  MSG077: .ASCIZ  <CRLF>/END PASS #/
16607 077153  040  105  122  MSG079: .ASCIZ  / ERROR(S) DETECTED/<CRLF>
16608 077177  200  106  111  MSG085: .ASCIZ  <CRLF>/FILL COUNT(OCTAL)? /
16609 077224  200  113  105  MSG088: .ASCIZ  <CRLF>/KERNEL STACK/
16610 077242  200  123  125  MSG089: .ASCIZ  <CRLF>/SUPERVISOR STACK/
16611 077264  200  125  123  MSG090: .ASCIZ  <CRLF>/USER STACK/
16612 077300  040  111  123  MSG091: .ASCIZ  / IS EMPTY/
16613 077312  122  105  114  MSG092: .ASCIZ  /RELOCATED  /
16614 077326  102  101  116  MSG093: .ASCIZ  /BANK=/
16615 077334  040  040  124  MSG095: .ASCIZ  /  TEST=/
16616 077344  200  105  116  MSG101: .ASCIZ  <CRLF>/ENTERING KAMIKAZE MODE/
16617 077374  200  114  105  MSG102: .ASCIZ  <CRLF>/LEAVING KAMIKAZE MODE/
16618 077423  200  114  105  MSG103: .ASCIZ  <CRLF>/LEAVING FS MODE/<CRLF>
16619 077445  032  000       MSG104: .BYTE   32,0                    ;CONTROL Z
16620 077447  200  105  116  MSG105: .ASCIZ  <CRLF>/ENTER BANKS - USE NUMBER 200 TO TERMINATE/
16621 077522  200  103  101  MSG106: .ASCIZ  <CRLF>/CACHE IS OFF/
16622 077540  200  103  101  MSG107: .ASCIZ  <CRLF>/CACHE IS ON (EXCEPT DURING ACTUAL PATTERNS)/
16623 077615  200  117  116  MSG110: .ASCIZ  <CRLF>/ONLY SELECTED BANKS WILL BE TESTED/
16624 077661  200  101  114  MSG111: .ASCIZ  <CRLF>/ALL BANKS WILL BE TESTED/
16625 077713  113  040  117  MSG112: .ASCIZ  /K OF MS11-L/<CRLF>
16626 077730  113  040  117  MSG113: .ASCIZ  /K OF MS11-M/<CRLF>
16627 077745  113  040  117  MSG114: .ASCIZ  /K OF MS11-P/<CRLF>
16628 077762  200  040  040  MSG117: .ASCIZ  <CRLF>"   11/44"
16629 077774  200  040  040  MSG119: .ASCIZ  <CRLF>/   NO/
16630 100003  040  103  101  MSG120: .ASCIZ  / CACHE AVAILABLE/
16631 100024  040  103  101  MSG121: .ASCIZ  / CACHE BYPASSED/
16632 100044  200  103  123  MSG122: .ASCII  <CRLF>/CSR NUMBER /
16633 100060  000       MSGA122:.BYTE   0
16634 100061  040  103  117          .ASCIZ  / CONTROLS TOO MANY BANKS/
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MESSAGES

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16635 100112      040      120      101  MSG125: .ASCIZ  / PASSES COMPLETED/
16636 100134      200      120      122  MSG126: .ASCIZ  <LRLF>/PROGRAM CSR COULD NOT BE DETERMINED/
16637 100201      200      124      122  MSG127: .ASCIZ  <CRLF>/TRACE ENABLED/
16638 100220      200      124      122  MSG128: .ASCIZ  <CRLF>/TRACE DISABLED/
16639 100240      200      200      040  MSG008: .ASCIZ  <CRLF><CRLF>/                CSR MAP/<CRLF>
16640 100272      200      040      103  MSG000: .ASCIZ  <CRLF>" CZMSPB  MS11-L/M/P MEMORY DIAGNOSTIC"
16641 100341      200      200      000  MSG129: .ASCIZ  <CRLF><CRLF>
16642 100344      120      122      117  EM62:   .ASCIZ  /PROCESSOR NOT SUPPORTED BY THIS DIAGNOSTIC/
16643                                            .EVEN
16649 100420                                     $$END
16650 100420                               END:
16651 100420  001236                               .PRINT  60000-SUPLIMIT  ;SUPERVISOR ADDRESSES LEFT
16655         000200                               .END START3
```

SYMBOL TABLE

```
ABORTF  002142    B0      004616    B62     043616    CPUBIT  002104    DH13    073151
ACFLAG  002114    B1      005552    B63     044022    CPUERR= 177766    DH14    073246
ACTF_A  002346    B10     013464    B64     044026    CR    = 000015    DH15    073325
ADDRES  002032    B100    054626    B65     045246    CRLF  = 000200    DH16    073444
ANA2    010004    B101    055124    B66     045254    CSR     002146    DH19    073461
APTDOW  047760    B102    055132    B67     045404    CSRADD= 172100    DH2     072515
APTECC  002422    B103    062574    B7      013422    CSRCAS  020176    DH20    073466
APTFLA  002350    B104    062600    B70     045420    CSRFBA  002230    DH23    073545
APTHAN  015320    B105    062676    B71     052550    CSRFIR  002224    DH24    073624
APTHLT  050026    B106    062770    B72     053006    CSRHOL  002524    DH25    073673
APTPAR  002420    B107    063054    B73     053270    CSRINC  002326    DH26    073731
APTSIZ  002442    B11     014216    B74     053564    CSRINF  002460    DH27    073747
BACK    060602    B12     014304    B75     053564    CSRINT  002234    DH3     072540
BACKGN  041236    B13     014346    B76     053662    CSRLAS  002226    DH30    074023
BAD     002050    B14     014572    B77     054622    CSRLBA  002232    DH5     072574
BADPC   002020    B15     015364    CACHKF  002546    CSRLOO  002330    DH6     072653
BADPSW  002030    B16     017002    CACHKN  002542    CSRMAP  005776    DH7     072720
BADSP   002024    B17     017252    CACHOF= 104424    CSRNO   002150    DIAGFL  002002
BADSTA  042626    B2      006012    CACHON= 104423    CSROUT  044014    DISPLA  002626
BADXOR  002056    B20     017260    CACHVE= 000114    CSRSTU= 000021    DISPRE= 000174
BAD2    002052    B21     017276    CBCSR = 104474    CSR1S   002320    DISPTB  014772
BAD3    002054    B22     017340    CBITS   002314    CTEST   006660    DOBACK  015354
BAFPAF  015454    B23     017412    CBREG = 104513    CTLKVE  002144    DONE    006644
BAFPAR  015562    B24     024172    CB1CSR= 104475    DATARG= 177754    DSWR  = 177570
BAKPAT  002620    B25     024176    CHECK   002312    DATBUF  002240    DT1     067176
BANK    002100    B26     024376    CHKDIS= 104504    DBEMSK  002254    DT10    067316
BANKIN  002102    B27     024404    CHKGEN  044400    DDISP = 177570    DT11    067340
BANKMO  046422    B3      006062    CHKTAB  044506    DEENER= 104421    DT12    067346
BANKOK  047460    B30     024702    CHKTRP  040626    DETAIL  062340    DT13    067352
BAWPAF  015670    B31     032414    CHK1DI= 104505    DETFLA  002216    DT14    067374
BAWPAR  016020    B32     034132    CKEND   064114    DETPSW  002214    DT16    067412
BGTEST  036250    B33     034170    CKSWR = 104410    DETR0   002176    DT17    067442
BITNO   002322    B34     034612    CLRCSR= 104502    DETR1   002200    DT2     067210
BIT0  = 000001    B35     034650    CLREX   007754    DETR2   002202    DT20    067450
BIT1  = 000002    B36     034664    CLRMEM  007644    DETR3   002204    DT22    067460
BIT10 = 002000    B37     035004    CLR1CS= 104503    DETR4   002206    DT23    067466
BIT11 = 004000    B4      006370    CMD16A  053650    DETR5   002210    DT24    067510
BIT12 = 010000    B40     035164    CMD16L= 000074    DETSP   002212    DT25    067530
BIT13 = 020000    B41     035206    CMD5B   052012    DET1    063030    DT26    067542
BIT14 = 040000    B42     036402    CMD5C   052306    DF1     067610    DT27    067550
BIT15 = 100000    B43     036542    CMD7B   052544    DF11    067733    DT3     067214
BIT2  = 000004    B44     036600    CMD7C   052620    DF13    067744    DT30    067570
BIT3  = 000010    B45     037072    CMD9B   053264    DF14    067754    DT4     067224
BIT4  = 000020    B46     037260    CMD9C   053340    DF15    067763    DT5     067234
BIT5  = 000040    B47     037456    CONFGE  002446    DF16    067772    DT6     067252
BIT6  = 000100    B5      006424    CONFIE  003656    DF2     067611    DT7     067266
BIT7  = 000200    B50     037632    CONFIG  002652    DF3     067635    DUMMY   002174
BIT8  = 000400    B51     037652    CONTFL  002220    DF4     067650    DUMPCS= 000103
BIT9  = 001000    B52     037662    CONTRL= 177746    DF5     067663    ECCDIS= 104470
BLOCK1  050030    B53     040200    CONTS   064264    DF6     067676    ECCINI= 104472
BLOCK2  050050    B54     040350    CONTS1  063642    DF7     067711    ECCTYP  005716
BLOCK3  050064    B55     040364    CONTS2  064266    DF8     067724    ECC1DI= 104471
BMFLAG  002126    B56     040430    CONTS3  056424    DF9     067726    ECC1IN= 104473
BOOT    047536    B57     043446    CONTT   064210    DH1     072460    EMTVEC= 000030
BOOT1   047602    B6      012576    COUNT   002366    DH10    073030    EM11    070301
BRG088  036252    B60     043452    CPERRF  061366    DH11    073126    EM12    070323
BSIZE   002372    B61     043612    CPSAVE  061364    DH12    073144    EM13    070347
```

SYMBOL TABLE

```
EM14    070401      E10     013550      E64     044056      HIPAT   047512      LOADER= 000065
EM15    070445      E100    054662      E65     045404      HOLDLO= 000016      LOADHO  002564
EM17    070513      E101    055166      E66     045364      HT    = 000011      LOOP    014744
EM19    070553      E102    055166      E67     045620      I       002450      LOWMAP  046356
EM2     070001      E103    062642      E7      013564      IBSAVE  061362      LSIZE   002376
EM20    070625      E104    062642      E70     045532      IIII  = 177777      LWDBE = 000061
EM21    070704      E105    062726      E71     052612      ILLCSR  014126      LWSBE = 000057
EM22    070740      E106    063022      E72     053110      IMPTES  013066      L0      004626
EM23    070765      E107    063106      E73     053332      INCBNK  047522      L1      004670
EM24    071014      E11     014276      E74     053624      INCPAT  047476      L10     005166
EM25    071073      E12     014344      E75     053624      INCRPT  047476      L100    013056
EM26    071120      E13     014374      E76     053700      INHBAN  002536      L101    013060
EM27    071171      E14     014712      E77     054662      INHECC  002534      L102    013326
EM29    071261      E15     015452      FASTCI= 177640      INTFLA  002134      L103    013326
EM3     070037      E16     017022      FATAL$  002062      INT64K  002136      L104    013226
EM30    071343      E17     017606      FCMD10  053424      INVALI= 104511      L105    013234
EM32    071453      E2      006056      FCMD11  053452      IOTVEC= 000020      L106    013326
EM33    071560      E20     017566      FCMD12  053474      JMPRL1  045752      L107    013300
EM35    071666      E21     017516      FCMD13  053514      KAMIKA  002004      L11     005174
EM36    071753      E22     017516      FCMD14  053536      KAMITE  027000      L110    013306
EM4     070071      E23     017466      FCMD15  053554      KDIAG = 000010      L111    013332
EM40    072022      E24     024354      FCMD16  053640      KDPAR0= 172360      L112    013550
EM5     070137      E25     024340      FCMD17  053702      KDPAR6= 172374      L113    013550
EM50    072074      E26     024562      FCMD18  053716      KDPAR7= 172376      L114    013540
EM51    072130      E27     024546      FIELDS  050114      KERNEL= 104417      L115    013536
EM52    072200      E3      006200      FINDBA= 000067      KERSTK= 002000      L116    013542
EM53    072225      E30     024760      FINT    007176      KFLAG   002526      L117    014266
EM55    072254      E31     032500      FIRST = 060000      KIPAR0= 172340      L12     005244
EM56    072275      E32     034406      FLIPLO  002604      KIPAR4= 172350      L120    014262
EM57    072327      E33     034374      FLIPWA  041106      KIPAR5= 172352      L121    014254
EM6     070214      E34     035156      FLUSH   015064      KIPAR6= 172354      L122    014260
EM60    072375      E35     035142      FSCMD0  050312      KIPDR0= 172300      L123    014266
EM61    072437      E36     034756      FSCMD1  050414      KMAP  = 104422      L124    014362
EM62    100344      E37     035126      FSCMD2  050524      KPFLAG  002112      L125    014432
EM7     070241      E4      006566      FSCMD3  050672      KSIZE   002374      L126    014544
ENASBE= 104506      E40     035202      FSCMD4  051146      KSTACK  002562      L127    014744
ENA1SB= 104507      E41     035226      FSCMD5  051466      LAST  = 157776      L13     005240
END     100420      E42     036524      FSCMD6  052404      LASTBA  002554      L130    014702
ENERGI= 104420      E43     036730      FSCMD7  052412      LASTBL  002556      L131    014620
ENEXBK  047450      E44     036716      FSCMD8  052704      LASTER  002014      L132    014622
ERRADD  002456      E45     037176      FSCMD9  053132      LBLS0 = 000610      L133    014662
ERRGEN= 104512      E46     037430      FSINFL  002440      LBLS1 = 000107      L134    014676
ERRMAX  002552      E47     037626      FSPAT   052166      LBLS2 = 000602      L135    014742
ERROR = 104000      E5      006556      FSSTAC  002304      LBLS3 = 000575      L136    014744
ERRPC   002016      E50     040150      FS1     050200      LBLS4 = 000447      L137    015060
ERRPSW  002026      E51     040132      FS7FLA  002444      LBLS5 = 000451      L14     005244
ERRSP   002022      E52     040116      FULLRE  002540      LBLS6 = 000023      L140    015170
ERRVEC= 000004      E53     040334      GBLENG= 000076      LCSROU= 000063      L141    015200
EUFLAG  002130      E54     040620      GETCSR  041336      LCSRRE= 000101      L142    015350
EVEN    002362      E55     040610      GETDAT  054312      LCSRSA= 000077      L143    015350
EXBANK  047032      E56     040576      GETDA1  054410      LEGALC= 000010      L144    015436
EXCMD3  051100      E57     043520      GETDIS  060514      LF    = 000012      L145    015550
EXCMD4  051420      E6      013014      GOOD    002042      LINK1   002520      L146    015656
EXIT    047644      E60     043520      GOOD2   002044      LINK2   002522      L147    016006
EXIT2   047650      E61     043664      GOOD3   002046      LKS   = 177546      L15     005504
E0      004644      E62     043664      GTSWR = 104407      LOADBA  002430      L150    016136
E1      005670      E63     044056      HEADER  002600      LOADCS= 104425      L151    016266
```

SYMBOL TABLE

L152	016440	L235	023172	L322	034756	L42	006420	L501	052120
L153	016570	L236	023224	L323	034706	L420	042162	L502	052132
L154	016742	L237	023270	L324	034720	L421	042172	L503	052462
L155	017022	L24	005764	L325	034736	L422	042216	L504	052464
L156	017060	L240	023540	L326	034744	L423	042320	L505	052576
L157	017070	L241	023550	L327	034770	L424	043232	L506	053110
L16	005504	L242	023550	L33	006144	L425	043240	L507	053074
L160	017516	L243	023560	L330	035126	L426	043476	L51	006546
L161	017500	L244	024324	L331	035026	L427	043476	L510	053044
L162	017550	L245	024272	L332	035040	L43	006424	L511	053202
L163	020020	L246	024324	L333	035072	L430	043540	L512	053204
L164	020130	L247	024370	L334	035056	L431	043546	L513	053316
L165	020266	L25	005774	L335	035070	L432	043642	L514	053606
L166	020314	L250	024532	L336	035114	L433	043642	L515	053610
L167	020320	L251	024500	L337	035102	L434	043704	L516	054054
L17	005616	L252	024532	L34	006154	L435	043712	L517	054070
L170	020322	L253	024744	L340	035114	L436	044034	L520	054074
L171	020366	L254	024744	L341	035226	L437	045220	L521	054112
L172	020422	L255	025052	L342	036574	L44	006454	L522	054240
L173	020426	L256	025024	L343	036600	L440	045234	L523	054242
L174	020430	L257	025102	L344	036664	L441	045246	L524	054306
L175	020576	L260	025272	L345	036702	L442	045246	L525	054532
L176	021252	L261	025624	L346	036706	L443	045350	L526	054640
L177	022120	L262	026114	L351	037024	L444	045400	L527	055144
L2	004776	L263	026152	L352	037162	L445	045522	L530	056462
L20	005644	L264	026252	L354	037334	L446	045522	L531	056464
L200	022130	L265	026276	L355	037404	L447	045522	L532	057314
L201	022130	L266	026350	L357	037540	L45	006526	L533	057326
L202	022140	L267	026420	L36	006252	L450	045502	L534	057344
L203	022176	L27	006146	L360	037610	L451	045522	L535	057346
L204	022206	L270	026462	L362	037762	L452	045564	L536	057366
L205	022206	L271	026526	L363	040036	L453	045564	L537	057400
L206	022216	L272	026566	L364	040054	L454	045614	L54	006602
L207	022246	L273	026630	L365	040102	L455	045734	L540	057416
L21	005662	L274	026670	L37	006256	L456	047170	L541	057420
L210	022252	L275	026730	L371	040244	L457	047376	L542	057434
L211	022302	L276	027022	L372	040306	L46	006516	L543	057636
L212	022312	L277	027030	L374	040424	L460	047560	L544	057644
L213	022312	L3	005020	L375	040430	L461	047664	L545	057672
L214	022322	L30	006126	L376	040502	L462	047670	L546	057704
L215	022366	L300	027034	L377	040504	L463	047676	L547	057722
L216	022376	L301	030652	L4	005036	L464	047712	L55	006644
L217	022376	L302	030650	L40	006322	L465	047724	L550	057734
L220	022406	L303	030652	L400	040542	L466	050136	L551	057746
L221	022456	L304	032350	L401	040562	L467	050146	L552	057770
L222	022466	L305	032406	L402	040566	L47	006520	L553	060036
L223	022466	L306	032466	L406	040660	L470	050302	L554	060116
L224	022476	L31	006120	L407	040656	L471	050342	L555	060132
L225	022530	L310	034164	L41	006364	L472	050346	L556	060134
L226	022544	L311	034170	L410	040700	L473	050376	L557	060250
L227	022554	L312	034264	L411	040700	L474	050410	L56	011564
L23	005766	L313	034342	L412	041016	L475	051576	L560	060340
L230	022554	L314	034360	L413	041064	L476	051636	L561	060350
L231	022634	L315	034364	L414	041476	L477	051676	L562	060656
L232	022644	L32	006126	L415	042062	L5	005114	L563	060656
L233	022644	L320	034634	L416	042164	L50	006542	L564	061116
L234	022662	L321	034644	L417	042154	L500	052104	L565	061052

SYMBOL TABLE

```
L566    061076          MMR0  = 177572          MSG049  076505          MTPA21  034434          MT0004  021474
L567    061116          MMR1  = 177574          MSG051  076540          MTPA24  035260          MT0005  021616
L57     011570          MMR2  = 177576          MSG055  076557          MTPA25  035670          MT0006  021752
L570    061136          MMR3  = 172516          MSG056  076600          MTPA26  036020          MT0007  022006
L571    061330          MMTRAP  042602          MSG058  076633          MTPB03  027554          MT0010  022050
L572    061200          MMVEC = 000250          MSG061  076655          MTPB04  027706          MT0011  022104
L573    061326          MONFLG  002274          MSG062  076664          MTPB21  034464          MT0012  022162
L574    061256          MSEEDH  002574          MSG063  076704          MTPB24  035320          MT0013  022266
L575    061270          MSEEDL  002576          MSG064  076715          MTPB25  035712          MT0014  022352
L576    061326          MSGA12  100060          MSG065  076725          MTPB26  036034          MT0015  022442
L577    061336          MSGA34  076075          MSG066  076737          MTPC03  027614          MT0016  022520
L6      005174          MSGB34  076133          MSG067  077006          MTPC21  034520          MT0017  022576
L60     011572          MSG000  100272          MSG070  077015          MTPC24  035334          MT0020  022620
L600    061672          MSG001  074102          MSG073  077046          MTPC25  035752          MT0021  022710
L601    062620          MSG002  074164          MSG075  077064          MTPC26  036070          MT0022  023162
L602    063024          MSG003  074241          MSG076  077116          MTPD03  027632          MT0023  023214
L603    063030          MSG004  074346          MSG077  077137          MTPD21  034554          MT0024  023260
L604    063110          MSG005  074454          MSG079  077153          MTPD25  035616          MT0025  023524
L605    063114          MSG006  074466          MSG085  077177          MTPD26  036110          MT0026  023602
L606    064230          MSG007  074523          MSG088  077224          MTPE25  035640          MT0027  024104
L607    064320          MSG008  100240          MSG089  077242          MTP000  027404          MT0030  024570
L61     012404          MSG009  074535          MSG090  077264          MTP001  027430          MT0031  025072
L610    064322          MSG010  074547          MSG091  077300          MTP002  027462          MT0032  025262
L62     012420          MSG011  074561          MSG092  077312          MTP005  027726          MT0033  025614
L63     012544          MSG012  074647          MSG093  077326          MTP006  027762          MT0034  026002
L64     012522          MSG013  074744          MSG095  077334          MTP007  030162          MT0035  026154
L65     012534          MSG014  074746          MSG101  077344          MTP010  030262          MT0036  026266
L66     012550          MSG015  074750          MSG102  077374          MTP011  030370          MT0037  026340
L67     013000          MSG016  074752          MSG103  077423          MTP012  031166          MT0040  026406
L7      005174          MSG017  074764          MSG104  077445          MTP013  031554          MT0041  026410
L70     013000          MSG018  074775          MSG105  077447          MTP014  032270          MT0042  026452
L71     013000          MSG019  075000          MSG106  077522          MTP015  032514          MT0043  026516
L72     012656          MSG020  075004          MSG107  077540          MTP016  033260          MT0044  026556
L73     012662          MSG021  075025          MSG110  077615          MTP017  034042          MT0045  026620
L74     013000          MSG022  075613          MSG111  077661          MTP020  034120          MT0046  026660
L75     012732          MSG023  075635          MSG112  077713          MTP022  034604          MT0047  026720
L76     013000          MSG025  075651          MSG113  077730          MTP025  035352          MT0999  026764
L77     013052          MSG026  075675          MSG114  077745          MTP030  036126          MT1     017030
MAINT = 177750          MSG027  075707          MSG117  077762          MTP031  036136          MT2     017034
MAPHO = 170202          MSG028  075724          MSG119  077774          MTP032  036214          MUT     002106
MAPKER  046720          MSG029  075740          MSG120  100003          MTP033  036246          NC      056464
MAPLO = 170200          MSG030  075760          MSG121  100024          MTP034  036344          NEMCNT  002066
MAPL1 = 170204          MSG031  075777          MSG122  100044          MTP035  036370          NEWBAN  002306
MAPPER  044546          MSG032  076037          MSG125  100112          MTP036  036532          NEWKER  046652
MASK    002316          MSG033  076056          MSG126  100134          MTP037  036756          NEWLOA  046754
MBERR   014004          MSG035  076161          MSG127  100201          MTP041  037030          NOCH    063624
MEMDON  015012          MSG036  076164          MSG128  100220          MTP042  037202          NOERRO  002426
MFPT  = 000007          MSG037  076203          MSG129  100341          MTP043  037436          NOFSMO  002424
MJPAT   020622          MSG038  076222          MSIZE   002400          MTP044  037632          NONEM   002076
MJTEST  020516          MSG039  076240          MTA030  024602          MTP045  040154          NONEXI  042524
MKCNT   017670          MSG040  076262          MTEST   016754          MTP046  040342          NOOJ    041476
MKCONT  017050          MSG041  076306          MTLA11  030416          MTP047  040702          NOPAR   002074
MKCSRT  020206          MSG042  076333          MTLB11  030430          MTST3   012424          NORES   003666
MKFLAG  002116          MSG043  076351          MTLC11  030442          MT0000  020702          NOSCOP  002436
MKLOOP  017232          MSG046  076373          MTLD11  030536          MT0001  020762          NOSUPE  002454
MKPAT   020436          MSG047  076426          MTPA03  027514          MT0002  021102          NOTAB   002370
MKTEST  020276          MSG048  076445          MTPA04  027652          MT0003  021242          NOTRCE  060264
```

SYMBOL TABLE

```
NO22BI  002452   PERR30= 104454   SAVREG= 104415   SUPDR1  002160   TRAPVE= 000034
NULLFL  002342   PERR31= 104455   SAV4    002266   SUPDR2  002162   TSTBAN  012312
NXTCSR  005644   PERR32= 104456   SBEMSK  002250   SUPDR3  002164   TSTDAT  002244
OLDCAC  002300   PERR33= 104457   SBENT   020150   SUPDR4  002166   TSTRD1  043242
OLDCSR  002154   PERR34= 104460   SBESYN  034414   SUPDR5  002170   TSTREA= 104510
ONES    002602   PERR35= 104461   SBETES  017672   SUPDR6  002172   TST1    005524
PADDRE  002034   PERR36= 104462   SCOPE = 000004   SUPLIM  056542   TST2    011406
PAFBAF  016150   PERR37= 104463   SDPAR0= 172260   SUPSTK= 000740   TST3    011572
PAFBAW  016300   PERR40= 104464   SDPAR5= 172272   SWAPAT  002622   TST4    012560
PARBAF  016452   PERR41= 104465   SDPAR6= 172274   SWR     002624   TST5    014744
PARBAW  016602   PERR42= 104466   SDPAR7= 172276   SWREG = 000176   TST6    015016
PARCNT  002070   PERR43= 104467   SEEDHI  002570   SW0   = 000001   TYPDS = 104405
PARITY  042420   PERXOR  057506   SEEDLO  002572   SW1   = 000002   TYPEIT= 104401
PARTHE  002302   PFECDF  062004   SELONL  002000   SW10  = 002000   TYPOC = 104402
PARVEC= 000114   PFECDH  061744   SETPAT  047512   SW11  = 004000   TYPOS = 104403
PASFLG  002262   PFECDT  061774   SHADL1  012454   SW12  = 010000   TYPS0 = 000000
PASSNO  002264   PFECEM  061710   SHUTUP  047676   SW13  = 020000   TYPS1 = 000002
PATERR  002072   PFECWS  061700   SIPAR0= 172240   SW14  = 040000   TYPS2 = 000000
PATPLU  004610   PFLAG   002120   SIPAR3= 172246   SW15  = 100000   TYPS3 = 000000
PATTER  002110   PGMCSR  002530   SIPAR5= 172252   SW2   = 000004   TYPS4 = 000000
PCBUMP  002324   PHEBE   014006   SIPAR6= 172254   SW3   = 000010   TYPS5 = 000000
PCONFI  041364   PHYADD  002036   SIPDR0= 172200   SW4   = 000020   TYPS6 = 000002
PCONFS  041664   PMEMFL  002140   SIZE  = 040000   SW5   = 000040   T12A    033260
PCONF1  041574   PROTYP  003754   SKIPKA  002006   SW6   = 000100   T12B    033302
PCONF2  041632   PSIZE   002402   SKIPMK  002340   SW7   = 000200   UDPAR0= 177660
PDP110  042614   PSW   = 177776   SKJ     060312   SW8   = 000400   UDPAR7= 177676
PD1     054532   PTABLE  036736   SKPERR  002064   SW9   = 001000   UIPAR0= 177640
PERA05  056700   PWRVEC= 000024   SKUB    045614   SYSSIZ  003756   UIPAR1= 177642
PERBNK  057532   QUICK   002434   SKUJ    014010   TAG2$   012044   UIPAR2= 177644
PERECC  057612   QVFLAG  002344   SOBK    002560   TAG3$   012100   UIPAR3= 177646
PERRAB  057350   RANODD  036050   SOBLEN= 000056   TAG4$   027130   UIPAR4= 177650
PERRAW  057276   RDCHR = 104411   SOFTPA  002606   TAG70$  062010   UIPAR5= 177652
PERRA3  054100   RDDEC = 104414   SOURCE  002310   TAG71$  062020   UIPAR6= 177654
PERRA7  057422   RDLIN = 104412   SPLTCS  002236   TAG72$  062030   UIPDR0= 177600
PERR01= 104427   RDOCT = 104413   SSP   =%000006   TAG73$  062100   UNITOP  002414
PERR02= 104430   READCS= 104426   ST    = 177776   TAG74$  062140   UNMAP   047006
PERR03= 104431   READON  002406   STACK = 002000   TAG75$  062152   UNRELO  046070
PERR04= 104432   REALPA  002276   START   003656   TAG76$  062164   UPPFLG  002263
PERR05  056674   REFRES  035160   START1  000300   TAG77$  062230   USERMA  046570
PERR06  056722   REFSUB  035230   START2  000310   TAG78$  062236   USESTK= 000700
PERR07= 104433   REGCOP  041076   START3  000200   TAG79$  062316   USP   =%000006
PERR10= 104434   RELENT  045624   STAR27  024164   TAG9$   011672   WARN1   011760
PERR11= 104435   RELOCA  045204   STOPOK  002416   TBG4$   027306   WARN2   027526
PERR12= 104436   RELOC1  045640   STRIPE  002364   TCFIG1  041740   WARN3   027542
PERR13= 104437   RESREG= 104416   SUBAAA  004646   TCFIG2  042100   WARN4   027566
PERR14= 104440   RESTAR  002614   SUBAAB  004776   TCFIG3  042234   WARN5   027602
PERR15= 104441   RESVEC= 000010   SUBAAI  012450   TCONFI  041666   WARN6   041320
PERR16= 104442   RES0    050410   SUBAAP  014170   TEMP    002432   WARN6A  041260
PERR17= 104443   RES1    050470   SUBAAR  013374   TESTAD  002410   WARN6B  041312
PERR20= 104444   RES2    050636   SUBAAS  011402   TESTMO  002550   WARN7   024142
PERR21= 104445   RLFLAG  002124   SUCCES  002332   TIME    002336   WASDBE= 104500
PERR22= 104446   RRFLAG  002122   SUPD0A  002260   TIMEOU  042570   WASSBE= 104476
PERR23= 104447   RTNVAL=%000000   SUPD01  027034   TKVEC = 000060   WAS1DB= 104501
PERR24= 104450   RWCSR   006210   SUPD02  027050   TMFLAG  002132   WAS1SB= 104477
PERR25= 104451   SAVCSR  002152   SUPD03  027212   TOOMAN  002404   WHICHC  053730
PERR26= 104452   SAVMON  002272   SUPD04  027226   TOTCSR  002222   WOOPEN  055740
PERR27= 104453   SAVPAR  002270   SUPDR0  002156   TRACE   006206   WOOPS   055372
```

SYMBOL TABLE

```
WOOPSA  055770        $DIDDO= 000000        $L     = 000110        $PER10  056752        $SWR   = 163000
WOOPUP  055556        $DOAGA  015350        $LF      002647        $PER11  057002        $SWREG  065726
WORST   002566        $DOAGN  015244        $LL    = 000106        $PER12  057022        $T     = 000611
XOCHAR  056332        $DOWN   054762        $LOADC  042750        $PER13  057044        $TESTN  065710
XXDPCH  002352        $DTBL   063562        $LPADR  002610        $PER14  057064        $TKB    002632
ZEROS   002334        $ECCDI  043270        $LPERR  002612        $PER15  057106        $TKS    002630
$APTHD  066004        $ECCIN  043316        $LS    = 000000        $PER16  057130        $TN    = 000007
$AUTO   002060        $ECC1D  043304        $MADR1  065736        $PER17  057150        $TPB    002636
$BANK   002011        $ECC1I  043332        $MADR2  065742        $PER20  057166        $TPFLG  002356
$BASE   065760        $ENASB  043344        $MADR3  065746        $PER21  057204        $TPS    002634
$BELL   002641        $ENA1S  043360        $MADR4  065752        $PER22  057224        $TRAP   066020
$CACHF  042732        $ENDAD  015234        $MAIL   065704        $PER23  057242        $TRAP2  066042
$CACHN  042706        $ENERG  042666        $MAMS1  065734        $PER24  057260        $TRPAD  066062
$CBCSR  043372        $ENV    065724        $MAMS2  065740        $PER25  054016        $TSTM   066010
$CBREG  044362        $ENVM   065725        $MAMS3  065744        $PER26  057450        $TSTRD  043064
$CB1CS  043414        $EOP    015070        $MAMS4  065750        $PER27  057470        $TTYIN  064750
$CDW1   065764        $ERFLG  002012        $MBADR  066006        $PER30  054244        $TYPDS  063356
$CDW2   065766        $ERRGE  044112        $MNEW   065024        $PER31  057660        $TYPE   056206
$CHARC  056520        $ERROR  060566        $MSGAD  065720        $PER32  057756        $TYPEC  056334
$CHKDI  043766        $ERRTB  066326        $MSGLG  065722        $PER33  060024        $TYPEX  056522
$CHK1D  044002        $ERRTY  061370        $MSGTY  065704        $PER34  060104        $TYPOC  063154
$CKSWR  063602        $ERTTL  002616        $MSWR   065013        $PER35  060136        $TYPON  063170
$CLRCS  043744        $ESCAP  002360        $MTYP1  065735        $PER36  060172        $TYPOS  063130
$CLR1C  043756        $ETABL  065724        $MTYP2  065741        $PER37  060222        $T1    = 000000
$CMTAG  002000        $ETEND  066004        $MTYP3  065745        $PER40  060226        $T2    = 000610
$CMTGE  002542        $EXHAL  047670        $MTYP4  065751        $PWRDN  054412        $UNIT   065716
$CNTLC  064774        $ES    = 000001        $NOTRA  066054        $PWRUP  054766        $UNITM  066014
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ERRORS DETECTED:  0

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DYNAMIC MEMORY:  21558 WORDS  ( 82 PAGES)
ELAPSED TIME:  00:26:58
CZMSPB.BIN,CZMSPB/CR/-SP=CZMSPB/ML,CZMSPB.P11
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CZMSPB CREATED BY MACRO ON 6-JUL-82 AT 10:46 PAGE 1
SYMBOL CROSS REFERENCE CREF

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ACTFLA	002346	#139-5676 *153-5992 167-6735 173-6950 217-7919 217-7934 226-8189 226-8198 226-8213 227-8224 229-8238 229-8248 231-8263 234-8383 253-8825 363-11627 377-12038 466-14917
ADDRES	002032	#139-5575 *160-6207 *167-6729 *273-9224 *273-9230 *273-9251 *273-9264 *275-9340 *275-9354 *277-9428 *282-9487 *283-9571 *283-9577 *285-9669 *285-9676 *305-10130 *305-10142 *315-10339 *315-10354 *316-10391 *317-10429 *323-10606 *323-10622 *339-11109 *421-13226 *421-13226 *421-13252 *423-13272 *423-13272 423-13275 423-13285 *451-14491 *451-14492 *451-14497 *451-14498 *451-14503 *451-14504 *451-14509 *451-14510 *451-14517 *451-14525 *451-14530 *451-14530 *451-14535 *451-14540 *453-14546 *453-14551 *453-14556 *453-14561 *453-14566 *453-14571 *453-14576 *453-14581 *453-14586 *453-14591 458-14662 *460-14690 *460-14699 473-15107 509-16405 509-16408 509-16411 509-16416 509-16427
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BAD3	002054	#139-5583 *421-13258 *421-13259 509-16419
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BANK	002100	#139-5593 *169-6750 *169-6762 169-6763 169-6765 169-6772 *169-6791 *170-6871 *170-6877 *170-6880 *170-6884 170-6886 *172-6910 *173-6947 173-6947 *173-6949 174-6959 *182-7052 *182-7082 182-7082 *191-7352 *191-7360 191-7360 *193-7367 *195-7397 *197-7427 *199-7464 *201-7503 *203-7541 *205-7586 *207-7624 211-7692 211-7719 211-7756 *211-7772 213-7828 213-7853 232-8289 232-8303 234-8356 236-8406 236-8419 *238-8454 238-8458 *238-8476 238-8476 *238-8483 238-8486 *238-8505 238-8505 *240-8525 *240-8534 240-8534 *240-8544 242-8562 244-8591 246-8655 255-8833 257-8866 319-10441 321-10484 321-10490 326-10777 354-11380 361-11590 *363-11631 363-11634 *363-11644 363-11644 365-11737 *365-11738 *365-11742

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		365-11768	365-11781	375-12030	478-15240	478-15256				
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SYMBOL VALUE REFERENCES

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CZMSPB CREATED BY MACRO ON 6-JUL-82 AT 10:46 PAGE 5
SYMBOL CROSS REFERENCE CREF

SYMBOL	VALUE	REFERENCES
CSR	002146	#139-5612 *160-6220 *160-6230 *160-6256 *160-6278 166-6547 166-6631 *174-6961 *174-6977 *174-6989 *174-6991 *174-7004 *174-7006 213-7822 213-7847 273-9235 273-9235 *282-9489 *282-9498 282-9499 282-9501 *291-9786 *291-9792 291-9793 291-9795 *291-9800 291-9804 291-9807 *315-10334 *315-10349 *316-10386 319-10459 *321-10497 *321-10503 321-10504 321-10505 *321-10509 *321-10512 321-10513 321-10514 *322-10543 *322-10549 322-10550 322-10552 *322-10558 322-10559 322-10562 *323-10592 *323-10600 323-10603 *323-10616 323-10619 323-10621 *324-10664 324-10672 324-10674 *324-10680 324-10681 324-10682 *324-10688 *325-10724 325-10735 325-10736 *326-10782 *326-10785 *326-10791 326-10792 326-10793 *326-10801 326-10802 326-10803 *343-11186 343-11187 *343-11195 344-11221 344-11221 *344-11232 *346-11237 *346-11241 *346-11245 *346-11249 *346-11253 *346-11257 *346-11261 *346-11262 *346-11266 *346-11267 348-11281 348-11301 350-11316 350-11335 *352-11344 *352-11348 *352-11353 *352-11358 355-11406 *355-11442 *355-11443 *384-12205 *421-13242 421-13248 426-13356 *428-13423 460-14710 478-15209 478-15218 *478-15224 509-16414 509-16415 509-16416 509-16424 509-16425 509-16428
CSRADD	= 172100	#113-4981 157-6096 *162-6311 *162-6314 *162-6316 *162-6319 162-6321 *163-6364 163-6379 *163-6396 163-6409 *166-6534 *166-6537 *166-6635 166-6637 *166-6640 166-6641 *166-6642 *343-11187 343-11195 344-11201 *355-11415 355-11416 *355-11417
CSRCAS	020176	211-7744 #215-7872
CSRFBA	002230	#139-5640 *211-7693 211-7718 *211-7763
CSRFIR	002224	#139-5638 *211-7718 211-7724 211-7726 *211-7760 211-7760
CSRHOL	002524	#139-5719 *211-7703 *211-7713 211-7715
CSRINC	002326	#139-5668
CSRINF	002460	#139-5715 *157-6103 *157-6104 157-6112 157-6113 *158-6137 *158-6144 *158-6147 159-6169 159-6170 159-6171 159-6177 160-6208 *160-6222 *160-6232 160-6246 *160-6262 160-6272 *160-6280 162-6309 162-6322 162-6330 163-6374 163-6404 166-6532 166-6552 166-6559 166-6582 166-6663 166-6665 182-7049 *182-7060 182-7088 182-7090
CSRINT	002234	#139-5642 *211-7695 *211-7709 211-7762
CSRLAS	002226	#139-5639 *211-7724 *211-7725 211-7751
CSRLBA	002232	#139-5641 *211-7694 *211-7707 211-7760
CSRLOO	002330	#139-5669 *211-7697 *211-7708 211-7766
CSRMAP	005776	157-6128 #159-6151
CSRNO	002150	#139-5613 *160-6206 *162-6297 *162-6303 *163-6358 *163-6371 *163-6390 *163-6401 *166-6513 *166-6520 166-6634 *172-6926 172-6927 172-6928 *173-6938 *211-7715 *211-7716 *246-8716 246-8717 *329-10878 343-11176 343-11182 343-11184 343-11194 344-11202 344-11208 344-11210 *348-11277 *348-11287 348-11287 *350-11312 *350-11322 350-11322 *354-11367 *354-11373 354-11373 355-11414 380-12123 *382-12166 390-12348 *390-12355 390-12379 *390-12381 *390-12440 *406-12661 *406-12675 425-13315 *426-13352 *426-13359 426-13359 *428-13420 *428-13427 428-13427 *429-13462 478-15209 *478-15214 *478-15222 478-15222 *478-15224 509-16425
CSROUT	044014	346-11238 346-11246 346-11254 346-11263 352-11345 352-11354 #354-11363
CSRIS	002320	#139-5665 *160-6213 *160-6214 160-6224 160-6228 160-6229
CTEST	006660	157-6129 #162-6290
CTLKVE	002144	#139-5611 *211-7742 *211-7743 *217-7931 *217-7932 *219-7983 *219-7984 483-15482
DATARG	= 177754	#111-4773 154-6020
DATBUF	002240	#139-5644 *267-9048 *267-9049 267-9050 267-9051 267-9053 267-9058 267-9062 *267-9064 *267-9064 *267-9067 *267-9068 267-9069 267-9070 267-9072 267-9077 267-9081 *267-9083 *267-9083 *273-9188 *273-9189 273-9194 273-9195 273-9276 *273-9278 *273-9278 *275-9309 *275-9310 275-9313 275-9314 275-9373 *275-9375 *275-9375 *277-9391 *277-9392 277-9397 277-9398 *283-9529 *283-9530 283-9535 283-9536 *285-9630 *285-9631 285-9636 285-9637 451-14527 451-14532
DBEMSK	002254	#139-5647 *277-9395 *277-9396 277-9404 277-9406 277-9414 277-9416 279-9436 *279-9438 *279-9438 *279-9455 279-9459 *279-9461 279-9462 *279-9467 *279-9468 *283-9533 *283-9534 283-9542 283-9544 283-9552 283-9554 283-9584 *283-9586 *283-9586 *283-9602 283-9606 *283-9608 283-9609 *283-9614 *283-9615 *285-9634 *285-9635 285-9642 285-9644 285-9652

SYMBOL	VALUE	REFERENCES
		285-9654 287-9686 *287-9688 *287-9688 *287-9704 287-9708 *287-9710 287-9711 *287-9716 *287-9717
DDISP	= 177570	#111-4698 141-5758 151-5962
DEENER	= 104421	#110-4621 155-6044 375-12018 377-12063
DETAIL	062340	470-15021 #476-15169 476-15201
DETFLA	002216	#139-5634 466-14913 470-15020 *476-15170 476-15171 476-15173 *478-15271
DETPSW	002214	#139-5633 509-16413
DETR0	002176	#139-5626 *476-15178 476-15187 509-16413
DETR1	002200	#139-5627 476-15179 509-16413
DETR2	002202	#139-5628 509-16413
DETR3	002204	#139-5629 509-16413
DETR4	002206	#139-5630 509-16413
DETR5	002210	#139-5631 509-16413
DETSP	002212	#139-5632 509-16413
DET1	063030	478-15239 #478-15256
DF1	067610	508-16337 #511-16432
DF11	067733	500-16134 502-16201 502-16206 502-16211 504-16233 504-16238 504-16253 508-16347 #511-16441
DF13	067744	502-16226 506-16305 508-16377 508-16382 508-16402 #511-16442
DF14	067754	506-16320 508-16342 508-16362 508-16372 508-16387 508-16392 #511-16443
DF15	067763	#511-16444
DF16	067772	508-16352 508-16357 508-16367 #511-16445
DF2	067611	500-16139 500-16154 500-16159 500-16164 500-16169 502-16186 502-16216 504-16243 504-16248 504-16258 504-16263 506-16280 506-16325 508-16332 508-16397 #511-16433
DF3	067635	502-16176 504-16273 506-16290 506-16295 506-16310 506-16315 #511-16434
DF4	067650	502-16181 #511-16435
DF5	067663	502-16191 502-16221 506-16300 #511-16436
DF6	067676	502-16196 #511-16437
DF7	067711	504-16268 #511-16438
DF8	067724	506-16285 #511-16439
DF9	067726	500-16144 500-16149 #511-16440
DH1	072460	500-16137 #515-16495
DH10	073030	502-16184 #515-16502
DH11	073126	504-16246 #515-16503
DH12	073144	504-16241 #515-16504
DH13	073151	500-16132 502-16199 502-16204 502-16209 504-16231 504-16236 504-16251 508-16345 #515-16505
DH14	073246	504-16256 #515-16507
DH15	073325	504-16266 #515-16508
DH16	073444	504-16271 506-16283 #515-16510
DH19	073461	#515-16511
DH2	072515	508-16330 #515-16496
DH20	073466	506-16303 508-16375 508-16380 508-16400 #515-16512
DH23	073545	502-16224 #515-16513
DH24	073624	506-16318 508-16340 508-16360 508-16370 508-16385 508-16390 #515-16514
DH25	073673	500-16167 506-16278 #515-16515
DH26	073731	502-16214 #515-16516
DH27	073747	508-16335 #515-16517
DH3	072540	500-16142 500-16147 #515-16497
DH30	074023	508-16350 508-16355 508-16365 #515-16518
DH5	072574	500-16152 500-16157 500-16162 504-16261 508-16395 #515-16498
DH6	072653	506-16323 #515-16499
DH7	072720	502-16174 502-16179 502-16189 502-16194 502-16219 506-16288 506-16293 506-16298 506-16308 506-16313 #515-16500

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SYMBOL CROSS REFERENCE CREF

SYMBOL		VALUE	REFERENCES								
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DISPLA		002626	#141-5758	*151-5962	*151-5969	429-13460	463-14821				
DISPRE	=	000174	#113-4977	151-5969	*429-13461	*463-14822					
DISPTB		014772	187-7257	#187-7259							
DOBACK		015354	187-7268	187-7279	#191-7350						
DONE		006644	160-6272	#160-6282							
DSWR	=	177570	#111-4697	141-5757	151-5961						
DT1		067176	500-16138	#509-16405							
DT10		067316	502-16185	#509-16413							
DT11		067340	504-16247	#509-16414							
DT12		067346	504-16242	#509-16415							
DT13		067352	500-16133	502-16200	502-16205	502-16210	504-16232	504-16237	504-16252	508-16346	#509-16416
DT14		067374	*145-5835	*145-5847	*145-5853	504-16257	#509-16417				
DT16		067412	504-16267	#509-16418							
DT17		067442	504-16272	506-16284	#509-16420						
DT2		067210	#509-16406								
DT20		067450	508-16331	#509-16421							
DT22		067460	#509-16422								
DT23		067466	502-16225	506-16304	508-16376	508-16381	508-16401	#509-16423			
DT24		067510	506-16319	508-16341	508-16361	508-16371	508-16386	508-16391	#509-16424		
DT25		067530	500-16168	506-16279	#509-16425						
DT26		067542	502-16215	#509-16426							
DT27		067550	508-16336	#509-16427							
DT3		067214	500-16143	#509-16407							
DT30		067570	508-16351	508-16356	508-16366	#509-16428					
DT4		067224	500-16148	#509-16408							
DT5		067234	*145-5846	*145-5852	500-16153	500-16158	500-16163	504-16262	508-16396	#509-16409	
DT6		067252	506-16324	#509-16410							
DT7		067266	502-16175	502-16180	502-16190	502-16195	502-16220	506-16289	506-16294	506-16299	506-16309
			506-16314	#509-16411							
DUMMY		002174	#139-5624	509-16411	509-16411	509-16412	509-16412	509-16412	509-16412	509-16416	509-16416
			509-16418	509-16418	509-16419	509-16419	509-16420	509-16422	509-16423	509-16423	509-16423
			509-16423	509-16423	509-16424	509-16424	509-16424	509-16424	509-16424	509-16427	509-16427
			509-16427	509-16427	509-16427	509-16428	509-16428	509-16428			
ECCDIS	=	104470	#110-4664	217-7920	240-8523	390-12377	393-12455	397-12529			
ECCINI	=	104472	#110-4666	167-6704	#167-6738	#173-6953	211-7769	#217-7937	240-8540	240-8547	240-8551
			375-12014	377-12055	#421-13266						
ECCTYP		005716	157-6108	#158-6136							
ECC1DI	=	104471	#110-4665	174-7022	213-7807	213-7830	273-9213	273-9220	273-9297	275-9323	275-9378
			277-9418	279-9470	283-9557	283-9617	285-9657	287-9719	303-10099	305-10107	305-10117
			325-10728								
ECC1IN	=	104473	#110-4667	213-7857	213-7865	282-9504	282-9507	303-10064	305-10110		
EMTVEC	=	000030	#111-4759	*147-5887	*147-5888						
EM11		070301	502-16173	502-16178	502-16188	502-16193	#513-16460				
EM12		070323	502-16183	#513-16461							
EM13		070347	502-16198	508-16374	#513-16462						
EM14		070401	502-16203	#513-16463							
EM15		070445	502-16208	#513-16464							
EM17		070513	502-16218	#513-16465							
EM19		070553	504-16230	508-16369	#513-16466						
EM2		070001	500-16136	#513-16454							
EM20		070625	504-16235	508-16359	508-16364	508-16384	#513-16467				

SYMBOL CROSS REFERENCE CREF

SYMBOL		VALUE	REFERENCES								
EM21		070704	504-16245	#513-16468							
EM22		070740	504-16250	508-16389	508-16399	#513-16469					
EM23		070765	504-16260	#513-16470							
EM24		071014	500-16131	#513-16471							
EM25		071073	504-16265	508-16349	#513-16472						
EM26		071120	504-16270	#513-16473							
EM27		071171	506-16282	#513-16474							
EM29		071261	506-16292	508-16344	#513-16475						
EM3		070037	500-16141	#513-16455							
EM30		071343	506-16297	508-16379	#513-16476						
EM32		071453	506-16307	#513-16478							
EM33		071560	506-16312	#513-16479							
EM35		071666	506-16287	#513-16480							
EM36		071753	506-16322	#513-16481							
EM4		070071	500-16146	#513-16456							
EM40		072022	508-16329	#513-16482							
EM5		070137	500-16151	#513-16457							
EM50		072074	502-16223	#513-16483							
EM51		072130	506-16317	#513-16484							
EM52		072200	506-16277	#513-16485							
EM53		072225	500-16166	#513-16486							
EM55		072254	502-16213	#513-16487							
EM56		072275	508-16334	#513-16488							
EM57		072327	508-16354	#513-16489							
EM6		070214	500-16156	#513-16458							
EM60		072375	506-16302	#513-16490							
EM61		072437	508-16339	#513-16491							
EM62		100344	508-16394	#517-16642							
EM7		070241	500-16161	#513-16459							
ENASBE	=	104506	#110-4678	167-6736	173-6951	217-7935	421-13264				
ENA1SB	=	104507	#110-4679	303-10068	303-10101	305-10112	#325-10730				
END		100420	#517-16650								
ENERGI	=	104420	#110-4620	155-6071	189-7332						
ENEXBK		047450	371-11942	371-11965	371-11971	#371-11973					
ERRADD		002456	#139-5714	213-7825	213-7850	*355-11436					
ERRGEN	=	104512	#110-4682	213-7824	213-7849	273-9241	273-9267	279-9433	315-10345		
ERRMAX		002552	#141-5732	458-14655							
ERROR	=	104000	#111-4692	154-6005	154-6024	154-6027	157-6114	160-6221	160-6231	160-6258	#160-6260
			160-6279	167-6726	167-6730	174-7031	186-7249	273-9236	275-9341	277-9429	282-9495
			282-9502	282-9516	291-9796	291-9808	303-10073	305-10131	305-10143	315-10340	315-10355
			316-10395	317-10430	321-10507	321-10517	322-10553	322-10563	324-10675	324-10684	325-10738
			325-10760	325-10765	326-10796	326-10806	337-11093	339-11118	339-11122	339-11125	382-12185
			384-12201	384-12210	421-13261	454-14602	#454-14604	454-14614	#454-14616	456-14625	458-14672
			458-14677	458-14680	458-14683	460-14694	460-14705	460-14711	#460-14713	460-14722	460-14729
			460-14733	460-14736	462-14764	476-15189	476-15195				
ERRPC		002016	#139-5569	*465-14858	*465-14859	465-14862	*465-14881	*465-14882	465-14887	468-14955	470-15030
			509-16405	509-16406	509-16407	509-16408	509-16409	509-16410	509-16411	509-16414	509-16416
			509-16418	509-16420	509-16421	509-16422	509-16423	509-16424	509-16425	509-16426	509-16427
			509-16428								
ERRPSW		002026	#139-5573	*465-14861	*465-14884	476-15186					
ERRSP		002022	#139-5571	*465-14860	*465-14883	476-15185					
ERRVEC	=	000004	#111-4752	*147-5897	*147-5898	462-14784	*462-14785	*462-14787	*462-14793		

SYMBOL	VALUE	REFERENCES
EUFLAG	002130	#139-5605 222-8087 355-11396 355-11411
EVEN	002362	#139-5685 *296-9905 296-9906 *297-9968 297-9968
EXBANK	047032	170-6872 172-6912 182-7053 191-7353 193-7369 195-7399 197-7429 199-7466 201-7505 203-7543 205-7588 207-7626 238-8455 238-8484 240-8526 240-8545 363-11632 365-11739 365-11743 *371-11897 390-12342 390-12439 393-12472 393-12486 397-12545 397-12559
EXCMD3	051100	386-12245 386-12248 386-12252 #386-12254
EXCMD4	051420	388-12288 388-12292 #388-12306
EXIT	047644	#377-12036 462-14775 466-14919 486-15630
EXIT2	047650	#377-12038
E1	005670	#157-6122
E2	006056	#159-6166
E3	006200	#159-6187
E31	032500	#282-9519
E32	034406	#291-9819
E33	034374	#291-9817
E4	006566	#160-6271
E43	036730	#316-10406
E44	036716	#316-10404
E45	037176	#319-10471
E46	037430	#321-10523
E47	037626	#322-10567
E5	006556	#160-6270
E50	040150	#323-10650
E51	040132	#323-10646
E52	040116	#323-10644
E53	040334	#324-10689
E54	040620	#325-10751
E55	040610	#325-10750
E56	040576	#325-10748
FASTCI =	177640	#111-4806 169-6787 169-6821 255-8858 344-11218 379-12090
FATAL$	002062	#139-5586 *167-6726 *167-6730 *303-10073 *337-11093 *339-11118 *339-11122 *339-11125 466-14917 468-14972
FCMD10	053424	380-12144 #399-12564
FCMD11	053452	380-12145 #399-12574
FCMD12	053474	380-12146 #399-12579
FCMD13	053514	380-12147 #399-12585
FCMD14	053536	380-12148 #399-12592
FCMD15	053554	380-12149 #400-12611
FCMD16	053640	380-12150 #400-12631
FCMD17	053702	380-12151 #402-12645
FCMD18	053716	380-12152 #404-12651
FIELDS	050114	#380-12111 483-15470
FINT	007176	162-6343 #163-6350
FIRST =	060000	#113-4984 169-6776 169-6809 169-6839 172-6911 211-7693 219-7976 219-7977 220-8025 220-8038 220-8062 222-8091 222-8127 222-8145 224-8173 232-8284 234-8350 236-8400 238-8459 238-8488 240-8530 242-8564 242-8569 242-8570 244-8596 244-8626 244-8633 246-8658 246-8661 246-8662 246-8663 246-8664 246-8681 249-8762 251-8789 282-9487 289-9734 296-9918 296-9937 297-9973 297-9975 297-9976 315-10333 319-10445 328-10852 *377-12075 *377-12076 *377-12077 386-12233 388-12274 390-12369 390-12370 430-13490 430-13491 430-13492 *430-13493 *430-13494 430-13495 430-13497 *432-13531 *432-13532 432-13537 473-15108
FLIPLO	002604	#141-5745 *147-5876 222-8117 *327-10824 *327-10825 327-10826 327-10828 327-10830
FLIPWA	041106	222-8090 #327-10822

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SYMBOL CROSS REFERENCE CREF

SYMBOL		VALUE	REFERENCES
FLUSH		015064	#187-7284
FSCMD0		050312	#380-12134 #382-12157
FSCMD1		050414	380-12135 #382-12179
FSCMD2		050524	380-12136 #384-12194
FSCMD3		050672	380-12137 #386-12218
FSCMD4		051146	380-12138 #388-12260
FSCMD5		051466	380-12139 #390-12312
FSCMD6		052404	380-12140 #391-12443
FSCMD7		052412	380-12141 #393-12449
FSCMD8		052704	380-12142 #395-12490
FSCMD9		053132	380-12143 #397-12523
FSINFL		002440	#139-5707 *189-7295
FSPAT		052166	390-12387 #390-12391
FSSTAC		002304	#139-5659 *382-12181 382-12189 *384-12196 384-12213 *390-12314 390-12432 *393-12451 393-12481 *397-12525 397-12554
FS1		050200	#380-12126 380-12132 380-12154
FS7FLA		002444	#139-5709 238-8478
FULLRE		002540	#139-5724 *240-8513 *240-8541 *240-8552 363-11671
GBLENG	=	000076	246-8658 246-8661 #313-10315
GETCSR		041336	227-8231 231-8270 247-8733 248-8748 249-8760 250-8771 251-8787 #329-10868
GETDAT		054312	#423-13280 454-14598 454-14610
GETDA1		054410	*423-13282 423-13290 #423-13293
GETDIS		060514	255-8834 257-8867 462-14806 #463-14810 465-14847
GOOD		002042	#139-5578 *160-6219 *160-6229 *160-6277 *282-9491 282-9499 *282-9514 *291-9794 *291-9806 *317-10421 *319-10466 *321-10506 *321-10515 *322-10551 *322-10561 *323-10607 *323-10620 *324-10663 324-10681 *324-10687 *326-10794 *326-10804 *421-13233 *421-13235 *421-13253 *423-13271 *451-14494 *451-14500 *451-14505 *451-14512 *451-14515 *451-14522 *451-14527 *451-14532 *451-14537 *451-14542 *453-14548 *453-14553 *453-14558 *453-14563 *453-14568 *453-14573 *453-14578 *453-14583 *453-14588 *453-14593 456-14638 *458-14663 *458-14665 *460-14692 *460-14702 *460-14721 *460-14726 509-16405 509-16411 509-16418 509-16421 509-16423 509-16425 509-16428
GOOD2		002044	#139-5579 *456-14628 *456-14632 509-16418
GOOD3		002046	#139-5580 *456-14629 *456-14633 509-16418
GTSWR	=	104407	#110-4607 155-6064
HEADER		002600	#141-5743 *147-5877 *187-7274 *187-7276 *191-7355 *191-7358 *209-7667 *209-7682 *211-7738 *273-9250 *273-9253 *273-9263 *273-9266 *275-9339 *275-9342 *275-9353 *275-9356 *277-9427 *277-9430 *282-9500 *282-9513 *291-9805 *305-10132 *305-10144 *321-10516 *322-10560 *323-10609 *323-10623 *324-10673 *324-10683 *325-10737 *325-10759 *325-10764 *326-10795 *326-10805 *390-12363 *393-12469 *397-12542 *458-14668 *458-14685 *460-14693 *460-14695 *460-14704 *460-14706 *460-14728 *460-14730 *466-14929 468-14970 468-14982 *470-15018 476-15175 *476-15176 476-15191 *476-15192 *476-15199
HIPAT		047512	205-7584 207-7622 #373-11996
HT	=	000011	#111-4702 434-13581
I		002450	#139-5711 *149-5934 *149-5940 149-5940 *166-6528 *166-6530 166-6578 166-6586 166-6590 166-6617 166-6621 166-6667 166-6672 166-6674 166-6678 *184-7180 *184-7186 184-7197 *184-7197 184-7211 *211-7737 211-7740 *211-7746 211-7746 *238-8453 238-8463 238-8469 *238-8477 238-8477 *238-8482 238-8492 238-8498 *238-8506 238-8506
IBSAVE		061362	*465-14841 465-14866 *465-14874 *465-14877 466-14932 #466-14936
IIII	=	177777	157-6122 157-6122 157-6122 #157-6122 159-6166 159-6166 159-6166 #159-6166 159-6187 159-6187 159-6187 #159-6187 160-6270 160-6270 160-6270 #160-6270 160-6271 160-6271 160-6271 #160-6271 282-9519 282-9519 282-9519 #282-9519 291-9817 291-9817 291-9817 #291-9817 291-9819 291-9819 291-9819 #291-9819 316-10404 316-10404 316-10404 #316-10404 316-10406 316-10406 316-10406 #316-10406 319-10471 319-10471 319-10471 #319-10471 321-10523

CZMSPB CREATED BY MACRO ON 6-JUL-82 AT 10:46 PAGE 11
SYMBOL CROSS REFERENCE CREF

SYMBOL	VALUE	REFERENCES								
		321-10523	321-10523	#321-10523	322-10567	322-10567	322-10567	#322-10567	323-10644	323-10644
		323-10644	#323-10644	323-10646	323-10646	323-10646	#323-10646	323-10650	323-10650	323-10650
		#323-10650	324-10689	324-10689	324-10689	#324-10689	325-10748	325-10748	325-10748	#325-10748
		325-10750	325-10750	325-10750	#325-10750	325-10751	325-10751	325-10751	#325-10751	
ILLCSR	014126	182-7092	182-7109	#182-7149						
IMPTES	013066	172-6932	173-6940	#174-6958						
INCBNK	047522	193-7382	195-7412	197-7444	199-7481	201-7515	203-7555	205-7598	207-7638	*373-12000
INCPAT	047476	193-7378	197-7440	#373-11988						
INCRPT	047476	201-7518	203-7558	#373-11987						
INHBAN	002536	#139-5723	*363-11665	363-11673						
INHECC	002534	#139-5722	211-7691	343-11177	363-11663	*363-11664	363-11672	*363-11679	*363-11687	*365-11747
INTFLA	002134	#139-5607	170-6874	172-6917	173-6934	182-7064	211-7704	355-11425	*371-11922	*371-11966
INT64K	002136	#139-5608	170-6875	355-11428	361-11569	*371-11922	*371-11969			
INVALI	= 104511	#110-4681	211-7720	217-7929	219-7981	238-8457	388-12280	390-12341	393-12474	397-12547
IOTVEC	= 000020	#111-4757	*147-5885	*147-5886						
JMPRL1	045752	363-11698	#363-11708							
KAMIKA	002004	#139-5561	253-8825	380-12123	*380-12125	*382-12164	*399-12576	*399-12581		
KAMITE	027000	233-8323	233-8331	234-8341	242-8557	244-8586	246-8650	#253-8824		
KDIAG	= 000010	#296-9904	296-9920	297-9941	297-9967					
KDPAR0	= 172360	#111-4897	222-8109	222-8111	222-8135	222-8136	222-8155	222-8156	234-8368	234-8371
		236-8424	236-8427	236-8432						
KDPAR6	= 172374	#111-4903	*222-8112	*234-8372						
KDPAR7	= 172376	#111-4904	*222-8137	*222-8157	*236-8425					
KERNEL	= 104417	#110-4618	169-6788	169-6801	169-6822	169-6845	174-7035	213-7856	213-7864	242-8565
		244-8621	246-8659	255-8860	257-8897	363-11696	365-11755	367-11814	367-11830	377-12078
		386-12243	386-12254	388-12284	388-12302	388-12306	421-13230	421-13246	421-13257	423-13276
		423-13288	426-13341	426-13347	429-13444	429-13448	430-13507	432-13541		
KERSTK	= 002000	#111-4689								
KFLAG	002526	#139-5720	273-9233	275-9333						
KIPAR0	= 172340	#111-4887	361-11529	361-11605	369-11838	369-11858	430-13496	432-13514		
KIPAR4	= 172350	#111-4891	*162-6292	*163-6353	*163-6368	*163-6418	*163-6422	*163-6426	*164-6440	*164-6449
		164-6450	*166-6508	*166-6516	166-6602	166-6650	*166-6689	166-6690	166-6692	369-11873
		*369-11874	369-11882	*369-11891	395-12495	*395-12496	*395-12518			
KIPAR5	= 172352	#111-4892	*166-6509	*166-6517	166-6653	*166-6670	*166-6676	*166-6682	*166-6690	*321-10488
		*369-11876	*369-11893							
KIPAR6	= 172354	#111-4893								
KIPDR0	= 172300	#111-4867	361-11607	369-11840	425-13330	428-13406	428-13430	432-13515		
KMAP	= 104422	#110-4622	155-6069							
KPFLAG	002112	#139-5598	*371-11919	*371-11929						
KSIZE	002374	#139-5690								
KSTACK	002562	#141-5736	144-5805	166-6518	189-7328	478-15229				
LAST	= 157776	#113-4985	211-7694	220-8060	232-8282	234-8351	242-8571	244-8597	244-8625	246-8665
		289-9736	296-9919	297-9940	297-9977	315-10357	323-10650	386-12236	388-12276	
LASTBA	002554	#141-5733	*144-5810	*145-5851	166-6501	166-6503	169-6763	170-6886	173-6947	182-7082
		*182-7124	184-7163	191-7360	234-8362	238-8476	238-8483	240-8534	331-10894	331-10903
		361-11586	361-11593	363-11644	363-11651	373-12003	386-12231	388-12273	390-12319	393-12477
		395-12516	397-12550	400-12636						
LASTBL	002556	#141-5734	*166-6499	*166-6506	166-6692					
LASTER	002014	#139-5568	*189-7301							
LBLS0	= 000405	157-6122	159-6166	159-6187	160-6271	282-9519	291-9819	316-10406	319-10471	321-10523
		322-10567	323-10650	324-10689	325-10751					
LBLS1	= 000404	160-6270	291-9817	316-10404	323-10646	325-10750				

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SYMBOL  VALUE          REFERENCES
LBLS2   = 000403        323-10644  325-10748
LF      = 000012       #111-4703   434-13659
LINK1     002520       #139-5717  *169-6756  *169-6760   169-6775   169-6814  *238-8447  *238-8451   238-8467   238-8496
                       *240-8519  *240-8521   240-8531  *242-8571  *242-8579  *244-8595  *244-8608  *246-8665  *246-8673
                        309-10216  311-10263  313-10306
LINK2     002522       #139-5718  *169-6757  *169-6761   169-6800  *244-8598  *244-8609   244-8627   244-8634
LKS     = 177546       #111-4699
LOADBA    002430       #139-5703  *363-11635  365-11733  365-11738
LOADCS  = 104425       #110-4627   282-9490   291-9787   315-10335  315-10350  316-10387  321-10498  321-10510  322-10544
                        323-10593  323-10601  324-10667  325-10725  326-10783  326-10786  346-11242  346-11250  346-11258
                        346-11268  352-11349  352-11359  354-11370  355-11444  384-12206  428-13424
LOADHO    002564       #141-5737   189-7333   363-11636  365-11734  365-11742  377-12061
LOOP      014744       #187-7253   189-7347
LOWMAP    046356        363-11706  365-11765 #365-11775  428-13403
LSIZE     002376       #139-5691  *184-7162  *184-7175   184-7199   184-7201   186-7248   509-16410
LST$$   = ******        157-6122   157-6122   157-6125   157-6125   159-6166   159-6166   159-6187   159-6187   160-6270
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                        316-10404  316-10404  316-10406  316-10406  319-10471  319-10471  321-10523  321-10523  322-10567
                        322-10567  323-10644  323-10644  323-10646  323-10646  323-10650  323-10650  324-10689  324-10689
                        325-10748  325-10748  325-10750  325-10750  325-10751  325-10751
MAINT   = 177750       #111-4771   145-5830   154-6018
MAPH0   = 170202       #113-4912  *363-11705 *365-11764  426-13374 *428-13402
MAPKER    046720        227-8229   231-8268   247-8737   248-8747   250-8770   251-8779   251-8795   251-8803   251-8811
                       #369-11869
MAPL0   = 170200       #113-4911  *363-11703 *365-11764   365-11777  426-13374 *428-13402
MAPL1   = 170204       #113-4913   365-11778
MAPPER    044546        155-6070   169-6772   173-6948   174-6959   211-7719   242-8562   244-8591   246-8655   255-8833
                        257-8866  #361-11528  377-12073  386-12240  388-12279  390-12340  390-12373  390-12438  393-12485
                        397-12558  430-13488  432-13529
MASK      002316       #139-5664
MBERR     014004       *182-7087  *182-7103   182-7107  *182-7111  *182-7116  #182-7126
MEMDON    015012        187-7258  #187-7268
MFPI    = 000007       #111-4706   145-5856
MJPAT     020622        149-5925   219-7980   219-7980   219-7985  #219-7993
MJTEST    020516        209-7680  #219-7973
MKCNT     017670       *211-7717  *211-7762   211-7762  #211-7774
MKCONT    017050        209-7675  #211-7686
MKCSRT    020206        149-5911  #215-7878
MKFLAG    002116       #139-5600   172-6915   182-7061   209-7670   240-8527  *371-11919 *371-11945  373-11983
MKLOOP    017232       #211-7715   211-7768
MKPAT     020436        149-5918   217-7928   217-7928   217-7933  #217-7945
MKTEST    020276        191-7356   209-7678  #217-7918
MMR0    = 177572       #111-4780  *341-11150 *341-11154 *363-11708 *363-11717 *365-11756 *365-11759  426-13362 *428-13415
                        430-13506 *432-13525  509-16409  509-16417
MMR1    = 177574       #111-4781   426-13362 *428-13415  430-13505 *432-13524  509-16409  509-16417
MMR2    = 177576       #111-4782   426-13362 *428-13415  430-13504 *432-13523  509-16409  509-16417
MMR3    = 172516       #111-4783   145-5837  *145-5838  *145-5839   145-5840  *189-7331  *363-11699 *363-11707 *365-11763
                       *365-11766 *375-12021 *377-12066   426-13365 *428-13414  430-13503 *432-13522  509-16409  509-16417
MMTRAP    042602        147-5899  #339-11121
MMVEC   = 000250       #111-4767  *147-5899  *147-5900
MONFLG    002274       #139-5655  *144-5803  *154-6004  *154-6023  *154-6026   465-14897
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SYMBOL	VALUE	REFERENCES
		428-13388 430-13475 434-13609 434-13652 435-13671 462-14765 463-14818 470-15006 473-15126
		479-15275 483-15454 485-15544 485-15560 493-15971
MSEEDH	002574	#141-5741 *147-5878 147-5880
MSEEDL	002576	#141-5742 *147-5879 147-5881
MSGA12	00060	*182-7155 #517-16633
MSGA34	076075	211-7755 #517-16575
MSGB34	076133	211-7757 #517-16576
MSG000	100272	154-6007 #517-16640
MSG001	074102	331-10891 #517-16522
MSG002	074164	331-10892 #517-16523
MSG003	074241	331-10893 #517-16524
MSG004	074346	331-10901 331-10921 #517-16526
MSG005	074454	333-10948 #517-16528
MSG006	074466	494-16009 #517-16529
MSG007	074523	335-10963 #517-16530
MSG008	100240	159-6153 #517-16639
MSG009	074535	159-6167 335-10994 #517-16531
MSG010	074547	335-11046 #517-16532
MSG011	074561	331-10907 331-10920 #517-16533
MSG012	074647	331-10910 331-10922 #517-16534
MSG013	074744	333-10951 #517-16535
MSG014	074746	159-6164 159-6184 331-10919 333-10953 335-11056 465-14852 472-15054 472-15058 473-15124
		#517-16536
MSG015	074750	*159-6162 159-6163 *159-6172 *159-6174 *159-6178 *159-6181 159-6183 *335-10970 *335-10972
		*335-10982 335-10983 *335-11004 *335-11006 *335-11009 *335-11012 335-11013 *335-11025 *335-11035
		335-11036 *335-11049 *335-11053 335-11054 #517-16537
MSG016	074752	159-6154 335-11024 #517-16538
MSG017	074764	331-10906 331-10909 #517-16539
MSG018	074775	470-15013 473-15122 478-15219 478-15234 478-15249 478-15264 #517-16540
MSG019	075000	473-15092 #517-16541
MSG020	075004	380-12113 #517-16542
MSG021	075025	380-12131 #517-16543
MSG022	075613	406-12664 #517-16564
MSG023	075635	384-12203 #517-16565
MSG025	075651	382-12188 384-12212 #517-16566
MSG026	075675	380-12126 #517-16567
MSG027	075707	384-12199 #517-16568
MSG028	075724	384-12208 #517-16569
MSG029	075740	386-12221 #517-16570
MSG030	075760	390-12316 400-12616 #517-16571
MSG031	075777	386-12222 388-12264 #517-16572
MSG032	076037	386-12247 388-12287 #517-16573
MSG033	076056	386-12251 388-12291 #517-16574
MSG035	076161	189-7306 #517-16577
MSG036	076164	388-12263 #517-16578
MSG037	076203	388-12294 #517-16579
MSG038	076222	388-12303 #517-16580
MSG039	076240	388-12296 #517-16581
MSG040	076262	390-12315 #517-16582
MSG041	076306	390-12325 #517-16583
MSG042	076333	390-12329 #517-16584
MSG043	076351	390-12334 #517-16585

SYMBOL CROSS REFERENCE CREF

SYMBOL	VALUE	REFERENCES
MSG046	076373	390-12347 393-12461 397-12535 #517-16586
MSG047	076426	#517-16587
MSG048	076445	380-12116 #517-16588
MSG049	076505	390-12344 #517-16589
MSG051	076540	429-13464 #517-16591
MSG055	076557	393-12452 #517-16592
MSG056	076600	393-12459 397-12533 #517-16593
MSG058	076633	478-15210 #517-16594
MSG061	076655	473-15101 #517-16595
MSG062	076664	487-15730 487-15789 #517-16596
MSG063	076704	487-15731 #517-16597
MSG064	076715	487-15732 487-15791 #517-16598
MSG065	076725	487-15790 #517-16599
MSG066	076737	466-14922 #517-16600
MSG067	077006	468-14974 #517-16601
MSG070	077015	184-7212 #517-16602
MSG073	077046	397-12526 #517-16603
MSG075	077064	363-11646 363-11683 #517-16604
MSG076	077116	395-12507 #517-16605
MSG077	077137	189-7304 #517-16606
MSG079	077153	395-12499 #517-16607
MSG085	077177	399-12566 #517-16608
MSG088	077224	478-15228 #517-16609
MSG089	077242	478-15244 #517-16610
MSG090	077264	478-15259 #517-16611
MSG091	077300	478-15253 478-15268 #517-16612
MSG092	077312	485-15554 #517-16613
MSG093	077326	485-15556 #517-16614
MSG095	077334	485-15558 #517-16615
MSG101	077344	399-12575 #517-16616
MSG102	077374	399-12580 #517-16617
MSG103	077423	382-12158 #517-16618
MSG104	077445	470-15023 #517-16619
MSG105	077447	400-12612 #517-16620
MSG106	077522	399-12586 #517-16621
MSG107	077540	399-12593 #517-16622
MSG110	077615	400-12627 #517-16623
MSG111	077661	400-12632 #517-16624
MSG112	077713	184-7202 #517-16625
MSG113	077730	184-7206 #517-16626
MSG114	077745	184-7210 #517-16627
MSG117	077762	154-6021 #517-16628
MSG119	077774	154-6040 #517-16629
MSG120	100003	154-6041 #517-16630
MSG121	100024	154-6035 #517-16631
MSG122	100044	182-7156 #517-16632
MSG125	100112	395-12497 #517-16635
MSG126	100134	163-6427 #517-16636
MSG127	100201	402-12646 #517-16637
MSG128	100220	404-12652 #517-16638
MSG129	100341	159-6188 #517-16641
MSIZE	002400	#139-5692 *184-7162 *184-7172 184-7203 184-7205 186-7248 509-16410

SYMBOL CROSS REFERENCE CREF

SYMBOL	VALUE	REFERENCES								
MTA030	024602	#240-8514	240-8546							
MTEST	016754	193-7376	195-7406	197-7438	199-7475	201-7512	203-7552	205-7595	207-7635	#209-7666
MTLA11	030416	273-9183	#273-9188	273-9283						
MTLB11	030430	#273-9191	273-9279							
MTLC11	030442	#273-9194	273-9273							
MTLD11	030536	#273-9211	273-9295							
MTPA03	027514	222-8099	222-8105	#261-8950						
MTPA04	027652	222-8131	222-8134	222-8152	#265-9009	265-9029				
MTPA21	034434	232-8293	232-8307	#292-9829						
MTPA24	035260	234-8366	#299-9993	301-10052						
MTPA25	035670	303-10063	303-10098	305-10106	#305-10117					
MTPA26	036020	236-8410	236-8411	236-8423	#307-10149	307-10192				
MTPB03	027554	222-8102	222-8108	#261-8973	263-9006					
MTPB04	027706	222-8135	*222-8150	*222-8152	222-8155	265-9013	#265-9022	265-9035		
MTPB21	034464	232-8295	232-8310	#292-9846						
MTPB24	035320	234-8360	234-8367	299-10034	#301-10037					
MTPB25	035712	303-10100	305-10108	#305-10124						
MTPB26	036034	236-8414	236-8415	236-8431	#307-10156					
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MTP013	031554	226-8218	#277-9387							
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MTP016	033260	229-8252	#285-9625							
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MTP033	036246	246-8658	#313-10272	313-10315						
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MTP044	037632	251-8788	#323-10571						
MTP045	040154	251-8797	#324-10654						
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MT0014	022352	215-7884	#227-8223	390-12403					
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MT0037	026340	215-7888	#248-8742	390-12422					
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SYMBOL CROSS REFERENCE CREF

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NEWBAN	002306	#139-5660 240-8544 *363-11691 363-11700 363-11710 *365-11751 369-11846 369-11859
NEWKER	046652	363-11709 365-11757 #369-11856
NEWLOA	046754	363-11638 365-11736 #369-11879
NOCH	063624	483-15460 #483-15464
NOERRO	002426	#139-5702 *382-12184 *384-12200 *384-12209 465-14842 465-14879 466-14902 *466-14931 468-14968 468-14980 470-15020 *476-15188 *476-15194
NOFSMO	002424	#139-5701 *238-8452 *238-8479 *238-8507 *240-8524 *240-8541 *240-8552 380-12115
NONEM	002076	#139-5592 *167-6715 *169-6752 *169-6830 *169-6847 339-11104
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NOOJ	041476	331-10895 #331-10898
NOPAR	002074	#139-5591 *144-5815 *144-5821 *157-6097 *164-6439 *167-6713 *169-6751 *169-6793 *211-7736 *217-7924 *217-7939 *219-7974 *219-7986 *226-8219 *240-8515 *242-8561 *244-8590 *246-8654 *282-9486 *303-10060 *303-10095 *315-10331 *315-10359 *325-10710 337-11077 337-11081 337-11088 386-12219 *386-12220 *386-12255 388-12261 *388-12262 *388-12307 *390-12383 *390-12388 393-12450 *393-12484 397-12524 *397-12557
NORES	003666	144-5801 #144-5803
NOSCOP	002436	#139-5706 *232-8276 *232-8319 *234-8343 *234-8380 *240-8524 *240-8541 *240-8552 *242-8559 *242-8581 *244-8588 *244-8643 *246-8652 *246-8676 462-14777 466-14907
NOSUPF	002454	#139-5713 *145-5845 *145-5864 155-6045 220-8040 220-8064 242-8572 244-8599 246-8666 257-8889 355-11390 361-11532 361-11549 361-11574 361-11595 425-13322 426-13343 426-13363 428-13412 429-13439 430-13501 432-13520 478-15238
NOTAB	002370	#139-5688 335-10984 335-11014 335-11037 *472-15053 *472-15056 *472-15067 *472-15069 *473-15091 *473-15094
NOTRCE	060264	462-14756 #462-14758
NO22BI	002452	#139-5712 *145-5848 *145-5850 154-6003 166-6497 189-7329 355-11409 361-11588 375-12019 377-12064
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NXTCSR	005644	157-6098 #157-6116
OLDCAC	002300	#139-5657
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ONES	002602	#141-5744 169-6813 174-6979 174-6981 213-7833 213-7835 222-8125 296-9908 296-9910 327-10833 327-10838 453-14553
PADDRE	002034	#139-5576 509-16407
PAFBAF	016150	187-7263 #201-7500 201-7525 201-7533
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PARBAF	016452	187-7265 #205-7583 205-7608 205-7616
PARBAW	016602	187-7266 #207-7621 207-7648 207-7653 207-7661
PARCNT	002070	#139-5589 *167-6712 167-6724 *169-6770 169-6805 169-6827 169-6849 *282-9485 282-9494 *282-9509 282-9512 *282-9522 *325-10718 325-10758 325-10763 *337-11079 509-16407
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PATPLU	004610	149-5913 149-5916 149-5920 149-5923 149-5927 149-5930 #149-5933
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		337-11085 390-12313 *390-12384 *390-12436
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PCONFS	041664	*331-10884 331-10925 #331-10931
PCONF1	041574	331-10897 #331-10916
PCONF2	041632	331-10885 331-10904 331-10914 #331-10925
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PERA05	056700	#451-14516 451-14523
PERBNK	057532	211-7758 315-10341 315-10356 421-13260 454-14597 454-14609 456-14624 #458-14645 460-14718
		465-14888
PERECC	057612	#458-14661 458-14675
PERRAB	057350	451-14538 451-14543 #454-14608
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		453-14554 453-14559 453-14564 453-14569 453-14574 453-14584 453-14589 453-14594 #454-14596
PERRA3	054100	#421-13239 456-14630 456-14634
PERRA7	057422	453-14579 #456-14621
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PERR02	= 104430	#110-4631 259-8920 259-8945 311-10261 314-10325
PERR03	= 104431	#110-4632 263-8994 263-9002
PERR04	= 104432	#110-4633 265-9018 265-9040
PERR05	056674	#451-14515
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PERR07	= 104433	#110-4634 267-9055 267-9074
PERR10	= 104434	#110-4635 267-9060 267-9079
PERR11	= 104435	#110-4636 269-9096 271-9146
PERR12	= 104436	#110-4637 269-9102 271-9153
PERR13	= 104437	#110-4638 269-9110
PERR14	= 104440	#110-4639 269-9116
PERR15	= 104441	#110-4640
PERR16	= 104442	#110-4641
PERR17	= 104443	#110-4642 292-9834 292-9856 292-9867 294-9891 297-9946 297-9950
PERR20	= 104444	#110-4643 292-9840 292-9850 292-9873 294-9885 297-9955 297-9959
PERR21	= 104445	#110-4644
PERR22	= 104446	#110-4645 289-9749
PERR23	= 104447	#110-4646 292-10022 301-10051
PERR24	= 104450	#110-4647 299-10027
PERR25	= 104451	#110-4648 307-10162 307-10167
PERR26	= 104452	#110-4649

SYMBOL CROSS REFERENCE CREF

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PERR33   = 104457       #110-4654   275-9347
PERR34   = 104460       #110-4655   273-9252   273-9265   275-9355
PERR35   = 104461       #110-4656   313-10284  313-10291
PERR36   = 104462       #110-4657   355-11435
PERR37   = 104463       #110-4658   323-10610
PERR40   = 104464       #110-4659   323-10624
PERR41   = 104465       #110-4660
PERR42   = 104466       #110-4661
PERR43   = 104467       #110-4662
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PFECDH     061744        470-15026  #470-15028
PFECDT     061774        470-15026  #470-15030
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                         *363-11725   365-11758  *365-11758
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                          273-9182    273-9239
PHYADD     002036       #139-5577   *473-15107  *473-15108  *473-15109  *473-15110  *473-15112   473-15113
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PSW      = 177776       #111-4694   *155-6049   *155-6050   *155-6056   *169-6782   *169-6799   *169-6816   *169-6842   *174-6962
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                         *426-13339  *426-13345  *429-13442  *429-13446  *430-13489  *432-13530  *478-15240  *478-15241  *478-15256
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REFRES		035160	296-9934 #297-9971
REFSUB		035230	297-9974 297-9978 #297-9982
REGCOP		041076	220-8027 220-8049 #327-10816
RELENT		045624	363-11675 363-11676 #363-11688
RELOCA		045204	193-7388 195-7418 197-7455 199-7492 201-7530 203-7575 205-7613 207-7658 240-8538 #363-11625
RELOC1		045640	#363-11691
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RESTAR		002614	*137-5548 *137-5550 #141-5749 151-5948
RESVEC	=	000010	#111-4753 *147-5895 *147-5896
RES0		050410	382-12168 382-12173 #382-12176
RES1		050470	382-12182 #382-12188
RES2		050636	384-12197 #384-12212
RLFLAG		002124	#139-5603 193-7385 195-7415 197-7452 199-7489 201-7527 203-7572 205-7610 207-7655 *363-11726 *365-11760 371-11952 375-12016 377-12056 380-12115 425-13328 463-14814 485-15553
RRFLAG		002122	#139-5602 191-7354 193-7372 195-7402 197-7434 199-7471 201-7510 203-7550 205-7593 207-7633 211-7723 238-8456 238-8485 240-8528 *371-11921 *371-11951 *371-11954 *371-11962 390-12343 393-12473 397-12546
RWCSR		006210	157-6111 #160-6202
SAVCSR		002152	#139-5614 *390-12348 390-12440
SAVMON		002272	#139-5654 *144-5804 465-14898
SAVPAR		002270	#139-5653 *369-11873 369-11891 *369-11892 369-11893
SAVREG	=	104415	#110-4615 222-8098 222-8106 234-8359 234-8365 236-8409 236-8422 328-10851 367-11793 367-11796 380-12112 468-14949 491-15870
SAV4		002266	#139-5652 *395-12495 395-12518
SBEMSK		002250	#139-5646 *273-9191 *273-9192 273-9207 273-9209 273-9270 *273-9272 *273-9272 *275-9311 *275-9312 275-9317 275-9319 275-9330 275-9367 *275-9369 *275-9369 *277-9393 *277-9394 277-9404 277-9406 277-9410 277-9412 279-9442 *279-9444 *279-9444 *279-9454 279-9457 *279-9464 279-9465 279-9467 *283-9531 *283-9532 283-9542 283-9544 283-9548 283-9550 283-9590 *283-9592 *283-9592 *283-9601 283-9604 *283-9611 283-9612 283-9614 *285-9632 *285-9633 285-9642 285-9644 285-9648 285-9650 287-9692 *287-9694 *287-9694 *287-9703 287-9706 *287-9713 287-9714 287-9716
SBENT		020150	213-7810 213-7812 213-7817 213-7819 213-7828 213-7834 213-7836 213-7842 213-7844 213-7853 #213-7862
SBESYN		034414	291-9801 #291-9826
SBETES		017672	211-7733 #213-7777
SCOPE	=	000004	#111-4693 157-6074 167-6705 169-6742 172-6890 187-7253 187-7270 255-8861 257-8898
SDPAR0	=	172260	#111-4857 222-8110 222-8112 234-8367 234-8369 234-8370 236-8426
SDPAR5	=	172272	#111-4862 *222-8114 *234-8371

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SYMBOL  VALUE           REFERENCES
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SDPAR7  = 172276        #111-4864  *222-8113
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SEEDLO    002572        #141-5740  *147-5881   236-8396  *236-8435   489-15842  489-15848 *489-15854
SELONL    002000        #139-5559   187-7273   211-7690   371-11961 *400-12628 *400-12633
SETPAT    047512         195-7404   199-7473  #373-11995
SHADL1    012454        #170-6872   170-6887
SHUTUP    047676         189-7316   377-12037 #377-12045
SIPAR0  = 172240        #111-4847   361-11530
SIPAR3  = 172246        #111-4850   273-9184  *273-9185   355-11392  361-11548
SIPAR5  = 172252        #111-4852   220-8042   220-8066   242-8574   244-8601   246-8668   273-9185  *273-9186   361-11578
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SIPAR6  = 172254        #111-4853   220-8042   220-8066   242-8574   244-8601   246-8668  *361-11599
SIPDR0  = 172200        #111-4827   361-11531  425-13332  428-13432
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                         236-8401   238-8461   238-8490   240-8529   244-8594   244-8631   246-8682   328-10853  363-11695
                         365-11754  367-11813  367-11829
SKIPKA    002006        #139-5562   382-12160 *382-12162 *399-12576 *399-12582
SKIPMK    002340        #139-5673   172-6916   209-7674  *371-11922 *371-11972
SKJ       060312         462-14760  462-14763 #462-14773
SKPERR    002064        #139-5587  *213-7823  *213-7848   355-11433 *355-11437
SKUB      045614         363-11682 #363-11685
SKUJ      014010         182-7125  #182-7128
SOBK      002560        #141-5735   242-8566
SOBLEN  = 000056         242-8564   242-8569  #309-10223
SOFTPA    002606        #141-5746   246-8683
SOURCE    002310        #139-5661  *273-9202  *275-9315  *277-9408  *283-9546  *285-9646  *303-10058  357-11459
SPLTCS    002236        #139-5643  *172-6919  *173-6941  *211-7696  *211-7706   211-7728  *211-7761  *211-7764  *211-7771
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SSP     =%000006        #111-4711  *155-6053  *255-8856  *257-8893   426-13346 *429-13443  478-15242
ST      = 177776        #498-16113
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START2    000310         137-5546  #137-5550
START3    000200        #137-5545   517-16655
STAR27    024164         238-8448  #238-8453
STOPOK    002416        #139-5698  *174-7038   462-14773 *462-14774 *486-15629
STRIPE    002364        #139-5686  *296-9913   296-9917   296-9936  *297-9967   297-9967
SUBAAA    004646         149-5931  #151-5944
SUBAAB    004776        #153-5974
SUBAAI    012450         169-6794  #170-6867
SUBAAP    014170         182-7148  #184-7161
SUBAAR    013374         173-6956  #174-7038
SUBAAS    011402         166-6519  #167-6703
SUCCES    002332        #139-5670  *211-7722  *211-7748   211-7754  *395-12501   395-12506 *395-12508
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                        *224-8176  *224-8183  *226-8194  *226-8209  *226-8218  *229-8243  *229-8252  *229-8257  *232-8293
                        *232-8295  *232-8298  *232-8300  *233-8326  *233-8334  *234-8360  *234-8369  *234-8388  *236-8411
                        *236-8415  *238-8450  *238-8466  *238-8472  *238-8495  *238-8501  *240-8522  *242-8570  *244-8626
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SYMBOL	VALUE	REFERENCES								
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		246-8704	#255-8832	328-10864						
SUPDO2	027050	222-8116	222-8138	222-8158	232-8311	232-8315	232-8318	244-8642	#255-8834	
SUPDO3	027212	220-8031	220-8053	220-8079	222-8100	224-8167	224-8177	224-8184	226-8195	226-8210
		226-8220	229-8244	229-8253	229-8258	232-8294	233-8327	233-8336	234-8389	236-8412
		236-8417	238-8447	238-8473	238-8502	240-8521	246-8696	246-8702	246-8723	249-8763
		251-8790	#257-8866	328-10858						
SUPDO4	027226	222-8103	222-8132	222-8151	232-8296	232-8299	232-8301	234-8373	234-8379	242-8580
		244-8630	244-8640	246-8675	246-8727	#257-8867				
SUPDR0	002156	#139-5617	*255-8836	255-8844	*257-8869	257-8877				
SUPDR1	002160	#139-5618	255-8837	257-8870						
SUPDR2	002162	#139-5619								
SUPDR3	002164	#139-5620								
SUPDR4	002166	#139-5621								
SUPDR5	002170	#139-5622								
SUPDR6	002172	#139-5623	255-8847	257-8880						
SUPLIM	056542	#434-13669	517-16650	517-16651						
SUPSTK	= 000740	#111-4690	155-6052	255-8856	257-8893	478-15245	478-15251			
SWAPAT	002622	#141-5754	*147-5883							
SWR	002624	#141-5757	*151-5961	151-5963	*151-5968	*153-5987	155-6063	167-6735	173-6950	184-7213
		187-7255	189-7305	217-7919	217-7934	273-9274	275-9371	279-9440	283-9588	287-9690
		331-10897	363-11626	363-11645	363-11680	390-12376	393-12454	397-12528	421-13263	426-13376
		428-13398	462-14773	462-14780	462-14798	465-14849	465-14889	465-14892	466-14903	466-14907
		470-15020	483-15484	483-15492	483-15514	486-15627				
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SW1	= 000002	#111-4730								
SW10	= 002000	#111-4721	465-14849							
SW11	= 004000	#111-4720	189-7305	273-9274	275-9371	279-9440	283-9588	287-9690		
SW12	= 010000	#111-4719	363-11626							
SW13	= 020000	#111-4718	363-11645	363-11680	465-14889					
SW14	= 040000	#111-4717	462-14780							
SW15	= 100000	#111-4716								
SW2	= 000004	#111-4729								
SW3	= 000010	#111-4728								
SW4	= 000020	#111-4727	331-10897							
SW5	= 000040	#111-4726	465-14892							
SW6	= 000100	#111-4725	184-7213							
SW7	= 000200	#111-4724	470-15020							
SW8	= 000400	#111-4723	462-14773							
SW9	= 001000	#111-4722	462-14798	466-14907						
SYSSIZ	003756	145-5825	#145-5827							
TAG2$	012044	169-6764	#169-6791							
TAG3$	012100	169-6790	#169-6795							
TAG4$	027130	255-8845	#255-8847							
TAG70$	062010	470-14996	#472-15038							
TAG71$	062020	470-14997	#472-15044							
TAG72$	062030	470-14998	#472-15050							
TAG73$	062100	470-14999	#472-15064							
TAG74$	062140	470-15000	#472-15076							
TAG75$	062152	470-15001	#472-15082							
TAG76$	062164	470-15002	#473-15088							

SYMBOL CROSS REFERENCE CREF

SYMBOL	VALUE	REFERENCES
TAG77$	062230	470-15003 #473-15101
TAG78$	062236	470-15004 #473-15107
TAG79$	062316	470-15005 #473-15122
TAG9$	011672	169-6758 #169-6762 169-6797 169-6834 169-6856
TBG4$	027306	257-8878 #257-8880
TCFIG1	041740	#335-10965 335-10986 472-15055
TCFIG2	042100	#335-10995 335-11016 473-15093
TCFIG3	042234	#335-11025 335-11039 472-15068
TCONFI	041666	331-10902 331-10913 331-10923 #333-10947
TEMP	002432	#139-5704 *166-6549 166-6605 166-6607 *186-7220 186-7237 *186-7238 *395-12492 *395-12493 395-12494
TESTAD	002410	#139-5696 162-6293 *162-6294 *162-6295 166-6493 *166-6523 *166-6524 *166-6669 *166-6680 *166-6681 *211-7726 211-7727 *211-7727 *211-7730 *211-7732 *211-7751 211-7751 213-7803 213-7804 *219-7976 *219-7977 224-8165 224-8182 273-9211 273-9212 273-9298 273-9299 275-9321 275-9362 275-9379 277-9390 279-9471 283-9556 283-9563 283-9567 283-9618 285-9656 285-9665 287-9720 303-10061 390-12313 *390-12369 *390-12370 *390-12374 *390-12436 458-14662
TESTMO	002550	#141-5731 *145-5844 *145-5865 169-6782 169-6799 169-6816 169-6842 174-6962 213-7805 242-8563 244-8611 246-8657 257-8888 344-11229 377-12074 386-12241 388-12281 388-12299 421-13228 421-13244 421-13254 423-13274 423-13286
TIME	002336	#139-5672
TIMEOU	042570	145-5871 147-5897 151-5967 164-6457 167-6732 169-6792 #339-11117 382-12186 382-12190 384-12202 384-12214 386-12256 388-12308
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TOQMAN	002404	#139-5694 *458-14657 465-14892 *466-14931
TOTCSR	002222	#139-5636 *157-6127 162-6298 163-6356 163-6388 166-6494 348-11274 350-11309 354-11365 406-12658 426-13350 428-13417 478-15212
TRACE	006206	#159-6190 *164-6438 *164-6444 164-6446 *164-6452 *164-6456 *402-12647 *404-12653 462-14755
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TSTBAN	012312	169-6774 #169-6837
TSTDAT	002244	#139-5645 *273-9194 *273-9195 *273-9198 *273-9199 273-9200 273-9201 273-9202 *273-9208 *273-9210 273-9214 273-9216 273-9222 273-9228 *273-9287 *273-9288 *275-9313 *275-9314 275-9315 *275-9318 *275-9320 275-9324 275-9327 *277-9397 *277-9398 *277-9401 *277-9402 277-9408 *277-9411 *277-9413 *277-9415 *277-9417 277-9419 277-9421 *279-9452 *279-9453 *283-9535 *283-9536 *283-9539 *283-9540 283-9546 *283-9549 *283-9551 *283-9553 *283-9555 283-9558 283-9561 283-9569 283-9575 *283-9599 *283-9600 *285-9636 *285-9637 *285-9640 *285-9641 285-9646 *285-9649 *285-9651 *285-9653 *285-9655 285-9658 285-9660 285-9667 285-9674 *287-9701 *287-9702 *303-10056 *303-10057 303-10058 *303-10074 *303-10076 *303-10078 *303-10079 *303-10081 *303-10084 *303-10085 *303-10087 *303-10089 *303-10090 *303-10092 305-10118 305-10120 *316-10393 *316-10394 453-14558 453-14563 458-14663 458-14665 509-16416 509-16416
TSTRD1	043242	344-11215 344-11217 #344-11228
TSTREA =	104510	#110-4680 213-7821 213-7846 273-9248 273-9261 275-9337 275-9349
TST1	005524	#157-6074
TST2	011406	#167-6705
TST3	011572	#169-6742
TST4	012560	#172-6890
TST5	014744	#187-7253
TST6	015016	#187-7270
TYPDS =	104405	#110-4604 184-7201 184-7205 184-7209 184-7211 189-7309 395-12494 395-12498 395-12513

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TYPOC	= 104402	#110-4601 468-14955 472-15038 478-15218 478-15233 478-15235 478-15248 478-15250 478-15263 478-15265 483-15492
TYPOS	= 104403	#110-4602 211-7756 386-12244 388-12295 388-12304 395-12510 472-15076 472-15082 473-15123 485-15557 485-15559
TYPSO	= 000000	157-6122 159-6166 159-6187 160-6271 282-9519 291-9819 316-10406 319-10471 321-10523 322-10567 323-10650 324-10689 325-10751
TYPS1	= 000000	160-6270 291-9817 316-10404 323-10646 325-10750
TYPS2	= 000000	323-10644 325-10748
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T12B	033302	#285-9634 287-9695
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UDPAR7	= 177676	#111-4824 *234-8370
UIPAR0	= 177640	111-4806 #111-4807 160-6203 *160-6238 *160-6245 160-6270 *160-6283 361-11534 369-11837
UIPAR1	= 177642	#111-4808 *222-8111 *236-8427 *236-8432
UIPAR2	= 177644	#111-4809 169-6760 222-8113 236-8428 *328-10863
UIPAR3	= 177646	#111-4810 169-6761 238-8450 246-8690 355-11394 361-11551
UIPAR4	= 177650	#111-4811 367-11799 367-11816
UIPAR5	= 177652	#111-4812 220-8045 220-8069 *222-8136 *222-8156 242-8577 244-8604 246-8671 361-11576 361-11597
UIPAR6	= 177654	#111-4813 220-8045 220-8069 222-8137 222-8157 242-8577 244-8604 246-8671 *361-11597
UIPDR0	= 177600	#111-4786 361-11535 369-11839 425-13331 428-13431
UNITOP	002414	#139-5697 *184-7190 *184-7193 *184-7194 *184-7195 *184-7196 184-7197 184-7197
UNMAP	047006	227-8233 231-8272 247-8739 248-8750 250-8773 251-8782 251-8798 251-8806 251-8815 #369-11890
UNRELO	046070	193-7392 195-7422 197-7459 199-7496 201-7534 203-7579 205-7617 207-7662 240-8548 #365-11730 375-12016 377-12056
UPPFLG	002263	#139-5650 *285-9661 287-9680 *287-9682
USERMA	046570	363-11693 365-11752 367-11794 #369-11836
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USP	=%000006	#111-4712 *155-6059 *257-8891 426-13340 *429-13447 478-15257
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WARN3	027542	#261-8967 *327-10843
WARN4	027566	#261-8979 *327-10844
WARN5	027602	#261-8984 *327-10845
WARN6	041320	#328-10863
WARN6A	041260	#328-10856
WARN6B	041312	328-10855 #328-10862
WARN7	024142	#238-8450
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WASSBE	= 104476	#110-4670
WAS1DB	= 104501	#110-4673 174-6972 174-6985 174-7000 174-7015 277-9425
WAS1SB	= 104477	#110-4671
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WOOPS	055372	425-13328 #430-13485
WOOPSA	055770	*430-13490 *430-13491 430-13492 432-13531 432-13532 432-13535 #432-13547
WOOPUP	055556	430-13492 430-13492 430-13493 430-13495 430-13495 430-13495 #432-13512 432-13536 432-13537 432-13547
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XOCHAR	056332	#434-13601 *434-13635 *434-13638 *434-13639 434-13640 *434-13644 *434-13645 434-13646 483-15459 483-15461 *483-15462
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ZEROS	002334	#139-5671 145-5835 296-9907 296-9911
$APTHD	066004	137-5543 #493-15978
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$BELL	002641	#141-5764 393-12478 397-12551 465-14851
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MACRO CROSS REFERENCE CREF

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.EMITR	#108-4551
.GENBR	#108-4552
.GOTO	#108-4554
.IFARI	#108-4554
.IFOPR	#108-4552
.IS	#108-4552
.LEAVE	#108-4554
.OPADD	#108-4552
.OPSUB	#108-4552
.OR	#108-4554
.SIMPL	#108-4557
..BRAN	#108-4551
..POP	#108-4551 #157-6122 #159-6166 #159-6187 #160-6270 #160-6271 #282-9519 #291-9817 #291-9819 #316-10404 #316-10406 #319-10471 #321-10523 #322-10567 #323-10644 #323-10646 #323-10650 #324-10689 #325-10748 #325-10750 #325-10751
..PUSH	#108-4551
..TAG	#108-4551 157-6122 159-6166 159-6187 160-6270 160-6271 282-9519 291-9817 291-9819 316-10404 316-10406 319-10471 321-10523 322-10567 323-10644 323-10646 323-10650 324-10689 325-10748 325-10750 325-10751