MS11

0-124K MEMORY EXERCISER 16K AH-9047F-MC APR 1978

CZQMCFO

FICHE 1 OF 1 MADE IN USA

digital

PROJECT CODE: AC-90MSF-MC

PROJECT NAME: C2DMCFD 0-12MK MEM EXER 15

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MAINTAINER: DIAGNOSTIC ENGINEERING

REVISION HISTORY

Revision A:	May 1975
Revision B:	October 1975
Revision C:	October 1976
Revision D:	June 1977
Revision E:	December 1977
Revision F:	February 1978

TABLE OF CONTENTS

1.0 GENERAL PROGRAM INFORMATION.

1.1 Program Purpose (Abstract)

This program has the ability to test memory from address 000000 to address 757777. It does so using:

A. Unique addressing techniques
B. Worse case noise patterns, and
C. Instruction execution thruout memory.

There is also a special routine to type out all unibus address ranges which do not timeout, as well as two(2) toggle in address tests provided in section 6.1 of this document.

The intent of this program is to test as comprehensively as possible all memory systems manufactured by DEC without concentrating on any one system. Although the tests relate to general designs they may be complete for certain systems. E.G. Any core memory from the 8K MM11-L on up need not have any other addressing or worst case patterns run but in order to completely test the MS11-K MOS memory another diagnostic is required. This test is also not intended to be a 100% test of the memory. Other tests that do I/O may find memory problems that this test is unable to.

1.2 System Requirements

A. Hardware Requirements

PDP11 family processor with a minimum of 16K of memory.
optional...
Any parity memory control module.
KT11 memory management.

B. Software Requirements

The smallest unit of memory this program will recognize is 4K. If any address in a 4K bank causes a time out trap, that entire bank of memory is ignored by the program.

The program is designed to exercise the vector portion of memory (locations 0-776) in exactly the same manner as the rest of memory. To make this possible, without requiring memory management, no software traps are used in the program. This means that if memory management is not available or is disabled (SW12=1), if the program is relocated out of bank 0, if location 0-776 are selected for test, and if an unexpected hardware trap occurs, the results will be unpredictable.

The program has the proper interface code to allow running under the automated manufacturing test line system - ACT11 and APT.

1.3 Related Documents and Standards

A. Programming Practices - Document No. 175-003-009-01
B. PDP-11 MAINDEC SYSMAC Package - MAINDEC-11-DZQAC-C2-D
C. The applicable Memory System Maintenance Manual
D. The applicable Circuit Schematics

1.4 Diagnostic Hierarchy Prerequisites

Before running this program, a CPU diagnostic should be run to verify the functionality of the processor and PDP-11 instruction set.

If memory management is to be used, then the KT11 diagnostic should also be run before this program.

PDP-11/20 - MAINDEC-11-DZQKC
PDP-11/34 - MAINDEC-11-DFKTH
PDP-11/40 - MAINDEC-11-DBQEA
OR MAINDEC-11-DCQKC
PDP-11/45 - MAINDEC-11-DCQKC
PDP-11/60 - MAINDEC-11-DQKDA
KT11-C - MAINDEC-11-DCKTA THRU DCKTF
KT11-D - MAINDEC-11-DBKTA THRU DBKTF

1.5 Assumptions

This program assumes the correct operation of the CPU and, if used, the memory management option.

2.0 OPERATING INSTRUCTIONS

2.1 Loading and Starting Procedures

2.1.1 Load the program using any standard absolute loader.

2.1.2 Starting address 200:

Normal program execution.

2.1.3 Starting address 204:

Allows the operator to input, via teletype conversation, first and last addresses to be exercised, and a data pattern to be used in tests 6 and 7.

2.1.4 Starting Address 210:

Restart program using previously selected parameters.

2.1.5 Starting Address 214:

Restore loaders and halt. This routine is capable of relocating the program back to banks 0 and 1 if the program was halted while running the top two banks of memory. There are special procedures required for this situation.

A. If memory addresses 0-1000 have not been exercised, either through parameter selection (SA=204) or by running with SW05=1, then:

    Load Address 214.
    Press START.

B. If running without memory management, then:

    Load Address (214+relocation factor)
    (Relocation factor is typed when the program is relocated).
    Press START.

C. If running with memory management and the unibus has not been initialized (via reset instruction, start switch, etc.), then:

    Load Address 777707 (PC)
    Deposit 214
    Press CONTinue

D. If running with memory management and the unibus has been initialized:

    Load Address 772340 (KIPAR0)
    Deposit   (relocation factor)/100)
    (Example: Relocation factor=540000, then
                  deposit 005400)
    Load Address 777572 (SR0)
    Deposit   000001
    Load Address 777707 (PC)
    Deposit   214
    Press   Continue

2.1.6 Starting address 220:

Byte address memory map typeout routine. This routine performs DATI, DATIP, DATO, and DATOB on all possible addresses, and types the ranges of addresses which do not cause a timeout trap.

2.2 Special Environments

If the program is run in quick verify mode under ACT11 or XPT11 the program is done after the first pass. Also, the

program does not relocate to test the lower 8K of memory.

2.3 Program Options

SW15 = 1 OR UP.... HALT ON ERROR

SW14 = 1 OR UP.... LOOP ON TEST

SW13 = 1 OR UP.... INHIBIT ERROR TYPEOUT

SW12 = 1 OR UP.... INHIBIT MEMORY MANAGEMENT (INITIAL START ONLY)

SW11 = 1 OR UP.... INHIBIT SUBTEST ITERATION

SW10 = 1 OR UP.... RING BELL ON ERROR

SW9 = 1 OR UP.... LOOP ON ERROR

SW8 = 1 OR UP.... LOOP ON TEST IN SWR<4:0>

SW7 = 1 OR UP.... INHIBIT PROGRAM RELOCATION

SW6 = 1 OR UP.... INHIBIT PARITY ERROR DETECTION

NOTE: With parity error detection enabled, a memory failure while running the worse case noise tests (non-parity) can cause a parity error. The error printout on a parity error does not type the good data. Thus a bit drop or pickup will not be typed as such. It is best to run the program for 1 pass with parity disabled, then, restart the program with parity enabled.

SW5 = 1 OR UP.... INHIBIT EXERCISING VECTOR AREA (LOCATIONS 0-1000).

2.4 EXECUTION TIMES

Execution time is dependent on type of memory, and amount of memory. Worse case run times with 900ns memorys are:

a. For Non-Parity Memory
First Pass: 65 seconds for first 16k + 15 seconds for each additional 16k.

Full Pass: 3 minutes 40 seconds for first 16k + 3 minutes for each additional 16k.

Iteration Inhibited: same as first pass

b. For Parity Memory
First Pass: 1 minute 40 seconds per 16k.

Full Pass: 8 minutes per 16K

Iteration Inhibited: same as first pass

3.0 ERROR INFORMATION

3.1 Error Reporting

There are a total of 31(8) types of error reports generated by the program. Some of the key column heading mnemonics are descr.bed below for c. ty:

PC = Program Counter of error detection code. (V/PC=P/PC)

V PC = Virtual Program Counter. This is where the error detection code can be found in the program listing.

P PC = Physical Program Counter. This is where the error detection code is actually located in memory.

TRP PC = Physical Program Counter of the code which caused a trap.

MA = Memory Address

REG = Parity REGister address.

PS = Processor Status word.

IUT = Instruction Under Test.

S/B = What contents Should Be.

WAS = What contents WAS.

3.2 Error Halts

With the 'HALT ON ERROR' switch (SW15) not set there are several programmed 'HALTS' in the program:

A. In the error trap service routine for unexpected traps to vector 4. This one will occur if a 2nd trap to 4 occurs before the error report for the first has had a chance to be printed out.

B. In the relocation routine if the program is being relocated back to the first 8K of memory and the program code was not able to be transferred properly.

C. In the case of error reporting and there is no terminal to allow the information transfer.

C. In the power fail routine if the power up sequence was started before the power down sequence had a chance to complete itself.

E. In the Memory mapping routine or any of the address control routines, failures to find a meaningful map.

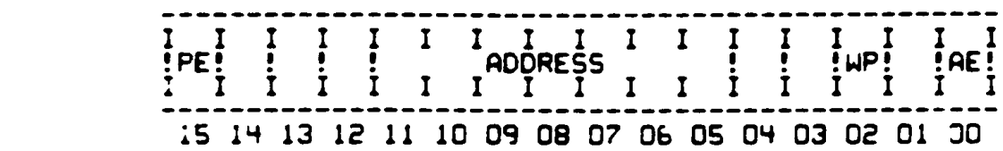
4.0 PERFORMANCE AND PROGRESS REPORTS

Not applicable

5.0 DEVICE INFORMATION TABLES

The following is a picture view of a parity control status registers, which will show bit assignments and definitions, to provide a handy reference:

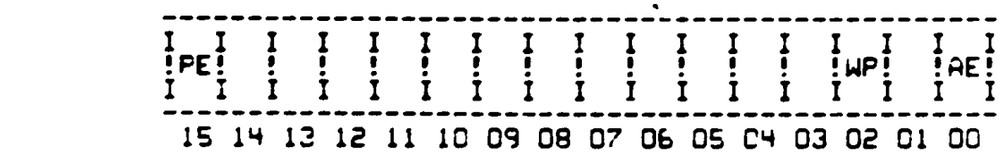
5.1 CORE PARITY REGISTER



Bit assignments are defined as follows:

BIT15	PARITY ERROR	
BITS 11-5	ERROR ADDRESS	HIGH ORDER ADDRESS BITS OF ADDRESS OF PARITY ERROR (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

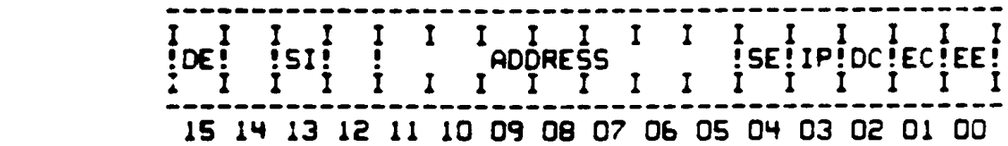
5.2 MOS PARITY REGISTER



BIT ASSIGNMENTS ARE DEFINED AS FOLLOWS:

BIT15	PARITY ERROR	
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-K CSR



BIT ASSIGNMENTS ARE DEFINED AS FOLLOWS:

BIT15	DOUBLE ERROR	
BIT 13	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.
BITS 11-5	ERROR ADDRESS	WHEN BIT02 CLEARED CONTAINS HIGH ORDER BITS OF ADDRESS OF PARITY ERROR(BITS 17-11). WHEN BIT02 SET 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 BIT 13 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...BIT 3 =1 THE SECOND 16K OF MEMORY IS INHIBITTED. WHEN BIT 13 IS SET TO A 0, BIT 3 BECOMES INOPERATIVE.
BIT02	DIAGNOSTIC CHECK A	WHEN SET ENABLES READ-WRITE OF CHECK BITS(SEE BITS 11-5)
BIT01	DISABLE ERROR CORRECTION	WHEN SET NO ERROR CORRECTION TAKES PLACE
BIT00	DOUBLE ERROR ENABLE	WHEN SET ENABLES TRAP TO VECTOR 114 ON DOUBLE ERROR.

5.0 SUB-TEST SUMMARIES

6.1 Section 1: Address Tests.

These tests verify the uniqueness of every memory address.

TEST 1 Writes and reads the value of each memory Word Address into that Memory location. After all memory has been written, all locations are checked again.

TEST 2 Writes the byte value of each address into that byte location and checks it.

TEST 3 Writes the complement of each word address into that location and checks it.

TEST 4 Writes the 4K bank number into each byte of that bank and checks it.

TEST 5 Writes the complement of the bank number into each byte of that bank and checks it.

5.2 Section 2: Worst Case Noise Tests.

These are intended to apply maximum stress to the various types of PDP-11 core memories.

TEST 6 and TEST 7 Are supplied to allow the operator to select a single word data pattern (SA=204) and SCOPE on

either the writing (DATO) in TEST 6 or the reading (DATI) in TEST 7 of that data.

TEST 10 Writes and then checks a series of single word patterns which are designed to stress parity memory.

TEST 11 Writes all memory with 1's in every bit and then "Ripples" a "0" through it.

TEST 12 Writes all memory with 0's in every bit and then "Ripples" a "1" through it.

TEST 13,14,15, AND 16 Write a pattern which complements when address BIT 3 XOR BIT 9 complements.

TEST 17 Writes wrong parity in each byte of memory and checks that the parity detection logic works. This test is skipped for non-parity memory.

TEST 20 Write "random" program code through memory and checks it.

3.3 Section 3: Instruction Execution Tests.

This group of tests place instructions in the memory under test, then executes the instructions, and finally, checks that they executed correctly.

TEST 21 Executes an instruction which does a DATI and a DATO on the memory under test.

TEST 22 Executes an instruction which does a DATI and a DATOB on the low byte of memory under test.

TEST 23 Executes an instruction which does a DATI and a DATOB on the high byte.

TEST 24 Executes an instruction which does a DATIP and a DATO.

TEST 25 Executes an instruction which does a DATIP and a DATOB on the low byte.

TEST 26 EXECUTES AN INSTRUCTION WHICH DOES A DATIP and a DATOB on the high byte.

3.4 Section 4: Mos Tests

TEST 27 -Writes a pattern of 000377 through memory, then compliments it addressing downward, compliments the new pattern addressing upward, compliments the third pattern addressing upward and finally compliments this new AB patterns addressing downward.

TEST 30-31 Write a checkerboard through memory then stalls for 2 seconds and then verifies no data has changed.

6.5 Special Toggle In Tests

6.5.1 Toggle-in-program #1

The following is a toggle in memory address test. This test is useful when an address selection failure is suspected involving the first 8K of memory. This program writes the value of each address into itself starting with the lower limit and continuing to the upper limit. After all addresses have been written each address is checked for the correct contents starting with the upper limit and continuing to the lower limit.

```
LOCATION CONTENTS       MNEMONIC     COMMENT
  10     012700         MOV #50,R0   ;GET FIRST ADDRESS
* 12     000050                      ;TO TEST
                                     ;(EXAMPLE START ADDRESS)
  14     010001         MOV R0,R1    ;SAVE IN R1
  16     020037     1$: CMP R0,@#SWR ;CHECK UPPER LIMIT
  20     177570                      ;(IN SWITCH REGISTER)
  22     001403         BEQ 2$       ;BRANCH IF AT UPPER LIMIT
  24     010010         MOV R0,(R0)  ;LOAD VALUE INTO ADDRESS
  26     005720         TST (R0)+    ;STEP TO NEXT ADDRESS
  30     000772         BR 1$        ;LOOP UNTIL DONE
  32     010004     2$: MOV R0,R4    ;SAVE UPPER LIMIT
  34     020001     3$: CMP R0,R1    ;CHECK IF AT LOWER LIMIT
* 36     001767         BEQ 1$       ;BRANCH IF DONE
  40     024000         CMP -(R0),R0 ;CHECK DATA WRITTEN
  42     001774         BEQ 3$       ;BRANCH IF OK
  44     000000         HALT         ;ERROR
  46     000772         BR 3$        ;LOOP BACK
```

After toggling the program LA=10**set upper limit**, start

NOTES: The upper limit address obtained from the switch register may be changed during program operation. However occasionally the program may halt because of 'SWITCH BOUNCE'. (The best procedure when changing limits is to stop the program make the change and continue.) The lower limit address (12) may be patched to any desired address.

6.5.2 Toggle-in-Program #2

The following is also a toggle in program to be used with toggle-in-program #1 for more complete address testing. This program writes the complement value of each address into itself starting with the upper limit and continuing to the lower limit. After all addresses have been written each address is checked for the correct contents starting with the

lower limit address and continuing to the upper limit
toggle in the following patches to the program above.

These are the patches to toggle-in-program #1:

LOCATION	CONTENTS	MNEMONIC	COMMENT
12	100		;CHANGE LOWER LIMIT
36	001404	BEQ 4$	;BRANCH TO PROGRAM #2

These are the additions to toggle-in-program #1:

LOCATION	CONTENTS		MNEMONIC	COMMENT
50	010402	4$:	MOV R4,R2	;GET UPPER LIMIT
52	005142	5$:	COM -(R2)	;COMPLEMENT ADDRESS
54	020201		CMP R2,R1	;CHECK IF AT LOWER LIMIT
56	001375		BNE 5$	;LOOP UNTIL DONE
60	020204	6$:	CMP R2,R4	;CHECK IF AT UPPER LIMIT
62	001755		BEQ 1$	;GO TO PROGRAM 1 IF DONE
64	010203		MOV R2,R3	;GET VALUE OF ADDRESS
66	005103		COM R3	;COMPLEMENT VALUE
70	020322		CMP R3,(R2)+	;CHECK ADDRESS
72	001772		BEQ 6$	;BRANCH IF OK
74	000000		HALT	;ERROR
76	000770		BR 6$	;GO CHECK NEXT ADDRESS

7.0 PROGRAM FUNCTIONAL FLOW CHARTS
Attached

8.0 PROGRAM LISTING
Attached

FLOW CHART
****

C2QMCF0 0-124K MEM EXER 16K

****

TABLE OF CONTENTS
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TABLE OF CONTENTS
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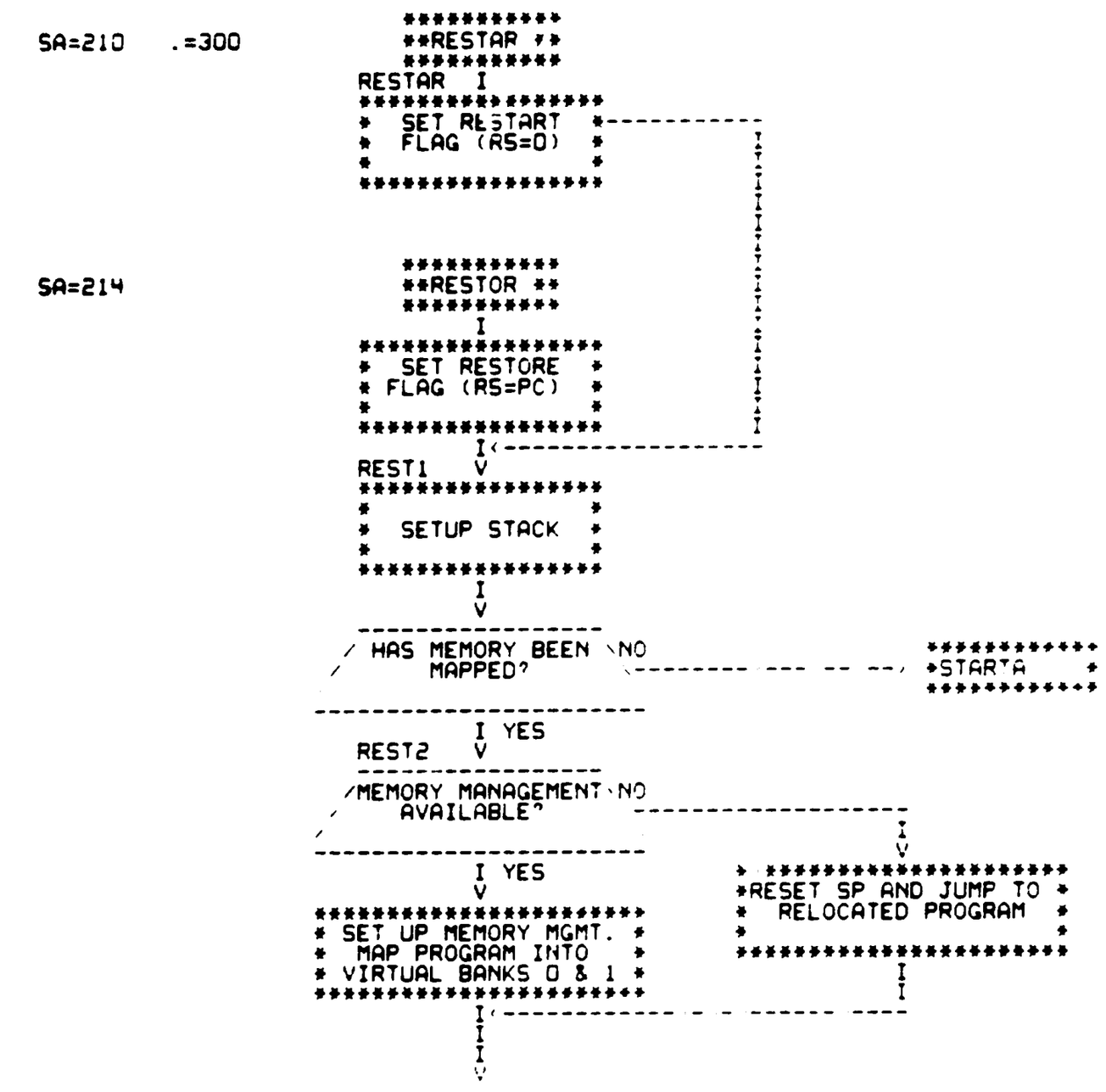
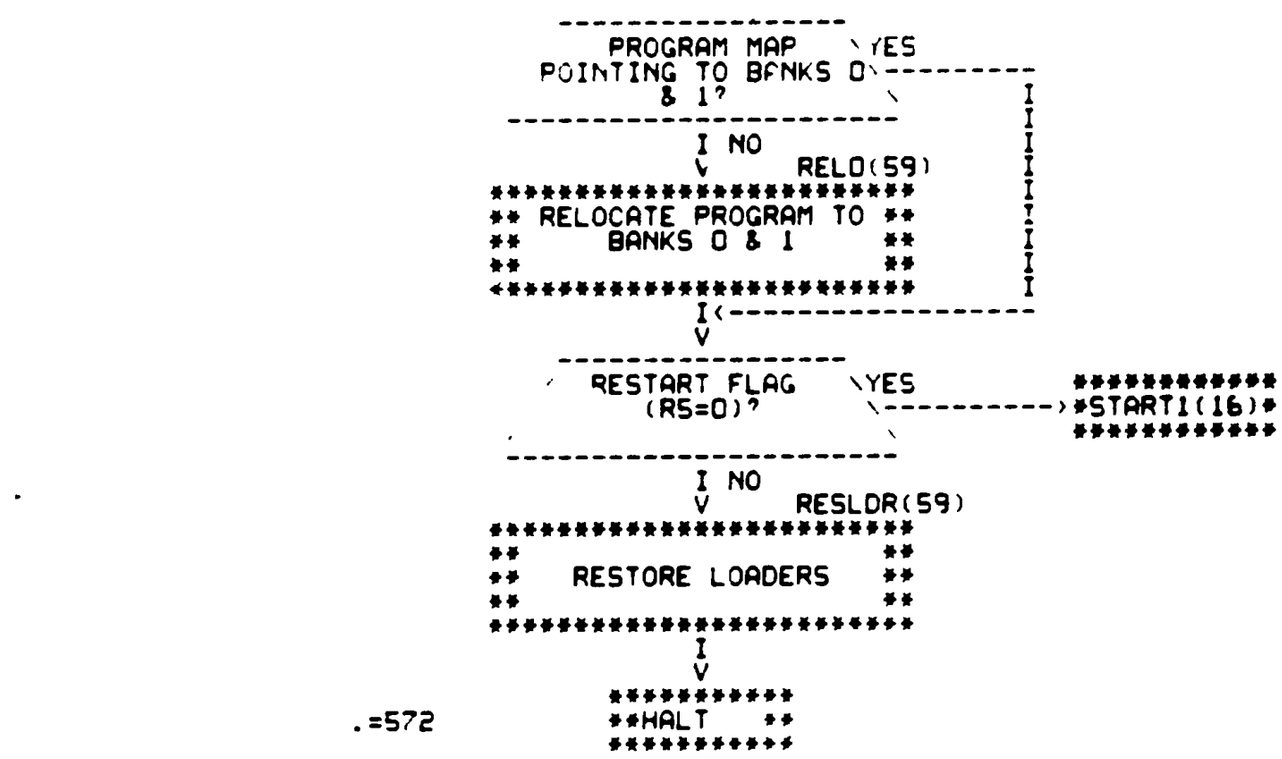
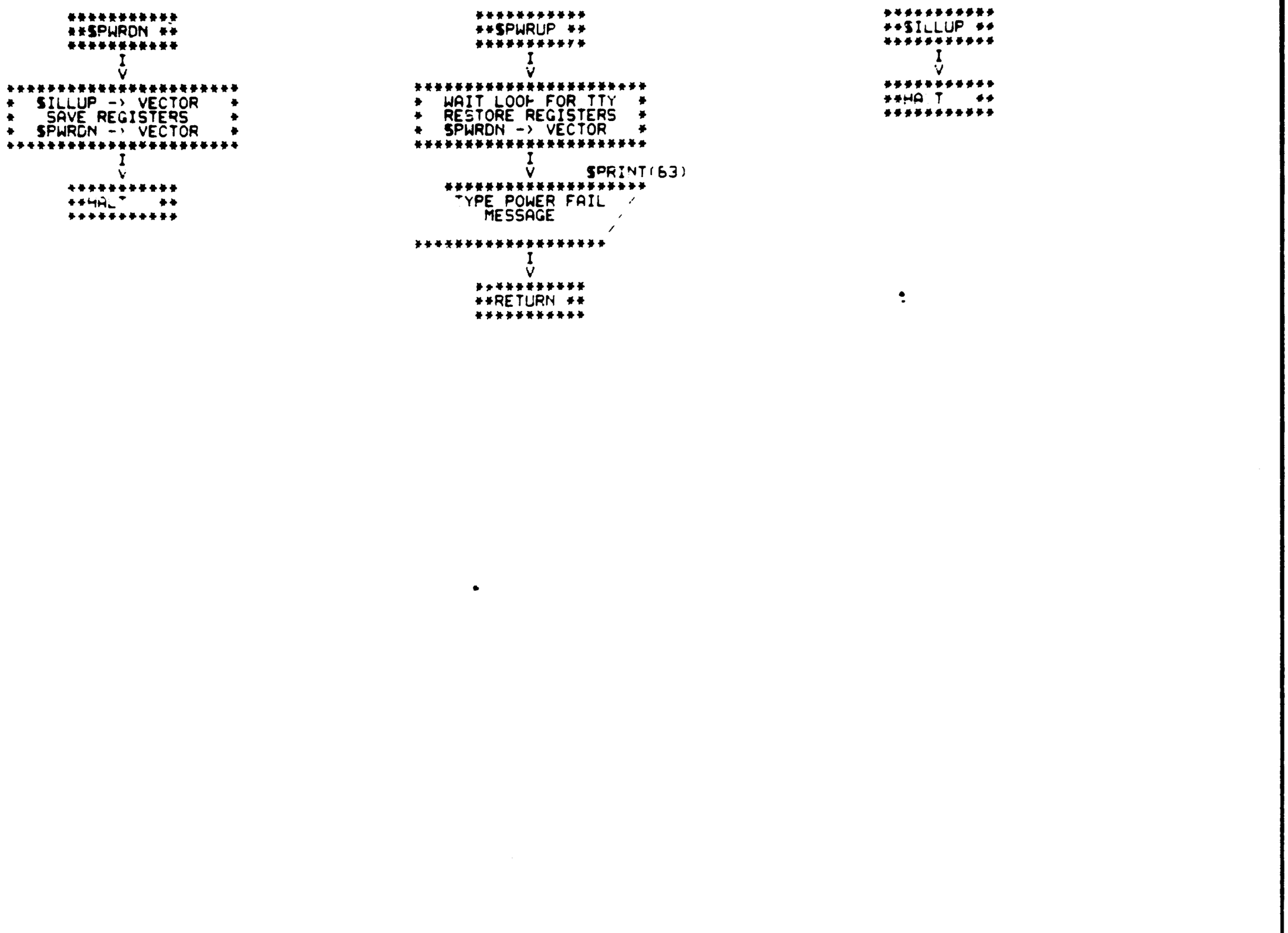
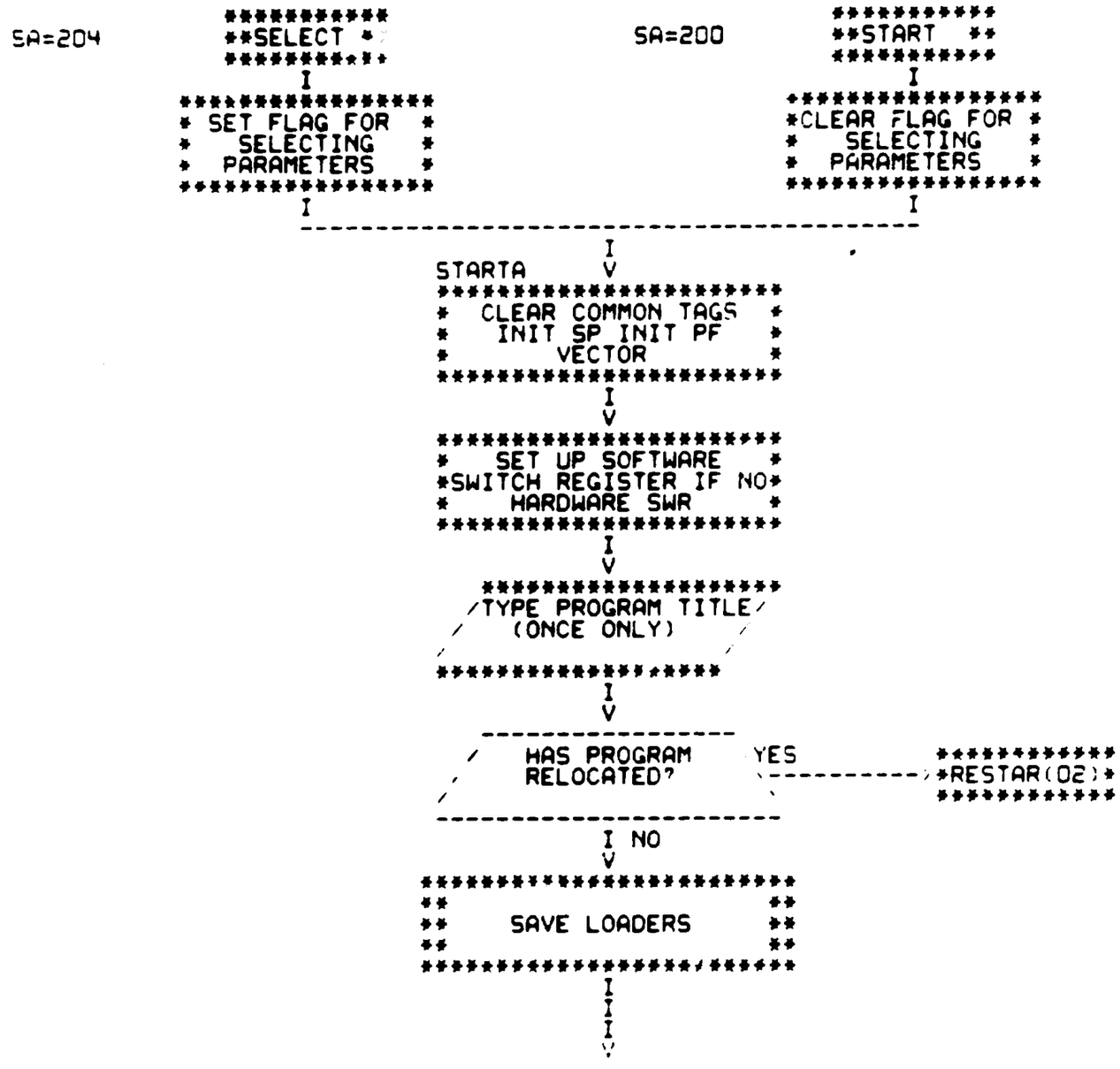
```
                        **************************
                        * SWITCH SETTINGS AND    *
                        *  BASIC DEFINITIONS     *
                        *                        *
                        **************************


                        **************************
                        *  TRAP CATCHER AND      *
            .=0         * STARTING ADDRESSES     *
                        *                        *
                        **************************
```

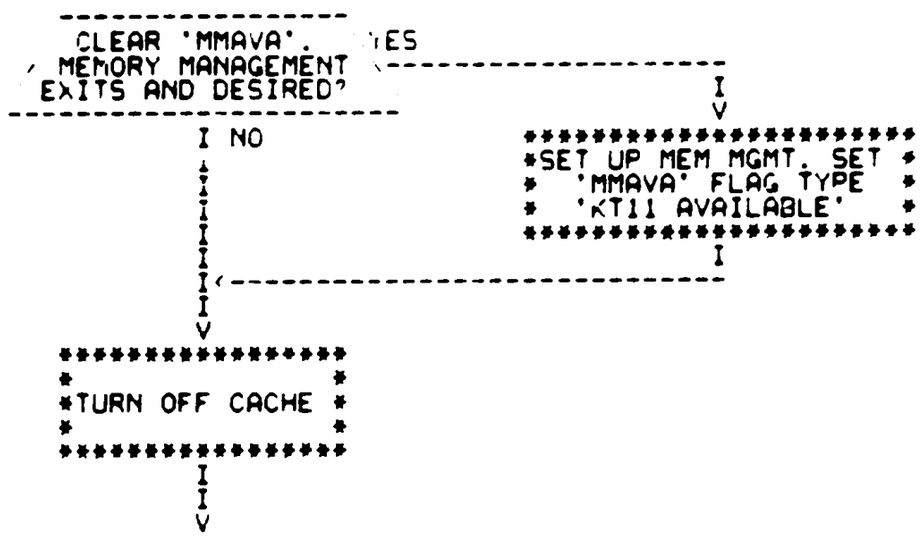

SA=210 .=300
**RESTAR **
RESTAR
SET RESTART FLAG (RS=0)
SA=214
**RESTOR **
SET RESTORE FLAG (RS=PC)
REST1
SETUP STACK
HAS MEMORY BEEN MAPPED?
NO
*START A *
YES
REST2
MEMORY MANAGEMENT AVAILABLE?
NO
YES
SET UP MEMORY MGMT. MAP PROGRAM INTO VIRTUAL BANKS 0 & 1
RESET SP AND JUMP TO RELOCATED PROGRAM

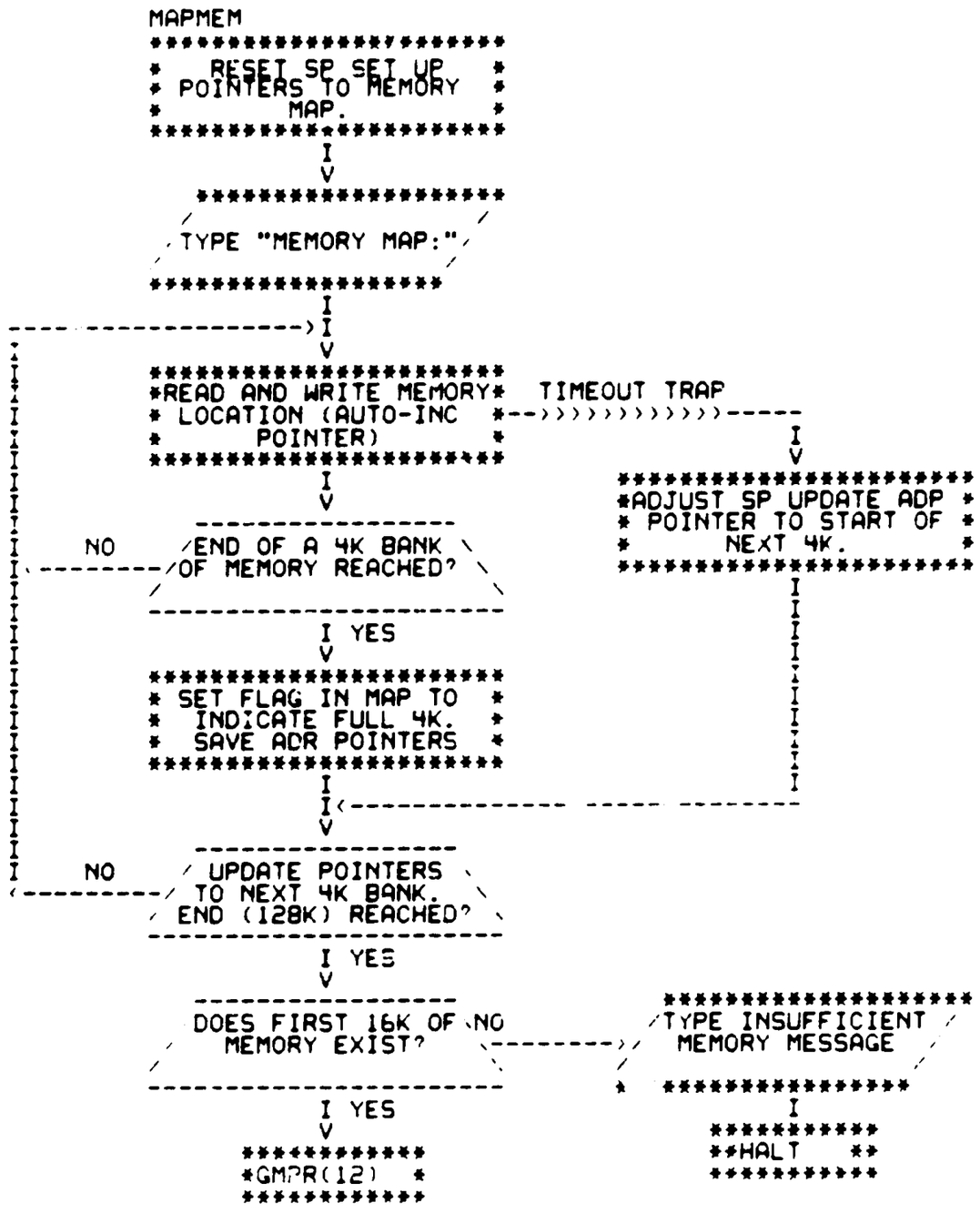

PROGRAM MAP POINTING TO BANKS 0 & 1?
YES
NO
RELO(59)
RELOCATE PROGRAM TO BANKS 0 & 1
RESTART FLAG (R5=0)?
YES
START1(16)
NO
RESLDR(59)
RESTORE LOADERS
.=572
HALT

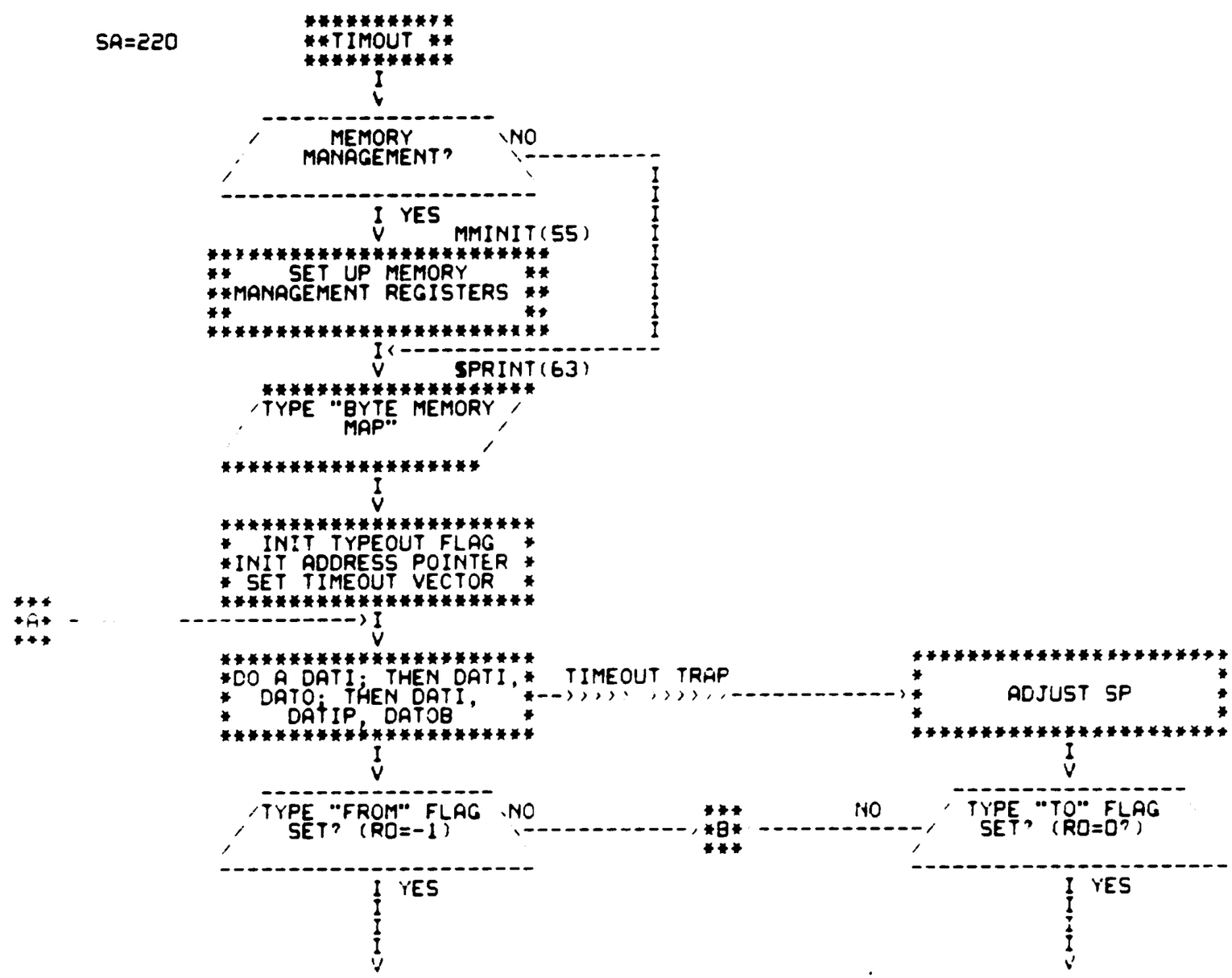

**$PWRDN **
$ILLUP -> VECTOR
SAVE REGISTERS
$PWRDN -> VECTOR
**HALT **
**$PWRUP **
WAIT LOOP FOR TTY
RESTORE REGISTERS
$PWRDN -> VECTOR
$PRINT(63)
TYPE POWER FAIL MESSAGE
**RETURN **
**$ILLUP **
**HALT **

```
                        ;************************
                        ;*  STANDARD 'SYSMAC'   *
.=1100                  ;*     COMMON TAGS      *
                        ;*                      *
                        ;************************


                        ;************************
                        ;*    APT MAILBOX AND   *
                        ;*        ETABLE        *
                        ;*                      *
                        ;************************


                        ;************************
                        ;*COMMON TAGS FOR THIS   *
                        ;*        PROGRAM       *
                        ;*                      *
                        ;************************


                        ;************************
                        ;* RELATIVE ADDRESSING  *
                        ;*  TABLE. ERROR DATA   *
                        ;*        POINTER       *
                        ;************************


                        ;************************
                        ;* MEMORY PARITY WORSE  *
                        ;* CASE PATTERNS TABLE  *
                        ;*                      *
                        ;************************


                        ;************************
                        ;*     MEMORY PARITY    *
                        ;*REGISTER ADDRESS AND  *
                        ;*       MAP TABLE      *
                        ;************************


                        ;************************
                        ;*ERROR MESSAGE POINTER *
                        ;*         TABLE        *
                        ;*                      *
                        ;************************
```

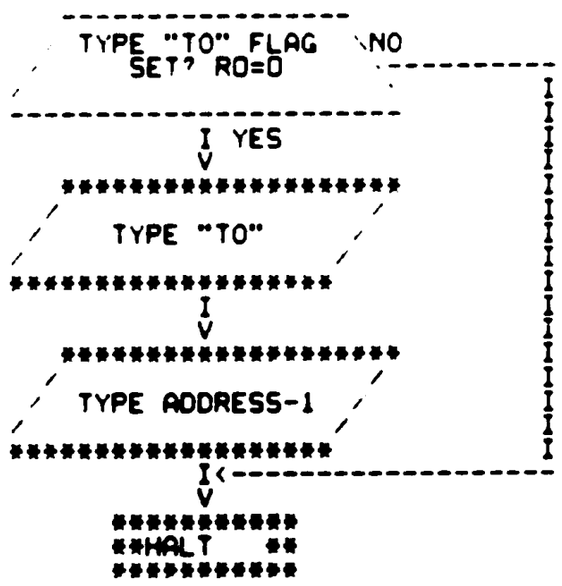

SA=204
SELECT
SET FLAG FOR SELECTING PARAMETERS
SA=200
START
CLEAR FLAG FOR SELECTING PARAMETERS
STARTA
CLEAR COMMON TAGS INIT SP INIT PF VECTOR
SET UP SOFTWARE SWITCH REGISTER IF NO HARDWARE SWR
TYPE PROGRAM TITLE (ONCE ONLY)
HAS PROGRAM RELOCATED?
YES
RESTAR(02)
NO
SAVE LOADERS

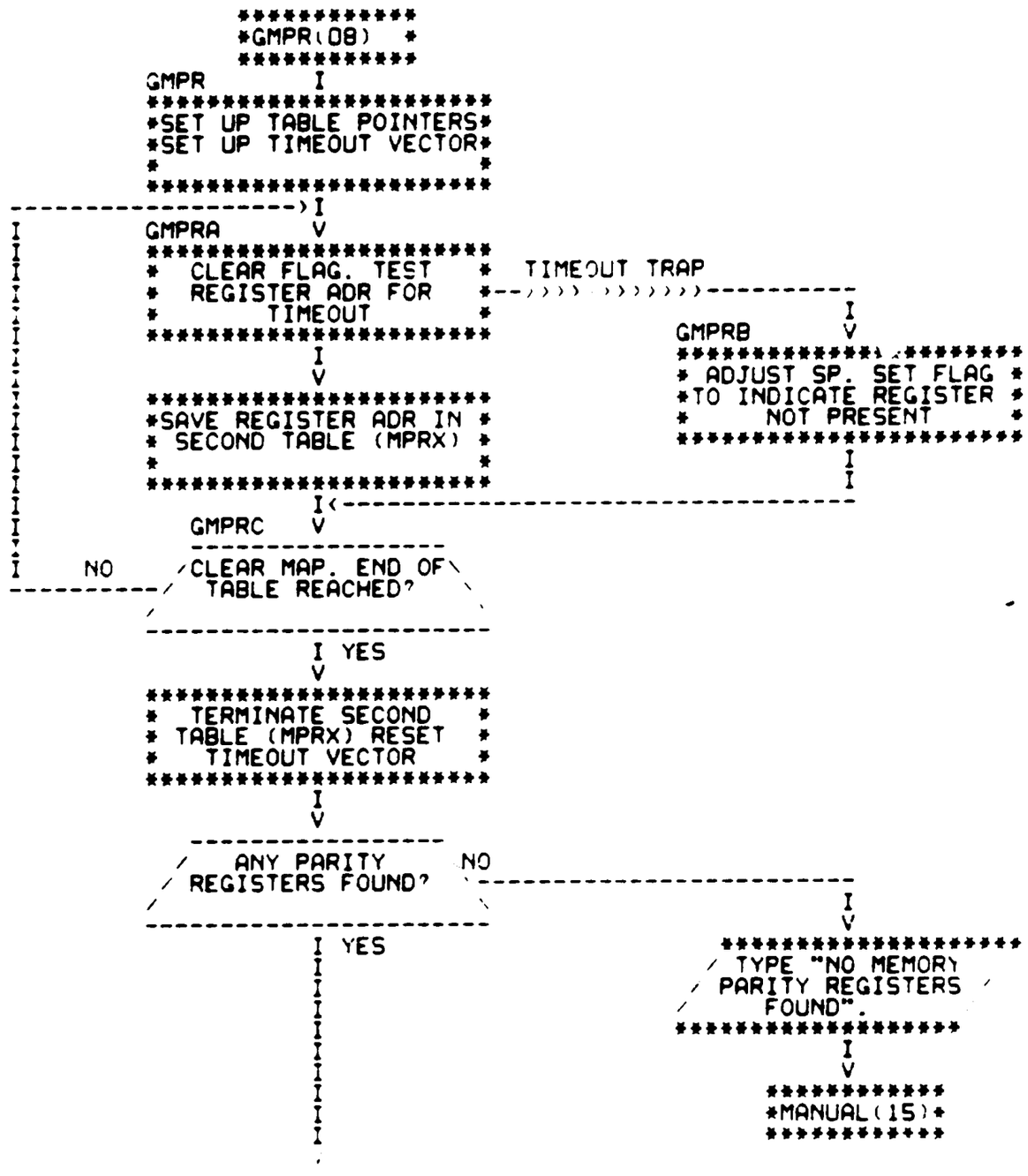

CLEAR 'MMAVA'.
MEMORY MANAGEMENT
EXITS AND DESIRED?
NO
SET UP MEM MGMT. SET
'MMAVA' FLAG TYPE
'KT11 AVAILABLE'
TURN OFF CACHE

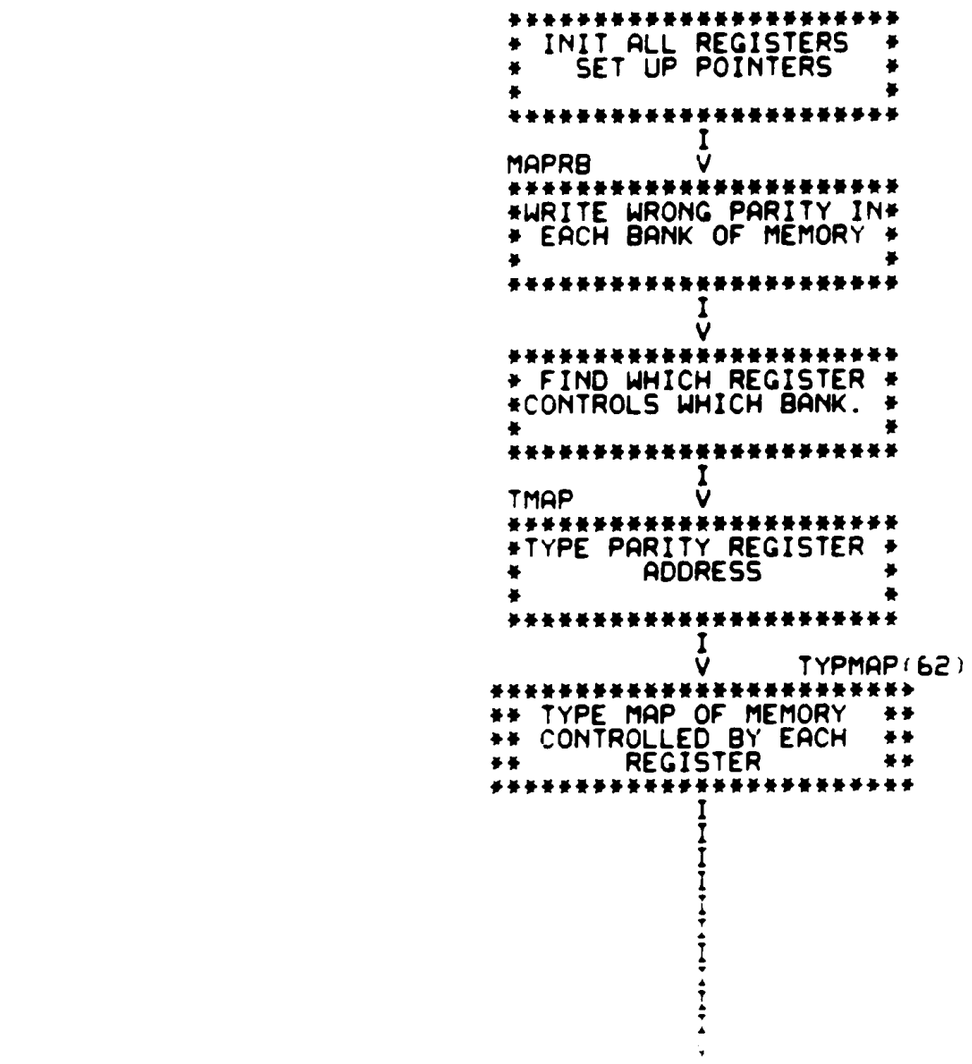

MAPMEM
RESET SP SET UP POINTERS TO MEMORY MAP.
TYPE "MEMORY MAP:"
READ AND WRITE MEMORY LOCATION (AUTO-INC POINTER)
TIMEOUT TRAP
ADJUST SP UPDATE ADP POINTER TO START OF NEXT 4K.
END OF A 4K BANK OF MEMORY REACHED?
NO
YES
SET FLAG IN MAP TO INDICATE FULL 4K. SAVE ADR POINTERS
UPDATE POINTERS TO NEXT 4K BANK. END (128K) REACHED?
NO
YES
DOES FIRST 16K OF MEMORY EXIST?
NO
YES
TYPE INSUFFICIENT MEMORY MESSAGE
HALT
GMPR(12)

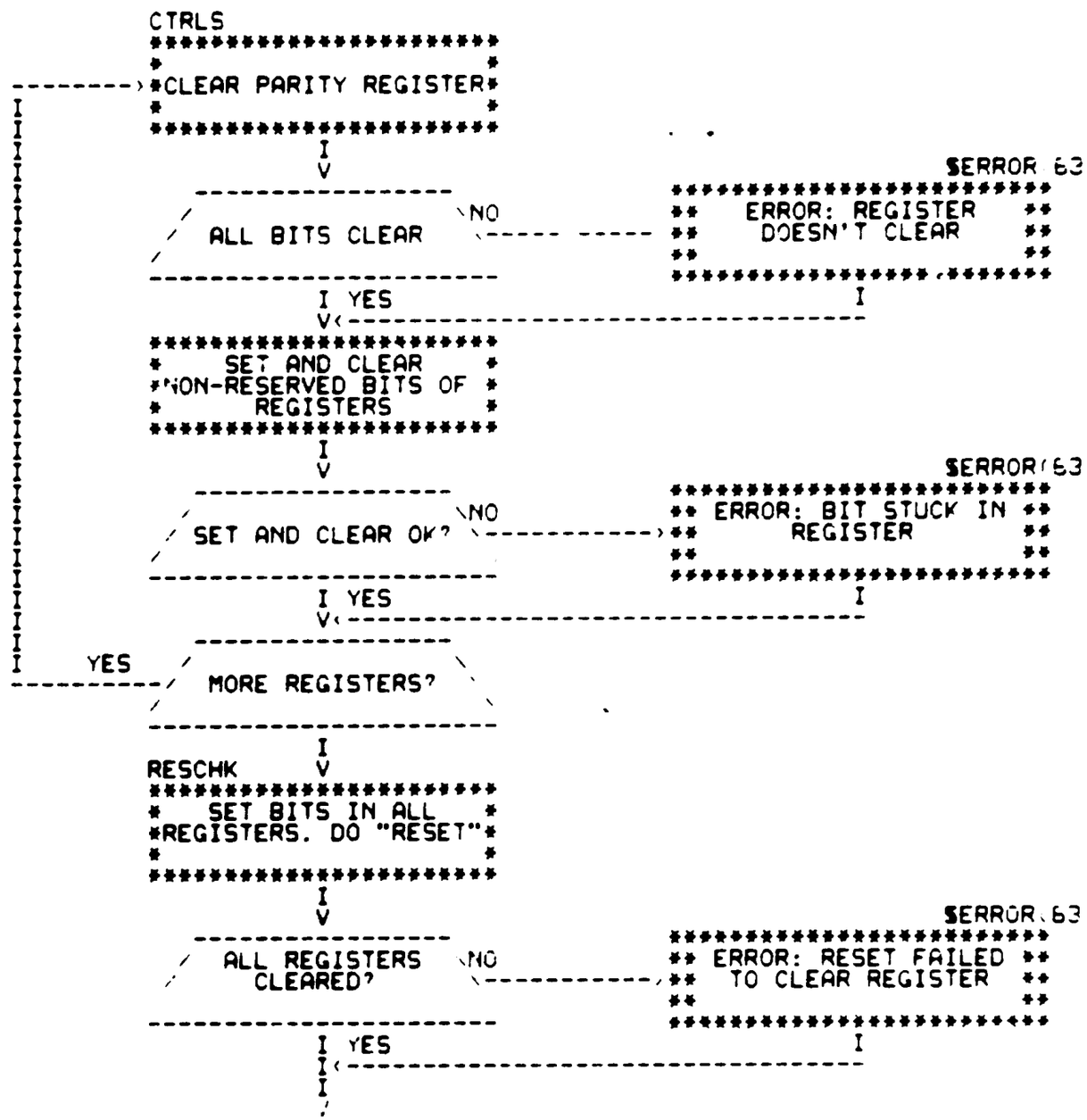

SA=220
**TIMOUT **
MEMORY MANAGEMENT?
NO
YES
MMINIT(55)
SET UP MEMORY MANAGEMENT REGISTERS
$PRINT(63)
TYPE "BYTE MEMORY MAP"
INIT TYPEOUT FLAG
INIT ADDRESS POINTER
SET TIMEOUT VECTOR
A
DO A DATI; THEN DATI, DATO; THEN DATI, DATIP, DATOB
TIMEOUT TRAP
ADJUST SP
TYPE "FROM" FLAG SET? (R0=-1)
NO
YES
B
NO
TYPE "TO" FLAG SET? (R0=0?)
YES

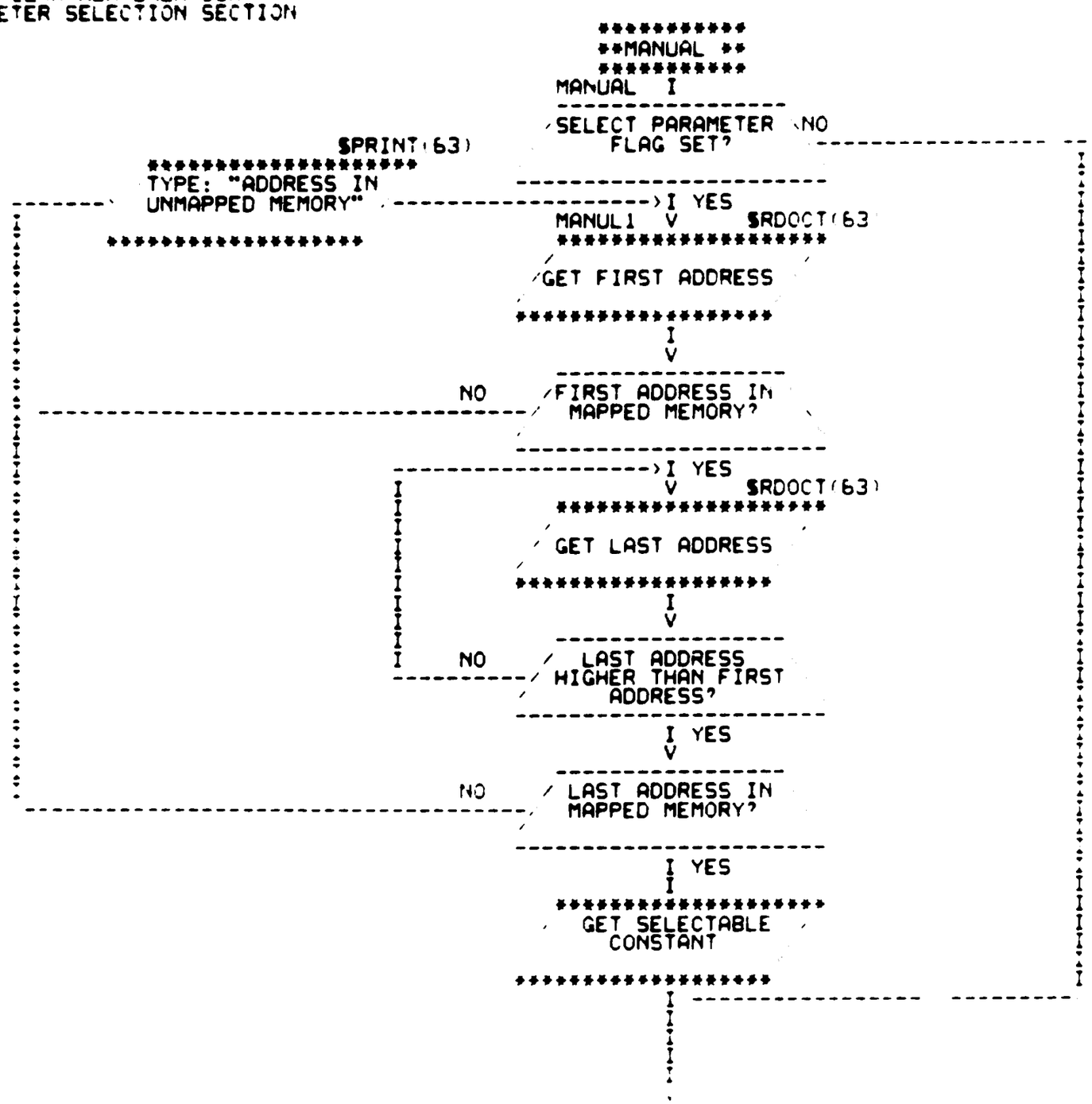

$PRINT 63
TYPE "FROM"
$TYPAD 63
TYPE ADDRESS
COMPLEMENT TYPEOUT FLAG (RD)
UPDATE ADDRESS POINTER
NOT=0
NO
4K BANK BOUNDRY?
YES
NO
MEMORY MANAGEMENT AVAILABLE?
YES
NO
END OF MEMORY?
YES
UPDATE MEM MGMT REGISTERS + ADDRESS POINTER
A
B
$PRINT 63
TYPE "TO"
$TYPAD 63
TYPE ADDRESS-1


TYPE "TO" FLAG SET? R0=0
NO
YES
TYPE "TO"
TYPE ADDRESS-1
HALT

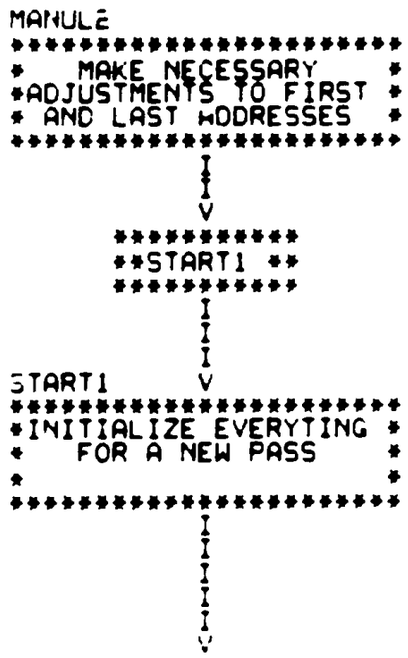

GMPR(08)
GMPR
I
SET UP TABLE POINTERS
SET UP TIMEOUT VECTOR
GMPRA
V
* CLEAR FLAG. TEST *
* REGISTER ADR FOR *
* TIMEOUT *
TIMEOUT TRAP
GMPRB
V
* ADJUST SP. SET FLAG *
*TO INDICATE REGISTER *
* NOT PRESENT *
*SAVE REGISTER ADR IN *
* SECOND TABLE (MPRX) *
GMPRC
V
CLEAR MAP. END OF TABLE REACHED?
NO
YES
* TERMINATE SECOND *
* TABLE (MPRX) RESET *
* TIMEOUT VECTOR *
ANY PARITY REGISTERS FOUND?
NO
YES
TYPE "NO MEMORY PARITY REGISTERS FOUND".
MANUAL(15)

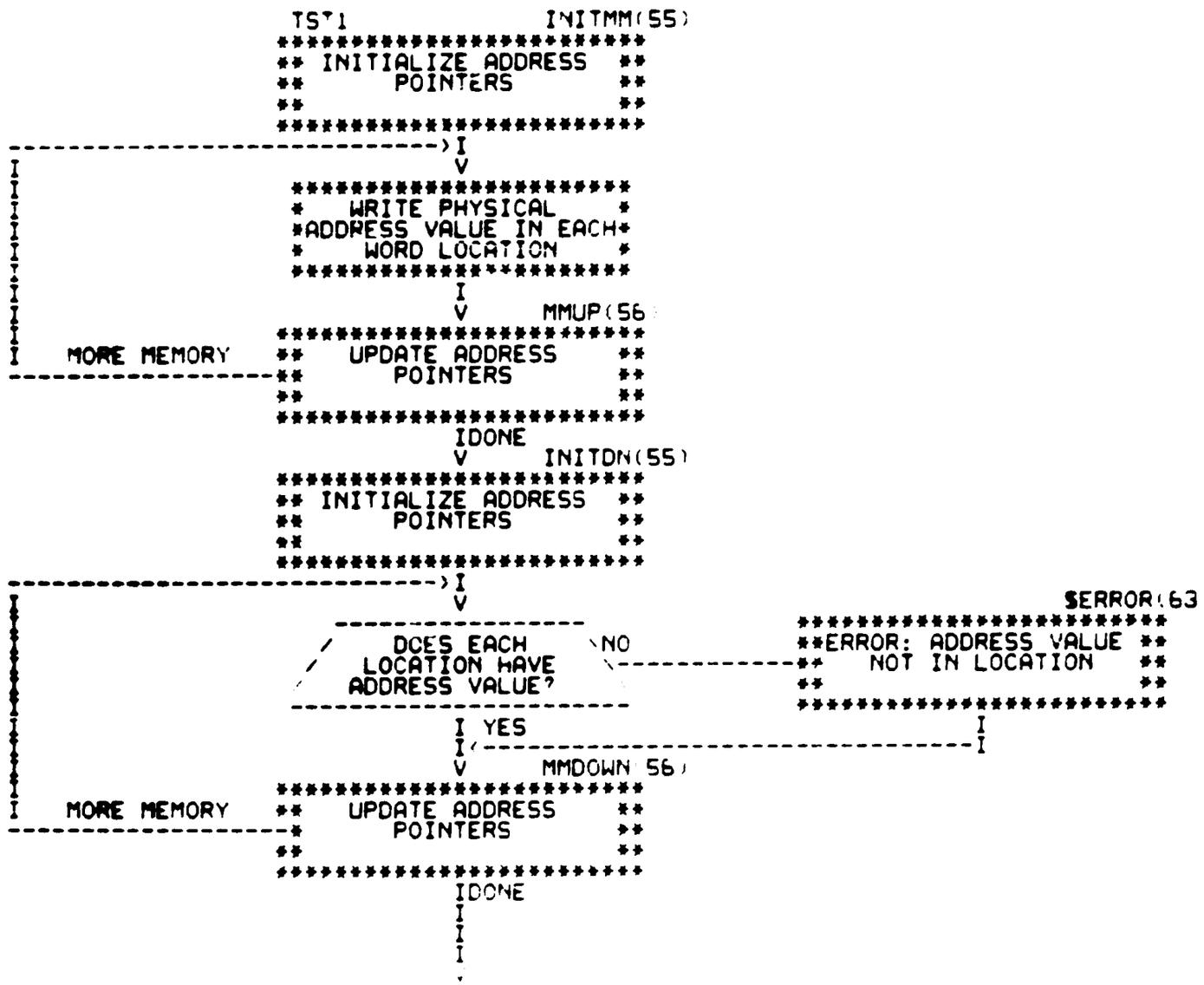

INIT ALL REGISTERS
SET UP POINTERS
MAPRB
WRITE WRONG PARITY IN
EACH BANK OF MEMORY
FIND WHICH REGISTER
CONTROLS WHICH BANK.
TMAP
TYPE PARITY REGISTER
ADDRESS
TYPMAP(62)
TYPE MAP OF MEMORY
CONTROLLED BY EACH
REGISTER


CTRLS
CLEAR PARITY REGISTER
ALL BITS CLEAR
NO
YES
$ERROR 63
ERROR: REGISTER DOESN'T CLEAR
SET AND CLEAR NON-RESERVED BITS OF REGISTERS
SET AND CLEAR OK?
NO
YES
$ERROR 63
ERROR: BIT STUCK IN REGISTER
MORE REGISTERS?
YES
RESCHK
SET BITS IN ALL REGISTERS. DO "RESET"
ALL REGISTERS CLEARED?
NO
YES
$ERROR 63
ERROR: RESET FAILED TO CLEAR REGISTER

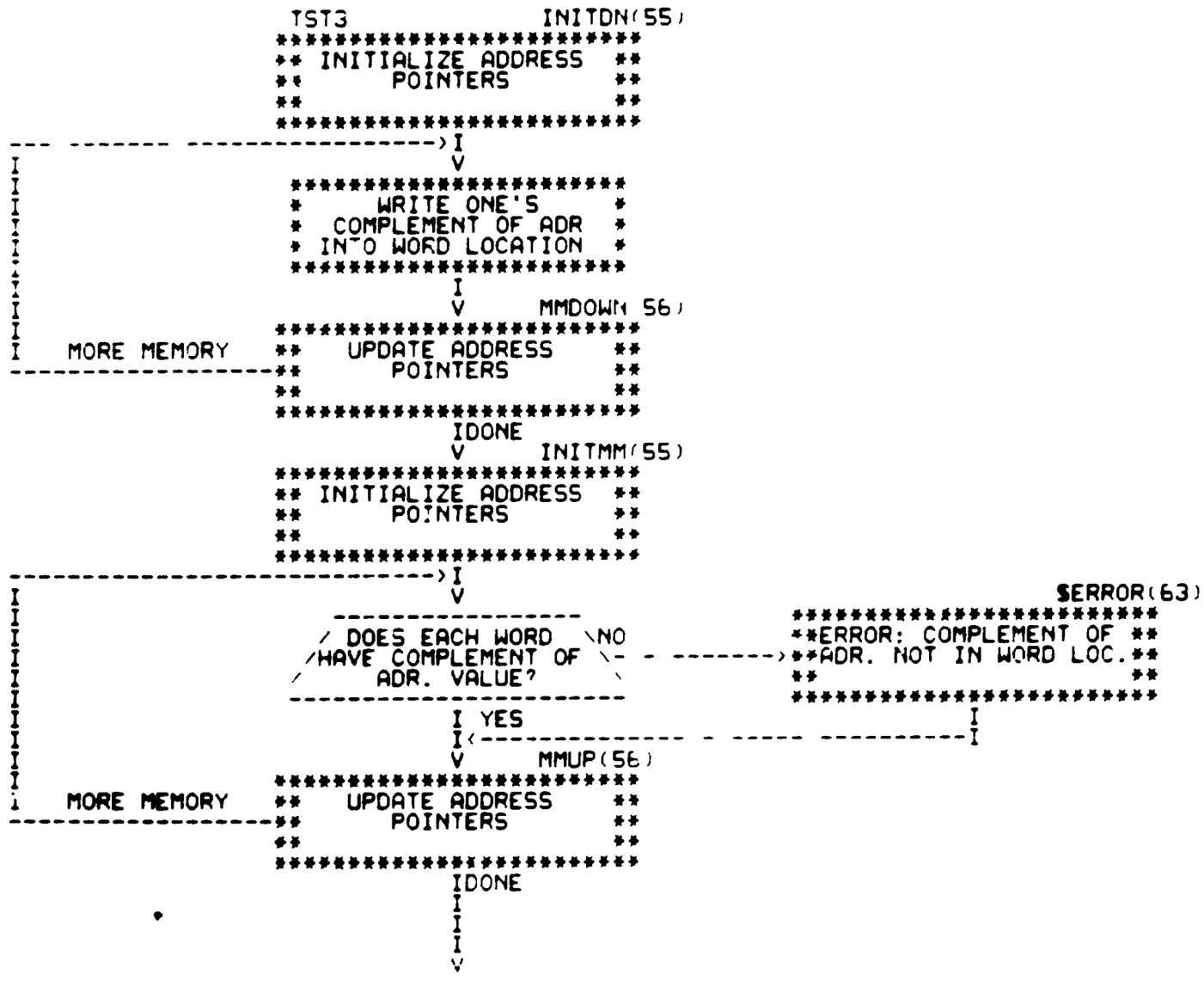

MANUAL
MANUAL I
SELECT PARAMETER FLAG SET?
NO
I YES
MANUL1
$RDOCT(63)
$PRINT(63)
TYPE: "ADDRESS IN UNMAPPED MEMORY"
GET FIRST ADDRESS
FIRST ADDRESS IN MAPPED MEMORY?
NO
I YES
$RDOCT(63)
GET LAST ADDRESS
LAST ADDRESS HIGHER THAN FIRST ADDRESS?
NO
I YES
LAST ADDRESS IN MAPPED MEMORY?
NO
I YES
GET SELECTABLE CONSTANT

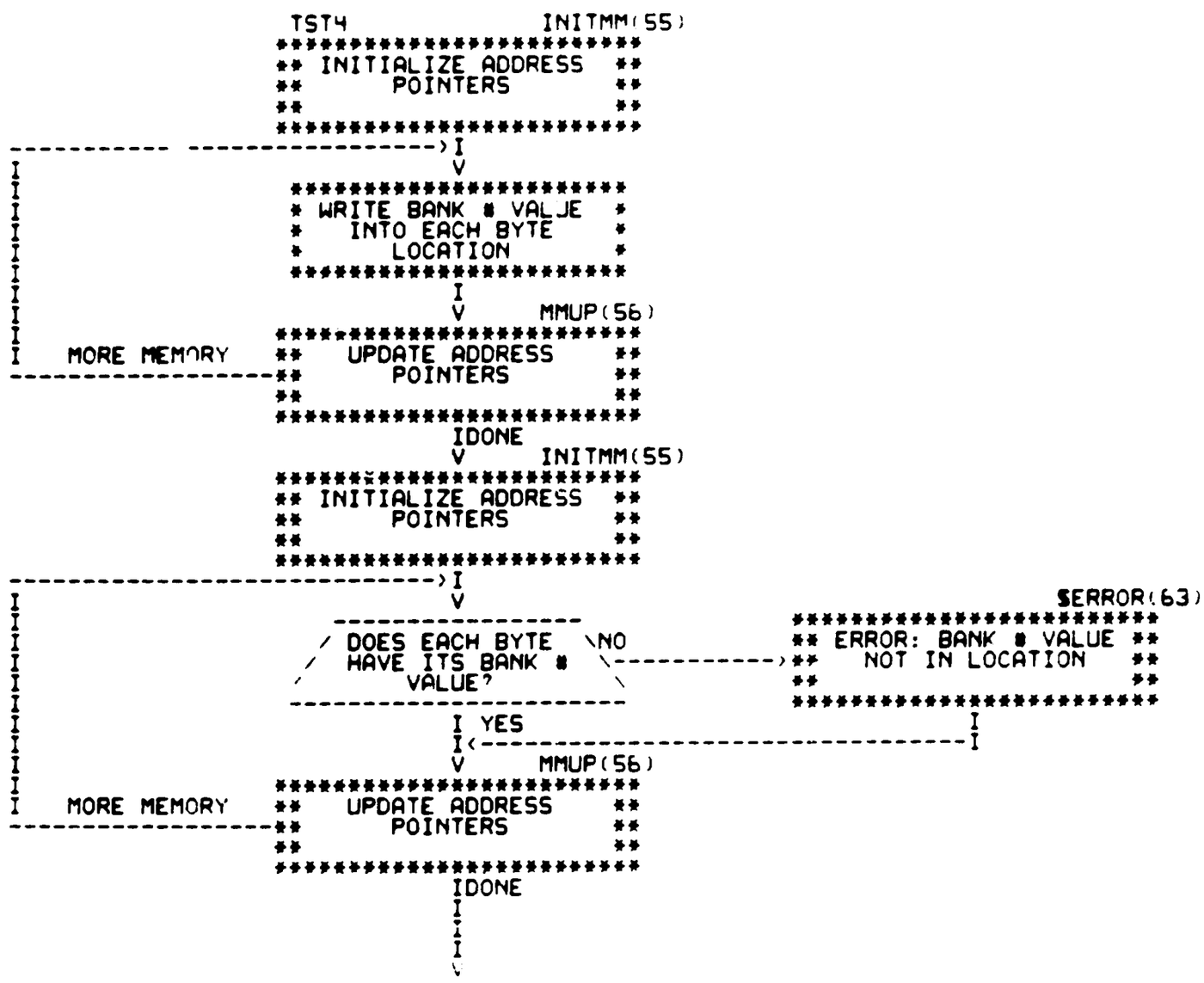
H03

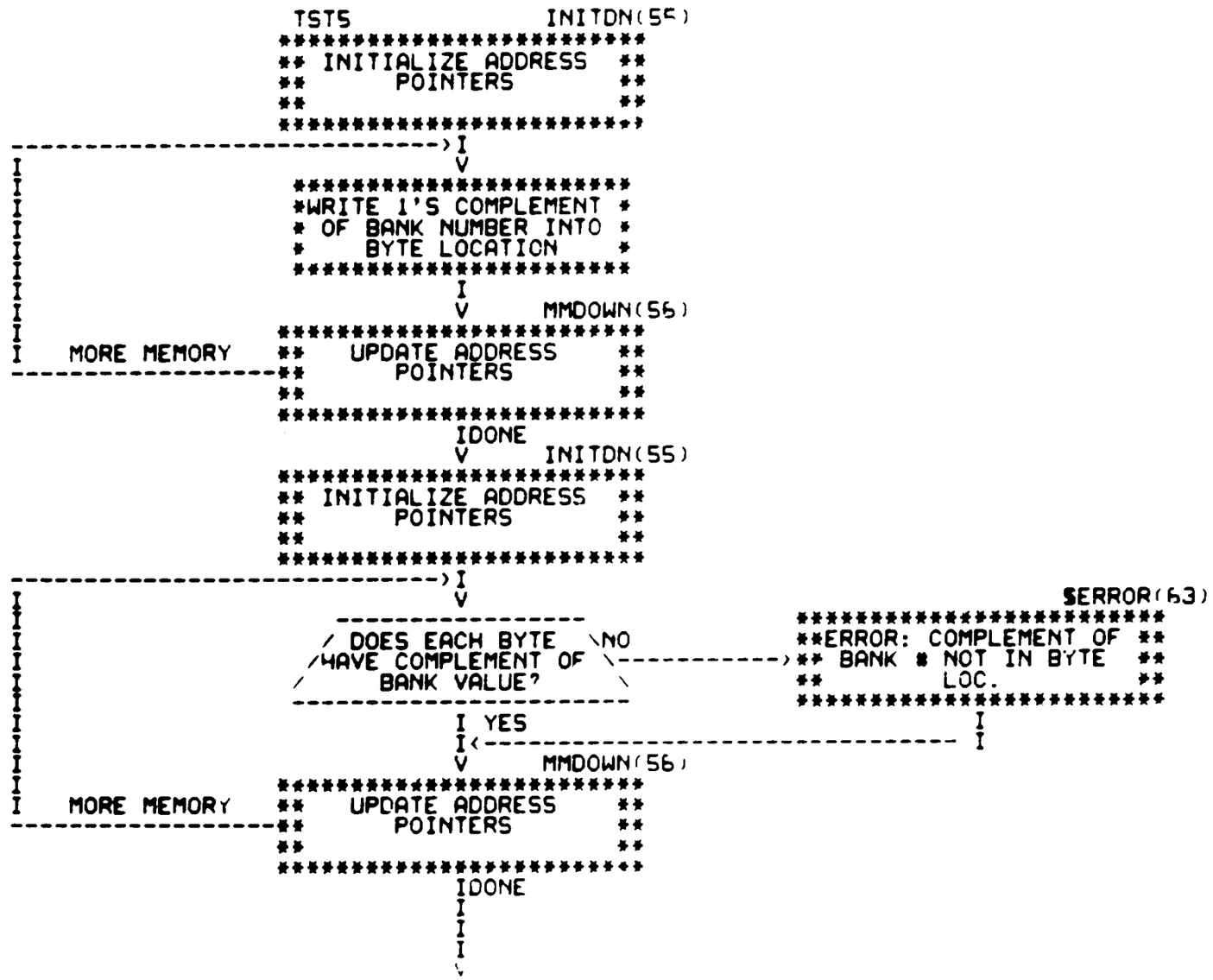

MANUL2
MAKE NECESSARY
ADJUSTMENTS TO FIRST
AND LAST ADDRESSES
**START1 **
START1
INITIALIZE EVERYTING
FOR A NEW PASS

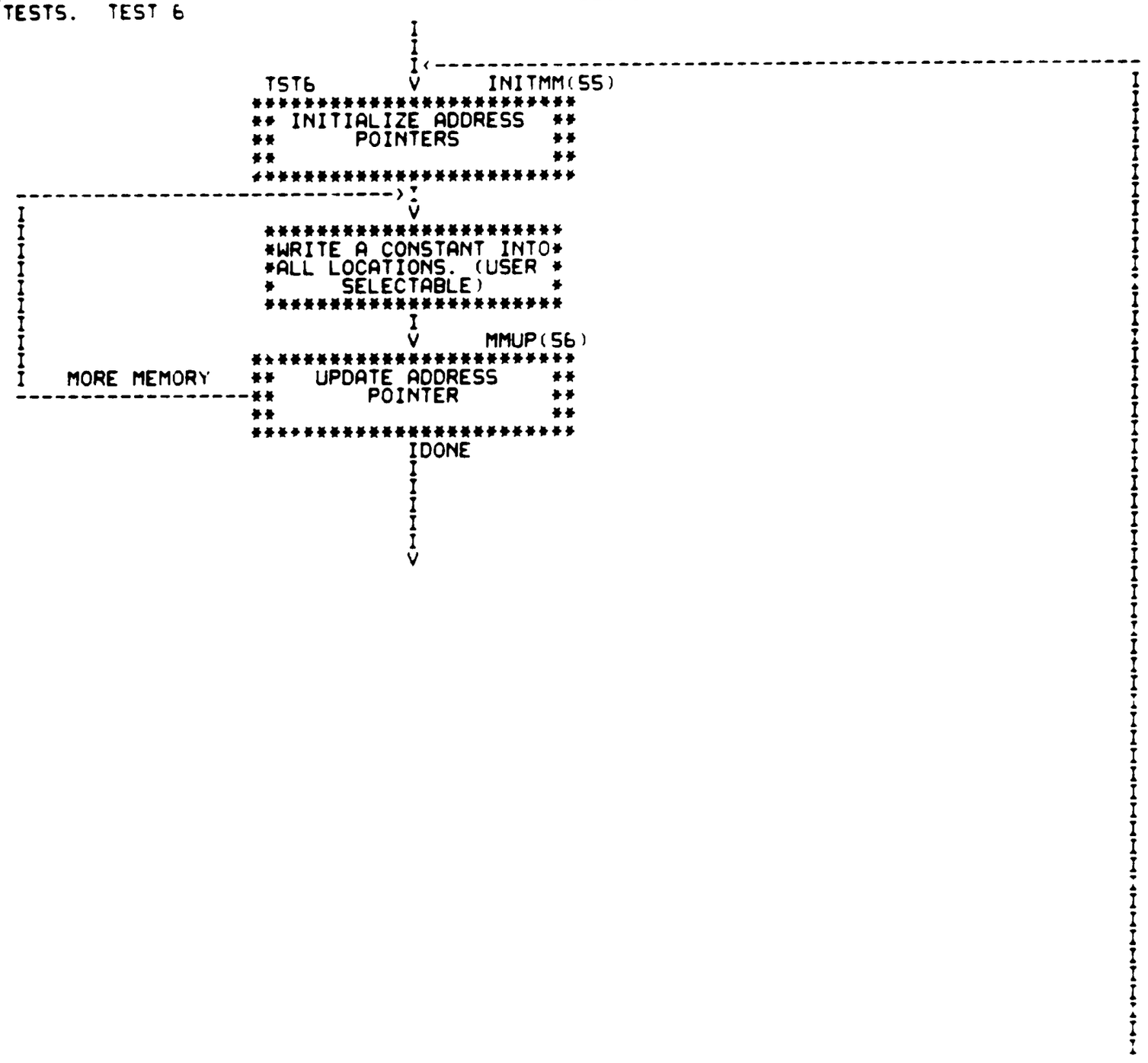

TST1
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
WRITE PHYSICAL
ADDRESS VALUE IN EACH
WORD LOCATION
MMUP(56)
UPDATE ADDRESS
POINTERS
MORE MEMORY
IDONE
INITDN(55)
** INITIALIZE ADDRESS **
** POINTERS **
DOES EACH LOCATION HAVE ADDRESS VALUE?
NO
$ERROR(63)
**ERROR: ADDRESS VALUE **
** NOT IN LOCATION **
YES
MMDOWN(56)
UPDATE ADDRESS
POINTERS
MORE MEMORY
IDONE

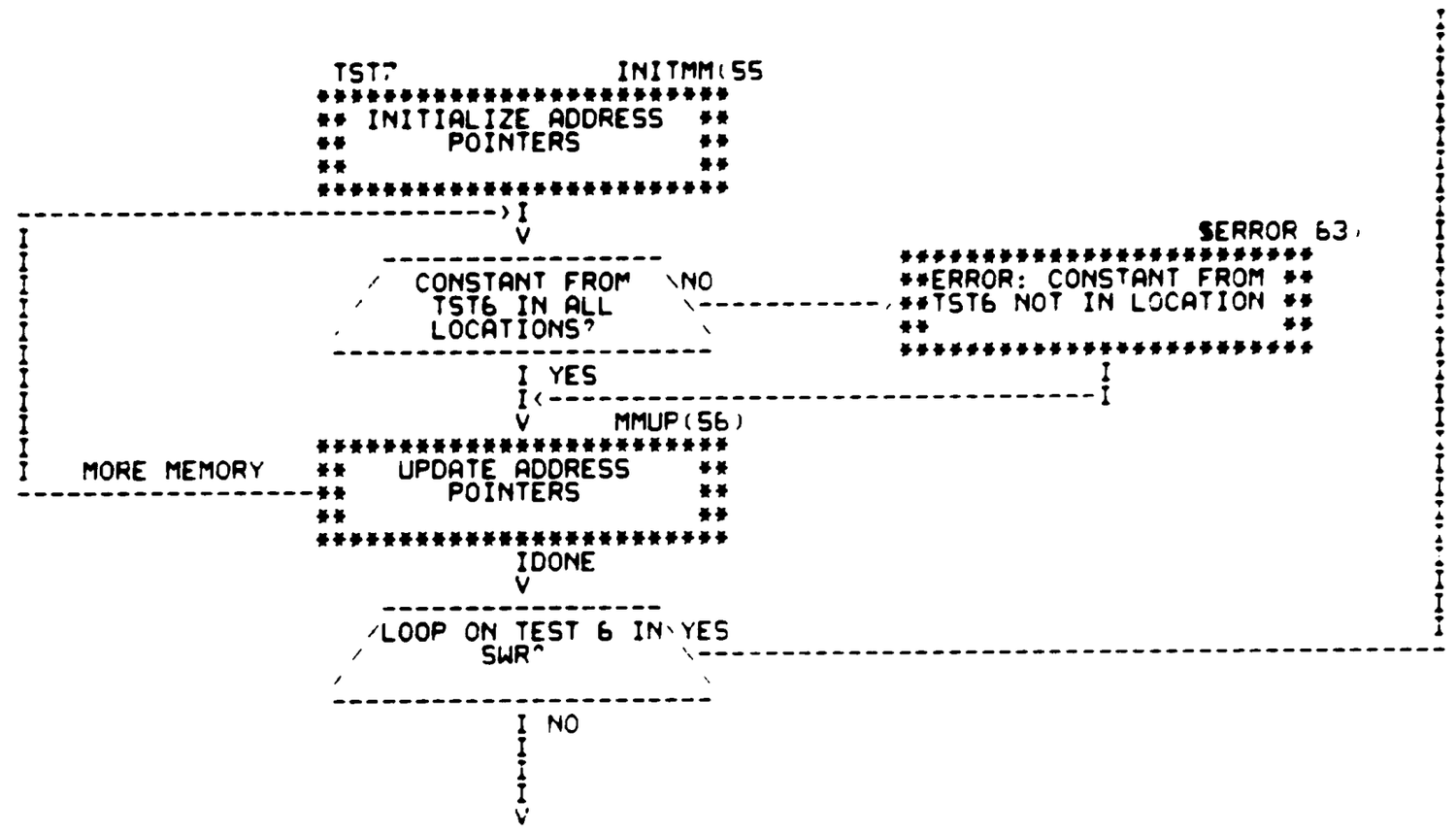

TST2
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
WRITE PHYSICAL
ADDRESS VALUE IN EACH
BYTE LOCATION
MMUP(56)
MORE MEMORY
UPDATE ADDRESS
POINTERS
IDONE
INITDN(55)
** INITIALIZE ADDRESS **
** POINTERS **
DOES EACH BYTE LOCATION HAVE ADDRESS VALUE?
NO
SERROR(63)
**ERROR: ADDRESS VALUE **
**NOT IN BYTE LOCATION **
YES
MMDOWN(56)
MORE MEMORY
UPDATE ADDRESS
POINTERS
IDONE

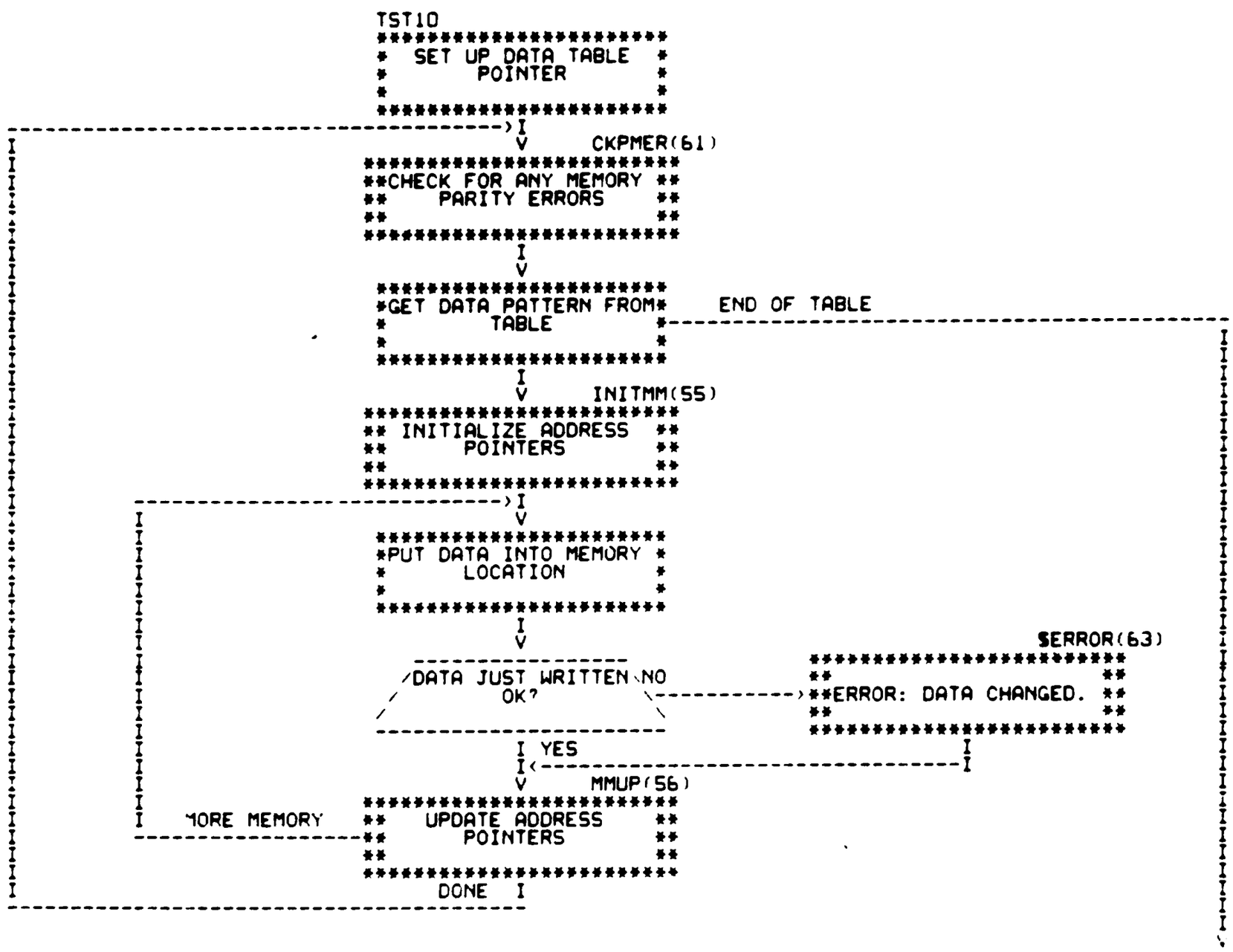

TST3
INITDN(55)
** INITIALIZE ADDRESS **
** POINTERS **
WRITE ONE'S COMPLEMENT OF ADR INTO WORD LOCATION
MMDOWN(56)
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
IDONE
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
DOES EACH WORD HAVE COMPLEMENT OF ADR. VALUE?
NO
SERROR(63)
**ERROR: COMPLEMENT OF **
ADR. NOT IN WORD LOC.
YES
MMUP(56)
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
IDONE

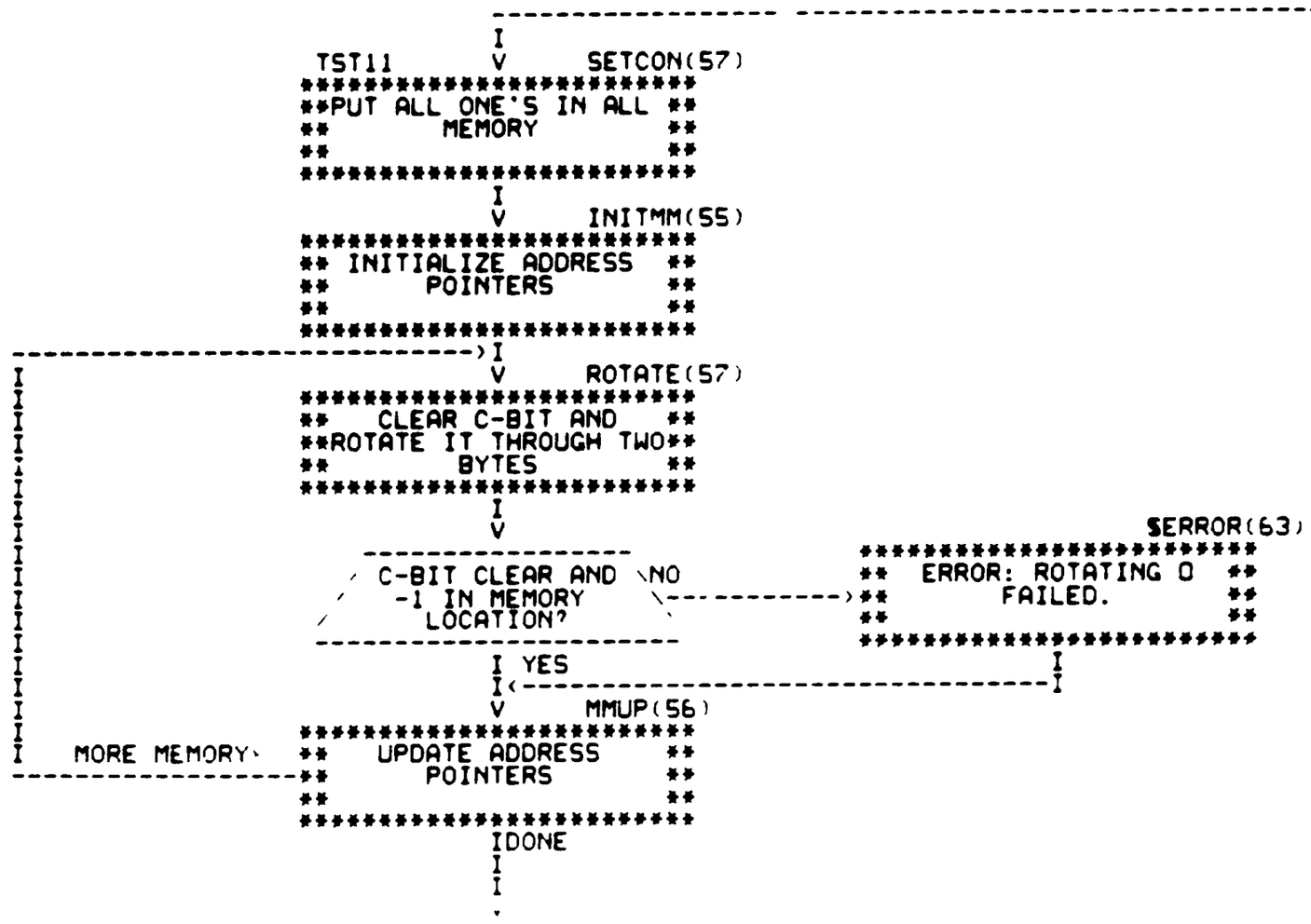

TST4
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
WRITE BANK # VALUE
INTO EACH BYTE
LOCATION
MMUP(56)
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
IDONE
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
DOES EACH BYTE HAVE ITS BANK # VALUE?
NO
SERROR(63)
** ERROR: BANK # VALUE NOT IN LOCATION **
YES
MMUP(56)
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
IDONE

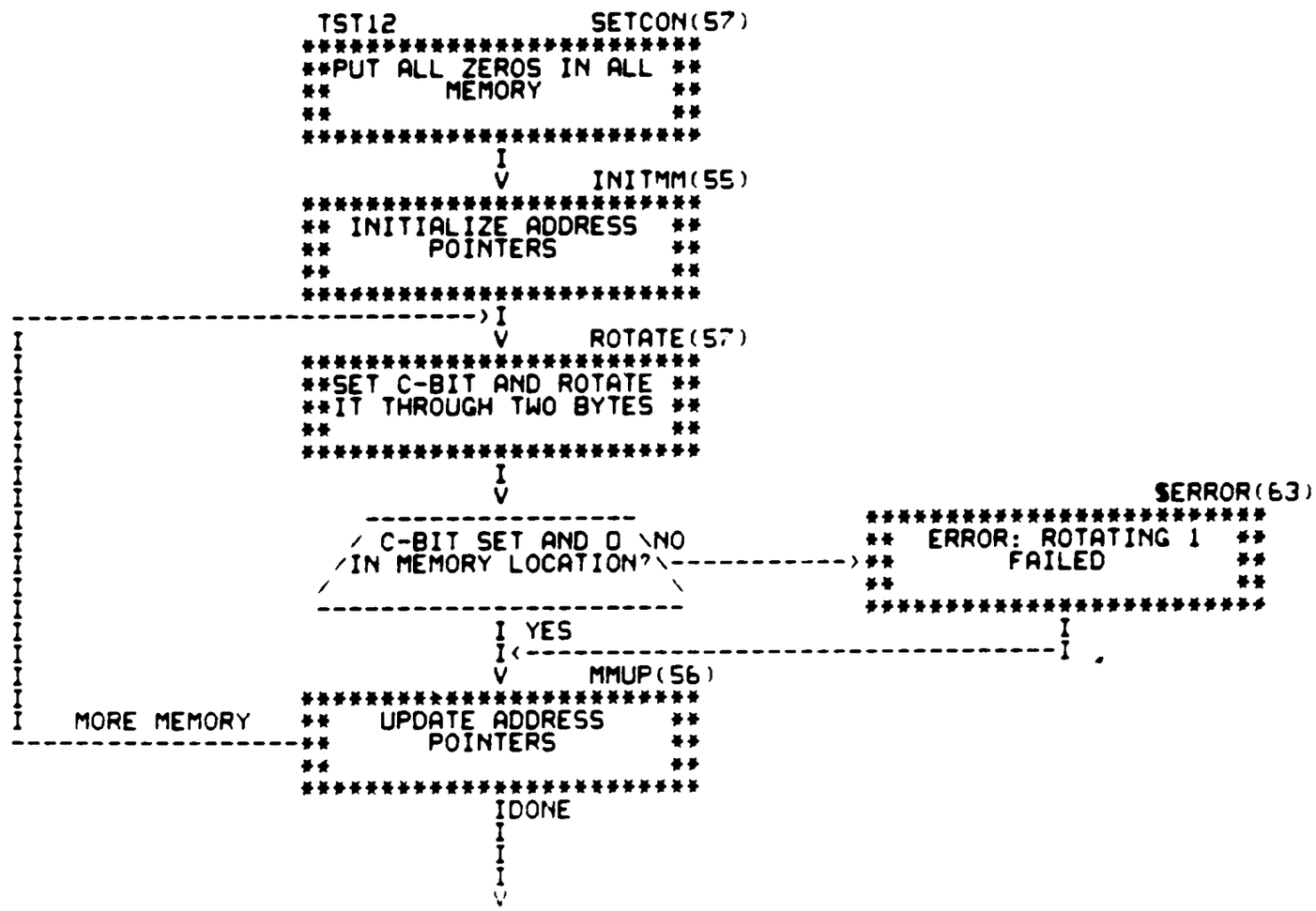

TSTS
INITDN(55)
** INITIALIZE ADDRESS **
** POINTERS **
WRITE 1'S COMPLEMENT OF BANK NUMBER INTO BYTE LOCATION
MMDOWN(56)
MORE MEMORY
UPDATE ADDRESS POINTERS
IDONE
INITDN(55)
** INITIALIZE ADDRESS **
** POINTERS **
DOES EACH BYTE HAVE COMPLEMENT OF BANK VALUE?
NO
$ERROR(63)
**ERROR: COMPLEMENT OF BANK # NOT IN BYTE LOC.
YES
MMDOWN(56)
MORE MEMORY
UPDATE ADDRESS POINTERS
IDONE


TST6
INITMM(55)
INITIALIZE ADDRESS POINTERS
WRITE A CONSTANT INTO ALL LOCATIONS. (USER SELECTABLE)
MMUP(56)
UPDATE ADDRESS POINTER
MORE MEMORY
IDONE


TST7
INITMM(55
INITIALIZE ADDRESS POINTERS
CONSTANT FROM TST6 IN ALL LOCATIONS?
NO
$ERROR 63
ERROR: CONSTANT FROM TST6 NOT IN LOCATION
YES
MMUP(56)
MORE MEMORY
UPDATE ADDRESS POINTERS
IDONE
LOOP ON TEST 6 IN SW?
YES
NO

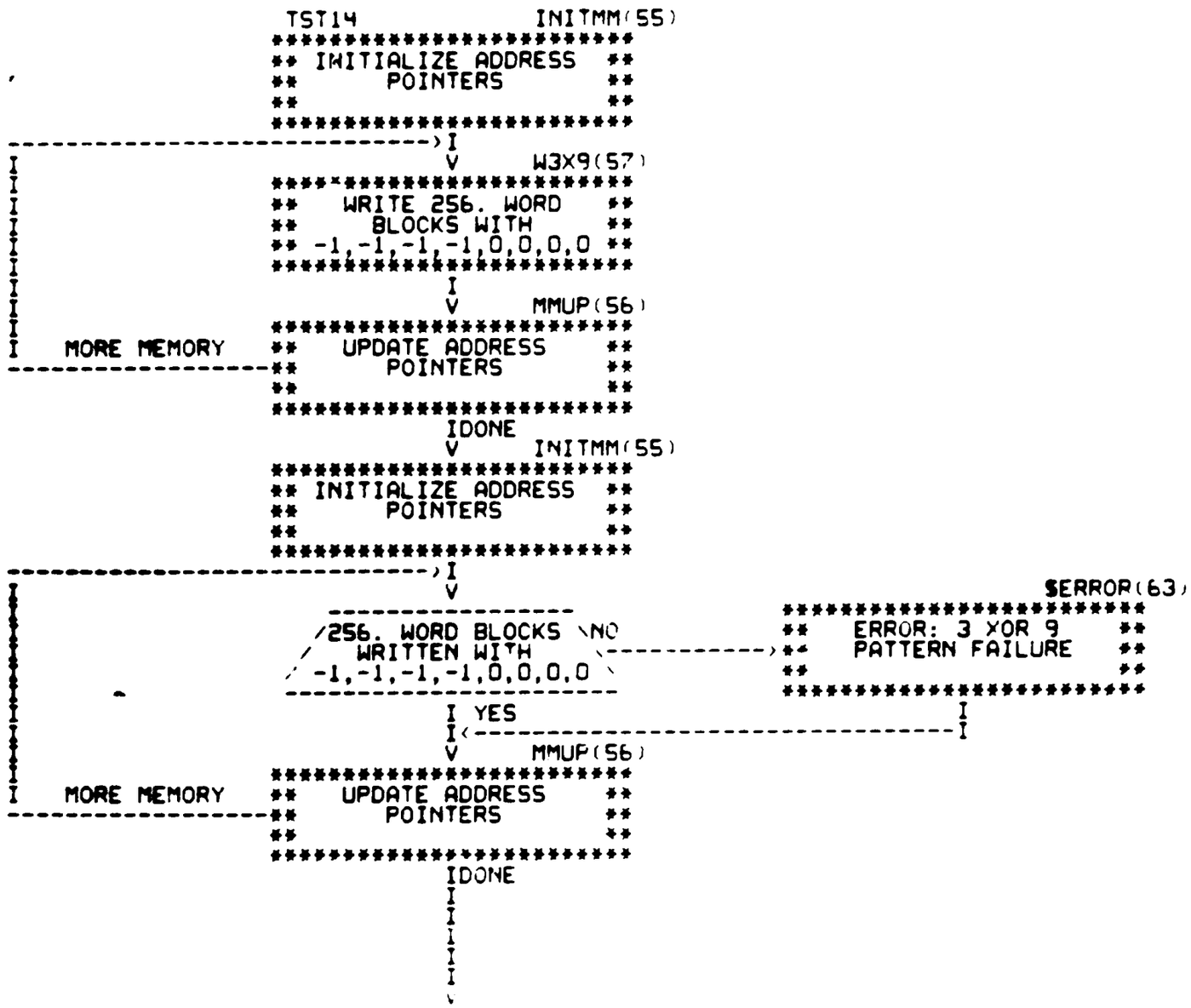

TST10
SET UP DATA TABLE POINTER
CKPMER(61)
CHECK FOR ANY MEMORY PARITY ERRORS
GET DATA PATTERN FROM TABLE
END OF TABLE
INITMM(55)
INITIALIZE ADDRESS POINTERS
PUT DATA INTO MEMORY LOCATION
DATA JUST WRITTEN OK?
NO
SERROR(63)
ERROR: DATA CHANGED.
YES
MMUP(56)
UPDATE ADDRESS POINTERS
MORE MEMORY
DONE


TST11
SETCON(57)
PUT ALL ONE'S IN ALL MEMORY
INITMM(55)
** INITIALIZE ADDRESS POINTERS **
ROTATE(57)
** CLEAR C-BIT AND ROTATE IT THROUGH TWO BYTES **
C-BIT CLEAR AND -1 IN MEMORY LOCATION?
NO
SERROR(63)
** ERROR: ROTATING 0 FAILED. **
YES
MMUP(56)
MORE MEMORY
** UPDATE ADDRESS POINTERS **
DONE

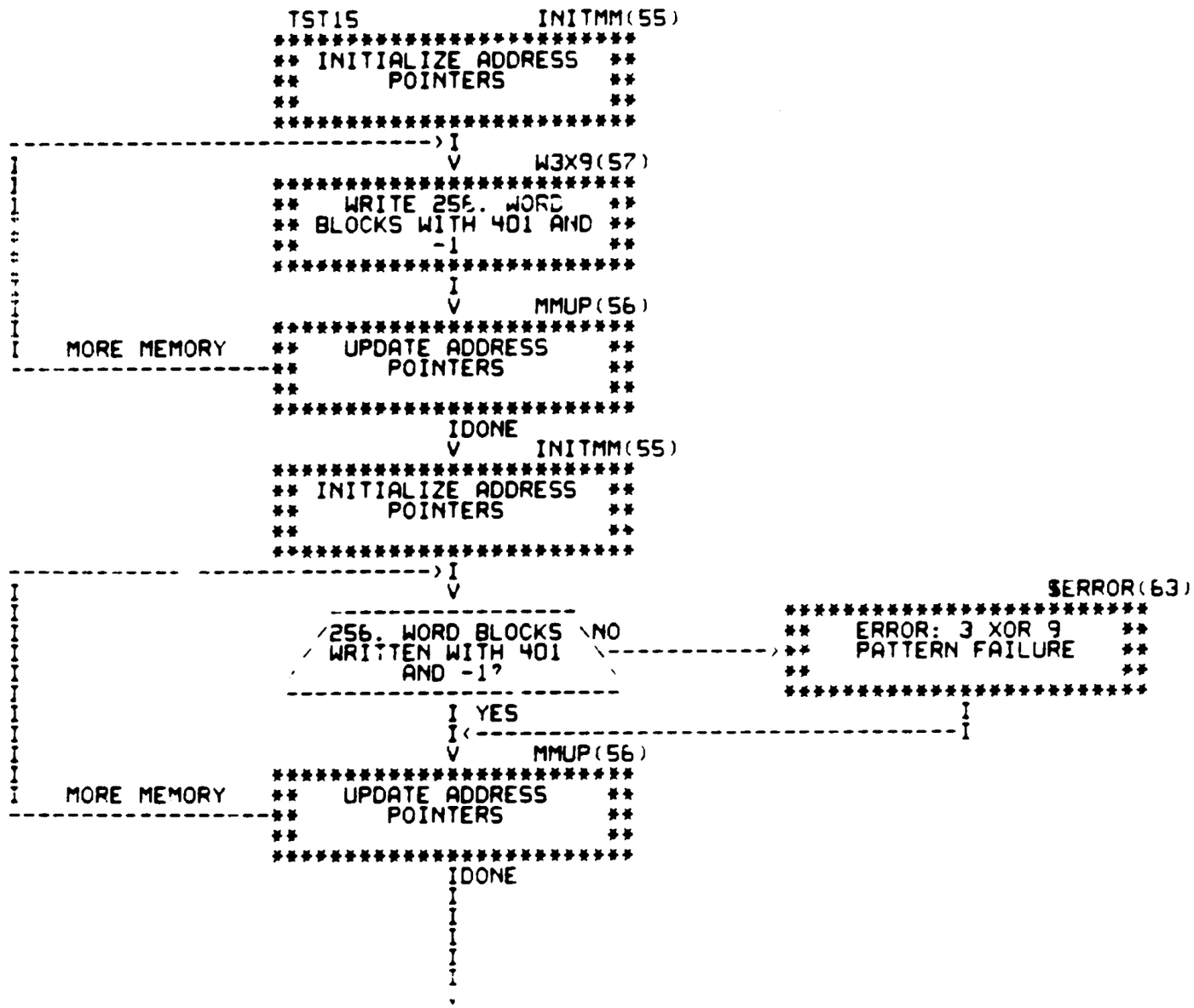

TST12
SETCON(57)
**PUT ALL ZEROS IN ALL MEMORY
INITMM(55)
** INITIALIZE ADDRESS POINTERS
ROTATE(57)
**SET C-BIT AND ROTATE IT THROUGH TWO BYTES
C-BIT SET AND 0 IN MEMORY LOCATION?
NO
SERROR(63)
** ERROR: ROTATING 1 FAILED
YES
MMUP(56)
MORE MEMORY
UPDATE ADDRESS POINTERS
DONE

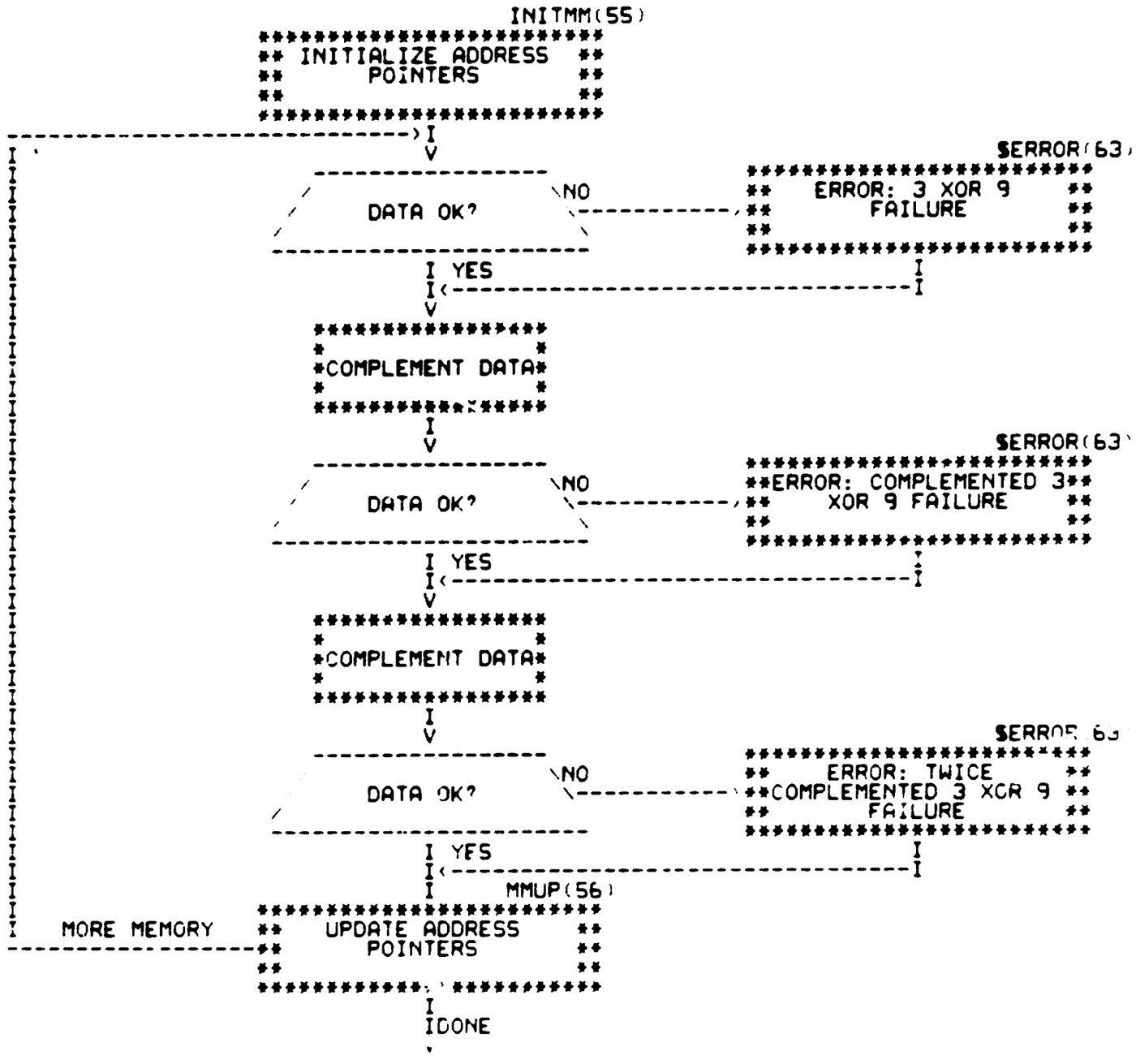

TST13
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
W3X9(57)
** WRITE 256. WORD **
** BLOCKS WITH **
** 0,0,0,0,-1,-1,-1,-1 **
MMUP(56)
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
IDONE
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
256. WORD BLOCKS WRITTEN WITH 0,0,0,0,-1,-1,-1,-1
NO
$ERROR(63
** ERROR: 3 XOR 9 **
** PATTERN FAILURE **
YES
MMUP(56
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
IDONE

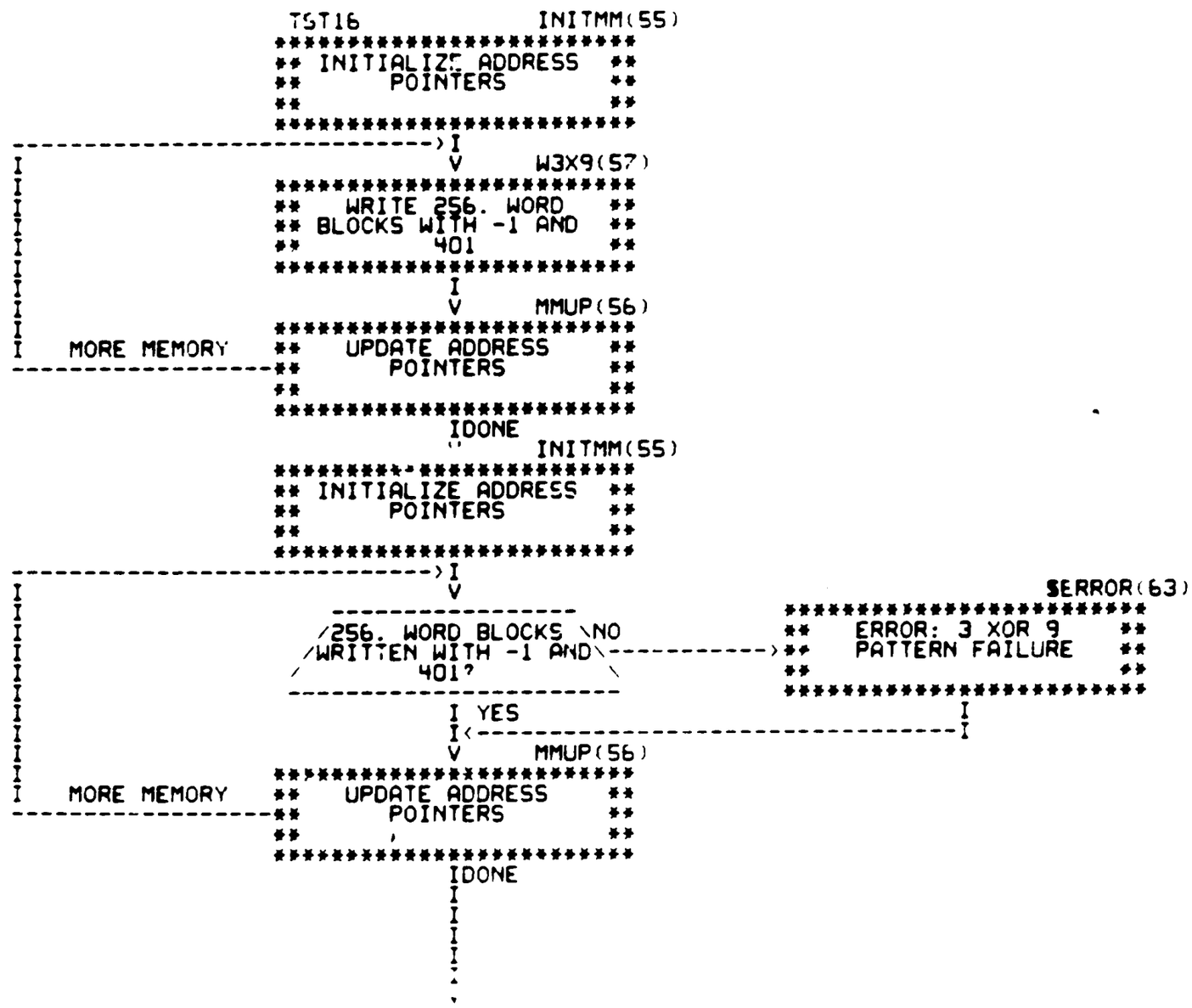

INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
$ERROR 63
** ERROR: 3 XOR 9 **
** FAILURE **
DATA OK?
NO
YES
COMPLEMENT DATA
$ERROR 63
ERROR: COMPLEMENTED 3
** XOR 9 FAILURE **
DATA OK?
NO
YES
COMPLEMENT DATA
$ERROR 63
** ERROR: TWICE **
**COMPLEMENTED 3 XOR 9 **
** FAILURE **
DATA OK?
NO
YES
MMUP(56)
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
DONE

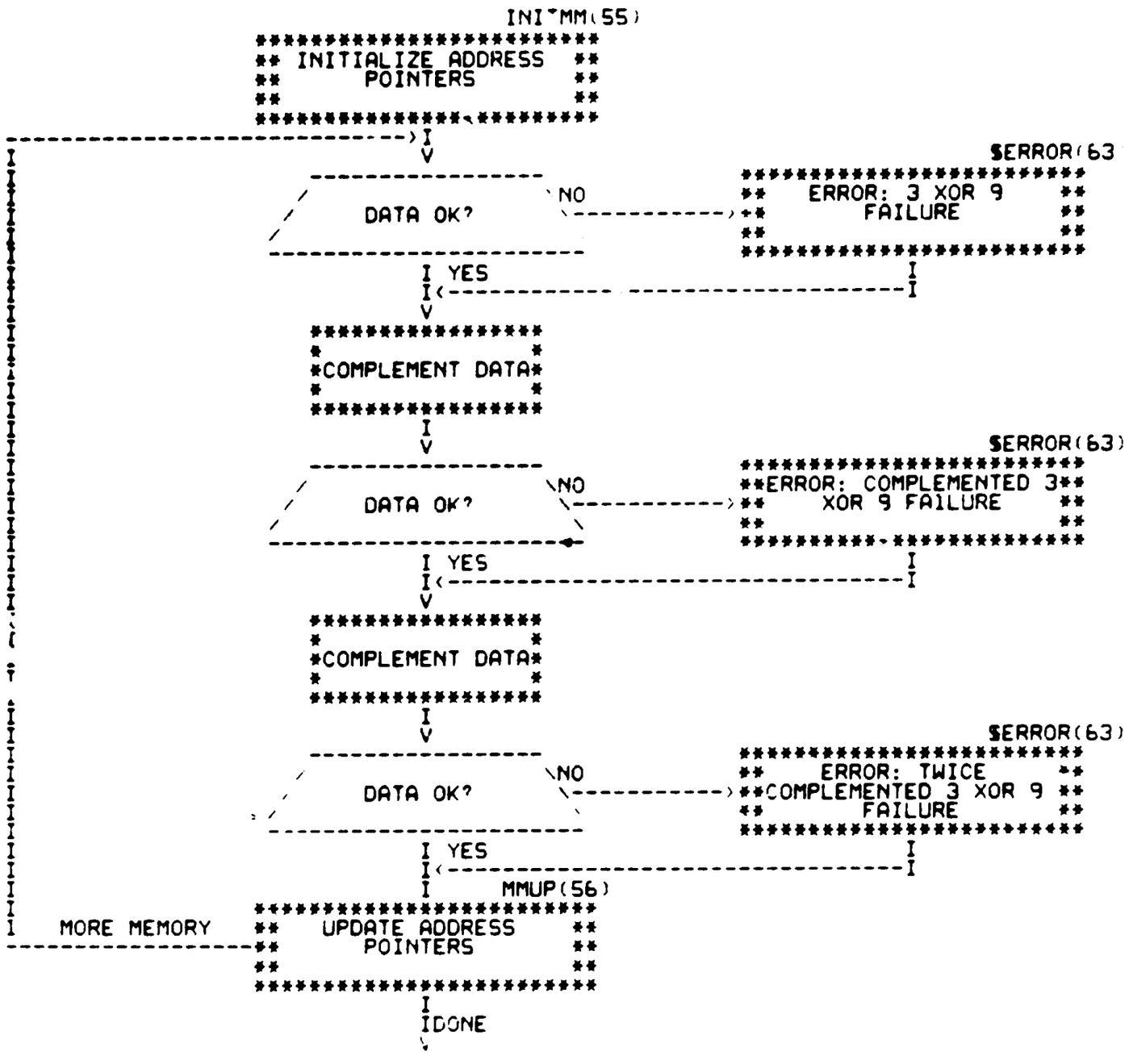

TST14
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
W3X9(57)
** WRITE 256. WORD **
** BLOCKS WITH **
** -1,-1,-1,-1,0,0,0,0 **
MMUP(56)
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
IDONE
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
256. WORD BLOCKS WRITTEN WITH -1,-1,-1,-1,0,0,0,0
NO
YES
$ERROR(63)
** ERROR: 3 XOR 9 **
** PATTERN FAILURE **
MMUP(56)
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
IDONE

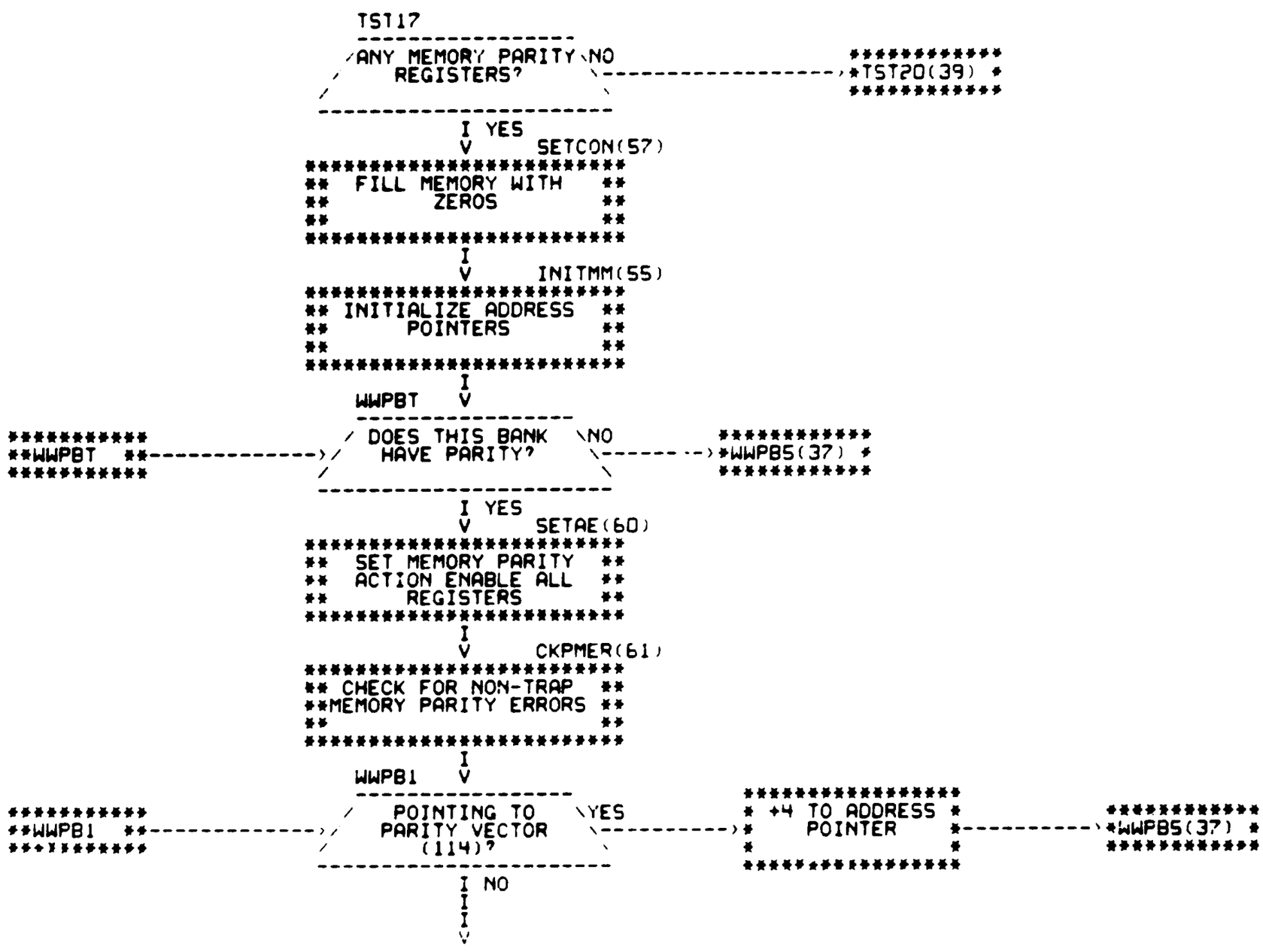

INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
DATA OK?
NO
$ERROR(63)
** ERROR: 3 XOR 9 **
** FAILURE **
YES
COMPLEMENT DATA
DATA OK?
NO
$ERROR(63)
ERROR: COMPLEMENTED 3
** XOR 9 FAILURE **
YES
COMPLEMENT DATA
DATA OK?
NO
$ERROR(63)
** ERROR: TWICE **
**COMPLEMENTED 3 XOR 9 **
** FAILURE **
YES
MMUP(56)
MORE MEMORY
** UPDATE ADDRESS **
** POINTERS **
DONE

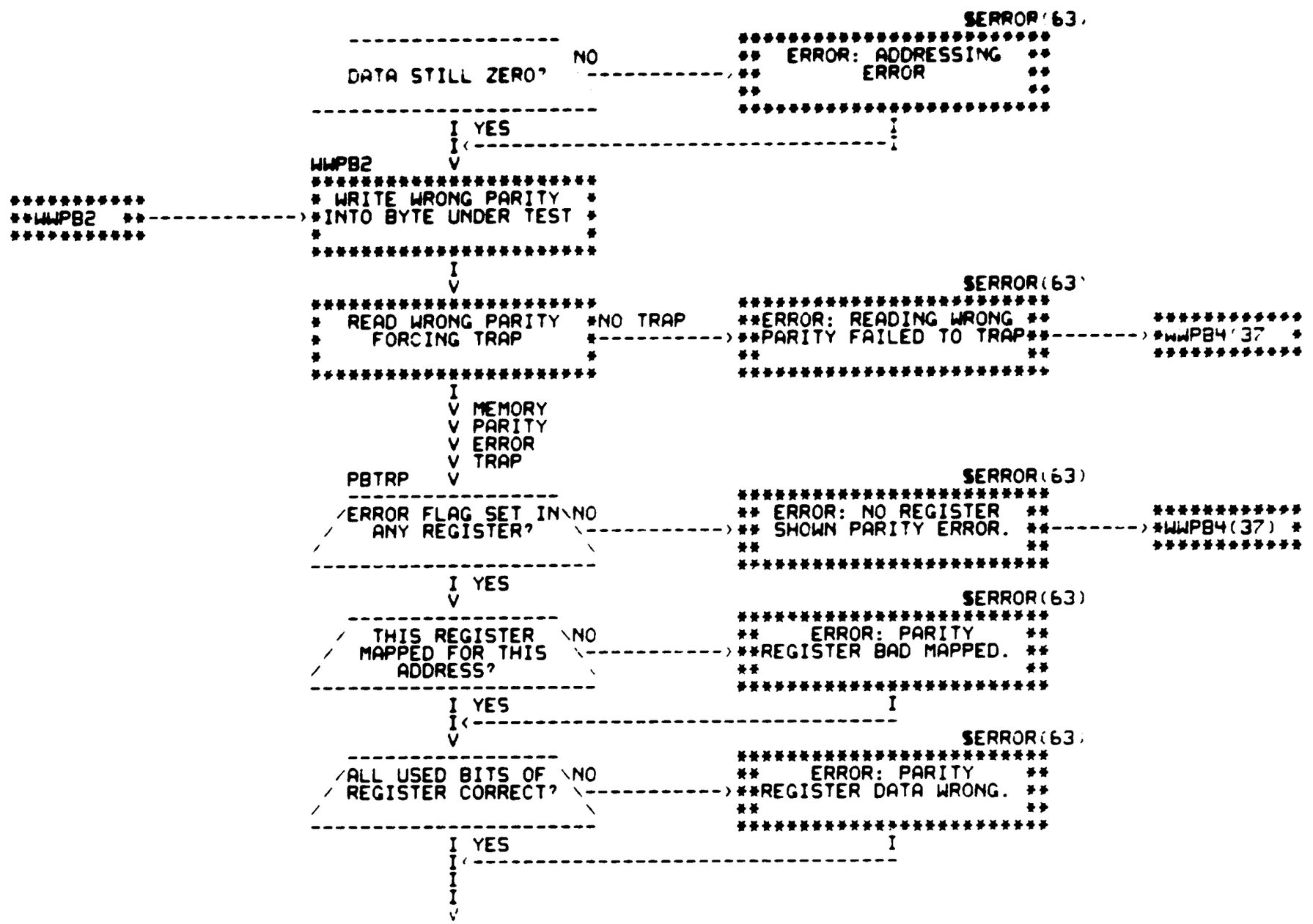

TST15
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
W3X9(57)
** WRITE 256. WORD **
** BLOCKS WITH 401 AND **
** -1 **
MMUP(56)
MORE MEMORY
** UPDATE ADDRESS **
** POINTERS **
IDONE
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
256. WORD BLOCKS WRITTEN WITH 401 AND -1?
NO
$ERROR(63)
** ERROR: 3 XOR 9 **
** PATTERN FAILURE **
YES
MMUP(56)
MORE MEMORY
** UPDATE ADDRESS **
** POINTERS **
IDONE

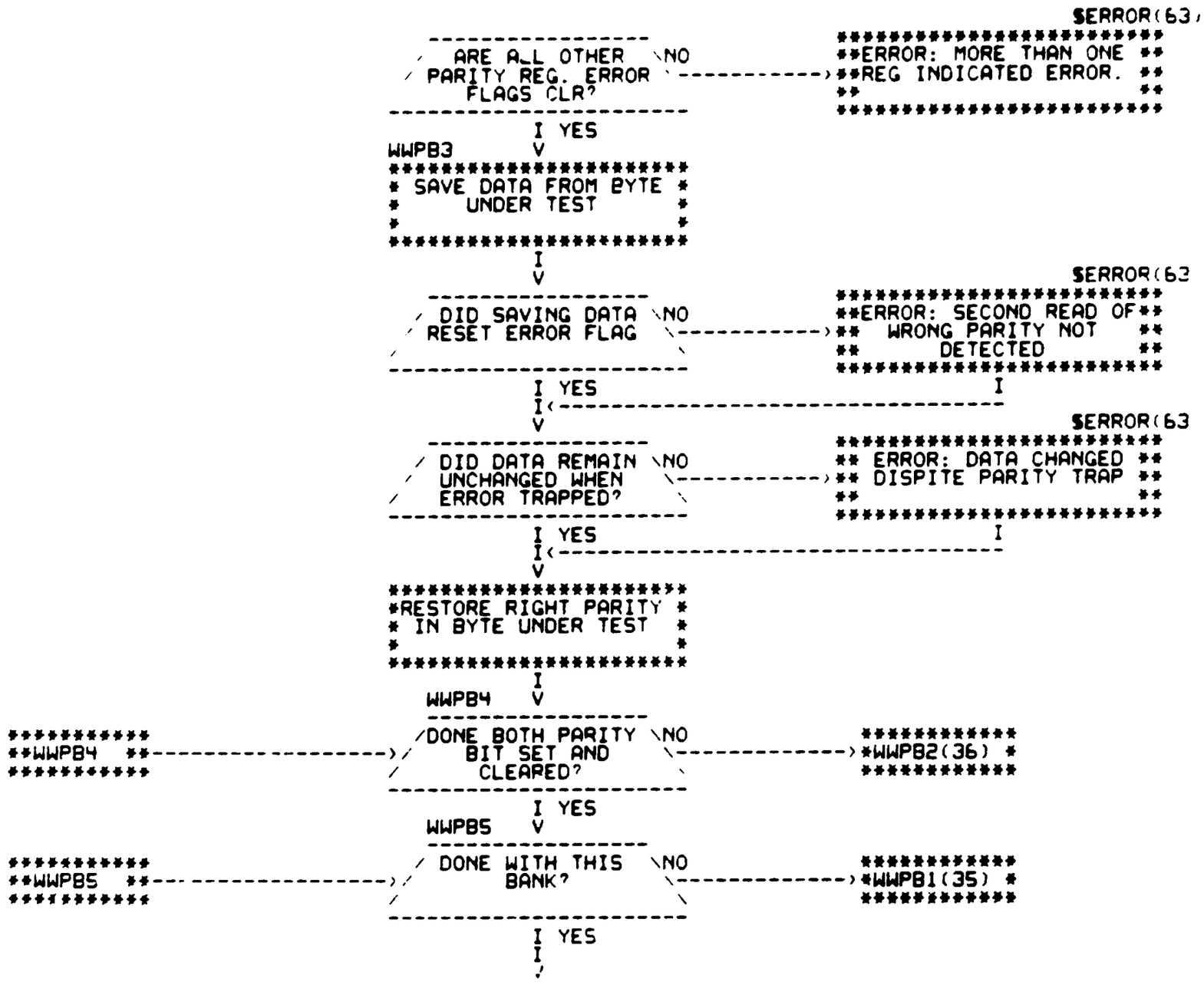

INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
DATA OK?
NO
$ERROR(63)
** ERROR: 3 XOR 9 **
** FAILURE **
YES
COMPLEMENT DATA
DATA OK?
NO
$ERROR(63)
ERROR: COMPLEMENTED 3
** XOR 9 FAILURE **
YES
COMPLEMENT DATA
DATA OK?
NO
$ERROR(63)
** ERROR: TWICE **
**COMPLEMENTED 3 XOR 9 **
** FAILURE **
YES
MMUP(56)
MORE MEMORY
** UPDATE ADDRESS **
** POINTERS **
DONE

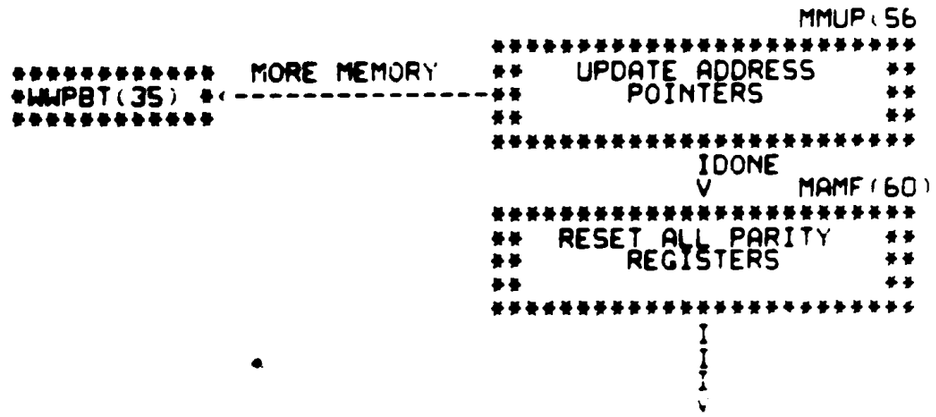

TST16
INITMM(55)
INITIALIZE ADDRESS POINTERS
W3X9(57)
WRITE 256. WORD BLOCKS WITH -1 AND 401
MMUP(56)
UPDATE ADDRESS POINTERS
MORE MEMORY
IDONE
INITMM(55)
INITIALIZE ADDRESS POINTERS
256. WORD BLOCKS WRITTEN WITH -1 AND 401?
NO
$ERROR(63)
ERROR: 3 XOR 9 PATTERN FAILURE
YES
MMUP(56)
UPDATE ADDRESS POINTERS
MORE MEMORY
IDONE

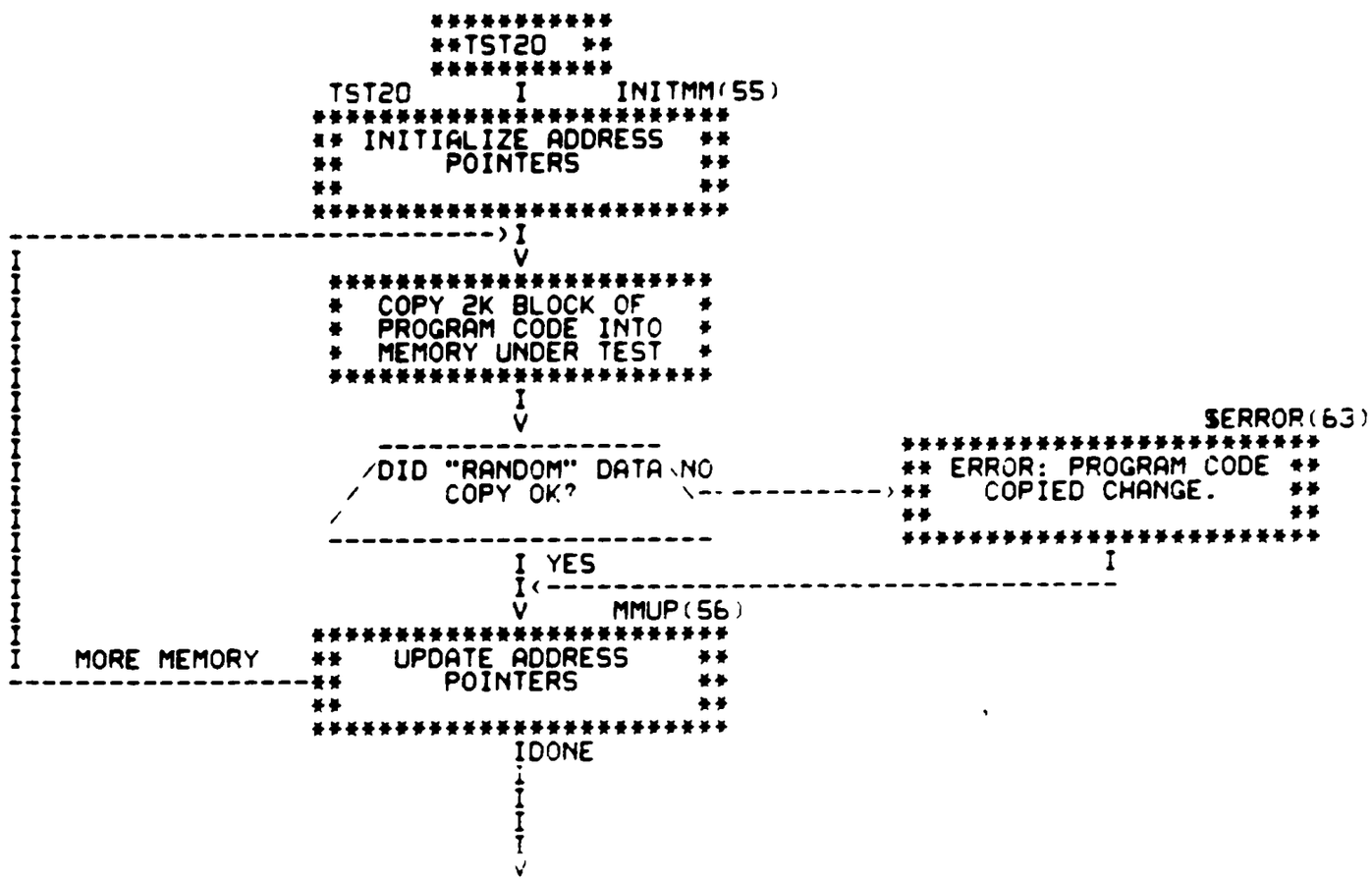

INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
DATA OK?
NO
$ERROR(63)
** ERROR: 3 XOR 9 **
** FAILURE **
YES
COMPLEMENT DATA
DATA OK?
NO
$ERROR(63)
ERROR: COMPLEMENTED 3
** XOR 9 FAILURE **
YES
COMPLEMENT DATA
DATA OK?
NO
$ERROR(63)
** ERROR: TWICE **
**COMPLEMENTED 3 XOR 9 **
** FAILURE **
YES
MMUP(56)
MORE MEMORY
** UPDATE ADDRESS **
** POINTERS **
DONE

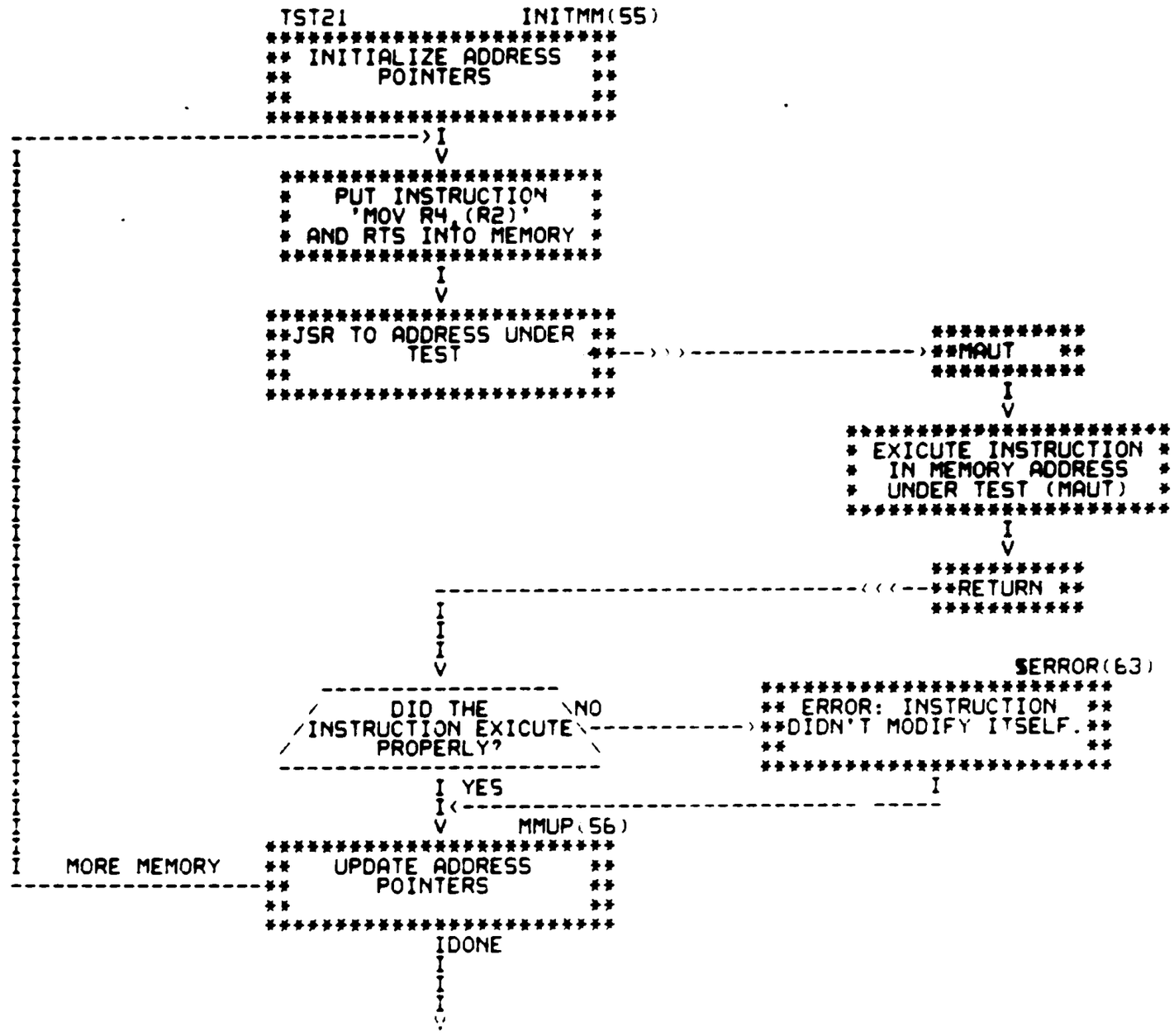

TST17
ANY MEMORY PARITY REGISTERS?
NO
TST20(39)
I YES
SETCON(57)
FILL MEMORY WITH ZEROS
INITMM(55)
INITIALIZE ADDRESS POINTERS
WWPBT
DOES THIS BANK HAVE PARITY?
WWPBT
NO
WWPB5(37)
I YES
SETAE(60)
SET MEMORY PARITY ACTION ENABLE ALL REGISTERS
CKPMER(61)
CHECK FOR NON-TRAP MEMORY PARITY ERRORS
WWPB1
POINTING TO PARITY VECTOR (114)?
WWPB1
YES
+4 TO ADDRESS POINTER
WWPB5(37)
I NO

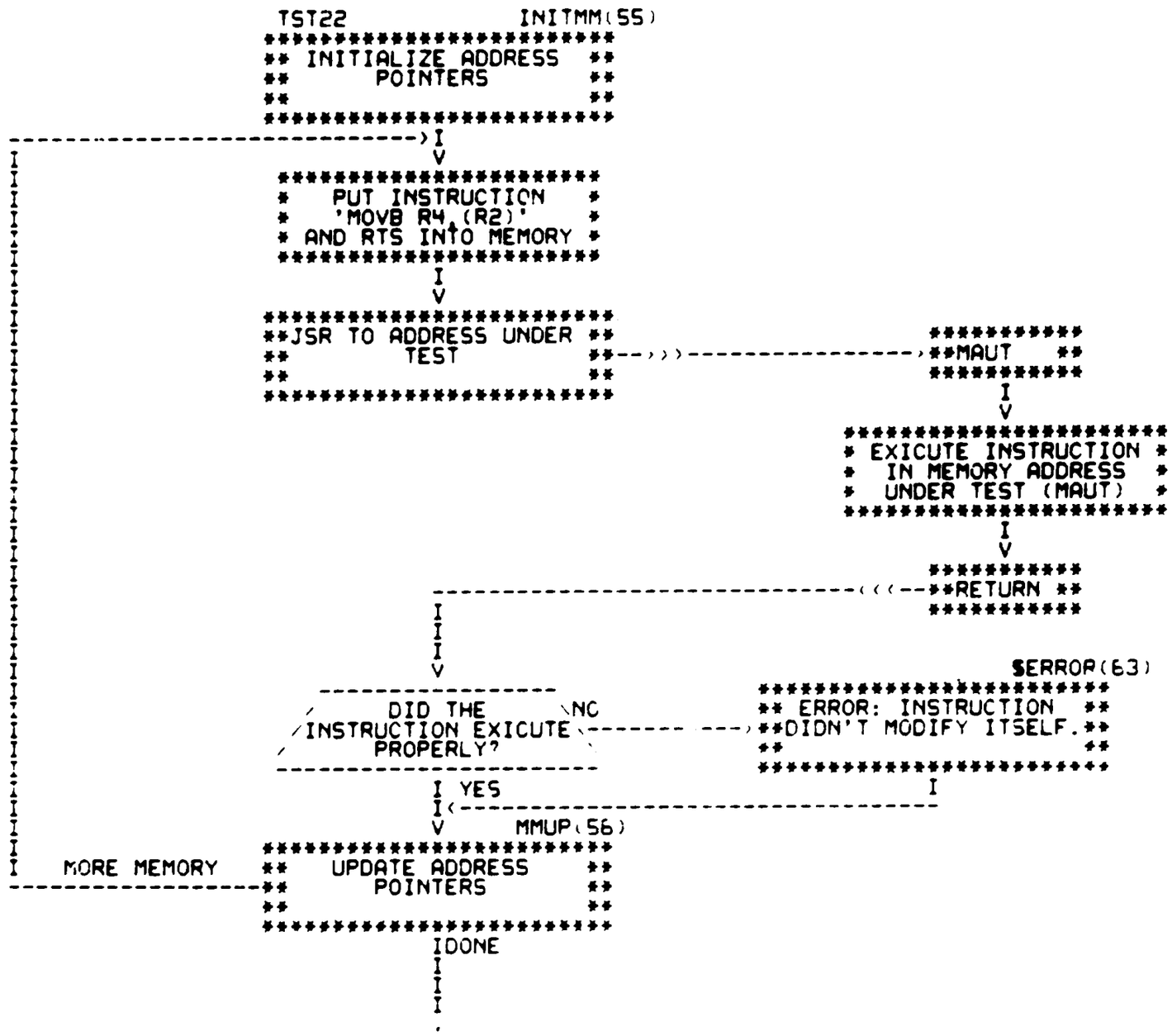

$ERROR(63)
DATA STILL ZERO?
NO
** ERROR: ADDRESSING **
** ERROR **
YES
WWPB2
WRITE WRONG PARITY INTO BYTE UNDER TEST
**WWPB2 **
READ WRONG PARITY FORCING TRAP
NO TRAP
ERROR: READING WRONG PARITY FAILED TO TRAP
**WWPB4(37) **
MEMORY PARITY ERROR TRAP
PBTRP
ERROR FLAG SET IN ANY REGISTER?
NO
** ERROR: NO REGISTER SHOWN PARITY ERROR. **
**WWPB4(37) **
YES
THIS REGISTER MAPPED FOR THIS ADDRESS?
NO
** ERROR: PARITY **
**REGISTER BAD MAPPED. **
YES
ALL USED BITS OF REGISTER CORRECT?
NO
** ERROR: PARITY **
**REGISTER DATA WRONG. **
YES

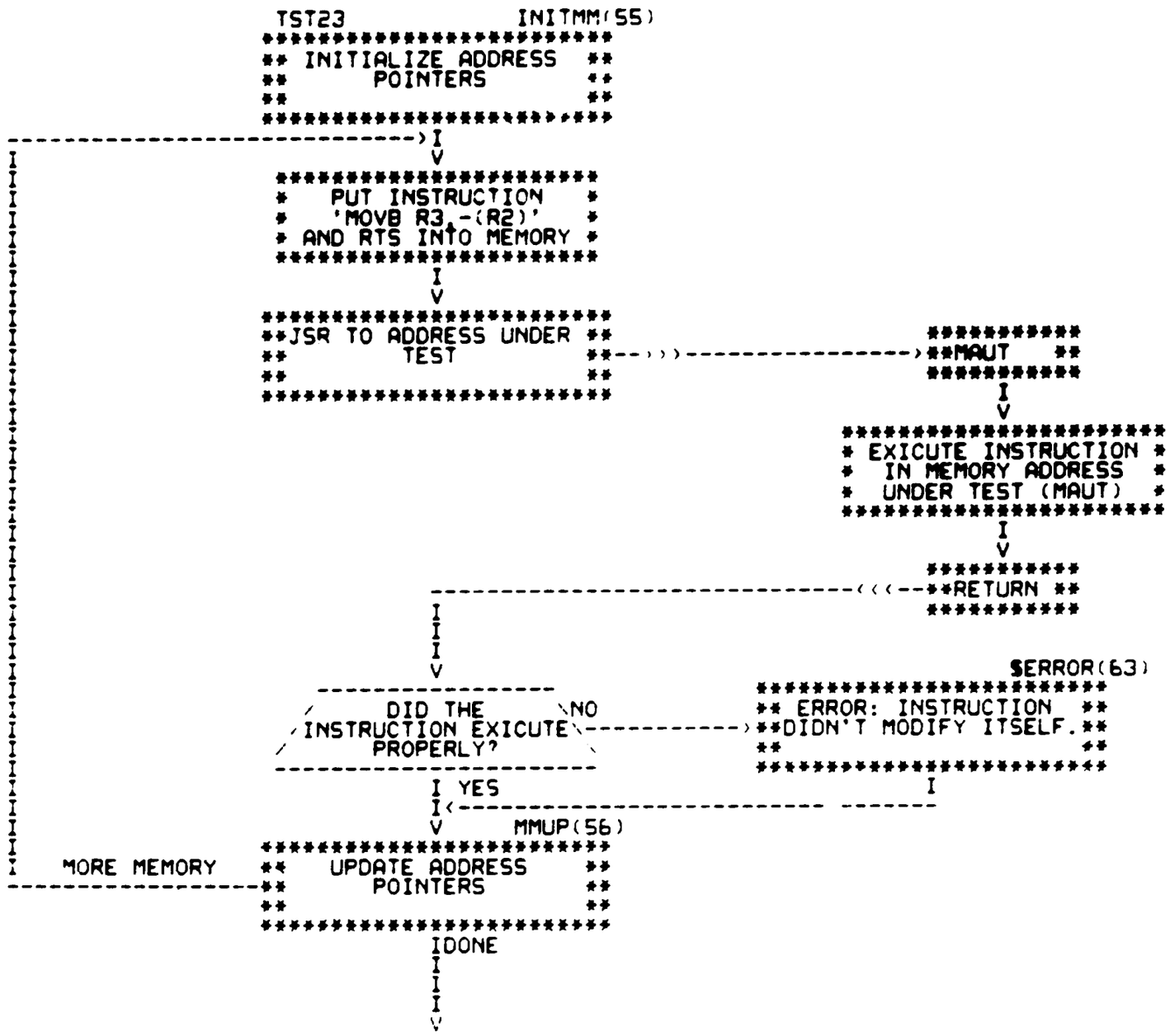

$ERROR(63)
ARE ALL OTHER PARITY REG. ERROR FLAGS CLR?
NO
ERROR: MORE THAN ONE REG INDICATED ERROR.
YES
WWPB3
SAVE DATA FROM BYTE UNDER TEST
$ERROR(63
DID SAVING DATA RESET ERROR FLAG
NO
ERROR: SECOND READ OF WRONG PARITY NOT DETECTED
YES
$ERROR(63
DID DATA REMAIN UNCHANGED WHEN ERROR TRAPPED?
NO
** ERROR: DATA CHANGED DISPITE PARITY TRAP **
YES
RESTORE RIGHT PARITY IN BYTE UNDER TEST
WWPB4
**WWPB4 **
DONE BOTH PARITY BIT SET AND CLEARED?
NO
*WWPB2(36) *
YES
WWPB5
**WWPB5 **
DONE WITH THIS BANK?
NO
*WWPB1(35) *
YES

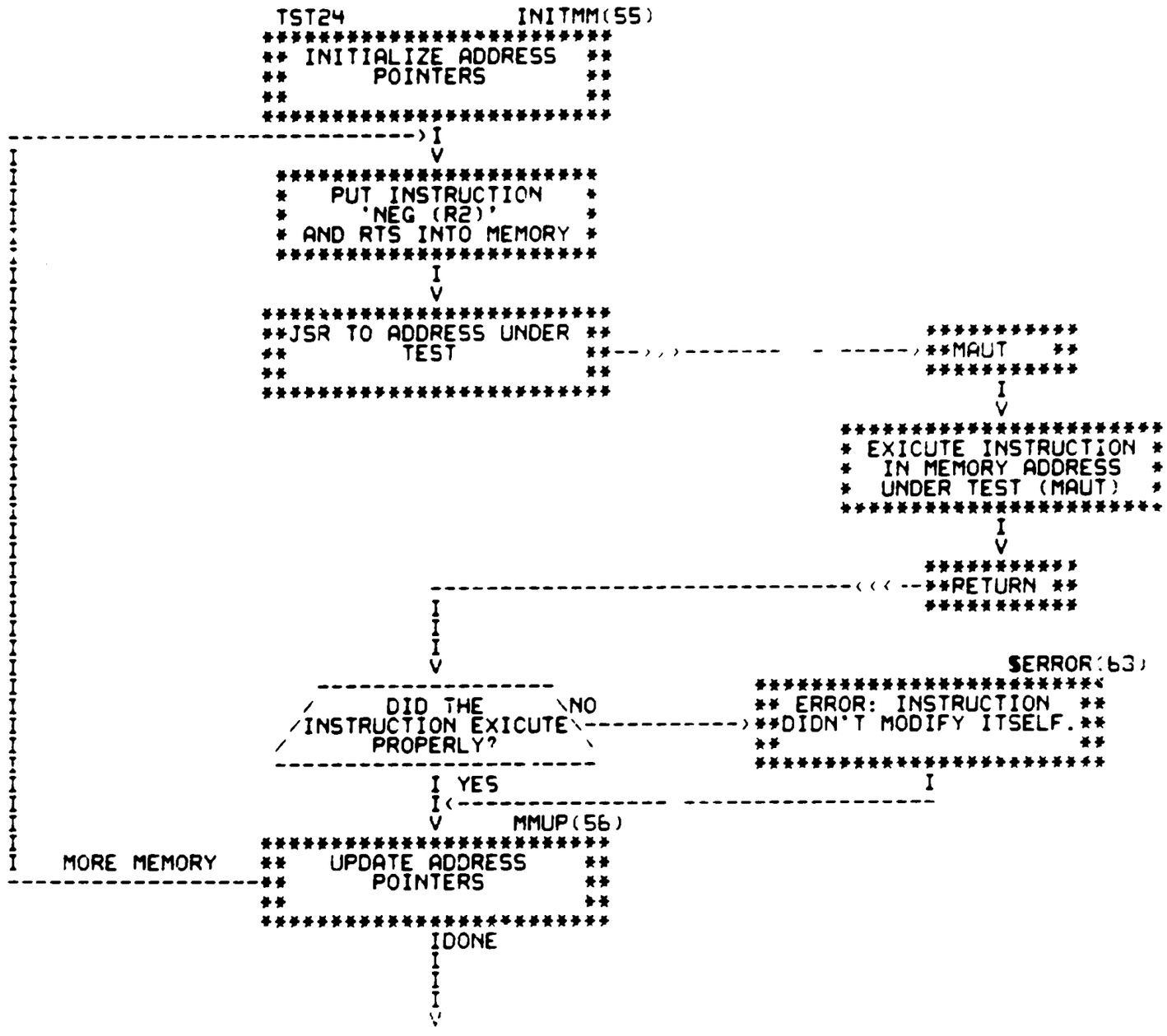

MMUP(56
UPDATE ADDRESS POINTERS
MORE MEMORY
*WWPBT(35)
IDONE
V
MAMF(60)
RESET ALL PARITY REGISTERS

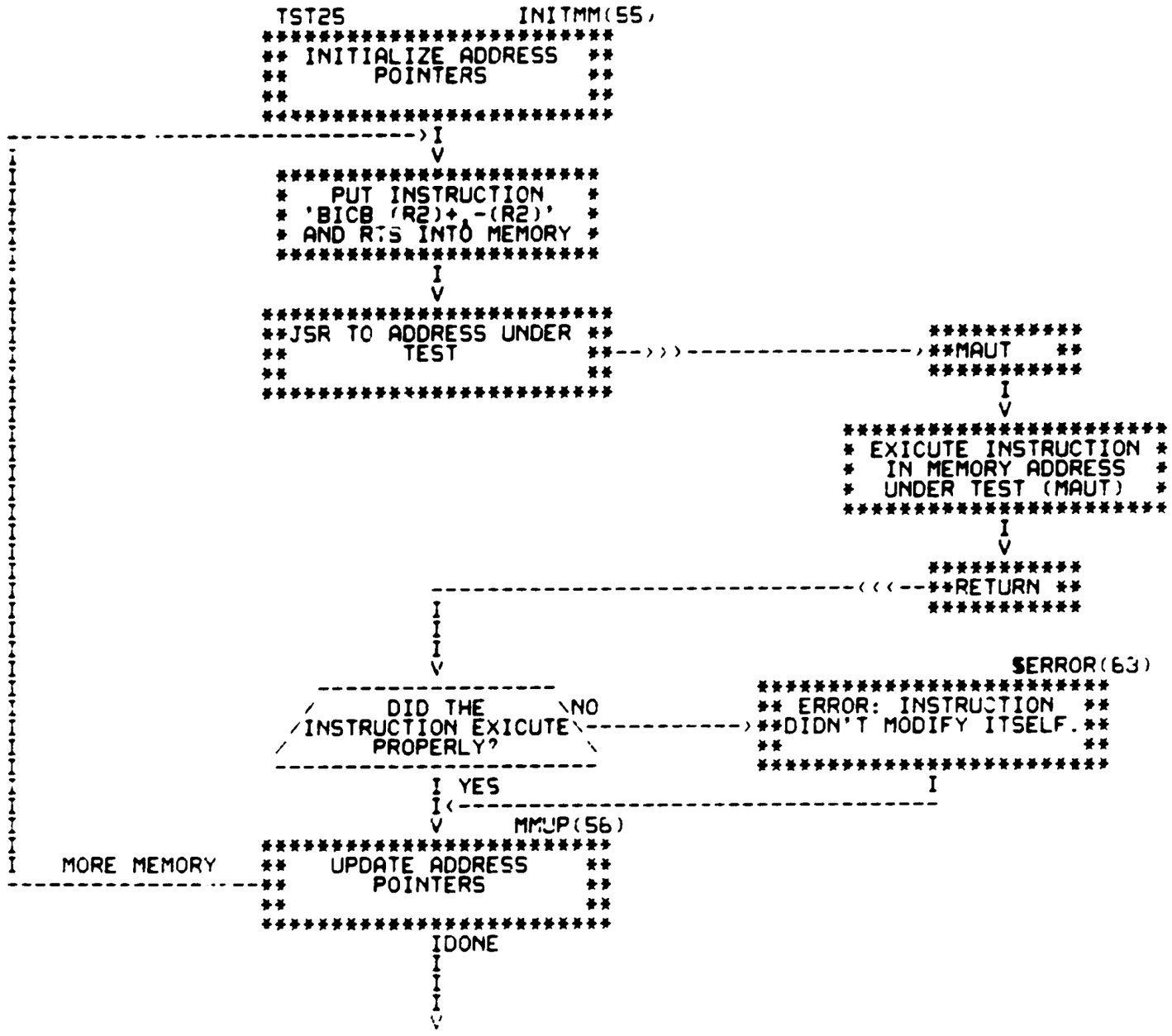

TST20
TST20
INITMM(55)
INITIALIZE ADDRESS POINTERS
COPY 2K BLOCK OF PROGRAM CODE INTO MEMORY UNDER TEST
DID "RANDOM" DATA COPY OK?
NO
$ERROR(63)
ERROR: PROGRAM CODE COPIED CHANGE.
YES
MMUP(56)
UPDATE ADDRESS POINTERS
MORE MEMORY
IDONE

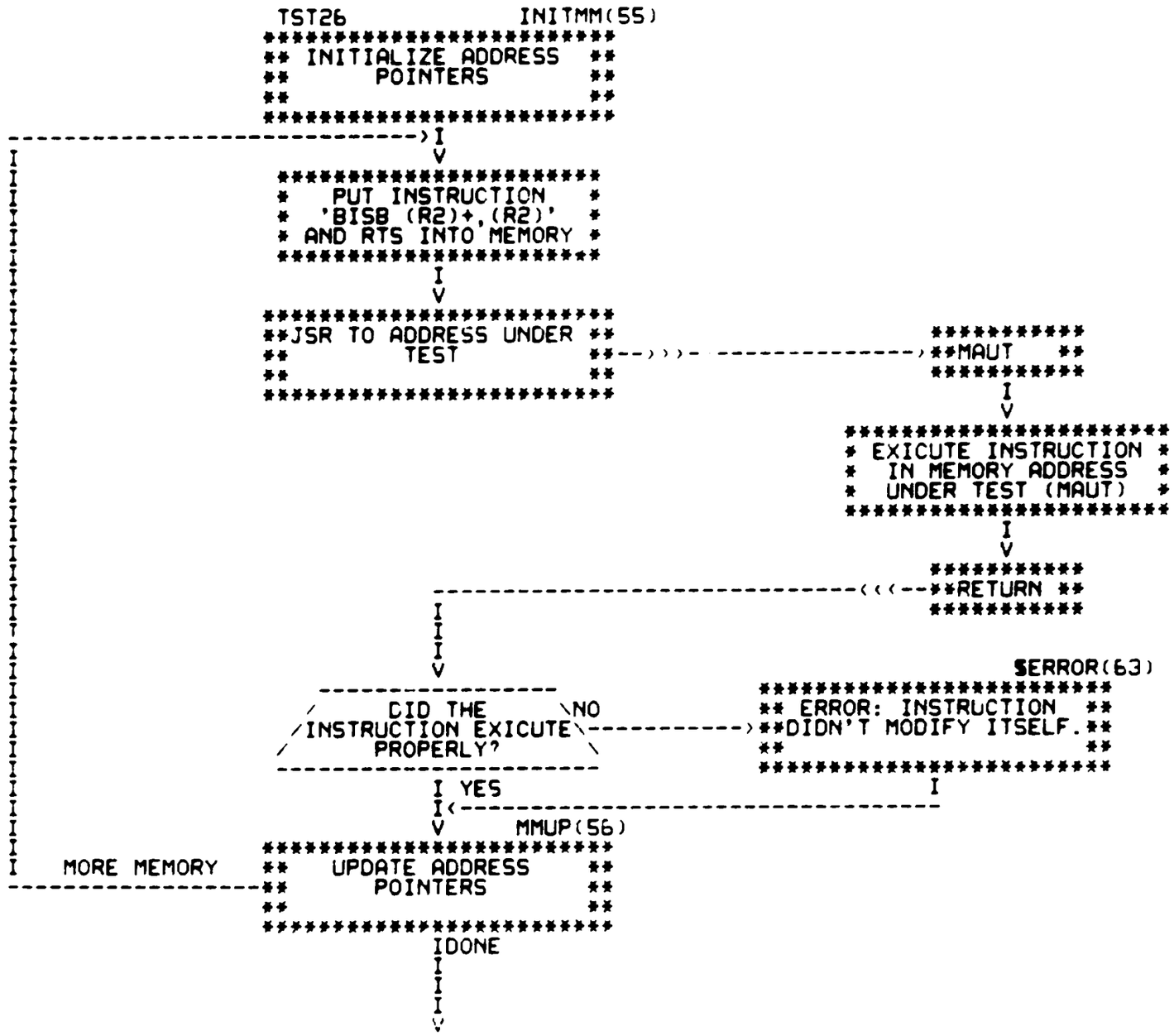

TST21
INITMM(55)
INITIALIZE ADDRESS POINTERS
PUT INSTRUCTION 'MOV R4,(R2)' AND RTS INTO MEMORY
JSR TO ADDRESS UNDER TEST
MAUT
EXICUTE INSTRUCTION IN MEMORY ADDRESS UNDER TEST (MAUT)
RETURN
DID THE INSTRUCTION EXICUTE PROPERLY?
NO
SERROR(63)
ERROR: INSTRUCTION DIDN'T MODIFY ITSELF.
YES
MMUP(56)
UPDATE ADDRESS POINTERS
MORE MEMORY
IDONE

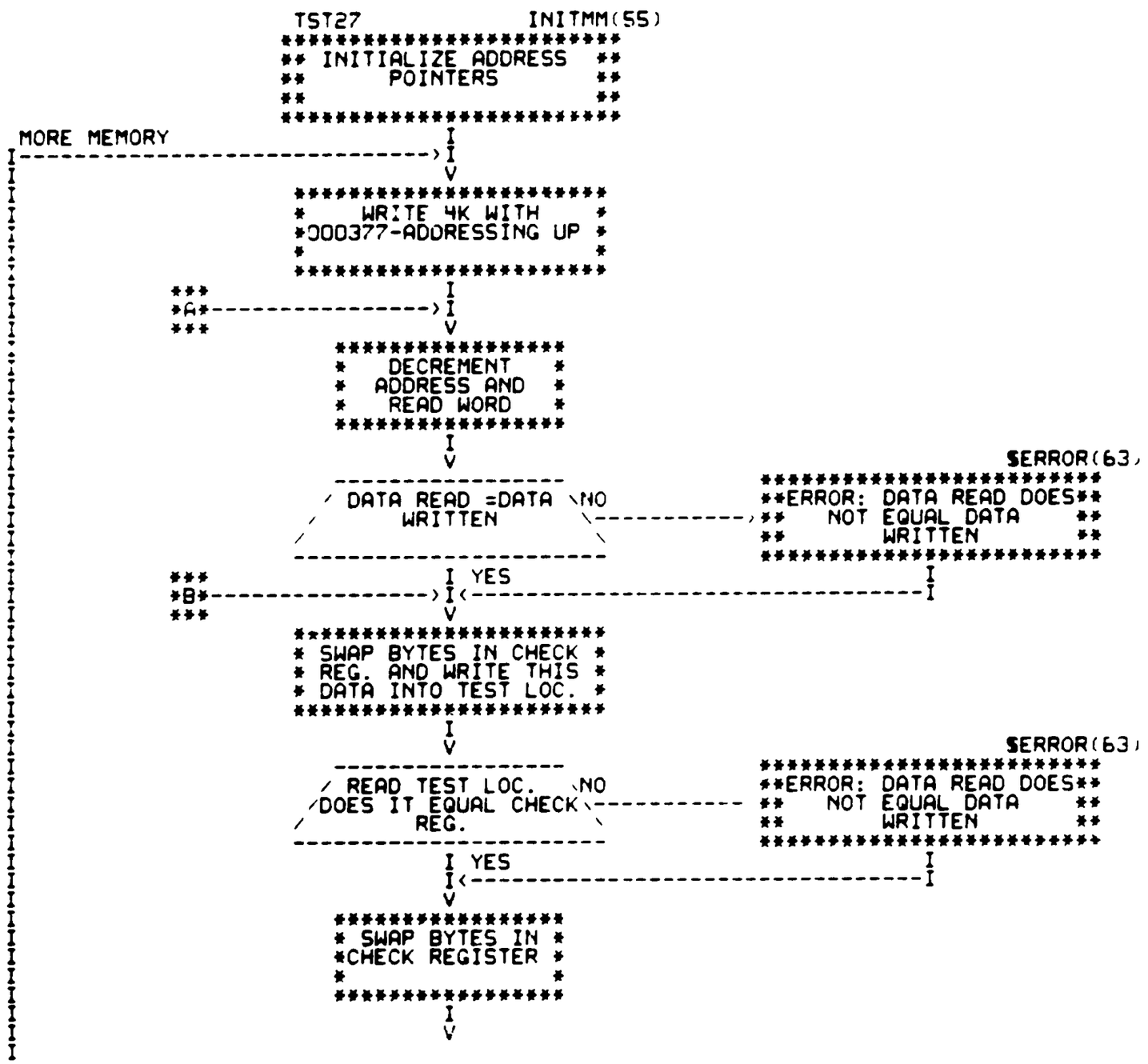

TST22
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
PUT INSTRUCTION
'MOVB R4,(R2)'
AND RTS INTO MEMORY
**JSR TO ADDRESS UNDER **
** TEST **
**MAUT **
EXICUTE INSTRUCTION
IN MEMORY ADDRESS
UNDER TEST (MAUT)
**RETURN **
DID THE INSTRUCTION EXICUTE PROPERLY?
NO
$ERROR(63)
** ERROR: INSTRUCTION **
DIDN'T MODIFY ITSELF.
YES
MMUP(56)
MORE MEMORY
UPDATE ADDRESS POINTERS
IDONE

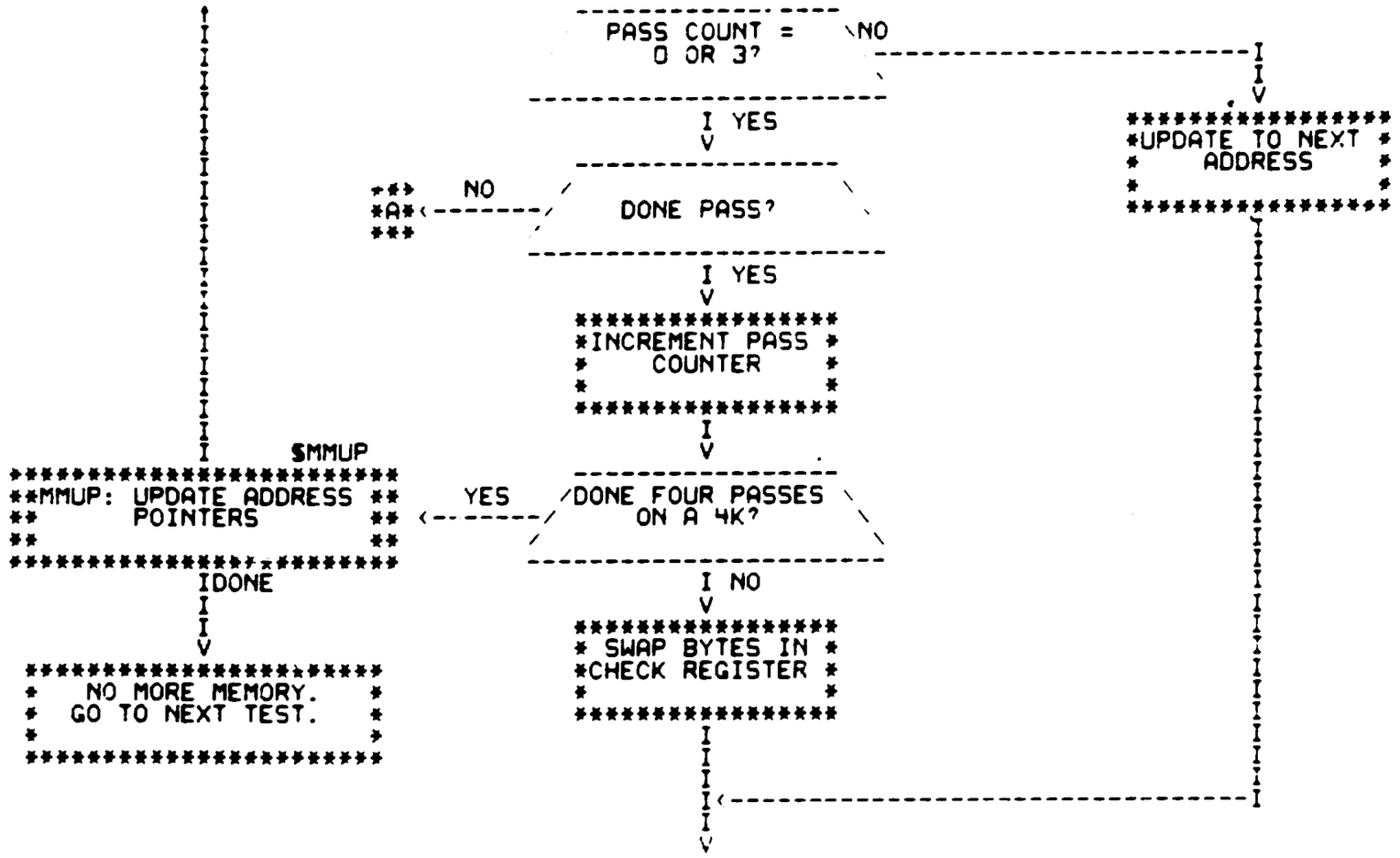

TST23
INITMM(55)
INITIALIZE ADDRESS POINTERS
PUT INSTRUCTION 'MOVB R3,-(R2)' AND RTS INTO MEMORY
JSR TO ADDRESS UNDER TEST
MAUT
EXICUTE INSTRUCTION IN MEMORY ADDRESS UNDER TEST (MAUT)
RETURN
DID THE INSTRUCTION EXICUTE PROPERLY?
NO
$ERROR(63)
ERROR: INSTRUCTION DIDN'T MODIFY ITSELF.
YES
MMUP(56)
UPDATE ADDRESS POINTERS
MORE MEMORY
IDONE

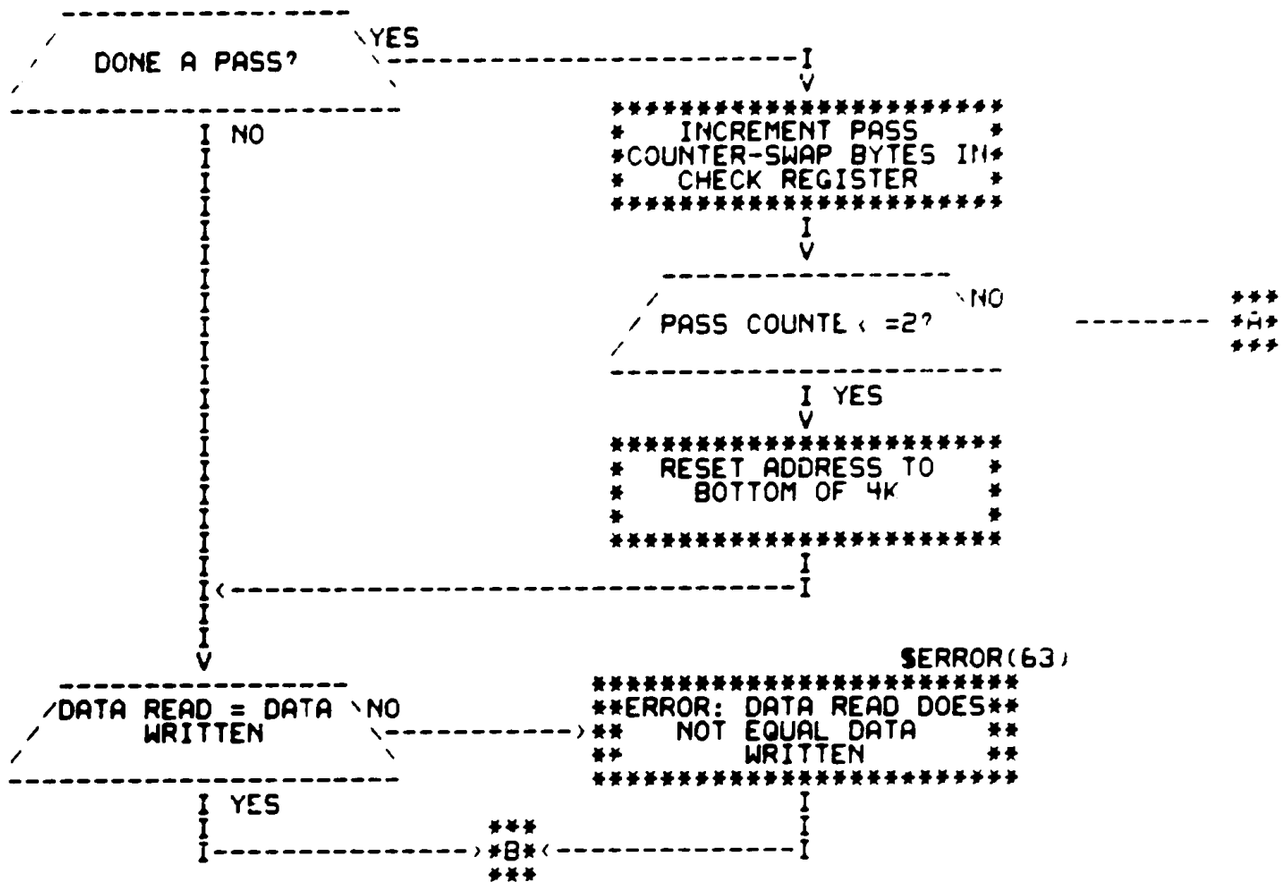

TST24 INITMM(55)
INITIALIZE ADDRESS POINTERS
PUT INSTRUCTION 'NEG (R2)' AND RTS INTO MEMORY
JSR TO ADDRESS UNDER TEST
MAUT
EXICUTE INSTRUCTION IN MEMORY ADDRESS UNDER TEST (MAUT)
RETURN
DID THE INSTRUCTION EXICUTE PROPERLY?
NO
$ERROR(63)
ERROR: INSTRUCTION DIDN'T MODIFY ITSELF.
YES
MMUP(56)
UPDATE ADDRESS POINTERS
MORE MEMORY
IDONE

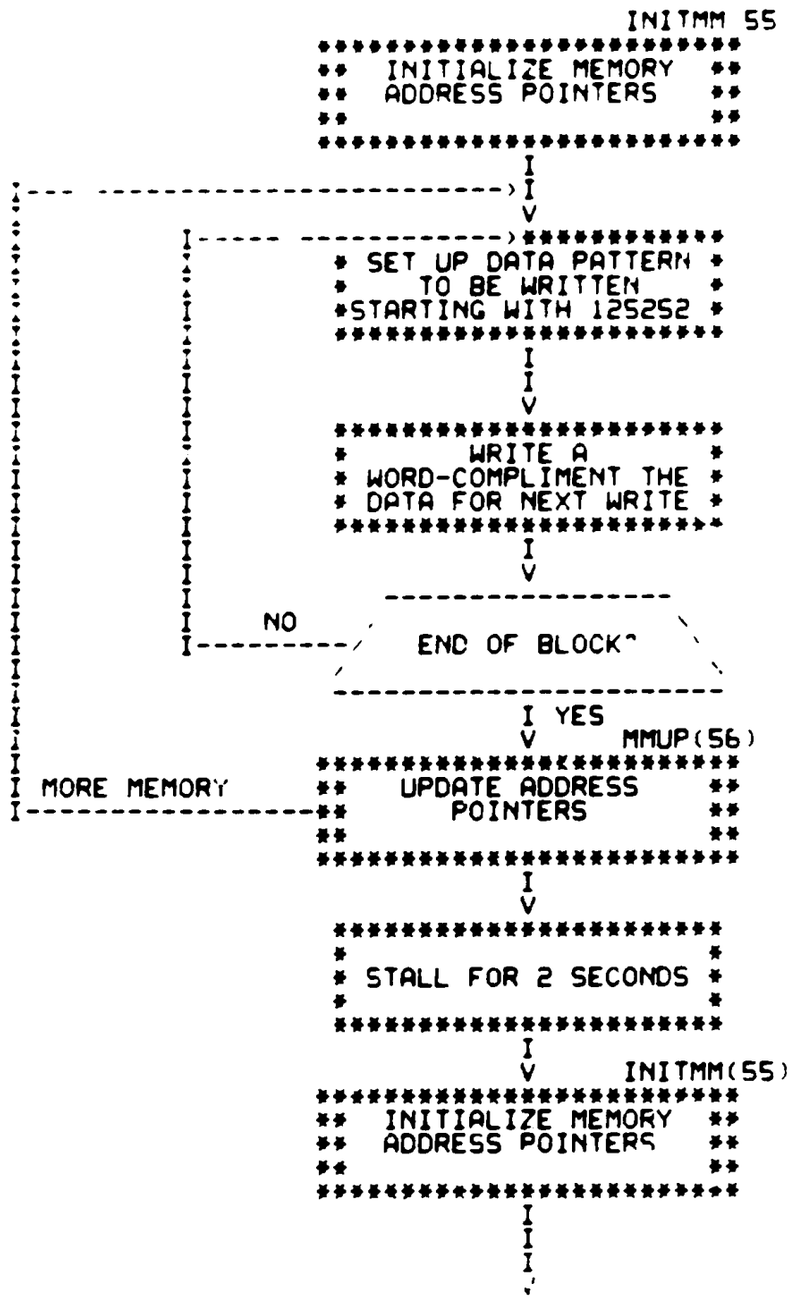

TST25
INITMM(55)
INITIALIZE ADDRESS POINTERS
PUT INSTRUCTION 'BICB (R2)+,-(R2)' AND R?S INTO MEMORY
JSR TO ADDRESS UNDER TEST
MAUT
EXICUTE INSTRUCTION IN MEMORY ADDRESS UNDER TEST (MAUT)
RETURN
DID THE INSTRUCTION EXICUTE PROPERLY?
NO
$ERROR(63)
ERROR: INSTRUCTION DIDN'T MODIFY ITSELF.
YES
MMUP(56)
UPDATE ADDRESS POINTERS
MORE MEMORY
IDONE

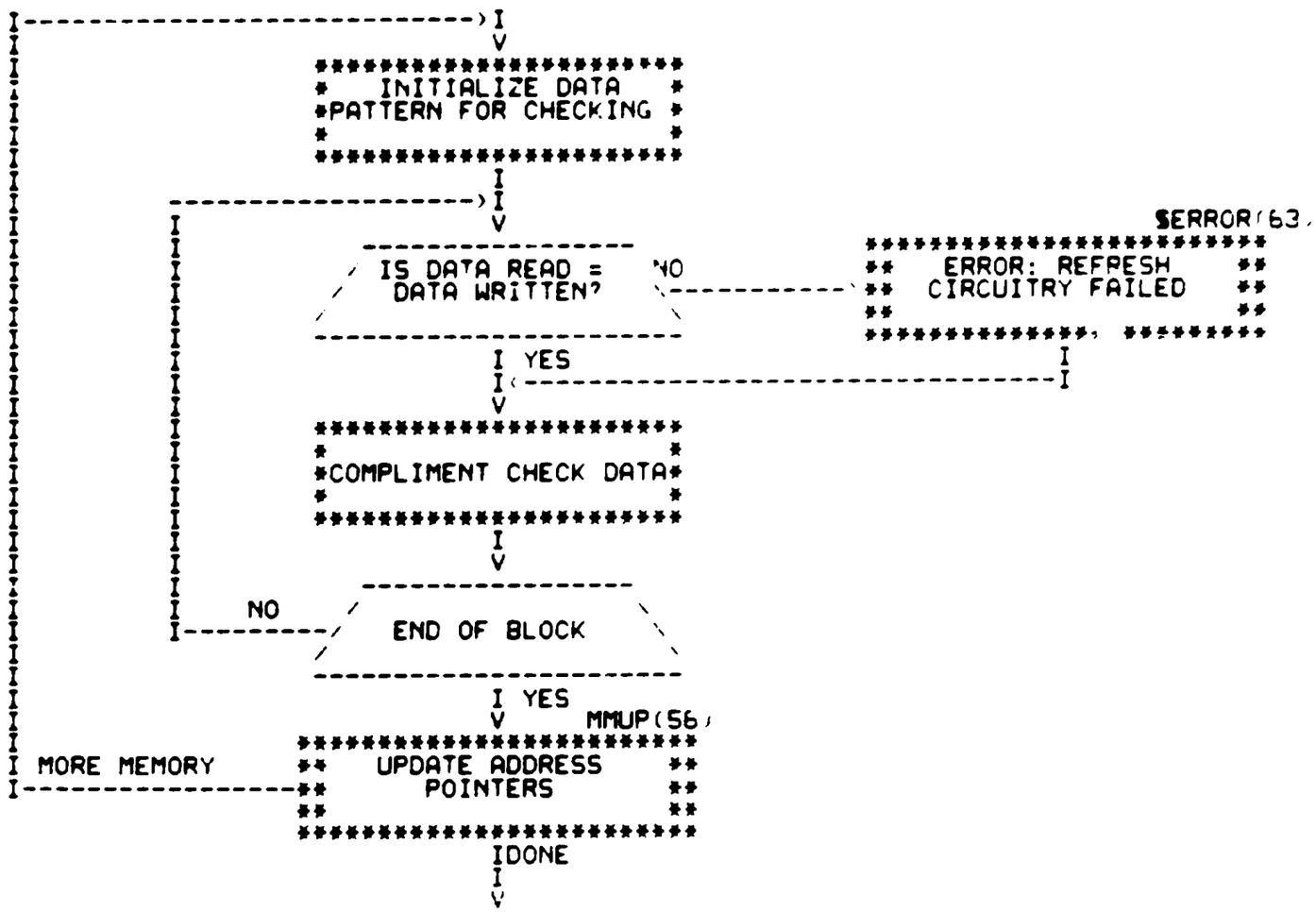

TST26
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
PUT INSTRUCTION 'BISB (R2)+,(R2)' AND RTS INTO MEMORY
JSR TO ADDRESS UNDER TEST
**MAUT **
EXICUTE INSTRUCTION IN MEMORY ADDRESS UNDER TEST (MAUT)
**RETURN **
SERROR(63)
** ERROR: INSTRUCTION **
DIDN'T MODIFY ITSELF.
DID THE INSTRUCTION EXICUTE PROPERLY?
NO
YES
MMUP(56)
** UPDATE ADDRESS **
** POINTERS **
MORE MEMORY
IDONE

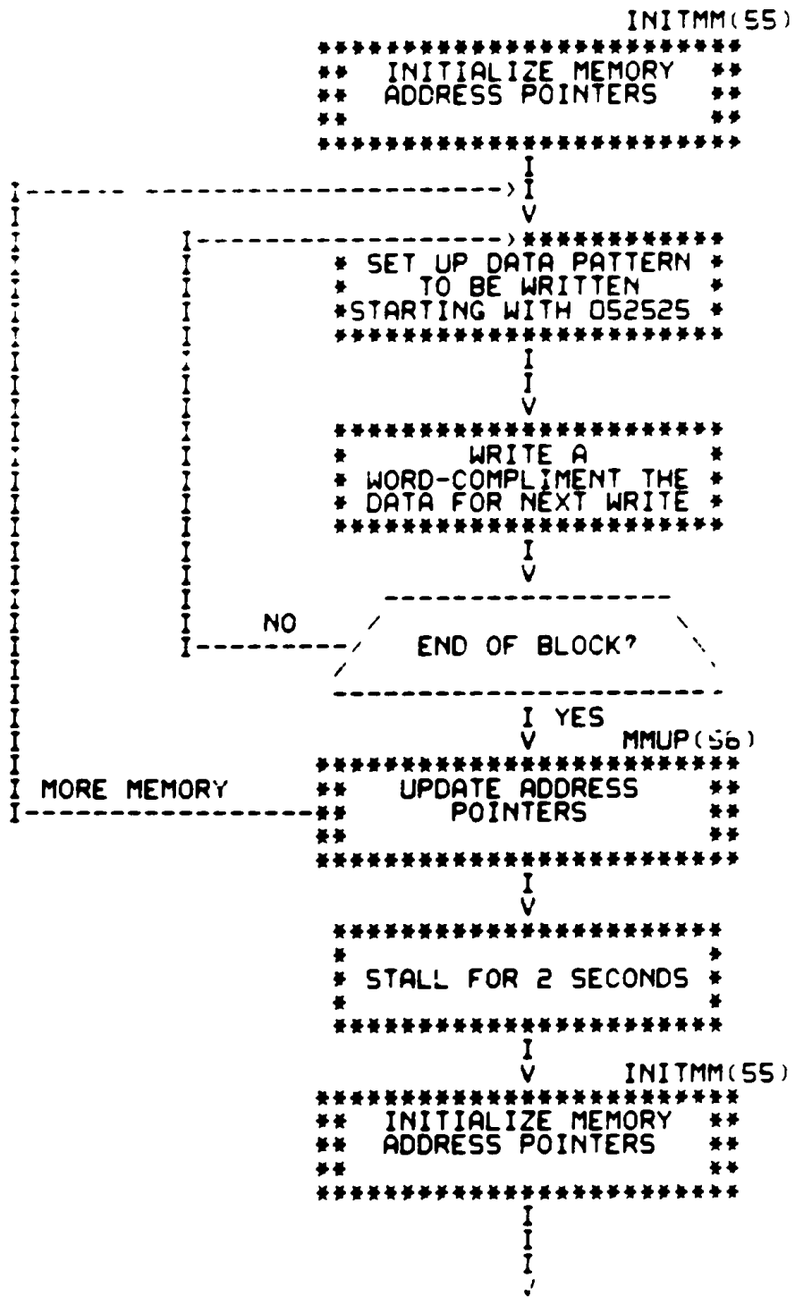

TST27
INITMM(55)
** INITIALIZE ADDRESS **
** POINTERS **
MORE MEMORY
WRITE 4K WITH
000377-ADDRESSING UP
A
DECREMENT
ADDRESS AND
READ WORD
DATA READ =DATA WRITTEN
NO
$ERROR(63)
**ERROR: DATA READ DOES NOT EQUAL DATA WRITTEN **
YES
B
SWAP BYTES IN CHECK REG. AND WRITE THIS DATA INTO TEST LOC.
READ TEST LOC. DOES IT EQUAL CHECK REG.
NO
$ERROR(63)
**ERROR: DATA READ DOES NOT EQUAL DATA WRITTEN **
YES
SWAP BYTES IN CHECK REGISTER

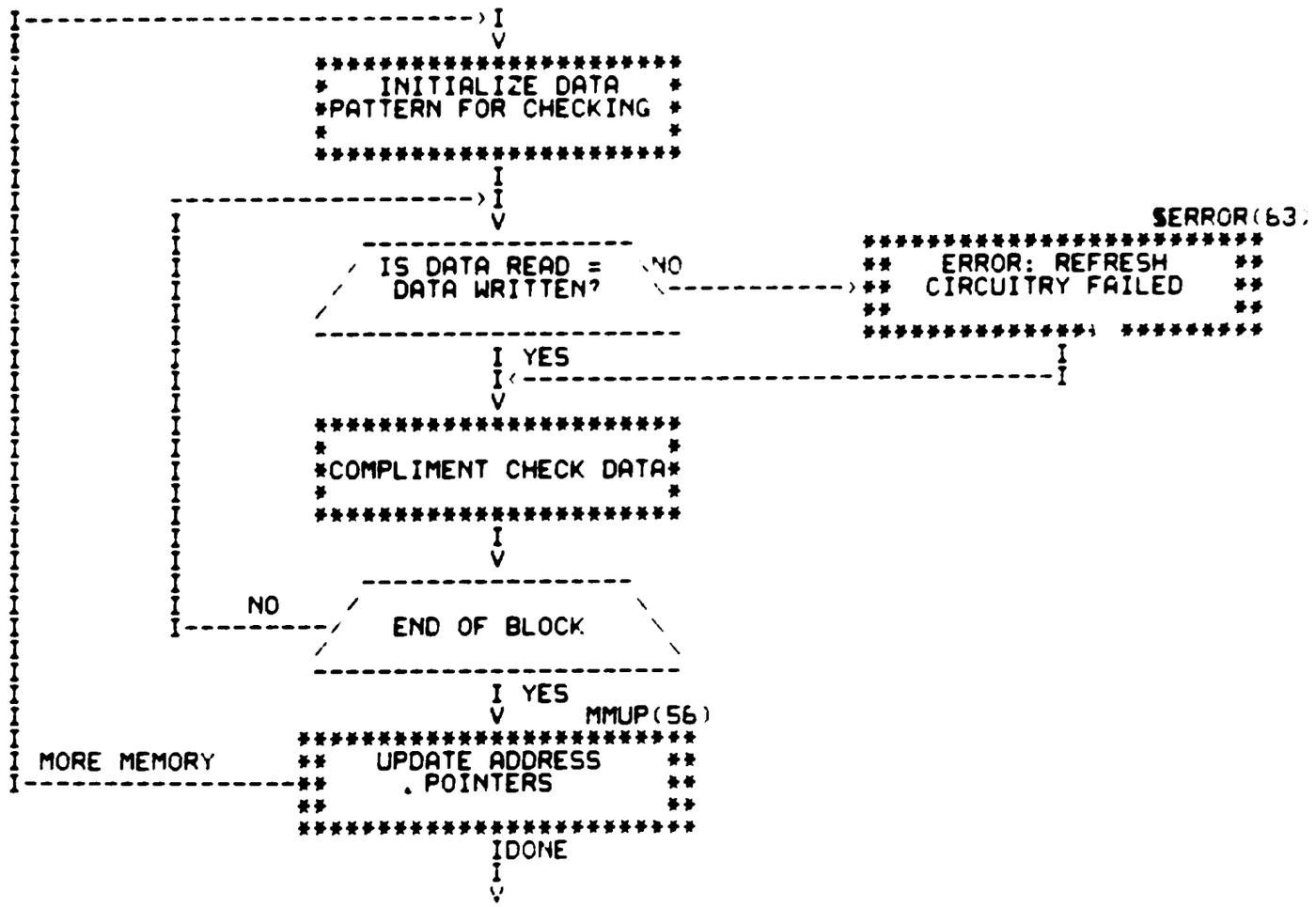

$MMUP
**MMUP: UPDATE ADDRESS POINTERS
IDONE
NO MORE MEMORY.
GO TO NEXT TEST.
PASS COUNT = 0 OR 3?
NO
I YES
DONE PASS?
NO
YES
I YES
INCREMENT PASS COUNTER
DONE FOUR PASSES ON A 4K?
YES
I NO
SWAP BYTES IN CHECK REGISTER
UPDATE TO NEXT ADDRESS

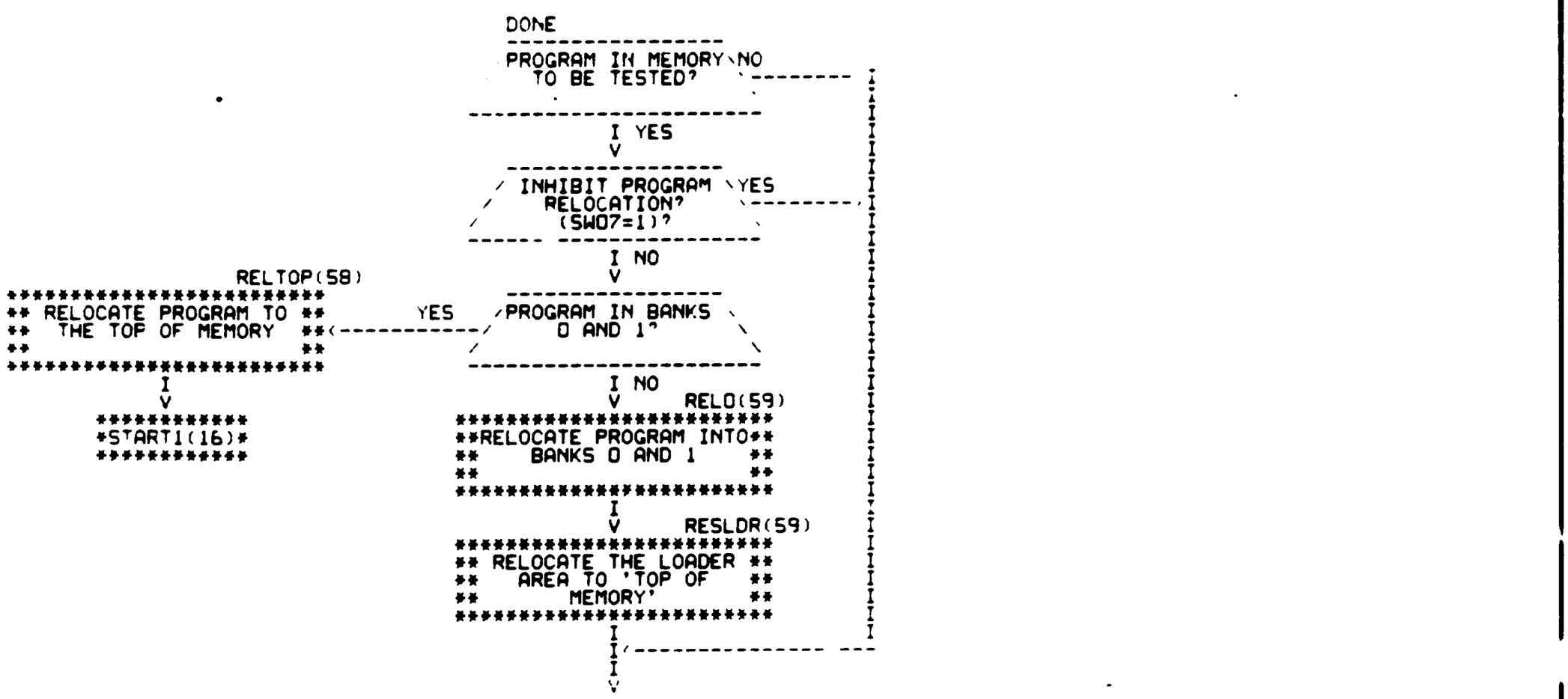

DONE A PASS?
YES
NO
INCREMENT PASS
COUNTER-SWAP BYTES IN
CHECK REGISTER
PASS COUNTE < =2?
NO
YES
RESET ADDRESS TO
BOTTOM OF 4K
$ERROR(63)
DATA READ = DATA
WRITTEN
NO
YES
ERROR: DATA READ DOES
NOT EQUAL DATA
WRITTEN
A
B

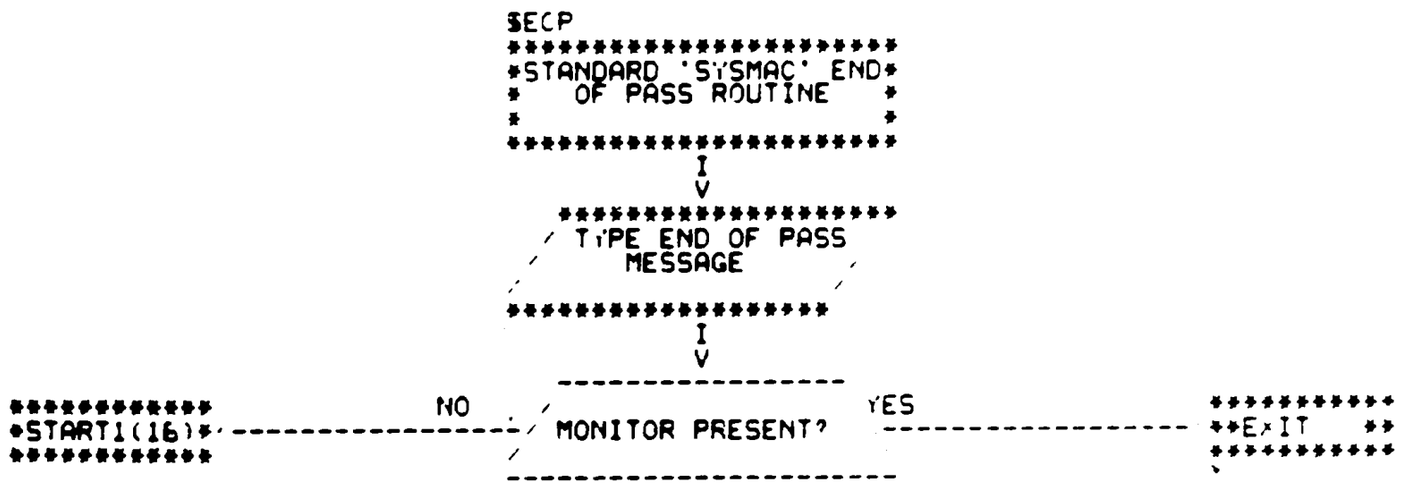

INITMM 55
INITIALIZE MEMORY ADDRESS POINTERS
SET UP DATA PATTERN TO BE WRITTEN STARTING WITH 125252
WRITE A WORD-COMPLIMENT THE DATA FOR NEXT WRITE
NO
END OF BLOCK?
YES
MMUP(56)
MORE MEMORY
UPDATE ADDRESS POINTERS
STALL FOR 2 SECONDS
INITMM(55)
INITIALIZE MEMORY ADDRESS POINTERS

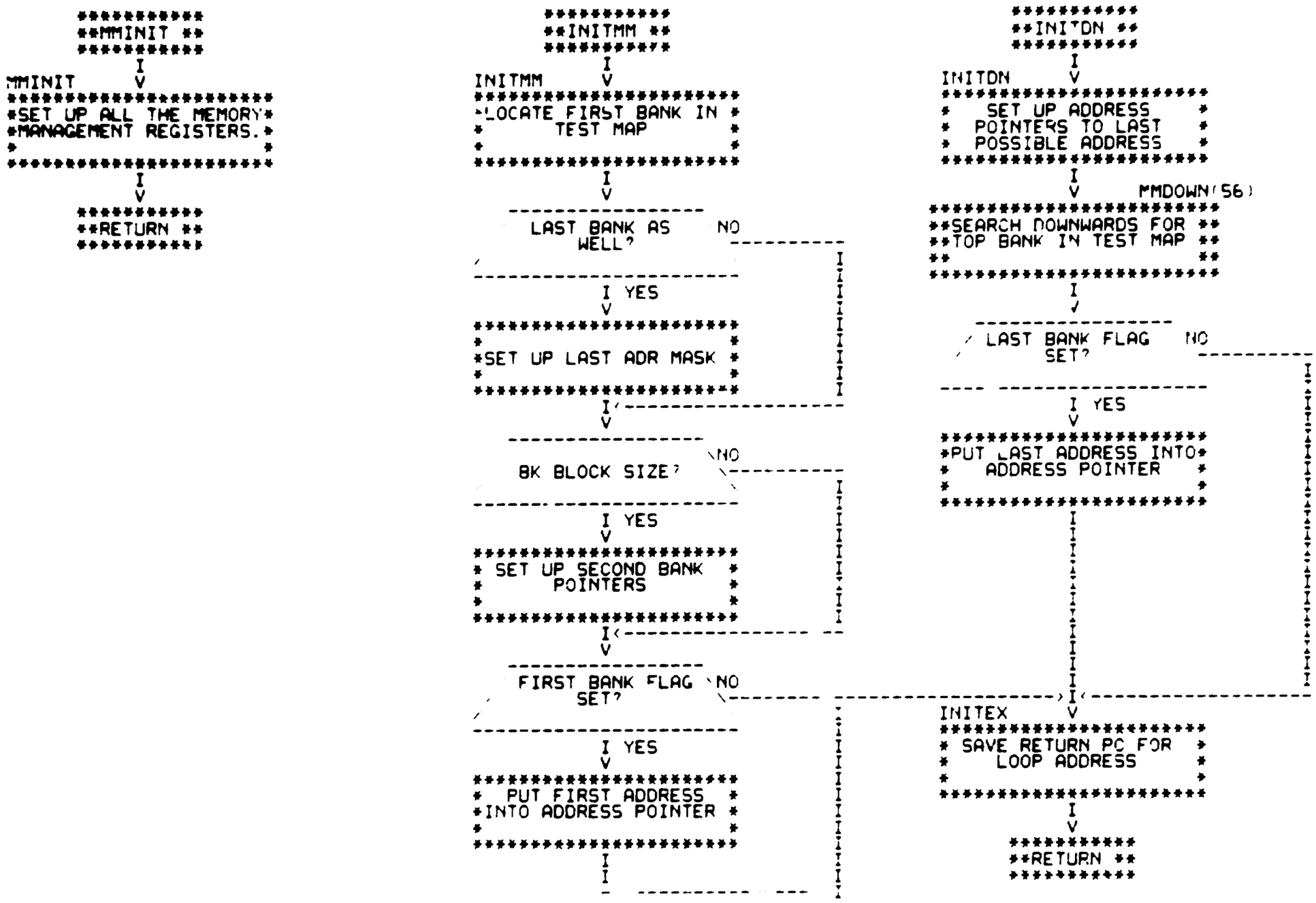

INITIALIZE DATA PATTERN FOR CHECKING
IS DATA READ = DATA WRITTEN?
NO
$ERROR(63,
ERROR: REFRESH CIRCUITRY FAILED
YES
COMPLIMENT CHECK DATA
END OF BLOCK
NO
YES
MMUP(56,
MORE MEMORY
UPDATE ADDRESS POINTERS
DONE

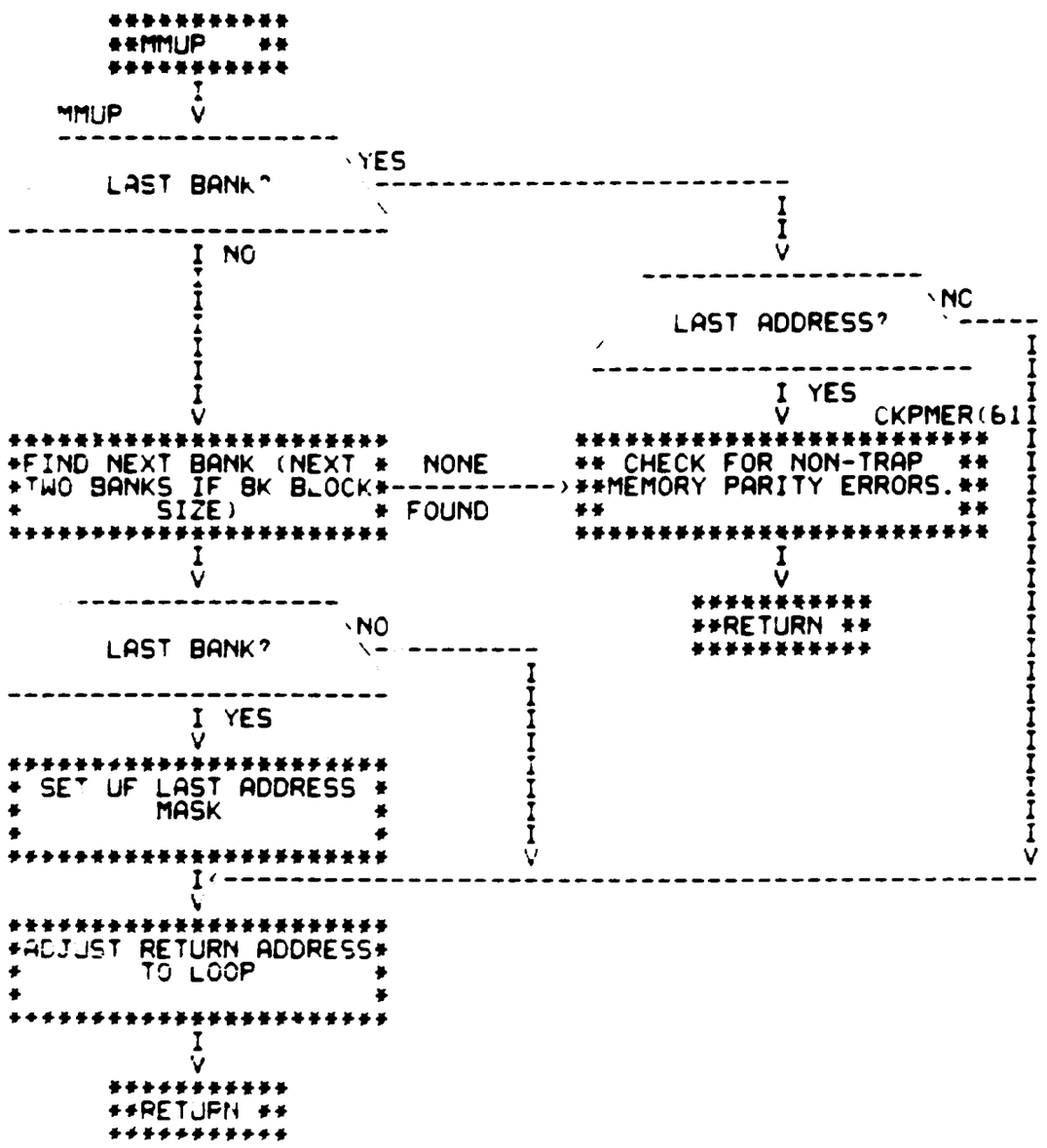

INITMM(55)
INITIALIZE MEMORY ADDRESS POINTERS
SET UP DATA PATTERN TO BE WRITTEN STARTING WITH 052525
WRITE A WORD-COMPLIMENT THE DATA FOR NEXT WRITE
NO
END OF BLOCK?
I YES
MMUP(56)
MORE MEMORY
UPDATE ADDRESS POINTERS
STALL FOR 2 SECONDS
INITMM(55)
INITIALIZE MEMORY ADDRESS POINTERS

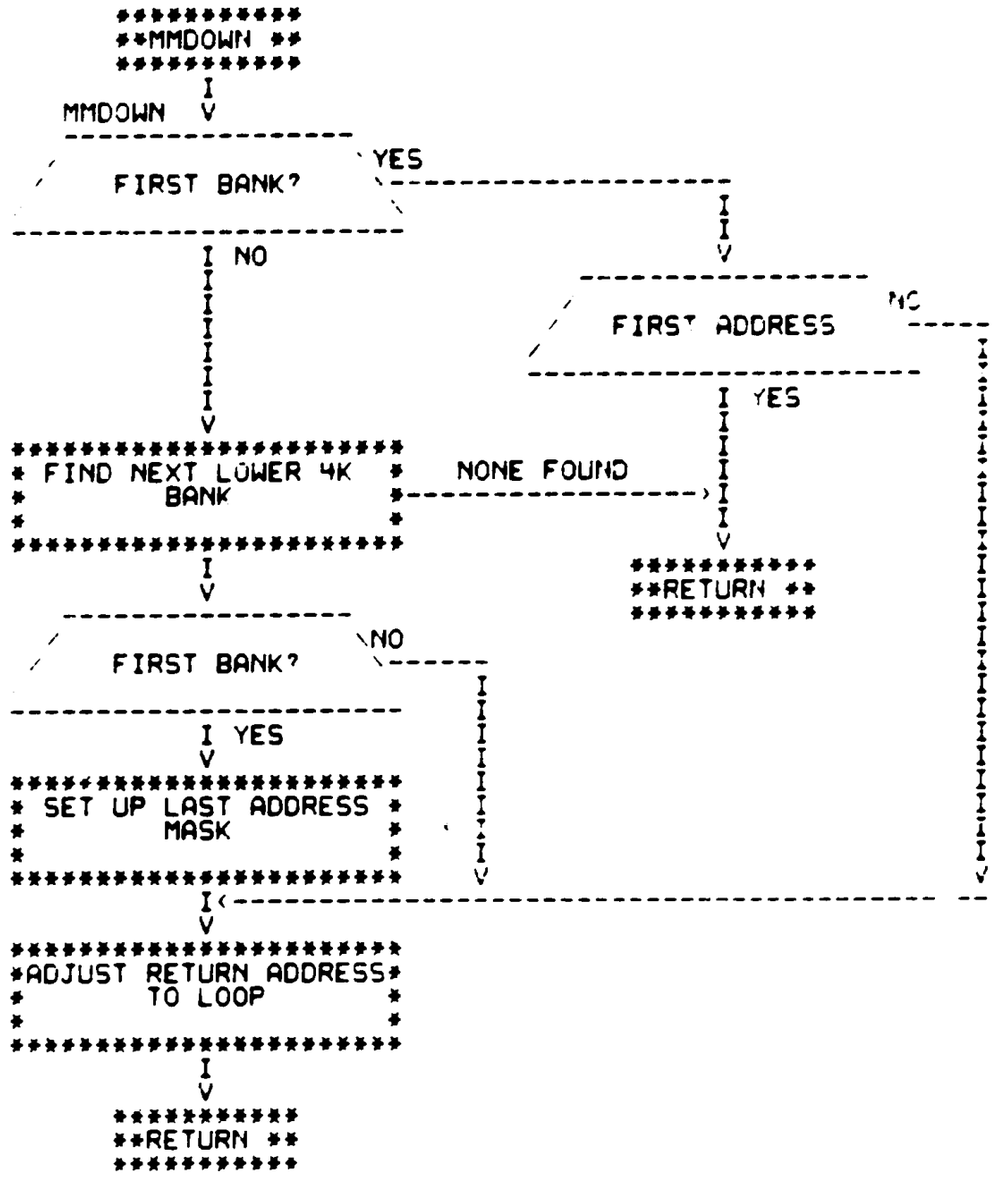

INITIALIZE DATA PATTERN FOR CHECKING
IS DATA READ = DATA WRITTEN?
NO
$ERROR(63,
ERROR: REFRESH CIRCUITRY FAILED
YES
COMPLIMENT CHECK DATA
END OF BLOCK
NO
YES
MMUP(56)
MORE MEMORY
UPDATE ADDRESS POINTERS
IDONE

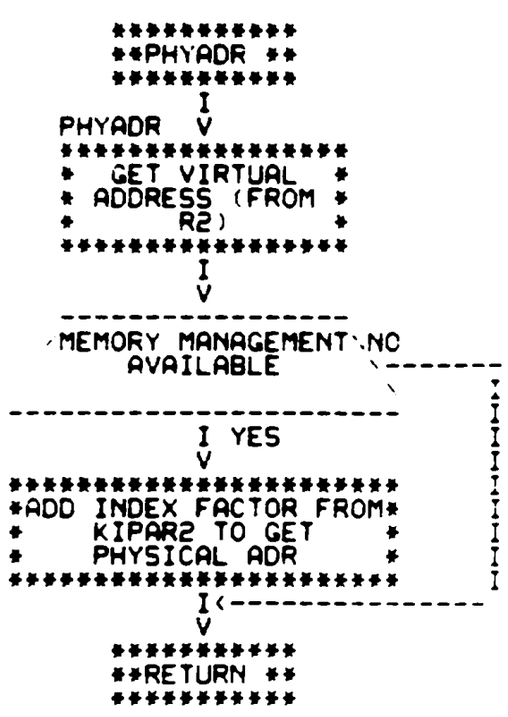

DONE
PROGRAM IN MEMORY TO BE TESTED?
NO
YES
INHIBIT PROGRAM RELOCATION? (SW07=1)?
YES
NO
PROGRAM IN BANKS 0 AND 1?
YES
NO
RELTOP(58)
RELOCATE PROGRAM TO THE TOP OF MEMORY
START1(16)
RELO(59)
RELOCATE PROGRAM INTO BANKS 0 AND 1
RESLDR(59)
RELOCATE THE LOADER AREA TO 'TOP OF MEMORY'

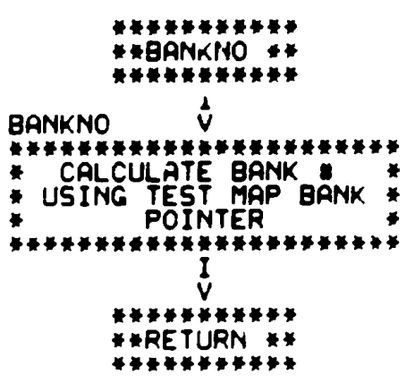

$ECP
STANDARD 'SYSMAC' END
* OF PASS ROUTINE *
TYPE END OF PASS MESSAGE
MONITOR PRESENT?
NO
YES
START1(16)
**EXIT **

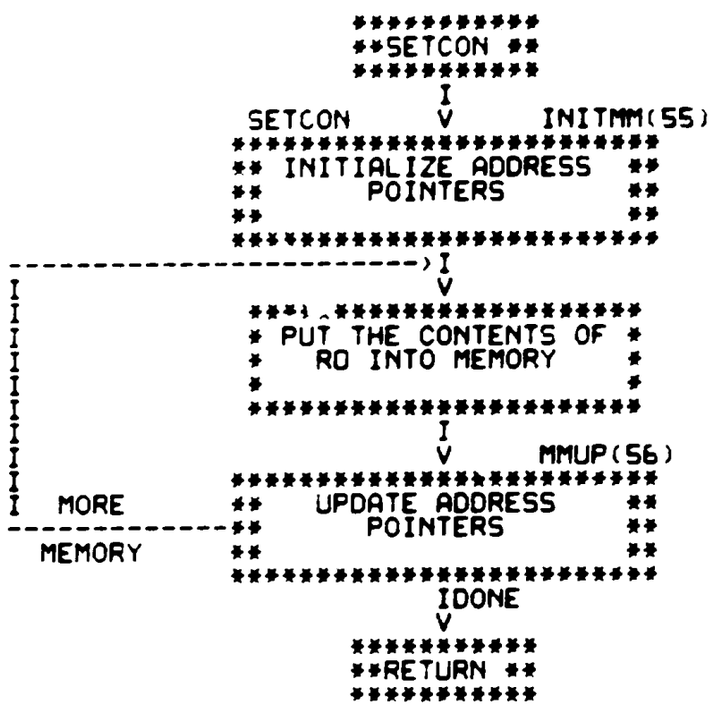

**MMINIT **
MMINIT
SET UP ALL THE MEMORY
MANAGEMENT REGISTERS.
**RETURN **
**INITMM **
INITMM
*LOCATE FIRST BANK IN *
* TEST MAP *
LAST BANK AS WELL?
NO
YES
*SET UP LAST ADR MASK *
8K BLOCK SIZE?
NO
YES
* SET UP SECOND BANK *
* POINTERS *
FIRST BANK FLAG SET?
NO
YES
* PUT FIRST ADDRESS *
*INTO ADDRESS POINTER *
**INITDN **
INITDN
* SET UP ADDRESS *
* POINTERS TO LAST *
* POSSIBLE ADDRESS *
MMDOWN(56)
**SEARCH DOWNWARDS FOR **
**TOP BANK IN TEST MAP **
LAST BANK FLAG SET?
NO
YES
PUT LAST ADDRESS INTO
* ADDRESS POINTER *
INITEX
* SAVE RETURN PC FOR *
* LOOP ADDRESS *
**RETURN **

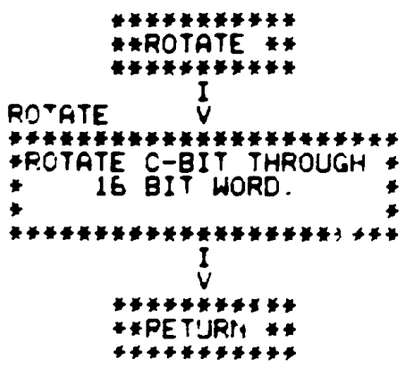

**MMUP **
MMUP
LAST BANK?
YES
NO
FIND NEXT BANK (NEXT TWO BANKS IF 8K BLOCK SIZE)
NONE FOUND
LAST BANK?
NO
YES
SET UP LAST ADDRESS MASK
LAST ADDRESS?
NO
YES
CKPMER(6)
** CHECK FOR NON-TRAP MEMORY PARITY ERRORS.**
**RETURN **
ADJUST RETURN ADDRESS TO LOOP
**RETURN **

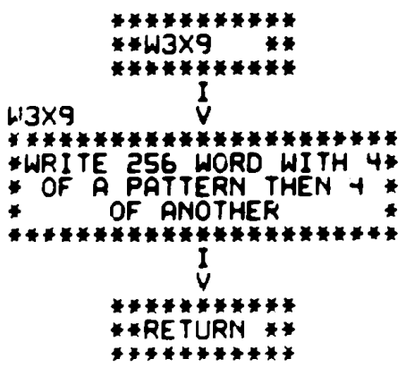

**MMDOWN **
MMDOWN
FIRST BANK?
YES
NO
FIND NEXT LOWER 4K BANK
NONE FOUND
FIRST BANK?
NO
YES
SET UP LAST ADDRESS MASK
FIRST ADDRESS
NO
YES
**RETURN **
ADJUST RETURN ADDRESS TO LOOP
**RETURN **

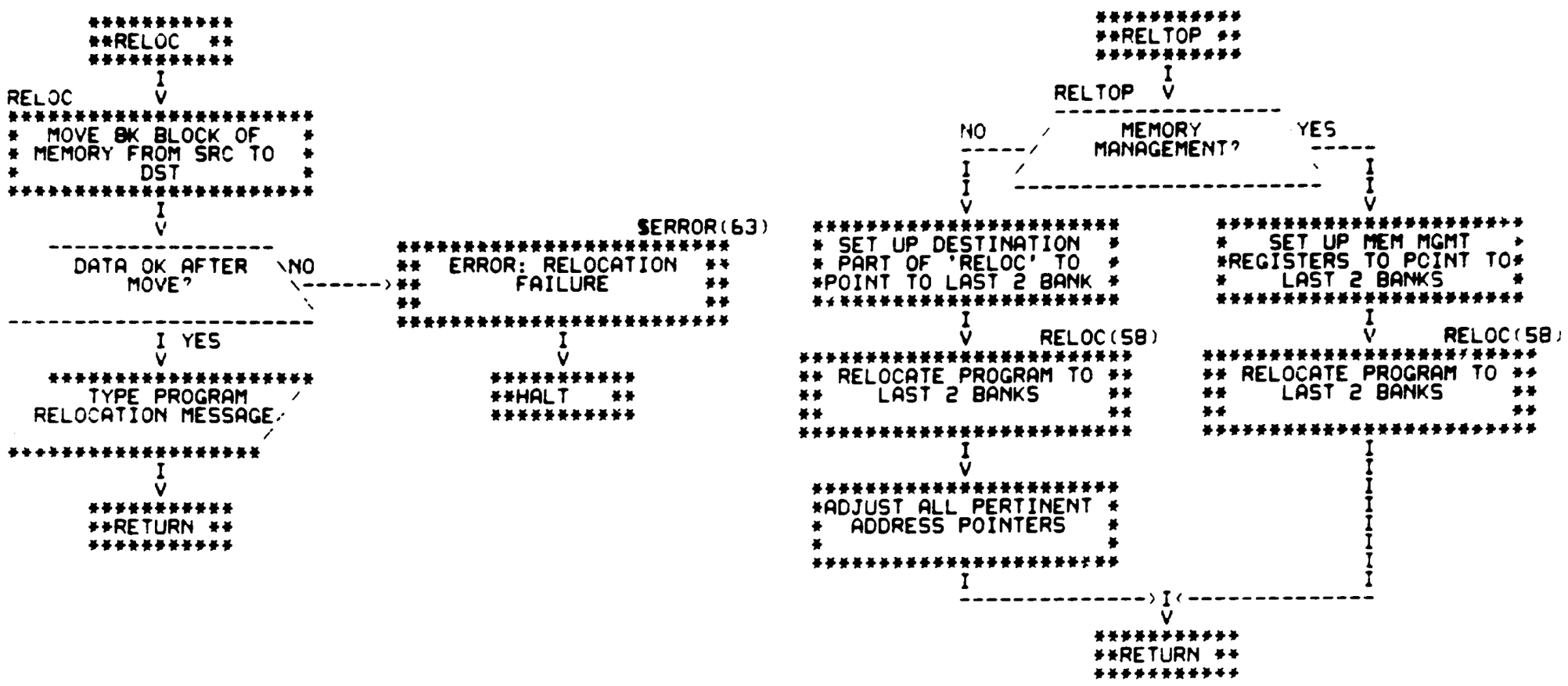

**PHYADR **
PHYADR
GET VIRTUAL ADDRESS (FROM R2)
MEMORY MANAGEMENT AVAILABLE
NO
YES
ADD INDEX FACTOR FROM KIPAR2 TO GET PHYSICAL ADR
**RETURN **

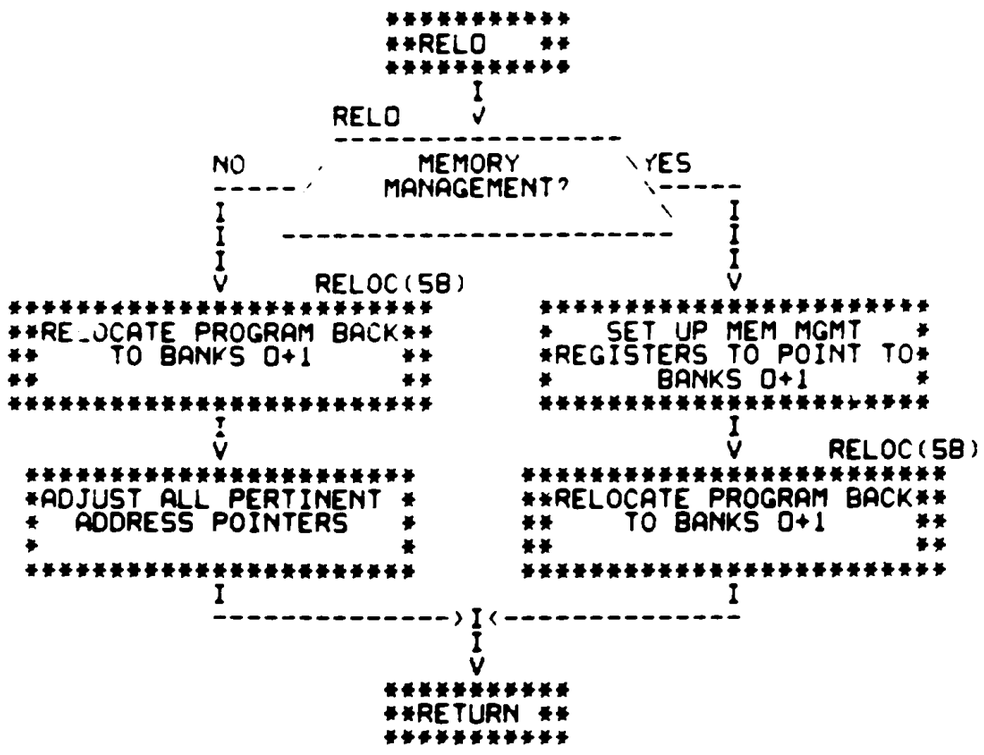

**BANKNO **
BANKNO
CALCULATE BANK # USING TEST MAP BANK POINTER
**RETURN **

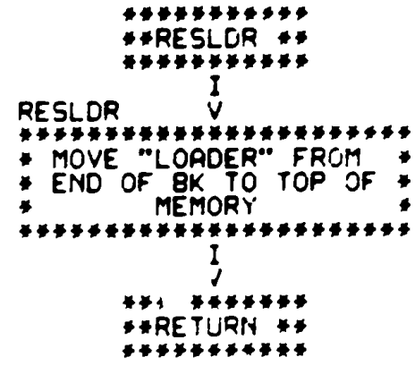

**SETCON **
SETCON
INITMM(55)
INITIALIZE ADDRESS POINTERS
PUT THE CONTENTS OF R0 INTO MEMORY
MMUP(56)
UPDATE ADDRESS POINTERS
MORE MEMORY
IDONE
**RETURN **

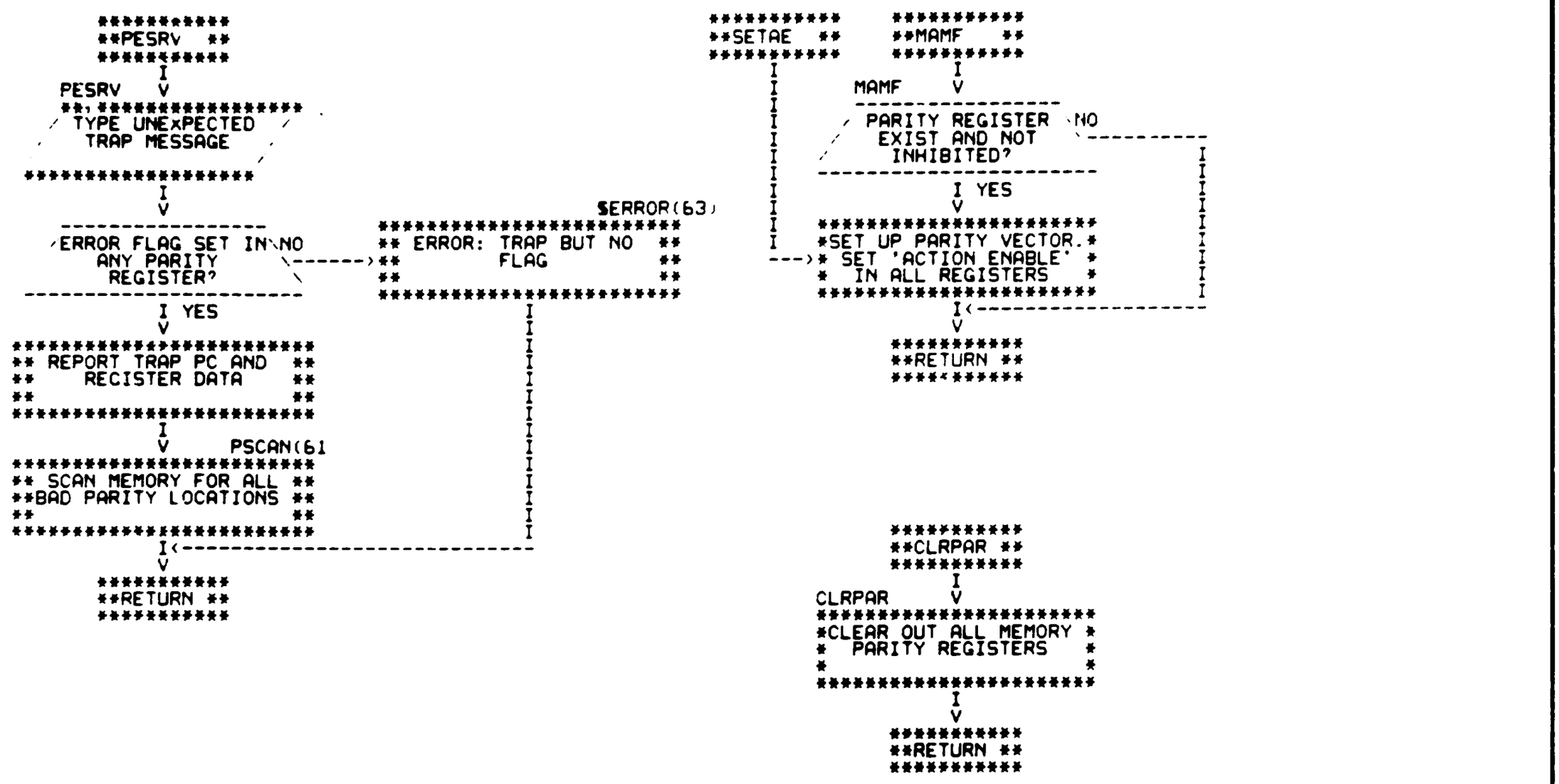

**ROTATE **
ROTATE
ROTATE C-BIT THROUGH 16 BIT WORD.
**RETURN **

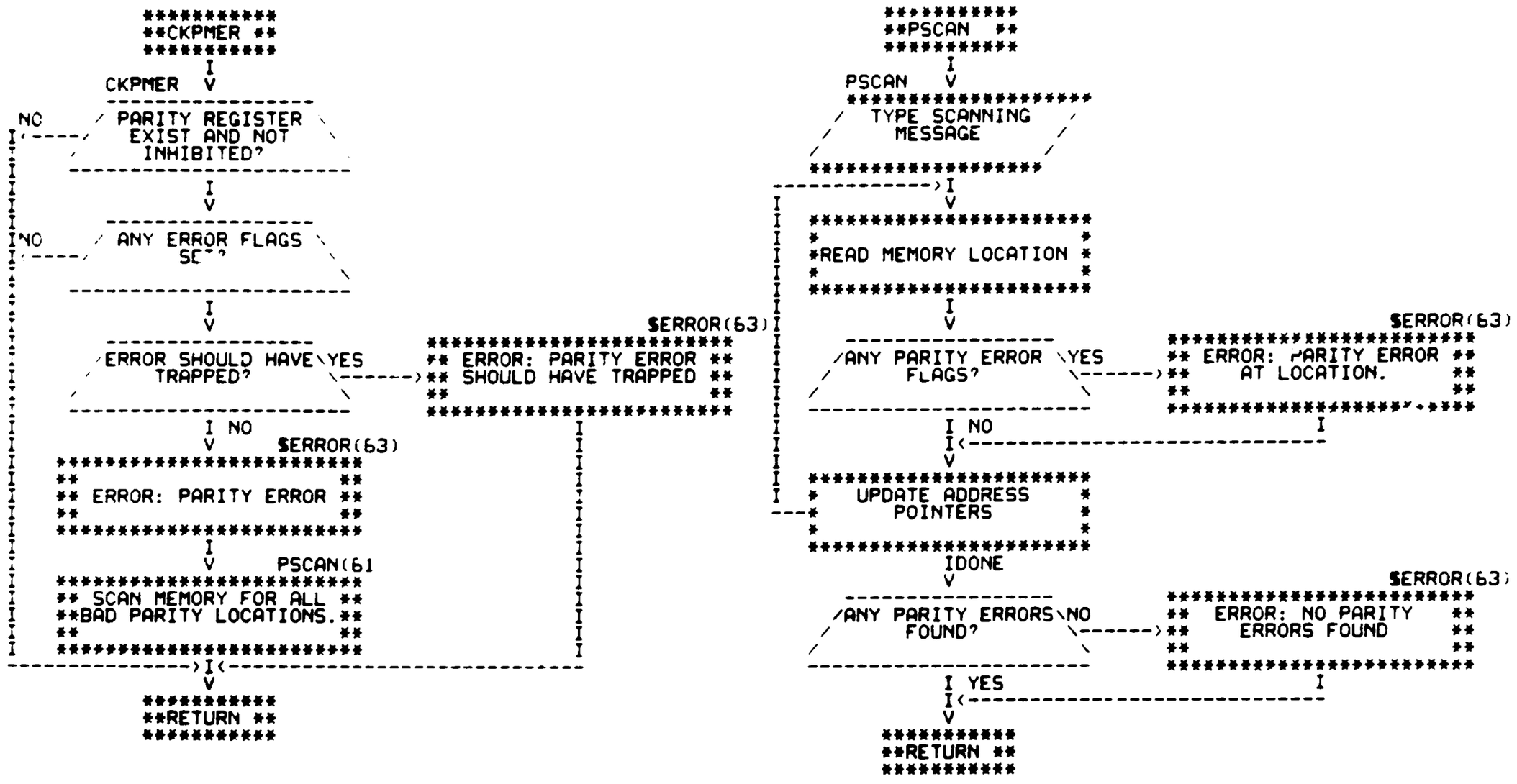

**W3X9 **
W3X9
WRITE 256 WORD WITH 4 OF A PATTERN THEN 4 OF ANOTHER
**RETURN **

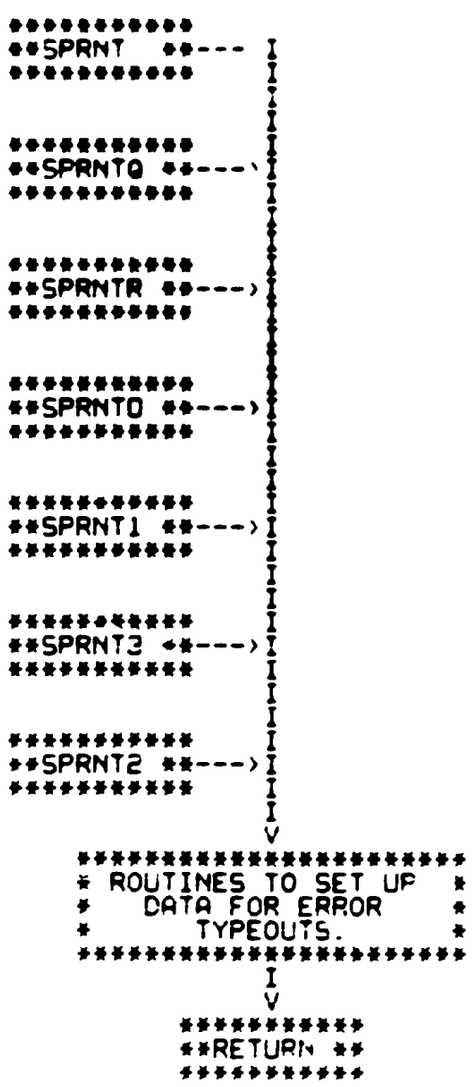

**RELOC **
RELOC
MOVE 8K BLOCK OF MEMORY FROM SRC TO DST
DATA OK AFTER MOVE?
NO
$ERROR(63)
** ERROR: RELOCATION FAILURE **
**HALT **
YES
TYPE PROGRAM RELOCATION MESSAGE
**RETURN **
**RELTOP **
RELTOP
MEMORY MANAGEMENT?
NO
YES
SET UP DESTINATION PART OF 'RELOC' TO POINT TO LAST 2 BANK
SET UP MEM MGMT REGISTERS TO POINT TO LAST 2 BANKS
RELOC(58)
RELOCATE PROGRAM TO LAST 2 BANKS
ADJUST ALL PERTINENT ADDRESS POINTERS
**RETURN **

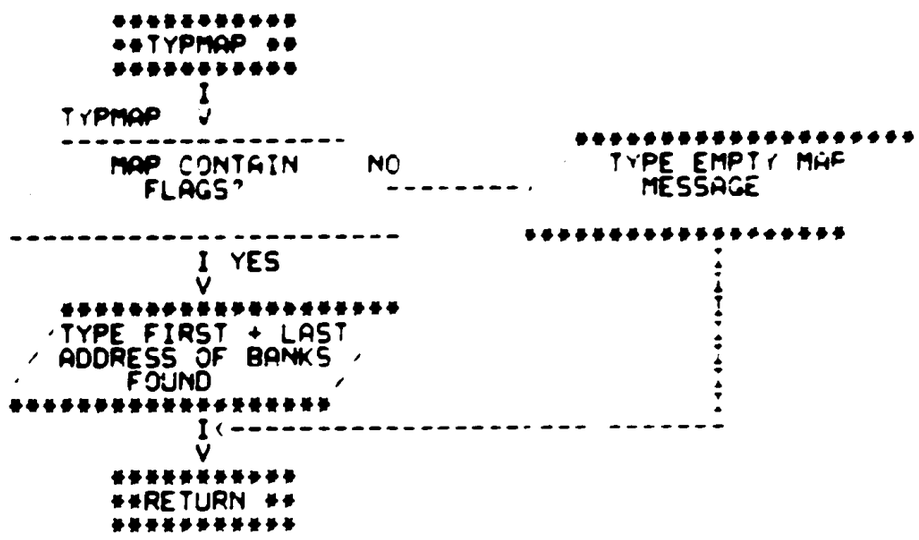

**RELO **
RELO
MEMORY MANAGEMENT?
NO
YES
RELOC(58)
RELOCATE PROGRAM BACK
** TO BANKS 0+1 **
*ADJUST ALL PERTINENT *
* ADDRESS POINTERS *
* SET UP MEM MGMT *
REGISTERS TO POINT TO
* BANKS 0+1 *
RELOC(58)
RELOCATE PROGRAM BACK
** TO BANKS 0+1 **
**RETURN **

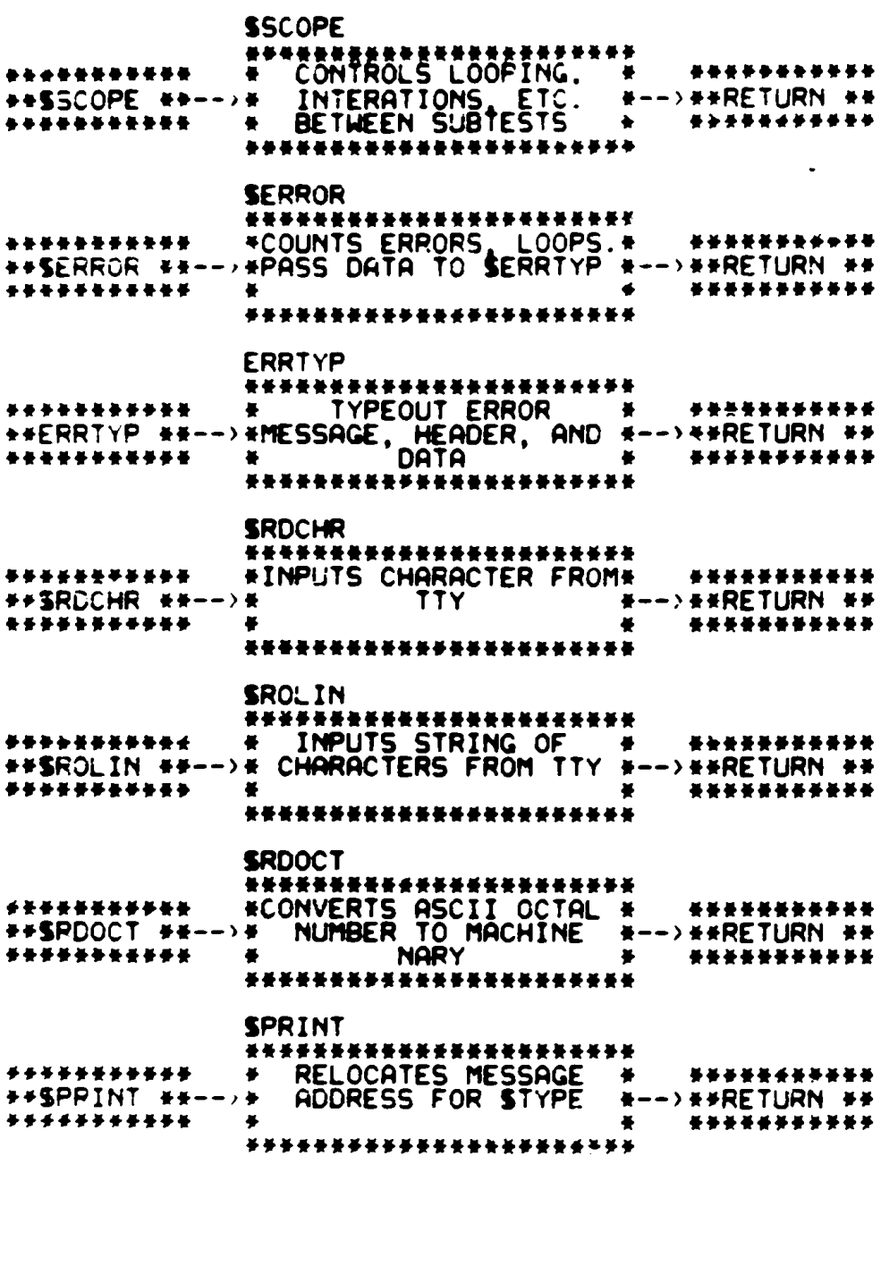

**RESLDR **
RESLDR
* MOVE "LOADER" FROM *
* END OF 8K TO TOP OF *
* MEMORY *
**RETURN **

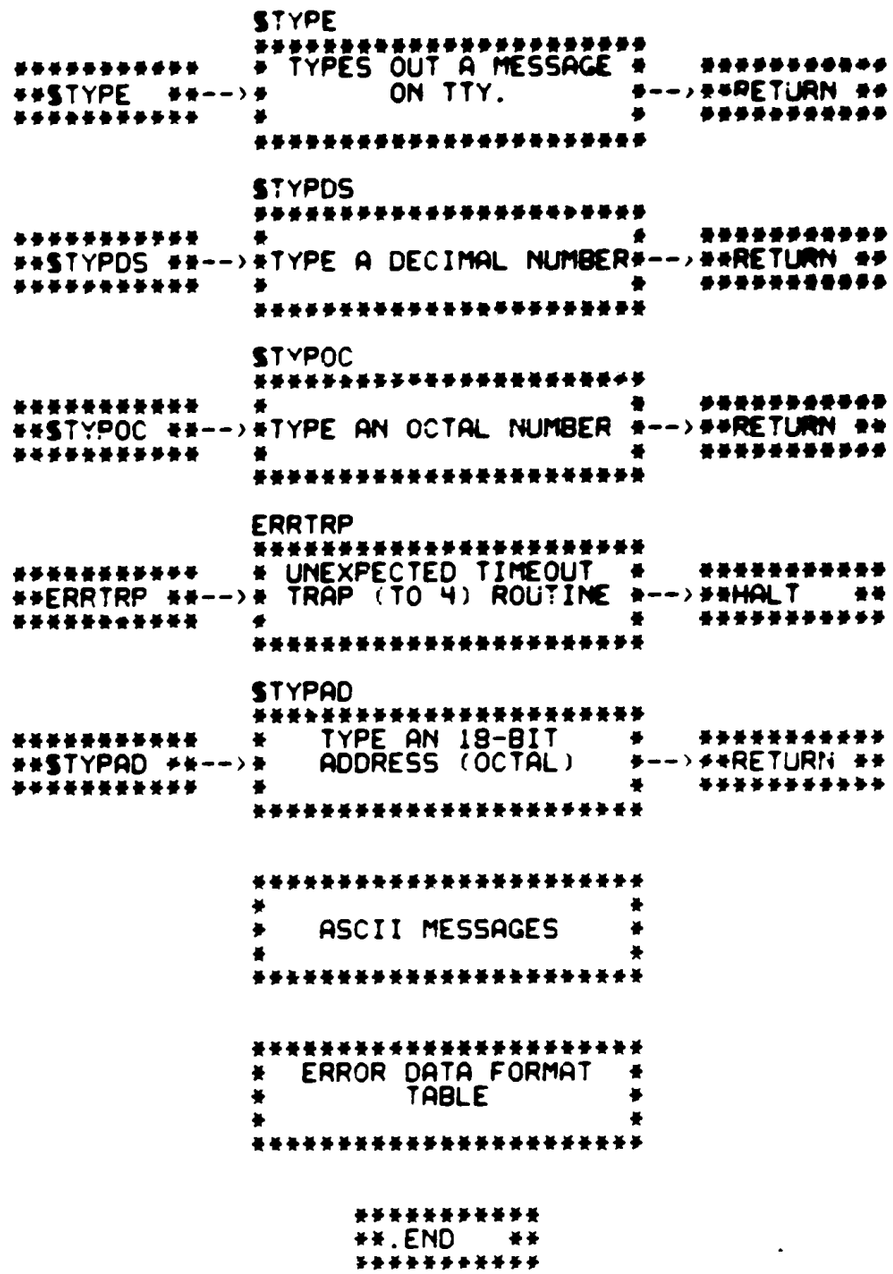

**PESRV **
PESRV
TYPE UNEXPECTED TRAP MESSAGE
ERROR FLAG SET IN ANY PARITY REGISTER?
NO
YES
$ERROR(63)
** ERROR: TRAP BUT NO FLAG **
** REPORT TRAP PC AND REGISTER DATA **
PSCAN(61
** SCAN MEMORY FOR ALL BAD PARITY LOCATIONS **
**RETURN **
**SETAE **
**MAMF **
MAMF
PARITY REGISTER EXIST AND NOT INHIBITED?
NO
YES
*SET UP PARITY VECTOR. * SET 'ACTION ENABLE' IN ALL REGISTERS *
**RETURN **
**CLRPAR **
CLRPAR
*CLEAR OUT ALL MEMORY PARITY REGISTERS *
**RETURN **


**CKPMER **
CKPMER
PARITY REGISTER EXIST AND NOT INHIBITED?
NO
ANY ERROR FLAGS SET?
NO
ERROR SHOULD HAVE TRAPPED?
YES
$ERROR(63)
** ERROR: PARITY ERROR **
** SHOULD HAVE TRAPPED **
NO
$ERROR(63)
** ERROR: PARITY ERROR **
PSCAN(61
** SCAN MEMORY FOR ALL **
BAD PARITY LOCATIONS.
**RETURN **
**PSCAN **
PSCAN
TYPE SCANNING MESSAGE
*READ MEMORY LOCATION *
ANY PARITY ERROR FLAGS?
YES
$ERROR(63)
** ERROR: PARITY ERROR **
** AT LOCATION. **
NO
* UPDATE ADDRESS POINTERS *
IDONE
ANY PARITY ERRORS FOUND?
NO
$ERROR(63)
** ERROR: NO PARITY ERRORS FOUND **
YES
**RETURN **


**SPRNT **
**SPRNTQ **
**SPRNTR **
**SPRNTO **
**SPRNT1 **
**SPRNT3 **
**SPRNT2 **
* ROUTINES TO SET UP *
* DATA FOR ERROR *
* TYPEOUTS. *
**RETURN **


**TYPMAP **
TYPMAP
MAP CONTAIN FLAGS?
NO
TYPE EMPTY MAP MESSAGE
YES
TYPE FIRST + LAST ADDRESS OF BANKS FOUND
**RETURN **


$SCOPE
CONTROLS LOOPING, ITERATIONS, ETC. BETWEEN SUBTESTS
**$SCOPE **
**RETURN **
$ERROR
COUNTS ERRORS, LOOPS. PASS DATA TO $ERRTYP
**$ERROR **
**RETURN **
ERRTYP
TYPEOUT ERROR MESSAGE, HEADER, AND DATA
**ERRTYP **
**RETURN **
$RDCHR
INPUTS CHARACTER FROM TTY
**$RDCHR **
**RETURN **
$ROLIN
INPUTS STRING OF CHARACTERS FROM TTY
**$ROLIN **
**RETURN **
$RDOCT
CONVERTS ASCII OCTAL NUMBER TO MACHINE BINARY
**$RDOCT **
**RETURN **
$PRINT
RELOCATES MESSAGE ADDRESS FOR $TYPE
**$PRINT **
**RETURN **


$TYPE
TYPES OUT A MESSAGE ON TTY.
**$TYPE **
**RETURN **
$TYPDS
TYPE A DECIMAL NUMBER
**$TYPDS **
**RETURN **
$TYPOC
TYPE AN OCTAL NUMBER
**$TYPOC **
**RETURN **
ERRTRP
UNEXPECTED TIMEOUT TRAP (TO 4) ROUTINE
**ERRTRP **
**HALT **
$TYPAD
TYPE AN 18-BIT ADDRESS (OCTAL)
**$TYPAD **
**RETURN **
ASCII MESSAGES
ERROR DATA FORMAT TABLE
**.END **

BANKNO	57#	57															
CKPMER	24	35	56	61#	61												
CLRPAR	60#	60															
CTRLS	14																
DONE	53																
ERRTRP	63	63#															
ERRTYP	63	63#															
EXIT	54																
GMPR	08	12	12														
GMPRA	12																
GMPRB	12																
GMPRC	12																
HALT	03	04	04	08	11	58	63										
INITDN	17	18	19	21	21	55#	55										
INITEX	55																
INITMM	17	18	19	20	20	22	23	24	25	26	27	27	28	29	29	30	31	31
	32	33	33	34	35	39	40	41	42	43	44	45	46	49	49	51	51	55#
	55	57																
MAMF	38	60#	60															
MANUAL	12	15#	15															
MANUL1	15																	
MANUL2	16																	
MAPRB	13																	
MAUT	40	41	42	43	44	45												
MMDOWN	17	18	19	21	21	55	56#	56										
MMINIT	09	53#	55															
MMUP	17	18	19	20	20	22	23	24	25	26	27	27	28	29	29	30	31	31
	32	33	33	34	38	39	40	41	42	43	44	45	49	50	51	52	56#	56
	57																	
PBTRP	36																	
PESRV	60#	60																
PHYADP	57#	57																
PSCAN	60	61	61#	61														
RELC	03	53	59#	59														
RELOC	58#	58	58	58	59	59												
RELTOP	53	58#	58															
RESCHK	14																	
RESLDR	03	53	59#	59														
REST1	02																	
REST2	02																	
RESTAR	02#	02	06															
RESTOR	02#																	
RETURN	04	40	41	42	43	44	45	55	55	56	56	56	56	57	57	57	57	57
	58	58	59	59	60	60	60	61	61	62	62	63	63	63	63	63	63	63
	63	63	63	63														
ROTATE	25	26	57#	57														
SELECT	06#																	
SETAE	35	60#																
SETCON	25	26	35	57#	57													
SPRNT	62#																	
SPRNTC	62#																	
SPRNTI	62#																	

SPRNT2	62#																	
SPRNT3	62#																	
SPRNTQ	62#																	
SPRNTR	62#																	
START	06#																	
START1	03	16#	16	53	54													
STARTA	02	06																
TIMOUT	09#																	
TMAP	13																	
TST1	17																	
TST11	25																	
TST12	26																	
TST13	27																	
TST14	29																	
TST15	31																	
TST16	33																	
TST17	35																	
TST2	18																	
TST20	35	39#	39															
TST21	40																	
TST22	41																	
TST23	42																	
TST24	43																	
TST25	44																	
TST26	45																	
TST27	46																	
TST3	19																	
TST4	20																	
TST5	21																	
TST6	22																	
TST7	23																	
TYPMAP	13	62#	62															
W3X9	27	29	31	33	57#	57												
WWPB1	35	35#	37															
WWPB2	36	36#	37															
WWPB3	37																	
WWPB4	36	36	37	37#														
WWPB5	35	35	37	37#														
WWPBT	35	35#	38															
$EOP	54																	
$ERROR	14	14	14	17	13	19	20	21	23	24	25	26	27	28	28	28	29	30
	30	30	31	32	32	32	33	34	34	34	36	36	36	36	36	37	37	37
	39	40	41	42	43	44	45	46	46	48	50	52	58	60	61	61	61	61
	63	63#																
$ILLUP	04#																	
$MMUP	47																	
$PRINT	04	09	10	10	15	63	63#											
$PWRDN	04#																	
$PWRUP	04#																	
$RDCHR	63	63#																
$RDOCT	15	15	63	63#														
$POLIN	63																	

	63#			
$SCOPE	63	63#		
$TYPAD	10	10	63	63#
$TYPDS	63	63#		
$TYPE	63	63#		
$TYPOC	63	63#		
.END	63			

```
        .TITLE  CZQMCF0  0-124K MEMORY EXERCISER, 16K VER
        ;*COPYRIGHT (C) 1975,1978
        ;*DIGITAL EQUIPMENT CORP.
        ;*MAYNARD, MASS. 01754
        ;*
        ;*PROGRAM BY BRUCE BURGESS/KEN CHAPMAN
        ;*
        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
        ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
        ;*

                                .SBTTL  OPERATIONAL SWITCH SETTINGS
                                ;*
                                ;*      SWITCH                  USE
                                ;*      ------          --------------------
                                ;*        15            HALT ON ERROR
                                ;*        14            LOOP ON TEST
                                ;*        13            INHIBIT ERROR TYPEOUTS
                                ;*        12            INHIBIT KT11 (AT START TIME ONLY)
                                ;*        11            INHIBIT ITERATIONS
                                ;*        10            BELL ON ERROR
                                ;*         9            LOOP ON ERROR
                                ;*         8            LOOP ON TEST IN SWR<4:0>
                                ;*         7            INHIBIT PROGRAM RELOCATION
                                ;*         6            INHIBIT PARITY ERROR DETECTION
                                ;*         5            INHIBIT EXRERCISING VECTOR AREA.
                                .SBTTL  BASIC DEFINITIONS

                                ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
        001100                  STACK=  1100
                                .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                                .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL

                                ;*MISCELLANEOUS DEFINITIONS
        000011                  HT=     11              ;;CODE FOR HORIZONTAL TAB
        000012                  LF=     12              ;;CODE FOR LINE FEED
        000015                  CR=     15              ;;CODE FOR CARRIAGE RETURN
        000200                  CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
        177776                  PS=     177776          ;;PROCESSOR STATUS WORD
                                .EQUIV  PS,PSW
        177774                  STKLMT= 177774          ;;STACK LIMIT REGISTER
        177772                  PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
        177570                  DSWR=   177570          ;;HARDWARE SWITCH REGISTER
        177570                  DDISP=  177570          ;;HARDWARE DISPLAY REGISTER

                                ;*GENERAL PURPOSE REGISTER DEFINITIONS
        000000                  R0=     %0              ;;GENERAL REGISTER
        000001                  R1=     %1              ;;GENERAL REGISTER
        000002                  R2=     %2              ;;GENERAL REGISTER
        000003                  R3=     %3              ;;GENERAL REGISTER
        000004                  R4=     %4              ;;GENERAL REGISTER
        000005                  R5=     %5              ;;GENERAL REGISTER
        000006                  R6=     %6              ;;GENERAL REGISTER
        000007                  R7=     %7              ;;GENERAL REGISTER
        000006                  SP=     %6              ;;STACK POINTER
```

```
                000007          PC=     %7              ;;PROGRAM COUNTER

                                ;*PRIORITY LEVEL DEFINITIONS
                000000          PR0=    0               ;;PRIORITY LEVEL 0
                000040          PR1=    40              ;;PRIORITY LEVEL 1
                000100          PR2=    100             ;;PRIORITY LEVEL 2
                000140          PR3=    140             ;;PRIORITY LEVEL 3
                000200          PR4=    200             ;;PRIORITY LEVEL 4
                000240          PR5=    240             ;;PRIORITY LEVEL 5
                000300          PR6=    300             ;;PRIORITY LEVEL 6
                000340          PR7=    340             ;;PRIORITY LEVEL 7

                                ;*"SWITCH REGISTER" SWITCH DEFINITIONS
                100000          SW15=   100000
                040000          SW14=   40000
                020000          SW13=   20000
                010000          SW12=   10000
                004000          SW11=   4000
                002000          SW10=   2000
                001000          SW09=   1000
                000400          SW08=   400
                000200          SW07=   200
                000100          SW06=   100
                000040          SW05=   40
                000020          SW04=   20
                000010          SW03=   10
                000004          SW02=   4
                000002          SW01=   2
                000001          SW00=   1
                                .EQUIV  SW09,SW9
                                .EQUIV  SW08,SW8
                                .EQUIV  SW07,SW7
                                .EQUIV  SW06,SW6
                                .EQUIV  SW05,SW5
                                .EQUIV  SW04,SW4
                                .EQUIV  SW03,SW3
                                .EQUIV  SW02,SW2
                                .EQUIV  SW01,SW1
                                .EQUIV  SW00,SW0

                                ;*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          BIT09=  1000
                000400          BIT08=  400
                000200          BIT07=  200
                000100          BIT06=  100
                000040          BIT05=  40
                000020          BIT04=  20
                000010          BIT03=  10
                000004          BIT02=  4
                000002          BIT01=  2
```

```
                        BIT00=  1
                        .EQUIV  BIT09,BIT9
                        .EQUIV  BIT08,BIT8
                        .EQUIV  BIT07,BIT7
                        .EQUIV  BIT06,BIT6
                        .EQUIV  BIT05,BIT5
                        .EQUIV  BIT04,BIT4
                        .EQUIV  BIT03,BIT3
                        .EQUIV  BIT02,BIT2
                        .EQUIV  BIT01,BIT1
                        .EQUIV  BIT00,BIT0

                        ;*BASIC "CPU" TRAP VECTOR ADDRESSES
000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
000014                  TBITVEC=14              ;;"T" BIT
000014                  TRTVEC= 14              ;;TRACE TRAP
000014                  BPTVEC= 14              ;;BREAKPOINT TRAP (BPT)
000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
000024                  PWRVEC= 24              ;;POWER FAIL
000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
000034                  TRAPVEC=34              ;;"TRAP" TRAP
000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
000240                  PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR

                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS

                        ;*KT11 VECTOR ADDRESS

000250                  MMVEC=  250

                        ;*KT11 STATUS REGISTER ADDRESSES

177572                  SR0=    177572
177574                  SR1=    177574
177576                  SR2=    177576
172516                  SR3=    172516

                        ;*KERNEL "I" PAGE DESCRIPTOR REGISTERS

172300                  KIPDR0= 172300
172302                  KIPDR1= 172302
172304                  KIPDR2= 172304
172306                  KIPDR3= 172306
172310                  KIPDR4= 172310
172312                  KIPDR5= 172312
172314                  KIPDR6= 172314
172316                  KIPDR7= 172316

                        ;*KERNEL "I" PAGE ADDRESS REGISTERS

172340                  KIPAR0= 172340
172342                  KIPAR1= 172342
172344                  KIPAR2= 172344
```

```
                 172346                 KIPAR3= 172346
                 172350                 KIPAR4= 172350
                 172352                 KIPAR5= 172352
                 172354                 KIPAR6= 172354
                 172356                 KIPAR7= 172356

                 000000                 UP = 0                  ;CODE FOR UPWARDS MAP IN MEM MGMT PDR'S
                 000006                 RW = 6                  ;CODE FOR READ/WRITE IN MEM MGMT PDR'S

                                        ;*  PARITY MEMORY DEFINITIONS.
                 000001                 AE=1                            ;PARITY ACTION ENABLE
                 000114                 PARVEC=114                      ;PARITY TRAP VECTOR

                                        ;*  MISCELLANEOUS ASSIGNMENTS
                 017777                 MASK4K= 17777                   ;MASK FOR 4K ADDRESS BANK BOUNDRY.

                                        ;* CACHE REGISTER DEFINITIONS.
                 177746                 IMPCHE= 177746

                                        .SBTTL  TRAP CATCHER

                 000000                         .=0
                                        ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
                                        ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                        ;*LOCATION 0 CONTAIN 0 TO CATCH IMPROPERLY LOADED VECTORS
                 000174                         .=174
000174  000000                         DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
000176  000000                         SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
                                        .SBTTL  STARTING ADDRESS(ES)
000200  000137  002640                         JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM
000204  000167  002436                         JMP     SELECT          ;STARTING ADDRESS TO ALLOW THE OPERATOR TO
                                                                        ;SELECT VARIOUS PARAMETERS.
000210  000167  000064                         JMP     RESTAR          ;RESTART ADDRESS, USING PREVIOUS PARAMETERS.
000214  000167  000064                         JMP     RESTOR          ;RESTORE LOADERS TO END OF MEMORY AND HALT.
000220  000167  003376                         JMP     TIMOUT          ;TYPE OUT MEMORY MAP, BYTE BY BYTE.

                 000004                         .=ERRVEC
000004  025114                         .WORD   ERRTRP
000006  000000                         .WORD   0

                                    .SBTTL  ACT11 HOOKS

                                    ;;**********************************************************
                                    ;HOOKS REQUIRED BY ACT11
                 000010                         $SVPC=.                 ;SAVE PC
                 000046                         .=46
000046  014222                         $ENDAD                          ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .SEOP
                 000052                         .=52
000052  040000                         .WORD   BIT14                   ;;2)SET LOC.52 TO BIT14
                 000010                         .=$SVPC                 ;; RESTORE PC
```

```
                    000300                          .=300
                                                    ;;*****************************************************************
                                                    ;*  THE FOLLOWING ROUTINES ARE LOCATED IN THE VECTOR AREA (0-1000) SO THAT
                                                    ;*   THEY CAN BE PROTECTED BY SELECTING SW05 (SEE DOCUMENT FOR USE OF SW05..
                                                    ;*   THE CODE CAN ALSO BE RUN FROM ANY BANK OF MEMORY, ASSUMING MEMORY
                                                    ;*   MANAGEMENT IS DISABLED BY "CONSOLE START".
                                                    ;*****************************************************************
000300  005005                          RESTAR: CLR     R5              ;CLEAR FLAG TO INDICATE RESTART.
000302  000401                                  BR      REST1           ;GO RESTORE PROGRAM BEFORE RESTARTING.
000304  010705                          RESTOR: MOV     PC,     R5      ;PUT DATA INTO FLAG FOR RESTORE.
000306  012706  001100                  REST1:  MOV     #STACK, SP      ;SET UP THE STACK POINTER.
000312  005767  001206                          TST     MEMMAP          ;CHECK IF THE MEMORY HAS BEEN MAPPED.
000316  001002                                  BNE     REST2           ;BR IF MEMORY MAPPED.
000320  000167  002330                          JMP     START           ;GO START
000324  005767  000256                  REST2:  TST     MMAVA           ;CHECK IF MEM MGMT AVAILABLE.
000330  001470                                  BEQ     10$             ;BR IF NO MEM MGMT.
000332  032737  000001  177572                  BIT     #BIT0,  @#SR0   ;CHECK IF MEM MGMT ACTIVE.
000340  001034                                  BNE     2$              ;BR IF MEM MGMT ALREADY SET UP.
000342  012700  172300                          MOV     #KIPDR0,R0      ;POINT TO FIRST MEM MGMT DDATA REG
000346  012701  000010                          MOV     #8.,    R1      ;SET UP COUNTER.
000352  012720  077406                  1$:     MOV     #077406,(R0)+   ;MAP FIRST 28K 1-FOR-1.
000356  005301                                  DEC     R1              ;COUNT REGESTERS.
000360  001374                                  BNE     1$              ;BR IF MORE REG.
000362  012700  172340                          MOV     #KIPAR0,R0      ;POINT TO FIRST MEM MGMT ADDRESS REG.
000366  005020                                  CLR     (R0)+           ;PAR0 MAPPED INTO BANK0.
000370  012720  000200                          MOV     #200,   (R0)+   ;PAR1 MAPPED INTO BANK1.
000374  012720  000400                          MOV     #400,   (R0)+   ;PAR2 MAPPED INTO BANK2.
000400  012720  000600                          MOV     #600,   (R0)+   ;PAR3 MAPPED INTO BANK3.
000404  012720  001000                          MOV     #1000,  (R0)+   ;PAR4 MAPPED INTO BANK4.
000410  012720  001200                          MOV     #1200,  (R0)+   ;PAR5 MAPPED INTO BANK5.
000414  012720  001400                          MOV     #1400,  (R0)+   ;PAR6 MAPPED INTO BANK6.
000420  012720  007600                          MOV     #7600,  (R0)+   ;PAR7 MAPPED INTO BANK37.
000424  012737  000001  177572                  MOV     #BIT0,  @#SR0   ;ENABLE MEM MGMT.
000432  005000                          2$:     CLR     R0              ;INIT TEMP PAR REG.
000434  016701  000142                          MOV     PRGMAP, R1      ;GET THE PROGRAM MAP...LO 64K.
000440  016702  000140                          MOV     PRGMAP+2,R2     ;...HI 64K.
000444  006202                          3$:     ASR     R2              ;SHIFT THE MAP POINTER...HI
000446  006001                                  ROR     R1              ;...LO.
000450  103404                                  BCS     4$              ;BR WHEN FIRST BANK FOUND.
000452  062700  000200                          ADD     #200,   R0      ;UPDATE TMP PAR TO NEXT BANK.
000456  100372                                  BPL     3$              ;BR IF MORE.
000460  000000                                  HALT                    ;FATAL ERROR!!!  MAP EMPTY?
000462  010037  172340                  4$:     MOV     R0,     @#KIPAR0 ;PUT TEMP PAR INTO FIRST PAR.
000466  000137  000472                          JMP     @#5$            ;JUMP INTO PROGRAM IF NOT THERE ALREADY.
000472  062700  000200                  5$:     ADD     #200,   R0      ;KEEP UPDATING TEMP PAR REG.
000476  006202                                  ASR     R2              ;SHIFT POINTER...HI
000500  006001                                  ROR     R1              ;...LO
000502  103373                                  BCC     5$              ;BR IF TOP BANK NOT YET FOUND.
000504  010037  172342                          MOV     R0,     @#KIPAR1 ;SET UP SECOND PROGRAM ANK POINTER.
000510  000410                                  BR      20$             ;BR TO RELOCATE SECTION.
000512  016700  000062                  10$:    MOV     RELOCF, R0      ;GET RELOCATION FACTOR.
000516  062700  001100                          ADD     #STACK, R0      ;SET UP STACK POINTER.
000522  010006                                  MOV     R0,     SP      ;SET STACK TO RELOCATE PROGRAM.
000524  062700  177432                          ADD     #20$-STACK,R0   ;ADJUST R0 TO RELOCATED "20$" ADDRESS.
000530  000110                                  JMP     (R0)            ;GO TO "20$" (RELOCATED).
000532  022767  000003  000042  20$:     CMP     #3.     PRGMAP  ;CHECK IF PROGRAM IS IN BANKS 0 AND 1.
```

```
  275  000540  001402                    BEQ     21$             ;BR IF IN BANKS 0 AND 1.
  276  000542  004767  016314            JSR     PC,     RELO    ;RELOCATE THE PROGRAM BACK TO BANKS 0 AND 1.
  277  000546  005705            21$:    TST     R5              ;CHECK RESTART/RESTORE FLAG.
  278  000550  001006                    BNE     22$             ;BR IF RESTORE.
  279  000552  005067  000412            CLR     $TIMES          ;CLEAN UP BEFORE STARTING.
  280  000556  105067  000320            CLRB    $TSTNM
  281  000562  000167  005316            JMP     START1          ;RESTART WITH PREVIOUSLY SELECTED PARAMETERS.
  282  000566  004767  016476    22$:    JSR     PC,     RESLDR  ;RESTORE THE LOADERS TO THE "TOP" OF MEMORY.
  283  000572  000000                    HALT                    ;HALT AFTER RESTORING THE LOADERS.
  284  000574  000167  002054            JMP     START           ;CONTINUE WILL RESTART THE PROGRAM.
  285                              ;* THE FOLLOWING LOCATIONS ARE USED BY THE ABOVE ROUTINE AND MUST BE LOCATED
  286                              ;*  BELOW 1000 TO INSURE CORRECT OPERATION UNDER THE WIDEST VARIETY OF
  287                              ;*  CIRCUMSTANCES.
  288  000600  000000            RELOCF: .WORD   0               ;CONTAINS RELOCATION FACTOR (NO MEM MGMT)
  289  000602  000000  000000    PRGMAP: .WORD   0,0             ;PROGRAM MAP - WHERE THE PROGRAM IS LOCATED
  290  000606  000000            MMAVA:  .WORD   0               ;MEMORY MANAGEMENT AVAILABLE FLAG.
```

```
                                .SBTTL  POWER DOWN AND UP ROUTINES

                                ;;*****************************************************************
                                ;POWER DOWN ROUTINE
000610  012737  000756  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
000616  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
000624  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
000626  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
000630  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
000632  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
000634  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
000636  010546                        MOV     R5,-(SP)        ;;PUSH R5 ON STACK
000640  017746  000274                MOV     @SWR,-(SP)      ;;PUSH @SWR ON STACK
000644  010667  000112                MOV     SP,$SAVR6       ;;SAVE SP
000650  012737  000662  000024        MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
000656  000000                        HALT
000660  000776                        BR      .-2             ;;HANG UP

                                ;;*****************************************************************
                                ;POWER UP ROUTINE
000662  012737  000756  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
000670  016706  000066                MOV     $SAVR6,SP       ;;GET SP
000674  005067  000062                CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
000700  005267  000056          1$:   INC     $SAVR6          ;;WAIT FOR THE INC
000704  001375                        BNE     1$              ;;OF  WORD
000706  012677  000226                MOV     (SP)+,@SWR      ;;POP STACK INTO @SWR
000712  012605                        MOV     (SP)+,R5        ;;POP STACK INTO R5
000714  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
000716  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
000720  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
000722  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
000724  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
000726  012737  000610  000024        MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
000734  012737  000340  000026        MOV     #340,@#PWRVEC+2 ;;PRIO:7
000742  004567  022544                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
000746  025641                $PWRMG: .WORD   PWRMSG          ;;POWER FAIL MESSAGE POINTER
000750  012716                        MOV     (PC)+,(SP)      ;;RESTART AT RESTART
000752  000300                $PWRAD: .WORD   RESTART         ;;RESTART ADDRESS
000754  000002                        RTI
000756  000000                $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
000760  000776                        BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
000762  000000                $SAVR6: 0                       ;;PUT THE SP HERE
```

```
                                .SBTTL  COMMON TAGS

                                ;;*****************************************************************
                                ;*THIS TABLE CONTAINS VARIOUS COMMON STORAGE LOCATIONS
                                ;*USED IN THE PROGRAM.

                        001100                  .=1100
001100                  $CMTAG:                                 ;;START OF COMMON TAGS
001100  000000                  .WORD   0
001102     000          $TSTNM: .BYTE   0                       ;;CONTAINS THE TEST NUMBER
001103     000          $ERFLG: .BYTE   0                       ;;CONTAINS ERROR FLAG
001104  000000          $ICNT:  .WORD   0                       ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000          $LPADR: .WORD   0                       ;;CONTAINS SCOPE LOOP ADDRESS
001110  000000          $LPERR: .WORD   0                       ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000          $ERTTL: .WORD   0                       ;;CONTAINS TOTAL ERRORS DETECTED
001114     000          $ITEMB: .BYTE   0                       ;;CONTAINS ITEM CONTROL B.TE
001115     001          $ERMAX: .BYTE   1                       ;;CONTAINS MAX. ERRORS PER TEST
001116  000000          $ERRPC: .WORD   0                       ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000          $GDADR: .WORD   0                       ;;CONTAINS ADDRESS OF 'GOOD' DATA
001122  000000          $BDADR: .WORD   0                       ;;CONTAINS ADDRESS OF 'BAD' DATA
001124  000000          $GDDAT: .WORD   0                       ;;CONTAINS 'GOOD' DATA
001126  000000          $BDDAT: .WORD   0                       ;;CONTAINS 'BAD' DATA
001130  000000                  .WORD   0                       ;;RESERVED--NOT TO BE USED
001132  000000                  .WORD   0
001134     000          $AUTOB: .BYTE   0                       ;;AUTOMATIC MODE INDICATOR
001135     000          $INTAG: .BYTE   0                       ;;INTERRUPT MODE INDICATOR
001136  000000                  .WORD   0
001140  177570          SWR:    .WORD   DSWR                    ;;ADDRESS OF SWITCH REGISTER
001142  177570          DISPLAY: .WORD  DDISP                   ;;ADDRESS OF DISPLAY REGISTER
001144  177560          $TKS:   177560                          ;;TTY KBD STATUS
001146  177562          $TKB:   177562                          ;;TTY KBD BUFFER
001150  177564          $TPS:   177564                          ;;TTY PRINTER STATUS REG. ADDRESS
001152  177566          $TPB:   177566                          ;;TTY PRINTER BUFFER REG. ADDRESS
001154     000          $NULL:  .BYTE   0                       ;;CONTAINS NULL CHARACTER FOR FILLS
001155     002          $FILLS: .BYTE   2                       ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156     012          $FILLC: .BYTE   12                      ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001157     000          $TPFLG: .BYTE   0                       ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001160  000000          $TMP0:  .WORD   0                       ;;USER DEFINED
001162  000000          $TMP1:  .WORD   0                       ;;USER DEFINED
001164  000000          $TMP2:  .WORD   0                       ;;USER DEFINED
001166  000000          $TMP3:  .WORD   0                       ;;USER DEFINED
001170  000000          $TIMES: 0                               ;;MAX. NUMBER OF ITERATIONS
001172  000000          $ESCAPE:0                               ;;ESCAPE ON ERROR ADDRESS
001174  177607  000377  $BELL:  .ASCIZ  <207><377><377>        ;;CODE FOR BELL
001200     077          $QUES:  .ASCII  /?/                     ;;QUESTION MARK
001201     015          $CRLF:  .ASCII  <15>                    ;;CARRIAGE RETURN
001202  000012          $LF:    .ASCIZ  <12>                    ;;LINE FEED
                                ;;*****************************************************************
                                .SBTTL  APT MAILBOX-ETABLE

                                ;;*****************************************************************
                                .EVEN
001204                  $MAIL:                          ;;APT MAILBOX
001204  000000          $MSGTY: .WORD   AMSGTY          ;;MESSAGE TYPE CODE
001206  000000          $FATAL: .WORD   AFATAL          ;;FATAL ERROR NUMBER
001210  000000          $TESTN: .WORD   ATESTN          ;;TEST NUMBER
```

```
  389  001212  000000                $PASS:  .WORD   APASS   ;;PASS COUNT
  390  001214  000000                $DEVCT: .WORD   ADEVCT  ;;DEVICE COUNT
  391  001216  000000                $UNIT:  .WORD   AUNIT   ;;I/O UNIT NUMBER
  392  001220  000000                $MSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
  393  001222  000000                $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
  394  001224                        $ETABLE:                ;;APT ENVIRONMENT TABLE
  395  001224      000               $ENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
  396  001225      000               $ENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
  397  001226  000000                $SWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
  398  001230  000000                $USWR:  .WORD   AUSWR   ;;USER SWITCHES
  399  001232  000000                $CPUOP: .WORD   ACPUOP  ;;CPU TYPE,OPTIONS
  400                                .*                      BITS 15-11=CPU TYPE
  401                                ;*                              11/04=01,11/05=02,11 20=03,11 40=04,11 45=05
  402                                ;*                              11/70=06,PDQ=07,Q=10
  403                                ;*                      BIT 10=REAL TIME CLOCK
  404                                ;*                      BIT  9=FLOATING POINT PROCESSOR
  405                                ;*                      BIT  8=MEMORY MANAGEMENT
  406  001234      000               $MAMS1: .BYTE   AMAMS1  ;;HIGH ADDRESS,M.S. BYTE
  407  001235      000               $MTYP1: .BYTE   AMTYP1  ;;MEM. TYPE,BLK#1
  408                                ;*                      MEM.TYPE BYTE   --  (HIGH BYTE)
  409                                ;*                              900 NSEC CORE=001
  410                                ;*                              300 NSEC BIPOLAR=002
  411                                ;*                              500 NSEC MOS=003
  412  001236  000000                $MADR1: .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
  413                                .*                        MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
  414  001240      000               $MAMS2: .BYTE   AMAMS2  ;;HIGH ADDRESS,M.S. BYTE
  415  001241      000               $MTYP2: .BYTE   AMTYP2  ;;MEM.TYPE,BLK#2
  416  001242  000000                $MADR2: .WORD   AMADR2  ;;MEM.LAST ADDRESS,BLK#2
  417  001244      000               $MAMS3: .BYTE   AMAMS3  ;;HIGH ADDRESS,M.S.BYTE
  418  001245      000               $MTYP3: .BYTE   AMTYP3  ;;MEM.TYPE,BLK#3
  419  001246  000000                $MADR3: .WORD   AMADR3  ;;MEM.LAST ADDRESS,BLK#3
  420  001250      000               $MAMS4: .BYTE   AMAMS4  ;;HIGH ADDRESS,M.S.BYTE
  421  001251      000               $MTYP4: .BYTE   AMTYP4  ;;MEM.TYPE,BLK#4
  422  001252  000000                $MADR4: .WORD   AMADR4  ;;MEM.LAST ADDRESS,BLK#4
  423  001254  000000                $VECT1: .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
  424  001256  000000                $VECT2: .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
  425  001260  000000                $BASE:  .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
  426  001262  000000                $DEVM:  .WORD   ADEVM   ;;DEVICE MAP
  427  001264  000000                $CDW1:  .WORD   ACDW1   ;;CONTROLLER DESCRIPTION WORD#1
  428  001266  000000                $CDW2:  .WORD   ACDW2   ;;CONTROLLER DESCRIPTION WORD#2
  429  001270  000000                $DDW0:  .WORD   ADDW0   ;;DEVICE DESCRIPTOR WORD#0
  430  001272  000000                $DDW1:  .WORD   ADDW1   ;;DEVICE DESCRIPTOR WORD#1
  431  001274  000000                $DDW2:  .WORD   ADDW2   ;;DEVICE DESCRIPTOR WORD#2
  432  001276  000000                $DDW3:  .WORD   ADDW3   ;;DEVICE DESCRIPTOR WORD#3
  433  001300  000000                $DDW4:  .WORD   ADDW4   ;;DEVICE DESCRIPTOR WORD#4
  434  001302  000000                $DDW5:  .WORD   ADDW5   ;;DEVICE DESCRIPTOR WORD#5
  435  001304  000000                $DDW6:  .WORD   ADDW6   ;;DEVICE DESCRIPTOR WORD#6
  436  001306  000000                $DDW7:  .WORD   ADDW7   ;;DEVICE DESCRIPTOR WORD#7
  437  001310  000000                $DDW8:  .WORD   ADDW8   ;;DEVICE DESCRIPTOR WORD#8
  438  001312  000000                $DDW9:  .WORD   ADDW9   ;;DEVICE DESCRIPTOR WORD#9
  439  001314  000000                $DDW10: .WORD   ADDW10  ;;DEVICE DESCRIPTOR WORD#10
  440  001316  000000                $DDW11: .WORD   ADDW11  ;;DEVICE DESCRIPTOR WORD#11
  441  001320  000000                $DDW12: .WORD   ADDW12  ;;DEVICE DESCRIPTOR WORD#12
  442  001322  000000                $DDW13: .WORD   ADDW13  ;;DEVICE DESCRIPTOR WORD#13
  443  001324  000000                $DDW14: .WORD   ADDW14  ;;DEVICE DESCRIPTOR WORD#14
  444  001326  000000                $DDW15: .WORD   ADDW15  ;;DEVICE DESCRIPTOR WORD#15
```

```
                                        $ETEND:
                                        .MEXIT
                                        .SBTTL  APT PARAMETER BLOCK

                                        ;;*****************************************************
                                        ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                        ;;*****************************************************
001330                                          .$X=.   ;;SAVE CURRENT LOCATION
000024                                          .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024  000200                                 200     ;;FOR APT START UP
000044                                          .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044  001330                                 $APTHDR ;;POINT TO APT HEADER BLOCK
001330                                          .=.$X   ;;RESET LOCATION COUNTER
                                        ;;*****************************************************
                                        ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                        ;INTERFACE SPEC.

001330                                  $APTHD:
001330  000000                          $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001332  001204                          $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001334  004540                          $TSTM:  .WORD   2400.   ;;RUN TIM OF LONGEST TEST
001336  000170                          $PASTM: .WORD   120.    ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001340  000360                          $UNITM: .WORD   240.    ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
001342  000052                                  .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
                                        .SBTTL  APT STATISTICS TABLE

                                        ;;*****************************************************
001344                                  $ASTAT:
001344  177777  000000                          .WORD   -1,0
001350  177777  000000                          .WORD   -1,0
001354  177777  000000                          .WORD   -1,0
001360  177777  000000                          .WORD   -1,0
001364  177777  000000                          .WORD   -1,0
001370  177777  000000                          .WORD   -1,0
001374  177777  000000                          .WORD   -1,0
001400  177777  000000                          .WORD   -1,0
001404  177777  000000                          .WORD   -1,0
001410  177777  000000                          .WORD   -1,0
001414  177777  000000                          .WORD   -1,0
001420  177777  000000                          .WORD   -1,0
001424  177777  000000                          .WORD   -1,0
001430  177777  000000                          .WORD   -1,0
001434  177777  000000                          .WORD   -1,0
001440  177777  000000                          .WORD   -1,0
001444  177777  000000                          .WORD   -1,0
001450  177777  000000                          .WORD   -1,0
001454  177777  000000                          .WORD   -1,0
001460  177777  000000                          .WORD   -1,0
001464  177777  000000                          .WORD   -1,0
001470  177777  000000                          .WORD   -1,0
001474  177777  000000                          .WORD   -1,0
001500  177777  000000                          .WORD   -1,0
001504  177777  000000                          .WORD   -1,0
001510  177777                          $ASTEND:        -1
001512  001344                          $APTR:  $ASTAT
```

```
                                ;;*****************************************************************
                                ;*THE FOLLOWING TAGS ARE USER DEFINED
                                ;;*****************************************************************
001514  000000  $VERPC: .WORD   0       ;VIRTUAL PC LOCATION FOR ERROR TYPEOUT ROUTINE ($ERTYP).
001516  070032  RESRVD: .WORD   070032  ;CORE PARITY REG BITS RESERVED FOR FUTURE USE.
                                        ;NOTE:  FOR MS11 MEMORY WITH PARITY, CHANGE TO 077772.
001520  000000  LMAD:   .WORD   0       ;LAST CONTIGUOUS MEMORY ADDRESS (+2)
001522  000000  LDDISP: .WORD   0       ;CONTAINS DISPLAY REGISTER IMAGE
001524          MEMMAP:                 ;MEMORY MAP - EACH BIT CORRESPONDS TO 4K
001524  000000          .WORD   0       ;FIRST WORD CONTAINS LOW (0-64K) MAP
001526  000000          .WORD   0       ;SECOND WORD CONTAINS HIGH (64-128K) MAP
001530          TSTMAP:                 ;TEST MAP - WHICH BANKS ARE SELECTED FOR TEST.
001530  000000          .WORD   0       ;FIRST WORD CONTAINS LOW (0-64K) MAP
001532  000000          .WORD   0       ;SECOND WORD CONTAINS HIGH (64-128K) MAP
001534          SAVTST:                 ;SAVED TEST MAP - USED DURING FIRST PASS TO ONLY
                                        ; TEST EACH BANK ONCE.
001534  000000          .WORD   0       ;FIRST WORD CONTAINS LOW (0-64K) MAP
001536  000000          .WORD   0       ;SECOND WORD CONTAINS HIGH (64-128K) MAP
001540          PMEMAP:                 ;PARITY MAP - WHICH BANKS HAVE MEMORY PARITY
001540  000000          .WORD   0       ;FIRST WORD CONTAINS LOW (0-64K) MAP
001542  000000          .WORD   0       ;SECOND WORD CONTAINS HIGH (64-128K) MAP
001544          BITPT:                  ;POINTER TO CURRENT 4K BANK OF MEMORY
001544  000000          .WORD   0       ;FIRST WORD CONTAINS LOW (0-64K) MAP
001546  000000          .WORD   0       ;SECOND WORD CONTAINS HIGH (64-128K) MAP
001550          TMPPT:                  ;TEMPORARY POINTER FOR 2ND 4K BANK OF MEMORY
001550  000000          .WORD   0       ;FIRST WORD CONTAINS LOW (0-64K) MAP
001552  000000          .WORD   0       ;SECOND WORD CONTAINS HIGH (64-128K) MAP
001554  000000  MMORE:   .WORD   0       ;LOOP ADDRESS FOR MULTIPLE BLOCK TESTING.
                                        ;SET UP BY "INITMM" AND "INITDN" ROUTINEES.
                                        ;USED BY "MMUP" AND "MMDOWN" ROUTINES.
001556  000     SELFLG: .BYTE   0       ;OPERATOR SELECTED PARAMETERS FLAG.  (SA=204)
001557  000     FLAG8K: .BYTE   0       ;8K BLOCK INDICATOR.  USED IN "INITMM" AND "MMUP".
001560  000     OEFLG:  .BYTE   0       ;ODD/EVEN FLAG USED IN PARITY MEMORY BYTE TEST.
001562                  .EVEN
001562  000000  FSTADR: .WORD   0       ;FIRST VIRTUAL ADDRESS TO BE TESTED.
                                        ;FIRST ADDRESS IS USER SELECTABLE.
001564  000000  TMPFAD: .WORD   0       ;ADJUSTED FIRST ADDRESS.
001566  000000  FADMSK: .WORD   0       ;BIT MASK TO ALLOW DOWNWARD ADDRESSING TESTS
                                        ; TO BREAK TO "MMDOWN" TO FIND FIRST ADDRESS.
001570  000000  000000  FADMAP: .WORD   0,0     ;MAP OF BANK IN WHICH FIRST ADDRESS IS LOCATED.
001574  000000  LSTADR: .WORD   0       ;LAST VIRTUAL ADDRESS (+2) TO BE TESTED.
                                        ;LAST ADDRESS IS USER SELECTABLE.
001576  000000  TMPLAD: .WORD   0       ;ADJUSTED LAST ADDRESS.
001600  000000  LADMSK: .WORD   0       ;BIT MASK TO ALLOW UPWARD ADDRESSING TESTS
                                        ; TO BREAK TO "MMUP" TO FIND LAST ADDRESS.
001602  000000  000000  LADMAP: .WORD   0,0     ;MAP OF BANK IN WHICH LAST ADDRESS IS LOCATED.
001606  000000  BLKMSK: .WORD   0       ;BLOCK MASK, DETERMINES THE BLOCK SIZE.
001610  000000  .CONST:  .WORD   0       ;USER SELECTABLE CONSTANT DATA.
001612  000004  WWP:    .WORD   4       ;WRITE WRONG PARITY COMMAND
001614  000000  TEMP:   .WORD   0       ;TEMPORARY STORAGE
001616  000000  CASFLG: .WORD   0       ;CACHE PRESENT FLAG
001620  177746  CASREG: .WORD   177746  ;CACHE CONTROL REGISTER

                                ;;*****************************************************************
                                ;*  RELATIVE ADDRESSING TABLE.
                                ;*  THE FOLLOWING LOCATIONS ARE MODIFIED AT RELOCATION TIME TO ALLOW
```

```
                                        ;*  RELATIVE ADDRESSING TO GET THE RELOCATED VALUE OF THE ARGUMENT THIS.
                                        ;;*****************************************************************
001622                                  RADTAB:
001622  001100                          .STACK: STACK           ;STACK POINTER INITIAL ADDRESS.
001624  001516                          .RESRV: RESRVD          ;PARITY REGISTER RESERVED BIT MASK ADDRESS.
001626  002076                          .MPRO:  MPRO            ;MEMORY PARITY REGISTER TABLE ADDRESS.
001630  002276                          .MPRX:  MPRX            ;MEMORY PARITY REGISTER EXIST TABLE ADDRESS.
001632  012052                          .PBTRP: PBTRP           ;PARITY BYTE TEST TRAP ROUTINE ADDRESS.
001634  002050                          .MPPAT: MPPATS          ;MEMORY PARITY PATTERN TABLE ADDRESS.
001636  017430                          .PESRV: PESRV           ;MEMORY PARITY ERROR TRAP ROUTINE ADDRESS.
001640  002340                          .ERRTB: $ERRTB          ;ERROR TYPEOUT TABLE PONTER.
001642  000010                          .EIGHT: 8.              ;DECIMAL TYPE ROUTINE COUNT DESIGNATOR.
001644  014004                          .TST32: TST32           ;SCOPE ABORT ADR FOR WHEN NO MEM AVA FOR TEST.
                                        ;;*****************************************************************
                                        ;*  DATA CONTAINERS FOR ERROR PRINTOUT.
                                        ;;*****************************************************************
001646  001116  001120  001124          DT1:    $ERRPC,$GDADR,$GDDAT,$BDDAT,0

001654  001126  000000

001660  001514  001116  001120          DT2:    $VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT,0

001666  001124  001126  000000

001674  001514  001116  001120          DT12:   $VERPC,$ERRPC,$GDADR,$GDDAT,0

001702  001124  000000

001706  001514  001116  001160          DT14:   $VERPC,$ERRPC,$TMP0,$GDADR,0

001714  001120  000000

001720  001514  001116  001120          DT15:   $VERPC,$ERRPC,$GDADR,$TMP0,$GDDAT,$BDDAT,0

001726  001160  001124  001126

001734  000000

001736  001514  001116  001160          DT21:   $VERPC,$ERRPC,$TMP0,$GDADR,$GDDAT,$BDDAT,0

001744  001120  001124  001126

001752  000000

001754  001514  001116  001120          DT23:   $VERPC,$ERRPC,$GDADR,$BDADR,$GDDAT,$BDDAT,0

001762  001122  001124  001126

001770  000000

001772  001514  001116  001122          DT24:   $VERPC,$ERRPC,$BDADR,0

002000  000000

002002  001514  001116  001122          DT25:   $VERPC,$ERRPC,$BDADR,$TMP0,$TMP1,0

002010  001160  001162  000000

002016  001514  001116  001160          DT26:   $VERPC,$ERRPC,$TMP0,$TMP1,0

002024  001162  000000

002030  001160  001162  001120          DT30:   $TMP0,$TMP1,$GDADR,$BDDAT,0

002036  001126  000000

002042  001166  000000                  DT31:   $TMP3,0
002046  177777                                  .WORD   -1      ;TABLE TERMINATOR.

                                        .SBTTL  MEMORY PARITY PATTERNS TABLE
                                        ;;*****************************************************************
                                        ;THE FOLLOWING ARE THE PARITY PATTERNS EXERCISED THRUOUT MEMORY
                                        ;;*****************************************************************

002050  125325                          MPPATS: 125325                  ;EVEN,ODD
002052  152652                          152652                  ;ODD,EVEN
002054  052452                          052452                  ;EVEN,ODD
002056  025125                          025125                  ;ODD,EVEN
002060  102070                          102070                  ;EVEN,EVEN
002062  072527                          072527                  ;ODD,ODD
002064  177777                          177777                  ;EVEN,EVEN
```

```
                        107030                  ;ODD,ODD
                        152525                  ;ODD,EVEN
                        0                       ;EXTRA PATTERN HOLDER FOR
                                                ;FUTURE USE
MFEND:                  0                       ;TABLE TERMINATOR

                .SBTTL  MEMORY PARITY REGISTER ADDRESS TABLE
                ;*////////////////////////////////////////////////////////////
                ;*  THE FOLLOWING REPRESENTS THE MEMORY PARITY REGISTER ADDRESS TABLE
                ;*  FROM WHICH PARITY MEMORY IS ADDRESSED & CONTROLLED.
                ;*
                ;*  THE LEAST SIGNIFICANT BIT IN THE DEVICE ADDRESS IS SET TO A ONE (1)
                ;*  IF THE CONTROL IS FOUND NOT TO BE PRESENT.  THE MEMORY PRESENT UNDER
                ;*  THE CONTROL OF EACH CONTROLLER IS REPRESENTED BY TWO (2) WORDS FOLLOWING
                ;*  THE DEVICE ADDRESS,  EACH BIT REPRESENTING A 4K BLOCK.  I.E.
                ;*  FIRST WORD BIT0 = 0 - 4K,  BIT1 = 4 - 8K,...  BIT15 = 60 - 64K
                ;*  SECOND WORD BIT0 = 64 - 68K,... BIT14 = 120 - 124K.
                ;*////////////////////////////////////////////////////////////
MPR0:           172100 +1               ;PARITY STATUS REGISTER
                0                       ;CONTROL MAP (LOW 64K)
                0                       ;CONTROL MAP (HIGH 64K)
                0                       ;MASK FOR MOS CORE MS11-K
MPR1:           172102 +1               ;PARITY STATUS REGISTER
                0                       ;CONTROL MAP (LOW 64K)
                0                       ;CONTROL MAP (HIGH 64K)
                0                       ;MASK FOR MOS CORE MS11-K
MPR2:           172104 +1               ;PARITY STATUS REGISTER
                0                       ;CONTROL MAP (LOW 64K)
                0                       ;CONTROL MAP (HIGH 64K)
                0                       ;MASK FOR MOS CORE MS11-K
MPR3:           172106 +1               ;PARITY STATUS REGISTER
                0                       ;CONTROL MAP (LOW 64K)
                0                       ;CONTROL MAP (HIGH 64K)
                0                       ;MASK FOR MOS CORE MS11-K
MPR4:           172110 +1               ;PARITY STAUS REGISTER
                0                       ;CONTROL MAP (LOW 64K)
                0                       ;CONTROL MAP (HIGH 64K)
                0                       ;MASK FOR MOS CORE MS11-K
MPR5:           172112 +1               ;PARITY STATUS REGISTER
                0                       ;CONTROL MAP (LOW 64K)
                0                       ;CONTROL MAP (HIGH 64K)
                0                       ;MASK FOR MOS CORE MS11-K
MPR6:           172114 +1               ;PARITY STATUS REGISTER
                0                       ;CONTROL MAP (LOW 64K)
                0                       ;CONTROL MAP (HIGH 64K)
                0                       ;MASK FOR MOS CORE MS11-K
MPR7:           172116 +1               ;PARITY STATUS REGISTER
                0                       ;CONTROL MAP (LOW 64K)
                0                       ;CONTROL MAP (HIGH 64K)
                0                       ;MASK FOR MOS CORE MS11-K
MPR8:           172120 +1               ;PARITY STATUS REGISTER
                0                       ;CONTROL MAP (LOW 64K)
                0                       ;CONTROL MAP (HIGH 64K)
                0                       ;MASK FOR MOS CORE MS11-K
MPR9:           172122 +1               ;PARITY STATUS REGISTER
```

```
                        ;THIS IS THE END OF THE TABLE !
002276  000021  MPRX:   .BLKW   17.      ;TABLE TO HOLD JUST PARITY STATUS REGISTERS THAT EXIST.
                                         ; (THE EXTRA WORD IS FOR A TERMINATOR.)
```

669	002210	000000		0	;CONTROL MAP (LOW 64K)
670	002212	000000		0	;CONTROL MAP (HIGH 64K)
671	002214	000000		0	;MASK FOR MOS,CORE,MS11-K
672	002216	172125	MPR10:	172124 +1	;PARITY STATUS REGISTER
673	002220	000000		0	;CONTROL MAP (LOW 64K)
674	002222	000000		0	;CONTROL MAP (HIGH 64K)
675	002224	000000		0	;MASK FOR MOS,CORE,MS11-K
676	002226	172127	MPR11:	172126 +1	;PARITY STATUS REGISTER
677	002230	000000		0	;CONTROL MAP (LOW 64K)
678	002232	000000		0	;CONTROL MAP (HIGH 64K)
679	002234	000000		0	;MASK FOR MOS,CORE,MS11-K
680	002236	172131	MPR12:	172130 +1	;PARITY STATUS REGISTER
681	002240	000000		0	;CONTROL MAP (LOW 64K)
682	002242	000000		0	;CONTROL MAP (HIGH 64K)
683	002244	000000		0	;MASK FOR MOS,CORE,MS11-K
684	002246	172133	MPR13:	172132 +1	;PARITY STATUS REGISTER
685	002250	000000		0	;CONTROL MAP (LOW 64K)
686	002252	000000		0	;CONTROL MAP (HIGH 64K)
687	002254	000000		0	;MASK FOR MOS,CORE,MS11-K
688	002256	172135	MPR14:	172134 +1	;PARITY STATUS REGISTER
689	002260	000000		0	;CONTROL MAP (LOW 64K)
690	002262	000000		0	;CONTROL MAP (HIGH 64K)
691	002264	000000		0	;MASK FOR MOS,CORE,MS11-K
692	002266	172137	MPR15:	172136 +1	;PARITY STATUS REGISTER
693	002270	000000		0	;CONTROL MAP (LOW 64K)
694	002272	000000		0	;CONTROL MAP (HIGH 64K)
695	002274	000000		0	;MASK FOR MOS,CORE,MS11-K
696					
697	002276	000021	MPRX:	.BLKW 17.	;TABLE TO HOLD JUST PARITY STATUS REGISTERS THAT EXIST.
698					; (THE EXTRA WORD IS FOR A TERMINATOR.)
699					

```
                        .SBTTL  ERROR POINTER TABLE

                        ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
                        ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
                        ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
                        ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS ($ERRPC).
                        ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:

                        ;*      EM              ;;POINTS TO THE ERROR MESSAGE
                        ;*      DH              ;;POINTS TO THE DATA HEADER
                        ;*      DT              ;;POINTS TO THE DATA
                        ;*      DF              ;;POINTS TO THE DATA FORMAT


002340                  $ERRTB:
                        ;*  ITEM 1
002340  027010                  DM1             ;PARITY REGISTER DATA ERROR.
002342  030367                  DH1             ;PC,REG,S/B,WAS
002344  001646                  DT1             ;$ERRPC,$GDADR,$GDDAT,$BDDAT
002346  030734                  DF1             ;16,18,16,16
                        ;*  ITEM 2
002350  027044                  DM2             ;ADDRESS TEST ERROR(TST1-5).
002352  030406                  DH2             ;V/PC,P/PC,MA,S/B,WAS
002354  001660                  DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
002356  030740                  DF2             ;16,18,18,16,16
                        ;*  ITEM 3
002360  027044                  DM2             ;ADDRESS TEST ERROR(TST1-5).
002362  030406                  DH2             ;V/PC,P/PC,MA,S/B,WAS
002364  001660                  DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
002366  030745                  DF3             ;16,18,18,8,8
                        ;*  ITEM 4
002370  027100                  DM4             ;CONSTANT DATA ERROR(TST6-10).
002372  030406                  DH2             ;V/PC,P/PC,MA,S/B,WAS
002374  001660                  DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
002376  030740                  DF2             ;16,16,18,16,16
                        ;*  ITEM 5
002400  027136                  DM5             ;ROTATING BIT ERROR(TST11-12).
002402  030406                  DH2             ;V/PC,P/PC,MA,S/B,WAS
002404  001660                  DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
002406  030740                  DF2             ;16,18,18,16,16
                        ;*  ITEM 6
002410  027174                  DM6             ;MOS REFRESH TEST ERROR (TST30-31).
002412  030406                  DH2             ;V/PC,P/PC,MA,S/B,WAS
002414  001660                  DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
002416  030740                  DF2             ;16,18,18,16,16
                        ;*  ITEM 7
002420  027240                  DM7             ;3 XOR 9 PATTERN ERROR(TST13-16).
002422  030406                  DH2             ;V/PC,P/PC,MA,S/B,WAS
002424  001660                  DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
002426  030740                  DF2             ;16,18,18,16,16
                        ;*  ITEM 10
002430  027301                  DM1C            ;MARCHING 1'S AND 0'S ERROR(TST27).
002432  030406                  DH2             ;V/PC,P/PC,MA,S/B,WAS
002434  001660                  DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
002436  03074C                  DF2             ;16,18,18,16,16
                        ;*  ITEM 11
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                                ;* ITEM 11
000756  002440  027345                DM11            ;PARITY MEMORY ADDRESS ERROR(TST17).
000757  002442  030406                DH2             ;V/PC,P/PC,MA,S/B,WAS
000760  002444  001660                DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
000761  002446  030745                DF3             ;16,18,18,8,8
000762                          ;* ITEM 12
000763  002450  027411                DM12            ;DATIP WITH WRONG PARITY DIDN'T TRAP(TST17).
000764  002452  030433                DH12            ;V/PC,P/PC,MA,S/B
000765  002454  001674                DT12            ;$VERPC,$ERRPC,$GDADR,$GDDAT
000766  002456  030745                DF3             ;16,18,18,8
000767                          ;* ITEM 13
000770  002460  027465                DM13            ;WRONG PARITY TRAPED, BUT NO REGISTER SHOWS ERROR FLAG.
000771  002462  030433                DH12            ;V/PC,P/PC,MA,S/B
000772  002464  001674                DT12            ;$VERPC,$ERRPC,$GDADR,$GDDAT
000773  002466  030745                DF3             ;16,18,18,8
000774                          ;* ITEM 14
000775  002470  027555                DM14            ;PARITY REGISTER NOT MAPPED AS CONTROLLING THIS ADDRESS (TST17).
000776  002472  030454                DH14            ;V/PC,P/PC,REG,MA
000777  002474  001706                DT14            ;$VERPC,$ERRPC,$TMPO,$GDADR
001000  002476  030752                DF14            ;16,18,18,18
001001                          ;* ITEM 15
001002  002500  027010                DM1             ;PARITY REGISTER DATA ERROR.
001003  002502  030475                DH15            ;V/PC,P/PC,MAUT,REG,S/B,WAS
001004  002504  001720                DT15            ;$VERPC,$ERRPC,$GDADR,$TMPO,$GDDAT,$BDDAT
001005  002506  030752                DF14            ;16,18,18,18,16,16
001006                          ;* ITEM 16
001007  002510  027654                DM16            ;MORE THAN ONE REGISTER INDICATED PARITY ERROR.
001010  002512  030454                DH14            ;V/PC,P/PC,REG,MA
001011  002514  001706                DT14            ;$VERPC,$ERRPC,$TMPO,$GDADR
001012  002516  030752                DF14            ;16,18,18,18
001013                          ;* ITEM 17
001014  002520  027733                DM17            ;DATA SHOULDN'T HAVE CHANGED WHEN PARITY ERROR
001015                                                  ; TRAPPED(TST21).
001016  002522  030406                DH2             ;V/PC,P/PC,MA,S/B,WAS
001017  002524  001660                DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
001020  002526  030745                DF3             ;16,18,18,8,8
001021                          ;* ITEM 20
001022  002530  030031                DM20            ;RANDOM DATA ERROR(TST20).
001023  002532  030406                DH2             ;V/PC,P/PC,MA,S/B,WAS
001024  002534  001660                DT2             ;$VERPC,$ERRPC,$GDADR,$GDDAT,$BDDAT
001025  002536  030740                DF2             ;16,18,18,16,16
001026                          ;* ITEM 21
001027  002540  030063                DM21            ;INSTRUCTION EXICUTION ERROR(TST21-26).
001030  002542  030530                DH21            ;V/PC,P/PC,IUT,MA,S/B,WAS
001031  002544  001736                DT21            ;$VERPC,$ERRPC,$TMPO,$GDADR,$GDDAT,$BDDAT
001032  002546  030760                DF21            ;16,18,16,18,16,16
001033                          ;* ITEM 22            ;NOT USED
001034                          ;* ITEM 23
001035  002550  030132                DM23            ;PROGRAM CODE CHANGED WHEN RELOCATED.
001036  002552  030561                DH23            ;V/PC,P/PC,SRC MA,DST MA,S/B,WAS
001037  002554  001754                DT23            ;$VERPC,$ERRPC,$GDADR,$BDADR,$GDDAT,$BDDAT
001040  002556  030752                DF14            ;16,18,18,18,16,16
001041                          ;* ITEM 24
001042  002560  030177                DM24            ;TRAPPED, BUT NO REGISTER HAD ERROR BIT SET.
001043  002562  030621                DH24            ;V/PC,P/PC,TRP/PC
001044  002564  001772                DT24            ;$VERPC,$ERRPC,$BDADR
001045  002566  030752                DF14            ;16,18,18
```

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  812
  813  002570  030253                ;*  ITEM 25
  814  002572  030642                        DM25            ;TRAPPED TO 114.
  815  002574  002002                        DH25            ;V/PC,P/PC,TRP/PC,REG,WAS
  816  002576  030752                        DT25            ;$VERPC,$ERRPC,$BDADR,$TMP0,$TMP1
  817                                        DF14            ;16,18,18,18,16
  818  002600  030273                ;*  ITEM 26
  819  002602  030673                        DM26            ;FAILED TO TRAP.
  820  002604  002016                        DH26            ;V/PC,P/PC,REG,WAS
  821  002606  030740                        DT26            ;$VERPC,$ERRPC,$TMP0,$TMP1
  822                                        DF2             ;16,18,18,16
  823  002610  030313                ;*  ITEM 27
  824  002612  030673                        DM27            ;(ACTION ENABLE WASN'T SET).
  825  002614  002016                        DH26            ;V/PC,P/PC,REG,WAS
  826  002616  030740                        DT26            ;$VERPC,$ERRPC,$TMP0,$BDDAT
  827                                        DF2             ;16,18,18,16
  828  002620  000000                ;*  ITEM 30
  829  002622  030715                        0               ;NO MESSAGE.
  830  002624  002030                        DH30            ;REG,WAS,MA,WAS
  831  002626  030766                        DT30            ;$TMP0,$TMP1,$GDADR,$BDDAT
  832                                        DF30            ;18,16,18,8
  833  002630  030347                ;*  ITEM 31
  834  002632  000000                        DM31            ;TRAPPED TO 4
  835  002634  002042                        0               ;NO HEADER
  836  002636  030766                        DT31            ;$TMP3
                                         DF30            ;18
```

```
837                                     .SBTTL START:   SETUP AND MAP MEMORY

                        ;*\:*\:*\:/*\:/*\:/*\:/*\: *\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/* :
                        ;*      THIS IS THE NORMAL (SA = 200) BEGINNING OF THE PROGRAM.
                        ;*      NOTE:   THIS CODE IS NOT POSITION INDEPENDENT.
                        ;*\:*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*

844  002640  105067  176712          START:  CLRB    SELFLG          ;CLEAR SELECT PARAMETER FLAG.
845  002644  000403                          BR      STARTA          ;GO DO SETUP AND MEMORY MAP.
846  002646  112767  177777  176702  SELECT: MOVB    #-1,    SELFLG  ;SET THE SELECT PARAMETERS FLAG.
847  002654                          STARTA:
848                                  .SBTTL  INITIALIZE THE COMMON TAGS
849                                  ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
850  002654  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
851  002660  005026                          CLR     (R6)+           ;;CLEAR MEMORY LOCATION
852  002662  022706  001140                  CMP     #SWR,R6 ;;DONE?
853  002666  001374                          BNE     .-6             ;;LOOP BACK IF NO
854  002670  012706  001100                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER
855                                  ;;INITIALIZE A FEW VECTORS
856  002674  012737  000610  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
857  002702  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
858  002710  016767  011242  011232          MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
859                                  ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
860                                  ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
861  002716  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
862  002722  012737  002756  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
863  002730  012767  177570  176202          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
864  002736  012767  177570  176176          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
865  002744  022777  177777  176166          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
866  002752  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
867                                                                  ;;AND  THE HARDWARE SWR IS NOT = -1
868  002754  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
869  002756  012716  002764          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
870  002762  000002                          RTI
871  002764  012767  000176  176146  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
872  002772  012767  000174  176142          MOV     #DISPREG,DISPLAY
873  003000  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
874
875  003004  005067  176202                  CLR     $PASS           ;;CLEAR PASS COUNT
876  003010  132767  000200  176207          BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
877  003016  001403                          BEQ     67$             ;;YES,USE NON-APT SWITCH
878  003020  012767  001226  176112          MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
879  003026                          67$:
880  003026  005067  176470                  CLR     LDDISP          ;CLEAR DISPLAY REGISTER STORAGE LOCN
881  003032  005077  176104                  CLR     @DISPLAY        ;CLEAR DISPLAY REGISTER
882                                  .SBTTL  TYPE PROGRAM NAME
883                                  ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
884  003036  005227  177777                  INC     #-1             ;;FIRST TIME?
885  003042  001040                          BNE     68$             ;;BRANCH IF NO
886  003044  022737  014222  000042          CMP     #$ENDAD,@#42    ;;ACT-11?
887  003052  001434                          BEQ     68$             ;;BRANCH IF YES
888  003054  004567  020432                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
889  003060  003132                          .WORD   69$             ;ADDRESS OF MESSAGE TO BE TYPED
890                                  .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
891  003062  005737  000042                  TST     @#42            ;;ARE WE RUNNING UNDER XXDP ACT?
892  003066  001015                          BNE     70$             ;;BRANCH IF YES
```

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                                ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $GTSWR ROUTINE
                                ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
003110  013746  177776          MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
003114  004767  017316          JSR     PC,     $GTSWR  ;GO TO THE SUBROUTINE
003120  000403                  BR      71$
003122  112767  000001  176004 70$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
003130                          71$:
003130  000405                  BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  <CRLF>'CZQMCF0'<CRLF>
003144                          68$:
003144  010700                  MOV     PC,     R0      ;GET CURRENT PROGRAM COUNTER.
003146  022700  003146          CMP     #.,     R0      ;CHECK IF THE PROGRAM IS RELOCATED.
003152  001402                  BEQ     10$             ;BR IF PROGRAM NOT RELOCATED.
003154  000167  175120          JMP     RESTAR          ;GO TRY TO RELOCTED BEFORE CONTINUING.
003160  012767  000003  175414 10$:    MOV     #3,     PRGMAP  ;INITIALIZE PROGRAM MAP....LO 64K.
003166  005067  175412          CLR     PRGMAP+2        ;...HI 64K.
003172  005067  175402          CLR     RELOCF          ;INIT THE RELOCATION FACTOR.
003176  105737  001224          TSTB    @#$ENV          ;CHECK FOR APT11
003202  001011                  BNE     13$             ;BR IF APT11
003204  005737  000042          TST     @#42            ;CHECK FOR STANDALONE
003210  001406                  BEQ     13$             ;BR IF STANDALONE
003212  023737  000042  000046  CMP     @#42,@#46       ;CHECK FOR ACT11
003220  001402                  BEQ     13$             ;BR IF ACT11
                                                        ;MUST BE XXDP
003222  004767  014122          JSR     PC,SAVLDR       ;GO SAVE LOADERS

                                ;*  CHECK IF MEMORY MANAGEMENT IS AVAILABLE, AND SET IT UP IF IT IS.
003226  005067  175354 13$:     CLR     MMAVA           ;CLEAR MEM MGMT AVAILABLE FLAG
003232  032777  010000  175700  BIT     #SW12,  @SWR    ;CHECK FOR INHIBIT KT11 SWITCH
003240  001014                  BNE     IMPCK           ;BRANCH IF SET
003242  012737  003272  000004  MOV     #IMPCK,@#ERRVEC ;SET UP TIMEOUT TRAP VECTOR
003250  005037  177572          CLR     @#SR0           ;CLEAR MEM MGMT STATUS REG
003254  004767  011020          JSR     PC      MMINIT  ;MEM MGMT INITIALIZATION ROUTINE.
003260  005267  175322          INC     MMAVA           ;SET MEM MGMT AVAILABLE FLAG
003264  004567  020222          JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
003270  025354                  .WORD   MMAMES          ;ADDRESS OF MESSAGE TO BE TYPED
                                                        ;"KT11 AVAILABLE"

                                ;*      CHECK IF CACHE PRESENT, IF SO TURN IT OFF!!!
003272  012706  001100  IMPCK:  MOV     #STACK, SP
003276  005067  176314          CLR     CASFLG          ;CLEAR CACHE PRESENT FLAG
003302  012737  003324  000004  MOV     #MAPMEM,@#ERRVEC
003310  052767  000014  174430  BIS     #14,    IMPCHE
003316  012767  000001  176272  MOV     #1,     CASFLG  ;SET CACHE PRESENT FLAG

                                ;;**************************************************************
                                ;*  ROUTINE TO MAP ALL OF MEMORY.
                                ;*  ONLY FULL 4K BANKS WILL BE RECOGNIZED.
                                ;*      R0 = MEMMAP POINTER...LO 64K.
                                ;*      R1 = MEMMAP POINTER...HI 64K.
                                ;*      R2 = ADDRESS POINTER
                                ;*      R3 = BANK POINTER...LO 64K.
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                                ;*      R4 = BANK POINTER...HI 64K.
                                ;*      R5 = SCRATCH REGISTER.
                                ;;*****************************************************************
003324  012706  001100          MAPMEM: MOV     #STACK, SP      ;RESET THE STACK
003330  012700  001524                  MOV     #MEMMAP,R0      ;SET UP MEMORY MAP POINTER...LO 64K.
003334  012701  001526                  MOV     #MEMMAP+2,R1    ;...HI 64K.
003340  005010                          CLR     (R0)            ;CLR MEMORY MAP...LO 64K.
003342  005011                          CLR     (R1)            ;...HI 64K.
003344  005002                          CLR     R2              ;SET ADDRESS POINTER TO 0
003346  012703  000001                  MOV     #1,     R3      ;SETUP 4K BANK POINTER...LO 64K.
003352  005004                          CLR     R4              ;...HI 64K.
003354  005067  175606                  CLR     $TMP3           ;INIT TEMPORARY HIGH ADDRESS BITS.
003360  004567  020126                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
003364  025421                          .WORD   MEMMES          ;ADDRESS OF MESSAGE TO BE TYPED
                                                                ;"MEMORY MAP:"
003366  012737  003502  000004          MOV     #2$, @#ERRVEC   ;SET UP TIMEOUT VECTOR
003374  011222                  1$:     MOV     (R2),   (R2)+   ;READ+WRITE ALL MEMORY
003376  032702  017777                  BIT     #MASK4K,R2      ;CHECK FOR 4K BOUNDRY
003402  001374                          BNE     1$              ;BRANCH IF MORE IN BANK
003404  050310                          BIS     R3,     (R0)    ;SET FLAG FOR BANK...LO 64K.
003406  050411                          BIS     R4,     (R1)    ;...HI 64K.
003410  010267  175550                  MOV     R2,     $TMP2   ;SAVE ADDRESS POINTER.
003414  005367  175544                  DEC     $TMP2           ;ADJUST TO LAST ADR, LAST BANK.
003420  005767  175162                  TST     MMAVA           ;CHECK FOR MEM MGMT.
003424  001432                          BEQ     3$              ;BR IF NO MEM MGMT.
003426  042767  160000  175530          BIC     #160000,$TMP2   ;CLEAR BANK BITS ON RELATIVE ADDRESS.
003434  013705  172344                  MOV     @#KIPAR2,R5     ;SAVE KIPAR2.
003440  005067  175522                  CLR     $TMP3           ;MAKE SURE HI BITS ARE INIT.
003444  006305                          ASL     R5              ;SHIFT IT 6 PLACES.
003446  006305                          ASL     R5
003450  006305                          ASL     R5
003452  006305                          ASL     R5
003454  006305                          ASL     R5
003456  006167  175504                  ROL     $TMP3
003462  006305                          ASL     R5
003464  006167  175476                  ROL     $TMP3
003470  060567  175470                  ADD     R5,     $TMP2   ;MAKE LAST ADR PHYSICAL.
003474  005567  175466                  ADC     $TMP3
003500  000404                          BR      3$              ;GO TO UPDATE POINTERS.

                                ;*  TIMEOUT TRAPS TO HERE
003502  022626                  2$:     CMP     (SP)+,  (SP)+   ;RESTORE THE STACK POINTER
003504  052702  017777                  BIS     #MASK4K,R2      ;LAST ADDRESS OF 4K BANK
003510  005202                          INC     R2              ;FIRST ADDRESS OF NEXT BANK.
003512  005767  175070          3$:     TST     MMAVA           ;CHECK FOR MEM MGMT
003516  001411                          BEQ     4$              ;BRANCH IF NO MEM MGMT
003520  062737  000200  172344          ADD     #200, @#KIPAR2  ;UPDATE THIRD PAR
003526  012702  040000                  MOV     #40000, R2      ;POINT TO START OF THIRD PAR
003532  006303                          ASL     R3              ;UPDATE LO BANK POINTER.
003534  006104                          ROL     R4              ;UPDATE HI BANK POINTER
003536  100316                          BPL     1$              ;BRANCH IF MORE MEMORY TO MAP.
003540  000402                          BR      5$              ;EXIT WHEN DONE.

003542  106303                  4$:     ASLB    R3              ;UPDATE MAP POINTER
003544  100313                          BPL     1$              ;BRANCH IF NOT YET DONE
003546  012737  025114  000004  5$:     MOV     #ERRTRP, @#ERRVEC ;RESET TIMEOUT VECTOR
```

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1005  003554  004767  014632                  JSR     PC,     TYPMAP  ;GO TYPE THE MAP.
1006  003560  004567  017726                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1007  003564  001201                          .WORD   $CRLF           ;ADDRESS OF MESSAGE TO BE TYPED
1008  003566  011067  175742                  MOV     (R0),   SAVTST  ;SET UP TEST MAP...LO 64K.
1009  003572  011167  175740                  MOV     (R1),   SAVTST+2;....HI 64K.
1010  003576  011000                          MOV     (R0),   R0      ;GET LOW MEM MAP
1011  003600  042700  177760                  BIC     #177760, R0     ;MASK ALL BUT BOTTOM 4 BANKS
1012  003604  020027  000017                  CMP     R0,     #17     ;CHECK THAT BOTTOM 16K IS ALL THERE!
1013  003610  001530                          BEQ     GMPR            ;BRANCH IF BOTTOM 16K EXISTS
1014  003612  004567  017674                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1015  003616  025524                          .WORD   INSUFF          ;ADDRESS OF MESSAGE TO BE TYPED
1016                                                                  ;"FIRST 16K OF MEMORY NOT ALL THEPE "
1017  003620  000000                  6$:     HALT                    ;FATAL ERROR HALT...
1018                                                                  ;MEMORY IS NOT CONFIGURED TO RUN THIS PROGRAM.
1019                                  ;;*************************************************************
1020                                  ;*  SPECIAL ROUTINE TO TYPE OUT ALL UNIBUS ADDRESSES WHICH RESPOND TO
1021                                  ;*    DATI, DATIP, DATO, AND DATOB.
1022                                  ;;*************************************************************
1023  003622  012706  001100          TIMOUT: MOV     #STACK, SP      ;SET UP THE STACK POINTER.
1024  003626  005067  174754                  CLR     MMAVA           ;CLEAR MEM MGMT AVAILABLE FLAG.
1025  003632  032777  010000  175300          BIT     #SW12,  @SWR    ;CHECK IF MEM MGMT TO BE INHIBITED.
1026  003640  001011                          BNE     1$              ;BR IF NO MEM MGMT.
1027  003642  012737  003664  000004          MOV     #1$,    @#ERRVEC;SET TIMEOUT FOR MEM MGMT CHECK.
1028  003650  005037  177572                  CLR     @#SR0           ;CHECK FOR MEM MGMT...TIMES OUT IF NONE.
1029  003654  004767  010420                  JSR     PC,     MMINIT  ;INIT ALL MEM MGMT REGISTERS.
1030  003660  005267  174722                  INC     MMAVA           ;SET MEM MGMT AVAILABLE FLAG.
1031  003664                          1$:
1032  003664  004567  017622                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1033  003670  025437                          .WORD   BYTMES          ;ADDRESS OF MESSAGE TO BE TYPED
1034                                                                  ;"BYTE MEMORY MAP:"
1035  003672  005000                          CLR     R0              ;SET UP TYPE OUT FLAG.
1036  003674  005002                          CLR     R2              ;SET ADDRESS POINTER TO ZERO.
1037  003676  012737  003742  000004          MOV     #20$,   @#ERRVEC;SET TIME OUT VEC TO SERVICE NON-EX MEM.
1038  003704  105712                  10$:    TSTB    (R2)            ;DO DATI ONLY.
1039  003706  032702  000001                  BIT     #BIT0,  R2      ;CHECK FOR WORD ADDRESS.
1040  003712  001001                          BNE     11$             ;BR IF ODD BYTE ADDRESS.
1041  003714  011212                          MOV     (R2),   (R2)    ;DO DATI, DATO...NOP FOR READ ONLY MAP.
1042  003716  151212                  11$:    BISB    (R2),   (R2)    ;DO DATI, DATIP, DATOB... NOP FOR READ ONLY MAP.
1043  003720  005700                          TST     R0              ;CHECK FOR PREVIOUS TYPOUT.
1044  003722  001023                          BNE     30$             ;BR IF ALREADY TYPED "FROM".
1045  003724  004567  017562                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1046  003730  025507                          .WORD   FROM            ;ADDRESS OF MESSAGE TO BE TYPED
1047                                                                  ;"FROM"
1048  003732  010246                          MOV     R2,     -(SP)   ;PUT THE DATA ON THE STACK.
1049  003734  004767  021212                  JSR     PC,     $TYPAD  ;DETERMINE THE PHYSICAL ADDRESS AND TYPE IT.
1050  003740  000413                          BR      29$             ;GO TO ADDRESS POINTER UPDATE.
1051                                  ;*  TIME OUTS COME HERE.
1052  003742  022626                  20$:    CMP     (SP)+,  (SP)+   ;POP TWO OFF STACK.
1053  003744  005700                          TST     R0              ;CHECK FOR PREVIOUS TYPOUT.
1054  003746  001411                          BEQ     30$             ;BR IF ALREADY TYPED "TO".
1055  003750  004567  017536                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1056  003754  025517                          .WORD   TO              ;ADDRESS OF MESSAGE TO BE TYPED
1057                                                                  ;"TO"
1058  003756  005302                          DEC     R2              ;BACK UP ONE BYTE.
1059  003760  010246                          MOV     R2,     -(SP)   ;PUT THE DATA ON THE STACK.
1060  003762  004767  021164                  JSR     PC,     $TYPAD  ;DETERMINE THE PHYSICAL ADDRESS AND TYPE IT.
```

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1061  003766  005202                          INC     R2              ;RESET ADDRESS POINTER.
1062  003770  005100                  23$     COM     R0              ;RESET PREVIOUS TYPOUT FLAG
1063  003772  005202                  33$:    INC     R2              ;UPDATE ADDRESS POINTER TO NEXT BYTE
1064  003774  001423                          BEQ     31$             ;EXIT IF ZERO REACHED.
1065  003776  032702  017777                  BIT     #MASK4K,R2      ;CHECK FOR 4K BANK BOUNDRY.
1066  004002  001340                          BNE     10$             ;BR IF MORE THIS 4K BANK.
1067  004004  005767  174576                  TST     MMAVA           ;CHECK IF MEM MGMT IS AVAILABLE
1068  004010  001735                          BEQ     10$             ;BR IF NO MEM MGMT.
1069  004012  022737  007600  172346          CMP     #7600,  @#KIPAR3 ;CHECK FOR END OF LAST 4K BANK
1070  004020  001411                          BEQ     31$             ;EXIT WHEN ALL DONE.
1071  004022  012702  060000                  MOV     #60000, R2      ;RESET VIRTUAL ADDRESS POINTER.
1072  004026  013737  172346  172344          MOV     @#KIPAR3,@#KIPAR2 ;SAVE MEM MGMT REG FOR TYPEOUT.
1073  004034  062737  000200  172346          ADD     #200,   @#KIPAR3 ;UPDATE MEM MGMT REG 2 TO NEXT 4K BANK
1074  004042  000720                          BR      10$             ;BR BACK TO DO NEXT BANK
1075  004044  005700                  31$:    TST     R0              ;CHECK PREVIOUS TYPE FLAG BEFORE EXIT.
1076  004046  001407                          BEQ     32$             ;BR TO EXIT IF TYPING ALL DONE.
1077  004050  004567  017436                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1078  004054  025517                          .WORD   TO              ;ADDRESS OF MESSAGE TO BE TYPED
1079                                                                  ;"TO"
1080  004056  005302                          DEC     R2              ;BACK ADDRESS POINTER UP ONE BYTE.
1081  004060  010246                          MOV     R2,     -(SP)   ;PUT THE DATA ON THE STACK.
1082  004062  004767  021064                  JSR     PC,     $TYPAD  ;DETERMINE THE PHYSICAL ADDRESS AND TYPE IT.
1083  004066  000000                  32$:    HALT                    ;* THIS ROUTINE IS FOR DEBUG USE ONLY.
1084                                                                  ;*  TO RUN THE MAIN PROGRAM RESTART AT 200 OR 204.
1085  004070  000654                          BR      TIMOUT          ;LOOP BACK AND DO AGAIN UPON CONTINUE.
1086
1087                                  .SBTTL  MAP PARITY REGISTERS
1088                                  ;*****************************************************************
1089                                  ;*  SEARCH FOR PARITY REGISTERS PRESENT AND TYPE ADDRESSES OF THOSE FOUND
1090                                  ;*  THAT ARE FUNCTIONAL AND HAVE CORRESPONDING PARITY MEMORY
1091                                  ;*****************************************************************
1092
1093  004072  012704  002276          GMPR:   MOV     #MPRX,  R4      ;SET UP POINTER TO PARITY REG EXIST TABLE
1094  004076  032777  000100  175034          BIT     #SW06,  @SWR    ;CHECK FOR INHIBIT PARITY SWITCH.
1095  004104  001036                          BNE     GMPRD           ;BR IF INHIBIT PARITY.
1096  004106  012703  002076                  MOV     #MPRO,  R3      ;SET UP TABLE POINTER
1097  004112  012737  004134  000004          MOV     #GMPRB, @#ERRVEC ;SET UP TIMEOUT TRAP SERVICE
1098  004120  042713  000001          GMPRA:  BIC     #1,     (R3)    ;CLEAR FLAG BIT IN TABLE
1099  004124  005773  000000                  TST     @(R3)           ;DOES THIS MEMORY PARITY REGISTER EXIST.
1100                                  ;*  IF IT DOESN'T EXIST, A TIMEOUT TRAP WILL GO TO "GMPRB".
1101  004130  012324                          MOV     (R3)+,  (R4)+   ;SAVE IT IN THE PARITY REG EXIST TABLE.
1102  004132  000403                          BR      GMPRC           ;SKIP TIMEOUT SERVICE CODE
1103                                  ;*  TIMEOUT COMES HERE
1104  004134  022626                  GMPRB:  CMP     (SP)+,  (SP)+   ;RESTORE STACK POINTER
1105  004136  052723  000001                  BIS     #1,     (R3)+   ;SET FLAG TO INDICATE REGISTER NOT PRESENT
1106  004142  005023                  GMPRC:  CLR     (R3)+           ;CLEAR THE MAP...LO 64K.
1107  004144  005023                          CLR     (R3)+           ;...HI 64K.
1108  004146  005023                          CLR     (R3)+           ;...AND THE MASK.
1109  004150  020327  002276                  CMP     R3,     #MPRX   ;HAVE WE CHECKED ALL REGISTERS?
1110  004154  103761                          BLO     GMPRA           ;NO - GO BACK TO CHECK NEXT ONE
1111  004156  005014                          CLR     (R4)            ;SET TERMINATOR IN PARITY REG EXIST TABLE.
1112  004160  012737  025114  000004          MOV     #ERRTRP,@#ERRVEC ; RESTORE TRAPCATCHER
1113  004166  005767  176104                  TST     MPRX                    ;ANY PARITY REGISTERS PRESENT?
1114  004172  001006                          BNE     MPAMEM                  ;YES - GO TEST CONTROLS PRESENT
1115  004174  004567  017312                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1116  004200  025605                          .WORD   MTR             ;ADDRESS OF MESSAGE TO BE TYPED
```

```
 1117
 1118  004202  005014                GMPRD:  CLR     (R4)            ;"NO MEMORY PARITY REGISTERS FOUND"
 1119  004204  000167  001156                JMP     MANUAL          ;MAKE SURE TABLE IS CLEAR.
 1120                                                                        ;AND SKIP ALL CONTROLS TESTING
```

```
                                .SBTTL  MAP PARITY MEMORY
                                ;;*****************************************************************
                                ;MAP CORRESPONDENCE BETWEEN PARITY REGISTERS AND MEMORY, AND TYPE RESULTS
                                ;NOTE THAT IF PARITY MEMORY IS NOT LOCATED CORRECTLY THAT IT IS IN ALL
                                ;PROBABILITY DUE TO ONE OF THE FOLLOWING FAILURES:
                                ;       - SETTING WRITE WRONG PARITY DIDN'T CAUSE BAD PARITY TO BE WRITTEN
                                ;       - PARITY GENERATE OR DETECT LOGIC FAILED
                                ;       - PARITY ERROR BIT FAILED TO SET
                                ;       - PARITY BITS IN MEMORY LOCATION FAILED
                                ;       - I.E. BIT STUCK AT GOOD PARITY VALUE
                                ;;*****************************************************************

004210  004767  014054          MPAMEM: JSR     PC,     CLRPAR  ;INITIALIZE ALL PARITY REGISTERS
004214  012767  000001  175322          MOV     #1,     BITPT   ;INITIALIZE 4K POINTER
004222  005067  175320                  CLR     BITPT+2         ;CLEAR HI 64K POINTER
004226  012702  014000                  MOV     #14000, R2      ;SET ADR POINTER TO 1400O.
004232  005767  174350                  TST     MMAVA           ;CHECK FOR MEM MGMT
004236  001404                          BEQ     MAPRB           ;BRANCH IF NO MEM MGMT
004240  012702  054000                  MOV     #54000, R2      ;SET ADR POINTER TO PAR2
004244  004767  010030                  JSR     PC,     MMINIT  ;SET UP ALL MEMORY MGMT REGISTERS

                                ;;*****************************************************************
                                ;SET WRITE WRONG PARITY IN ALL REGISTERS PRESENT
                                ;*  THEN WRITE TEST LOCATION VIA DATO & READ TEST LOCATION VIA DATI
                                ;*  THEN CLEAR WRITE WRONG PARITY IN ALL REGISTERS.
                                ;;*****************************************************************

004250  005067  175264          MAPRB:  CLR     PMEMAP          ;CLEAR THE PARITY MEMORY MAP
004254  005067  175262                  CLR     PMEMAP+2
004260  012703  002076          1$:     MOV     #MPR0,  R3      ;INITIALIZE TABLE ADDRESS
004264  032713  000001          2$:     BIT     #1,     (R3)    ;IS THIS REGISTER PRESENT?
004270  001052                          BNE     3$              ;NO - GET THE NEXT ONE
004272  013773  001612  000000          MOV     @#WWP,  @(R3)   ;YES - SET WRITE WRONG PARITY
                                                                ;AND CLEAR REST OF REGISTER
004300  011212                          MOV     (R2),   (R2)    ;WRITE WRONG PARITY
004302  005712                          TST     (R2)            ;READ WRONG PARITY
004304  043773  001612  000000          BIC     @#WWP,  @(R3)   ;CLEAR WRITE WRONG PARITY
004312  005773  000000                  TST     @(R3)           ;OTHERWISE, CHECK TO SEE IF THIS
                                                                ;CONTROL REGISTER GOT A PARITY
                                                                ;ERROR
004316  100014                          BPL     6$              ;BRANCH IF IT DIDN'T AND CHECK
004320  032773  007740  000000          BIT     #7740,  @(R3)   ;IS IT A CORE PAR. REG.
004326  001404                          BEQ     5$              ;BRANCH IF NOT.
004330  012763  070032  000006          MOV     #70032, 6(R3)   ;IF IT IS SET UP MASK
004336  000413                          BR      7$              ;AND BRANCH TO SET BITS.
004340  012763  077772  000006  5$:     MOV     #77772, 6(R3)   ;IF MOS SET UP MASK
004346  000407                          BR      7$              ;AND BRANCH TO SET BIT.
004350  032773  007740  000000  6$:     BIT     #7740,  @(R3)   ;IF ANY BITS ARE SET
004356  001417                          BEQ     3$              ;THEN CSR IS MSII-K.
004360  012763  070000  000006          MOV     #70000, 6(R3)   ;IF MSII-K SET MASK.
004366  056763  175152  000002  7$:     BIS     BITPT,  2(R3)   ;SET FLAG IN MAP FOR THIS PARITY REGISTER
004374  056763  175146  000004          BIS     BITPT+2,4(R3)
004402  056767  175136  175130          BIS     BITPT,  PMEMAP  ;SET FLAG IN PARITY MAP
004410  056767  175132  175124          BIS     BITPT+2,PMEMAP+2
004416  062703  000010          3$:     ADD     #10,    R3      ;STEP UP TO NEXT REGISTER
004422  020327  002276                  CMP     R3,     #MPRX   ;ARE WE DONE WITH TABLE?
```

```
1177  004426  103716                          BLO     2$              ;GO BACK TO CHECK FOR ANY MORE!
1178  004430  011212                          MOV     (R2),   (R2)    ;CLEAR BAD PARITY
1179  004432  005767  174150                  TST     MMAVA           ;CHECK FOR MEM MGMT
1180  004436  001444                          BEQ     10$             ;BR IF NO MEM MGMT
1181  004440  062737  000200  172344  4$:     ADD     #200,   @#KIPAR2 ;UPDATE PAR IC NEXT 4K BANK.
1182  004446  006367  175072                  ASL     BITPT           ;UPDATE BANK POINTER.  LO 64K.
1183  004452  006167  175070                  ROL     BITPT+2         ;...HI 64K.
1184  004456  100441                          BMI     TMAP            ;BR IF ALL DONE.
1185  004460  023727  172344  001000          CMP     @#KIPAR2,#1000  ;THIS CODE TESTS IF MS11-K IS
1186  004466  001013                          BNE     12$             ;PRESENT AND IF IT IS I SET
1187  004470  032737  000003  002260          BIT     #3,@#MPR14+2    ;THE BIT TO DISABLE ECC IN
1188  004476  001004                          BNE     13$             ;THE LOCATION WWP THAT 'S
1189  004500  032737  000003  002270          BIT     #3,@#MPR15+2    ;USED AS THE COMMAND TO
1190  004506  001400                          BEQ     13$             ;WRITE WRONG PARITY.
1191  004510  012737  020004  001612  13$:     MOV     #2000$,@#WWP
1192  004516  036767  175022  175000  12$:     BIT     BITPT,  MEMMAP  ;CHECK IF BANK EXISTS...LO 64K.
1193  004524  001255                          BNE     1$              ;BR IF BANK EXISTS.
1194  004526  036767  175014  174772          BIT     BITPT+2,MEMMAP+2 ;...HI 64K.
1195  004534  001251                          BNE     1$              ;BR IF BANK EXISTS.
1196  004536  000740                          BR      4$              ;BR IF BANK DOESN'T EXIST.
1197  004540  036767  175000  174756  11$:     BIT     BITPT,  MEMMAP  ;CHECK IF BANK EXISTS.
1198  004546  001244                          BNE     1$              ;BR IF BANK EXISTS.
1199  004550  062702  020000          10$:     ADD     #20000, R2      ;UPDATE ADDRESS POINTER TO NEXT BANK.
1200  004554  106367  174764                  ASLB    BITPT           ;MOVE POINTER TO NEXT BANK.
1201  004560  100367                          BPL     11$             ;BR IF MORE TO LOOK FOR.
1202
1203                                  ;;*****************************************************************
1204                                  ;*  ROUTINE TO TYPE MAP OF WHERE PARITY MEMORY IS PRESENT
1205                                  ;*  AND WHICH CONTROL REGISTERS CONTROL WHICH MEMORY
1206                                  ;;*****************************************************************
1207
1208  004562  004767  013502          TMAP:   JSR     PC,     CLRPAR  ;INITIALIZE ALL PARITY REGISTERS PRESENT
1209  004566  004567  015720                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1210  004572  025462                          .WORD   MTMAP           ;ADDRESS OF MESSAGE TO BE TYPED
1211                                                                  ;"PARITY MEMORY MAP:"
1212  004574  012703  002076                  MOV     #MPR0,  R3      ;INITIALIZE TABLE POINTER
1213  004600  032713  000001          1$:     BIT     #BIT0,  (R3)    ;CHECK IF THIS REGISTER IS PRESENT.
1214  004604  001046                          BNE     2$              ;BR IF NOT PRESENT.
1215  004606  022763  070032  000006          CMP     #70032, 6(R3)
1216  004614  001004                          BNE     3$
1217  004616  004567  016670                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1218  004622  026123                          .WORD   MX3             ;ADDRESS OF MESSAGE TO BE TYPED
1219                                                                  ;"CORE PARITY"
1220  004624  000417                          BR      5$
1221  004626  022763  077772  000006  3$:     CMP     #77772, 6(R3)
1222  004634  001004                          BNE     4$
1223  004636  004567  016650                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1224  004642  026142                          .WORD   MX4             ;ADDRESS OF MESSAGE TO BE TYPED
1225                                                                  ;"MOS PARITY"
1226  004644  000407                          BR      5$
1227  004646  022763  070000  000006  4$:     CMP     #70000, 6(R3)
1228  004654  001003                          BNE     5$
1229  004656  004567  016630                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1230  004662  026160                          .WORD   MX5             ;ADDRESS OF MESSAGE TO BE TYPED
1231                                                                  ;"MS11-K CSR"
1232  004664                          5$:
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1233  004664  004567  016622                  JSP     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1234  004670  026071                          .WORD   MX1             ;ADDRESS OF MESSAGE TO BE TYPED
1235                                                                  ;"REGISTER AT"
1236  004672  011346                          MOV     (R3),-(SP)      ;SAVE (R3) FOR TYPEOUT
1237                                  ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPOC ROUTINE
1238                                  ;*  WITHOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
1239  004674  013746  177776                  MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
1240  004700  004767  020004                  JSR     PC,     $TYPOC  ;GO TO THE SUBROUTINE
1241  004704  004567  016602                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1242  004710  026110                          .WORD   MX2             ;ADDRESS OF MESSAGE TO BE TYPED
1243                                                                  ;"CONTROLS"
1244  004712  010300                          MOV     R3,     R0      ;SET UP R0 FOR TYPMAP ROUTINE.
1245  004714  005720                          TST     (R0)+           ;UPDATE POINTER TO MAP.
1246  004716  004767  013470                  JSR     PC,     TYPMAP  ;GO TYPE THE MEMORY COVERED BY THIS REGISTER.
1247  004722  062703  000010          2$:     ADD     #10,    R3      ;UPDATE TO NEXT REGISTER IN TABLE.
1248  004726  020327  002276                  CMP     R3,     #MPRX   ;ARE WE ALL DONE WITH TABLE?
1249  004732  103722                          BLO     1$              ;BRANCH IF MORE REGISTERS
1250  004734  004567  016552                  JSR     R5,     $PRINT  ;THE REASON I'M OUTPUTTING THIS CRLF
1251  004740  001201                          $CRLF                   ;IS TO GIVE THE PRINTER ENOUGH TIME TO
1252                                                                  ;FINISH PRINTING THE MEMORY MAP BEFORE THE RESET OCCURS.
1253  004742  022737  070000  002264          CMP     #70000,@#MPR14+6 ;DO WE HAVE MS11-K AT THIS ADDRESS
1254  004750  001006                          BNE     7$              ;IF NO BRANCH
1255  004752  043727  002260  001540          BIC     @#MPR14+2,#PMEMAP ;IF YES THEN CLEAR THE BITS IN
1256  004760  043737  002262  001540          BIC     @#MPR14+4,@#PMEMAP ;THE PARITY MEMORY MAP.
1257  004766  022737  070000  002274  7$:     CMP     #70000, @#MPR15+6       ;DO WE HAVE A MS11-K
1258  004774  001031                          BNE     9$              ;IF NO GO TO TESTS NOW.
1259  004776  043737  002270  001540          BIC     @#MPR15+2,@#PMEMAP      ;IF YES I AM GOING TO
1260  005004  043737  002272  001542          BIC     @#MPR15+4,@#PMEMAP+2    ;CLEAR THE PARITY INDICATORS
1261  005012  012705  002276                  MOV     #MPRX,  R5      ;FOR THAT PORTION OF MEMORY.
1262  005016  021537  002256          6$:     CMP     (R5),@#MPR14    ;SEARCH FOR THIS MS11-K  CSR IN
1263  005022  001004                          BNE     8$              ;AND IF ITS THERE DELETE IT
1264  005024  005015                          CLR     (R5)
1265  005026  052737  000001  002256          BIS     #1,@#MPR14
1266  005034  022537  002266          8$:     CMP     (R5)+,  @#MPR15 ;SEARCH FOR MS11-K CSR IN
1267  005040  001366                          BNE     6$              ;THE AVAILABILITY TABLE,
1268  005042  005045                          CLR     -(R5)           ;AND CLEAR ITS ADDRESS FROM THE TABLE
1269  005044  052737  000001  002266          BIS     #1,     @#MPR15 ;SET BIT0 IN ADDRESS IN CSR TABLE
1270  005052  004567  016434                  JSR     R5,     $PRINT  ;OUTPUT MESSAGE TO RUN MS11-K TEST.
1271  005056  026176                          .WORD   MX6
1272  005060  005737  002276          9$:     TST     @#MPRX          ;ARE THERE ANY PARITY REGISTERS TO TEST?
1273  005064  001002                          BNE     CTRLS           ;IF SO TEST THE BITS IN THE REGISTERS.
1274  005066  000167  000274                  JMP     MANUAL          ;IF NO JUMP OVER REGISTER TESTS.
1275
1276                                  .SBTTL  TEST PARITY REGISTERS
1277                                  ;;*****************************************************************
1278                                  ;* SHOW THAT BITS 0, 2, 5 - 11, AND 15 OF EACH PARITY REGISTER PRESENT
1279                                  ;*  CAN BE SET AND CLEARED.
1280                                  ;*  THIS IS A ONCE ONLY TEST.
1281                                  ;;*****************************************************************
1282
1283  005072  012703  002076          CTRLS:  MOV     #MPR0,  R3      ;LOAD INITIAL TABLE ADDRESS FOR A POINTER
1284  005076  011302                  1$:     MOV     (R3),   R2      ;LOAD R2 WITH ADDRESS OF THIS PARITY REGISTER
1285  005100  062703  000010                  ADD     #10,    R3      ;UPDATE POINTER TO NEXT PAR. REG. ADD.
1286  005104  032702  000001                  BIT     #1,     R2      ;IS THIS REGISTER BEING USED?
1287  005110  001372                          BNE     1$              ;GO TO NEXT IF NOT
1288  005112  020327  002276                  CMP     R3,     #MPRX   ;ARE WE AT END OF TABLE
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1289  005116  003055                        BGT     RESCHK          ;GO TO NEXT TEST IF YES
1290  005120  005763  177776                TST     -2(R3)          ;TEST MASK FOR PARITY REGISTER
1291  005124  001764                        BEQ     1$              ;IF = 0,THEN DO NOT TEST
1292  005126  016367  177776  174362        MOV     -2(R3), RESRVD  ;GET MASK FOR REGISTER WE ARE WORKING ON
1293  005134  012700  000001                MOV     #1,     R0      ;LOAD R0 WITH VALUE OF 1ST BIT TESTED
1294  005140  005012                        CLR     (R2)            ;INITIALIZE THE PARITY REGISTER
1295  005142  011201                        MOV     (R2),   R1      ;READ THE CONTENTS OF THE PARITY REGISTER
1296  005144  046701  174346                BIC     RESRVD, R1      ;CLEAR BITS WHICH ARE RESERVED
1297  005150  001405                        BEQ     2$              ;CHECK OTHER BITS - BRANCH IF OK
1298  005152  004767  013134        64$:    JSR     PC,     SPRNT   ;SET UP VALUES FOR ERROR PRINTING.
1299  005156  004767  014456                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1300  005162  000001                        .WORD   1               ;ERROR TYPE CODE.
1301  005164  030067  174326        2$:     BIT     R0,     RESRVD  ;IS THIS BIT RESERVED?
1302  005170  001025                        BNE     3$              ;YES - DON'T TEST IT
1303  005172  010012                        MOV     R0,     (R2)    ;NO - SET THIS BIT IN THE PARITY REGISTER
1304  005174  011201                        MOV     (R2),   R1      ;READ & SAVE CONTENTS OF THE PARITY REGISTER
1305  005176  005012                        CLR     (R2)            ;CLEAR THE PARITY REGISTER
1306  005200  046701  174312                BIC     RESRVD, R1      ;CLEAR BIT LOCATIONS THAT ARE RESERVED
1307  005204  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
1308  005206  001405                        BEQ     66$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1309  005210  004767  013126        65$:    JSR     PC,     SPRNTD  ;SET UP VALUES FOR ERROR PRINTING.
1310  005214  004767  014420                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1311  005220  000001                        .WORD   1               ;ERROR TYPE CODE.
1312  005222                        66$:
1313  005222  011201                        MOV     (R2),   R1      ;READ THE CONTENTS OF THE PARITY REGISTER
1314  005224  046701  174266                BIC     RESRVD, R1      ;CLEAR BITS WHICH ARE RESERVED
1315  005230  001405                        BEQ     3$              ;CHECK OTHER BITS - BRANCH IF OK
1316  005232  004767  013054        67$:    JSR     PC,     SPRNT   ;SET UP VALUES FOR ERROR PRINTING.
1317  005236  004767  014376                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1318  005242  000001                        .WORD   1               ;ERROR TYPE CODE.
1319  005244  006300                3$:     ASL     R0              ;ROTATE TO GET NEXT BIT TO BE TESTED
1320  005246  103346                        BCC     2$              ;BRANCH IF NOT DONE WITH ALL BITS
1321  005250  000712                        BR      1$              ;AFTER TESTING FOR BIT 15 GO GET NEXT REGISTER.
1322
1323                                ;;*****************************************************************
1324                                ;* SHOW THAT RESET CLEARS BITS 0,2, AND 15 OF EACH PARITY REGISTER PRESENT.
1325                                ;*  THIS IS A ONCE ONLY TEST.
1326                                ;;*****************************************************************
1327
1328  005252  012704  002076        RESCHK: MOV     #MPRO,  R4      ;LOAD INITIAL TABLE ADDRESS FOR A POINTER
1329  005256  010403                1$:     MOV     R4,     R3
1330  005260  062704  000010                ADD     #10,    R4
1331  005264  032713  000001        BIT     #1,     (R3)    ;IS THIS REGISTER BEING USED
1332  005270  001372                        BNE     1$              ;BRANCH IF NO
1333  005272  012773  177777  000000        MOV     #-1,    @(R3)   ;SET ALL BITS TO A 1
1334  005300  022704  002276                CMP     #MPRX,R4        ;ARE WE AT THE END OF THE TABLE
1335  005304  002764                        BLT     1$              ;IF YES THEN WE ARE READY TO TEST
1336  005306  000005                        RESET                   ;RESET THE WORLD
1337  005310  012703  002076                MOV     #MPRO,  R3      ;LOAD INITIAL ADDRESS FOR POINTER
1338  005314  011302                2$:     MOV     (R3),   R2      ;STORE PARITY REGISTER ADDRESS
1339  005316  062703  000010                ADD     #10,    R3
1340  005322  032702  000001                BIT     #1,     R2
1341  005326  001372                        BNE     2$
1342  005330  022703  002276                CMP     #MPRX,  R3
1343  005334  002014                        BGE     MANUAL
1344  005336  011201                        MOV     (R2),   R1      ;GET CONTENTS OF REGISTER
```

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1345  005340  005012                        CLR     (R2)
1346  005342  042701  077772                BIC     #77772,R1       ;CLEAR BITS NOT EFFECTED  BY RESET
1347  005346  005701                        TST     R1              ;CHECK IF REST  WERE CLEARED BY  RESET
1348  005350  001405                        BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1349  005352  004767  012734        64$:    JSR     PC,     SPRNT   ;SET UP VALUES FOR ERROR PRINTING.
1350  005356  004767  014256                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1351  005362  000001                        .WORD   1               ;ERROR TYPE CODE.
1352  005364                        65$:
1353  005364  000753                        BR      2$              ;BRANCH BACK TO CHECK NEXT REGISTER
1354
1355
1356  005366  012700  000014        MANUAL: MOV     #12.,   R0      ;SET COUNTER TO CLEAR 12 WORDS.
1357  005372  012701  001562                MOV     #FSTADR,R1      ;STARTING AT FSTADR.
1358  005376  005021                1$:     CLR     (R1)+           ;CLEAR THE LOCATIONS.
1359  005400  005300                        DEC     R0              ;COUNT.
1360  005402  001375                        BNE     1$              ;BR IF MORE.
1361  005404  105767  174146                TSTB    SELFLG          ;CHECK FOR SELECT PARAMETERS STARTUP.
1362  005410  001005                        BNE     MANUL1          ;BR IF PARAMETERS TO BE SELECTED.
1363  005412  016767  173546  174154        MOV     $TMP2,  LSTADR  ;SET UP VIRTUAL LAST ADDRESS.
1364  005420  000167  000402                JMP     MANUL2          ;SKIP PARAMETER SELECTION SECTION.
```

```
1365                                    .SBTTL  USER PARAMETER SELECTION SECTION
1366                                    ;;*************************************************************
1367                                    ;* USER PARAMETER SELECTION SECTION IS ENTERED BY STARTING AT 204.
1368                                    ;;*************************************************************
1369  005424  012700  000001           MANUL1: MOV     #BIT0,  R0      ;SET UP BANK POINTER.
1370  005430  005001                           CLR     R1              ;...HI 64K.
1371  005432  005002                           CLR     R2              ;CLEAR ADDRESS POINTER.
1372  005434  005003                           CLR     R3              ;...HI ADDRESS BITS.
1373  005436  004567  016050                   JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1374  005442  026311                           .WORD   FADMES          ;ADDRESS OF MESSAGE TO BE TYPED
1375                                                                   ;"FIRST ADDRESS:"
1376                                    ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $RDOCT ROUTINE
1377                                    ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
1378  005444  013746  177776                   MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
1379  005450  004767  015664                   JSR     PC,     $RDOCT  ;GO TO THE SUBROUTINE
1380  005454  042716  000001                   BIC     #BIT0,  (SP)    ;MAKE SURE ADDRESS IS ON A WORD BOUNDRY.
1381  005460  005067  174050                   CLR     SAVTST          ;INIT TEST MAP...LO 64K.
1382  005464  005067  174046                   CLR     SAVTST+2        ;...HI 64K.
1383  005470  062702  020000           1$:     ADD     #20000, R2      ;UPDATE ADDRESS POINTER TO NEXT BANK.
1384  005474  005503                           ADC     R3
1385  005476  020367  016006                   CMP     R3,     $HIOCT  ;CHECK HI ADDRESS BITS.
1386  005502  103403                           BLO     2$              ;BR IF NOT HI ENOUGH YET.
1387  005504  101006                           BHI     3$              ;BR IF PAST SELECTED ADDRESS.
1388  005506  020216                           CMP     R2,     (SP)    ;CHECK THE LO ADDRESS BITS.
1389  005510  101004                           BHI     3$              ;BR IF PAST SELECTED ADDRESS.
1390  005512  006300                   2$:     ASL     R0              ;UPDATE POINTER...LO 64K.
1391  005514  006101                           ROL     R1              ;...HI 64K.
1392  005516  100364                           BPL     1$              ;BR BACK TO CHECK NEXT BANK.
1393  005520  000507                           BR      17$             ;BR IF OVERFLOW.
1394  005522  030067  173776           3$:     BIT     R0,     MEMMAP  ;CHECK IF BANK EXISTS.
1395  005526  001003                           BNE     4$              ;BR IF BANK EXISTS.
1396  005530  030167  173772                   BIT     R1,     MEMMAP+2 ;CHECK HI 64K.
1397  005534  001501                           BEQ     17$             ;BR IF ADDRESS IN UN-MAPPED BANK.
1398  005536  016704  015746           4$:     MOV     $HIOCT, R4      ;SAVE FIRST ADR HI BITS.
1399  005542                           10$:
1400  005542  004567  015744                   JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1401  005546  026376                           .WORD   LADMES          ;ADDRESS OF MESSAGE TO BE TYPED
1402                                                                   ;"LAST ADDRESS:"
1403                                    ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $RDOCT ROUTINE
1404                                    ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
1405  005550  013746  177776                   MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
1406  005554  004767  015560                   JSR     PC,     $RDOCT  ;GO TO THE SUBROUTINE
1407  005560  005716                           TST     (SP)            ;CHECK IF ADR 0 SELECTED (DEFAULT).
1408  005562  001010                           BNE     11$             ;BR IF NOT 0 (DEFAULT)
1409  005564  005767  015720                   TST     $HIOCT          ;CHECK HI BITS.
1410  005570  001005                           BNE     11$             ;BR IF NOT 0 (DEFAULT)
1411  005572  016716  173366                   MOV     $TMP2,  (SP)    ;SET UP DEFAULT LAST ADR.
1412  005576  016767  173364  015704           MOV     $TMP3,  $HIOCT
1413  005604  012667  173764           11$:    MOV     (SP)+,  LSTADR  ;GET THE DATA.
1414  005610  020467  015674                   CMP     R4,     $HIOCT  ;CHECK FOR LAST ADR BELOW FIRST ADR.
1415  005614  101352                           BHI     10$             ;BB IF LAST BELOW FIRST.
1416  005616  103403                           BLO     12$             ;BR IF LAST ABOVE FIRST.
1417  005620  021667  173750                   CMP     (SP),   LSTADR  ;CHECK FOR LAST BELOW FIRST.
1418  005624  101346                           BHI     10$             ;BR IF LAST BELOW FIRST.
1419  005626  032716  017777           12$:    BIT     #MASK4K,(SP)    ;CHECK IF FIRST ADR ON BANK BOUNDRY.
1420  005632  001404                           BEQ     13$             ;BR IF ON BOUNDRY.
```

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1421  005634  010067  173730          MOV     R0,     FADMAP  ;SET UP FIRST ADDRESS MAP.
1422  005640  010167  173726          MOV     R1,     FADMAP+2
1423  005644  050067  173664  13$:    BIS     R0,     SAVTST  ;SET FLAG IN TEST MAP...LO 64K.
1424  005650  050167  173662          BIS     R1,     SAVTST+2;....HI 64K.
1425  005654  020367  015630  14$:    CMP     R3,     $HIOCT  ;CHECK FOR PAST LAST ADR.
1426  005660  103404                  BLO     15$             ;BR IF BELOW LAST ADR.
1427  005662  101020                  BHI     16$             ;BR IF GONE PAST LAST ADR.
1428  005664  020267  173704          CMP     R2,     LSTADR  ;CHECK FOR PAST LAST ADR.
1429  005667  101015                  BHI     16$             ;BR IF GONE PAST LAST ADR.
1430  005[    062702  020000  15$:    ADD     #20000, R2      ;UPDATE ADDRESS POINTER.
1431  005676  005503                  ADC     R3              ;...HI BITS.
1432  005700  006300                  ASL     R0              ;UPDATE BANK POINTER...LO 64K.
1433  005702  006101                  ROL     R1              ;...HI 64K.
1434  005704  100415                  BMI     17$             ;BR IF OVERFLOW.
1435  005706  030067  173612          BIT     R0,     MEMMAP  ;CHECK IF THIS BANK EXISTS.
1436  005712  001354                  BNE     13$             ;BR IF BANK EXISTS.
1437  005714  030167  173606          BIT     R1,     MEMMAP+2;CHECK IF THIS BANK EXISTS.
1438  005720  001351                  BNE     13$             ;BR IF BANK EXISTS.
1439  005722  000754                  BR      14$             ;BR IF BANK DOESN'T EXIST.
1440  005724  030067  173574  16$.    BIT     R0,     MEMMAP  ;CHECK IF THIS BANK EXISTS.
1441  005730  001010                  BNE     20$             ;BR IF IT EXISTS.
1442  005732  030167  173570          BIT     R1,     MEMMAP+2;CHECK IF THIS BANK EXISTS.
1443  005736  001005                  BNE     20$             ;BR IF IT EXISTS.
1444  005740  005726          17$:    TST     (SP)+           ;ADJUST THE STACK.
1445  005742  004567  015544          JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1446  005746  026421                  .WORD   BADADR          ;ADDRESS OF MESSAGE TO BE TYPED
1447                                                          ;"?ADDRESS IN UNMAPPED BANK?"
1448  005750  000606                  BR      MANUAL          ;LOOP BACK TO THE BEGINNING.
1449  005752  010067  173624  20$:    MOV     R0,     LADMAP  ;SET UP MAP FOR LAST ADDRESS.
1450  005756  010167  173622          MOV     R1,     LADMAP+2
1451  005762  005767  172620  21$:    TST     MMAVA           ;CHECK FOR MEMORY MANAGEMENT.
1452  005766  001404                  BEQ     22$             ;BR IF NO MEM MGMT.
1453  005770  042716  160000          BIC     #160000,(SP)    ;ADJUST FSTADR TO VITRUAL BANK 0.
1454  005774  062716  040000          ADD     #40000, (SP)    ;...TO VIRTUAL BANK 2.
1455  006000  012667  173556  22$:    MOV     (SP)+,  FSTADR  ;SAVE FISRT ADDRESS OFF THE STACK.
1456  006004                  30$:
1457  006004  004567  015502          JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
1458  006010  026456                  .WORD   CONST           ;ADDRESS OF MESSAGE TO BE TYPED
1459                                                          ;"SELECT CONSTANT: "
1460                                  ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $RDOCT ROUTINE
1461                                  ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
1462  006012  013746  177776          MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
1463  006016  004767  015316          JSR     PC,     $RDOCT  ;GO TO THE SUBROUTINE
1464  006022  012667  173562          MOV     (SP)+,  .CONST  ;SAVE THE CONSTANT
1465  006026  005767  172554  MANUL2: TST     MMAVA           ;CHECK IF MEM MGMT IS AVAILABLE.
1466  006032  001406                  BEQ     31$             ;BR IF NO MEM MGMT.
1467  006034  042767  160000  173532  BIC     #160000,LSTADR  ;ADJUST LSTADR TO VIRTUAL BANK 0.
1468  006042  062767  040000  173524  ADD     #40000, LSTADR  ;...VIRTUAL BANK 2.
1469  006050  062767  000002  173516  31$:    ADD     #2,     LSTADR  ;ADJUST LAST ADDRESS UP ONE WORD.
1470  006056  042767  000001  173510  BIC     #BIT0,  LSTADR  ;MAKE SURE IT IS A WORD ADDRESS.
1471  006064  032767  017777  173502  BIT     #MASK4K,LSTADR  ;CHECK IF LAST ADR IS ON BANK BOUNDRY.
1472  006072  001004                  BNE     START1          ;BR IF NOT ON BOUNDRY.
1473  006074  005067  173502          CLR     LADMAP          ;CLEAR OUT THE LAST ADDRESS MAP.
1474  006100  005067  173500          CLR     LADMAP+2
1475
```

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                ;*\:*\:/*\:/*\:/*\:/*\:*\:*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:
                ;*  THE REST OF THE PROGRAM IS POSITION INDEPENDENT CODE, SO THAT IT CAN EXICUTE PROPERLY WHEN THE PROGRAM HAS BEEN RELO
                ;*  THIS IS DONE SO THAT THE FIRST TWO BANKS OF MEMORY CAN BE EXERCISED IN EXACTLY THE SAME MANNER AS THE REST OF MEMORY
                ;/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*

 1482  006104  016706  173512          START1: MOV     .STACK, SP      ;SET STACK POINTER
 1483  006110  005767  173502                  TST     CASFLG          ;CHECK CACHE PRESENT FLAG
 1484  006114  001403                          BEQ     1$              ;BRANCH IF NO CACHE
 1485  006116  052777  000014  173474          BIS     #14,    @CASREG ;TURN OFF CACHE
 1486  006124  012767  006104  172754  1$:     MOV     #START1,$LPADR  ;INI  LOOP ADDRESS.
 1487  006132  066767  172442  172746          ADD     RELOCF, $LPADR
 1488  006140  004767  011372                  JSR     PC,     MAMF    ;SET UP MEMORY PARITY ERROR VECTOR
 1489  006144  005767  172436                  TST     MMAVA           ;CHECK FOR MEMORY MANAGEMENT AVAILABLE.
 1490  006150  001406                          BEQ     TST1            ;BRANCH IF NO MEM MGMT.
 1491  006152  032737  000001  177572          BIT     #BIT0,  @#SR0   ;CHE  . IF MEM MGMT ENABLED.
 1492  006160  001002                          BNE     TST1            ;BR IF MEM MGMT ENABLED.
 1493  006162  004767  006112                  JSR     PC,     MMINIT  ;SET UP MEM MGMT REGISTERS.
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                                .SBTTL SECTION 1:       MEMORY ADDRESS TESTS
                                ;;*****************************************************************
                                ;*TEST 1         WRITE VALUE OF MEMORY ADDRESS INTO MEMORY
                                ;*      R0 = DATA WRITTEN INTO MEMORY (SHOULD BE)
                                ;*      R1 = DATA READ FROM MEMORY (WAS)
                                ;*      R2 = VIRTUAL ADDRESS
                                ;*      R3 = NOT USED
                                ;*      R4 = NOT USED
                                ;*      R5 = BLOCK BOUNDRY BIT MASK.
                                ;;*****************************************************************
006166                          TST1:
006166  004567  012436                  JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
006172  000001                          .WORD   1               ;MINIMUM BLOCK SIZE OF 1 WORDS
                                                                ; REQUIRED FOR THIS TEST
006174  000167  005604                  JMP     TST32           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
                                                                ; AVAILABLE FOR TEST.
                                ;*  UPWARDS WORD ADDRESSING.
006200  004467  006222                  JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
006204  004767  007644          1$:     JSR     PC,     PHYADR  ;GET PHYSICAL ADDRESS INTO R0
006210  010012                  2$:     MOV     R0,     (R2)    ;WRITE VALUE OF ADDRESS INTO ADDRESS
006212  012201                          MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
006214  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
006216  001405                          BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
006220  004767  012142          64$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
006224  004767  013410                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
006230  000002                          .WORD   2               ;ERROR TYPE CODE.
006232                          65$:
006232  062700  000002                  ADD     #2,     R0      ;ADD #2 TO PHYSICAL ADDRESS
006236  030502                          BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
006240  001363                          BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
006242  004767  006736                  JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.

                                ;*  CHECK THAT VALUE OF MEMORY ADDRESS WAS WRITTEN CORRECTLY
                                ;*  DOWNWARDS WORD ADDRESSING.
006246  004467  006612                  JSR     R4,     INITDN  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
006252  004767  007576          3$:     JSR     PC,     PHYADR  ;GET PHYSICAL ADDRESS INTO R0
006256  162700  000002          4$:     SUB     #2,     R0      ;DEC DATA BY 2
006262  014201                          MOV     -(R2),  R1      ;GET THE DATA FROM MEMORY
006264  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
006266  001405                          BEQ     67$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
006270  004767  012046          66$:    JSR     PC,     SPRNT0  ;SET UP VALUES FOR ERROR PRINTING.
006274  004767  013340                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
006300  000002                          .WORD   2               ;ERROR TYPE CODE.
006302                          67$:
006302  030502                          BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
006304  001364                          BNE     4$              ;BRANCH IF MORE IN CURRENT BLOCK.
006306  004767  007362                  JSR     PC,     MMDOWN  ;FIND NEXT BLOCK AND LOOP TO $TAG1.
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1541                                    ;;*****************************************************************
1542                                    ;*TEST 2        WRITE VALUE OF MEMORY ADDRESS INTO MEMORY
1543                                    ;*       R0 = DATA WRITTEN INTO MEMORY (SHOULD BE)
1544                                    ;*       R1 = DATA READ FROM MEMORY (WAS)
1545                                    ;*       R2 = VIRTUAL ADDRESS
1546                                    ;*       R3 = NOT USED
1547                                    ;*       R4 = NOT USED
1548                                    ;*       R5 = BLOCK BOUNDRY BIT MASK.
1549                                    ;;*****************************************************************
1550  006312                            TST2:
1551  006312  004567  012312                   JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
1552  006316  000000                            .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
1553                                    ;*  UPWARDS BYTE ADDRESSING.
1554  006320  004467  006102                   JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1555  006324  004767  007524           1$:     JSR     PC,     PHYADR  ;GET PHYSICAL ADDRESS INTO R0
1556  006330  110022                   2$:     MOVB    R0,     (R2)+   ;WRITE VALUE OF ADDRESS INTO ADDRESS
1557  006332  005200                            INC     R0              ;ADD ONE TO PHYSICAL ADDRESS
1558  006334  030502                            BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
1559  006336  001374                            BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
1560  006340  004767  006640                   JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
1561
1562                                    ;*  CHECK THAT VALUE OF MEMORY ADDRESS WAS WRITTEN CORRECTLY
1563                                    ;*  DOWNWARDS BYTE ADDRESSING.
1564  006344  004467  006514                   JSR     R4,     INITDN  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1565  006350  004767  007500           3$:     JSR     PC,     PHYADR  ;GET PHYSICAL ADDRESS INTO R0
1566  006354  005300                   4$:     DEC     R0              ;DEC DATA BY 1
1567  006356  114201                            MOVB    -(R2),  R1      ;GET THE DATA FROM MEMORY
1568  006360  120001                            CMPB    R0,     R1      ;CHECK THE DATA...LO BYTE ONLY VALID.
1569  006362  001405                            BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1570  006364  004767  011752           64$:    JSR     PC,     SPRNTO  ;SET UP VALUES FOR ERROR PRINTING.
1571  006370  004767  013244                   JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1572  006374  000003                            .WORD   3               ;ERROR TYPE CODE.
1573  006376                           65$:
1574  006376  030502                            BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
1575  006400  001365                            BNE     4$              ;BRANCH IF MORE IN CURRENT BLOCK.
1576  006402  004767  007266                   JSR     PC,     MMDOWN  ;FIND NEXT BLOCK AND LOOP TO $TAG1.
1577
1578                                    ;;*****************************************************************
1579                                    ;*TEST 3        WRITE 1'S COMPLEMENT VALUE OF ADDRESS INTO ADDRESS.
1580                                    ;*       R0 = DATA WRITTEN INTO MEMORY (SHOULD BE)
1581                                    ;*       R1 = DATA READ FROM MEMORY (WAS)
1582                                    ;*       R2 = VIRTUAL ADDRESS
1583                                    ;*       R3 = NOT USED
1584                                    ;*       R4 = NOT USED
1585                                    ;*       R5 = BLOCK BOUNDRY BIT MASK.
1586                                    ;;*****************************************************************
1587  006406                            TST3:
1588  006406  004567  012216                   JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
1589  006412  000000                            .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
1590                                    ;*  DOWNWARDS WORD ADDRESSING.
1591  006414  004467  006444                   JSR     R4,     INITDN  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1592  006420  004767  007430           1$:     JSR     PC,     PHYADR  ;GET PHYSICAL ADDRESS INTO R0
1593  006424  005100                            COM     R0              ;COMPLEMENT THE ADR
1594  006426  062700  000002           2$:     ADD     #2,     R0      ;+2 TO DATA--ADR GOES DOWN SO COM GOES UP
1595  006432  010042                            MOV     R0,     -(R2)   ;PUT DATA INTO MEMORY
1596  006434  030502                            BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
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1597  006436  001373                        BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
1598  006440  004767  007230                JSR     PC,     MMDOWN  ;FIND NEXT BLOCK AND LOOP TO 1$.
1599
1600                                  ;*  CHECK COMPLEMENT DATA WRITTEN DOWN
1601                                  ;*  UPWARDS WORD ADDRESSING.
1602  006444  004467  005756                JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1603  006450  004767  007400          3$:   JSR     PC,     PHYADR  ;GET PHYSICAL ADDRESS INTO R0
1604  006454  005100                        COM     R0              ;COMPLEMENT IT
1605  006456                          4$:
1606  006456  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
1607  006460  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
1608  006462  001405                        BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1609  006464  004767  011676          64$:  JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
1610  006470  004767  013144                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1611  006474  000002                        .WORD   2               ;ERROR TYPE CODE.
1612  006476                          65$:
1613  006476  162700  000002                SUB     #2,     R0      ;COUNT DOWN WITH ADDRESS
1614  006502  030502                        BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
1615  006504  001364                        BNE     4$              ;BRANCH IF MORE IN CURRENT BLOCK.
1616  006506  004767  006472                JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 3$.
1617
1618                                  ;;*****************************************************************
1619                                  ;*TEST 4        WRITE BANK # INTO ALL ADDRESSES IN A 4K BANK
1620                                  ;*      R0 = DATA WRITTEN INTO MEMORY (SHOULD BE)
1621                                  ;*      R1 = DATA READ FROM MEMORY (WAS)
1622                                  ;*      R2 = VIRTUAL ADDRESS
1623                                  ;*      R3 = NOT USED
1624                                  ;*      R4 = NOT USED
1625                                  ;*      R5 = BLOCK BOUNDRY BIT MASK.
1626                                  ;;*****************************************************************
1627  006512                          TST4:
1628  006512  004567  012112                JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
1629  006516  000000                        .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
1630                                  ;*  UPWARDS BYTE ADDRESSING.
1631  006520  004467  005702                JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1632  006524  004767  007400          1$:   JSR     PC,     BANKNO  ;GET THE BANK NUMBER INTO R0
1633  006530  110022                  2$:   MOVB    R0,     (R2)+   ;WRITE BANK # INTO ALL ADDRESSES
1634  006532  030502                        BIT     R5,     R2      ;CHECK FOR END OF A BLOCK
1635  006534  001375                        BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
1636  006536  004767  006442                JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
1637
1638                                  ;*  CHECK THAT DATA WRITTEN ABOVE CAN BE READ
1639                                  ;*  UPWARDS BYTE ADDRESSING.
1640  006542  004467  005660                JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1641  006546  004767  007356          3$:   JSR     PC,     BANKNO  ;GET THE BANK NUMBER INTO R0
1642  006552  112201                  4$:   MOVB    (R2)+,  R1      ;READ THE DATA OUT OF MEMORY
1643  006554  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
1644  006556  001405                        BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1645  006560  004767  011564          64$:  JSR     PC,     SPRNT1  ;SET UP VALUES FOR ERROR PRINTING.
1646  006564  004767  013050                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1647  006570  000003                        .WORD   3               ;ERROR TYPE CODE.
1648  006572                          65$:
1649  006572  030502                        BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
1650  006574  001366                        BNE     4$              ;BRANCH IF MORE IN CURRENT BLOCK.
1651  006576  004767  006402                JSR     PC      MMUP    ;FIND NEXT BLOCK AND LOOP TO 3$.
1652
```

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                                        ;*********************************************************
                                        ;*TEST 5       WRITE 1'S COMPLEMENT OF BANK #.
                                        ;*      R0 = DATA WRITTEN INTO MEMORY (SHOULD BE
                                        ;*      R1 = DATA READ FROM MEMORY (WAS
                                        ;*      R2 = VIRTUAL ADDRESS
                                        ;*      R3 = NOT USED
                                        ;*      R4 = NOT USED
                                        ;*      R5 = BLOCK BOUNDRY BIT MASK.
                                        ;*********************************************************
                                        ;TST5:
006602                                          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
006602  004567  012022                            .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST
006606  000000
                                        ;*  DOWNWARDS BYTE ADDRESSING
006610  004467  006250                    1$:     JSR     R4,     INITDN  ;INITIALIZE THE MEMORY ADDRESS POINTERS
006614  004767  007310                            JSR     PC,     BANK NO ;GET THE BANK NUMBER INTO R0
006620  005100                                    COM     R0              ;1'S COMPLEMENT OF BANK #
006622  110042                            2$:     MOVB    R0,     -(R2)   ;PUT 1'S COM OF BANK # INTO MEMORY
006624  030502                                    BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
006626  001375                                    BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
006630  004767  007040                            JSR     PC,     MMDOWN  ;FIND NEXT BLOCK AND LOOP TO 1$
                                        ;*  CHECK THAT DATA WRITTEN CAN BE READ.
                                        ;*  DOWNWARDS BYTE ADDRESSING
006634  004467  006224                            JSR     R4,     INITDN  ;INITIALIZE THE MEMORY ADDRESS POINTERS
006640  004767  007254                    3$:     JSR     PC,     BANK NO ;GET THE BANK # INTO R0
006644  005100                                    COM     R0              ;SET 1'S COMPLEMENT OF BANK #
006646  114201                            4$:     MOVB    -(R2),  R1      ;READ DATA OUT OF MEMORY
006650  020001                                    CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ
006652  001405                                    BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA
006654  004767  011462                    64$:    JSR     PC,     SPRNTD  ;SET UP VALUES FOR ERROR PRINTING.
006660  004767  012754                            JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
006664  000003                                    .WORD   3               ;ERROR TYPE CODE.
006666                                  65$:
006666  030502                                    BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
006670  001366                                    BNE     4$              ;BRANCH IF MORE IN CURRENT BLOCK
006672  004767  006776                            JSR     PC,     MMDOWN  ;FIND NEXT BLOCK AND LOOP TO [illegible]
```

```
                        .SBTTL SECTION 2:       WORST CASE NOISE TESTS
                        ;;*****************************************************************
                        ;*  THESE TESTS WRITE MEMORY WORST CASE NOISE TEST PATTERNS THROUGHOUT
                        ;*  MEMORY AND CHECK THAT THEY CAN BE WRITTEN AND READ.
                        ;;*****************************************************************
                        ;;*****************************************************************
                        ;*TEST 6        WRITE A CONSTANT INTO MEMORY.
                        ;*      THE CONSTANT IS USER SELECTABLE (DEFAULT = 0).
                        ;*      R0 = DATA WRITTEN INTO MEMORY (SHOULD BE
                        ;*      R1 = DATA READ FROM MEMORY (WAS)
                        ;*      R2 = VIRTUAL ADDRESS
                        ;*      R3 = NOT USED
                        ;*      R4 = NOT USED
                        ;*      R5 = BLOCK BOUNDRY BIT MASK.
                        ;;*****************************************************************
006676                  TST6:
006676  004567  011726          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
006702  000000                  .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
006704  016700  172700  TST6A:  MOV     .CONST, R0      ;GET USER CONSTANT
006710  004467  005512          JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
006714  010022          1$:     MOV     R0,     (R2)+   ;WRITE CONSTANT INTO MEMORY.
006716  030502                  BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
006720  001375                  BNE     1$              ;BRANCH IF MORE IN CURRENT BLOCK.
006722  004767  006256          JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.

                        ;;*****************************************************************
                        ;*TEST 7        READ MEMORY AND COMPARE TO CONSTANT.
                        ;*  IMPORTANT:  THIS TEST SHOULD NOT BE RUN WITHOUT FIRST RUNNING TEST $TN.
                        ;;*****************************************************************
006726                  TST7:
006726  004567  011676          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
006732  000000                  .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
006734  016700  172650          MOV     .CONST, R0      ;GET USER CONSTANT
006740  004467  005462          JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
006744                  1$:
006744  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
006746  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
006750  001405                  BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
006752  004767  011410  64$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
006756  004767  012656          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
006762  000004                  .WORD   4               ;ERROR TYPE CODE.
006764                  65$:
006764  030502                  BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
006766  001366                  BNE     1$              ;BRANCH IF MORE IN CURRENT BLOCK.
006770  004767  006210          JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
                        ;*  SPECIAL CHECK TO SEE IF TEST 6 IS SELECTED THRU THE SWR.
                        ;*  ALLOWS THE OPERATOR TO SWITCH BACK AND FORTH BETWEEN TESTS 6 AND 7
                        ;*  BY SIMPLY "TOGGLING" SW00 WHEN SW01, SW02, AND SW08 ARE SET.
006774  032777  000400  172136          BIT     #SW08,  @SWR    ;CHECK THAT LOOP ON TEST BIT SET
007002  001416                  BEQ     TST10           ;BRANCH IF NOT LOOP ON TEST
007004  017746  172130          MOV     @SWR,   -(SP)   ;GET SWITCH REGISTER DATA.
007010  042716  177740          BIC     #177740,(SP)    ;CLEAR NON-TEST-NUMBER SWITCHS.
007014  022726  000006          CMP     #6,     (SP)+   ;CHECK IF TEST 6 IN SWITCHES.
007020  001007                  BNE     TST10           ;BRANCH IF NOT TEST 6
007022  162767  000001  172052  SUB     #1,     $TSTNM  ;RESET TEST NUM
007030  162767  000030  172050  SUB     #TST7-TST6,$LPADR ;RESET LOOP ADR
```

```
1745  007036  000722                        BR      TST6A           ;GO TO TEST 6
1746
1747
1748                                  ;;*****************************************************************
1749                                  ;*TEST 10       WORSE CASE NOISE (PARITY) WORD TESTING
1750                                  ;*  CHECK MEMORY WITH A SERIES OF PATTERNS
1751  007040                          ;;*****************************************************************
1752  007040  004567  011564          TST10:
1753  007044  000000                        JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
1754  007046  016704  172562                .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
1755  007052  004767  010560          1$:   MOV     .MPPAT, R4      ;INITIALIZE PATTERN TABLE POINTER
1756  007056  012400                        JSR     PC,     CKPMER  ;CHECK FOR NON-TRAP PARITY MEMORY ERRORS.
1757  007060  001420                        MOV     (R4)+,  R0      ;GET THE DATA PATTERN.
1760  007062  004467  005340                BEQ     TST11           ;;BR IF END OF TABLE.
1761  007066  010012                        JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1762  007070  012201                2$:     MOV     R0,     (R2)    ;PUT DATA PATTERN INTO MEMORY.
1763  007072  020001                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
1764  007074  001405                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
1765  007076  004767  011264                BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1766  007102  004767  012532          64$:  JSR     PC,     $PRNT2  ;SET UP VALUES FOR ERROR PRINTING.
1767  007106  000004                        JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1770  007110                                .WORD   4               ;ERROR TYPE CODE.
1771  007110  030502                65$:
1772  007112  001365                        BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
1773  007114  004767  006064                BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
1774  007120  000754                        JSR     PC,     MMJP    ;FIND NEXT BLOCK AND LOOP TO 2$.
                                            BR      1$              ;BR BACK TO DO NEXT PATTERN
```

```
                                        ;;*****************************************************************
                                        ;*TEST 11       ROTATE A "0" BIT THROUGH A FIELD OF ONES.
                                        ;;*****************************************************************
007122                                  $ST11:
007122  004567  011502                          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
007126  000000                                  .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
007130  012700  177777                          MOV     #-1,    R0      ;SET CHECK WORD
007134  004767  007030                          JSR     PC,     SETCON  ;PUT THE CONTENTS OF R0 IN ALL MEMORY.
007140  004467  005262                          JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
007144  000241                          1$:     CLC                     ;CLEAR CARRY BIT IN PSW
007146  004767  007036                          JSR     PC,     ROTATE
007152  016201  177776                          MOV     -2(R2), R1      ;GET RESULT
007156  103402                                  BCS     63$             ;BRANCH IF 'C' BIT WAS SET
007160  020001                                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
007162  001405                                  BEQ     64$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
007164  004767  011176                  63$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR  RINTING.
007170  004767  012444                          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
007174  000005                                  .WORD   5               ;ERROR TYPE CODE.
007176                                  64$:
007176  030502                                  BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
007200  001361                                  BNE     1$              ;BRANCH IF MORE IN CURRENT BLOCK.
007202  004767  005776                          JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.

                                        ;;*****************************************************************
                                        ;*TEST 12       ROTATE A "1" BIT THROUGH A FIELD OF ZEROS
                                        ;;*****************************************************************
007206                                  $ST12:
007206  004567  011416                          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
007212  000000                                  .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
007214  005000                                  CLR     R0              ;SET CHECK WORD
007216  004767  006746                          JSR     PC,     SETCON  ;PUT THE CONTENTS OF R0 IN ALL MEMORY
007222  004467  005200                          JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
007226  000261                          1$:     SEC                     ;SET 'C' BIT IN PSW
007230  004767  006754                          JSR     PC,     ROTATE  ;GO ROTATE '1' BIT
007234  016201  177776                          MOV     -2(R2), R1      ;GET RESULT
007240  103002                                  BCC     63$             ;BRANCH IF 'C' IS CLEAR
007242  020001                                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
007244  001405                                  BEQ     64$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
007246  004767  011114                  63$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
007252  004767  012362                          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
007256  000005                                  .WORD   5               ;ERROR TYPE CODE.
007260                                  64$:
007260  030502                                  BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
007262  001361                                  BNE     1$              ;BRANCH IF MORE IN CURRENT BLOCK.
007264  004767  005714                          JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
```

```
1816                                    ;;*****************************************************************
1817                                    ;*TEST 13       3 XOR 9 TEST PATTERN.
1818                                    ;;*****************************************************************
1819  007270                            ;ST13:
1820  007270  004567  011334                   JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
1821  007274  000777                           .WORD   777             ;MINIMUM BLOCK SIZE OF 256. WORDS
1822                                                                    ; REQUIRED FOR THIS TEST.
1823  007276  000167  000312                   JMP     TST14           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
1824                                                                    ; AVAILABLE FOR TEST.
1825  007302  005000            .3*9:   CLR     R0                      ;SET UP TEST DATA
1826  007304  012703  177777           MOV     #-1.    R3              ;SET COM DATA REG
1827  007310  004467  005112           JSR     R4,     INITMM          ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1828  007314  004767  006736   1$:     JSR     PC,     W3X9            ;WRITE 256. WORD BLOCK WITH 3 XOR 9 PAT.
1829  007320  030502                   BIT     R5,     R2              ;CHECK FOR END OF A BLOCK.
1830  007322  001374                   BNE     1$                      ;BRANCH IF MORE IN CURRENT BLOCK.
1831  007324  004767  005654           JSR     PC,     MMUP            ;FIND NEXT BLOCK AND LOOP TO 1$.
1832
1833                                    ;;*****************************************************************
1834                                    ;*  CHECK 3 XOR 9 TEST PATTERN WRITTEN ABOVE
1835                                    ;;*****************************************************************
1836  007330  005000                   CLR     R0                      ;SET CHECK WORD
1837  007332  004467  005070           JSR     R4,     INITMM          ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1838  007336  012704  000100   11$:    MOV     #64.    R4              ;SET 256. WORD COUNTER
1839  007342                    12$:
1840  007342  012201                   MOV     (R2)+,  R1              ;GET THE DATA FROM MEMORY UNDER TEST.
1841  007344  020001                   CMP     R0,     R1              ;COMPARE THE CHECK WORD WITH THE DATA READ.
1842  007346  001405                   BEQ     65$                     ;BRANCH OVER ERROR CALL IF GOOD DATA.
1843  007350  004767  011012   64$:    JSR     PC,     SPRNT2          ;SET UP VALUES FOR ERROR PRINTING.
1844  007354  004767  012260           JSR     PC,     $ERROR          ;*** ERROR *** (GO TYPE A MESSAGE)
1845  007360  000007                   .WORD   7                       ;ERROR TYPE CODE.
1846  007362                    65$:
1847  007362  012201                   MOV     (R2)+,  R1              ;GET THE DATA FROM MEMORY UNDER TEST.
1848  007364  020001                   CMP     R0,     R1              ;COMPARE THE CHECK WORD WITH THE DATA READ.
1849  007366  001405                   BEQ     67$                     ;BRANCH OVER ERROR CALL IF GOOD DATA.
1850  007370  004767  010772   66$:    JSR     PC,     SPRNT2          ;SET UP VALUES FOR ERROR PRINTING.
1851  007374  004767  012240           JSR     PC,     $ERROR          ;*** ERROR *** (GO TYPE A MESSAGE)
1852  007400  000007                   .WORD   7                       ;ERROR TYPE CODE.
1853  007402                    67$:
1854  007402  012201                   MOV     (R2)+,  R1              ;GET THE DATA FROM MEMORY UNDER TEST.
1855  007404  020001                   CMP     R0,     R1              ;COMPARE THE CHECK WORD WITH THE DATA READ.
1856  007406  001405                   BEQ     69$                     ;BRANCH OVER ERROR CALL IF GOOD DATA.
1857  007410  004767  010752   68$:    JSR     PC,     SPRNT2          ;SET UP VALUES FOR ERROR PRINTING.
1858  007414  004767  012220           JSR     PC,     $ERROR          ;*** ERROR *** (GO TYPE A MESSAGE)
1859  007420  000007                   .WORD   7                       ;ERROR TYPE CODE.
1860  007422                    69$:
1861  007422  012201                   MOV     (R2)+,  R1              ;GET THE DATA FROM MEMORY UNDER TEST.
1862  007424  020001                   CMP     R0,     R1              ;COMPARE THE CHECK WORD WITH THE DATA READ.
1863  007426  001405                   BEQ     71$                     ;BRANCH OVER ERROR CALL IF GOOD DATA.
1864  007430  004767  010732   70$:    JSR     PC,     SPRNT2          ;SET UP VALUES FOR ERROR PRINTING.
1865  007434  004767  012200           JSR     PC,     $ERROR          ;*** ERROR *** (GO TYPE A MESSAGE)
1866  007440  000007                   .WORD   7                       ;ERROR TYPE CODE.
1867  007442                    71$:
1868  007442  005100                   COM     R0                      ;COMPLEMENT CHECK WORD
1869  007444  005304                   DEC     R4                      ;DECREMENT 256. WORD COUNTER
1870  007446  001335                   BNE     12$
1871  007450  005100                   COM     R0                      ;COMPLEMENT CHECK WORD
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 1872  007452  030502                        BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
 1873  007454  001330                        BNE     11$             ;BRANCH IF MORE IN CURRENT BLOCK.
 1874  007456  004767  005522                JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 11$.
 1875
 1876                                ;;*****************************************************************
 1877                                ;*  CHECK, COM, CHECK, COM, CHECK 3 XOR 9 PATTERN WRITTEN ABOVE.
 1878                                ;;*****************************************************************
 1879  007462  005000                        CLR     R0
 1880  007464  004467  004736                JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
 1881  007470  012704  000100        21$:    MOV     #64.,   R4      ;SET 256. WORD COUNTER
 1882  007474  012703  000004        22$:    MOV     #4.,    R3      ;SET 4 WORD COUNTER
 1883  007500                        23$:
 1884  007500  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 1885  007502  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 1886  007504  001405                        BEQ     73$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 1887  007506  004767  010654        72$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR  RINTING.
 1888  007512  004767  012122                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE.
 1889  007516  000007                        .WORD   7               ;ERROR TYPE CODE.
 1890  007520                        73$:
 1891  007520  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 1892  007522  005142                        COM     -(R2)           ;COMPLEMENT TEST DATA
 1893  007524  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 1894  007526  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 1895  007530  001405                        BEQ     75$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 1896  007532  004767  010630        74$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 1897  007536  004767  012076                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
 1898  007542  000007                        .WORD   7               ;ERROR TYPE CODE.
 1899  007544                        75$:
 1900  007544  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 1901  007546  005142                        COM     -(R2)           ;COMPLEMENT TEST DATA
 1902  007550  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 1903  007552  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 1904  007554  001405                        BEQ     77$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 1905  007556  004767  010604        76$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 1906  007562  004767  012052                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 1907  007566  000007                        .WORD   7               ;ERROR TYPE CODE.
 1908  007570                        77$:
 1909  007570  005303                        DEC     R3              ;DECREMENT 4 WORD COUNTER
 1910  007572  001342                        BNE     23$             ;BR IF NOT DONE.
 1911  007574  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 1912  007576  005304                        DEC     R4              ;DECREMENT 256. WORD COUNTER
 1913  007600  001335                        BNE     22$             ;BR IF NOT DONE.
 1914  007602  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 1915  007604  030502                        BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
 1916  007606  001330                        BNE     21$             ;BRANCH IF MORE IN CURRENT BLOCK.
 1917  007610  004767  005370                JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 21$.
```

```
1918                                    ;;*****************************************************************
1919                                    ;*TEST 14       COMPLEMENT 3 XOR 9 TEST PATTERN
1920                                    ;;*****************************************************************
1921  007614                            T$T14:
1922  007614  004567  011010                  JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
1923  007620  000777                           .WORD   777             ;MINIMUM BLOCK SIZE OF 256. WORDS
1924                                                                    ; REQUIRED FOR THIS TEST.
1925  007622  000167  000316                  JMP     TST15           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
1926                                                                    ; AVAILABLE FOR TEST.
1927  007626  012700  177777                  MOV     #-1,    R0      ;SET UP TEST DATA
1928  007632  005003                           CLR     R3              ;SET COM DATA REG
1929  007634  004467  004566                  JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1930  007640  004767  006412          1$:     JSR     PC,     W3X9    ;WRITE 256. WORD BLOCK WITH 3 XOR 9 PAT.
1931  007644  030502                           BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
1932  007646  001374                           BNE     1$              ;BRANCH IF MORE IN CURRENT BLOCK.
1933  007650  004767  005330                  JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
1934
1935
1936                                    ;;*****************************************************************
1937                                    ;*  CHECK COMPLEMENTED 3 XOR 9 TEST PATTERN WRITTEN ABOVE.
1938                                    ;;*****************************************************************
1939  007654  012700  177777                  MOV     #-1,    R0      ;SET CHECK WORD
1940  007660  004467  004542                  JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
1941  007664  012704  000100          11$:    MOV     #64.,   R4      ;SET 256. WORD COUNTER
1942  007670                           12$:
1943  007670  012201                           MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
1944  007672  020001                           CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
1945  007674  001405                           BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1946  007676  004767  010464          64$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
1947  007702  004767  011732                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1948  007706  000007                           .WORD   7               ;ERROR TYPE CODE.
1949  007710                           65$:
1950  007710  012201                           MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
1951  007712  020001                           CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
1952  007714  001405                           BEQ     67$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1953  007716  004767  010444          66$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
1954  007722  004767  011712                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1955  007726  000007                           .WORD   7               ;ERROR TYPE CODE.
1956  007730                           67$:
1957  007730  012201                           MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
1958  007732  020001                           CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
1959  007734  001405                           BEQ     69$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1960  007736  004767  010424          68$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
1961  007742  004767  011672                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1962  007746  000007                           .WORD   7               ;ERROR TYPE CODE.
1963  007750                           69$:
1964  007750  012201                           MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
1965  007752  020001                           CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
1966  007754  001405                           BEQ     71$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
1967  007756  004767  010404          70$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
1968  007762  004767  011652                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
1969  007766  000007                           .WORD   7               ;ERROR TYPE CODE.
1970  007770                           71$:
1971  007770  005100                           COM     R0              ;COMPLEMENT CHECK WORD
1972  007772  005304                           DEC     R4              ;DECREMENT 256. WORD COUNTER
1973  007774  001335                           BNE     12$
```

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 1974  010076  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 1975  010000  030502                        BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
 1976  010002  001330                        BNE     11$             ;BRANCH IF MORE IN CURRENT BLOCK.
 1977  010004  004767  005174                JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 11$.
 1978
 1979                                ;;*****************************************************************
 1980                                ;*  CHECK, COM, CHECK, COM, CHECK COMPLEMENTED 3 XOR 9 PATTERN.
 1981                                ;;*****************************************************************
 1982  010010  012700  177777                MOV     #-1,    R0      ;SET UP CHECK WORD.
 1983  010014  004467  004406                JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
 1984  010020  012704  000100        21$:    MOV     #64.,   R4      ;SET 256. WORD COUNTER
 1985  010024  012703  000004        22$:    MOV     #4.,    R3      ;SET 4 WORD COUNTER
 1986  010030                        23$:
 1987  010030  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 1988  010032  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 1989  010034  001405                        BEQ     73$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 1990  010036  004767  010324        72$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 1991  010042  004767  011572                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 1992  010046  000007                        .WORD   7               ;ERROR TYPE CODE.
 1993  010050                        73$:
 1994  010050  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 1995  010052  005142                        COM     -(R2)           ;COMPLEMENT TEST DATA
 1996  010054  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 1997  010056  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 1998  010060  001405                        BEQ     75$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 1999  010062  004767  010300        74$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2000  010066  004767  011546                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2001  010072  000007                        .WORD   7               ;ERROR TYPE CODE.
 2002  010074                        75$:
 2003  010074  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 2004  010076  005142                        COM     -(R2)           ;COMPLEMENT TEST DATA
 2005  010100  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2006  010102  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2007  010104  001405                        BEQ     77$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2008  010106  004767  010254        76$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2009  010112  004767  011522                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2010  010116  000007                        .WORD   7               ;ERROR TYPE CODE.
 2011  010120                        77$:
 2012  010120  005303                        DEC     R3              ;DECREMENT 4 WORD COUNTER
 2013  010122  001342                        BNE     23$             ;BR IF NOT DONE.
 2014  010124  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 2015  010126  005304                        DEC     R4              ;DECREMENT 256. WORD COUNTER
 2016  010130  001335                        BNE     22$             ;BR IF NOT DONE.
 2017  010132  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 2018  010134  030502                        BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
 2019  010136  001330                        BNE     21$             ;BRANCH IF MORE IN CURRENT BLOCK.
 2020  010140  004767  005040                JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 21$.
```

```
2021                                    ;;*****************************************************************
2022                                    ;*TEST 15       MODIFIED 3 XOR 9 PATTERN FOR PARITY MEMORY
2023                                    ;;*****************************************************************
2024  010144                            T$T15:
2025  010144  004567  010460                  JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
2026  010150  000777                           .WORD   777             ;MINIMUM BLOCK SIZE OF 256. WORDS
2027                                                                    ; REQUIRED FOR THIS TEST.
2028  010152  000167  000610                   JMP     TST16           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
2029                                                                    ; AVAILABLE FOR TEST.
2030  010156  012700  000401                   MOV     #401,   R0      ;SET UP PARITY "ALL ZEROS" PATTERN
2031  010162  012703  177777                   MOV     #-1,    R3      ;SET COM DATA REG
2032  010166  004467  004234                   JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
2033  010172  004767  006060           1$:     JSR     PC,     W3X9    ;WRITE 256. WORD BLOCK WITH 3 XOR 9 PAT.
2034  010176  030502                           BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
2035  010200  001374                           BNE     1$              ;BRANCH IF MORE IN CURRENT BLOCK.
2036  010202  004767  004776                   JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
2037
2038                                    ;;*****************************************************************
2039                                    ;*  CHECK PARITY 3 XOR 9 PATTERN WRITTEN ABOVE.
2040                                    ;;*****************************************************************
2041  010206  012700  000401                   MOV     #401,   R0      ;RESET PARITY "ALL ZEROS" PATTERN.
2042  010212  012703  177777                   MOV     #-1,    R3      ;RESET PARITY ALL ONES PATTERN.
2043  010216  004467  004204                   JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
2044  010222  012704  000100           11$:    MOV     #64.,   R4      ;SET 256. WORD COUNTER
2045  010226                           12$:
2046  010226  012201                           MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2047  010230  020001                           CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2048  010232  001405                           BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA
2049  010234  004767  010126           64$.    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2050  010240  004767  011374                   JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
2051  010244  000007                           .WORD   7               ;ERROR TYPE CODE.
2052  010246                           65$:
2053  010246  012201                           MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2054  010250  020001                           CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2055  010252  001405                           BEQ     67$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2056  010254  004767  010106           66$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2057  010260  004767  011354                   JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2058  010264  000007                           .WORD   7               ;ERROR TYPE CODE.
2059  010266                           67$:
2060  010266  012201                           MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2061  010270  020001                           CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2062  010272  001405                           BEQ     69$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2063  010274  004767  010066           68$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2064  010300  004767  011334                   JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2065  010304  000007                           .WORD   7               ;ERROR TYPE CODE.
2066  010306                           69$:
2067  010306  012201                           MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2068  010310  020001                           CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2069  010312  001405                           BEQ     71$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2070  010314  004767  010046           70$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2071  010320  004767  011314                   JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2072  010324  000007                           .WORD   7               ;ERROR TYPE CODE.
2073  010326                           71$:
2074  010326  010046                           MOV     R0,     -(SP)   ;SAVE R0
2075  010330  010300                           MOV     R3,     R0      ;PUT R3 INTO R0
2076  010332  012603                           MOV     (SP)+,  R3      ;PUT SAVED R0 INTO R3
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 2077  010334  005304                          DEC     R4              ;COUNT 256. WORDS
 2078  010336  001333                          BNE     12$             ;BRANCH IF MORE
 2079  010340  010046                          MOV     R0,     -(SP)   ;SAVE R0
 2080  010342  010300                          MOV     R3,     R0      ;PUT R3 INTO R0
 2081  010344  012603                          MOV     (SP)+,  R3      ;PUT SAVED R0 INTO R3
 2082  010346  030502                          BIT     R5,     R2      ;CHECK FOR END OF 3 BLOCK.
 2083  010350  001324                          BNE     11$             ;BRANCH IF MORE IN CURRENT BLOCK.
 2084  010352  004767  004626                  JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 11$.
 2085
 2086                          ;;*****************************************************************
 2087                          ;*  CHECK, COM, CHECK, COM, CHECK PARITY 3 XOR 9 PATTERN.
 2088                          ;;*****************************************************************
 2089  010356  012700  000401                  MOV     #401,   R0      ;SET UP PARITY "ALL ZEROS" PATTERN.
 2090  010362  012703  177777                  MOV     #-1,    R3      ;SET UP ALL ONES PATTERN
 2091  010366  004467  004034                  JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
 2092  010372  012704  000100          21$:    MOV     #64.,R4         ;SET 256. WORD COUNTER
 2093  010376                          22$:
 2094  010376  012201                          MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2095  010400  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2096  010402  001405                          BEQ     73$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2097  010404  004767  007756          72$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2098  010410  004767  011224                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2099  010414  000007                          .WORD   7               ;ERROR TYPE CODE.
 2100  010416                          73$:
 2101  010416  005100                          COM     R0              ;COMPLEMENT CHECK WORD
 2102  010420  005142                          COM     -(R2)           ;COMPLEMENT TEST DATA
 2103  010422  012201                          MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2104  010424  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2105  010426  001405                          BEQ     75$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2106  010430  004767  007732          74$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2107  010434  004767  011200                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2108  010440  000007                          .WORD   7               ;ERROR TYPE CODE.
 2109  010442                          75$:
 2110  010442  005100                          COM     R0              ;COMPLEMENT CHECK WORD
 2111  010444  005142                          COM     -(R2)           ;RESTORE DATA
 2112  010446  012201                          MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2113  010450  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2114  010452  001405                          BEQ     77$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2115  010454  004767  007706          76$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2116  010460  004767  011154                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2117  010464  000007                          .WORD   7               ;ERROR TYPE CODE.
 2118  010466                          77$:
 2119  010466  012201                          MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2120  010470  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2121  010472  001405                          BEQ     79$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2122  010474  004767  007666          78$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2123  010500  004767  011134                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2124  010504  000007                          .WORD   7               ;ERROR TYPE CODE.
 2125  010506                          79$:
 2126  010506  005100                          COM     R0              ;COMPLEMENT CHECK WORD
 2127  010510  005142                          COM     -(R2)           ;COMPLEMENT TEST DATA
 2128  010512  012201                          MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2129  010514  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2130  010516  001405                          BEQ     81$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2131  010520  004767  007642          80$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2132  010524  004767  011110                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
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 2133  010530  000007                        .WORD   7               ;ERROR TYPE CODE.
 2134  010532                        81$:
 2135  010532  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 2136  010534  005142                        COM     -(R2            ;RESTORE DATA
 2137  010536  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2138  010540  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2139  010542  001405                        BEQ     83$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2140  010544  004767  007616        82$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2141  010550  004767  011064                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2142  010554  000007                        .WORD   7               ;ERROR TYPE CODE.
 2143  010556                        83$:
 2144  010556  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2145  010560  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2146  010562  001405                        BEQ     85$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2147  010564  004767  007576        84$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2148  010570  004767  011044                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2149  010574  000007                        .WORD   7               ;ERROR TYPE CODE.
 2150  010576                        85$:
 2151  010576  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 2152  010600  005142                        COM     -(R2)           ;COMPLEMENT TEST DATA
 2153  010602  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2154  010604  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2155  010606  001405                        BEQ     87$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2156  010610  004767  007552        86$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2157  010614  004767  011020                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2158  010620  000007                        .WORD   7               ;ERROR TYPE CODE.
 2159  010622                        87$:
 2160  010622  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 2161  010624  005142                        COM     -(R2)           ;RESTORE DATA
 2162  010626  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2163  010630  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2164  010632  001405                        BEQ     89$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2165  010634  004767  007526        88$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2166  010640  004767  010774                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2167  010644  000007                        .WORD   7               ;ERROR TYPE CODE.
 2168  010646                        89$.
 2169  010646  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2170  010650  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2171  010652  001405                        BEQ     91$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2172  010654  004767  007506        90$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2173  010660  004767  010754                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2174  010664  000007                        .WORD   7               ;ERROR TYPE CODE.
 2175  010666                        91$.
 2176  010666  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 2177  010670  005142                        COM     -(R2)           ;COMPLEMENT TEST DATA
 2178  010672  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2179  010674  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2180  010676  001405                        BEQ     93$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2181  010700  004767  007462        92$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2182  010704  004767  010730                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2183  010710  000007                        .WORD   7               ;ERROR TYPE CODE.
 2184  010712                        93$:
 2185  010712  005100                        COM     R0              ;COMPLEMENT CHECK WORD
 2186  010714  005142                        COM     -(R2)           ;RESTORE DATA
 2187  010716  012201                        MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2188  010720  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
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2189  010722  001405                    BEQ     95$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2190  010724  004767  007436    94$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2191  010730  004767  010704            JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2192  010734  000007                    .WORD   7               ;ERROR TYPE CODE.
2193  010736                    95$:
2194  010736  010046                    MOV     R0,     -(SP)   ;SAVE R0
2195  010740  010300                    MOV     R3,     R0      ;PUT R3 INTO R0
2196  010742  012603                    MOV     (SP)+,  R3      ;PUT SAVED R0 INTO R3
2197  010744  005304                    DEC     R4              ;DECREMENT 256. WORD COUNTER
2198  010746  001213                    BNE     22$             ;BRANCH IF MORE.
2199  010750  010046                    MOV     R0,     -(SP)   ;SAVE R0
2200  010752  010300                    MOV     R3,     R0      ;PUT R3 INTO R0
2201  010754  012603                    MOV     (SP)+,  R3      ;PUT SAVED R0 INTO R3
2202  010756  030502                    BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
2203  010760  001204                    BNE     21$             ;BRANCH IF MORE IN CURRENT BLOCK.
2204  010762  004767  004216            JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 21$.
2205
2206                            ;;*****************************************************************
2207                            ;*TEST 16       COMPLEMENT PARITY 3 XOR 9 TEST PATTERN.
2208                            ;;*****************************************************************
2209  010766                    TST16:
2210  010766  004567  007636            JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
2211  010772  000777                    .WORD   777             ;MINIMUM BLOCK SIZE OF 256. WORDS
2212                                                            ; REQUIRED FOR THIS TEST.
2213  010774  000167  000610            JMP     TST17           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
2214                                                            ; AVAILABLE FOR TEST.
2215  011000  012700  177777            MOV     #-1,    R0      ;SET UP ALL ONES PATTERN
2216  011004  012703  000401            MOV     #401,   R3      ;SET UP PARITY "ALL ZEROS" PATTERN
2217  011010  004467  003412            JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
2218  011014  004767  005236    1$:     JSR     PC,     W3X9    ;WRITE 256. WORD BLOCK WITH 3 XOR 9 PAT.
2219  011020  030502                    BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
2220  011022  001374                    BNE     1$              ;BRANCH IF MORE IN CURRENT BLOCK.
2221  011024  004767  004154            JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
2222
2223                            ;;*****************************************************************
2224                            ;*  CHECK COMPLEMENT PARITY 3 XOR 9 PATTERN WRITTEN ABOVE.
2225                            ;;*****************************************************************
2226  011030  012700  177777            MOV     #-1,    R0      ;SET UP ALL ONES PATTERN
2227  011034  012703  000401            MOV     #401,   R3      ;SET UP PARITY "ALL ZEROS" PATTERN
2228  011040  004467  003362            JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
2229  011044  012704  000100    11$:    MOV     #64.,   R4      ;SET 256. WORD COUNTER
2230  011050                    12$:
2231  011050  012201                    MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2232  011052  020001                    CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2233  011054  001405                    BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2234  011056  004767  007304    64$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2235  011062  004767  010552            JSR     PC,     $FRROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2236  011066  000007                    .WORD   7               ;ERROR TYPE CODE.
2237  011070                    65$:
2238  011070  012201                    MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2239  011072  020001                    CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2240  011074  001405                    BEQ     67$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2241  011076  004767  007264    66$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2242  011102  004767  010532            JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2243  011106  000007                    .WORD   7               ;ERROR TYPE CODE.
2244  011110                    67$:
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 2245  011110  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2246  011112  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2247  011114  001405                  BEQ     69$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2248  011116  004767  007244  68$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2249  011122  004767  010512          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2250  011126  000007                  .WORD   7               ;ERROR TYPE CODE.
 2251  011130                  69$:
 2252  011130  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2253  011132  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2254  011134  001405                  BEQ     71$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2255  011136  004767  007224  70$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2256  011142  004767  010472          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2257  011146  000007                  .WORD   7               ;ERROR TYPE CODE.
 2258  011150                  71$:
 2259  011150  010046                  MOV     R0,     -(SP)   ;SAVE R0
 2260  011152  010300                  MOV     R3,     R0      ;PUT R3 INTO R0
 2261  011154  012603                  MOV     (SP)+,  R3      ;PUT SAVED R0 INTO R3
 2262  011156  005304                  DEC     R4              ;COUNT 256. WORDS
 2263  011160  001333                  BNE     12$             ;BRANCH IF MORE
 2264  011162  010046                  MOV     R0,     -(SP)   ;SAVE R0
 2265  011164  010300                  MOV     R3,     R0      ;PUT R3 INTO R0
 2266  011166  012603                  MOV     (SP)+,  R3      ;PUT SAVED R0 INTO R3
 2267  011170  030502                  BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
 2268  011172  001324                  BNE     11$             ;BRANCH IF MORE IN CURRENT BLOCK.
 2269  011174  004767  004004          JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 11$.
 2270
 2271                          ;;*****************************************************************
 2272                          ;*  CHECK, COM, CHECK, COM, CHECK COMPLEMENTED PARITY 3 XOR 9 PATTERN.
 2273                          ;;*****************************************************************
 2274  011200  012700  177777          MOV     #-1,    R0      ;SET UP ALL ONES PATTERN
 2275  011204  012703  000401          MOV     #401,   R3      ;SET UP PARITY "ALL ZEROS" PATTERN
 2276  011210  004467  003212          JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
 2277  011214  012704  000100  21$:    MOV     #64.,R4         ;SET 256. WORD COUNTER
 2278  011220                  22$:
 2279  011220  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2280  011222  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2281  011224  001405                  BEQ     73$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2282  011226  004767  007134  72$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2283  011232  004767  010402          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2284  011236  000007                  .WORD   7               ;ERROR TYPE CODE.
 2285  011240                  73$:
 2286  011240  005100                  COM     R0              ;COMPLEMENT CHECK WORD
 2287  011242  005142                  COM     -(R2)           ;COMPLEMENT TEST DATA
 2288  011244  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2289  011246  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2290  011250  001405                  BEQ     75$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2291  011252  004767  007110  74$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2292  011256  004767  010356          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2293  011262  000007                  .WORD   7               ;ERROR TYPE CODE.
 2294  011264                  75$:
 2295  011264  005100                  COM     R0              ;COMPLEMENT CHECK WORD
 2296  011266  005142                  COM     -(R2)           ;RESTORE DATA
 2297  011270  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2298  011272  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2299  011274  001405                  BEQ     77$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2300  011276  004767  007064  76$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
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2301  011302  004767  010332          JSR     PC,     $ERROR  ;*** ERROR *** GO TYPE A MESSAGE
2302  011306  000007                  .WORD   7               ;ERROR TYPE CODE.
2303  011310                  7$:
2304  011310  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2305  011312  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2306  011314  001405                  BEQ     73$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2307  011316  004767  007044  73$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2308  011322  004767  010312          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
2309  011326  000007                  .WORD   7               ;ERROR TYPE CODE.
2310  011330                  73$:
2311  011330  005100                  COM     R0              ;COMPLEMENT CHECK WORD
2312  011332  005142                  COM     -(R2)           ;COMPLEMENT TEST DATA
2313  011334  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2314  011336  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ
2315  011340  001405                  BEQ     81$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2316  011342  004767  007020  80$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING
2317  011346  004767  010266          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
2318  011352  000007                  .WORD   7               ;ERROR TYPE CODE.
2319  011354                  81$:
2320  011354  005100                  COM     R0              ;COMPLEMENT CHECK WORD
2321  011356  005142                  COM     -(R2)           ;RESTORE DATA
2322  011360  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2323  011362  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ
2324  011364  001405                  BEQ     83$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2325  011366  004767  006774  82$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2326  011372  004767  010242          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
2327  011376  000007                  .WORD   7               ;ERROR TYPE CODE.
2328  011400                  83$:
2329  011400  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2330  011402  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ
2331  011404  001405                  BEQ     85$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2332  011406  004767  006754  84$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2333  011412  004767  010222          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
2334  011416  000007                  .WORD   7               ;ERROR TYPE CODE.
2335  011420                  85$:
2336  011420  005100                  COM     R0              ;COMPLEMENT CHECK WORD
2337  011422  005142                  COM     -(R2)           ;COMPLEMENT TEST DATA
2338  011424  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2339  011426  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ
2340  011430  001405                  BEQ     87$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2341  011432  004767  006730  86$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2342  011436  004767  010176          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
2343  011442  000007                  .WORD   7               ;ERROR TYPE CODE.
2344  011444                  87$:
2345  011444  005100                  COM     R0              ;COMPLEMENT CHECK WORD
2346  011446  005142                  COM     -(R2)           ;RESTORE DATA
2347  011450  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2348  011452  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ
2349  011454  001405                  BEQ     89$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2350  011456  004767  006704  88$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2351  011462  004767  010152          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2352  011466  000007                  .WORD   7               ;ERROR TYPE CODE.
2353  011470                  89$:
2354  011470  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2355  011472  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ
2356  011474  001405                  BEQ     91$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
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 2357  011476  004767  006664          90$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2358  011502  004767  010132                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
 2359  011506  000007                          .WORD   7               ;ERROR TYPE CODE.
 2360  011510                          91$:
 2361  011510  005100                          COM     R0              ;COMPLEMENT CHECK WORD
 2362  011512  005142                          COM     -(R2            ;COMPLEMENT TEST DATA
 2363  011514  012201                          MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2364  011516  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2365  011520  001405                          BEQ     93$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2366  011522  004767  006640          92$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2367  011526  004767  010106                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2368  011532  000007                          .WORD   7               ;ERROR TYPE CODE.
 2369  011534                          93$:
 2370  011534  005100                          COM     R0              ;COMPLEMENT CHECK WORD
 2371  011536  005142                          COM     -(R2)           ;RESTORE DATA
 2372  011540  012201                          MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
 2373  011542  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
 2374  011544  001405                          BEQ     95$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
 2375  011546  004767  006614          94$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
 2376  011552  004767  010062                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 2377  011556  000007                          .WORD   7               ;ERROR TYPE CODE.
 2378  011560                          95$:
 2379  011560  010046                          MOV     R0,     -(SP)   ;SAVE R0
 2380  011562  010300                          MOV     R3,     R0      ;PUT R3 INTO R0
 2381  011564  012603                          MOV     (SP)+,  R3      ;PUT SAVED R0 INTO R3
 2382  011566  005304                          DEC     R4              ;DECREMENT 256. WORD COUNTER
 2383  011570  001213                          BNE     22$             ;BRANCH IF MORE.
 2384  011572  010046                          MOV     R0,     -(SP)   ;SAVE R0
 2385  011574  010300                          MOV     R3,     R0      ;PUT R3 INTO R0
 2386  011576  012603                          MOV     (SP)+,  R3      ;PUT SAVED R0 INTO R3
 2387  011600  030502                          BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
 2388  011602  001204                          BNE     21$             ;BRANCH IF MORE IN CURRENT BLOCK.
 2389  011604  004767  003374                  JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 21$.
```

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                                        ;;*****************************************************************
                                        ;*TEST 17       WORSE CASE NOISE PARITY BYTE TESTING
                                        ;*  CHECK PARITY MEMORY WITH A SERIES OF BYTE PATTERNS
                                        ;*       1) FORCE WRONG PARITY IN EACH BYTE OF PARITY MEMORY
                                        ;*       2) READ IT BACK WITH ACTION ENABLE SET, MAKING SURE THAT A TRAP OCCURS
                                        ;*       3) WRITE GOOD PARITY AND MAKE SURE NO TRAP OCCURS WHEN IT IS READ
                                        ;*       4) MAKE SURE THE ERROR ADDRESS BITS (CSR BITS <11-5>) ARE CORRECT
                                        ;;*****************************************************************
011610                                  TST17:
011610  004567  007014                         JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
011614  000000                                 .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
011616  005767  170454               WWPB0:  TST     MPRX            ;CHECK FOR ANY PARITY MEMORY.
011622  001404                         BEQ     1$              ;BR IF NO PARITY MEMORY.
011624  032777  000100  167306               BIT     #SW06,  @SWR    ;CHECK FORINHIBIT PARITY SWITCH.
011632  001402                         BEQ     2$              ;BR IF NOT SET.
011634  000167  000622               1$:     JMP     TST20           ;SKIP THIS TEST IF NO PARITY MEMORY PRESENT.
011640  005000                         2$:     CLR     R0              ;ZERO TO BE PUT IN ALL MEMORY.
011642  004767  004322                         JSR     PC,     SETCON  ;ROUTINE TO LOAD ALL MEMORY.
011646  004467  002554                         JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
011652  036767  167666  167660   WWPBYT: BIT     BITPT,  PMEMAP  ;CHECK IF CURRENT BANK HAS PARITY MEMORY.
011660  001010                         BNE     2$              ;BR IF PARITY MEM.
011662  036767  167660  167652         BIT     BITPT+2,PMEMAP+2 ;...HI 64K.
011670  001004                         BNE     2$              ;BR IF PARITY MEM.
011672  050502                         BIS     R5,     R2      ;POINT TO END OF BLOCK.
011674  005202                         INC     R2              ;FIRST ADR OF NEXT BLOCK.
011676  000167  000540                 JMP     WWPB5           ;BR TO FIND NEXT BLOCK.
011702  004767  005674               2$:     JSR     PC,     SETAE   ;SET ACTION ENABLE (EVEN IF BANK0.)
011706  004767  005724                         JSR     PC,     CKPMER  ;CHECK FOR ANY NON TRAP PARITY ERRORS.
011712  020227  000114               WWPB1:  CMP     R2,     #114    ;CKECK IF POINTING TO PARITY ERROR VECTOR.
011716  001004                         BNE     3$              ;BR IF NOT AT VECTOR.
011720  062702  000004                         ADD     #4,     R2      ;SKIP PARITY VECTOR.
011724  000167  000512                 JMP     WWPB5           ;CHECK FOR BLOCK END.
011730  111201                         3$:     MOVB    (R2),   R1      ;CHECK IF BYTE STILL CLEARED.
011732  001405                         BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
011734  004767  006352                 64$:    JSR     PC,     SPRNT   ;SET UP VALUES FOR ERROR PRINTING.
011740  004767  007674                         JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
011744  000011                                 .WORD   11              ;ERROR TYPE CODE.
011746                                  65$:
011746  105067  167606                         CLRB    OEFLG           ;CLEAR ODD/EVEN FLAG.
011752  112700  000252                         MOVB    #252,   R0      ;SET UP DATA...EVEN, SETS PARITY BIT.
011756  110012                         WWPB2:  MOVB    R0,     (R2)    ;MOV DATA INTO TEST LOCATION.
011760  016703  167644                         MOV     .MPRX,  R3      ;GET PARITY REGISTER TABLE POINTER.
011764  056773  167622  000000         10$:    BIS     WP,@(R3)        ;SET WRITE WRONG PARITY.
011772  052733  000001                         BIS     #AE,@(R3)+
011776  005713                                 TST     (R3)            ;CHECK FOR TABLE TERMINATOR.
012000  001371                                 BNE     10$             ;BR IF MORE REGS IN TABLE.
                                        ;*  SET WRONG PARITY IN LOCATION UNDER TEST.
012002  110012                                 MOVB    R0,     (R2)    ;WRITE SAME DATA (EXCEPT PARITY) VIA DATOB.
012004  016703  167620                         MOV     .MPRX,  R3      ;GET PARITY REG TABLE POINTER.
012010  046733  167576                 11$:    BIC     WWP,    @(R3)+  ;CLEAR WRITE WRONG PARITY.
012014  005713                                 TST     (R3)            ;CHECK FOR TABLE TERMINATOR.
012016  001374                                 BNE     11$             ;BR IF MORE PARITY REGISTERS.
012020  016737  167606  000114                 MOV     .PBTRP, @#PARVEC ;SET UP VECTOR FOR EXPECTED TRAP.
                                        ;*  DETECT WRONG PARITY VIA DATIP; DATOB SHOULDN'T EXECUTE.
012026  105412                                 NEGB    (R2)            ;DATIP (DATOB AND COM PARITY BIT.
                                        ;*  SHOULD HAVE TRAPPED TO PBTRP.
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2446  012030  016737  167602  000114          MOV     .PESRV, @#PARVEC ;RESET VECTOR FOR UNEXPECTED TRAPS.
2447  012036  004767  006300                  64$:    JSR     PC,     SPRNTO  ;SET UP VALUES FOR ERROR PRINTING.
2448  012042  004767  007572                          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
2449  012046  000012                                  .WORD   12              ;ERROR TYPE CODE.
2450  012050  000562                                  BR      WWPB4           ;SKIP TRAP SERVICE.
2451
2452                                          ;*  EXPECTED PARITY MEMORY TRAPS COME HERE.
2453  012052  016737  167560  000114  PBTRP:  MOV     .PESRV, @#PARVEC ;RESET PARITY VECTOR FOR UNEXPECTED TRAPS.
2454  012060  022626                          CMP     (SP)+,  (SP)+   ;RESET THE STACK POINTER AFTER TRAP.
2455  012062  016703  167540                  MOV     .MPR0,  R3      ;GET PARITY REG AND MAP TABLE POINTER.
2456  012066  032713  000001                  21$:    BIT     #BIT0,  (R3)    ;CHECK IF THIS REGISTER EXISTS.
2457  012072  001003                          BNE     22$             ;BR IF IT DOESN'T EXIST.
2458  012074  017301  000000                  MOV     @(R3),  R1      ;GET THE CONTENTS.
2459  012100  100413                          BMI     23$             ;BR IF ERROR FLAG SET.
2460  012102  062703  000010                  22$:    ADD     #10,    R3      ;MOVE POINTER TO NEXT REG.
2461  012106  020367  167516                  CMP     R3,     .MPRX   ;CHECK FOR END OF TABLE.
2462  012112  103765                          BLO     21$             ;BR IF MORE REGISTERS.
2463  012114  004767  006222                  64$:    JSR     PC,     SPRNTO  ;SET UP VALUES FOR ERROR PRINTING.
2464  012120  004767  007514                          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2465  012124  000013                                  .WORD   13              ;ERROR TYPE CODE.
2466  012126  000533                                  BR      WWPB4           ;EXIT AFTER ERROR.
2467  012130  036763  167410  000002  23$:    BIT     BITPT,  2(R3)   ;CHECK THE MAP FOR THIS REGISTER.
2468  012136  001011                          BNE     24$             ;BR IF THIS REGISTER CONTROLS THIS BANK.
2469  012140  036763  167402  000004          BIT     BITPT+2,4(R3)   ;CHECK THE HI 64K.
2470  012146  001005                          BNE     24$             ;BR IF THIS REGISTER CONTROLS THIS BANK.
2471  012150  004767  006162                  65$:    JSR     PC,     SPRNTP  ;SET UP VALUES FOR ERROR PRINTING.
2472  012154  004767  007460                          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2473  012160  000014                                  .WORD   14              ;ERROR TYPE CODE.
2474  012162                                  24$:
2475  012162  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
2476  012164  010200                          MOV     R2,     R0      ;GET THE ADDRESS POINTER.
2477  012166  042700  003777                  BIC     #3777,  R0      ;CLEAR LOW ADDRESS BITS.
2478  012172  000300                          SWAB    R0              ;SHIFT 6 PLACES RIGHT.
2479  012174  006300                          ASL     R0
2480  012176  006300                          ASL     R0
2481  012200  005767  166402                  TST     MMAVA           ;CHECK FOR MEM MGMT.
2482  012204  001404                          BEQ     25$             ;BR IF NO MEM MGMT.
2483  012206  042700  177600                  BIC     #177600,R0      ;CLEAR BANK BITS
2484  012212  063700  172344                  ADD     @#KIPAR2,R0     ;ADD MEM MGMT OFFSET.
2485  012216  052700  100001          25$:    BIS     #BIT15+BIT0,R0  ;SET ERROR AND AE BIT IN CHECK WORD.
2486  012222  016367  000006  167266          MOV     6(R3),  RESRVD  ;GET APPROPIATE MASK.
2487  012230  046700  167262                  BIC     RESRVD, R0      ;CLEAR PARITY REG BITS RESERVED FOR FUTURE.
2488  012234  046701  167256                  BIC     RESRVD, R1      ;CLEAR PARITY REG BITS RESERVED FOR FUTURE.
2489                                  ;NOTE:  THE ABOVE INSTRUCTION (2 WORDS) CAN BE NOP'ED FOR UNMIXED MEMORY TYPES.
2490  012240  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2491  012242  001405                          BEQ     67$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2492  012244  004767  006066                  66$:    JSR     PC,     SPRNTP  ;SET UP VALUES FOR ERROR PRINTING.
2493  012250  004767  007364                          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2494  012254  000015                                  .WORD   15              ;ERROR TYPE CODE.
2495  012256                                  67$:
2496  012256  005073  000000                          CLR     @(R3)           ;CLEAR REG INCLUDING ACTION ENABLE.
2497  012262  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
2498  012264  062703  000010          26$:    ADD     #10,    R3      ;UPDATE POINTER TO NEXT PARITY REG + MAP.
2499  012270  020367  167334                  CMP     R3,     .MPRX   ;CHECK FOR END OF TABLE.
2500  012274  101014                          BHI     WWPB3           ;BR IF END OF TABLE REACHED.
2501  012276  032713  000001                  BIT     #BIT0,  R3)     ;CHECK IF NEXT REG EXISTS.
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2502  012302  001370                        BNE     26$                 ;BR IF THIS PARITY REG DOESN'T EXIST.
2503  012304  017301  000000                MOV     @(R3),  R1          ;SAVE AND CHECK FOR ERROR FLAG.
2504  012310  100365                        BPL     26$                 ;BR IF NO ERROR FLAG.
2505  012312  004767  006020          68$:  JSR     PC,     SPRNTP      ;SET UP VALUES FOR ERROR PRINTING.
2506  012316  004767  007316                JSR     PC,     $ERROR      ;*** ERROR *** (GO TYPE A MESSAGE)
2507  012322  000016                        .WORD   16                  ;ERROR TYPE CODE.
2508  012324  000757                        BR      26$                 ;BR AFTER ERROR.
2509  012326  111204                WWPB3:  MOVB    (R2),   R4          ;GET THE DATA FOR CHECKING.
2510                                        ;* READING THE DATA VIA DATI TO CHECK IT SHOULD CAUSE PARITY ERROR, BUT
2511                                        ;*  ACTION ENABLE IS NOT SET IN CONTROLING REG, SO NO TRAP SHOULD OCCURE.
2512  012330  111212                        MOVB    (R2),   (R2)        ;RESTORE RIGHT PARITY
2513                                ;NOTE:  THE ABOVE INSTRUCTION CAN BE NOP'ED FOR PROCESSORS
2514                                ;       WHICH DO ONLY DATOB TO DESTINATION OF MOVB INSTRUCTIONS.
2515  012332  012603                        MOV     (SP)+,R3            ;;POP STACK INTO R3
2516  012334  017301  000000                MOV     @(R3),  R1          ;READ THE PARITY REGISTER TO CHECK IT AGAIN.
2517  012340  046701  167152                BIC     RESRVD, R1          ;CLEAR PARITY REG BITS RESERVED FOR FUTURE.
2518                                ;NOTE: THE ABOVE INSTRUCTION (2 WORDS) CAN BE NOP'ED FOR UNMIXED MEMORY TYPES.
2519  012344  042700  000001                BIC     #AE,    R0          ;CLEAR THE ACTION ENABLE BIT IN TEST DATA.
2520  012350  020001                        CMP     R0,     R1          ;COMPARE THE CHECK WORD WITH THE DATA READ.
2521  012352  001405                        BEQ     65$                 ;BRANCH OVER ERROR CALL IF GOOD DATA.
2522  012354  004767  005756          64$:  JSR     PC,     SPRNTP      ;SET UP VALUES FOR ERROR PRINTING.
2523  012360  004767  007254                JSR     PC,     $ERROR      ;*** ERROR *** (GO TYPE A MESSAGE
2524  012364  000015                        .WORD   15                  ;ERROR TYPE CODE.
2525  012366                          65$:
2526  012366  012773  000001  000000        MOV     #1,     @(R3)       ;CLEAR ALL BUT ACTION ENABLE.
2527  012374  010401                        MOV     R4,     R1          ;GET DATA READ FROM MEMORY FOR TESTING.
2528  012376  012600                        MOV     (SP)+,R0            ;;POP STACK INTO R0
2529  012400  120001                        CMPB    R0,     R1          ;CHECK THE DATA.
2530  012402  001405                        BEQ     67$                 ;BRANCH OVER ERROR CALL IF GOOD DATA.
2531  012404  004767  005732          66$:  JSR     PC,     SPRNTD      ;SET UP VALUES FOR ERROR PRINTING.
2532  012410  004767  007224                JSR     PC,     $ERROR      ;*** ERROR *** (GO TYPE A MESSAGE)
2533  012414  000017                        .WORD   17                  ;ERROR TYPE CODE.
2534  012416                          67$:
2535  012416  110012                WWPB4:  MOVB    R0,     (R2)        ;RESTORE DATA.
2536  012420  105712                        TSTB    (R2)                ;DO A DATI TO BE SURE RIGHT PARITY.
2537  012422  012700  000253                MOV     #253,   R0          ;SET ODD PARITY DATA.
2538  012426  105167  167126                COMB    OEFLG               ;CHECK IF DONE BOTH ODD AND EVEN PARITY.
2539  012432  100002                        BPL     27$                 ;BR IF DONE BOTH EVEN AND ODD
2540  012434  000167  177316                JMP     WWPB2               ;LOOP BACK AND DO ODD(PARITY BIT CLR .
2541  012440  005202                  27$:  INC     R2                  ;MOVE POINTER TO NEXT MEMORY BYTE.
2542  012442  030502                WWPB5:  BIT     R5,     R2          ;CHECK FOR END OF BLOCK.
2543  012444  001402                        BEQ     30$                 ;BR IF END OF BLOCK FOUND.
2544  012446  000167  177240                JMP     WWPB1               ;LOOP BACK TO TEST NEXT BYTE.
2545  012452  004767  002526          30$:  JSR     PC,     NMUP        ;FIND NEXT BLOCK AND LOOP TO WWPB1
2546  012456  004767  005054                JSR     PC,     MAMF        ;GO RESET PARITY REGISTERS.
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2547                                    ;;*****************************************************************
2548                                    ;*TEST 20       RANDOM DATA  TESTING THRU PROGRAM CODE RELOCATION.
2549                                    ;;*****************************************************************
2550   012462                           T$T20:
2551   012462  004567  006142                  JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
2552   012466  000000                          .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
2553   012470  010703                  RANTST: MOV     PC,     R3      ;GET CURRENT PROGRAM COUNTER.
2554   012472  042703  007777                  BIC     #7777,  R3      ;POINT TO BEGINNING OF CURRENT 2K BLOCK.
2555   012476  004467  001724                  JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
2556   012502  010246                  1$:     MOV     R2,     -(SP)   ;SAVE MEMORY POINTER.
2557   012504  010346                          MOV     R3,     -(SP)   ;SAVE "DATA" POINTER.
2558   012506  012322                  2$:     MOV     (R3)+,  (R2)+   ;MOV CODE INTO TEST MEMORY.
2559   012510  032703  007777                  BIT     #7777,  R3      ;CHECK FOR END OF "DATA TABLE"
2560   012514  001002                          BNE     3$              ;BRANCH IF MORE
2561   012516  162703  010000                  SUB     #10000, R3      ;RESET POINTER TO START OF "RANDOM DATA"
2562   012522  030502                  3$:     BIT     R5,     R2      ;CHECK FOR END OF BLOCK
2563   012524  001370                          BNE     2$              ;BRANCH IF MORE.
2564   012526  012603                          MOV     (SP)+,  R3      ;RESET "DATA" POINTER.
2565   012530  012602                          MOV     (SP)+,  R2      ;RESET MEMORY POINTER.
2566   012532  012300                  4$:     MOV     (R3)+,  R0      ;GET S/B DATA.
2567   012534  012201                          MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2568   012536  020001                          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2569   012540  001405                          BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2570   012542  004767  005620          64$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2571   012546  004767  007066                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2572   012552  000020                          .WORD   20              ;ERROR TYPE CODE.
2573   012554                          65$:
2574   012554  032703  007777                  BIT     #7777,  R3      ;CHECK FOR END OF "DATA TABLE"
2575   012560  001002                          BNE     5$              ;BR IF MORE.
2576   012562  162703  010000                  SUB     #10000, R3      ;RESET POINTER TO TOP OF "DATA TABLE".
2577   012566                          5$:
2578   012566  030502                          BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
2579   012570  001360                          BNE     4$              ;BRANCH IF MORE IN CURRENT BLOCK.
2580   012572  004767  002406                  JSR     PC,     MMJP    ;FIND NEXT BLOCK AND LOOP TO 1$.
```

```
                        .SBTTL SECTION 3:       INSTRUCTION EXECUTION TESTS.
                        ;;*****************************************************************
                        ;*TEST 21        EXECUTE DATI, DATO THRU MEMORY.
                        ;*  EXECUTES THE INSTRUCTION 'MOV R4,(R2)' THROUGHOUT MEMORY.
                        ;*  AN 'RTS R5' (CODE 205) IS PLACED AFTER THE 'MOV' INSTRUCTION TO RETURN
                        ;*  CONTROL TO THE MAIN PROGRAM FOR INSTRUCTION EXECUTION CHECKOUT.
                        ;*  THIS IS AN EXAMPLE OF WHAT THIS TEST DOES IN RELATION TO MEMORY:
                        ;*
                        ;*                MEMORY        INSTRUCTION      CONTENTS OF MEMORY LOCATION
                        ;*               LOCATION       PLACED THERE     AFTER INSTRUCTION EXECUTION
                        ;*
                        ;*   1ST PASS /  40000           010412           000205
                        ;*  THRU TEST /  40002           000205           000205
                        ;*
                        ;*   2ND PASS /  40002           010412           000205
                        ;*  THRU TEST /  40004           000205           000205
                        ;*
                        ;*      ETC., ETC., ETC.
                        ;*
                        ;*  R0 = DATA WRITTEN ON TOP OF IUT BY THE IUT  SHOULD BE .
                        ;*  R1 = DATA READ FROM MEMORY (WAS).
                        ;*  R2 = ADDRESS OF IUT/DATA.
                        ;*  R3 = INSTRUCTION UNDER TEST (IUT).
                        ;*  R4 = RTS R5 (CODE 205).
                        ;*  R5 = BLOCK BOUNDRY BIT MASK.
                        ;;*****************************************************************
012576                  TST21:
012576  004567  006026          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
012602  000003                  .WORD   3               ;MINIMUM BLOCK SIZE OF 2 WORDS
                                                        ; REQUIRED FOR THIS TEST.
012604  000167  000056          JMP     TST22           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
                                                        ; AVAILABLE FOR TEST.
012610  012703  010412  DIDO:   MOV     #010412,R3      ;GET 'MOV R4,(R2)' INSTRUCTION (IUT).
012614  012704  000205          MOV     #205,   R4      ;GET 'RTS R5'
012620  010400                  MOV     R4,     R0      ;SET UP S/B DATA AFTER EXECUTION.
012622  004467  001600          JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
012626  010322  1$:     MOV     R3,     (R2)+   ;PUT IUT INTO FIRST LOC OF BLOCK.
012630  010412  2$:     MOV     R4,     (R2)    ;PUT 'RTS R5' FOLLOWING IUT.
012632  004542          JSR     R5,     -(R2)   ;GO EXECUTE THE IUT.
012634  012201          MOV     (R2)+,  R1      ;GET THE DATA FROM THE MEM ADR UNDER TEST.
012636  020001          CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
012640  001405          BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
012642  004767  005514  64$:    JSR     PC,     SPRNT3  ;SET UP VALUES FOR ERROR PRINTING.
012646  004767  006766          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
012652  000021          .WORD   21              ;ERROR TYPE CODE.
012654                  65$:
012654  010322          MOV     R3,     (R2)+   ;PUT THE IUT INTO THE NEXT LOCATION.
012656  030502          BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
012660  001363          BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
012662  004767  002316          JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
```

```
                        ;*****************************************************************
                        ;*TEST 22       EXECUTE DATI, DATOB (LOW BYTE) THRU MEMORY.
                        ;*  EXECUTES THE INSTRUCTION 'MOVB R4,(R2)' THROUGHOUT MEMORY.
                        ;*  AN 'RTS R5' (CODE 205) IS PLACED AFTER THE 'MOVB' INSTRUCTION TO RETURN
                        ;*  CONTROL TO THE MAIN PROGRAM FOR INSTRUCTION EXECUTION CHECKOUT.
                        ;*  THIS IS AN EXAMPLE OF WHAT THIS TEST DOES IN RELATION TO MEMORY:
                        ;*
                        ;*                MEMORY          INSTRUCTION       CONTENTS OF MEMORY LOCATION
                        ;*               LOCATION        PLACED THERE      AFTER INSTRUCTION EXECUTION
                        ;*
                        ;*   1ST PASS /   40000           110412            110605
                        ;*  THRU TEST /   40002           000205            000205
                        ;*
                        ;*   2ND PASS /   40002           110412            110605
                        ;*  THRU TEST /   40004           000205            000205
                        ;*
                        ;*      ETC., ETC., ETC.
                        ;*
                        ;*  R0 = DATA WRITTEN ON TOP OF IUT BY THE IUT (SHOULD BE .
                        ;*  R1 = DATA READ FROM MEMORY (WAS).
                        ;*  R2 = ADDRESS OF IUT/DATA.
                        ;*  R3 = INSTRUCTION UNDER TEST (IUT).
                        ;*  R4 = RTS R5 (CODE 205).
                        ;*  R5 = BLOCK BOUNDRY BIT MASK.
                        ;*****************************************************************
012666                  TST22:
012666  004567  005736          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
012672  000003                  .WORD   3               ;MINIMUM BLOCK SIZE OF 2 WORDS
                                                        ; REQUIRED FOR THIS TEST.
012674  000167  000060          JMP     TST23           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
                                                        ; AVAILABLE FOR TEST.
012700  012703  110412  DIDBL:  MOV     #110412,R3      ;GET 'MOVB R4,(R2)' INSTRUCTION (IUT).
012704  012704  000205          MOV     #205,   R4      ;GET 'RTS R5'
012710  012700  110605          MOV     #110605,R0      ;SET UP S/B DATA AFTER EXECUTION.
012714  004467  001506          JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
012720  010322          1$:     MOV     R3,     (R2)+   ;PUT IUT INTO FIRST LOC OF BLOCK.
012722  010412          2$:     MOV     R4,     (R2)    ;PUT 'RTS R5' FOLLOWING IUT.
012724  004542                  JSR     R5,     -(R2)   ;GO EXECUTE THE IUT.
012726  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM THE MEM ADR UNDER TEST.
012730  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
012732  001405                  BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
012734  004767  005422  64$:    JSR     PC,     SPRNT3  ;SET UP VALUES FOR ERROR PRINTING.
012740  004767  006674          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
012744  000021                  .WORD   21              ;ERROR TYPE CODE.
012746                  65$:
012746  010322                  MOV     R3,     (R2)+   ;PUT THE IUT INTO THE NEXT LOCATION.
012750  030502                  BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
012752  001363                  BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
012754  004767  002224          JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
```

```
                        ;*****************************************************************
                        ;*TEST 23       EXECUTE DATI, DATOB (HIGH BYTE) THRU MEMORY.
                        ;*  EXECUTES THE INSTRUCTION 'MOVB R3,-(R2)' THROUGHOUT MEMORY.
                        ;*  AN 'RTS R5' (CODE 205) IS PLACED AFTER THE 'MOVB' INSTRUCTION TO RETURN
                        ;*  CONTROL TO THE MAIN PROGRAM FOR INSTRUCTION EXECUTION CHECKOUT.
                        ;*  THIS IS AN EXAMPLE OF WHAT THIS TEST DOES IN RELATION TO MEMORY:
                        ;*
                        ;*                MEMORY        INSTRUCTION     CONTENTS OF MEMORY LOCATION
                        ;*               LOCATION      PLACED THERE     AFTER INSTRUCTION EXECUTION
                        ;*
                        ;*   1ST PASS /   40000           110342           161342
                        ;*  THRU TEST     40002           000205           000205
                        ;*
                        ;*   2ND PASS /   40002           110342           161342
                        ;*  THRU TEST /   40004           000205           000205
                        ;*
                        ;*      ETC., ETC., ETC.
                        ;*
                        ;*  R0 = DATA WRITTEN ON TOP OF IUT BY THE IUT (SHOULD BE).
                        ;*  R1 = DATA READ FROM MEMORY (WAS).
                        ;*  R2 = ADDRESS OF IUT/DATA.
                        ;*  R3 = INSTRUCTION UNDER TEST (IUT).
                        ;*  R4 = RTS R5 (CODE 205).
                        ;*  R5 = BLOCK BOUNDRY BIT MASK.
                        ;*****************************************************************
2705  012760            TST23:
2706  012760  004567     344          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
2707  012764  000003                  .WORD   3               ;MINIMUM BLOCK SIZE OF 2 WORDS
2708                                                          ; REQUIRED FOR THIS TEST.
2709  012766  000167  000064          JMP     TST24           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
2710                                                          ; AVAILABLE FOR TEST.
2711  012772  012703  110342  DIDBH:  MOV     #110342,R3      ;GET 'MOVB R3,-(R2)' INSTRUCTION (IUT).
2712  012776  012704  000205          MOV     #205,   R4      ;GET 'RTS R5'
2713  013002  012700  161342          MOV     #161342,R0      ;SET UP S/B DATA AFTER EXECUTION.
2714  013006  004467  001414          JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
2715  013012  010322          1$:     MOV     R3,     (R2)+   ;PUT IUT INTO FIRST LOC OF BLOCK.
2716  013014  010412          2$:     MOV     R4,     (R2)    ;PUT 'RTS R5' FOLLOWING IUT.
2717  013016  004562  177776          JSR     R5,     -2(R2)  ;GO EXECUTE THE IUT.
2718  013022  005302                  DEC     R2              ;ADJUST R2 TO POINT TO MAUT.
2719  013024  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM THE MEM ADR UNDER TEST.
2720  013026  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2721  013030  001405                  BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2722  013032  004767  005324  64$:    JSR     PC,     SPRNT3  ;SET UP VALUES FOR ERROR PRINTING.
2723  013036  004767  006576          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2724  013042  000021                  .WORD   21              ;ERROR TYPE CODE.
2725  013044                  65$:
2726  013044  010322                  MOV     R3,     (R2)+   ;PUT THE IUT INTO THE NEXT LOCATION.
2727  013046  030502                  BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
2728  013050  001361                  BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
2729  013052  004767  002126          JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
```

```
2730                                    ;*****************************************************************
2731                                    ;*TEST 24       EXECUTE DATI, DATIP, DATO THRU MEMORY.
2732                                    ;*  EXECUTES THE INSTRUCTION 'NEG (R2)' THROUGHOUT MEMORY.
2733                                    ;*  AN 'RTS R5' (CODE 205) IS PLACED AFTER THE 'NEG' INSTRUCTION TO RETURN
2734                                    ;*  CONTROL TO THE MAIN PROGRAM FOR INSTRUCTION EXECUTION CHECKOUT.
2735                                    ;*  THIS IS AN EXAMPLE OF WHAT THIS TEST DOES IN RELATION TO MEMORY:
2736                                    ;*
2737                                    ;*                MEMORY        INSTRUCTION      CONTENTS OF MEMORY LOCATION
2738                                    ;*               LOCATION       PLACED THERE     AFTER INSTRUCTION EXECUTION
2739                                    ;*
2740                                    ;*   1ST PASS /  40000           005412           172366
2741                                    ;*  THRU TEST /  40002           000205           000205
2742                                    ;*
2743                                    ;*   2ND PASS /  40002           005412           172366
2744                                    ;*  THRU TEST /  40004           000205           000205
2745                                    ;*
2746                                    ;*      ETC., ETC., ETC.
2747                                    ;*
2748                                    ;*  R0 = DATA WRITTEN ON TOP OF IUT BY THE IUT (SHOULD BE).
2749                                    ;*  R1 = DATA READ FROM MEMORY (WAS).
2750                                    ;*  R2 = ADDRESS OF IUT/DATA.
2751                                    ;*  R3 = INSTRUCTION UNDER TEST (IUT).
2752                                    ;*  R4 = RTS R5 (CODE 205).
2753                                    ;*  R5 = BLOCK BOUNDRY BIT MASK.
2754                                    ;*****************************************************************
2755  013056                            TST24:
2756  013056  004567  005546                   JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
2757  013062  000003                            .WORD   3               ;MINIMUM BLOCK SIZE OF 2 WORDS
2758                                                                    ; REQUIRED FOR THIS TEST.
2759  013064  000167  000060                   JMP     TST25           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
2760                                                                    ; AVAILABLE FOR TEST.
2761  013070  012703  005412           DIPDO:  MOV     #005412,R3      ;GET 'NEG (R2)' INSTRUCTION (IUT).
2762  013074  012704  000205                   MOV     #205,   R4      ;GET 'RTS R5'
2763  013100  012700  172366                   MOV     #172366,R0      ;SET UP S/B DATA AFTER EXECUTION.
2764  013104  004467  001316                   JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
2765  013110  010322                    1$:    MOV     R3,     (R2)+   ;PUT IUT INTO FIRST LOC OF BLOCK.
2766  013112  010412                    2$:    MOV     R4,     (R2)    ;PUT 'RTS R5' FOLLOWING IUT.
2767  013114  004542                            JSR     R5,     -(R2)   ;GO EXECUTE THE IUT.
2768  013116  012201                            MOV     (R2)+,  R1      ;GET THE DATA FROM THE MEM ADR UNDER TEST.
2769  013120  020001                            CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2770  013122  001405                            BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2771  013124  004767  005232           64$:    JSR     PC,     SPRNT3  ;SET UP VALUES FOR ERROR PRINTING.
2772  013130  004767  006504                   JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
2773  013134  000021                            .WORD   21              ;ERROR TYPE CODE.
2774  013136                            65$:
2775  013136  010322                            MOV     R3,     (R2)+   ;PUT THE IUT INTO THE NEXT LOCATION.
2776  013140  030502                            BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
2777  013142  001363                            BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
2778  013144  004767  002034                   JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
```

```
                        ;;*****************************************************************
                        ;*TEST 25       EXECUTE DATI, DATI, DATIP, DATOB (LOW BYTE) THRU MEMORY.
                        ;*  EXECUTES THE INSTRUCTION 'BICB (R2)+,-(R2)' THROUGHOUT MEMORY.
                        ;*  AN 'RTS R5' (CODE 205) IS PLACED AFTER THE 'BICB' INSTRUCTION TO RETURN
                        ;*  CONTROL TO THE MAIN PROGRAM FOR INSTRUCTION EXECUTION CHECKOUT.
                        ;*  THIS IS AN EXAMPLE OF WHAT THIS TEST DOES IN RELATION TO MEMORY:
                        ;*
                        ;*                  MEMORY        INSTRUCTION      CONTENTS OF MEMORY LOCATION
                        ;*                 LOCATION       PLACED THERE     AFTER INSTRUCTION EXECUTION
                        ;*
                        ;*   1ST PASS /   40000            142242           142000
                        ;*  THRU TEST /   40002            000205           000205
                        ;*
                        ;*   2ND PASS /   40002            142242           142000
                        ;*  THRU TEST /   40004            000205           000205
                        ;*
                        ;*      ETC., ETC., ETC.
                        ;*
                        ;*  R0 = DATA WRITTEN ON TOP OF IUT BY THE IUT (SHOULD BE).
                        ;*  R1 = DATA READ FROM MEMORY (WAS).
                        ;*  R2 = ADDRESS OF IUT/DATA.
                        ;*  R3 = INSTRUCTION UNDER TEST (IUT).
                        ;*  R4 = RTS R5 (CODE 205).
                        ;*  R5 = BLOCK BOUNDRY BIT MASK.
                        ;*****************************************************************
013150                  TST25:
013150  004567  005454          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
013154  000003                  .WORD   3               ;MINIMUM BLOCK SIZE OF 2 WORDS
                                                        ; REQUIRED FOR THIS TEST.
013156  000167  000060          JMP     TST26           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
                                                        ; AVAILABLE FOR TEST.
013162  012703  142242  DPDBL:  MOV     #142242,R3      ;GET BICB (R2)+,-(R2)' INSTRUCTION (IUT).
013166  012704  000205          MOV     #205,   R4      ;GET 'RTS R5'
013172  012700  142000          MOV     #142000,R0      ;SET UP S/B DATA AFTER EXECUTION.
013176  004467  001224          JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
013202  010322          1$:     MOV     R3,     (R2)+   ;PUT IUT INTO FIRST LOC OF BLOCK.
013204  010412          2$:     MOV     R4,     (R2)    ;PUT 'RTS R5' FOLLOWING IUT.
013206  004542                  JSR     R5,     -(R2)   ;GO EXECUTE THE IUT.
013210  012201                  MOV     (R2)+,  R1      ;GET THE DATA FROM THE MEM ADR UNDER TEST.
013212  020001                  CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
013214  001405                  BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
013216  004767  005140  64$:    JSR     PC,     SPRNT3  ;SET UP VALUES FOR ERROR PRINTING.
013222  004767  006412          JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
013226  000021                  .WORD   21.             ;ERROR TYPE CODE.
013230                  65$:
013230  010322                  MOV     R3,     (R2)+   ;PUT THE IUT INTO THE NEXT LOCATION.
013232  030502                  BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
013234  001363                  BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
013236  004767  001742          JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
```

```
                        ;*****************************************************************
                        ;*TEST 26       EXECUTE DATI, DATI, DATIP, DATOB (HIGH BYTE) THRU MEMORY.
                        ;*  EXECUTES THE INSTRUCTION 'BISB (R2)+,(R2)' THROUGHOUT MEMORY.
                        ;*  AN 'R15 R5' (CODE 205) IS PLACED AFTER THE 'BISB' INSTRUCTION TO RETURN
                        ;*  CONTROL TO THE MAIN PROGRAM FOR INSTRUCTION EXECUTION CHECKOUT.
                        ;*  THIS IS AN EXAMPLE OF WHAT THIS TEST DOES IN RELATION TO MEMORY:
                        ;*
                        ;*                  MEMORY        INSTRUCTION     CONTENTS OF MEMORY LOCATION
                        ;*                 LOCATION       PLACED THERE    AFTER INSTRUCTION EXECUTION
                        ;*
                        ;*   1ST PASS /   40000            152212          157212
                        ;*  THRU TEST /   40002            000205          000205
                        ;*
                        ;*   2ND PASS /   40002            152212          157212
                        ;*  THRU TEST /   40004            000205          000205
                        ;*
                        ;*      ETC., ETC., ETC.
                        ;*
                        ;*  R0 = DATA WRITTEN ON TOP OF IUT BY THE IUT (SHOULD BE).
                        ;*  R1 = DATA READ FROM MEMORY (WAS).
                        ;*  R2 = ADDRESS OF IUT/DATA.
                        ;*  R3 = INSTRUCTION UNDER TEST (IUT).
                        ;*  R4 = RTS R5 (CODE 205).
                        ;*  R5 = BLOCK BOUNDRY BIT MASK.
                        ;*****************************************************************
013242                  TST26:
013242  004567  005362            JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
013246  000003                    .WORD   3               ;MINIMUM BLOCK SIZE OF 2 WORDS
                                                        ;  REQUIRED FOR THIS TEST.
013250  000167  000062            JMP     TST27           ;SKIP TO NEXT TEST WHEN LESS THAN ONE BLOCK
                                                        ;  AVAILABLE FOR TEST.
013254  012703  152212    DPDBH:  MOV     #152212,R3      ;GET 'BISB (R2)+,(R2)' INSTRUCTION (IUT).
013260  012704  000205            MOV     #205,   R4      ;GET 'RTS R5'
013264  012700  157212            MOV     #157212,R0      ;SET UP S/B DATA AFTER EXECUTION.
013270  004467  001132            JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
013274  010322            1$:     MOV     R3,     (R2)+   ;PUT IUT INTO FIRST LOC OF BLOCK.
013276  010412            2$:     MOV     R4,     (R2)    ;PUT 'RTS R5' FOLLOWING IUT.
013300  004542                    JSR     R5,     -(R2)   ;GO EXECUTE THE IUT.
013302  005302                    DEC     R2              ;RESET R2 TO POINT TO IUT.
013304  012201                    MOV     (R2)+,  R1      ;GET THE DATA FROM THE MEM ADR UNDER TEST.
013306  020001                    CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
013310  001405                    BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
013312  004767  005044    64$:    JSR     PC,     SPRNT3  ;SET UP VALUES FOR ERROR PRINTING.
013316  004767  006316            JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
013322  000021                    .WORD   21              ;ERROR TYPE CODE.
013324                    65$:
013324  010322                    MOV     R3,     (R2)+   ;PUT THE IUT INTO THE NEXT LOCATION.
013326  030502                    BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
013330  001362                    BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
013332  004767  001646            JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
```

```
                                .SBTTL  SECTION 4:MOS TESTS
                                ;*****************************************************************
                                ;*TEST 27        MARCHING 1'S AND 0'S.
                                ;* THIS TEST IS DESIGNED TO STRESS MOS MEMORIES.
                                ;* STARTING AT THE BOTTOM ADDRESS AND ADDRESSING UPWARDS A 4K BANK IS
                                ;* WRITTEN WITH 000377.THEN STARTING AT THE TOP ADDRESS OF THE BANK THE
                                ;* 000377 IS READ,THE BYTES ARE SWAPPED TO 177400 AND THE LOCATION
                                ;* REREAD TO CONFIRM THE WRITE.THIS IS REPEATED FOR EVERY LOCATION
                                ;* ADDRESSED DOWNWARD UNTIL THE BOTTOM IS REACHED. STARTING AT THE
                                ;* BOTTOM EACH LOCATION IS READ FOR 177400,THE BYTES ARE SWAPPED TO
                                ;* 000377 AND REREAD TO CONFIRM THE WRITE UNTIL THE TOP ADDRESS OF THE
                                ;* BANK IS REACHED. AGAIN STARTING AT THE BOTTOM EACH LOCATION IS READ
                                ;* FOR 000377,THE BYTES SWAPPED TO 177400 AND THE LOCATION REREAD TO
                                ;* CONFIRM THE WRITE. LASTLY STARTING FROM THE TOP AND ADDRESSING DOWN-
                                ;* WARD EACH LOCATION IS READ,THE BYTES SWAPPED TO 000377 AND THE
                                ;* LOCATION IS REREAD TO CONFIRM THE WRITE. THIS IS REPEATED FOR EVERY
                                ;*4K BANK UNDER TEST.
                                ;*
                                ;*      R0=DATA WRITTEN INTO MEMORY(SHOULD BE)
                                ;*      R1=DATA READ FROM MEMORY(WAS)
                                ;*      R2=VIRTUAL ADDRESS
                                ;*      R3=TIMES THROUGH COUNTER
                                ;*      R4=NOT USED
                                ;*      R5=BLOCK BOUNDARY BIT MASK.
                                ;*****************************************************************
013336                          TST27:
013336  004567  005256                JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
013342  000000                        .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
013344  004467  001056                JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
013350  010267  166240                MOV     R2,TEMP         ;SAVE BANK STARTING ADDRESS
013354  005003                1$:     CLR     R3              ;CLEAR PASS COUNTER
013356  012700  000377                MOV     #000377,R0      ;SETUP TO WRITE PATTERN
013362  010022                2$:     MOV     R0,(R2)+        ;WRITE PATTERN
013364  030502                        BIT     R5,R2           ;END OF 4K?
013366  001375                        BNE     2$              ;CONTINUE WRITING IF NO.
013370  014201                3$:     MOV     -(R2),R1        ;GET DATA WRITEN
013372  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
013374  001405                        BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
013376  004767  004764        64$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
013402  004767  006232                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
013406  000010                        .WORD   10              ;ERROR TYPE CODE.
013410                          65$:
013410  000300                4$:     SWAB    R0              ;SWAP BYTES OF DATA
013412  010012                        MOV     R0,(R2) ;WRITE SWAPPED WORD
013414  011201                        MOV     (R2),R1         ;GET DATA WRITEN
013416  020001                        CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
013420  001405                        BEQ     67$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
013422  004767  004740        66$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
013426  004767  006206                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
013432  000010                        .WORD   10              ;ERROR TYPE CODE.
013434                          67$:
013434  000300                        SWAB    R0              ;PUT DATA BACK TO ORINGINAL
013436  005703                        TST     R3              ;IF ON PASS 0 OR PASS 3
013440  001403                        BEQ     5$              ;WE ARE ADDRESSING DOWN
013442  020327  000003                CMP     R3,#3           ;IF ON PASS 1 OR 2 GO TO
013446  001010                        BNE     6$              ;UPWARD
```

```
2934  013450  030502                  5$:     BIT     R5,R2           ;DONE A PASS?
2935  013452  001346                          BNE     3$              ;IF NO CONTINUE
2936  013454  005203                          INC     R3              ;IF YES INCREMENT PASS COUNTER
2937  013456  022703  000004                  CMP     #4,R3           ;ARE WE DONE ALL PASSES FOR THIS TEST?
2938  013462  001427                          BEQ     9$              ;IF YES BRANCH
2939  013464  000300                          SWAB    R0              ;ELSE SET UP NEW READ WORD
2940  013466  000404                          BR      7$              ;GO TO START OF ADDRESS UP
2941  013470  062702  000002                  ADD     #2,R2           ;UPDATE TO NEXT ADDRESS
2942  013474  030502                  3$:     BIT     R5,R2           ;DONE A PASS
2943  013476  001411                          BEQ     8$              ;IF YES BRANCH
2944  013500  011201                  7$:     MOV     (R2),R1         ;GET DATA WRITTEN
2945  013502  020001                          CMP     R0,R1           ;COMPARE THE CHECK WORD WITH THE DATA READ
2946  013504  001405                          BEQ     6$              ;BRANCH OVER ERROR CALL IF GOOD COMPARE
2947  013506  004767  000654          68$:    JSR     R0,SPRNT2       ;SET UP VALUES FOR ERROR PRINTOUT
2948  013512  004767  000622                  JSR     R0,$ERROR       ;*** ERROR *** (GO TYPE A MESSAGE
2949  013516  000010                          .WORD   10              ;ERROR TYPE CODE.
2950  013520                          6$:
2951  013520  000733                          BR      4$
2952  013522  005203                  8$:     INC     R3              ;INCREMENT      PASS COUNTER
2953  013524  000300                          SWAB    R0              ;SET UP NEW READ WORD
2954  013526  020327  000002                  CMP     R3,#2           ;ADDRESSING UP?
2955  013532  001316                          BNE     3$              ;IF NO GO TO DOWN SEQUENCE
2956  013534  016702  166054                  MOV     TEMP,R2         ;IF YES RESET ADDRESS TO START
2957  013540  000755                          BR      7$              ;GO TO UP SEQUENCE
2958  013542  004467  000660          9$:     JSR     R4,INITMM       ;INITIALIZE MEMORY ADDRESS POINTERS
2959  013546  004767  001432                  JSR     PC,MMUP         ;UPDATE TO NEW BANK IF EXISTS
2960
2961                                  ;*****************************************************************
2962                                  ;TEST 30        WRITE CHECKERBOARD STARTING WITH '125252' DATA
2963                                  ;* THESE TESTS WRITE A CHECKERBOARD THROUGHOUT MEMORY,STALL
2964                                  ;* FOR 2 SECONDS THEN CHECK PATTERN TO VERIFY DATA DID NOT
2965                                  ;* DETERIORATE BETWEEN REFRESH CYCLES.
2966                                  ;*
2967                                  ;*       R0=DATA WRITTEN INTO MEMORY(SHOULD BE
2968                                  ;*       R1=DATA READ FROM MEMORY(WAS,
2969                                  ;*       R2=VIRTUAL ADDRESS
2970                                  ;*       R3=SMALL LOOP COUNTER FOR STALL
2971                                  ;*       R4=NUMBER OF TIMES SMALL LOOP DONE
2972                                  ;*       R5=BLOCK BOUNDARY BIT MASK.
2973                                  ;*****************************************************************
2974  013552                          ST30:
2975  013552  004567  005052                  JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
2976  013556  000000                          .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
2977  013560  004467  000642                  JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
2978  013564  012700  125252                  MOV     #125252,R0      ;SETUP DATA PATTERN
2979  013570  010022                  1$:     MOV     R0      ,(R2)+  ;WRITE A WORD
2980  013572  005100                          COM     R0              ;COMPLEMENT DATA
2981  013574  030502                          BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
2982  013576  001374                          BNE     1$              ;BRANCH IF MORE IN CURRENT BLOCK.
2983  013600  004767  001400                  JSR     PC      MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
2984  013604  005003                          CLR     R3              ;SET UP COUNTER FOR STALL
2985  013606  012704  000046                  MOV     #46.    R4      ;DO LOOP 46 TIMES OR 2 SEC. TOTAL.
2986  013612  005303                  2$:     DEC     R3
2987  013614  001376                          BNE     2$
2988  013616  005304                          DEC     R4
2989  013620  001374                          BNE     2$
```

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2990  013622  004467  000600                    JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS
2991  013626  012700  125252                    MOV     #125252,R0      ;INIT DATA FOR CHECKING
2992  013632                            3$:
2993  013632  012201                            MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
2994  013634  020001                            CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
2995  013636  001405                            BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
2996  013640  004767  004522            64$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
2997  013644  004767  005?70                    JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
2998  013650  000006                            .WORD   6               ;ERROR TYPE CODE.
2999  013652                            65$:
3000  013652  005100                            COM     R0
3001  013654  030502                            BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
3002  013656  001365                            BNE     3$              ;BRANCH IF MORE IN CURRENT BLOCK.
3003  013660  004767  0C1320                    JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
3004                              ;;*************************************************************
3005                              ;*TEST 31       WRITE CHECKERBOARD STARTING WITH 052525 DATA
3006                              ;;*************************************************************
3007  013664                            ;ST31:
3008  013664  004567  004740                    JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
3009  013670  000000                            .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
3010  013672  004467  000530                    JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
3011  013676  012700  052525                    MOV     #052525,R0      ;SETUP DATA PATTERN
3012  013702  010022            1$:     MOV     R0,     (R2)+   ;WRITE A WORD
3013  013704  005100                            COM     R0
3014  013706  030502                            BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
3015  013710  001374                            BNE     1$              ;BRANCH IF MORE IN CURRENT BLOCK.
3016  013712  004767  001266                    JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
3017  013716  005003                            CLR     R3              ;SET COUNTER FOR LOOP
3018  013720  012704  000046                    MOV     #46.,   R4      ;DO LOOP 46 TIMES OR 2 SEC. TOTAL
3019  013724  005303            2$:     DEC     R3
3020  013726  001376                            BNE     2$
3021  013730  005304                            DEC     R4
3022  013732  001374                            BNE     2$
3023  013734  004467  000466                    JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
3024  013740  012700  052525                    MOV     #052525,R0      ;INIT PATTERN FOR CHECKING
3025  013744                            3$:
3026  013744  012201                            MOV     (R2)+,  R1      ;GET THE DATA FROM MEMORY UNDER TEST.
3027  013746  020001                            CMP     R0,     R1      ;COMPARE THE CHECK WORD WITH THE DATA READ.
3028  013750  001405                            BEQ     65$             ;BRANCH OVER ERROR CALL IF GOOD DATA.
3029  013752  004767  004410            64$:    JSR     PC,     SPRNT2  ;SET UP VALUES FOR ERROR PRINTING.
3030  013756  004767  005656                    JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE.
3031  013762  000006                            .WORD   6               ;ERROR TYPE CODE.
3032  013764                            65$:
3033  013764  005100                            COM     R0
3034  013766  030502                            BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
3035  013770  001365                            BNE     3$              ;BRANCH IF MORE IN CURRENT BLOCK.
3036  013772  004767  001206                    JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
```

```
                                                .SBTTL DONE:    RELOCATE PROGRAM AND REPEAT ALL TESTS.
013776                                          DONE:
013776  004567  004626                          JSR     R5,     $SCOPE  ;GO TO SCOPE ROUTINE.
014002  000000                                  .WORD   0               ;NO MINIMUM BLOCK SIZE REQUIRED THIS TEST.
014004  005067  165160                TST32:    CLR     $TIMES          ;RESET ITERATION COUNTER FOR RESTARTING TEST.
014010  105067  165066                          CLRB    $TSTNM          ;RESET TEST NUMBER.
014014  036767  164562  165512        1$:       BIT     PRGMAP, SAVTST  ;CHECK IF PROGRAM IS IN TEST AREA.
014022  001004                                  BNE     2$              ;BR IF IT PROG IN MEM TO BE TESTED.
014024  036767  164554  165504                BIT     PRGMAP+2,SAVTST+2 ;CHECK HI 64K
014032  001435                                  BEQ     $EOP            ;BR IF PROG NOT IN MEM TO BE TESTED.
014034  032777  000200  165076  2$:       BIT     #SW07,  @SWR    ;CHECK FOR INHIBIT RELOCATION SWITCH.
014042  001031                                  BNE     $EOP            ;SKIP RELOCATION IF SWITCH SET.
014044  022767  000003  164530                CMP     #3,     PRGMAP  ;CHECK IF PROGRAM IN FIRST 8K.
014052  001013                                  BNE     4$              ;BR IF NOT IN FIRST 8K.
014054  023737  000042  000046                CMP     @#42,@#46       ;CHECK FOR ACT11
014062  001416                                  BEQ     6$              ;BR IF ACT11.
014064  105737  001224                          TSTB    @#$ENV          ;CHECK FOR APT11
014070  001013                                  BNE     6$              ;IF APT11 DO NOT RELOCATE
                                                                        ;MUST BE XXDP OR STANDALONE
014072  004767  002362                          JSR     PC,     RELTOP  ;RELOCATE PROGRAM TO TOP OF MEMORY.
014076  000167  172002                3$:       JMP     START1          ;LOOP BACK AND RUN ALL TESTS AGAIN.

014102  004767  002754                4$:       JSR     PC,     RELO    ;RELOCATE PROGRAM BACK TO FIRST 8K.
014106  005737  000042                          TST     @#42            ;TEST FOR XXDP
014112  001402                                  BEQ     6$              ;IF NOT RUNNING UNDER MON. DONT
014114  004767  003150                5$:       JSR     PC,     RESLDR  ;RESTORE LOADERS.
014120                                  6$:
014120  004567  007366                          JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
014124  001201                                  .WORD   $CRLF           ;ADDRESS OF MESSAGE TO BE TYPED
```

```
                                        ;;*****************************************************************
                                        .SBTTL  END OF PASS ROUTINE
                                        ;*INCREMENT THE PASS NUMBER ($PASS)
                                        ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER.
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO START1
014126                                  $EOP:
014126  000240                                  NOP
014130  005067  165034                          CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
014134  005267  165052                          INC     $PASS           ;;INCREMENT THE PASS NUMBER
014140  042767  100000  165044                  BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
014146  005327                                  DEC     (PC)+           ;;LOOP?
014150  000001                          $EOPCT: .WORD   1
014152  003040                                  BGT     $DOAGN          ;;YES
014154  012737                                  MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
014156  000001                          $ENDCT: .WORD   1
014160  014150                                  $EOPCT
014162  004567  007324                          JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
014166  014260                                  .WORD   $ENDMG          ;ADDRESS OF MESSAGE TO BE TYPED
014170  016746  165016                          MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
                                        ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPDS ROUTINE
                                        ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
014174  013746  177776                          MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
014200  004767  010226                          JSR     PC,     $TYPDS  ;GO TO THE SUBROUTINE
014204  004567  007302                          JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
014210  014275                                  .WORD   $ENULL          ;ADDRESS OF MESSAGE TO BE TYPED
014212                                  $GET42:
014212  016700  163624                          MOV     42,     R0              ;;GET MONITOR ADDRESS
014216  001416                                  BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
014220  000005                                  RESET                   ;;CLEAR THE WORLD
014222  004710                          $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
014224  000240                                  NOP                     ;;SAVE ROOM
014226  000240                                  NOP                     ;;FOR
014230  000240                                  NOP                     ;;ACT11
014232  023737  000042  000046                  CMP     @#42,@#46       ;;ARE WE UNDER ACT11 OR XXDP
014240  001405                                  BEQ     $DOAGN          ;;IF ACT11 THEN RESTART
014242  105737  001224                          TSTB    @#$ENV          ;;CHECK FOR APT11
014246  001002                                  BNE     $DOAGN          ;;IF APT11 THEN RESTART
014250  004767  003074                          JSR     PC,     SAVLDR  ;;IF XXDP FIRST SAVE MONITOR
014254                                  $DOAGN:
014254  000167  171624                          JMP     START1          ;;RETURN*****
014260  005015  047105  020104          $ENDMG: .ASCIZ  <15><12>/END PASS #/
014266  040520  051523  021440
014274     000
014275     377     377     000          $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
                                        .SBTTL SUBROUTINE AND TRAP ROUTINE SECTION.
                                        .SBTTL  MEMORY MANAGEMENT AND ADDRESSING SUBROUTINES.
                                        ;;*****************************************************************
                                        ;*  SET UP ALL THE MEM MGMT REGISTERS FOR NORMAL OPERATION.
                                        ;*  THE PROGRAM IS POINTED TO BY PARS 0 AND 1.
                                        ;*  THE MEMORY UNDER TEST IS POINTED TO BY PARS 2 AND 3.
                                        ;*  THE DEVICE ADDRESS AREA IS POINTED TO BY PAR 7.
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3122                                    ;*  PARS 4, 5, AND 6 ARE UNUSED.
3123                                    ;;*****************************************************************
3124   014300                           MMINIT:
3125   014300  012737  077406  172300           MOV     #200-1*400+UP+RW,@#KIPDR0       ;SET KIPDR0 = RW UP 200 BLOCKS
3126   014306  012737  077406  172302           MOV     #200-1*400+UP+RW,@#KIPDR1       ;SET KIPDR1 = RW UP 200 BLOCKS
3127   014314  012737  077406  172304           MOV     #200-1*400+UP+RW,@#KIPDR2       ;SET KIPDR2 = RW UP 200 BLOCKS
3128   014322  012737  077406  172306           MOV     #200-1*400+UP+RW,@#KIPDR3       ;SET KIPDR3 = RW UP 200 BLOCKS
3129   014330  005037  172310                   CLR     @#KIPDR4
3130   014334  005037  172312                   CLR     @#KIPDR5
3131   014340  005037  172314                   CLR     @#KIPDR6
3132   014344  012737  077406  172316           MOV     #200-1*400+UP+RW,@#KIPDR7       ;SET KIPDR7 = RW UP 200 BLOCKS
3133   014352  005037  172340                   CLR     @#KIPAR0        ;MAP PAR0 INTO BANK0
3134   014356  012737  000200  172342           MOV     #200, @#KIPAR1  ;MAP PAR1 INTO BANK1
3135   014364  005037  172344                   CLR     @#KIPAR2        ;MAP PAR2 INTO BANK0
3136   014370  005037  172346                   CLR     @#KIPAR3
3137   014374  005037  172350                   CLR     @#KIPAR4
3138   014400  005037  172352                   CLR     @#KIPAR5
3139   014404  005037  172354                   CLR     @#KIPAR6
3140   014410  012737  007600  172356           MOV     #7600, @#KIPAR7 ;MAP PAR7 INTO I/O BANK
3141   014416  012737  000001  177572           MOV     #1,     @#SR0   ;ENABLE MEMORY MANAGEMENT
3142   014424  000207                           RTS     PC              ;RETURN
3143
3144
3145                                    ;;*****************************************************************
3146                                    ;*  MEMORY ADDRESS POINTER INITIALIZATION ROUTINES.
3147                                    ;;*****************************************************************
3148   014426  012767  000001  165110   INITMM: MOV     #BIT0,  BITPT   ;SET POINTER TO BANK0
3149   014434  005067  165106                   CLR     BITPT+2         ;CLEAR HI 64K BANK POINTERS
3150   014440  005002                           CLR     R2              ;SET ADDRESS POINTER TO 0
3151   014442  016705  165140                   MOV     BLKMSK, R5      ;RESET R5 TO BLOCK MASK.
3152   014446  005767  164134                   TST     MMAVA           ;CHECK FOR MEM MGMT AVAILABLE
3153   014452  001514                           BEQ     10$             ;BRANCH IF NO MEM MGMT
3154   014454  005037  172344                   CLR     @#KIPAR2        ;SET UP 3RD PAR TO BANK0
3155   014460  012702  040000                   MOV     #40000, R2      ;RESET VIRTUAL ADR POINTER
3156   014464  036767  165054  165036   1$:     BIT     BITPT,  TSTMAP  ;CHECK IF THIS BANK TO BE TESTED
3157   014472  001015                           BNE     2$              ;BRANCH IF MATCH
3158   014474  036767  165046  165030           BIT     BITPT+2,TSTMAP+2 ;CHECK IN HI MAP
3159   014502  001011                           BNE     2$              ;BRANCH IF MATCH
3160   014504  062737  000200  172344           ADD     #200,   @#KIPAR2 ;UPDATE MEM MGMT, THIRD PAR.
3161   014512  006367  165026                   ASL     BITPT           ;UPDATE LO POINTER TO NEXT BANK.
3162   014516  006167  165024                   ROL     BITPT+2         ;...HI POINTER.
3163   014522  100360                           BPL     1$              ;BR IF MORE.
3164   014524  000000                           HALT                    ;FATAL ERROR!!!  NO 4K BANK FOUND?
3165   014526  036767  165012  165046   2$:     BIT     BITPT,  LADMAP  ;CHECK IF LAST BANK.
3166   014534  001004                           BNE     3$              ;BR IF LAST BANK.
3167   014536  036767  165004  165040           BIT     BITPT+2,LADMAP+2 ;CHECK IF LAST BANK.
3168   014544  001405                           BEQ     4$              ;BR IF NOT LAST BANK.
3169   014546  016705  165026           3$:     MOV     LADMSK, R5      ;SET MASK TO FIND LAST ADR.
3170   014552  042767  020000  165016           BIC     #20000, TMPLAD  ;MAKE SURE VIRTUAL LAST ADR IN BANK 2.
3171   014560  013737  172344  172346   4$:     MOV     @#KIPAR2,@#KIPAR3 ;COPY CURRENT PAR INTO FORTH PAR.
3172   014566  016767  164752  164754           MOV     BITPT,  TMPPT   ;COPY BITPT...LO 64K.
3173   014574  016767  164746  164750           MOV     BITPT+2,TMPPT+2 ;...HI 64K.
3174   014602  032705  020000                   BIT     #BIT13, R5      ;CHECK FOR A BLOCK SIZE OF 8K.
3175   014606  001505                           BEQ     21$             ;BRANCH IF NOT 8K.
3176   014610  062737  000200  172346   5$:     ADD     #200,   @#KIPAR3 ;UP DATE FORTH PAR.
3177   014616  006367  164726                   ASL     TMPPT           ;UPDATE LO POINTER TO NEXT 4K BANK.
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3178  014622  006167  164724                  ROL     TMPPT+2         ;...HI POINTER.
3179  014626  100473                          BMI     20$             ;BR IF NO MORE.
3180  014630  036767  164714  164672          BIT     TMPPT,  TSTMAP  ;CHECK IF BANK TO BE TESTED.
3181  014636  001004                          BNE     6$              ;BRANCH IF A MATCH.
3182  014640  036767  164706  164664          BIT     TMPPT+2,TSTMAP+2 ;CHECK FOR HI 64K BANKS.
3183  014646  001760                          BEQ     5$              ;BRANCH IF NO MEMORY
3184  014650  036767  164674  164724  6$:     BIT     TMPPT,  LADMAP  ;CHECK IF LAST BANK.
3185  014656  001004                          BNE     7$              ;BRANCH IF A MATCH
3186  014660  036767  164666  164716          BIT     TMPPT+2,LADMAP+2 ;CHECK HI 64K
3187  014666  001455                          BEQ     21$             ;BR IF NOT LAST BANK.
3188  014670  016705  164704          7$:     MOV     LADMSK, R5      ;RESET MASK TO FIND LAST ADR.
3189  014674  052767  020000  164674          BIS     #20000, TMPLAD  ;MAKE SURE LAST ADDRESS IS IN BANK 3.
3190  014702  000447                          BR      21$             ;BR TO FINISH UP.
3191
3192  014704  036767  164634  164616  10$:    BIT     BITPT,  TSTMAP  ;CHECK IF THIS BANK TO BE TESTED.
3193  014712  001006                          BNE     11$             ;BR IF MATCH.
3194  014714  062702  020000                  ADD     #20000, R2      ;UPDATE PHYSICAL ADR PNTR TO NEXT BANK
3195  014720  106367  164620                  ASLB    BITPT           ;UPDATE BANK POINTER TO NEXT BANK.
3196  014724  100367                          BPL     10$             ;BR IF MORE BANKS.
3197  014726  000000                          HALT                    ;FATAL ERROR!!!  NO 4K BANK FOUND
3198  014730  016767  164610  164612  11$:    MOV     BITPT, TMPPT    ;COPY BANK POINTER.
3199  014736  036767  164602  164636          BIT     BITPT,  LADMAP  ;CHECK IF LAST BANK.
3200  014744  001021                          BNE     12$             ;BR IF LAST BANK.
3201  014746  032705  020000                  BIT     #BIT13, R5      ;CHECK FOR 8K BLOCK SIZE.
3202  014752  001423                          BEQ     21$             ;BRANCH IF SMALLER BLOCK SIZE.
3203  014754  106367  164570                  ASLB    TMPPT           ;POINT TO NEXT BANK.
3204  014760  100416                          BMI     20$             ;BRANCH IF OVERFLOW.
3205  014762  036767  164562  164540          BIT     TMPPT,  TSTMAP  ;CHECK IF BANK TO BE TESTED.
3206  014770  001412                          BEQ     20$             ;BRANCH IF NOT TO BE TESTED.
3207  014772  112767  000011  164557          MOVB    #11,    FLAG8K  ;SET 8K BLOCK SIZE FLAG.
3208  015000  036767  164544  164574          BIT     TMPPT,  LADMAP  ;CHECK FOR LAST BANK.
3209  015006  001403                          BEQ     20$             ;BR IF NOT LAST BANK.
3210  015010  016705  164564          12$:    MOV     LADMSK, R5      ;RESET MASK TO FIND LAST ADR.
3211  015014  000402                          BR      21$             ;SKIP MASK RESET.
3212  015016  012705  017777          20$:    MOV     #MASK4K,R5      ;RESET MASK TO 4K BLOCK SIZE
3213  015022  056767  164516  164520  21$:    BIS     BITPT,  TMPPT   ;SET TMPPT FOR FLAGING LAST BANK.
3214  015030  056767  164512  164514          BIS     BITPT+2,TMPPT+2
3215  015036  036767  164502  164524          BIT     BITPT,  FADMAP  ;CHECK IF FIRST ADDRESS NEEDS TO BE SET.
3216  015044  001004                          BNE     22$             ;BR IF FIRST BANK.
3217  015046  036767  164474  164516          BIT     BITPT+2,FADMAP+2 ;CHECK HI 64K.
3218  015054  001450                          BEQ     INITEX          ;BR IF NOT FIRST BANK.
3219  015056  016702  164502          22$:    MOV     TMPFAD, R2      ;RESET ADDRESS POINTER TO FIRST ADR.
3220  015062  000445                          BR      INITEX
3221
3222  015064  016705  164516          INITDN: MOV     BLKMSK, R5      ;RESET R5 TO CURRENT BLOCK MASK.
3223  015070  005002                          CLR     R2              ;INIT ADDRESS POINTER.
3224  015072  005767  163510                  TST     MMAVA           ;CHECK FOR MEM MGMT
3225  015076  001411                          BEQ     31$             ;BRANCH IF NO MEM MGMT
3226  015100  012767  100000  164440          MOV     #BIT15, BITPT+2 ;SET POINTER TO TOP BIT
3227  015106  005067  164432                  CLR     BITPT
3228  015112  012737  007600  172344          MOV     #7600,  @#KIPAR2 ;SET PAR TO TOP OF MEM
3229  015120  000403                          BR      32$             ;BRANCH TO COMMON AREA
3230
3231  015122  012767  000400  164414  31$:    MOV     #BIT8,  BITPT   ;SET UP BANK POINTER
3232  015130  012767  015152  164416  32$:    MOV     #33$,   MMORE   ;SET "MMDOWN" EXIT ADDRESS
3233  015136  066767  163436  164410          ADD     RELOCF, MMORE   ;ADD OFFSET
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3234  015144  004767  000524                        JSR     PC,     MMDOWN  ;ROUTINE TO SEARCH DOWNWARD FOR TOP MEM BANK
3235  015150  000000                                HALT                    ;FATAL ERROR!!!  NO MEM INDICATED IN MEM MAP ABOVE 8K!
3236  015152  036767  164366  164422  33$:  BIT     BITPT,  LADMAP  ;CHECK FOR NON BOUNDRY LAST ADDR.
3237  015160  001004                        BNE     34$             ;BR IF LAST BANK FLAG FOUND.
3238  015162  036767  164360  164414        BIT     BITPT+2,LADMAP+2 ;CHECK FOR NON BOUNDRY LAST ADDR.
3239  015170  001402                        BEQ     INITEX          ;BR IF NO LAD FLG FOUND.
3240  015172  016702  164376        34$:  MOV     LSTADR, R2      ;SET UP R2.
3241  015176  010467  164352        INITEX: MOV     R4,     MMORE   ;PUT RETURN PC INTO "MMORE"
3242  015202  000204                        RTS     R4              ;RETURN
3243
3244                                ;;*****************************************************************
3245                                ;*  COMMON UPWARDS ADDRESSING ROUTINE
3246                                ;*  FINDS NEXT EXISTING 4K BANK AND UPDATES POINTERS.
3247                                ;*  GOES TO ADDRESS IN "MMORE" IF MORE BANKS
3248                                ;*  DOES STRAIGHT EXIT WHEN ALL MEMORY HAS BEEN DONE.
3249                                ;;*****************************************************************
3250  015204  036767  164340  164370  MMUP:  BIT     TMPPT,  LADMAP  ;CHECK FOR LAST BANK FLAG.
3251  015212  001122                        BNE     10$             ;BR IF LAST BANK.
3252  015214  036767  164332  164362        BIT     TMPPT+2,LADMAP+2 ;CHECK FOR LAST BANK FLAG.
3253  015222  001116                        BNE     10$             ;BR IF LAST BANK.
3254  015224  016705  164356                MOV     BLKMSK, R5      ;RESET R5 TO BLOCK MASK.
3255  015230  005767  163352                TST     MMAVA           ;CHECK FOR MEM MGMT AVAILABLE
3256  015234  001515                        BEQ     20$             ;BRANCH IF NO MEM MGMT
3257  015236  012702  040000                MOV     #40000, R2      ;RESET VIRTUAL ADR POINTER
3258  015242  062737  000200  172344  1$:   ADD     #200,   @#KIPAR2 ;UPDATE MEM MGMT, THIRD PAR.
3259  015250  006367  164270                ASL     BITPT           ;UPDATE LO POINTER TO NEXT BANK.
3260  015254  006167  164266                ROL     BITPT+2         ;...HI POINTER.
3261  015260  100577                        BMI     32$             ;BR IF ALL DONE.
3262  015262  036767  164256  164240        BIT     BITPT,  TSTMAP  ;CHECK IF THIS BANK EXISTS
3263  015270  001004                        BNE     2$              ;BRANCH IF MATCH
3264  015272  036767  164250  164232        BIT     BITPT+2,TSTMAP+2 ;CHECK IN HI MAP
3265  015300  001760                        BEQ     1$              ;BRANCH IF NO MATCH
3266  015302  036767  164236  164272  2$:   BIT     BITPT,  LADMAP  ;CHECK FOR LAST BANK FLAG.
3267  015310  001004                        BNE     3$              ;BRANCH IF LAST BANK FLAG.
3268  015312  036767  164230  164264        BIT     BITPT+2,LADMAP+2 ;CHECK IF LAST BANK FLAG.
3269  015320  001405                        BEQ     4$              ;BR IF NOT LAST BANK.
3270  015322  016705  164252          3$:   MOV     LADMSK, R5      ;RESET MASK.
3271  015326  042767  020000  164242        BIC     #20000, TMPLAD  ;MAKE SURE VIRTUAL LAST ADR IN BANK 2
3272  015334  016767  164204  164206  4$:   MOV     BITPT,  TMPPT   ;COPY BITPT...LO 64K.
3273  015342  016767  164200  164202        MOV     BITPT+2,TMPPT+2 ;...HI 64K.
3274  015350  032705  020000                BIT     #BIT13, R5      ;CHECK FOR A BLOCK SIZE OF 8K.
3275  015354  001530                        BEQ     31$             ;BRANCH IF NOT.
3276  015356  013737  172344  172346        MOV     @#KIPAR2,@#KIPAR3 ;COPY CURRENT PAR INTO FORTH PAR.
3277  015364  062737  000200  172346  5$:   ADD     #200,   @#KIPAR3 ;UP DATE FORTH PAR.
3278  015372  006367  164152                ASL     TMPPT           ;UPDATE LO POINTER TO NEXT 4K BANK.
3279  015376  006167  164150                ROL     TMPPT+2         ;...HI POINTER.
3280  015402  100513                        BMI     30$             ;BR IF NO MORE.
3281  015404  036767  164140  164116  6$:   BIT     TMPPT,  TSTMAP  ;CHECK IF BANK TO BE TESTED.
3282  015412  001004                        BNE     7$              ;BRANCH IF A MATCH.
3283  015414  036767  164132  164110        BIT     TMPPT+2,TSTMAP+2 ;CHECK FOR HI 64K BANKS.
3284  015422  001760                        BEQ     5$              ;BRANCH IF NO MEMORY
3285  015424  036767  164120  164150  7$:   BIT     TMPPT,LADMAP    ;CHECK FOR LAST BANK FLAG.
3286  015432  001004                        BNE     8$              ;BRANCH IF A MATCH
3287  015434  036767  164112  164142        BIT     TMPPT+2,LADMAP+2 ;CHECK HI 64K
3288  015442  001475                        BEQ     31$             ;BR IF NO LAST BANK FLAG.
3289  015444  016705  164130          8$:   MOV     LADMSK, R5      ;RESET MASK TO FIND LAST ADDRESS
```

```
3290  015450  052767  020000  164120          BIS     #20000, TMPLAD  ;SET VIRTUAL ADR TO BANK 3.
3291  015456  000467                          BR      31$
3292
3293  015460  026702  164112          10$:    CMP     TMPLAD, R2      ;CHECK IF LAST ADR REACHED.
3294  015464  001064                          BNE     31$             ;BR IF MORE.
3295  015466  000474                          BR      32$             ;BR IF ALL DONE.
3296
3297  015470  106267  164063          20$:    ASRB    FLAG8K          ;SHIFT 8K FLAG
3298  015474  001407                          BEQ     22$             ;BR IF NOT 8K BLOCK.
3299  015476  103455                          BCS     30$             ;BR IF ANOTHER 4K.
3300  015500  105067  164053                  CLRB    FLAG8K          ;CLEAR OUT ALL FLAGS.
3301  015504  162702  040000                  SUB     #40000, R2      ;BACK UP 8K.
3302  015510  062702  020000          21$:    ADD     #20000, R2      ;UPDATE PHYSICAL ADR PNTR TO NEXT BANK.
3303  015514  106367  164024          22$:    ASLB    BITPT           ;UPDATE POINTER.
3304  015520  100457                          BMI     32$             ;BRANCH WHEN END IS REACHED.
3305  015522  036767  164016  164000          BIT     BITPT, TSTMAP   ;CHECK IF THIS BANK EXISTS.
3306  015530  001767                          BEQ     21$             ;BRANCH IF NO MATCH.
3307  015532  036767  164006  164042          BIT     BITPT, LADMAP   ;CHECK FOR LAST BANK FLAG.
3308  015540  001402                          BEQ     23$             ;BR IF NO MATCH.
3309  015542  016705  164032                  MOV     LADMSK, R5      ;RESET MASK TO FIND LAST ADR.
3310  015546  016767  163772  163774  23$:    MOV     BITPT, TMPPT    ;SET UP TMP POINTER.
3311  015554  032705  020000                  BIT     #BIT13, R5      ;CHECK FOR 8K BLOCK SIZE.
3312  015560  001426                          BEQ     31$             ;BRANCH IF SMALLER BLOCK SIZE.
3313  015562  106367  163762                  ASLB    TMPPT           ;POINT TO NEXT BANK.
3314  015566  100421                          BMI     30$             ;BRANCH IF OVERFLOW.
3315  015570  036767  163754  163732          BIT     TMPPT, TSTMAP   ;CHECK IF BANK TO BE TESTED.
3316  015576  001415                          BEQ     30$             ;BRANCH IF NOT TO BE TESTED.
3317  015600  036767  163740  163774          BIT     BITPT, LADMAP   ;CHECK FOR LAST BANK FLAG.
3318  015606  112767  000011  163743          MOVB    #11, FLAG8K     ;SET 8K BLOCK FLAG.
3319  015614  036767  163724  163760          BIT     BITPT, LADMAP   ;CHECK FOR LAST BANK FLAG.
3320  015622  001403                          BEQ     30$             ;BR IF NO FLAG.
3321  015624  016705  163750                  MOV     LADMSK, R5      ;RESET MASK TOFIND LAST ADR.
3322  015630  000402                          BR      31$
3323  015632  012705  017777          30$:    MOV     #MASK4K,R5      ;SET MASK TO 4K.
3324  015636  056767  163702  163704  31$:    BIS     BITPT, TMPPT    ;SET TMPPT FOR FINDING LAST ADR.
3325  015644  056767  163676  163700          BIS     BITPT+2,TMPPT+2
3326  015652  016716  163676                  MOV     MMORE, (SP)     ;FUDGE RETURN ADDRESS TO LOOP.
3327  015656  000207                          RTS     PC              ;RETURN
3328                                  ;*  BEFORE FINAL EXIT, CHECK FOR ANY NON-TRAP PARITY ERRORS.
3329  015660  005767  164412          32$:    TST     MPRX            ;CHECK FOR ANY PARITY REGISTERS PRESENT.
3330  015664  001402                          BEQ     33$             ;BR IF NONE.
3331  015666  004767  001744                  JSR     PC,     CKPMER  ;CHECK FOR PARITY MEMORY ERRORS.
3332  015672  000207                  33$:    RTS     PC              ;STRAIGHT RETURN.
3333
3334                                  ;;**************************************************************
3335                                  ;*  MEMORY DOWNWARDS ADDRESSING SUBROUTINE.
3336                                  ;*  FINDS NEXT LOWER 4K BANK AND UPDATES POINTERS.
3337                                  ;*  GOES TO ADDRESS IN "MMORE" IF MORE BANKS.
3338                                  ;*  DOES STRAIGHT EXIT WHEN ALL MEMORY HAS BEEN DONE.
3339                                  ;;**************************************************************
3340  015674  036767  163644  163666  MMDOWN: BIT     BITPT,  FADMAP  ;CHECK FOR FIRST ADR FLAG.
3341  015702  001004                          BNE     1$              ;BR IF FIRST ADR IN THIS BANK.
3342  015704  036767  163636  163660          BIT     BITPT+2,FADMAP+2 ;CHECK FOR FIRST ADR FLAG.
3343  015712  001404                          BEQ     2$              ;BR IF NO FLAG
3344  015714  026702  163644          1$:     CMP     TMPFAD, R2      ;CHECK IF FIRST ADDRESS REACHED.
3345  015720  001052                          BNE     9$              ;BR IF MORE.
```

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3346  015722  000453                        BR      10$             ;BR IF ALL DONE.
3347  015724  005767  162656                2$:     TST     MMAVA           ;CHECK IF MEM MGMT IS AVAILABLE
3348  015730  001425                        BEQ     6$              ;BRANCH IF NOT
3349  015732  162737  000200  172344        3$:     SUB     #200, @#KIPAR2  ;LOWER MEM MGMT PAR BY 4K
3350  015740  006067  163602                ROR     BITPT+2         ;MOV POINTER TO NEXT LOWER BANK...HI MAP.
3351  015744  006067  163574                ROR     BITPT           ;...LO MAP.
3352  015750  103440                        BCS     10$             ;BR IF NO MORE.
3353  015752  036767  163566  163550        BIT     BITPT,  TSTMAP  ;CHECK FOR BANK EXISTING
3354  015760  001004                        BNE     4$              ;BR IF BANK TO BE TESTED.
3355  015762  036767  163560  163542        BIT     BITPT+2,TSTMAP+2 ;CHECK FOR BANK IN HI MAP.
3356  015770  001760                        BEQ     3$              ;BR IF NOT THERE.
3357  015772  012702  060000                4$:     MOV     #60000, R2      ;SET ADR POINTER TO TOP OF BANK
3358  015776  000411                        BR      7$              ;GO TO COMMON EXIT
3359  016000  162702  020000                5$:     SUB     #20000, R2      ;BACK POINTER DOWN ONE BANK
3360  016004  006267  163534                6$:     ASR     BITPT           ;MOVE POINTER TO NEXT LOWER BANK
3361  016010  103420                        BCS     10$             ;BRANCH TO EXIT IF NO MORE MEM
3362  016012  036767  163526  163510        BIT     BITPT,  TSTMAP  ;CHECK IF BANK EXISTS
3363  016020  001767                        BEQ     5$              ;BRANCH IF BANK DOESN'T EXIST
3364  016022  036767  163516  163540  7$:   BIT     BITPT,  FADMAP  ;CHECK IF FIRST BANK FLAG.
3365  016030  001004                        BNE     8$              ;BR IF FIRST BANK.
3366  016032  036767  163510  163532        BIT     BITPT+2,FADMAP+2 ;CHECK IF FIRST BANK FLAG.
3367  016040  001402                        BEQ     9$              ;BR IF NO FLAG FOUND.
3368  016042  016705  163520                8$:     MOV     FADMSK, R5      ;SET UP R5 TO FIND FIRST ADDRESS.
3369  016046  016716  163502                9$:     MOV     MMORE,  (SP)    ;RESET RETURN ADDRESS
3370  016052  000207                        10$:    RTS     PC              ;RETURN
```

```
                                .SBTTL  SUBROUTINES FOR ADDRESS AND WORSE CASE NOISE TESTS.
                                ;;*****************************************************************
                                ;*  SUBROUTINE TO CALCULATE PHYSICAL ADDRESS AND PUT IT IN R0 (BOTTOM 16 BITS..
                                ;*  BITS 16 AND 17 ARE IN $TMP0.
                                ;;*****************************************************************
016054  010200                  PHYADR: MOV     R2,     R0              ;VITRUAL INTO R0
016056  005067  163076                  CLR     $TMP0                   ;CLEAR TEMP SAVE OF HIGH BITS
016062  005767  162520                  TST     MMAVA                   ;CHECK FOR MEM MGMT AVAILABLE
016066  001417                          BEQ     1$                      ;BRANCH IF NO MEM MGMT
016070  010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
016072  013701  172344                  MOV     @#KIPAR2, R1            ;GET PAR TO BE ADDED TO VIRTUAL
016076  006301                          ASL     R1                      ;SHIFT IT 6 TIMES
016100  006301                          ASL     R1
016102  006301                          ASL     R1
016104  006301                          ASL     R1
016106  006301                          ASL     R1
016110  006167  163044                  ROL     $TMP0                   ;SAVE EXTRA BITS
016114  006301                          ASL     R1
016116  006167  163036                  ROL     $TMP0
016122  060100                          ADD     R1,     R0              ;ADD SHIFTED PAR TO VIRTUAL
016124  012601                          MOV     (SP)+,R1                ;;POP STACK INTO R1
016126  000207                  1$:     RTS     PC                      ;RETURN
                                ;;*****************************************************************
                                ;*  SUBROUTINE TO PUT BANK NUMBER INTO R0.
                                ;;*****************************************************************
016130  005000                  BANKNO: CLR     R0                      ;INIT R0
016132  010146                          MOV     R1,-(SP)                ;;PUSH R1 ON STACK
016134  010246                          MOV     R2,-(SP)                ;;PUSH R2 ON STACK
016136  016701  163402                  MOV     BITPT,  R1              ;GET BANK MAP POINTER...LO 64K.
016142  016702  163400                  MOV     BITPT+2,R2              ;...HI 64K.
016146  006202                  1$:     ASR     R2                      ;SHIFT POINTER...HI
016150  006001                          ROR     R1                      ;...LO
016152  103403                          BCS     2$                      ;BR WHEN POINTER FOUND.
016154  105200                          INCB    R0                      ;COUNT BANKS.
016156  100373                          BPL     1$                      ;BR IF NOT OVERFLOW.
016160  000000                          HALT                    ;FATAL ERROR!!!  NO POINTER FOUND.
016162                          2$:
016162  012602                          MOV     (SP)+,R2                ;;POP STACK INTO R2
016164  012601                          MOV     (SP)+,R1                ;;POP STACK INTO R1
016166  000207                          RTS     PC                      ;RETURN
                                ;;*****************************************************************
                                ;*  SUBROUTINE TO WRITE THE CONSTANT IN R0 INTO ALL OF MEMORY.
                                ;;*****************************************************************
016170                          SETCON:
016170  004467  176232                  JSR     R4,     INITMM  ;INITIALIZE THE MEMORY ADDRESS POINTERS.
016174  010022                  2$:     MOV     R0,     (R2)+   ;MOV CONSTANT INTO MEMORY
016176  030502                          BIT     R5,     R2      ;CHECK FOR END OF A BLOCK.
016200  001375                          BNE     2$              ;BRANCH IF MORE IN CURRENT BLOCK.
016202  004767  176776                  JSR     PC,     MMUP    ;FIND NEXT BLOCK AND LOOP TO 1$.
016206  000207                          RTS     PC              ;RETURN
```

```
3423                                    ;;*****************************************************************
3424                                    ;* ROUTINE TO ROTATE 'C' BIT THROUGH A MEMORY LOCATION.
3425                                    ;;*****************************************************************
3426  016210  106112                    ROTATE: ROLB    (R2)            ;(R2)=177776 OR 000001
3427  016212  106112                            ROLB    (R2)            ;(R2)=177775 OR 000002
3428  016214  106112                            ROLB    (R2)            ;(R2)=177773 OR 000004
3429  016216  106112                            ROLB    (R2)            ;(R2)=177767 OR 000010
3430  016220  106112                            ROLB    (R2)            ;(R2)=177757 OR 000020
3431  016222  106112                            ROLB    (R2)            ;(R2)=177737 OR 000040
3432  016224  106112                            ROLB    (R2)            ;(R2)=177677 OR 000100
3433  016226  106112                            ROLB    (R2)            ;(R2)=177777 OR 000000
3434  016230  106122                            ROLB    (R2)+           ;(R2)=177577 OR 000200
3435  016232  106112                            ROLB    (R2)            ;(R2)=177377 OR 000400
3436  016234  106112                            ROLB    (R2)            ;(R2)=176777 OR 001000
3437  016236  106112                            ROLB    (R2)            ;(R2)=175777 OR 002000
3438  016240  106112                            ROLB    (R2)            ;(R2)=173777 OR 004000
3439  016242  106112                            ROLB    (R2)            ;(R2)=167777 OR 010000
3440  016244  106112                            ROLB    (R2)            ;(R2)=157777 OR 020000
3441  016246  106112                            ROLB    (R2)            ;(R2)=137777 OR 040000
3442  016250  106112                            ROLB    (R2)            ;(R2)=077777 OR 100000
3443  016252  106122                            ROLB    (R2)+           ;(R2)=177777 OR 000000
3444  016254  000207                            RTS     PC              ;RETURN
3445
3446                                    ;;*****************************************************************
3447                                    ;*  SUBROUTINE TO WRITE 3 XOR 9 PATTERN INTO 256. WORD BLOCK.
3448                                    ;;*****************************************************************
3449  016256  012704  000020            W3X9:   MOV     #16.,R4         ;EACH LOOP WRITES 256. WORDS
3450
3451  016262  010022                    2$:     MOV     R0,(R2)+
3452  016264  010022                            MOV     R0,(R2)+
3453  016266  010022                            MOV     R0,(R2)+
3454  016270  010022                            MOV     R0,(R2)+
3455
3456  016272  010322                            MOV     R3,(R2)+
3457  016274  010322                            MOV     R3,(R2)+
3458  016276  010322                            MOV     R3,(R2)+
3459  016300  010322                            MOV     R3,(R2)+
3460
3461  016302  010022                            MOV     R0,(R2)+
3462  016304  010022                            MOV     R0,(R2)+
3463  016306  010022                            MOV     R0,(R2)+
3464  016310  010022                            MOV     R0,(R2)+
3465
3466  016312  010322                            MOV     R3,(R2)+
3467  016314  010322                            MOV     R3,(R2)+
3468  016316  010322                            MOV     R3,(R2)+
3469  016320  010322                            MOV     R3,(R2)+
3470
3471  016322  005304                            DEC     R4
3472  016324  001356                            BNE     2$
3473  016326  010046                            MOV     R0,     -(SP)   ;SAVE R0
3474  016330  010300                            MOV     R3,     R0      ;PUT R3 INTO R0
3475  016332  012603                            MOV     (SP)+,  R3      ;PUT SAVED R0 INTO R3
3476  016334  000207                            RTS     PC              ;RETURN
```

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                                .SBTTL  RELOCATION SUBROUTINES.
                                ;;**************************************************************
                                ;* ROUTINE TO RELOCATE PROGRAM CODE
                                ;;**************************************************************
016336                          RELOC:
016336  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
016340  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
016342  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
016344  012502                  4$:     MOV     (R5)+,  R2      ;GET FIRST LOCATION.
016346  012503                          MOV     (R5)+,  R3      ;GET FIRST LOCATION OF DESTINATION.
016350  012704  020000                  MOV     #20000, R4      ;SET UP WK COUNTER.
016354  012223                  1$:     MOV     (R2)+,  (R3)+   ;MOV THE DATA.
016356  005304                          DEC     R4              ;COUNT THE WORDS.
016360  001375                          BNE     1$              ;BR IF MORE.
016362  012704  020000                  MOV     #20000, R4      ;RESET THE COUNTER.
016366  024243                  2$:     CMP     -(R2),  -(R3)   ;CHECK THE DATA JUST MOVED.
016370  001417                          BEQ     3$              ;BR IF DATA OK.
016372  011267  162526                  MOV     (R2),   $GDDAT  ;GET SOURCE DATA.
016376  011367  162524                  MOV     (R3),   $BDDAT  ;GET DESTINATION DATA.
016402  010267  162512                  MOV     R2,     $GDADR  ;GET SOURCE ADDRESS.
016406  010367  162510                  MOV     R3,     $BDADR  ;GET DESTINATION ADDRESS.
016412  004767  003222                  JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
016416  000023                          .WORD   23              ;ERROR TYPE CODE.
016420  000000                          HALT                    ;FATAL ERROR!!!  RELOCATION FAILED.
016422  162705  000004                  SUB     #4,     R5      ;ADJUST RETURN POINTER.
016426  000746                          BR      4$              ;GO BACK AND TRY AGAIN.
016430  005304                  3$:     DEC     R4              ;COUNT WORDS.
016432  001355                          BNE     2$              ;BR IF MORE.
016434  004567  005052                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
016440  026542                          .WORD   PRELOC          ;ADDRESS OF MESSAGE TO BE TYPED
                                                                ;"PROGRAM RELOCATED TO "
016442  010346                          MOV     R3,     -(SP)   ;PUT THE DATA ON THE STACK
016444  004767  006502                  JSR     PC,     $TYPAD  ;DETERMINE THE PHYSICAL ADDRESS AND TYPE IT.
016450  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
016452  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
016454  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
016456  000205                          RTS     R5              ;RETURN
                                ;;**************************************************************
                                ;*  SUBROUTINE TO MOVE PROGRAM FROM BOTTOM TO TOP OF MEMORY.
                                ;;**************************************************************
016460  022767  000003  162114  RELTOP: CMP     #3,     PRGMAP  ;CHECK THAT THE PROGRAM IS NOW IN BANKS 0 AND 1.
016466  001401                          BEQ     1$              ;BR IF OK
016470  000000                          HALT                    ;FATAL ERROR!!!  PROG SHOULD BE IN BANKS 0 AND 1
016472                          1$:
016472  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
016474  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
016476  005767  162104                  TST     MMAVA
016502  001465                          BEQ     10$
016504  012737  007600  172346          MOV     #7600,  @#KIPAR3 ;SET PAR TO TOP OF MEM
016512  005000                          CLR     R0              ;INIT BANK POINTER...LO 64K
016514  012701  100000                  MOV     #BIT15, R1      ;...HI 64K.
016520  162737  000200  172346  2$:     SUB     #200,   @#KIPAR3        ;BACK DOWN ONE BANK.
016526  006001                          ROR     R1              ;MOVE POINTER...HI 64K.
016530  006000                          ROR     R0              ;. LO 64K.
016532  103500                          BCS     90$
016534  030167  162766                  BIT     R1,     MEMMAP+2 ;CHECK FOR BANK EXISTS.
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3533  016540  001003                    BNE     3$              ;BR IF AVAILABLE
3534  016542  030067  162756            BIT     R0,     MEMMAP  ;CHECK FOR BANK EXISTS.
3535  016546  001764                    BEQ     2$              ;BR IF NO BANK FOUND.
3536  016550  013737  172346  172344  3$:       MOV     @#KIPAR3,@#KIPAR2 ;COPY PAR
3537  016556  010046                    MOV     R0,-(SP)        ;;PUSH R0 ON STACK
3538  016560  010146                    MOV     R1,-(SP)        ;;PUSH R1 ON STACK
3539  016562  162737  000200  172344  4$:       SUB     #200,   @#KIPAR2 ;BACK DOWN WITH LOW PAR.
3540  016570  006001                    ROR     R1              ;SHIFT POINTER.
3541  016572  006000                    ROR     R0              ;...LO 64K.
3542  016574  103457                    BCS     90$             ;BR IF OVERFLOW.
3543  016576  030167  162724          5$:       BIT     R1,     MEMMAP+2 ;       CHECK IF BANK EXISTS...HI 64K.
3544  016602  001003                    BNE     6$              ;BR IF BANK EXISTS.
3545  016604  030067  162714            BIT     R0,     MEMMAP  ;CHECK IF BANK EXISTS...LO 64K.
3546  016610  001764                    BEQ     4$              ;BR IF BANK DOESN'T EXIST.
3547  016612  052601                  6$:       BIS     (SP)+,  R1      ;GET SECOND BANK POINTER.
3548  016614  052600                    BIS     (SP)+,  R0      ;...LO 64K.
3549  016616  030067  161760            BIT     R0,     PRGMAP  ;CHECK FOR CONFLICT.
3550  016622  001044                    BNE     90$             ;ABORT IF DESTINATION OVERLAYS SOURCE.
3551  016624  004567  177506            JSR     R5,     RELOC   ;GO RELOCATE PROGRAM.
3552  016630  000000                    .WORD   0               ;SOURCE FIRST ADDRESS.
3553  016632  040000                    .WORD   40000           ;DESTINATION FIRST ADDRESS.
3554  016634  013737  172344  172340    MOV     @#KIPAR2,@#KIPAR0 ;RELOCATE LO BANK
3555  016642  013737  172346  172342    MOV     @#KIPAR3,@#KIPAR1 ;RELOCATE HI BANK.
3556                          ;*  PROGRAM SHOULD NOW BE EXICUTING OUT OF LAST TWO BANKS OF MEMOR·.
3557  016650  010167  161730            MOV     R1,     PRGMAP+2 ;RESET PROGRAM MAP.
3558  016654  000473                    BR      30$             ;BR TO COMMON EXIT.
3559
3560  016656  012700  000400          10$:      MOV     #BIT8,  R0      ;SET BANK POINTER TO TOP OF MEM.
3561  016662  005001                    CLR     R1              ;SET ADDRESS POINTER TO TOP.
3562  016664  162701  020000          11$:      SUB     #20000, R1      ;BACK DOWN ONE BANK.
3563  016670  006200                    ASR     R0              ;MOVE POINTER DOWN ONE BANK.
3564  016672  103420                    BCS     90$             ;BR IF OVERFLOW.
3565  016674  030067  162624            BIT     R0,     MEMMAP  ;CHECK IF THIS BANK EXISTS.
3566  016700  001771                    BEQ     11$             ;BR IF NON-EXISTANT BANK.
3567  016702  162701  020000            SUB     #20000, R1      ;BACK DOWN TO NEXT BANK.
3568  016706  006200                    ASR     R0              ;MOV POINTER DOWN ONE BANK.
3569  016710  103411                    BCS     90$             ;BR IF OVERFLOW.
3570  016712  030067  162606            BIT     R0,     MEMMAP  ;CHECK IF THIS BANK EXISTS.
3571  016716  001762                    BEQ     11$             ;BR TO START OVER IF NO LOWER BANK.
3572  016720  010046                    MOV     R0,     -(SP)   ;SAVE THE POINTER.
3573  016722  006300                    ASL     R0              ;RESET POINTER TO HI BANK.
3574  016724  052600                    BIS     (SP)+,  R0      ;SET BIT FOR LO BANK.
3575  016726  030067  161650            BIT     R0,     PRGMAP  ;CHECK FOR A PROGRAM CONFLICT.
3576  016732  001401                    BEQ     12$             ;BR IF NO CONFLICT.
3577  016734                        90$:
3578  016734  000000                    HALT                    ;FATAL ERROR!!!  NOT ENOUGH MEMORY??
3579  016736  010167  000006          12$:      MOV     R1,     13$     ;SET DATA FOR RELOCATION SUBROUTINE.
3580  016742  004567  177370            JSR     R5,     RELOC   ;GO RELOCATE THE PROGRAM TO TOP OF MEM.
3581  016746  000000                    .WORD   0               ;SOURCE STARTING ADDRESS.
3582  016750  000000                  13$:      .WORD   0       ;DESTINATION STARTING ADDRESS.
3583  016752  010167  161622            MOV     R1,     RELOCF  ;SET RELOCATION FACTOR IN UNRELOCATED CODE.
3584  016756  060107                    ADD     R1,     PC      ;JUMP TO RELOCATED PROGRAM
3585                          ;*  PROGRAM NOW EXICUTING OUT OF TOP OF MEMORY.
3586  016760  060106                    ADD     R1,     SP      ;ADJUST THE STACK POINTER TO TOP OF MEMORY.
3587  016762  010167  161612            MOV     R1,     RELOCF  ;SET THE RELOCATION FACTOR.
3588  016766  060137  000004            ADD     R1,     @#ERRVEC ;ADJUST ERROR VECTOR
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3589  017772  060137  000024                  ADD     R0,     @#PWRVEC  ;ADJUST POWER FAIL VECTOR
3590  017776  060137  000034                  ADD     R0,     @#PARVEC  ;ADJUST PARITY ERROR VECTOR.
3591  020002  026727  162132  177570          CMP     SWR,    #177570   ;CHECK FOR HARDWARE SWITCH REGISTER
3592  020010  001404                          BEQ     .+8               ;BR IF HARDWARE SWITCH REGISTER
3593  020012  060167  162122                  ADD     R0,     SWR       ;ADJUST SOFTWARE SWITCH REGISTER
3594  020016  060167  162120                  ADD     R0,     DISPLAY   ;ADJUST SOFTWARE DISPLAY REGISTER
3595  020022  062701  000622          .+8     ADD     #RADTAB,R1        ;POINT TO THE RELATIVE RELOCATION TABLE
3596  020026  066721  161546          .+8     ADD     RELOCF, (R1)+     ;ADD RELOCATION FACTOR TO ADDRESSES IN TABLE
3597  020032  005721                  .+8     TST     (R1)+             ;CHECK FOR INTERUM TERMINATOR
3598  020034  001776                          BEQ     .+8               ;BR SO AS TO NOT MODIFY ZERO
3599  020036  024127  177777                  CMP     -(R1),  #-1       ;CHECK FOR END OF TABLE
3600  020042  001371                          BNE     .+8               ;BR IF MORE IN TABLE.
3601  020044  012600          .+30    MOV     (SP)+,  R0        ;SET NEW PROGRAM MAP
3602  020046  012601                          MOV     (SP)+,  R1        ;POP STACK INTO R1
3603  020050  012600                          MOV     (SP)+,  R0        ;POP STACK INTO R0
3604  020052  066716  161522                  ADD     RELOCF, (SP)      ;ADJUST RETURN ADDRESS
3605  020056  000207                          RTS     PC                ;RETURN
3606
3607                                  ;*****************************************************
3608                                  ;* SUBROUTINE TO RELOCATE PROGRAM BACK TO BANKS 0 AND 1 *
3609                                  ;*****************************************************
3610  020060  032767  000003  161512  RELOC   BIT     #3,     PRGMAP    ;CHECK FOR PROGRAM ALREADY IN BANKS 0 & 1.
3611  020066  001401                          BEQ     .+4               ;BR IF NO CONFLICT.
3612  020070  000000                          HALT                      ;FATAL ERROR!!! PROGRAM ALREADY IN BANKS 0 OR 1!!!!
3613  020072  005767  161506          .+8     TST     MMAVA             ;CHECK FOR MEM MGMT
3614  020076  001417                          BEQ     10$               ;BR IF NO MEMMGMT.
3615  020100  005037  172344                  CLR     @#IPAR2           ;SET PAR 2 TO BANK 0.
3616  020104  012737  000200  172346          MOV     #200,   @#IPAR3   ;SET PAR 3 TO BANK 1.
3617  020112  004567  177216                  JSR     R5,     RELOC     ;GO MOVE BK INTO BANKS 0 AND 1.
3618  020116  000000                          .WORD   0                 ;SOURCE STARTING ADDRESS
3619  020120  040000                          .WORD   40000             ;DESTINATION STARTING ADDRESS
3620  020122  005037  172340                  CLR     @#IPAR0           ;RESTORE PAR 0 TO BANK 0
3621  020126  012737  000200  172342          MOV     #200,   @#IPAR1   ;RESTORE PAR 1 TO BANK 1
3622                                  ;* PROGRAM IS NOW EXICUTING OUT OF BANKS 0 AND 1.
3623  020134  000444                          BR      30$               ;BR TO COMMON EXIT.
3624
3625  020136  016746  161434          .+8     MOV     RELOCF, -(SP)     ;PUT RELOCATION FACTOR ONTO THE STACK.
3626  020142  011667  000004                  MOV     (SP),   20$       ;SET DATA FOR RELOC SUBROUTINE.
3627  020146  004567  177162                  JSR     R5,     RELOC     ;GO MOVE THE PROGRAM BACK TO BANKS 0 AND 1.
3628  020152  000000          20$:    .WORD   0                 ;SOURCE STARTING ADDRESS.
3629  020154  000000                          .WORD   0                 ;DESTINATION STARTING ADDRESS.
3630  020156  161607                          SUB     (SP),   PC        ;JUMP TO RELOCATED PROGRAM
3631                                  ;* THE PROGRAM IS NOW EXICUTING OUT OF BANKS 0 AND 1.
3632  020160  161606                          SUB     (SP),   (SP)      ;RESET THE STACK POINTER.
3633  020162  010046                          MOV     R0,     -(SP)     ;PUSH R0 ON STACK
3634  020164  012700  000622                  MOV     #RADTAB,R0        ;SET UP POINTER TO RELATIVE ADDRESS TABLE.
3635  020170  166620  000002          21$:    SUB     2(SP),  (R0)+     ;RESET ADDRESSES TO UNRELOCATED VALUES
3636  020174  005720          22$:    TST     (R0)+             ;CHECK FOR TERMINATORS.
3637  020176  001776                          BEQ     22$               ;BR OVER TERMINATORS.
3638  020200  024027  177777                  CMP     (R0),   #-1       ;CHECK FOR END OF TABLE INDICATOR.
3639  020204  001371                          BNE     21$               ;BR IF MORE ADDRESSES IN TABLE.
3640  020206  012600                          MOV     (SP)+,  R0        ;POP STACK INTO R0
3641  020210  161637  000004                  SUB     (SP),   @#ERRVEC  ;ADJUST ERROR VECTOR.
3642  020214  161637  000024                  SUB     (SP),   @#PWRVEC  ;ADJUST POWER FAIL VECTOR.
3643  020220  161637  000114                  SUB     (SP),   @#PARVEC  ;ADJUST PARITY ERROR VECTOR.
3644  020224  026727  161504  177570          CMP     SWR,    #177570   ;CHECK FOR HARDWARE SWITCH REGISTER
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3645  017234  001404                          BEQ     23$             ;BR IF HARDWARE SWITCH REGISTER.
3646  017236  161667  161676                  SUB     (SP),   SWR     ;ADJUST SOFTWARE SWITCH REGISTER.
3647  017242  161667  161674                  SUB     (SP),   DISPLAY ;ADJUST SOFTWARE DISPLAY REGISTER
3648  017246  162616                  23$:    SUB     (SP)+,  (SP)    ;ADJUST RETURN ADDRESS.
3649  017250  005067  161324          30$:    CLR     RELOCF          ;RESET RELOCATION FACTOR.
3650  017254  012767  000003  161320          MOV     #3,     PRGMAP  ;SET PROGRAM MAP TO POINT TO BANKS 3 AND 2.
3651  017262  005067  161316                  CLR     PRGMAP+2        ;  HI 64K.
3652  017266  000207                          RTS     PC              ;RETURN.
3653
3654                                  ;;*****************************************************************
3655                                  ;* THIS SUBROUTINE MOVES THE LOADER AREA BACK TO THE "TOP" OF MEMORY FROM
3656                                  ;*  WHENCE IT CAME.  THE LOADER AREA IS SAVED AT THE END OF THE 8K OF
3657                                  ;*  PROGRAM CODE WHEN THE PROGRAM IS INITIALLY RUN.
3658                                  ;*****************************************************************
3659  017270  016700  162224          RESLDR: MOV     LMAD,   R0      ;CHECK IF THE LOADERS WERE SAVED.
3660  017274  001001                          BNE     1$              ;BR IF LOADER AREA WAS SAVED.
3661  017276  000000                          HALT                    ;FATAL ERROR!!!  CAN'T RESTORE LOADER AREA IF IT WASN'T SAVED.
3662  017300  005767  161302          1$:     TST     MMAVH           ;CHECK FOR MEM MGMT.
3663  017304  001402                          BEQ     2$              ;SKIP IF NO MEM MGMT.
3664  017306  005037  177572                  CLR     @#SR0           ;DISABLE MEM MGMT.
3665  017312  012701  040000          2$:     MOV     #40000, R1      ;GET END OF 8K, ASSUME PROG NOT RELOCATED.
3666  017316  012702  002734                  MOV     #1500., R2      ;GET COUNTER.
3667  017322  014140                  3$:     MOV     -(R1),  -(R0)   ;MOVE THE LOADER AREA.
3668  017324  005302                          DEC     R2              ;COUNT HOW LONG THE AREA IS.
3669  017326  001375                          BNE     3$              ;BR IF NOT MORE TO MOVE.
3670  017330  005067  162164                  CLR     LMAD            ;CLEAR MONITOR SAVED FLAG
3671  017334  005767  161246                  TST     MMAVA           ;CHECK FOR MEM MGMT.
3672  017340  001402                          BEQ     4$              ;BR IF NO MEM MGMT.
3673  017342  005237  177572                  INC     @#SR0           ;ENABLE MEM MGMT.
3674  017346  000207                  4$:     RTS     PC              ;RETURN.
3675
3676                                  ;*  ROUTINE TO SAVE THE LOADERS AT THE END OF 8K.
3677  017350  005767  162144          SAVLDR: TST     LMAD            ;CHECK IF LOADERS HAVE BEEN SAVED ALREADY.
3678  017354  001024                          BNE     4$              ;BRANCH IF ALREADY SAVED
3679  017356  012700  040000                  MOV     #40000, R0      ;GET END OF 8K
3680  017362  010001                          MOV     R0,     R1      ;GET END OF 8K
3681  017364  012737  017376  000004          MOV     #2$, @#ERRVEC   ;SET UP TIMEOUT VECTOR
3682  017372  011020                  1$:     MOV     (R0),   (R0)+   ;SEARCH FOR END OF MEMORY
3683  017374  000776                          BR      1$              ;KEEP SEARCHING
3684  017376  022626                  2$:     CMP     (SP)+,  (SP)+   ;RESTORE STACK POINTER
3685  017400  012737  025114  000004          MOV     #ERRTRP,@#ERRVEC ;RESET TIMEOUT VECTOR.
3686  017406  010046                          MOV     R0,     -(SP)   ;SAVE LAST MEMORY ADDRESS  CONTIGUOUS
3687  017410  012702  002734                  MOV     #1500., R2      ;SET UP WORD COUNTER
3688  017414  014041                  3$:     MOV     -(R0),  -(R1)   ;SAVE THE LOADERS
3689  017416  005302                          DEC     R2              ;COUNT THE WORDS
3690  017420  001375                          BNE     3$              ;BRANCH IF MORE WORDS
3691  017422  012667  162072                  MOV     (SP)+,  LMAD    ;SAVE LAST MEMORY ADDRESS
3692  017426  000207                  4$:     RTS     PC              ;RETURN
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                                        .SBTTL  PARITY MEMORY TRAP SERVICE AND SUBROUTINES.
                                        ;;*****************************************************************
                                        ;* PARITY MEMORY UNEXPECTED ERROR TRAP SERVICE ROUTINE.
                                        ;*  FIND OUT WHICH REGISTER DETECTED THE ERROR.
                                        ;*  THEN SCAN MEMORY TO SEE IF PARITY ERROR STILL SET AND REPORT LOCATION.
                                        ;*****************************************************************
017430  011667  161466        PESRV:  MOV     (SP),   $ERADR  ;GET PC OF INSTRUCTION WHICH CAUSED ERROR.
017434  004567  004052                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
017440  026501                        .WORD   UNEXPT          ;ADDRESS OF MESSAGE TO BE TYPED
                                                                ;"UNEXPECTED MEMORY PARITY TRAP."
017442  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
017444  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
017446  016703  062156                MOV     .MPRX,  R3      ;GET POINTER TO PARITY REGISTERS.
017452  005733                1$:     TST     @(R3)+          ;CHECK THE PARITY REG FOR AN ERROR FLAG
017454  100415                        BMI     3$              ;BR IF THIS REGISTER SHOWS THE ERROR.
017456  005713                        TST     (R3)            ;CHECK FOR TABLE TERMINATOR.
017460  001374                        BNE     1$              ;BR IF MORE REGISTERS.
017462  004767  002152                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
                                ;***ERROR***    NO REGISTER INDICATED ERROR
017466  000024                        .WORD   24              ;ERROR TYPE CODE.
017470  000417                        BR      4$              ;EXIT
017472  005713                2$:     TST     (R3)            ;CHECK FOR TABLE TERMINATOR.
017474  001415                        BEQ     4$              ;BR IF NO MORE PARITY REGISTERS.
017476  005733                        TST     @(R3)+          ;CHECK THE PARITY REG FOR AN ERROR FLAG.
017500  100374                        BPL     2$              ;BR IF NO ERROR FLAG.
017502  004567  004004                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
017506  026572                        .WORD   MTOE            ;ADDRESS OF MESSAGE TO BE TYPED
                                                                ;"MORE THAN ONE ERROR FOUND."
017510                          3$:
017510  004767  000610        E4$:    JSR     PC,     SPRNTQ  ;SET UP VALUES FOR ERROR PRINTING
017514  004767  002120                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
017520  000025                        .WORD   25              ;ERROR TYPE CODE.
017522  004767  000216                JSR     PC,     PSCAN   ;GO SCAN MEMORY FOR BAD PARITY.
017526  000761                        BR      2$              ;GO LOOK FOR MORE ERRORS.
017530                          4$:
017530  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
017532  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
017534  000002                        RTI                     ;RETURN.

                                        ;*****************************************************************
                                        ;ROUTINE TO ENABLE PARITY ERROR ACTION ON MA/MF PARITY MEMORIES
                                        ;THIS ROUTINE IS MEANT TO CATCH UNEXPECTEDS
                                        ;*****************************************************************
017536  005767  162534        MAMF:   TST     MPRX            ;CHECK IF ANY PARITY REGISTERS EXIST.
017542  001434                        BEQ     MAMF2           ;EXIT IF NO PARITY REGISTERS.
017544  032777  000100  161366        BIT     #SW6,   @SWR    ;CHECK FOR INHIBIT PARITY ERROR DETECTION.
017552  001030                        BNE     MAMF2           ;EXIT IF NO PARITY ERROR DETECTION.
017554  005767  161020                TST     RELOCF          ;CHECK IF PROGRAM RELOCATED OUT OF BANK 0.
017560  001410                        BEQ     SETAE           ;BR IF PROG IN BANK 0.
017562  032777  000040  161350        BIT     #SW5,   @SWR    ;CHECK IF VECTORS PROTECTED.
017570  001004                        BNE     SETAE           ;BR IF VECTOR AREA PROTECTED.
017572  026727  161764  001000        CMP     FSTADR, #1000   ;CHECK FOR STARTING ADDRESS ABOVE THE VECTORS.
017600  103415                        BLO     MAMF2           ;EXIT IF VECTORS EXPOSED TO TESTING.
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3746  017602  016737  162030  000114  SETAE:  MOV     .PESRV, @#PARVEC ;SET PARITY ERROR TRAP VECTOR
3747  017610  005037  000116                  CLR     @#PARVEC+2       ;PRIORITY LEVEL 0 ON TRAP
3748  017614  010346                        MOV     R3,-(SP)         ;;PUSH R3 ON STACK
3749  017616  016703  162006                MOV     .MPRX,  R3       ;GET PARITY REGISTER TABLE POINTER.
3750  017622  052733  000001        MAMF1:  BIS     #AE,    @(R3)+   ;SET ACTION ENABLE BIT IN PARITY REG
3751  017626  005713                        TST     (R3)             ;CHECK FOR END OF TABLE.
3752  017630  001374                        BNE     MAMF1            ;BR IF MORE PARITY REGISTERS.
3753  017632  012603                        MOV     (SP)+,R3         ;;POP STACK INTO R3
3754  017634  000207        MAMF2:  RTS     PC                       ;RETURN.
3755
3756                                ;;*****************************************************************
3757                                ;*  SUBROUTINE TO CHECK PARITY REGISTERS FOR ERRORS THAT DIDN'T TRAP.
3758                                ;;*****************************************************************
3759  017636  005767  162434        CKPMER: TST     MPRX             ;CHECK IF ANY PARITY REGISTERS EXIST.
3760  017642  001437                        BEQ     4$               ;BR IF NO PARITY REGISTERS.
3761  017644  032777  000100  161266        BIT     #SW6,   @SWR     ;CHECK FOR INHIBIT PARITY ERROR CHECKING.
3762  017652  001033                        BNE     4$               ;BR IF PARITY ERROR CHECKING INHIBITED.
3763  017654  010346                        MOV     R3,-(SP)         ;;PUSH R3 ON STACK
3764  017656  016703  161746                MOV     .MPRX,  R3       ;GET PARITY REG TABLE POINTER.
3765  017662  005733                .1$:    TST     @(R3)+           ;CHECK THE PARITY REG FOR AN ERROR FLAG.
3766  017664  100023                        BPL     3$               ;BR IF NO ERROR
3767  017666  032773  000001  177776        BIT     #BIT0,  @-2(R3)  ;CHECK IF A TRAP SHOULD HAVE OCCURRED.
3768  017674  001010                        BNE     2$               ;BR IF NO ACTION ENABLE.
3769  017676  004767  000422        64$:    JSR     PC,     SPRNTQ   ;SET UP VALUES FOR ERROR PRINTING.
3770  017702  004767  001732                JSR     PC,     $ERROR   ;*** ERROR *** (GO TYPE A MESSAGE)
3771  017706  000026                        .WORD   26               ;ERROR TYPE CODE.
3772  017710  000411                        BR      3$
3773  017712  004767  000026                JSR     PC,     PSCAN    ;GO SCAN ALL MEMORY FOR PARITY ERRORS.
3774  017716                        2$:
3775  017716  004767  000402        65$:    JSR     PC,     SPRNTQ   ;SET UP VALUES FOR ERROR PRINTING.
3776  017722  004767  001712                JSR     PC,     $ERROR   ;*** ERROR *** (GO TYPE A MESSAGE)
3777  017726  000027                        .WORD   27               ;ERROR TYPE CODE.
3778  017730  004767  000010                JSR     PC,     PSCAN    ;GO SCAN ALL MEMORY FOR PARITY ERRORS.
3779  017734  005713                3$:     TST     (R3)             ;CHECK FOR TABLE TERMINATOR.
3780  017736  001351                        BNE     1$               ;BR IF MORE.
3781  017740  012603                        MOV     (SP)+,R3         ;;POP STACK INTO R3
3782  017742  000207                4$:     RTS     PC               ;RETURN.
3783
3784
3785                                ;;*****************************************************************
3786                                ;*  THIS SUBROUTINE WILL SCAN ALL OF MEMORY LOOKING FOR BAD PARITY,
3787                                ;*  TYPE OUT ALL LOCATIONS FOUND TO BE BAD, AND WRITE BACK INTO THE
3788                                ;*  LOCATIONS IN ORDER TO RESTORE GOOD PARITY.
3789                                ;;*****************************************************************
```

```
 3789  017744                          PSCAN:
 3790  017744  010046                        MOV     R0,-(SP)        ;  PUSH R0 ON STACK
 3791  017746  010146                        MOV     R1,-(SP         ;;PUSH R1 ON STACK
 3792  017750  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 3793  017752  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 3794  017754  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 3795  017756  013746  000114                MOV     @#114,-(SP)     ;;PUSH @#114 ON STACK
 3796  017762  013746  000116                MOV     @#116,-(SP)     ;;PUSH @#116 ON STACK
 3797  017766  004567  003520                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 3798  017772  026636                        .WORD   SCANM           ;ADDRESS OF MESSAGE TO BE TYPED
 3799                                                                ;"SCANNING MEMORY FOR BAD PARITY."
 3800  017774  012700  000001                MOV     #BIT0,  R0      ;SET BIT POINTER TO FIRST BANK.
 3801  020000  005001                        CLR     R1              ;CLR HI 64K POINTER.
 3802  020002  005002                        CLR     R2              ;INIT ADDRESS POINTER.
 3803  020004  005004                        CLR     R4              ;INIT ERROR DETECTED FLAG.
 3804  020006  004767  000256                JSR     PC,     CLRPAR  ;CLEAR THE PARITY REGISTERS.
 3805  020012  012737  000116  000114        MOV     #116,   @#114   ;HALT IF ANOTHER PARITY TRAP.
 3806  020020  005037  000116                CLR     @#116
 3807  020024  005767  160556                TST     MMAVA           ;CHECK FOR MEMORY MANAGEMENT.
 3808  020030  001406                        BEQ     1$              ;BR IF NO MEM MGMT.
 3809  020032  013746  172344                MOV     @#KIPAR2,-(SP)          ;;PUSH @#KIPAR2 ON STACK
 3810  020036  005037  172344                CLR     @#KIPAR2        ;INIT MEM MGMT TO POINT TO BANK 0.
 3811  020042  012702  040000                MOV     #40000, R2      ;SET ADR POINTER TO PAR2.
 3812  020046  030067  161452        1$:     BIT     R0,     MEMMAP  ;CHECK IF THIS BANK OF MEM EXISTS.
 3813  020052  001003                        BNE     2$              ;BR IF THIS BANK EXISTS.
 3814  020054  030167  161446                BIT     R1,     MEMMAP+2 ;CHECK HI 64K MAP.
 3815  020060  001442                        BEQ     10$             ;BR IF THIS BANK DOESN'T EXIST.
 3816  020062                          2$:
 3817  020062  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 3818  020064  111201                3$:     MOVB    (R2),   R1      ;READ THE LOCATION TO SEE IF IT HAS A PARITY ERROR.
 3819  020066  016703  161536                MOV     .MPRX,  R3      ;SET UP POINTER TO PARITY REGISTERS.
 3820  020072  005733                4$:     TST     @(R3)+          ;CHECK FOR THE ERROR FLAG.
 3821  020074  100024                        BPL     6$              ;BR IF NO ERROR FLAG.
 3822  020076  005704                        TST     R4              ;CHECK IF FIRST ERROR, THIS SCAN.
 3823  020100  001003                        BNE     5$              ;BR IF MORE THAN ONE ERROR FOUND.
 3824  020102  005367  161004                DEC     $ERTTL          ;ADJUST ERROR COUNT.
 3825  020106  005204                        INC     R4              ;SET FLAG TO INDICATE ERROR FOUND.
 3826  020110                          5$:
 3827  020110  004767  000210        64$:    JSR     PC,     SPRNTQ  ;SET UP VALUES FOR ERROR PRINTING.
 3828  020114  004767  001520                JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE)
 3829  020120  000030                        .WORD   30              ;ERROR TYPE CODE.
 3830  020122  111212                        MOVB    (R2),   (R2)    ;REWRITE THE LOCATION TO CLEAR BAD PARITY.
 3831  020124  005053                        CLR     @-(R3)          ;CLEAR THE ERROR FLAG.
 3832  020126  105712                        TSTB    (R2)            ;CHECK IF THE PARITY ERROR WAS CLEARED.
 3833  020130  005733                        TST     @(R3)+          ;CHECK FOR THE ERROR FLAG.
 3834  020132  100005                        BPL     6$              ;BR IF IT IS OK.
 3835  020134  004567  003352                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 3836  020140  026700                        .WORD   FEWNC           ;ADDRESS OF MESSAGE TO BE TYPED
 3837                                                                ;"PARITY ERROR WILL NOT CLEAR."
 3838  020142  005073  177776                CLR     @-2(R3)         ;CLEAR OUT THE PARITY ERROR FLAG.
 3839  020146  005713                6$:     TST     (R3)            ;CHECK FOR THE END OF REG ADR TABLE.
 3840  020150  001350                        BNE     4$              ;BR IF MORE PARITY REGISTERS.
 3841  020152  005202                        INC     R2              ;GO TO NEXT MEMORY ADDRESS.
 3842  020154  032702  017777                BIT     #MASK4K,R2      ;CHECK FOR END OF 4K BANK.
 3843  020160  001341                        BNE     3$              ;BR IF MORE MEMORY THIS BANK.
 3844  020162  012601                        MO.     SP +,R1         ;;POP STACK INTO R1
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3845  020164  000402                        BR      11$             ;BR TO CHECK FOR NEXT BANK.
3846  020166  062702  020000          10$:  ADD     #20000, R2      ;SKIP BANKS THAT AREN'T THERE.
3847  020172  005767  160410          11$:  TST     MMAVA           ;CHECK FOR MEM MGMT.
3848  020176  001413                        BEQ     12$             ;BR IF NO MEM MGMT.
3849  020200  062737  000200  172344        ADD     #200, @#KIPAR2  ;UPDATE MEM MGMT REG TO NEXT 4K.
3850  020206  012702  040000                MOV     #40000, R2      ;RESET ADDRESS POINTER TO BEGINNING OF BANK
3851  020212  006300                        ASL     R0              ;UPDATE BANK POINTER.
3852  020214  006101                        ROL     R1              ;...HI 64K.
3853  020216  100313                        BPL     1$              ;BR IF MORE BANKS.
3854  020220  012637  172344                MOV     (SP)+,@#KIPAR2          ;;POP STACK INTO @#KIPAR2
3855  020224  000402                        BR      20$             ;GO CHECK IF ANY ERRORS FOUND
3856  020226  106300          12$:  ASLB    R0              ;UPDATE POINTER TO NEXT BANK.
3857  020230  100306                        BPL     1$              ;BR IF MORE BANKS.
3858  020232  005704          20$:  TST     R4              ;CHECK IF ANY PARITY ERRORS DETECTED.
3859  020234  001003                        BNE     21$             ;BR IF ERRORS DETECTED.
3860  020236  004567  003250                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
3861  020242  025706                        .WORD   NOPES           ;ADDRESS OF MESSAGE TO BE TYPED
3862  020244                          21$:
3863  020244  012637  000116                MOV     (SP)+,@#116     ;;POP STACK INTO @#116
3864  020250  012637  000114                MOV     (SP)+,@#114     ;;POP STACK INTO @#114
3865  020254  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
3866  020256  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
3867  020260  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
3868  020262  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
3869  020264  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
3870  020266  000207                        RTS     PC              ;RETURN.
3871
3872                          ;;*****************************************************************
3873                          ;ROUTINE TO CLEAR ALL PARITY REGISTERS PRESENT
3874                          ;;*****************************************************************
3875  020270                  CLRPAR:
3876  020270  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
3877  020272  016703  161332                MOV     .MPRX,  R3      ;GET PARITY REGISTER TABLE POINTER
3878  020276  005713          1$:   TST     (R3)            ;CHECK FOR THE TABLE TERMINATOR.
3879  020300  001402                        BEQ     2$              ;BR IF DONE ALL PARITY REGISTERS.
3880  020302  005033                        CLR     @(R3)+          ;CLEAR THE PARITY REGISTER.
3881  020304  000774                        BR      1$              ;BR FOR MORE
3882  020306                          2$:
3883  020306  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
3884  020310  000207                        RTS     PC              ;RETURN.
3885
3886                          .SBTTL  SUBROUTINES TO SET UP DATA FOR ERROR PRINTOUT ROUTINE.
3887                          ;;*****************************************************************
3888                          ;*  THESE ROUTINES ARE USED TO TRANSFER DATA TO COMMON TAG AREA (.$CMTAG
3889                          ;*  FOR ERROR PRINTOUT BY .$ERROR & .$ERRTYP ROUTINES FROM **SYSMAC**.
3890                          ;;*****************************************************************
3891  020312  010267  160602  SPRNT:  MOV     R2,     $GDADR  ;SAVE THE ADDRESS UNDER TEST.
3892  020316  005067  160602          CLR     $GDDAT          ;SHOULD BE DATA IS "0".
3893  020322  000430                  BR      SPRNTB
3894
3895  020324  014367  160630  SPRNTQ: MOV     -(R3),  $TMP0   ;GET THE PARITY REGISTER ADDRESS.
3896  020330  013367  160626          MOV     @(R3)+, $TMP1   ;GET THE CONTENTS OF THE PARITY REG.
3897  020334  000402                  BR      SPRNTO
3898
3899  020336  011367  160616  SPRNTP: MOV     (R3),   $TMP0   ;GET THE PARITY REGISTER ADDRESS.
3900  020342  010267  160552  SPRNTO: MOV     R2,     $GDADR  ;GET THE MEMORY ADDRESS BEING TESTED
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3901  020346  000414                          BR      SPRNTA          ;BR TO COMMON SECTION.
3902
3903  020350  010267  160544          SPRNT1: MOV     R2,     $GDADR  ;GET THE MEMORY ADDRESS BEING TESTED
3904  020354  005367  160540                  DEC     $GDADR          ;ADJUST IT FOR PRINTOUT.
3905  020360  000407                          BR      SPRNTA          ;BR TO COMMON SECTION.
3906
3907  020362  010367  160572          SPRNT3: MOV     R3,     $TMPD   ;GET THE DATA IN R3.
3908  020366  010267  160526          SPRNT2: MOV     R2,     $GDADR  ;GET THE MEMORY ADDRESS BEING TESTED
3909  020372  162767  000002  160520          SUB     #2,     $GDADR  ;ADJUST IT FOR PRINTOUT.
3910  020400  010067  160520          SPRNTA: MOV     R0,     $GDDAT  ;GET WHAT THE DATA SHOULD BE
3911  020404  010167  160516          SPRNTB: MOV     R1,     $BDDAT  ;GET WHAT THE DATA WAS
3912  020410  000207                          RTS     PC              ;RETURN TO ENTER ERROR ROUTINES
3913
3914                                  ;;**********************************************************************
3915                                  ;*  SUBROUTINE TO TYPE OUT A MAP OF 4K BANK.
3916                                  ;*  R0 POINTS TO THE MAP UPON ENTERING THIS ROUTINE.
3917                                  ;;**********************************************************************
3918  020412  005710                  TYPMAP: TST     (R0)            ;CHECK IF ANY MEMORY IN MAP...LO 64K.
3919  020414  001007                          BNE     1$              ;BR IF MEMORY IN MAP.
3920  020416  005760  000002                TST     2(R0)           ;...HI 64K.
3921  020422  001004                          BNE     1$              ;BR IF MEMORY IN MAP.
3922  020424  004567  003062                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
3923  020430  026266                          .WORD   NOMEM           ;ADDRESS OF MESSAGE TO BE TYPED
3924                                                                  ;"NO MEMORY FOUND."
3925  020432  000475                          BR      6$              ;EXIT
3926  020434                          1$:
3927  020434  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
3928  020436  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
3929  020440  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
3930  020442  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
3931  020444  012701  000001                  MOV     #BIT0,  R1      ;SET UP BANK POINTER...LO 64K.
3932  020450  005002                          CLR     R2              ;...HI 64K.
3933  020452  012703  177777                  MOV     #-1,    R3      ;SET UP ADDRESS POINTER TO -1.
3934  020456  010304                          MOV     R3,     R4      ;HI BITS OF ADDRESS AS WELL.
3935  020460  030110                  2$:     BIT     R1,     (R0)    ;CHECK THE MAP FOR THIS BANK.
3936  020462  001014                          BNE     3$              ;BR IF THIS BANK PRESENT.
3937  020464  030260  000002                BIT     R2,     2(R0)   ;CHECK HI 64K MAP.
3938  020470  001011                          BNE     3$              ;BR IF THIS BANK PRESENT.
3939  020472  105703                          TSTB    R3              ;CHECK FOR PREVIOUS PRINTOUT.
3940  020474  001042                          BNE     5$              ;BR IF ALREADY TYPED "TO"
3941  020476  162703  000001                  SUB     #1,     R3      ;BACK UP TO LAST ADR OF PREVIOUS BANK.
3942  020502  005604                          SBC     R4              ;...HI ADDRESS BITS.
3943  020504  004567  003002                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
3944  020510  025517                          .WORD   TO              ;ADDRESS OF MESSAGE TO BE TYPED
3945  020512  000410                          BR      4$              ;GO TO TYPE THE ADDRESS.
3946  020514  105703                  3$:     TSTB    R3              ;CHECK FOR PREVIOUS TYPEOUT.
3947  020516  001431                          BEQ     5$              ;BR IF ALREADY TYPE "FROM".
3948  020520  062703  000001                  ADD     #1,     R3      ;POINT TO FIRST ADDRESS OF THIS BANK
3949  020524  005504                          ADC     R4              ;...HI BITS OF ADDRESS.
3950  020526  004567  002760                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
3951  020532  025507                          .WORD   FROM            ;ADDRESS OF MESSAGE TO BE TYPED
3952  020534                          4$:
3953  020534  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
3954  020536  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
3955  020540  006303                          ASL     R3              ;BIT 15 INTO C-BIT
3956  020542  006104                          ROL     R4              ;BIT 15 INTO R4.
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CZQMCF0   0-124K MEMORY EXERCISER, 16K VER      MACY11 30A(1052)  20-FEB-78  07:56  PAGE 82
CZQMCF.P11    14-FEB-78 08:19                   SUBROUTINES TO SET UP DATA FOR ERROR PRINTOUT ROUTINE                    SEQ 0164

  3957  020544  006003                                ROR     R3                      ;RESTORE BITS 14-0.
  3958  020546  010446                                MOV     R4,-(SP)                ;;SAVE R4 FOR TYPEOUT
  3959                                                                                ;;TYPE ADDRESS BITS 21-15
  3960                                          ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPOS ROUTINE
  3961                                          ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
  3962  020550  013746  177776                           MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
  3963  020554  004767  004104                           JSR     PC,     $TYPOS  ;GO TO THE SUBROUTINE
  3964  020560     003                                  .BYTE   3               ;;TYPE 3 DIGIT(S)
  3965  020561     000                                  .BYTE   0               ;;SUPPRESS LEADING ZEROS
  3966  020562  010346                                MOV     R3,-(SP)                ;;SAVE R3 FOR TYPEOUT
  3967                                                                                ;;TYPE ADDRESS BITS 14-0
  3968                                          ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPOS ROUTINE
  3969                                          ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
  3970  020564  013746  177776                           MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
  3971  020570  004767  004070                           JSR     PC,     $TYPOS  ;GO TO THE SUBROUTINE
  3972  020574     005                                  .BYTE   5               ;;TYPE 5 DIGIT(S)
  3973  020575     001                                  .BYTE   1               ;;TYPE LEADING ZEROS
  3974  020576  012604                                MOV     (SP)+,R4                ;;POP STACK INTO R4
  3975  020600  012603                                MOV     (SP)+,R3                ;;POP STACK INTO R3
  3976  020602  062703  020000           5$:          ADD     #20000, R3              ;UPDATE TO NEXT BANK.
  3977  020606  005504                                ADC     R4                      ;...HI ADDRESS BITS.
  3978  020610  006301                                ASL     R1                      ;SHIFT POINTER...LO 64K.
  3979  020612  006102                                ROL     R2                      ;...HI 64K.
  3980  020614  103321                                BCC     2$                      ;BR IF MORE BANKS.
  3981  020616  012604                                MOV     (SP)+,R4                ;;POP STACK INTO R4
  3982  020620  012603                                MOV     (SP)+,R3                ;;POP STACK INTO R3
  3983  020622  012602                                MOV     (SP)+,R2                ;;POP STACK INTO R2
  3984  020624  012601                                MOV     (SP)+,R1                ;;POP STACK INTO R1
  3985  020626  000207                     6$:        RTS     PC                      ;RETURN.
  3986
  3987                                          .SBTTL  SCOPE HANDLER ROUTINE
  3988
  3989                                          ;;**********************************************************************
  3990                                          ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
  3991                                          ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>
  3992                                          ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
  3993                                          ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
  3994                                          ;*SW14=1          LOOP ON TEST
  3995                                          ;*SW11=1          INHIBIT ITERATIONS
  3996                                          ;*SW09=1          LOOP ON ERROR
  3997                                          ;*SW08=1          LOOP ON TEST IN SWR<4:0>
  3998                                          ;*CALL
  3999                                          ;*        SCOPE             ;;SCOPE=IOT
  4000
  4001  020630                                  $SCOPE:
  4002                                          ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $CKSWR ROUTINE
  4003                                          ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
  4004  020630  013746  177776                           MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
  4005  020634  004767  001524                           JSR     PC,     $CKSWR  ;GO TO THE SUBROUTINE
  4006  020640  012504                                MOV     (R5)+,  R4              ;SAVE MINIMUM BLOCK MASK NEXT TEST.
  4007  020642  010516                                MOV     R5,     (SP)            ;PUT RETURN PC ONTO STACK, SIMULATE JSR PC.
  4008  020644  032777  040000  16[266  1$:          BIT     #BIT14,@SWR             ;;LOOP ON PRESENT TEST?
  4009  020652  001117                                BNE     $OVER                   ;;YES IF SW14=1
  4010                                          ;*****START OF CODE FOR THE XOR TESTER*****
  4011  020654  000416                     $XTSTR: BR      6$                      ;;IF RUNNING ON THE "XOR" TESTER CHANGE
  4012                                                                                ;;THIS INSTRUCTION TO A "NOP" (NOP=240
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 4013  020656  013746  000004                 MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
 4014  020662  012737  020702  000004         MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
 4015  020670  005737  177060                 TST     @#177060        ;;TIME OUT ON XOR?
 4016  020674  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
 4017  020700  000466                         BR      $SVLAD          ;;GO TO THE NEXT TEST
 4018  020702  022626                 5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
 4019  020704  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
 4020  020710  000426                         BR      7$              ;;LOOP ON THE PRESENT TEST
 4021  020712                         6$:;*****END OF CODE FOR THE XOR TESTER*****
 4022  020712  032777  000400  160220         BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
 4023  020720  001407                         BEQ     2$              ;;BR IF NO
 4024  020722  017746  160212                 MOV     @SWR,-(SP)      ;;SET DESIRED TEST NUM. FROM SWR
 4025  020726  042716  000340                 BIC     #$SWRMK,(SP)    ;;STRIP AWAY UNDESIRED BITS
 4026  020732  122667  160144                 CMPB    (SP)+,$TSTNM    ;;ON THE RIGHT TEST?
 4027  020736  001465                         BEQ     $OVER           ;;BR IF YES
 4028  020740  105767  160137         2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
 4029  020744  001421                         BEQ     3$              ;;BR IF NO
 4030  020746  126767  160143  160127         CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
 4031  020754  101015                         BHI     3$              ;;BR IF NO
 4032  020756  032777  001000  160154         BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
 4033  020764  001404                         BEQ     4$              ;;BR IF NO
 4034  020766  016767  160116  160112  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
 4035  020774  000446                         BR      $OVER
 4036  020776  105067  160101         4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
 4037  021002  005067  160162                 CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
 4038  021006  000415                         BR      1$              ;;ESCAPE TO THE NEXT TEST
 4039  021010  032777  004000  160122  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
 4040  021016  001011                         BNE     1$              ;;BR IF YES
 4041  021020  005767  160166                 TST     $PASS           ;;IF FIRST PASS OF PROGRAM
 4042  021024  001406                         BEQ     1$              ;;      INHIBIT ITERATIONS
 4043  021026  005267  160052                 INC     $ICNT           ;;INCREMENT ITERATION COUNT
 4044  021032  026767  160132  160044         CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
 4045  021040  002024                         BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
 4046  021042  012767  000001  160034  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
 4047  021050  016767  000552  160112         MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
 4048  021056  105267  160020         $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
 4049  021062  116767  160014  160120         MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
 4050  021070  011667  160012                 MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
 4051  021074  011667  160010                 MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
 4052  021100  005067  160066                 CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
 4053  021104  112767  000001  160003         MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
 4054  021112  016777  157764  160022  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
 4055  021120  016716  157762                 MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
 4056  021124  020516                 INSERT: CMP     R5,     (SP)    ;CHECK FOR LOOP ON TEST.
 4057  021126  001402                         BEQ     1$              ;BR IF START NEXT TEST.
 4058  021130  000167  000470                 JMP     ENDINS          ;JMP IF LOOP ON LAST TEST.
 4059  021134  012767  037777  160444  1$:     MOV     #37777, BLKMSK  ;SET 8K BOUNDRY MASK.
 4060  021142  005767  160044                 TST     $PASS           ;CHECK FOR PASS 0.
 4061  021146  001404                         BEQ     2$              ;BR IF PASS 0
 4062  021150  126727  157726  000021         CMPB    $TSTNM, #21     ;CHECK IF IN SECTION 3.
 4063  021156  103002                         BHIS    3$              ;BR IF IN SECTION 3.
 4064  021160  006267  160422         2$:     ASR     BLKMSK          ;RESET BOUNDRY TO 4K.
 4065  021164  016767  160372  160372  3$:     MOV     FSTADR, TMPFAD  ;GET FIRST ADDRESS.
 4066  021172  005767  157402                 TST     RELOCF          ;CHECK IF PRG RELOCATED.
 4067  021176  001430                         BEQ     4$              ;BR IF NOT RELOCATED.
 4068  021200  032777  000040  157732         BIT     #SW05,  @SWR    ;CHECK IF LOC 0-776 TO BE PROTECTED
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 4069  021206  001424                          BEQ     4$              ;BR IF SW NOT SET.
 4070  021210  026727  160350  001000          CMP     TMPFAD, #1000   ;CHECK IF NOT BEING TESTED.
 4071  021216  103020                          BHIS    4$              ;BR IF ALREADY PROTECTED.
 4072  021220  012767  001000  160336          MOV     #1000, TMPFAD   ;RESET FIRST ADDRESS.
 4073  021226  052767  000001  160334          BIS     #BIT0, FADMAP   ;SET FLAG IN FIRST BANK.
 4074  021234  026727  160334  001000          CMP     LSTADR, #1000   ;CHECK IF GONE PAST LAST ADR.
 4075  021242  101006                          BHI     4$              ;ER IF ENOUGH MEMORY.
 4076  021244  004567  002242                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4077  021250  026737                          .WORD   NOMTST          ;ADDRESS OF MESSAGE TO BE TYPED
 4078                                                                  ;"NO MEMORY TESTED"
 4079  021252  016716  160366                  MOV     .TST32, (SP)    ;ADJUST RETURN ADR FOR ABORT.
 4080  021256  000207                          RTS     PC              ;ABORT.
 4081  021260  016767  160310  160310  4$:     MOV     LSTADR, TMPLAD  ;GET LAST ADDRESS.
 4082  021266  016767  160242  160234          MOV     SAVTST, TSTMAP  ;GET TEST MAP, LO 64K.
 4083  021274  016767  160236  160230          MOV     SAVTST+2, TSTMAP+2 ;...HI 64K.
 4084  021302  046767  157274  160220          BIC     PRGMAP, TSTMAP  ;DON'T TEST OVER THE PROGRAM.
 4085  021310  046767  157270  160214          BIC     PRGMAP+2, TSTMAP+2
 4086  021316  005767  157670                  TST     $PASS           ;CHECK FOR FIRST PASS
 4087  021322  001011                          BNE     10$             ;BR IF NOT FIRST PASS.
 4088  021324  032767  000003  160176          BIT     #3,     TSTMAP  ;CHECK IF FIRST TWO BANKS AVAILABLE.
 4089  021332  001405                          BEQ     10$             ;NOT TESTING FIRST 2 BANKS.
 4090  021334  042767  177774  160166          BIC     #177774, TSTMAP ;CLR ALL BUT FIRST 2 BANKS.
 4091  021342  005067  160164                  CLR     TSTMAP+2
 4092  021346  005704                  10$:     TST     R4              ;CHECK FOR A MINIMUM BLOCK SIZE.
 4093  021350  001503                          BEQ     20$             ;BR IF NO MIN BLOCK SIZE.
 4094  021352  030467  160206                  BIT     R4,     TMPFAD  ;CHECK IF FIRST ADR ON BLOCK BOUNDRY.
 4095  021356  001416                          BEQ     11$             ;BR IF FIRST ADR ON BLOCK BOUNDRY.
 4096  021360  050467  160200                  BIS     R4,     TMPFAD  ;ADJUST FIRST ADR TO END OF BLOCK.
 4097  021364  005267  160174                  INC     TMPFAD          ;FIRST ADR TO FIRST ADR OF NEXT BLOCK.
 4098  021370  032767  017777  160166          BIT     #MASK4K, TMPFAD ;CHECK IF FIRST ADR REACHED 4K BOUNDRY.
 4099  021376  001006                          BNE     11$             ;BR IF NOT ON 4K BOUNDRY.
 4100  021400  046767  160164  160122          BIC     FADMAP, TSTMAP  ;DON'T TEST FIRST BANK.
 4101  021406  046767  160160  160116          BIC     FADMAP+2, TSTMAP+2
 4102  021414  030467  160156          11$:     BIT     R4,     TMPLAD  ;CHECK IF LAST ADR ON BLOCK BOUNDRY.
 4103  021420  001414                          BEQ     12$             ;BR IF ON BLOCK BOUNDRY.
 4104  021422  040467  160150                  BIC     R4,     TMPLAD  ;ADJUST LAST ADR DOWN TO NEXT BLOCK BOUNDRY.
 4105  021426  032767  017777  160142          BIT     #MASK4K, TMPLAD ;CHECK IF ADJUSTED TO 4K BOUNDRY.
 4106  021434  001006                          BNE     12$             ;BR IF NOT ON 4K BOUNDRY.
 4107  021436  046767  160140  160064          BIC     LADMAP, TSTMAP  ;SKIP TESTING LAST BANK.
 4108  021444  046767  160134  160060          BIC     LADMAP+2, TSTMAP+2
 4109  021452  036767  160112  160122  12$:     BIT     FADMAP, LADMAP  ;CHECK IF FIRST AND LAST IN SAME BANK.
 4110  021460  001004                          BNE     13$             ;BR IF IN SAME BANK.
 4111  021462  036767  160104  160114          BIT     FADMAP+2, LADMAP+2 ;...UPPER 64K.
 4112  021470  001404                          BEQ     14$             ;BR IF FIRST AND LAST NOT SAME BANK.
 4113  021472  026767  160100  160064  13$:     CMP     TMPLAD, TMPFAD  ;CHECK IF ANY MEMORY LEFT.
 4114  021500  101406                          BLOS    15$             ;BR IF NO MEMORY TO TEST.
 4115  021502  005767  160022          14$:     TST     TSTMAP          ;CHECK IF ANY BANKS LEFT TO TEST!!
 4116  021506  001017                          BNE     16$             ;BR IF TEST MAP NOT EMPTY.
 4117  021510  005767  160016                  TST     TSTMAP+2        ;CHECK FOR ANY BANKS.
 4118  021514  001014                          BNE     16$             ;BR IF TEST MAP NOT EMPTY.
 4119  021516                          15$:
 4120  021516  004567  001770                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4121  021522  026763                          .WORD   SKPMES          ;ADDRESS OF MESSAGE TO BE TYPED
 4122                                                                  ;"SKIPPING TEST #"
 4123  021524  005046                          CLR     -(SP)           ;CLEAR THE WORD ON THE STACK.
 4124  021526  116716  157350                  MOVB    $TSTNM, (SP)    ;PUT THE DATA ON THE STACK.
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                                        ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPOS ROUTINE
                                        ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
021532  013746  177776                          MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
021536  004767  003122                          JSR     PC,     $TYPOS  ;GO TO THE SUBROUTINE
021542     003                                  .BYTE   3               ;TYPE 3 DIGITS,
021543     001                                  .BYTE   1               ;TYPE LEADING ZEROS.
021544  000427                                  BR      ENDINS          ;RETURN TO SKIP TEST.
021546  062716  000004                  16$:    ADD     #4,     (SP)    ;SKIP THE SKIP ON RETURN.
021552  062767  000004  157326                  ADD     #4,     $LPADR  ;ADJUST THE LOOP ADR PAST THE SKIP.
021560  012767  017777  160000          20$:    MOV     #MASK4K,FADMSK  ;GET 4K MASK.
021566  016705  157772                          MOV     TMPFAD, R5      ;GET FIRST ADR.
021572  040567  157770                  21$:    BIC     R5,     FADMSK  ;CLR MASK ABOVE LOWEST BIT OF FIRST ADR.
021576  006305                                  ASL     R5              ;MOVE LOWEST BIT UP ONE.
021600  001374                                  BNE     21$             ;LOOP UNTIL OVERFLOW.
021602  012767  017777  157770                  MOV     #MASK4K,LADMSK  ;SET MASK BITS
021610  016705  157762                          MOV     TMPLAD, R5      ;GET LAST ADR.
021614  040567  157760                  22$:    BIC     R5,     LADMSK  ;CLR ALL MASK BITS ABOVE LOWEST BIT IN LAST ADR.
021620  006305                                  ASL     R5              ;MOVE LOWEST BIT OF LAST ADR UP ONE.
021622  001374                                  BNE     22$             ;LOOP UNTIL OVERFLOW.
021624  000207                          ENDINS: RTS     PC              ;EXIT SCOPE ROUTINE BACK TO TEST.
021626  000004                          $MXCNT: 4                       ;;MAX. NUMBER OF ITERATIONS
                                        ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $CKSWR ROUTINE
                                        ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
021630  013746  177776                          MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
021634  004767  000524                          JSR     PC,     $CKSWR  ;GO TO THE SUBROUTINE
                                        .SBTTL  ERROR HANDLER ROUTINE

                                        ;;*****************************************************************
                                        ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                        ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                        ;*AND GO TO $ERRTYP ON ERROR
                                        ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                        ;*SW15=1         HALT ON ERROR
                                        ;*SW13=1         INHIBIT ERROR TYPEOUTS
                                        ;*SW10=1         BELL ON ERROR
                                        ;*SW09=1         LOOP ON ERROR
                                        ;*CALL
                                        ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER

021640                                  $ERROR:
                                        ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $CKSWR ROUTINE
                                        ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
021640  013746  177776                          MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
021644  004767  000514                          JSR     PC,     $CKSWR  ;GO TO THE SUBROUTINE
021650  062716  000002                          ADD     #2,     (SP)    ;ADJUST POINTER PAST CODE WORD.
021654  105267  157223                  7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
021660  001775                                  BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
021662  016777  157214  157252                  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
021670  032777  002000  157242                  BIT     #BIT10,@SWR     ;;BELL ON ERROR?
021676  001403                                  BEQ     1$              ;;NO - SKIP
021700  004567  001606                          JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
021704  001174                                  .WORD   $BELL           ;ADDRESS OF MESSAGE TO BE TYPED
021706  005267  157200                  1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
021712  011667  157200                          MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
021716  162767  000002  157172                  SUB     #2,$ERRPC
021724  117767  157166  157162                  MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
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C2QMCF0   0-124K MEMORY EXERCISER, 16K VER      MACY11 30A(1052)  20-FEB-78  07:56  PAGE 86
C2QMCF.P11    14-FEB-78 08:19            ERROR HANDLER ROUTINE                                  SEQ 0169

 4181  021732  032777  020000  157200          BIT     #BIT13,@$SWR    ;;SKIP TYPEOUT IF SET
 4182  021740  001005                          BNE     20$             ;;SKIP TYPEOUTS
 4183  021742  004767  000116                  JSR     PC,$ERRTYP      ;;GO TO USER ERROR ROUTINE
 4184  021746  004567  001540                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4185  021752  001201                          .WORD   $CRLF           ;ADDRESS OF MESSAGE TO BE TYPED
 4186  021754                          20$:
 4187  021754  122767  000001  157242          CMPB    #AP ENV,$ENV    ;;RUNNING IN APT MODE
 4188  021762  001007                          BNE     2$              ;;NO,SKIP APT ERROR REPORT
 4189  021764  116767  157124  000004          MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
 4190  021772  004767  002044                  JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
 4191  021776     000                  21$:    .BYTE   0
 4192  021777     000                          .BYTE   0
 4193  022000  000777                  22$:    BR      22$             ;;APT ERROR LOOP
 4194  022002  005777  157132            2$:   TST     @$SWR           ;;HALT ON ERROR
 4195  022006  100005                          BPL     3$              ;;SKIP IF CONTINUE
 4196  022010  000000                          HALT                    ;;HALT ON ERROR!
 4197                                  ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $CKSWR ROUTINE
 4198                                  ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
 4199  022012  013746  177776                  MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
 4200  022016  004767  000342                  JSR     PC,     $CKSWR  ;GO TO THE SUBROUTINE
 4201  022022  032777  001000  157110    3$:   BIT     #BIT09,@$SWR    ;;LOOP ON ERROR SWITCH SET?
 4202  022030  001402                          BEQ     4$              ;;BR IF NO
 4203  022032  016716  157052                  MOV     $_PERR,(SP)     ;;FUDGE RETURN FOR LOOPING
 4204  022036  005767  157130            4$:   TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
 4205  022042  001402                          BEQ     5$              ;;BR IF NONE
 4206  022044  016716  157122                  MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
 4207  022050                            5$:
 4208  022050  022737  014222  000042          CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
 4209  022056  001001                          BNE     6$              ;;BRANCH IF NO
 4210  022060  000000                          HALT                    ;;YES
 4211  022062                            6$:
 4212  022062  000207                          RTS     PC
 4213                                  ;;**********************************************************************
 4214
 4215                                   SBTTL  ERROR MESSAGE TYPEOUT ROUTINE
 4216
 4217                                  ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
 4218                                  ;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE" ($ERRTB .
 4219                                  ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.
 4220
 4221  022064                          $ERRTYP:
 4222  022064  004567  001422                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4223  022070  001201                          .WORD   $CRLF           ;ADDRESS OF MESSAGE TO BE TYPED
 4224  022072  010046                          MOV     R0,-(SP)                ;SAVE R0
 4225  022074  005000                          CLR     R0                      ;PICKUP THE ITEM INDEX
 4226  022076  156700  157012                  BISB    $ITEMB,R0
 4227  022102  001007                          BNE     1$                      ;IF ITEM NUMBER IS ZERO, JUST
 4228                                                                          ;TYPE THE PC OF THE ERROR
 4229  022104  016746  157006                  MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
 4230                                                                  ;;ERROR ADDRESS
 4231                                  ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPOC ROUTINE
 4232                                  ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
 4233  022110  013746  177776                  MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
 4234  022114  004767  002570                  JSR     PC,     $TYPOC  ;GO TO THE SUBROUTINE
 4235  022120  000513                          BR      10$             ;GET OUT
 4236  022122  016767  156770  157364    1$:   MOV     $ERRPC, $VERPC  ;SET UP VIRTUAL PC FOR TYPEOUT.
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4237  022130  166767  56444  157356          SUB     RELOCF, $VERPC  ;MAKE VIRTUAL IF NOT ALREADY.
4238  022136  005300                          DEC     R0              ;ADJUST THE INDEX SO THAT IT WILL
4239  022140  006300                          ASL     R0              ;       WORK FOR THE ERROR TABLE
4240  022142  006300                          ASL     R0
4241  022144  006300                          ASL     R0
4242  022146  066[illegible]  157466          ADD     .ERRTB, R0      ;FORM TABLE POINTER
4243  022152  012[illegible]  000006          MOV     (R0)+,2$        ;PICKUP "ERROR MESSAGE" POINTER
4244  022156  001[illegible]                  BEQ     3$              ;SKIP TYPEOUT IF NO POINTER
4245  022160  004567  001326                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
4246  022164  000000                  2$:     .WORD   0               ;"ERROR MESSAGE" POINTER GOES HERE
4247  022166  004567  001320                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
4248  022172  001201                          .WORD   $CRLF           ;ADDRESS OF MESSAGE TO BE TYPED
4249  022174  012067  000006          3$:     MOV     (R0)+,4$        ;PICKUP "DATA HEADER" POINTER
4250  022200  001406                          BEQ     5$              ;SKIP TYPEOUT IF 0
4251  022202  004567  001304                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
4252  022206  000000                  4$:     .WORD   0               ;"DATA HEADER" POINTER GOES HERE
4253  022210  004567  001276                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
4254  022214  001201                          .WORD   $CRLF           ;ADDRESS OF MESSAGE TO BE TYPED
4255  022216  010146                  5$:     MOV     R1,-(SP)        ;SAVE R1
4256  022220  012001                          MOV     (R0)+,R1        ;PICKUP "DATA TABLE" POINTER
4257  022222  001451                          BEQ     9$              ;BR IF NO DATA TO BE TYPED
4258  022224  066701  156350                  ADD     RELOCF, R1      ;ADJUST POINTER
4259  022230  012000                          MOV     (R0)+,R0        ;PICKUP "DATA FORMAT" POINTER
4260  022232  066700  156342                  ADD     RELOCF, R0      ;ADJUST POINTER.
4261  022236  105720                  6$:     TSTB    (R0)+           ;CHECK THE FORMAT
4262  022240  001006                          BNE     7$              ;BR IF NOT 16-BIT OCTAL
4263  022242  013146                          MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
4264                                  ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPOC ROUTINE
4265                                  ;*  WITHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
4266  022244  013746  177776                  MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
4267  022250  004767  002434                  JSR     PC,     $TYPOC  ;GO TO THE SUBROUTINE
4268  022254  000426                          BR      8$
4269  022256  100406                  7$:     BMI     17$             ;BRANCH IF NOT DECIMAL
4270  022260  013146                          MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
4271                                  ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPDS ROUTINE
4272                                  ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
4273  022262  013746  177776                  MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
4274  022266  004767  002140                  JSR     PC,     $TYPDS  ;GO TO THE SUBROUTINE
4275  022272  000417                          BR      8$              ;SKIP
4276  022274  122760  177777  177777  17$:     CMPB    #-1,    -1(R0)  ;CHECK FOR 18-BIT ADDRESS FORMAT.
4277  022302  001004                          BNE     18$             ;BR IF NOT 18-BIT ADDRESS FORMAT.
4278  022304  013146                          MOV     @(R1)+, -(SP)   ;PUT THE DATA ON THE STACK.
4279  022306  004767  002640                  JSR     PC,     $TYPAD  ;DETERMINE THE PHYSICAL ADDRESS AND TYPE IT
4280  022312  000407                          BR      8$              ;SKIP
4281  022314                          18$:
4282  022314  005046                          CLR     -(SP)           ;CLEAR THE WORD ON THE STACK.
4283  022316  113116                          MOVB    @(R1)+, (SP)    ;PUT THE DATA ON THE STACK.
4284                                  ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPOS ROUTINE
4285                                  ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
4286  022320  013746  177776                  MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
4287  022324  004767  002334                  JSR     PC,     $TYPOS  ;GO TO THE SUBROUTINE
4288  022330     003                          .BYTE   3               ;TYPE 3 DIGITS.
4289  022331     001                          .BYTE   1               ;TYPE LEADING ZEROS.
4290  022332  005711                  8$:     TST     (R1             ;IS THERE ANOTHER NUMBER?
4291  022334  001404                          BEQ     9$              ;BR IF NO
4292  022336  004567  001150                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE
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022342  022362                    .ASCIZ  ...                    ;ADDRESS OF MESSAGE
022344  000734                    BR      6$                     ;LOOP

022346  012600            1$:     MOV     (SP)+,R0               ;RESTORE R0
022350  012600            5$:     MOV     (SP)+,R0               ;RESTORE R0
022352  004567  ...               JSR     R5,$PRINT              ;PRINT OUT THE ...
022356  00.20.                    .WORD   $.A..                  ;ADDRESS OF MESSAGE
022360  ......                    RTS     R                      ;RETURN
022362  ......            .$:     .ASCIZ                         ;THE CHARACTER
                                  .EVEN
                          .SBTTL  TTY INPUT ROUTINE

                          ;**********************************************************************
                          ENABL   LSB

                          ;**********************************************************************
                          ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                          ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
                          ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP ...
                          ;*WHEN OPERATING IN TTY FLAG MODE.
022364  022767  000.7.  .56...  $TKSWR: CMP   #SWREG,SWR         ;;IS THE SOFT-SWR SELECTED?
022372  001.3.                    BNE     15$                    ;;BRANCH IF NO
022374  105737  156544            TSTB    @$TKS                  ;;CHAR THERE?
022400  100101                    BPL     15$                    ;;IF NO, DON'T WAIT AROUND
022402  117746  156540            MOVB    @$TKB,-(SP)            ;;SAVE THE CHAR
022406  042716  177600            BIC     #C177,(SP)             ;;STRIP-OFF THE ASCII
022412  022726  00000.            CMP     #7,(SP)+               ;;IS IT A CONTROL G?
022416  001072                    BNE     15$                    ;;NO, RETURN TO USER
022420  12672.  15651.  000.. .   CMPB    $AUTOB,#.              ;;ARE WE RUNNING IN AUTO-MODE
022426  001466                    BEQ     15$                    ;;BRANCH IF YES

022430  004567  00..56            JSR     R5,$PRINT              ;GO PRINT OUT THE FOLLOWING MESSAGE
022434  023311                    .WORD   $CNTLG                 ;ADDRESS OF MESSAGE TO BE TYPED
022436                    $GTSWR:
022436  004567  001050            JSR     R5,$PRINT              ;GO PRINT OUT THE FOLLOWING MESSAGE
022442  023316                    .WORD   $MSWR                  ;ADDRESS OF MESSAGE TO BE TYPED
022444  016746  155526            MOV     SWREG,-(SP)            ;;SAVE SWREG FOR TYPEOUT
                          ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPOC ROUTINE
                          ;*  WITHOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
022450  013746  177776            MOV     @#PSW,-(SP)            ;PUT THE PROCESSOR STATUS ON THE STACK
022454  004767  002230            JSR     PC,$TYPOC              ;GO TO THE SUBROUTINE
022460  004567  001026            JSR     R5,$PRINT              ;GO PRINT OUT THE FOLLOWING MESSAGE
022464  023327                    .WORD   $MNEW                  ;ADDRESS OF MESSAGE TO BE TYPED
022466  005046            19$:    CLR     -(SP)                  ;;CLEAR COUNTER
022470  005046                    CLR     -(SP)                  ;;THE NEW SWR
022472  105777  156446    7$:     TSTB    @$TKS                  ;;CHAR THERE?
022476  100375                    BPL     7$                     ;;IF NOT TRY AGAIN

022500  117746  156442            MOVB    @$TKB,-(SP)            ;;PICK UP CHAR
022504  042716  177600            BIC     #C177,(SP)             ;;MAKE IT 7-BIT ASCII



022510  021627  000025    9$:     CMP     (SP),#25               ;;IS IT A CONTROL-U?
022514  001006                    BNE     10$                    ;;BRANCH IF NOT
022516  004567  0007.0            JSR     R5,$PRINT              ;GO PRINT OUT THE FOLLOWING MESSAGE.
```

```
 4349  022522  023304                          .WORD   $CNTLO          ;ADDRESS OF MESSAGE TO BE TYPED
 4350  022524  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
 4351  022530  000756                          BR      19$             ;;LET'S TRY IT AGAIN
 4352
 4353
 4354  022532  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
 4355  022536  001023                          BNE     16$             ;;BRANCH IF NO
 4356  022540  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
 4357  022544  001403                          BEQ     11$             ;;BRANCH IF YES
 4358  022546  016677  000000      364         MOV     2(SP),@SWR      ;;SAVE NEW SWR
 4359  022554  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
 4360  022560                          14$:
 4361  022560  004567  000026                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4362  022564  001201                          .WORD   $CRLF           ;ADDRESS OF MESSAGE TO BE TYPED
 4363  022566  126727  156343  000001          CMPB    @#177560,#1     ;;RE-ENABLE TTY KBD INTERRUPTS?
 4364  022574  001003                          BNE     15$             ;;BRANCH IF NOT
 4365  022576  012777  000100  156340          MOV     #100,@#177560   ;;RE-ENABLE TTY KBD INTERRUPTS
 4366  022604  000002                  15$:    RTI                     ;;RETURN
 4367  022606  004767  001142          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
 4368  022612  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
 4369  022616  002420                          BLT     18$             ;;BRANCH IF YES
 4370  022620  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
 4371  022624  003015                          BGT     18$             ;;BRANCH IF YES
 4372  022626  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
 4373  022632  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
 4374  022636  001403                          BEQ     17$             ;;BRANCH IF YES
 4375  022640  006316                          ASL     (SP             ;;NO, SHIFT PRESENT
 4376  022642  006316                          ASL     (SP)            ;;    CHAR OVER TO MAKE
 4377  022644  006316                          ASL     (SP)            ;;    ROOM FOR NEW ONE
 4378  022646  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
 4379  022652  056616  177776                  BIS     @2(SP),-(SP)    ;;SET IN NEW CHAR
 4380  022656  000705                          BR      7$              ;;GET THE NEXT ONE
 4381  022660                          18$:
 4382  022660  004567  000626                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4383  022664  001200                          .WORD   $QUES           ;ADDRESS OF MESSAGE TO BE TYPED
 4384  022666  000716                          BR      20$             ;;SIMULATE CONTROL-U
 4385                                  .DSABL  LSB
 4386
 4387
 4388                                  ;;*****************************************************************
 4389                                  ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
 4390                                  ;*CALL:
 4391                                  ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
 4392                                  ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
 4393                                  ;*                              ;;WITH PARITY BIT STRIPPED OFF
 4394                                  ;
 4395
 4396  022670  011646                  $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
 4397  022672  016666  000004  000002          MOV     4(SP),2(SP)     ;;SAVE THE PS
 4398  022700  105777  156240          1$:     TSTB    @#177560        ;;WAIT FOR
 4399  022704  100375                          BPL     1$              ;;A CHARACTER
 4400  022706  117766  156234  000004          MOVB    @#177562,4(SP   ;;READ THE TTY
 4401  022714  042766  177600  000004          BIC     #^C<177>,4(SP   ;;GET RID OF JUNK IF ANY
 4402  022722  026627  000004  000023          CMP     4(SP),#23       ;;IS IT A CONTROL-S?
 4403  022730  001013                          BNE     3$              ;;BRANCH IF NO
 4404  022732  105777  156206          2$:     TSTB    @#177560        ;;WAIT FOR A CHARACTER
```

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 4405  022736  100375                        BPL     2$              ;;LOOP UNTIL ITS THERE
 4406  022740  117746  156202                MOVB    @$TKB+6,-(SP)   ;;GET CHARACTER
 4407  022744  042716  177600                BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
 4408  022750  022627  000021                CMP     (SP)+,#21       ;;IS IT A CONTROL-Q
 4409  022754  001366                        BNE     2$              ;;IF NOT DISCARD IT
 4410  022756  000750                        BR      1$              ;;YES, RESUME
 4411  022760  026627  000004  000140  3$:   CMP     4(SP),#140      ;;IS IT UPPER CASE
 4412  022766  002407                        BLT     4$              ;;BRANCH IF YES
 4413  022770  026627  000004  000175        CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR
 4414  022776  003003                        BGT     4$              ;;BRANCH IF YES
 4415  023000  042766  000040  000004        BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
 4416  023006  000002              4$:       RTI                     ;;GO BACK TO USER
 4417                                ;;*****************************************************
 4418                                ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
 4419                                ;*CALL:
 4420                                ;*      RDLIN                   ;;INPUT A STRING FROM THE TT
 4421                                ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
 4422                                ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
 4423
 4424  023010  010346              $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
 4425  023012  005046                      CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
 4426  023014  012703  023274      1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
 4427  023020  022703  023304      2$:     CMP     #$TTYIN+80.,R3  ;;BUFFER FULL?
 4428  023024  101467                      BLOS    4$              ;;BR IF YES
 4429                                ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $RDCHR ROUTINE
 4430                                ;*  WITHOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **S;SMAC**.
 4431  023026  013746  177776              MOV     @#PSW,-(SP)     ;PUT THE PROCESSOR STATUS ON THE STACK
 4432  023032  004767  177632              JSR     PC,     $RDCHR  ;GO TO THE SUBROUTINE
 4433  023036  112613                      MOVB    (SP)+,(R3)      ;;GET CHARACTER
 4434  023040  122713  000177      10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
 4435  023044  001024                      BNE     5$              ;;BR IF NO
 4436  023046  005716                      TST     (SP)            ;;IS THIS THE FIRST RUBOUT
 4437  023050  001010                      BNE     6$              ;;BR IF NO
 4438  023052  112767  000134  000212      MOVB    #'\,9$          ;;TYPE A BACK SLASH
 4439  023060  004567  000426              JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE
 4440  023064  023272                      .WORD   9$              ;ADDRESS OF MESSAGE TO BE TYPED
 4441  023066  012716  177777              MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
 4442  023072  005303              6$:     DEC     R3              ;;BACKUP BY ONE
 4443  023074  020327  023274              CMP     R3,#$TTYIN      ;;STACK EMPTY?
 4444  023100  103441                      BLO     4$              ;;BR IF YES
 4445  023102  111367  000164              MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR
 4446  023106  004567  000400              JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4447  023112  023272                      .WORD   9$              ;ADDRESS OF MESSAGE TO BE TYPED
 4448  023114  000741                      BR      2$              ;;GO READ ANOTHER CHAR.
 4449  023116  005716              5$:     TST     (SP)            ;;RUBOUT KEY SET?
 4450  023120  001407                      BEQ     7$              ;;BR IF NO
 4451  023122  112767  000134  000142      MOVB    #'\,9$          ;;TYPE A BACK SLASH
 4452  023130  004567  000356              JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE
 4453  023134  023272                      .WORD   9$              ;ADDRESS OF MESSAGE TO BE TYPED
 4454  023136  005016                      CLR     (SP)            ;;CLEAR THE RUBOUT KEY
 4455  023140  122713  000025      7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
 4456  023144  001004                      BNE     8$              ;;BR IF NO
 4457  023146  004567  000340              JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4458  023152  023304                      .WORD   $CNTLU          ;ADDRESS OF MESSAGE TO BE TYPED
 4459  023154  000717                      BR      1$              ;;GO START OVER
 4460  023156  122713  000022      8$:     CMPB    #22,(R3)        ;;IS CHARACTER A "^R"?
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4461  023162  001014                        BNE     3$              ;;BRANCH IF NO
4462  023164  105013                        CLRB    (R3             ;;CLEAR THE CHARACTER
4463  023166  004567  000320                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
4464  023172  001201                        .WORD   $CRLF           ;ADDRESS OF MESSAGE TO BE TYPED
4465  023174  004567  000312                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
4466  023200  023274                        .WORD   $TTYIN          ;ADDRESS OF MESSAGE TO BE TYPED
4467  023202  000706                        BR      2$              ;;GO PICKUP ANOTHER CHACTER
4468  023204                          4$:
4469  023204  004567  000302                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
4470  023210  001200                        .WORD   $QUES           ;ADDRESS OF MESSAGE TO BE TYPED
4471  023212  000700                        BR      1$              ;;CLEAR THE BUFFER AND LOOP
4472  023214  111367  000052          3$:   MOVB    (R3),.9$        ;;ECHO THE CHARACTER
4473  023220  004567  000266                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
4474  023224  023272                        .WORD   9$              ;ADDRESS OF MESSAGE TO BE TYPED
4475  023226  122723  000015                CMPB    #15,(R3)+       ;;CHECK FOR RETURN
4476  023232  001272                        BNE     2$              ;;LOOP IF NOT RETURN
4477  023234  105063  177777                CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
4478  023240  004567  000246                JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
4479  023244  001202                        .WORD   $CR             ;ADDRESS OF MESSAGE TO BE TYPED
4480  023246  005726                        TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
4481  023250  012603                        MOV     (SP)+,R3        ;;RESTORE R3
4482  023252  011646                        MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
4483  023254  016666  000004  000002        MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
4484  023262  012766  023274  000004        MOV     #$TTYIN,4(SP)
4485  023270  000002                        RTI                     ;;RETURN
4486  023272     000                  9$:   .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
4487  023273     000                        .BYTE   0               ;;TERMINATOR
4488  023274  000010             $TTYIN:   .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
4489  023304  052536  005015       000  $CNTLU:  .ASCIZ  /^U/<15><12>    ;;CONTROL "U"
4490  023311     136  006507  000012  $CNTLG:  .ASCIZ  /^G/<15><12>    ;;CONTROL "G"
4491  023316  005015  053523  020122  $MSWR:   .ASCIZ  <15><12>/SWR = /
4492  023324  020075     000
4493  023327     040  047040  053505  $MNEW:   .ASCIZ  /  NEW = /
4494  023334  036440  000040
4495                                  .SBTTL  READ AN OCTAL NUMBER FROM THE TTY
4496
4497                                  ;;**********************************************************************
4498                                  ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
4499                                  ;*CHANGE IT TO BINARY.
4500                                  ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
4501                                  ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
4502                                  ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
4503                                  ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
4504                                  ;*CALL:
4505                                  ;*      RDOCT                   ;;READ AN OCTAL NUMBER
4506                                  ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
4507                                  ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT
4508
4509  023340  011646             $RDOCT:  MOV     (SP),-(SP)      ;PROVIDE SPACE FOR THE
4510  023342  016666  000004  000002       MOV     4(SP),2(SP)     ;;INPUT NUMBER
4511  023350  010046                       MOV     R0,-(SP)        ;;PUSH R0 ON STACK
4512  023352  010146                       MOV     R1,-(SP)        ;;PUSH R1 ON STACK
4513  023354  010246                       MOV     R2,-(SP)        ;;PUSH R2 ON STACK
4514  023356                          1$:
4515                                  ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $RDLIN ROUTINE
4516                                  ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
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                    D-1248 MEMORY EXERCISER, 16K .ER      MACY11 30A(1052)  20-FEB-78  07:56  PAGE 92
                    14-FEB-78 08:19               READ AN OCTAL NUMBER FROM THE TT:

 4517   023356  013746  177776                   MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
 4518   023362  004767  177422                   JSR     PC,     $POLIN  ;GO TO THE SUBROUTINE
 4519   023366  012600                           MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
 4520   023370  010067  000102                   MOV     R0,5$           ;;AND SAVE IT
 4521   023374  005001                           CLR     R1              ;;CLEAR DATA WORD
 4522   023376  005002                           CLR     R2
 4523   023400  112046                  2$:      MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
 4524   023402  001420                           BEQ     3$              ;;IF ZERO GET OUT
 4525   023404  122716  000060                   CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
 4526   023410  003026                           BGT     4$              ;;IS AN OCTAL DIGIT
 4527   023412  122716  000067                   CMPB    #'7,(SP)
 4528   023416  002423                           BLT     4$
 4529   023420  006301                           ASL     R1              ;;*2
 4530   023422  006102                           ROL     R2
 4531   023424  006301                           ASL     R1              ;;*4
 4532   023426  006102                           ROL     R2
 4533   023430  006301                           ASL     R1              ;;*8
 4534   023432  006102                           ROL     R2
 4535   023434  042716  177770                   BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
 4536   023440  062601                           ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
 4537   023442  000756                           BR      2$              ;;LOOP
 4538   023444  005726                  3$:      TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
 4539   023446  010166  000012                   MOV     R1,12(SP)       ;;SAVE THE RESULT
 4540   023452  010267  000032                   MOV     R2,$HIOCT
 4541   023456  012602                           MOV     (SP)+,R2        ;;POP STACK INTO R2
 4542   023460  012601                           MOV     (SP)+,R1        ;;POP STACK INTO R1
 4543   023462  012600                           MOV     (SP)+,R0        ;;POP STACK INTO R0
 4544   023464  000002                           RTI                     ;;RETURN
 4545   023466  005726                  4$:      TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
 4546   023470  105010                           CLRB    (R0)            ;;SET A TERMINATOR
 4547   023472  004567  000014                   JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4548   023476  000000                  5$:      .WORD   0
 4549   023500  004567  000006                   JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4550   023504  001200                           .WORD   $QUES           ;ADDRESS OF MESSAGE TO BE TYPED
 4551   023506  000723                           BR      1$              ;;TRY AGAIN
 4552   023510  000000                  $HIOCT:  .WORD   0               ;;HIGH ORDER BITS GO HERE
 4553
 4554                                    ;;*****************************************************************
 4555                                    ;* SUBROUTINE TO PASS RELOCATED MESSAGE ADDRESSES TO THE $TYPE ROUTINE.
 4556                                    ;*  CALL:       JSR     R5,     $PRINT
 4557                                    ;*              <MESSAGE VIRTUAL ADDRESS>
 4558                                    ;*****************************************************************
 4559   023512  012567  000016          $PRINT:  MOV     (R5)+,  1$      ;GET THE MESSAGE VIRTUAL ADDRESS.
 4560   023516  066767  155056  000010           ADD     RELOCF, 1$      ;MAKE IT PHYSICAL.
 4561                                    ;*  THE NEXT TWO INSTRUCTIONS PROVIDE AN INTERFACE TO THE $TYPE ROUTINE
 4562                                    ;*  WIHTOUT USING A "TRAP" INSTRUCTION AS CALLED FOR BY **SYSMAC**.
 4563   023524  013746  177776                   MOV     @#PSW,  -(SP)   ;PUT THE PROCESSOR STATUS ON THE STACK
 4564   023530  004767  000004                   JSR     PC,     $TYPE   ;GO TO THE SUBROUTINE
 4565   023534  000000                  1$:      .WORD   0               ;CONTAINS THE PHYSICAL MESSAGE ADDRESS.
 4566   023536  000205                           RTS     R5              ;RETURN.
 4567
 4568                                    .SBTTL  TYPE ROUTINE
 4569
 4570                                    ;*****************************************************************
 4571                                    ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
 4572                                    ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
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                                        ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                        ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                        ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                        ;*
                                        ;*CALL:
                                        ;*1) USING A TRAP INSTRUCTION
                                        ;*      TYPE    .MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                        ;*OR
                                        ;*      TYPE
                                        ;*      MESADR
                                        ;*

023540  105767  155413          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
023544  100002                          BPL     1$              ;;BR IF YES
023546  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
023550  000430                          BR      3$              ;;LEAVE
023552  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
023554  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
023560  122767  000001  155436          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
023566  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
023570  132767  000100  155427          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
023576  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
023600  010067  000004                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
023604  004767  000222                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
023610  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
023612  132767  000040  155405  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
023620  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
023622  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
023624  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
023626  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
023630  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
023632  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
023636  000002                          RTI                     ;;RETURN
023640  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
023644  001431                          BEQ     8$
023646  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF
023652  001007                          BNE     5$
023654  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
023656  004567  177630                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
023662  001201                          $CRLF
023664  105067  000130                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
023670  000754                          BR      2$              ;;GET NEXT CHARACTER
023672  004767  000056          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
023676  126726  155254          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
023702  001347                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
023704  016746  155244                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
023710  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
023714  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
023716  004767  000032                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
023722  105367  000072                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
023726  000770                          BR      7$              ;;LOOP

                                ;HORIZONTAL TAB PROCESSOR

023730  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
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 4629  023734  004767  000014            3$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
 4630  023740  132767  000007  000052            BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
 4631  023746  001372                            BNE     9$              ;;TAB STOP
 4632  023750  005726                            TST     (SP)+           ;;POP SPACE OFF STACK
 4633  023752  000723                            BR      2$              ;;GET NEXT CHARACTER
 4634  023754  105777  155170          $TYPEC:   TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
 4635  023760  100375                            BPL     $TYPEC
 4636  023762  116677  000002  155162            MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
 4637  023770  122766  000015  000002            CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
 4638  023776  001003                            BNE     1$              ;;BRANCH IF NO
 4639  024000  105067  000014                    CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
 4640  024004  000406                            BR      $TYPEX          ;;EXIT
 4641  024006  122766  000012  000002  1$:       CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
 4642  024014  001402                            BEQ     $TYPEX          ;;BRANCH IF YES
 4643  024016  105227                            INCB    (PC)+           ;;COUNT THE CHARACTER
 4644  024020  000000          $CHARCNT:.WORD    0                       ;;CHARACTER COUNT STORAGE
 4645  024022  000207          $TYPEX: RTS       PC
 4646
 4647                          .SBTTL  APT COMMUNICATIONS ROUTINE
 4648
 4649                          ;;**************************************************************************
 4650  024024  112767  000001  000376  $ATY1:   MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
 4651  024032  112767  000001  000366  $ATY3:   MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
 4652  024040  000403                            BR      $ATYC
 4653  024042  112767  000001  000360  $ATY4:   MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
 4654  024050                          $ATYC:
 4655  024050  010046                            MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 4656  024052  010146                            MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 4657  024054  105767  000346                    TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
 4658  024060  001450                            BEQ     5$              ;;IF NOT:  BR
 4659  024062  122767  000001  155134            CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
 4660  024070  001031                            BNE     3$              ;;IF NOT:  BR
 4661  024072  132767  000100  155125            BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
 4662  024100  001425                            BEQ     3$              ;;IF NOT:  BR
 4663  024102  017600  000004                    MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
 4664  024106  062766  000002  000004            ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
 4665  024114  005767  155064          1$:       TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION
 4666  024120  001375                            BNE     1$              ;;IF NOT:  WAIT
 4667  024122  010067  155072                    MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
 4668  024126  105720                  2$:       TSTB    (R0)+           ;;FIND END OF MESSAGE
 4669  024130  001376                            BNE     2$
 4670  024132  166700  155062                    SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
 4671  024136  006200                            ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
 4672  024140  010067  155056                    MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
 4673  024144  012767  000004  155032            MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
 4674  024152  000413                            BR      5$
 4675  024154  017667  000004  000016  3$:       MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
 4676  024162  062766  000002  000004            ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
 4677  024170  016746  153602                    MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
 4678  024174  004767  177340                    JSR     PC,$TYPE        ;;CALL TYPE MACRO
 4679  024200  000000                  4$:       .WORD   0
 4680  024202                          5$:
 4681  024202  105767  000221                    TSTB    $LFLG           ;;SHOULD LOG AN ERROR?
 4682  024206  001422                            BEQ     10$             ;;IF NOT:  BR
 4683  024210  017600  000004                    MOV     @4(SP),R0               ;;GET ERROR #
 4684  024214  062766  000002  000004            ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
```

```
 4685  024222  012701  001344            MOV     #$ASTAT,R1      ;;POINT TO TABLE STAR?
 4686  024226  005711                6$: TST     (R1)            ;;END OF TABLE?
 4687  024230  100404                    BMI     8$              ;;IF SO:  BR
 4688  024232  020021                    CMP     R0, R1 +        ;;PROPER ENTR?
 4689  024234  001406                    BEQ     9$              ;;IF SO:  BR
 4690  024236  005721                    TST     (R1)+           ;;MOVE PAST COUNTER WORD
 4691  024240  000772                    BR      6$              ;;KEEP LOOKING
 4692  024242  026701  155244        8$: CMP     $APTR,R1        ;;TABLE FULL?
 4693  024246  001402                    BEQ     10$             ;;IF SO:  BR -- NO MORE ROOM
 4694  024250  010021                    MOV     R0,(R1)+        ;;SET UP NEW ENTRY
 4695  024252  005211                9$: INC     (R1)            ;;BUMP ERROR COUNT
 4696  024254  105767  00015C       10$: TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
 4697  024260  001416                    BEQ     12$             ;;IF NOT:  BR
 4698  024262  005767  154736            TST     $ENV            ;;RUNNING UNDER APT?
 4699  024266  001413                    BEQ     12$             ;;IF NOT:  BR
 4700  024270  005767  154710       11$: TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
 4701  024274  001375                    BNE     11$             ;;IF NOT:  WAIT
 4702  024276  017667  000004  154702    MOV     @4(SP),$FATAL   ;;GET ERROR #
 4703  024304  062766  000002  000004    ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
 4704  024312  005267  154666            INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
 4705  024316  105067  000106       12$: CLRB    $FFLG           ;;CLEAR FATAL FLAG
 4706  024322  105067  000101            CLRB    $LFLG           ;;CLEAR LOG FLAG
 4707  024326  105067  000074            CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
 4708  024332  012601                    MOV     (SP)+,R1        ;;POP STACK INTO R1
 4709  024334  012600                    MOV     (SP)+,R0        ;;POP STACK INTO R0
 4710  024336  000207                    RTS     PC              ;;RETURN
 4711  024340                        $ATY6:
 4712  024340  010046                    MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 4713  024342  016700  155144            MOV     $APTR,R0
 4714  024346  162700  001344            SUB     #$ASTAT,R0      ;;GET SIZE OF STAT TABLE
 4715  024352  005767  154626        1$: TST     $MSGTY          ;;SEE IF DONE LAST COMMUNICATION
 4716  024356  001375                    BNE     1$              ;;IF NOT:  WAIT
 4717  024360  010067  154636            MOV     R0,$MSGLG       ;;SET MESSAGE LENGTH
 4718  024364  012767  001344  154626    MOV     #$ASTAT,$MSGAD  ;;SET MESSAGE ADDR.
 4719  024372  012767  000002  154604    MOV     #2,$MSGTY       ;;TELL APT TO TAKE STATS.
 4720  024400  012600                    MOV     (SP)+,R0        ;;POP STACK INTO R0
 4721  024402  000207                    RTS     PC              ;;RETURN
 4722  024404                        $ATY7:
 4723  024404  010046                    MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 4724  024406  012701  001344            MOV     #$ASTAT,R1      ;;GET START OF TABLE
 4725  024412  005721                1$: TST     (R1)+           ;;END OF TABLE?
 4726  024414  100402                    BMI     2$              ;;IF SO:  BR
 4727  024416  005021                    CLR     (R1)+           ;;CLEAR ERROR COUNT
 4728  024420  000774                    BR      1$              ;;KEEP CLEARING
 4729  024422                        2$:
 4730  024422  012600                    MOV     (SP)+,R0        ;;POP STACK INTO R0
 4731  024424  000207                    RTS     PC              ;;RETURN
 4732  024426     000            $MFLG: .BYTE   0               ;;MESSG. FLAG
 4733  024427     000            $LFLG: .BYTE   0               ;;LOG FLAG
 4734  024430     000            $FFLG: .BYTE   0               ;;FATAL FLAG
 4735          024432                    .EVEN
 4736          000200            APTSIZE=200
 4737          000001            APTENV=001
 4738          000100            APTSPOOL=100
 4739          000040            APTCSUP=040
 4740                            ;;**************************************************************
```

```
                                        .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

                                        ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
                                        ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
                                        ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
                                        ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
                                        ;*REPLACED WITH SPACES.
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
                                        ;*      TYPDS                   ;;GO TO THE ROUTINE

                                        $TYPDS:
                                                MOV     R0,-(SP)        ;;PUSH R0 ON STACK
                                                MOV     R1,-(SP)        ;;PUSH R1 ON STACK
                                                MOV     R2,-(SP)        ;;PUSH R2 ON STACK
                                                MOV     R3,-(SP)        ;;PUSH R3 ON STACK
                                                MOV     R5,-(SP)        ;;PUSH R5 ON STACK
                                                MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
                                                MOV     20(SP),R5       ;;GET THE INPUT NUMBER
                                                BPL     1$              ;;BR IF INPUT IS POS.
                                                NEG     R5              ;;MAKE THE BINARY NUMBER POS.
                                                MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
                                        1$:     MOV     RELOCF,R0       ;GET RELOCATION FACTOR.
                                                MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
                                                ADD     R0,     R3      ;ADD IN RELOCATION FACTOR.
                                                MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
                                        2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
                                                MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
                                        3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
                                                BLT     4$              ;;BR IF DONE
                                                INC     R2              ;;INCREASE THE BCD DIGIT BY 1
                                                BR      3$
                                        4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
                                                TST     R2              ;;CHECK IF BCD DIGIT=0
                                                BNE     5$              ;;FALL THROUGH IF 0
                                                TSTB    (SP)            ;;STILL DOING LEADING 0'S?
                                                BMI     7$              ;;BR IF YES
                                        5$:     ASLB    (SP)            ;;MSD?
                                                BCC     6$              ;;BR IF NO
                                                MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
                                        6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
                                        7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
                                                MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
                                                TST     (R0)+           ;;JUST INCREMENTING
                                                CMP     R0,     .EIGHT  ;CHECK THE TABLE INDEX
                                                BLO     2$              ;GO DO THE NEXT DIGIT
                                                BHI     8$              ;;GO TO EXIT
                                                MOV     R5,R2           ;;GET THE LSD
                                                BR      6$              ;;GO CHANGE TO ASCII
                                        8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
                                                BPL     9$              ;;BR IF NO
                                                MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
                                        9$:     CLRB    (R3)            ;;SET THE TERMINATOR
                                                MOV     (SP)+,R5        ;;POP STACK INTO R5
                                                MOV     (SP)+,R3        ;;POP STACK INTO R3
```

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                                        MOV     (SP)+,R2        ;;POP STACK INTO R2
                                        MOV     (SP)+,R1        ;;POP STACK INTO R1
                                        MOV     (SP)+,R0        ;;POP STACK INTO R0
                                        JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
                                        .WORD   $DBLK           ;ADDRESS OF MESSAGE TO BE TYPED
                                        MOV     2(SP),4(SP)     ;;ADJUST THE STACK
                                        MOV     (SP)+,(SP)
                                        RTI                     ;;RETURN TO USER
                                $DTBL:  10000.
                                        1000.
                                        100.
                                        10.
                                $DBLK:  .BLKW   4
                                .SBTTL  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

000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
000001  000213          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
000211                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
000406                  BR      $TYPON
000001  000173  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
000006  000167          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
000005  000156  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
                        MOV     R3,-(SP)        ;;SAVE R3
                        MOV     R4,-(SP)        ;;SAVE R4
                        MOV     R5,-(SP)        ;;SAVE R5
000147                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
                        NEG     R4
000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
000134                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
000127                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
                        CLR     R3              ;;CLEAR THE OUTPUT WORD
```

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 4853  024770  006105                    1$:     ROL     R5              ;;ROTATE MSB INTO "C"
 4854  024772  000404                            BR      3$              ;;GO DO MSB
 4855  024774  006105                    2$:     ROL     R5              ;;FORM THIS DIGIT
 4856  024776  006105                            ROL     R5
 4857  025000  006105                            ROL     R5
 4858  025002  010503                            MOV     R5,R3
 4859  025004  006103                    3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
 4860  025006  105367  000100                    DECB    $OMODE          ;;TYPE THIS DIGIT?
 4861  025012  100017                            BPL     7$              ;;BR IF NO
 4862  025014  042703  177770                    BIC     #177770,R3      ;;GET RID OF JUNK
 4863  025020  001002                            BNE     4$              ;;TEST FOR 0
 4864  025022  005704                            TST     R4              ;;SUPPRESS THIS 0?
 4865  025024  001403                            BEQ     5$              ;;BR IF YES
 4866  025026  005204                    4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
 4867  025030  052703  000060                    BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
 4868  025034  052703  000040            5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
 4869  025040  110367  000042                    MOVB    R3,8$           ;;SAVE FOR TYPING
 4870  025044  004567  176442                    JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4871  025050  025106                            .WORD   8$              ;ADDRESS OF MESSAGE TO BE TYPED
 4872  025052  105367  000032            7$:     DECB    $OCNT           ;;COUNT BY 1
 4873  025056  003346                            BGT     2$              ;;BR IF MORE TO DO
 4874  025060  002402                            BLT     6$              ;;BR IF DONE
 4875  025062  005204                            INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
 4876  025064  000743                            BR      2$              ;;GO DO THE LAST DIGIT
 4877  025066  012605                    6$:     MOV     (SP)+,R5        ;;RESTORE R5
 4878  025070  012604                            MOV     (SP)+,R4        ;;RESTORE R4
 4879  025072  012603                            MOV     (SP)+,R3        ;;RESTORE R3
 4880  025074  016666  000002  000004            MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
 4881  025102  012616                            MOV     (SP)+,(SP)
 4882  025104  000002                            RTI                     ;;RETURN
 4883  025106     000                    8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
 4884  025107     000                            .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
 4885  025110     000                    $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
 4886  025111     000                    $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
 4887  025112  000000                    $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
 4888                                    ;ERROR TRAP SERVICE ROUTINE
 4889  025114  005727                    ERRTRP: TST     (PC)+           ;CHECK IF PREV TRAP TO 4 REPORTED
 4890  025116  000000                    1$:     .WORD   0               ;CONTAINS ERROR REPORTED FLAG
 4891  025120  001010                            BNE     2$              ;BRANCH IF NOT REPORTED
 4892  025122  005267  177770                    INC     1$              ;SET DOUBLE TRAP FLAG.
 4893  025126  011667  154034                    MOV     (SP),   $TMP3   ;SAVE THE BAD PC FOR TYPOUT.
 4894  025132  004767  174502                    JSR     PC,     $ERROR  ;*** ERROR *** (GO TYPE A MESSAGE
 4895  025136  000031                            .WORD   31              ;ERROR TYPE CODE.
 4896  025140  000401                            BR      3$              ;SKIP HALT
 4897  025142  000000                    2$:     HALT                    ;ERROR! SECOND TRAP TO 4 OCCURRED
 4898                                                                    ;BEFORE FIRST WAS PRINTED
 4899  025144  005067  177746            3$:     CLR     1$
 4900  025150  000002                            RTI                     ;RETURN TO PROGRAM AND TRY TO RECOVER
 4901
 4902                                    .SBTTL  PHYSICAL ADDRESS TYPE ROUTINE
 4903                                    ;*  ROUTINE TO TYPE A PHYSICAL ADDRESS (18 BITS).
 4904  025152                            $TYPAD:
 4905  025152  010046                            MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 4906  025154  010146                            MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 4907  025156  010246                            MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 4908  025160  010346                            MOV     R3,-(SP)        ;;PUSH R3 ON STACK
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 4909  025162  016602  000012                  MOV     12(SP), R2      ;GET BASE ADDRESS
 4910  025166  005003                          CLR     R3              ;WORKING & INDEX REGISTER
 4911  025170  005767  153412                  TST     MMAVA           ;CHECK FOR MEM MGMT AVAILABLE
 4912  025174  001430                          BEQ     1$              ;BRANCH IF NO MEM MGMT
 4913  025176  032737  000001  177572          BIT     #1,     @#SR0   ;CHECK IF MEM MGMT ENABLED
 4914  025204  001424                          BEQ     1$              ;BRANCH IF MEM MGMT NOT ENABLED
 4915  025206  010201                          MOV     R2,     R1      ;COPY VIRTUAL ADR
 4916  025210  006101                          ROL     R1              ;SHUFFLE BITS 13,14,15 INTO 1,2,3
 4917  025212  006101                          ROL     R1
 4918  025214  006101                          ROL     R1
 4919  025216  006101                          ROL     R1
 4920  025220  006101                          ROL     R1
 4921  025222  042701  177761                  BIC     #177761, R1     ;CLR ALL EXCEPT BITS 1,2,3
 4922  025226  062701  172340                  ADD     #KIPAR0, R1     ;SET TO APPROPRIATE PAR
 4923  025232  011101                          MOV     (R1),   R1      ;GET CONTENTS OF PAR
 4924  025234  012700  000006                  MOV     #6,     R0      ;SET UP COUNTER
 4925  025240  006301                  4$:     ASL     R1              ;SHIFT PAR
 4926  025242  006103                          ROL     R3              ;SAVE OVERFLOW BITS
 4927  025244  077003                          SOB     R0,     4$      ;COUNT SIX SHIFTS
 4928  025246  042702  160000                  BIC     #160000, R2     ;SAVE BANK BITS
 4929  025252  060102                          ADD     R1,     R2      ;COMPUTE PHYSICAL ADDRESS
 4930  025254  005503                          ADC     R3              ;MAKE SURE CARRY ISN'T LOST!
 4931  025256  006302                  1$:     ASL     R2              ;FIRST DIGIT TO R3
 4932  025260  006103                          ROL     R3
 4933  025262  012700  000006                  MOV     #6,R0           ;DIGIT COUNT
 4934  025266  000404                          BR      3$              ;PRINT FIRST DIGIT
 4935  025270  006302                  2$:     ASL     R2
 4936  025272  006103                          ROL     R3
 4937  025274  005301                          DEC     R1
 4938  025276  001374                          BNE     2$
 4939  025300  012701  000003                  MOV     #3,R1           ;DIGIT SHIFT COUNT
 4940  025304  062703  000060                  ADD     #60,    R3      ;MAKE IT AN ASCII DIGIT
 4941  025310  110367  000036                  MOVB    R3,     8$      ;LOAD DIGIT INTO MESSAGE
 4942  025314  004567  176172                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4943  025320  025352                          .WORD   8$              ;ADDRESS OF MESSAGE TO BE TYPED
 4944  025322  005003                          CLR     R3              ;CLEAR INDEX
 4945  025324  005300                          DEC     R0              ;DEC DIGIT COUNT
 4946  025326  001360                          BNE     2$
 4947  025330  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
 4948  025332  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
 4949  025334  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 4950  025336  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
 4951  025340  012616                          MOV     (SP)+,  (SP)    ;ADJUST THE STACK TO CLEAR DATA
 4952  025342  004567  176144                  JSR     R5,     $PRINT  ;GO PRINT OUT THE FOLLOWING MESSAGE.
 4953  025346  027005                          .WORD   FILL2           ;ADDRESS OF MESSAGE TO BE TYPED
 4954  025350  000207                          RTS     PC              ;RETURN
 4955  025352     000                  8$:     .BYTE   0               ;ONE DIGIT MESSAGE BUFFER
 4956  025353     000                          .BYTE   0               ;MESSAGE TERMINATOR
 4957
 4958                                          .SBTTL  STANDARD PROGRAM MESSAGES
 4959                                  ;;*****************************************************************
 4960                                  ;VARIOUS MESSAGE PRINTOUTS USED THRUOUT
 4961                                  ;THE PROGRAM
 4962                                  ;;*****************************************************************
 4963  025354  005015  052113  030461  MMAMES: .ASCIZ  <15><12>'KT11 (MEMORY MANAGEMENT) AVAILABLE'
 4964  025362  024040  042515  047515
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 4965  025370  054522  046440  047101
 4966  025376  043501  046505  047105
 4967  025404  024524  040440  040526
 4968  025412  046111  041101  042514
 4969  025420     000
 4970  025421     015  046412  046505  MEMMES: .ASCIZ   15><12>'MEMORY MAP:'
 4971  025426  051117  020131  040515
 4972  025434  035120     000
 4973  025437     015  041012  052131  BYTMES: .ASCIZ  <15><12>'BYTE MEMORY MAP:'
 4974  025444  020105  042515  047515
 4975  025452  054522  046440  050101
 4976  025460  000072
 4977  025462  005015  040520  044522  MTMAP:  .ASCIZ  <15><12>'PARITY MEMORY MAP:'
 4978  025470  054524  046440  046505
 4979  025476  051117  020131  040515
 4980  025504  035120     000
 4981  025507     015  043012  047522  FROM:   .ASCIZ  <15><12>'FROM '
 4982  025514  020115     000
 4983  025517     040  047524  000040  TO:     .ASCIZ  ' TO '
 4984  025524  005015  047111  052523  INSUFF: .ASCIZ  <15><12>'INSUFFICIENT MEMORY...FIRST 16K NOT ALL THERE!'
 4985  025532  043106  041511  042511
 4986  025540  052116  046440  046505
 4987  025546  051117  027131  027056
 4988  025554  044506  051522  020124
 4989  025562  033061  020113  047516
 4990  025570  020124  046101  020114
 4991  025576  044124  051105  020505
 4992  025604     000
 4993  025605     015  047012  020117  MTR:    .ASCIZ  <15><12>'NO PARITY REGISTERS FOUND'
 4994  025612  040520  044522  054524
 4995  025620  051040  043505  051511
 4996  025626  042524  051523  043040
 4997  025634  052117  042116     000
 4998  025641     015  051012  051505  PWRMSG: .ASCIZ  <15><12>'RESTARTING AFTER A POWER FAILURE'<15><12>
 4999  025646  040524  052122  047111
 5000  025654  020107  043101  042524
 5001  025662  020122  020101  047520
 5002  025670  042527  020122  040506
 5003  025676  046111  051125  006505
 5004  025704  000012
 5005  025706  005015  047516  050040  NOPES:  .ASCIZ  <15><12>'NO PARITY ERRORS FOUND ON MEMORY SCAN'<15><12>
 5006  025714  051101  052111  020131
 5007  025722  051105  047522  051522
 5008  025730  043040  052517  042116
 5009  025736  047440  020116  042515
 5010  025744  047515  054522  051440
 5011  025752  040503  006516  000012
 5012  025760  005015  051120  043517  PROREL: .ASCII  <15><12> PROGRAM NOW RESIDES BACK AT 0 TO 8K'
 5013  025766  040522  020115  047516
 5014  025774  020127  042522  044523
 5015  026002  042504  020123  040502
 5016  026010  045503  040440  020124
 5017  026016  020060  047524  034040
 5018  026024     113
 5019  026025     015  044012  052111          .ASCIZ  <15><12>'HIT CONTINUE FOR NORMAL RUNNING'<15><12
 5020  026032  041440  047117  044524
```

```
5021   026040   0525,6   020,05   047516
5022   026046   020,22   047,6    046440
5023   026054   046,01   051040   047,,,
5024   026062   0445,6   0435,6   0050,5
5025   026070      000
5026   026071      015   051,,,   043505   MES:    .ASCII  <15><12>'REGISTER AT '
5027   026076   051511   042524   020132
5028   026104   052101   000040
5029   026110   041440   047111   05,,2,   MES:    .ASCII  ' CONTROLS '
5030   026116   046117   020123      000
5031   026123      015   041412   05,,,,   MES:    .ASCII  <15><12>'CORE PARITY '
5032   026130   020105   040520   044522
5033   026136   054524   000040
5034   026142   005015   047,5,5  020,23   MES:    .ASCII  <15><12>'MOS PARITY '
5035   026150   040520   044522   054524
5036   026156   000040
5037   026160   005015   051515   03046,   MES:    .ASCII  <15><12>'MS11-K CSR '
5038   026166   045455   041440   05,,23
5039   026174   000040
5040   026176   051515   030461   045455   MES:    .ASCII  <15><12>'MS11-K MEMORY PRESENT!! TO COMPLETELY TEST RUN DZMPL...'
5041   026204   046440   046505   051,,,
5042   026212   020131   051120   051505
5043   026220   047105   020524   020041
5044   026226   047524   041440   04651,
5045   026234   046120   052105   046105
5046   026242   020131   042524   052123
5047   026250   051040   047125   042040
5048   026256   046532   046115   027056
5049   026264   000056
5050   026266   005015   047515   046440   NOMEM:  .ASCIZ  <15><12>'NO MEMORY FOUND.'
5051   026274   046505   051117   020131
5052   026302   047506   047125   027104
5053   026310      000
5054   026311      015   005012   044412   FADMES: .ASCII  <15><12><12><12>'INPUT ALL PARAMETERS IN OCTAL.'
5055   026316   050116   052125   040440
5056   026324   046114   050040   051101
5057   026332   046501   052105   051105
5058   026340   020123   047111   047440
5059   026346   052103   046101      056
5060   026353      015   043012   051111           .ASCIZ  <15><12>'FIRST ADDRESS:  '
5061   026360   052123   040440   042104
5062   026366   042522   051523   020072
5063   026374   000040
5064   026376   005015   040514   052123   LADMES: .ASCIZ  <15><12>'LAST ADDRESS:  '
5065   026404   040440   042104   042522
5066   026412   051523   020072   020040
5067   026420      000
5068   026421      015   037412   042101   BADADR: .ASCIZ  <15><12>'?ADDRESS IN UNMAPPED BANK?'
5069   026426   051104   051505   020123
5070   026434   047111   052440   046516
5071   026442   050101   042520   020104
5072   026450   040502   045516   000077
5073   026456   005015   042523   042514   CONST:  .ASCIZ  <15><12>'SELECT CONSTANT:'
5074   026464   052103   041440   047117
5075   026472   052123   047101   035124
5076   026500      000
```

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5077  026501  000015  052412  042516  UNEXPT: .ASCIZ  <15><12>'UNEXPECTED MEMORY PARITY ERROR'
5078  026506  050130  041505  042524
5079  026514  020104  042515  047515
5080  026522  054522  050040  051101
5081  026530  052111  020131  051105
5082  026536  047522  000122
5083  026542  005015  051120  043517  PRELOC: .ASCIZ   15 <12>'PROGRAM RELOCATED TO '
5084  026550  040522  020115  042522
5085  026556  047514  040503  042524
5086  026564  020104  047524  000040
5087  026572  005015  047515  042522  MTOE:   .ASCIZ  <15 <12>'MORE THAN ONE PARITY ERROR FOUND.'
5088  026600  052040  040510  020116
5089  026606  047117  020105  040520
5090  026614  044522  054524  042440
5091  026622  051122  051117  043040
5092  026630  052517  042116  000056
5093  026636  005015  041523  047101  SCANM:  .ASCIZ  <15><12>'SCANNING MEMORY FOR BAD PARITY.'
5094  026644  044516  043516  046440
5095  026652  046505  051117  020131
5096  026660  047506  020122  040502
5097  026666  020104  040520  044522
5098  026674  054524  000056
5099  026700  005015  040520  044522  PEWNC:  .ASCIZ  <15><12>'PARITY ERROR WILL NOT CLEAR.'
5100  026706  054524  042440  051122
5101  026714  051117  053440  046111
5102  026722  020114  047516  020124
5103  026730  046103  040505  027122
5104  026736  000
5105  026737  000015  047012  020117  NOMTST: .ASCIZ  <15><12>'NO MEMORY TESTED.'
5106  026744  042515  047515  054522
5107  026752  052040  051505  042524
5108  026760  027104  000
5109  026763  000015  051412  044513  SKPMES: .ASCIZ  <15><12>'SKIPPING TEST #'
5110  026770  050120  047111  020107
5111  026776  042524  052123  021440
5112  027004  000
5113  027005  000377  000377          FILL2:  .ASCIZ  <377><377>
5114
5115                                  .SBTTL  ERROR REPORTING MESSAGES AND TABLES.
5116                                  ;;*****************************************************
5117                                  ;* MESSAGE BLOCK FOR ERROR TABLE TYPEOUTS
5118                                  ;;*****************************************************
5119  027010  040520  044522  054524  DM1:     .ASCIZ  'PARITY REGISTER DATA ERROR.'
5120  027016  051040  043505  051511
5121  027024  042524  020122  040504
5122  027032  040524  042440  051122
5123  027040  051117  000056
5124  027044  042101  051104  051505  DM2:     .ASCIZ  'ADDRESS TEST ERROR(TST1-5).'
5125  027052  020123  042524  052123
5126  027060  042440  051122  051117
5127  027066  052050  052123  026461
5128  027074  024465  000056
5129  027100  047503  051516  040524  DM4:     .ASCIZ  'CONSTANT DATA ERROR.TST6-10 .'
5130  027106  052116  042040  052101
5131  027114  020101  051105  047522
5132  027122  024122  051524  033124
```

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 5133  027130  030455  024460  000056
 5134  027136  047522  040524  044524  DM5:    .ASCIZ  'ROTATING BIT ERROR TST11-12 .'
 5135  027144  043516  041040  052111
 5136  027152  042440  051122  051117
 5137  027160  052050  052123  030461
 5138  027166  030455  024460  000056
 5139  027174  047515  020123  042522  DM6:    .ASCIZ  'MOS REFRESH TEST ERROR (TST 30-31 .'
 5140  027202  051106  051505  020110
 5141  027210  042524  052123  042440
 5142  027216  051122  051117  024040
 5143  027224  051524  020124  030063
 5144  027232  031455  024461  000056
 5145  027240  020063  047530  020122  DM7:    .ASCIZ  '3 >OR 9 PATTERN ERROR(TST13-16 .'
 5146  027246  020071  040520  052124
 5147  027254  051105  020116  051105
 5148  027262  047522  024122  051524
 5149  027270  030524  026463  03306.
 5150  027276  027051     000
 5151  027301     115  051101  044103  DM10:   .ASCIZ  "MARCHING 1'S AND 0'S ERROR(TST 2? ."
 5152  027306  047111  020107  023461
 5153  027314  020123  047101  020104
 5154  027322  023460  020123  051105
 5155  027330  047522  024122  051524
 5156  027336  020124  033462  027051
 5157  027344     000
 5158  027345     120  051101  052111  DM11:   .ASCIZ  'PARITY MEMORY ADDRESS ERROR(TST1?).'
 5159  027352  020131  042515  047515
 5160  027360  054522  040440  042104
 5161  027366  042522  051523  042440
 5162  027374  051122  051117  052050
 5163  027402  052123  033461  027051
 5164  027410     000
 5165  027411     104  052101  050111  DM12:   .ASCIZ  "DATIP WITH WRONG PARITY DIDN'T TRAP (TST1? ."
 5166  027416  053440  052111  020110
 5167  027424  051127  047117  020107
 5168  027432  040520  044522  054524
 5169  027440  042040  042111  023516
 5170  027446  020124  051124  050101
 5171  027454  052050  052123  033461
 5172  027462  027051     000
 5173  027465     127  047522  043516  DM13:   .ASCIZ  'WRONG PARITY TRAPPED, BUT NO REGISTER SHOWS ERROR FLAG.'
 5174  027472  050040  051101  052111
 5175  027500  020131  051124  050101
 5176  027506  042520  026104  041040
 5177  027514  052125  047040  020117
 5178  027522  042522  044507  052123
 5179  027530  051105  051440  047510
 5180  027536  051527  042440  05.122
 5181  027544  051117  043040  040514
 5182  027552  027107     000
 5183  027555     120  051101  052111  DM14:   .ASCIZ  'PARITY REGISTER NOT MAPPED AS CONTROLLING THIS ADDRESS TST1? .'
 5184  027562  020131  042522  044507
 5185  027570  052123  051105  047040
 5186  027576  052117  046440  050101
 5187  027604  042520  020104  051501
 5188  027612  041440  047117  051124
```

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 5189  027620  046117  044514  043516
 5190  027626  052040  044510  020123
 5191  027634  042101  051104  051505
 5192  027642  024123  051524  030524
 5193  027650  024467  000056
 5194  027654  047515  042522  052040  DM1B:   .ASCIZ  'MORE THAN ONE REGISTER INDICATED PARITY ERROR.'
 5195  027662  040510  020116  047111
 5196  027670  020105  042522  044507
 5197  027676  052123  051105  044440
 5198  027704  042116  041511  052101
 5199  027712  042105  050040  051101
 5200  027720  052111  020131  051105
 5201  027726  047522  027122     000  DM1C:   .ASCIZ  "DATA SHOULDN'T HAVE CHANGED WHEN PARITY ERROR TRAPPED TST2"
 5202  027733     104  052101  020101
 5203  027740  044123  052517  042114
 5204  027746  023516  020124  040510
 5205  027754  042526  041440  040510
 5206  027762  043516  042105  053440
 5207  027770  042510  020116  040520
 5208  027776  044522  054524  042440
 5209  030004  051122  051117  052040
 5210  030012  040522  050120  042105
 5211  030020  052050  052123  033461
 5212  030026  027051     000
 5213  030031     122  047101  047504  DM20:   .ASCIZ  'RANDOM DATA ERROR, TST20..'
 5214  030036  020115  040504  040524
 5215  030044  042440  051122  051117
 5216  030052  052050  052123  030062
 5217  030060  027051     000
 5218  030063     111  051516  051124  DM21:   .ASCIZ  'INSTRUCTION EXECUTION ERROR TST21-24..'
 5219  030070  041525  044524  047117
 5220  030076  042440  042530  052503
 5221  030104  044524  047117  042440
 5222  030112  051122  051117  052050
 5223  030120  052123  030462  031055
 5224  030126  024466  000056
 5225  030132  051120  043517  040522  DM23:   .ASCIZ  'PROGRAM CODE CHANGED WHEN RELOCATED.'
 5226  030140  020115  047503  042504
 5227  030146  041440  040510  043516
 5228  030154  042105  053440  042510
 5229  030162  020116  042522  047514
 5230  030170  040503  042524  027104
 5231  030176     000
 5232  030177     124  040522  050120  DM24:   .ASCIZ  'TRAPPED, BUT NO REGISTER HAD ERROR BIT SET.'
 5233  030204  042105  020054  052502
 5234  030212  020124  047516  051040
 5235  030220  043505  051511  042524
 5236  030226  020122  040510  020104
 5237  030234  051105  047522  020122
 5238  030242  044502  020124  042523
 5239  030250  027124     000
 5240  030253     124  040522  050120  DM25:   .ASCIZ  'TRAPPED TO 114.'
 5241  030260  042105  052040  020111
 5242  030266  030461  027064     000
 5243  030273     106  044501  042514  DM26:   .ASCIZ  'FAILED TO TRAP.'
 5244  030300  020124  047524  052040
```

F15


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 5245  030306  040522  027120     000
 5246  030313     050  041501  044524  DM2*:   .ASCIZ  * ACTION ENAB.E WASN'* SET .*
 5247  030320  047117  042440  040516
 5248  030326  046102  020105  040527
 5249  030334  047123  052047  051440
 5250  030342  052105  027051     000
 5251  030347     015  052012  040522  DM31:   .ASCIZ   15  12 'TRAPPED TO 4 '
 5252  030354  050120  042105  052040
 5253  030362  020117  020064     000
 5254
 5255                                  ;;*****************************************************************
 5256                                  ;DATA COLUMN HEADINGS
 5257                                  ;;*****************************************************************
 5258
 5259  030367     120  004503  042522  DH1:    .ASCIZ  'PC     REG     S B     WAS'
 5260  030374  004507  027523  004502
 5261  030402  040527  000123
 5262  030406  027526  041520  050011  DH2:    .ASCIZ  'V PC   P PC    MA      S B     WAS'
 5263  030414  050057  004503  040515
 5264  030422  051411  041057  053411
 5265  030430  051501     000
 5266  030433     126  050057  004503  DH12:   .ASCIZ  'V PC   P PC    MA      S B'
 5267  030440  027520  041520  046411
 5268  030446  004501  027523  000102
 5269  030454  027526  041520  050011  DH14:   .ASCIZ  'V PC   P PC    REG     MA'
 5270  030462  050057  004503  042522
 5271  030470  004507  040515     000
 5272  030475     126  050057  004503  DH15:   .ASCIZ  'V PC   P PC    MAJ'    REG     S B     WAS'
 5273  030502  027520  041520  046411
 5274  030510  052501  004524  042522
 5275  030516  004507  027523  004502
 5276  030524  040527  000123
 5277  030530  027526  041520  050011  DH21:   .ASCIZ  'V PC   P PC    IOT     MA      S B     WAS'
 5278  030536  050057  004503  052511
 5279  030544  004524  040515  051411
 5280  030552  041057  053411  051501
 5281  030560     000
 5282  030561     126  050057  004503  DH23:   .ASCIZ  'V PC   P PC    SRC MA  DST MA  S B     WAS'
 5283  030566  027520  041520  051411
 5284  030574  041522  046440  004501
 5285  030602  051504  020124  040515
 5286  030610  051411  041057  053411
 5287  030616  051501     000
 5288  030621     126  050057  004503  DH24:   .ASCIZ  'V PC   P PC    TRP PC'
 5289  030626  027520  041520  052011
 5290  030634  050122  050057  000103
 5291  030642  027526  041520  050011  DH25:   .ASCIZ  'V PC   P PC    TRP PC  REG     WAS'
 5292  030650  050057  004503  051124
 5293  030656  027520  041520  051011
 5294  030664  043505  053411  051501
 5295  030672     000
 5296  030673     126  050057  004503  DH26:   .ASCIZ  'V PC   P PC    REG     WAS'
 5297  030700  027520  041520  051011
 5298  030706  043505  053411  051501
 5299  030714     000
 5300  030715     122  043505  053411  DH30:   .ASCIZ  'REG    WAS     MA      WAS'
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DZQMCF0   0-12A+ MEMORY EXERCISER, 16+ VER      MACY11 30A(1052)  20-FEB-78  07:56  PAGE 106
DZQMCF.P11    14-FEB-78 09:19          ERROR REPORTING MESSAGES AND TABLES.                    SEQ 0199

  5301   030722  051501  046411  004501
  5302   030730  040527  000123
  5303
  5304                                   ;;*****************************************************************
  5305                                   ;* DATA FORMAT TABLE FOR ERROR PRINTOUT.
  5306                                   ;;*****************************************************************
  5307   030734      000     377     000  DF1:    .BYTE   0,-1,0,0
  5308   030737      000
  5309   030740      000     377     377  DF2:    .BYTE   0,-1,-1,0,0
  5310   030743      000     000
  5311   030745      000     377     377  DF3:    .BYTE   0,-1,-1,-2,-2
  5312   030750      376     376
  5313   030752      000     377     377  DF14:   .BYTE   0,-1,-1,-1,0,0
  5314   030755      377     000     000
  5315   030760      000     377     000  DF21:   .BYTE   0,-1,0,-1,0,0
  5316   030763      377     000     000
  5317   030766      377     000     377  DF30:   .BYTE   -1,0,-1,-2
  5318   030771      376
  5319                                           .EVEN
  5320
  5321           032110                  . = 32110                       ;THE LOADERS ARE SAVE HERE TO END OF B+
  5322
  5323           000001                          .END
```

```
ABASE = 000000            384      425
ACDW1 = 000000            384      427
ACDW2 = 000000            384      428
ACPUOP= 000000            384      399
ADDW0 = 000000            384      429
ADDW1 = 000000            384      430
ADDW10= 000000            384      439
ADDW11= 000000            384      440
ADDW12= 000000            384      441
ADDW13= 000000            384      442
ADDW14= 000000            384      443
ADDW15= 000000            384      444
ADDW2 = 000000            384      431
ADDW3 = 000000            384      432
ADDW4 = 000000            384      433
ADDW5 = 000000            384      434
ADDW6 = 000000            384      435
ADDW7 = 000000            384      436
ADDW8 = 000000            384      437
ADDW9 = 000000            384      438
ADEVCT= 000000            384      390
ADEVM = 000000            384      426
AE    = 000001            179#    2433     2513     3750
AENV  = 000000            384      395
AENVM = 000000            384      396
AFATAL= 000000            384      387
AMADR1= 000000            384      412
AMADR2= 000000            384      416
AMADR3= 000000            384      419
AMADR4= 000000            384      422
AMAMS1= 000000            384      406
AMAMS2= 000000            384      414
AMAMS3= 000000            384      417
AMAMS4= 000000            384      420
AMSGAD= 000000            384      392
AMSGLG= 000000            384      393
AMSGTY= 000000            384      386
AMTYP1= 000000            384      407
AMTYP2= 000000            384      415
AMTYP3= 000000            384      418
AMTYP4= 000000            384      421
APASS = 000000            384      389
APRIOR= 000000            384
APTCSU= 000040           4598     4739#
APTENV= 000001           4187     4591     4659     4737#
APTSIZ= 000200            876     4736#
APTSPO= 000100           4593     4661     4738#
ASWREG= 000000            384      397
ATESTN= 000000            384      388
AUNIT = 000000            384      391
AUSWR = 000000            384      398
AVECT1= 000000            384      423
AVECT2= 000000            384      424
BADADR  026421           1446     5068#
BAUNO   016130           1632     1641     1667     1677     3397#
BITBIT  001644            522#    1134#    1135#    1171     1172     1173     1174     1182#    1183#    1192     1194     1197     1200#
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                        2409    2411    2467    2469    3148*   3149*   3156    3158    3161*   3162*   3165    3167    3172
                        3173    3192    3195*   3198    3199    3213    3214    3215    3217    3226*   3227*   3231*   3236
                        3238    3259*   3260*   3262    3264    3266    3268    3272    3273    3303*   3305    3307    3312
                        3317    3319    3324    3325    3340    3342    3350*   3351*   3353    3355    3360*   3362    3364
                        3366    3400    3401
BIT0    = 000001         123*    235     251    1039    1213    1369    1380    1470    1491    2456    2485    2501    3142
                        3767    3800    3931    4073
BIT00   = 000001         113*    123
BIT01   = 000002         112*    122
BIT02   = 000004         111*    121
BIT03   = 000010         110*    120
BIT04   = 000020         109*    119
BIT05   = 000040         108*    118
BIT06   = 000100         107*    117
BIT07   = 000200         106*    116
BIT08   = 000400         105*    115    4022
BIT09   = 001000         104*    114    4032    4201
BIT1    = 000002         122*
BIT10   = 002000         103*   4173
BIT11   = 004000         102*   4C39
BIT12   = 010000         101*
BIT13   = 020000         100*   3174    3201    3274    3311    4181
BIT14   = 040000          99*    217    4008
BIT15   = 100000          98*   2485    3226    3527
BIT2    = 000004         121*
BIT3    = 000010         120*
BIT4    = 000020         119*
BIT5    = 000040         118*
BIT6    = 000100         117*
BIT7    = 000200         116*
BIT8    = 000400         115*   3231    3560
BIT9    = 001000         114*
BLKMSK  001606           547*   3151    3222    3254    4059*   4064*
BPTVEC= 000014           130*
BYTMES  025437          1033    4973*
CASFLG  001616           551*    937*    940*   1483
CASREG  001620           552*   1485*
CKPMER  017636          1755    2417    3331    3759*
CLRPAR  020270          1133    1208    3804    3875*
CONST   026456          1458    5073*
CR      = 000015           38*   4637    4647
CRLF    = 000200           39*    706    4608    4647
CTRLS   005072          1273    1783*
DDISP   = 177570           45*    361     864
DF1     030734           719    5307*
DF14    030752           774     779     784     806     811     816    5313*
DF2     030740           724     734     739     744     749     754     795     821     826    5309*
DF21    030760           800    5315*
DF3     030745           729     759     764     769     790    5311*
DF30    030766           831     836    5317*
DH1     030367           717    5259*
DH12    030433           762     767    5266*
DH14    030454           772     782    5269*
DH15    030475           777    5272*
DH2     030406           722     727     732     737     742     747     752     757     788     793    5262*
DH21    030530           798    5277*
```

DH23	030561	804	5282#									
DH24	030621	809	5288#									
DH25	030642	814	5291#									
DH26	030673	819	824	5296#								
DH30	030715	829	5300#									
DIDBH	012772	2711#										
DIDBL	012700	2662#										
DIDO	012610	2613#										
DIPDO	013070	2761#										
DISPLA	001142	361#	964*	872*	881*	3594*	3647*	4054*	4172*			
DISPRE	000174	195#	872									
DM1	027010	716	776	5119#								
DM10	027301	751	5151#									
DM11	027345	756	5158#									
DM12	027411	761	5165#									
DM13	027465	766	5173#									
DM14	027555	771	5183#									
DM16	027654	781	5194#									
DM17	027733	786	5202#									
DM2	027044	721	726	5124#								
DM20	030031	792	5213#									
DM21	030063	797	5218#									
DM23	030132	803	5225#									
DM24	030177	808	5232#									
DM25	030253	813	5240#									
DM26	030273	818	5243#									
DM27	030313	823	5246#									
DM31	030347	833	5251#									
DM4	027100	731	5129#									
DM5	027136	736	5134#									
DM6	027174	741	5139#									
DM7	027240	746	5145#									
DONE	013776	3038#										
DPDBH	013254	2859#										
DPDBL	013162	2810#										
DSWR =	177570	44#	360	863								
DT1	001646	573#	718									
DT12	001674	577#	763	768								
DT14	001706	579#	773	783								
DT15	001720	581#	778									
DT2	001660	575#	723	728	733	738	743	748	753	758	789	794
DT21	001736	584#	799									
DT23	001754	587#	805									
DT24	001772	590#	810									
DT25	002002	592#	815									
DT26	002016	594#	820	925								
DT30	002030	596#	830									
DT31	002042	598#	835									
EMTVEC=	000030	133#										
ENDINS	021624	4058	4131	4144#								
ERRTRP	025114	206	1004	1112	3685	4889#						
ERRVEC=	000004	126#	205	861	862*	873*	927*	938*	964*	1004*	1027*	1037*	1097*	1112*
		3588*	3641*	3681*	3685*	4013	4014*	4016*	4019*					
FADMAP	001570	540#	1421*	1422*	3215	3217	3340	3342	3364	3366	4073*	4100	4101	4109
		4111												
FADMES	026311	1374	5054#											

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FADMSK  001566            538#   3368   4134*  4136*
FILL2   027005           4953    5113#
FLAGBK  001557            532#   3207*  3297*  3300*  3318*
FROM    025507           1046    3951   4981#
FSTADR  001562            535#   1357   1455*  3744   4065
GMPR    004072           1013    1093#
GMPRA   004120           1098#   1110
GMPRB   004134           1097    1104#
GMPRC   004142           1102    1106#
GMPRD   004202           1095    1118#
GNS     =  ******         194     905
HT      =  000011          36#   4606   4647
IMPCHE= 177746            186#   939*
IMPCK   003272            926     927    936#
INITDN  015064           1528    1564   1591   1666   1676   3222#
INITEX  015176           3218    3220   3239   3241#
INITMM  014426           1511    1554   1602   1631   1640   1708   1722   1758   1779   1802   1827   1837   1880
                         1929    1940   1983   2032   2043   2091   2217   2228   2276   2408   2555   2616   2665
                         2714    2764   2813   2862   2906   2958   2977   2990   3010   3023   3148#  3417
INSERT  021124           4056#
INSUFF  025524           1015    4984#
IOTVEC= 000020            131#
KIPAR0= 172340            166#    242    261*  3133*  3554*  3620*  4922
KIPAR1= 172342            167#    267*  3134*  3555*  3621#
KIPAR2= 172344            168#    975    995*  1072*  1181*  1185   2484   3135*  3154*  3160*  3171   3228*  3258*
                         3276    3349*  3381   3536*  3539*  3554   3615*  3809   3810*  3849*  3854*
KIPAR3= 172346            169#   1069   1072   1073*  3136*  3171*  3176*  3276*  3277*  3525*  3528*  3536   3555
                         3616*
KIPAR4= 172350            170#   3137*
KIPAR5= 172352            171#   3138*
KIPAR6= 172354            172#   3139*
KIPAR7= 172356            173#   3140*
KIPDR0= 172300            155#    237   3125*
KIPDR1= 172302            156#   3126*
KIPDR2= 172304            157#   3127*
KIPDR3= 172306            158#   3128*
KIPDR4= 172310            159#   3129*
KIPDR5= 172312            160#   3130*
KIPDR6= 172314            161#   3131*
KIPDR7= 172316            162#   3132*
LADMAP  001602            546#   1449*  1450*  1473*  1474*  3165   3167   3184   3186   3199   3208   3236   3238
                         3250    3252   3266   3268   3285   3287   3307   3317   3319   4107   4108   4109   4111
LADMES  026376           1401    5064#
LADMSK  001600            544#   3169   3188   3210   3270   3289   3309   3321   4139*  4141*
LDDISP  001522            508#    880*
LF      =  000012          37#   4641   4647
LMAD    001520            507#   3659   3670*  3677   3691*
LSTADR  001574            541#   1363*  1413*  1417   1428   1467*  1468*  1469*  1470*  1471   3240   4074   4081
MAMF    017536           1488    2546   3736#
MAMF1   017622           3750#   3752
MAMF2   017634           3737    3739   3745   3754#
MANUAL  005366           1119    1274   1343   1356#  1448
MANUL1  005424           1362    1369#
MANUL2  006026           1364    1465#
MAPMEM  003324            938     952#
MAPRB   004250           1138    1148#
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MASK4K= 017777   183#   966    991   1065   1419   1471   3212   3323   3842   4098   4105   4134   4139
MEMMAP  001524   230    509#   953    954   1192   1194   1197   1394   1396   1435   1437   1440   1442
                3532   3534   3543   3545   3565   3570   3812   3814
MEMMES  025421   962    497C#
MMAMES  025354   932    4963#
MMAVA   000606   633    290#   924*   930*   972    993   1024*  1030*  1067   1137   1179   1451   1465
                1487   2481   3152   3224   3265   3347   3378   3523   3613   3662   3671   3804   3847
                4911
MMDOWN  015674  1540   1576   1598   1672   1688   3234   3340#
MMINIT  014300   929    1029   1140   1493   3124#
MMORE   001554   528#   3232*  3233*  3241*  3326   3369
MMUP    015204  1524   1560   1616   1636   1651   1712   1733   1769   1792   1815   1831   1874   1917
                1933   1977   2020   2036   2084   2204   2221   2269   2389   2545   2580   2630   2679
                2729   2778   2827   2875   2959   2983   3003   3016   3036   3250#  3421
MMVEC = 000250   144#
MPAMEM  004210  1114   1133#
MPEND   002074   617#
MPPATS  002050   565    606#
MPRX    002276   563    697#   1093   1109   1113   1176   1248   1261   1272   1288   1334   1342   1401
                3329   3736   3759
MPR0    002076   562    632#   1096   1150   1212   1283   1328   1337
MPR1    002106   636#
MPR10   002216   672#
MPR11   002226   676#
MPR12   002236   680#
MPR13   002246   684#
MPR14   002256   688#   1187   1253   1255   1256   1262   1265*
MPR15   002266   692#   1189   1257   1259   1260   1266   1269*
MPR2    002116   640#
MPR3    002126   644#
MPR4    002136   648#
MPR5    002146   652#
MPR6    002156   656#
MPR7    002166   660#
MPR8    002176   664#
MPR9    002206   668#
MTMAP   025462  1210   4977#
MTOE    026572  3719   5087#
MTR     025605  1116   4993#
MX1     026071  1234   5026#
MX2     026110  1242   5029#
MX3     026123  1218   5031#
MX4     026142  1224   5034#
MX5     026160  1230   5037#
MX6     026176  1271   5040#
NOMEM   026266  3923   5050#
NOMTST  026737  4077   5105#
NOPES   025706  3861   5005#
OEFLG   001560   533#   2428#  2538#
PARVEC= 000114   180#   2442*  2446*  2453*  3590*  3643*  3746*  3747*
PBTRP   012052   564    2453#
PESRV   017430   566    3699#
PEWNC   026700  3836   5099#
PHYADR  016054  1512   1529   1555   1565   1592   1603   3376#
PIRQ  = 177772    43#
PIRQ.E= 000240   137#
```

```
PMEMAP  001540            519*  1148*  1149*  1173*  1174*  1255*  1256*  1259*  1260*  2409  2411
PRELOC  026542           3506   5083*
PRGMAP  000602            253    254    274    289*   911*   912*  3043   3045   3049   3517  3549  3557*  3575
                         3601*  3610   3650*  3651*  4084   4085
PROREL  025760           5012*
PRO     = 000000           60*
PR1     = 000040           61*
PR2     = 000100           62*
PR3     = 000140           63*
PR4     = 000200           64*
PR5     = 000240           65*
PR6     = 000300           66*
PR7     = 000340           67*
PS      = 177776           40*    41
PSCAN   017744           3725   3773   3778   3789*
PSW     = 177776           41*   899   1239   1378   1405   1462   3091   3962   3970   4004  4127  4148  4167
                         4199   4233   4266   4273   4286   4332   4431   4517   4563
PWRMSG  025641            326   4998*
PWRVEC= 000024            132*   295*   296*   305*   311*   323*   324*   856*   857*  3589*  3642*
RADTAB  001622            559*  3595   3634
RANTST  012470           2553*
RELOC   016336           3481*  3551   3580   3617   3627
RELOCF  000600            269    288*   913*  1487   3233   3583*  3587*  3596   3604   3625  3649*  3740  4065
                         4237   4258   4260   4560   4764
RELTOP  016460           3056   3517*
RELO    017062            276   3059   3610*
RESCHK  005252           1289   1328*
RESLDR  017270            282   3062   3659*
RESRVD  001516            505*   561   1292*  1296   1301   1306   1314   2486*  2487  2488  2517
RESTAR  000300            201    226*   328    910
RESTOR  000304            202    228*
REST1   000306            227    229*
REST2   000324            231    233*
RESVEC= 000010            127*
ROTATE  016210           1781   1804   3426*
RW      = 000006           176*  3125   3126   3127   3128   3132
SAVLDR  017350            921   3108   3677*
SAVTST  001534            515*  1008*  1009*  1381*  1382*  1423*  1424*  3043   3045  4082  4083
SCANM   026636           3798   5093*
SELECT  002646            199    846*
SELFLG  001556            531*   844*   846*  1361
SETAE   017602           2416   3741   3743   3746*
SETCON  016170           1778   1801   2407   3416*
SKPMES  026763           4121   5109*
SPRNT   020312           1298   1316   1349   2424   3891*
SPRNTA  020400           3901   3905   3910*
SPRNTB  020404           3893   3911*
SPRNTP  020336           2471   2492   2505   2522   3899*
SPRNTQ  020324           3722   3769   3775   3827   3895*
SPRNTO  020342           1309   1534   1570   1682   2447   2463   2531   3897   3900*
SPRNT1  020350           1645   3903*
SPRNT2  020366           1517   1609   1727   1763   1786   1809   1843   1850   1857  1864  1887  1996  1905
                         1946   1953   1960   1967   1990   1999   2008   2049   2056  2063  2070  2097  2106
                         2115   2122   2131   2140   2147   2156   2165   2172   2181  2130  2234  2241  2248
                         2255   2282   2291   2300   2307   2316   2325   2332   2341  2350  2357  2366  2375
                         2970   2916   2925   2947   2996   3029   3908*
```

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SPRNT3  02C362          2623    2672    2722    2771    2820    2870    3907#
SR0     = 177572         148#    235     251#    928#    1491    3141#   3664#   3673#   4913
SR1     = 177574         149#
SR2     = 177576         150#
SR3     = 172516         151#
STACK   = 001100          31#    229     270     272     560     854     936     952     1023
START   002640           198     844#
STARTA  002654           232     284     845     847#
START1  006104           281    1472    1482#   1486    3057    3110
STKLMT= 177774            42#
SWR     001140           303     316#    360#    852     863#    865     871#    878#    895     925     1025    1034    1737
                        1739    2403    3047    3591    3593#   3644    3646#   3738    3742    3761    4008    4022    4024
                        4032    4039    4068    4173    4181    4194    4201    4313    4358#
SWREG   000176           196#    871     895    4313    4329
SW0     = 000001          95#
SW00    = 000001          85#     95
SW01    = 000002          84#     94
SW02    = 000004          83#     93
SW03    = 000010          82#     92
SW04    = 000020          81#     91
SW05    = 000040          80#     90    4068
SW06    = 000100          79#     89    1094    2403
SW07    = 000200          78#     88    3047
SW08    = 000400          77#     87    1737
SW09    = 001000          76#     86
SW1     = 000002          94#
SW10    = 002000          75#
SW11    = 004000          74#
SW12    = 010000          73#    925    1025
SW13    = 020000          72#
SW14    = 040000          71#
SW15    = 100000          70#
SW2     = 000004          93#
SW3     = 000010          92#
SW4     = 000020          91#
SW5     = 000040          90#   3742
SW6     = 000100          89#   3738    3761
SW7     = 000200          88#
SW8     = 000400          87#
SW9     = 001000          86#
TBITVE= 000014           128#
TEMP    001614           550#   2907#   2956
TIMOUT  003622           203    1023#   1085
TKVEC   = 000060         135#
TMAP    004562          1184    1208#
TMPFAD  001564           537#   3219    3344    4065#   4070    4072#   4094    4096#   4097#   4098    4113    4135
TMPLAD  001576           543#   3170#   3189#   3271#   3290#   3293    4081#   4102    4104#   4105    4113    4140
TMPPT   001550           525#   3172#   3173#   3177#   3178#   3180    3182    3184    3186    3198#   3203#   3205    3208
                        3213#   3214#   3250    3252    3272#   3273#   3278#   3279#   3281    3283    3285    3287    3310#
                        3313#   3315    3324#   3325#
TO      025517          1056    1078    3944    4983#
TPVEC   = 000064         136#
TRAPVE= 000034           134#
TRTVEC= 000014           129#
TSTMAP  001530           512#   3156    3158    3180    3182    3192    3205    3262    3264    3281    3283    3305    3315
                        3353    3355    3362    4082#   4083#   4084#   4085#   4088    4090#   4091#   4100#   4101#   4107#
```

	006406	1587						
	013552	2974						
	013664	3007						
ST32	014004	569	1508	3094				
ST4	006512	1627						
ST5	006602	1662						
ST6	006676	1704	1744					
ST6A	006704	1707	1745					
ST7	006726	1718	1744					
TYPMAP	020412	1005	1246	3918				
UNEXPT	026500	3701	5077					
UP =	000000	175	3125	3126	3127	3128	3132	
UUP	001612	549	1153	1155	1191	2432	2439	
UUPBYT	011652	2409						
UUPB0	011616	2401						
UUPB1	011712	2418	2544					
UUPB2	011756	2430	2540					
UUPB3	012326	2500	2509					
UUPB4	012416	2450	2466	2535				
UUPB5	012442	2415	2421	2542				
W3X9	016256	1828	1930	2033	2218	3449		
$APTHD	001330	456	462					
$APTR	001512	499	4692	4713				
$ASTAT	001344	472	499	4681	4685	4711	4714	4718	4724
$ASTEN	001510	498						
$ATYC	024050	4652	4654					
$ATYI	024024	4650						
$ATY3	024032	4596	4651					
$ATY4	024042	4190	4653					
$ATY6	024340	4711						
$ATY7	024404	4722						
$AUTOB	001134	357	902	4301	4485			
$BASE	001260	425						
$BDADR	001122	352	587	591	592	3497	3699	
$BDDAT	001126	354	588	595	581	584	587	5% 3495 391
$BELL	001174	376	4176	4213				
$COM:	001264	427						

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$CDW2   001266          428#
$CHARC  024020         4613#  4623#  4630   4639#  4644#
$CKSWR  022364         4005   4149   4163   4200   4313#
$CMTAG  001100          340#   849    850    858
$CM3    = 000000        370#
$CM4    = 000004        370#   371#   372#   373#   374#
$CNTLG  023311         4325   4490#
$CNTLC  023304         4349   4458   4489#
$CPUOP  001232          399#
$CRLF   001201          376#   1007   1251   3065   4185   4213   4223   4245   4254   4333   4353   4454   4494
                       4552   4612   4647
$DEVA   024654         4765   4801   4809#
$DDW0   001270          429#
$DDW1   001272          430#
$DDW10  001314          439#
$DDW11  001316          440#
$DDW12  001320          441#
$DDW13  001322          442#
$DDW14  001324          443#
$DDW15  001326          444#
$DDW2   001274          431#
$DDW3   001276          432#
$DDW4   001300          433#
$DDW5   001302          434#
$DDW6   001304          435#
$DDW7   001306          436#
$DDW8   001310          437#
$DDW9   001312          438#
$DEVCT  001214          390#
$DEVM   001262          426#
$DOAGN  014254         3082   3098   3105   3107   3109#
$DTBL   024644         4769   4805#
$ENDAD  014222          215    886   3100#  4208
$ENDCT  014156          858   3084#
$ENDMG  014260         3083   3111#
$ENULL  014275         3094   3114#
$ENV    001224          395#   893    914   3053   3106   4187   4254   4263
$ENVM   001225          396#   876   4593   4598   4661
$EOP    014126         3046   3040   3075#
$EOPCT  014150          858#  3081#  3085
$ERFLG  001103          343#  3992   4028   4030   4036#  4146   4213
$ERMAX  001115          349#  4030   4053#  4146
$ERPOR  021640         1299   1310   1317   1350   1518   1535   1571   1610   1646   1683   1729   1764   1799
                       1810   1844   1851   1858   1865   1888   1893   1906   1942   1954   1961   1963   1991
                       2000   2009   2050   2057   2064   2071   2098   2101   2125   2123   2132   2141   2148
                       2157   2166   2173   2182   2191   2235   2242   2249   2256   2283   2292   2301   2309
                       2317   2326   2333   2342   2351   2358   2367   2376   2425   2449   2464   2472   2493
                       2506   2523   2532   2571   2624   2673   2723   2772   2821   2871   2919   2926   2948
                       2997   3030   3498   3710   3723   3730   3776   3828   4164#  4834
$ERRPC  001116          350#   573    575    577    579    581    584    587    590    592    594   4178#  4178#
                       4180   4213   4229   4236
$ERRTB  002340          567    714#
$ERRTY  022064         4183   4221#
$ERTTL  001112          347#  3824#  4177#  4204   4207   4211
$ESCAP  001122          375#  4052#  4204   4207   4211
$EVABL  001224          394#
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$E.END  001330            445#    468
$FA.AL  001206             38*#   4702#
$FFLG   024430           4650#   4653#   4696    4705#   4734#
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$FILLS  001155             36*#   4644
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$OMODE  025112           4837#   4841#   4846    4849#   4860#   4887#
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                        3010     3072    3077    3096    3110    3111    3993    3994    3995    3996    3997    4008    4020
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F16

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ENDCOM    1#     12     1387    842    1480
ERROF    32#
ESCAPE    1#    136#
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          1794 1796    1816    1818    1833    1835    1876    1878    1918    1920    1936    1938    1979    1981    2021
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ERRORS DETECTED: 0

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RUN-TIME RATIO: 130/53=2.5
CORE USED: 39K [illegible] PAGES

K16