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IDENTIFICATION

PRODUCT CODE:	AC-F627E-MC
PRODUCT NAME:	CKKUAE0 11/24/44 UBI MAP
DATE CREATED:	JANUARY, 1982
MAINTAINER:	DIAGNOSTIC ENGINEERING
AUTHOR:	DAN MILLEVILLE

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                                HISTORY SECTION


                CKKUAA0 WAS RELEASED OCTOBER, 1979 > INITIAL RELEASE
                CKKUAB0 WAS RELEASED OCTOBER, 1980 > ADDITION OF UNIBUS MEMORY TEST
                CKKUAC0 WAS RELEASED APRIL,   1981 > TESTING OF 11/24 MAP, 11/24 WITH UNIBUS
                                                     MEMORY ONLY, & POWER MONITOR BIT CHECK.
                CKKUAD0 WAS RELEASED OCTOBER, 1981 > SETUP OF SOFTWARE/HARDWARE SWR ADDRESS
                                                     WAS ADDED TO STARTUP CODE.
                                                   > WHEN SELECTED, THE OPTIONAL CACHE TESTS
                                                     NOW RUN CORRECTLY.
                CKKUAE0 WAS RELEASED JANUARY, 1982 > THE LMA TEST (11/24 ONLY) WAS MODIFIED TO
                                                     DO A MORE THOROUGH JOB OF CHECKING THE
                                                     ADDRESS LINES.
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TABLE OF CONTENTS

1. ABSTRACT

THIS PROGRAM IS DESIGNED TO BE RUN ON A PDP 11/24 OR 11/44 ON WHICH THE CPU, CACHE (IF APPLICABLE), AND MEMORY MANAGEMENT DIAGNOSTIC PROGRAMS HAVE BEEN RUN. THE PROGRAM WILL DETECT ALL ERRORS THAT ORIGINATE WITH THE MAP BOX AND PROVIDE LOOPING CAPABILITIES SO THAT THE FIELD SERVICE ENGINEER CAN VERIFY THE FAILURES. THERE MAY BE SOME CASES, SUCH AS THE CACHE REGISTER DATA PATH, AND CACHE MEMORY DATA PATH, WHERE INTERACTION BETWEEN MODULES PROHIBITS CLOSE ISOLATION, BUT THE FAILING FUNCTION WILL BE CALLED OUT SO THE FIELD SERVICE ENGINEER CAN COMPLETE THE ISOLATION PROCESS.

IF THE PROGRAM CATCHES AN ERROR IN AN EARLY TEST AND IS ALLOWED TO CONTINUE RUNNING THROUGH THE LATER TESTS THE ERROR INDICATIONS FROM THOSE LATER TESTS MAY BE INVALID. THIS IS DUE TO THE STRUCTURE OF THE PROGRAM, WHICH ASSUMES THAT ALL AREAS TESTED PRIOR TO THE CURRENT TEST ARE FUNCTIONING PROPERLY.

THE ERROR TYPE OUTS WILL BE IN TABLE FORMAT, WITH A MESSAGE INDICATING

THE CLASS OF ERROR, A HEADER IDENTIFYING EACH COLUMN AND A REPORT OF ALL PERTINENT DATA. WHEN THE TEST CAN PRODUCE MORE THAN ONE ERROR CONDITION, A SUMMARY OF ERRORS WILL BE GIVEN AT THE END OF THAT TEST CONSISTING OF: THE LOGICAL 'AND' AND 'OR' OF THE DATA PREVIOUSLY REPORTED AND THE NUMBER OF ERRORS IN THIS TEST. (SEE SECTION 6.3 FOR AN EXAMPLE OF THE ERROR TYPEOUTS.)

2. REQUIREMENTS

2.1 EQUIPMENT

THE BASIC PDP-11/24 OR 44 COMPUTER, INCLUDING THE CPU, CACHE (11/44 ONLY), MEMORY MANAGEMENT, AND AN LA-30 OR EQUIVALENT DEVICE FOR ERROR MESSAGES.

2.2 STORAGE

THIS PROGRAM WILL REQUIRE 8K TO LOAD BUT WILL UTILIZE ALL EXISTING CORE FOR A DUAL ADDRESSING TEST OF MEMORY FROM THE UNIBUS.

2.3 PRELIMINARY PROGRAMS

THE CPU, CACHE(IF APPLICABLE), AND MEMORY MANAGEMENT DIAGNOSTICS SHOULD BE RUN BEFORE THIS PROGRAM. THE MEMORY DIAGNOSTIC SHOULD AT LEAST MAKE A QUICK VERIFY OF THE AREA OF MEMORY THIS PROGRAM WILL LOAD AND RUN IN.

3. LOADING PROCEDURE

3.1 METHOD.

THIS PROGRAM CAN BE LOADED FROM ANY DEVICE THAT IS SUPPORTED BY XXDP AND SHOULD BE LOADED USING THE XXDP PROCEDURE FOR THAT DEVICE.

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153                     4.      STARTING PROCEDURE
154
155                     4.1     STARTING ADDRESS
156
157                             PROGRAM STARTS AT ADDRESS 200
158
159                     4.2     PROGRAM AND/OR OPERATOR ACTION
160
161                             THE PROGRAM WILL IDENTIFY ITSELF.  IF CPU IS AN 11/44, PROGRAM
162                             WILL PROCEED WITH TESTING.  IF CPU IS AN 11/24, AND LOCATION 176
163                             CONTAINS ZERO (SUCH AS JUST AFTER LOADING), PROGRAM WILL PROMPT
164                             FOR A SWITCH REGISTER INPUT.  IF NONE IS REQUIRED, ENTER <CR>.
165                             IF YOU DO SO, PROGRAM WILL DEPOSIT A "1" IN LOCATION 176 (MEANINGLESS
166                             UNLESS BIT 8 IS ALSO SET) SO THAT SUBSEQUENT RUNNING OF THE PROGRAM
167                             WILL NOT RESULT IN THE SAME REQUEST.  IF MANUFACTURING IS RUNNING
168                             THIS PROGRAM ON AN 11/24 WITH UNIBUS MEMORY ONLY (NO MAIN MEMORY),
169                             ENTER A NUMBER WITH AT LEAST BIT 11 SET (SWR=4000).  THIS WILL KEY
170                             THE PROGRAM TO TEST THE 11/24 IN THAT CONFIGURATION.
171
172                     4.3     SPECIAL STARTING PROCEDURE
173
174                             IF IT APPEARS THAT THE CACHE IS CAUSING SOME TROUBLE AND
175                             YOU STILL WANT TO RUN THIS PROGRAM, IT IS POSSIBLE TO RUN
176                             WITH THE CACHE DISABLED.  SIMPLY LOAD THE CACHE CONTROL
177                             REGISTER (17777746) WITH THE DESIRED NUMBER.  THEN LOAD
178                             THE PC (17777707) WITH THE STARTING ADDRESS (200) AND
179                             PRESS "CONTINUE".  THE PROGRAM WILL NOW RUN NORMALLY EXCEPT
180                             THAT CERTAIN TESTS WILL BE SKIPPED SINCE THE CACHE IS DISABLED.
181                             THIS FACT IS INDICATED IN THE ABSTRACT OF EACH TEST THAT
182                             CHECKS THE CACHE CONTROL REGISTER.
183
184                             DEFINITION OF THE BITS IN THE CACHE CONTROL REGISTER:
185                             BIT00   -DISABLE TRAPS
186                             BIT02   -FORCE MISS ON READ,WHERE ADDRESS BIT 12 IS 0
187                             BIT03   -FORCE MISS ON READ,WHERE ADDRESS BIT 12 IS 1
188                             BIT09   -UNCONDITIONAL CACHE BYPASS
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                        5.      OPERATING PROCEDURE

                        5.1     OPERATIONAL SWITCH SETTINGS

                                SW15    1=      HALT ON ERROR
                                SW14    1=      LOOP ON TEST
                                SW13    1=      INHIBIT ERROR TYPEOUTS
                                SW12    1=      INHIBIT TRACE TRAP
                                SW11    1=      SET WHEN RUNNING AN 11/24 WITH NO MAIN MEMORY
                                                AND ONLY UNIBUS MEMORY
                                SW10    1=      BELL ON ERROR
                                SW09    1=      LOOP ON ERROR
                                SW08    1=      LOOP ON TEST IN SWR<05:00>
                                SW07    1=      INHIBIT MULTIPLE ERROR TYPE OUTS
                                SW06    1=      SELECT CACHE TESTS. THIS IS USED FOR
                                                MFG. QUICK VERIFY STATION AND CAN BE SELECTED
                                                BY APT SCRIPTING. THESE TESTS ASSUME THAT
                                                ALL MODULES EXCEPT UBI MODULE ARE KNOWN GOOD.
                                SW05    1=      SELECT UNIBUS MEMORY TESTS
                                                SET WHEN A WINDOW EXISTS (SOME UBMAP JUMPERS CUT), AND
                                                UNIBUS MEMORY OCCUPIES THE ENTIRE WINDOW ADDRESS AREA.

                        5.2     SUB-ROUTINE ABSTRACTS

                                ALL SUBROUTINE ABSTRACTS APPEAR IN THE CODE BEFORE THEIR
                                EXPANSION AND IN THE DOCUMENT THAT IMMEDIATELY FOLLOWS THIS.
                                BELOW IS A LIST OF THE SUBROUTINE TITLES.

                        5.2.1   MACRO LIBRARY SUBROUTINES (FOUND IN MOST PROGRAMS) (SOME IN THIS SOURCE)

                                SCOPE HANDLER ROUTINE
                                ERROR HANDLER ROUTINE
                                ERROR MESSAGE TYPE OUT ROUTINE
                                CONVERT 16-BIT VIRTUAL ADDRESSES TO 22-BIT PHYSICAL ADDRESSES
                                SAVE AND RESTORE R0-R5 ROUTINES
                                TYPE ROUTINE
                                BINARY TO OCTAL (ASCII) AND TYPE
                                CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
                                TRAP DECODER
                                POWER DOWN AND UP ROUTINES
                                DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT ROUTINE
                                END OF PASS ROUTINE

                        5.2.2   SUBROUTINES UNIQUE TO THIS PROGRAM

                                SUBROUTINE TO TURN OFF AND SAVE T-BIT
                                SUBROUTINE TO RESTORE T-BIT TO ITS PREVIOUS CONDITION
                                SUBROUTINE TO CLEAR ALL OF THE MAP REGISTERS
                                SUBROUTINE TO EXTRACT MAP ADDRESS FROM PAR CONTENTS
                                SUBROUTINE TO DETERMINE 11/24 WITH UNIBUS MEM ONLY & CHECK LMA'S IF SO

                        5.2.3   TRAP AND ABORT HANDLER ROUTINES

                                CPU TRAP HANDLER ROUTINE
                                CACHE TRAPS AND ABORTS HANDLER ROUTINE
                                MEMORY MANAGEMENT TRAPS AND ABORTS HANDLER ROUTINE
```

5.3 RUNNING UNDER APT

THE EXECUTION TIMES PROVIDED IN THE APT SCRIPT THAT FOLLOWS ARE FOR EXECUTION WITH A 11/44 PROCESSOR, CACHE, 16K CORE MEMORY, AND 300 BAUD.
THE FOLLOWING IS A PROGRAM LOAD FILE USED BY APT:

1. E TABLE 'A' IS USED FOR APT DUMP MODE.
   A. IN ADDITION TO NORMAL CPU DIAGNOSTIC TESTS, THIS TABLE WILL SELECT THE OPTIONAL CACHE TESTS, ($SWREG=100).

2. E TABLE 'B' IS USED FOR APT QV MODE WHILE RUNNING ON A MANUFACTURING QV STATION. IT ACCOMPLISHES WHAT ETABLE 'A' DOES BUT ADDITIONALLY SUPRESSES TYPEOUTS.($ENVM=240)

3. ETABLE 'C' IS USED FOR APT QV OR RUNTIME MODES WHILE RUNNING ON SYSTEMS OTHER THAN MFG. QV STATIONS. THIS TABLE DESELECTS THE OPTIONAL CACHE TESTS.

4. ETABLE 'D' IS USED BY MANUFACTURING TO RUN AN 11/24 UNDER APT WITH UNIBUS MEMORY AND NO MAIN MEMORY, AND BECAUSE OF NO CACHE IN AN 11/24, DESELECTS THE OPTIONAL CACHE TESTS.

1ST PASS RUN TIME	LONGEST TEST TIME	ADDITIONAL RUN TIME
10	5	0

..... E TABLES .....

	A	B	C	D
E-MODE/S-MODE ($ENVM/$ENV)	000/000	240/001	240/001	240/001
SWITCH REGISTER 1 ($SWREG)	000100	000100	000000	004000
SWITCH REGISTER 2	000000	000000	000000	000000
CPU TYPE/OPTIONS	00/0000	00/0000	00/0000	00/0000
MEMORY MAP CODE 1	000/0000	000/0000	000/0000	000/0000
MEMORY MAP CODE 2	000/0000	000/0000	000/0000	000/0000
MEMORY MAP CODE 3	000/0000	000/0000	000/0000	000/0000
MEMORY MAP CODE 4	000/0000	000/0000	000/0000	000/0000
BUS PRIORITY/INTERRUPT 1	0000	0000	0000	0000
BUS PRIORITY/INTERRUPT 2	0000	0000	0000	0000
BASE ADDRESS CODE	000000	000000	000000	000000
DEVICE MAP CODE	000000	000000	000000	000000
CTLR. SPECIFIC WORD 1	000000	000000	000000	000000
CTLR. SPECIFIC WORD 2	000000	000000	000000	000000
DEVICE DESCRIPTOR WORD 0	177777	177777	177777	177777
DEVICE DESCRIPTOR WORD 1	177777	177777	177777	177777
DEVICE DESCRIPTOR WORD 2 THROUGH DEVICE DESCRIPTOR WORD 15	000000	000000	000000	000000

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                        6.      ERRORS
                        6.1     ERROR HALTS AND DESCRIPTION

                                WHEN AN ERROR IS DETECTED AN 'ERROR' (EMT)
                                INSTRUCTION IS EXECUTED AND THE 'ERROR HANDLER ROUTINE'
                                CHECKS THE SWITCH REGISTER FOR MODE SELECTED.
                                THE PROGRAM WILL:
                                HALT ON ERROR           IF SW15=1
                                INHIBIT ERROR TYPE OUT  IF SW13=1
                                RING BELL ON ERROR      IF SW10=1
                                LOOP ON ERROR           IF SW9=1

                        6.2     ERROR RECOVERY

                                IF SW09=1, THE PROGRAM WILL LOOP BACK TO
                                THE POINT WHERE THE INSTRUCTION THAT CAUSED THE ERROR WAS
                                EXECUTED, WITHOUT ALLOWING ANY OF THE CONDITIONS TO CHANGE.
                                THIS WILL PROVIDE THE TIGHTEST POSSIBLE SCOPE LOOP.
                                IF SW09=0, EACH ERROR WILL BE REPORTED AND
                                LOGGED AND, AT THE END OF EACH TEST, A SUMMARY OF ALL ERRORS
                                OCCURRING IN THAT TEST WILL BE PROVIDED.  THE SUMMARY
                                CONSISTS OF THE LOGICAL AND AND OR OF THE ADDRESS AND/OR
                                DATA THAT WAS WRONG.

                                IF THE POWER MONITOR BIT ERROR IS CALLED, YOU MUST CORRECT THE POWER
                                SUPPLY OR CPU ERROR REGISTER PROBLEM BEFORE YOU CAN RELY ON THE
                                RESULTS OF THIS DIAGNOSTIC.  THE ERROR CAN BE CALLED AT 1 OF 2
                                PLACES - 1) IN THE SCOPE ROUTINE EXECUTED AT THE BEGINNING OF EACH
                                TEST, AND 2) IN AN ERROR CALL IN CASE BIT BECOMES SET AFTER THE SCOPE.
                                IF THE BIT IS CAUGHT IN THE ERROR ROUTINE, *TWO* ERRORS WILL CALL -
                                1) POWER MONITOR BIT ERROR WILL CALL FIRST TO ALERT YOU TO THE
                                POSSIBILITY THE PROBLEM COULD BE CAUSED BY THE OUT-OF-SPEC POWER
                                SUPPLY, AND THEN THE ERROR THAT WAS TO CALL.

                        6.3     SAMPLE ERROR TYPE OUTS
                                SEE "$ERRTB:" FOR SAMPLE ERROR TYPEOUTS.
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6.3.1 MULTIPLE TYPE ERRORS: AN EXAMPLE:

THE FOLLOWING REGISTERS TIMED OUT WHEN REFERENCED

REG.ADR	TESTNO	ERRORPC
170210	000001	015226
170212	000001	015232
'	'	'
'	'	'
	TO	
'	'	'
'	'	'
170372	000001	015232
170374	000001	015232
170376	000001	015232

SUMMARY OF MAP REGISTERS THAT TIMED OUT ON READ

REGADRS ''OR''	REGADRS ''AND''	#ERRORS	TESTNO	ERRORPC
170376	170210	32	000001	010530

7. RESTRICTIONS

7.1 STARTING RESTRICTIONS

NONE

7.2 OPERATING RESTRICTIONS

NONE

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                8.      MISCELLANEOUS

                8.1     EXECUTION TIME

                        THE RUN TIME FOR ANY PASS IS APPROXIMATELY 3 SECONDS.

                8.2     ADDRESS GENERATION IN THE PDP-11/44

                        THE FOLLOWING IS AN EXAMPLE OF HOW A MEMORY ADDRESS
                        IS GENERATED BY THE UNIBUS MAP.  THIS ASSUMES THAT
                        THE ADDRESS ORIGINATES IN THE CPU BUT THE PROCESS CAN
                        APPLY TO ANY UNIBUS ADDRESS, STARTING AT LINE C2.


                A.  VIRTUAL ADDRESS                         15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00

                A1. P.A.R. PAGE NUMBER (0-7)                15 14 13

                A2. OFFSET (FROM VIRTUAL ADDRESS)            +       12 11 10 09 08 07 06 05 04 03 02 01 00

                B.  P.A.R.[PAGE NO.] +  15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00
                                        ------------------------------------------------

                C.  PHYS ADDRS (A2+B)   21 20 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00

                C1. 17XXXXXX=> U.B.ADR. 21 20 19 18

                C2. MAPPING REG.NO.(0-36)           17 16 15 14 13

                C3. OFFSET                                      12 11 10 09 08 07 06 05 04 03 02 01 00

                D.  MAP REG.[NO.]    +  21 20 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01
                                        ------------------------------------------------------------

                E.  PHYS ADDR (C3+D)    21 20 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00


                        DESCRIPTION OF LINES:
                        A: VIRTUAL ADDRESS (16 BITS)
                                A1: UPPER 3 BITS OF VIRTUAL ADDRESS, USED TO
                                    SELECT A PAGE ADDRESS REGISTER (PAR)
                                A2: LOWER 13 BITS OF VIRTUAL ADDRESS, ADDED TO
                                    SELECTED PAR

                        B: PAGE ADDRESS REGISTER (16 BITS), IN ADDITION PROCESS THIS GETS
                           LEFT SHIFTED 6 BITS BEFORE ADDITION TO A2

                        C: PHYSICAL ADDRESS CREATED BY MEMORY MANAGEMENT, (22 BITS)
                                C1: IF UPPER 4 BITS ARE ALL ONES THEN BITS <17:00> GO OUT ON UNIBUS
                                C2: IF MAP RELOCATION IS ENABLED THEN BITS <17:13> SELECT ONE
                                    OF THE 36 (OCTAL) MAP REGISTERS.
                                C3: LOWER 13 BITS OF UNIBUS ADDRESS, ADDED TO SELECTED MAP REGISTER

                        D: MAP REGISTER (22 BITS), ADDED TO BITS <12:00> OF UNIBUS ADDRESS

                        E: PHYSICAL ADDRESS GENERATED BY UNIBUS MAP AND SENT TO THE CACHE.
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9. PROGRAM DESCRIPTION

THE ASSEMBLED LISTING, CKKUAE.SEQ, HAS A PARAGRAPH DESCRIBING EACH OF THE TESTS. THE PARAGRAPH WILL INDICATE IF THE TEST IS RUN CONDITIONALLY ON THE STATUS ON THE CACHE CONTROL REGISTER.@

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1485                    .TITLE  CKKUAE0 11/24/44 UBI MAP
                        ;*COPYRIGHT (C) JANUARY 1982
                        ;*DIGITAL EQUIPMENT CORP.
                        ;*MAYNARD, MASS. 01754
                        ;*
                        ;*PROGRAM BY DAN P. MILLEVILLE
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-C5), JAN, 1981.
                        ;*
1486                    .SBTTL  OPERATIONAL SWITCH SETTINGS
                        ;*
                        ;*      SWITCH                  USE
                        ;*      ------          --------------------
                        ;*        15            HALT ON ERROR
                        ;*        14            LOOP ON TEST
                        ;*        13            INHIBIT ERROR TYPEOUTS
                        ;*        12            INHIBIT TRACE TRAP
                        ;*        11            INHIBIT TRACE TRAP
                        ;*        10            BELL ON ERROR
                        ;*         9            LOOP ON ERROR
                        ;*         8            LOOP ON TEST IN SWR<4:0>
1487                    ;*         7            INHIBIT MULTIPLE ERROR TYPEOUTS
                        ;*         6            SELECT CACHE-CIS TESTS
1488                    ;*         5            SELECT MEMORY ON UNIBUS TEST
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1489

                        .SBTTL  BASIC DEFINITIONS
                        ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                  STACK=  1100            ;;FIRST ADDRESS OF THE STACK
001100                  KERSTK= STACK           ;;KERNEL STACK
000700                  SUPSTK= STACK-200       ;;SUPERVISOR STACK
000600                  USESTK= STACK-300       ;;USER STACK
104000                          ERROR=EMT               ;
000004                          SCOPE=IOT               ;
177776                  PS=     177776          ;;PROCESSOR STATUS WORD
177776                          PSW=PS          ;
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
177546                  LKS=    177546          ;;LINE CLOCK (KW11-L) STATUS REGISTER
                        ;*MISCELLANEOUS DEFINITIONS
000011                  HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                  LF=     12              ;;CODE LINE FEED
000015                  CR=     15              ;;CODE CARRIAGE RETURN
000200                  CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
                        ;*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
000000                          R10=R0          ;
000001                          R11=R1          ;
000002                          R12=R2          ;
000003                          R13=R3          ;
000004                          R14=R4          ;
000005                          R15=R5          ;
000006                  SP=     %6              ;;STACK POINTER
000006                          KSP=SP          ;
000006                          SSP=SP          ;
000006                          USP=SP          ;
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
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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
001000                          SW9=SW09                ;
000400                          SW8=SW08                ;
000200                          SW7=SW07                ;
000100                          SW6=SW06                ;
000040                          SW5=SW05                ;
000020                          SW4=SW04                ;
000010                          SW3=SW03                ;
000004                          SW2=SW02                ;
000002                          SW1=SW01                ;
000001                          SW0=SW00                ;
                        ;*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
000001                  BIT00=  1
001000                          BIT9=BIT09              ;
000400                          BIT8=BIT08              ;
000200                          BIT7=BIT07              ;
000100                          BIT6=BIT06              ;
000040                          BIT5=BIT05              ;
000020                          BIT4=BIT04              ;
000010                          BIT3=BIT03              ;
000004                          BIT2=BIT02              ;
000002                          BIT1=BIT01              ;
000001                          BIT0=BIT00              ;
                        ;*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
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000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
000100                  LKVEC=  100             ;;LINE CLOCK (KW11-L) VECTER
000114                  CACHVEC=114             ;;CACHE ERROR INTERRUPT VECTOR
000240                  PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR
000250                  MMVEC=  250             ;;MEMORY MANAGEMENT VECTOR
                        .SBTTL  CACHE   REGISTER DEFINITIONS
177740                  LOADRS = 177740         ;;LOWER 16 BITS OF ADDRESS THAT CAUSED ERROR
177742                  HIADRS = 177742         ;;UPPER SIX BITS OF ADDRESS THAT CAUSED ERROR
177744                  MEMERR = 177744         ;;CACHE ERROR REGISTER
177746                  CONTRL = 177746         ;;MEMORY CONTROL REGISTER
177750                  MAINT  = 177750         ;;MEMORY MAINTENENCE REGISTER
177752                  HITMIS = 177752         ;;HIT MISS REGISTER "1" IMPLIES HIT IN CACHE
                        .SBTTL  CPU REGISTER DEFINITIONS
177760                  SIZELO = 177760         ;;MEMORY SIZE REGISTER NUMBER TO PUT INTO A PAR
                                                ;;TO GET TO THE LAST 32 WORDS OF MEMORY
177762                  SIZEHI = 177762         ;;HIGH SIZE REGISTER, RESERVED FOR FUTURE USE
                                                ;;CURRENTLY ALL ZERO
177764                  SYSTID = 177764         ;;SYSTEM ID REGISTER
177766                  CPUERR = 177766         ;;CPU ERROR REGISTER HOLDS CONDITION THAT CAUSED
                                                ;;THE TRAP TO ERRVEC (000004)
                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS
                        ;*MEMORY MANAGEMENT STATUS REGISTER ADDRESSES
177572                  MMR0=   177572
177574                  MMR1=   177574
177576                  MMR2=   177576
172516                  MMR3=   172516
177572                          SR0=MMR0                ;
177574                          SR1=MMR1                ;
177576                          SR2=MMR2                ;
172516                          SR3=MMR3                ;
                        ;*USER "I" PAGE DESCRIPTOR REGISTERS
177600                  UIPDR0= 177600
177602                  UIPDR1= 177602
177604                  UIPDR2= 177604
177606                  UIPDR3= 177606
177610                  UIPDR4= 177610
177612                  UIPDR5= 177612
177614                  UIPDR6= 177614
177616                  UIPDR7= 177616
                        ;*USER "D" PAGE DESCRIPTOR REGISTORS
177620                  UDPDR0= 177620
177622                  UDPDR1= 177622
177624                  UDPDR2= 177624
177626                  UDPDR3= 177626
177630                  UDPDR4= 177630
177632                  UDPDR5= 177632
177634                  UDPDR6= 177634
177636                  UDPDR7= 177636
                        ;*USER "I" PAGE ADDRESS REGISTERS
177640                  UIPAR0= 177640
177642                  UIPAR1= 177642
177644                  UIPAR2= 177644
177646                  UIPAR3= 177646
177650                  UIPAR4= 177650
177652                  UIPAR5= 177652
177654                  UIPAR6= 177654
177656                  UIPAR7= 177656
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                        ;*USER "D" PAGE ADDRESS REGISTERS
177660                  UDPAR0= 177660
177662                  UDPAR1= 177662
177664                  UDPAR2= 177664
177666                  UDPAR3= 177666
177670                  UDPAR4= 177670
177672                  UDPAR5= 177672
177674                  UDPAR6= 177674
177676                  UDPAR7= 177676
                        ;*SUPERVISOR "I" PAGE DESCRIPTOR REGISTERS
172200                  SIPDR0= 172200
172202                  SIPDR1= 172202
172204                  SIPDR2= 172204
172206                  SIPDR3= 172206
172210                  SIPDR4= 172210
172212                  SIPDR5= 172212
172214                  SIPDR6= 172214
172216                  SIPDR7= 172216
                        ;*SUPERVISOR "D" PAGE DESCRIPTOR REGISTERS
172220                  SDPDR0= 172220
172222                  SDPDR1= 172222
172224                  SDPDR2= 172224
172226                  SDPDR3= 172226
172230                  SDPDR4= 172230
172232                  SDPDR5= 172232
172234                  SDPDR6= 172234
172236                  SDPDR7= 172236
                        ;*SUPERVISOR "I" PAGE ADDRESS REGISTERS
172240                  SIPAR0= 172240
172242                  SIPAR1= 172242
172244                  SIPAR2= 172244
172246                  SIPAR3= 172246
172250                  SIPAR4= 172250
172252                  SIPAR5= 172252
172254                  SIPAR6= 172254
172256                  SIPAR7= 172256
                        ;*SUPERVISOR "D" PAGE ADDRESS REGISTERS
172260                  SDPAR0= 172260
172262                  SDPAR1= 172262
172264                  SDPAR2= 172264
172266                  SDPAR3= 172266
172270                  SDPAR4= 172270
172272                  SDPAR5= 172272
172274                  SDPAR6= 172274
172276                  SDPAR7= 172276
                        ;*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 "D" PAGE DESCRIPTOR REGISTERS
172320                  KDPDR0= 172320
172322                  KDPDR1= 172322
```

```
                        KDPDR2= 172324
                        KDPDR3= 172326
                        KDPDR4= 172330
                        KDPDR5= 172332
                        KDPDR6= 172334
                        KDPDR7= 172336
                        ;*KERNEL "I" PAGE ADDRESS REGISTERS
                        KIPAR0= 172340
                        KIPAR1= 172342
                        KIPAR2= 172344
                        KIPAR3= 172346
                        KIPAR4= 172350
                        KIPAR5= 172352
                        KIPAR6= 172354
                        KIPAR7= 172356
                        ;*KERNEL "D" PAGE ADDRESS REGISTERS
                        KDPAR0= 172360
                        KDPAR1= 172362
                        KDPAR2= 172364
                        KDPAR3= 172366
                        KDPAR4= 172370
                        KDPAR5= 172372
                        KDPAR6= 172374
                        KDPAR7= 172376
                        .SBTTL  UNIBUS MAP REGISTER DEFINITIONS
                        ;*THE LOWER 16 BITS OF THE MAP REGISTERS ARE LABELED 'MAPLXX'
                        ;*THE UPPER 6 BITS OF THE MAP REGISTERS ARE LABELED 'MAPHXX'
                        MAPL00 = 170200
                        MAPH00 = 170202
                        MAPL01 = 170204
                        MAPH01 = 170206
                        MAPL02 = 170210
                        MAPH02 = 170212
                        MAPL03 = 170214
                        MAPH03 = 170216
                        MAPL04 = 170220
                        MAPH04 = 170222
                        MAPL05 = 170224
                        MAPH05 = 170226
                        MAPL06 = 170230
                        MAPH06 = 170232
                        MAPL07 = 170234
                        MAPH07 = 170236
                        MAPL10 = 170240
                        MAPH10 = 170242
                        MAPL11 = 170244
                        MAPH11 = 170246
                        MAPL12 = 170250
                        MAPH12 = 170252
                        MAPL13 = 170254
                        MAPH13 = 170256
                        MAPL14 = 170260
                        MAPH14 = 170262
                        MAPL15 = 170264
                        MAPH15 = 170266
                        MAPL16 = 170270
                        MAPH16 - 170272
```

UNIBUS MAP REGISTER DEFINITIONS

```
170274                  MAPL17 = 170274
170276                  MAPH17 = 170276
170300                  MAPL20 = 170300
170302                  MAPH20 = 170302
170304                  MAPL21 = 170304
170306                  MAPH21 = 170306
170310                  MAPL22 = 170310
170312                  MAPH22 = 170312
170314                  MAPL23 = 170314
170316                  MAPH23 = 170316
170320                  MAPL24 = 170320
170320                  MAPH24 = 170320
170324                  MAPL25 = 170324
170326                  MAPH25 = 170326
170330                  MAPL26 = 170330
170332                  MAPH26 = 170332
170334                  MAPL27 = 170334
170336                  MAPH27 = 170336
170340                  MAPL30 = 170340
170342                  MAPH30 = 170342
170344                  MAPL31 = 170344
170346                  MAPH31 = 170346
170350                  MAPL32 = 170350
170352                  MAPH32 = 170352
170354                  MAPL33 = 170354
170356                  MAPH33 = 170356
170360                  MAPL34 = 170360
170362                  MAPH34 = 170362
170364                  MAPL35 = 170364
170366                  MAPH35 = 170366
170370                  MAPL36 = 170370
170372                  MAPH36 = 170372
170374                  MAPL37 = 170374
170376                  MAPH37 = 170376
170200                          MAPL0=MAPL00            ;
170202                          MAPH0=MAPH00            ;
170204                          MAPL1=MAPL01            ;
170206                          MAPH1=MAPH01            ;
170210                          MAPL2=MAPL02            ;
170212                          MAPH2=MAPH02            ;
170214                          MAPL3=MAPL03            ;
170216                          MAPH3=MAPH03            ;
170220                          MAPL4=MAPL04            ;
170222                          MAPH4=MAPH04            ;
170224                          MAPL5=MAPL05            ;
170226                          MAPH5=MAPH05            ;
170230                          MAPL6=MAPL06            ;
170232                          MAPH6=MAPH06            ;
170234                          MAPL7=MAPL07            ;
170236                          MAPH7=MAPH07            ;
```

```
1492
                000000                  .SBTTL  TRAP CATCHER
                                                .=0
                                        ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ''.+2,HALT''
                                        ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                        ;*LOCATION 0 CONTAINS 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  010000                  JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM
```

```
1494                                .SBTTL  ACT11 HOOKS
                                    ;;******************************************************************
                                    ;HOOKS REQUIRED BY ACT11
            000204                          $SVPC=.                 ;SAVE PC
            000046                          .=46
000046      022024                          $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
            000052                          .=52
000052      000000                          .WORD   0               ;;2)SET LOC.52 TO ZERO
            000204                          .=$SVPC                 ;; RESTORE PC
```

```
 1496                                   .SBTTL  COMMON TAGS

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

        001100                                  .=1100
 001100                                 $CMTAG:                         ;;START OF COMMON TAGS
                                        ;$PASS: .WORD   0               ;;CONTAINS PASS COUNT           ;DPM001
 001100     000                         $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
 001101     000                         $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
 001102  000000                         $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
 001104  000000                         $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
 001106  000000                         $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
 001110  000000                         $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
 001112     000                         $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
 001113     001                         $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
 001114  000000                         $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
 001116  000000                         $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
 001120  000000                         $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
 001122  000000                         $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
 001124  000000                         $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
 001126  000000                                 .WORD   0               ;;RESERVED--NOT TO BE USED
 001130  000000                                 .WORD   0
 001132     000                         $AUTOB: .BYTE   0               ;;AUTOMATIC MODE INDICATOR
 001133     000                         $INTAG: .BYTE   0               ;;INTERRUPT MODE INDICATOR
 001134  000000                                 .WORD   0
 001136  177570                         SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
 001140  177570                         DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
 001142  177560                         $TKS:   177560                  ;;TTY KBD STATUS
 001144  177562                         $TKB:   177562                  ;;TTY KBD BUFFER
 001146  177564                         $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
 001150  177566                         $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
 001152     000                         $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
 001153     002                         $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
 001154     012                         $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
 001155     000                         $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
 001156  000000                         $REGAD: .WORD   0               ;;CONTAINS THE ADDRESS FROM
                                                                         ;;WHICH  ($REG0) WAS OBTAINED
        000006                                  .REPT   $CM3
 001160  000000                         $REG0:  .WORD   0               ;;CONTAINS (($REGAD)+0)
 001162  000000                         $REG1:  .WORD   0               ;;CONTAINS (($REGAD)+2)
 001164  000000                         $REG2:  .WORD   0               ;;CONTAINS (($REGAD)+4)
 001166  000000                         $REG3:  .WORD   0               ;;CONTAINS (($REGAD)+6)
 001170  000000                         $REG4:  .WORD   0               ;;CONTAINS (($REGAD)+10)
 001172  000000                         $REG5:  .WORD   0               ;;CONTAINS (($REGAD)+12)
        000007                          .REPT   7
 001174  000000                         $TMP0:  .WORD   0               ;;USER DEFINED
 001176  000000                         $TMP1:  .WORD   0               ;;USER DEFINED
 001200  000000                         $TMP2:  .WORD   0               ;;USER DEFINED
 001202  000000                         $TMP3:  .WORD   0               ;;USER DEFINED
 001204  000000                         $TMP4:  .WORD   0               ;;USER DEFINED
 001206  000000                         $TMP5:  .WORD   0               ;;USER DEFINED
 001210  000000                         $TMP6:  .WORD   0               ;;USER DEFINED
 001212  000000                         $TIMES: 0                       ;;MAX. NUMBER OF ITERATIONS
 001214  000000                         $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
 001216     207     377     377         $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
```

```
001222     077                  $QUES:  .ASCII  /?/             ;;QUESTION MARK
001223     015                  $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001224     012     000          $LF:    .ASCIZ  <12>            ;;LINE FEED
                                ;;*****************************************************************
001226  000000                  PADRSL: .WORD   0               ;HOLDS THE LOWER 16 BITS OF A 22 BIT ADDRESS
                                                                ;GENERATED FOR TYPE OUT.
001230  000000                  PADRSH: .WORD   0               ;HOLDS THE UPPER 6 BITS OF A 22 BIT ADDRESS
                                                                ;GENERATED FOR TYPE OUT.
001232  000000  000077          ADRAND: .WORD   0,77            ;LOGICAL AND OF FAILING ADDRESSES
001236  000000  000077          ADDROR: .WORD   0,77            ;LOGICAL OR OF FAILING ADDRESSES
001242  000000  000077          DATAND: .WORD   0,77            ;LOGICAL AND OF BAD DATA
001246  000000  000077          DATAOR: .WORD   0,77            ;LOGICAL OR OF BAD DATA
001252  000000                  PATAND: .WORD   0               ;LOGICAL AND OF PATTERN LOADED
001254  000000                  PATTOR: .WORD   0               ;LOGICAL OR OF PATTERN LOADED
001256  000000                  LOWEST: .WORD   0               ;HOLDS NUMBER TO PUT IN PAR TO CAUSE THE
                                                                ;LOWEST USABLE MAP REGISTER TO RESPOND
001260  000000                  HIGEST: .WORD   0               ;HOLDS NUMBER TO PUT IN PAR TO CAUSE THE
                                                                ;HIGHEST USABLE MAP REGISTER TO RESPOND
001262  000000                  UBMLOW: .WORD   0               ;HOLDS NUMBER TO PUT IN PAR TO SIGNAL 1ST
                                                                ;ADDRESS OF UNIBUS MEMORY
001264  000000                  UBMHI:  .WORD   0               ;HOLDS NUMBER TO PUT IN PAR TO SIGNAL LAST
                                                                ;BLOCK OF 4K OF UNIBUS MEMORY
001266  000000                  MMRLOW: .WORD   0               ;HOLDS LOWEST MAP REGISTER NUMBER FROM 'LOWEST:'
001270  000000                  MMRHI:  .WORD   0               ;HOLDS HIGHEST MAP REGISTER NUMBER FROM 'HIGEST:'
001272  000000                  UBRLOW: .WORD   0               ;HOLDS LOWEST MAP REGISTER NUMBER FROM 'UBMLOW:'
001274  000000                  UBRHI:  .WORD   0               ;HOLDS HIGHEST MAP REGISTER NUMBER FROM 'UBMHI:'
001276  000000                  BUPWIN: .WORD   0               ;HOLDS LOWEST USEABLE PAR OF UPPER WINDOW
001300  000000                  LREGL:  .WORD   0               ;HOLDS I/O PAGE ADDR OF LOW 16 BITS OF
                                                                ;THE LOWEST USABLE MAP REGISTER
001302  000000                  LREGU:  .WORD   0               ;HOLDS I/O PAGE ADDR OF HIGH 6 BITS OF
                                                                ;OF THE LOWEST USABLE MAP REGISTER
001304  000000                  LMAH:   .WORD   0               ;LOCATION TO HOLD LMA HIGH REGISTER CONTENTS
001306  000000                  LMAL:   .WORD   0               ;LOCATION TO HOLD LMA LOW REGISTER CONTENTS
001310  000000                  UBM24L: .WORD   0               ;LOCATION USED TO HOLD LMA LOW EXPECTED VALUE
001312  000000                  UBM24U: .WORD   0               ;LOCATION USED TO HOLD LMA HIGH EXPECTED VALUE
001314  000000                  UBM24P: .WORD   0               ;LOCATION USED TO HOLD LMALOW PRELOAD VALUE
001316  000000                  NUMOFK: .WORD   0               ;LOCATION TO HOLD NUMBER OF K OF UB MEMORY
001320  000000                  ERRCNT: .WORD   0               ;MULTIPLE ERROR ERROR COUNTER
001322  000000                  CNTR:   .WORD   0               ;AUXILIARY COUNTER
001324  000000                  FLAG:   .WORD   0               ;FLAG TO INDICATE TO LAST PROGRAM PASS N
001326  000000                  CPUEXP: .WORD   0               ;HOLDS THE EXPECTED CPU ERROR CODE
001330  000000                  PCPUER: .WORD   0               ;HOLDS RECEIVED CPU ERROR CONDITION
001332  000000                  PPARER: .WORD   0               ;HOLDS RECEIVED PARITY ERROR CONDITION
001334  000000                  PCONTR: .WORD   0               ;HOLDS CONTENTS OF CONTROL REGISTER
001336  000000                  PMAINT: .WORD   0               ;HOLDS CONTENTS OF MAINTENENCE REGISTER
001340  000000                  BADPC:  .WORD   0               ;HOLDS PC OF INST THAT CAUSED TRAP
001342  000000                  OLDPC:  .WORD   0               ;HOLDS THE RETURN ADDRESS AFTER A TRAP
001344  000000                  OLDPS:  .WORD   0               ;HOLDS THE OLD PROCESSOR STATUS
001346  000000                  OLDPSW: .WORD   0               ;HOLDS OLD PSW FOR TBITRESTORE
001350  000000                  PMMR0:  .WORD   0               ;HOLDS CONTENTS OF MMR0 AFTER TRAP
001352  000000                  PMMR1:  .WORD   0               ;HOLDS CONTENTS OF MMR1 AFTER TRAP
001354  000000                  PMMR2:  .WORD   0               ;HOLDS CONTENTS OF MMR2 AFTER TRAP
001356  000000                  RSIZE:  .WORD   0               ;WILL HOLD P.A.R. DATA FOR TOP OF MEMORY
001360  000000                  RETRY:  .WORD   0               ;RETRY FLAG IN CASE OF PARITY ABORTS
001362  000000                  NXTTST: .WORD   0               ;LOCATION TO HOLD ESCAPE ADDRESS ON
                                                                ;PARITY ERRORS.
001364  000200                  DATA:   .WORD   200             ;PATTERN TO BE USED TO LOAD INTO MEMORY
```

```
                                .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


     001366                     $ERRTB:
1497                            ;ITEM 1
1498 001366  024160                     .WORD   EM1     ;NOT THE CORRECT CPU TRAP CONDITION THROUGH ERRVEC (#004)
1499 001370  030121                     .WORD   DH1     ;RECEIVD EXPECTD TESTNO  PC AT ABORT
1500 001372  032340                     .WORD   DT1     ;PCPUER,CPUEXP,$TESTN,BADPC,0
1501 001374  033641                     .WORD   DF1     ; 0, 0, 0, 0
1502
1503                            ;ITEM 2
1504 001376  024245                     .WORD   EM2     ;UNEXPECTED CPU TRAP THROUGH ERRVEC (#004)
1505 001400  030160                     .WORD   DH2     ;RECEIVD TESTNO  PC AT ABORT
1506 001402  032352                     .WORD   DT2     ;PCPUER,$TESTN,BADPC,0
1507 001404  033641                     .WORD   DF1     ; 0, 0, 0
1508
1509                            ;ITEM 3
1510 001406  024317                     .WORD   EM3     ;MEMORY MANAGEMENT TRAP, MEMORY MANAGEMENT STATUS REGISTERS
1511 001410  030207                     .WORD   DH3     ;STATUS  AUTOI/D VIRTADR
1512                                                    ;REGISTR REGISTR REGISTR TESTNO  PC AT ABORT
1513 001412  032362                     .WORD   DT3     ;PMMR0,PMMR1,PMMR2,$TESTN,BADPC,0
1514 001414  033641                     .WORD   DF1     ; 0, 0, 0, 0, 0
1515
1516                            ;ITEM 4
1517 001416  024425                     .WORD   EM4     ;SUMMARY OF MAP REGISTERS THAT TIMED OUT ON READ
1518 001420  030306                     .WORD   DH4     ;REGADRS   REGADRS
1519                                                    ; "OR"      "AND"     #ERRORS TESTNO  ERR PC
1520 001422  032376                     .WORD   DT4     ;ADDROR,ADRAND,ERRCNT,$TESTN,$ERRPC,0
1521 001424  033646                     .WORD   DF4     ; 2, 2, 1, 0, 0
1522
1523                            ;ITEM 5
1524 001426  024505                     .WORD   EM5     ;SUMMARY OF DUAL ADDRESSING ERRORS ON LOADING MAP REGISTERS
1525 001430  030403                     .WORD   DH5     ;REGLOAD   REGLOAD   REGDUAL   REGDUAL
1526                                                    ; "OR"      "AND"     "OR"      "AND"     #ERRORS TESTNO
1527 001432  032412                     .WORD   DT5     ;ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,$TESTN,0
1528 001434  033653                     .WORD   DF5     ; 2, 2, 2, 2, 1, 0
1529
1530                            ;ITEM 6
1531 001436  024600                     .WORD   EM6     ;SUMMARY OF BIT PATTERN FAILURES IN LOWER 16 BITS OF MAP REGISTERS
1532 001440  030540                     .WORD   DH6     ;MAPREG    MAPREG    EXPECTD EXPECTD RECEIVD RECEIVD
1533                                                    ; "OR"      "AND"     "OR"      "AND"     "OR"      "AND"     #ERRORS TESTNO
1534 001442  032430                     .WORD   DT6     ;ADDROR,ADRAND,PATTOR,PATAND,DATAOR,DATAND,ERRCNT,$TESTN,0
1535 001444  033661                     .WORD   DF6     ; 2, 2, 0, 0, 0, 0, 1, 0
```

```
1536                            ;ITEM 7
1537 001446  024702                     .WORD   EM7     ;SUMMARY OF BIT PATTERN FAILURES IN UPPER 6 BITS OF MAP REGISTERS
1538 001450  030540                     .WORD   DH6     ;MAPREG    MAPREG    EXPECTD EXPECTD RECEIVD RECEIVD
1539                                                    ; "OR"      "AND"     "OR"    "AND"   "OR"    "AND"   #ERRORS TESTNO
1540 001452  032430                     .WORD   DT6     ;ADDROR,ADRAND,PATTOR,PATAND,DATAOR,DATAND,ERRCNT,$TESTN,0
1541 001454  033661                     .WORD   DF6     ; 2, 2, 0, 0, 0, 0, 1, 0
1542
1543                            ;ITEM 10
1544 001456  025003                     .WORD   EM10    ;CAN'T GET TO MAIN MEMORY FROM UNIBUS WITH THE MAP OFF
1545                                                    ;SO JUMPING TO THE SIZE JUMPER TEST FOR VERIFICATION
1546 001460  030727                     .WORD   DH10    ;TESTNO  ERR PC
1547 001462  032452                     .WORD   DT10    ;$TESTN,$ERRPC,0
1548 001464  033641                     .WORD   DF1     ;0, 0
1549
1550                            ;ITEM 11
1551 001466  025155                     .WORD   EM11    ;SUMMARY OF COUNT PATTERN FAILURES ON THE UNIBUS DATA PATH
1552 001470  030754                     .WORD   DH11    ;EXPECTD EXPECTD RECEIVD RECEIVD
1553                                                    ; "OR"    "AND"   "OR"    "AND"  #ERRORS TESTNO
1554 001472  032462                     .WORD   DT11    ;PATTOR,PATAND,DATAOR,DATAND,ERRCTN,$TESTN,0
1555 001474  033671                     .WORD   DF11    ; 0, 0, 0, 0, 1, 0
1556
1557                            ;ITEM 12
1558 001476  025247                     .WORD   EM12    ;UNIBUS MAP IS RELOCATING WHEN NOT ENABLED
1559 001500  030727                     .WORD   DH10    ;TESTNO  ERR PC
1560 001502  032452                     .WORD   DT10    ;$TESTN,$ERRPC,0
1561 001504  033641                     .WORD   DF1     ; 0, 0
1562
1563                            ;ITEM 13
1564 001506  025321                     .WORD   EM13    ;CANNOT USE ANY OF THE MAP REGISTERS OR PHYSICAL
1565                                                    ;ADDRESS BIT14 IS STUCK LOW, MUST RESTART PROGRAM
1566                                                    ;IF YOU DON'T LOOP ON THIS PROBLEM.
1567 001510  030727                     .WORD   DH10    ;TESTNO  ERR PC
1568 001512  032452                     .WORD   DT10    ;$TESTN,$ERRPC,0
1569 001514  033641                     .WORD   DF1     ; 0, 0
1570
1571                            ;ITEM 14
1572 001516  025525                     .WORD   EM14    ;SUMMARY OF UNIBUS ADDRESS ERRORS, WITH MAP RELOCATION DISABLED
1573 001520  030754                     .WORD   DH11    ;EXPECTD   EXPECTD   RECEIVD RECEIVD
1574                                                    ; "OR"      "AND"     "OR"    "AND"  #ERRORS TESTNO
1575 001522  032500                     .WORD   DT14    ;ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,$TESTN,0
1576 001524  033677                     .WORD   DF14    ; 2, 2, 0, 0, 1, 0
1577
1578                            ;ITEM 15
1579 001526  025630                     .WORD   EM15    ;MAIN MEMORY TIME OUT OVER THE UNIBUS DID NOT OCCUR PROPERLY.
1580 001530  031111                     .WORD   DH15    ;CONDITN CONDITN
1581                                                    ;EXPECTD RECEIVD TESTNO  ERR PC
1582 001532  032516                     .WORD   DT15    ;CPUEXP,PCPUER,$TESTN,$ERRPC,0
1583 001534  033641                     .WORD   DF1     ; 0, 0, 0, 0
1584
1585                            ;ITEM 16
1586 001536  025723                     .WORD   EM16    ;SUMMARY OF DUAL MAPPING ERRORS
1587 001540  030754                     .WORD   DH11    ;EXPECTD   EXPECTD   RECEIVD   RECEIVD
1588                                                    ; "OR"      "AND"     "OR"      "AND"    #ERRORS TESTNO
1589 001542  032500                     .WORD   DT14    ;ADDROR,ADRAND,DATAOR,DATAND,$ERRPC,$TESTN,0
1590 001544  033653                     .WORD   DF5     ; 2, 2, 2, 2, 1, 0
```

ERROR POINTER TABLE

```
1591                                    ;ITEM 17
1592 001546  026021                             .WORD   EM17    ;NO UNIBUS MEMORY EXISTS
1593 001550  030727                             .WORD   DH10    ;TESTNO  ERR PC
1594 001552  032452                             .WORD   DT10    ;$TESTN,$ERRPC,0
1595 001554  033641                             .WORD   DF1     ; 0, 0
1596
1597                                    ;ITEM 20
1598 001556  026051                             .WORD   EM20    ;INTERRUPT/ABORT LOGIC TESTS TRAP TO LOCATION 114 DID NOT OCCUR
1599 001560  030727                             .WORD   DH10    ;TESTNO  ERR PC
1600 001562  032452                             .WORD   DT10    ;$TESTN,$ERRPC,0
1601 001564  033641                             .WORD   DF1     ; 0, 0
1602
1603                                    ;ITEM 21
1604 001566  026150                             .WORD   EM21    ;INTERRUPT/ABORT TESTS R4 WAS OVERWRITTEN WITH
1605                                            ;DATA INDICATING THAT INSTRUCTION WAS NOT ABORTED
1606 001570  030727                             .WORD   DH10    ;TESTNO  ERR PC
1607 001572  032452                             .WORD   DT10    ;$TESTN,$ERRPC,0
1608 001574  033641                             .WORD   DF1     ; 0, 0
1609
1610                                    ;ITEM 22
1611 001576  026226                             .WORD   EM22    ;INTERRUPT/ABORT TESTS TRAP DID NOT OCCUR DUE TO ABORT
1612 001600  030727                             .WORD   DH10    ;TESTNO  ERR PC
1613 001602  032452                             .WORD   DT10    ;$TESTN,$ERRPC,0
1614 001604  033641                             .WORD   DF1     ; 0, 0
1615
1616                                    ;ITEM 23
1617 001606  026314                             .WORD   EM23    ;LMA NOT LOADED PROPERLY
1618 001610  031170                             .WORD   DH23    ;TESTNO  ERR PC  LMAEXP    LMARCV
1619 001612  032530                             .WORD   DT23    ;$TESTN,$ERRPC,EADRES,EADRS2,0
1620 001614  033705                             .WORD   DF23    ; 0, 0, 2, 2
1621
1622                                    ;ITEM 24
1623 001616  026344                             .WORD   EM24    ;LMA FORCE JUMPER BIT NOT ZERO
1624 001620  031231                             .WORD   DH24    ;TESTNO  ERR PC  LMAEXP  LMARCV
1625 001622  032542                             .WORD   DT24    ;$TESTN,$ERRPC,$REG1,LMAHI,0
1626 001624  033641                             .WORD   DF1     ; 0, 0, 0, 0
1627
1628                                    ;ITEM 25
1629 001626  026402                             .WORD   EM25    ;LMA FORCE JUMPER BIT NOT SET
1630 001630  031231                             .WORD   DH24    ;TESTNO  ERR PC  LMAEXP  LMARCV
1631 001632  032542                             .WORD   DT24    ;$TESTN,$ERRPC,$REG1,LMAHI,0
1632 001634  033641                             .WORD   DF1     ; 0, 0, 0, 0
1633
1634                                    ;ITEM 26
1635 001636  026437                             .WORD   EM26    ;LMA CONTROL BITS INCORRECT
1636 001640  031231                             .WORD   DH24    ;TESTNO  ERR PC  LMAEXP  LMARCV
1637 001642  032554                             .WORD   DT26    ;$TESTN,$ERRPC,$TMP0,$REG2,0
1638 001644  033641                             .WORD   DF1     ; 0, 0, 0, 0
1639
1640                                    ;ITEM 27
1641 001646  026472                             .WORD   EM27    ;FORCE JUMPER BIT FAILS TO REVERT MAP REGISTER STATUS TO DEFAULT
1642 001650  031270                             .WORD   DH27    ;TESTNO  ERR PC  LMARCV  KIPAR4
1643 001652  032566                             .WORD   DT27    ;$TESTN,$ERRPC,$TMP0,KIPAR4,0
1644 001654  033641                             .WORD   DF1     ; 0, 0, 0
```

ERROR POINTER TABLE

```
1645                                    ;ITEM 30
1646 001656  026572                             .WORD   EM30    ;KIPAR5 NOT LOADED PROPERLY
1647 001660  031327                             .WORD   DH30    ;TESTNO  ERR PC  PR5EXP  PR5RCV
1648 001662  032600                             .WORD   DT30    ;$TESTN,$ERRPC,$TMP5,KIPAR5,0
1649 001664  033641                             .WORD   DF1     ; 0, 0, 0, 0
```

ERROR POINTER TABLE

```
1650 001666                        ER200:                  ;THIS IS THE STARTING POINT FOR ERROR MESSAGES
1651                                                       ;201 THROUGH 377.  THEY ARE USED FOR MULTIPLE
1652                                                       ;ERROR MESSAGES.
1653
1654                               ;ITEM 201
1655 001666  026625                       .WORD   EM201   ;THE FOLLOWING REGISTERS TIMED OUT WHEN READ
1656 001670  031366                       .WORD   DH201   ;REGADRS TESTNO  ERR PC
1657 001672  032612                       .WORD   DT201   ;EADRES,$TESTN,$ERRPC,0
1658 001674  033711                       .WORD   DF201   ; 2, 0, 0
1659
1660                               ;ITEM 202
1661 001676  026701                       .WORD   EM202   ;THE FOLLOWING ARE DUAL ADDRESSING ERRORS IN THE UNIBUS MAP
1662 001700  031415                       .WORD   DH202   ;MAPREG    MAPREG    NON-ZER
1663                                                       ;TESTING   DUALED    CONTNTS TESTNO  ERR PC
1664 001702  032622                       .WORD   DT202   ;EADRES,EADRS2,$TMP3,$TESTN,$ERRPC,0
1665 001704  033661                       .WORD   DF6     ; 2, 2, 0, 0, 0
1666
1667                               ;ITEM 203
1668 001706  026774                       .WORD   EM203   ;THE BIT PATTERN THROUGH THE MAP REGISTERS FAILED
1669 001710  031524                       .WORD   DH203   ;REGADRS   PATTRN  EXPCTD  RECEVD  TESTNO  ERR PC
1670 001712  032636                       .WORD   DT203   ;EADRS2,$TMP0,$REG4,$REG3,$TESTN,$ERRPC,0
1671 001714  033711                       .WORD   DF201   ; 2, 0, 0, 0, 0, 0
1672
1673                               ;ITEM 204
1674 001716  027055                       .WORD   EM204   ;UNIBUS DATA PATH COUNT PATTERN FAILURE
1675 001720  031605                       .WORD   DH204   ;EXPECTD RECEIVD ADDRSLOAD TESTNO  ERR PC
1676 001722  032654                       .WORD   DT204   ;$TMP0,$TMP1,$REG2,$TESTN,$ERRPC,0
1677 001724  033717                       .WORD   DF204   ;0, 0, 3, 0, 0
1678
1679                               ;ITEM 205
1680 001726  027124                       .WORD   EM205   ;UNIBUS ADDRESSING ERRORS, MAP RELOCATION DISABLED
1681 001730  031656                       .WORD   DH205   ;ADDRESS   ADDRESS
1682                                                       ;EXPECTD   RECEIVD   TESTNO ERR PC
1683 001732  032670                       .WORD   DT205   ;EADRES,EADRS2,$TESTN,$ERRPC,0
1684 001734  033677                       .WORD   DF14    ; 2, 2, 0, 0
1685
1686                               ;ITEM 206
1687 001736  027206                       .WORD   EM206   ;DATA PATTERN NOT CORRECT
1688 001740  031743                       .WORD   DH206   ;ADDRESS  EXPCTD  RECVED  TESTNO  ERR PC
1689 001742  032702                       .WORD   DT206   ;EADRES,$TMP4,$TMP5,$TESTN,$ERRPC,2
1690 001744  033711                       .WORD   DF201   ; 2, 0, 0, 0, 0
1691
1692                               ;ITEM 207
1693 001746  027237                       .WORD   EM207   ;REFERENCED MAP REGISTER 0 WITH ADDRESS ONE BIT DIFFERENT THAN 17770
1694 001750  032013                       .WORD   DH207   ;ADDRUSED  BITDIFF TESTNO  ERR PC
1695 001752  032716                       .WORD   DT207   ;EADRES,$REG0,$TESTN,$ERRPC,0
1696 001754  033711                       .WORD   DF201   ;2, 0, 0, 0
1697
1698                               ;ITEM 210
1699 001756  027346                       .WORD   EM210   ;MAP REGISTER UNDER TEST DID NOT RESPOND IN DUAL MAPPING TEST
1700 001760  032054                       .WORD   DH210   ;TESTNO  ERR PC MAPREGADR
1701 001762  032730                       .WORD   DT210   ;$TESTN,$ERRPC,EADRES,0
1702 001764  033724                       .WORD   DF210   ; 0, 0, 2
```

```
                                ;ITEM 211
001766  027446                          .WORD   EM211   ;RELOCATION THROUGH THE MAP WAS NOT CORRECT, CARRY PROPAGATION
                                                        ;TEST BEING RUN OVER UNIBUS
001770  032106                          .WORD   DH211   ;CORRECT   EXPECTD RECEIVD
                                                        ;ADDRESS   DATA    FROM UB TESTNO  ERR PC
001772  032740                          .WORD   DT211   ;EADRES,$REG3,$REG2,$TESTN,$ERRPC,0
001774  033711                          .WORD   DF201   ; 2, 0, 0, 0, 0

                                ;ITEM 212
001776  027604                          .WORD   EM212   ;MAIN MEMORY TIME OUT OVER THE UNIBUS DID NOT OCCUR PROPERLY.
                                                        ;TEST BEING RUN OVER UNIBUS
002000  032106                          .WORD   DH211   ;CONDITN CONDITN
                                                        ;EXPECTD RECEIVD TESTNO  ERR PC
002002  032740                          .WORD   DT211   ;CPUEXP,PCPUER,$TESTN,$ERRPC,0
002004  033711                          .WORD   DF201   ; 0, 0, 0, 0

                                ;ITEM 213
002006  027737                          .WORD   EM213   ;MAP REGISTER ENABLED WHEN DDW SAYS IT SHOULD BE DISABLED
002010  032270                          .WORD   DH213   ;TESTNO  ERR PC  REG NO  DDWDAT  DDWADR
002012  032766                          .WORD   DT213   ;$TESTN,$ERRPC,$TMP0,$TMP1,$REG5,0
002014  033641                          .WORD   DF1     ; 0, 0, 0, 0, 0

                                ;ITEM 214
002016  030030                          .WORD   EM214   ;MAP REGISTER DISABLED WHEN DDW SAYS IT SHOULD BE ENABLED
002020  032270                          .WORD   DH213   ;TESTNO  ERR PC  REG NO  DDWDAT  DDWADR
002022  032766                          .WORD   DT213   ;$TESTN,$ERRPC,$TMP0,$TMP1,$REG5,0
002024  033641                          .WORD   DF1     ; 0, 0, 0, 0, 0
```

SOFTWARE SWITCH REGISTER LOCATION

```
                                .SBTTL  SOFTWARE SWITCH REGISTER LOCATION
                                        .$Y=.           ;SAVE ADDRESS LOCATION
                                        .=176           ;ADDRESS TO SOFTWARE SWITCH REGISTER LOCATION
000176  000000                  $SSWR:  .WORD   0       ;LOCATION FOR SOFTWARE SWITCH REGISTER
                                        .=.$Y           ;RETURN TO PREVIOUS ADDRESS LOCATION
```

```
                                .SBTTL  ERROR MESSAGE TYPE OUT ROUTINE
                                ;;*****************************************************************
                                ;*
                                ;*      THIS SUBROUTINE IS CALLED BY THE ERROR HANDLER TO TYPE
                                ;*      THE ERROR MESSAGES.  IT PICKS UP THE ITEM BYTE ($ITEMB) NUMBER
                                ;*      AND USES THAT TO INDEX THROUGH THE ERROR TABLE.  THE ERROR
                                ;*      TABLE STARTS AT "$ERRTB" AND HAS FOUR (4) POINTERS FOR EACH
                                ;*      ENTRY, 'EM', 'DH', 'DT', 'DF'.  THE 'EM' POINTS TO THE ERROR
                                ;*      MESSAGE WHICH IS AN ASCIZ STRING.  THE 'DH' POINTS TO THE DATA
                                ;*      HEADER WHICH IS ANOTHER ASCIZ STRING.  THE 'DT' POINTS TO THE
                                ;*      DATA TABLE WHICH IS A GROUP OF WORDS CONTAINING THE ADDRESSES
                                ;*      OF THE DATA TO BY TYPED.  THE FORMAT OF THIS DATA IS
                                ;*      CONTROLLED BY THE 'DF' WHICH IS THE POINTER TO THE DATA FORMAT.
                                ;*      THE DATA FORMAT IS A GROUP OF BYTES WHICH CONTAIN NUMBERS
                                ;*      THAT CORRESPOND TO DIFFERENT TYPING FORMATS.
                                ;*      0       -16 BIT OCTAL FORMAT
                                ;*      1       -DECIMAL FORMAT
                                ;*      2       -22 BIT OCTAL FORMAT.  DATA IS LOWER 16 BITS OF THE
                                ;*               PHYSICAL ADDRESS, UPPER 6 BITS ARE ADJACENT TO LOWER 16
                                ;*      3       -22 BIT OCTAL FORMAT.  DATA IS THE 16 BIT VIRTUAL
                                ;*               ADDRESS IN KERNEL I-SPACE.
                                ;*      4       -18 BIT OCTAL FORMAT.  DATA IS A 16 BIT NUMBER THAT
                                ;*               WILL BE CONVERTED INTO A UNIBUS ADDRESS BY LEFT
                                ;*               SHIFTING IT 6 BITS.
                                ;*      5       -16 BIT OCTAL, SUPPRESS LEADING ZEROS
                                ;*      6       -16 BIT DECIMAL, SUPPRESS SPACES
                                ;*      IF YOU SHOULD HAVE A NEED TO JUST TYPE A STRING OF
                                ;*      NUMBERS, SET UP YOUR CODE THIS WAY:
                                ;*      MOV     #CONTINUE,-(SP) ;MOVE THE ADFRESS OF THE INSTRUCTION AFTER THE
                                ;*                              ;JUMP TO THE STACK
                                ;*      MOV     R0,-(SP)        ;SAVE R0
                                ;*      MOV     R1,-(SP)        ;AND R1 ON THE STACK
                                ;*      MOV     DTNAME,R0       ;MOVE THE ADDRESS OF THE DATA TABLE TO R0
                                ;*      JMP     TYPDAT          ;SUBROUTINE IDENTIFIED IN CENTER OF THIS ROUTINE
                                ;* CONTINUE: NEXT INSTRUCTION
                                ;*      AT A CONVENIENT SPOT, ALOCATE THE FOLLOWING:
                                ;*DTNAME: .WORD DTLIST,DFNAME   ;IDENTIFY THE LIST NAME AND DATA FORMAT BELOW
                                ;*DFNAME: .BYTE N,N,N,N,ETC.    ;CONSTRUCT YOUR OWN DATA FORMAT LINE
                                ;*      .EVEN
                                ;*DTLIST: VAR1,VAR2,VAR3,VAR4,.....,$CRLF,0      ;VARIABLES YOU WANT TYPED
                                ;*
                                ;;*****************************************************************
002026  010046                  ERTYPE: MOV     R0,-(KSP)       ;SAVE R0 ON STACK
002030  005000                          CLR     R0              ;CLEAR R0
002032  113700  001112                  MOVB    $ITEMB,R0       ;PUT ITEM NUMBER IN R0
002036  001004                          BNE     1$              ;BRANCH IF IT IS NON-ZERO
002040  013746  001114                  MOV     $ERRPC,-(KSP)   ;PUT ERROR PC ON STACK FOR TYPING
002044  104402                          TYPOC                   ;TYPE FAILING PC
002046  000565                          BR      13$             ;GO TO RETURN
002050  122700  000177          1$:     CMPB    #177,R0         ;SEE IF THIS IS THE PWR MON BIT ERROR   ;DPM001
002054  001003                          BNE     200$            ;BRANCH IF NOT TO CALL ERROR
002056  012700  002432                  MOV     #PMBECW,R0      ;MOVE ADDRESS OF SPECIAL DATA HEADER TO R0
002062  000451                          BR      210$            ;BRANCH TO CALL ERROR
002064  005300                  200$:   DEC     R0              ;ADJUST ITEM NUMBER TO BE A POINTER
002066  072027  000003                  ASH     #3,R0           ;LEFT SHIFT ITEM NO. 3 PLACES
002072  100041                          BPL     22$             ;BRANCH IF ITEM NUMBER IS LESS THAN 200
002074  023727  001320  000020          CMP     ERRCNT,#20      ;;* SEE IF 20 (OCTAL) ERRORS HAVE PRINTED
```

```
1792 002102 002410                          BLT     40$             ;;* BRANCH TO PRINT THE ERROR IF LESS
1793 002104 001404                          BEQ     41$             ;;* BRANCH TO TYPE NO MORE DATA LINES IF EQUAL
1794 002106 062766 000004 000002            ADD     #4,2(KSP)       ;;* CORRECT PC RETURN TO RETURN AFTER <CRLF> PRINT
1795 002114 000542                          BR      13$             ;;* GO TO RETURN
1796 002116 104401 006421           41$:    TYPE    ,NOMORE         ;;* TYPE MESSAGE TO ANNOUNCE NO MORE PRINTING OF ERRORS
1797 002122 000537                          BR      13$             ;;* GO TO RETURN
1798 002124 022737 000001 001320    40$:    CMP     #1,ERRCNT       ;;* SEE IF THIS IS THE FIRST ERROR
1799 002132 001415                          BEQ     21$             ;;* BRANCH IF IT WAS AND GO TYPE ERROR MESSAGE
1800 002134 032777 000200 176774            BIT     #SW7,@SWR       ;SEE IF SWITCH 7 IS UP
1801 002142 001404                          BEQ     20$             ;BRANCH IF SWITCH NOT UP AND TYPE DATA
1802 002144 062766 000004 000002            ADD     #4,2(KSP)       ;SKIP 'TYPE   ,$CRLF' IF SW 7 IS UP
1803                                                                ;INHIBIT MULTIPLE ERROR TYPEOUTS
1804 002152 000523                          BR      13$             ;BRANCH TO EXIT
1805 002154 042700 177400           20$:    BIC     #177400,R0      ;CLEAR UPPER BYTE OF R0
1806 002160 062700 001672                   ADD     #ER200+4,R0     ;POINT TO DATA TABLE ENTRY
1807 002164 000426                          BR      5$              ;GO TYPE DATA TABLE
1808 002166 042700 177000           21$:    BIC     #177000,R0      ;CLEAR UPPER BYTE OF R0
1809 002172 062700 000300                   ADD     #<ER200-$ERRTB>,R0 ;ADD DIFFERENCE BETWEEN
1810                                                                ;ITEM 1 AND ITEM 201
1811                                                        ;:GET POINTER TO ERROR MESSAGE AND TYPE IT
1812                                                        ;:IF THE POINTER IS NOT ZERO
1813 002176 104401 001223           22$:    TYPE    ,$CRLF          ;TYPE A <CRLF>
1814 002202 062700 001366                   ADD     #$ERRTB,R0      ;ADD BASE OF ERROR TABLE
1815 002206 012037 002216           210$:   MOV     (R0)+,2$        ;P M MESSAGE POINTER IN TYPE STATEMENT
1816 002212 001404                          BEQ     3$              ;BRANCH IF NO ERROR MESSAGE
1817 002214 104401                          TYPE                    ;TYPE ERROR MESSAGE
1818 002216 000000                  2$:     .WORD   0               ;POINTER TO ERROR MESSAGE
1819 002220 104401 001223                   TYPE    ,$CRLF          ;TYPE CRLF
1820                                                        ;:GET THE POINTER TO THE DATA HEADER AND
1821                                                        ;:TYPE IT IF THE POINTER IS NOT ZERO
1822 002224 012037 002234           3$:     MOV     (R0)+,4$        ;PUT HEADER POINTER IN TYPE STATEMENT
1823 002230 001404                          BEQ     5$              ;BRANCH IF NO DATA HEADER
1824 002232 104401                          TYPE                    ;TYPE THE DATA HEADER
1825 002234 000000                  4$:     .WORD   0               ;POINTER TO DATA HEADER
1826 002236 104401 001223                   TYPE    ,$CRLF          ;TYPE CRLF
1827                                                        ;:THIS IS THE START OF THE DATA OUTPUT IF THE
1828                                                        ;:DATA POINTER IS NOT ZERO.  R0 POINTS TO THE
1829                                                        ;:DATA FORMAT, R1 POINTS TO THE ADDRESS OF
1830                                                        ;:THE DATA WORDS.
1831 002242 010146                  5$:     MOV     R1,-(KSP)       ;SAVE R1 ON THE STACK
1832        002244                  TYPDAT=.
1833 002244 012001                          MOV     (R0)+,R1        ;PUT DATA TABLE POINTER IN R1
1834 002246 001464                          BEQ     12$             ;BRANCH IF NO DATA TABLE
1835 002250 012000                          MOV     (R0)+,R0        ;PICK UP DATA FORMAT POINTER
1836 002252 105710                  6$:     TSTB    (R0)            ;IS THIS WORD OCTAL
1837 002254 001003                          BNE     7$              ;BRANCH IF NOT 16-BIT OCTAL
1838                                                        ;:WORD IS 16 BIT OCTAL FORMAT (DF = 0)
1839 00225  013146                          MOV     @(R1)+,-(KSP)   ;PUSH NEXT 16-BIT WORD ON STACK
1840 002260 104402                          TYPOC                   ;TYPE THE WORD ON STACK AS 16 BIT OCTAL
1841 002262 000451                          BR      11$             ;GET READY FOR NEXT WORD
1842 002264 122710 000001           7$:     CMPB    #1,(R0)         ;IS THE WORD DECIMAL
1843 002270 001003                          BNE     8$              ;BRANCH IF NOT DECIMAL
1844                                                        ;:WORD IS DECIMAL FORMAT (DF = 1)
1845 002272 013146                          MOV     @(R1)+,-(KSP)   ;PUSH NEXT 16-BIT WORD ON STACK
1846 002274 104405                          TYPDS                   ;TYPE THE WORD ON STACK AS DECIMAL
1847 002276 000443                          BR      11$             ;GET READY FOR NEXT WORD
1848 002300 122710 000002           8$:     CMPB    #2,(R0)         ;IS WORD 22-BIT PHYSICAL ADDRESS
```

```
1849 002304  001012                          BNE     9$              ;BRANCH IF NOT 22-BIT PHYSICAL ADDR
1850                                                 ;:WORD IS 22-BIT PHYSICAL FORMAT (DF = 2)
1851 002306  012146                          MOV     (R1)+,-(KSP)    ;PUSH NEXT 16-BIT WORD ON STACK
1852 002310  004737  024040                 JSR     PC,$DB2O        ;CONVERT NUMBER TO OCTAL ASCIZ
1853 002314  062716  000003                 ADD     #3,(KSP)        ;ONLY WANT 8 DIGITS
1854 002320  012637  002326                 MOV     (KSP)+,30$      ;PUT POINTER AFTER 'TYPE' CALL
1855 002324  104401                          TYPE                    ;TYPE ASCIZ STRING
1856 002326  000000                 30$:    .WORD   0               ;WORD HOLDS POINTER TO ASCIZ STRING
1857 002330  000426                          BR      11$             ;GET READY FOR NEXT WORD
1858 002332  122710  000003         9$:     CMPB    #3,(R0)         ;IS THIS A 16-BIT VIRTUAL ADDRESS
1859 002336  001004                          BNE     10$             ;BRANCH IF NOT 16-BIT VIRT. ADDR.
1860                                                 ;:WORD IS 22-BIT VIRTUAL ADDRESS FORMAT
1861                                                 ;:KERNEL I-SPACE ASSUMED.  (DF = 3)
1862 002340  013146                          MOV     @(R1)+,-(KSP)   ;PUSH NEXT 16-BIT WORD ON STACK
1863 002342  004737  002542                 JSR     PC,TYPVAD       ;GO TYPE 22-BIT ADDRESS FROM 16-BIT V.A.
1864 002346  000417                          BR      11$             ;GET READY FOR NEXT WORD
1865 002350  122710  000004         10$:    CMPB    #4,(R0)         ;IS THIS A 16 BIT NUMBER TO BE CONVERTED TO
1866                                                                 ;AN 18 BIT UNIBUS ADDRESS LEFT SHIFTED 6?
1867 002354  001003                          BNE     100$            ;SKIP OVER FORMAT 4 ROUTINE IF NOT
1868                                                 ;:WORD IS FORMAT 4.  DATA WORD IS A UNIBUS
1869                                                 ;:ADDRESS OUTPUT WILL BE 18-BITS WORD LEFT SHIFTED 6.
1870
1871 002356  004737  002650                 JSR     PC,UBADDR       ;CONVERT TO 18-BIT UNIBUS ADDR AND TYPE
1872 002362  000411                          BR      11$             ;GET READY FOR NEXT WORD
1873 002364  122710  000005         100$:   CMPB    #5,(R0)         ;IS THIS A 16 BIT NUMBER TO BE PRINTED AS
1874                                                                 ;OCTAL WITH LEADING ZEROS SUPPRESSED?
1875 002370  001004                          BNE     110$            ;BRANCH TO DECIMAL LEADING SPACES SUPPRESS ROUTINE
1876                                                 ;:WORD IS FORMAT 5.  DATA WORD IS TO BE
1877                                                 ;:PRINTED IN OCTAL, LEADING ZEROS SUPPRESSED.
1878 002372  013146                          MOV     @(R1)+,-(KSP)   ;PUSH NEXT 16-BIT WORD ON STACK
1879 002374  104403                          TYPOS                   ;GO TYPE OCTAL SUPPRESS LEADING ZEROS
1880 002376     006                          .BYTE   6               ;TYPE 6 DIGITS AND
1881 002377     000                          .BYTE   0               ;SUPPRESS LEADING ZEROS
1882 002400  000402                          BR      11$             ;GET READY FOR NEXT WORD
1883 002402                         110$:                            ;:WORD IS FORMAT 6. DATA WORD IS TO BE
1884                                                 ;:PRINTED IN DECIMAL, LEADING SPACES SUPPRESSED.
1885 002402  013146                          MOV     @(R1)+,-(KSP)   ;PUSH NEXT 16-BIT WORD ON STACK
1886 002404  104405                          TYPDS
1887 002406  005200                 11$:    INC     R0              ;POINT TO NEXT FORMAT BYTE
1888 002410  104401  002426                 TYPE    ,32$            ;TYPE TWO SPACES
1889 002414  005711                          TST     (R1)            ;IS THERE ANOTHER WORD?
1890 002416  001315                          BNE     6$              ;BRANCH IF NOT ALL DONE
1891 002420  012601                 12$:    MOV     (KSP)+,R1       ;RESTORE R1
1892 002422  012600                 13$:    MOV     (KSP)+,R0       ;RESTORE R0
1893 002424  000207                          RTS     PC              ;RETURN TO ERROR ROUTINE
1894 002426     040      040      000  32$:  .ASCIZ  ?  ?            ;TWO SPACES
1895                                          .EVEN
1896 002432  002442  002476  002526  PMBECW: .WORD   PMBECM,PMBECH,PMBECD,PMBECF     ;4 WORDS POINTING TO BELOW
1897 002442     120      117      127  PMBECM: .ASCIZ  ?POWER MONITOR BIT FOUND SET?
1898 002476     124      105      123  PMBECH: .ASCIZ  ?TESTNO  ERR PC  CPUERR?
1899                                          .EVEN
1900 002526  020146  001114  020700  PMBECD: .WORD   $TESTN,$ERRPC,CPSAVE,0
1901 002536     000      000      000  PMBECF: .BYTE   0,0,0,0
```

```
                                .SBTTL  CONVERT 16-BIT VIRTUAL ADDRESS TO 22-BIT PHYSICAL ADDRESS
                                ;;*****************************************************************
                                ;*
                                ;*      THIS ROUTINE IS CALLED BY A 'JSR PC' AFTER THE VIRTUAL ADDRESS
                                ;*      IS PUSHED ON THE KERNEL STACK.  THE V.A. IS THEN LOADED INTO
                                ;*      R1 AND THE UPPER 3 BITS ARE SHIFTED INTO R0 TO SELECT THE
                                ;*      CORRECT KERNEL I-SPACE PAR.  THE LOWER 12 BITS OF THE VIRTUAL
                                ;*      ADDRESS ARE ADDED TO THE PAR AS THEY ARE BY MEMORY MANAGEMENT
                                ;*      AND THE PHYSICAL ADDRESS IS SAVED IN MEMORY TO BE CONVERTED
                                ;*      TO ASCIZ AND TYPED.
                                ;*
                                ;;*****************************************************************
002542  104411                  TYPVAD: SAVREG                          ;SAVE ALL REGISTERS
002544  016601  000002                  MOV     2(KSP),R1               ;PUT VIRTUAL ADDR IN R1
002550  005000                          CLR     R0                      ;CLEAR R0 FOR CALCULATIONS
002552  073027  000003                  ASHC    #3,R0                   ;LEFT SHIFT R0,R1 3 PLACES
002556  006300                          ASL     R0                      ;LEFT SHIFT R0 ONE MORE PLACE
002560  006001                          ROR     R1                      ;RIGHT SHIFT R1 SO OFFSET IS CORRECT
002562  006001                          ROR     R1                      ;RIGHT SHIFT R1
002564  006001                          ROR     R1                      ;RIGHT SHIFT R1
002566  062700  172340                  ADD     #KIPAR0,R0              ;FORM DESIRED PAR ADDR IN R0
002572  011003                          MOV     (R0),R3                 ;PUT CONTENTS OF PAR IN R3
002574  005002                          CLR     R2                      ;CLEAR R2 FOR PHYSICAL ADDR CALCULATIONS
002576  073227  000006                  ASHC    #6,R2                   ;LEFT SHIFT <R2,R3> 6 PLACES
002602  060103                          ADD     R1,R3                   ;ADD OFFSET IN R1 TO BASE IN R3
002604  005502                          ADC     R2                      ;ADD ANY POSSIBLE CARRY TO UPPER 6 BITS
002606  010237  001230                  MOV     R2,PADRSH               ;PUT UPPER 6 BITS OF ADDR IN CORE
002612  010337  001226                  MOV     R3,PADRSL               ;PUT LOWER 16 BITS OF ADDR IN CORE
002616  012746  001226                  MOV     #PADRSL,-(KSP)          ;PUT POINTER TO LOWER 16 BITS ON STACK
002622  004737  024040                  JSR     PC,$DB2O                ;CONVERT NUMBER TO OCTAL ASCIZ
002626  062716  000003                  ADD     #3,(KSP)                ;ONLY TYPE 8 DIGITS
002632  012637  002640                  MOV     (KSP)+,3$               ;PUT POINTER AFTER TYPE INST
002636  104401                          TYPE                            ;TYPE THE 22-BIT VIRTUAL ADDRESS
002640  000000                  3$:     .WORD   0                       ;THIS WORD HOLDS THE POINTER TO
                                                                        ;THE ASCIZ STRING
002642  104412                          RESREG                          ;RESTORE ALL THE REGISTERS
002644  012616                          MOV     (KSP)+,(KSP)            ;LEAVE ONLY RETURN ADDR ON STACK
002646  000207                          RTS     PC                      ;RETURN TO ERROR HANDLER
```

```
                                        .SBTTL  SUBROUTINE TO CONVERT WORD TO A UNIBUS ADDRESS AND TYPE
                                        ;;*****************************************************************
                                        ;*THIS SUBROUTINE IS USED TO CONVERT THE A WORD PUSHED
                                        ;*ON THE STACK INTO A UNIBUS ADDRESS AND TYPE IT AS A
                                        ;*6 DIGIT NUMBER.  IT USES R1 & R0 AND LEAVES
                                        ;*ALL OTHER REGISTERS UNCHANGED.
                                        ;;*****************************************************************
002650  104411                  UBADDR: SAVREG
002652  016601  000002                  MOV     2(KSP),R1       ;LOAD 16 BIT ADDRESS INTO R1
002656  005000                          CLR     R0              ;CLEAR R0 FOR CALCULATIONS
002660  073027  000006                  ASHC    #6,R0           ;LEFT SHIFT <R0:R1> 6 PLACES
002664  010137  001226                  MOV     R1,PADRSL       ;PUT LOWER 16 BITS IN PADRSL
002670  010037  001230                  MOV     R0,PADRSH       ;PUT UPPER 6 BITS IN PADRSH
002674  012746  001226                  MOV     #PADRSL,-(KSP)  ;PUSH POINTER TO WORDS ON STACK
002700  004737  024040                  JSR     PC,$DB2O        ;JUMP TO CONVERT ROUTINE
002704  062716  000005                  ADD     #5,(KSP)        ;ONLY USE LOWER 6 CHARS.
002710  012637  002716                  MOV     (KSP)+,3$       ;PUT POINTER AFTER TYPE CALL.
002714  104401                          TYPE
002716  000000                  3$:     .WORD   0               ;HOLDS POINTER TO FIRST CHAR.
002720  104412                          RESREG
002722  012616                          MOV     (KSP)+,(KSP)    ;LEAVE ONLY RETURN ADDRESS ON STACK
002724  000207                          RTS     PC              ;RETURN TO ERROR TYPE ROUTINE.
```

```
                                        .SBTTL  TURN OFF AND SAVE T-BIT
                                        ;;*****************************************************************
                                        ;;*****************************************************************
                                        ;*               **SUBROUTINES UNIQUE TO THIS PROGRAM**
                                        ;;*****************************************************************
                                        ;;*****************************************************************

                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS TRAP ROUTINE IS REACHED BY THE TRAP CALL 'TBITO'.  IT IS
                                        ;*      USED TO TURN OFF THE T-BIT IF IT IS ON.  THE PROCESSOR STATUS
                                        ;*      IS SAVED IN ''OLDPSW'' SO THAT THE T-BIT CAN BE RESTORED TO ITS
                                        ;*      PREVIOUS STATUS WHEN CONDITIONS WARRANT.
                                        ;*
                                        ;;*****************************************************************
 000020                                 TBIT=BIT4               ;T-BIT IS BIT04 IN PROC. STATUS
002726  032766  000020  000002  TBITOF: BIT     #TBIT,2(KSP)    ;IS THE T-BIT ON?
002734  001406                         BEQ     1$              ;BRANCH TO EXIT IF IT IS NOT ON
002736  016637  000002  001346         MOV     2(KSP),OLDPSW   ;SAVE OLD PSW FOR RESTORING T BIT
002744  042766  000020  000002         BIC     #TBIT,2(KSP)    ;CLEAR T BIT
002752  000006                 1$:     RTT                     ;RETURN TO PROGRAM
```

```
                                        .SBTTL  RESTORE T-BIT TO ITS PREVIOUS CONDITION
                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS TRAP ROUTINE CAN BE REACHED BY THE TRAP CALL 'TBITR'.  IT IS
                                        ;*      USED TO RESTORE THE T-BIT AFTER A PARTICULAR TEST THAT CANNOT
                                        ;*      BE RUN WITH THE T-BIT ON.  IT USES THE PROCESSOR STATUS STORED
                                        ;*      IN ''OLDPSW'' BY 'TBITO', REPLACES THE PS ON THE STACK WITH IT
                                        ;*      AND DOES AN 'RTT'.
                                        ;*
                                        ;;*****************************************************************
002754  013766  001346  000002  TBITRE: MOV     OLDPSW,2(KSP)   ;PUT OLD PSW ON STACK
002762  042737  000020  001346          BIC     #TBIT,OLDPSW    ;CLEAR T-BIT IN ''OLDPSW''
                                                                ;SO THAT IT WON'T BE TURNED ON BY ACCIDENT
002770  000006                          RTT     ;RETURN TO PROGRAM AND INHIBIT T-BIT TRAP AFTER THIS INSTRUCTION
```

```
                                        .SBTTL  SUBROUTINE TO CLEAR ALL OF THE MAP REGISTERS
                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS SUBROUTINE CLEARS ALL OF THE MAP REGISTERS IF MAPPING IS
                                        ;*      DISABLED BY LOADING THE ADDRESS OF MAPL00 INTO R3 AND THEN
                                        ;*      CLEARING THE REGISTER POINTED TO BY R3 UNTIL R3 POINTS ABOVE
                                        ;*      MAPH37.  IF MAPPING IS ENABLED, ALL REGISTERS EXCEPT MAPL1
                                        ;*      IS CLEARED.  THE LOWER WORD OF MAPL1 RECEIVES 20000.  THIS IS
                                        ;*      SO APT CAN PROPERLY MONITOR THE PROGRESS OF THE DIAGNOSTIC.
                                        ;*
                                        ;;*****************************************************************
002772  012703  170200        CLRMAP: MOV     #MAPL0,R3       ;PUT FIRST MAP ADDR IN R3
002776  005023                        CLR     (R3)+           ;CLEAR MAPL0
003000  005023                        CLR     (R3)+           ;CLEAR MAPL0+2
003002  032737  000040  172516        BIT     #BIT5,MMR3      ;SEE IF MAPPING IS ENABLED
003010  001402                        BEQ     1$              ;BRANCH TO CLEAR ALL IF NOT ENABLED
003012  012723  020000                MOV     #20000,(R3)+    ;LOAD 20000 INTO MAPL1 FOR POSSIBLE APT USE
003016  005023                  1$:   CLR     (R3)+           ;CLEAR MAP REGISTERS
003020  022703  170400                CMP     #MAPH37+2,R3    ;SEE IF LAST ADDR+2 IS IN R3
003024  001374                        BNE     1$              ;BRANCH IF NOT DONE YET
003026  000207                        RTS     PC              ;RETURN TO MAIN PROGRAM
```

```
                                .SBTTL  SUBROUTINE TO LOG AND REPORT TIMEOUTS OF MAP REGISTERS
                                ;;*****************************************************************
                                ;*
                                ;*      THIS SUBROUTINE IS USED TO LOG AND REPORT THE FACT THAT A
                                ;*      REFERENCE TO A MAPPING REGISTER TIMED OUT ON THE UNIBUS.  IT
                                ;*      KEEPS A "LOGICAL AND" AND A "LOGICAL OR" OF EACH ADDRESS THAT
                                ;*      TIMES OUT.
                                ;*
                                ;;*****************************************************************
003030  005227                  TIMEOUT:INC     (PC)+           ;INCREMENT ONE TIME GATE
003032  177777                  TOFLAG: .WORD   -1              ;ONE TIME ENTANCE FLAG
003034  001403                          BEQ     10$             ;BRANCH IF FLAG IS NOW ZERO
003036  005237  020142                  INC     $MSGTY          ;INDICATE TO APT A FATAL ERROR OCCURED
003042  000000                          HALT    ;I HAVE ENTERED THIS ROUTINE BEFORE I FINISHED REPORTING THE FIRST ERROR.
                                                                ;THE SECOND ENTRY ADDRESS IS ON THE STACK AND THE
                                                                ;FIRST ERROR CONDITION IS PROBABLY STILL LOCKED UP.
003044  012637  001342          10$:    MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS
003050  012637  001344                  MOV     (KSP)+,OLDPS    ;SAVE OLD PSW
003054  105737  007140                  TSTB    CPUTYP          ;SEE IF THIS IS AN 11/44
003060  001406                          BEQ     1$              ;BRANCH TO CONTINUE IF IT IS
003062  005237  001330                  INC     PCPUER          ;INCREMENT PCPUER TO SHOW A TIMEOUT OCCURED
003066  005737  001326                  TST     CPUEXP          ;SEE IF THERE WAS AN EXPECTED ERROR
003072  001435                          BEQ     3$              ;GO REPORT ERROR IF NONE EXPECTED
003074  000442                          BR      4$              ;BRANCH TO EXIT IF TIMEOUT WAS EXPECTED
003076  013737  177766  001330  1$:     MOV     CPUERR,PCPUER   ;SAVE CPU ERROR REGISTER
003104  013737  001330  177766          MOV     PCPUER,CPUERR   ;CLEAR CPU ERROR REGISTER
003112  023737  001330  001326          CMP     PCPUER,CPUEXP   ;SEE IF EXPECTED CONDITION CAME UP.
003120  001405                          BEQ     2$              ;BRANCH IF IT WAS A TIMEOUT
003122  012737  177777  003032          MOV     #-1,TOFLAG      ;RESET ONE TIME GATE
003130  104001                          ERROR   +1              ;NOT THE CORRECT CPU TRAP THROUGH 4
003132  000423                          BR      4$              ;BRANCH TO EXIT
003134  105737  007140          2$:     TSTB    CPUTYP          ;IS THIS AN 11/24?
003140  001403                          BEQ     25$             ;BRANCH IF NOT
003142  005237  001320                  INC     ERRCNT          ;COUNT THIS AS A TIMEOUT
003146  000415                          BR      4$              ;GO TO EXIT
003150  022737  000020  001326  25$:    CMP     #TIMOUT,CPUEXP  ;SEE IF A TIMEOUT WAS EXPECTED
003156  001411                          BEQ     4$              ;BRANCH TO EXIT THIS ROUTINE IF IT WAS
003160  010046                          MOV     R0,-(SP)        ;PUT VIRTUAL ADDRESS ON STACK FOR ADREXT SUBROUTINE USE
003162  013746  172356                  MOV     KIPAR7,-(SP)    ;PUT PAR ON STACK FOR ADREXT SUBROUTINE USE
003166  004737  003674          3$:     JSR     PC,ADREXT       ;GO SET DATA IN THE 4 WORDS OF ADDROR AND ADRAND
003172  012737  177777  003032          MOV     #-1,TOFLAG      ;RESET ONE TIME GATE
003200  104201                          ERROR   +201            ;THE FOLLOWING REGISTERS TIMED OUT WHEN READ
003202  012737  177777  003032  4$:     MOV     #-1,TOFLAG      ;RESET ONE TIME GATE
003210  013746  001344                  MOV     OLDPS,-(KSP)    ;RESTORE OLD PSW
003214  013746  001342                  MOV     OLDPC,-(KSP)    ;PUSH RETURN ADDRESS BACK ON THE STACK
003220  000006                          RTT                     ;RETURN TO THE TEST
```

```
                                        .SBTTL  CPU TRAP HANDLER ROUTINES
                                        ;;*****************************************************************
                                        ;*                      **TRAP HANDLING ROUTINES**
                                        ;;*****************************************************************

                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS SUBROUTINE WILL HANDLE ALL CPU TRAPS AND ABORTS, THROUGH
                                        ;*      'ERRVEC' (000004).  IF THIS SUBROUTINE IS ENTERED BY A SECOND
                                        ;*      TRAP BEFORE THE FIRST HAS BEEN PROCESSED A HALT IS EXECUTED.
                                        ;*      IF THE WORD 'CPUEXP' IS ZERO, NO TRAP WAS EXPECTED AND AN
                                        ;*      UNEXPECTED ERROR MESSAGE IS GIVEN.  IF THE WORD 'CPUEXP' IS
                                        ;*      NOT ZERO THEN THE CPU ERROR REGISTER 'CPUERR' IS COMPARED WITH
                                        ;*      'CPUEXP' TO SEE IF THE PROPER CONDITION OCCURRED.  'PCPUER' CAN
                                        ;*      BE USED AS A FLAG TO INDICATE THAT A TRAP HAS OCCURRED SINCE IT
                                        ;*      IS LOADED WITH THE ERROR REGISTER IF A TRAP VECTORS HERE
                                        ;*
                                        ;;*****************************************************************
003222  005227                  CPUER:  INC     (PC)+           ;MAKE FLAG ZERO IF FIRST TIME
003224  177777                  CPFLAG: .WORD   -1              ;NEGATIVE ONE FOR A FLAG
003226  001403                          BEQ     10$             ;BRANCH IF FIRST TIME IN
003230  005237  020142                  INC     $MSGTY          ;INDICATE TO APT A FATAL ERROR OCCURED
003234  000000                          HALT                    ;I HAVE ENTERED THIS ROUTINE BEFORE
                                        ;I FINISHED REPORTING THE FIRST ERROR.  THE SECOND ENTRY ADDRESS IS ON
                                        ;THE STACK, AND THE FIRST ERROR CONDITION IS PROBABLY STILL LOCKED UP.
003236  012637  001342          10$:    MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF LOOP
003242  012637  001344                  MOV     (KSP)+,OLDPS    ;SAVE OLD PSW IN CASE OF LOOP
003246  013737  177766  001330          MOV     CPUERR,PCPUER   ;SAVE CPU ERROR REGISTER
003254  013737  001342  001340          MOV     OLDPC,BADPC     ;SAVE PC+2 AT TIME OF ABORT
003262  005737  001326                  TST     CPUEXP          ;SEE IF ANY CONDITION WAS EXPECTED
003266  001414                          BEQ     1$              ;BRANCH IF NO TRAP WAS EXPECTED
003270  105737  007140                  TSTB    CPUTYP          ;SEE IF THIS WAS AN 11/44
003274  001016                          BNE     2$              ;BRANCH TO CONTINUE IF AN 11/24
003276  023737  001330  001326          CMP     PCPUER,CPUEXP   ;SEE IF EXPECTED ERROR OCCURED
003304  001417                          BEQ     3$              ;BRANCH IF ERROR CODES MATCH
003306  012737  177777  003224          MOV     #-1,CPFLAG      ;MAKE FLAG NEGATIVE ONE FOR NEXT TIME
003314  104001                          ERROR   +1              ;NOT THE CORRECT CPU TRAP THROUGH 4
003316  000412                          BR      3$              ;SKIP NEXT INSTRUCTION
003320  012737  177777  003224  1$:     MOV     #-1,CPFLAG      ;MAKE FLAG NEGATIVE ONE FOR NEXT TIME
003326  104002                          ERROR   +2              ;UNEXPECTED CPU TRAP THROUGH 4
003330  000405                          BR      3$              ;SKIP NEXT INSTRUCTION
003332  005237  001320          2$:     INC     ERRCNT          ;INCREMENT ERRCNT TO SHOW AN ERROR FOR 11/24
003336  013737  001326  001330          MOV     CPUEXP,PCPUER   ;PUT EXPECTED CONTENTS IN PCPUER
003344  012737  177777  003224  3$:     MOV     #-1,CPFLAG      ;MAKE FLAG NEGATIVE ONE FOR NEXT TIME
003352  013737  001330  177766          MOV     PCPUER,CPUERR   ;CLEAR CPU ERROR REGISTER
003360  013746  001344                  MOV     OLDPS,-(KSP)    ;PUSH OLD PSW BACK ON STACK
003364  013746  001342                  MOV     OLDPC,-(KSP)    ;PUSH RETURN ADDRESS BACK ON STACK
003370  000006                          RTT                     ;RETURN FROM INTERRUPT OR ABORT
```

```
                                        .SBTTL  MEMORY MANAGEMENT TRAPS AND ABORTS HANDLER ROUTINE
                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS  ROUTINE WILL HANDLE ALL SPURIOUS MEMORY MANAGEMENT TRAPS
                                        ;*      AND ABORTS.  IT WILL REPORT THE CONDITION OF ALL THE MEMORY
                                        ;*      MAMAGEMENT STATUS REGISTERS, AND THEN RETURN TO THE TEST AND
                                        ;*      TRY TO CONTINUE RUNNING.
                                        ;*
                                        ;;*****************************************************************
003372  005227                  MMTRAP: INC     (PC)+           ;MAKE FLAG ZERO IF FIRST TIME
003374  177777                  MMFLAG: .WORD   -1              ;FLAG SHOULD BE NEG ONE
003376  001403                          BEQ     10$             ;BRANCH IF FIRST TIME INTO ROUTINE
003400  005237  020142                  INC     $MSGTY          ;INDICATE TO APT A FATAL ERROR OCCURED
003404  000000                          HALT    ;I HAVE ENTERED THIS ROUTINE BEFORE I FINISHED REPORTING THE
                                        ;FIRST ERROR.  THE SECOND ENTRY ADDRESS IS ON THE STACK AND THE FIRST ERROR
                                        ;CONDITION IS PROBABLY STILL LOCKED UP .
003406  011637  001340          10$:    MOV     (KSP),BADPC     ;SAVE PC AT TIME OF ABORT OR TRAP
003412  012637  001342                  MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF LOOP
003416  012637  001344                  MOV     (KSP)+,OLDPS    ;SAVE OLD PSW IN CASE OF LOOP
003422  013737  177572  001350          MOV     MMR0,PMMR0      ;SAVE STATUS REGISTER
003430  013737  177574  001352          MOV     MMR1,PMMR1      ;SAVE AUTO INC/DEC REGISTER
003436  013737  177576  001354          MOV     MMR2,PMMR2      ;SAVE VIRTUAL ADDRESS REGISTER
003444  104003                          ERROR   +3              ;UNEXPECTED M.M. ABORT OR TRAP
003446  042737  177776  177572  1$:     BIC     #177776,MMR0    ;CLEAR ALL BITS EXCEPT 0
003454  012737  177777  003374          MOV     #-1,MMFLAG      ;RESTORE A NEGATIVE ONE TO FLAG
003462  013746  001344                  MOV     OLDPS,-(KSP)    ;PUSH OLD PSW ONTO STACK
003466  013746  001342                  MOV     OLDPC,-(KSP)    ;PUSH RETURN ADDRESS ON STACK
003472  000006                          RTT                     ;RETURN TO MAIN PROGRAM
```

```
2140                                    .SBTTL  SUBROUTINE TO TEST A LOCATION FOR WRITEABILITY
2141                                    ;;*****************************************************************
2142                                    ;*
2143                                    ;*      THIS SUBROUTINE CLEARS A TEST LOCATION, LOADS THE LOCATION USING
2144                                    ;*      THE MAP REGISTER, AND DETERMINES IF THE LOCATION WAS LOADED.  IF
2145                                    ;*      IT WAS, RETURN IS NORMAL TO THE TEST.  IF NOT, THE PC ON THE
2146                                    ;*      STACK IS UPDATED BY 2 AND THEN A RETURN IS EXECUTED.
2147                                    ;*
2148                                    ;;*****************************************************************
2149 003474  005237  001174            TSTLOC: INC     $TMP0           ;INCREMENT REGISTER COUNTER
2150 003500  005737  005774                    TST     FLOATR          ;SEE IF BIT 15 OF FLOATR IS SET
2151 003504  100011                            BPL     1$              ;BRANCH IF STILL PLUS
2152 003506  022705  020230                    CMP     #$DDW1,R5       ;SEE IF R5 IS POINTING TO UPPER DW
2153 003512  001417                            BEQ     NEXT            ;BRANCH IF SO - ALL DONE
2154 003514  012705  020230                    MOV     #$DDW1,R5       ;MOVE ADDRESS OF DDW1 TO R5 AND
2155 003520  012737  000001  005774            MOV     #BIT0,FLOATR    ;RESET BIT 0 IN FLOATR
2156 003526  000411                            BR      NEXT            ;BRANCH OVER ASL
2157 003530  005227                    1$:     INC     (PC)+           ;INCREMENT NEXT LOCATION FOR FIRST TIME THROUGH CHECK
2158 003532  177777                    FTTHRU: .WORD   -1              ;FIRST TIME ENTRANCE FLAG
2159 003534  001004                            BNE     1$              ;BRANCH IF NOT FIRST TIME
2160 003536  012737  000001  005774            MOV     #BIT0,FLOATR    ;MOVE BIT 0 TO LOCATION FLOATR
2161 003544  000402                            BR      NEXT            ;BRANCH OVER THE ASL
2162 003546  006337  005774            1$:     ASL     FLOATR          ;ROTATE THE TEST BIT TO THE LEFT
2163 003552  005037  037776            NEXT:   CLR     37776           ;CLEAR TEST LOCATION
2164 003556  005037  001330                    CLR     PCPUER          ;CLEAR ERROR LOCATION
2165 003562  010210                            MOV     R2,(R0)         ;TRY TO LOAD TEST CELL THROUGH MAP
2166 003564  023702  037776                    CMP     37776,R2        ;SEE IF TEST LOCATION WAS LOADED
2167 003570  001414                            BEQ     2$              ;BRANCH IF IT WAS LOADED
2168 003572  004737  005076                    JSR     PC,CHKLMA       ;GO SEE IF USER SAYS THIS IS AN 11/24 WITH UB MEMORY
2169 003576  177736  177734                    .WORD   LMAHI,LMALOW    ;ADDRESSES OF LMA REGISTERS
2170 003602  000407                            BR      2$              ;RETURN IS HERE IF OK
2171 003604  005737  001330                    TST     PCPUER          ;SEE IF A TIMEOUT OCCURED
2172 003610  001402                            BEQ     1$              ;BRANCH OVER SPECIAL STACK PUSH IF NOT
2173 003612  013743  001174                    MOV     $TMP0,-(R3)     ;PUSH REGISTER NUMBER THAT TIMED OUT ON SPECIAL STACK
2174 003616  062716  000002            1$:     ADD     #2,(SP)         ;CORRECT PC RETURN FOR LOAD FAILURE INDICATION
2175 003622  000207                    2$:     RTS     PC              ;RETURN FROM THIS SUBROUTINE
```

```
                                        .SBTTL  SUBROUTINE TO LOAD DATAOR AND DATAND
                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS SUBROUTINE ASSUMES THE DATA TO BE ANDED AND ORED HAS BEEN PUT
                                        ;*      ON THE STACK BEFORE THIS SUBROUTINE WAS CALLED.  IT BIT SETS THE
                                        ;*      DATA ONTO DATAOR, COMPLEMENTS THE DATA AND BIT CLEARS IT ONTO
                                        ;*      DATAND.
                                        ;*
                                        ;;*****************************************************************
003624  056637  000002  001246  DATEXT: BIS     2(SP),DATAOR    ;SET THE 'OR' PATTERN TO DATAOR
003632  005166  000002                  COM     2(SP)           ;COMPLIMENT THE DATA
003636  046637  000002  001242          BIC     2(SP),DATAND    ;CLEAR THE 'AND' PATTERN TO DATAND
003644  012616                          MOV     (SP)+,(SP)      ;CLEAN THE STACK FOR THE RETURN
003646  000207                          RTS     PC              ;RETURN
```

```
                                        .SBTTL  SUBROUTINE TO LOAD PATAOR AND PATAND
                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS SUBROUTINE ASSUMES THE DATA TO BE ANDED AND ORED HAS BEEN PUT
                                        ;*      ON THE STACK BEFORE THIS SUBROUTINE WAS CALLED.  IT BIT SETS THE
                                        ;*      DATA ONTO PATTOR, COMPLEMENTS THE DATA AND BIT CLEARS IT ONTO
                                        ;*      PATAND.
                                        ;*
                                        ;*****************************************************************
003650  056637  000002  001254  PATEXT: BIS     2(SP),PATTOR    ;SET THE 'OR' PATTERN TO PATTOR
003656  005166  000002                  COM     2(SP)           ;COMPLIMENT THE PATTERN
003662  046637  000002  001252          BIC     2(SP),PATAND    ;CLEAR THE 'AND' PATTERN TO PATAND
003670  012616                          MOV     (SP)+,(SP)      ;CLEAN UP STACK FOR RETURN
003672  000207                          RTS     PC              ;RETURN
```

```
                                        .SBTTL  SUBROUTINE TO TAKE PAR AND LOAD 2 WORDS EACH OF ADDROR & ADRAND
                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS SUBROUTINE ASSUMES THE CONTENTS OF THE PAR, AND THE VIRTUAL
                                        ;*      ADDRESS HAVE BEEN PUT ON THE STACK.  IT TAKES THE PAR, SHIFTS IT
                                        ;*      TO EXPOSE THE UPPER ADDRESS BITS, BIT SETS THEM TO ADDROR+2, COM-
                                        ;*      PLIMENTS THE CONTENTS AND BIT CLEARS ADRAND+2.  AFTER RELOADING
                                        ;*      THE PAR IN R5, IT SHIFTS TO GET THE LOWER 16 BIT EQUIVALENT AND
                                        ;*      ADDS THE VIRTUAL ADDRESS TO CREATE THE PHYSICAL LOWER 16 BITS.
                                        ;*      THEN IT BIT SETS THEM TO ADDROR, COMPLIMENTS THE CONTENTS AND
                                        ;*      BIT CLEARS ADRAND.  ANOTHER COMPLIMENT BRINGS THE STATE BACK TO
                                        ;*      ITS ORIGINAL STATE.  THIS SUBROUTINE LEAVES WITH THE LOWER 16
                                        ;*      BITS AND THE UPPER 6 BITS ON THE STACK, AND ARE TO BE REMOVED IN
                                        ;*      THAT ORDER, AND MUST BE REMOVED AFTER RETURN.
                                        ;*
                                        ;;*****************************************************************
003674  010546                ADREXT: MOV     R5,-(SP)        ;SAVE R5
003676  016605  000004              MOV     4(SP),R5        ;MOVE PAR CONTENTS TO R5 FOR SHIFTING
003702  072527  177766              ASH     #-10.,R5        ;SHIFT R5 TO THE RIGHT 10 PLACES
003706  042705  177700              BIC     #177700,R5      ;CLEAR BITS 15 TO 6
003712  022705  000074              CMP     #74,R5          ;SEE IF I/O PAGE
003716  001002                      BNE     1$              ;BRANCH IF NOT
003720  012705  000077              MOV     #77,R5          ;RESET R5 TO 77
003724  010537  001206        1$:   MOV     R5,$TMP5        ;MOVE OBTAINED UPPER 6 BITS TO $TMP5 FOR FUTURE TRANSFER
003730  050537  001240              BIS     R5,ADDROR+2     ;SET THE 'OR' PATTERN OF UPPER 6 BITS TO ADDROR+2
003734  005105                      COM     R5              ;COMPLIMENT R5
003736  040537  001234              BIC     R5,ADRAND+2     ;CLEAR THE 'AND' PATTERN OF UPPER 6 BITS TO ADRAND+2
003742  016605  000004              MOV     4(SP),R5        ;PUT PAR CONTENTS BACK IN R5
003746  013766  001206  000004      MOV     $TMP5,4(SP)     ;MOVE UPPER 6 BITS OF PHYSICAL ADDRESS ON STACK
003754  022737  000074  001206      CMP     #74,$TMP5       ;SEE IF I/O PAGE
003762  001007                      BNE     2$              ;BRANCH IF NOT
003764  012737  000077  005766      MOV     #77,EADRES+2    ;SET 77 IN UPPER ERROR LOCATION
003772  016637  000006  005764      MOV     6(SP),EADRES    ;SET LOWER ADDRESS IN LOWER ERROR LOCATION
004000  000411                      BR      3$              ;BRANCH OVER PREP
004002  042705  176000        2$:   BIC     #176000,R5      ;STRIP OFF UPPER 6 BITS OF PAR CONTENTS
004006  072527  000006              ASH     #6,R5           ;SHIFT REMAINING BITS 6 PLACES TO THE LEFT
004012  042766  160000  000006      BIC     #160000,6(SP)   ;STRIP OFF PAR PAGE BITS FROM ADDRESS TO FORM OFFSET
004020  060566  000006              ADD     R5,6(SP)        ;FORM LOWER 16 BITS OF ADDRESS
004024  012605                3$:   MOV     (SP)+,R5        ;RESTORE R5
004026  056637  000004  001236      BIS     4(SP),ADDROR    ;SET THE 'OR' PATTERN TO ADDROR
004034  005166  000004              COM     4(SP)           ;COMPLIMENT THE ADDRESS
004040  046637  000004  001232      BIC     4(SP),ADRAND    ;CLEAR THE 'AND' PATTERN TO ADRAND
004046  005166  000004              COM     4(SP)           ;RETURN ADDRESS TO ITS ORIGINAL STATE
004052  022737  000077  005766      CMP     #77,EADRES+2    ;SEE IF I/O PAGE IN UPPER LOCATION
004060  001406                      BEQ     4$              ;BRANCH TO EXIT IF SO
004062  016637  000004  005764      MOV     4(SP),EADRES    ;PUT LOWER 16 BITS IN ERROR STATUS LOCATION
004070  016637  000002  005766      MOV     2(SP),EADRES+2  ;PUT UPPER 6 BITS IN ERROR STATUS LOCATION
004076  012666  000002        4$:   MOV     (SP)+,2(SP)     ;PUT RETURN ADDRESS WHERE IT BELONGS
004102  005726                      TST     (SP)+           ;CLEAN STACK
004104  000207                      RTS     PC              ;RETURN
```

SUBROUTINE TESTING RELOCATION ADDER

```
                                        .SBTTL  SUBROUTINE TESTING RELOCATION ADDER
                                    ;;**************************************************************
                                    ;*      THE FOLLOWING SUBROUTINE IS USED IN TESTS 13 AND 16, AND USES THE DATA
                                    ;*      BANK FOLLOWING TO EXECUTE THE LOOPS IN THE TEST.  R3 IS THE SPECIAL
                                    ;*      'STACK' POINTER, INITIALIZED AT THE BEGINING TO THE R3STAK DATA BANK.
                                    ;*      THE STACK POINTER IS ADVANCED 3 WORDS FOR EACH PASS.  CALL THIS SUB-
                                    ;*      ROUTINE IN THIS MANNER:
                                    ;*          CLR     $TMP4           ;CLEAR $TMP4 - USED IN ERROR RETURN
                                    ;*1$:       JSR     PC,MAPADD       ;GO DO THE TEST
                                    ;*          ERROR   +ERRORNUMBER    ;RETURN IS HERE FOR ERROR
                                    ;*          BR      1$              ;BRANCH BACK TO CONTINUE TEST
                                    ;;**************************************************************
004106  005737  004312          MAPADD: TST     LOEFLG          ;SEE IF THIS ENTRY WAS AN ERROR
004112  001070                          BNE     3$              ;GO CONTINUE TEST
004114  011646                          MOV     (SP),-(SP)      ;MOVE RETURN UP ONE NOTCH
004116  062766  000004  000002          ADD     #4,2(SP)        ;CREATE ADDRESS ON STACK FOR FINAL RETURN
004124  012703  004314                  MOV     #R3STAK,R3      ;SET THE SPECIAL STACK POINTER
004130  012704  000013                  MOV     #13,R4          ;SET THE LOOP COUNTER
004134  012737  004162  001106          MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
004142  005077  175134                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
004146  012377  175126          1$:     MOV     (R3)+,@LREGL    ;LOAD LOWER BITS OF MAPPING REG
004152  013737  001256  172354          MOV     LOWEST,KIPAR6   ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
004160  012300                          MOV     (R3)+,R0        ;SELECT PAR6, OFFSET IS AUGEND
004162  011001                  2$:     MOV     (R0),R1         ;READ LOCATION DEFINED BY 4TH WORD IN TABLE
004164  012337  001310                  MOV     (R3)+,UBM24L    ;MOVE ANTICIPATED PHYSICAL ADDRESS TO UBM24L
004170  020137  001310                  CMP     R1,UBM24L       ;SEE IF THE MAP'S FETCH WAS CORRECT
004174  001443                          BEQ     4$              ;BRANCH IF FETCHED DATA MATCHES ADDRESS
004176  004737  005076                  JSR     PC,CHKLMA       ;GO SEE IF USER SAYS THIS IS AN 11/24 WITH UB MEMORY
004202  177736  177734                  .WORD   LMAHI,LMALOW    ;ADDRESSES OF LMA REGISTERS
004206  000436                          BR      4$              ;RETURN IS HERE IF OK
004210  032777  004000  174720          BIT     #BIT11,@SWR     ;CHECK TO SEE IF 11/24 WITH UB MEMORY ONLY
004216  001406                          BEQ     25$             ;BRANCH IF NOT
004220  017737  175064  001176          MOV     @UBM24L,$TMP1   ;GET EXPECTED DATA FOR ERROR CALL
004226  004737  005000                  JSR     PC,PTMP2        ;GO PREPARE $TMP2 FOR ERROR CALL
004232  000404                          BR      26$             ;GO CALL ERROR
004234  011037  001176          25$:    MOV     (R0),$TMP1      ;GET EXPECTED DATA FOR ERROR CALL
004240  010137  001200                  MOV     R1,$TMP2        ;GET DATA FROM R1 FOR ERROR CALL
004244  162703  000002          26$:    SUB     #2,R3           ;ANTICIPATE ERROR LOOPING BY UNDOING AUTOINC
004250  013737  001310  005764          MOV     UBM24L,EADRES   ;PUT ADDRESS IN EADRES FOR ERROR CALL
004256  005037  005766                  CLR     EADRES+2        ;CLEAR UPPER LOCATION
004262  011646                          MOV     (SP),-(SP)      ;PUT AN EXTRA RETURN ON FOR POSSIBLE ERROR LOOPING
004264  012737  000001  004312          MOV     #1,LOEFLG       ;SET FLAG SHOWING ERROR CALL WAS CALLED
004272  000207                          RTS     PC              ;EXIT TO ERROR CALL AT TEST
004274  062703  000002          3$:     ADD     #2,R3           ;RESTORE AUTOINC, ERROR LOOPING NOT DONE
004300  062706  000002                  ADD     #2,SP           ;CLEAN EXTRA RETURN OFF STACK - LOOPING NOT DONE
004304  077460                  4$:     SOB     R4,1$           ;SUBTRACT 1 FROM R4 AND BRANCH IF NOT 0
004306  005726                          TST     (SP)+           ;EXPOSE NEXT TEST RETURN ADDRESS
004310  000207                          RTS     PC              ;EXIT TO NEXT TEST
004312  000000          LOEFLG. .WORD   0               ;LOOP ON ERROR FLAG LOCATION
```

```
2303                                                    ;DATA IN THE R3STAK DATA BANK BELOW IS ARRANGED IN THE FOLLOWING ORDER:
2304                                                    ;>>>NOTE<<<: THE 'OFFSET' COLUMN IS NOT IN THE STACK DUE TO THE DELIMITER
2305                                                    ;            (;) BETWEEN THE EXPECTED ADDRESS AND THE OFFSET VALUES
2306                                                    ;                 .VRTUAL!PHYSCL!
2307                                                    ;       BASE      .ADDRES!ADDRES!OFFSET     R4 VALUE
2308                                                    ;                        !EXPCTD!
2309 004314  060000  140000  060000  R3STAK: .WORD    060000,140000,060000;000000     R4=13
2310 004322  052524  145252  057776          .WORD    052524,145252,057776;005252     R4=12
2311 004330  045252  152524  057776          .WORD    045252,152524,057776;012524     R4=11
2312 004336  050420  150420  061040          .WORD    050420,150420,061040;010420     R4=10
2313 004344  054630  144210  061040          .WORD    054630,144210,061040;004210     R4=7
2314 004352  044210  154630  061040          .WORD    044210,154630,061040;014630     R4=6
2315 004360  056734  142104  061040          .WORD    056734,142104,061040;002104     R4=5
2316 004366  042104  156734  061040          .WORD    042104,156734,061040;016734     R4=4
2317 004374  057776  141042  061040          .WORD    057776,141042,061040;001042     R4=3
2318 004402  041042  157776  061040          .WORD    041042,157776,061040;017776     R4=2
2319 004410  057776  140002  060000          .WORD    057776,140002,060000;000002     R4=1
```

SUBROUTINE TO TEST CARRY PROP OF MAP'S RELOC ADDER

```
                                        .SBTTL  SUBROUTINE TO TEST CARRY PROP OF MAP'S RELOC ADDER
                                    ;;**********************************************************************
                                    ;*      THIS SUBROUTINE IS USED BY TESTS 14 AND 17.  CODE CALLING THIS SUB-
                                    ;*      ROUTINE IS AS FOLLOWS:
                                    ;*      CLR     $TMP4           ;CLEAR $TMP4 - USED IN ERROR RETURN
                                    ;*LAB:  JSR     PC,TCPMRA       ;GO DO THE TEST
                                    ;*      ERROR   +211            ;RETURN IS HERE IF AN ERROR
                                    ;*      BR      LAB             ;BRANCH BACK TO CONTINUE TEST
                                    ;;**********************************************************************
004416  005737  004312          TCPMRA: TST     LOEFLG          ;TEST ERROR FLAG TO SEE IF THIS ENTRY IS FROM ERROR
004422  001132                          BNE     4$              ;BRANCH TO CONTINUE TEST IF SO
004424  011646                          MOV     (SP),-(SP)      ;MOVE RETURN ADDRESS UP ONE NOTCH
004426  062766  000004  000002          ADD     #4,2(SP)        ;CREATE CORRECT FINAL RETURN ADDRESS
004434  012737  177777  004674          MOV     #-1,35$         ;INITIALIZE FLAG AS NEGATIVE ONE
004442  005077  174634                  CLR     @LREGU          ;CLEAR UPPER 6 BITS OF MAP REG
004446  012777  020000  174624          MOV     #20000,@LREGL   ;LOAD 4K BASE INTO MAP REGISTER
004454  012701  100100                  MOV     #100100,R1      ;LOAD BITS TO SELECT PAR 4, OFFSET 100
004460  012700  150000                  MOV     #150000,R0      ;LOAD BITS TO SELECT PAR 6, OFFSET 2K
004464  012737  000277  172350          MOV     #277,KIPAR4     ;START WITH PHYSICAL 6K
004472  013737  001256  172354          MOV     LOWEST,KIPAR6   ;LOAD PAR 6 WITH MAP REG'S ADDR
004500  012737  004552  001106          MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
004506  005037  001330          1$:     CLR     PCPUER          ;CLEAR TIME OUT FLAG
004512  062737  010000  001310          ADD     #10000,UBM24L   ;FORM EXPECTED LMA FOR POSSIBLE USE
004520  001002                          BNE     15$             ;BRANCH AROUND UBM24U INCREMENT IF NOT ZERO
004522  005237  001312                  INC     UBM24U          ;INCREMENT UPPER LOCATION
004526  012737  000020  001326  15$:    MOV     #20,CPUEXP      ;EXPECTING A UNIBUS TIME OUT DURING TEST
004534  013710  001364                  MOV     DATA,(R0)       ;THIS LOAD WILL TIME OUT WHEN YOU HAVE REACHED THE TOP
                                    ;OF MEMORY IT SELECTS PAR 6 WHICH WILL PUT ADDR <XXX1>0000 ON THE UNIBUS. THE X'S WILL
                                    ;SELECT THE LOWEST USABLE MAPPING REGISTER.  THE DEFAULT CASE IS 00010000, SELECTING
                                    ;MAP REGISTER 0.
004540  005037  001326                  CLR     CPUEXP          ;CLEAR CPUEXP - DON'T EXPECT TRAPS FOR A WHILE
004544  005737  001330                  TST     PCPUER          ;SEE IF THERE WAS MAIN MEMORY
004550  001050                          BNE     3$              ;BRANCH IF NO MAIN MEMORY FROM UNIBUS
004552  012737  000040  001326  2$:     MOV     #NEXMEM,CPUEXP  ;POSSIBLE CACHE NON-EXISTENT MEMORY
004560  011103                          MOV     (R1),R3         ;READ TEST LOCATION VIA FASTBUS
004562  005037  001326                  CLR     CPUEXP          ;CLEAR CPUEXP - DON'T EXPECT TRAPS FOR A WHILE
004566  022737  000040  001330          CMP     #NEXMEM,PCPUER  ;WAS THIS CACHE NON-EXISTENT MEMORY
004574  001436                          BEQ     3$              ;BRANCH IF NON-EXISTENT MEMORY
004576  011002                          MOV     (R0),R2         ;READ TEST LOCATION VIA UNIBUS MAP
004600  020203                          CMP     R2,R3           ;COMPARE TEST DATA R2=MAP DATA, R3=FASTBUS DATA
004602  001433                          BEQ     3$              ;BRANCH IF IT WAS THE SAME
004604  004737  005076                  JSR     PC,CHKLMA       ;GO CHECK FOR 11/24 WITH UB MEMORY
004610  177736  177734                  .WORD   LMAHI,LMALOW    ;ADDRESSES OF LMA REGISTERS
004614  000426                          BR      3$              ;RETURN IS HERE IF OK
004616  032777  004000  174312          BIT     #BIT11,@SWR     ;SEE IF THIS IS AN 11/24 WITH UB MEMORY ONLY
004624  001403                          BEQ     25$             ;BRANCH IF NOT
004626  004737  005000                  JSR     PC,PTMP2        ;GO PREPARE $TMP2 FOR ERROR CALL
004632  000402                          BR      26$             ;BRANCH TO CALL ERROR
004634  011037  001200          25$:    MOV     (R0),$TMP2      ;GET RECEIVED DATA FOR ERROR CALL
004640  010337  001176          26$:    MOV     R3,$TMP1        ;GET EXPECTED DATA FOR ERROR CALL
004644  011646                          MOV     (SP),-(SP)      ;PUT AN EXTRA RETURN ADDRESS ON STACK FOR POSSIBLE LOOP
004646  013737  001310  005764          MOV     UBM24L,EADRES   ;LOAD LOWER 16 BITS OF ADDRESS FOR ERROR CALL
004654  013737  001312  005766          MOV     UBM24U,EADRES+2 ;LOAD UPPER 6 BITS OF ADDRESS FOR ERROR CALL
004662  012737  000001  004312          MOV     #1,LOEFLG       ;SET FLAG SHOWING AN ERROR RETURN
004670  000207                          RTS     PC              ;RETURN TO THE ERROR
004672  005227                  3$:     INC     (PC)+           ;INCREMENT ONE TIME ENTRANCE FLAG
004674  177777                  35$:    .WORD   -1              ;FLAG
```

```
2377 004676  001006                          BNE     5$              ;BRANCH IF I'VE BEEN HERE BEFORE
2378 004700  013737  172350  001356          MOV     KIPAR4,RSIZE    ;SAVE UPPER LIMIT OF MEMORY
2379 004706  000402                          BR      5$              ;BRANCH OVER ERROR LOOP CORRECTION
2380 004710  062706  000002          4$:     ADD     #2,SP           ;POP EXCESS RETURN ADDRESS OFF STACK
2381 004714  062737  000100  001364  5$:     ADD     #100,DATA       ;CHANGE PATTERN FOR NEXT LOAD
2382 004722  062737  000100  172350          ADD     #100,KIPAR4     ;ADD 2K TO PAR4
2383 004730  062777  010000  174342          ADD     #10000,@LREGL   ;ADD 2K TO MAP REGISTER
2384 004736  001263                          BNE     1$              ;BRANCH IF MAP REGISTER NOT ZERO
2385 004740  005277  174336                  INC     @LREGU          ;ADD ONE TO UPPER 6 BITS OF MAP REG
2386 004744  022777  000073  174330          CMP     #73,@LREGU      ;SEE IF TOP 128K BLOCK HAS BEEN PASSED
2387 004752  103255                          BHIS    1$              ;BRANCH IF NOT PAST IT
2388 004754  005237  001364                  INC     DATA            ;CHANGE DATA PATTERN FOR NEXT PASS
2389 004760  042737  177700  001364          BIC     #177700,DATA    ;CLEAR UPPER 10 BITS OF DATA PATTERN
2390 004766  052737  000300  001364          BIS     #300,DATA       ;START WITH 3XX IN DATA PATTERN
2391 004774  005726                          TST     (SP)+           ;POP STACK EXPOSING FINAL RETURN ADDRESS
2392 004776  000207                          RTS     PC              ;EXIT
```

```
2393                                            .SBTTL  SUBROUTINE TO OBTAIN CONTENTS OF LMA CONTENTS LOCATION
2394 005000  013705  177734          PTMP2:    MOV     LMALOW,R5       ;MOVE LMA LOW REGISTER CONTENTS TO R5 FOR SHIFTING
2395 005004  072527  177772                    ASH     #-6,R5          ;SHIFT PHYSICAL UPPER 3 BITS TO THE RIGHT 6 PLACES
2396 005010  042705  176177                    BIC     #176177,R5      ;CLEAR ALL BUT THE THREE SHIFTED BITS
2397 005014  010546                            MOV     R5,-(SP)        ;SAVE THIS NUMBER ON THE STACK
2398 005016  013705  177736                    MOV     LMAHI,R5        ;MOVE LMA HIGH REGISTER CONTENTS TO R5 FOR SHIFTING
2399 005022  072527  000012                    ASH     #10.,R5         ;SHIFT LOWER 6 BITS TO THE LEFT 10 PLACES
2400 005026  062605                            ADD     (SP)+,R5        ;ADD PREVIOUSLY SHIFTED CONTENTS TO R5
2401 005030  013746  172346                    MOV     KIPAR3,-(SP)    ;SAVE PAR3 ON STACK
2402 005034  010537  172346                    MOV     R5,KIPAR3       ;MOVE OBTAINED PAR VALUE TO PAR3
2403 005040  013737  177734  001200            MOV     LMALOW,$TMP2    ;GET ADDRESS MAP CREATED
2404 005046  042737  100000  001200            BIC     #BIT15,$TMP2    ;CLEAR BIT 15 AND
2405 005054  052737  060000  001200            BIS     #60000,$TMP2    ;SET BITS 13 & 14 TO PUT PAR PAGE 3 IN $TMP2
2406 005062  017737  174112  001200            MOV     @$TMP2,$TMP2    ;MOVE CONTENTS OF LOCATION TO $TMP2
2407 005070  012637  172346                    MOV     (SP)+,KIPAR3    ;RESTORE PAR3
2408 005074  000207                            RTS     PC              ;EXIT
```

```
                                        .SBTTL  SUBROUTINE TO CHECK FOR 11/24 WITH UBMEMORY
                                ;;**************************************************************
                                ;*
                                ;*      THIS SUBROUTINE CHECKS THE SWITCH REGISTER TO SEE IF USER STATES THAT
                                ;*      THIS IS AN 11/24 CPU WITH UNIBUS MEMORY ONLY.  IF NOT, AN EXIT IS
                                ;*      EXECUTED WITH THE RETURN BEING UPDATED TO THE 2ND LOCATION AFTER THE
                                ;*      JSR CALL.  IF IT IS, THE LMA HIGH REGISTER IS CHECKED FOR BEING EQUAL
                                ;*      TO THE CONTENTS OF UBM24U, (ASSUMED TO BE PRELOADED. THESE 6 BITS ARE
                                ;*      THE UPPER 6 BITS OF THE MAPPED ADDRESS FORMED BY THE MAP REGISTER
                                ;*      LOGIC), IF NOT, EXIT TO FUDGE RETURN.  IF SO, THE LMA LOW REGISTER IS
                                ;*      CHECKED.  IT IS ASSUMED THAT LOCATION UBM24L CONTAINS THE EXPECTED
                                ;*      PHYSICAL ADDRESS.  IT COMPARES THE LMA LOW REGISTER WITH UBM24L, AND IF
                                ;*      EQUAL, EXECUTES A RETURN WITHOUT THE FUDGING OF THE RETURN ADDRESS,
                                ;*      OTHERWISE IT IS FUDGED.
                                ;*
                                ;;**************************************************************
005076  017637  000000  005134  CHKLMA: MOV     @0(SP),10$      ;MOVE LMAHI ADDRESS TO ACCESS TO 10$
005104  062716  000002                 ADD     #2,(SP)         ;ADVANCE TO NEXT PARAMETER
005110  017637  000000  005154         MOV     @0(SP),11$      ;MOVE LMALOW ADDRESS TO ACCESS TO 11$
005116  062716  000002                 ADD     #2,(SP)         ;CORRECT RETURN OVER PARAMETER
005122  032777  004000  174006         BIT     #BIT11,@SWR     ;SEE IF USER SAYS THIS IS AN 11/24 WITH UB MEMORY
005130  001413                         BEQ     1$              ;BRANCH OUT IF NOT
005132  013746                         MOV     @(PC)+,-(SP)    ;MOVE LMA HIGH REGISTER CONTENTS TO STACK
005134  000000         10$:    .WORD   0               ;LOCATION FOR ADDRESS TO ACCESS
005136  042716  177700                 BIC     #177700,(SP)    ;CLEAR ALL BUT LOWER 6 BITS (UPPER 6 BITS OF ADDRESS)
005142  023726  001312                 CMP     UBM24U,(SP)+    ;SEE IF UPPER 6 BITS ARE AS EXPECTED
005146  001004                         BNE     1$              ;BRANCH TO PREPARE FOR 2ND RETURN LOCATION IF NOT
005150  023737  001310                 CMP     UBM24L,@(PC)+   ;SEE IF EXPECTED DATA WAS CLOCKED PROPERLY
005154  000000         11$:    .WORD   0               ;LOCATION FOR ADDRESS TO ACCESS
005156  001402                         BEQ     2$              ;BRANCH AROUND STACK RETURN FUDGE IF OK
005160  062716  000002         1$:     ADD     #2,(SP)         ;FUDGE RETURN OVER NON-ERROR BRANCH
005164  000207         2$:     RTS     PC                      ;EXIT
```

```
                                        .SBTTL  PRETEST DATA SETUP SUBROUTINE
                                ;;*****************************************************************
005166  011600                PRETST: MOV     (SP),R0         ;MOVE RETURN ADDRESS TO R0
005170  012037  001362                MOV     (R0)+,NXTTST    ;SAVE STARTING ADDRESS OF NEXT TEST FOR ESCAPE ON PAR ERRORS
005174  012037  001106                MOV     (R0)+,$LPERR    ;SET LOOP ON ERROR POINTER TO 20$ IN TEST
005200  012037  001100                MOV     (R0)+,$TSTNM    ;SETUP TEST NUMBER AND CLEAR THE ERROR FLAG
005204  013777  001100  173726        MOV     $TSTNM,@DISPLAY ;DISPLAY TEST NUMBER FOR ALL TO SEE
005212  010016                       MOV     R0,(SP)         ;FUDGE RETURN OVER PARAMETERS
005214  010037  001104                MOV     R0,$LPADR       ;SET LOOP ON TEST POINTER TO START OF TEST
005220  012737  000001  001212        MOV     #1,$TIMES       ;RESET ITERATIONS COUNTER TO 1
005226  000207                       RTS     PC              ;RETURN TO BEGIN TEST
```

```
                                        .SBTTL  DISABLE CHECK SUBROUTINE
                                ;;*****************************************************************
                                ;;*****************************************************************
                                ;*
                                ;*      THIS SUBROUTINE CHECKS THE STATUS OF THE BIT POINTED TO IN FLOATR
                                ;*      IN THE LOCATION POINTED TO BY R5 (EITHER $DDW0 OR $DDW1), AND DETER-
                                ;*      MINES IF THE LOCATION SHOULD BE DISABLED.
005230  105737  020162          DSABLD: TSTB    $ENV            ;TEST APT STATUS
005234  001411                          BEQ     1$              ;BRANCH IF NOT APT
005236  105737  020163                  TSTB    $ENVM           ;DOES APT SAY TO SIZE
005242  100006                          BPL     1$              ;BRANCH TO EXIT IF NOT
005244  033715  005774                  BIT     FLOATR,(R5)     ;TEST DISABLE STATUS
005250  001403                          BEQ     1$              ;BRANCH IF IT SHOULD BE DISABLED
005252  011537  001176                  MOV     (R5),$TMP1      ;MOVE CONTENTS OF DEVICE DESCRIPTOR WORD TO $TMP1
005256  000402                          BR      2$              ;BRANCH OVER RETURN CORRECTION
005260  062716  000002          1$:     ADD     #2,(SP)         ;CHOCOLATE FUDGE RETURN OVER ERROR CALL
005264  000207                  2$:     RTS     PC              ;RETURN WITHOUT CORRECTING STACK SO ERROR WILL CALL
```

```
                                        .SBTTL  ENABLE CHECK SUBROUTINE
                                ;;**************************************************************
                                ;*      THIS SUBROUTINE CHECKS THE STATUS OF THE BIT POINTED TO IN FLOATR
                                ;*      IN THE LOCATION POINTED TO BY R5 (EITHER $DDW0 OR $DDW1), AND DETER-
                                ;*      MINES IF THE LOCATION SHOULD BE ENABLED.
005266  105737  020162          ENABLD: TSTB    $ENV            ;TEST APT STATUS
005272  001411                          BEQ     1$              ;BRANCH IF NOT APT
005274  105737  020163                  TSTB    $ENVM           ;DOES APT SAY TO SIZE
005300  100006                          BPL     1$              ;BRANCH TO EXIT IF NOT
005302  033715  005774                  BIT     FLOATR,(R5)     ;TEST DISABLE STATUS
005306  001003                          BNE     1$              ;BRANCH IF IT SHOULD BE ENABLED
005310  011537  001176                  MOV     (R5),$TMP1      ;MOVE CONTENTS OF DEVICE DESCRIPTOR WORD TO $TMP1
005314  000402                          BR      2$              ;BRANCH OVER RETURN CORRECTION
005316  062716  000002          1$:     ADD     #2,(SP)         ;VANILLA FUDGE RETURN OVER ERROR CALL
005322  000207                  2$:     RTS     PC              ;RETURN WITHOUT CORRECTING STACK SO ERROR WILL CALL
```

```
                                        .SBTTL  CACHE TEST IN SUBROUTINE FORM
                                ;;**************************************************************
                                        .ENABL  LSB
005324  042737  000001  177572  CASHSR: BIC     #BIT00,MMR0     ;TURN OFF RELOCATION
005332  052737  000400  177746          BIS     #BIT08,CACHE    ;FLUSH CACHE TO INVALIDATE ALL CACHE LOCATIONS
005340  032737  010000  177746  1$:     BIT     #BIT12,CACHE    ;WAIT TILL DONE
005346  001374                          BNE     1$
005350  013702  000000                  MOV     0,R2            ;SAVE ADDR. 0 CONTENTS
005354  005037  000000                  CLR     0               ;0'S TO MAIN MEMORY LOCATION 0.
005360  005003                          CLR     R3              ;CLEAR ERROR FLAG
005362  012704  177777                  MOV     #-1,R4          ;ALL 1'S TO R4
005366  013700  000114                  MOV     CTRAPV,R0       ;SAVE VECTORS
005372  013701  000116                  MOV     CTRAPS,R1
005376  012737  005524  000114          MOV     #3$,CTRAPV      ;SETUP FOR CACHE TRAP
005404  012737  000340  000116          MOV     #340,CTRAPS
005412  112737  000002  177750          MOVB    #2,MAINT        ;HODO ALLOWS CACHE UPDATES AND CLOCKING OF
                                                                ;PARITY INFO TO INTERRUPT LOGIC ONLY DURING
                                                                ;THE DESTINATION ACCESS OF AN INSTRUCTION.
005420  012737  000015  177746          MOV     #15,CACHE       ;NO UCB SO AS TO WRITE CACHE STORES
005426  005737  040000                  TST     40000           ;UPDATE CACHE LOCATION 0000 WITH CORRECT
                                                                ;PARITY STORAGE
005432  052737  000100  177746          BIS     #BIT06,CACHE    ;ALLOW WRITE WRONG PARITY DATA TO LO & HI BYTE
                                                                ;PARITY STORE.
005440  005737  000000                  TST     0               ;READ UPDATE TO CACHE LOCATION 0000;
                                                                ;WRITE WRONG PARITY TO HI/LO BYTE PARITY STORES
005444  042737  000100  177746          BIC     #BIT06,CACHE    ;DISABLE WWPD
005452  005037  177744                  CLR     CMPE            ;CLEAR CMPE AND PARITY DETECT LOGIC
005456  142737                          BICB    (PC)+,@(PC)+    ;ALLOW INT & ENABLE LOW CACHE (1ST       ;DPM002
005460  000000          CASH1:  .WORD   0               ;LOCATION LOADED BY THE TEST                    ;DPM002
005462  177746                  .WORD   CACHE           ;ADDRESS OF CACHE LOCATION                      ;DPM002
005464  122727                  CMPB    (PC)+,(PC)+     ;WHICH TEST                                     ;DPM002
005466  000002                  .WORD   2               ;TEST 2 IS TESTED FOR                           ;DPM002
005470  000000          CASH2:  .WORD   0               ;THIS LOCATION LOADED BY THE TEST               ;DPM002
005472  001405                  BEQ     2$              ;GO TO 2ND TEST SECTION IF 2ND TEST EXECUTING
005474  005737  000000                  TST     0               ;READ HIT LO & HI BYTE PARITY CHECK GENERATORS
                                                                ;WILL DETECT  WRONG PARITY AND THE PARITY
                                                                ;ERROR WILL BE CLOCKED TO INTERRUPT LOGIC
005500  000240                          NOP                     ;NEEDED FOR 11/44
005502  005203                          INC     R3              ;INDICATE THAT TRAP DID NOT OCCUR
005504  000410                          BR      4$              ;BRANCH OVER STACK CORRECTION AND 2ND TEST SECTION
005506  052737  000200  177746  2$:     BIS     #BIT07,CACHE    ;ALLOW FOR ABORT
005514  011304                          MOV     (R3),R4         ;READ HIT LO & HI BYTE PARITY CHECK GENERATORS WILL
                                ;DETECT WRONG PARITY USING HODO AND SOURCE MODE FOR READING LOCATION 0 WILL
                                ;INHIBIT PARITY ERROR FROM BEING CLOCKED TO INTERRUPT LOGIC.  HOWEVER, THE PARITY
                                ;ERROR SIGNAL WILL CAUSE THE ABORT SIGNAL TO BE ASSERTED.  THE ABORT SIGNAL WILL
                                ;BECAUSE CMPE<15> TO BE SET.  THIS INSTRUCTION SHOULD BE ABORTED
005516  000240                          NOP                     ;NEEDED IN AN 11/44 TO ALLOW 1 INSTRUCTION BEFORE ABORT
005520  005203                          INC     R3              ;INDICATE NO TRAP OCCURED
005522  000401                          BR      4$              ;BRANCH OVER STACK CORRECTION
005524  022626          3$:     CMP     (R6)+,(R6)+     ;READJUST STACK DUE TO INTERRUPT
005526  005037  177744  4$:     CLR     CMPE            ;CLEAR CMPE
005532  012737  001015  177746          MOV     #1015,CACHE     ;DISABLE CACHE
005540  105037  177750                  CLRB    MAINT           ;DISABLE MAINT. MODE
005544  010237  000000                  MOV     R2,0            ;RESTORE LOCATION 0
005550  010037  000114                  MOV     R0,CTRAPV       ;RESTORE CACHE INTERRUPT VECTORS
005554  010137  000116                  MOV     R1,CTRAPS
005560  052737  000400  177746          BIS     #BIT08,CACHE    ;BEFORE LEAVING TEST FLUSH CACHE TO ELIMINATE EFFECTS OF WWP
```

```
2541 005566  032737  010000  177746  5$:     BIT     #BIT12,CACHE    ;WAIT TILL DONE
2542 005574  001374                          BNE     5$
2543 005576  000207                          RTS     PC              ;EXIT
2544                                         .DSABL  LSB
2545                                         .SBTTL  SUBROUTINE TO PREPARE AND CHECK DATA PATTERN
2546                                 ;;*****************************************************************
2547 005600  011504                 CHKPAT: MOV     (R5),R4         ;MOVE NEXT COUNT PATTERN TO R2
2548 005602  043704  005776                  BIC     MASK1,R4        ;USE MASK1 PRE-LOADED FOR PROPER LOADING
2549 005606  010410                          MOV     R4,(R0)         ;LOAD MAP REGISTER WITH COUNT PATTERN
2550 005610  011504                          MOV     (R5),R4         ;RELOAD PATTERN
2551 005612  043704  006000                  BIC     MASK2,R4        ;USE THE 2ND MASK TO CONSTRUCT EXPECTED VALUE
2552 005616  020410                          CMP     R4,(R0)         ;COMPARE EXPECTED WITH RECEIVED
2553 005620  001402                          BEQ     1$              ;BRANCH IF DATA IS OK
2554 005622  062716  000002                  ADD     #2,(SP)         ;FUDGE RETURN TO SHOW ERROR
2555 005626  000207                 1$:     RTS     PC              ;EXIT
```

```
                                        .SBTTL  READ AN OCTAL NUMBER FROM THE TTY
                                ;;**************************************************************
                                ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY, CHANGE IT TO
                                ;*BINARY AND PUT THE NUMBER ON THE STACK.
                                ;*CALL:
                                ;*      RDOCT                           ;READ AN OCTAL NUMBER
                                ;*      MOV     (SP)+,LOCATION          ;POP THE INPUTED NUMBER OFF STACK
                                ;*                                      ;HIGH ORDER BITS ARE IN $HIOCT

005630  011646                 $RDOCT: MOV     (SP),-(SP)              ;MAKE ROOM FOR THE
005632  016666  000004  000002          MOV     4(SP),2(SP)             ;OCTAL NUMBER
005640  010046                         MOV     R0,-(SP)                ;SAVE R0
005642  010146                         MOV     R1,-(SP)                ;SAVE R1
005644  010246                         MOV     R2,-(SP)                ;SAVE R2
005646  104407                 1$:     RDLIN                           ;READ THE OCTAL NUMBER
005650  012600                         MOV     (SP)+,R0                ;GET ADDRESS OF 1ST CHARACTER
005652  005001                         CLR     R1                      ;CLEAR R1
005654  005002                         CLR     R2                      ;CLEAR R2
005656  112046                 2$:     MOVB    (R0)+,-(SP)             ;MOVE CHARACTER TO STACK
005660  001415                         BEQ     3$                      ;IF ZERO, EXIT
005662  000241                         CLC                             ;CLEAR THE CARRY BIT
005664  006101                         ROL     R1                      ;SHIFT MSB TO THE CARRY BIT
005666  006102                         ROL     R2                      ;SHIFT IT TO UPPER RECEIVER
005670  000241                         CLC                             ;CLEAR THE CARRY BIT
005672  006101                         ROL     R1                      ;SHIFT MSB TO THE CARRY BIT
005674  006102                         ROL     R2                      ;SHIFT IT TO UPPER RECEIVER
005676  000241                         CLC                             ;CLEAR THE CARRY BIT
005700  006101                         ROL     R1                      ;SHIFT MSB TO THE CARRY BIT
005702  006102                         ROL     R2                      ;SHIFT IT TO UPPER RECEIVER
005704  042716  177770                 BIC     #177770,(SP)            ;STRIP ALL BUT BINARY EQUIVALENT
005710  052601                         BIS     (SP)+,R1                ;SET THE BINARY EQUIVALENT TO LOWER RECEIVER
005712  000761                         BR      2$                      ;BRANCH BACK
005714  005726                 3$:     TST     (SP)+                   ;CLEAN TERMINATOR FROM STACK
005716  010166  000012                 MOV     R1,12(SP)               ;SAVE THE RESULT
005722  010237  005736                 MOV     R2,$HIOCT
005726  012602                         MOV     (SP)+,R2                ;RESTORE R2
005730  012601                         MOV     (SP)+,R1                ;RESTORE R1
005732  012600                         MOV     (SP)+,R0                ;RESTORE R0
005734  000002                         RTI                             ;RETURN
005736  000000                 $HIOCT: .WORD   0                       ;HIGH ORDER BITS GO HERE
```

DATA TABLES AND ASCII STRINGS USED IN THIS DIAGNOSTIC

```
                                                .SBTTL  DATA TABLES AND ASCII STRINGS USED IN THIS DIAGNOSTIC
2597 005740  005744  006120          DTMS:     .WORD   DTMSG,DFMSG     ;POINTER TO DATA VARIABLE ADDRESSES
2598 005744  001266  001270  001272  DTMSG:    .WORD   MMRLOW,MMRHI,UBRLOW,UBRHI,$TESTN,0 ;DATA VARIABLES TO BE PRINTED
2599 005760  000000                  CHARCT:   .WORD   0       ;THIS LOCATION HOLDS CHARACTERS INPUTED DURING THE TYPE ROUTINE
2600 005762  000000                  EXTOUT:   .WORD   0       ;THIS LOCATION STORES THE OUTPUT OF THE EXTRACTION ROUTINE
2601 005764  000000  000077          EADRES:   .WORD   0,77    ;LOCATIONS FOR STORING 22 BITS OF THE UBMAP REGISTER ADDRESS
2602 005770  000000  000077          EADRS2:   .WORD   0,77    ;LOCATIONS FOR STORING ANOTHER UBMAP REGISTER ADDRESS
2603 005774  000000                  FLOATR:   .WORD   0       ;LOCATION TO HOLD BIT TO FLOAT TO TEST DDW'S STATUS
2604 005776  000000                  MASK1:    .WORD   0       ;PRE-LOADED BY THE TEST WITH THE 1ST BIT-MASK
2605 006000  000000                  MASK2:    .WORD   0       ;PRE-LOADED BY THE TEST WITH THE 2ND BIT-MASK
2606 006002                          SPECST:   .BLKW   40
2607         000002                               .RADIX  2                  ;SET RADIX TO BINARY REPRESENTATION
2608 006102  177777                  PATRNS:   .WORD   1111111111111111 ;ALL BITS SET
2609 006104  000000                            .WORD   0000000000000000 ;ALL BITS CLEAR
2610 006106  125252                            .WORD   1010101010101010 ;ODD BITS SET, EVEN BITS CLEAR
2611 006110  052525                            .WORD   0101010101010101 ;EVEN BITS SET, ODD BITS CLEAR
2612 006112  031463                            .WORD   0011001100110011 ;ALTERNATING PAIRS OF BITS SET
2613 006114  007417                            .WORD   0000111100001111 ;ALTERNATING GROUPS OF 4 BITS SET
2614 006116  000377                            .WORD   0000000011111111 ;LOWER BYTE SET, UPPER BYTE CLEAR
2615         000010                               .RADIX  8                  ;SET RADIX BACK TO OCTAL
2616 006120     000      000      000  DFMSG:    .BYTE   0,0,0,0,0          ;ALL NUMBERS ARE TO BE PRINTED IN OCTAL
2617 006125     200      125      116  UBMAVA:   .ASCIZ  <CRLF>?UNIBUS MEMORY AVAILABLE = ?
2618 006161     123      127      122  NEWSWR:   .ASCIZ  ?SWR INPUT ?
2619 006174     040      113      200  UBMEND:   .ASCIZ  ? K?<CRLF>
```

DATA TABLES AND ASCII STRINGS USED IN THIS DIAGNOSTIC

```
2620 006200      200      104      111  CPUMSG: .ASCIZ  <CRLF>?DIAGNOSTIC HAS DETERMINED THAT CPU IS AN 11/ 4?<CRLF>
2621 006261      101      103      103  TOMSG:  .ASCII  ?ACCESSING MEMORY THROUGH THE FOLLOWING REGISTER(S)?<CRLF>
2622 006344      103      101      125          .ASCIZ  ?CAUSED TIME OUTS (THEY MIGHT BE UNEXPECTED)?<CRLF>
2623 006421      124      110      105  NOMORE: .ASCII  ?THERE ARE STILL MORE ERRORS BUT WILL NOT BE TYPED.  EACH?<CRLF>
2624 006512      105      122      122          .ASCIZ  ?ERROR WILL BE COUNTED AND NUMBER PRINTED AT THE END-OF-PASS?<CRLF>
2625 006607      124      110      111  BADCPU: .ASCII  ?THIS DIAGNOSTIC IS DESIGNED FOR AN 11/24 OR 11/44.?<CRLF>
2626 006672      104      111      101          .ASCIZ  ?DIAGNOSTIC DOES NOT INTERPRET CPU AS EITHER ONE.?<CRLF>
2627 006754      111      123      040  MRQUES: .ASCIZ  ?IS THERE A MAP REGISTER MODULE IN THIS CPU (Y OR <CR>)?
2628 007043      040      200      000  GMRMD1: .ASCIZ  ? ?<CRLF> ;PLACE FOR USER INPUT CHARACTER
2629 007046      104      111      101  GMRMOD: .ASCIZ  ?DIAGNOSTIC CHECKS THIS MODULE - INSERT BEFORE RE-RUNNING?<CRLF>
2630 007140      000                   CPUTYP: .BYTE   0               ;LOCATION TO STORE THE CPU TYPE NUMBER
2631                                           .EVEN
2632                                   ;RESERVE REMAINING AREA FOR PERMANENT PATCHES
2633                                   ;THIS AREA MAY GO BEYOND 10000.  USE ONLY THAT AREA UP TO 7776.
2634 007142  000000   000000   000000  PATCH:  .WORD   0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
2635 007242  000000   000000   000000          .WORD   0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
```

PRE-TESTING SETUP

```
                                        .SBTTL  PRE-TESTING SETUP
                                        ;******************
                                        ;START OF TEST CODE
                                        ;******************

                010000                          .=10000                 ;START TEST CODE AT ADDRESS 10000 (2K)
010000  012737  000340  177776  START:  MOV     #340,PS                 ;LOCK OUT ALL INTERRUPTS
010006  012700  001100                  MOV     #$CMTAG,R0              ;FIRST LOCATION TO BE CLEARED
010012  012701  000021                  MOV     #<$TKS-$CMTAG>/2,R1;MOVE LOOP COUNTER TO R1
010016  005020                  11$:     CLR     (R0)+                   ;CLEAR MEMORY LOCATION
010020  077102                          SOB     R1,11$                  ;SUBTRACT 1 AND BRANCH IF NOT DONE YET
010022  005037  020150                  CLR     $PASS                   ;INITIALIZE PASS COUNT
010026  012706  001100                  MOV     #STACK,SP               ;INITILAIZE STACK
010032  012700  010054                  MOV     #13$,R0                 ;MOVE ADDRESS OF VECTORS TO R0
010036  012701  000005                  MOV     #5,R1                   ;DO 5 LOADS
010042  012030                  12$:     MOV     (R0)+,@(R0)+            ;MOVE VECTOR TO LOCATION
010044  012730  000340                  MOV     #340,@(R0)+             ;MOVE PRIORITY 7 TO NEXT LOCATION
010050  077104                          SOB     R1,12$                  ;BRANCH BACK IF NOT DONE YET
010052  000417                          BR      14$                     ;BRANCH OVER DATA WORDS
010054  020266  000020  000022  13$:     .WORD   $SCOPE,IOTVEC,IOTVEC+2,$ERROR,EMTVEC,EMTVEC+2,$TRAP,TRAPVE
010074  000036  023610  000024          .WORD   TRAPVE+2,$PWRDN,PWRVEC,PWRVEC+2,$RTRN,TBITVE,TBITVE+2
010112  013737  021644  021636  14$:     MOV     $ENDCT,$EOPCT           ;SETUP END-OF-PROGRAM COUNTER
010120  005037  001214                  CLR     $ESCAPE                 ;CLEAR THE ESCAPE ON ERROR ADDRESS
010124  112737  000001  001113          MOVB    #1,$ERMAX               ;ALLOW ONE ERROR PER TEST
010132  012737  000002  022070          MOV     #RTI,$RTRN              ;SET $RTRN TO AN RTI
010140  012737  010166  000010          MOV     #16$,RESVEC             ;MOVE 16$ (FAILURE) TO RESVEC
010146  012746  000340                  MOV     #340,-(SP)              ;MOVE PRIORITY 7 TO STACK
010152  012746  010160                  MOV     #15$,-(SP)              ;MOVE 15$ (SUCCESS) TO THE STACK
010156  000006                          RTT                             ;TRY TO DO AN RTT
010160  012737  000006  022070  15$:     MOV     #RTT,$RTRN              ;RTT IS LEGAL--SET $RTRN TO AN RTT
010166  012706  001100          16$:     MOV     #STACK,SP               ;RESET STACK IF NECESSARY
010172  012737  000012  000010          MOV     #RESVEC+2,RESVEC;RESET TRAP CATCHER
010200  005037  022076                  CLR     $TBIT                   ;CLEAR 'T' BIT SWITCH
010204  012737  010700  001104          MOV     #TST1+2,$LPADR          ;SETUP $LPADR
010212  012737  010700  001106          MOV     #TST1+2,$LPERR          ;SETUP $LPERR
010220  005227  177777                  INC     #-1                     ;FIRST TIME?
010224  001017                          BNE     18$                     ;BRANCH IF NOT
010226  104401  010234                  TYPE    ,17$                    ;TYPE THE TEST TITLE
010232  000414                          BR      18$                     ;BRANCH OVER ASCIZ
010234     103     113     113  17$:     .ASCIZ  'CKKUAE 11/24/44 UBI MAP'
                                        .EVEN
010264  005737  020150          18$:     TST     $PASS                   ;IS THIS THE FIRST PASS?
010270  001140                          BNE     8$                      ;BRANCH IF NOT
010272  013746  000004                  MOV     4,-(SP)                 ;SAVE TIMEOUT VECTOR
010276  012737  010470  000004          MOV     #2$,4                   ;TIMEOUTS TO 104$
010304  013746  000006                  MOV     6,-(SP)                 ;SAVE PS VECTOR
010310  012737  000340  000006          MOV     #340,6                  ;PRIORITY 7
010316  000007                          MFPT                            ;DETERMINE PROCESSOR TYPE
010320  110037  007140                  MOVB    R0,CPUTYP               ;MOVE THE CPU NUMBER TO CPUTYP
010324  105337  007140                  DECB    CPUTYP                  ;MAKE THE 11/44 VALUE ZERO
010330  001021                          BNE     1$                      ;BRANCH TO NEXT TEST IF NOT AN 11/44
010332  022737  177777  177570          CMP     #-1,177570              ;SEE IF SSWR IS TO BE USED              ;DPM002
010340  001004                          BNE     1000$                   ;BRANCH TO SETUP FOR HARDWARE SWR       ;DPM002
010342  012737  000176  001136          MOV     #176,SWR                ;SET UP FOR SSWR                        ;DPM002
010350  000403                          BR      1010$                   ;BRANCH                                 ;DPM002
010352  012737  177570  001136  1000$:  MOV     #177570,SWR             ;SET UP FOR HARDWARE SWITCH REGISTER    ;DPM002
010360  112737  000064  006255  1010$:  MOVB    #'4,CPUMSG+55           ;MOVE ASCII 4 TO LOCATION IN MESSAGE TO PRINT
```

PRE-TESTING SETUP

```
2693 010366  104401  006200                    TYPE    ,CPUMSG         ;TYPE THE CPU TYPE HEADER
2694 010372  000446                            BR      6$              ;CONTINUE
2695 010374  122737  000002  007140  1$:      CMPB    #2,CPUTYP       ;SEE IF THIS IS AN 11/24
2696 010402  001034                            BNE     3$              ;BRANCH TO FATAL ERROR MESSAGE PRINTING IF NOT
2697 010404  012737  000176  001136            MOV     #$SSWR,SWR      ;SETUP SOFTWARE SWITCH REGISTER          ;DPM002
2698 010412  112737  000062  006255            MOVB    #'2,CPUMSG+55   ;MOVE ASCII 2 TO LOCATION IN MESSAGE TO PRINT
2699 010420  104401  006200                    TYPE    ,CPUMSG         ;TYPE THE CPU TYPE HEADER
2700 010424  105737  020163                    TSTB    $ENVM           ;IS APT SIZING
2701 010430  100427                            BMI     6$              ;BRANCH IF NO
2702 010432  012737  000176  001136            MOV     #$SSWR,SWR      ;SETUP SOFTWARE SWITCH REGISTER
2703 010440  005737  000176                    TST     $SSWR           ;SEE IF SWR IS NON-ZERO
2704 010444  001021                            BNE     6$              ;BRANCH IF SO
2705 010446  104401  006161                    TYPE    ,NEWSWR         ;TYPE:  'SWR INPUT '
2706 010452  104410                            RDOCT                   ;GO READ USER OCTAL INPUT
2707 010454  012637  000176                    MOV     (SP)+,$SSWR     ;MOVE NEW CONTENTS TO THE SOFTWARE SWR LOCATION
2708 010460  001013                            BNE     6$              ;BRANCH IF NON-ZERO
2709 010462  005237  000176                    INC     $SSWR           ;MAKE SWR NON-ZERO FOR POSSIBLE NEXT RUN
2710 010466  000410                            BR      6$              ;CONTINUE
2711 010470  062706  000004          2$:       ADD     #4,SP           ;CLEAN STACK AFTER TIMEOUT
2712 010474  005237  020142          3$:       INC     $MSGTY          ;TELL APT THIS IS A FATAL ERROR
2713 010500  104401  006607          4$:       TYPE    ,BADCPU         ;TYPE THE BAD CPU MESSAGE
2714 010504  000000                            HALT                    ;FATAL ERROR - THIS DIAGNOSTIC IS WRITTEN
2715                                                                    ;FOR 11/24 AND 11/44 PROCESSORS ONLY
2716 010506  000774                            BR      4$              ;DON'T ALLOW CONTINUE
2717 010510  012637  000006          6$:       MOV     (SP)+,6         ;RESTORE TIMEOUT PS
2718 010514  012637  000004                    MOV     (SP)+,4         ;RESTORE TIMEOUT VECTOR
2719 010520  013746  172346                    MOV     KIPAR3,-(SP)    ;SAVE PAR3
2720 010524  012737  000400  172346            MOV     #400,KIPAR3     ;START WITH ADDRESS 40000
2721 010532  012704  060000                    MOV     #60000,R4       ;ADDRESS PAR3. OFFSET=0
2722 010536  012705  040222                    MOV     #40222,R5       ;DATA TO LOAD TO 40000
2723 010542  010514          7$:       MOV     R5,(R4)         ;MOVE DATA TO LOCATION
2724 010544  062705  010000                    ADD     #10000,R5       ;MOVE DATA UP 10000
2725 010550  062737  000100  172346            ADD     #100,KIPAR3     ;MOVE ADDRESS UP 10000
2726 010556  022737  007600  172346            CMP     #7600,KIPAR3    ;SEE IF ALL DONE YET
2727 010564  001366                            BNE     7$              ;BRANCH BACK IF NOT
2728 010566  012637  172346                    MOV     (SP)+,KIPAR3    ;RESTORE PAR3
2729 010572  105737  020163          8$:       TSTB    $ENVM           ;IS APT SIZING
2730 010576  100003                            BPL     LOOP            ;BRANCH IF NOT
2731 010600  012737  020164  001136            MOV     #$SWREG,SWR     ;USE APT SWITCH REGISTER
2732 010606  012737  003372  000250  LOOP:     MOV     #MMTRAP,MMVEC   ;LOAD MEMORY MANAGEMENT TRAP SERVICE ROUTINE ADDRESS
2733 010614  012737  000340  000252            MOV     #340,MMVEC+2    ;SET PRIORITY SEVEN
2734 010622  012737  003222  000004            MOV     #CPUER,ERRVEC   ;LOAD CPU TRAP SERVICE ROUTINE ADDR
2735 010630  012737  000340  000006            MOV     #340,ERRVEC+2   ;SET PRIORITY SEVEN
2736 010636  005037  001326                    CLR     CPUEXP          ;NOT EXPECTING ANY CPU ERRORS
2737 010642  005037  177572                    CLR     MMR0            ;START IN 16 BIT MAPPING
2738 010646  005037  172516                    CLR     MMR3            ;DISABLE MAP AND 22-BIT MAPPING
2739 010652  012700  177777                    MOV     #-1,R0          ;NEGATIVE ONE USED TO INITIALIZE FLAGS
2740 010656  010037  003224                    MOV     R0,CPFLAG       ;INITIALIZE FLAGS
2741 010662  010037  003032                    MOV     R0,TOFLAG       ;INITIALIZE FLAGS
2742 010666  010037  003374                    MOV     R0,MMFLAG       ;INITIALIZE FLAGS
2743 010672  010037  177766                    MOV     R0,CPUERR       ;CLEAR CPU ERROR REGISTER
```

```
2753                                    .SBTTL  TEST # 1 - MAP REGISTER RESPONSE TEST
                                        ;*****************************************************************
                                        ;*TEST 1        MAP REGISTER RESPONSE TEST
                                        ;*
                                        ;*      THIS TEST IS USED TO ENSURE THAT ALL THE UNIBUS MAP REGISTERS
                                        ;*      CAN BE REFERENCED UNDER PROGRAM CONTROL, WITHOUT TIMING OUT.
                                        ;*      THE ADDRESSES OF ANY MAP REGISTERS THAT TIME OUT WILL BE REPORTED
                                        ;*      AND, AT THE END OF THE TEST, A SUMMARY OF THOSE REGISTERS WILL
                                        ;*      BE GIVEN.
                                        ;*
                                        ;*****************************************************************
     010676                             TST1:
     010676  000004                             SCOPE
     010700  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     010704  011122  011042  000001             .WORD   TST2,20$,1      ;DATA USED BY PRETST
2754 010712  012737  003030  000004             MOV     #TIMEOUT,ERRVEC ;LOAD ERRVEC WITH ROUTINE ADDRESS
2755 010720  105737  007140                     TSTB    CPUTYP          ;TEST TO SEE WHICH CPU IS RUNNING THIS DIAGNOSTIC
2756 010724  001435                             BEQ     3$              ;BRANCH AROUND MAP REGISTER EXISTENCE CHECK IF 11/44
2757 010726  005037  001320                     CLR     ERRCNT          ;CLEAR THE ERROR COUNTER
2758 010732  013702  170200             1$:     MOV     MAPLO,R2        ;READ FIRST MAP REGISTER TO R2
2759 010736  005737  001320                     TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
2760 010742  001426                             BEQ     3$              ;BRANCH TO CHECK THEM ALL IF NONE, THEY ARE IN THIS 11/24
2761 010744  105737  020162                     TSTB    $ENV            ;ARE WE RUNNING UNDER APT
2762 010750  100004                             BPL     2$              ;BRANCH IF NOT
2763 010752  005237  020142                     INC     $MSGTY          ;TELL APT THIS IS A FATAL ERROR
2764 010756  000000                             HALT                    ;HALT - FATAL ERROR
2765 010760  000764                             BR      1$              ;TRY AGAIN - RESTART REQUESTED
2766 010762  104401  006754             2$:     TYPE    ,MRQUES         ;ASK USER IF THERE ARE MAP REGISTERS IN THIS 11/24
2767 010766  104406                             RDCHR                   ;GO READ USER INPUT
2768 010770  112637  007043                     MOVB    (SP)+,GMRMD1    ;MOVE THE CHARACTER TO THE PRINTING LOCATION
2769 010774  104401  007043                     TYPE    ,GMRMD1         ;TYPE THE CHARACTER
2770 011000  122737  000131  007043             CMPB    #'Y,GMRMD1      ;SEE IF THIS WAS A 'Y'
2771 011006  001404                             BEQ     3$              ;BRANCH AROUND FATAL MESSAGE IF EQUAL TO A 'Y'
2772 011010  104401  007046                     TYPE    ,GMRMOD         ;TYPE:  'DIAGNOSTIC CHECKS THIS MODULE - INSERT
2773                                                                    ;       'BEFORE RE-RUNNING'
2774 011014  000000                             HALT                    ;FATAL ERROR - WAIT FOR USER ACTION
2775 011016  000745                             BR      1$              ;TRY AGAIN - RESTART REQUESTED
2776 011020  012700  170200             3$:     MOV     #MAPLO,R0       ;PUT FIRST MAP REGISTER ADDR IN R0
2777 011024  012703  000100                     MOV     #100,R3         ;TEST ALL MAP REGISTERS
2778 011030  005037  001320                     CLR     ERRCNT          ;CLEAR THE ERROR COUNTER
2779 011034  012737  011042  001106             MOV     #20$,$LPERR     ;MAKE SURE $LPERR IS POINTING AT 20$
2780 011042  011002                     20$:    MOV     (R0),R2         ;READ MAP REGISTERS TO R2
2781 011044  032777  001000  170064             BIT     #BIT09,@SWR     ;SEE IF LOOP ON ERROR IS SET
2782 011052  001403                             BEQ     4$              ;BRANCH AROUND SETUP IF NOT
2783 011054  005737  001320                     TST     ERRCNT          ;SEE IF AN ERROR OCCURED
2784 011060  001370                             BNE     20$             ;BRANCH BACK IF SO
2785 011062  005720                     4$:     TST     (R0)+           ;INCREMENT R0 TO NEXT REGISTER LOCATION
2786 011064  077312                             SOB     R3,20$          ;DO ALL OF THEM
2787 011066  012737  003222  000004             MOV     #CPUER,ERRVEC   ;RESTORE CPU TRAP SERVICE ROUTINE ADDRESS TO ERRVEC
2788 011074  012737  011020  001106             MOV     #3$, $LPERR     ;MOVE 3$ TO LOOP ON ERROR FOR ERROR +4 BELOW
2789 011102  005737  001320                     TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
2790 011106  001405                             BEQ     TST2            ;;GO TO NEXT TEST IF NO ERRORS
2791 011110  005337  001110                     DEC     $ERTTL          ;DON'T COUNT SUMMARY AS AN ADDITIONAL ERROR
2792 011114  005337  001320                     DEC     ERRCNT          ;DECREMENT ERRCNT FOR SAME REASON
2793 011120  104004                             ERROR   +4              ;SUMMARY OF MAP REGISTERS THAT TIMED OUT ON READ
```

```
2808                                    .SBTTL  TEST # 2 - BIT PATTERN AND CLEAR TEST OF 40 MAP REGISTERS
                                        ;*****************************************************************
                                        ;*TEST 2        BIT PATTERN AND CLEAR TEST OF 40 MAP REGISTERS
                                        ;*
                                        ;*      THIS TEST WILL RUN 7 BIT PATTERNS THROUGH BOTH WORDS OF 40 UNIBUS
                                        ;*      MAP REGISTER LOCATIONS MAPL00 - MAPL37, USING TWO MAJOR PASSES.
                                        ;*      IT WILL TEST THE LOWER 16 BITS ON THE FIRST PASS, AND THE UPPER
                                        ;*      6 BITS ON THE SECOND.  THIS TEST WILL MAKE SURE THE REGISTER CAN
                                        ;*      CLEAR, AND THEN RUN 6 BIT PATTERNS THROUGH EACH UNIBUS MAP REGISTER.
                                        ;*      IF THE DATA PATTERN RECEIVED DOES NOT MATCH THE EXPECTED PATTERN,
                                        ;*      THEN THE MAP REGISTER ADDRESS, DATA RECEIVED, PATTERN LOADED, AND
                                        ;*      PATTERN EXPECTED ARE REPORTED.  AT THE END OF EACH OF THE TWO MAJOR
                                        ;*      PASSES, A SUMMARY OF ALL ERRORS IS GIVEN SO THAT YOU CAN DETERMINE
                                        ;*      IF THE ERROR IS BIT SENSITIVE OR REGISTER SENSITIVE.
                                        ;*
                                        ;*****************************************************************
     011122                             TST2:
     011122  000004                             SCOPE
     011124  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     011130  011444  011254  000002             .WORD   TST3,20$,2      ;DATA USED BY PRETST
2809 011136  005037  001320                     CLR     ERRCNT          ;CLEAR THE ERROR COUNT LOCATION
2810 011142  012737  011254  001106  1$:       MOV     #20$,$LPERR     ;SETUP 20$ AS LOOP ON ERROR INDICATOR (IF NOT ALREADY)
2811 011150  012700  170200                     MOV     #MAPL00,R0      ;MOVE STARTING ADDRESS OF LOWER 16 BITS REGISTER TO R0
2812 011154  005037  005776                     CLR     MASK1           ;MOVE '0' TO MASK1
2813 011160  012737  000001  006000             MOV     #1,MASK2        ;MOVE '1' TO MASK2
2814 011166  012701  000040          2$:        MOV     #40,R1          ;DO 40 REGISTERS LOOP COUNTER
2815 011172  012702  000007          3$:        MOV     #7,R2           ;MOVE PATTERN LOOP COUNTER TO R2
2816 011176  012705  006102                     MOV     #PATRNS,R5      ;MOVE PATTERN START TO R5
2817 011202  004737  005600          4$:        JSR     PC,CHKPAT       ;GO CHECK PATTERN
2818 011206  000435                             BR      7$              ;RETURN IS HERE IF DATA IS OK
2819 011210  011003                             MOV     (R0),R3         ;READ BAD MAP REGISTER DATA INTO R3
2820 011212  011537  001174                     MOV     (R5),$TMP0      ;MOVE PATTERN TO $TMP0
2821 011216  011546                             MOV     (R5),-(SP)      ;MOVE PATTERN TO STACK FOR SUBROUTINE USE
2822 011220  004737  003650                     JSR     PC,PATEXT       ;GO SET DATA INTO PATTOR AND PATAND
2823 011224  010346                             MOV     R3,-(SP)        ;MOVE BAD DATA TO STACK FOR SUBROUTINE USE
2824 011226  004737  003624                     JSR     PC,DATEXT       ;SUBROUTINE TO LOAD DATAOR AND DATAND
2825 011232  043737  005776  001174             BIC     MASK1,$TMP0     ;FORM INPUT PATTERN FOR ERROR PRINTING
2826 011240  010046                             MOV     R0,-(SP)        ;PUT VIRTUAL ADDRESS ON STACK FOR ADREXT SUBROUTINE
2827 011242  013746  172356                     MOV     KIPAR7,-(SP)    ;PUT PAR CONTENTS ON STACK FOR ADREXT SUBROUTINE
2828 011246  004737  003674                     JSR     PC,ADREXT       ;GO SET DATA IN THE 4 WORDS OF ADDROR AND ADRAND
2829                                                                     ;AND FORM A PHYSICAL 22-BIT ADDRESS
2830 011252  000403                             BR      5$              ;BRANCH OVER LOOP ON ERROR SECTION
2831 011254  004737  005600          20$:       JSR     PC,CHKPAT       ;GO TO SUBROUTINE TO CHECK PATTERN
2832 011260  000401                             BR      6$              ;RETURN IS HERE IF DATA IS OK
2833 011262  104203                  5$:        ERROR   +203            ;THE BIT PATTERN THROUGH THE MAP REGISTERS FAILED
2834 011264  032777  001000  167644  6$:        BIT     #BIT9,@SWR      ;SEE IF LOOP ON ERROR IS SET
2835 011272  001370                             BNE     20$             ;LOOP BACK IF SO
2836 011274  012737  011172  001106             MOV     #3$,$LPERR      ;MOVE 3$ TO LOOP ON ERROR INDICATOR
2837 011302  005725                  7$:        TST     (R5)+           ;POINT R5 TO NEXT PATTERN
2838 011304  077242                             SOB     R2,4$           ;DECREMENT LOOP COUNTER
2839 011306  062700  000004                     ADD     #4,R0           ;POINT TO NEXT MAP REGISTER UNDER TEST
2840 011312  077151                             SOB     R1,3$           ;DECREMENT LOOP COUNTER AND
2841 011314  005737  001320                     TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
2842 011320  001416                             BEQ     9$              ;BRANCH IF NO ERRORS
2843 011322  012737  011142  001106             MOV     #1$,$LPERR      ;MOVE 1$ TO LOOP ON ERROR FOR ERROR +6 OR +7 BELOW
2844 011330  005337  001110                     DEC     $ERTTL          ;SUMMATION ERROR NOT COUNTED AS ANOTHER ERROR
2845 011334  005337  001320                     DEC     ERRCNT          ;SAME AS ABOVE
```

```
2846 011340  022700  170402                    CMP     #MAPH37+4,R0    ;SEE IF THIS PASS WAS UPPER 6 BITS
2847 011344  001402                            BEQ     8$              ;GO SERVICE UPPER 6 BITS ERROR IF SO
2848 011346  104006                            ERROR   +6              ;SUMMARY OF BIT PATTERN FAILURES, LOWER 16 BITS
2849 011350  000405                            BR      10$             ;GO SET UP DATA FOR TESTING UPPER 6 BITS
2850 011352  104007                    8$:     ERROR   +7              ;SUMMARY OF BIT PATTERN FAILURES, UPPER 6 BITS
2851 011354  000433                            BR      TST3            ;;GO TO NEXT TEST - LOWER 16 BITS ALREADY TESTED
2852 011356  022700  170402            9$:     CMP     #MAPH37+4,R0    ;SEE IF THIS PASS WAS FOR THE UPPER 6 BITS
2853 011362  001430                            BEQ     TST3            ;;GO TO NEXT TEST IF IT WAS
2854 011364  012737  011254  001106    10$:    MOV     #20$,$LPERR     ;RESET LOOP ON ERROR TO 20$
2855 011372  012700  170202                    MOV     #MAPH00,R0      ;MOVE STARTING ADDRESS OF UPPER 6 BITS REGISTER TO R0
2856 011376  012737  177700  005776            MOV     #177700,MASK1   ;MOVE 1ST MASK TO MASK1
2857 011404  012737  177700  006000            MOV     #177700,MASK2   ;MOVE 2ND MASK TO MASK2
2858 011412  005037  001254                    CLR     PATTOR          ;CLEAR PATTOR FOR NEXT PASS
2859 011416  005037  001246                    CLR     DATAOR          ;CLEAR DATAOR FOR NEXT PASS
2860 011422  012737  177777  001252            MOV     #-1,PATAND      ;MOVE -1 TO PATAND FOR NEXT PASS
2861 011430  012737  177777  001242            MOV     #-1,DATAND      ;MOVE -1 TO DATAND FOR NEXT PASS
2862 011436  005037  001320                    CLR     ERRCNT          ;CLEAR ERROR COUNT FOR NEXT PASS
2863 011442  000651                            BR      2$              ;GO REACCOMPLISH TEST FOR UPPER 6 BITS
```

```
2876                                    .SBTTL  TEST # 3 - DUAL ADDRESS LOADS & READS MAP REG'S
                                        ;;*****************************************************************
                                        ;*TEST 3        DUAL ADDRESS LOADS & READS MAP REG'S
                                        ;*
                                        ;*      THIS TEST ENSURES THAT ONLY ONE UNIBUS MAP REGISTER IS LOADED
                                        ;*      DURING A 'MOV   #DATA,MAPREG" INSTRUCTION.  ALL MAP REGISTERS
                                        ;*      ARE CLEARED AND ONE REGISTER AT A TIME, STARTING WITH MAPL00,
                                        ;*      IS LOADED WITH A -1.  THEN, ALL MAP REGISTERS ARE READ,
                                        ;*      STARTING WITH MAPH37, AND VERIFIED TO BE ZERO.  ANY REGISTER
                                        ;*      THAT IS NOT ZERO AND WHOSE UNIBUS ADDRESS DOES NOT MATCH THAT
                                        ;*      OF THE REGISTER UNDER TEST IS REPORTED TO BE IN ERROR.  AT THE
                                        ;*      END OF THE TEST A SUMMARY OF ALL DUALED REGISTERS IS GIVEN.
                                        ;*
                                        ;;*****************************************************************
     011444                             TST3:
     011444  000004                             SCOPE
     011446  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     011452  011762  011616  000003             .WORD   TST4,20$,3      ;DATA USED BY PRETST
2877 011460  042737  000001  177572             BIC     #1,MMR0         ;TURN OFF MEMORY MANAGEMENT
2878 011466  012700  170200                     MOV     #MAPL00,R0      ;LOAD ADDRESS OF MAPL00 IN R0
2879 011472  012702  177700                     MOV     #177700,R2      ;SET UP XOR DATA
2880 011476  012701  170400             1$:     MOV     #MAPH37+2,R1    ;PUT ADDRESS OF MAPH37+2 IN R1
2881 011502  012737  000077  001174             MOV     #77,$TMP0       ;SET UP TEST PATTERN IN $TMP0
2882 011510  004737  002772                     JSR     PC,CLRMAP       ;CLEAR ALL MAP REGISTERS FOR TEST
2883 011514  012703  000100                     MOV     #100,R3         ;SET UP LOOP COUNTER FOR TESTING 40 REGISTERS, 2 WORDS EACH
2884 011520  005037  172516                     CLR     MMR3            ;CLEAR MMR3
2885 011524  012704  000100             2$:     MOV     #100,R4         ;SET UP LOOP COUNTER FOR CHECKING 40 REGISTERS, 2 WORDS EACH
2886 011530  074237  001174                     XOR     R2,$TMP0        ;REVERSE BIT STATES OF $TMP0 IN BITS 7 TO 15
2887 011534  013710  001174                     MOV     $TMP0,(R0)      ;LOAD MAP REGISTER UNDER TEST
2888 011540  012701  170400                     MOV     #MAPH37+2,R1    ;PUT ADDRESS OF MAPH37+2 IN R1
2889 011544  005741                     3$:     TST     -(R1)           ;SEE IF MAP REGISTER IS ZERO
2890 011546  001435                             BEQ     7$              ;GO SEE IF MORE REGISTERS TO TEST IF = 0
2891 011550  005011                             CLR     (R1)            ;CLEAR THE FAILED LOCATION
2892 011552  020100                             CMP     R1,R0           ;SEE IF NON-ZERO REGISTER ADDRESS MATCHES ADDRESS LOADED
2893 011554  001432                             BEQ     7$              ;GO SEE IF MORE REGISTERS TO TEST IF SO
2894 011556  012137  001202                     MOV     (R1)+,$TMP3     ;MOVE FAULTY DATA TO $TMP3 & PREPARE R1 FOR POSSIBLE LOOP
2895 011562  013746  001202                     MOV     $TMP3,-(SP)     ;MOVE FAULTY DATA TO STACK FOR SUBROUTINE USE
2896 011566  013746  172350                     MOV     KIPAR4,-(SP)    ;MOVE PAR4 TO STACK FOR SUBROUTINE USE
2897 011572  004737  003674                     JSR     PC,ADREXT       ;GO SET DATA IN THE 4 WORDS OF ADDROR AND ADRAND
2898                                                                     ;AND FORM A PHYSICAL 22-BIT ADDRESS
2899 011576  013746  172356                     MOV     KIPAR7,-(SP)    ;PUT PAR ON STACK FOR DATEXT SUBROUTINE USE
2900 011602  010146                             MOV     R1,-(SP)        ;PUT VIRTUAL ADDRESS ON STACK FOR DATEXT SUBROUTINE USE
2901 011604  004737  003624                     JSR     PC,DATEXT       ;SUBROUTINE TO LOAD DATAOR AND DATAND
2902 011610  010037  005770                     MOV     R0,EADRS2       ;MOVE ADDRESS IN R0 TO EADRS2 FOR ERROR CALL
2903 011614  000405                             BR      5$              ;BRANCH OVER LOOP ON ERROR SECTION
2904 011616  013710  001174             20$:    MOV     $TMP0,(R0)      ;LOAD MAP REGISTER UNDER TEST
2905 011622  005711                             TST     (R1)            ;SEE IF MAP REGISTER IS ZERO
2906 011624  001402                             BEQ     6$              ;GO SEE IF LOOP ON ERROR IS STILL SET IF ZERO
2907 011626  005011                             CLR     (R1)            ;CLEAR THE FAILED LOCATION
2908 011630  104202                     5$:     ERROR   +202            ;DUAL ADDRESSING ERROR IN THE UNIBUS MAP
2909 011632  032777  001000  167276     6$:     BIT     #BIT09,@SWR     ;SEE IF LOOP ON ERROR IS SET
2910 011640  001366                             BNE     20$             ;BRANCH BACK IF SO
2911 011642  077440                     7$:     SOB     R4,3$           ;BRANCH IF MORE REGISTERS TO CHECK
2912 011644  005020                             CLR     (R0)+           ;CLEAR THE REGISTER JUST TESTED AND POINT TO NEXT REGISTER
2913 011646  005303                             DEC     R3              ;DECREMENT LOOP COUNTER AND
2914 011650  001325                             BNE     2$              ;BRANCH IF MORE REGISTERS TO TEST
2915 011652  005737  001320                     TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
```

TEST # 3 - DUAL ADDRESS LOADS & READS MAP REG'S

```
2916 011656  001405                    BEQ     RELC22          ;GO TO NEXT SECTION IF NO ERRORS
2917 011660  005337  001110            DEC     $ERTTL          ;DON'T COUNT ERROR +5 AS ANOTHER ERROR
2918 011664  005337  001320            DEC     ERRCNT          ;SAME AS ABOVE
2919 011670  104005                    ERROR   +5              ;SUMMARY OF DUAL ADDRESSING ERRORS ON LOADING MAP REGISTERS
```

```
2920 011672  104414                    RELC22: TBITR                   ;RESTORE THE T BIT TO ITS CONDITION
2921                                            ;BEFORE THE LAST TEST
2922 011674  012700  077406                      MOV     #77406,R0      ;MAKE THE KERNEL I-SPACE PAGES ALL
2923                                            ;4K, UPWARD EXPANDABLE, READ/WRITE
2924 011700  012701  172300                      MOV     #KIPDR0,R1     ;MOVE ADDRESS OF KIPDR0 TO R1
2925 011704  012702  000010                      MOV     #8.,R2         ;LOAD 8 PDR'S
2926 011710  010021                    1$:       MOV     R0,(R1)+       ;KERNEL I-SPACE PAGE X KIPDRX
2927 011712  077202                              SOB     R2,1$          ;SUBTRACT 1 AND BRANCH BACK IF NOT DONE
2928 011714  005000                              CLR     R0             ;CLEAR R0
2929 011716  012701  172340                      MOV     #KIPAR0,R1     ;MOVE ADDRESS OF KIPAR0 TO R1
2930 011722  012702  000006                      MOV     #6,R2          ;LOAD FIRST 6 PAR'S
2931 011726  010021                    2$:       MOV     R0,(R1)+       ;MAP KIPARX TO NEXT PHYSICAL PAGE
2932 011730  062700  000200                      ADD     #200,R0        ;MAP R0 TO NEXT PAGE
2933 011734  077204                              SOB     R2,2$          ;SUBTRACT 1 AND BRANCH BACK IF NOT DONE
2934 011736  012721  170000                      MOV     #170000,(R1)+  ;MAP KIPAR6 TO UNIBUS
2935 011742  012721  177600                      MOV     #177600,(R1)+  ;MAP KIPAR7 TO I/O PAGE
2936 011746  012737  000001  177572              MOV     #BIT0,MMR0     ;ENABLE FULL 18-BIT MAPPING
2937 011754  012737  000020  172516              MOV     #BIT4,MMR3     ;ENABLE 22-BIT MAPPING
2938                                    ;*        AT THIS POINT 22-BIT RELOCATION FROM MEMORY MANAGEMENT
2939                                    ;*        IS ENABLED, WITH THE KIPAR'S MAPPED TO PHYSICAL 0-24K.
2940                                    ;*        KIPAR6 IS MAPPED TO THE UNIBUS (170000) AND
2941                                    ;*        KIPAR7 IS MAPPED TO THE I/O PAGE (177600).
```

```
2952                                    .SBTTL  TEST # 4 - MAP REGISTER ADDRESS DECODE TEST
                                        ;;*****************************************************************
                                        ;*TEST 4        MAP REGISTER ADDRESS DECODE TEST
                                        ;*
                                        ;*      THIS TEST TRIES TO VERIFY THAT NONE OF THE INPUTS TO THE ADDRESS
                                        ;*      DECODER FOR THE UNIBUS MAP REGISTERS IS STUCK TRUE.  KIPAR6 IS
                                        ;*      SET UP TO HOLD 177702 AND R4 HAS THE VIRTUAL ADDRESS TO SELECT
                                        ;*      MAPL00, THROUGH KIPAR6.  THE TEST THEN CHANGES ONE BIT AT A TIME
                                        ;*      IN PAR6 SO THAT IT SHOULD NEVER REFERENCE MAPL00.  IF IT DOES, AN
                                        ;*      ERROR IS REPORTED.
                                        ;*
                                        ;;*****************************************************************
     011762                             TST4:
     011762  000004                             SCOPE
     011764  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     011770  012242  012126  000004             .WORD   TST5,20$,4      ;DATA USED BY PRETST
2953 011776  013737  172354  001200             MOV     KIPAR6,$TMP2    ;SAVE KIPAR6 FOR RESTORATION LATER
2954 012004  012737  177702  172354             MOV     #177702,KIPAR6  ;PUT MAP REGISTER 0 ADDR IN PAR6
2955 012012  012702  175254                     MOV     #175254,R2      ;PATTERN FOR TESTING.
2956 012016  010237  170200                     MOV     R2,MAPL0        ;LOAD MAP REGISTER 0
2957 012022  012700  004000                     MOV     #BIT11,R0       ;SET BIT 11 TO FLOAT THROUGH PAR6
2958 012026  012704  140000                     MOV     #140000,R4      ;VIRT.ADDR. TO SELECT PAR6
2959 012032  074037  172354             1$:     XOR     R0,KIPAR6       ;CHANGE A BIT OF MAP REGISTER 0'S ADDR
2960 012036  010046                             MOV     R0,-(SP)        ;SAVE R0 ON STACK
2961 012040  013746  172354                     MOV     KIPAR6,-(SP)    ;SAVE KIPAR6 ON STACK
2962 012044  012737  000020  001326             MOV     #TIMOUT,CPUEXP  ;EXPECTING CPU TIME OUT ON UNIBUS
2963 012052  011401                             MOV     (R4),R1         ;READ LOCATION POINTED TO BY PAR6
2964 012054  005037  001326                     CLR     CPUEXP          ;CLEAR CPUEXP - DON'T EXPECT TRAPS FOR A WHILE
2965 012060  020201                             CMP     R2,R1           ;SEE IF DATA FETCHED MATCHES PATTERN
2966 012062  001047                             BNE     4$              ;BRANCH IF NOT SAME
2967 012064  012737  000020  001326             MOV     #TIMOUT,CPUEXP  ;EXPECTING CPU TIME OUT ON UNIBUS
2968 012072  005014                             CLR     (R4)            ;TRY TO CLEAR THIS LOCATION
2969 012074  005037  001326                     CLR     CPUEXP          ;CLEAR CPUEXP - DON'T EXPECT TRAPS FOR A WHILE
2970 012100  005737  170200                     TST     MAPL0           ;SEE IF MAP REGISTER 0 GOT CLEARED
2971 012104  001036                             BNE     4$              ;BRANCH IF MAP REGISTER NOT ZERO
2972 012106  010237  170200                     MOV     R2,MAPL0        ;RESTORE MAPL0
2973 012112  010446                             MOV     R4,-(SP)        ;PUT VIRTUAL ADDRESS ON STACK FOR ADREXT SUBROUTINE USE
2974 012114  013746  172354                     MOV     KIPAR6,-(SP)    ;PUT PAR ON STACK FOR ADREXT SUBROUTINE USE
2975 012120  004737  003674                     JSR     PC,ADREXT       ;GO SET DATA IN THE 4 WORDS OF ADDROR AND ADRAND
2976 012124  000416                             BR      2$              ;GO CALL ERROR
2977 012126  012737  000020  001326     20$:    MOV     #TIMOUT,CPUEXP  ;EXPECTING CPU TIME OUT ON UNIBUS
2978 012134  011401                             MOV     (R4),R1         ;READ LOCATION POINTED TO BY PAR6
2979 012136  005037  001326                     CLR     CPUEXP          ;CLEAR CPUEXP - DON'T EXPECT TRAPS FOR A WHILE
2980 012142  020201                             CMP     R2,R1           ;SEE IF DATA FETCHED MATCHES PATTERN
2981 012144  001012                             BNE     3$              ;BRANCH IF NOT SAME
2982 012146  005014                             CLR     (R4)            ;TRY TO CLEAR THIS LOCATION
2983 012150  005737  170200                     TST     MAPL0           ;SEE IF MAP REGISTER 0 GOT CLEARED
2984 012154  001006                             BNE     3$              ;BRANCH IF MAP REGISTER NOT ZERO
2985 012156  010237  170200                     MOV     R2,MAPL0        ;RESTORE MAPL0
2986 012162  104207                     2$:     ERROR   +207            ;GOT TO MAPL0 WITH ONE BIT DIFFERENT IN ADDRESS FROM 177020
2987 012164  012737  000077  005766             MOV     #77,EADRES+2    ;RESTORE 77 TO EADRES+2
2988 012172  032777  001000  166736     3$:     BIT     #BIT09,@SWR     ;SEE IF LOOP ON ERROR IS SET
2989 012200  001352                             BNE     20$             ;BRANCH BACK TO LOOP IF SO
2990 012202  012737  000020  001326     4$:     MOV     #TIMOUT,CPUEXP  ;EXPECTING CPU TIME OUT ON UNIBUS
2991 012210  010114                             MOV     R1,(R4)         ;RELOAD THE LOCATION
2992 012212  005037  001326                     CLR     CPUEXP          ;CLEAR CPUEXP - DON'T EXPECT TRAPS FOR A WHILE
2993 012216  012637  172354             5$:     MOV     (SP)+,KIPAR6    ;RESTORE KIPAR6
```

```
2994 012222  012600                        MOV     (SP)+,R0        ;RESTORE R0
2995 012224  074037  172354                XOR     R0,KIPAR6       ;RESTORE BIT TO ORIGINAL STATUS
2996 012230  006200                        ASR     R0              ;RIGHT SHIFT ONE PLACE
2997 012232  001277                        BNE     1$              ;GO CONTINUE TEST IF BIT NOT SHIFTED OUT YET
2998 012234  013737  001200  172354  6$:  MOV     $TMP2,KIPAR6    ;RESTORE KIPAR6
```

```
3011                                    .SBTTL  TEST # 5 - DATA PATH, UNIBUS TO MAIN MEMORY
                                        ;*****************************************************************
                                        ;*TEST 5        DATA PATH, UNIBUS TO MAIN MEMORY
                                        ;*
                                        ;*      THIS TEST RUNS A COUNT PATTERN THROUGH A MEMORY LOCATION VIA
                                        ;*      THE UNIBUS.  THE UNIBUS MAP IS LEFT OFF DURING THIS TEST SO
                                        ;*      THAT THE ADDRESS IS NOT RELOCATED.  THE TEST TRIES TO LOAD THE
                                        ;*      PATTERN INTO ADDRESS 040000 (8K) BUT IF THE MAP JUMPERS ARE
                                        ;*      SET NOT TO RESPOND TO THAT ADDRESS THE NEXT 4K IS TRIED UNTIL
                                        ;*      THE TEST GETS TO MAIN MEMORY FROM THE UNIBUS.  IF THIS TEST
                                        ;*      DETERMINES THAT IT CANNOT GET TO MAIN MEMORY FROM THE UNIBUS
                                        ;*      IT REPORTS THE FACT AND SKIPS THE NEXT TEST FOR VERIFICATION.
                                        ;*
                                        ;*****************************************************************
     012242                             TST5:
     012242  000004                             SCOPE
     012244  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     012250  012630  012262  000005             .WORD   TST6,20$,5      ;DATA USED BY PRETST
3012 012256  004737  002772                     JSR     PC,CLRMAP       ;CLEAR ALL MAP REGISTERS
3013 012262  012704  000035             20$:    MOV     #35,R4          ;DO 35 ACCESSES
3014 012266  012737  170400  172354             MOV     #170400,KIPAR6  ;START WITH ADDRESS 8K FROM UNIBUS
3015 012274  012737  170400  001210             MOV     #170400,$TMP6   ;MOVE IT TO $TMP6 ALSO
3016 012302  005037  001330             2$:     CLR     PCPUER          ;CLEAR ERROR CONDITION LOCATION
3017 012306  012737  000020  001326             MOV     #TIMOUT,CPUEXP  ;TIMEOUTS MIGHT OCCUR IN THIS TEST.
3018 012314  013700  140000                     MOV     140000,R0       ;TRY TO READ ADDRESS POINTED TO BY PAR6
3019 012320  005037  001326                     CLR     CPUEXP          ;CLEAR CPUEXP - NO TIMEOUTS FOR A WHILE
3020 012324  005737  001330                     TST     PCPUER          ;SEE IF READ OF ADDRESS TIMED OUT
3021 012330  001411                             BEQ     4$              ;BRANCH IF REFERENCE WAS GOOD
3022 012332  062737  000200  172354     3$:     ADD     #200,KIPAR6     ;TRY NEXT 4K BLOCK OF MEMORY
3023 012340  062737  000200  001210             ADD     #200,$TMP6      ;ADD 200 TO $TMP6 ALSO
3024 012346  077423                             SOB     R4,2$           ;SUBTRACT 1 FROM R4 AND BRANCH IF NOT DONE
3025 012350  104010                             ERROR   +10             ;NO UNIBUS ADDRESSES RESPOND
3026 012352  000574                             BR      SIZEJ0          ;BRANCH TO SIZE JUMPER SECTION
3027 012354  013737  172354  172352     4$:     MOV     KIPAR6,KIPAR5   ;PUT PAR6 INTO PAR5
3028 012362  013737  001210  001206             MOV     $TMP6,$TMP5     ;DO SAME TRANSFER
3029 012370  042737  170000  172352             BIC     #170000,KIPAR5  ;MAKE PAR5 A NON UNIBUS ADDRESS
3030 012376  042737  170000  001206             BIC     #170000,$TMP5   ;CLEAR SAME BITS
3031 012404  012737  173214  120000             MOV     #173214,120000  ;PUT RANDOM NUMBER INTO TEST LOCATION BY FAST BUS
3032 012412  012737  000020  001326             MOV     #TIMOUT,CPUEXP  ;TIMEOUTS MIGHT OCCUR IN THIS TEST.
3033 012420  013701  140000                     MOV     140000,R1       ;READ TEST LOCATION BY UNIBUS
3034 012424  005037  001326                     CLR     CPUEXP          ;CLEAR CPUEXP - NO TIMEOUTS FOR A WHILE
3035 012430  022701  173214                     CMP     #173214,R1      ;SEE IF DATA WAS READ PROPERLY
3036 012434  001406                             BEQ     5$              ;DATA OKAY NOW VERIFY DATA PATH
3037 012436  020001                             CMP     R0,R1           ;SEE IF DATA CHANGED FROM FIRST READ
3038 012440  001004                             BNE     5$              ;BRANCH AROUND NEXT TRY IF SO
3039 012442  062737  000200  172354             ADD     #200,KIPAR6     ;TRY NEXT 4K BLOCK OF MEMORY
3040 012450  077464                             SOB     R4,2$           ;BRANCH BACK TO TRY NEXT 4K BLOCK
3041 012452  012701  006102             5$:     MOV     #PATRNS,R1      ;LOAD ADDRESS OF BIT PATTERNS IN R1
3042 012456  012702  140000                     MOV     #140000,R2      ;LOAD VIRTUAL ADDRESS INTO R2
3043 012462  012703  000007                     MOV     #7,R3           ;DO 7 PATTERNS
3044 012466  012737  000020  001326             MOV     #TIMOUT,CPUEXP  ;TIMEOUTS MIGHT OCCUR IN THIS TEST.
3045 012474  011112                     6$:     MOV     (R1),(R2)       ;LOAD COUNT INTO TEST LOCATION VIA U.B.
3046 012476  021112                             CMP     (R1),(R2)       ;COMPARE COUNT WITH DATA READ
3047 012500  001426                             BEQ     10$             ;BRANCH IF DATA MATCHES
```

```
3048 012502  011137  001174                    MOV     (R1),$TMP0      ;MOVE EXPECTED PATTERN TO $TMP0
3049 012506  011237  001176                    MOV     (R2),$TMP1      ;MOVE RECEIVED PATTERN TO $TMP1
3050 012512  011246                            MOV     (R2),-(SP)      ;PUT DATA ON STACK FOR DATEXT SUBROUTINE USE
3051 012514  004737  003624                    JSR     PC,DATEXT       ;SUBROUTINE TO LOAD DATAOR AND DATAND
3052 012520  011146                            MOV     (R1),-(SP)      ;PUT PATTERN ON STACK FOR PATEXT SUBROUTINE USE
3053 012522  004737  003650                    JSR     PC,PATEXT       ;GO SET DATA INTO PATTOR AND PATAND
3054 012526  012737  012536  001106            MOV     #7$,$LPERR      ;SET LOOP ON ERROR POINTER TO 61$
3055 012534  000403                            BR      8$              ;BRANCH OVER LOOP ON ERROR SECTION
3056 012536  011112                    7$:     MOV     (R1),(R2)       ;LOAD COUNT INTO TEST LOCATION VIA U.B.
3057 012540  021112                            CMP     (R1),(R2)       ;COMPARE COUNT WITH DATA READ
3058 012542  001401                            BEQ     9$              ;BRANCH IF OK NOW
3059 012544  104204                    8$:     ERROR   +204            ;REPORT ERROR(S) ON UNIBUS DATA PATH
3060 012546  032777  001000  166362    9$:     BIT     #BIT9,@SWR      ;SEE IF LOOP ON ERROR IS SET
3061 012554  001370                            BNE     7$              ;BRANCH BACK IF SO
3062 012556  062701  000002            10$:    ADD     #2,R1           ;MOVE TO NEXT PATTERN
3063 012562  077334                            SOB     R3,6$           ;DECREMENT LOOP COUNTER AND BRANCH IF NOT DONE
3064 012564  005037  001326                    CLR     CPUEXP          ;CLEAR CPUEXP - NO TIMEOUTS FOR A WHILE
3065 012570  005737  001320                    TST     ERRCNT          ;WERE THERE ANY ERRORS ON THIS TEST
3066 012574  001405                            BEQ     11$             ;BRANCH IF NO ERRORS ON THIS TEST
3067 012576  005337  001110                    DEC     $ERTTL          ;DON'T COUNT ERROR +11 AS ANOTHER ERROR
3068 012602  005337  001320                    DEC     ERRCNT          ;SAME AS ABOVE
3069 012606  104011                            ERROR   +11             ;SUMMARY OF ERRORS ON THE UNIBUS DATA PATH
3070 012610  023737  001206  172352    11$:    CMP     $TMP5,KIPAR5    ;MAKE SURE PAR5 CONTAINS EXPECTED CONTENTS
3071 012616  001404                            BEQ     TST6            ;;BRANCH IF OK
3072 012620  104030                            ERROR   +30             ;KIPAR5 NOT LOADED PROPERLY - SKIPPING NEXT TEST
3073 012622  013737  001206  172352            MOV     $TMP5,KIPAR5    ;RESET KIPAR5 FOR EXECUTION OF NEXT TEST
```

```
3087                                    .SBTTL  TEST # 6 - MAP DOESN'T RELOCATE IF NOT ENABLED
                                        ;*****************************************************************
                                        ;*TEST 6        MAP DOESN'T RELOCATE IF NOT ENABLED
                                        ;*
                                        ;*      THIS TEST VERIFIES THAT THE UNIBUS MAP DOES NOT RELOCATE IF BIT5
                                        ;*      OF MMR3 IS NOT SET.  THE TEST ASSUMES THAT THE PREVIOUS TEST HAS
                                        ;*      RUN SUCCESSFULLY AND LEFT KIPAR6 POINTING TO THE FIRST UNIBUS
                                        ;*      MAPPING REGISTER THAT THE UNIBUS MAP WILL RESPOND TO GREATER
                                        ;*      THAN OR EQUAL TO MAPREG #2.  KIPAR5 IS ALSO POINTING TO THE
                                        ;*      SAME MEMORY BASE ADDRESS EXCEPT IT POINTS OVER THE FASTBUS.
                                        ;*      THE TEST THEN SETS ONE BIT IN EACH A.L.U. OF THE UNIBUS MAP
                                        ;*      AND TRIES TO REFERENCE MAIN MEMORY OVER THE UNIBUS.  SINCE THE
                                        ;*      MAP IS NOT ENABLED THE LOAD WILL GO TO MAIN MEMORY UNRELOCATED.
                                        ;*
                                        ;*****************************************************************
    012630  000004                      TST6:   SCOPE
3088 012632  004737  005166                      JSR     PC,PRETST       ;GO SET UP PRETEST DATA
3089 012636  012744  012710  000006              .WORD   SIZEJ0,20$,6    ;DATA USED BY PRETST
3090 012644  052737  000001  177572              BIS     #BIT0,MMR0      ;TURN MEMORY MANAGEMENT BACK ON
3091 012652  013700  172354                      MOV     KIPAR6,R0       ;PUT UNIBUS ADDRESS OF MAP REGISTER IN R0
3092 012656  072027  177773                      ASH     #-5,R0          ;RIGHT SHIFT R0 5 PLACES
3093 012662  042700  177400                      BIC     #177400,R0      ;CLEAR UPPER BYTE
3094 012666  042737  177000  172352              BIC     #177000,KIPAR5  ;MAKE KIPAR5 ACCESS THE FAST BUS
3095 012674  012720  021042                      MOV     #021042,(R0)+   ;SET BOTTOM BIT IN EACH ALU
3096 012700  012710  000042                      MOV     #42,(R0)        ;SET BOTTOM BIT IN EACH ALU
3097 012704  005037  120000                      CLR     120000          ;CLEAR TEST LOCATION VIA FAST BUS
3098 012710  012737  000020  001326  20$:        MOV     #TIMOUT,CPUEXP  ;TIMEOUTS MIGHT OCCUR IN THIS TEST.
3099 012716  012737  043207  140000              MOV     #43207,140000   ;LOAD TEST LOCATION VIA UNIBUS THIS LOAD SHOULD NOT BE
3100                                                                     ;RELOCATED BY THE UNIBUS MAP, SINCE BIT05 OF MMR3 IS CLEAR.
3101 012724  005037  001326                      CLR     CPUEXP          ;CLEAR CPUEXP - NO TIMEOUTS FOR A WHILE
3102 012730  013703  120000                      MOV     120000,R3       ;READ TEST LOCATION VIA FAST BUS
3103 012734  022703  043207                      CMP     #43207,R3       ;SEE IF DATA MATCHES
3104 012740  001401                              BEQ     SIZEJ0          ;BRANCH IF DATA GOOD
3105 012742  104012                              ERROR   +12             ;MAP RELOCATED WHEN NOT ENABLED
```

```
                                        .SBTTL  DETERMINATION OF FIRST USEABLE MAP REGISTER
                                ;;*****************************************************************
                                ;*
                                ;*      THIS TEST DETERMINES THE SETTING OF THE JUMPERS ON THE UNIBUS
                                ;*      MAP WHICH ALLOW THE MAP TO RESPOND TO THOSE ADDRESSES BETWEEN
                                ;*      THE JUMPER RANGE.  THE DEFAULT SETTING ALLOWS THE MAP TO RESPOND
                                ;*      TO ADDRESSES 000000 - 757776 ON THE UNIBUS.  IF THE JUMPERS ARE
                                ;*      NOT SET IN THEIR DEFAULT POSITION AN INFORMATIONAL MESSAGE IS GIVEN.
                                ;*                      >>>>>>>>>NOTE<<<<<<<<<
                                ;*      THIS IS THE FIRST TEST IN WHICH THE UNIBUS MAP IS TURNED ON.
                                ;*
                                ;;*****************************************************************
012744  012705  020226          SIZEJ0: MOV     #$DDW0,R5       ;PUT ADDRESS OF $DDW0 IN R5
012750  012700  170200                  MOV     #MAPL0,R0       ;LOAD ADDRESS OF FIRST MAP REGISTER IN R0
012754  012701  000040                  MOV     #40,R1          ;DO ALL 40 REGISTERS
012760  012702  006002                  MOV     #SPECST,R2      ;SET R2 TO BEGINING OF SPECIAL STACK
012764  012720  020000          1$:     MOV     #20000,(R0)+    ;LOAD 4K INTO LOWER 16 BITS AND
012770  005020                  CLR     (R0)+           ;CLEAR THE UPPER 6 BITS
012772  005022                  CLR     (R2)+           ;CLEAR THE SPECIAL STACK LOCATION
012774  077105                  SOB     R1,1$           ;BRANCH IF THERE ARE MORE TO LOAD
012776  012703  006002                  MOV     #SPECST,R3      ;RESET SPECIAL STACK POINTER
013002  052737  000040  172516          BIS     #BIT5,MMR3      ;TURN ON MAP RELOCATION
013010  052737  000001  177572          BIS     #BIT0,MMR0      ;MAKE SURE MEMORY MANAGEMENT IS ON
013016  012700  117776                  MOV     #117776,R0      ;THIS WILL BE USED TO SELECT PAR 4, ADDRESS 17776
013022  012737  170000  172350          MOV     #170000,KIPAR4  ;LOAD MAP REGISTER 0 -200 IN KIPAR4
013030  012702  125252                  MOV     #125252,R2      ;CONSTANT TO LOAD INTO LOCATION 17776
013034  012737  177777  001174          MOV     #-1,$TMP0       ;MOVE -1 TO MAP REGISTER POINTER
013042  012737  177777  003532          MOV     #-1,FTTHRU      ;INITIALIZE ONE TIME ENTRANCE FLAG IN SUBROUTINE
013050  012737  037776  001310          MOV     #37776,UBM24L   ;MOVE TEST CELL ADDRESS TO LOCATION UBM24L
013056  005037  001312                  CLR     UBM24U          ;CLEAR UPPER LOCATION UBM24U
013062  012737  013070  001106          MOV     #2$,$LPERR      ;MOVE LOOP ON ERRROR ADDRESS TO $LPERR
013070  012737  000020  001326  2$:     MOV     #TIMOUT,CPUEXP  ;EXPECTING CPU TIME OUT ON UNIBUS
013076  004737  003474                  JSR     PC,TSTLOC       ;GO TO SUBROUTINE TO SEE IF LOCATION RESPONDS
013102  000417                  BR      3$              ;RETURN IS HERE IF LOWEST FOUND
013104  005037  001326                  CLR     CPUEXP          ;CLEAR CPUEXP - NO TIMEOUTS FOR A WHILE
013110  004737  005230                  JSR     PC,DSABLD       ;GO SEE IF REGISTER SHOULD BE DISABLED
013114  104214                  ERROR   +214            ;MAP REGISTER DISABLED WHEN SHOULD BE ENABLED
013116  062737  000200  172350          ADD     #200,KIPAR4     ;MAP TO NEXT REGISTER
013124  022737  177400  172350          CMP     #177400,KIPAR4  ;SEE IF WE ARE POINTING JUST BELOW THE I/O PAGE
013132  001356                  BNE     2$              ;GO TEST NEXT MAP REGISTER IF NOT
013134  104013                  ERROR   +13             ;FATAL ERROR, RESTARTING PROGRAM
013136  000137  010000                  JMP     START           ;JUMP TO RESTART PROGRAM
013142  005037  001326          3$:     CLR     CPUEXP          ;CLEAR CPUEXP - NO TIMEOUTS FOR A WHILE
013146  004737  005266                  JSR     PC,ENABLD       ;GO CHECK TO SEE IF REGISTER SHOULD BE ENABLED
013152  104213                  ERROR   +213            ;MAP REGISTER ENABLED WHEN SHOULD BE DISABLED
```

```
                                        .SBTTL  SECTION TO DETERMINE NUMBER OF USEABLE MAP REGISTERS
                                ;;*****************************************************************
                                ;*      THIS SECTION DETERMINES THE NUMBER OF USEABLE MAP REGISTERS BY ACCOM-
                                ;*      PLISHING THE SAME LOCATION ACCESS TEST AS IN THE PREVIOUS SECTION.
                                ;*
                                ;;*****************************************************************
013154  013737  001174  001266  SIZEJ1: MOV     $TMP0,MMRLOW    ;MOVE REGISTER NUMBER FOUND USEABLE TO MMRLOW
013162  013737  172350  001256          MOV     KIPAR4,LOWEST   ;MOVE LOWEST USEABLE REGISTER TO LOWEST
013170  022737  170000  001256          CMP     #170000,LOWEST  ;SEE IF LOWEST REGISTER FOUND WAS THE LOWEST
013176  001427                          BEQ     1$              ;BRANCH AROUND SETUP IF IT WAS
013200  005037  001272                  CLR     UBRLOW          ;MAP REGISTER 0 IS LOWEST FOR UNIBUS MEMORY
013204  012737  170000  001262          MOV     #170000,UBMLOW  ;MOVE PAR VALUE OF UB MEMORY TO UBMLOW
013212  013737  001174  001274          MOV     $TMP0,UBRHI     ;MOVE REGISTER NUMBER FOUND USEABLE TO UBRHI
013220  005337  001274                  DEC     UBRHI           ;POINT IT AT HIGHEST UB MEMORY MAP REGISTER
013224  013737  172350  001264          MOV     KIPAR4,UBMHI    ;MOVE KIPAR4 TO UNIBUS MAP HIGHEST AND
013232  162737  000200  001264          SUB     #200,UBMHI      ;SUBTRACT 200 FROM IT TO POINT TO LAST USEABLE UBMEM PAGE
013240  012737  177400  001260          MOV     #177400,HIGEST  ;MOVE HIGHEST REGISTER TO HIGEST AND
013246  012737  000031  001270          MOV     #31,MMRHI       ;POINT TO LAST USEABLE MAP REGISTER
013254  000532                          BR      YESMSG          ;GO TYPE MESSAGE OF NON-DEFAULT INFORMATION
013256  012737  013324  001106  1$:     MOV     #3$,$LPERR      ;SET LOOP ON ERROR TO 3$
013264  062737  000200  172350          ADD     #200,KIPAR4     ;MAP TO NEXT REGISTER
013272  000414                          BR      3$              ;BRANCH OVER POST-TSTLOC CODE
013274  005037  001326          2$:     CLR     CPUEXP          ;CLEAR CPUEXP - DON'T EXPECT TRAPS FOR A WHILE
013300  062737  000200  172350          ADD     #200,KIPAR4     ;MAP TO NEXT REGISTER
013306  022737  177400  172350          CMP     #177400,KIPAR4  ;SEE IF ALL MAP REGISTERS HAVE BEEN TRIED
013314  001416                          BEQ     4$              ;BRANCH IF ALL ARE DONE
013316  004737  005266                  JSR     PC,ENABLD       ;GO SEE IF MAP REGISTER SHOULD BE ENABLED
013322  104213                          ERROR   +213            ;MAP REGISTER ENABLED WHEN SHOULD BE DISABLED
013324  012737  000020  001326  3$:     MOV     #TIMOUT,CPUEXP  ;TIMEOUTS MIGHT OCCUR IN THIS TEST.
013332  004737  003474                  JSR     PC,TSTLOC       ;GO TO SUBROUTINE TO SEE IF IT RESPONDS
013336  000756                          BR      2$              ;RETURN IS HERE IF IT WAS LOADED
013340  005037  001326                  CLR     CPUEXP          ;CLEAR CPUEXP - NO TIMEOUTS FOR A WHILE
013344  004737  005230                  JSR     PC,DSABLD       ;RETURN IS HERE IF NOT LOADED - GO SEE IF
                                                                ;REGISTER SHOULD BE DISABLED
013350  104214                          ERROR   +214            ;MAP REGISTER DISABLED WHEN SHOULD BE ENABLED
013352  013737  001174  001270  4$:     MOV     $TMP0,MMRHI     ;MOVE REGISTER FOUND TO MMRHI
013360  005337  001270                  DEC     MMRHI           ;DECREMENT THIS VALUE - IT IS ONE TOO MANY
013364  013737  172350  001260          MOV     KIPAR4,HIGEST   ;MOVE FIRST UNUSABLE REGISTER TO HIGEST
013372  023727  001260  177400          CMP     HIGEST,#177400  ;SEE IF UPPER JUMPER IS DEFAULT.
013400  001522                          BEQ     NOMSG           ;BRANCH AROUND MESSAGE TYPEOUT IF IT IS DEFAULT
```

DETERMINE UNUSEABLE MAP REGISTER WINDOW SIZE

```
3191                                            .SBTTL  DETERMINE UNUSEABLE MAP REGISTER WINDOW SIZE
3192                                    ;;*****************************************************************
3193                                    ;*      THIS SECTION PERFORMS THE SAME LOCATION ACCESS TEST PREVIOUSLY DONE
3194                                    ;*      LOOKING FOR THE FIRST ACCESSIBLE REGISTER, OR THE UPPER LIMIT.  ONCE
3195                                    ;*      FOUND, THE SIZE OF THE WINDOW HAS BEEN DETERMINED AND THE MESSAGE
3196                                    ;*      TELLING THE USER OF THE SIZE IS PRINTED.
3197                                    ;*
3198                                    ;;*****************************************************************
3199 013402  013737  001260  001262  SIZEJ2: MOV     HIGEST,UBMLOW   ;MOVE UPPER LIMIT TO UBMLOW LOCATION
3200 013410  062737  000200  001262          ADD     #200,UBMLOW     ;POINT UBMLOW TO FIRST USABLE UNIBUS MEM PAGE
3201 013416  013737  001174  001272          MOV     $TMP0,UBRLOW    ;MOVE REGISTER NUMBER TO UBRLOW
3202 013424  012737  013460  001106          MOV     #2$,$LPERR      ;SET LOOP ON ERROR TO 2$
3203 013432  000412                          BR      2$              ;BRANCH OVER CHECK FOR NON-EXISTENT LOCATION
3204 013434  062737  000200  172350  1$:     ADD     #200,KIPAR4     ;MAP TO NEXT REGISTER
3205 013442  022737  177400  172350          CMP     #177400,KIPAR4  ;SEE IF WE ARE POINTING JUST BELOW THE I/O PAGE
3206 013450  001414                          BEQ     3$              ;GO INITIALIZE UBMHI IF WE ARE
3207 013452  004737  005230                  JSR     PC,DSABLD       ;GO SEE IF LOCATION SHOULD BE DISABLED
3208 013456  104214                          ERROR   +214            ;MAP REGISTER DISABLED WHEN SHOULD BE ENABLED
3209 013460  012737  000020  001326  2$:     MOV     #TIMOUT,CPUEXP  ;TIMEOUTS MIGHT OCCUR IN THIS TEST.
3210 013466  004737  003474                  JSR     PC,TSTLOC       ;GO TO SUBROUTINE TO SEE IF IT DOESN'T RESPOND
3211 013472  000403                          BR      3$              ;RETURN IS HERE IF IT WAS LOADED - GO INITIALIZE UBMHI
3212 013474  005037  001326                  CLR     CPUEXP          ;CLEAR CPUEXP - NO TIMEOUTS FOR A WHILE
3213 013500  000755                          BR      1$              ;RETURN IS HERE IF NOT - GO BACK FOR ANOTHER TRY
3214                                          ;AT THIS POINT, KIPAR4 POINTS JUST ABOVE HIGHEST ADDRESS OF UNIBUS MEMORY
3215 013502  005037  001326          3$:     CLR     CPUEXP          ;CLEAR CPUEXP - NO TIMEOUTS FOR A WHILE
3216 013506  004737  005266                  JSR     PC,ENABLD       ;GO SEE IF MAP REGISTER SHOULD BE ENABLED
3217 013512  104213                          ERROR   +213            ;MAP REGISTER ENABLED WHEN SHOULD BE DISABLED
3218 013514  013737  172350  001276          MOV     KIPAR4,BUPWIN   ;MOVE THIS VALUE TO 'B'EGINING 'UP'PER 'WIN'DOW
3219 013522  013737  172350  001264          MOV     KIPAR4,UBMHI    ;MOVE THIS TO UBMHI ALSO
3220 013530  013737  001174  001274          MOV     $TMP0,UBRHI     ;MOVE MAP REGISTER POINTER TO UBRHI
3221 013536  005337  001274                  DEC     UBRHI           ;DECREMENT THIS VALUE - IT IS ONE TOO MANY
```

```
3222                                                    .SBTTL  ROUTINE TO PRINT THE WINDOW SIZE MESSAGE
3223                                            ;;*****************************************************************
3224 013542  005737  020150                    YESMSG: TST     $PASS           ;SEE IF THIS IS FIRST PASS
3225 013546  001037                                    BNE     NOMSG           ;BRANCH TO NEXT SECTION IF NOT FIRST PASS
3226 013550  104401  033002                            TYPE    ,JMPMSG         ;TYPE SIZE JUMPERS NOT IN DEFAULT - FOR INFO ONLY
3227 013554  012700  005740                            MOV     #DTMS,R0        ;SET UP MESSAGE POINTER
3228 013560  012746  013574                            MOV     #1$,-(SP)       ;PUSH RETURN ON THE STACK
3229 013564  010046                                    MOV     R0,-(SP)        ;PUSH R0 ON THE STACK
3230 013566  010146                                    MOV     R1,-(SP)        ;PUSH R1 ON THE STACK
3231 013570  000137  002244                            JMP     TYPDAT          ;GO TYPE THE DATA
3232 013574  104401  001223                    1$:     TYPE    ,$CRLF          ;TYPE A <CRLF>
3233 013600  104401  001223                            TYPE    ,$CRLF          ;TYPE ONE MORE <CRLF>
3234 013604  022703  006002                            CMP     #SPECST,R3      ;SEE IF ANY TIMEOUTS OCCURED
3235 013610  001416                                    BEQ     NOMSG           ;BRANCH TO NEXT SECTION IF NONE
3236 013612  104401  006261                            TYPE    ,TOMSG          ;TYPE THE TIMEOUTS MESSAGE
3237 013616  012703  006002                            MOV     #SPECST,R3      ;RESET R3
3238 013622  014346                            2$:     MOV     -(R3),-(SP)     ;PUSH THE REGISTER # ONTO THE STACK IN ORDER IT WAS PUSHED
3239 013624  104405                            3$:     TYPDS                   ;TYPE THE NUMBER IN DECIMAL, LEADING ZEROS SUPPRESSED
3240 013626  104401  001223                            TYPE    ,$CRLF          ;TYPE A <CRLF>
3241 013632  005743                                    TST     -(R3)           ;SEE IF THERE IS ANOTHER REGISTER NUMBER TO PRINT
3242 013634  001402                                    BEQ     4$              ;BRANCH AROUND SETUP IF NONE
3243 013636  011346                                    MOV     (R3),-(SP)      ;PUSH THIS NUMBER ON THE STACK
3244 013640  000771                                    BR      3$              ;BRANCH BACK TO PRINT IT
3245 013642  104401  001223                    4$:     TYPE    ,$CRLF          ;TYPE ONE MORE <CRLF>
```

```
                                        .SBTTL  SETUP POINTERS FOR LOWEST AND HIGHEST MAP REGISTERS
                                ;;**************************************************************
                                ;;
                                ;*      SETUP POINTERS TO THE LOWEST AND THE HIGHEST USABLE
                                ;*      MAPPING REGISTERS TO CONTINUE WITH TEST.
                                ;;
                                ;;**************************************************************
013646  010546                  NOMSG:  MOV     R5,-(SP)        ;SAVE R5
013650  013705  001256                  MOV     LOWEST,R5       ;MOVE PAR DATA TO R5 FOR CONVERSION
013654  042705  170000                  BIC     #170000,R5      ;CLEAR BITS 15 TO 12
013660  072527  177773                  ASH     #-5,R5          ;SHIFT INDICATOR BITS TO THE RIGHT 5 PLACES
013664  052705  170200                  BIS     #170200,R5      ;FORM ADDRESS
013670  010537  001300                  MOV     R5,LREGL        ;SAVE RESULTS
013674  012605                          MOV     (SP)+,R5        ;RESTORE R5
013676  013737  001300  001302          MOV     LREGL,LREGU     ;MOVE ADDRESS TO LREGU
013704  062737  000002  001302          ADD     #2,LREGU        ;POINT TO UPPER 6 BITS OF MAP REG
```

TEST # 7 - ENSURE THAT THERE IS NO DUAL MAPPING

```
3280                                    .SBTTL  TEST # 7 - ENSURE THAT THERE IS NO DUAL MAPPING
                                        ;;*****************************************************************
                                        ;*TEST 7        ENSURE THAT THERE IS NO DUAL MAPPING
                                        ;*
                                        ;*      THIS TEST VERIFIES THAT THERE IS NO DUAL MAPPING. IT CLEARS
                                        ;*      ALL THE MAP REGISTERS EXCEPT THE ONE UNDER TEST, AND LOADS
                                        ;*      THAT ONE WITH 00040000.  IF MAP RELOCATION IS ENABLED (AND
                                        ;*      IN THIS TEST IT IS), SUBROUTINE CLRMAP CLEARS ALL BUT THE
                                        ;*      LOWER 16 BITS OF MAPL1, AND LOADS 20000 THERE.  THIS IS SO
                                        ;*      THAT APT, IF CONTROLLING THIS DIAGNOSTIC, CAN STILL EXAMINE
                                        ;*      THE PROPER LOCATIONS.  THE TEST THEN USES A VIRTUAL ADDRESS
                                        ;*      TO SELECT THAT MAP REGISTER AND ADD 17776, SO THAT IT SHOULD
                                        ;*      REFERENCE ADDRESS 00057776 (00037776 IF MAPL1 CONTAINS 20000
                                        ;*      AS PER CONDITIONS DESCRIBED ABOVE).  A REFERENCE IS MADE THROUGH
                                        ;*      EACH OF THE REGISTERS AND ANY THAT FETCH THE CORRECT DATA ARE
                                        ;*      CHECKED TO SEE THAT IT WAS THE MAP REGISTER UNDER TEST.  IF
                                        ;*      NOT, BOTH THE MAP REGISTER UNDER TEST AND THE DUALED REGISTER
                                        ;*      ARE REPORTED.
                                        ;*
                                        ;;*****************************************************************
     013712                             TST7:
     013712  000004                             SCOPE
     013714  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     013720  014616  014260  000007             .WORD   TST10,20$,7     ;DATA USED BY PRETST
3281 013726  005037  172516                     CLR     MMR3            ;CLEAR MMR3
3282 013732  005037  001312                     CLR     UBM24U          ;CLEAR THE UPPER EXPECTED LMA LOCATION
3283 013736  052737  000060  172516             BIS     #60,MMR3        ;ENABLE 22-BIT ADDRESSING AND MAP RELOCATION
3284 013744  004737  002772                     JSR     PC,CLRMAP       ;CLEAR ALL MAP REGISTERS
3285 013750  042737  000001  177572             BIC     #1,MMR0         ;TURN OFF MEMORY MANAGEMENT
3286 013756  005037  001174                     CLR     $TMP0           ;$TMP0 IS USED AS A FLAG IN THIS TEST
3287 013762  012703  117776                     MOV     #117776,R3      ;SELECT P.A.R. 4 OFFSET OF 17776
3288 013766  013702  001300                     MOV     LREGL,R2        ;PUT ADDRESS OF LOWEST USABLE MAP REGISTER IN R2
3289 013772  013700  001256                     MOV     LOWEST,R0       ;LOAD PAR POINTING TO MAP REGISTER UNDER TEST IN R0
3290 013776  052737  000001  177572             BIS     #1,MMR0         ;MAKE SURE MEMORY MANAGEMENT IS ON
3291 014004  005037  001320                     CLR     ERRCNT          ;CLEAR THE ERROR COUNT FOR ERROR 202 BELOW
3292 014010  013737  001256  172350  100$:      MOV     LOWEST,KIPAR4   ;PAR OF LOWEST USEABLE MAP REGISTER IS LOADED IN KIPAR4
3293 014016  022702  170204                     CMP     #MAPL01,R2      ;SEE IF WE ARE POINTING AT MAPL1
3294 014022  001003                             BNE     1$              ;BRANCH IF NOT
3295 014024  022712  020000                     CMP     #20000,(R2)     ;SEE IF IT CONTAINS 20000 (FOR APT USE)
3296 014030  001410                             BEQ     2$              ;BRANCH IF SO
3297 014032  012712  040000          1$:        MOV     #40000,(R2)     ;LOAD MAP REGISTER UNDER TEST WITH 8K BASE
3298 014036  010237  057776                     MOV     R2,57776        ;LOAD TEST LOCATION WITH THE ADDRESS
3299                                                                     ;OF THE MAP REGISTER UNDER TEST
3300 014042  012737  057776  001314             MOV     #57776,UBM24P   ;MOVE ANTICIPATED ADDRESS TO LOCATION UBM24P
3301 014050  000405                             BR      3$              ;BRANCH OVER LOCATION SETUP
3302 014052  010237  037776          2$:        MOV     R2,37776        ;LOAD TEST LOCATION WITH THE ADDRESS
3303                                                                     ;OF THE MAP REGISTER UNDER TEST
3304 014056  012737  037776  001314             MOV     #37776,UBM24P   ;MOVE ANTICIPATED ADDRESS TO LOCATION
3305 014064  162737  000200  172350  3$:        SUB     #200,KIPAR4     ;PREPARE KIPAR4 FOR FIRST 'ADD 200'
3306 014072  062737  000200  172350  4$:        ADD     #200,KIPAR4     ;TRY NEXT MAP REGISTER
3307 014100  005037  001330          41$:       CLR     PCPUER          ;CLEAR THE ERROR RECEIVER
3308 014104  012737  017776  001310             MOV     #17776,UBM24L   ;MOVE DEFAULT LMA ADDRESS TO UBM24L
3309 014112  020037  172350                     CMP     R0,KIPAR4       ;SEE IF REGISTER UNDER TEST IS POINTED TO BY KIPAR4
3310 014116  001003                             BNE     45$             ;BRANCH AROUND SETUP IF NOT
3311 014120  013737  001314  001310             MOV     UBM24P,UBM24L   ;MOVE SPECIAL LMA ADDRESS TO LOCATION
3312 014126  012737  000020  001326  45$:       MOV     #TIMOUT,CPUEXP  ;POSSIBLE NON-EXISTENT MEMORY
3313 014134  011304                             MOV     (R3),R4         ;READ THROUGH THE MAP REGISTER
```

TEST # 7 - ENSURE THAT THERE IS NO DUAL MAPPING

```
3314 014136  005037  001326                    CLR     CPUEXP          ;NO MORE TIMEOUTS FOR AWHILE
3315 014142  005037  001320                    CLR     ERRCNT          ;CLEAR ERROR COUNT
3316 014146  005737  001330                    TST     PCPUER          ;SEE IF THERE WAS AN ERROR
3317 014152  001110                          BNE     8$              ;BRANCH AROUND DATA TEST IF SO
3318 014154  020402                          CMP     R4,R2           ;SEE IF CORRECT DATA WAS FETCHED
3319 014156  001075                          BNE     6$              ;BRANCH IF NO MATCH
3320 014160  032777  004000  164750          BIT     #BIT11,@SWR     ;SEE IF THIS IS AN 11/24 WITH UB MEM ONLY
3321 014166  001406                          BEQ     49$             ;BRANCH IF NOT
3322 014170  013737  177736  001304          MOV     LMAHI,LMAH      ;SAVE LMA HIGH REG IN LMAH
3323 014176  013737  177734  001306          MOV     LMALOW,LMAL     ;SAVE LMA LOW REG IN LMAL
3324 014204  020037  172350          49$:    CMP     R0,KIPAR4       ;SEE IF MAP REGISTERS ARE THE SAME
3325 014210  001455                          BEQ     5$              ;BRANCH IF CORRECT MAP REGISTER WAS  ED
3326 014212  004737  005076                  JSR     PC,CHKLMA       ;GO CHECK FOR 11/24 WITH UB MEMORY  Y
3327 014216  001304  001306                  .WORD   LMAH,LMAL       ;ADDRESSES OF LOCATIONS CONTAINING L  CONTENTS
3328 014222  000450                          BR      5$              ;RETURN IS HERE IF MATCH ACHIEVED
3329 014224  011337  001202                  MOV     (R3),$TMP3      ;SAVE CONTENTS FOR ERROR PRINTING
3330 014230  013746  001202                  MOV     $TMP3,-(SP)     ;MOVE FAULTY DATA TO STACK FOR SUBROUTINE USE
3331 014234  013746  172350                  MOV     KIPAR4,-(SP)    ;MOVE PAR4 CONTENTS TO STACK FOR SUBROUTINE USE
3332 014240  004737  003674                  JSR     PC,ADREXT       ;GO SET DATA IN THE 4 WORDS OF ADDROR AND ADRAND
3333 014244  010246                          MOV     R2,-(SP)        ;PUT ADDRESS OF REGISTER ON STACK FOR DATEXT USE
3334 014246  013746  172356                  MOV     KIPAR7,-(SP)    ;MOVE PAR CONTENTS TO STACK FOR SUBROUTINE USE
3335 014252  004737  003624                  JSR     PC,DATEXT       ;GO SET DATA IN DATAOR AND DATAND
3336 014256  000424                          BR      46$             ;BRANCH OVER LOOP ON ERROR SETUP
3337 014260  020402                  20$:    CMP     R4,R2           ;SEE IF CORRECT DATA WAS FETCHED
3338 014262  001023                          BNE     47$             ;BRANCH IF NO MATCH
3339 014264  032777  004000  164644          BIT     #BIT11,@SWR     ;SEE IF THIS IS AN 11/24 WITH UB MEM ONLY
3340 014272  001406                          BEQ     59$             ;BRANCH IF NOT
3341 014274  013737  177736  001304          MOV     LMAHI,LMAH      ;SAVE LMA HIGH REG IN LMAH
3342 014302  013737  177734  001306          MOV     LMALOW,LMAL     ;SAVE LMA LOW REG IN LMAL
3343 014310  020037  172350          59$:    CMP     R0,KIPAR4       ;SEE IF MAP REGISTERS ARE THE SAME
3344 014314  001406                          BEQ     47$             ;BRANCH IF CORRECT MAP REGISTER WAS USED
3345 014316  004737  005076                  JSR     PC,CHKLMA       ;GO CHECK FOR 11/24 WITH UB MEMORY ONLY
3346 014322  001304  001306                  .WORD   LMAH,LMAL       ;ADDRESSES OF LOCATIONS CONTAINING LMA CONTENTS
3347 014326  000401                          BR      47$             ;RETURN IS HERE IF MATCH ACHIEVED
3348 014330  104210                  46$:    ERROR   +210            ;DUAL MAPPING ERROR IN THE UNIBUS MAP
3349 014332  032777  001000  164576  47$:    BIT     #BIT9,@SWR      ;SEE IF LOOP ON ERROR IS SET
3350 014340  001347                          BNE     20$             ;BRANCH BACK IF SO
3351 014342  000414                          BR      8$              ;BRANCH AROUND ADDRESS MATCH SETTING
3352 014344  005237  001174          5$:     INC     $TMP0           ;SET FLAG WHEN ADDRESSES MATCH
3353 014350  000411                          BR      8$              ;BRANCH AROUND SUBROUTINE CHECK - NOT NEEDED
3354 014352  004737  005076          6$:     JSR     PC,CHKLMA       ;GO CHECK FOR 11/24 WITH UB MEMORY ONLY
3355 014356  001304  001306                  .WORD   LMAH,LMAL       ;ADDRESSES OF LOCATIONS CONTAINING LMA CONTENTS
3356 014362  000401                          BR      7$              ;RETURN IS HERE IF MATCH ACHIEVED
3357 014364  000403                          BR      8$              ;BRANCH OVER LMA SPECIFIC COMPARE CODE
3358 014366  020037  172350          7$:     CMP     R0,KIPAR4       ;SEE IF MAP REGISTERS ARE THE SAME
3359 014372  001764                          BEQ     5$              ;BRANCH IF CORRECT MAP REGISTER WAS USED
3360 014374  022737  177400  172350  8$:     CMP     #177400,KIPAR4  ;SEE IF LAST REGISTER HAS BEEN TRIED
3361 014402  001420                          BEQ     10$             ;BRANCH TO CONTINUE IF SO
3362 014404  023737  001260  172350          CMP     HIGEST,KIPAR4   ;SEE IF ALL HAVE BEEN TRIED
3363 014412  001227                          BNE     4$              ;BRANCH IF STILL MORE TO TRY
3364 014414  062737  000200  172350  9$:     ADD     #200,KIPAR4     ;MAP TO NEXT MAP REGISTER
3365 014422  022737  177400  172350          CMP     #177400,KIPAR4  ;SEE IF WE ARE AT THE TOP
3366 014430  001405                          BEQ     10$             ;BRANCH TO CONTINUE IF SO
3367 014432  023737  001276  172350          CMP     BUPWIN,KIPAR4   ;SEE IF WE ARE POINTING TO THE UPPER WINDOW START
3368 014440  001365                          BNE     9$              ;BRANCH BACK FOR ANOTHER INCREMENTING SET IF NOT
3369 014442  000616                          BR      41$             ;GO BACK FOR A NEW TRY
3370 014444  005737  001174          10$:    TST     $TMP0           ;SEE THAT THERE WAS A SUCCESSFUL MATCH
```

TEST # 7 - ENSURE THAT THERE IS NO DUAL MAPPING

```
3371 014450  001006                      BNE     11$             ;BRANCH IF THERE WAS
3372 014452  010246                      MOV     R2,-(SP)        ;PUT ADDRESS OF REGISTER ON STACK FOR ADREXT USE
3373 014454  013746  172356              MOV     KIPAR7,-(SP)    ;PUT PAR ON STACK FOR SUBROUTINE ADREXT USE
3374 014460  004737  003674              JSR     PC,ADREXT       ;GO SET DATA IN THE 4 WORDS OF ADDROR AND ADRAND
3375 014464  104210                      ERROR   +210            ;DUAL MAPPING ERROR IN THE UNIBUS MAP
3376 014466  005037  001174      11$.    CLR     $TMP0           ;CLEAR FLAG FOR NEXT REGISTER
3377 014472  022702  170204              CMP     #MAPL01,R2      ;SEE IF R2 IS POINTING TO MAPL1
3378 014476  001006                      BNE     12$             ;BRANCH IF NOT
3379 014500  022712  040000              CMP     #40000,(R2)     ;DOES MAPL1 CONTAIN 40000?
3380 014504  001403                      BEQ     12$             ;BRANCH IF IT DOES
3381 014506  005037  037776              CLR     37776           ;CLEAR LOCATION 37776 ONLY - MAPL1 IS TO BE LEFT ALONE
3382 014512  000401                      BR      13$             ;SKIP OVER REGISTER CLEAR STEP
3383 014514  005012              12$:    CLR     (R2)            ;CLEAR MAP REGISTER JUST TESTED
3384 014516  062700  000200      13$:    ADD     #200,R0         ;POINT TO NEXT MAP REGISTER UNDER TEST
3385 014522  062702  000004              ADD     #4,R2           ;POINT TO NEXT MAP REGISTER TO LOAD
3386 014526  022700  177400              CMP     #177400,R0      ;SEE IF LAST REGISTER HAS BEEN TRIED
3387 014532  001421                      BEQ     15$             ;BRANCH TO NEXT SECTION IF SO
3388 014534  023700  001260              CMP     HIGEST,R0       ;SEE IF ALL MAP REGS HAVE BEEN TESTED
3389 014540  001402                      BEQ     14$             ;BRANCH IF NO MORE TO TEST
3390 014542  000137  014010              JMP     100$            ;JUMP TO BEGIN AGAIN
3391 014546  062700  000200      14$:    ADD     #200,R0         ;POINT TO NEXT MAP REGISTER UNDER TEST
3392 014552  062702  000004              ADD     #4,R2           ;POINT TO NEXT MAP REGISTER TO LOAD
3393 014556  022700  177400              CMP     #177400,R0      ;SEE IF LAST REGISTER HAS BEEN TRIED
3394 014562  001405                      BEQ     15$             ;BRANCH TO NEXT SECTION IF SO
3395 014564  020037  001276              CMP     R0,BUPWIN       ;SEE IF WE ARE POINTING TO UPPER WINDOW START
3396 014570  001336                      BNE     11$             ;BRANCH FOR ANOTHER INCREMENT SET IF NOT
3397 014572  000137  014072              JMP     4$              ;JUMP BACK FOR ANOTHER RUN
3398 014576  005737  001320      15$:    TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
3399 014602  001405                      BEQ     TST10           ;;BRANCH TO NEXT TEST IF NO ERRORS
3400 014604  005337  001110              DEC     $ERTTL          ;DON'T COUNT ERROR +16 AS ANOTHER ERROR
3401 014610  005337  001320              DEC     ERRCNT          ;SAME AS ABOVE
3402 014614  104016                      ERROR   +16             ;SUMMARY OF DUAL MAPPING ERRORS
```

```
                                        .SBTTL  TEST # 10 - LOAD LOC'S 40000-77776 WITH THEIR ADRES'S
                                        ;;*****************************************************************
                                        ;*TEST 10       LOAD LOC'S 40000-77776 WITH THEIR ADRES'S
                                        ;*
                                        ;*      THIS TEST IS USED TO LOAD MAIN MEMORY FROM ADDRESS 00040000 TO
                                        ;*      ADDRESS 000077776 WITH ITS OWN ADDRESS.  IT THEN CHECKS THAT
                                        ;*      MEMORY OVER THE UNIBUS AND LOGS ANG REPORTS ANY ERRORS THAT
                                        ;*      IT FINDS.
                                        ;*
                                        ;;*****************************************************************
     014616                             TST10:
     014616  000004                             SCOPE
     014620  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     014624  015072  015030  000010             .WORD   TST11,20$,10    ;DATA USED BY PRETST
3412 014632  042737  000040  172516             BIC     #BIT5,MMR3      ;TURN OFF MAP RELOCATION
3413 014640  012737  000400  172350             MOV     #400,KIPAR4     ;MAP PAGE 4 TO 8K
3414 014646  012700  040000                     MOV     #40000,R0       ;STARTING ADDRESS FOR DATA PATTERN
3415 014652  012701  100000             1$:     MOV     #100000,R1      ;VIRTUAL ADDRESS
3416 014656  012702  010000                     MOV     #4096.,R2       ;LOAD 4096 LOCATIONS AT A TIME
3417 014662  010021                     2$:     MOV     R0,(R1)+        ;LOAD PHY. ADDR. INTO EACH MEMORY LOC.
3418 014664  062700  000002                     ADD     #2,R0           ;POINT TO NEXT PHYSICAL ADDRESS
3419 014670  077204                             SOB     R2,2$           ;BRANCH IF 4K OF MEMORY NOT LOADED
3420 014672  062737  000200  172350             ADD     #200,KIPAR4     ;POINT TO NEXT 4K BANK OF MEMORY
3421 014700  022737  001000  172350             CMP     #1000,KIPAR4    ;SEE IF 16K IS LOADED
3422 014706  101361                             BHI     1$              ;BRANCH IF MORE MEMORY TO LOAD
3423                                    ;*
3424                                    ;*      MEMORY FROM 8K - 16K IS NOW LOADED WITH ITS OWN ADDRESS
3425                                    ;*
3426 014710  022737  171000  172354             CMP     #171000,KIPAR6  ;DID I USE ANY MAP REGISTER
3427                                                                     ;BELOW REGISTER 6 (UB. ADDR 100000)
3428 014716  101465                             BLOS    TST11           ;;BRANCH TO NEXT TEST IF NOT
3429 014720  013700  172354                     MOV     KIPAR6,R0       ;LOAD PAR6 INTO R0 TO GET
3430                                                                     ;THE STARTING DATA PATTERN
3431 014724  072027  000006                     ASH     #6,R0           ;R0 NOW HOLDS THE STARTING DATA PATTERN
3432 014730  012701  140000             3$:     MOV     #140000,R1      ;STARTING VIRTUAL ADDRESS
3433 014734  012702  010000                     MOV     #4096.,R2       ;PREPARE TO READ 4K AT A TIME
3434 014740  011103                     4$:     MOV     (R1),R3         ;READ MAIN MEMORY THROUGH UNIBUS
3435 014742  020003                             CMP     R0,R3           ;SEE IF THE ADDRESSES MATCH
3436 014744  001012                             BNE     6$              ;BRANCH IF ERROR
3437 014746  022120                     5$:     CMP     (R1)+,(R0)+     ;CHANGE VIRTUAL & PHYSICAL ADDRESSES
3438 014750  077205                             SOB     R2,4$           ;BRANCH IF 4K OF MEMORY NOT READ
3439 014752  062737  000200  172354             ADD     #200,KIPAR6     ;POINT TO NEXT BANK OF 4K THROUGH UNIBUS
3440 014760  022737  171000  172354             CMP     #171000,KIPAR6  ;SEE IF THIS POINTS TO 16K PLUS 2
3441 014766  101360                             BHI     3$              ;BRANCH IF 16K OF MEMORY NOT CHECKED
3442 014770  000430                             BR      10$             ;TEST FINISHED, BRANCH TO EXIT
3443 014772  011146                     6$:     MOV     (R1),-(SP)      ;PUT VIRTUAL ADDRESS ON STACK FOR ADREXT SUBROUTINE USE
3444 014774  013746  172354                     MOV     KIPAR6,-(SP)    ;PUT PAR6 CONTENTS ON STACK FOR SUBROUTINE USE
3445 015000  004737  003674                     JSR     PC,ADREXT       ;GO SET DATA IN THE 4 WORDS OF ADDROR AND ADRAND
3446 015004  010146                             MOV     R1,-(SP)        ;PUT DATA ON STACK FOR DATEXT SUBROUTINE
3447 015006  013746  172344                     MOV     KIPAR2,-(SP)    ;MOVE PAR CONTENTS TO STACK FOR SUBROUTINE USE
3448 015012  004737  003624                     JSR     PC,DATEXT       ;SUBROUTINE TO LOAD DATAOR AND DATAND
3449 015016  010337  005770                     MOV     R3,EADRS2       ;MOVE DATA IN R3 TO EADRS2 FOR ERROR CALL
3450 015022  005037  005772                     CLR     EADRS2+2        ;CLEAR UPPER 6 BITS TO PRINT
3451 015026  000403                             BR      7$              ;BRANCH OVER LOOP ON ERROR SETUP
3452 015030  011103                     20$:    MOV     (R1),R3         ;READ MAIN MEMORY THROUGH UNIBUS
3453 015032  020003                             CMP     R0,R3           ;SEE IF THE ADDRESSES MATCH
3454 015034  001401                             BEQ     8$              ;BRANCH IF OK
```

TEST # 10 - LOAD LOC'S 40000-77776 WITH THEIR ADRES'S

```
3455 015036  104205                    7$:     ERROR   +205            ;DIDN'T READ ADDRESSES CORRECTLY FROM UNIBUS
3456 015040  032777  001000  164070    8$:     BIT     #BIT9,@SWR      ;SEE IF LOOP ON ERROR IS SET
3457 015046  001370                            BNE     20$             ;BRANCH BACK IF SO
3458 015050  000736                            BR      5$              ;CONTINUE TESTING
3459 015052  005737  001320            10$:    TST     ERRCNT          ;WERE THERE ANY ERRORS ON THIS TEST?
3460 015056  001405                            BEQ     TST11           ;;BRANCH IF NO ERRORS ON THIS TEST
3461 015060  005337  001110                    DEC     $ERTTL          ;DON'T COUNT ERROR +14 AS ANOTHER ERROR
3462 015064  005337  001320                    DEC     ERRCNT          ;SAME AS ABOVE
3463 015070  104014                            ERROR   +14             ;SUMMARY OF UNIBUS ADDRESS FAILURES
```

```
3472                                    .SBTTL  TEST # 11 - MAIN MEMORY TIMEOUT THROUGH MAP
                                        ;;*****************************************************************
                                        ;*TEST 11       MAIN MEMORY TIMEOUT THROUGH MAP
                                        ;*
                                        ;*      THIS TEST GENERATES A TIME OUT THROUGH THE UNIBUS MAP BY TRYING
                                        ;*      TO REFERENCE ADDRESS 17000000 IN MAIN MEMORY.  IT USES THE LOWEST
                                        ;*      USABLE MAP REGISTER, WHICH IN THE DEFAULT CASE IS MAP REGISTER
                                        ;*      ZERO.
                                        ;*
                                        ;;*****************************************************************
     015072                             TST11:
     015072  000004                             SCOPE
     015074  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     015100  015140  015132  000011             .WORD   TST12,20$,11    ;DATA USED BY PRETST
3473 015106  052737  000040  172516             BIS     #BIT5,MMR3      ;TURN MAP RELOCATION BACK ON
3474 015114  005037  004312                     CLR     LOEFLG          ;CLEAR LOEFLG FOR ERROR LOOP INDICATOR
3475 015120  012737  000074  001312             MOV     #74,UBM24U      ;EXPECTING 74 IN UPPER POSITION OF 11/24 LMA
3476 015126  005037  001310                     CLR     UBM24L          ;EXPECTING ZERO IN LOWER POSITION
3477 015132  004737  020014             20$:    JSR     PC,MMTOTM       ;GO DO THE TEST
3478 015136  104015                             ERROR   +15             ;RETURN HERE IF ERROR - UNIBUS DID NOT TIME OUT
```

```
3489                                    .SBTTL  TEST # 12 - RELOC USING LOWEST USABLE MAP REG THRU UNIBUS
                                        ;;*****************************************************************
                                        ;*TEST 12       RELOC USING LOWEST USABLE MAP REG THRU UNIBUS
                                        ;*
                                        ;*      THIS TEST CHECKS OUT THE FULL ADDITION PROPERTIES OF THE UNIBUS
                                        ;*      MAP A.L.U..  IN THE DEFAULT CASE IT USES MAP REGISTER ZERO BUT
                                        ;*      IF THE MAP JUMPERS HAVE BEEN ALTERED TO DE-SELECT SOME MAP REGISTERS
                                        ;*      THIS TEST WILL USE THE LOWEST USABLE MAP REGISTER.
                                        ;*      IF AN ERROR OCCURS THE TEST WILL REPORT THE PHYSICAL ADDRESS
                                        ;*      THAT WAS DESIRED, AND THE DATA AT THE ADDRESS THAT WAS REFERENCED.
                                        ;*
                                        ;;*****************************************************************
     015140                             TST12:
     015140  000004                             SCOPE
     015142  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     015146  015174  015154  000012             .WORD   TST13,20$,12    ;DATA USED BY PRETST
3490 015154  005037  004312             20$:    CLR     LOEFLG          ;CLEAR LOEFLG - FLAG USED FOR ERROR RETURN
3491 015160  005037  001312                     CLR     UBM24U          ;CLEAR UPPER LOCATION
3492 015164  004737  004106             1$:     JSR     PC,MAPADD       ;GO DO THE TEST
3493 015170  104211                             ERROR   +211            ;RETURN IS HERE FOR ERROR
3494 015172  000774                             BR      1$              ;GO BACK TO THE SUBROUTINE
```

```
3503                                    .SBTTL  TEST # 13 - CARRY PROP OF MAP'S RELOC ADDER THRU UNIBUS
                                        ;;*****************************************************************
                                        ;*TEST 13       CARRY PROP OF MAP'S RELOC ADDER THRU UNIBUS
                                        ;*
                                        ;*      EVERY ADDRESS OF THE FORM XXXX0000 IS GENERATED HERE STARTING
                                        ;*      WITH 00030000 UP TO 17000000.  THAT IS, THE FIRST OF EVERY 2K
                                        ;*      WORDS IS ADDRESSED, TO INSURE THAT THE ADDER IN THE MAP IS
                                        ;*      WORKING PROPERLY .
                                        ;*
                                        ;;*****************************************************************
     015174  000004                     TST13:  SCOPE
3504 015176  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
3505                                    ;;*****************************************************************
3506                                    ;**IMPORTANT**: IF THE POSITION OF THIS TEST IS CHANGED, CHANGE THE THIRD
3507                                    ;               WORD BELOW TO THE NEW TEST NUMBER THIS TEST WILL OCCUPY.
3508                                    ;;*****************************************************************
3509 015202  015236  015210  000013             .WORD   2$,20$,13       ;DATA USED BY PRETST
3510         000040                     NEXMEM=BIT5                     ;BIT05 IS NON-EXISTENT MEMORY BIT IN THE CPU ERROR REGISTER
3511 015210  005037  004312             20$:    CLR     LOEFLG          ;CLEAR LOEFLG - USED AS AN ERROR RETURN FLAG
3512 015214  005037  001312                     CLR     UBM24U          ;CLEAR UPPER LOCATION
3513 015220  012737  020000  001310             MOV     #20000,UBM24L   ;PUT 20000 IN LOWER LOCATION
3514 015226  004737  004416             1$:     JSR     PC,TCPMRA       ;GO DO THE TEST
3515 015232  104211                             ERROR   +211            ;RETURN IS HERE IF AN ERROR
3516 015234  000774                             BR      1$              ;RETURN TO THE TEST
3517 015236                             2$:
```

```
                                        .SBTTL  UNIBUS MAP SETTUP
                                ;;*****************************************************************
                                ;       THE NEXT 3 TESTS ARE RUN THROUGH THE UNIBUS MAP
                                ;;*****************************************************************

015236  000004                UBMSU:  SCOPE                   ;LOOP ON PREVIOUS TEST
015240  105337  001100                DECB    $TSTNM          ;DECREMENT $TSTNM - THIS IS NOT A TEST
015244  104414                        TBITR                   ;RESTORE T-BIT IF IT WAS ON
015246  032777  004000  163662        BIT     #BIT11,@SWR     ;SEE IF THIS IS AN 11/24 WITH UB MEMORY ONLY
015254  001405                        BEQ     1$              ;BRANCH TO SETUP IF NOT
015256  062737  000005  001100        ADD     #5,$TSTNM       ;FUDGE $TSTNM 5 TESTS AHEAD AND
015264  000137  015744                JMP     TST21           ;JUMP OVER NEXT 5 TESTS

                                ;;*****************************************************************
                                ;*
                                ;*      THIS CODE SETS UP THE TWO MAP REGISTERS ABOVE THE LOWEST
                                ;*      USABLE ONE TO POINT TO PHYSICAL MEMORY FROM 0 - 8K.  IN THE
                                ;*      DEFAULT CASE, IN MANUFACTURING AND IF THERE IS NO UNIBUS MEMORY,
                                ;*      THIS WILL BE MAP REGISTERS 1 AND 2.  MAP REGISTER 1 WILL POINT
                                ;*      TO PHYSICAL 4K - 8K SO "ACT-11" WILL WORK PROPERLY AND MAP
                                ;*      REGISTER 2 WILL POINT TO PHYSICAL 0 - 4K.  THIS MEANS THAT
                                ;*      KIPAR0 SHOULD GET 170400 SO IT PUTS ADDRESSES 040000 TO 057776
                                ;*      ON THE UNIBUS AND KIPAR1 SHOULD GET 170200 SO IT PUTS ADDRESSES
                                ;*      020000 TO 037776 ON THE UNIBUS.
                                ;*
                                ;;*****************************************************************

015270  013701  001302        1$:     MOV     LREGU,R1        ;PUT POINTER TO LOWEST MAP REGISTER IN R1
015274  005721                        TST     (R1)+           ;POINT TO LOWER 16 BITS OF LOWEST + 1
015276  012721  020000                MOV     #20000,(R1)+    ;LOAD LOWER 16 BITS OF (LOWEST + 1), POINTING TO 4-8K
015302  005021                        CLR     (R1)+           ;CLEAR UPPER 6 BITS OF (LOWEST + 1)
015304  005021                        CLR     (R1)+           ;CLEAR LOWER 16 BITS OF (LOWEST + 2)
015306  005021                        CLR     (R1)+           ;CLEAR UPPER 6 BITS OF (LOWEST + 2)
015310  013701  001256                MOV     LOWEST,R1       ;LOAD R1
015314  062701  000200                ADD     #200,R1         ;POINT R1 TO (LOWEST + 1)
015320  010137  172342                MOV     R1,KIPAR1       ;LOAD PAR1
015324  062701  000200                ADD     #200,R1         ;POINT R1 TO (LOWEST + 2)
015330  010137  172340                MOV     R1,KIPAR0       ;LOAD PAR0
```

```
3567                                    .SBTTL  TEST # 14 - MAIN MEM. T.O. THROUGH MAP, CODE RUN OVER U.B.
                                        ;;*****************************************************************
                                        ;*TEST 14       MAIN MEM. T.O. THROUGH MAP, CODE RUN OVER U.B.
                                        ;*
                                        ;*      THIS TEST GENERATES A TIME OUT THROUGH THE UNIBUS MAP BY TRYING
                                        ;*      TO REFERENCE ADDRESS 17000000 IN MAIN MEMORY.  IT USES THE LOWEST
                                        ;*      USABLE MAP REGISTER, WHICH IN THE DEFAULT CASE IS MAP REGISTER
                                        ;*      ZERO.
                                        ;*
                                        ;*      THIS TEST IS BEING RUN WITH ALL MEMORY REFERENCES GOING THROUGH
                                        ;*      THE UNIBUS MAP.
                                        ;*
                                        ;;*****************************************************************
     015334                             TST14:
     015334  000004                             SCOPE
     015336  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     015342  015362  015354  000014             .WORD   TST15,20$,14    ;DATA USED BY PRETST
3568 015350  005037  004312                     CLR     LOEFLG          ;CLEAR LOOP ON ERROR FLAG
3569 015354  004737  020014             20$:    JSR     PC,MMTOTM       ;GO DO TEST ON PAGE 60 OF THIS LISTING
3570 015360  104015                             ERROR   +15             ;RETURN HERE IF ERROR - UNIBUS DID NOT TIME OUT
```

```
3584                                    .SBTTL  TEST # 15 - RELOC USING LOWEST USABLE MAP REG USING MAP REG
                                        ;;*****************************************************************
                                        ;*TEST 15       RELOC USING LOWEST USABLE MAP REG USING MAP REG
                                        ;*
                                        ;*      THIS TEST CHECKS OUT THE FULL ADDITION PROPERTIES OF THE UNIBUS
                                        ;*      MAP A.L.U..  IN THE DEFAULT CASE IT USES MAP REGISTER ZERO BUT
                                        ;*      IF THE MAP JUMPERS HAVE BEEN ALTERED TO DE-SELECT SOME MAP REGISTERS
                                        ;*      THIS TEST WILL USE THE LOWEST USABLE MAP REGISTER.
                                        ;*      IF AN ERROR OCCURS THE TEST WILL REPORT THE PHYSICAL ADDRESS
                                        ;*      THAT WAS DESIRED, AND THE DATA AT THE ADDRESS THAT WAS REFERENCED.
                                        ;*
                                        ;*      THIS TEST IS BEING RUN WITH ALL MEMORY REFERENCES GOING THROUGH
                                        ;*      THE UNIBUS MAP.
                                        ;*
                                        ;;*****************************************************************
     015362                             TST15:
     015362  000004                             SCOPE
     015364  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     015370  015420  015404  000015             .WORD   TST16,20$,15    ;DATA USED BY PRETST
3585 015376  012737  060000  060000             MOV     #060000,060000  ;MAKE SURE ADDRESS 060000 CONTAINS ITS OWN ADDRESS AS DATA
3586 015404  005037  004312             20$:    CLR     LOEFLG          ;CLEAR LOEFLG - USED IN ERROR RETURN
3587 015410  004737  004106             1$:     JSR     PC,MAPADD       ;GO DO THE TEST
3588 015414  104211                             ERROR   +211            ;RETURN IS HERE FOR ERROR
3589 015416  000774                             BR      1$              ;RETURN TO THE SUBROUTINE
```

```
3598                                    .SBTTL  TEST # 16 - CARRY PROP OF MAP'S RELOC ADDER USING MAP REG
                                        ;;*****************************************************************
                                        ;*TEST 16       CARRY PROP OF MAP'S RELOC ADDER USING MAP REG
                                        ;*
                                        ;*      EVERY ADDRESS OF THE FORM XXXX0000 IS GENERATED HERE STARTING
                                        ;*      WITH 00030000 UP TO 17000000.  THAT IS THE FIRST OF EVERY 2K
                                        ;*      WORDS IS ADDRESSED, TO INSURE THAT THE ADDER IN THE MAP IS
                                        ;*      WORKING PROPERLY .
                                        ;*
                                        ;;*****************************************************************
     015420                             TST16:
     015420  000004                             SCOPE
     015422  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     015426  015450  015434  000016             .WORD   TST17,20$,16    ;DATA USED BY PRETST
3599 015434  005037  004312             20$:    CLR     LOEFLG          ;CLEAR LOEFLG - USED AS ERROR RETURN FLAG
3600 015440  004737  004416             1$:     JSR     PC,TCPMRA       ;GO DO THE TEST
3601 015444  104211                             ERROR   +211            ;RETURN IS HERE IF AN ERROR
3602 015446  000774                             BR      1$              ;RETURN TO THE TEST
```

```
3633                                    .SBTTL  TEST # 17 - VERIFY TRAP DUE TO CACHE PARITY INTERRUPT
                                        ;;*****************************************************************
                                        ;*TEST 17       VERIFY TRAP DUE TO CACHE PARITY INTERRUPT
                                        ;;*****************************************************************
                                        ;*                  **********NOTE**********
                                        ;*      THE MAP WILL BE SHUT OFF FOR THE REMAINDER OF THE DIAGNOSTIC
                                        ;*      BEFORE ANY TEST CODE IS EXECUTED.  IT IS NOT NEEDED.
                                        ;;*****************************************************************
                                        ;;*****************************************************************
                                        ;*      THIS TEST IS OPTIONAL AND IS SELECTED BY SETTING MFM HARDWARE
                                        ;*      SWITCH REGISTER BIT 08 TO A 1 IN THE CASE OF STANDALONE OPERATION
                                        ;*      OF THE DIAGNOSTIC. IN THE CASE OF MANUFACTURING APT RUNTIME MODE
                                        ;*      THEN BIT 08 OF $SWREG IS SET TO 1 THROUGH APT SCRIPTING.

                                        ;*       THE TEST VERIFIES THE SIGNAL GENERATED FROM THE CACHE
                                        ;*      TO THE UBI MODULE WHICH INDICATES TO THE UBI THAT A CACHE INTERRUPT
                                        ;*      IS BEING CALLED FOR(CACHE PE INTR L).
                                        ;*
                                        ;*      THIS TEST ASSUMES THAT ALL MODULES EXCEPT THE UBI MODULE ARE KNOWN
                                        ;*      GOOD MODULES.

                                        ;*      THIS TEST TOGETHER WITH OTHER CACHE TESTS,ALLOW MFG. TO ELIMINATE
                                        ;*      HAVING TO RUN THE  CACHE  DIAGNOSTIC DURING QUICK
                                        ;*      VERIFY TESTING  OF THE UBI MODULE.

                                        ;*      TEST DESCRIPTION:
                                        ;*      VERIFY INTERRUPT LOGIC BY ASSURING THAT A TRAP OCCURS TO LOCATION
                                        ;*      114 WHEN A LOCATION PREVIOUSLY WRITTEN
                                        ;*      WITH WRONG HI/LO BYTE PARITY IS ACCESSED.
                                        ;*              CONDITIONS:     PEA=0
                                        ;*                              DCPI=0
                                        ;;*****************************************************************
     015450                             TST17:
     015450  000004                             SCOPE
     015452  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     015456  015610  015554  000017             .WORD   TST20,20$,17    ;DATA USED BY PRETST
3634 015464  005037  177572                     CLR     @#MMR0          ;TURN OFF MEMORY MANAGEMENT
3635 015470  005037  172516                     CLR     @#MMR3          ;TURN OFF MAP RELOCATION
3636 015474  005037  172340                     CLR     KIPAR0          ;PUT PAR0 BACK WHERE IT SHOULD AND
3637 015500  012737  000200  172342             MOV     #200,KIPAR1     ;PUT PAR1 BACK WHERE IT SHOULD
3638 015506  105737  007140                     TSTB    CPUTYP          ;IS THIS AN 11/24?
3639 015512  001403                             BEQ     1$              ;BRANCH OVER JUMP IF 11/44
3640 015514  105237  001100                     INCB    $TSTNM          ;INCREMENT TEST NUMBER TO SIMULATE SKIPPING TEST
3641 015520  000511                             BR      TST21           ;BRANCH OVER THIS AND NEXT TESTS
3642 015522  132737  000200  020163  1$:       BITB    #200,$ENVM      ;IS APT SIZING?
3643 015530  001405                             BEQ     2$              ;NO;TRY HARDWARE SWITCH REGISTER
3644 015532  032737  000100  020164             BIT     #100,$SWREG     ;YES APT IS SIZING;DOES APT SAY TO DO THIS TEST
3645 015540  001423                             BEQ     TST20           ;;NO - SKIP TEST
3646 015542  000404                             BR      20$             ;YES,DO TEST
3647 015544  032777  000100  163364  2$:       BIT     #100,@#SWR      ;DOES HARDWARE SWITCH REGISTER SAY TO DO TEST?
3648 015552  001416                             BEQ     TST20           ;;NO - SKIP TEST
3649 015554  012737  000005  005460  20$:      MOV     #5,CASH1        ;MOVE BYTE TO LOAD TO CACHE TO SUB      ;DPM002
3650 015562  112737  000001  005470             MOVB    #1,CASH2        ;MOVE TEST 1 TO LOCATION IN SUBROUTINE  ;DPM002
3651 015570  004737  005324                     JSR     PC,CASHSR       ;GO DO THE CASH TEST
3652 015574  012737  000000  177746             MOV     #0,@#CACHE      ;TURN CACHE ON
3653 015602  005703                             TST     R3              ;DID TRAP OCCUR?
3654 015604  001401                             BEQ     TST20           ;;BRANCH TO NEXT TEST IF YES
```

TEST # 17 - VERIFY TRAP DUE TO CACHE PARITY INTERRUPT

```
   3655 015606  104020                    ERROR   +20          ;INTERRUPT/ABORT LOGIC TESTS TRAP TO LOC 114 DID NOT OCCUR
```

```
3689                                    .SBTTL  TEST # 20 - VERIFY TRAP DUE TO CACHE PARITY ABORT
                                        ;;*****************************************************************
                                        ;*TEST 20       VERIFY TRAP DUE TO CACHE PARITY ABORT
                                        ;*      THIS TEST IS OPTIONAL AND IS SELECTED BY SETTING MFM HARDWARE
                                        ;*      SWITCH REGISTER BIT 08 TO A 1 IN THE CASE OF STANDALONE OPERATION
                                        ;*      OF THE DIAGNOSTIC. IN THE CASE OF MANUFACTURING APT RUNTIME MODE
                                        ;*      THEN BIT 08 OF $SWREG IS SET TO 1 THROUGH APT SCRIPTING.
                                        ;*
                                        ;*       THE TEST VERIFIES THE SIGNAL GENERATED FROM THE CACHE(BUS PBL)
                                        ;*      TO THE UBI MODULE WHICH INDICATES TO THE UBI THAT A CACHE ABORT
                                        ;*      IS BEING CALLED FOR.
                                        ;*
                                        ;*      THIS TEST ASSUMES THAT ALL MODULES EXCEPT UBI ARE KNOWN GOOD  MODULES
                                        ;*
                                        ;*      THIS TEST TOGETHER WITH OTHER CACHE TESTS,ALLOW MFG. TO ELIMINATE
                                        ;*      HAVING TO RUN THE  CACHE  DIAGNOSTIC DURING QUICK
                                        ;*      VERIFY TESTING  OF THE UBI MODULE.
                                        ;*
                                        ;*      TEST DESCRIPTION:
                                        ;*
                                        ;*      VERIFY ABORT LOGIC BY THE FOLLOWING RESULTS WHEN A LOCATION
                                        ;*      PREVIOUSLY WRITTEN WITH WRONG HI/LO BYTE PARITY IS ACCESSED.
                                        ;*              1. INSTRUCTION CYCLE WILL BE ABORTED
                                        ;*              2. THE ABORT CAUSES TRAP TO 114
                                        ;*
                                        ;*              PROCEDURE:      INHIBIT CLOCKING OF PARITY ERROR SIGNAL TO
                                        ;*                              INTERRUPT LOGIC. ALLOW CMPE<15> TO BE SET
                                        ;*                              BY ABORT SIGNAL WHICH IS ASSERTED BY PARITY
                                        ;*                              ERROR SIGNAL TO ABORT LOGIC.
                                        ;*
                                        ;*
                                        ;*              CONDITIONS:     PEA=1
                                        ;*                              DCPI=1
                                        ;*
                                        ;*****************************************************************
     015610                             TST20:
     015610  000004                             SCOPE
     015612  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     015616  015744  015666  000020             .WORD   TST21,20$,20    ;DATA USED BY PRETST
3690 015624  032777  000100  163304             BIT     #BIT6,@SWR      ;DOES SWITCH REGISTER SAY TO DO TEST?
3691 015632  001437                             BEQ     21$             ;NO - SKIP TEST
3692 015634  132737  000200  020163             BITB    #200,$ENVM      ;IS APT SIZING?
3693 015642  001405                             BEQ     12$             ;NO;TRY HARDWARE SWITCH REGISTER
3694 015644  032737  000100  020164             BIT     #100,$SWREG     ;YES APT IS SIZING;DOES APT SAY TO DO THIS TEST
3695 015652  001427                             BEQ     21$             ;NO - SKIP TEST
3696 015654  000404                             BR      20$             ;YES,DO TEST
3697 015656  032777  000100  163252  12$:       BIT     #100,@SWR       ;DOES HARDWARE SWITCH REGISTER SAY TO DO TEST?
3698 015664  001422                             BEQ     21$             ;NO - SKIP TEST
3699 015666  012737  000004  005460  20$:       MOV     #4,CASH1        ;MOVE CACHE LOAD VALUE TO LOC IN SUB    ;DPM002
3700 015674  112737  000002  005470             MOVB    #2,CASH2        ;MOVE 2ND TEST FLAG TO LOCATION IN SUB  ;DPM002
3701 015702  004737  005324                     JSR     PC,CASHSR       ;GO DO CACHE TEST
3702 015706  022704  177777                     CMP     #-1,R4          ;WAS INSTRUCTION ABORTED LEAVING R4 INTACT?
3703 015712  001401                             BEQ     1$              ;YES
3704 015714  104021                             ERROR   +21             ;INTERRUPT/ABORT TESTS R4 WAS OVERWRITTEN WITH
3705                                                                    ;DATA INDICATING THAT INSTRUCTION WAS NOT ABORTED
3706 015716  005703                     1$:     TST     R3              ;DID TRAP OCCUR
3707 015720  001401                             BEQ     2$              ;YES, PASS
```

TEST # 20 - VERIFY TRAP DUE TO CACHE PARITY ABORT

```
3708 015722  104022                          ERROR   +22             ;INTERRUPT/ABORT TESTS TRAP DID NOT OCCUR DUE TO ABORT
3709 015724  012737  000000  177746  2$:     MOV     #0,CACHE        ;TURN CACHE ON
3710 015732  062737  000007  001100  21$:    ADD     #7,$TSTNM       ;ADD 7 TO $TSTNM TO COMPENSATE FOR 7 TESTS SKIPPED
3711 015740  000137  017164                  JMP     TST30           ;JUMP OVER NEXT 7 TESTS - THEY ARE FOR AN 11/24 ONLY
```

```
3724                                    .SBTTL  TEST # 21 - LMA REGISTER PHYSICAL ADDRESS CHECK
                                        ;;*****************************************************************
                                        ;*TEST 21       LMA REGISTER PHYSICAL ADDRESS CHECK
                                        ;*
                                        ;*      THE NEXT 7 TESTS ARE EXECUTED ON THE 11/24 ONLY.
                                        ;*
                                        ;*      THIS TEST IS TO CHECK OUT THE LMA (LAST MAPPED ADDRESS) REGISTER FOR
                                        ;*      PROPER CONTENTS.  FIRST, THE PAR AND MAP REGISTERS ARE SET, THEN A
                                        ;*      PHYSICAL ADDRESS IS LOADED INTO AN EXPECTED DATA LOCATION.  THEN THE
                                        ;*      MAP IS INSURED TO BE ON AND A MEMORY ACCESS IS DONE, USING THE MAP
                                        ;*      REGISTER SO THE LMA IS LOADED.  THE LMA IS THEN CHECKED FOR CONTAINING
                                        ;*      THE PROPER CONTENTS, CALLING AN ERROR IF EXPECTED DATA DID NOT APPEAR.
                                        ;*
                                        ;;*****************************************************************
     015744                             TST21:
     015744  000004                             SCOPE
     015746  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     015752  016220  016104  000021             .WORD   TST22,20$,21    ;DATA USED BY PRETST
3725 015760  000416                             BR      10$             ;BRANCH OVER TEST PATTERN TABLE         ;DPM002
3726         000002                             .RADIX  2               ;SET RADIX TO BINARY REPRESENTATION     ;DPM002
3727 015762  040000                     100$:   .WORD   0100000000000000 ;SELECT MAP REG 2, ALL BITS CLEAR       ;DPM002
3728 015764  057776                             .WORD   0101111111111110 ;SELECT MAP REG 2, ALL BITS SET EXC 0   ;DPM002
3729 015766  052524                             .WORD   0101010101010100 ;SELECT MAP REG 2, EVEN BITS SET        ;DPM002
3730 015770  045252                             .WORD   0100101010101010 ;SELECT MAP REG 2, ODD BITS SET         ;DPM002
3731 015772  043146                             .WORD   0100011001100110 ;SELECT MAP REG 2, PAIRS OF BITS SET    ;DPM002
3732 015774  057036                             .WORD   0101111000011110 ;SELECT MAP REG 2, 2 SETS OF 4 BITS SET;DPM002
3733 015776  040776                             .WORD   0100000111111110 ;SELECT MAP REG 2, 8 BITS SET           ;DPM002
3734                                    ;EXPECTED RESULTS IN LMALOW:                                            ;DPM002
3735 016000  000000                             .WORD   0000000000000000 ;EXPECTED RESULT WITH ALL BITS CLEAR    ;DPM002
3736 016002  017776                             .WORD   0001111111111110 ;EXPECTED RESULT WITH ALL BITS 1 EXC 0  ;DPM002
3737 016004  012524                             .WORD   0001010101010100 ;EXPECTED RESULT WITH EVEN 3ITS SET     ;DPM002
3738 016006  005252                             .WORD   0000101010101010 ;EXPECTED RESULT WITH ODD BITS SET      ;DPM002
3739 016010  003146                             .WORD   0000011001100110 ;EXPECTED RESULT WITH PAIRS OF BITS SET;DPM002
3740 016012  017036                             .WORD   0001111000011110 ;EXPECTED RESULT WITH GRPS OF 4 BITS =1;DPM002
3741 016014  000776                             .WORD   0000000111111110 ;EXPECTED RESULT WITH 8 BITS SET        ;DPM002
3742         000010                             .RADIX  8               ;SET RADIX BACK TO OCTAL                ;DPM002
3743 016016  012701  015762             10$:    MOV     #100$,R1        ;MOVE TABLE ADDRESS TO R1               ;DPM002
3744 016022  012702  000007                     MOV     #7,R2           ;DO 7 PATTERNS                          ;DPM002
3745 016026  042737  000001  177572             BIC     #BIT0,MMR0      ;TURN OFF MEMORY MANAGEMENT
3746 016034  042737  000060  172516             BIC     #60,MMR3        ;TURN OFF 22-BIT AND MAP RELOCATION
3747 016042  013746  172344                     MOV     KIPAR2,-(SP)    ;SAVE KIPAR2
3748 016046  013737  001256  172344             MOV     LOWEST,KIPAR2   ;PUT PAR VALUE IN PAR2 TO ACCESS LOWEST MAP REGISTER
3749 016054  052737  000060  172516             BIS     #60,MMR3        ;TURN ON 22-BIT AND MAP RELOCATION
3750 016062  005037  172340                     CLR     KIPAR0          ;CLEAR PAR0 FOR PAGE ACCESSING THIS TEST
3751 016066  052737  000001  177572             BIS     #BIT0,MMR0      ;TURN ON  MEMORY MANAGEMENT
3752 016074  005077  163200                     CLR     @LREGL          ;CLEAR LOWEST USEABLE MAP REGISTER LOW WORD
3753 016100  005077  163176                     CLR     @LREGU          ;CLEAR LOWEST USEABLE MAP REGISTER HIGH WORD
3754 016104  017137  000000  001174     20$:    MOV     @0(R1),$TMP0    ;DO THE MAP REGISTER READ THRU THE MAP  ;DPM002
3755 016112  026137  000016  177734             CMP     16(R1),LMALOW   ;SEE IF LMA LWR 16 WERE LOADED PROPERLY ;DPM002
3756 016120  001007                             BNE     1$              ;BRANCH TO CALL ERROR IF NOT            ;DPM002
3757 016122  013737  177736  001174             MOV     LMAHI,$TMP0     ;MOVE HI 6 BITS TO $TMP0 FOR PREPARATION
3758 016130  042737  177700  001174             BIC     #177700,$TMP0   ;CLEAR ALL BUT LOWER 6 BITS
3759 016136  001424                             BEQ     2$              ;BRANCH AROUND ERROR IF OK
3760 016140  013737  177734  005770     1$:     MOV     LMALOW,EADRS2   ;MOVE LOWER 16 BITS OF RECEIVED DATA TO EADRS2 FOR ERROR
3761 016146  013737  177736  005772             MOV     LMAHI,EADRS2+2  ;MOVE UPPER 6 BITS OF RECEIVED DATA TO EADRS2+2 FOR ERROR
3762 016154  016137  000016  005764             MOV     16(R1),EADRES   ;MOVE EXPECTED DATA TO EADRES           ;DPM002
3763 016162  005037  005766                     CLR     EADRES+2        ;CLEAR THE UPPER LOCATION
```

```
3764 016166  011637  172344                MOV     (SP),KIPAR2     ;RESTORE KIPAR2
3765 016172  104023                        ERROR   +23             ;LMA NOT LOADED PROPERLY
3766 016174  013737  001256  172344        MOV     LOWEST,KIPAR2   ;RESET PAR2 TO PRE-ERROR SETUP
3767 016202  012703  004000                MOV     #4000,R3        ;MOVE 4000 TO WAIT LOOP COUNTER
3768 016206  077301                15$:    SOB     R3,15$          ;WAIT A LITTLE
3769 016210  005721                2$:     TST     (R1)+           ;INCREMENT TO NEXT TABLE VALUE          ;DP%002
3770 016212  077244                        SOB     R2,20$          ;SUBTRACT 1 AND BRANCH IF NOT DONE YET  ;DP%002
3771 016214  012637  172344        3$:     MOV     (SP)+,KIPAR2    ;RESTORE KIPAR2 FOR GOOD NOW
```

TEST # 22 - LMA FORCE JUMPER BIT TEST

```
3778                                    .SBTTL  TEST # 22 - LMA FORCE JUMPER BIT TEST
                                        ;;*****************************************************************
                                        ;*TEST 22       LMA FORCE JUMPER BIT TEST
                                        ;*
                                        ;*      THIS TEST DETERMINES THAT THE FORCE JUMPER BIT OF THE LMA IS ZERO AFTER
                                        ;*      A SYSTEM RESET.
                                        ;*
                                        ;;*****************************************************************
     016220                             TST22:
     016220  000004                             SCOPE
     016222  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     016226  016266  016234  000022             .WORD   TST23,20$,22    ;DATA USED BY PRETST
3779         000100                     FJBIT   =100                    ;FORCE JUMPER BIT IS BIT 6
3780 016234  042737  000060  172516     20$:    BIC     #60,MMR3        ;TURN OFF 22-BIT AND MAP RELOCATION
3781 016242  000005                             RESET                   ;RESET THE WORLD, CLEARING THE FJBIT
3782 016244  032737  000100  177736             BIT     #FJBIT,LMAHI    ;CHECK THE BIT FOR BEING ZERO
3783 016252  001405                             BEQ     TST23           ;;BRANCH TO NEXT TEST IF OK
3784 016254  013701  177736                     MOV     LMAHI,R1        ;MOVE LMAHI TO R1 FOR ERROR CALL
3785 016260  042701  000100                     BIC     #FJBIT,R1       ;CLEAR THE BIT THAT SHOULD HAVE BEEN CLEAR
3786 016264  104024                             ERROR   +24             ;LMA FORCE JUMPER BIT NOT ZERO
```

```
3796                                    .SBTTL  TEST # 23 - SETTING LMA FORCE JUMPER BIT TEST
                                        ;;*****************************************************************
                                        ;*TEST 23       SETTING LMA FORCE JUMPER BIT TEST
                                        ;*
                                        ;*      THIS TEST SETS THE FORCE JUMPER BIT AND TESTS ITS FUNCTIONALITY IF
                                        ;*      THE JUMPERS ARE NOT IN THEIR DEFAULT STATE.  IF NOT ('LOWEST' OR
                                        ;*      'HIGEST' DO NOT CONTAIN THE DEFAULT VALUES OF 170000 OR 177400
                                        ;*      RESPECTIVELY), THIS TEST INSURES THAT THE PREVIOUSLY DISABLED MAP
                                        ;*      REGISTERS ARE ENABLED WITH THE FJ BIT SET.
                                        ;*
                                        ;;*****************************************************************
     016266                             TST23:
     016266  000004                             SCOPE
     016270  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     016274  016474  016302  000023             .WORD   TST24,20$,23    ;DATA USED BY PRETST
3797 016302  052737  000100  177736  20$:       BIS     #FJBIT,LMAHI    ;SET THE BIT
3798 016310  032737  000100  177736             BIT     #FJBIT,LMAHI    ;SEE IF IT WAS SET
3799 016316  001005                             BNE     1$              ;BRANCH IF SET
3800 016320  013701  177736                     MOV     LMAHI,R1        ;MOVE LMAHI TO R1 FOR ERROR CALL
3801 016324  052701  000100                     BIS     #FJBIT,R1       ;SET THE BIT THAT SHOULD HAVE BEEN SET
3802 016330  104025                             ERROR   +25             ;LMA FORCE JUMPER BIT NOT SET
3803 016332  022737  170000  001256  1$:        CMP     #170000,LOWEST  ;SEE IF MAP REGISTER 0 IS LOWEST
3804 016340  001004                             BNE     2$              ;BRANCH AROUND UPPER LIMIT CHECK IF NOT
3805 016342  022737  177400  001260             CMP     #177400,HIGEST  ;SEE IF MAP REGISTER 31 IS HIGHEST
3806 016350  001451                             BEQ     TST24           ;;BRANCH TO NEXT TEST IF SO
3807 016352  052737  000060  172516  2$:        BIS     #60,MMR3        ;TURN ON 22-BIT AND MAP RELOCATION
3808 016360  012737  016440  001106             MOV     #6$,$LPERR      ;RESET LOOP ON ERROR TO 6$
3809 016366  013746  172350                     MOV     KIPAR4,-(SP)    ;SAVE PAR4
3810 016372  013737  001262  172350             MOV     UBMLOW,KIPAR4   ;MOVE LOWEST PAGE OF MEMORY WINDOW TO PAR4
3811 016400  012700  117776                     MOV     #117776,R0      ;THIS WILL BE USED TO SELECT PAR4, ADDRESS 17776
3812 016404  012702  125252                     MOV     #125252,R2      ;LOAD CONSTANT TO R2
3813 016410  000407                             BR      5$              ;BRANCH OVER LOOP SETUP
3814 016412  062737  000200  172350  4$:        ADD     #200,KIPAR4     ;MAP TO NEXT REGISTER
3815 016420  023737  001264  172350             CMP     UBMHI,KIPAR4    ;SEE IF HIGHEST HAS BEEN REACHED
3816 016426  001415                             BEQ     9$              ;BRANCH TO RESTORE PAR4 AND LEAVE TEST IF SO
3817 016430  004737  003474             5$:     JSR     PC,TSTLOC       ;GO TEST LOCATION FOR WRITEABILITY
3818 016434  000766                             BR      4$              ;BRANCH BACK FOR ANOTHER TEST IF LOCATION LOADED
3819 016436  000403                             BR      7$              ;BRANCH AROUND LOOP ON ERROR SETUP
3820 016440  004737  003474             6$:     JSR     PC,TSTLOC       ;GO TEST LOCATION FOR WRITEABILITY
3821 016444  000401                             BR      8$              ;GO TEST FOR LOOP ON ERROR IF OK NOW
3822 016446  104027                     7$:     ERROR   +27             ;FORCE JUMPER BIT FAILS TO REVERT MAP REGISTER STATUS TO DEF
3823 016450  032777  001000  162460  8$:        BIT     #BIT9,@SWR      ;SEE IF LOOP ON ERROR IS STILL SET
3824 016456  001370                             BNE     6$              ;BRANCH BACK TO LOOP SECTION IF SO
3825 016460  000754                             BR      4$              ;BRANCH BACK FOR ANOTHER TEST
3826 016462  012637  172350             9$:     MOV     (SP)+,KIPAR4    ;RESTORE KIPAR4
3827 016466  042737  000060  172516             BIC     #60,MMR3
```

```
                                        .SBTTL  TEST # 24 - CLEARING THE FORCE JUMPER BIT
                                        ;;*****************************************************************
                                        ;*TEST 24       CLEARING THE FORCE JUMPER BIT
                                        ;*
                                        ;*      THIS TEST CLEARS THE FJ BIT AND INSURES THAT IT IS SUCCESSFULLY CLEARED.
                                        ;*
                                        ;;*****************************************************************
      016474                            TST24:
      016474  000004                            SCOPE
      016476  004737  005166                    JSR     PC,PRETST       ;GO SET UP PRETEST DATA
      016502  016540  016510  000024            .WORD   TST25,20$,24    ;DATA USED BY PRETST
3834  016510  042737  000100  177736  20$:      BIC     #FJBIT,LMAHI    ;CLEAR THE BIT
3835  016516  032737  000100  177736            BIT     #FJBIT,LMAHI    ;CHECK TO SEE THAT IT WAS CLEARED
3836  016524  001405                            BEQ     TST25           ;;BRANCH IF CLEARED
3837  016526  013701  177736                    MOV     LMAHI,R1        ;MOVE LMAHI TO R1 FOR ERROR CALL
3838  016532  042701  000100                    BIC     #FJBIT,R1       ;CLEAR THE BIT THAT SHOULD HAVE BEEN CLEAR
3839  016536  104024                            ERROR   +24             ;LMA FORCE JUMPER BIT NOT ZERO
```

```
3846                                    .SBTTL  TEST # 25 - LMA CONTROL BITS TEST - DATI
                                        ;;*****************************************************************
                                        ;*TEST 25       LMA CONTROL BITS TEST - DATI
                                        ;*
                                        ;*       THIS TEST INSURES THE CONTROL BITS 14 AND 15 LOAD PROPERLY DOING A
                                        ;*       DATI.
                                        ;*
                                        ;;*****************************************************************
     016540                             TST25:
     016540  000004                             SCOPE
     016542  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     016546  016702  016644  000025             .WORD   TST26,20$,25    ;DATA USED BY PRETST
3847 016554  013746  172344                     MOV     KIPAR2,-(SP)    ;SAVE KIPAR2
3848 016560  012737  170000  172344             MOV     #170000,KIPAR2  ;LOAD KIPAR2
3849 016566  012737  000001  177572             MOV     #1,MMR0         ;TURN ON MEMORY MANAGEMENT
3850 016574  012737  000020  172516             MOV     #20,MMR3        ;TURN ON 22-BIT ADDRESSING
3851 016602  012700  056664                     MOV     #1$+BIT14,R0    ;MOVE LOCATION ADDRESS +40000 (TO REF PAR2) TO R0
3852 016606  011001                             MOV     (R0),R1         ;DO A DATI
3853 016610  013737  177736  001174             MOV     LMAHI,$TMP0     ;MOVE LMAHI TO $TMP0 FOR PREPARATION OF EXPECTED
3854 016616  013737  001174  001200             MOV     $TMP0,$TMP2     ;MOVE IT TO $TMP2 ALSO
3855 016624  042737  037777  001200             BIC     #37777,$TMP2    ;CLEAR ALL BUT THE CONTROL BITS
3856 016632  023737  001174  001200             CMP     $TMP0,$TMP2     ;SEE IF EXPECTED DATA CAME UP
3857 016640  001416                             BEQ     3$              ;BRANCH TO FINISH TEST IF ALL CLEAR
3858 016642  000410                             BR      1$              ;BRANCH OVER LOOP ON ERROR SETUP
3859 016644  011001                     20$:    MOV     (R0),R1         ;DO A DATI
3860 016646  013737  177736  001174             MOV     LMAHI,$TMP0     ;MOVE LMAHI TO $TMP0 FOR COMPARE
3861 016654  023737  001174  001200             CMP     $TMP0,$TMP2     ;SEE IF EXPECTED DATA CAME UP
3862 016662  001401                             BEQ     2$              ;BRANCH AROUND ERROR IF IT DID
3863 016664  104026                     1$:     ERROR   +26             ;LMA CONTROL BITS INCORRECT
3864 016666  032777  001000  162242     2$:     BIT     #BIT9,@SWR      ;SEE IF LOOP ON ERROR IS SET
3865 016674  001363                             BNE     20$             ;BRANCH BACK FOR ANOTHER TRY IF SET
3866 016676  012637  172344             3$:     MOV     (SP)+,KIPAR2    ;RESTORE KIPAR2
```

```
3873                                    .SBTTL  TEST # 26 - LMA CONTROL BITS TEST - DATO
                                        ;;*****************************************************************
                                        ;*TEST 26       LMA CONTROL BITS TEST - DATO
                                        ;*
                                        ;*      THIS TEST INSURES THE CONTROL BITS 14 AND 15 LOAD PROPERLY DOING A
                                        ;*      DATO.
                                        ;*
                                        ;;*****************************************************************
     016702                             TST26:
     016702  000004                             SCOPE
     016704  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     016710  017036  017000  000026             .WORD   TST27,20$,26    ;DATA USED BY PRETST
3874         100000                     DATO    =100000
3875 016716  013746  172344                     MOV     KIPAR2,-(SP)    ;SAVE KIPAR2
3876 016722  012737  170000  172344             MOV     #170000,KIPAR2  ;LOAD KIPAR2
3877 016730  012700  057020                     MOV     #1$+BIT14,R0    ;MOVE LOCATION ADDRESS +40000 (TO REF PAR2) TO R0
3878 016734  010110                             MOV     R1,(R0)         ;DO A DATO
3879 016736  013737  177736  001174             MOV     LMAHI,$TMP0     ;MOVE LMAHI TO $TMP0 FOR CONTROL BIT ANALYSIS
3880 016744  013737  001174  001200             MOV     $TMP0,$TMP2     ;MOVE IT IT $TMP2 ALSO
3881 016752  052737  100000  001200             BIS     #DATO,$TMP2     ;SET AND CLEAR THE CONTROL BITS EXPECTED TO BE SET
3882 016760  042737  040000  001174             BIC     #BIT14,$TMP0    ;AND CLEAR SO $TMP2 WILL CONTAIN THE EXPECTED
3883 016766  023737  001174  001200             CMP     $TMP0,$TMP2     ;SEE IF BIT 15 IS SET AND 14 IS CLEAR
3884 016774  001416                             BEQ     3$              ;BRANCH IF OK
3885 016776  000410                             BR      1$              ;GO CALL ERROR
3886 017000  010110                     20$:    MOV     R1,(R0)         ;DO A DATO
3887 017002  013737  177736  001174             MOV     LMAHI,$TMP0     ;MOVE LMA HIGH REGISTER CONTENTS TO $TMP0 FOR COMPARE
3888 017010  023737  001174  001200             CMP     $TMP0,$TMP2     ;SEE IF EXPECTED CAME UP
3889 017016  001401                             BEQ     2$              ;BRANCH AROUND ERROR IF IT DID
3890 017020  104026                     1$:     ERROR   +26             ;LMA CONTROL BITS INCORRECT
3891 017022  032777  001000  162106     2$:     BIT     #BIT9,@SWR      ;SEE IF LOOP ON ERROR IS SET
3892 017030  001363                             BNE     20$             ;BRANCH BACK FOR ANOTHER TRY IF SET
3893 017032  012637  172344             3$:     MOV     (SP)+,KIPAR2    ;RESTORE KIPAR2
```

```
3900                                    .SBTTL  TEST # 27 - LMA CONTROL BITS TEST - DAT08
                                        ;;*****************************************************************
                                        ;*TEST 27       LMA CONTROL BITS TEST - DAT08
                                        ;*
                                        ;*      THIS TEST INSURES THE CONTROL BITS 14 AND 15 LOAD PROPERLY DOING A
                                        ;*      DAT08.
                                        ;*
                                        ;;*****************************************************************
     017036                             TST27:
     017036  000004                             SCOPE
     017040  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     017044  017164  017126  000027             .WORD   TST30,20$,27    ;DATA USED BY PRETST
3901         140000                     DAT08   =140000                 ;DAT08 CONTROL BITS STATUS=140000
3902 017052  013746  172344                     MOV     KIPAR2,-(SP)    ;SAVE KIPAR2
3903 017056  012737  170000  172344             MOV     #170000,KIPAR2  ;LOAD KIPAR2
3904 017064  012700  057146                     MOV     #1$+BIT14,R0    ;MOVE LOCATION ADDRESS +40000 (TO REF PAR2) TO R0
3905 017070  110110                             MOVB    R1,(R0)         ;DO A DAT08
3906 017072  013737  177736  001174             MOV     LMAHI,$TMP0     ;MOVE LMAHI TO $TMP0 FOR CONTROL BIT CHECK
3907 017100  013737  001174  001200             MOV     $TMP0,$TMP2     ;MOVE TO $TMP2 ALSO
3908 017106  052737  140000  001200             BIS     #DAT08,$TMP2    ;SET THE EXPECTED DATA BITS INTO $TMP0
3909 017114  023737  001174  001200             CMP     $TMP0,$TMP2     ;SEE IF EXPECTED DATA CAME UP
3910 017122  001416                             BEQ     3$              ;BRANCH IF OK
3911 017124  000410                             BR      1$              ;BRANCH TO CALL ERROR
3912 017126  110110                     20$:    MOVB    R1,(R0)         ;DO A DAT08
3913 017130  013737  177736  001174             MOV     LMAHI,$TMP0     ;MOVE LMA HIGH REGISTER CONTENTS TO $TMP0 FOR COMPARE
3914 017136  023737  001174  001200             CMP     $TMP0,$TMP2     ;SEE IF EXPECTED DATA CAMPE UP
3915 017144  001401                             BEQ     2$              ;BRANCH IF OK
3916 017146  104026                     1$:     ERROR   +26             ;LMA CONTROL BITS INCORRECT
3917 017150  032777  001000  161760     2$:     BIT     #BIT9,@SWR      ;SEE IF LOOP ON ERROR IS SET
3918 017156  001363                             BNE     20$             ;BRANCH BACK FOR ANOTHER TRY IF SET
3919 017160  012637  172344             3$:     MOV     (SP)+,KIPAR2    ;RESTORE KIPAR2
3920                                    ;;*****************************************************************
3921                                    ;*
3922                                    ;*      >>NOTE<<: 'DATIP' CANNOT BE CHECKED IN THE 11/24 BECAUSE THE LMA IS
3923                                    ;*                WRITTEN TWICE WHEN A 'DATIP' IS EXECUTED, DESTROYING THE
3924                                    ;*                'DATIP' STATE THAT WAS WRITTEN FIRST.
3925                                    ;*
3926                                    ;;*****************************************************************
```

```
3928                            .SBTTL  MEMORY ON UNIBUS TESTS HEADER
3929                    ;;*****************************************************************
3930                    ;*
3931                    ;*      THE NEXT TWO TESTS WILL EXECUTE IF A '1' IN BIT 5 OF THE SWITCH
3932                    ;*      REGISTER IS FOUND SET.  IF IT HAS, IT THEN DETERMINES IF THERE IS ANY
3933                    ;*      UNIBUS MEMORY - AN ERROR RESULTS IF THERE IS NONE.  IF THERE IS MEMORY,
3934                    ;*      IT THEN  SIZES THE AMOUNT OF MEMORY ON THE UNIBUS, INFORMS THE USER
3935                    ;*      HOW MUCH MEMORY IT FOUND ON THE FIRST PASS, THEN SETS AND CLEARS ALL
3936                    ;*      BITS OF ALL LOCATIONS IN THE UNIBUS MEMORY FOUND USING THE 'MARCH'
3937                    ;*      ALGORITHM.
3938                    ;*
3939                    ;*              M7098 FOR THE 11/44, M7134 FOR THE 11/24
3940                    ;*               JUMPER SETTINGS FOR THE MAP REGISTERS
3941                    ;*
3942                    ;*         V<<<<<LOWER LIMIT>>>>>V    V<<<<UPPER LIMIT>>>>V
3943                    ;*         0     0     0    0    0    0    0    0    0    0
3944                    ;*         |     |     |    |    |    |    |    |    |    |
3945                    ;*      W12|  W11|  W10|  W9|  W8|  W7|  W6|  W5|  W4|  W3|
3946                    ;*         |     |     |    |    |    |    |    |    |    |
3947                    ;*         0     0     0    0    0    0    0    0    0    0
3948                    ;*
3949                    ;*W3-W7 AND W8-W12 ARE THE BINARY-CODED PAGE NUMBER LIMIT (UPPER OR LOWER).
3950                    ;*A JUMPER IN CORRESPONDS TO A LOGIC "0"; A JUMPER OUT TO A LOGIC "1".  TO
3951                    ;*SET THE JUMPERS, DETERMINE WHICH UNIBUS PAGE THE MEMORY RESIDES IN (0 TO 31)
3952                    ;*BY CHECKING WHICH OF THE 5 ADDRESS BITS BA17-BA13 ARE ASSERTED.  ALL ZEROS
3953                    ;*IS PAGE 0, 10000 IS PAGE 1, 01000 IS PAGE 2, 11000 IS PAGE 3, ETC.  UP TO
3954                    ;*PAGE 31 (11111).  FOR THE MEMORY TO BE DETECTED, IT MUST LIE AT OR ABOVE
3955                    ;*THE LOWER LIMIT JUMPER SETTING AND BELOW THE UPPER LIMIT JUMPER SETTING.
3956                    ;*THUS TO HAVE UNIBUS MEMORY IN PAGES 5-9, ONE WOULD SET THE LOWER LIMIT TO
3957                    ;*PAGE 5 (10100) OR W10 AND W12 OUT, AND W8, W9 AND W11 IN, AND THE UPPER LIMIT
3958                    ;*TO PAGE 10 (01010) OR W4 AND W6 OUT, AND W3, W5 AND W7 IN.  UNIBUS MEMORY
3959                    ;*MUST BE CONTIGUOUS SINCE NO GAPS ARE PERMITTED.
3960                    ;;*****************************************************************
```

```
3972                                    .SBTTL  TEST # 30 - MEMORY ON UNIBUS TEST
                                        ;;*****************************************************************
                                        ;*TEST 30       MEMORY ON UNIBUS TEST
                                        ;*
                                        ;*      THIS TEST FIRST CHECKS TO SEE IF THE UNIBUS MEMORY TESTS HAVE BEEN
                                        ;*      SELECTED.  IF NOT, THE EOP IS EZECUTED.  IT THEN CHECKS FOR UNIBUS
                                        ;*      MEMORY EXISTENCE BY CHECKING THAT THE CONTENTS OF LOWEST OR HIGHEST
                                        ;*      LOCATIONS IS NOT IN ITS DEFAULT STATE.  IF BOTH ARE, AN ERROR IS
                                        ;*      CALLED AND THE EOP IS EZECUTED.  IF EITHER ARE NOT, THE NEXT SECTION
                                        ;*      IS EXECUTED THAT DETERMINES THE SIZE OF THE UB MEMORY AND TELLS
                                        ;*      USER OF THE RESULTS ON THE FIRST PASS ONLY.
                                        ;*
                                        ;;*****************************************************************
     017164                             TST30:
     017164  000004                             SCOPE
     017166  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     017172  017412  017200  000030             .WORD   TST31,20$,30    ;DATA USED BY PRETST
3973 017200  042737  000001  177572  20$:       BIC     #1,MMR0         ;TURN OFF MEMORY MANAGEMENT
3974 017206  032777  000040  161722             BIT     #BIT5,@SWR      ;SEE IF THIS TEST HAS BEEN SELECTED
3975 017214  001425                             BEQ     2$              ;BRANCH TO JUMP IF TEST NOT SELECTED
3976 017216  012737  021576  001362             MOV     #$EOP,NXTTST    ;POINT TO ESCAPE VECTOR
3977 017224  022737  170000  001256  1$:       CMP     #170000,LOWEST  ;SEE IF LOWEST IS LOWEST
3978 017232  001020                             BNE     3$              ;GO DO TEST IF IT ISN'T - UNIBUS MEMORY EXISTS
3979 017234  022737  177400  001260             CMP     #177400,HIGEST  ;SEE IF HIGEST IS HIGHEST
3980 017242  001014                             BNE     3$              ;GO DO TEST IF IT ISN'T - UNIBUS MEMORY EXISTS
3981 017244  012737  012744  001106             MOV     #SIZEJ0,$LPERR  ;MOVE SIZE JUMPER ROUTINE TO LOOP ON ERROR
3982 017252  112737  000007  001100             MOVB    #7,$TSTNM       ;EXECUTING AFTER TEST 7 ON LOOPBACK
3983 017260  112737  000007  020146             MOVB    #7,$TESTN       ;EXECUTING AFTER TEST 7 ON LOOPBACK
3984 017266  104017                             ERROR   +17             ;NO UNIBUS MEMORY EXISTS
3985 017270  000137  021576             2$:     JMP     $EOP            ;JUMP TO END OF PASS
3986 017274  005037  001320             3$:     CLR     ERRCNT          ;CLEAR THE ERROR COUNT INDICATOR
3987 017300  005037  001330                     CLR     PCPUER          ;CLEAR THE ERROR REGISTER RECEIVER
3988 017304  005037  172516                     CLR     MMR3            ;CLEAR MEMORY MANAGEMENT REGISTER MMR3
3989 017310  052737  000020  172516             BIS     #20,MMR3        ;TURN ON 22-BIT MAPPING
3990 017316  005037  172340                     CLR     KIPAR0          ;MAP PAR0 TO 0-4K
3991 017322  012737  000200  172342             MOV     #200,KIPAR1     ;MAP PAR1 TO 4-8K
3992 017330  013700  001274                     MOV     UBRH,R0         ;MOVE UBRHI TO R0
3993 017334  163700  001272                     SUB     UBRLOW,R0       ;SUBTRACT UBRLOW FROM IT, AND
3994 017340  005200                             INC     R0              ;ADD LAST BLOCK OF 4K TO LOOP COUNTER
3995 017342  010037  001316                     MOV     R0,NUMOFK       ;SAVE R0 IN NUMOFK
3996 017346  005046                     4$:     CLR     -(SP)           ;CLEAR THE MAJOR LOOP INDICATOR ON STACK
3997 017350  012746  000200                     MOV     #200,-(SP)      ;MOVE PAR CHANGE TO STACK
3998 017354  013746  001262                     MOV     UBMLOW,-(SP)    ;MOVE STARTING PAR VALUE TO STACK
3999 017360  012746  000002                     MOV     #2,-(SP)        ;MOVE INCREMENT VALUE TO STACK
4000 017364  005737  020150                     TST     $PASS           ;SEE IF THIS IS FIRST PASS
4001 017370  001010                             BNE     TST31           ;;BRANCH TO NEXT TEST IF NOT
4002 017372  010046                             MOV     R0,-(SP)        ;MOVE LOOP COUNTER TO THE STACK AND
4003 017374  006316                             ASL     (SP)            ;ROTATE THIS TO THE LEFT 2 PLACES
4004 017376  006316                             ASL     (SP)            ;TO INDICATE NUMBER OF K IN OCTAL
4005 017400  104401  006125                     TYPE    ,UBMAVA         ;GO TYPE THE UNI-BUS MEMORY AVAILABLE MESSAGE
4006 017404  104405                             TYPDS                   ;GO TYPE THE NUMBER IN DECIMAL
4007 017406  104401  006174                     TYPE    ,UBMEND         ;TYPE A " K" AND <CRLF>
4008         021576                     TST32=$EOP
```

```
4015                                    .SBTTL  TEST # 31 - USING MARCH ALGORITHM, CHECK UB MEMORY
                                        ;;*****************************************************************
                                        ;*TEST 31       USING MARCH ALGORITHM, CHECK UB MEMORY
                                        ;*
                                        ;*      THIS TEST LOADS PATTERN 125252 INTO ALL LOCATIONS IN UB MEMORY, THEN
                                        ;*      USING THE MARCH ALGORITHM, CHECKS THE MEMORY
                                        ;*
                                        ;;*****************************************************************
     017412                             TST31:
     017412  000004                             SCOPE
     017414  004737  005166                     JSR     PC,PRETST       ;GO SET UP PRETEST DATA
     017420  021576  017530  000031             .WORD   TST32,20$,31    ;DATA USED BY PRETST
4016 017426  012704  125252                     MOV     #125252,R4      ;MOVE FIRST TEST PATTERN TO R4
4017 017432  012705  052525                     MOV     #52525,R5       ;MOVE SECOND TEST PATTERN TO R5
4018 017436  013737  001262  172354  1$:       MOV     UBMLOW,KIPAR6   ;INITIALIZE PAR6
4019 017444  013700  001316                     MOV     NUMOFK,R0       ;REINITIALIZE LOOP COUNTER R0
4020 017450  052737  000001  177572             BIS     #1,MMR0         ;TURN ON MEMORY MANAGEMENT
4021 017456  012702  010000             2$:     MOV     #10000,R2       ;ACCESS ALL WORDS IN THIS 4K BLOCK
4022 017462  012703  140000                     MOV     #140000,R3      ;FIRST ADDRESS OF THIS PAGE
4023 017466  010423                     3$:     MOV     R4,(R3)+        ;MOVE THE PATTERN TO THE LOCATION
4024 017470  077202                             SOB     R2,3$           ;SUBTRACT 1 AND BRANCH IF 4K NOT DONE
4025 017472  062737  000200  172354             ADD     #200,KIPAR6     ;MAP TO NEXT 4K BLOCK
4026 017500  077012                             SOB     R0,2$           ;SUBTRACT 1 AND BRANCH IF BLOCKS OF 4K NOT DONE
4027 017502  016637  000002  172354             MOV     2(SP),KIPAR6    ;REINITIALIZE KIPAR6 TO POINT AT BEGINNING
4028 017510  010100                             MOV     R1,R0           ;REINITIALIZE LOOP COUNTER R0
4029 017512  012702  010000             4$:     MOV     #10000,R2       ;ACCESS ALL WORDS IN THIS 4K BLOCK
4030 017516  012703  140000                     MOV     #140000,R3      ;FIRST ADDRESS OF THIS PAGE
4031 017522  066603  000006                     ADD     6(SP),R3        ;ADD OFFSET FOR THIS MAJOR PASS
4032 017526  000401                             BR      5$              ;BRANCH OVER LOOP ON ERROR PREPARATION
4033 017530  010413             20$:    MOV     R4,(R3)         ;REWRITE 1ST PATTERN TO LOCATION FOR LOOP ON ERROR
4034 017532  020413             5$:     CMP     R4,(R3)         ;SEE IF IT WAS LOADED PROPERLY
4035 017534  001403                             BEQ     6$              ;BRANCH AROUND ERROR CALL IF OK
4036 017536  010437  001204                     MOV     R4,$TMP4        ;MOVE EXPECTED DATA TO $TMP4
4037 017542  000405                             BR      7$              ;GO COMPLETE DATA FETCHING AND CALL ERROR
4038 017544  005113             6$:     COM     (R3)            ;COMPLEMENT THAT LOCATION TO PRODUCE SECOND TEST PATTERN
4039 017546  020513                             CMP     R5,(R3)         ;SEE IF IT IS THE COMPLEMENT
4040 017550  001417                             BEQ     11$             ;BRANCH AROUND ERROR CALL IF IT IS
4041 017552  010537  001204                     MOV     R5,$TMP4        ;MOVE EXPECTED DATA TO $TMP4
4042 017556  011337  001206             7$:     MOV     (R3),$TMP5      ;MOVE RECEIVED DATA TO $TMP5
4043 017562  005737  001330                     TST     PCPUER          ;SEE IF THIS ACCESS TIMED OUT - IF IT DID, BRANCH
4044 017566  001010                             BNE     11$             ;AROUND ERROR CALLS - TIMEOUT ROUTINE LOGGED ERROR
4045 017570  010337  005764                     MOV     R3,EADRES       ;MOVE ADDRESS IN R3 TO EADRES FOR ERROR CALL
4046 017574  104206             8$:     ERROR   +206            ;DATA PATTERN NOT CORRECT
4047 017576  000404                             BR      11$             ;BRANCH AROUND INCREMENT AND CLEAR INSTRUCTIONS
4048 017600  005237  001110             9$:     INC     $ERTTL          ;STILL COUNT THIS AS AN ERROR
4049 017604  005037  001330             10$:    CLR     PCPUER          ;CLEAR TIMEOUT RECEIVER
4050 017610  061603             11$:    ADD     (SP),R3         ;ADD INCREMENT/DECREMENT VALUE TO R3
4051 017612  077231                             SOB     R2,5$           ;SUBTRACT 1 AND BRANCH IF 4K NOT CHECKED
4052 017614  066637  000004  172354             ADD     4(SP),KIPAR6    ;MAP TO NEXT 4K BLOCK
4053 017622  077045                             SOB     R0,4$           ;BRANCH BACK IF MORE BLOCKS TO CHECK
4054 017624  005766  000006                     TST     6(SP)           ;TEST TO SEE IF THIS IS SECOND PASS
4055 017630  001404                             BEQ     12$             ;BRANCH TO 2ND PASS SETUP IF NOT
4056 017632  062706  000010                     ADD     #10,SP          ;CLEAN UP STACK
4057 017636  000137  021576                     JMP     $EOP            ;JUMP TO END OF PASS
4058 017642  012766  017776  000006  12$:     MOV     #17776,6(SP)    ;MOVE 2K WORDS -2 (ALSO 2ND PASS INDICATOR) TO STACK
4059 017650  012766  177600  000004             MOV     #-200,4(SP)     ;MOVE REVERSE PAR STEP TO STACK
4060 017656  013766  001264  000002             MOV     UBMHI,2(SP)     ;MOVE LAST PAR VALUE TO STACK
```

TEST # 31 - USING MARCH ALGORITHM, CHECK UB MEMORY

```
4061 017664  012716  177776          MOV     #-2,(SP)        ;MOVE DECREMENT VALUE TO STACK
4062 017670  000662                  BR      1$              ;BRANCH BACK FOR SECOND PASS
```

```
4063          020000                          .=20000         ;THE APT TABLES NEED TO START AT 20000 - THIS STATEMENT DOES THAT
4064
4065          177777                  ADDW0=  177777
4066          177777                  ADDW1=  177777
4067                                  .SBTTL  APT PARAMETER BLOCK
                                      ;;*****************************************************************
                                      ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                      ;;*****************************************************************
              020000                          .$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    020000                          $APTHDR ;;POINT TO APT HEADER BLOCK
              020000                          .=.$X   ;;RESET LOCATION COUNTER
                                      ;;*****************************************************************
                                      ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                      ;INTERFACE SPEC.
    020000                            $APTHD:
    020000    000000                  $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
    020002    020142                  $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
    020004    000005                  $TSTM:  .WORD   5       ;;RUN TIM OF LONGEST TEST
    020006    000010                  $PASTM: .WORD   10      ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
    020010    000000                  $UNITM: .WORD   0       ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
    020012    000052                          .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
                                        .SBTTL  SUBROUTINE TO TEST TIMEOUT THROUGH UNIBUS MAP
                                ;;**************************************************************
020014  005737  004312          MMTOTM: TST     LOEFLG          ;SEE IF THIS ENTRY IS FROM ERROR LOOPING
020020  001402                          BEQ     1$              ;BRANCH IF NOT
020022  062706  000002                  ADD     #2,SP           ;CLEAN EXTRA RETURN OFF STACK
020026  005037  001320          1$:     CLR     ERRCNT          ;CLEAR ERRCNT FOR THIS TEST
020032  013737  001256  172350        MOV     LOWEST,KIPAR4   ;LOAD PAR 4 WITH LOWEST USABLE MAP REG
020040  012777  000074  161234        MOV     #74,@LREGU      ;LOAD UPPER 6 BITS OF LOWEST MAP REG
020046  005077  161226              CLR     @LREGL          ;LOAD LOWER 16 BITS OF LOWEST MAP REG
020052  032777  004000  161056        BIT     #BIT11,@SWR     ;SEE IF AN 11/24 WITH JB MEMORY ONLY
020060  001403                          BEQ     20$             ;BRANCH IF NOT
020062  012737  177600  172350        MOV     #177600,KIPAR4  ;RESET KIPAR4 SO A TIMEOUT THROUGH MAP CAN BE EXPECTED
020070  005037  001330          20$:    CLR     PCPUER          ;CPU ERROR REGISTER LOCATION
020074  012737  000020  001326        MOV     #TIMOUT,CPUEXP  ;EXPECTING TIMEOUT IN THIS TEST
020102  013703  100000              MOV     100000,R3       ;TRY TO READ THROUGH PAGE 4 THIS REFERENCE WILL GO OUT
                                ;ON THE UNIBUS TO SELECT THE LOWEST USABLE MAP REGISTER (DEFAULT MAP REG. 0).  PHYSICAL
                                ;ADDRESS 17700000 IS THEN GENERATED, WHICH SHOULD TIME OUT SINCE IT IS THE FIRST
                                ;NON-EXISTENT LOCATION.
020106  005037  001326              CLR     CPUEXP          ;CLEAR LOCATION - NO MORE TIMEOUTS FOR A WHILE
020112  022737  000020  001330        CMP     #TIMOUT,PCPUER  ;THE UNIBUS SHOULD HAVE TIMED OUT
020120  001405                          BEQ     3$              ;BRANCH IF CONDITION WAS CORRECT
020122  011646                  2$:     MOV     (SP),-(SP)      ;PUSH ANOTHER RETURN ONTO THE STACK FOR POSSIBLE ERROR LOOP
020124  012737  000001  004312        MOV     #1,LOEFLG       ;SET ERROR LOOP FLAG
020132  000402                          BR      4$              ;EXIT
020134  062716  000002          3$:     ADD     #2,(SP)         ;CORRECT RETURN PC OVER ERROR CALL
020140  000207                  4$:     RTS     PC              ;EXIT
```

```
4095                                    .SBTTL  APT MAILBOX-ETABLE
                                        ;;*****************************************************************
                                        .EVEN
020142                                  $MAIL:                          ;;APT MAILBOX
020142  000000                          $MSGTY: .WORD   AMSGTY  ;;MESSAGE TYPE CODE
020144  000000                          $FATAL: .WORD   AFATAL  ;;FATAL ERROR NUMBER
020146  000000                          $TESTN: .WORD   ATESTN  ;;TEST NUMBER
020150  000000                          $PASS:  .WORD   APASS   ;;PASS COUNT
020152  000000                          $DEVCT: .WORD   ADEVCT  ;;DEVICE COUNT
020154  000000                          $UNIT:  .WORD   AUNIT   ;;I/O UNIT NUMBER
020156  000000                          $MSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
020160  000000                          $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
020162                                  $ETABLE:                        ;;APT ENVIRONMENT TABLE
020162      000                         $ENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
020163      000                         $ENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
020164  000000                          $SWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
020166  000000                          $USWR:  .WORD   AUSWR   ;;USER SWITCHES
020170  000000                          $CPUOP: .WORD   ACPUOP  ;;CPU TYPE,OPTIONS
                                        ;*                              BITS 15-11=CPU TYPE
                                        ;*                                      11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                                        ;*                                      11/70=06,PDQ=07,Q=10
                                        ;*                              BIT 10=REAL TIME CLOCK
                                        ;*                              BIT  9=FLOATING POINT PROCESSOR
                                        ;*                              BIT  8=MEMORY MANAGEMENT
020172      000                         $MAMS1: .BYTE   AMAMS1  ;;HIGH ADDRESS,M.S. BYTE
020173      000                         $MTYP1: .BYTE   AMTYP1  ;;MEM. TYPE,BLK#1
                                        ;*                              MEM.TYPE BYTE   --  (HIGH BYTE)
                                        ;*                                      900 NSEC CORE=001
                                        ;*                                      300 NSEC BIPOLAR=002
                                        ;*                                      500 NSEC MOS=003
020174  000000                          $MADR1: .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
                                        ;*                                MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
020176      000                         $MAMS2: .BYTE   AMAMS2  ;;HIGH ADDRESS,M.S. BYTE
020177      000                         $MTYP2: .BYTE   AMTYP2  ;;MEM.TYPE,BLK#2
020200  000000                          $MADR2: .WORD   AMADR2  ;;MEM.LAST ADDRESS,BLK#2
020202      000                         $MAMS3: .BYTE   AMAMS3  ;;HIGH ADDRESS,M.S.BYTE
020203      000                         $MTYP3: .BYTE   AMTYP3  ;;MEM.TYPE,BLK#3
020204  000000                          $MADR3: .WORD   AMADR3  ;;MEM.LAST ADDRESS,BLK#3
020206      000                         $MAMS4: .BYTE   AMAMS4  ;;HIGH ADDRESS,M.S.BYTE
020207      000                         $MTYP4: .BYTE   AMTYP4  ;;MEM.TYPE,BLK#4
020210  000000                          $MADR4: .WORD   AMADR4  ;;MEM.LAST ADDRESS,BLK#4
020212  000000                          $VECT1: .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
020214  000000                          $VECT2: .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
020216  000000                          $BASE:  .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
020220  000000                          $DEVM:  .WORD   ADEVM   ;;DEVICE MAP
020222  000000                          $CDW1:  .WORD   ACDW1   ;;CONTROLLER DESCRIPTION WORD#1
020224  000000                          $CDW2:  .WORD   ACDW2   ;;CONTROLLER DESCRIPTION WORD#2
020226  177777                          $DDW0:  .WORD   ADDW0   ;;DEVICE DESCRIPTOR WORD#0
020230  177777                          $DDW1:  .WORD   ADDW1   ;;DEVICE DESCRIPTOR WORD#1
020232  000000                          $DDW2:  .WORD   ADDW2   ;;DEVICE DESCRIPTOR WORD#2
020234  000000                          $DDW3:  .WORD   ADDW3   ;;DEVICE DESCRIPTOR WORD#3
020236  000000                          $DDW4:  .WORD   ADDW4   ;;DEVICE DESCRIPTOR WORD#4
020240  000000                          $DDW5:  .WORD   ADDW5   ;;DEVICE DESCRIPTOR WORD#5
020242  000000                          $DDW6:  .WORD   ADDW6   ;;DEVICE DESCRIPTOR WORD#6
020244  000000                          $DDW7:  .WORD   ADDW7   ;;DEVICE DESCRIPTOR WORD#7
020246  000000                          $DDW8:  .WORD   ADDW8   ;;DEVICE DESCRIPTOR WORD#8
020250  000000                          $DDW9:  .WORD   ADDW9   ;;DEVICE DESCRIPTOR WORD#9
```

```
020252  000000                  $DDW10: .WORD   ADDW10  ;;DEVICE DESCRIPTOR WORD#10
020254  000000                  $DDW11: .WORD   ADDW11  ;;DEVICE DESCRIPTOR WORD#11
020256  000000                  $DDW12: .WORD   ADDW12  ;;DEVICE DESCRIPTOR WORD#12
020260  000000                  $DDW13: .WORD   ADDW13  ;;DEVICE DESCRIPTOR WORD#13
020262  000000                  $DDW14: .WORD   ADDW14  ;;DEVICE DESCRIPTOR WORD#14
020264  000000                  $DDW15: .WORD   ADDW15  ;;DEVICE DESCRIPTOR WORD#15
020266                          $ETEND:
```

```
4097                                    .SBTTL  SCOPE HANDLER ROUTINE

                                        ;;**********************************************************************
                                        ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                                        ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
                                        ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                                        ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                        ;*SW14=1         LOOP ON TEST
                                        ;*SW11=1         INHIBIT ITERATIONS
                                        ;*SW09=1         LOOP ON ERROR
                                        ;*SW08=1         LOOP ON TEST IN SWR<4:0>
                                        ;*CALL
                                        ;*      SCOPE           ;;SCOPE=IOT

020266                                  $SCOPE:
020266  005037  001360                          CLR     RETRY           ;CLEAR RETRY FLAG AN THE START OF EACH TEST
020272  005037  001320                          CLR     ERRCNT          ;CLEAR THE MULTIPLE ERROR COUNTER
020276  005037  001246                          CLR     DATAOR          ;LOCATION FOR LOGICAL OR OF BAD DATA
020302  005037  001236                          CLR     ADDROR          ;LOCATION FOR LOGICAL OR OF ADDRESS
020306  005037  001240                          CLR     ADDROR+2        ;LOCATION FOR UPPER 6 BITS OF LOGICAL OR OF ADDRESS
020312  005037  001254                          CLR     PATTOR          ;LOCATION FOR LOGICAL OR OF PATTERN LOADED
020316  012737  177777  001242                  MOV     #-1,DATAND      ;LOCATION FOR LOGICAL AND OF BAD DATA
020324  012737  177777  001232                  MOV     #-1,ADRAND      ;LOCATION FOR LOGICAL AND OF ADDRESS
020332  012737  000077  001234                  MOV     #77,ADRAND+2    ;LOCATION FOR UPPER 6 BITS OF LOGICAL AND OF ADDRESS
020340  012737  177777  001252                  MOV     #-1,PATAND      ;LOCATION FOR LOGICAL AND OF PATTERN LOADED
020346  012737  000077  005766                  MOV     #77,EADRES+2    ;RESTORE UPPER 6 BIT LOCATION OF EADRES+2
020354  012737  000077  005772                  MOV     #77,EADRS2+2    ;RESTORE UPPER 6 BIT LOCATION OF EADRS2+2
020362  032777  040000  160546  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
020370  001134                          BNE     $OVER           ;;YES IF SW14=1
                                        ;#####START OF CODE FOR THE XOR TESTER#####
020372  000416                          $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                        ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
020374  013746  000004                          MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
020400  012737  020420  000004                  MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
020406  005737  177060                          TST     @#177060        ;;TIME OUT ON XOR?
020412  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
020416  000503                          BR      $SVLAD          ;;GO TO THE NEXT TEST
020420  022626                          5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
020422  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
020426  000443                          BR      7$              ;;LOOP ON THE PRESENT TEST
020430                                  6$:;#####END OF CODE FOR THE XOR TESTER#####
020430  032777  000400  160500                  BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
020436  001407                          BEQ     2$              ;;BR IF NO
020440  017746  160472                          MOV     @SWR,-(SP)      ;;SET DESIRED TEST NUM. FROM SWR
020444  042716  000340                          BIC     #$SWRMK,(SP)    ;;STRIP AWAY UNDESIRED BITS
020450  122637  001100                          CMPB    (SP)+,$TSTNM    ;;ON THE RIGHT TEST?
020454  001502                          BEQ     $OVER           ;;BR IF YES
020456  013737  177766  020700  2$:     MOV     177766,CPSAVE   ;MOVE CPU ERR REG VALUE TO LOC FOR TST  ;DPM001
020464  032737  000001  020700                  BIT     #BIT00,CPSAVE   ;SEE IF THE POWER MONITOR BIT IS ON     ;DPM001
020472  001406                          BEQ     2000$           ;BRANCH TO CONTINUE ROUTINE IF CLEAR    ;DPM001
020474  042737  000001  177766                  BIC     #BIT00,177766   ;CLEAR THE BIT FOUND TO BE SET       ;DPM001
020502  104177                          EMT     +177            ;CALL SPECIAL POWER FAIL BIT ERROR CALL ;DPM001
020504  105037  001101                          CLRB    $ERFLG          ;CLEAR THE ERROR FLAG                   ;DPM001
020510  105737  001101          2000$:  TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
020514  001421                          BEQ     3$              ;;BR IF NO
020516  123737  001113  001101                  CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
020524  101015                          BHI     3$              ;;BR IF NO
```

```
020526  032777  001000  160402          BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
020534  001404                          BEQ     4$              ;;BR IF NO
020536  013737  001106  001104  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
020544  000446                          BR      $OVER
020546  105037  001101          4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
020552  005037  001212                  CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
020556  000415                          BR      1$              ;;ESCAPE TO THE NEXT TEST
020560  032777  004000  160350  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
020566  001011                          BNE     1$              ;;BR IF YES
020570  005737  020150                  TST     $PASS           ;;IF FIRST PASS OF PROGRAM
020574  001406                          BEQ     1$              ;;      INHIBIT ITERATIONS
020576  005237  001102                  INC     $ICNT           ;;INCREMENT ITERATION COUNT
020602  023737  001212  001102          CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
020610  002024                          BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
020612  012737  000001  001102  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
020620  013737  020676  001212          MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
020626  105237  001100          $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
020632  113737  001100  020146          MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
020640  011637  001104                  MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
020644  011637  001106                  MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
020650  005037  001214                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
020654  112737  000001  001113          MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
020662  013777  001100  160250  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
020670  013716  001104                  MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
020674  000002                          RTI                     ;;FIXES PS
020676  000002                  $MXCNT: 2.                      ;;MAX. NUMBER OF ITERATIONS
020700  000000                  CPSAVE: .WORD   0               ;LOCATION TO SAVE CPU ERR REG CONTENTS  ;DPM001
```

```
4099                                    .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 ERTYPE 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

020702  000000                  IBSAVE: .WORD   0               ;LOC'N TO HOLD $ITEMB DURING DUAL ERR   ;DPM001
020704  105037  020702          $ERROR: CLRB    IBSAVE          ;CLEAR THE ITEM BYTE SAVE LOCATION      ;DPM001
020710  113737  001100  020146         MOVB    $TSTNM,$TESTN   ;SAVE TEST NUMBER FOR ERROR TYPE OUT
020716  005237  001320                 INC     ERRCNT          ;COUNT ALL MULTIPLE ERRORS
020722  010037  001160                 MOV     R0,$REG0        ;SAVE R0 FOR POSSIBLE TYPE OUT
020726  010137  001162                 MOV     R1,$REG1        ;SAVE R1 FOR POSSIBLE TYPE OUT
020732  010237  001164                 MOV     R2,$REG2        ;SAVE R2 FOR POSSIBLE TYPE OUT
020736  010337  001166                 MOV     R3,$REG3        ;SAVE R3 FOR POSSIBLE TYPE OUT
020742  010437  001170                 MOV     R4,$REG4        ;SAVE R4 FOR POSSIBLE TYPE OUT
020746  010537  001172                 MOV     R5,$REG5        ;SAVE R5 FOR POSSIBLE TYPE OUT
020752  105237  001101         7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
020756  001775                 1$:     BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
020760  013777  001100  160152         MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
020766  032777  002000  160142         BIT     #BIT10,@SWR     ;;BELL ON ERROR?
020774  001402                 2$:     BEQ     1$              ;;NO - SKIP
020776  104401  001216                 TYPE    ,$BELL          ;;RING BELL
021002  005237  001110         1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
021006  011637  001114                 MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
021012  162737  000002  001114         SUB     #2,$ERRPC
021020  117737  160070  001112         MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
021026  122737  000177  001112         CMPB    #177,$ITEMB     ;SEE IF THIS IS THE POWER FAIL CALL      ;DPM001
021034  001426                         BEQ     2001$           ;BRANCH AROUND ROUTINE IF IT IS          ;DPM001
021036  105737  020702                 TSTB    IBSAVE          ;SEE IF THIS IS THE 2ND ERROR CALL       ;DPM001
021042  001021                         BNE     2000$           ;BRANCH IF SO                            ;DPM001
021044  013737  177766  020700         MOV     177766,CPSAVE   ;MOVE CPU ERR REG TO CPSAVE FOR TEST     ;DPM001
021052  032737  000001  020700         BIT     #BIT00,CPSAVE   ;SEE IF POWER MONITOR BIT IS SET         ;DPM001
021060  001414                         BEQ     2001$           ;BRANCH IF OK                            ;DPM001
021062  042737  000001  177766         BIC     #BIT00,177766   ;CLEAR THE BIT FOUND SET                 ;DPM001
021070  113737  001112  020702         MOVB    $ITEMB,IBSAVE   ;MAKE IBSAVE NON-ZERO FOR DUAL CALL      ;DPM001
021076  112737  000177  001112         MOVB    #177,$ITEMB     ;SET $ITEMB TO SPECIAL POWER FAIL PNTR   ;DPM001
021104  000402                         BR      2001$           ;BRANCH OVER IBSAVE CLEARING             ;DPM001
021106  105037  020702         2000$:  CLRB    IBSAVE          ;CLEAR IBSAVE SO AFTER 2ND ERROR, EXIT   ;DPM001
021112                         2001$:
021112  032777  020000  160016         BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
021120  001004                         BNE     20$             ;;SKIP TYPEOUTS
021122  004737  002026                 JSR     PC,ERTYPE       ;;GO TO USER ERROR ROUTINE
021126  104401  001223                 TYPE    ,$CRLF
021132                         20$:
021132  122737  000001  020162         CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
021140  001007                         BNE     2$              ;;NO,SKIP APT ERROR REPORT
021142  113737  001112  021154         MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
021150  004737  021346                 JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
021154     000                 21$:    .BYTE   0
```

```
021155     000                          .BYTE   0
021156  000777                  22$:    BR      22$             ;;APT ERROR LOOP
021160  105737  020702          2$:     TSTB    IBSAVE          ;SEE IF POWER FAIL ERROR CALL           ;DPM001
021164  001004                          BNE     3$              ;BRANCH IF NOT - HALT NOT ALLOWED       ;DPM001
021166  005777  157744                  TST     @SWR            ;;HALT ON ERROR
021172  100001                          BPL     3$              ;;SKIP IF CONTINUE
021174  000000                          HALT                    ;;HALT ON ERROR!
021176  032777  001000  157732  3$:     BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
021204  001405                          BEQ     4$              ;;BR IF NO
021206  105737  020702                  TSTB    IBSAVE          ;SEE IF THIS IS THE PWR MNTR BIT ERROR  ;DPM001
021212  001257                          BNE     7$              ;BRANCH BACK IF SO - FUDGING NOT ALLOWED;DPM001
021214  013716  001106                  MOV     $'PERR,(SP)     ;;FUDGE RETURN FOR LOOPING
021220  005737  001214          4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
021224  001405                          BEQ     5$              ;;BR IF NONE
021226  105737  020702                  TSTB    IBSAVE          ;SEE IF THIS IS THE PWR MNTR BIT ERROR  ;DPM001
021232  001247                          BNE     7$              ;BRANCH BACK IF SO - FUDGING NOT ALLOWED;DPM001
021234  013716  001214                  MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
021240                          5$:
021240  022737  022024  000042          CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
021246  001001                          BNE     6$              ;;BRANCH IF NO
021250  000000                          HALT                    ;;YES
021252                          6$:
021252  105737  020702                  TSTB    IBSAVE          ;SEE IF THIS IS THE PWR FAIL ERROR CALL ;DPM001
021256  001235                          BNE     7$              ;BRANCH BACK TO CALL ORIGINAL ERR IF SO ;DPM001
021260  032777  001000  157650          BIT     #SW9,@SWR       ;ARE WE LOOPING ON THIS ERROR?
021266  001417                          BEQ     1000$           ;BRANCH IF NOT
021270  012737  177777  177766          MOV     #-1,CPUERR      ;CLEAR CPU ERROR REGISTER
021276  042737  177776  177572          BIC     #177776,MMR0    ;CLEAR MEMORY MANAGEMENT STATUS REGISTER
021304  012737  177777  003032          MOV     #-1,TOFLAG      ;INITIALIZE TRAP FLAG
021312  012737  177777  003224          MOV     #-1,CPFLAG      ;INITIALIZE CP TRAP FLAG
021320  012737  177777  003374          MOV     #-1,MMFLAG      ;INITIALIZE MEMORY MANAGEMENT TRAP FLAG
021326  000002                  1000$:  RTI                     ;RETURN TO TEST
```

```
4101                                    .SBTTL  APT COMMUNICATIONS ROUTINE
                                        ;;*****************************************************************
021330  112737  000001  021574  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
021336  112737  000001  021572  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
021344  000403                        BR      $ATYC
021346  112737  000001  021574  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
021354                          $ATYC:
021354  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
021356  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
021360  105737  021572                TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
021364  001450                        BEQ     5$              ;;IF NOT:  BR
021366  122737  000001  020162        CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
021374  001031                        BNE     3$              ;;IF NOT:  BR
021376  132737  000100  020163        BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
021404  001425                        BEQ     3$              ;;IF NOT:  BR
021406  017600  000004                MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
021412  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
021420  005737  020142          1$:   TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
021424  001375                        BNE     1$              ;;IF NOT:  WAIT
021426  010037  020156                MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
021432  105720                  2$:   TSTB    (R0)+           ;;FIND END OF MESSAGE
021434  001376                        BNE     2$
021436  163700  020156                SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
021442  006200                        ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
021444  010037  020160                MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
021450  012737  000004  020142        MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
021456  000413                        BR      5$
021460  017637  000004  021504  3$:   MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
021466  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
021474  013746  177776                MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
021500  004737  022200                JSR     PC,$TYPE        ;;CALL TYPE MACRO
021504  000000                  4$:   .WORD   0
021506                          5$:
021506  105737  021574          10$:  TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
021512  001416                        BEQ     12$             ;;IF NOT:  BR
021514  005737  020162                TST     $ENV            ;;RUNNING UNDER APT?
021520  001413                        BEQ     12$             ;;IF NOT:  BR
021522  005737  020142          11$:  TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
021526  001375                        BNE     11$             ;;IF NOT:  WAIT
021530  017637  000004  020144        MOV     @4(SP),$FATAL   ;;GET ERROR #
021536  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
021544  005237  020142                INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
021550  105037  021574          12$:  CLRB    $FFLG           ;;CLEAR FATAL FLAG
021554  105037  021573                CLRB    $LFLG           ;;CLEAR LOG FLAG
021560  105037  021572                CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
021564  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
021566  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
021570  000207                        RTS     PC              ;;RETURN
021572     000          $MFLG:  .BYTE   0               ;;MESSG. FLAG
021573     000          $LFLG:  .BYTE   0               ;;LOG FLAG
021574     000          $FFLG:  .BYTE   0               ;;FATAL FLAG
                                .EVEN
            000200      APTSIZE=200
            000001      APTENV=001
            000100      APTSPOOL=100
            000040      APTCSUP=040
```

```
4103                                    .SBTTL  END OF PASS ROUTINE

                                        ;;*****************************************************************
                                        ;*INCREMENT THE PASS NUMBER ($PASS)
                                        ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
                                        ;*TYPE 'END PASS #XXXXX TOTAL NUMBER OF ERRORS SINCE LAST REPORT YYYYY''
                                        ;*WHERE XXXXX AND YYYYY ARE DECIMAL NUMBERS
                                        ;*IF SW12=1 INHIBIT TRACE TRAP
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO LOOP

021576                                  $EOP:
021576  000004                                SCOPE                   ;LOOP ON LAST TEST
021600  005037  177572                       CLR     MMR0            ;TURN OFF FULL RELOCATION
021604  005037  172516                       CLR     MMR3            ;DISABLE THE UNIBUS MAP
021610  104414                              TBITR                   ;RESTORE THE T BIT IF IT WAS ON
021612  005037  001100                       CLR     $TSTNM          ;;ZERO THE TEST NUMBER
021616  005037  001212                       CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
021622  005237  020150                       INC     $PASS           ;;INCREMENT THE PASS NUMBER
021626  042737  100000  020150               BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
021634  005327                              DEC     (PC)+           ;;LOOP?
021636  000001                  $EOPCT: .WORD   1
021640  003075                              BGT     $DOAGN          ;;YES
021642  012737                              MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
021644  000001                  $ENDCT: .WORD   1
021646  021636                              $EOPCT
021650  104401  021656                      TYPE    ,65$            ;;TYPE ASCIZ STRING
021654  000407                              BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <12><15>/END PASS #/
021674                                  64$:
021674  013746  020150                       MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
                                                                    ;;TYPE PASS NUMBER
021700  104405                              TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
021702  005737  001110                       TST     $ERTTL          ;SEE IF THERE ARE ANY ERRORS TO REPORT  ;DPM001
021706  001427                              BEQ     1000$           ;BRANCH AROUNT MESSAGE PRINT IF NOT     ;DPM001
021710  104401  021716                      TYPE    ,67$            ;;TYPE ASCIZ STRING
021714  000421                              BR      66$             ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  /  TOTAL ERRORS SINCE LAST REPORT /
021760                                  66$:
021760  013746  001110                       MOV     $ERTTL,-(SP)    ;;SAVE $ERTTL FOR TYPEOUT
                                                                    ;;TOTAL NUMBER OF ERRORS
021764  104405                              TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
021766  104401  001223          1000$:  TYPE    ,$CRLF          ;;TYPE CARRIAGE RETURN, LINE FEED
021772  005037  001110                       CLR     $ERTTL          ;;CLEAR ERROR TOTAL
021776  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
022002  001414                              BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
022004  005046                              CLR     -(SP)           ;;INSURE THE "T" BIT IS CLEAR
022006  012746  022014                      MOV     #$CLR.T,-(SP)   ;;SETUP FOR AN RTI OR RTT
022012  000426                              BR      $RTRN           ;;GO DO AN RTI OR RTT TO LOAD THE PSW
                                                                    ;;WITH A CLEARED "T" BIT
022014                                  $CLR.T:
022014  013700  000042                       MOV     @#42,R0         ;;INSURE R0 CONTAINS THE MONITORS
022020  001405                              BEQ     $DOAGN          ;;RETURN ADDRESS
022022  000005                              RESET                   ;;CLEAR THE WORLD
022024  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
022026  000240                              NOP                     ;;SAVE ROOM
022030  000240                              NOP                     ;;FOR
```

END OF PASS ROUTINE

```
022032  000240                          NOP                     ;;ACT11
022034                          $DOAGN:
022034  104400                          TRAP                    ;;PUSH OLD PSW AND PC ON STACK
022036  042716  000020                  BIC     #20,(SP)        ;;CLEAR THE "T" BIT
022042  032777  010000  157066          BIT     #BIT12,@SWR     ;;RUN WITH TRACE TRAP?
022050  001005                          BNE     1$              ;;BR IF NO
022052  005137  022076                  COM     $TBIT           ;;IS IT TIME FOR TRACE TRAP
022056  100402                          BMI     1$              ;;BR IF NO
022060  052716  000020                  BIS     #20,(SP)        ;;SET TRACE TRAP
022064  012746  022072          1$:     MOV     #$LOOP,-(SP)    ;;JUMP TO START OF TEST
022070  000002                  $RTRN:  RTI                     ;;RETURN--THIS IS CHANGED TO
                                                                ;;AN "RTT" IF "RTT" IS A LEGAL
                                                                ;;INSTRUCTION
022072                          $LOOP:
022072  000137                          JMP     @(PC)+          ;;RETURN
022074  010606                  $RTNAD: .WORD   LOOP
022076  000000                  $TBIT:  .WORD   0               ;;"T" BIT STATE INDICATOR
022100     377     377     000  $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
                                        .EVEN
```

```
 4105                                   .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES
                                        ;;*****************************************************************
                                        ;*SAVE R0-R5
                                        ;*CALL:
                                        ;*      SAVREG
                                        ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                                        ;*
                                        ;*TOP---(+16)
                                        ;*  +2---(+18)
                                        ;*  +4---R5
                                        ;*  +6---R4
                                        ;*  +8---R3
                                        ;*+10---R2
                                        ;*+12---R1
                                        ;*+14---R0
 022104                                 $SAVREG:
 022104  010046                                 MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 022106  010146                                 MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 022110  010246                                 MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 022112  010346                                 MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 022114  010446                                 MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 022116  010546                                 MOV     R5,-(SP)        ;;PUSH R5 ON STACK
 022120  016646  000022                         MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
 022124  016646  000022                         MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
 022130  016646  000022                         MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
 022134  016646  000022                         MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
 022140  000002                               RTI
                                        ;*RESTORE R0-R5
                                        ;*CALL:
                                        ;*      RESREG
 022142                                 $RESREG:
 022142  012666  000022                         MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
 022146  012666  000022                         MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
 022152  012666  000022                         MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
 022156  012666  000022                         MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
 022162  012605                               MOV     (SP)+,R5        ;;POP STACK INTO R5
 022164  012604                               MOV     (SP)+,R4        ;;POP STACK INTO R4
 022166  012603                               MOV     (SP)+,R3        ;;POP STACK INTO R3
 022170  012602                               MOV     (SP)+,R2        ;;POP STACK INTO R2
 022172  012601                               MOV     (SP)+,R1        ;;POP STACK INTO R1
 022174  012600                               MOV     (SP)+,R0        ;;POP STACK INTO R0
 022176  000002                               RTI
```

```
4107                                    .SBTTL  TYPE ROUTINE
                                        ;;*****************************************************************
                                        ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                        ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                        ;*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
                                        ;*
022200  105737  001155          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
022204  100002                          BPL     1$              ;;BR IF YES
022206  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
022210  000430                          BR      3$              ;;LEAVE
022212  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
022214  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
022220  122737  000001  020162          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
022226  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
022230  132737  000100  020163          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
022236  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
022240  010037  022250                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
022244  004737  021336                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
022250  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
022252  132737  000040  020163  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
022260  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
022262  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
022264  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
022266  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
022270  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
022272  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
022276  000002                          RTI                     ;;RETURN
022300  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
022304  001430                          BEQ     8$
022306  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
022312  001006                          BNE     5$
022314  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
022316  104401                          TYPE                    ;;TYPE A CR AND LF
022320  001223                          $CRLF
022322  105037  022540                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
022326  000755                          BR      2$              ;;GET NEXT CHARACTER
022330  004737  022412          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
022334  123726  001154          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
022340  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
022342  013746  001152                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
022346  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
022352  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
022354  004737  022412                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
022360  105337  022540                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
022364  000770                          BR      7$              ;;LOOP
                                        ;HORIZONTAL TAB PROCESSOR
022366  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
```

```
022372  004737  022412          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
022376  132737  000007  022540          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
022404  001372                          BNE     9$              ;;TAB STOP
022406  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
022410  000724                          BR      2$              ;;GET NEXT CHARACTER
022412                          $TYPEC:
022412  105777  156524                  TSTB    @$TKS           ;;CHAR IN KYBD BUFFER?          ;MJD001
022416  100022                          BPL     10$             ;;BR IF NOT                     ;MJD001
022420  017746  156520                  MOV     @$TKB,-(SP)     ;;GET CHAR                      ;MJD001
022424  042716  177600                  BIC     #177600,(SP)    ;;STRIP EXTRANEOUS BITS         ;MJD001
022430  122716  000023                  CMPB    #$XOFF,(SP)     ;;WAS CHAR XOFF                 ;MJD001
022434  001012                          BNE     102$            ;;BR IF NOT                     ;MJD001
022436                          101$:                                                           ;MJD001
022436  105777  156500                  TSTB    @$TKS           ;;WAIT FOR CHAR                 ;MJD001
022442  100375                          BPL     101$                                            ;MJD001
022444  117716  156474                  MOVB    @$TKB,(SP)      ;;GET CHAR                      ;MJD001
022450  042716  177600                  BIC     #177600,(SP)    ;;STRI  IT                      ;MJD001
022454  122716  000021                  CMPB    #$XON,(SP)      ;;WAS IT XON?                   ;MJD001
022460  001366                          BNE     101$            ;;BR IF NOT                     ;MJD001
022462                          102$:                                                           ;MJD001
022462  005726                          TST     (SP)+           ;;FIX STACK                     ;MJD001
022464                          10$:                                                            ;MJD001
022464  105777  156456                  TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
022470  100375                          BPL     10$                                             ;MJD001
022472  126627  000002  000021          CMPB    2(SP),#$XON     ;;IS CHARACTER A RANDOM XON?    ;RAN001
022500  001420                          BEQ     $TYPEX          ;;BRANCH IF YES                 ;RAN001
022502  116677  000002  156440          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
022510  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
022516  001003                          BNE     1$              ;;BRANCH IF NO
022520  105037  022540                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
022524  000406                          BR      $TYPEX          ;;EXIT
022526  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
022534  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
022536  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
022540  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
022542  000207          $TYPEX: RTS     PC
```

```
4109                                    .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
022544  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
022550  116637  000001  022767          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
022556  112637  022771                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
022562  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
022566  000406                          BR      $TYPON
022570  112737  000001  022767  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
022576  112737  000006  022771          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
022604  112737  000005  022766  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
022612  010346                          MOV     R3,-(SP)        ;;SAVE R3
022614  010446                          MOV     R4,-(SP)        ;;SAVE R4
022616  010546                          MOV     R5,-(SP)        ;;SAVE R5
022620  113704  022771                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
022624  005404                          NEG     R4
022626  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
022632  110437  022770                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
022636  113704  022767                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
022642  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
022646  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
022650  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
022652  000404                          BR      3$              ;;GO DO MSB
022654  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
022656  006105                          ROL     R5
022660  006105                          ROL     R5
022662  010503                          MOV     R5,R3
022664  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
022666  105337  022770                  DECB    $OMODE          ;;TYPE THIS DIGIT?
022672  100016                          BPL     7$              ;;BR IF NO
022674  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
022700  001002                          BNE     4$              ;;TEST FOR 0
022702  005704                          TST     R4              ;;SUPPRESS THIS 0?
022704  001403                          BEQ     5$              ;;BR IF YES
022706  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
022710  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
022714  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
```

BINARY TO OCTAL (ASCII) AND TYPE

```
022720  110337  022764                  MOVB    R3,8$           ;;SAVE FOR TYPING
022724  104401  022764                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
022730  105337  022766          7$:     DECB    $OCNT           ;;COUNT BY 1
022734  003347                          BGT     2$              ;;BR IF MORE TO DO
022736  002402                          BLT     6$              ;;BR IF DONE
022740  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
022742  000744                          BR      2$              ;;GO DO THE LAST DIGIT
022744  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
022746  012604                          MOV     (SP)+,R4        ;;RESTORE R4
022750  012603                          MOV     (SP)+,R3        ;;RESTORE R3
022752  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
022760  012616                          MOV     (SP)+,(SP)
022762  000002                          RTI                     ;;RETURN
022764     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
022765     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
022766     000                  $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
022767     000                  $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
022770  000000                  $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
```

```
4111                                    .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
022772                                  $TYPDS:
022772  010046                                MOV     R0,-(SP)        ;;PUSH R0 ON STACK
022774  010146                                MOV     R1,-(SP)        ;;PUSH R1 ON STACK
022776  010246                                MOV     R2,-(SP)        ;;PUSH R2 ON STACK
023000  010346                                MOV     R3,-(SP)        ;;PUSH R3 ON STACK
023002  010546                                MOV     R5,-(SP)        ;;PUSH R5 ON STACK
023004  012746  020200                        MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
023010  016605  000020                        MOV     20(SP),R5       ;;GET THE INPUT NUMBER
023014  100004                                BPL     1$              ;;BR IF INPUT IS POS.
023016  005405                                NEG     R5              ;;MAKE THE BINARY NUMBER POS.
023020  112766  000055  000001                MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
023026  005000                          1$:   CLR     R0              ;;ZERO THE CONSTANTS INDEX
023030  012703  023206                        MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
023034  112723  000040                        MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
023040  005002                          2$:   CLR     R2              ;;CLEAR THE BCD NUMBER
023042  016001  023176                        MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
023046  160105                          3$:   SUB     R1,R5           ;;FORM THIS BCD DIGIT
023050  002402                                BLT     4$              ;;BR IF DONE
023052  005202                                INC     R2              ;;INCREASE THE BCD DIGIT BY 1
023054  000774                                BR      3$
023056  060105                          4$:   ADD     R1,R5           ;;ADD BACK THE CONSTANT
023060  005702                                TST     R2              ;;CHECK IF BCD DIGIT=0
023062  001002                                BNE     5$              ;;FALL THROUGH IF 0
023064  105716                                TSTB    (SP)            ;;STILL DOING LEADING 0'S?
023066  100407                                BMI     7$              ;;BR IF YES
023070  106316                          5$:   ASLB    (SP)            ;;MSD?
023072  103003                                BCC     6$              ;;BR IF NO
023074  116663  000001  177777                MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
023102  052702  000060                  6$:   BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
023106  052702  000040                  7$:   BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
023112  110223                                MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
023114  005720                                TST     (R0)+           ;;JUST INCREMENTING
023116  020027  000010                        CMP     R0,#10          ;;CHECK THE TABLE INDEX
023122  002746                                BLT     2$              ;;GO DO THE NEXT DIGIT
023124  003002                                BGT     8$              ;;GO TO EXIT
023126  010502                                MOV     R5,R2           ;;GET THE LSD
023130  000764                                BR      6$              ;;GO CHANGE TO ASCII
023132  105726                          8$:   TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
023134  100003                                BPL     9$              ;;BR IF NO
023136  116663  177777  177776                MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
023144  105013                          9$:   CLRB    (R3)            ;;SET THE TERMINATOR
023146  012605                                MOV     (SP)+,R5        ;;POP STACK INTO R5
023150  012603                                MOV     (SP)+,R3        ;;POP STACK INTO R3
023152  012602                                MOV     (SP)+,R2        ;;POP STACK INTO R2
023154  012601                                MOV     (SP)+,R1        ;;POP STACK INTO R1
023156  012600                                MOV     (SP)+,R0        ;;POP STACK INTO R0
023160  104401  023206                        TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
```

```
023164  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
023172  012616                          MOV     (SP)+,(SP)
023174  000002                          RTI                     ;;RETURN TO USER
023176  023420                  $DTBL:  10000.
023200  001750                          1000.
023202  000144                          100.
023204  000012                          10.
023206                          $DBLK:  .BLKW   4
```

```
 4113                                   .SBTTL  TTY INPUT ROUTINE
                                        ;;*****************************************************************
                                        .ENABL  LSB
                                        .DSABL  LSB
                                        ;;*****************************************************************
                                        ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                        ;*CALL:
                                        ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
                                        ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
                                        ;*                              ;;WITH PARITY BIT STRIPPED OFF
                                        ;
023216  011646                          $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
023220  016666  000004  000002                  MOV     4(SP),2(SP)     ;;SAVE THE PS
023226  105777  155710                  1$:     TSTB    @$TKS           ;;WAIT FOR
023232  100375                                  BPL     1$              ;;A CHARACTER
023234  117766  155704  000004                  MOVB    @$TKB,4(SP)     ;;READ THE TTY
023242  042766  177600  000004                  BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
023250  026627  000004  000023                  CMP     4(SP),#23       ;;IS IT A CONTROL-S?
023256  001013                                  BNE     3$              ;;BRANCH IF NO
023260  105777  155656                  2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
023264  100375                                  BPL     2$              ;;LOOP UNTIL ITS THERE
023266  117746  155652                          MOVB    @$TKB,-(SP)     ;;GET CHARACTER
023272  042716  177600                          BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
023276  022627  000021                          CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
023302  001366                                  BNE     2$              ;;IF NOT DISCARD IT
023304  000750                                  BR      1$              ;;YES, RESUME
023306  026627  000004  000021  3$:     CMP     4(SP),#$XON     ;;IS IT A RANDOM XON?                   ;RAN001
023314  001744                                  BEQ     1$              ;;BRANCH IF YES                 ;RAN001
023316  026627  000004  000140                  CMP     4(SP),#140      ;;IS IT UPPER CASE?
023324  002407                                  BLT     4$              ;;BRANCH IF YES
023326  026627  000004  000175                  CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
023334  003003                                  BGT     4$              ;;BRANCH IF YES
023336  042766  000040  000004                  BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
023344  000002                          4$:     RTI                     ;;GO BACK TO USER
                                        ;;*****************************************************************
                                        ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                                        ;*CALL:
                                        ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
                                        ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                        ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
023346  010346                          $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
023350  012703  023454                  1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
023354  022703  023464                  2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
023360  101405                                  BLOS    4$              ;;BR IF YES
023362  104406                                  RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
023364  112613                                  MOVB    (SP)+,(R3)      ;;GET CHARACTER
023366  122713  000177                  10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
023372  001003                                  BNE     3$              ;;SKIP IF NOT
023374  104401  001222                  4$:     TYPE    ,$QUES          ;;TYPE A '?'
023400  000763                                  BR      1$              ;;CLEAR THE BUFFER AND LOOP
023402  111337  023452                  3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
023406  104401  023452                          TYPE    ,9$
023412  122723  000015                          CMPB    #15,(R3)+       ;;CHECK FOR RETURN
023416  001356                                  BNE     2$              ;;LOOP IF NOT RETURN
023420  105063  177777                          CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
023424  104401  001224                          TYPE    ,$LF            ;;TYPE A LINE FEED
023430  012603                                  MOV     (SP)+,R3        ;;RESTORE R3
```

```
023432  011646                          MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
023434  016666  000004  000002          MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
023442  012766  023454  000004          MOV     #$TTYIN,4(SP)
023450  000002                          RTI                     ;;RETURN
023452     000                  9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
023453     000                          .BYTE   0               ;;TERMINATOR
023454                          $TTYIN: .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
023464     136     125     015  $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL "U"
023471     136     107     015  $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL "G"
023476     015     012     123  $MSWR:  .ASCIZ  <15><12>/SWR = /
023507     040     040     116  $MNEW:  .ASCIZ  /  NEW = /
```

```
4115                                    .SBTTL  TRAP DECODER
                                        ;;*****************************************************************
                                        ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
                                        ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                        ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                        ;*GO TO THAT ROUTINE.
023520  010046                          $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
023522  016600  000002                          MOV     2(SP),R0        ;;GET TRAP ADDRESS
023526  005740                                  TST     -(R0)           ;;BACKUP BY 2
023530  111000                                  MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
023532  006300                                  ASL     R0              ;;POSITION FOR INDEXING
023534  016000  023554                          MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
023540  000200                                  RTS     R0              ;;GO TO ROUTINE
                                        ;;THIS IS USE TO HANDLE THE "GETPRI" MACRO
023542  011646                          $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
023544  016666  000004  000002                  MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
023552  000002                                  RTI                     ;;RESTORE THE PSW
                                        .SBTTL  TRAP TABLE
                                        ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                        ;*BY THE "TRAP" INSTRUCTION.
                                        ;       ROUTINE
                                        ;       -------
023554  023542                          $TRPAD: .WORD   $TRAP2
023556  022200                                  $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
023560  022570                                  $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
023562  022544                                  $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
023564  022604                                  $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
023566  022772                                  $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
023570  023216                                  $RDCHR  ;;CALL=RDCHR    TRAP+6(104406)  TTY TYPEIN CHARACTER ROUTINE
023572  023346                                  $RDLIN  ;;CALL=RDLIN    TRAP+7(104407)  TTY TYPEIN STRING ROUTINE
023574  005630                                  $RDOCT  ;;CALL=RDOCT    TRAP+10(104410) READ AN OCTAL NUMBER FROM TTY
023576  022104                                  $SAVREG ;;CALL=SAVREG   TRAP+11(104411) SAVE R0-R5 ROUTINE
023600  022142                                  $RESREG ;;CALL=RESREG   TRAP+12(104412) RESTORE R0-R5 ROUTINE
4116 023602  002726                             TBITOF  ;;CALL=TBITO    TRAP+13(104413) THIS WILL TURN OFF T BIT TRAPPING
4117 023604  002754                             TBITRE  ;;CALL=TBITR    TRAP+14(104414) THIS WILL RETURN THE T BIT TO PREVIOUS CONDI
4118 023606  005630                             $RDOCT  ;;CALL=RDOCT    TRAP+15(104415) READ OCTAL NUMBER
```

```
4120                                    .SBTTL  POWER DOWN AND UP ROUTINES
                                        ;;*****************************************************************
                                        ;POWER DOWN ROUTINE
023610  012737  023766  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
023616  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
023624  010046                        MOV     R0,-(SP)         ;;PUSH R0 ON STACK
023626  010146                        MOV     R1,-(SP)         ;;PUSH R1 ON STACK
023630  010246                        MOV     R2,-(SP)         ;;PUSH R2 ON STACK
023632  010346                        MOV     R3,-(SP)         ;;PUSH R3 ON STACK
023634  010446                        MOV     R4,-(SP)         ;;PUSH R4 ON STACK
023636  010546                        MOV     R5,-(SP)         ;;PUSH R5 ON STACK
023640  017746  155272                MOV     @SWR,-(SP)       ;;PUSH @SWR ON STACK
023644  010637  023772                MOV     SP,$SAVR6        ;;SAVE SP
023650  012737  023662  000024        MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
023656  000000                        HALT
023660  000776                        BR      .-2              ;;HANG UP
                                        ;;*****************************************************************
                                        ;POWER UP ROUTINE
023662  012737  023766  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
023670  013706  023772                MOV     $SAVR6,SP        ;;GET SP
023674  005037  023772                CLR     $SAVR6           ;;WAIT LOOP FOR THE TTY
023700  005237  023772        1$:     INC     $SAVR6           ;;WAIT FOR THE INC
023704  001375                        BNE     1$               ;;OF  WORD
023706  012677  155224                MOV     (SP)+,@SWR       ;;POP STACK INTO @SWR
023712  012605                        MOV     (SP)+,R5         ;;POP STACK INTO R5
023714  012604                        MOV     (SP)+,R4         ;;POP STACK INTO R4
023716  012603                        MOV     (SP)+,R3         ;;POP STACK INTO R3
023720  012602                        MOV     (SP)+,R2         ;;POP STACK INTO R2
023722  012601                        MOV     (SP)+,R1         ;;POP STACK INTO R1
023724  012600                        MOV     (SP)+,R0         ;;POP STACK INTO R0
023726  012737  023610  000024        MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
023734  012737  000340  000026        MOV     #340,@#PWRVEC+2 ;;PRIO:7
023742  104401                        TYPE                     ;;REPORT THE POWER FAILURE
023744  023774        $PWRMG: .WORD   PWRMSG           ;;POWER FAIL MESSAGE POINTER
023746  012716                        MOV     (PC)+,(SP)       ;;RESTART AT START
023750  010000        $PWRAD: .WORD   START            ;;RESTART ADDRESS
023752  042766  000020  000002        BIC     #20,2(SP)        ;;CLEAR "T" BIT
023760  005037  022076                CLR     $TBIT            ;;CLEAR THE "T" BIT FLAG
023764  000002                        RTI
023766  000000        $ILLUP: HALT                     ;;THE POWER UP SEQUENCE WAS STARTED
023770  000776                        BR      .-2              ;; BEFORE THE POWER DOWN WAS COMPLETE
023772  000000        $SAVR6: 0                        ;;PUT THE SP HERE
4121 023774     012     015     120  PWRMSG: .ASCIZ  <12><15>?POWER FAILURE, RESTARTING PROGRAM?
4122                                    .EVEN
```

```
4124                                    .SBTTL  DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT ROUTINE
                                        ;;**********************************************************************
                                        ;*THIS ROUTINE WILL CONVERT A 32-BIT UNSIGNED BINARY NUMBER TO AN
                                        ;*UNSIGNED OCTAL ASCIZ NUMBER.
                                        ;*CALL
                                        ;*      MOV     #PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
                                        ;*      JSR     PC,@#$DB20      ;;CALL THE ROUTINE
                                        ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK
024040  104411                  $DB20:  SAVREG                  ;;SAVE ALL REGISTERS
024042  016601  000002                  MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
024046  012705  024157                  MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
024052  012704  000014                  MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
024056  012703  177770                  MOV     #^C7,R3         ;;MASK
024062  012100                          MOV     (R1)+,R0        ;;LOWER WORD
024064  012101                          MOV     (R1)+,R1        ;;HIGH WORD
024066  005002                          CLR     R2              ;;TERMINATOR
024070  110245                  1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
024072  010002                          MOV     R0,R2           ;;GET THIS DIGIT
024074  005304                          DEC     R4              ;;COUNT THIS CHARACTER
024076  003007                          BGT     3$              ;;BR IF NOT THE LAST DIGIT
024100  001405                          BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
024102  005205                          INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
024104  010566  000002                  MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
024110  104412                          RESREG                  ;;RESTORE ALL REGISTERS
024112  000207                          RTS     PC              ;;RETURN TO USER
024114  006203                  2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
024116  006001                  3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
024120  006000                          ROR     R0              ;;      THE NEXT OCTAL DIGIT
024122  006001                          ROR     R1
024124  006000                          ROR     R0
024126  006001                          ROR     R1
024130  006000                          ROR     R0
024132  040302                          BIC     R3,R2           ;;MASK OUT ALL JUNK
024134  062702  000060                  ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
024140  000753                          BR      1$              ;;GO PUT IT IN THE DATA TABLE
024142                          $OCTVL: .BLKB   14.             ;;RESERVE DATA TABLE
```

```
4126                                    .SBTTL  ERROR MESSAGES
4127 024160  116  117  124  EM1:    .ASCIZ  ?NOT THE CORRECT TRAP CONDITION THROUGH ERRVEC (#004)?
4128 024245  125  116  105  EM2:    .ASCIZ  ?UNEXPECTED CPU TRAP THROUGH ERRVEC (#004)?
4129 024317  125  116  105  EM3:    .ASCIZ  ?UNEXPECTED MEMORY MANAGEMENT TRAP, MEMORY MANAGEMENT STATUS REGISTERS?
4130 024425  123  125  115  EM4:    .ASCIZ  ?SUMMARY OF MAP REGISTERS THAT TIMED OUT ON READ?
4131 024505  123  125  115  EM5:    .ASCIZ  ?SUMMARY OF DUAL ADDRESSING ERRORS ON LOADING MAP REGISTERS?
4132 024600  123  125  115  EM6:    .ASCIZ  ?SUMMARY OF BIT PATTERN FAILURES IN LOWER 16 BITS OF MAP REGISTERS?
4133 024702  123  125  115  EM7:    .ASCIZ  ?SUMMARY OF BIT PATTERN FAILURES IN UPPER 6 BITS OF MAP REGISTERS?
4134 025003  103  101  116  EM10:   .ASCII  ?CAN'T GET TO MAIN MEMORY FROM UNIBUS WITH THE MAP OFF?<CRLF>
4135 025071  123  117  040          .ASCIZ  ?SO JUMPING TO THE SIZE JUMPER TEST FOR VERIFICATION?
4136 025155  123  125  115  EM11:   .ASCIZ  ?SUMMARY OF COUNT PATTERN FAILURES ON THE UNIBUS DATA PATH?
4137 025247  125  116  111  EM12:   .ASCIZ  ?UNIBUS MAP IS RELOCATING WHEN NOT ENABLED?
4138 025321  103  101  116  EM13:   .ASCII  ?CANNOT USE ANY OF THE MAP REGISTERS OR PHYSICAL?<CRLF>
4139 025401  101  104  104          .ASCII  ?ADDRESS BIT14 IS STUCK LOW, MUST RESTART PROGRAM?<CRLF>
4140 025462  111  106  040          .ASCIZ  ?IF YOU DON'T LOOP ON THIS PROBLEM.?
4141 025525  123  125  115  EM14:   .ASCIZ  ?SUMMARY OF UNIBUS ADDRESS ERRORS, WITH THE MAP RELOCATION DISABLED?
4142 025630  115  101  111  EM15:   .ASCIZ  ?MAIN MEMORY TIMEOUT OVER THE UNIBUS DID NOT OCCUR PROPERLY?
4143 025723  122  105  114  EM16:   .ASCIZ  ?RELOCATION THROUGH THE MAP WAS NOT CORRECT, CARRY PROPAGATION?
4144 026021  116  117  040  EM17:   .ASCIZ  ?NO UNIBUS MEMORY EXISTS?
4145 026051  111  116  124  EM20:   .ASCIZ  ?INTERRUPT/ABORT LOGIC TESTS TRAP TO LOCATION 114 DID NOT OCCUR?
4146 026150  111  116  124  EM21:   .ASCIZ  ?INTERRUPT/ABORT TESTS R4 WAS OVERWRITTEN WITH?
4147 026226  111  116  124  EM22:   .ASCIZ  ?INTERRUPT/ABORT TESTS TRAP DID NOT OCCUR DUE TO ABORT?
4148 026314  114  115  101  EM23:   .ASCIZ  ?LMA NOT LOADED PROPERLY?
4149 026344  114  115  101  EM24:   .ASCIZ  ?LMA FORCE JUMPER BIT NOT ZERO?
4150 026402  114  115  101  EM25:   .ASCIZ  ?LMA FORCE JUMPER BIT NOT SET?
4151 026437  114  115  101  EM26:   .ASCIZ  ?LMA CONTROL BITS INCORRECT?
4152 026472  106  117  122  EM27:   .ASCIZ  ?FORCE JUMPER BIT FAILS TO REVERT MAP REGISTER STATUS TO DEFAULT?
4153 026572  113  111  120  EM30:   .ASCIZ  ?KIPAR5 NOT LOADED PROPERLY?
4154 026625  124  110  105  EM201:  .ASCIZ  ?THE FOLLOWING REGISTERS TIMED OUT WHEN READ?
4155 026701  124  110  105  EM202:  .ASCIZ  ?THE FOLLOWING ARE DUAL ADDRESSING ERRORS IN THE UNIBUS MAP?
4156 026774  124  110  105  EM203:  .ASCIZ  ?THE BIT PATTERN THROUGH THE MAP REGISTERS FAILED?
4157 027055  125  116  111  EM204:  .ASCIZ  ?UNIBUS DATA PATH COUNT PATTERN FAILURE?
4158 027124  125  116  111  EM205:  .ASCIZ  ?UNIBUS ADDRESSING ERRORS, MAP RELOCATION DISABLED?
4159 027206  104  101  124  EM206:  .ASCIZ  ?DATA PATTERN NOT CORRECT?
4160 027237  122  105  106  EM207:  .ASCIZ  ?REFERENCED MAP REGISTER 0 WITH ADDRESS ONE BIT DIFFERENT THAN 17770200?
4161 027346  115  101  120  EM210:  .ASCIZ  ?MAP REGISTER(S) UNDER TEST DID NOT RESPOND IN DUAL MAPPING TEST?
4162 027446  122  105  114  EM211:  .ASCII  ?PELOCATION THROUGH THE MAP WAS NOT CORRECT, CARRY PROPAGATION?<CRLF>
4163 027544  124  105  123          .ASCIZ  ?TEST CODE BEING RUN OVER UNIBUS?
4164 027604  115  101  111  EM212:  .ASCII  ?MAIN MEMORY TIMEOUT OVER THE UNIBUS DID NOT OCCUR PROPERLY?<CRLF>
4165 027677  124  105  123          .ASCIZ  ?TEST CODE BEING RUN OVER UNIBUS?
4166 027737  115  101  120  EM213:  .ASCIZ  ?MAP REGISTER ENABLED WHEN DDW SAYS IT SHOULD BE DISABLED?
4167 030030  115  101  120  EM214:  .ASCIZ  ?MAP REGISTER DISABLED WHEN DDW SAYS IT SHOULD BE ENABLED?
```

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4168                                        .SBTTL  DATA HEADERS
4169 030121  122  105  103  DH1:    .ASCIZ  ?RECEIVD EXPECTD TESTNO  ERR PC?
4170 030160  122  105  103  DH2:    .ASCIZ  ?RECEIVD TESTNO  ERR PC?
4171 030207  123  124  101  DH3:    .ASCII  ?STATUS  AUTOI/D VIRTUAL?<CRLF>
4172 030237  122  105  107         .ASCIZ  ?REGISTR REGISTR ADDRESS TESTNO  ERR PC?
4173 030306  122  105  107  DH4:    .ASCII  ?REGADRS   REGADRS?<CRLF>
4174 030330  040  042  117         .ASCIZ  ? "OR"       "AND"     #ERRORS TESTNO  ERR PC?
4175 030403  122  105  107  DH5:    .ASCII  ?REGLOAD   REGLOAD   REGDUAL   REGDUAL?<CRLF>
4176 030451  040  042  117         .ASCIZ  ? "OR"       "AND"     "OR"      "AND"    #ERRORS TESTNO?
4177 030540  115  101  120  DH6:    .ASCII  ?MAPREG    MAPREG    EXPECTD EXPECTD RECEIVD RECEIVD?<CRLF>
4178 030624  040  042  117         .ASCIZ  ? "OR"       "AND"     "OR"    "AND"   "OR"    "AND"  #ERRORS TESTNO?
4179 030727  124  105  123  DH10:   .ASCIZ  ?TESTNO  ERR PC  MMR3?
4180 030754  105  130  120  DH11:   .ASCII  ?EXPECTD   EXPECTD   RECEIVD   RECEIVD?<CRLF>
4181 031022  040  042  117         .ASCIZ  ? "O."       "AND"     "OR"      "AND"    #ERRORS TESTNO?
4182 031111  103  117  116  DH15:   .ASCII  ?CONDITN CONDITN?<CRLF>
4183 031131  105  130  120         .ASCIZ  ?EXPECTD RECEIVD TESTNO  ERR PC?
4184 031170  124  105  123  DH23:   .ASCIZ  ?TESTNO  ERR PC  LMAEXP    LMARCV?
4185 031231  124  105  123  DH24:   .ASCIZ  ?TESTNO  ERR PC  LMAEXP  LMARCV?
4186 031270  124  105  123  DH27:   .ASCIZ  ?TESTNO  ERR PC  LMARCV  KIPAR4?
4187 031327  124  105  123  DH30:   .ASCIZ  ?TESTNO  ERR PC  PR5EXP  PR5RCV?
4188 031366  122  105  107  DH201:  .ASCIZ  ?REGADRS TESTNO  ERR PC?
4189 031415  115  101  120  DH202:  .ASCII  ?MAPREG    MAPREG    NON-ZER?<CRLF>
4190 031451  124  105  123         .ASCIZ  ?TESTING   DUALED    CONTNTS TESTNO  ERR PC?
4191 031524  122  105  107  DH203:  .ASCIZ  ?REGADRS   PATTRN  EXPCTD  RECEVD  TESTNO  ERR PC?
4192 031605  105  130  120  DH204:  .ASCIZ  ?EXPECTD RECEIVD ADDRSLOAD TESTNO  ERR PC?
4193 031656  101  104  104  DH205:  .ASCII  ?ADDRESS   ADDRESS?<CRLF>
4194 031700  105  130  120         .ASCIZ  ?EXPECTD   RECEIVD   TESTNO  ERR PC?
4195 031743  101  104  104  DH206:  .ASCIZ  ?ADDRESS  EXPCTD  RECVED  TESTNO  ERR PC?
4196 032013  101  104  104  DH207:  .ASCIZ  ?ADDRUSED  BITDIFF TESTNO  ERR PC?
4197 032054  124  105  123  DH210:  .ASCIZ  ?TESTNO  ERR PC  MAPREGADR?
4198 032106  103  117  122  DH211:  .ASCII  ?CORRECT   EXPECTD RECEIVD?<CRLF>
4199 032140  101  104  104         .ASCIZ  ?ADDRESS   DATA    FROM UB TESTNO  ERR PC?
4200 032211  103  117  116  DH212:  .ASCII  ?CONDITN CONDITN?<CRLF>
4201 032231  105  130  120         .ASCIZ  ?EXPECTD RECEIVD TESTNO  ERR PC?
4202 032270  124  105  123  DH213:  .ASCIZ  ?TESTNO  ERR PC  REG NO  DDWDAT  DDWADR?
4203                                        .EVEN
```

```
4204                                        .SBTTL  DATA TABLES
4205 032340  001330  001326  020146  DT1:    .WORD   PCPUER,CPUEXP,$TESTN,BADPC,0
4206 032352  001330  020146  001340  DT2:    .WORD   PCPUER,$TESTN,BADPC,0
4207 032362  001350  001352  001354  DT3:    .WORD   PMMR0,PMMR1,PMMR2,$TESTN,BADPC,0
4208 032376  001236  001232  001320  DT4:    .WORD   ADDROR,ADRAND,ERRCNT,$TESTN,$ERRPC,0
4209 032412  001236  001232  001246  DT5:    .WORD   ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,$TESTN,0
4210 032430  001236  001232  001254  DT6:    .WORD   ADDROR,ADRAND,PATTOR,PATAND,DATAOR,DATAND,ERRCNT,$TESTN,0
4211 032452  020146  001114  172516  DT10:   .WORD   $TESTN,$ERRPC,MMR3,0
4212 032462  001254  001252  001246  DT11:   .WORD   PATTOR,PATAND,DATAOR,DATAND,ERRCNT,$TESTN,0
4213 032500  001236  001232  001246  DT14:   .WORD   ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,$TESTN,0
4214 032516  001326  001330  020146  DT15:   .WORD   CPUEXP,PCPUER,$TESTN,$ERRPC,0
4215 032530  020146  001114  005764  DT23:   .WORD   $TESTN,$ERRPC,EADRES,EADRS2,0
4216 032542  020146  001114  001162  DT24:   .WORD   $TESTN,$ERRPC,$REG1,LMAHI,0
4217 032554  020146  001114  001174  DT26:   .WORD   $TESTN,$ERRPC,$TMP0,$REG2,0
4218 032566  020146  001114  001174  DT27:   .WORD   $TESTN,$ERRPC,$TMP0,KIPAR4,0
4219 032600  020146  001114  001206  DT30:   .WORD   $TESTN,$ERRPC,$TMP5,KIPAR5,0
4220 032612  005764  020146  001114  DT201:  .WORD   EADRES,$TESTN,$ERRPC,0
4221 032622  005770  005764  001202  DT202:  .WORD   EADRS2,EADRES,$TMP3,$TESTN,$ERRPC,0
4222 032636  005770  001174  001170  DT203:  .WORD   EADRS2,$TMP0,$REG4,$REG3,$TESTN,$ERRPC,0
4223 032654  001174  001176  001164  DT204:  .WORD   $TMP0,$TMP1,$REG2,$TESTN,$ERRPC,0
4224 032670  005764  005770  020146  DT205:  .WORD   EADRES,EADRS2,$TESTN,$ERRPC,0
4225 032702  005764  001204  001206  DT206:  .WORD   EADRES,$TMP4,$TMP5,$TESTN,$ERRPC,0
4226 032716  005764  001160  020146  DT207:  .WORD   EADRES,$REG0,$TESTN,$ERRPC,0
4227 032730  020146  001114  005764  DT210:  .WORD   $TESTN,$ERRPC,EADRES,0
4228 032740  005764  001166  001164  DT211:  .WORD   EADRES,$REG3,$REG2,$TESTN,$ERRPC,0
4229 032754  001326  001330  020146  DT212:  .WORD   CPUEXP,PCPUER,$TESTN,$ERRPC,0
4230 032766  020146  001114  001174  DT213:  .WORD   $TESTN,$ERRPC,$TMP0,$TMP1,$REG5,0
```

```
                                                .SBTTL  NON-DEFAULT UNIBUS MAP JUMPER MESSAGE
033002  200     123     111     JMPMSG: .ASCII  <CRLF>?SIZE JUMPERS ON UNIBUS MAP ARE NOT IN THEIR DEFAULT?<CRLF>
033067  120     117     123             .ASCII  ?POSITION.  MAP REGISTERS BETWEEN THE LOWEST AND HIGHEST?<CRLF>
033157  125     123     105             .ASCII  ?USEABLE, AND ABOVE THE UNIBUS END NUMBER WILL BE TESTED.?<CRLF>
033250  125     116     111             .ASCII  ?UNIBUS MEMORY WILL BE ASSUMED TO BE BETWEEN UNIBUS BEGIN?<CRLF>
033341  101     116     104             .ASCII  ?AND END REGISTER NUMBERS IF BIT <5> IS SET IN THE SWR,?<CRLF>
033430  105     116     101             .ASCII  ?ENABLING TEST #23 TO EXECUTE.?<CRLF><CRLF>
033467  040     040     114             .ASCII  ?  LOWEST  HIGEST  UNIBUS  UNIBUS?<CRLF>
033530  040     040     125             .ASCII  ?  USABLE  USABLE  BEGIN    END?<CRLF>
033567  040     040     040             .ASCIZ  ?   REG#    REG #   REG #   REG #  TEST #?<CRLF>
```

```
                                        .SBTTL  DATA FIELDS
4241
4242 033641     000     000     000    DF1:     .BYTE   0,0,0,0,0
4243 033646     002     002     001    DF4:     .BYTE   2,2,1,0,0
4244 033653     002     002     002    DF5:     .BYTE   2,2,2,2,1,0
4245 033661     002     002     000    DF6:     .BYTE   2,2,0,0,0,0,1,0
4246 033671     000     000     000    DF11:    .BYTE   0,0,0,0,1,0
4247 033677     002     002     000    DF14:    .BYTE   2,2,0,0,1,0
4248 033705     000     000     002    DF23:    .BYTE   0,0,2,2
4249 033711     002     000     000    DF201:   .BYTE   2,0,0,0,0,0
4250 033717     000     000     003    DF204:   .BYTE   0,0,3,0,0
4251 033724     000     000     002    DF210:   .BYTE   0,0,2
4252          000001                           .END
```

SYMBOL TABLE

```
ABASE = 000000
ACDW1 = 000000
ACDW2 = 000000
ACPUOP= 000000
ADDROR  001236
ADDW0 = 177777
ADDW1 = 177777
ADDW10= 000000
ADDW11= 000000
ADDW12= 000000
ADDW13= 000000
ADDW14= 000000
ADDW15= 000000
ADDW2 = 000000
ADDW3 = 000000
ADDW4 = 000000
ADDW5 = 000000
ADDW6 = 000000
ADDW7 = 000000
ADDW8 = 000000
ADDW9 = 000000
ADEVCT= 000000
ADEVM = 000000
ADRAND  001232
ADREXT  003674
AENV  = 000000
AENVM = 000000
AFATAL= 000000
AMADR1= 000000
AMADR2= 000000
AMADR3= 000000
AMADR4= 000000
AMAMS1= 000000
AMAMS2= 000000
AMAMS3= 000000
AMAMS4= 000000
AMSGAD= 000000
AMSGLG= 000000
AMSGTY= 000000
AMTYP1= 000000
AMTYP2= 000000
AMTYP3= 000000
AMTYP4= 000000
APASS = 000000
APRIOR= 000000
APTCSU= 000040
APTENV= 000001
APTSIZ= 000200
APTSPO= 000100
ASWREG= 000000
ATESTN= 000000
AUNIT = 000000
AUSWR = 000000
AVECT1= 000000
AVECT2= 000000
BADCPU  006607
BADPC   001340
BIT0  - 000001
BIT00 = 000001
BIT01 = 000002
BIT02 = 000004
BIT03 = 000010
BIT04 = 000020
BIT05 = 000040
BIT06 = 000100
BIT07 = 000200
BIT08 = 000400
BIT09 = 001000
BIT1  = 000002
BIT10 = 002000
BIT11 = 004000
BIT12 = 010000
BIT13 - 020000
BIT14 = 040000
BIT15 = 100000
BIT2  = 000004
BIT3  = 000010
BIT4  = 000020
BIT5  = 000040
BIT6  = 000100
BIT7  = 000200
BIT8  = 000400
BIT9  = 001000
BPTVEC= 000014
BUPWIN  001276
CACHE = 177746
CACHVE= 000114
CASHSR  005324
CASH1   005460
CASH2   005470
CHARCT  005760
CHKLMA  005076
CHKPAT  005600
CLRMAP  002772
CMPE  = 177744
CNTR    001322
CONTRL= 177746
CPFLAG  003224
CPSAVE  020700
CPUER   003222
CPUERR= 177766
CPUEXP  001326
CPUMSG  006[illegible]0
CPUTYP  00  0
CR    = 000015
CRLF  = 000200
CTRAPS= 000116
CTRAPV= 000114
DATA    001364
DATAND  001242
DATAOR  001246
DATEXT  003624
DATO  = 100000
DATOB = 140000
DDISP = 177570
DFMSG   006120
DF1     033641
DF11    033671
DF14    033677
DF201   033711
DF204   033717
DF210   033724
DF23    033705
DF4     033646
DF5     033653
DF6     033661
DH1     030121
DH10    030727
DH11    030754
DH15    031111
DH2     030160
DH201   031366
DH202   031415
DH203   031524
DH204   031605
DH205   031656
DH206   031743
DH207   032013
DH210   032054
DH211   032106
DH212   032211
DH213   032270
DH23    031170
DH24    031231
DH27    031270
DH3     030207
DH30    031327
DH4     030306
DH5     030403
DH6     030540
DISPLA  001140
DISPRE  000174
DSABLD  005230
DSWR  = 177570
DTMS    005740
DTMSG   005744
DT1     032340
DT10    032452
DT11    032462
DT14    032500
DT15    032516
DT2     032352
DT201   032612
DT202   032622
DT203   032636
DT204   032654
DT205   032670
DT206   032702
DT207   032716
DT210   032730
DT211   032740
DT212   032754
DT213   032766
DT23    032530
DT24    032542
DT26    032554
DT27    032566
DT3     032362
DT30    032600
DT4     032376
DT5     032412
DT6     032430
EADRES  005764
EADRS2  005770
EMTVEC= 000030
EM1     024160
EM10    025003
EM11    025155
EM12    025247
EM13    025321
EM14    025525
EM15    025630
EM16    025723
EM17    026021
EM2     024245
EM20    026051
EM201   026625
EM202   026701
EM203   026774
EM204   027055
EM205   027124
EM206   027206
EM207   027237
EM21    026150
EM210   027346
EM211   027446
EM212   027604
EM213   027737
EM214   030030
EM22    026226
EM23    026314
EM24    026344
EM25    026402
EM26    026437
EM27    026472
EM3     024317
EM30    026572
EM4     024425
EM5     024505
EM6     024600
EM7     024702
ENABLD  005266
ERRCNT  001320
ERROR = 104000
ERRVEC= 000004
ERTYPE  002026
ER200   001666
EXTOUT  005762
FJBIT - 000100
FLAG    001324
FLOATR  005774
FTTHRU  003532
GMRMD1  007043
GMRMOD  007046
HIADRS= 177742
HIGEST  001260
HITMIS= 177752
HT    = 000011
IBSAVE  020702
IOTVEC= 000020
JMPMSG  033002
KDPAR0= 172360
KDPAR1= 172362
KDPAR2= 172364
KDPAR3= 172366
KDPAR4= 172370
KDPAR5= 172372
KDPAR6= 172374
KDPAR7= 172376
KDPDR0= 172320
KDPDR1= 172322
KDPDR2= 172324
KDPDR3= 172326
KDPDR4= 172330
KDPDR5= 172332
KDPDR6= 172334
KDPDR7= 172336
KERSTK= 001100
KIPAR0= 172340
KIPAR1= 172342
KIPAR2= 172344
KIPAR3= 172346
KIPAR4= 172350
KIPAR5= 172352
KIPAR6= 172354
KIPAR7= 172356
KIPDR0= 172300
KIPDR1= 172302
KIPDR2= 172304
KIPDR3= 172306
KIPDR4= 172310
KIPDR5= 172312
KIPDR6= 172314
KIPDR7= 172316
KSP   =%000006
LF    = 000012
LKS   = 177546
LKVEC = 000100
LMAH    001304
LMAHI = 177736
LMAL    001306
LMALOW= 177734
LOADRS= 177740
LOEFLG  004312
LOOP    010606
```

SYMBOL TABLE

```
LOWEST  001256          MAPL12= 170250          PATEXT  003650          SDPAR7= 172276          SW13   = 020000
LREGL   001300          MAPL13= 170254          PATRNS  006102          SDPDR0= 172220          SW14   = 040000
LREGU   001302          MAPL14= 170260          PATTOR  001254          SDPDR1= 172222          SW15   = 100000
MAINT = 177750          MAPL15= 170264          PCONTR  001334          SDPDR2= 172224          SW2    = 000004
MAPADD  004106          MAPL16= 170270          PCPUER  001330          SDPDR3= 172226          SW3    = 000010
MAPH0 = 170202          MAPL17= 170274          PIRQ   = 177772         SDPDR4= 172230          SW4    = 000020
MAPH00= 170202          MAPL2 = 170210          PIRQVE= 000240          SDPDR5= 172232          SW5    = 000040
MAPH01= 170206          MAPL20= 170300          PMAINT  001336          SDPDR6= 172234          SW6    = 000100
MAPH02= 170212          MAPL21= 170304          PMBECD  002526          SDPDR7= 172236          SW7    = 000200
MAPH03= 170216          MAPL22= 170310          PMBECF  002536          SIPAR0= 172240          SW8    = 000400
MAPH04= 170222          MAPL23= 170314          PMBECH  002476          SIPAR1= 172242          SW9    = 001000
MAPH05= 170226          MAPL24= 170320          PMBECM  002442          SIPAR2= 172244          SYSTID= 177764
MAPH06= 170232          MAPL25= 170324          PMBECW  002432          SIPAR3= 172246          TBIT   = 000020
MAPH07= 170236          MAPL26= 170330          PMMR0   001350          SIPAR4= 172250          TBITO  = 104413
MAPH1 = 170206          MAPL27= 170334          PMMR1   001352          SIPAR5= 172252          TBITOF  002726
MAPH10= 170242          MAPL3 = 170214          PMMR2   001354          SIPAR6= 172254          TBITR  = 104414
MAPH11= 170246          MAPL30= 170340          PPARER  001332          SIPAR7= 172256          TBITRE  002754
MAPH12= 170252          MAPL31= 170344          PRETST  005166          SIPDR0= 172200          TBITVE= 000014
MAPH13= 170256          MAPL32= 170350          PR0    = 000000         SIPDR1= 172202          TCPMRA  004416
MAPH14= 170262          MAPL33= 170354          PR1    = 000040         SIPDR2= 172204          TIMEOU  003030
MAPH15= 170266          MAPL34= 170360          PR2    = 000100         SIPDR3= 172206          TIMOUT= 000020
MAPH16= 170272          MAPL35= 170364          PR3    = 000140         SIPDR4= 172210          TKVEC  = 000060
MAPH17= 170276          MAPL36= 170370          PR4    = 000200         SIPDR5= 172212          TOFLAG  003032
MAPH2 = 170212          MAPL37= 170374          PR5    = 000240         SIPDR6= 172214          TOMSG   006261
MAPH20= 170302          MAPL4 = 170220          PR6    = 000300         SIPDR7= 172216          TPVEC  = 000064
MAPH21= 170306          MAPL5 = 170224          PR7    = 000340         SIZEHI= 177762          TRAPVE= 000034
MAPH22= 170312          MAPL6 = 170230          PS     = 177776         SIZEJ0  012744          TRTVEC= 000014
MAPH23= 170316          MAPL7 = 170234          PSW    = 177776         SIZEJ1  013154          TSTLOC  003474
MAPH24= 170320          MASK1   005776          PTMP2   005000          SIZEJ2  013402          TST1    010676
MAPH25= 170326          MASK2   006000          PWRMSG  023774          SIZELO= 177760          TST10   014616
MAPH26= 170332          MEMERR= 177744          PWRVEC= 000024          SPECST  006002          TST11   015072
MAPH27= 170336          MFPT   = 000007         RDCHR  = 104406         SR0    = 177572         TST12   015140
MAPH3 = 170216          MMFLAG  003374          RDLIN  = 104407         SR1    = 177574         TST13   015174
MAPH30= 170342          MMRHI   001270          RDOCT  = 104415         SR2    = 177576         TST14   015334
MAPH31= 170346          MMRLOW  001266          RELC22  011672          SR3    = 172516         TST15   015362
MAPH32= 170352          MMR0   = 177572         RESREG= 104412          SSP    =%000006         TST16   015420
MAPH33= 170356          MMR1   = 177574         RESVEC= 000010          STACK  = 001100         TST17   015450
MAPH34= 170362          MMR2   = 177576         RETRY   001360          START   010000          TST2    011122
MAPH35= 170366          MMR3   = 172516         RSIZE   001356          STKLMT= 177774          TST20   015610
MAPH36= 170372          MMTOTM  020014          R10    =%000000         SUPSTK= 000700          TST21   015744
MAPH37= 170376          MMTRAP  003372          R11    =%000001         SWR     001136          TST22   016220
MAPH4 = 170222          MMVEC  = 000250         R12    =%000002         SWREG   000176          TST23   016266
MAPH5 = 170226          MRQUES  006754          R13    =%000003         SW0    = 000001         TST24   016474
MAPH6 = 170232          NEWSWR  006161          R14    =%000004         SW00   = 000001         TST25   016540
MAPH7 = 170236          NEXMEM= 000040          R15    =%000005         SW01   = 000002         TST26   016702
MAPL0 = 170200          NEXT    003552          R3STAK  004314          SW02   = 000004         TST27   017036
MAPL00= 170200          NOMORE  006421          R6     =%000006         SW03   = 000010         TST3    011444
MAPL01= 170204          NOMSG   013646          R7     =%000007         SW04   = 000020         TST30   017164
MAPL02= 170210          NUMOFK  001316          SAVREG= 104411          SW05   = 000040         TST31   017412
MAPL03= 170214          NXTTST  001362          SCOPE  = 000004         SW06   = 000100         TST32  = 021576
MAPL04= 170220          OLDPC   001342          SDPAR0= 172260          SW07   = 000200         TST4    011762
MAPL05= 170224          OLDPS   001344          SDPAR1= 172262          SW08   = 000400         TST5    012242
MAPL06= 170230          OLDPSW  001346          SDPAR2= 172264          SW09   = 001000         TST6    012630
MAPL07= 170234          PADRSH  001230          SDPAR3= 172266          SW1    = 000002         TST7    013712
MAPL1 = 170204          PADRSL  001226          SDPAR4= 172270          SW10   = 002000         TYPDAT= 002244
MAPL10= 170240          PATAND  001252          SDPAR5= 172272          SW11   = 004000         TYPDS  = 104405
MAPL11= 170244          PATCH   007142          SDPAR6= 172274          SW12   = 010000         TYPE   = 104401
```

SYMBOL TABLE

```
TYPOC = 104402          USESTK= 000600          $DOAGN  022034          $MBADR  020002          $SVPC = 000204
TYPON = 104404          USP   =%000006          $DTBL   023176          $MFLG   021572          $SWR  = 177400
TYPOS = 104403          YESMSG  013542          $ENDAD  022024          $MNEW   023507          $SWREG  020164
TYPVAD  002542          $APTHD  020000          $ENDCT  021644          $MSGAD  020156          $SWRMK= 000340
UBADDR  002650          $ATYC   021354          $ENULL  022100          $MSGLG  020160          $TBIT   022076
UBMAVA  006125          $ATY1   021330          $ENV    020162          $MSGTY  020142          $TESTN  020146
UBMEND  006174          $ATY3   021336          $ENVM   020163          $MSWR   023476          $TIMES  001212
UBMHI   001264          $ATY4   021346          $EOP    021576          $MTYP1  020173          $TKB    001144
UBMLOW  001262          $AUTOB  001132          $EOPCT  021636          $MTYP2  020177          $TKS    001142
UBMSU   015236          $BASE   020216          $ERFLG  001101          $MTYP3  020203          $TMP0   001174
UBM24L  001310          $BDADR  001120          $ERMAX  001113          $MTYP4  020207          $TMP1   001176
UBM24P  001314          $BDDAT  001124          $ERROR  020704          $MXCNT  020676          $TMP2   001200
UBM24U  001312          $BELL   001216          $ERRPC  001114          $NULL   001152          $TMP3   001202
UBRHI   001274          $CDW1   020222          $ERRTB  001366          $NWTST= 000001          $TMP4   001204
UBRLOW  001272          $CDW2   020224          $ERTTL  001110          $OCNT   022766          $TMP5   001206
UDPAR0= 177660          $CHARC  022540          $ESCAP  001214          $OCTVL  024142          $TMP6   001210
UDPAR1= 177662          $CLR.T  022014          $ETABL  020162          $OMODF  022770          $TN   = 000032
UDPAR2= 177664          $CMTAG  001100          $ETEND  020266          $OVER   020662          $TPB    001150
UDPAR3= 177666          $CM1  = 000006          $FATAL  020144          $PASS   020150          $TPFLG  001155
UDPAR4= 177670          $CM2  = 000014          $FFLG   021574          $PASTM  020006          $TPS    001146
UDPAR5= 177672          $CM3  = 000006          $FILLC  001154          $PWRAD  023750          $TRAP   023520
UDPAR6= 177674          $CM4  = 000007          $FILLS  001153          $PWRDN  023610          $TRAP2  023542
UDPAR7= 177676          $CNTLG  023471          $GDADR  001116          $PWRMG  023744          $TRP  = 000016
UDPDR0= 177620          $CNTLU  023464          $GDDAT  001122          $PWRUP  023662          $TRPAD  023554
UDPDR1= 177622          $CPUOP  020170          $GET42  021776          $QUES   001222          $TSTM   020004
UDPDR2= 177624          $CRLF   001223          $HD   = 000000          $RDCHR  023216          $TSTNM  001100
UDPDR3= 177626          $DBLK   023206          $HIBTS  020000          $RDLIN  023346          $TTYIN  023454
UDPDR4= 177630          $DB20   024040          $HIOCT  005736          $RDOCT  005630          $TYPDS  022772
UDPDR5= 177632          $DDW0   020226          $ICNT   001102          $RDSZ = 000010          $TYPE   022200
UDPDR6= 177634          $DDW1   020230          $ILLUP  023766          $REGAD  001156          $TYPEC  022412
UDPDR7= 177636          $DDW10  020252          $INTAG  001133          $REG0   001160          $TYPEX  022542
UIPAR0= 177640          $DDW11  020254          $ITEMB  001112          $REG1   001162          $TYPOC  022570
UIPAR1= 177642          $DDW12  020256          $LF     001224          $REG2   001164          $TYPON  022604
UIPAR2= 177644          $DDW13  020260          $LFLG   021573          $REG3   001166          $TYPOS  022544
UIPAR3= 177646          $DDW14  020262          $LOOP   022072          $REG4   001170          $UNIT   020154
UIPAR4= 177650          $DDW15  020264          $LPADR  001104          $REG5   001172          $UNITM  020010
UIPAR5= 177652          $DDW2   020232          $LPERR  001106          $RESRE  022142          $USWR   020166
UIPAR6= 177654          $DDW3   020234          $MADR1  020174          $RTNAD  022074          $VECT1  020212
UIPAR7= 177656          $DDW4   020236          $MADR2  020200          $RTRN   022070          $VECT2  020214
UIPDR0= 177600          $DDW5   020240          $MADR3  020204          $SAVRE  022104          $XOFF = 000023
UIPDR1= 177602          $DDW6   020242          $MADR4  020210          $SAVR6  023772          $XON  = 000021
UIPDR2= 177604          $DDW7   020244          $MAIL   020142          $SCOPE  020266          $XTSTR  020372
UIPDR3= 177606          $DDW8   020246          $MAMS1  020172          $SETUP= 000037          $$GET4= 000001
UIPDR4= 177610          $DDW9   020250          $MAMS2  020176          $SSWR   000176          $0FILL  022767
UIPDR5= 177612          $DEVCT  020152          $MAMS3  020202          $STUP - 177777          .$X   = 020000
UIPDR6= 177614          $DEVM   020220          $MAMS4  020206          $SVLAD  020626          .$Y   = 002026
UIPDR7= 177616

. ABS.  033727     000
        000000     001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  56440 WORDS  ( 221 PAGES)
DYNAMIC MEMORY:  20034 WORDS  ( 77 PAGES)
ELAPSED TIME:  00:10:24
CKKUAE.BIN,CKKUAE/CR/-SP/NL:TOC=CKKUAE.MLB/ML,CKKUAE.P11
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CKKUAF CREATED BY MACRO ON 11-JAN-82 AT 11:32 PAGE 1
SEQUENCE 139
CREF V01

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
ABASE	= 000000	91-4095	91-4095							
ACDW1	= 000000	91-4095	91-4095							
ACDW2	= 000000	91-4095	91-4095							
ACPUOP	= 000000	91-4095	91-4095							
ADDROR	001236	#21-1496	*41-2228	*41-2243	*92-4097	*92-4097	106-4208	106-4209	106-4210	106-4213
ADDW0	= 177777	#89-4065	91-4095	91-4095						
ADDW1	= 177777	#89-4066	91-4095	91-4095						
ADDW10	= 000000	91-4095	91-4095							
ADDW11	= 000000	91-4095	91-4095							
ADDW12	= 000000	91-4095	91-4095							
ADDW13	= 000000	91-4095	91-4095							
ADDW14	= 000000	91-4095	91-4095							
ADDW15	= 000000	91-4095	91-4095							
ADDW2	= 000000	91-4095	91-4095							
ADDW3	= 000000	91-4095	91-4095							
ADDW4	= 000000	91-4095	91-4095							
ADDW5	= 000000	91-4095	91-4095							
ADDW6	= 000000	91-4095	91-4095							
ADDW7	= 000000	91-4095	91-4095							
ADDW8	= 000000	91-4095	91-4095							
ADDW9	= 000000	91-4095	91-4095							
ADEVCT	= 000000	91-4095	91-4095							
ADEVM	= 000000	91-4095	91-4095							
ADRAND	001232	#21-1496	*41-2230	*41-2245	*92-4097	*92-4097	106-4208	106-4209	106-4210	106-4213
ADREXT	003674	35-2057	#41-2220	56-2828	57-2897	59-2975	68-3332	68-3374	69-3445	
AENV	= 000000	91-4095	91-4095							
AENVM	= 000000	91-4095	91-4095							
AFATAL	= 000000	91-4095	91-4095							
AMADR1	= 000000	91-4095	91-4095							
AMADR2	= 000000	91-4095	91-4095							
AMADR3	= 000000	91-4095	91-4095							
AMADR4	= 000000	91-4095	91-4095							
AMAMS1	= 000000	91-4095	91-4095							
AMAMS2	= 000000	91-4095	91-4095							
AMAMS3	= 000000	91-4095	91-4095							
AMAMS4	= 000000	91-4095	91-4095							
AMSGAD	= 000000	91-4095	91-4095							
AMSGLG	= 000000	91-4095	91-4095							
AMSGTY	= 000000	91-4095	91-4095							
AMTYP1	= 000000	91-4095	91-4095							
AMTYP2	= 000000	91-4095	91-4095							
AMTYP3	= 000000	91-4095	91-4095							
AMTYP4	= 000000	91-4095	91-4095							
APASS	= 000000	91-4095	91-4095							
APRIOR	= 000000	91-4095								
APTCSU	= 000040	#94-4101	97-4107							
APTENV	= 000001	93-4099	94-4101	#94-4101	97-4107					
APTSIZ	= 000200	#94-4101								
APTSPO	= 000100	94-4101	#94-4101	97-4107						
ASWREG	= 000000	91-4095	91-4095							
ATESTN	= 000000	91-4095	91-4095							
AUNIT	= 000000	91-4095	91-4095							

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
AUSWR	= 000000	91-4095	91-4095							
AVECT1	= 000000	91-4095	91-4095							
AVECT2	= 000000	91-4095	91-4095							
BADCPU	006607	#53-2625	54-2713							
B/DPC	001340	#21-1496	*36-2092	*37-2128	106-4205	106-4206	106-4207			
?.F0	= 000001	#17-1489	38-2155	38-2160	58-2936	62-3090	63-3128	79-3745	79-3751	
BIT00	= 000001	#17-1489	17-1489	50-2487	92-4097	92-4097	93-4099	93-4099		
BIT01	= 000002	#17-1489	17-1489							
BIT02	= 000004	#17-1489	17-1489							
BIT03	= 000010	#17-1489	17-1489							
BIT04	= 000020	#17-1489	17-1489							
BIT05	= 000040	#17-1489	17-1489							
BIT06	= 000100	#17-1489	17-1489	50-2505	50-2509					
BIT07	= 000200	#17-1489	17-1489	50-2524						
BIT08	= 000400	#17-1489	17-1489	50-2488	50-2540	92-4097				
BIT09	= 001000	#17-1489	17-1489	55-2781	57-2909	59-2988	92-4097	93-4099		
BIT1	= 000002	#17-1489								
BIT10	= 002000	#17-1489	93-4099							
BIT11	= 004000	#17-1489	42-2284	44-2364	46-2429	59-2957	68-3320	68-3339	73-3526	90-4078
		92-4097								
BIT12	= 010000	#17-1489	50-2489	50-2541	95-4103					
BIT13	= 020000	#17-1489	93-4099							
BIT14	= 040000	#17-1489	83-3851	84-3877	84-3882	85-3904	92-4097			
BIT15	= 100000	#17-1489	45-2404							
BIT2	= 000004	#17-1489								
BIT3	= 000010	#17-1489								
BIT4	= 000020	16-1460	#17-1489	32-1977	58-2937					
BIT5	= 000040	#17-1489	34-2011	63-3127	69-3412	70-3473	72-3510	87-3974		
BIT6	= 000100	#17-1489	78-3690							
BIT7	= 000200	#17-1489								
BIT8	= 000400	#17-1489								
BIT9	= 001000	#17-1489	56-2834	61-3060	68-3349	69-3456	81-3823	83-3864	84-3891	85-3917
BPTVEC	= 000014	#17-1489								
BUPWIN	001276	#21-1496	*65-3218	68-3367	68-3395					
CACHE	= 177746	#16-1464	*50-2488	50-2489	*50-2502	*50-2505	*50-2509	50-2513	*50-2524	*50-2535
		*50-2540	50-2541	*77-3652	*78-3709					
CACHVE	= 000114	#17-1489								
CASHSR	005324	#50-2487	77-3651	78-3701						
CASH1	005460	#50-2512	*77-3649	*78-3699						
CASH2	005470	#50-2516	*77-3650	*78-3700						
CHARCT	005760	#52-2599								
CHKLMA	005076	38-2168	42-2281	44-2361	#46-2425	68-3326	68-3345	68-3354		
CHKPAT	005600	#50-2547	56-2817	56-2831						
CLRMAP	002772	#34-2008	57-2882	60-3012	68-3284					
CMPE	= 177744	#16-1465	*50-2510	*50-2534						
CNTR	001322	#21-1496								
CONTRL	= 177746	#17-1489								
CPFLAG	003224	#36-2083	*36-2099	*36-2102	*36-2107	*54-2740	*93-4099			
CPSAVE	020700	29-1900	*92-4097	92-4097	#92-4097	*93-4099	93-4099			
CPUER	003222	#36-2082	54-2734	55-2787						
CPUERR	= 177766	#17-1489	35-2042	*35-2043	36-2091	*36-2108	*54-2743	*93-4099		
CPUEXP	001326	#21-1496	35-2039	35-2044	35-2053	36-2093	36-2097	36-2106	*44-2345	*44-2350

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
		*44-2353	*44-2355	*54-2736	*59-2962	*59-2964	*59-2967	*59-2969	*59-2977	*59-2979
		*59-2990	*59-2992	*60-3017	*60-3019	*60-3032	*60-3034	*60-3044	*61-3064	*62-3098
		*62-3101	*63-3137	*63-3140	*63-3148	*64-3173	*64-3179	*64-3182	*65-3209	*65-3212
		*65-3215	*68-3312	*68-3314	*90-4082	*90-4087	106-4205	106-4214	106-4229	
CPUMSG	006200	#53-2620	*54-2692	54-2693	*54-2698	54-2699				
CPUTYP	007140	35-2036	35-2049	36-2095	#53-2630	*54-2684	*54-2685	54-2695	55-2755	77-3638
CR	= 000015	#17-1489	97-4107	97-4107						
CRLF	= 000200	#17-1489	52-2617	52-2619	53-2620	53-2620	53-2621	53-2622	53-2623	53-2624
		53-2625	53-2626	53-2628	53-2629	97-4107	97-4107	104-4134	104-4138	104-4139
		104-4162	104-4164	105-4171	105-4173	105-4175	105-4177	105-4180	105-4182	105-4189
		105-4193	105-4198	105-4200	107-4232	107-4232	107-4233	107-4234	107-4235	107-4236
		107-4237	107-4237	107-4238	107-4239	107-4240				
CTRAPS	= 000116	#16-1468	50-2496	*50-2498	*50-2539					
CTRAPV	= 000114	#16-1467	50-2495	*50-2497	*50-2538					
DATA	001364	#21-1496	44-2346	*44-2381	*44-2388	*44-2389	*44-2390			
DATAND	001242	#21-1496	*39-2187	*56-2861	*92-4097	106-4209	106-4210	106-4212	106-4213	
DATAOR	001246	#21-1496	*39-2185	*56-2859	*92-4097	106-4209	106-4210	106-4212	106-4213	
DATEXT	003624	#39-2185	56-2824	57-2901	61-3051	68-3335	69-3448			
DATO	= 100000	#84-3874	84-3881							
DATOB	= 140000	#85-3901	85-3908							
DDISP	= 177570	#17-1489	21-1496							
DFMSG	006120	52-2597	#52-2616							
DF1	033641	22-1501	22-1507	22-1514	23-1548	23-1561	23-1569	23-1583	24-1595	24-1601
		24-1608	24-1614	24-1626	24-1632	24-1638	24-1644	25-1649	27-1723	27-1729
		#108-4242								
DF11	033671	23-1555	#108-4246							
DF14	033677	23-1576	26-1684	#108-4247						
DF201	033711	26-1658	26-1671	26-1690	26-1696	27-1709	27-1717	#108-4249		
DF204	033717	26-1677	#108-4250							
DF210	033724	26-1702	#108-4251							
DF23	033705	24-1620	#108-4248							
DF4	033646	22-1521	#108-4243							
DF5	033653	22-1528	23-1590	#108-4244						
DF6	033661	22-1535	23-1541	26-1665	#108-4245					
DH1	030121	22-1499	#105-4169							
DH10	030727	23-1546	23-1559	23-1567	24-1593	24-1599	24-1606	24-1612	#105-4179	
DH11	030754	23-1552	23-1573	23-1587	#105-4180					
DH15	031111	23-1580	#105-4182							
DH2	030160	22-1505	#105-4170							
DH201	031366	26-1656	#105-4188							
DH202	031415	26-1662	#105-4189							
DH203	031524	26-1669	#105-4191							
DH204	031605	26-1675	#105-4192							
DH205	031656	26-1681	#105-4193							
DH206	031743	26-1688	#105-4195							
DH207	032013	26-1694	#105-4196							
DH210	032054	26-1700	#105-4197							
DH211	032106	27-1706	27-1714	#105-4198						
DH212	032211	#105-4200								
DH213	032270	27-1721	27-1727	#105-4202						
DH23	031170	24-1618	#105-4184							
DH24	031231	24-1624	24-1630	24-1636	#105-4185					

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
DH27	031270	24-1642	#105-4186							
DH3	030207	22-1511	#105-4171							
DH30	031327	25-1647	#105-4187							
DH4	030306	22-1518	#105-4173							
DH5	030403	22-1525	#105-4175							
DH6	030540	22-1532	23-1538	#105-4177						
DISPLA	001140	#21-1496	47-2447	92-4097	93-4099					
DISPRE	000174	#18-1492								
DSABLD	005230	#48-2459	63-3141	64-3183	65-3207					
DSWR	= 177570	#17-1489	21-1493							
DTMS	005740	#52-2597	66-3227							
DTMSG	005744	52-2597	#52-2598							
DT1	032340	22-1500	#106-4205							
DT10	032452	23-1547	23-1560	23-1568	24-1594	24-1600	24-1607	24-1613	#106-4211	
DT11	032462	23-1554	#106-4212							
DT14	032500	23-1575	23-1589	#106-4213						
DT15	032516	23-1582	#106-4214							
DT2	032352	22-1506	#106-4206							
DT201	032612	26-1657	#106-4220							
DT202	032622	26-1664	#106-4221							
DT203	032636	26-1670	#106-4222							
DT204	032654	26-1676	#106-4223							
DT205	032670	26-1683	#106-4224							
DT206	032702	26-1689	#106-4225							
DT207	032716	26-1695	#106-4226							
DT210	032730	26-1701	#106-4227							
DT211	032740	27-1708	27-1716	#106-4228						
DT212	032754	#106-4229								
DT213	032766	27-1722	27-1728	#106-4230						
DT23	032530	24-1619	#106-4215							
DT24	032542	24-1625	24-1631	#106-4216						
DT26	032554	24-1637	#106-4217							
DT27	032566	24-1643	#106-4218							
DT3	032362	22-1513	#106-4207							
DT30	032600	25-1648	#106-4219							
DT4	032376	22-1520	#106-4208							
DT5	032412	22-1527	#106-4209							
DT6	032430	22-1534	23-1540	#106-4210						
EADRES	005764	*41-2235	*41-2236	41-2247	*41-2249	*41-2250	*42-2292	*42-2293	*44-2371	*44-2372
		#52-2601	*59-2987	*79-3762	*79-3763	*88-4045	*92-4097	106-4215	106-4220	106-4221
		106-4224	106-4225	106-4226	106-4227	106-4228				
EADRS2	005770	#52-2602	*57-2902	*69-3449	*69-3450	*79-3760	*79-3761	*92-4097	106-4215	106-4221
		106-4222	106-4224							
EMTVEC	= 000030	#17-1489	54-2655	54-2655						
EM1	024160	22-1498	#104-4127							
EM10	025003	23-1544	#104-4134							
EM11	025155	23-1551	#104-4136							
EM12	025247	23-1558	#104-4137							
EM13	025321	23-1564	#104-4138							
EM14	025525	23-1572	#104-4141							
EM15	025630	23-1579	#104-4142							
EM16	025723	23-1586	#104-4143							

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
EM17	026021	24-1592	#104-4144							
EM2	024245	22-1504	#104-4128							
EM20	026051	24-1598	#104-4145							
EM201	026625	26-1655	#104-4154							
EM202	026701	26-1661	#104-4155							
EM203	026774	26-1668	#104-4156							
EM204	027055	26-1674	#104-4157							
EM205	027124	26-1680	#104-4158							
EM206	027206	26-1687	#104-4159							
EM207	027237	26-1693	#104-4160							
EM21	026150	24-1604	#104-4146							
EM210	027346	26-1699	#104-4161							
EM211	027446	27-1704	#104-4162							
EM212	027604	27-1712	#104-4164							
EM213	027737	27-1720	#104-4166							
EM214	030030	27-1726	#104-4167							
EM22	026226	24-1611	#104-4147							
EM23	026314	24-1617	#104-4148							
EM24	026344	24-1623	#104-4149							
EM25	026402	24-1629	#104-4150							
EM26	026437	24-1635	#104-4151							
EM27	026472	24-1641	#104-4152							
EM3	024317	22-1510	#104-4129							
EM30	026572	25-1646	#104-4153							
EM4	024425	22-1517	#104-4130							
EM5	024505	22-1524	#104-4131							
EM6	024600	22-1531	#104-4132							
EM7	024702	23-1537	#104-4133							
ENABLD	005266	#49-2474	63-3149	64-3177	65-3216					
ERRCNT	001320	#21-1496	29-1791	29-1798	*35-2051	*36-2105	*55-2757	55-2759	*55-2778	55-2783
		55-2789	*55-2792	*56-2809	56-2841	*56-2845	*56-2862	57-2915	*57-2918	61-3065
		*61-3068	*68-3291	*68-3315	68-3398	*68-3401	69-3459	*69-3462	*87-3986	*90-4074
		*92-4097	*93-4099	106-4208	106-4209	106-4210	106-4212	106-4213		
ERROR	= 104000	#16-1473	#17-1489	35-2047	35-2059	36-2100	36-2103	37-2134	55-2793	56-2833
		56-2848	56-2850	57-2908	57-2919	59-2986	60-3025	61-3059	61-3069	61-3072
		62-3105	63-3142	63-3146	63-3150	64-3178	64-3185	65-3208	65-3217	68-3348
		68-3375	68-3402	69-3455	69-3463	70-3478	71-3493	72-3515	74-3570	75-3588
		76-3601	77-3655	78-3704	78-3708	79-3765	80-3786	81-3802	81-3822	82-3839
		83-3863	84-3890	85-3916	87-3984	88-4046				
ERRVEC	= 000004	#17-1489	*54-2734	*54-2735	*55-2754	*55-2787	92-4097	*92-4097	*92-4097	*92-4097
ERTYPE	002026	#29-1777	93-4099							
ER200	001666	#26-1650	29-1806	29-1809						
EXTOUT	005762	#52-2600								
FJBIT	= 000100	#80-3779	80-3782	80-3785	81-3797	81-3798	81-3801	82-3834	82-3835	82-3838
FLAG	001324	#21-1496								
FLOATR	005774	38-2150	*38-2155	*38-2160	*38-2162	48-2463	49-2478	#52-2603		
FTTHRU	003532	#38-2158	*63-3133							
GMRMD1	007043	#53-2628	*55-2768	55-2769	55-2770					
GMRMOD	007046	#53-2629	55-2772							
GNS	= ******	18-1492	18-1492	95-4103	95-4103	101-4115	101-4115	101-4115	101-4115	101-4115
		101-4115	101-4115	101-4115	101-4115	101-4115	101-4115	101-4115	101-4115	101-4115
		101-4115	101-4115	101-4115	101-4115	101-4115	101-4115	101-4116	101-4116	101-4117

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
		101-4117	101-4118	101-4118						
HIADRS	= 177742	#17-1489								
HIGEST	001260	#21-1496	*64-3167	*64-3188	64-3189	65-3199	68-3362	68-3388	81-3805	87-3979
HITMIS	= 177752	#17-1489								
HT	= 000011	#17-1489	97-4107	97-4107						
IBSAVE	020702	#93-4099	*93-4099	93-4099	*93-4099	*93-4099	93-4099	93-4099	93-4099	93-4099
IOTVEC	= 000020	#17-1489	54-2655	54-2655						
JMPMSG	033002	66-3226	#107-4232							
KDPAR0	= 172360	#17-1489								
KDPAR1	= 172362	#17-1489								
KDPAR2	= 172364	#17-1489								
KDPAR3	= 172366	#17-1489								
KDPAR4	= 172370	#17-1489								
KDPAR5	= 172372	#17-1489								
KDPAR6	= 172374	#17-1489								
KDPAR7	= 172376	#17-1489								
KDPDR0	= 172320	#17-1489								
KDPDR1	= 172322	#17-1489								
KDPDR2	= 172324	#17-1489								
KDPDR3	= 172326	#17-1489								
KDPDR4	= 172330	#17-1489								
KDPDR5	= 172332	#17-1489								
KDPDR6	= 172334	#17-1489								
KDPDR7	= 172336	#17-1489								
KERSTK	= 001100	#17-1489								
KIPAR0	= 172340	#17-1489	30-1922	58-2929	*73-3555	*77-3636	*79-3750	*87-3990		
KIPAR1	= 172342	#17-1489	*73-3553	*77-3637	*87-3991					
KIPAR2	= 172344	#17-1489	69-3447	79-3747	*79-3748	*79-3764	*79-3766	*79-3771	83-3847	*83-3848
		*83-3866	84-3875	*84-3876	*84-3893	85-3902	*85-3903	*85-3919		
KIPAR3	= 172346	#17-1489	45-2401	*45-2402	*45-2407	54-2719	*54-2720	*54-2725	54-2726	*54-2728
KIPAR4	= 172350	#17-1489	*44-2338	44-2378	*44-2382	57-2896	*63-3130	*63-3143	63-3144	64-3158
		64-3165	*64-3171	*64-3174	64-3175	64-3188	*65-3204	65-3205	65-3218	65-3219
		*68-3292	*68-3305	*68-3306	68-3309	68-3324	68-3331	68-3343	68-3358	68-3360
		68-3362	*68-3364	68-3365	68-3367	*69-3413	*69-3420	69-3421	81-3809	*81-3810
		*81-3814	81-3815	*81-3826	*90-4075	*90-4080	106-4218			
KIPAR5	= 172352	#17-1489	*60-3027	*60-3029	61-3070	*61-3073	*62-3094	106-4219		
KIPAR6	= 172354	#17-1489	*42-2275	*44-2339	59-2953	*59-2954	*59-2959	59-2961	59-2974	*59-2993
		*59-2995	*59-2998	*60-3014	*60-3022	60-3027	*60-3039	62-3091	69-3426	69-3429
		*69-3439	69-3440	69-3444	*88-4018	*88-4025	*88-4027	*88-4052		
KIPAR7	= 172356	#17-1489	35-2056	56-2827	57-2899	68-3334	68-3373			
KIPDR0	= 172300	#17-1489	58-2924							
KIPDR1	= 172302	#17-1489								
KIPDR2	= 172304	#17-1489								
KIPDR3	= 172306	#17-1489								
KIPDR4	= 172310	#17-1489								
KIPDR5	= 172312	#17-1489								
KIPDR6	= 172314	#17-1489								
KIPDR7	= 172316	#17-1489								
KSP	=%000006	#17-1489	*29-1777	*29-1781	29-1794	29-1802	*29-1831	*29-1839	*29-1845	*29-1851
		29-1853	*29-1854	*29-1862	*29-1878	*29-1885	*29-1891	*29-1892	30-1915	*30-1930
		30-1932	*30-1933	*30-1938	30-1938	31-1948	*31-1953	31-1955	*31-1956	*31-1960
		31-1960	32-1978	32-1980	32-1981	33-1993	*35-2034	*35-2035	*35-2061	*35-2062

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
		*36-2089	*36-2090	*36-2109	*36-2110	37-2128	*37-2129	*37-2130	*37-2137	*37-2138
LF	= 000012	#17-1489	97-4107	97-4107						
LKS	= 177546	#17-1489								
LKVEC	= 000100	#17-1489								
LMAH	001304	#21-1496	*68-3322	68-3327	*68-3341	68-3346	68-3355			
LMAHI	= 177736	#16-1475	38-2169	42-2282	44-2362	45-2398	68-3322	68-3341	79-3757	79-3761
		80-3782	80-3784	*81-3797	81-3798	81-3800	*82-3834	82-3835	82-3837	83-3853
		83-3860	84-3879	84-3887	85-3906	85-3913	106-4216			
LMAL	001306	#21-1496	*68-3323	68-3327	*68-3342	68-3346	68-3355			
LMALOW	= 177734	#16-1474	38-2169	42-2282	44-2362	45-2394	45-2403	68-3323	68-3342	79-3755
		79-3760								
LOADRS	= 177740	#17-1469								
LOEFLG	004312	42-2266	*42-2295	#42-2302	44-2329	*44-2373	*70-3474	*71-3490	*72-3511	*74-3568
		*75-3586	*76-3599	90-4071	*90-4091					
LOOP	010606	54-2730	#54-2732	95-4103						
LOWEST	001256	#21-1496	42-2275	44-2339	*64-3158	64-3159	67-3254	68-3289	68-3292	73-3551
		79-3748	79-3766	81-3803	87-3977	90-4075				
LREGL	001300	#21-1496	42-2274	44-2335	44-2383	*67-3258	67-3260	68-3288	79-3752	90-4077
LREGU	001302	#21-1496	42-2273	44-2334	44-2385	44-2386	*67-3260	*67-3261	73-3545	79-3753
		90-4076								
MAINT	= 177750	#16-1466	#17-1489	*50-2499	*50-2536					
MAPADD	004106	#42-2266	71-3492	75-3587						
MAPH0	= 170202	#17-1489								
MAPH00	= 170202	#17-1489	17-1489	56-2855						
MAPH01	= 170206	#17-1489	17-1489							
MAPH02	= 170212	#17-1489	17-1489							
MAPH03	= 170216	#17-1489	17-1489							
MAPH04	= 170222	#17-1489	17-1489							
MAPH05	= 170226	#17-1489	17-1489							
MAPH06	= 170232	#17-1489	17-1489							
MAPH07	= 170236	#17-1489	17-1489							
MAPH1	= 170206	#17-1489								
MAPH10	= 170242	#17-1489								
MAPH11	= 170246	#17-1489								
MAPH12	= 170252	#17-1489								
MAPH13	= 170256	#17-1489								
MAPH14	= 170262	#17-1489								
MAPH15	= 170266	#17-1489								
MAPH16	= 170272	#17-1489								
MAPH17	= 170276	#17-1489								
MAPH2	= 170212	#17-1489								
MAPH20	= 170302	#17-1489								
MAPH21	= 170306	#17-1489								
MAPH22	= 170312	#17-1489								
MAPH23	= 170316	#17-1489								
MAPH24	= 170320	#17-1489								
MAPH25	= 170326	#17-1489								
MAPH26	= 170332	#17-1489								
MAPH27	= 170336	#17-1489								
MAPH3	= 170216	#17-1489								
MAPH30	= 170342	#17-1489								
MAPH31	= 170346	#17-1489								

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
MAPH32	= 170352	#17-1489								
MAPH33	= 170356	#17-1489								
MAPH34	= 170362	#17-1489								
MAPH35	= 170366	#17-1489								
MAPH36	= 170372	#17-1489								
MAPH37	= 170376	#17-1489	34-2015	56-2846	56-2852	57-2880	57-2888			
MAPH4	= 170222	#17-1489								
MAPH5	= 170226	#17-1489								
MAPH6	= 170232	#17-1489								
MAPH7	= 170236	#17-1489								
MAPL0	= 170200	#17-1489	34-2008	55-2758	55-2776	*59-2956	59-2970	*59-2972	59-2983	*59-2985
		63-3119								
MAPL00	= 170200	#17-1489	17-1489	56-2811	57-2878					
MAPL01	= 170204	#17-1489	17-1489	68-3293	68-3377					
MAPL02	= 170210	#17-1489	17-1489							
MAPL03	= 170214	#17-1489	17-1489							
MAPL04	= 170220	#17-1489	17-1489							
MAPL05	= 170224	#17-1489	17-1489							
MAPL06	= 170230	#17-1489	17-1489							
MAPL07	= 170234	#17-1489	17-1489							
MAPL1	= 170204	#17-1489								
MAPL10	= 170240	#17-1489								
MAPL11	= 170244	#17-1489								
MAPL12	= 170250	#17-1489								
MAPL13	= 170254	#17-1489								
MAPL14	= 170260	#17-1489								
MAPL15	= 170264	#17-1489								
MAPL16	= 170270	#17-1489								
MAPL17	= 170274	#17-1489								
MAPL2	= 170210	#17-1489								
MAPL20	= 170300	#17-1489								
MAPL21	= 170304	#17-1489								
MAPL22	= 170310	#17-1489								
MAPL23	= 170314	#17-1489								
MAPL24	= 170320	#17-1489								
MAPL25	= 170324	#17-1489								
MAPL26	= 170330	#17-1489								
MAPL27	= 170334	#17-1489								
MAPL3	= 170214	#17-1489								
MAPL30	= 170340	#17-1489								
MAPL31	= 170344	#17-1489								
MAPL32	= 170350	#17-1489								
MAPL33	= 170354	#17-1489								
MAPL34	= 170360	#17-1489								
MAPL35	= 170364	#17-1489								
MAPL36	= 170370	#17-1489								
MAPL37	= 170374	#17-1489								
MAPL4	= 170220	#17-1489								
MAPL5	= 170224	#17-1489								
MAPL6	= 170230	#17-1489								
MAPL7	= 170234	#17-1489								
MASK1	005776	50-2548	#52-2604	*56-2812	56-2825	*56-2856				

SYMBOL CROSS REFERENCE CREF V01

SYMBOL	VALUE	REFERENCES								
MASK2	006000	50-2551	#52-2605	*56-2813	*56-2857					
MEMERR	= 177744	#17-1489								
MFPT	= 000007	#16-1472	54-2683							
MMFLAG	003374	#37-2122	*37-2136	*54-2742	*93-4099					
MMRHI	001270	#21-1496	52-2598	*64-3168	*64-3186	*64-3187				
MMRLOW	001266	#21-1496	52-2598	*64-3157						
MMR0	= 177572	#17-1489	17-1489	37-2131	*37-2135	*50-2487	*54-2737	*57-2877	*58-2936	*62-3090
		*63-3128	*68-3285	*68-3290	*77-3634	*79-3745	*79-3751	*83-3849	*87-3973	*88-4020
		*93-4099	*95-4103							
MMR1	= 177574	#17-1489	17-1489	37-2132						
MMR2	= 177576	#17-1489	17-1489	37-2133						
MMR3	= 172516	#17-1489	17-1489	34-2011	*54-2738	*57-2884	*58-2937	*63-3127	*68-3281	*68-3283
		*69-3412	*70-3473	*77-3635	*79-3746	*79-3749	*80-3780	*81-3807	*81-3827	*83-3850
		*87-3988	*87-3989	*95-4103	106-4211					
MMTOTM	020014	70-3477	74-3569	#90-4071						
MMTRAP	003372	#37-2121	54-2732							
MMVEC	= 000250	#17-1489	*54-2732	*54-2733						
MRQUES	006754	#53-2627	55-2766							
NEWSWR	006161	#52-2618	54-2705							
NEXMEM	= 000040	44-2353	44-2356	#72-3510						
NEXT	003552	38-2153	38-2156	38-2161	#38-2163					
NOMORE	006421	29-1796	#53-2623							
NOMSG	013646	64-3190	66-3225	66-3235	#67-3253					
NUMOFK	001316	#21-1496	*87-3995	88-4019						
NXTTST	001362	#21-1496	*47-2444	*87-3976						
OLDPC	001342	#21-1496	*35-2034	35-2062	*36-2089	36-2092	36-2110	*37-2129	37-2138	
OLDPS	001344	#21-1496	*35-2035	35-2061	*36-2090	36-2109	*37-2130	37-2137		
OLDPSW	001346	#21-1496	*32-1980	33-1993	*33-1994					
PADRSH	001230	#21-1496	*30-1928	*31-1952						
PADRSL	001226	#21-1496	*30-1929	30-1930	*31-1951	31-1953				
PATAND	001252	#21-1496	*40-2201	*56-2860	*92-4097	106-4210	106-4212			
PATCH	007142	#53-2634								
PATEXT	003650	#40-2199	56-2822	61-3053						
PATRNS	006102	#52-2608	56-2816	60-3041						
PATTOR	001254	#21-1496	*40-2199	*56-2858	*92-4097	106-4210	106-4212			
PCONTR	001334	#21-1496								
PCPUER	001330	#21-1496	*35-2038	*35-2042	35-2043	35-2044	*36-2091	36-2097	*36-2106	36-2108
		*38-2164	38-2171	*44-2341	44-2351	44-2356	*60-3016	60-3020	*68-3307	68-3316
		*87-3987	88-4043	*88-4049	*90-4081	90-4088	106-4205	106-4206	106-4214	106-4229
PIRQ	= 177772	#17-1489								
PIRQVE	= 000240	#17-1489								
PMAINT	001336	#21-1496								
PMBECD	002526	29-1896	#29-1900							
PMBECF	002536	29-1896	#29-1901							
PMBECH	002476	29-1896	#29-1898							
PMBECM	002442	29-1896	#29-1897							
PMBECW	002432	29-1786	#29-1896							
PMMR0	001350	#21-1496	*37-2131	106-4207						
PMMR1	001352	#21-1496	*37-2132	106-4207						
PMMR2	001354	#21-1496	*37-2133	106-4207						
PPARER	001332	#21-1496								
PRETST	005166	#47-2443	55-2753	56-2808	57-2876	59-2952	60-3011	62-3088	68-3280	69-3411

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
		70-3472	71-3489	72-3504	74-3567	75-3584	76-3598	77-3633	78-3689	79-3724
		80-3778	81-3796	82-3833	83-3846	84-3873	85-3900	87-3972	88-4015	
PR0	= 000000	#17-1489								
PR1	= 000040	#17-1489								
PR2	= 000100	#17-1489								
PR3	= 000140	#17-1489								
PR4	= 000200	#17-1489								
PR5	= 000240	#17-1489								
PR6	= 000300	#17-1489								
PR7	= 000340	#17-1489								
PS	= 177776	#17-1489	17-1489	*54-2642						
PSW	= 177776	#17-1489								
PTMP2	005000	42-2287	44-2366	#45-2394						
PWRMSG	023774	102-4120	#102-4121							
PWRVEC	= 000024	#17-1489	54-2656	54-2656	*102-4120	*102-4120	*102-4120	*102-4120	*102-4120	*102-4120
RDCHR	= 104406	55-2767	100-4113	#101-4115						
RDLIN	= 104407	51-2570	#101-4115							
RDOCT	= 104415	#16-1476	54-2706	#101-4115	#101-4118					
RELC22	011672	57-2916	#58-2920							
RESREG	= 104412	30-1937	31-1959	#101-4115	103-4124					
RESVEC	= 000010	#17-1489	*54-2661	54-2667	*54-2667					
RETRY	001360	#21-1496	*92-4097							
RSIZE	001356	#21-1496	*44-2378							
R10	=%000000	#17-1489								
R11	=%000001	#17-1489								
R12	=%000002	#17-1489								
R13	=%000003	#17-1489								
R14	=%000004	#17-1489								
R15	=%000005	#17-1489								
R3STAK	004314	42-2270	#43-2309							
R6	=%000006	#17-1489	*50-2533	*50-2533						
R7	=%000007	#17-1489								
SAVREG	= 104411	30-1914	31-1947	#101-4115	103-4124					
SCOPE	= 000004	#17-1489	55-2753	56-2808	57-2876	59-2952	60-3011	62-3087	68-3280	69-3411
		70-3472	71-3489	72-3503	73-3523	74-3567	75-3584	76-3598	77-3633	78-3689
		79-3724	80-3778	81-3796	82-3833	83-3846	84-3873	85-3900	87-3972	88-4015
		95-4103								
SDPAR0	= 172260	#17-1489								
SDPAR1	= 172262	#17-1489								
SDPAR2	= 172264	#17-1489								
SDPAR3	= 172266	#17-1489								
SDPAR4	= 172270	#17-1489								
SDPAR5	= 172272	#17-1489								
SDPAR6	= 172274	#17-1489								
SDPAR7	= 172276	#17-1489								
SDPDR0	= 172220	#17-1489								
SDPDR1	= 172222	#17-1489								
SDPDR2	= 172224	#17-1489								
SDPDR3	= 172226	#17-1489								
SDPDR4	= 172230	#17-1489								
SDPDR5	= 172232	#17-1489								
SDPDR6	= 172234	#17-1489								

SYMBOL CROSS REFERENCE CREF V01

SYMBOL	VALUE	REFERENCES								
SDPDR7	= 172236	#17-1489								
SIPAR0	= 172240	#17-1489								
SIPAR1	= 172242	#17-1489								
SIPAR2	= 172244	#17-1489								
SIPAR3	= 172246	#17-1489								
SIPAR4	= 172250	#17-1489								
SIPAR5	= 172252	#17-1489								
SIPAR6	= 172254	#17-1489								
SIPAR7	= 172256	#17-1489								
SIPDR0	= 172200	#17-1489								
SIPDR1	= 172202	#17-1489								
SIPDR2	= 172204	#17-1489								
SIPDR3	= 172206	#17-1489								
SIPDR4	= 172210	#17-1489								
SIPDR5	= 172212	#17-1489								
SIPDR6	= 172214	#17-1489								
SIPDR7	= 172216	#17-1489								
SIZEHI	= 177762	#17-1489								
SIZEJ0	012744	60-3026	62-3089	62-3104	#63-3118	87-3981				
SIZEJ1	013154	#64-3157								
SIZEJ2	013402	#65-3199								
SIZELO	= 177760	#17-1489								
SPECST	006002	#52-2606	63-3121	63-3126	66-3234	66-3237				
SR0	= 177572	#17-1489								
SR1	= 177574	#17-1489								
SR2	= 177576	#17-1489								
SR3	= 172516	#17-1489								
SSP	=%000006	#17-1489								
STACK	= 001100	#17-1489	17-1489	17-1489	17-1489	54-2648	54-2666			
START	010000	18-1492	#54-2642	63-3147	102-4120					
STKLMT	= 177774	#17-1489								
SUPSTK	= 000700	#17-1489								
SWR	001136	#21-1496	29-1800	42-2284	44-2364	46-2429	*54-2689	*54-2691	*54-2697	*54-2702
		*54-2731	55-2781	56-2834	57-2909	59-2988	61-3060	68-3320	68-3339	68-3349
		69-3456	73-3526	77-3647	78-3690	78-3697	81-3823	83-3864	84-3891	85-3917
		87-3974	90-4078	92-4097	92-4097	92-4097	92-4097	92-4097	93-4099	93-4099
		93-4099	93-4099	93-4099	95-4103	102-4120	102-4120			
SWREG	000176	#18-1492								
SW0	= 000001	#17-1489								
SW00	= 000001	#17-1489	17-1489							
SW01	= 000002	#17-1489	17-1489							
SW02	= 000004	#17-1489	17-1489							
SW03	= 000010	#17-1489	17-1489							
SW04	= 000020	#17-1489	17-1489							
SW05	= 000040	#17-1489	17-1489							
SW06	= 000100	#17-1489	17-1489							
SW07	= 000200	#17-1489	17-1489							
SW08	= 000400	#17-1489	17-1489							
SW09	= 001000	#17-1489	17-1489							
SW1	= 000002	#17-1489								
SW10	= 002000	#17-1489								
SW11	= 004000	#17-1489								

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES							
SW12	= 010000	#17-1489							
SW13	= 020000	#17-1489							
SW14	= 040000	#17-1489							
SW15	= 100000	#17-1489							
SW2	= 000004	#17-1489							
SW3	= 000010	#17-1489							
SW4	= 000020	#17-1489							
SW5	= 000040	#17-1489							
SW6	= 000100	#17-1489							
SW7	= 000200	#17-1489	29-1800						
SW8	= 000400	#17-1489							
SW9	= 001000	#17-1489	93-4099						
SYSTID	= 177764	#17-1489							
TBIT	= 000020	#32-1977	32-1978	32-1981	33-1994				
TBITO	= 104413	#101-4116							
TBITOF	002726	#32-1978	101-4116						
TBITR	= 104414	58-2920	73-3525	95-4103	#101-4117				
TBITRE	002754	#33-1993	101-4117						
TBITVE	= 000014	#17-1489	54-2656	54-2656					
TCPMRA	004416	#44-2329	72-3514	76-3600					
TIMEOU	003030	#35-2027	55-2754						
TIMOUT	= 000020	#16-1460	35-2053	59-2962	59-2967	59-2977	59-2990	60-3017	60-3032	60-3044
		62-3098	63-3137	64-3179	65-3209	68-3312	90-4082	90-4088	
TKVEC	= 000060	#17-1489							
TOFLAG	003032	#35-2028	*35-2046	*35-2058	*35-2060	*54-2741	*93-4099		
TOMSG	006261	#53-2621	66-3236						
TPVEC	= 000064	#17-1489							
TRAPVE	= 000034	#17-1489	54-2655	54-2656					
TRTVEC	= 000014	#17-1489							
TSTLOC	003474	#38-2149	63-3138	64-3180	65-3210	81-3817	81-3820		
TST1	010676	54-2669	54-2670	#55-2753					
TST10	014616	68-3280	68-3399	#69-3411					
TST11	015072	69-3411	69-3428	69-3460	#70-3472				
TST12	015140	70-3472	#71-3489						
TST13	015174	71-3489	#72-3503						
TST14	015334	#74-3567							
TST15	015362	74-3567	#75-3584						
TST16	015420	75-3584	#76-3598						
TST17	015450	76-3598	#77-3633						
TST2	011122	55-2753	55-2790	#56-2808					
TST20	015610	77-3633	77-3645	77-3648	77-3654	#78-3689			
TST21	015744	73-3529	77-3641	78-3689	#79-3724				
TST22	016220	79-3724	#80-3778						
TST23	016266	80-3778	80-3783	#81-3796					
TST24	016474	81-3796	81-3806	#82-3833					
TST25	016540	82-3833	82-3836	#83-3846					
TST26	016702	83-3846	#84-3873						
TST27	017036	84-3873	#85-3900						
TST3	011444	56-2808	56-2851	56-2853	#57-2876				
TST30	017164	78-3711	85-3900	#87-3972					
TST31	017412	87-3972	87-4001	#88-4015					
TST32	= 021576	#87-4008	88-4015						

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
TST4	011762	57-2876	#59-2952							
TST5	012242	59-2952	#60-3011							
TST6	012630	60-3011	61-3071	#62-3087						
TST7	013712	#68-3280								
TYPDAT	= 002244	#29-1832	66-3231							
TYPDS	= 104405	29-1846	29-1886	66-3239	87-4006	95-4103	95-4103	#101-4115		
TYPE	= 104401	29-1796	29-1813	29-1817	29-1819	29-1824	29-1826	29-1855	29-1888	30-1934
		31-1957	54-2673	54-2693	54-2699	54-2705	54-2713	55-2766	55-2769	55-2772
		66-3226	66-3232	66-3233	66-3236	66-3240	66-3245	87-4005	87-4007	93-4099
		93-4099	95-4103	95-4103	95-4103	97-4107	98-4109	99-4111	100-4113	100-4113
		100-4113	#101-4115	102-4120						
TYPOC	= 104402	29-1782	29-1840	#101-4115						
TYPON	= 104404	#101-4115								
TYPOS	= 104403	29-1879	#101-4115							
TYPVAD	002542	29-1863	#30-1914							
UBADDR	002650	29-1871	#31-1947							
UBMAVA	006125	#52-2617	87-4005							
UBMEND	006174	#52-2619	87-4007							
UBMHI	001264	#21-1496	*64-3165	*64-3166	*65-3219	81-3815	88-4060			
UBMLOW	001262	#21-1496	*64-3162	*65-3199	*65-3200	81-3810	87-3998	88-4018		
UBMSU	015236	#73-3523								
UBM24L	001310	#21-1496	*42-2278	42-2279	42-2286	42-2292	*44-2342	44-2371	46-2436	*63-3134
		*68-3308	*68-3311	*70-3476	*72-3513					
UBM24P	001314	#21-1496	*68-3300	*68-3304	68-3311					
UBM24U	001312	#21-1496	*44-2344	44-2372	46-2434	*63-3135	*68-3282	*70-3475	*71-3491	*72-3512
UBRHI	001274	#21-1496	52-2598	*64-3163	*64-3164	*65-3220	*65-3221	87-3992		
UBRLOW	001272	#21-1496	52-2598	*64-3161	*65-3201	87-3993				
UDPAR0	= 177660	#17-1489								
UDPAR1	= 177662	#17-1489								
UDPAR2	= 177664	#17-1489								
UDPAR3	= 177666	#17-1489								
UDPAR4	= 177670	#17-1489								
UDPAR5	= 177672	#17-1489								
UDPAR6	= 177674	#17-1489								
UDPAR7	= 177676	#17-1489								
UDPDR0	= 177620	#17-1489								
UDPDR1	= 177622	#17-1489								
UDPDR2	= 177624	#17-1489								
UDPDR3	= 177626	#17-1489								
UDPDR4	= 177630	#17-1489								
UDPDR5	= 177632	#17-1489								
UDPDR6	= 177634	#17-1489								
UDPDR7	= 177636	#17-1489								
UIPAR0	= 177640	#17-1489								
UIPAR1	= 177642	#17-1489								
UIPAR2	= 177644	#17-1489								
UIPAR3	= 177646	#17-1489								
UIPAR4	= 177650	#17-1489								
UIPAR5	= 177652	#17-1489								
UIPAR6	= 177654	#17-1489								
UIPAR7	= 177656	#17-1489								
UIPDR0	= 177600	#17-1489								

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES
UIPDR1	= 177602	#17-1489
UIPDR2	= 177604	#17-1489
UIPDR3	= 177606	#17-1489
UIPDR4	= 177610	#17-1489
UIPDR5	= 177612	#17-1489
UIPDR6	= 177614	#17-1489
UIPDR7	= 177616	#17-1489
USESTK	= 000600	#17-1489
USP	=%000006	#17-1489
YESMSG	013542	64-3169 #66-3224
$APTHD	020000	89-4067 #89-4067
$ASTAT	= ******	94-4101 94-4101
$ATYC	021354	94-4101 #94-4101
$ATY1	021330	#94-4101
$ATY3	021336	#94-4101 97-4107
$ATY4	021346	93-4099 #94-4101
$AUTOB	001132	#21-1496
$BASE	020216	#91-4095
$BDADR	001120	#21-1496
$BDDAT	001124	#21-1496
$BELL	001216	#21-1496 93-4099 93-4099 93-4099
$CDW1	020222	#91-4095
$CDW2	020224	#91-4095
$CHARC	022540	*97-4107 *97-4107 97-4107 *97-4107 #97-4107
$CKSWR	= ******	101-4115
$CLR.T	022014	95-4103 #95-4103
$CMTAG	001100	#21-1496 54-2643 54-2644
$CM1	= 000006	#21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496
		#21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496
		#21-1496
$CM2	= 000014	#21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496
		#21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496
		#21-1496
$CM3	= 000006	#21-1496 21-1496 21-1496
$CM4	= 000007	#21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496
		#21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496 #21-1496 21-1496 21-1496
		#21-1496 21-1496 21-1496 #21-1496
$CNTLG	023471	#100-4113
$CNTLU	023464	#100-4113
$CPUOP	020170	#91-4095
$CRLF	001223	#21-1496 29-1813 29-1819 29-1826 66-3232 66-3233 66-3240 66-3245 93-4099
		93-4099 93-4099 95-4103 97-4107 97-4107 97-4107 100-4113 100-4113
$DBLK	023206	99-4111 99-4111 #99-4111
$DB20	024040	29-1852 30-1931 31-1954 #103-4124
$DDW0	020226	63-3118 #91-4095
$DDW1	020230	38-2152 38-2154 #91-4095
$DDW10	020252	#91-4095
$DDW11	020254	#91-4095
$DDW12	020256	#91-4095
$DDW13	020260	#91-4095
$DDW14	020262	#91-4095
$DDW15	020264	#91-4095

CKKUAE CREATED BY MACRO ON 11-JAN-82 AT 11:32 PAGE 15
SEQUENCE 153
CREF V01

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
$DDW2	020232	#91-4095								
$DDW3	020234	#91-4095								
$DDW4	020236	#91-4095								
$DDW5	020240	#91-4095								
$DDW6	020242	#91-4095								
$DDW7	020244	#91-4095								
$DDW8	020246	#91-4095								
$DDW9	020250	#91-4095								
$DEVCT	020152	#91-4095								
$DEVM	020220	#91-4095								
$DOAGN	022034	95-4103	95-4103	95-4103	#95-4103					
$DTBL	023176	99-4111	#99-4111							
$ENDAD	022024	19-1494	93-4099	#95-4103						
$ENDCT	021644	54-2657	#95-4103							
$ENULL	022100	#95-4103								
$ENV	020162	48-2459	49-2474	55-2761	#91-4095	93-4099	94-4101	94-4101	97-4107	
$ENVM	020163	48-2461	49-2476	54-2700	54-2729	77-3642	78-3692	#91-4095	94-4101	97-4107
		97-4107								
$EOP	021576	87-3976	87-3985	87-4008	88-4057	#95-4103				
$EOPCT	021636	*54-2657	#95-4103	95-4103						
$ERFLG	001101	#21-1496	92-4097	*92-4097	92-4097	92-4097	*92-4097	92-4097	92-4097	*93-4099
		93-4099	93-4099							
$ERMAX	001113	#21-1496	*54-2659	92-4097	*92-4097	92-4097	92-4097			
$ERROR	020704	54-2655	#93-4099							
$ERRPC	001114	#21-1496	29-1781	29-1900	*93-4099	*93-4099	93-4099	93-4099	93-4099	106-4208
		106-4211	106-4214	106-4215	106-4216	106-4217	106-4218	106-4219	106-4220	106-4221
		106-4222	106-4223	106-4224	106-4225	106-4226	106-4227	106-4228	106-4229	106-4230
$ERRTB	001366	#22-1496	29-1809	29-1814						
$ERTTL	001110	#21-1496	*55-2791	*56-2844	*57-2917	*61-3067	*68-3400	*69-3461	*88-4048	*93-4099
		93-4099	93-4099	95-4103	95-4103	*95-4103				
$ESCAP	001214	#21-1496	*54-2658	*92-4097	93-4099	93-4099	93-4099	93-4099		
$ETABL	020162	#91-4095								
$ETEND	020266	89-4067	#91-4095							
$FATAL	020144	#91-4095	*94-4101							
$FFLG	021574	*94-4101	*94-4101	94-4101	*94-4101	#94-4101				
$FILLC	001154	#21-1496	97-4107	97-4107	97-4107					
$FILLS	001153	#21-1496	97-4107	97-4107						
$GDADR	001116	#21-1496								
$GDDAT	001122	#21-1496								
$GET42	021776	#95-4103								
$GTSWR	= ******	101-4115								
$HD	= 000000	16-1485	16-1485	16-1485						
$HIBTS	020000	#89-4067								
$HIOCT	005736	*51-2590	#51-2595							
$ICNT	001102	#21-1496	*92-4097	92-4097	*92-4097	92-4097	92-4097			
$ILLUP	023766	102-4120	102-4120	#102-4120						
$INTAG	001133	#21-1496								
$ITEMB	001112	#21-1496	29-1779	*93-4099	93-4099	93-4099	*93-4099	93-4099	93-4099	93-4099
$LF	001224	#21-1496	93-4099	93-4099	97-4107	97-4107	100-4113	100-4113	100-4113	
$LFLG	021573	*94-4101	#94-4101							
$LOOP	022072	95-4103	#95-4103							
$LPADR	001104	#21-1496	*47-2449	*54-2669	*92-4097	*92-4097	92-4097	92-4097	92-4097	

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
$LPERR	001106	#21-1496	*42-2272	*44-2340	*47-2445	*54-2670	*55-2779	*55-2788	*56-2810	*56-2836
		*56-2843	*56-2854	*61-3054	*63-3136	*64-3170	*65-3202	*81-3808	*87-3981	92-4097
		*92-4097	92-4097	92-4097	93-4099					
$MADR1	020174	#91-4095								
$MADR2	020200	#91-4095								
$MADR3	020204	#91-4095								
$MADR4	020210	#91-4095								
$MAIL	020142	89-4067	89-4067	#91-4095	92-4097	93-4099	97-4107			
$MAMS1	020172	#91-4095								
$MAMS2	020176	#91-4095								
$MAMS3	020202	#91-4095								
$MAMS4	020206	#91-4095								
$MBADR	020002	#89-4067								
$MFLG	021572	*94-4101	94-4101	*94-4101	#94-4101					
$MNEW	023507	#100-4113								
$MSGAD	020156	#91-4095	*94-4101	94-4101						
$MSGLG	020160	#91-4095	*94-4101							
$MSGTY	020142	*35-2030	*36-2085	*37-2124	*54-2712	*55-2763	#91-4095	94-4101	*94-4101	94-4101
		*94-4101								
$MSWR	023476	#100-4113								
$MTYP1	020173	#91-4095								
$MTYP2	020177	#91-4095								
$MTYP3	020203	#91-4095								
$MTYP4	020207	#91-4095								
$MXCNT	020676	92-4097	92-4097	92-4097	#92-4097					
$NULL	001152	#21-1496	97-4107	97-4107	97-4107					
$NWTST	= 000001	#54-2753	54-2753	#55-2753	55-2753	#55-2808	55-2808	#56-2808	56-2808	#56-2876
		56-2876	#57-2876	57-2876	#58-2952	58-2952	#59-2952	59-2952	#59-3011	59-3011
		#60-3011	60-3011	#61-3087	61-3087	#62-3087	62-3087	#67-3280	67-3280	#68-3280
		68-3280	#68-3411	68-3411	#69-3411	69-3411	#69-3472	69-3472	#70-3472	70-3472
		#70-3489	70-3489	#71-3489	71-3489	#71-3503	71-3503	#72-3503	72-3503	#73-3567
		73-3567	#74-3567	74-3567	#74-3584	74-3584	#75-3584	75-3584	#75-3598	75-3598
		#76-3598	76-3598	#76-3633	76-3633	#77-3633	77-3633	#77-3689	77-3689	#78-3689
		78-3689	#78-3724	78-3724	#79-3724	79-3724	#79-3778	79-3778	#80-3778	80-3778
		#80-3796	80-3796	#81-3796	81-3796	#81-3833	81-3833	#82-3833	82-3833	#82-3846
		82-3846	#83-3846	83-3846	#83-3873	83-3873	#84-3873	84-3873	#84-3900	84-3900
		#85-3900	85-3900	#86-3972	86-3972	#87-3972	87-3972	#87-4015	87-4015	#88-4015
		88-4015								
$OCNT	022?06	*98-4109	*98-4109	#98-4109						
$OCTVL	024142	103-4124	#103-4124							
$OMODE	022770	*98-4109	*98-4109	98-4109	*98-4109	*98-4109	#98-4109			
$OVER	020662	92-4097	92-4097	92-4097	92-4097	#92-4097				
$PASS	020150	*54-2647	54-2677	66-3224	87-4000	#91-4095	92-4097	92-4097	92-4097	*95-4103
		*95-4103	95-4103	95-4103	95-4103					
$PASTM	020006	#89-4067								
$PWRAD	023750	#102-4120								
$PWRDN	023610	54-2656	#102-4120	102-4120						
$PWRMG	023744	#102-4120								
$PWRUP	023662	102-4120	#102-4120							
$QUES	001222	#21-1496	93-4099	93-4099	97-4107	97-4107	100-4113	100-4113	100-4113	
$RDCHR	023216	#100-4113	101-4115	101-4115						
$RDDEC	= ******	101-4115								

SYMBOL CROSS REFERENCE CREF V01

SYMBOL	VALUE	REFERENCES								
$RDLIN	023346	#100-4113	101-4115	101-4115						
$RDOCT	005630	#51-2565	101-4115	101-4115	101-4118					
$RDSZ	= 000010	#100-4113	100-4113							
$REGAD	001156	#21-1496								
$REG0	001160	#21-1496	*93-4099	106-4226						
$REG1	001162	#21-1496	*93-4099	106-4216						
$REG2	001164	#21-1496	*93-4099	106-4217	106-4223	106-4228				
$REG3	001166	#21-1496	*93-4099	106-4222	106-4228					
$REG4	001170	#21-1496	*93-4099	106-4222						
$REG5	001172	#21-1496	*93-4099	106-4230						
$RESRE	022142	#96-4105	101-4115							
$RTNAD	022074	#95-4103								
$RTRN	022070	54-2656	*54-2660	*54-2665	95-4103	#95-4103				
$R2A	= ******	101-4115								
$SAVRE	022104	#96-4105	101-4115	101-4115						
$SAVR6	023772	*102-4120	102-4120	*102-4120	*102-4120	#102-4120				
$SCOPE	020266	54-2655	#92-4097							
$SETUP	= 000037	#18-1491	18-1491	#18-1491	18-1491	#18-1491	18-1491	#18-1491	18-1491	#18-1491
		18-1491	#18-1491	92-4097	93-4099	93-4099	93-4099	93-4099	95-4103	95-4103
		100-4113	100-4113	102-4120						
$SSWR	000176	#28-1733	54-2697	54-2702	54-2703	*54-2707	*54-2709			
$STUP	= 177777	#18-1491	#18-1491	18-1491	#18-1491	#18-1491	18-1491	#18-1491	#18-1491	18-1491
		#18-1491	#18-1491	18-1491	#18-1491	#18-1491	18-1491			
$SVLAD	020626	92-4097	#92-4097							
$SVPC	= 000204	#19-1494	19-1494							
$SWR	= 177400	#16-1470	16-1485	16-1486	16-1486	16-1486	16-1486	16-1486	16-1486	16-1486
		16-1486	21-1496	21-1496	21-1496	55-2753	56-2808	57-2876	59-2952	60-3011
		62-3087	68-3280	69-3411	70-3472	71-3489	72-3503	74-3567	75-3584	76-3598
		77-3633	78-3689	79-3724	80-3778	81-3796	82-3833	83-3846	84-3873	85-3900
		87-3972	88-4015	92-4097	92-4097	92-4097	92-4097	92-4097	92-4097	92-4097
		92-4097	92-4097	92-4097	92-4097	92-4097	92-4097	92-4097	92-4097	92-4097
		92-4097	92-4097	92-4097	92-4097	93-4099	93-4099	93-4099	93-4099	93-4099
		93-4099	93-4099	93-4099	93-4099	93-4099	93-4099	95-4103	95-4103	95-4103
		95-4103	95-4103	102-4120						
$SWREG	020164	54-2731	77-3644	78-3694	#91-4095					
$SWRMK	= 000340	#16-1469	16-1486	16-1486	16-1486	16-1486	16-1486	16-1486	16-1486	16-1486
		16-1486	92-4097	92-4097	92-4097	92-4097	92-4097	92-4097	92-4097	92-4097
		92-4097	92-4097	92-4097						
$TBIT	022076	*54-2668	*95-4103	95-4103	95-4103	#95-4103	*102-4120			
$TESTN	020146	29-1900	52-2598	*87-3983	#91-4095	*92-4097	*93-4099	106-4205	106-4206	106-4207
		106-4208	106-4209	106-4210	106-4211	106-4212	106-4213	106-4214	106-4215	106-4216
		106-4217	106-4218	106-4219	106-4220	106-4221	106-4222	106-4223	106-4224	106-4225
		106-4226	106-4227	106-4228	106-4229	106-4230				
$TIMES	001212	#21-1496	*47-2450	*92-4097	92-4097	*92-4097	92-4097	92-4097	*95-4103	
$TKB	001144	#21-1496	97-4107	97-4107	97-4107	97-4107	100-4113	100-4113	100-4113	100-4113
$TKS	001142	#21-1496	54-2644	97-4107	97-4107	97-4107	97-4107	100-4113	100-4113	100-4113
		100-4113								
$TMPO	001174	#21-1496	*38-2149	38-2173	*56-2820	*56-2825	*57-2881	*57-2886	57-2887	57-2904
		*61-3048	*63-3132	64-3157	64-3163	64-3186	65-3201	65-3220	*68-3286	*68-3352
		68-3370	*68-3376	*79-3754	*79-3757	*79-3758	*83-3853	83-3854	83-3856	*83-3860
		83-3861	*84-3879	84-3880	*84-3882	84-3883	*84-3887	84-3888	*85-3906	85-3907
		85-3909	*85-3913	85-3914	106-4217	106-4218	106-4222	106-4223	106-4230	

SYMBOL CROSS REFERENCE

SYMBOL	VALUE	REFERENCES								
$TMP1	001176	#21-1496	*42-2286	*42-2289	*44-2369	*48-2465	*49-2480	*61-3049	106-4223	106-4230
$TMP2	001200	#21-1496	*42-2290	*44-2368	*45-2403	*45-2404	*45-2405	45-2406	*45-2406	*59-2953
		59-2998	*83-385.	*83-3855	83-3856	83-3861	*84-3880	*84-3881	84-3883	84-3888
		*85-3907	*85-3908	85-3909	85-3914					
$TMP3	001202	#21-1496	*57-2894	57-2895	*68-3329	68-3330	106-4221			
$TMP4	001204	#21-1496	*88-4036	*88-4041	106-4225					
$TMP5	001206	#21-1496	*41-2227	41-2232	41-2233	*60-3028	*60-3030	61-3070	61-3073	*88-4042
		106-4219	106-4225							
$TMP6	001210	#21-1496	*60-3015	*60-3023	60-3028					
$TN	= 000032	#16-1471	16-1485	54-2753	55-2753	55-2753	55-2753	#55-2753	55-2790	55-2808
		56-2808	56-2808	56-2808	#56-2808	56-2851	56-2853	56-2876	57-2876	57-2876
		57-2876	#57-2876	58-2952	59-2952	59-2952	59-2952	#59-2952	59-3011	60-3011
		60-3011	60-3011	#60-3011	61-3071	61-3087	62-3087	#62-3087	67-3280	68-3280
		68-3280	68-3280	#68-3280	68-3399	68-3411	69-3411	69-3411	69-3411	#69-3411
		69-3428	69-3460	69-3472	70-3472	70-3472	70-3472	#70-3472	70-3489	71-3489
		71-3489	71-3489	#71-3489	71-3503	72-3503	#72-3503	73-3567	74-3567	74-3567
		74-3567	#74-3567	74-3584	75-3584	75-3584	75-3584	#75-3584	75-3598	76-3598
		76-3598	76-3598	#76-3598	76-3633	77-3633	77-3633	77-3633	#77-3633	77-3645
		77-3648	77-3654	77-3689	78-3689	78-3689	78-3689	#78-3689	78-3711	78-3724
		79-3724	79-3724	79-3724	#79-3724	79-3778	80-3778	80-3778	80-3778	#80-3778
		80-3783	80-3796	81-3796	81-3796	81-3796	#81-3796	81-3806	81-3833	82-3833
		82-3833	82-3833	#82-3833	82-3836	82-3846	83-3846	83-3846	83-3846	#83-3846
		83-3873	84-3873	84-3873	84-3873	#84-3873	84-3900	85-3900	85-3900	85-3900
		#85-3900	86-3972	87-3972	87-3972	87-3972	#87-3972	87-4001	87-4015	88-4015
		88-4015	88-4015	#88-4015						
$TPB	001150	#21-1496	97-4107	97-4107	97-4107					
$TPFLG	001155	#21-1496	97-4107	97-4107	97-4107					
$TPS	001146	#21-1496	97-4107	97-4107	97-4107					
$TRAP	023520	54-2655	#101-4115							
$TRAP2	023542	#101-4115	101-4115							
$TRP	= 000016	#101-4115	101-4115	101-4115	101-4115	101-4115	#101-4115	101-4115	101-4115	101-4115
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		#101-4115	101-4115	101-4115	101-4115	101-4115	#101-4115	101-4116	101-4116	101-4116
		101-4116	#101-4116	101-4117	101-4117	101-4117	101-4117	#101-4117	101-4118	101-4118
		101-4118	101-4118	#101-4118						
$TRPAD	023554	101-4115	#101-4115							
$TSTM	020004'	#89-4067								
$TSTNM	001100	#21-1496	*47-2446	47-2447	*73-3524	*73-3528	*77-3640	*78-3710	*87-3982	92-4097
		92-4097	*92-4097	92-4097	92-4097	92-4097	92-4097	93-4099	93-4099	93-4099
		93-4099	*95-4103							
$TTYIN	023454	100-4113	100-4113	100-4113	#100-4113					
$TYPBN	= ******	101-4115								
$TYPDS	022772	#99-4111	101-4115	101-4115						
$TYPE	022200	94-4101	#97-4107	101-4115	101-4115					
$TYPEC	022412	97-4107	97-4107	97-4107	#97-4107					
$TYPEX	022542	97-4107	97-4107	97-4107	#97-4107					
$TYPOC	022570	#98-4109	101-4115	101-4115						
$TYPON	022604	98-4109	#98-4109	101-4115						
$TYPOS	022544	#98-4109	101-4115							

SYMBOL CROSS REFERENCE

SYMBOL		VALUE	REFERENCES			
$UNIT		020154	#91-4095			
$UNITM		020010	#89-4067			
$USWR		020166	#91-4095			
$VECT1		020212	#91-4095			
$VECT2		020214	#91-4095			
$XOFF	=	000023	97-4107	97-4107		
$XON	=	000021	97-4107	97-4107	97-4107	100-4113
$XTSTR		020372	#92-4097			
$$GET4	=	000001	#95-4103	#95-4103	95-4103	
$OFILL		022767	*98-4109	*98-4109	98-4109	#98-4109
$40CAT	=	******	92-4097	93-4099		
.$ASTA	=	******	94-4101	94-4101		
.$X	=	020000	#89-4067	89-4067		
.$Y	=	002026	#28-1731	28-1734		

CKKUAE CREATED BY MACRO ON 11-JAN-82 AT 11:32 PAGE 20
SEQUENCE 158

MACRO CROSS REFERENCE CREF V01

MACRO NAME	REFERENCES									
COMMEN	#17-1489									
DONE	#16-1346	95-4103								
ENDCOM	#17-1489									
ESCAPE	#17-1489									
GETPRI	#17-1489	#95-4103								
GETSWR	#17-1489									
MSG	#80-3787	#81-3796	#81-3828	#82-3833	#82-3840	#83-3846	#83-3867	#84-3873	#84-3894	#85-3900
	#87-4009	#88-4015								
MSG1	#54-2744	55-2753								
MSG11	#67-3262	68-3280								
MSG12	#68-3403	#69-3411								
MSG13	#69-3464	70-3472								
MSG14	#70-3479	71-3489								
MSG15	#71-3495	#72-3503								
MSG16	#73-3556	#74-3567								
MSG17	#74-3571	75-3584								
MSG2	#55-2794	#56-2808								
MSG20	#75-3590	76-3598								
MSG21	#76-3603	#77-3633								
MSG22	#77-3656	78-3689								
MSG220	#78-3712	79-3724								
MSG221	#79-3772	80-3778								
MSG23	#86-3961	#87-3972								
MSG4	#56-2864	#57-2876								
MSG5	#58-2942	#59-2952								
MSG6	#59-2999	#60-3011								
MSG7	#61-3074	#62-3087								
MULT	#17-1489									
NEWTST	#16-1462	#17-1489	#54-2753	#55-2808	#56-2876	#58-2952	#59-3011	#61-3087	#67-3280	#68-3411
	#69-3472	#70-3489	#71-3503	#73-3567	#74-3584	#75-3598	#76-3633	#77-3689	#78-3724	#79-3778
	#80-3796	#81-3833	#82-3846	#83-3873	#84-3900	#86-3972	#87-4015			
POP	#17-1489	#94-4101	#94-4101	#96-4105	#99-4111	#102-4120	#102-4120			
PUSH	#17-1489	94-4101	94-4101	94-4101	96-4105	99-4111	102-4120	102-4120		
REPORT	#17-1489									
SAVTST	#16-1384	#93-4099								
SETPRI	#17-1489									
SETTRA	#101-4115	101-4115	101-4115	101-4115	101-4115	101-4115	101-4115	101-4115	101-4115	101-4115
	101-4115	101-4116	101-4117	101-4118						
SETUP	#17-1489									
SKIP	#17-1489	#55-2790	#56-2851	#56-2853	#61-3071	#68-3399	#69-3428	#69-3460	#77-3645	#77-3648
	#77-3654	#80-3783	#81-3806	#82-3836	#87-4001					
SKIPJ	#16-1337	78-3711								
SLASH	#17-1489									
SPACE	#16-1343	#17-1489								
SSCOPE	#16-1362	#92-4097								
STARS	#17-1489	19-1494	21-1496	21-1496	29-1736	29-1776	30-1903	30-1913	31-1941	31-1946
	32-1963	32-1964	32-1966	32-1967	32-1969	32-1976	33-1984	33-1992	34-1998	34-2007
	35-2019	35-2026	36-2065	36-2067	36-2069	36-2081	37-2113	37-2120	38-2141	38-2148
	39-2177	39-2184	40-2191	40-2198	41-2205	41-2219	42-2255	42-2265	44-2321	44-2328
	46-2410	46-2424	47-2442	48-2453	48-2454	49-2470	50-2485	50-2546	51-2557	55-2753
	55-2753	56-2808	56-2808	57-2876	57-2876	59-2952	59-2952	60-3011	60-3011	62-3087
	62-3087	63-3107	63-3117	64-3152	64-3156	65-3192	65-3198	66-3223	67-3247	67-3252

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MACRO NAME      REFERENCES
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                 84-3873    85-3900    85-3900    85-3920    85-3926    86-3929    86-3960    87-3972    87-3972    88-4015
                 88-4015    89-4067    89-4067    89-4067    90-4070    91-4095    92-4097    93-4099    94-4101    95-4103
                 96-4105    97-4107    98-4109    99-4111    100-4113   100-4113   100-4113   101-4115   102-4120   102-4120
                 103-4124
SWRSU           #17-1489
TRACK           #16-1376    55-2753    56-2808    57-2876    59-2952    60-3011    68-3280    69-3411    70-3472    71-3489
                 74-3567    75-3584    76-3598    77-3633    78-3689    79-3724    80-3778    81-3796    82-3833    83-3846
                 84-3873    85-3900    87-3972    88-4015
TRACK1          #16-1379    55-2753    56-2808    57-2876    59-2952    60-3011    68-3280    69-3411    70-3472    71-3489
                 74-3567    75-3584    76-3598    77-3633    78-3689    79-3724    80-3778    81-3796    82-3833    83-3846
                 84-3873    85-3900    87-3972    88-4015
TRMTRP          #101-4115
TYPBIN          #17-1489
TYPDEC          #17-1489    95-4103    95-4103
TYPNAM          #17-1489
TYPNUM          #17-1489
TYPOCS          #17-1489
TYPOCT          #17-1489
TYPTXT          #16-1459   #17-1489   #95-4103   #95-4103
USER            #16-1404   #21-1496
ZEROER          #16-1352   #16-1394   #93-4099
$$CMRE          #20-1496   #21-1496   #21-1496   #21-1496   #21-1496   #21-1496   #21-1496
$$CMTM          #20-1496   #21-1496   #21-1496   #21-1496   #21-1496   #21-1496   #21-1496   #21-1496
$$ESCA          #17-1489
$$NEWT          #16-1462   #17-1489   #54-2753   #55-2808   #56-2876   #58-2952   #59-3011   #61-3087   #67-3280   #68-3411
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                #77-3654   #80-3783   #81-3806   #82-3836   #87-4001
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.HEADE          #16-1459    16-1485
.SETUP          #16-1459    18-1491
.SWRHI          #16-1273   #16-1486
.SWRLO          #16-1486    16-1487
.$ACT1          #16-1459    19-1494
.$APTB          #16-1463   #91-4095
.$APTH          #16-1463   #89-4067
.$APTY          #16-1463   #94-4101
.$CATC          #16-1459    18-1492
.$CMTA          #16-692    #16-1459   #20-1496
.$DB20          #16-1462    103-4124
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MACRO CROSS REFERENCE

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.$SAVE	#16-1461	96-4105
.$SCOP	#16-1042	92-4097
.$TRAP	#16-1462	#101-4115
.$TYPD	#16-1461	#99-4111
.$TYPE	#16-1461	97-4107
.$TYPO	#16-1461	98-4109
.1170	#16-1459	17-1489