PDP11/34

MEM MANG EXERCISER

MD-11-DFKTG-A

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IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-DFKTG-A
PRODUCT NAME:	11/34 MEMORY MANAGEMENT EXERCISER
DATE CREATED:	DECEMBER 21,1975
MAINTAINER:	DIAGNOSTIC ENGINEERING
AUTHOR:	GLENN JOHNSON

1.0 ABSTRACT

THIS PROGRAM IS AN INTERACTIVE EXERCISER FOR A PDP-11/34
IT PERFORMS A TEST OF INSTRUCTIONS AND
CONCURRENT OPERATIONS OF I/O EQUIPMENT WHILE RELOCATING THRU MEMORY.
IT PROVIDES NUMEROUS MODES OF TESTING, FROM 4K EXECUTION WITH
THE MEMORY MANAG. TURNED OFF AND ONLY KERNEL MODE IN USE, TO 128K EXECUTION
WITH EACH USER PAGE MAPPED SEQUENTIALLY TO EVERY 4K BANK OF MEMORY,
THIS PROGRAM IS NOT TO BE CONSIDERED A TOTAL CHECK OF THE
SYSTEM. IF AN ERROR IS DETECTED IN AN I/O DEVICE,
IT WILL PROBABLY BE NECESSARY TO CORRECT THE MALFUNCTION WITH THE
RESPECTIVE DIAGNOSTIC FOR THAT DEVICE.

2.0 REQUIREMENTS

2.1 EQUIPMENT

PDP-11/34 STANDARD COMPUTER
TELETYPE OR EQUIVALENT

2.1.1 OPTIONAL HARDWARE THAT THE PROGRAM WILL EXERCISE

MEMORY UP TO 124 KW OF MEMORY-DOES NOT HAVE TO BE CONTIGUOUS,
BUT BLOCKS OF LESS THAN 4KW WILL NOT BE USED
RF11 DISK
RK11 DISK
TC11 DECTAPE-TRANSPORT ONE(1)
KW11-L LINE CLOCK
KL11 ASR33 OR ASR35 TELEPRINTER
LP11 LINE PRINTER

2.2 STORAGE

THIS PROGRAM USES MEMORY FROM 00000 TO 17760.

3.0 LOADING PROCEDURE

PROCEDURE FOR NORMAL ABSOLUTE TAPES SHOULD BE FOLLOWED.

4.0 STARTING PROCEDURE AND SWITCH SETTINGS

4.1 NORMAL STARTING PROCEDURE

SET DESIRED MEMORY MANAGEMENT OPTION SWITCHES (IN LOC. 174,MMOPT)(SEE 4.2)-ALL
ZERO FOR WORST CASE TESTING.
SET DESIRED SWITCH REGISTER BITS
(USE LOC. 176 FOR SOFTWARE SWITCH REG. IF NECESSARY)
START AT 200.

D01

4.1 NORMAL STARTING PROCEDURE (CONTINUED)

THE PROGRAM WILL RING THE BELL (UNLESS THE TTY OUTPUT IS SELECTED) AT THE END OF EACH BANK. IF SWITCHES 0,1 AND 2 WERE ALL DOWN WHEN START WAS PRESSED (SELECTING THE USE OF 4K PHYSICAL ADDRESS SPACE AS 32K VIRTUAL ADDRESS SPACE-SEE 5.3.1) AN ASTERISK WILL BE TYPED AT THE END OF A FULL PASS THRU ALL MEMORY (UNLESS THE TTY OUTPUT IS SELECTED).

4.2 MEMORY MANAGEMENT SELECTION SWITCHES (BITS IN LOC. 174,MMOPT)..

THE SWITCHES SET BEFORE STARTUP DETERMINE THE WAY IN WHICH MEMORY IS MAPPED AND EXERCISED:

MMOPT BIT0=1 ---INHIBIT THE MEMORY MANAG. (SR0<0> WILL NOT BE SET AT ALL)
MMOPT BIT1=1 ---INHIBIT USE OF USER MODE.
(ALSO INHIBITS 4K AS 32K)
MMOPT BIT2=1 ---INHIBIT 4K AS 32 K (ALSO INHIBITED IF EITHER MMOPT BIT0 OR MMOPT BIT1 IS SET)-SEE SECTION 5.3.1 FOR EXPLANATION
MMOPT BIT5=1 ---INHIBIT VARIABLE CORE EXPANSION
=0 -CORE EXPAND UNLESS MMOPT BIT0, 1 AND 2 ARE ALL ZERO
(IN WHICH CASE 4K AS 32K IS RUN INSTEAD)

4.3 DEVICE SELECTION SWITCHES

THE DEVICE SELECTION SWITCHES ARE SET IN THE SWITCH REGISTER (USE LOC. 176 FOR SOFTWARE SR IF NECESSARY).
SEE ALSO 5.1.2. EACH SWITCH, IF SET, INHIBITS A SINGLE I/O DEVICE FROM BEING EXERCISED. IF A DEVICE DOES NOT EXIST, THE CORRESPONDING INHIBIT SWITCH DOES NOT HAVE TO BE SET.

SW0=1 ---INHIBIT TTY OUTPUT
SW3=1 ---INHIBIT RK11 DISK
SW4=1 ---INHIBIT LINE CLOCK
SW5=1 ---INHIBIT RF11 DISK
SW6=1 ---INHIBIT TC11 DECTAPE
SW7=1 ---INHIBIT LINE PRINTER (USE SA310 IF LP11 IS SELECTED)

4.4 RESTART PROCEDURE

USING RESTART ADDRESS 310 THE SWITCH REGISTER SETTINGS GIVEN PREVIOUSLY ARE USED (FOR BOTH MEMORY MANAGEMENT SELECTION AND DEVICE SELECTION). NO HALT OCCURS AFTER START IS PRESSED.

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

5.1.1 BASIC SWITCH SETTINGS-STARTUP

SEE SECTIONS 4.2 AND 4.3 FOR THE BASIC SWITCH SETTINGS USED AT STARTUP. THOSE SWITCHES ARE NOT RECHECKED AFTER THEY ARE INITIALLY STORED.

5.1.2 DYNAMIC SWITCH SETTINGS

@@NOTE: IF NO HARDWARE SWITCH REGISTER IS AVAILABLE, THE PROGRAM WILL AUTOMATICALLY USE THE CONTENTS OF LOC. 176 AS THE SOFTWARE SWITCH REGISTER.
THE USER SHOULD SET THIS LOCATION BEFORE STARTING THE PROGRAM.

THE FOLLOWING SWITCHES ARE RECHECKED PERIODICALLY DURING PROGRAM EXECUTION:

SW15=1 ---HALT ON ERROR
SW14=1 ---SCOPE LOOP
SW13=1 ---INHIBIT PRINT OUT
SW12=1 ---INHIBIT TRACE TRAPPING
SW11=1 ---INHIBIT SUB-PROGRAM ITERATION AND INHIBIT TESTS WHICH USE ALL COMBINATIONS OF NUMBERS
SW10=1 ---INHIBIT PROCESSOR TEST (ONCE SET, PROCESSOR TEST IS PERMANENTLY INHIBITED)

5.2 SUBROUTINE ABSTRACTS

5.2.1 SCOPE

THIS SUBROUTINE CALL IS PLACED BETWEEN EACH SUBTEST. IT RECORDS THE STARTING ADDRESS OF EACH SUBTEST AS IT IS BEING ENTERED. IF A SCOPE LOOP IS REQUESTED, IT WILL JUMP TO THE START OF THE SUBTEST THAT THE SCOPE LOOP IS REQUESTED FOR. IF A SCOPE LOOP IS NOT REQUESTED, THERE WILL BE 256 ITERATIONS ON THAT SUBTEST BEFORE THE NEXT SUBTEST IS ENTERED. SWITCH 11 ON A 1 INHIBITS ITERATION OF SUBTESTS.

F01

5.2.2 HLT

THIS EMT CALLS THE SUBROUTINE PRINT, WHICH PRINTS OUT THE LOCATION COUNTER AT THE TIME OF FAILURE, THE CONTENTS OF THE PROCESSOR STATUS REGISTER, AND THE CONTENTS OF THE CURRENT BANK COUNTER. NOTE THAT THE LOCATION COUNTER WILL BE THE VIRTUAL ADDRESS OF THE HLT PLUS TWO.

5.2.3 TRAPCATCHER

THIS IS A SERIES OF INSTRUCTIONS STARTING AT LOCATION 0 DESIGNED TO DETECT AND ISOLATE UNEXPECTED TRAPS AND INTERRUPTS TO THE TRAP AND INTERRUPT VECTOR AREA OF MEMORY.

EACH VECTOR ENTRANCE ADDRESS IS LOADED WITH THE ADDRESS OF THE NEXT LOCATION. THE NEXT LOCATION IS LOADED WITH A HALT (000000). THUS AN ILLEGAL TRAP OR INTERRUPT WILL CAUSE A HALT AT THE TRAP LOCATION PLUS TWO.

IF A HALT OCCURS IN THE TRAP OR INTERRUPT AREA EXAMINE KERNEL REGISTER SIX. IT WILL CONTAIN THE CURRENT STACK ADDRESS. THE CONTENTS OF THE CURRENT STACK ADDRESS IS THE VIRTUAL PC AT THE TIME THE TRAP OR INTERRUPT OCCURRED.

5.2.4 EMTSRV (EMT HANDLER)

THIS ROUTINE DECODES THE EMT CALLS AND PASSES CONTROL TO THE CORRECT SERVICE ROUTINE. THE ROUTINES HANDLED BY EMT CALLS ARE PRINT (HLT CALL) AND EOBSRV (EOB CALL).

5.2.6 EOBSRV (END OF BANK SERVICE)

THE VARIOUS EXECUTION OPTIONS FOR THIS EXERCISER REQUIRE SPECIAL HANDLING WHEN THE END OF THE PROCESSOR TESTS IS REACHED IN A BANK. THIS SERVICE ROUTINE PERFORMS THE VARIOUS MAPPING FUNCTIONS, DEPENDING UPON THE INITIAL SWITCH REGISTER SETTINGS.

5.2.7 BEGINX (CORE EXPANSION SPECIAL HANDLER)

WHEN CORE EXPANSION IS UTILIZED, A NUMBER OF SPECIAL ACTIONS MUST BE TAKEN AT THE BEGINNING OF EACH BANK. THE SCOPE ROUTINE VECTOR IS LOADED TO POINT TO THE NEW BANK, AND IF TC11 AND RF11 CODE AND BUFFER RELOCATION IS ALLOWED.

5.2.9 PFAIL (POWER FAIL)

IN THIS VERSION THE POWER FAIL ROUTINE IS NOT OPERABLE.

5.2.11 TYOUT (TTY OUTPUT)

THIS ROUTINE OUTPUTS A COUNT PATTERN IN THE INTERRUPT MODE TO THE TELEPRINTER.

5.2.12 RFSTART (RF11 DISK)

THIS ROUTINE PERFORMS A WRITE AND A WRITE CHECK OF THE DISK. THE DATA THAT IS WRITTEN ON THE DISK IS A PART OF THE TEST PROGRAM CODE THAT IS NEVER MODIFIED. THIS SEGMENT OF CORE IS WRITTEN IN CONTIGUOUS BLOCKS THRU THE DISK MEMORY. AFTER THE TOTAL DISK(S) HAS BEEN WRITTEN, A WRITE CHECK IS USED TO VERIFY THAT THE DATA HAS BEEN WRITTEN CORRECTLY ON THE DISK. NOTE THAT NO "DATI" ARE USED IN EXERCISING THE DISK (DATA IS NOT TRANSFERRED INTO MEMORY). THERE IS A LOCATION IN THE PROGRAM THAT IF MODIFIED WILL ALLOW EXERCISING UP TO EIGHT DISKS.

5.2.13 ENDZ (TC11 END ZONE HANDLER)

THIS ROUTINE IS PART OF THE TC11 SERVICE CODE. IT DRIVES THE DECTAPE INTO THE FORWARD OR REVERSE END ZONE, THEN REVERSES IT. IT ALSO DOES THE NECESSARY SETUP TO BEGIN READING OR WRITING THE TAPE.

5.2.14 REGEN (TC11 WRITE BUFFER REGENERATE ROUTINE)

THE TC11 CODE WRITES THE ENTIRE DECTAPE GOING FORWARD, THEN READS IT IN REVERSE. THE BUFFER IS REGENERATED BEFORE WRITING THE TAPE, AND IS CLEARED OUT ONCE THE ENTIRE TAPE HAS BEEN WRITTEN. THIS ROUTINE REGENERATES THE WRITE BUFFER.

5.2.15 RBN (TC11 READ BLOCK NUMBER SERVICE ROUTINE)

AT THE END OF EACH "BLOCK NUMBER FOUND" INTERRUPT, THIS ROUTINE IS ENTERED (UNLESS END ZONE IS BEING SEARCHED FOR). IT CHECKS FOR THE CORRECT SEQUENCE OF BLOCK NUMBERS, THEN SETS UP THE TC11 TO WRITE A BLOCK IF THE TAPE IS TRAVELLING FORWARD. IF IT IS GOING IN REVERSE, THE ROUTINE CHECKS TO SEE IF DATA IS STILL BEING CHECKED FROM A PREVIOUS READ. IF IT'S NOT, THE ROUTINE SETS UP TO READ A BLOCK. IF DATA IS STILL BEING CHECKED FROM BEFORE, IT SIMPLY DOES ANOTHER READ BLOCK NUMBER.

5.2.16 NXTBLK (TC11 READ BLOCK AND WRITE BLOCK SERVICE ROUTINE)

WHEN A READ BLOCK OR A WRITE BLOCK OPERATION IS COMPLETED, THIS ROUTINE IS ENTERED. IT CHECKS THE ERROR BIT, THEN SETS UP A CALL TO CHECK DATA IF DATA WAS JUST READ IN. THE ROUTINE ALSO SETS UP A READ BLOCK NUMBER OPERATION.

5.2.17 TCCK (TC11 CHECK DATA ROUTINE)

WHEN A READ BLOCK OPERATION HAS BEEN COMPLETED, THIS ROUTINE IS CALLED VIA A PRIORITY INTERRUPT REQUEST AT LEVEL 3. THE ENTIRE BUFFER IS CHECKED, AND THE CONTENTS OF THE BUFFER IS ALTERED AS THE CHECK PROGRESSES. THUS, IF A READ BLOCK OPERATION DOES NOT ACTUALLY READ IN ANY DATA, THE DATA CHECK ROUTINE WILL FIND BAD DATA INSTEAD OF SEEING GOOD DATA FROM AN EARLIER READ.

5.2.18 LCLK (LINE CLOCK)

THIS TEST OF THE LINE CLOCK IS IN THE INTERRUPT MODE. IF OPERATING CORRECTLY THE SYSTEM I/O WILL RUN AT FULL SPEED FOR 55 SECONDS. AND THEN ALL I/O AT LEVEL FOUR OR LESS (AND THE PROCESSOR TESTS) WILL STALL FOR 5 SECONDS. TIMES GIVEN ARE BASED ON 60 CYCLES AS THE LINE FREQUENCY.

5.2.19 LP1 (LINE PRINTER)

THIS ROUTINE OUTPUTS TO THE LINE PRINTER IN THE FLAG MODE WHILE FILLING THE BUFFER, AND IN THE INTERRUPT MODE WHILE THE BUFFER IS BEING PRINTED.

5.2.20 RKSTART (RK-11 DISK)

THIS ROUTINE PERFORMS A WRITE AND WRITE CHECK OF THE DISK. THE DATA THAT IS WRITTEN ON THE DISK IS PART OF THE TEST PROGRAM CODE THAT IS NEVER MODIFIED. THIS SEGMENT OF CORE IS WRITTEN IN CONTIGUOUS BLOCKS THRU THE DISK MEMORY. AFTER THE TOTAL DISK HAS BEEN WRITTEN, A WRITE CHECK IS USED TO VERIFY THAT DATA HAS BEEN WRITTEN CORRECTLY ON THE DISK.

5.2.22 CORE EXPANSION (DET1)

THIS ROUTINE IS CONTROLLED BY SWITCH 5. IF CALLED, THE PROCESSOR MAINLINE CODE WILL EXPAND TO THE MAXIMUM MEMORY THAT IS AVAILABLE (UP TO 28K). THE ROUTINE DETERMINES THE MAXIMUM MEMORY SIZE BY DOING A "DATO" TO A LOCATION IN EACH BANK. IF THE BANK DOES NOT EXIST, A TIMEOUT WILL OCCUR. AN IMAGE OF BANK 0 IS THEN TRANSFERRED TO EACH EXISTING BANK. THE CODE IN EACH BANK EXCEPT THE LAST IS MODIFIED TO CHANGE THE END OF BANK CALL TO A JUMP TO BEGINX (CORE EXPANSION SPECIAL HANDLER) IN THE NEXT BANK.

THE LISTING SHOWS ONLY THE CODE FOR BANK ZERO. WHEN AN ERROR OCCURS THAT IS NOT IN BANK ZERO, IGNORE THE BANK BITS OF THE PRINT OUT AND USE THE LISTING FOR BANK ZERO.

5.3 PROGRAM AND/OR OPERATOR ACTION

5.3.1 PROCESSOR TEST EXECUTION - 4K AS 32K

IF MMOPT BITS 0, 1, AND 2 ARE ALL ZERO (=0) AT STARTUP, THE PROCESSOR TEST WILL BE EXECUTED TREATING EACH 4K BANK AS 32K OF VIRTUAL ADDRESS SPACE. THE FOLLOWING DETAILS THIS MODE OF OPERATION.

USER PAGE 0 IS FIRST MAPPED RW, BANK 0, AND ALL OTHER USER PAGES ARE MAPPED NON-RESIDENT. THE PROCESSOR TESTS ARE EXECUTED IN USER THRU USER PAGE 0. WHEN DONE, USER PAGE 0 IS CHANGED TO NON-RESIDENT, AND USER PAGE 1 IS MAPPED RW, BANK 0. THE PC IS CHANGED TO ADDRESS THE START OF THE PROCESSOR TESTS THRU PAGE 1, AND ANOTHER PASS THRU THE PROCESSOR TESTS IS EXECUTED. AT THE END OF THIS PASS, USER PAGE 2 IS MAPPED RW, BANK 0, AND USER PAGE 1 IS MADE NON-RESIDENT. THE PC IS AGAIN CHANGED. THIS TIME TO ACCESS USER PAGE 2, AND THE PROCESSOR TESTS ARE EXECUTED THRU USER PAGE 2. THIS CYCLE IS REPEATED FOR THE REMAINING USER PAGES, MAPPING EACH IN TURN TO BANK 0 AND CHANGING THE PC TO EXECUTE THRU THE ONE CURRENTLY MAPPED. WHEN THE PASS USING USER PAGE 7 IS COMPLETED, A SEARCH IS MADE FOR THE NEXT 4K BANK OF MEMORY. WHEN A BANK IS FOUND, THE PROGRAM IS COPIED INTO THAT BANK FROM BANK 0. USER PAGE 0 IS MAPPED TO THE NEW BANK, AND THE PC IS CHANGED TO EXECUTE THRU USER PAGE 0. THE PREVIOUS CYCLE IS REPEATED, BUT THIS TIME EACH USER PAGE IS MAPPED IN TURN TO THE NEW BANK. ONCE EXECUTION THRU USER PAGE 7 IS COMPLETED, A SEARCH IS MADE FOR THE NEXT BANK. THE PREVIOUS BANK IS CLEARED (EXCEPT FOR THE LOADER), AND THE PROGRAM IS COPIED FROM BANK 0 INTO THE CURRENT BANK. THE CYCLE REPEATS UNTIL THE EXTERNAL BANK IS REACHED, AT WHICH POINT USER 0 IS MAPPED BACK TO BANK 0 AND THE PROCESS STARTS AGAIN.

5.3.2 PROCESSOR TEST EXECUTION - CORE EXPANSION

IF MMOPT BIT 1 OR 2 ARE ONE AND BIT 5 IS ZERO AT STARTUP,
THE PROCESSOR TESTS WILL BE CORE EXPANDED THRU ALL AVAILABLE
MEMORY UP TP 28K. THR ROUTINE DETI DOES THIS CORE EXPANSION,
COPYING BANK 0 INTO EACH OF THE OTHER BANKS. THE EMT CALL AT
THE END OF EACH BANK (EOB) WHICH CALLS THE END OF BANK SERVICE
ROUTINE IS CHANGED TO A JUMP TO BEGINX IN THE NEXT BANK.
THE EOB CALL IN THE LAST BANK IS LEFT ALONE. IF MMOPT BITS 0 AND 1
WERE BOTH ZERO AT STARTUP, USER PAGES 0 THRU 6 ARE MAPPED
SO THAT THE PHYSICAL AND VIRTUAL ADDRESSES CORRESPOND, AND THE
PROCESSOR TESTS ARE THEN RUN IN USER. IF BIT0 WAS ZERO BUT
BIT1 WAS SET, KERNEL PAGES 0-6 ARE MAPPED SO THAT THE PHYSICAL
AND VIRTUAL ADDRESSES ARE THE SAME, AND THE PROCESSOR TESTS ARE
THEN RUN IN KERNEL MODE. IF BIT0 WAS SET, ORDINARY CORE EXPANSION
IS RUN WITH NO SPECIAL MAPPING REQUIRED (MEMORY MANAG. IS TURNED OFF).

5.3.3 PROCESSOR TEST EXECUTION - BANK 0 ONLY

IF MMOPT BITS 0, 1 OR 2 ARE ONE AND BIT5 IS ONE AT STARTUP, ONLY
BANK 0 IS UTILIZED. IN THIS CASE, IF BIT0 AND BIT1 WERE ZERO
THE PROCESSOR TESTS ARE EXECUTED IN USER, WITH USER PAGE 0
MAPPED TO BANK 0. IF BIT0 WAS ZERO AND BIT1 WAS ONE, THE
PROCESSOR TESTS ARE EXECUTED IN KERNEL, WITH KERNEL PAGE 0
MAPPED TO BANK 0. IF BIT0 WAS ONE, THE MEMORY MANAG. IS TURNED OFF
AND THE PROCESSOR TESTS ARE EXECUTED IN KERNEL MODE OR USER
MODE (DEPENDING ON BIT1) IN BANK 0 ONLY.

6.0 ERRORS

6.1 ERROR PRINTOUT

PRINTOUTS ARE IN AN EXTENDED VERSION OF THE STANDARD FORMAT,
USING THREE WORDS. THE FIRST WORD IS THE OCTAL VALUE OF THE
VIRTUAL PC+2 OF THE DETECTED ERROR. THE SECOND WORD IS THE
CONTENTS OF THE PROCESSOR STATUS REGISTER WHEN THE ERROR WAS DETECTED.
THE THIRD IS THE TOP 12 BITS OF THE 18-BIT ADDRESS OF
THE BANK BEING CURRENTLY USED FOR EXECUTION OF THE PROCESSOR TEST.
THE FOURTH IS RETURN WHICH IS THE RETURN ADDRESS IN THE
CURRENT BANK OF MEMORY.
TO GET THE STARTING ADDRESS OF THE CURRENT BANK SIMPLY APPEND
TWO ZEROS TO THE END OF THE OCTAL VALUE PRINTED OUT (I.E.
007400 INDICATES THE BANK BEGINNING AT PHYSICAL ADDRESS
740000).

6.2 ERROR RECOVERY

IN GENERAL, TEST FAILURES WILL PRINTOUT AN ERROR MESSAGE AND
CONTINUE. IF THE "HALT ON ERROR" SWITCH IS SET, HITTING CONTINUE
WILL RECOVER. IF THE PROGRAM HANGS UP IN A LOOP, THE ERROR IS
LIKELY TO BE A SIGNAL WHICH WAS NEVER RECEIVED. IF A HALT
OCCURS IN THE TRAP AND VECTOR AREA THE PROGRAM MUST BE RESTARTED.
IF THE PROGRAM HALTS IN THE MAIN FLOW, CONSULT THE LISTING IF NO
MESSAGE IS TYPED OUT. FOR TTY READER AND HSR, TAPE MUST BE
REPOSITIONED TO LEADER BEFORE RESTARTING THE TEST.

6.3 FINDING WHICH PROCESSOR TEST WAS BEING EXECUTED WHEN AN ERROR OCCURRED

SOME ERRORS ARE DEPENDENT ON THE PROCESSOR TEST BEING RUN (SUCH AS LATENCY ERRORS WHICH ONLY SHOW UP IN WORST-CASE PROCESSOR TIMING). THE SCOPE ROUTINE CONTAINS A LOCATION CALLED "RETURN" WHICH STORES THE STARTING ADDRESS OF THE PROCESSOR TEST CURRENTLY BEING EXECUTED. NOTE THAT THE SCOPE ROUTINE IS EXECUTED IN USER MODE IF SW1 IS DOWN AT STARTUP, AND IS THEREFORE RELOCATED WITH THE PROCESSOR TESTS. THUS, TO DETERMINE WHICH PROCESSOR TEST WAS BEING EXECUTED WHEN A FAILURE OCCURRED, FIRST CHECK THE CONTENTS OF CURBNK IN BANK 0. THIS LOCATION CONTAINS THE ADDRESS OF THE CURRENT PHYSICAL BANK, SHIFTED RIGHT 6 PLACES. BY APPENDING 2 ZEROES TO IT, YOU HAVE THE 18-BIT ADDRESS OF THE CURRENT BANK OF MEMORY. ADD TO THIS THE ADDRESS OF RETURN IN BANK 0 AND YOU HAVE THE ADDRESS OF RETURN IN THE CURRENT BANK OF MEMORY. THE CONTENTS OF RETURN IN THE CURRENT BANK OF MEMORY IS THE VIRTUAL ADDRESS OF THE START OF THE CURRENT PROCESSOR TEST.

7.0 RESTRICTIONS

PROGRAM MUST BE LOADED INTO LOWER 4K OF MEMORY.

THE INHIBIT SWITCHES MUST ONLY BE SET FOR ALL DEVICES THAT ARE PART OF THE SYSTEM BUT WHICH YOU DO NOT WISH TO RUN.

IF THE LINE PRINTER IS USED, STARTING ADDRESS 310 MUST BE USED.

NO1

8.0 MISCELLANEOUS

8.1 EXECUTION TIME

EXECUTION TIME VARIES WITH THE AMOUNT OF MEMORY, THE TYPES OF MEMORY, THE DEVICES RUN, AND THE OPTIONAL MODES OF EXECUTION USED.

A PASS RUN WITH CORE EXPANSION AND 4K AS 32K RELOCATION BOTH INHIBITED TAKES LESS THAN 10 SECONDS (RUNNING NO I/O).

A PASS RUN WITH 4K AS 32K, IN CORE MEMORY WITH NO I/O, TAKES ABOUT 5MINUTES PER 4K BANK. (AN ASTERISK IS PRINTED AT THE END OF A FULL PASS, AND THE BELL IS RUNG AT THE END OF EACH 4K BANK).

8.2 STACK POINTERS

THE KERNEL STACK POINTER IS INITIALIZED TO 17760.

THE USER STACK POINTER IS INITIALIZED TO 400. IT IS RELOCATED THRU ALL USER PAGES AND TO EVERY 4K BANK IF THE 4K AS 32K MODE OF EXECUTION IS RUN.

9.0 PROGRAM DESCRIPTION

THIS MEMORY MANAGEMENT EXERCISER IS DESIGNED TO RUN BACKGROUND
PROCESSOR TESTS AND FOREGROUND CONCURRENT I/O WITH MEMORY
MANAGEMENT UTILIZED IN ANY OF SEVERAL DIFFERENT MODES. THE VARIOUS
MODES AVAILABLE FOR UTILIZING MEMORY MANAGEMENT ARE INCLUDED TO AID
IN FAULT ISOLATION BY PROVIDING A SERIES OF STEPS FROM SIMPLE TO COMPLEX.
MEMORY MANAGEMENT CAN BE LEFT TURNED OFF AND THE PROCESSOR TESTS
CAN STILL BE RUN IN 4K ONLY OR CORE EXPANDED UP TO 28K.
WITH MEMORY MANAGEMENT ON, THE PROGRAM CAN
BE RUN USING ONLY 4K, WITH EVERYTHING MAPPED IN KERNEL SPACE
OR WITH USER AND KERNEL BOTH USED. AT THE NEXT LEVEL
OF COMPLEXITY, CORE EXPANSION CAN BE RUN WITH MEMORY MANAGEMENT
ON, USING KERNEL ONLY OR USING BOTH MODES AS DESIRED.
FINALLY, ALL AVAILABLE MEMORY (IN 4K PIECES) CAN BE UTILIZED BY
RUNNING 4K AS 32K.
THERE IS NO MONITOR IN THE CONVENTIONAL SENSE. EACH DEVICE THAT
IS TO BE EXERCISED HAS ITS OWN STAND ALONE ROUTINE THAT OPERATES
IN THE INTERRUPT MODE. THESE ROUTINES NEED NO SUPERVISION OR
MONITORING AFTER THEY ARE INITIATED. THERE IS A PRIMER AREA
THAT CHECKS THE SWITCH REGISTER TO SEE WHAT DEVICES ARE TO BE
INITIATED. IT SETS THE INTERRUPT ENABLE BIT IN THE DEVICE STATUS
REGISTER, INITIALIZES THE DATA PATTERN, AND INITIATES AN OPERATION
TO RAISE DATA FLAGS ON DEVICES THAT CAN NOT INITIATE THEM THEMSELVES.
THE PRIMER CODE THEN ENTERS THE MEMORY MANAG. SETUP CODE.
THE RF11 AND TC11 PRIMER CODE IS IN WITH THE MEMORY MANAG. SETUP
CODE SINCE THEY REQUIRE CERTAIN PARTS OF THE MEMORY MANAG. CODE TO
BE RUN FIRST. AFTER MEMORY MANAGEMENT IS TURNED ON, EXECUTION
OF THE BACKGROUND PROCESSOR TESTS BEGINS, AND THE I/O DEVICES ARE
SERVICED WHEN THEY INTERRUPT.

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                                ;THIS PROGRAM IS A MODIFICATION OF THE 11/40 DIAGNOSTIC, DBKTG.
                                ;THIS TEST HAS BEEN MODIFIED TO PROVIDE SOFTWARE SWITCH CAPABILITY
                                ;AND TO ACCOUNT FOR ANY 11/34 - 11/40 DIFFERENCES.
                                ;THIS PROGRAM IS INTENDED FOR USE ON ONLY 11/34 PROCESSORS.


                                ;COPYRIGHT 1975, DIGITAL EQUIPMENT CORPORATION, MAYNARD, MASS. 01754
                                ;PDP11/34 SYSTEM EXERCISER, WITH MEMORY MANAG. --- TTY,PC11,KW11-L
                                ;LP11,RF11,TC11
                                ;TEST SIMULTANEOUS RUNNING OF I/O, WITH PROCESSOR INSTRUCTION TEST AND
                                ;WITH TRACE BIT ENABLED TO BE CONSIDERED MAINLINE CODE

                                ;I/O RUNS IN KERNEL MODE
                                ;CPU TESTS RUN IN USER MODE UNLESS INHIBITED BY SR SETTINGS
                                ;MEMORY MANAG. IS UTILIZED

                                ;(R6) IS THE STACK POINTER
                                ;((R6)) IS THE PC+2 OF LOCATION WHERE THE TRAP ORIGINATED
                                ;FOR NORMAL OPERATION RUN WITH ALL SWITCHES DOWN
                                ;SA - 200
                                ;RESTART - 310 ( OPTION SETTINGS PREVIOUSLY MADE ARE USED)

                                ;AT STARTUP, MMOPT(LOC. 174) SETTINGS ARE:
                                ;MMOPT BIT 0=1  --- RUN WITHOUT MEMORY MANAG.
                                ;MMOPT BIT 1=1  --- RUN ALL IN KERNEL MODE (INHIBITS RUNNING 4K AS 32K)
                                ;MMOPT BIT 2=1  --- INHIBIT RUNNING 28K USER MEMORY MANAG. FROM EVERY 4K
                                                ;BANK (ALLOW NORMAL CORE EXPANSION)
                                ;MMOPT BIT 5=1 ---INHIBIT VARIABLE CORE EXPANSION

                                ;SR (USE LOC. 176 IF NECESSARY) BIT SETTINGS ARE:
                                ;SR 15=1  ---HALT ON ERROR
                                ;SR 14=1 ---SCOPE LOOP
                                ;SR 13=1 ---INHIBIT PRINT OUT
                                ;SR 12=1 ---INHIBIT TRACE TRAPPING
                                ;SR 11=1 ---INHIBIT SUB-PROGRAM ITERATION AND INHIBIT TESTS WHICH
                                                ;USE ALL COMBINATIONS OF NUMBERS
                                ;SR 10=1 ---INHIBIT PROCESSOR TEST

                                ;SPECIAL DELETE SWITCHES-SET RESPECTIVE SWITCH TO A 1 TO INHIBIT
                                ;INITIATION OF DEVICE
                                ;SW 0=1 INHIBIT TTY OUTPUT
                                ;SW 3=1 INHIBIT RK11 DISK
                                ;SW 4=1 INHIBIT LINE CLOCK
                                ;SW 5=1 INHIBIT RF11 DISK
                                ;SW 6=1 INHIBIT TC11 DECTAPE
                                ;SW 7=1 INHIBIT LINE PRINTER

                                ;DEFINITIONS
000240                                  NOP=240                 ;SYSTEM NULL OPERATION
104400                                  SCOPE=TRAP              ;TRAP USED SCOPE LOOP AND ITERATION
000410                                  TCSR=TTCSR
000412                                  TDBR=TTDBR
177776                                  PSR=177776
104006                                  HLT=104006              ;ERROR PRINTOUT CALL
104010                                  EOB=104010              ;END OF BANK CALL
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                000000                          R0=%0
                000001                          R1=%1
                000002                          R2=%2
                000003                          R3=%3
                000004                          R4=%4
                000005                          R5=%5
                000006                          SP=%6
                000006                          R6=SP
                000007                          PC=%7

                                                .SBTTL MAIN
                                        ;TRAP CATCHER
                000000                          .=0
 000000         000002                          .+2                     ;TRAP ENTRANCE
 000002         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000004         000006                          .+2                     ;TRAP ENTRANCE
 000006         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000010         000012                          .+2                     ;TRAP ENTRANCE
 000012         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000014         000016                          .+2                     ;TRAP ENTRANCE
 000016         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000020         000022                          .+2                     ;TRAP ENTRANCE
 000022         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000024         000026                          .+2                     ;TRAP ENTRANCE
 000026         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000030         000032                          .+2                     ;TRAP ENTRANCE
 000032         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000034         000036                          .+2                     ;TRAP ENTRANCE
 000036         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000040         000042                          .+2                     ;TRAP ENTRANCE
 000042         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000044         000046                          .+2                     ;TRAP ENTRANCE
 000046         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000050         000052                          .+2                     ;TRAP ENTRANCE
 000052         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000054         000056                          .+2                     ;TRAP ENTRANCE
 000056         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000060         000062                          .+2                     ;TRAP ENTRANCE
 000062         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000064         000066                          .+2                     ;TRAP ENTRANCE
 000066         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000070         000072                          .+2                     ;TRAP ENTRANCE
 000072         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000074         000076                          .+2                     ;TRAP ENTRANCE
 000076         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000100         000102                          .+2                     ;TRAP ENTRANCE
 000102         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000104         000106                          .+2                     ;TRAP ENTRANCE
 000106         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000110         000112                          .+2                     ;TRAP ENTRANCE
 000112         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000114         000116                          .+2                     ;TRAP ENTRANCE
 000116         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000120         000122                          .+2                     ;TRAP ENTRANCE
 000122         000000                          HALT                    ;TRAPPED TO PREVIOUS LOCATION
 000124         000126                          .+2                     ;TRAP ENTRANCE
```

E02


```
645  000126  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
646  000130  000132          .+2             ;TRAP ENTRANCE
647  000132  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
648  000134  000136          .+2             ;TRAP ENTRANCE
649  000136  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
650  000140  000142          .+2             ;TRAP ENTRANCE
651  000142  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
652  000144  000146          .+2             ;TRAP ENTRANCE
653  000146  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
654  000150  000152          .+2             ;TRAP ENTRANCE
655  000152  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
656  000154  000156          .+2             ;TRAP ENTRANCE
657  000156  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
658  000160  000162          .+2             ;TRAP ENTRANCE
659  000162  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
660  000164  000166          .+2             ;TRAP ENTRANCE
661  000166  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
662  000170  000172          .+2             ;TRAP ENTRANCE
663  000172  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
664  000174  000176          .+2             ;TRAP ENTRANCE
665  000176  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
666  000200  000202          .+2             ;TRAP ENTRANCE
667  000202  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
668  000204  000206          .+2             ;TRAP ENTRANCE
669  000206  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
670  000210  000212          .+2             ;TRAP ENTRANCE
671  000212  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
672  000214  000216          .+2             ;TRAP ENTRANCE
673  000216  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
674  000220  000222          .+2             ;TRAP ENTRANCE
675  000222  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
676  000224  000226          .+2             ;TRAP ENTRANCE
677  000226  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
678  000230  000232          .+2             ;TRAP ENTRANCE
679  000232  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
680  000234  000236          .+2             ;TRAP ENTRANCE
681  000236  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
682  000240  000242          .+2             ;TRAP ENTRANCE
683  000242  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
684  000244  000246          .+2             ;TRAP ENTRANCE
685  000246  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
686  000250  000252          .+2             ;TRAP ENTRANCE
687  000252  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
688  000254  000256          .+2             ;TRAP ENTRANCE
689  000256  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
690  000260  000262          .+2             ;TRAP ENTRANCE
691  000262  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
692  000264  000266          .+2             ;TRAP ENTRANCE
693  000266  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
694  000270  000272          .+2             ;TRAP ENTRANCE
695  000272  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
696  000274  000276          .+2             ;TRAP ENTRANCE
697  000276  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
698  000300  000302          .+2             ;TRAP ENTRANCE
699  000302  000000          HALT            ;TRAPPED TO PREVIOUS LOCATION
700  000304  000306          .+2             ;TRAP ENTRANCE
```

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    701 000306  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    702 000310  000312                          .+2                                     ;TRAP ENTRANCE
    703 000312  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    704 000314  000316                          .+2                                     ;TRAP ENTRANCE
    705 000316  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    706 000320  000322                          .+2                                     ;TRAP ENTRANCE
    707 000322  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    708 000324  000326                          .+2                                     ;TRAP ENTRANCE
    709 000326  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    710 000330  000332                          .+2                                     ;TRAP ENTRANCE
    711 000332  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    712 000334  000336                          .+2                                     ;TRAP ENTRANCE
    713 000336  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    714 000340  000342                          .+2                                     ;TRAP ENTRANCE
    715 000342  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    716 000344  000346                          .+2                                     ;TRAP ENTRANCE
    717 000346  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    718 000350  000352                          .+2                                     ;TRAP ENTRANCE
    719 000352  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    720 000354  000356                          .+2                                     ;TRAP ENTRANCE
    721 000356  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    722 000360  000362                          .+2                                     ;TRAP ENTRANCE
    723 000362  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    724 000364  000366                          .+2                                     ;TRAP ENTRANCE
    725 000366  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    726 000370  000372                          .+2                                     ;TRAP ENTRANCE
    727 000372  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    728 000374  000376                          .+2                                     ;TRAP ENTRANCE
    729 000376  000000                          HALT                                    ;TRAPPED TO PREVIOUS LOCATION
    730
    731                                 ;LOAD VECTOR AREA
    732         000024                          .=24
    733 000024  016634                          PFAIL                   ;POWER FAIL TRAP
    734 000026  000340                          340
    735         000030                          .=30
    736 000030  015050                          EMTSRV                          ;EMT CALLS
    737 000032  000340                          340                             ;HIGHEST PRIORITY
    738         000034                          .=34
    739 000034  014642                          SCOPEC                          ;USER TRAP
    740 000036  000000                          0
    741         000046                          .=46
    742 000046  015662                          LOGICAL
    743         000052                          .=52
    744 000052  040000                          40000
    745         000174                          .=174
    746 000174  000000                  MMOPT:  0                       ;MEMORY MANAG OPTION SEL.
    747 000176  000000                  SWREG:  0                       ;SOFTWARE SWITCH REG
    748         000176                  SREG2=SWREG
    749
    750
    751                                 ;LOAD STARTING AREA
    752         000200                          .=200
    753 000200  000137  000640                  JMP     @#START
    754         000300                          .=300
    755 000300  000137  000640                  JMP     @#START
    756         000310                          .=310
```

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   757  000310  000137  000616                    JMP     @#RSTRT
   758
   759                                ;DATA AREA
   760          000400                            .=400
   761  000400  000000                UBUFF:  0                       ;BUFFER FOR USER SP
   762          000406                            .=.+4               ;FOR STACK OVERRUN
   763  000406  177560                TRCSR:  177560                  ;TTY READER STATUS REGISTER
   764  000410  177564                TTCSR:  177564                  ;TTY PUNCH STATUS REGISTER
   765  000412  177566                TTDBR:  177566
   766  000414  000064                TTPVC:  64
   767  000416  000066                TTPST:  66
   768  000420  000000                TTSAV:  0
   769  000422  000100                KWLVC:  100
   770  000424  000102                KWLST:  102
   771  000426  177546                LKCSR:  177546
   772  000430  177514                LPCSR:  177514
   773  000432  177516                LPDBR:  177516
   774  000434  000200                LPVC:   200
   775  000436  000202                LPST:   202
   776  000440  177470                RFDAE:  177470                  ;DISK ADDRESS AND ERROR
   777  000442  177466                RFDAR:  177466                  ;DISK ADDRESS REGISTER
   778  000444  177462                RFWC:   177462                  ;WORD COUNT REGISTER
   779  000446  177464                RFCAR:  177464                  ;CURRENT ADDRESS REGISTER
   780  000450  177460                RFCSR:  177460                  ;STATUS REGISTER
   781  000452  177461                RFCSRH: 177461                  ;HIGH BYTE ADDRESS OR CSR
   782  000454  000204                RFVC:   204
   783  000456  000206                RFST:   206
   784  000460  177413                RKDAH:  177413          :HIGH BYTE DISK ADR
   785  000462  177412                RKDAE:  177412                  ;DISK ADDRESS REGISTER
   786  000464  177406                RKWC:   177406          ;WORD COUNT REGISTER
   787  000466  177410                RKBAR:  177410          ;CURRENT ADDRESS REGISTER
   788  000470  177404                RKCSR:  177404                  ;STATUS REGISTER
   789  000472  177405                RKCSRH: 177405                  ;HIGH BYTE OF CSR
   790  000474  000220                RKVC:   220                      ;TRAP VECTOR
   791  000476  000222                RKST:   222
   792  000500  177572                SR0:    177572                  ;MEMORY MANAG.  REGISTERS
   793  000502  177600                UPDR0:  177600
   794  000504  177602                UPDR1:  177602
   795  000506  177616                UPDR7:  177616
   796  000510  177640                UPAR0:  177640
   797  000512  177642                UPAR1:  177642
   798  000514  177656                UPAR7:  177656
   799  000516  172300                KPDR0:  172300
   800  000520  172302                KPDR1:  172302
   801  000522  172304                KPDR2:  172304
   802  000524  172316                KPDR7:  172316
   803  000526  172340                KPAR0:  172340
   804  000530  172342                KPAR1:  172342
   805  000532  172344                KPAR2:  172344
   806  000534  172356                KPAR7:  172356
   807
   808  000536  177600                IPDRTAB:177600
   809  000540  177640                        177640
   810  000542  172300                        172300
   811  000544  172340                IPDREND:172340
   812  000546  177570                SR:     177570          ;SWITCH REGISTER POINTER
```

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                                SRH:    177571          ;HIGH BYTE SWITCH REG POINTER
                                TCCM:   177342                  ;CONTROL AND FUNCTION
                                TCST:   177340                  ;GENERAL STATUS
                                TCDT:   177350                  ;DATA
                                TCWC:   177344                  ;WORD COUNT
                                TCBA:   177346                  ;BUS ADDRESS
                                TCIV:   214                     ;DECTAPE INTERRUPT VECTOR
                                TCSTA:  216
                                CUF  K: 0                       ;SAF TO POINT TO CURRENT BANK
                                OLI  K: 0
                                CUF  R: 0                       ;ADDRESS OF CURRENT ISAR
                                CUF OR:0
                                BNKSTR: 0                       ; PC TO POINT TO BEGIN THRU CURRENT SEGMENT
                                TRP9:   0
                                ;THE NEXT TWO WORDS ARE THE MEMORY MAP. THE FIRST WORD REPRESENTS
                                ;0-64K WITH ONE BIT REPRESENTING A 4K CONTIGUOUS BLOCK. IF THE
                                ;BIT=1 THAT 4K BLOCK IS PRESENT. THE LSB REPRESENTS 0-4K, THE NEXT
                                ;SIGNIFICANT BIT REPRESENTS 4-8K ANS SO ON.
                                  10:   177777                  ;0-64K
                                  11:   77777                   ;64-124K
                                CUREPT: 1
                                MEMUT:  MEMO
                                TBANK:  0

                                ;RESTART ADD USING INITIAL SR SETTINGS
000616  012706  017760          RSTRT:  MOV     #KSTACK,R6
000622  012737  016634  000024          MOV     #PFAIL,@#24
000630  117737  17:714  000177          MOVB    @SRH,@#SREG2+1
000636  000452                        BR      START1

                                ;START UP FOR MINI MONITOR

000640  012706  017760          START:  MOV     #KSTACK,R6              ;SET UP STACK
000644  012737  000137  000200          MOV     #137,@#200              ;RESTORE 200 IF START AT 300
000652  012737  00 1640  000202          MOV     #START,@#202
000660  013746  00 0004                MOV     @#4,-(SP)       ;;SAVE ERROR VECTOR
000664  013746  00 0006                MOV     @#6,-(SP)
000670  012767  000704  177106          MOV     #1$,4           ;;SET UP TIME OUT VECTOR
000676  005777  177644                  TST     @SR             ;;TRY TO PEFERENCE HARDWARE SWR
000702  000404                        BR      2$              ;;BRANCH IF NO TIMEOUT TRAP OCCURS
000704  012767  000176  177634  1$:     MOV     #SWREG,SR       ;;POINT TO SOFTWARE SWR
000712  022626                        CMP     (SP)+,(SP)+     ;;RESTORE STACK
000714  016767  177626  177626  2$:     MOV     SR,SRH
000722  005267  177622                  INC     SRH             ;POINT TO HIGH BYTE OF SR
000726  012637  000006                  MOV     (SP)+,@#6       ;;RESTORE ERROR VECTOR
000732  012637  000004                  MOV     (SP)+,@#4
000736  005737  000042                  TST     @#42                    ;CHECK FOR MONITOR OPERATION
000742  001405                        BEQ     STARTX
000744  005037  000174                  CLR     @#MMOPT                 ;RUN ALL SW DOWN IF MONITOR
000750  005037  000176                  CLR     @#SREG2
000754  000403                        BR      START1
000756                          STARTX:
000756  017737  177564  000176          MOV     @SR,@#SREG2
000764  004767  014016          START1: JSR     %7,MRALL
000770  012777  077406  177520          MOV     #77406,@KPDR0
000776  012777  007600  177530          MOV     #7600,@KPAR7    ;MAP PAGE 7 TO EXT BANK
```

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DFKTG-A MACY11 27(732)  10-SEP-76  09:51  PAGE 21
DFKTGA.P11      MAIN

   869  001004  012777  077406  177512          MOV     #77406,@KPDR7
   870  001012  005067  177576                  CLR     TBANK
   871  001016  012767  177777  177560          MOV     #177777,MEM0    ;SET UP CORE MAPS
   872  001024  012767  077777  177554          MOV     #77777,MEM1
   873  001032  012767  000001  177550          MOV     #1,COREPT       ;SET UP 4K POINTER
   874  001040  012767  000024  177544          MOV     #MEM0,MEMUT
   875  001046  012777  077406  177446          MOV     #77406,@KPDR2   ;BEING CHECKED FOR
   876  001054  012737  001124  000004          MOV     #TIMEX,@#4      ;SET UP FOR TIME OUTS
   877  001062  005037  000006                  CLR     @#6
   878  001066  052777  000001  177404          BIS     #1,@SR0
   879  001074  016777  177514  177430  MAP1:   MOV     TBANK,@KPAR2    ;MAP KERNEL PAGE 2 TO BANK
   880  001102  005737  041000                  TST     @#41000         ;1ST K PRESENT
   881  001106  005737  045000                  TST     @#45000         ;2ND K PRESENT
   882  001112  005737  051000                  TST     @#51000         ;3RD K PRESENT
   883  001116  005737  055000                  TST     @#55000         ;4TH K PRESENT
   884  001122  000404                          BR      MOVEPT          ;OK, FULL 4K BLOCK PRESENT
   885  001124  047777  177460  177460  TIMEX:  BIC     COREPT,@MEMUT   ;NO, BLOCK NOT PRESENT
   886  001132  062626                          CMP     (SP)+,(SP)+     ;ADJUST STACK POINTER
   887  001134  062767  000200  177452  MOVEPT: ADD     #200,TBANK      ;UPDATE BANK POINTER
   888  001142  006367  177442                  ASL     COREPT
   889  001146  103006                          BCC     MAP2            ;THIS 1ST MEM WORD DONE
   890  001150  012767  000001  177432          MOV     #1,COREPT
   891  001156  012767  000606  177426          MOV     #MEM1,MEMUT
   892  001164  022767  007600  177422  MAP2:   CMP     #7600,TBANK     ;EXTERNAL BANK YET
   893  001172  001340                          BNE     MAP1            ;NO,NOT YET?
   894  001174  012767  000001  177406          MOV     #1,COREPT       ;RE-INIT
   895  001202  012767  000604  177402          MOV     #MEM0,MEMUT
   896  001210  042777  000001  177262          BIC     #1,@SR0
   897  001216  012767  000001  013510          MOV     #1,ICOUNT
   898  001224  004767  015452                  JSR     %7,CRLF
   899  001230  012737  014642  000034          MOV     #SCOPEC,@#34
   900  001236  005037  000036                  CLR     @#36                    ;INITIALIZE SCOPE CALL TO KERNEL STATUS
   901  001242  012737  015700  000030          MOV     #EMTSRV,@#30
   902  001250  012737  000340  000032          MOV     #340,@#32
   903  001256  012737  005452  014740          MOV     #BEGIN,@#RETURN
   904  001264  005037  014736                  CLR     @#SCOPEF
   905  001270  012737  000340  177776          MOV     #340,@#PSR              ;LOCK OUT INTERRUPTS
   906  001276  005037  016352                  CLR     @#PRTON                 ;PRINT ROUTINE BUSY FLAG
   907  001302  000005                          RESET
   908  001304  012737  002314  000004          MOV     #NODEV,@#4                      ;RETURN FOR NO DEVICE
   909  001312  005037  000006                  CLR     @#6
   910  001316  005067  001444                  CLR     DATA2                   ;BASE DATA FOR TTY TELEPRINTER
   911  001322  005737  000042                  TST     @#42                    ;ACT 11?
   912  001326  001403                          BEQ     ST3A                    ;YES
   913  001330  052737  000001  000176          BIS     #1,@#SREG2              ;INHIBIT TTY OUT
   914  001336  033727  000176  000001  ST3A:   BIT     @#SREG2,#1                      ;INHIBIT TTY OUTPUT?
   915  001344  001006                          BNE     ST3                     ;YES, GO CHECK NEXT.
   916  001346  012777  003000  177040          MOV     #TYOUTR,@TTPVC          ;NO, SETUP INTERRUPT VECTOR
   917  001354  052777  000100  177026          BIS     #100,@TTCSR             ;START TTY OUTPUT
   918  001362  012700  000010          ST3:    MOV     #10,R0
   919  001366  032737  000010  000176          BIT     #10,@#SREG2             ;INHIBIT RK DISK
   920  001374  001026                          BNE     ST4                     ;YES, SKIP OVER
   921  001376  005777  177066                  TST     @RKCSR          ;PRESENT
   922  001402  012777  003376  177064          MOV     #IRK,@RKVC              ;SETUP VECTOR RETURNS
   923  001410  012777  000240  177060          MOV     #240,@RKST
   924  001416  012767  043503  002014          MOV     #43503,RKFUNCT
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925  001424  005077  177032                CLR     @RKDAE                  ;INIT
926  001430  016777  002144  177030        MOV     LLIMIT,@RKBAR           ;CORE BASE
927  001436  016777  002140  177020        MOV     WORDCT,@RKWC            ;TRANSFER LENGTH
928  001444  116777  001770  177016        MOVB    RKFUNCT,@RKCSR
929  001452  006300                ST4:    ASL     R0
930  001454  033727  000176  000020        BIT     @#SREG2,#20             ;INHIBIT LINE CLOCK?
931  001462  001015                        BNE     ST5                     ;YES, GO CK NEXT
932  001464  005777  176736                TST     @LKCSR                  ;PRESENT
933  001470  012777  003C56  176724        MOV     #LK3,@KWLVC
934  001476  012777  000330  176720        MOV     #300,@KWLST
935  001504  005067  001442                CLR     TIME                    ;NO, INITIALIZE COUNT
936  001510  012777  000100  176710        BIS     #100,@LKCSR             ;START LINE CLOCK
937  001516  006300                ST5:    ASL     R0
938  001520  033727  000176  000040        BIT     @#SREG2,#40             ;TEST FOR INHIBITING RF11 DISK
939  001526  001026                        BNE     ST6                     ;SKIP IF SET
940  001530  005777  176714                TST     @RFCSR                  ;PRESENT?
941  001534  012777  003472  176712        MOV     #IRF,@RFVC              ;SET UP TRAP RETURN
942  001542  012777  000240  176706        MOV     #240,@RFST
943  001550  012767  043503  002020        MOV     #43503,RFFUNCT          ;WRITE CHECK/WRITE
944  001556  105277  176670                INCB    @RFCSRH                 ;INITIALIZE DISK-DAR,DAE
945  001562  016777  002014  176654        MOV     WORDCT,@RFWC            ;LENGTH OF TRANSFER
946  001570  016777  002004  176650        MOV     LLIMIT,@RFCAR           ;CORE ADDRESS OF START OF TRANSFER
947  001576  116777  001774  176644        MOVB    RFFUNCT,@RFCSR          ;START RF11 READ OR WRITE
948  001604  006300                ST6:    ASL     R0
949  001606  033727  000176  000100        BIT     @#SREG2,#100            ;CHECK FOR INHIBITING TC11 DECTAPE
950  001614  001013                        BNE     ST7                     ;SKIP IF SET
951  001616  005777  176732                TST     @TCST                   ;PRESENT
952  001622  012777  003612  176734        MOV     #FENDZ,@TCIV            ;GO TO END ZONE ON INTERRUPT
953  001630  012777  000300  176730        MOV     #300,@TCSTA
954  001636  012777  004503  176706        MOV     #R+IE+RB+DO,@TCCM       ;START REVERSE READ BLOCK NUMBER
955  001644  006300                ST7:    ASL     R0
956  001646  005737  000042                TST     @#42                    ;ACT 11?
957  001652  001402                        BEQ     1$                      ;YES
958  001654  050037  000176                BIS     R0,@#SREG2
959  001660  033727  000176  000200  1$:   BIT     @#SREG2,#200            ;INHIBIT LINE PRINTER?
960  001666  001032                        BNE     ST8                     ;YES, GO CK NEXT
961  001670  005777  176534                TST     @LPCSR                  ;PRESENT?
962  001674  012737  001754  000004        MOV     #ST8,@#4                ;DON'T CHANGE 200 IF NO SUCH DEVICE
963  001702  012767  000137  001246        MOV     #137,SOLPAT             ;RESET FOR START OF LINE PATTERN
964  001710  012767  000117  001332        MOV     #79.,CLINCT             ;LINE COUNT
965  001716  012767  000137  001234        MOV     #137,CURPAT
966  001724  012777  000014  176500        MOV     #14,@LPDBR              ;LINE FEED TO POSITION BUFFER
967  001732  012777  003200  176474        MOV     #LPINTR,@LPVC           ;INTERRUPT ENABLE
968  001740  012777  000200  176470        MOV     #200,@LPST              ;PROCESSOR LEVEL 4
969  001746  012777  000100  176454        MOV     #100,@LPCSR             ;INTERRUPT ENABLE
970  001754  005037  000602                CLR     @#TRPB                  ;NO "T" BIT FIRST PASS
971  001760  005037  000006                CLR     @#6                     ;CHANGE ADDRESS ERROR VECTOR TO CAUSE
972  001764  012737  000006  000004        MOV     #6,@#4                  ;HALT ON A TRAP TO 4
973  001772  004737  016676                JSR     %7,@#USER               ;FOR USER I/O PROGRAM INSERTION
974  001776  004767  000332                JSR     %7,DETI                 ;CHECK FOR CORE EXPANSION
975  002002  032737  000001  000174        BIT     #1,@#MMOPT              ;INHIBIT MEMORY MANAG.?
976  002010  001106                        BNE     MODE                    ;YES - GO SETUP USER
977  002012  004767  012770                JSR     %7,NRALL                ;NO - MAKE ALL SEGMENTS INITIALLY NON-RESIDENT
978  002016  012777  077406  176500        MOV     #77406,@KPDR7
979  002024  012777  007600  176502        MOV     #7600,@KPAR7
980  002032  032737  000006  000174        BIT     #6,@#MMOPT              ;INHIBIT USER/KERNEL OR 4K AS 32K?
```

```
  981  002040  001415                          BEQ     SEGM1                   ;NO - BRANCH
  982  002042  012701  000007                  MOV     #7,R1                   ;YES - MAP KERNEL ASR'S 0-6 TO PA
  983  002046  016702  176454                  MOV     KPARO,R2
  984  002052  005003                          CLR     R3
  985  002054  010312                  SETEX:  MOV     R3,@R2
  986  002056  012762  077406  177740          MOV     #77406,-40(R2)
  987  002064  005722                          TST     (R2)+
  988  002066  062703  000200                  ADD     #200,R3
  989  002072  077110                          SOB     R1,SETEX
  990  002074  012777  077406  176414  SEGM1:  MOV     #77406,@KPDRO           ;MAP KERNEL 0 TO BANK 0, RW
  991  002102  032737  000004  000174          BIT     #4,@#MMOPT              ;INHIBIT RUNNING 4K AS 32K?
  992  002110  001416                          BEQ     USEALL                  ;NO, SETUP FOR RUNNING 4K AS 32K
  993  002112  012701  000010                  MOV     #10,R1                  ;YES, MAP ALL USER ASR'S TO PA
  994  002116  016702  176366                  MOV     UPARO,R2
  995  002122  005003                          CLR     R3
  996  002124  010312                  SETUSE: MOV     R3,(R2)
  997  002126  062703  000200                  ADD     #200,R3
  998  002132  012762  077406  177740          MOV     #77406,-40(R2)
  999  002140  005722                          TST     (R2)+
 1000  002142  077110                          SOB     R1,SETUSE
 1001  002144  000425                          BR      SETSEG
 1002  002146  012777  077406  176326  USEALL: MOV     #77406,@UPDRO           ;MAP USER ASRO TO BANK 0, RW
 1003  002154  012737  000000  000570          MOV     #0,@#CURBNK             ;CURRENT SAR CONTENTS
 1004  002162  012767  000001  176420          MOV     #1,COREPT               ;INIT MAP POINTERS
 1005  002170  012767  000604  176414          MOV     #MEMO,MEMUT
 1006  002176  016767  176306  176370          MOV     UPARO,CURPAR            ;CURRENT SEGMENT REGISTER ADDRESSES
 1007  002204  016767  176272  176364          MOV     UPDRO,CURPDR
 1008  002212  012767  002452  176360          MOV     #BEGIN,BNKSTR           ;CURRENT STARTING PC
 1009  002220  052777  000001  176252  SETSEG: BIS     #1,@SRO                 ;SET MEMORY MANAG. BIT
 1010  002226  042737  000340  177776  MODE:   BIC     #340,@#PSR              ;PRIORITY LEVEL 0
 1011  002234  032737  000002  000174          BIT     #2,@#MMUPT              ;INHIBIT USER/KERNEL?
 1012  002242  001016                          BNE     MAIN+2                  ;YES - SKIP OVER
 1013  002244  052737  140000  000036          BIS     #140000,@#36            ;SET USER BIT IN SCOPE STATUS
 1014  002252  012746  000400                  MOV     #UBUFF,-(R6)
 1015  002256  052737  030000  177776          BIS     #30000,@#PSR
 1016  002264  006606                          MTPI    SP                      ;SET UP USER STACK
 1017  002266  012737  140000  177776          MOV     #140000,@#PSR           ;CHANGE TO USER
 1018  002274  000401                          BR      .+4
 1019  002276  000001                  MAIN:   WAIT
 1020  002300  033727  000176  002000          BIT     @#SREG2,#2000           ;INHIBIT PROCESSOR TEST
 1021  002306  001373                          BNE     MAIN
 1022  002310  000167  003136                  JMP     BEGIN
 1023
 1024                                          ;NON-EXISTING DEVICE SERVICE
 1025  002314  050037  000176          NODEV:  BIS     R0,@#SREG2              ;SET INHIBIT BIT
 1026  002320  162716  000006                  SUB     #6,(SP)                 ;ALTER PC RETURN
 1027  002324  042766  000017  000002          BIC     #17,2(SP)               ;CLEAR Z BIT ON STACK
 1028  002332  000002                          RTI
 1029
 1030                                          ;PDP-11 MEMORY DETERMINATION AND SETUP/
 1031                                          ;USE WITH VARIABLE CORE QUANTITY SYSTEMS/
 1032  002334  012767  104010  012236  DETI:   MOV     #EOB,DONE               ;RESTORE INITIAL CODE
 1033  002342  032767  000007  175624          BIT     #7,MMUPT                ;INHIBIT RUNNING 4K AS 32K USER?
 1034                                                                          ;OR INHIBIT SEGMENTATION?
 1035  002350  001001                          BNE     .+4                     ;YES - ALLOW CORE EXPANSION
 1036  002352  000207                          RTS     %7                      ;NO - INHIBIT CORE EXPANSION
```

```
1037  002354  032737  000040  000174          BIT     #40,@#MMOPT             ;CHECK VARIABLE CORE SWITCH
1038  002362  001401                          BEQ     DET4                    ;USE VARIABLE CORE ROUTINE
1039  002364  000207                          RTS     %7                      ;4K ONLY (SWITCH SET)
1040  002366  012737  002452  000004  DET4:   MOV     #DET2,@#4               ;TRAP VECTOR SETUP
1041  002374  012737  000340  000006          MOV     #340,@#6                ;TRAP STATUS SETUP
1042  002402  000241                          CLC
1043  002404  005537  037770          EIGHT:  ADC     @#37770                 ;CHECK FOR 8K
1044  002410  000240                          NOP
1045  002412  005537  057770                  ADC     @#57770                 ;CHECK FOR 12K
1046  002416  000240                          NOP
1047  002420  005537  077770                  ADC     @#077770                ;CHECK FOR 16K
1048  002424  000240                          NOP
1049  002426  005537  117770                  ADC     @#117770                ;CHECK FOR 20K
1050  002432  000240                          NOP
1051  002434  005537  137770                  ADC     @#137770                ;CHECK FOR 24K
1052  002440  000240                          NOP
1053  002442  005537  157770                  ADC     @#157770                ;CHECK FOR 28K
1054  002446  000240                          NOP
1055  002450  000437                          BR      STRT28
1056  002452  012602                  DET2:   MOV     (6)+,%2                 ;RETRIEVE TRAP PC
1057  002454  005726                          TST     (6)+                    ;DISCARD TRAP STATUS WORD
1058  002456  062702  000074                  ADD     #STRT4-EIGHT-4,R2
1059  002462  000112                          JMP     @R2
1060
1061  002464  005000                  MOVE:   CLR     %0                      ;SET UP MAIN CORE POINTER
1062  002466  010102                          MOV     %1,%2
1063  002470  062702  015006                  ADD     #0+2,%2                 ;SET UP MAX CORE MOVE
1064  002474  012021                          MOV     (0)+,(1)+               ;MOVE WORD
1065  002476  020201                          CMP     %2,%1                   ;MOVE COMPLETE?
1066  002500  001375                          BNE     .-4                     ;MOVE ANOTHER WORD
1067  002502  000207                          RTS     %7                      ;MOVE COMPLETE
1068  002504  000521                  STRT4:  BR      DET3
1069  002506  000240                          NOP
1070  002510  000240                          NOP
1071  002512  004767  000110                  JSR     7,XFER8                 ;START 8K TRANSFER
1072  002516  000506                          BR      004                     ;START 4K MODIFY
1073  002520  004767  000072                  JSR     %7,XFER12               ;START 12K TRANSFER
1074  002524  000475                          BR      M008                    ;START 8K MODIFY
1075  002526  004767  000054                  JSR     %7,XFER16               ;START 16K TRANSFER
1076  002532  000464                          BR      M012                    ;START 12K MODIFY
1077  002534  004767  000036                  JSR     %7,XFER20               ;START 20K TRANSFER
1078  002540  000453                          BR      M016                    ;START 16K MODIFY
1079  002542  004767  000020                  JSR     %7,XFER24               ;START 24K TRANSFER
1080  002546  000442                          BR      M020                    ;START 20K MODIFY
1081  002550  004767  000002          STRT28: JSR     %7,XFER28               ;START 28K TRANSFER
1082  002554  000431                          BR      M024                    ;START 24K MODIFY
1083  002556  012701  140000          XFER28: MOV     #140000,%1              ;SET UP MOVE START LOCATION
1084  002562  004767  177676                  JSR     %7,MOVE                 ;GO TO MOVE SUBROUTINE
1085  002566  012701  120000          XFER24: MOV     #120000,%1
1086  002572  004767  177666                  JSR     %7,MOVE
1087  002576  012701  100000          XFER20: MOV     #100000,%1
1088  002602  004767  177656                  JSR     %7,MOVE
1089  002606  012701  060000          XFER16: MOV     #60000,%1
1090  002612  004767  177646                  JSR     %7,MOVE
1091  002616  012701  040000          XFER12: MOV     #40000,%1
1092  002622  004767  177636                  JSR     %7,MOVE
```

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DFKTG-A MACY11 27(732)  10-SEP-76  09:51  PAGE 25
DFKTGA.P11      MAIN

1093  002626  012701  020000          XFER8:  MOV     #20000,%1
1094  002632  004767  177626                  JSR     %7,MOVE
1095  002636  000207                          RTS     %7                      ;RETURN FROM TRANSFERS
1096  002640  012767  000137  131732  MOD24:  MOV     #137,DONE+120000
1097  002646  012767  145420  131726          MOV     #BEGINX+140000,DONE+120002
1098  002654  012767  000137  111716  MOD20:  MOV     #137,DONE+100000
1099  002662  012767  125420  111712          MOV     #BEGINX+120000,DONE+100002
1100  002670  012767  000137  071702  MOD16:  MOV     #137,DONE+60000
1101  002676  012767  105420  071676          MOV     #BEGINX+100000,DONE+60002
1102  002704  012767  000137  051666  MOD12:  MOV     #137,DONE+40000
1103  002712  012767  065420  051662          MOV     #BEGINX+60000,DONE+40002
1104  002720  012767  000137  031652  MOD8:   MOV     #137,DONE+20000
1105  002726  012767  045420  031646          MOV     #BEGINX+40000,DONE+20002
1106  002734  012767  000137  011636  MOD4:   MOV     #137,DONE
1107  002742  012767  025420  011632          MOV     #BEGINX+20000,DONE+2
1108  002750  005037  000006          DET3:   CLR     @#6
1109  002754  012737  000006  000004          MOV     #6,@#4
1110  002762  000207                          RTS     %7
1111
1112                                  ;TTY TRANSMITTER PRINT VALUES 0 TO 377/
1113  002764  005027  000000          TYOUT:  CLR     #0                      ;INITAL DATA
1114          002766                          DATA2=.-2
1115  002770  016777  177772  175414  TYOUT1: MOV     DATA2,@TTDBR            ;OUTPUT TO DEVICE
1116  002776  000002                          RTI                             ;RETURN TO MAINLINE**
1117  003000  017767  175404  175412  TYOUTR: MOV     @TTCSR,TTSAV
1118  003006  105767  175406                  TSTB    TTSAV                   ;TEST FOR DONE
1119  003012  100401                          BMI     .+4                     ;BRANCH IF FLAG FOUND
1120  003014  104006                          HLT                             ;FALSE INTERRUPT RETURN
1121  003016  005267  177744                  INC     DATA2                   ;INCREMENT DATA
1122  003022  022767  000400  177736          CMP     #400,DATA2              ;TEST DATA FOR UPPER LIMIT
1123  003030  001755                          BEQ     TYOUT                   ;AT UPPER LIMIT START OVER
1124  003032  000756                          BR      TYOUT1                  ;FINISH REST OF DATA
1125
1126                                  ;TEST OF LINE CLOCK, INTERRUPT FOR 55 SECONDS THEN STALL FOR 5 SECONDS.
1127  003034  005037  003152          LK1:    CLR     @#TIME                  ;CLEAR LINE CLOCK TIMER
1128  003040  052777  000100  175360          BIS     #100,@LKCSR
1129  003046  052737  000100  177776          BIS     #100,@#PSR
1130  003054  000002          LK2:    RTI
1131  003056  105777  175344  LK3:    TSTB    @LKCSR
1132  003062  100401                          BMI     .+4
1133  003064  104006                          HLT                             ;FALSE INTERRUPT
1134  003066  042777  000200  175332          BIC     #200,@LKCSR
1135  003074  005237  003152  LK4:    INC     @#TIME                  ;HERE ON INTERRUPTS
1136  003100  022737  006344  003152          CMP     #3300.,@#TIME           ;55 SEC YET?
1137  003106  103362                          BHIS    LK2                     ;BR IF NOT
1138  003110  042777  000100  175310          BIC     #100,@LKCSR
1139  003116  042737  000100  177776          BIC     #100,@#PSR              ;LOWER PRIORITY
1140  003124  022737  007020  003152          CMP     #3600.,@#TIME           ;ONE MINUTE YET
1141  003132  001740                          BEQ     LK1                     ;YES RESET TIMER
1142  003134  105777  175266                  TSTB    @LKCSR                  ;NO, SKIP TILL MINUTE UP
1143  003140  100375                          BPL     .-4
1144  003142  042777  000200  175256          BIC     #200,@LKCSR             ;CLEAR FLAG
1145  003150  000751                          BR      LK4
1146  003152  000000          TIME:   0
1147
1148                                  ;LINE PRINTER SHOULD RAISE PROCESSOR PRIORITY TO LEVEL OF LINE PRINTER/
```

```
1149                                        ;INTERRUPT VECTOR IS 200/
1150  003154  012727  000000  000000  LP1:    MOV     #0,#0                   ;START OF LINE TO CURRENT
1151           003160                        CURPAT=.-2                      ;CHARACTER BEING PRINTED
1152           003156                        SOLPAT=.-4                      ;START OF LINE CHARACTER
1153  003162  016777  177772  175242  LP2:    MOV     CURPAT,@LPDBR           ;CURRENT PATTERN TO LINE PRINTER
1154  003170  105777  175234                  TSTB    @LPCSR
1155  003174  100420                        BMI     LP6
1156  003176  000002                        RTI                             ;RETURN TO MAIN LINE
1157  003200  105777  175224          LPINTR: TSTB    @LPCSR                  ;TEST FOR FLAG
1158  003204  100414                        BMI     LP6
1159  003206  005737  000042                TST     @#42                    ;MONITOR LOAD
1160  003212  001410                        BEQ     LP7                     ;NO, ERROR
1161  003214  032777  100000  175206        BIT     #100000,@LPCSR          ;YES, IS ERROR SET
1162  003222  001404                        BEQ     LP7                     ;NO, ERROR
1163  003224  042777  000100  175176        BIC     #100,@LPCSR             ;DISABLE INTERRUPT
1164  003232  000002                        RTI
1165  003234  104006          LP7:    HLT                             ;FALSE RETURN FROM MAIN LINE
1166  003236  026727  000006  000117  LP6:    CMP     CLINCT,#79.             ;TEST FOR END OF LINE
1167  003244  001415                        BEQ     LP4                     ;GO GENERATE CR/LF
1168  003246  005227  000000                INC     #0                      ;INCREMENT LINE POSITION COUNT
1169           003250                        CLINCT=.-2                      ;POSITION OF LINE
1170  003252  026727  177702  000137        CMP     CURPAT,#137             ;TEST FOR MAXIMUM PATTERN
1171  003260  001403                        BEQ     LP3                     ;YES - GO TO LP3 AND RESET
1172  003262  005267  177672                INC     CURPAT                  ;NO - INCREMENT TO NEXT PATTERN
1173  003266  000735                        BR      LP2                     ;GO SEND IT TO LINE PRINTER
1174  003270  012767  000040  177662  LP3:    MOV     #40,CURPAT              ;RESET PATTERN AND SEND TO PRINTER
1175  003276  000731                        BR      LP2                     ;SENT TO LINE PRINTER
1176  003300  005067  177744          LP4:    CLR     CLINCT                  ;RESET LINE COUNT
1177  003304  012777  000012  175120        MOV     #12,@LPDBR              ;LINE FEED
1178  003312  105777  175112                TSTB    @LPCSR
1179  003316  100375                        BPL     .-4
1180  003320  026727  177632  000137        CMP     SOLPAT,#137             ;START OF LINE PATTERN
1181  003326  001403                        BEQ     LP5
1182  003330  005267  177622                INC     SOLPAT                  ;INCREMENT START OF LINE
1183  003334  000707                        BR      LP1
1184  003336  012767  000040  177612  LP5:    MOV     #40,SOLPAT              ;RESET START OF LINE
1185  003344  000703                        BR      LP1                     ;PRINT
1186
1187                                        ;RK11 DISK TEST INTERRUPT LEVEL 5, 2000 WORD TRANSFERS
1188  003346  005077  175110          RKSTART:        CLR     @RKDAE  ;INIT
1189  003352  013777  003600  175106  RK1:    MOV     @#LLIMIT,@RKBAR         ;CORE BASE
1190  003360  013777  003602  175076          MOV     @#WORDCT,@RKWC          ;TRANSFER LENGTH
1191  003366  113777  003440  175074          MOVB    @#RKFUNCT,@RKCSR        ;WRITE OR WRITE CK TO DSK
1192  003374  000002                        RTI                             ;RETURN TO MAINLINE
1193  003376  032777  100200  175064  IRK:    BIT     #100200,@RKCSR         ;INTERRUPT RETURN
1194  003404  003002                        BGT     .+6
1195  003406  104006                        HLT
1196  003410  000756                        BR      RKSTART
1197  003412  032777  000037  175042          BIT     #37,@RKDAE              ;DISK AT UPPER LIMIT?
1198  003420  001354                        BNE     RK1
1199  003422  122777  000031  175030          CMPB    #31,@RKDAH
1200  003430  001350                        BNE     RK1
1201  003432  000337  003440                SWAB    @#RKFUNCT               ;CHANGE COMMAND
1202  003436  000743                        BR      RKSTART                 ;RESTART NEW TRANSFER OF DISK
1203  003440  000000          RKFUNCT:        0
1204
```

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1205                                                    ;RF11 DISK
1206  003442  105277  175004                RFSTART:    INCB    @RFCSR+1        ;INITIALIZE DISK - DAR-DAE
1207  003446  013777  003600  174772        RF1:        MOV     @#LLIMIT,@RFCAR ;CORE BASE
1208  003454  013777  003602  174762                    MOV     @#-WORDCT,@RFWC ;LENGTH OF TRANSFER
1209  003462  113777  003576  174760                    MOVB    @#RFFUNCT,@RFCSR        ;WRITE OR WRITE CHECK TO DISK
1210  003470  000002                                    RTI                     ;RETURN TO MAINLINE CODE
1211  003472  105777  174752                IRF:        TSTB    @RFCSR          ;INTERRUPT VECTOR POINTS HERE
1212  003476  100402                                    BMI     .+6
1213  003500  104006                                    HLT                     ;RF11 READY NOT UP
1214  003502  000757                                    BR      RFSTART
1215  003504  005777  174740                            TST     @RFCSR          ;ERROR SET?
1216  003510  100012                                    BPL     ERROK           ;BRANCH IF NOT
1217  003512  032777  020000  174730                    BIT     #20000,@RFCSR   ;YES-WRITE CHECK ERROR?
1218  003520  001404                                    BEQ     ERRSET          ;NO-BRANCH
1219  003522  104006                                    HLT                     ;YES-RF11 WRITE CHECK ERROR
1220  003524  000337  003576                          SWAB    @#RFFUNCT       ;CHANGE COMMAND TO DO WRITE
1221  003530  000744                                    BR      RFSTART
1222  003532  104006                ERRSET:     HLT                             ;RF11 ERROR SET-NOT WRITE CHECK
1223  003534  000742                                    BR      RFSTART
1224  003536  005777  174702                ERROK:      TST     @RFWC
1225  003542  100002                                    BPL     .+6
1226  003544  104006                                    HLT                     ;RF-11 WORD COUNT NOT ZERO
1227  003546  000735                                    BR      RFSTART
1228  003550  122777  000003  174662                    CMPB    #3,@RFDAE       ;DISK AT UPPER LIMIT? 7=2, 17=4, 37=8
1229  003556  001333                                    BNE     RF1             ;NO
1230  003560  027727  174656  174000                    CMP     @RFDAR,#174000  ;AS FAR ON DISK AS WE CAN GO
1231  003566  101727                                    BLOS    RF1             ;NO
1232  003570  000337  003576                          SWAB    @#RFFUNCT       ;CHANGE COMMAND
1233  003574  000722                                    BR      RFSTART         ;RESTART NEW TRANSFER OF DISK
1234  003576  000000                RFFUNCT:            0                       ;DISK COMMAND
1235  003600  005452                LLIMIT: BEGIN                               ;FIRST CORE ADDRESS OF TRANSFER
1236  003602  176000                WORDCT: -2000                               ;LENGTH OF TRANSFER
1237
1238                                                    ;DECTAPE DIAGNOSTIC ROUTINE.  THE TAPE IS FIRST DRIVEN TO THE FORWARD
1239                                                    ;END ZONE. THE DESIRED DATA IS THEN GENERATED IN THE DECTAPE BUFFER AREA
1240                                                    ;AND DATA IS WRITTEN ONTO ALL BLOCKS FROM THE BLOCK NUMBER IN TCFRST
1241                                                    ;THRU THE BLOCK NUMBER IN TCLAST.  BLOCK NUMBERS ARE ALSO CHECKED FOR
1242                                                    ;BEING IN ORDER. AFTER THE BLOCK NUMBER IN TCLAST IS WRITTEN, TAPE IS
1243                                                    ;DRIVEN INTO THE REVERSE END ZONE.
1244                                                    ;THE TAPE IS THEN STARTED IN REVERSE, AND WHEN THE CLOSEST BLOCK THAT
1245                                                    ;WAS WRITTEN (TCLAST) IS FOUND, IT IS READ INTO THE DECTAPE BUFFER AREA.
1246                                                    ;THE PROGRAM INTERRUPT REQUEST FACILITY IS THEN USED TO BOOK A REQUEST
1247                                                    ;FOR CHECKING THE DATA AT LEVEL 3, AND NO FURTHER DATA IS READ IN
1248                                                    ;UNTIL THAT DATA HAS BEEN CHECKED.  AFTER IT IS CHECKED, THE DATA IS
1249                                                    ;SCRAMBLED TO GUARANTEE THAT NEW DATA IS REALLY READ IN NEXT TIME. WHILE
1250                                                    ;THIS IS GOING ON, BLOCK NUMBERS ARE CHECKED FOR BEING IN ORDER AS THE
1251                                                    ;TAPE TRAVELS TOWARD THE FORWARD END ZONE.ONCE THE DATA IS FULLY CHECKED
1252                                                    ;THE NEXT BLOCK THAT COMES UP IS READ IN AND THE PROCESS REPEATED.  ONCE
1253                                                    ;THE BLOCK WHOSE NUMBER IS IN TCFRST HAS BEEN READ, THE TAPE IS DRIVEN
1254                                                    ;INTO THE FORWARD END ZONE AND THE WHOLE SEQUENCE IS REPEATED.
1255
1256                                                    ;FUNCTION VALUES IN CSR
1257                                                    ;DT11 DEC TAPE
1258            000004                                  RD=4                    ;READ DATA
1259            000014                                  WD=14                   ;WRITE DATA
1260            000002                                  RB=2
```

```
1261                    000500                  IE=500                          ;INTERRUPT ENABLE+UNIT 1
1262                    000001                  DO=1                            ;DO - THE FUNCTION
1263                    004000                  R=4000                          ;REVERSE
1264
1265    003604  000000                  TCFIRST:        0                       ;FIRST BLOCK TO BE SEARCHED FOR
1266    003606  001101                  TCLAST: 577.                            ;LAST BLOCK TO BE SEARCHED FOR
1267    003610  000000                  TCEXPE: 0                               ;THE BLOCK THAT IS EXPECTED
1268
1269                                    ;GO TO FORWARD END ZONE
1270    003612  012777  003612  174744  FEND2:  MOV     #FEND2,@TCIV            ;END ZONE VECTOR SETUP
1271    003620  005777  174730          TST     @TCST                           ;TEST FOR END ZONE
1272    003624  100403                  BMI     FEND1                           ;AT END ZONE'
1273    003626  105277  174720          INCB    @TCCM                           ;SET DO - NO DELAY
1274    003632  000002                  RTI                                     ;NO - WAIT SOME MORE
1275    003634  012777  003664  174722  FEND1:  MOV     #TCF1,@TCIV             ;YES - NEW VECTOR
1276    003642  042777  104000  174702          BIC     #104000,@TCCM           ;SEARCH BLOCK FOWARD
1277    003650  016767  177730  177732          MOV     TCFIRST,TCEXPE          ;COUNT WHEN THIS BLOCK IS FOUND
1278    003656  105277  174670          TCF1A:  INCB    @TCCM                   ;SET DO
1279    003662  000002                  RTI                                     ;RETURN ON NEXT BLOCK
1280    003664  032777  100200  174660  TCF1:   BIT     #100200,@TCCM           ;ANY ERROR ON READ'
1281    003672  100001                  BPL     .+4
1282    003674  104006                  HLT                                     ;TC ERROR SET - FORWARD READ BLOCK
1283    003676  001001                  BNE     .+4                             ;DONE FLAG UP'
1284    003700  104006                  HLT                                     ;FALSE INTERRUPT
1285    003702  027767  174650  177700          CMP     @TCDT,TCEXPE            ;IS THIS OUR BLOCK FOR SYNC
1286    003710  002762                  BLT     TCF1A                           ;NO-READ SOME MORE BLOCKS
1287    003712  001401                  BEQ     TCF2                            ;YES
1288    003714  104006                  HLT                                     ;WE PASSED THE BLOCK
1289
1290    003716  012777  003732  174640  TCF2:   MOV     #TCF3,@TCIV             ;VECTOR FOR SEQUENTIAL READS
1291    003724  105277  174622          INCB    @TCCM                           ;SET DO
1292    003730  000002                  RTI                                     ;RETURN AND TEST SEQENTIAL BLOCKS
1293
1294                                    ;FIND SEQUENTIAL BLOCK AT FOWARD DIRECTION
1295    003732  032777  100200  174612  TCF3:   BIT     #100200,@TCCM           ;TEST ERROR AND READY
1296    003740  100001                  BPL     .+4
1297    003742  104006                  HLT                                     ;FOWARD READ ERROR TC-11
1298    003744  001001                  BNE     .+4
1299    003746  104006                  HLT                                     ;FALSE INTERRUPT ON TC-11
1300    003750  027767  174602  177630          CMP     @TCDT,TCLAST            ;HAVE WE TESTED ALL BLOCKS
1301    003756  001414                  BEQ     REND2                           ;YES DRIVE UNIT IN END ZONE TO START OVER
1302    003760  005267  177624          INC     TCEXPE                          ;NO-INCREMENT EXPECTED COUNT
1303    003764  027767  174566  177616          CMP     @TCDT,TCEXPE            ;IS CURRENT BLOCK CORRECT
1304    003772  001401                  BEQ     .+4
1305    003774  104006                  HLT                                     ;FAILED IN FOWARD READ TO FIND NEXT BLOCK
1306    003776  000427                  BR      TCWBK                           ;THIS ROUTINE WRITES A BLOCK
1307    004000  105277  174546          TCF4:   INCB    @TCCM                   ;SET DO
1308    004004  000002                  RTI
1309    004006  000701                  XFEND2: BR      FEND2                   ;INDIRECT LINK
1310
1311                                    ;MOVE TAPE TO REVERSE END ZONE
1312    004010  012777  004010  174546  REND2:  MOV     #REND2,@TCIV            ;END ZONE VECTOR SETUP
1313    004016  016767  177564  177564          MOV     TCLAST,TCEXPE           ;SET UP FOR REVERSE SEARCH
1314    004024  005777  174524          TST     @TCST                           ;IN END ZONE
1315    004030  100403                  BMI     REND1                           ;YES - START TO TURN UNIT AROUND
1316    004032  105277  174514          INCB    @TCCM                           ;SET DO
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DC3


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1317  004036  000002                          RTI                     ;NO - WAIT TILL WE ARE
1318  004040  012777  004503  174504 REND1:   MOV     #R+IE+RB+DO,@TCCM ;FUNCTION = READ BLOCK, REVERSE AND GO
1319  004046  012777  004136  174510          MOV     #TCR1,@TCIV     ;SET UP NEW INTERRUPT VECTOR
1320  004054  000002                          RTI
1321                                  ;WRITE FORWARD ALL BLOCKS EXCEPT 0
1322
1323  004056  012777  004110  174500 TCWBK:   MOV     #TCWB1,@TCIV    ;INTERRUPT VECTOR FOR WRITE
1324  004064  012777  177400  174466          MOV     #-400,@TCWC     ;ONE BLOCK
1325  004072  012777  004420  174462          MOV     #TCWBUF,@TCBA   ;THE WRITE BUFFER ADDRESS
1326  004100  112777  000515  174444          MOVB    #IE+WO+DO,@TCCM ;WRITE THE BLOCK
1327  004106  000002                          RTI                     ;RETURN WHEN BLOCK IS WRITTEN
1328  004110  005777  174436          TCWB1:  TST     @TCCM           ;ANY ERRORS
1329  004114  100001                          BPL     .+4
1330  004116  104006                          HLT
1331  004120  012777  003732  174436          MOV     #TCF3,@TCIV     ;SEARCH BLOCK VECTOR
1332  004126  112777  000502  174416          MOVB    #IE+RB,@TCCM    ;READ BLOCK
1333  004134  000721                          BR      TCF4            ;FIND THE NEXT BLOCK
1334
1335  004136  032777  100200  174406 TCR1:    BIT     #100200,@TCCM   ;TEST FOR ERROR AND READY
1336  004144  100001                          BPL     .+4
1337  004146  104006                          HLT                     ;DECTAPE ERROR ON READ BLOCK REVERSE
1338  004150  001001                          BNE     .+4
1339  004152  104006                          HLT                     ;FALSE INTERRUPT FROM DECTAPE
1340  004154  027767  174376  177426          CMP     @TCDT,TCEXPE    ;IS IT OUR FIRST BLOCK
1341  004162  001406                          BEQ     TCR2            ;YES - GO TEST THE REST
1342  004164  002002                          BGE     TCR1A           ;NO - HAVE WE PASSED THE BLOCK
1343  004166  104006                          HLT                     ;WE PASS OUR BLOCK
1344  004170  000707                          BR      REND2           ;GO TO END ZONE AND TRY AGAIN
1345  004172  105277  174354          TCR1A:  INCB    @TCCM           ;SET DO
1346  004176  000002                          RTI                     ;WE FOUND OUR FIRST BLOCK
1347  004200  012777  004214  174356 TCR2:    MOV     #TCR3,@TCIV     ;SET UP INTERRUPT TO TEST ALL BLOCKS
1348  004206  105277  174340          [illegible]     INCB    @TCCM   ;SET DO
1349  004212  000002                          RTI                     ;WAIT FOR NEXT BLOCK TO INTERRUPT
1350
1351                                  ;FIND SEQUENTIAL BLOCK IN REVERSE DIRECTION
1352  004214  [illegible]  100200  174330 TCR3:    BIT     #100200,@TCCM   ;TEST FOR READ AND ERROR
1353  004222  [illegible]                      BPL     .+4
1354  004224  [illegible]                      HLT                     ;ERROR READING SEQUENTIAL BLOCK IN REVERSE
1355  004226  [illegible]                      BNE     .+4
1356  004230  104006                          HLT                     ;FALSE DECTAPE INTERRUPT
1357  004232  026777  177346  174316          CMP     TCFIRST,@TCDT   ;DID WE DO ALL THE BLOCKS
1358  004240  001662                          BEQ     XFEND2          ;YES - GO TO END ZONE TO RESTART
1359  004242  005367  177342                  DEC     TCEXPE          ;NO - DECREMENT BLOCK NUMBER
1360  004246  027767  174304  177334          CMP     @TCDT,TCEXPE    ;TEST SEQUENTAIL BLOCK IN REVERSE
1361  004254  001401                          BEQ     .+4
1362  004256  104006                          HLT                     ;TEST SEQUENTIAL READ BLOCK IN REVERSE FAILED
1363  004260  000403                          BR      TCRBK           ;THIS ROUTINE READ A BLOCK
1364  004262  105277  174264          TCR4:   INCB    @TCCM           ;SET DO
1365  004266  000002                          RTI                     ;LETS TRY A NEW BLOCK
1366
1367                                  ;READ REVERSE ALL BLOCK EXCEPT BLOCK 1101
1368  004270  012777  004326  174266 TCRBK:   MOV     #TCRB1,@TCIV    ;SET UP INTERRUPT VECTOR
1369  004276  012777  177400  174254          MOV     #-400,@TCWC     ;READ ONE BLOCK
1370  004304  012777  004420  174250          MOV     #TCRBUF,@TCBA   ;WHERE BUFFER IS
1371  004312  112777  000505  174232          MOVB    #IE+RD+DO,@TCCM ;READ THE BLOCK
1372  004320  004767  000030                  JSR     %7,TC1          ;CHECK DATA BUFFER
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1373  004324  000002                          RTI                     ;EXIT - RETURN WHEN BLOCK IS READ
1374  004326  005777  174220          TCRB1:  TST     @TCCM           ;AND ERRORS
1375  004332  100001                          BPL     .+4
1376  004334  104006                          HLT                     ;DECTAPE ERROR
1377  004336  012777  004214  174220          MOV     #TCR3,@TCIV     ;NEW VECTOR FOR BLOCK SEARCH
1378  004344  112777  000502  174200          MOVB    #IE+RB,@TCCM    ;READ BLOCK FUNCTION
1379  004352  000743                          BR      TCR4            ;RETURN TO BLOCK SEARCH
1380
1381                                  ;THIS ROUTINE CHECKS THE READ DATA BUFFER TC11
1382                                  ;BY DOING A CHECK SUM ON THE DATA
1383  004354  010146          TC1:    MOV     X1,-(6)         ;SAVE THESE ON THE STACK
1384  004356  010246                  MOV     X2,-(6)
1385  004360  010346                  MOV     X3,-(6)
1386  004362  005003                  CLR     X3              ;SUM OF DATA
1387  004364  012701  004420          MOV     #TCRBUF,X1      ;ADDRESS OF READ BUFFER
1388  004370  012702  005420          MOV     #TCRBUF+1000,X2 ;END OF READ BUFFER
1389  004374  062103          TC2:    ADD     (1)+,X3         ;EVEN ADD
1390  004376  062103                  ADD     (1)+,X3         ;ODD ADD -2'S COMPLIMENT
1391  004400  001401                  BEQ     .+4
1392  004402  104006                  HLT                     ;DATA ERROR TC-11
1393  004404  020102                  CMP     X1,X2           ;AT END OF BUFFER?
1394  004406  001372                  BNE     TC2             ;NO - SUM THE REST
1395  004410  012603                  MOV     (6)+,X3         ;RESTORE THE REGISTERS
1396  004412  012602                  MOV     (6)+,X2
1397  004414  012601                  MOV     (6)+,X1
1398  004416  000207                  RTS     X7              ;EXIT
1399
1400                                  ;THIS WRITE BUFFER LOOK THE SAME FORWARD OR REVERSE
1401  004420                  TCWBUF:
1402  004420                  TCRBUF:
1403          000001                  N=1
1404  004420  000001                  N                       ;DECTAPE WRITE BUFFER
1405  004422  177777                  -N
1406          000002                  N=N+1
1407  004424  000002                  N                       ;DECTAPE WRITE BUFFER
1408  004426  177776                  -N
1409          000003                  N=N+1
1410  004430  000003                  N                       ;DECTAPE WRITE BUFFER
1411  004432  177775                  -N
1412          000004                  N=N+1
1413  004434  000004                  N                       ;DECTAPE WRITE BUFFER
1414  004436  177774                  -N
1415          000005                  N=N+1
1416  004440  000005                  N                       ;DECTAPE WRITE BUFFER
1417  004442  177773                  -N
1418          000006                  N=N+1
1419  004444  000006                  N                       ;DECTAPE WRITE BUFFER
1420  004446  177772                  -N
1421          000007                  N=N+1
1422  004450  000007                  N                       ;DECTAPE WRITE BUFFER
1423  004452  177771                  -N
1424          000010                  N=N+1
1425  004454  000010                  N                       ;DECTAPE WRITE BUFFER
1426  004456  177770                  -N
1427          000011                  N=N+1
1428  004460  000011                  N                       ;DECTAPE WRITE BUFFER
```

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1429  004462  177767                          -N
1430          000012                          N=N+1
1431  004464  000012                          N               ;DECTAPE WRITE BUFFER
1432  004466  177766                          -N
1433          000013                          N=N+1
1434  004470  000013                          N               ;DECTAPE WRITE BUFFER
1435  004472  177765                          -N
1436          000014                          N=N+1
1437  004474  000014                          N               ;DECTAPE WRITE BUFFER
1438  004476  177764                          -N
1439          000015                          N=N+1
1440  004500  000015                          N               ;DECTAPE WRITE BUFFER
1441  004502  177763                          -N
1442          000016                          N=N+1
1443  004504  000016                          N               ;DECTAPE WRITE BUFFER
1444  004506  177762                          -N
1445          000017                          N=N+1
1446  004510  000017                          N               ;DECTAPE WRITE BUFFER
1447  004512  177761                          -N
1448          000020                          N=N+1
1449  004514  000020                          N               ;DECTAPE WRITE BUFFER
1450  004516  177760                          -N
1451          000021                          N=N+1
1452  004520  000021                          N               ;DECTAPE WRITE BUFFER
1453  004522  177757                          -N
1454          000022                          N=N+1
1455  004524  000022                          N               ;DECTAPE WRITE BUFFER
1456  004526  177756                          -N
1457          000023                          N=N+1
1458  004530  000023                          N               ;DECTAPE WRITE BUFFER
1459  004532  177755                          -N
1460          000024                          N=N+1
1461  004534  000024                          N               ;DECTAPE WRITE BUFFER
1462  004536  177754                          -N
1463          000025                          N=N+1
1464  004540  000025                          N               ;DECTAPE WRITE BUFFER
1465  004542  177753                          -N
1466          000026                          N=N+1
1467  004544  000026                          N               ;DECTAPE WRITE BUFFER
1468  004546  177752                          -N
1469          000027                          N=N+1
1470  004550  000027                          N               ;DECTAPE WRITE BUFFER
1471  004552  177751                          -N
1472          000030                          N=N+1
1473  004554  000030                          N               ;DECTAPE WRITE BUFFER
1474  004556  177750                          -N
1475          000031                          N=N+1
1476  004560  000031                          N               ;DECTAPE WRITE BUFFER
1477  004562  177747                          -N
1478          000032                          N=N+1
1479  004564  000032                          N               ;DECTAPE WRITE BUFFER
1480  004566  177746                          -N
1481          000033                          N=N+1
1482  004570  000033                          N               ;DECTAPE WRITE BUFFER
1483  004572  177745                          -N
1484          000034                          N=N+1
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1485  004574  000034                          N                       ;DECTAPE WRITE BUFFER
1486  004576  177744                          -N
1487          000035                          N=N+1
1488  004600  000035                          N                       ;DECTAPE WRITE BUFFER
1489  004602  177743                          -N
1490          000036                          N=N+1
1491  004604  000036                          N                       ;DECTAPE WRITE BUFFER
1492  004606  177742                          -N
1493          000037                          N=N+1
1494  004610  000037                          N                       ;DECTAPE WRITE BUFFER
1495  004612  177741                          -N
1496          000040                          N=N+1
1497  004614  000040                          N                       ;DECTAPE WRITE BUFFER
1498  004616  177740                          -N
1499          000041                          N=N+1
1500  004620  000041                          N                       ;DECTAPE WRITE BUFFER
1501  004622  177737                          -N
1502          000042                          N=N+1
1503  004624  000042                          N                       ;DECTAPE WRITE BUFFER
1504  004626  177736                          -N
1505          000043                          N=N+1
1506  004630  000043                          N                       ;DECTAPE WRITE BUFFER
1507  004632  177735                          -N
1508          000044                          N=N+1
1509  004634  000044                          N                       ;DECTAPE WRITE BUFFER
1510  004636  177734                          -N
1511          000045                          N=N+1
1512  004640  000045                          N                       ;DECTAPE WRITE BUFFER
1513  004642  177733                          -N
1514          000046                          N=N+1
1515  004644  000046                          N                       ;DECTAPE WRITE BUFFER
1516  004646  177732                          -N
1517          000047                          N=N+1
1518  004650  000047                          N                       ;DECTAPE WRITE BUFFER
1519  004652  177731                          -N
1520          000050                          N=N+1
1521  004654  000050                          N                       ;DECTAPE WRITE BUFFER
1522  004656  177730                          -N
1523          000051                          N=N+1
1524  004660  000051                          N                       ;DECTAPE WRITE BUFFER
1525  004662  177727                          -N
1526          000052                          N=N+1
1527  004664  000052                          N                       ;DECTAPE WRITE BUFFER
1528  004666  177726                          -N
1529          000053                          N=N+1
1530  004670  000053                          N                       ;DECTAPE WRITE BUFFER
1531  004672  177725                          -N
1532          000054                          N=N+1
1533  004674  000054                          N                       ;DECTAPE WRITE BUFFER
1534  004676  177724                          -N
1535          000055                          N=N+1
1536  004700  000055                          N                       ;DECTAPE WRITE BUFFER
1537  004702  177723                          -N
1538          000056                          N=N+1
1539  004704  000056                          N                       ;DECTAPE WRITE BUFFER
1540  004706  177722                          -N
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1541            000057                  N=N+1
1542  004710    000057                  N               ;DECTAPE WRITE BUFFER
1543  004712    177721                  -N
1544            000060                  N=N+1
1545  004714    000060                  N               ;DECTAPE WRITE BUFFER
1546  004716    177720                  -N
1547            000061                  N=N+1
1548  004720    000061                  N               ;DECTAPE WRITE BUFFER
1549  004722    177717                  -N
1550            000062                  N=N+1
1551  004724    000062                  N               ;DECTAPE WRITE BUFFER
1552  004726    177716                  -N
1553            000063                  N=N+1
1554  004730    000063                  N               ;DECTAPE WRITE BUFFER
1555  004732    177715                  -N
1556            000064                  N=N+1
1557  004734    000064                  N               ;DECTAPE WRITE BUFFER
1558  004736    177714                  -N
1559            000065                  N=N+1
1560  004740    000065                  N               ;DECTAPE WRITE BUFFER
1561  004742    177713                  -N
1562            000066                  N=N+1
1563  004744    000066                  N               ;DECTAPE WRITE BUFFER
1564  004746    177712                  -N
1565            000067                  N=N+1
1566  004750    000067                  N               ;DECTAPE WRITE BUFFER
1567  004752    177711                  -N
1568            000070                  N=N+1
1569  004754    000070                  N               ;DECTAPE WRITE BUFFER
1570  004756    177710                  -N
1571            000071                  N=N+1
1572  004760    000071                  N               ;DECTAPE WRITE BUFFER
1573  004762    177707                  -N
1574            000072                  N=N+1
1575  004764    000072                  N               ;DECTAPE WRITE BUFFER
1576  004766    177706                  -N
1577            000073                  N=N+1
1578  004770    000073                  N               ;DECTAPE WRITE BUFFER
1579  004772    177705                  -N
1580            000074                  N=N+1
1581  004774    000074                  N               ;DECTAPE WRITE BUFFER
1582  004776    177704                  -N
1583            000075                  N=N+1
1584  005000    000075                  N               ;DECTAPE WRITE BUFFER
1585  005002    177703                  -N
15 6            000076                  N=N+1
1587  005004    000076                  N               ;DECTAPE WRITE BUFFER
1588  005006    177702                  -N
1589            000077                  N=N+1
1590  005010    000077                  N               ;DECTAPE WRITE BUFFER
1591  005012    177701                  -N
1592            000100                  N=N+1
1593  005014    000100                  N               ;DECTAPE WRITE BUFFER
1594  005016    177700                  -N
1595            000101                  N=N+1
1596            000100                  N=N-1
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1597  005020  177700                          -N
1598  005022  000100                          N                ;DEC TAPE WRITE BUFFER
1599          000077                          N=N-1
1600  005024  177701                          -N
1601  005026  000077                          N                ;DEC TAPE WRITE BUFFER
1602          000076                          N=N-1
1603  005030  177702                          -N
1604  005032  000076                          N                ;DEC TAPE WRITE BUFFER
1605          000075                          N=N-1
1606  005034  177703                          -N
1607  005036  000075                          N                ;DEC TAPE WRITE BUFFER
1608          000074                          N=N-1
1609  005040  177704                          -N
1610  005042  000074                          N                ;DEC TAPE WRITE BUFFER
1611          000073                          N=N-1
1612  005044  177705                          -N
1613  005046  000073                          N                ;DEC TAPE WRITE BUFFER
1614          000072                          N=N-1
1615  005050  177706                          -N
1616  005052  000072                          N                ;DEC TAPE WRITE BUFFER
1617          000071                          N=N-1
1618  005054  177707                          -N
1619  005056  000071                          N                ;DEC TAPE WRITE BUFFER
1620          000070                          N=N-1
1621  005060  177710                          -N
1622  005062  000070                          N                ;DEC TAPE WRITE BUFFER
1623          000067                          N=N-1
1624  005064  177711                          -N
1625  005066  000067                          N                ;DEC TAPE WRITE BUFFER
1626          000066                          N=N-1
1627  005070  177712                          -N
1628  005072  000066                          N                ;DEC TAPE WRITE BUFFER
1629          000065                          N=N-1
1630  005074  177713                          -N
1631  005076  000065                          N                ;DEC TAPE WRITE BUFFER
1632          000064                          N=N-1
1633  005100  177714                          -N
1634  005102  000064                          N                ;DEC TAPE WRITE BUFFER
1635          000063                          N=N-1
1636  005104  177715                          -N
1637  005106  000063                          N                ;DEC TAPE WRITE BUFFER
1638          000062                          N=N-1
1639  005110  177716                          -N
1640  005112  000062                          N                ;DEC TAPE WRITE BUFFER
1641          000061                          N=N-1
1642  005114  177717                          -N
1643  005116  000061                          N                ;DEC TAPE WRITE BUFFER
1644          000060                          N=N-1
1645  005120  177720                          -N
1646  005122  000060                          N                ;DEC TAPE WRITE BUFFER
1647          000057                          N=N-1
1648  005124  177721                          -N
1649  005126  000057                          N                ;DEC TAPE WRITE BUFFER
1650          000056                          N=N-1
1651  005130  177722                          -N
1652  005132  000056                          N                ;DEC TAPE WRITE BUFFER
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1653            000055                          N=N-1
1654   005134   177723                          -N
1655   005136   000055                          N               ;DEC TAPE WRITE BUFFER
1656            000054                          N=N-1
1657   005140   177724                          -N
1658   005142   000054                          N               ;DEC TAPE WRITE BUFFER
1659            000053                          N=N-1
1660   005144   177725                          -N
1661   005146   000053                          N               ;DEC TAPE WRITE BUFFER
1662            000052                          N=N-1
1663   005150   177726                          -N
1664   005152   000052                          N               ;DEC TAPE WRITE BUFFER
1665            000051                          N=N-1
1666   005154   177727                          -N
1667   005156   000051                          N               ;DEC TAPE WRITE BUFFER
1668            000050                          N=N-1
1669   005160   177730                          -N
1670   005162   000050                          N               ;DEC TAPE WRITE BUFFER
1671            000047                          N=N-1
1672   005164   177731                          -N
1673   005166   000047                          N               ;DEC TAPE WRITE BUFFER
1674            000046                          N=N-1
1675   005170   177732                          -N
1676   005172   000046                          N               ;DEC TAPE WRITE BUFFER
1677            000045                          N=N-1
1678   005174   177733                          -N
1679   005176   000045                          N               ;DEC TAPE WRITE BUFFER
1680            000044                          N=N-1
1681   005200   177734                          -N
1682   005202   000044                          N               ;DEC TAPE WRITE BUFFER
1683            000043                          N=N-1
1684   005204   177735                          -N
1685   005206   000043                          N               ;DEC TAPE WRITE BUFFER
1686            000042                          N=N-1
1687   005210   177736                          -N
1688   005212   000042                          N               ;DEC TAPE WRITE BUFFER
1689            000041                          N=N-1
1690   005214   177737                          -N
1691   005216   000041                          N               ;DEC TAPE WRITE BUFFER
1692            000040                          N=N-1
1693   005220   177740                          -N
1694   005222   000040                          N               ;DEC TAPE WRITE BUFFER
1695            000037                          N=N-1
1696   005224   177741                          -N
1697   005226   000037                          N               ;DEC TAPE WRITE BUFFER
1698            000036                          N=N-1
1699   005230   177742                          -N
1700   005232   000036                          N               ;DEC TAPE WRITE BUFFER
1701            000035                          N=N-1
1702   005234   177743                          -N
1703   005236   000035                          N               ;DEC TAPE WRITE BUFFER
1704            000034                          N=N-1
1705   005240   177744                          -N
1706   005242   000034                          N               ;DEC TAPE WRITE BUFFER
1707            000033                          N=N-1
1708   005244   177745                          -N
```

```
005246  000033          N           ;DEC TAPE WRITE BUFFER
        000032          N=N-1
005250  177746          -N
005252  000032          N           ;DEC TAPE WRITE BUFFER
        000031          N=N-1
005254  177747          -N
005256  000031          N           ;DEC TAPE WRITE BUFFER
        000030          N=N-1
005260  177750          -N
005262  000030          N           ;DEC TAPE WRITE BUFFER
        000027          N=N-1
005264  177751          -N
005266  000027          N           ;DEC TAPE WRITE BUFFER
        000026          N=N-1
005270  177752          -N
005272  000026          N           ;DEC TAPE WRITE BUFFER
        000025          N=N-1
005274  177753          -N
005276  000025          N           ;DEC TAPE WRITE BUFFER
        000024          N=N-1
005300  177754          -N
005302  000024          N           ;DEC TAPE WRITE BUFFER
        000023          N=N-1
005304  177755          -N
005306  000023          N           ;DEC TAPE WRITE BUFFER
        000022          N=N-1
005310  177756          -N
005312  000022          N           ;DEC TAPE WRITE BUFFER
        000021          N=N-1
005314  177757          -N
005316  000021          N           ;DEC TAPE WRITE BUFFER
        000020          N=N-1
005320  177760          -N
005322  000020          N           ;DEC TAPE WRITE BUFFER
        000017          N=N-1
005324  177761          -N
005326  000017          N           ;DEC TAPE WRITE BUFFER
        000016          N=N-1
005330  177762          -N
005332  000016          N           ;DEC TAPE WRITE BUFFER
        000015          N=N-1
005334  177763          -N
005336  000015          N           ;DEC TAPE WRITE BUFFER
        000014          N=N-1
005340  177764          -N
005342  000014          N           ;DEC TAPE WRITE BUFFER
        000013          N=N-1
005344  177765          -N
005346  000013          N           ;DEC TAPE WRITE BUFFER
        000012          N=N-1
005350  177766          -N
005352  000012          N           ;DEC TAPE WRITE BUFFER
        000011          N=N-1
005354  177767          -N
005356  000011          N           ;DEC TAPE WRITE BUFFER
        000010          N=N-1
```

```
1765  005360  177770                          -N
1766  005362  000010                          N                       ;DEC TAPE WRITE BUFFER
1767          000007                          N=N-1
1768  005364  177771                          -N
1769  005366  000007                          N                       ;DEC TAPE WRITE BUFFER
1770          000006                          N=N-1
1771  005370  177772                          -N
1772  005372  000006                          N                       ;DEC TAPE WRITE BUFFER
1773          000005                          N=N-1
1774  005374  177773                          -N
1775  005376  000005                          N                       ;DEC TAPE WRITE BUFFER
1776          000004                          N=N-1
1777  005400  177774                          -N
1778  005402  000004                          N                       ;DEC TAPE WRITE BUFFER
1779          000003                          N=N-1
1780  005404  177775                          -N
1781  005406  000003                          N                       ;DEC TAPE WRITE BUFFER
1782          000002                          N=N-1
1783  005410  177776                          -N
1784  005412  000002                          N                       ;DEC TAPE WRITE BUFFER
1785          000001                          N=N-1
1786  005414  177777                          -N
1787  005416  000001                          N                       ;DEC TAPE WRITE BUFFER
1788
1789  005420  010701              BEGINX:     MOV     PC,R1           ;SET UP R1 TO SELECT CURBNK
1790  005422  042701  017777                  BIC     #17777,R1
1791  005426  042737  160000  000034        BIC     #160000,@#34            ;SET SCOPE RET TO CURRENT BANK
1792  005434  050137  000034                  BIS     R1,@#34
1793  005440  000301                          SWAB    R1
1794  005442  006201                          ASR     R1
1795  005444  006201                          ASR     R1
1796  005446  010137  000570                  MOV     R1,@#CURBNK
1797
1798                                          .SBTTL  BACKGROUND CPU TESTS
1799                                  ;BINARY INSTRUCTIONS
1800                                  ;INDEX, AND INDIRECT TEST OF PDP-11
1801  005452  010767  007262          BEGIN:  MOV     PC,RETURN               ;FOR SCOPING - SETUP ADDRESS OF BEGIN1 IN
1802  005456  062767  000016  007254          ADD     #16,RETURN              ;THIS BANK THRU CURRENT ASR
1803  005464  012767  000400  007242          MOV     #400,ICOUNT             ;ITERATION COUNT
1804                                  ;TEST COMPARE INSTRUCTION INDEXED
1805  005472  012700  177770                  MOV     #-10,%0                 ;MINUS 10 TO REG 0
1806  005476  026027  014752  125252          CMP     A(0),#125252            ;(A INDEX BY MINUS 10) TO #125252
1807  005504  001401                          BEQ     .+4
1808  005506  104006                          HLT                             ;COMPARE WITH INDEX FAILED
1809  005510  104400                          SCOPE
1810
1811  005512  012700  000010                  MOV     #10,%0
1812  005516  022760  052525  014752          CMP     #052525,A(0)
1813  005524  001401                          BEQ     .+4
1814  005526  104006                          HLT
1815  005530  104400                          SCOPE
1816
1817  005532  012700  177770                  MOV     #-10,%0
1818  005536  026060  014752  014752          CMP     A(0),A(0)
1819  005544  001401                          BEQ     .+4
1820  005546  104006                          HLT
```

```
1821  005550  104400                          SCOPE
1822
1823  005552  012700  000010                  MOV     #+10,%0
1824  005556  026060  014752  014752          CMP     A(0),A(0)
1825  005564  001401                          BEQ     .+4
1826  005566  104006                          HLT
1827  005570  104400                          SCOPE
1828
1829  005572  012700  177774                  MOV     #-4,%0
1830  005576  012701  000010                  MOV     #+10,%1
1831  005602  026061  014752  014752          CMP     A(0),A(1)
1832  005610  001401                          BEQ     .+4
1833  005612  104006                          HLT
1834  005614  104400                          SCOPE
1835
1836  005616  012700  177774                  MOV     #-4,%0
1837  005622  012701  000010                  MOV     #10,%1
1838  005626  026160  014752  014752          CMP     A(1),A(0)
1839  005634  001401                          BEQ     .+4
1840  005636  104006                          HLT
1841  005640  104400                          SCOPE
1842
1843                                  ;TEST MOVE INSTRUCTION FOR INDEX
1844
1845  005642  012700  177770                  MOV     #-10,%0
1846  005646  016067  014752  007120          MOV     A(0),TEMP
1847  005654  026727  007114  125252          CMP     TEMP,#125252
1848  005662  001401                          BEQ     .+4
1849  005664  104006                          HLT
1850  005666  104400                          SCOPE
1851
1852  005670  012700  177770                  MOV     #-10,%0
1853  005674  012760  125252  014774          MOV     #125252,TEMP(0)
1854  005702  023727  014764  125252          CMP     @#C,#125252
1855  005710  001401                          BEQ     .+4
1856  005712  104006                          HLT
1857  005714  104400                          SCOPE
1858
1859                                  ;TEST BIC INSTRUCTION FOR INDEXING
1860  005716  012767  177777  007050          MOV     #-1,TEMP
1861  005724  012700  177770                  MOV     #-10,%0
1862  005730  046067  014752  007036          BIC     A(0),TEMP
1863  005736  026727  007032  052525          CMP     TEMP,#052525
1864  005744  001401                          BEQ     .+4
1865  005746  104006                          HLT
1866  005750  104400                          SCOPE
1867
1868  005752  012700  177770                  MOV     #-10,%0
1869  005756  012767  177777  007000          MOV     #-1,TEMP-10
1870  005764  042767  052525  006772          BIC     #052525,TEMP-10
1871  005772  026727  006766  125252          CMP     TEMP-10,#125252
1872  006000  001401                          BEQ     .+4
1873  006002  104006                          HLT
1874  006004  104400                          SCOPE
1875
1876  006006  012737  125252  014774          MOV     #125252,@#TEMP
```

```
1877  006014  012700  177770                    MOV     #-10,%0
1878  006020  166760  006716  015004            SUB     B,TEMP+10(0)
1879  006026  001401                            BEQ     .+4
1880  006030  104006                            HLT
1881  006032  104400                            SCOPE
1882
1883  006034  012737  052525  014774            MOV     #052525,@#TEMP
1884  006042  012700  000010                    MOV     #10,%0
1885  006046  166760  006710  014764            SUB     A+10,C(0)
1886  006054  001401                            BEQ     .+4
1887  006056  104006                            HLT
1888  006060  104400                            SCOPE
1889
1890                                  ;TEST UNARYS INDEXED
1891
1892  006062  012737  177777  014774            MOV     #-1,@#TEMP
1893  006070  012700  000010                    MOV     #+10,%0
1894  006074  005060  014764                    CLR     C(0)
1895  006100  005737  014774                    TST     @#TEMP
1896  006104  001401                            BEQ     .+4
1897  006106  104006                            HLT
1898  006110  104400                            SCOPE
1899
1900  006112  012737  177777  014774            MOV     #-1,@#TEMP
1901  006120  012700  000010                    MOV     #10,%0
1902  006124  005160  014764                    COM     C(0)
1903  006130  005737  014774                    TST     @#TEMP
1904  006134  001401                            BEQ     .+4
1905  006136  104006                            HLT
1906  006140  104400                            SCOPE
1907
1908  006142  012737  177777  014774            MOV     #-1,@#TEMP
1909  006150  012700  177770                    MOV     #-10,%0
1910  006154  005260  015004                    INC     D(0)
1911  006160  005737  014774                    TST     @#TEMP
1912  006164  001401                            BEQ     .+4
1913  006166  104006                            HLT
1914  006170  104400                            SCOPE
1915
1916  006172  012737  000001  014774            MOV     #1,@#TEMP
1917  006200  012700  177770                    MOV     #-10,%0
1918  006204  005360  015004                    DEC     D(0)
1919  006210  005737  014774                    TST     @#TEMP
1920  006214  001401                            BEQ     .+4
1921  006216  104006                            HLT
1922  006220  104400                            SCOPE
1923
1924  006222  012737  000001  014774            MOV     #1,@#TEMP
1925  006230  012700  000010                    MOV     #10,%0
1926  006234  005360  014764                    DEC     C(0)
1927  006240  005737  014774                    TST     @#TEMP
1928  006244  001401                            BEQ     .+4
1929  006246  104006                            HLT
1930  006250  104400                            SCOPE
1931
1932  006252  012737  000001  014774            MOV     #1,@#TEMP
```

```
 1933  006260  012700  177770                MOV     #-10,%0
 1934  006264  005460  015004                NEG     D(0)
 1935  006270  022737  177777  014774        CMP     #-1,@#TEMP
 1936  006276  001401                        BEQ     .+4
 1937  006300  104006                        HLT
 1938  006302  104400                        SCOPE
 1939
 1940  006304  012737  000001  014774        MOV     #1,@#TEMP
 1941  006312  012700  000010                MOV     #+10,%0
 1942  006316  005460  014764                NEG     C(0)
 1943  006322  022737  177777  014774        CMP     #-1,@#TEMP
 1944  006330  001401                        BEQ     .+4
 1945  006332  104006                        HLT
 1946  006334  104400                        SCOPE
 1947
 1948  006336  012737  177777  014774        MOV     #-1,@#TEMP
 1949  006344  012700  177770                MOV     #-10,%0
 1950  006350  000261                        SEC
 1951  006352  005560  015004                ADC     D(0)
 1952  006356  005737  014774                TST     @#TEMP
 1953  006362  001401                        BEQ     .+4
 1954  006364  104006                        HLT
 1955  006366  104400                        SCOPE
 1956
 1957  006370  012737  177777  014774        MOV     #-1,@#TEMP
 1958  006376  012700  000010                MOV     #+10,%0
 1959  006402  000261                        SEC
 1960  006404  005560  014764                ADC     C(0)
 1961  006410  005737  014774                TST     @#TEMP
 1962  006414  001401                        BEQ     .+4
 1963  006416  104006                        HLT
 1964  006420  104400                        SCOPE
 1965
 1966  006422  012737  000001  014774        MOV     #1,@#TEMP
 1967  006430  012700  177770                MOV     #-10,%0
 1968  006434  000261                        SEC
 1969  006436  005660  015004                SBC     D(0)
 1970  006442  005737  014774                TST     @#TEMP
 1971  006446  001401                        BEQ     .+4
 1972  006450  104006                        HLT
 1973  006452  104400                        SCOPE
 1974
 1975  006454  012737  000001  014774        MOV     #1,@#TEMP
 1976  006462  012700  000010                MOV     #+10,%0
 1977  006466  000261                        SEC
 1978  006470  005660  014764                SBC     C(0)
 1979  006474  005737  014774                TST     @#TEMP
 1980  006500  001401                        BEQ     .+4
 1981  006502  104006                        HLT
 1982  006504  104400                        SCOPE
 1983
 1984                          ;TEST JMP INDIRECT
 1985  006506  010700                        MOV     %7,%0
 1986  006510  062700  000010                ADD     #10,%0
 1987  006514  000110                        JMP     @%0
 1988  006516  104006                        HLT
```

```
 1989  006520  000240                          NOP
 1990  006522  104400                          SCOPE
 1991
 1992  006524  010700                          MOV     %7,%0
 1993  006526  062700  000010                  ADD     #10,%0
 1994  006532  000110                          JMP     @%0
 1995  006534  104006                          HLT
 1996  006536  000240                          NOP
 1997  006540  104400                          SCOPE
 1998
 1999                                  ;TEST INDIRECT ADDRESSING
 2000                                  ;TEST COMPARE INSTRUCTION
 2001  006542  023727  014742  125252          CMP     @#8,#125252
 2002  006550  001401                          BEQ     .+4
 2003  006552  104006                          HLT
 2004  006554  104400                          SCOPE
 2005
 2006  006556  022737  125252  014742          CMP     #125252,@#8
 2007  006564  001401                          BEQ     .+4
 2008  006566  104006                          HLT
 2009  006570  104400                          SCOPE
 2010
 2011  006572  023737  014742  014742          CMP     @#8,@#8
 2012  006600  001401                          BEQ     .+4
 2013  006602  104006                          HLT
 2014  006604  104400                          SCOPE
 2015
 2016                                  ;TEST MOVE INSTRUCTIONS
 2017  006606  013700  014742                  MOV     @#8,%0
 2018  006612  022700  125252                  CMP     #125252,%0
 2019  006616  001401                          BEQ     .+4
 2020  006620  104006                          HLT
 2021  006622  104400                          SCOPE
 2022
```

```
 2023  006624  012737  125252  014774          MOV     #125252,@#TEMP
 2024  006632  023737  014742  014774          CMP     @#8,@#TEMP
 2025  006640  001401                          BEQ     .+4
 2026  006642  104006                          HLT
 2027  006644  104400                          SCOPE
 2028
 2029  006646  013737  014742  014764          MOV     @#8,@#C
 2030  006654  023737  014742  014764          CMP     @#8,@#C
 2031  006662  001401                          BEQ     .+4
```

```
  2032  006664  104006                          HLT
```

```
2033  006666  104400                          SCOPE
2034
2035                                  ;TEST BIC INSTRUCTION INDIRECT
2036  006670  012700  177777                   MOV     #-1,%0
```

```
 2037  006674  043700  014742                  BIC     @#8,%0
 2038  006700  020027  052525                  CMP     %0,#052525
 2039  006704  001401                          BEQ     .+4
 2040  006706  104006                          HLT
 2041  006710  104400                          SCOPE
 2042
 2043  006712  012737  177777  014774          MOV     #-1,@#TEMP
 2044  006720  042737  125252  014774          BIC     #125252,@#TEMP
 2045  006726  022737  052525  014774          CMP     #052525,@#TEMP
 2046  006734  001401                          BEQ     .+4
 2047  006736  104006                          HLT
 2048  006740  104400                          SCOPE
```

```
2049
2050  006742  012737  177777  014764          MOV     #-1,@#C
2051  006750  043737  014742  014764          BIC     @#8,@#C
2052  006756  023727  014764  052525          CMP     @#C,#52525
2053  006764  001401                          BEQ     .+4
2054  006766  104006                          HLT
2055  006770  104400                          SCOPE
2056
2057                                  ;TEST SUBTRACT INSTRUCTION
2058  006772  012700  125252                  MOV     #125252,%0
2059  006776  163700  014742                  SUB     @#8,%0
2060  007002  020027  000000                  CMP     %0,#0
2061  007006  001401                          BEQ     .+4
2062  007010  104006                          HLT
2063  007012  104400                          SCOPE
2064
2065  007014  012737  125252  014774          MOV     #125252,@#TEMP
2066  007022  166737  005714  014774          SUB     #8,@#TEMP
2067  007030  001401                          BEQ     .+4
2068  007032  104006                          HLT
2069  007034  104400                          SCOPE
2070
2071  007036  012767  125252  005730          MOV     #125252,TEMP
2072  007044  163767  014742  005722          SUB     @#8,TEMP
2073  007052  005767  005716                  TST     TEMP
2074  007056  001401                          BEQ     .+4
2075  007060  104006                          HLT
2076  007062  104400                          SCOPE
2077
2078                                  ;TEST ADD INDIRECT
2079  007064  005000                          CLR     %0
2080  007066  063700  014742                  ADD     @#8,%0
2081  007072  022700  125252                  CMP     #125252,%0
2082  007076  001401                          BEQ     .+4
2083  007100  104006                          HLT
2084  007102  104400                          SCOPE
2085
2086  007104  005037  014774                  CLR     @#TEMP
2087  007110  062737  125252  014774          ADD     #125252,@#TEMP
2088  007116  022737  125252  014774          CMP     #125252,@#TEMP
2089  007124  001401                          BEQ     .+4
2090  007126  104006                          HLT
2091  007130  104400                          SCOPE
2092
2093  007132  012737  125252  014774          MOV     #125252,@#TEMP
2094  007140  067737  005614  014774          ADD     @A+6,@#TEMP
2095  007146  023727  014774  177777          CMP     @#TEMP,#-1
2096  007154  001401                          BEQ     .+4
2097  007156  104006                          HLT
2098  007160  104400                          SCOPE
2099
2100                                  ;TEST UNARYS INDIRECT
2101  007162  012737  177777  014774          MOV     #-1,@#TEMP
2102  007170  005037  014774                  CLR     @#TEMP
2103  007174  005737  014774                  TST     @#TEMP
2104  007200  001401                          BEQ     .+4
```

```
2105  007202  104006                          HLT
2106  007204  104400                          SCOPE
2107
2108  007206  012737  125252  014774          MOV     #125252,@#TEMP
2109  007214  005137  014774                  COM     @#TEMP
2110  007220  022737  052525  014774          CMP     #052525,@#TEMP
2111  007226  001401                          BEQ     .+4
2112  007230  104006                          HLT
2113  007232  104400                          SCOPE
2114
2115  007234  005037  014774                  CLR     @#TEMP
2116  007240  005237  014774                  INC     @#TEMP
2117  007244  022737  000001  014774          CMP     #1,@#TEMP
2118  007252  001401                          BEQ     .+4
2119  007254  104006                          HLT
2120  007256  104400                          SCOPE
2121
2122  007260  005037  014774                  CLR     @#TEMP
2123  007264  005377  005506                  DEC     @TEMP+2
2124  007270  023727  014774  177777          CMP     @#TEMP,#-1
2125  007276  001401                          BEQ     .+4
2126  007300  104006                          HLT
2127  007302  104400                          SCOPE
2128
2129  007304  012737  000001  014774          MOV     #1,@#TEMP
2130  007312  005437  014774                  NEG     @#TEMP
2131  007316  022737  177777  014774          CMP     #-1,@#TEMP
2132  007324  001401                          BEQ     .+4
2133  007326  104006                          HLT
2134  007330  104400                          SCOPE
2135
2136                                  ;TEST INDIRECT ADDRESSING WITH INDEXING
2137                                  ;TEST COMPARE INSTRUCTION
2138  007332  027727  005406  125252          CMP     @B+2,#125252
2139  007340  001401                          BEQ     .+4
2140  007342  104006                          HLT
2141  007344  104400                          SCOPE
2142
2143  007346  022777  125252  005370          CMP     #125252,@B+2
2144  007354  001401                          BEQ     .+4
2145  007356  104006                          HLT
2146  007360  104400                          SCOPE
2147
2148  007362  027777  005356  005354          CMP     @B+2,@B+2
2149  007370  001401                          BEQ     .+4
2150  007372  104006                          HLT
2151  007374  104400                          SCOPE
2152
2153                                  ;TEST MOVE INSTRUCTIONS
2154  007376  017700  005342                  MOV     @B+2,%0
2155  007402  022700  125252                  CMP     #125252,%0
2156  007406  001401                          BEQ     .+4
2157  007410  104006                          HLT
2158  007412  104400                          SCOPE
2159
2160  007414  012777  125252  005354          MOV     #125252,@TEMP+2
```

```
2161  007422  023737  014742  014774          CMP     @#8,@#TEMP
2162  007430  001401                          BEQ     .+4
2163  007432  104006                          HLT
2164  007434  104400                          SCOPE
2165
2166  007436  017777  005302  005322          MOV     @B+2,@C+2
2167  007444  023737  014742  014764          CMP     @#8,@#C
2168  007452  001401                          BEQ     .+4
2169  007454  104006                          HLT
2170  007456  104400                          SCOPE
2171
2172                                ;TEST BIC INSTRUCTION INDIRECT WITH INDEXING
2173  007460  012700  177777                  MOV     #-1,%0
2174  007464  047700  005254                  BIC     @B+2,%0
2175  007470  020027  052525                  CMP     %0,#52525
2176  007474  001401                          BEQ     .+4
2177  007476  104006                          HLT
2178  007500  104400                          SCOPE
2179
2180  007502  012737  177777  014774          MOV     #-1,@#TEMP
2181  007510  042777  125252  005260          BIC     #125252,@TEMP+2
2182  007516  022737  052525  014774          CMP     #52525,@#TEMP
2183  007524  001401                          BEQ     .+4
2184  007526  104006                          HLT
2185  007530  104400                          SCOPE
2186
2187  007532  012737  177777  014764          MOV     #-1,@#C
2188  007540  047777  005200  005220          BIC     @B+2,@C+2
2189  007546  026737  005210  014764          CMP     A+10,@#C
2190  007554  001401                          BEQ     .+4
2191  007556  104006                          HLT
2192  007560  104400                          SCOPE
2193
2194  007562  012700  125252                  MOV     #125252,%0
2195  007566  167700  005152                  SUB     @B+2,%0
2196  007572  020027  000000                  CMP     %0,#0
2197  007576  001401                          BEQ     .+4
2198  007600  104006                          HLT
2199  007602  104400                          SCOPE
2200
2201  007604  012737  125252  014774          MOV     #125252,@#TEMP
2202  007612  166777  005124  005156          SUB     B,@TEMP+2
2203  007620  001401                          BEQ     .+4
2204  007622  104006                          HLT
2205  007624  104400                          SCOPE
2206
2207  007626  012737  125252  014774          MOV     #125252,@#TEMP
2208  007634  167777  005104  005134          SUB     @B+2,@TEMP+2
2209  007642  005737  014774                  TST     @#TEMP
2210  007646  001401                          BEQ     .+4
2211  007650  104006                          HLT
2212  007652  104400                          SCOPE
2213
2214                                ;TEST ADD INDIRECT WITH INDEXING
2215  007654  005000                          CLR     %0
2216  007656  067700  005062                  ADD     @B+2,%0
```

```
 2217  007662  022700  125252                  CMP     #125252,%0
 2218  007666  001401                          BEQ     .+4
 2219  007670  104006                          HLT
 2220  007672  104400                          SCOPE
 2221
 2222  007674  005037  014774                  CLR     @#TEMP
 2223  007700  062777  125252  005070          ADD     #125252,@TEMP+2
 2224  007706  022737  125252  014774          CMP     #125252,@#TEMP
 2225  007714  001401                          BEQ     .+4
 2226  007716  104006                          HLT
 2227  007720  104400                          SCOPE
 2228
 2229  007722  012737  125252  014774          MOV     #125252,@#TEMP
 2230  007730  067777  005024  005040          ADD     @A+6,@TEMP+2
 2231  007736  023727  014774  177777          CMP     @#TEMP,#-1
 2232  007744  001401                          BEQ     .+4
 2233  007746  104006                          HLT
 2234  007750  104400                          SCOPE
 2235
 2236                                  ;TEST UNARYS INDIRECT WITH INDEXING
 2237  007752  012737  177777  014774          MOV     #-1,@#TEMP
 2238  007760  005077  005012                  CLR     @TEMP+2
 2239  007764  005737  014774                  TST     @#TEMP
 2240  007770  001401                          BEQ     .+4
 2241  007772  104006                          HLT
 2242  007774  104400                          SCOPE
 2243
 2244  007776  012737  125252  014774          MOV     #125252,@#TEMP
 2245  010004  005177  004766                  COM     @TEMP+2
 2246  010010  022737  052525  014774          CMP     #052525,@#TEMP
 2247  010016  001401                          BEQ     .+4
 2248  010020  104006                          HLT
 2249  010022  104400                          SCOPE
 2250
 2251  010024  005037  014774                  CLR     @#TEMP
 2252  010030  005277  004742                  INC     @TEMP+2
 2253  010034  022737  000001  014774          CMP     #1,@#TEMP
 2254  010042  001401                          BEQ     .+4
 2255  010044  104006                          HLT
 2256  010046  104400                          SCOPE
 2257
 2258  010050  005037  014774                  CLR     @#TEMP
 2259  010054  005377  004716                  DEC     @TEMP+2
 2260  010060  023727  014774  177777          CMP     @#TEMP,#-1
 2261  010066  001401                          BEQ     .+4
 2262  010070  104006                          HLT
 2263  010072  104400                          SCOPE
 2264
 2265  010074  012737  000001  014774          MOV     #1,@#TEMP
 2266  010102  005477  004670                  NEG     @TEMP+2
 2267  010106  022737  177777  014774          CMP     #-1,@#TEMP
 2268  010114  001401                          BEQ     .+4
 2269  010116  104006                          HLT
 2270  010120  104400                          SCOPE
 2271
 2272  010122  012737  177777  014774          MOV     #-1,@#TEMP
```

```
2273  010130  000261                          SEC
2274  010132  005577  004640                  ADC     @TEMP+2
2275  010136  005737  014774                  TST     @#TEMP
2276  010142  001401                          BEQ     .+4
2277  010144  104006                          HLT
2278  010146  104400                          SCOPE
2279
2280  010150  012737  000001  014774          MOV     #1,@#TEMP
2281  010156  000261                          SEC
2282  010160  005677  004612                  SBC     @TEMP+2
2283  010164  005737  014774                  TST     @#TEMP
2284  010170  001401                          BEQ     .+4
2285  010172  104006                          HLT
2286  010174  104400                          SCOPE
2287
2288                                  ;TEST OF COMBINED INDEXING AND INDIRECT
2289  010176  012700  177772                  MOV     #-6,%0
2290  010202  027027  014752  125252          CMP     @A(0),#125252
2291  010210  001401                          BEQ     .+4
2292  010212  104006                          HLT
2293  010214  104400                          SCOPE
2294
2295  010216  012700  177772                  MOV     #-6,%0
2296  010222  022770  125252  014752          CMP     #125252,@A(0)
2297  010230  001401                          BEQ     .+4
2298  010232  104006                          HLT
2299  010234  104400                          SCOPE
2300
2301  010236  012700  177772                  MOV     #-6,%0
2302  010242  012701  000002                  MOV     #+2,%1
2303  010246  027071  014752  014752          CMP     @A(0),@A(1)
2304  010254  001401                          BEQ     .+4
2305  010256  104006                          HLT
2306  010260  104400                          SCOPE
2307
2308                                  ;TEST BIC INSTRUCTION
2309  010262  012700  000006                  MOV     #+6,%0
2310  010266  012767  177777  004500          MOV     #-1,TEMP
2311  010274  047067  014752  004472          BIC     @A(0),TEMP
2312  010302  022767  125252  004464          CMP     #125252,TEMP
2313  010310  001401                          BEQ     .+4
2314  010312  104006                          HLT
2315  010314  104400                          SCOPE
2316
2317  010316  012700  177772                  MOV     #-6,%0
2318  010322  012737  177777  014764          MOV     #-1,@#C
2319  010330  042770  125252  014774          BIC     #125252,@TEMP(0)
2320  010336  023727  014764  052525          CMP     @#C,#052525
2321  010344  001401                          BEQ     .+4
2322  010346  104006                          HLT
2323  010350  104400                          SCOPE
2324
2325  010352  012737  177777  014764          MOV     #-1,@#C
2326  010360  012700  177772                  MOV     #-6,%0
2327  010364  012701  177772                  MOV     #-6,%1
2328  010370  047071  014752  014774          BIC     @A(0),@TEMP(1)
```

```
2329  010376  022737  052525  014764          CMP     #052525,@#C
2330  010404  001401                          BEQ     .+4
2331  010406  104006                          HLT
2332  010410  104400                          SCOPE
2333
2334                                  ;BINARY INSTRUCTIONS
2335                                  ;INDEX, AND INDIRECT TEST OF PDP-11
2336                                  ;TEST COMPARE INSTRUCTION INDEXED
2337  010412  012700  177770                  MOV     #-10,%0                 ;MINUS 10 TO REG 0
2338  010416  126027  014752  000252          CMPB    A(0),#000252            ;(A INDEX BY MINUS 10) TO #125252
2339  010424  001401                          BEQ     .+4
2340  010426  104006                          HLT                             ;COMPARE WITH INDEX FAILED
2341  010430  104400                          SCOPE
2342
2343  010432  012700  177770                  MOV     #-10,%0                 ;FOR INDEX
2344  010436  122760  000252  014752          CMPB    #000252,A(0)            ;A INDEXED
2345  010444  001401                          BEQ     .+4
2346  010446  104006                          HLT
2347  010450  104400                          SCOPE
2348
2349  010452  012700  000010                  MOV     #10,%0                  ;INDEX
2350  010456  126027  014752  000125          CMPB    A(0),#000125
2351  010464  001401                          BEQ     .+4
2352  010466  104006                          HLT
2353  010470  104400                          SCOPE
2354
2355  010472  012700  000010                  MOV     #10,%0
2356  010476  122760  000125  014752          CMPB    #000125,A(0)
2357  010504  001401                          BEQ     .+4
2358  010506  104006                          HLT
2359  010510  104400                          SCOPE
2360
2361  010512  012700  177770                  MOV     #-10,%0
2362  010516  126060  014752  014752          CMPB    A(0),A(0)
2363  010524  001401                          BEQ     .+4
2364  010526  104006                          HLT
2365  010530  104400                          SCOPE
2366
2367  010532  012700  000010                  MOV     #+10,%0
2368  010536  126060  014752  014752          CMPB    A(0),A(0)
2369  010544  001401                          BEQ     .+4
2370  010546  104006                          HLT
2371  010550  104400                          SCOPE
2372
2373  010552  012700  177770                  MOV     #-10,%0
2374  010556  012701  000004                  MOV     #+4,%1
2375  010562  126061  014752  014752          CMPB    A(0),A(1)
2376  010570  001401                          BEQ     .+4
2377  010572  104006                          HLT
2378  010574  104400                          SCOPE
2379
2380  010576  126160  014752  014752          CMPB    A(1),A(0)
2381  010604  001401                          BEQ     .+4
2382  010606  104006                          HLT
2383  010610  104400                          SCOPE
2384
```

```
2385  010612  012700  177774                  MOV     #-4,%0
2386  010616  012701  000010                  MOV     #+10,%1
2387  010622  126061  014752  014752          CMPB    A(0),A(1)
2388  010630  001401                          BEQ     .+4
2389  010632  104006                          HLT
2390  010634  104400                          SCOPE
2391
2392  010636  012700  177774                  MOV     #-4,%0
2393  010642  012701  000010                  MOV     #10,%1
2394  010646  126160  014752  014752          CMPB    A(1),A(0)
2395  010654  001401                          BEQ     .+4
2396  010656  104006                          HLT
2397  010660  104400                          SCOPE
2398
2399                                  ;TEST MOVE INSTRUCTION FOR INDEX
2400  010662  012700  177770                  MOV     #-10,%0
2401  010666  116067  014752  004100          MOVB    A(0),TEMP
2402  010674  126727  004074  000252          CMPB    TEMP,#000252
2403  010702  001401                          BEQ     .+4
2404  010704  104006                          HLT
2405  010706  104400                          SCOPE
2406
2407  010710  012700  000010                  MOV     #+10,%0
2408  010714  116067  014752  004052          MOVB    A(0),TEMP
2409  010722  126727  004046  000125          CMPB    TEMP,#000125
2410  010730  001401                          BEQ     .+4
2411  010732  104006                          HLT
2412  010734  104400                          SCOPE
2413
2414  010736  012700  177770                  MOV     #-10,%0
2415  010742  112760  125252  014774          MOVB    #125252,TEMP(0)
2416  010750  123727  014764  125252          CMPB    @#C,#125252
2417  010756  001401                          BEQ     .+4
2418  010760  104006                          HLT
2419  010762  104400                          SCOPE
2420
2421  010764  012700  000010                  MOV     #+10,%0
2422  010770  112760  052525  014774          MOVB    #052525,TEMP(0)
2423  010776  123727  015004  052525          CMPB    @#TEMP+10,#052525
2424  011004  001401                          BEQ     .+4
2425  011006  104006                          HLT
2426  011010  104400                          SCOPE
2427
2428                                  ;TEST BIC INSTRUCTION FOR INDEXING
2429  011012  012767  177777  003754          MOV     #-1,TEMP
2430  011020  012700  177770                  MOV     #-10,%0
2431  011024  146067  014752  003742          BICB    A(0),TEMP
2432  011032  126727  003736  177525          CMPB    TEMP,#177525
2433  011040  001401                          BEQ     .+4
2434  011042  104006                          HLT
2435  011044  104400                          SCOPE
2436
2437  011046  012767  177777  003720          MOV     #-1,TEMP
2438  011054  012700  000010                  MOV     #10,%0
2439  011060  146067  014752  003706          BICB    A(0),TEMP
2440  011066  126727  003702  007652          CMPB    TEMP,#007652
```

```
2441  011074  001401                          BEQ     .+4
2442  011076  104006                          HLT
2443  011100  104400                          SCOPE
2444
2445  011102  012737  177777  015004          MOV     #-1,@#TEMP+10
2446  011110  012700  000010                  MOV     #10,%0
2447  011114  142760  125252  014774          BICB    #125252,TEMP(0)
2448  011122  123727  015004  002525          CMPB    @#TEMP+10,#2525
2449  011130  001401                          BEQ     .+4
2450  011132  104006                          HLT
2451  011134  104400                          SCOPE
2452
2453  011136  012700  177770                  MOV     #-10,%0
2454  011142  012767  177777  003614          MOV     #-1,TEMP-10
2455  011150  142767  052525  003606          BICB    #052525,TEMP-10
2456  011156  126727  003602  125252          CMPB    TEMP-10,#125252
2457  011164  001401                          BEQ     .+4
2458  011166  104006                          HLT
2459  011170  104400                          SCOPE
2460
2461                          ;TEST UNARYS INDEXED
2462  011172  012737  177777  014774          MOV     #-1,@#TEMP
2463  011200  012700  177770                  MOV     #-10,%0
2464  011204  105060  015004                  CLRB    0(0)
2465  011210  105737  014774                  TSTB    @#TEMP
2466  011214  001401                          BEQ     .+4
2467  011216  104006                          HLT
2468  011220  104400                          SCOPE
2469
2470  011222  012737  177777  01· ·74          MOV     #-1,@#TEMP
2471  011230  012700  177770                  MOV     #-10,%0
2472  011234  105060  015004                  CLRB    0(0)
2473  011240  023727  014774  177400          CMP     @#TEMP,#177400
2474  011246  001401                          BEQ     .+4
2475  011250  104006                          HLT
2476  011252  104400                          SCOPE
2477
2478  011254  012737  177777  014774          MOV     #-1,@#TEMP
2479  011262  012700  177771                  MOV     #-7,%0
2480  011266  105060  015004                  CLRB    0(0)
2481  011272  023727  014774  000377          CMP     @#TEMP,#000377
2482  011300  001401                          BEQ     .+4
2483  011302  104006                          HLT
2484  011304  104400                          SCOPE
2485
2486  011306  012737  177777  014774          MOV     #-1,@#TEMP
2487  011314  012700  000010                  MOV     #+10,%0
2488  011320  105060  014764                  CLRB    C(0)
2489  011324  105737  014774                  TS"B    @#TEMP
2490  011330  001401                          BEQ     .+4
2491  011332  104006                          HLT
2492  011334  104400                          SCOPE
2493
2494  011336  012737  177777  014774          MOV     #-1,@#TEMP
2495  011344  012700  177770                  MOV     #-10,%0
2496  011350  105160  015004                  COMB    0(0)
```

```
2497  011354  105737  014774                  TSTB    @#TEMP
2498  011360  001401                          BEQ     .+4
2499  011362  104006                          HLT
2500  011364  104400                          SCOPE
2501
2502  011366  012737  177777  014774          MOV     #-1,@#TEMP
2503  011374  012700  000010                  MOV     #+10,%0
2504  011400  105360  014764                  INCB    C(0)
2505  011404  105737  014774                  TSTB    @#TEMP
2506  011410  001401                          BEQ     .+4
2507  011412  104006                          HLT
2508  011414  104400                          SCOPE
2509
2510  011416  012737  000001  014774          MOV     #1,@#TEMP
2511  011424  012700  177770                  MOV     #-10,%0
2512  011430  105360  015004                  DECB    D(0)
2513  011434  105737  014774                  TSTB    @#TEMP
2514  011440  001401                          BEQ     .+4
2515  011442  104006                          HLT
2516  011444  104400                          SCOPE
2517
2518  011446  012737  000001  014774          MOV     #1,@#TEMP
2519  011454  012700  000010                  MOV     #+10,%0
2520  011460  105460  014764                  NEGB    C(0)
2521  011464  023727  014774  000377          CMP     @#TEMP,#377
2522  011472  001401                          BEQ     .+4
2523  011474  104006                          HLT
2524  011476  104400                          SCOPE
2525
2526  011500  012737  177777  014774          MOV     #-1,@#TEMP
2527  011506  012700  177770                  MOV     #-10,%0
2528  011512  000261                          SEC
2529  011514  105560  015004                  ADCB    D(0)
2530  011520  023727  014774  177400          CMP     @#TEMP,#177400
2531  011526  001401                          BEQ     .+4
2532  011530  104006                          HLT
2533  011532  104400                          SCOPE
2534
2535  011534  012737  000001  014774          MOV     #1,@#TEMP
2536  011542  012700  000010                  MOV     #+10,%0
2537  011546  000261                          SEC
2538  011550  105660  014764                  SBCB    C(0)
2539  011554  005737  014774                  TST     @#TEMP
2540  011560  001401                          BEQ     .+4
2541  011562  104006                          HLT
2542  011564  104400                          SCOPE
2543
2544                                  ;TEST INDIRECT ADDRESSING
2545                                  ;TEST COMPARE INSTRUCTION
2546  011566  123727  014742  000252          CMPB    @#8,#000252
2547  011574  001401                          BEQ     .+4
2548  011576  104006                          HLT
2549  011600  104400                          SCOPE
2550
2551  011602  122737  125252  014742          CMPB    #125252,@#8
2552  011610  001401                          BEQ     .+4
```

```
2552  011612  104006                          HLT
2553  011614  104400                          SCOPE
2554
2555                                  ;TEST MOVE INSTRUCTIONS
2556  011616  113700  014742                   MOVB    @#8,X0
2557  011622  122700  000252                   CMPB    #000252,X0
2558  011626  001401                           BEQ     .+4
2559  011630  104006                           HLT
2560  011632  104400                           SCOPE
2561
2562  011634  112737  125252  014774           MOVB    #125252,@#TEMP
2563  011642  126737  003074  014774           CMPB    B,@#TEMP
2564  011650  001401                           BEQ     .+4
2565  011652  104006                           HLT
2566  011654  104400                           SCOPE
2567
2568                                  ;TEST UNARYS INDIRECT
2569  011656  012737  177777  014774           MOV     #-1,@#TEMP
2570  011664  105037  014774                   CLRB    @#TEMP
2571  011670  023727  014774  177400           CMP     @#TEMP,#177400
2572  011676  001401                           BEQ     .+4
2573  011700  104006                           HLT
2574  011702  104400                           SCOPE
2575
2576  011704  012737  125252  014774           MOV     #125252,@#TEMP
2577  011712  105137  014775                   COMB    @#TEMP+1
2578  011716  022737  052652  014774           CMP     #052652,@#TEMP
2579  011724  001401                           BEQ     .+4
2580  011726  104006                           HLT
2581  011730  104400                           SCOPE
2582
2583  011732  005037  014774                   CLR     @#TEMP
2584  011736  105237  014775                   INCB    @#TEMP+1
2585  011742  022737  000400  014774           CMP     #400,@#TEMP
2586  011750  001401                           BEQ     .+4
2587  011752  104006                           HLT
2588  011754  104400                           SCOPE
2589
2590  011756  005037  014774                   CLR     @#TEMP
2591  011762  105377  003010                   DECB    @TEMP+2
2592  011766  023727  014774  000377           CMP     @#TEMP,#377
2593  011774  001401                           BEQ     .+4
2594  011776  104006                           HLT
2595  012000  104400                           SCOPE
2596
2597  012002  005037  014774                   CLR     @#TEMP
2598  012006  112737  000001  014775           MOVB    #1,@#TEMP+1
2599  012014  105437  014775                   NEGB    @#TEMP+1
2600  012020  022737  177400  014774           CMP     #177400,@#TEMP
2601  012026  001401                           BEQ     .+4
2602  012030  104006                           HLT
2603  012032  104400                           SCOPE
2604
2605                                  ;TEST INDIRECT ADDRESSING WITH INDEXING
2606                                  ;TEST COMPARE INSTRUCTION
2607
2608
```

```
 2609  012034  122777  125252  002702          CMPB    #125252,@B+2
 2610  012042  001401                          BEQ     .+4
 2611  012044  104006                          HLT
 2612  012046  104400                          SCOPE
 2613
 2614  012050  127777  002670  002666          CMPB    @B+2,@B+2
 2615  012056  001401                          BEQ     .+4
 2616  012060  104006                          HLT
 2617  012062  104400                          SCOPE
 2618
 2619                                  ;TEST MOVE INSTRUCTIONS
 2620  012064  117700  002654                  MOVB    @B+2,X0
 2621  012070  122700  125252                  CMPB    #125252,X0
 2622  012074  001401                          BEQ     .+4
 2623  012076  104006                          HLT
 2624  012100  104400                          SCOPE
 2625
 2626  012102  112777  125252  002666          MOVB    #125252,@TEMP+2
 2627  012110  126737  002626  014774          CMPB    B,@#TEMP
 2628  012116  001401                          BEQ     .+4
 2629  012120  104006                          HLT
 2630  012122  104400                          SCOPE
 2631
 2632  012124  117777  002614  002634          MOVB    @B+2,@C+2
 2633  012132  126737  002604  014764          CMPB    B,@#C
 2634  012140  0C 401                          BEQ     .+4
 2635  012142  104006                          HLT
 2636  012144  104400                          SCOPE
 2637
 2638                                  ;TEST BIC INSTRUCTION INDIRECT WITH INDEXING
 2639  012146  012700  177777                  MOV     #-1,X0
 2640  012152  147700  002566                  BICB    @B+2,X0
 2641  012156  120027  052525                  CMPB    X0,#52525
 2642  012162  001401                          BEQ     .+4
 2643  012164  104006                          HLT
 2644  012166  104400                          SCOPE
 2645
 2646  012170  012737  177777  014774          MOV     #-1,@#TEMP
 2647  012176  142777  125252  002572          BICB    #125252,@TEMP+2
 2648  012204  122737  052525  014774          CMPB    #52525,@#TEMP
 2649  012212  001401                          BEQ     .+4
 2650  012214  104006                          HLT
 2651  012216  104400                          SCOPE
 2652
 2653  012220  012737  177777  014764          MOV     #-1,@#C
 2654  012226  147777  002512  002532          BICB    @B+2,@C+2
 2655  012234  126737  002522  014764          CMPB    A+10,@#C
 2656  012242  001401                          BEQ     .+4
 2657  012244  104006                          HLT
 2658  012246  104400                          SCOPE
 2659
 2660                                  ;TEST UNARYS INDIRECT WITH INDEXING
 2661  012250  012737  177777  014774          MOV     #-1,@#TEMP
 2662  012256  105077  002514                  CLRB    @TEMP+2
 2663  012262  105737  014774                  TSTB    @#TEMP
 2664  012266  001401                          BEQ     .+4
```

```
2665  012270  104006                          HLT
2666  012272  104400                          SCOPE
2667
2668  012274  005037  014774                  CLR     @#TEMP
2669  012300  105277  002472                  INCB    @TEMP+2
2670  012304  122737  000001  014774          CMPB    #1,@#TEMP
2671  012312  001401                          BEQ     .+4
2672  012314  104006                          HLT
2673  012316  104400                          SCOPE
2674
2675  012320  005037  014774                  CLR     @#TEMP
2676  012324  105377  002446                  DECB    @TEMP+2
2677  012330  123727  014774  177777          CMPB    @#TEMP,#-1
2678  012336  001401                          BEQ     .+4
2679  012340  104006                          HLT
2680  012342  104400                          SCOPE
2681
2682  012344  012737  000001  014774          MOV     #1,@#TEMP
2683  012352  105477  002420                  NEGB    @TEMP+2
2684  012356  122737  177777  014774          CMPB    #-1,@#TEMP
2685  012364  001401                          BEQ     .+4
2686  012366  104006                          HLT
2687  012370  104400                          SCOPE
2688
2689  012372  012737  177777  014774          MOV     #-1,@#TEMP
2690  012400  000261                          SEC
2691  012402  105577  002370                  ADCB    @TEMP+2
2692  012406  022737  177400  014774          CMP     #177400,@#TEMP
2693  012414  001401                          BEQ     .+4
2694  012416  104006                          HLT
2695  012420  105737  014774                  TSTB    @#TEMP
2696  012424  001401                          BEQ     .+4
2697  012426  104006                          HLT
2698  012430  104400                          SCOPE
2699
2700  012432  012737  000001  014774          MOV     #1,@#TEMP
2701  012440  000261                          SEC
2702  012442  105377  002330                  DECB    @TEMP+2
2703  012446  005737  014774                  TST     @#TEMP
2704  012452  001401                          BEQ     .+4
2705  012454  104006                          HLT
2706  012456  104400                          SCOPE
2707
2708                                ;TEST OF COMBINED INDEXING AND INDIRECT
2709  012460  012700  177772                  MOV     #-6,%0
2710  012464  127027  014752  125252          CMPB    @A(0),#125252
2711  012472  001401                          BEQ     .+4
2712  012474  104006                          HLT
2713  012476  104400                          SCOPE
2714
2715  012500  012700  177772                  MOV     #-6,%0
2716  012504  012701  000002                  MOV     #+2,%1
2717  012510  127071  014752  014752          CMPB    @A(0),@A(1)
2718  012516  001401                          BEQ     .+4
2719  012520  104006                          HLT
2720  012522  104400                          SCOPE
```

```
2721
2722                                        ;TEST BIC INSTRUCTION
2723  012524  012700  000006                MOV     #+6,%0
2724  012530  012767  177777  002236        MOV     #-1,TEMP
2725  012536  147067  014752  002230        BICB    @A(0),TEMP
2726  012544  122767  125252  002222        CMPB    #125252,TEMP
2727  012552  001401                        BEQ     .+4
2728  012554  104006                        HLT
2729  012556  104400                        SCOPE
2730
2731  012560  012700  177772                MOV     #-6,%0
2732  012564  012737  177777  014764        MOV     #-1,@#C
2733  012572  142770  125252  014774        BICB    #125252,@TEMP(0)
2734  012600  123727  014764  000125        CMPB    @#C,#000125
2735  012606  001401                        BEQ     .+4
2736  012610  104006                        HLT
2737  012612  104400                        SCOPE
2738
2739  012614  012700  014744                MOV     #B+2,%0         ;ADDRESS OF ADDRESS OF B
2740  012620  023067  002116                CMP     @(0)+,B
2741  012624  001401                        BEQ     .+4
2742  012626  104006                        HLT
2743  012630  104400                        SCOPE
2744
2745  012632  012700  014746                MOV     #B+4,%0
2746  012636  023067  002100                CMP     @-(0),B
2747  012642  001401                        BEQ     .+4
2748  012644  104006                        HLT
2749  012646  104400                        SCOPE
2750
2751  012650  012700  014746                MOV     #B+4,%0
2752  012654  125067  002062                CMPB    @-(0),B
2753  012660  001401                        BEQ     .+4
2754  012662  104006                        HLT
2755  012664  104400                        SCOPE
2756
2757  012666  012700  014770                MOV     #C+4,%0
2758  012672  012737  177777  014764        MOV     #-1,@#C
2759  012700  105050                        CLRB    @-(0)
2760  012702  023727  014764  177400        CMP     @#C,#177400
2761  012710  001401                        BEQ     .+4
2762  012712  104006                        HLT
2763  012714  104400                        SCOPE
2764
2765  012716  012737  177777  014764        MOV     #-1,@#C
2766  012724  012700  177772                MOV     #-6,%0
2767  012730  012701  177772                MOV     #-6,%1
2768  012734  147071  014752  014774        BICB    @A(0),@TEMP(1)
2769  012742  022737  177525  014764        CMP     #177525,@#C
2770  012750  001401                        BEQ     .+4
2771  012752  104006                        HLT
2772  012754  104400                        SCOPE
2773
2774                                        ;SET UP TO TEST THAT R0 IS NOT DESTROYED BY FALSE SELECTION
2775  012756  012700  052525                MOV     #52525,%0       ;THIS IS CHECKED LATER IN PROGRAM
2776
```

```
2777                                            ;TEST JSR INSTRUCTION
2778  012762  004767  000002                            JSR     %7,TJSR2        ;PLACE PC ON STACK
2779  012766  000405                    TJSR1:  BR      TJSR3           ;RETURN HERE ON RTS %19
2780  012770  121627  012766            TJSR2:  CMPB    @%6,#TJSR1      ;CHECK FOR CORRECT PC ON STACK
2781  012774  001401                            BEQ     .+4
2782  012776  104006                            HLT                     ;INCORRECT PC ON STACK
2783  013000  000207                            RTS     %7              ;RETURN TO INST AFTER JSR
2784  013002  104400                    TJSR3:  SCOPE
2785
2786  013004  000257                            CCC
2787  013006  004717                            JSR     %7,@%7          ;INSTRUCTION UNDER TEST
2788  013010  121627  013010                    CMPB    @%6,#TJSR3+6            ;TEST THE STACK
2789  013014  001401                            BEQ     .+4
2790  013016  104006                            HLT                     ;PC OF JSR DID NOT GO TO STACK
2791  013020  005726                            TST     (6)+            ;REPOSITION THE STACK
2792  013022  104400                            SCOPE
2793
2794                                            ;TEST NESTED SUBROUTINES
2795  013024  000257                            CCC                     ;CLEAR CONDITION CODES
2796  013026  004767  001602                    JSR     %7,SUBR6
2797  013032  100401                            BMI     .+4
2798  013034  104006                            HLT                     ;JSR OR RTS FAILED
2799  013036  001401                            BEQ     .+4
2800  013040  104006                            HLT                     ;JSR OR RTS FAILED
2801  013042  102401                            BVS     .+4
2802  013044  104006                            HLT                     ;JSR OR RTS FAILED
2803  013046  103401                            BCS     .+4
2804  013050  104006                            HLT                     ;JSR OR RTS FAILED
2805  013052  104400                            SCOPE
2806
2807                                            ;TEST ROTATE ODD BYTE
2808  013054  104400                            SCOPE
2809  013056  000257                            CCC                             ;CLEAR "C"
2810  013060  012767  123456  001706            MOV     #123456,TEMP
2811  013066  106067  001703                    RORB    TEMP+1                  ;ROTATE ODD BYTE
2812  013072  103401                            BCS     .+4
2813  013074  104006                            HLT                             ;C NOT SET
2814  013076  102401                            BVS     .+4
2815  013100  104006                            HLT                             ;V NOT SET
2816  013102  022767  051456  001664            CMP     #051456,TEMP
2817  013110  001401                            BEQ     .+4
2818  013112  104006                            HLT                             ;ROTATE FAILED
2819  013114  104400                            SCOPE
2820
2821  013116  000277                            SCC                             ;SET C
2822  013120  012767  123456  001646            MOV     #123456,TEMP
2823  013126  106067  001643                    RORB    TEMP+1
2824  013132  103401                            BCS     .+4
2825  013134  104006                            HLT                             ;C NOT SET
2826  013136  102001                            BVC     .+4
2827  013140  104006                            HLT                             ;V NOT CLEARED
2828  013142  022767  151456  001624            CMP     #151456,TEMP
2829  013150  001401                            BEQ     .+4
2830  013152  104006                            HLT                             ;ROTATE FAILED
2831  013154  104400                            SCOPE
2832
```

```
2834  013156  000257                          CCC
2835  013160  012767  123456  001606          MOV     #123456,TEMP
2836  013166  106167  001603                  ROLB    TEMP+1
2837  013172  103401                          BCS     .+4
2838  013174  104006                          HLT                     ;C NOT SET
2839  013176  102401                          BVS     .+4
2840  013200  104006                          HLT                     ;V NOT SET
2841  013202  022767  047056  001564          CMP     #047056,TEMP
2842  013210  001401                          BEQ     .+4
2843  013212  104006                          HLT                     ;ROTATE BYTE FAILED
2844  013214  104400                          SCOPE
2845
2846  013216  000277                          SCC                     ;SET C
2847  013220  012767  123456  001546          MOV     #123456,TEMP
2848  013226  106167  001543                  ROLB    TEMP+1
2849  013232  103401                          BCS     .+4
2850  013234  104006                          HLT                     ;C NOT SET
2851  013236  102401                          BVS     .+4
2852  013240  104006                          HLT                     ;V NOT SET
2853  013242  022767  047456  001524          CMP     #047456,TEMP
2854  013250  001401                          BEQ     .+4
2855  013252  104006                          HLT                     ;ROTATE ODD BYTE FAILED
2856  013254  104400                          SCOPE
2857
2858  013256  000257                          CCC                     ;CLEAR C
2859  013260  012767  177777  001506          MOV     #-1,TEMP
2860  013266  106267  001503                  ASR     TEMP+1
2861  013272  103401                          BCS     .+4
2862  013274  104006                          HLT                     ;C NOT SET
2863  013276  102001                          BVC     .+4
2864  013300  104006                          HLT                     ;V NOT CLEARED
2865  013302  026727  001466  177777          CMP     TEMP,#-1
2866  013310  001401                          BEQ     .+4
2867  013312  104006                          HLT                     ;SHIFT FAILED
2868  013314  104400                          SCOPE
2869
2870  013316  000277                          SCC
2871  013320  012767  177777  001446          MOV     #-1,TEMP
2872  013326  106367  001443                  ASLB    TEMP+1
2873  013332  103401                          BCS     .+4
2874  013334  104006                          HLT                     ;C NOT SET
2875  013336  102001                          BVC     .+4
2876  013340  104006                          HLT                     ;V NOT CLEARED
2877  013342  026727  001426  177377          CMP     TEMP,#177377
2878  013350  001401                          BEQ     .+4
2879  013352  104006                          HLT                     ;SHIFT BYTE FAILED
2880  013354  104400                          SCOPE
2881
2882                          ;TEST THAT R0 WASN'T CLEARED BY FALSE SELECTION
2883  013356  022700  052525                  CMP     #52525,R0
2884  013362  001401                          BEQ     .+4
2885  013364  104006                          HLT
2886  013366  104400                          SCOPE
2887
2888                          ;TEST COMBINATION OF N, C AND V
```

```
2889  013370  005067  001340                  CLR     ICOUNT                  ;NO ITERATION
2890
2891                                  ;INHIBIT TESTS WHICH USE ALL NUMBERS WHEN SW11 IS SET
2892  013374  032737  004000  000176          BIT     #4000,@#SREG2
2893  013402  001402                          BEQ     COMPAR
2894  013404  000167  001170                  JMP     DONE
2895
2896                                  ;TEST ALL COMBINATIONS OF NUMBERS WITH COMPARE INSTRUCTION
2897  013410  005000                  COMPAR: CLR     %0                      ;INIT %0
2898  013412  005001                          CLR     %1                      ;INIT %1
2899  013414  020001                  CMP1:   CMP     %0,%1                   ;ARE THE EQUAL
2900  013416  001401                          BEQ     .+4
2901  013420  104006                          HLT                             ;R0 AND R1 DID NOT COMPARE
2902  013422  026727  177777  177777        CMP     %0,#-1                  ;AT UPPER LIMIT
2903  013430  001403                          BEQ     CMP2                    ;YES EXIT
2904  013432  005200                          INC     %0                      ;INCREMENT TO NEXT NUMBER
2905  013434  005201                          INC     %1
2906  013436  000767                          BR      CMP1
2907  013440  104400                  CMP2:   SCOPE
2908
2909                                  ;TEST ROTATING ALL NUMBERS
2910  013442  104400                          SCOPE
2911  013444  012767  177777  000132          MOV     #-1,REFF                ;INITIALIZE BASE NUMBER
2912  013452  005267  000126          TSROT:  INC     REFF                    ;INCREMENT NUMBER
2913  013456  004767  000012                  JSR     %7,ROTALL               ;GO TO COMPARE ROUTINE
2914  013464  026727  000116  177777          CMP     REFF,#-1                ;TEST ALL VALUES
2915  013472  001370                          BNE     TSROT                   ;NO TEST THEM ALL
2916  013474  000446                          BR      TSRT2A                  ;WE ARE DONE
2917
2918  013476  016767  000104  000104  ROTALL: MOV     REFF,TEST
2919  013504  006067  000100                  ROR     TEST
2920  013510  006067  000074                  ROR     TEST
2921  013514  006067  000070                  ROR     TEST
2922  013520  006167  000064                  ROL     TEST
2923  013524  006167  000060                  ROL     TEST
2924  013530  006167  000054                  ROL     TEST
2925  013534  100004                          BPL     .+12
2926  013536  103007                          BCC     .+20                    ;Z=1
2927  013540  102013                          BVC     .+30                    ;Z=1, C=1
2928  013542  104006                          HLT                             ;Z=C, BUT V=1
2929  013544  000411                          BR      .+24
2930  013546  103006                          BCC     .+16                    ;Z=0
2931  013550  102407                          BVS     .+20                    ;Z=0, C=1
2932  013552  104006                          HLT                             ;Z NOT EQUAL C, V=1
2933  013554  000405                          BR      .+14
2934  013556  102404                          BVS     .+12                    ;Z=1, C=0
2935  013560  104006                          HLT                             ;Z NOT EQUAL C, V=1
2936  013562  000402                          BR      .+6
2937  013564  102001                          BVC     .+4                     ;Z=0, C=0
2938  013566  104006                          HLT                             ;Z=C, BUT V=1
2939  013570  104400                          SCOPE
2940  013572  026767  000012  000006          CMP     TEST,REFF
2941  013600  001401                          BEQ     .+4
2942  013602  104006                          HLT                             ;INITIAL NOT EQUAL TO FINAL
2943  013604  000207                          RTS     %7
2944  013606  000000                  REFF:   0
```

```
2945  013604  000000                    TEST:   0
2946          013602                            REF=REFF
2947
2948                                    ;TEST ROTATING BYTE EVEN/ODD, ALL NUMBERS
2949  013606  012767  177777  177766    TSRT2A: MOV     #-1,REFF
2950  013614  005267  177762            TSROT2: INC     REFF
2951  013620  004767  000016                    JSR     %7,ROTBE
2952  013624  004767  000122                    JSR     %7,ROTBO
2953  013630  022767  177777  177744            CMP     #-1,REFF
2954  013636  001366                            BNE     TSROT2
2955  013640  000505                            BR      ROTEN1
2956  013642  016767  177734  177734    ROTBE:  MOV     REFF,TEST
2957  013650  106067  177730                    RORB    TEST                    ;ROTATE BYTE EVEN
2958  013654  106067  177724                    RORB    TEST
2959  013660  106067  177720                    RORB    TEST
2960  013664  106167  177714                    ROLB    TEST
2961  013670  106167  177710                    ROLB    TEST
2962  013674  106167  177704                    ROLB    TEST
2963  013700  100004                            BPL     .+12
2964  013702  103007                            BCC     .+20                    ;Z=1
2965  013704  102013                            BVC     .+30                    ;Z=1, C=1
2966  013706  104006                            HLT                             ;Z=C, BUT V=1
2967  013710  000411                            BR      .+24
2968  013712  103006                            BCC     .+16                    ;Z=0
2969  013714  102407                            BVS     .+20                    ;Z=0, C=1
2970  013716  104006                            HLT                             ;Z NOT EQUAL C, V=1
2971  013720  000405                            BR      .+14
2972  013722  102404                            BVS     .+12                    ;Z=1, C=0
2973  013724  104006                            HLT                             ;Z NOT EQUAL C, V=1
2974  013726  000402                            BR      .+6
2975  013730  102001                            BVC     .+4                     ;Z=0, C=0
2976  013732  104006                            HLT                             ;Z=C, BUT V=1
2977  013734  104400                            SCOPE
2978  013736  026767  177642  177636            CMP     TEST,REFF
2979  013744  001401                            BEQ     .+4
2980  013746  104006                            HLT
2981  013750  000207                            RTS     %7
2982  013752  106067  177627            ROTBO:  RORB    TEST+1                  ;ROTATE BYTE ODD
2983  013756  106067  177623                    RORB    TEST+1
2984  013762  106067  177617                    RORB    TEST+1
2985  013766  106167  177613                    ROLB    TEST+1
2986  013772  106167  177607                    ROLB    TEST+1
2987  013776  106167  177603                    ROLB    TEST+1
2988  014002  100004                            BPL     .+12
2989  014004  103007                            BCC     .+20                    ;Z=1
2990  014006  102013                            BVC     .+30                    ;Z=1, C=1
2991  014010  104006                            HLT                             ;Z=C, BUT V=1
2992  014012  000411                            BR      .+24
2993  014014  103006                            BCC     .+16                    ;Z=0
2994  014016  102407                            BVS     .+20                    ;Z=0, C=1
2995  014020  104006                            HLT                             ;Z NOT EQUAL C, V=1
2996  014022  000405                            BR      .+14
2997  014024  102404                            BVS     .+12                    ;Z=1, C=0
2998  014026  104006                            HLT                             ;Z NOT EQUAL C, V=1
2999  014030  000402                            BR      .+6
3000  014032  102001                            BVC     .+4                     ;Z=0, C=0
```

```
3001  014034  104006                          HLT                             ;Z=C, BUT V=1
3002  014036  104400                          SCOPE
3003  014040  026767  177540  177534         CMP     TEST,REFF
3004  014046  001401                          BEQ     .+4
3005  014050  104006                          HLT
3006  014052  000207                          RTS     %7
3007  014054  104400              ROTEN1:     SCOPE
3008
3009                                          ;ADD AND SUBTRACT ALL NUMBERS AGAINST FIXED NUMBERS
3010                                          ;A+B=C, C-A=B, BF SHOULD EQUAL BI
3011  014056  011667  000072                 MOV     @%6,NUMA
3012  014062  012767  000001  177512         MOV     #1,REF
3013  014070  005267  177506         ARITST: INC     REF
3014  014074  004767  000014                 JSR     %7,ADSUB
3015  014100  022767  177777  177474         CMP     #-1,REFF
3016  014106  001370                          BNE     ARITST
3017  014110  000422                          BR      ARIEND
3018  014112  104400                          SCOPE
3019  014114  016767  177462  177462  ADSUB: MOV     REF,TEST
3020  014122  066767  000026  177454         ADD     NUMA,TEST
3021  014130  166767  000020  177446         SUB     NUMA,TEST
3022  014136  026767  177440  177440         CMP     REF,TEST
3023  014144  001401                          BEQ     .+4
3024  014146  104006                          HLT
3025  014150  104400                          SCOPE
3026  014152  000207                          RTS     %7
3027  014154  000000              NUMA:       0
3028  014156  104400              ARIEND:     SCOPE
3029
3030                                          ;TEST COMPLIMENTING ALL NUMBERS
3031  014160  005067  000610                 CLR     TEMP            ;BASE DATA
3032  014164  005067  000610                 CLR     TEMP+4          ;BASE REFERENCE
3033  014170  005167  000600         TCOM:   COM     TEMP            ;COMPLIMENT DATA
3034  014174  005367  000600                 DEC     TEMP+4          ;DECREMENT REFERENCE
3035  014200  026767  000570  000572         CMP     TEMP,TEMP+4     ;COMPARE
3036  014206  001401                          BEQ     .+4             ;TEST
3037  014210  104006                          HLT                     ;COMPLIMENT OR DECREMENT FAILED
3038  014212  005167  000556                 COM     TEMP
3039  014216  005267  000552                 INC     TEMP            ;INCREMENT AND TEST FOR DONE
3040  014222  001362                          BNE     TCOM            ;NOT FINISHED GO LOOP
3041  014224  104400                          SCOPE
3042
3043                                          ;TEST COMB (EVEN BYTE)
3044  014226  005067  000542                 CLR     TEMP            ;BASE DATA
3045  014232  005067  000542                 CLR     TEMP+4          ;REFERENCE DATA
3046  014236  105167  000532         TCOM2:  COMB    TEMP
3047  014242  005367  000532                 DEC     TEMP+4
3048  014246  126767  000522  000524         CMPB    TEMP,TEMP+4     ;COMPARE
3049  014254  001401                          BEQ     .+4
3050  014256  104006                          HLT                     ;COMPLIMENT OR INCREMENT BYTE FAILED
3051  014260  105167  000510                 COMB    TEMP
3052  014264  105267  000504                 INCB    TEMP
3053  014270  001362                          BNE     TCOM2
3054  014272  104400                          SCOPE
3055
3056                                          ;TEST COMB (ODD BYTE)
```

```
 3057  014274  005067  000474                  CLR     TEMP              ;BASE DATA
 3058  014300  005067  000474                  CLR     TEMP+4            ;REFERENCE DATA
 3059  014304  105167  000465          TCOM3:  COMB    TEMP+1            ;ODD BYTE
 3060  014310  005367  000464                  DEC     TEMP+4
 3061  014314  126767  000455  000456          CMPB    TEMP+1,TEMP+4
 3062  014322  001401                          BEQ     .+4
 3063  014324  104006                          HLT                       ;COMPLIMENT BYTE FAILED
 3064  014326  105167  000443                  COMB    TEMP+1
 3065  014332  105267  000437                  INCB    TEMP+1
 3066  014336  001362                          BNE     TCOM3
 3067  014340  104400                          SCOPE
 3068
 3069                                  ;TEST COMPARE ALL VALUE EVEN BYTE WITH ODD
 3070  014342  005067  000426                  CLR     TEMP              ;BASE VALUE
 3071  014346  126767  000422  000421  TSCOMB: CMPB    TEMP,TEMP+1       ;COMPARE
 3072  014354  001401                          BEQ     .+4
```

```
3073  014356  104006                          HLT                     ;COMPARE FAILED
3074  014360  002001                          BGE     .+4
3075  014362  104006                          HLT                     ;V IS NOT = TO N
3076  014364  003401                          BLE     .+4
3077  014366  104006                          HLT                     ;V IS SET
3078  014370  062767  000401  000376          ADD     #401,TEMP
3079  014376  022767  177777  000370          CMP     #-1,TEMP
3080  014404  001360                          BNE     TSCOMB
3081  014406  104400                          SCOPE
3082
3083  014410  012767  000010  000316          MOV     #10,ICOUNT
3084
3085                                  ;TEST TO SEE IF I/O DEVICES WERE SELECTED
3086  014416  016767  163554  000026          MOV     SREG2,CKWAIT
3087  014424  005167  000022                  COM     CKWAIT
3088  014430  032767  000371  000014          BIT     #371,CKWAIT
3089  014436  001406                          BEQ     WAIT4           ;BRANCH IF NO DEVICES SELECTED
3090  014440  000001                          WAIT                    ;INTERRUPTS WILL OCCUR
3091  014442  000001                          WAIT                    ;IF DEVICES ARE SELECTED
3092  014444  000001                          WAIT
3093  014446  000001                          WAIT
3094  014450  000401                          BR      .+4
3095  014452  000000                  CKWAIT: 0
3096  014454  104400                  WAIT4:  SCOPE
3097  014456  012767  000400  000250          MOV     #400,ICOUNT
3098
3099                                  ;TEST SWAB
3100  014464  012767  000200  177112          MOV     #020L,TEST
3101  014472  000367  177106                  SWAB    TEST
3102  014476  100001                          BPL     .+4
3103  014500  104006                          HLT
3104  014502  001401                          BEQ     .+4
3105  014504  104006                          HLT
3106  014506  000367  177072                  SWAB    TEST
3107  014512  100401                          BMI     .+4
3108  014514  104006                          HLT
3109  014516  001001                          BNE     .+4
3110  014520  104006                          HLT
3111  014522  104400                          SCOPE
3112
3113                                  ;TEST ALL COMBINATIONS OF SWAB
3114  014524  005067  177054                  CLR     TEST            ;NUMBER UNDER TEST
3115  014530  005067  177046                  CLR     REF             ;REFERENCE NUMBER
3116  014534  000367  177044          SWABA:  SWAB    TEST            ;OPERATION UNDER TEST
3117  014540  026767  177040  177034          CMP     TEST,REF        ;TEST SWAB INSTRUCTION
3118  014546  001401                          BEQ     .+4
3119  014550  104006                          HLT                     ;SWAB FAILED
3120  014552  000367  177026                  SWAB    TEST
3121  014556  005267  177020                  INC     REF             ;INCREMENT REFERENCE NUMBER
3122  014562  105267  177017                  INCB    TEST+1          ;INC TEST NUMBER
3123  014566  001362                          BNE     SWABA           ;LOOP TILL DONE
3124  014570  104400                          SCOPE
3125  014572  012767  004000  000134          MOV     #4000,ICOUNT
3126
3127
3128                                  ;*********************************************************************************
```

```
                                        ;END OF USER CODE IN BANK/
                                        ;CALL KERNEL/
                                        ;ALTERRED IN CORE EXPANSION/
014600  104010                  DONE:   EOB
014602  000240                          NOP                     ;TO ALLOW CORE EXPANSION TO PATCH IN JMP

                                        ;GROUP OF NESTED SUBROUTINES/
014604  000207                  SUBR1:  RTS     x7              ;ONE INSTRUCTION
014606  000277                  SUBR2:  SCC                     ;ONE DEEP
014610  000207                          RTS     x7
014612  004767  177770          SUBR3:  JSR     x7,SUBR2        ;TWO DEEP
014616  000207                          RTS     x7
014620  004767  177766          SUBR4:  JSR     x7,SUBR3        ;THREE DEEP
014624  000207                          RTS     x7
014626  004767  177766          SUBR5:  JSR     x7,SUBR4        ;FOUR DEEP
014632  000207                          RTS     x7
014634  004767  177766          SUBR6:  JSR     x7,SUBR5        ;FIVE DEEP
014640  000207                          RTS     x7

                                        ;SCOPE AND/OR ITERATION LOOP FOR EACH TEST TIMES/
014642  032767  002000  163326  SCOPEC: BIT     #2000,SREG2     ;INHIBIT PROCESSOR TESTS?
014650  001403                          BEQ     .+10            ;NO
014652  022626                          CMP     (SP)+,(SP)+
014654  000167  165416                  JMP     MAIN            ;YES
014660  032767  040000  163310          BIT     #40000,SREG2    ;TEST SR FOR SCOPE
014666  001012                          BNE     SCOPEB          ;YES, SCOPE
014670  032767  004000  163300          BIT     #4000,SREG2     ;NO-TEST FOR ITERATION
014676  001011                          BNE     SCOPE1          ;INHIBIT ITERATION
014700  026767  000032  000026          CMP     SCOPEF,ICOUNT   ;COMPARE CURRENT COUNT TO MAX NUMBER
014706  100005                          BPL     SCOPEG          ;EXIT-DONE
014710  005267  000022                  INC     SCOPEF          ;INCREMENT COUNT
014714  016716  000020          SCOPEB: MOV     RETURN,@SP
014720  000002                          RTI
014722  005067  0000A0          SCOPEG: CLR     SCOPEF          ;CLEAR COUNT
014726  011667  000006                  MOV     @#6,RETURN      ;SAVE SCOPE RETURN POINTER
014732  000002                          RTI                     ;RETURN INLINE-NEXT TEST
014734  000400                  ICOUNT: 400                     ;ITERATION COUNT
014736  000000                  SCOPEF: 0                       ;COUNT LOCATION FOR ITERATION LOOP
014740  000000                  RETURN: 0                       ;ADDRESS OF LAST TEST

                                        ;FIXED VALUES FOR USE IN TEST/
014742  125252                  B:      125252
014744  014742                          B                               ;ADDRESS OF B
014746  052525                          052525
014752                                  .=B+10
014752  177777                  A:      -1
014754  014756                          A+4
014756                                  .=A+4
014756  125252                          125252
014760  014762                          A+10                            ;ADDRESS OF A+10
014762  052525                          052525

                                        ;FOR STORAGE
014764  000000                  C:      0
014766  014764                          C                               ;ADDRESS OF C
014774                                  .=C+10
```

```
3185  014774  000000                  TEMP:   0
3186  014776  014774                          TEMP                            ;ADDRESS OF TEMP
3187          015002                          .=TEMP+6
3188  015002  015004                          TEMP+10                         ;ADDRESS OF TEMP+10 OR "D"
3189  015004  000000                  D:      0
3190
3191                                  ;SUBROUTINE TO INITIALIZE ALL PAGES TO NR, BANK 0, 1 PAGE, UP/
3192  015006  010146                  NRALL:  MOV     R1,-(R6)        ;SAVE REGISTERS
3193  015010  010246                          MOV     R2,-(R6)
3194  015012  010346                          MOV     R3,-(R6)
3195  015014  012701  000536                  MOV     #IPORTAB,R1     ;R1 HOLDS ADDRESS OF CURRENT POSITION
3196                                                                  ;IN TABLE OF ADDRESSES
3197  015020  012703  000010          NRLOOP: MOV     #8.,R3          ;R3 USED AS COUNTER
3198  015024  012102                          MOV     (R1)+,R2        ;R2 CONTAINS ADDRESS OF PDR OR
3199                                                                  ;PAR TO BE CLEARED
3200  015026  005022                          CLR     (R2)+           ;CLEAR ALL ASR'S FOR THIS MODE
3201  015030  077302                          SOB     R3,.-2
3202  015032  020127  000544                  CMP     R1,#IPOREND     ;CHECK FOR DONE
3203  015036  003770                          BLE     NRLOOP          ;CLEAR ALL IN NEXT MODE IF NOT DONE
3204  015040  012603                          MOV     (R6)+,R3
3205  015042  012602                          MOV     (R6)+,R2
3206  015044  013601                          MOV     (R6)+,R1
3207  015046  000207                          RTS     %7
3208
3209                                  ;EMT HANDLER/
3210                                  ;FIRST 3 CALLS LEFT OPEN IN TABLE FOR EASY PATCHES/
3211  015050  162716  000002          EMTSRV: SUB     #2,@SP                  ;GET CALL
3212  015054  006576  000000                  MFPI    @(SP)
3213  015060  012667  000022                  MOV     (SP)+,EPC
3214  015064  062716  000002                  ADD     #2,@SP
3215  015070  105067  000013                  CLRB    EPC+1                   ;SAVE OFFSET ONLY
3216  015074  062767  015110  000004          ADD     #EMTAB,EPC              ;POINT TO TABLE OF ADDRESSES
3217  015102  017707  000000                  MOV     @EPC,PC                 ;JUMP TO DESIRED ROUTINE
3218  015106  000000                  EPC:    0
3219          000000                          PATCH1=0
3220          000000                          PATCH2=0
3221          000000                          PATCH3=0
3222  015110  000000                  EMTAB:  PATCH1                          ;PATCH IN ADDRESS OF ROUTINE
3223  015112  000000                          PATCH2
3224  015114  000000                          PATCH3
3225  015116  016164                          PRINT                           ;ERROR PRINTOUT
3226  015120  015122                          EOBSRV                          ;END OF BANK
3227
3228                                  ;END OF BANK SERVICE
3229  015122  117737  163422  000177  EOBSRV: MOVB    @SRH,@#SREG2+1  ;READ SWITCHES AGAIN
3230  015130  032767  000001  163036          BIT     #1,MMOPT        ;MEMORY MANAG. INHIBITED?
3231  015136  001507                          BEQ     EOB2            ;NO - CONTINUE
3232  015140  004767  001410          EOB1:   JSR     %7,BELL         ;SIGNAL END OF PASS
3233  015144  042766  000020  000002          BIC     #20,2(SP)       ;CLEAR TRACE BIT OF STATUS ON STACK
3234  015152  012737  000016  000014          MOV     #16,@#14        ;SETUP TRACE RETURN TO CAUSE HALT
3235  015160  005037  000016                  CLR     @#16            ;IF A TRACE TRAP OCCURS
3236  015164  032737  010000  000176          BIT     #10000,@#SREG2  ;INHIBIT TRACE TRAPPING?
3237  015172  001011                          BNE     EOB1A           ;YES - BRANCH
3238  015174  005167  163402                  COM     TRPB            ;SWITCH TRACE FLAG
3239  015200  100006                          BPL     EOB1A           ;IF NOT SET, LEAVE TRACE OFF
3240  015202  052766  000020  000002          BIS     #20,2(SP)       ;IF SET, SET TRACE BIT OF STATUS ON STACK
```

```
 3241  015210  012737  016162  000014          MOV     #TRTRP,@#14
 3242  015216  032737  000040  000174  E081A:  BIT     #40,@#MMOPT     ;CORE EXPANSION INHIBITED?
 3243  015224  001051                          BNE     E081C           ;YES, SKIP
 3244  015226  013701  000176                  MOV     @#SPEG2,R1
 3245  015232  032767  000002  163344          BIT     #2,MEMO
 3246  015240  001402                          BEQ     DSW1
 3247  015242  010137  020176                  MOV     R1,@#SPEG2+20000
 3248  015246  032767  000004  163330  DSW1:   BIT     #4,MEMO
 3249  015254  001402                          BEQ     DSW2
 3250  015256  010137  040176                  MOV     R1,@#SPEG2+40000
 3251  015264  032767  000010  163314  DSW2:   BIT     #10,MEMO
 3252  015270  001402                          BEQ     DSW3
 3253  015272  010137  060176                  MOV     R1,@#SPEG2+60000
 3254  015276  032767  000020  163300  DSW3:   BIT     #20,MEMO
 3255  015304  001402                          BEQ     DSW4
 3256  015306  010137  100176                  MOV     R1,@#SPEG2+100000
 3257  015312  032767  000040  163264  DSW4:   BIT     #40,MEMO
 3258  015320  001402                          BEQ     DSW5
 3259  015322  010137  120176                  MOV     R1,@#SPEG2+120000
 3260  015330  032767  000100  163250  DSW5:   BIT     #100,MEMO
 3261  015336  001402                          BEQ     E081B
 3262  015340  010137  140176                  MOV     R1,@#SPEG2+140000
 3263  015346  012716  005420          E081B:  MOV     #BEGINX,(SP)
 3264  015352  000002                          RTI
 3265  015354  012716  005452          E081C:  MOV     #BEGIN,(SP)
 3266  015360  000002                          RTI
 3267  015362  042737  000340  177776  E082:   BIC     #340,@#PSR
 3268  015370  032767  000002  162602          BIT     #2,MMUPT        ;USER/KERNEL INHIBITED?
 3269  015376  001262                          BNE     E081            ;YES - SET PC AND RETURN
 3270  015400  032767  000004  162572          BIT     #4,MMOPT        ;NO--INHIBIT 4K AS 32K?
 3271  015406  001256                          BNE     E081            ;YES - SET PC AND RETURN
 3272  015410  026767  163164  163102          CMP     CURPAR,UPAR7    ;LAST USER ASR DONE?
 3273  015416  001444                          BEQ     NXTBNK          ;YES - GO FIND NEXT BANK
 3274  015420  062737  020000  000034          ADD     #20000,@#34     ;UPDATE SCOPE VECTOR ADDRESS IN BANK 0
 3275  015426  062767  020000  163150          ADD     #20000,BNKSTR   ;UPDATE BANK START TO REFERENCE CURRENT ASR
 3276  015434  016716  163144                  MOV     BNKSTR,(SP)
 3277  015440  026767  163050  163132          CMP     UPAR0,CURPAR
 3278  015446  001404                          BEQ     NXTSEG
 3279  015450  005077  163124                  CLR     @CURPAR         ;SET PREVIOUS ASR TO NR, BANK 0
 3280  015454  005077  163122                  CLR     @CURPDR
 3281  015460  062767  000002  163112  NXTSEG: ADD     #2,CURPAR       ;UPDATE POINTERS TO NEXT SEGMENT
 3282  015466  062767  000002  163106          ADD     #2,CURPDR
 3283  015474  012777  077406  163100          MOV     #77406,@CURPDR  ;SET NEXT SEGMENT RW, 4K
 3284  015502  016777  163066  163070          MOV     CURBNK,@CURPAR  ;MAP NEXT SEGMENT TO CURRENT BANK
 3285  015510  052737  030000  177776          BIS     #30000,@#PSR    ;SET PREVIOUS MODE TO USER
 3286  015516  006506                          MFPI    R6              ;PICK UP USER STACK POINTER
 3287  015520  062716  020000                  ADD     #20000,R6       ;MAP IT TO NEXT ASR
 3288  015524  006606                          MTPI    R6              ;PUT IT BACK
 3289  015526  000002                          RTI                     ;GO BACK TO MAINLINE
 3290  015530  005327  000000          NXTBNK: DEC     #0              ;STALL SO DOUBLE BELL NOTED
 3291  015534  001375                          BNE     .-4
 3292  015536  004767  001016                  JSR     %7,BELL
 3293  015542  012746  000400                  MOV     #UBUFF,-(SP)
 3294  015546  052737  030000  177776          BIS     #30000,@#PSR
 3295  015554  006606                          MTPI    R6
 3296  015556  013737  000570  000572          MOV     @#CURBNK,@#OLDBNK       ;SAVE PREV BANK ADDRESS
```

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3297  015[illegible]0  0[illegible]767  000200  163002  BNKTST: ADD     #200,CURBNK
3298  01[illegible]6  0[illegible]767  163016                  ASL     COREPT
3299  01[illegible]2  10[illegible]6                          BCC     1$
3300  01[illegible]74  01[illegible]67  000001  163006          MOV     #1,COREPT
3301  01[illegible]2  0[illegible]67  [illegible]  163[illegible]2          MOV     #MEM1,MEMUT
3302  01[illegible]10  0[illegible]67  007600  162752  1$:     CMP     #7600,CURBNK    ;CHECK FOR EXTERNAL BANK
3303  015616  001067                          BNE     E083            ;IF NOT, TEST FOR ITS PRESENCE
3304  015[illegible]0  012767  000000  162742          MOV     #0,CURBNK       ;START OVER, TESTING BANK 0
3305  01[illegible]  015767  0[illegible]  162754          MOV     #1,COREPT
3306  01[illegible]4  012767  0[illegible]  162750          MOV     #MEM0,MEMUT
3307  015642  013701  000042          LOGIC:  MOV     @#42,R1
3308  015646  001412                  BEQ     BNKT
3309  01[illegible]  0[illegible]005                          RESET
3310  01[illegible]2  0[illegible]46                          CLR     -(SP)           ;CLEAR TBTT VIA RTI
3311  01[illegible]4  012746  015662                  MOV     #LOGICAL,-(SP)
3312  015660  000002                          RTI
3313  015[illegible]2  004711                  LOGICAL:JSR     X7,@R1
3314  015[illegible]4  0[illegible]240                          NOP
3315  015[illegible]6  0[illegible]240                          NOP
3316  015[illegible]0  0[illegible]240                          NOP
3317  015[illegible]2  000000                          HALT
3318  015674  032737  000001  000176  BNKT:   BIT     #1,@#SREG2      ;TTY OUT SELECTED
3319  015702  001410                  BEQ     BNKT1           ;YES, NO ASTERISK
3320  015704  004767  000672                  JSR     X7,CRLF
3321  015710  105777  162474                  TSTB    @TCSR           ;WAIT FOR TELETYPE
3322  015714  100375                  BPL     .-4
3323  015716  012777  000252  162466          MOV     #252,@TDBR      ;OUTPUT ASTERISK TO SIGNAL END OF PASS
3324  015724  042766  000020  000006  BNKT1:  BIC     #20,6(SP)       ;CLEAR TRACE BIT OF STATUS ON STACK
3325  015732  012737  000016  000014          MOV     #16,@#14
3326  015740  005037  000016                  CLR     @#16
3327  015744  032777  010000  162574          BIT     #10000,@SR
3328  015752  001011                  BNE     E083
3329  015754  005167  162622                  COM     TRPB
3330  015760  100006                  BPL     E083
3331  015764  052766  000020  000006          BIS     #20,6(SP)
3332  015770  012737  016162  000014          MOV     #TRTRP,@#14
3333  015776  016777  162566  162526  E083:   MOV     CURBNK,@KPAR2   ;MAP KERNEL SEGMENT 2 TO BANK BEING LOOKED FOR
3334  016004  012777  077406  162510          MOV     #77406,@KPDR2
3335  016012  036777  162572  162572          BIT     COREPT,@MEMUT
3336  016020  001657                  BEQ     BNKTST
3337  016022  042737  160000  000034          BIC     #160000,@#34    ;INITIALIZE SCOPE VECTOR ADDRESS
3338  016030  005001                  CLR     R1              ;R1 ADDRESSES BANK 0 THRU KERNEL ASR0
3339  016032  012702  040000                  MOV     #40000,R2       ;R2 ADDRESSES NEW BANK THRU KERNEL ASR2
3340  016036  012703  015004                  MOV     #0,R3
3341  016042  006203                  ASR     R3
3342  016044  012122                  CORMOV: MOV     (R1)+,(R2)+
3343  016046  077302                  SOB     R3,CORMOV
3344  016050  016767  162434  162516          MOV     UPAR0,CURPAR    ;FIRST ASR CHECKED IS USER ASR0
3345  016056  016767  162420  162512          MOV     UPDR0,CURPDR
3346  016064  016777  162500  162502          MOV     CURBNK,@CURPAR
3347  016072  012777  077406  162476          MOV     #77406,@CURPDR
3348  016100  005077  162410                  CLR     @UPAR7
3349  016104  005077  162376                  CLR     @UPDR7
3350  016110  026727  162456  000000          CMP     OLDBNK,#0               ;PREV BANK = 0
3351  016116  001414                  BEQ     E086            ;YES, DO NOT CLEAR
3352  016120  016777  162446  162404          MOV     OLDBNK,@KPAR2
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 3353  016126  012777  077406  162366          MOV     #77406,@KPDR2
 3354  016134  012701  040000                  MOV     #40000,R1
 3355  016140  012703  007630                  MOV     #7630,R3
 3356  016144  005021                  BNKLP:  CLR     (R1)+
 3357  016146  077302                          SOB     R3,BNKLP
 3358  016150  012716  005452          E086:   MOV     #BEGIN,(SP)
 3359  016154  011667  162420                  MOV     (SP),BNKSTR
 3360  016160  000002                          RTI
 3361
 3362                                  ;RTT EXECUTED WHEN TRACE IS ON/
 3363  016162  000006                  TRTRP:  RTT
 3364
 3365                                  ;ENTERED WITH SYSTEM TRAP CALL (HLT)
 3366                                  ;PRINT OUT THE ERROR PC+2, STATUS REGISTER, AND LOCATION IN BACKGROUND
 3367  016164  005767  000162          PRINT:  TST     PRTON           ;CHECK PRINT ON FLAG
 3368  016170  001401                          BEQ     .+4
 3369  016172  000002                          RTI                     ;IF ANOTHER HALT IS BEING PRINTED, SKIP THIS ONE
 3370  016174  005267  000152                  INC     PRTON
 3371  016200  012767  000340  161570          MOV     #340,PSR        ;SET PRIORITY TO 7
 3372  016206  037727  162334  020000          BIT     @SR,#20000      ;TEST FOR INHIBIT PRINT OUT
 3373  016214  001401                          BEQ     .+4             ;BRANCH TO PRINT
 3374  016216  000444                          BR      CK              ;INHIBIT, CHECK FOR HALT
 3375  016220  012667  000122                  MOV     (6)+,SAVPC      ;PC OF FAILING ROUTINE
 3376  016224  012667  000120                  MOV     (6)+,SAVPSR     ;PSR OF ERROR CONDITION
 3377  016230  024646                          CMP     -(6),-(6)       ;RESTORE STACK
 3378  016232  012767  000200  161536          MOV     #200,PSR
 3379  016240  004767  000336                  JSR     X7,CRLF         ;OUTPUT CARRIAGE RETURN AND LINE FEED
 3380  016244  016767  000076  000260          MOV     SAVPC,PTEMP1    ;LOAD WITH FAILING PC+2
 3381  016252  004767  000076                  JSR     X7,PROCT        ;PRINT FAILING PC+2
 3382  016256  004767  000354                  JSR     X7,SPACE
 3383  016262  016767  000062  000242          MOV     SAVPSR,PTEMP1   ;LOAD PROCESSOR STATUS
 3384  016270  004767  000060                  JSR     X7,PROCT        ;PRINT PROCESSOR STATUS
 3385  016274  004767  000236                  JSR     X7,SPACE
 3386  016300  016767  176264  000224          MOV     CURBNK,PTEMP1
 3387  016306  004767  000042                  JSR     X7,PROCT
 3388  016312  004767  000220                  JSR     X7,SPACE
 3389  016316  016767  176416  000206          MOV     RETURN,PTEMP1
 3390  016324  004767  000024                  JSR     X7,PROCT
 3391  016330  005777  162212          CK:     TST     @SR             ;CHECK SR FOR HALT SWITCH
 3392  016334  100001                          BPL     .+4             ;BRANCH IF NOT SET
 3393  016336  000000                          HALT                    ;HALT ON ERROR UP
 3394  016340  005067  000006                  CLR     PRTON           ;ROUTINE DONE - CLEAR FLAG
 3395  016344  000002                          RTI                     ;RETURN TO MAIN LINE
 3396  016346  000000                  SAVPC:  0
 3397  016350  000000                  SAVPSR: 0
 3398  016352  000000                  PRTON:  0
 3399
 3400                                  ;SUBROUTINE TO PRINT OUT OCTAL NUMBER/
 3401  016354  012727  000006  016360  PROCT:  MOV     #6,#PTEMP3      ;CLEAR R4 FOR COUNTING CHARACTERS OUTPUT
 3402          016360                  PTEMP3=.-2
 3403  016362  005067  000142                  CLR     PRFLG           ;INITIALIZE CARRY FLAG FOR ROTATES
 3404  016366  012767  000260  000140          MOV     #260,PTEMP2     ;SETUP R3
 3405  016374  005767  000132                  TST     PTEMP1          ;CHECK BIT 15 OF NUMBER
 3406  016400  100002                          BPL     .+6             ;BRANCH IF ZERO
 3407  016402  005267  000126                  INC     PTEMP2          ;INCREMENT R3 IF ONE
 3408  016406  006167  000120                  ROL     PTEMP1          ;ROTATE LEFT MOST OCTAL TO RIGHT END
```

```
3409  016412  006167  000114                  ROL     PTEMP1
3410  016416  005567  000106                  ADC     PRFLG           ;STORE CARRY
3411  016422  105777  161762          P.WAIT: TSTB    @TCSR           ;WAIT FOR TTY READY
3412  016426  100375                          BPL     P.WAIT
3413  016430  016777  000100  161754          MOV     PTEMP2,@TDBR    ;OUTPUT NEXT CHARACTER
3414  016436  005367  177716                  DEC     PTEMP3          ;COUNT
3415  016442  001001                          BNE     P.CNT1          ;BRANCH IF NOT DONE
3416  016444  000207                          RTS     %7              ;BRANCH IF NOT DONE
3417  016446  000241          P.CNT1: CLC                             ;CLEAR CARRY
3418  016450  005767  000054                  TST     PRFLG           ;CHECK FOR PREVIOUS CARRY
3419  016454  001403                          BEQ     .+10            ;BRANCH IF PREVIOUSLY ZERO
3420  016456  005067  000046                  CLR     PRFLG           ;INITIALIZE FLAG
3421  016462  000261                          SEC                     ;SET CARRY
3422  016464  006167  000042                  ROL     PTEMP1          ;ROTATE NEXT CHARACTER INTO RIGHT END OF REGISTER
3423  016470  006167  000036                  ROL     PTEMP1
3424  016474  006167  000032                  ROL     PTEMP1
3425  016500  005567  000024                  ADC     PRFLG           ;STORE CARRY
3426  016504  016767  000022  000022          MOV     PTEMP1,PTEMP2   ;LOAD DATA INTO R3
3427  016512  042767  177770  000014          BIC     #177770,PTEMP2  ;CLEAR ALL BUT LOWEST OCTAL DIGIT
3428  016520  052767  000260  000006          BIS     #260,PTEMP2     ;SET TO ASCII EQUIVALENT
3429  016526  000735                          BR      P.WAIT          ;LOOP
3430  016530  000000          PRFLG:  0
3431  016532  000000          PTEMP1: 0                               ;CONTAINS VALUE TO BE OUTPUT
3432  016534  000000          PTEMP2: 0                               ;SCRATCH
3433
3434                          ;SUBROUTINE TO ISSUE SPACE/
3435  016536  105777  161646  SPACE:  TSTB    @TCSR                   ;WAIT FOR TTY READY
3436  016542  100375                  BPL     .-4
3437  016544  012777  000240  161640          MOV     #240,@TDBR      ;OUTPUT A SPACE
3438  016552  000207                          RTS     %7              ;RETURN
3439
3440                          ;BELL ON PASS COMPLETE
3441  016554  032737  000001  000176  BELL:   BIT     #1,@#SREG2
3442  016562  001406                          BEQ     1$
3443  016564  105777  161620                  TSTB    @TCSR
3444  016570  100375                          BPL     .-4
3445  016572  012777  000207  161612          MOV     #207,@TDBR
3446  016600  000207          1$:     RTS     %7
3447
3448                          ;SUBROUTINE TO OUTPUT CARRIAGE RETURN AND LINEFEED/
3449  016602  105777  161602  CRLF:   TSTB    @TCSR                   ;WAIT FOR TTY READY
3450  016606  100375                  BPL     .-4
3451  016610  012777  000215  161574          MOV     #215,@TDBR      ;OUTPUT CARRIAGE RETURN
3452  016616  105777  161566                  TSTB    @TCSR           ;WAIT FOR TTY READY
3453  016622  100375                          BPL     .-4
3454  016624  012777  000212  161560          MOV     #212,@TDBR      ;OUTPUT LINEFEED
3455  016632  000207                          RTS     %7              ;RETURN
3456
3457                          ;ENTER HERE ON POWER FAIL/
3458  016634  013746  000024  PFAIL:  MOV     @#24,-(6)
3459  016640  010667  000010                  MOV     %6,SAVR6                ;STORE STACK POSITION
3460  016644  012737  016656  000024          MOV     #RESTRT,@#24
3461  016652  000000                          HALT                            ;HALT ON POWER DOWN NORMAL
3462  016654  000000          SAVR6:  0                               ;STACK IS SAVED HERE
3463  016656  016706  177772  RESTRT: MOV     SAVR6,%6                ;RESTORE STACK WHEN POWERING UP
3464  016662  012637  000024                  MOV     (6)+,@#24
```

```
3465  016666  022626                        CMP     (SP)+,(SP)+             ;RESTORE STACK
3466  016670  104006                        HLT                             ;POWER FAIL OCCURRED
3467  016672  000167  161720                JMP     RSTRT
3468                                                                          ;RETURN TO MAIN LINE
3469
3470  016676  000207                  USER: RTS     %7                      ;OVERLAY USER ROUTINE HERE IF 4KW
3471                                                                          ;USE BANK1 IF 8KW
3472          017760                        .=17760
3473  017760  000000                  KSTACK: 0
3474          000001                        .END
```

```
A       014752  1806  1812  1818  1824  1831  1838  1846  1862  1895  2094  2189  2230  2290
                2236  2303  2311  2328  2338  2344  2350  2356  2362  2368  2375  2383  2387
                2394  2401  2408  2431  2439  2655  2710  2717  2725  2768  3174#  3175  3176
                3178
ADSUB   014114  3014  3019#
ARIEND  014156  3017  3028#
ARITST  014070  3013#  3016
B       014742  1878  2001  2006  2011  2017  2024  2029  2030  2037  2051  2059  2066  2072
                2080  2138  2143  2148  2154  2161  2166  2167  2174  2188  2195  2202  2208
                2216  2546  2551  2557  2564  2609  2614  2620  2627  2632  2633  2640  2654
                2739  2740  2745  2746  2751  2752  3170#  3171  3173
BEGIN   005452   903  1008  1022  1235  1801#  3265  3358
BEGINX  005420  1097  1099  1101  1103  1105  1107  1789#  3263
BELL    016554  3232  3292  3441#
BNKLP   016144  3356#  3357
BNKSTR  000600   825#  1008*  3275*  3276  3359*
BNKT    015674  3308  3318#
BNKTST  015560  3297#  3336
BNKTI   015724  3319  3324#
C       014764  1854  1835*  1894*  1902*  1926*  1942*  1960*  1978*  2029*  2030  2050*  2051*  2052
                2166*  2167  2187*  2188*  2189  2318*  2320  2325*  2329  2416  2488*  2504*  2520*
                2533*  2632*  2633  2653*  2654*  2655  2732*  2734  2757  2758*  2760  2765*  2769
                3182#  3183  3184
CK      016730  3374  3391#
CKWAIT  014452  3086*  3087*  3088  3095#
CLINCT= 003250   964*  1166  1169#  1176*
CMP1    013414  2899#  2906
CMP2    013436  2903  2907#
COMPAR  013410  2893  2897#
COREPT  000610   833#   873*   885   888*   890*   894*  1004*  3298*  3300*  3305*  3335
CORMOV  016044  3342#  3343
CRLF    016602   898  3320  3379  3449#
CURMK   000570   821#  1003*  1796*  3284  3296  3297*  3302  3304*  3333  3346  3386
CURMR   000574   823#  1006*  3272  3277  3279*  3281*  3284*  3344*  3346*
CURPAT= 003160   965*  1151#  1153  1170  1172*  1174*
CURPOR  000576   824#  1007*  3280*  3282*  3283*  3345*  3347*
D       015004  1063  1910*  1918*  1934*  1951*  1969*  2464*  2472*  2480*  2496*  2512*  2529*  3189#
                3340
DATA2 = 002766   910*  1114#  1115  1121*  1122
DET1    002334   974  1032#
DET2    002452  1040  1056#
DET3    002750  1068  1108#
DET4    002366  1038  1040#
DO    = 000001   954  1262#  1318  1326  1371
DONE    014600  1032*  1096*  1097*  1098*  1099*  1100*  1101*  1102*  1103*  1104*  1105*  1106*  1107*
                2894  3132#
DSW1    015246  3246  3248#
DSW2    015262  3249  3251#
DSW3    015276  3252  3254#
DSW4    015312  3255  3257#
DSW5    015326  3258  3260#
EIGHT   002404  1043#  1058
EMTAB   015110  3216  3222#
EMTSRV  015050   736   901  3211#
EOB   = 104010   588#  1032  3132
EOBSRV  015122  3226  3229#
```

E081	015140	3232#	3269	3271								
E081A	015216	3237	3239	3242#								
E081B	015342	3261	3263#									
E081C	015350	3243	3265#									
E082	015356	3231	3267#									
E083	015776	3303	3328	3330	3333#							
E086	016150	3351	3358#									
EPC	015106	3213*	3215*	3216*	3217	3218#						
EPROK	003536	1216	1224#									
ERRSET	003532	1218	1222#									
FENDZ	003612	952	1270#	1309								
FENDI	003634	1272	1275#									
HLT	= 104006	[illegible]#	[illegible]	[illegible]	1165	1195	1213	1219	1222	1226	1282	1284	1288	1297
		1299	[illegible]	[illegible]	1337	1339	1343	1354	1356	1362	1376	1392	1808	1814
		1820	[illegible]	[illegible]	1840	1849	1856	1865	1873	1890	1887	1897	1905	1913
		1921	[illegible]	1937	1945	1954	1963	1972	1981	1988	1995	2003	2008	2013
		2020	[illegible]	2032	2040	2047	2054	2062	2068	2075	2083	2090	2097	2105
		2112	2119	2126	2133	2140	2145	2150	2157	2163	2169	2177	2184	2191
		2198	2204	2211	2219	2226	2233	2241	2248	2255	2262	2269	2277	2295
		2292	2298	2305	2314	2322	2331	2340	2346	2352	2358	2364	2370	2377
		2382	2389	2396	2404	2411	2418	2425	2434	2442	2450	2458	2467	2475
		2483	2491	2499	2507	2515	2523	2532	2541	2548	2553	2560	2566	2574
		2581	2588	2595	2603	2611	2616	2623	2629	2635	2643	2650	2657	2665
		2672	2679	2686	2694	2697	2705	2712	2719	2728	2736	2742	2748	2754
		2762	2771	2782	2790	2798	2800	2802	2804	2813	2815	2818	2825	2827
		2830	2837	2839	2842	2849	2851	2854	2861	2863	2866	2873	2875	2878
		2885	2901	2928	2932	2935	2938	2942	2966	2970	2973	2976	2980	2991
		2995	2998	3001	3005	3024	3037	3050	3063	3073	3075	3077	3103	3105
		3108	3110	3119	3466									
ICOUNT	014734	897*	1803*	2889*	3083*	3097*	3125*	3157	3165#					
IE	= 000500	954	1261#	1318	1326	1332	1371	1378						
IPDREN	000544	811#	3202											
IPDRTA	000536	808#	3195											
IRF	003472	941	1211#											
IRK	003376	922	1193#											
KPAR0	000526	803#	983											
KPAR1	000530	804#												
KPAR2	000532	805#	879*	3333*	3352*									
KPAR7	000534	806#	868*	979*										
KPDR0	000516	799#	867*	990*										
KPDR1	000520	800#												
KPDR2	000522	801#	875*	3334*	3353*									
KPDR7	000524	802#	869*	978*										
KSTACK	017760	838	845	3473#										
KWLST	000424	770#	934*											
KWLVC	000422	769#	933*											
LKCSR	000426	771#	932	936*	1128*	1131	1134*	1138*	1142	1144*				
LK1	003034	1127#	1141											
LK2	003054	1130#	1137											
LK3	003056	933	1131#											
LK4	003074	1135#	1145											
LLIMIT	003600	926	946	1189	1207	1235#								
LOGIC	015642	3307#												
LOGICA	015662	742	3311	3313#										
LPCSR	000430	772#	961	969*	1154	1157	1161	1163*	1178					
LPDBR	000432	773#	966*	1153*	1177*									

DFKTGA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
NODEV   002314            908    1025#
NOP   = 000240            582#
NRALL   015006            866     977    3192#
NRLOOP  015020           3197#   3203
NUMA    014154           3011*   3020    3021    3027#
NXTBNK  015524           3273    3290#
NXTSEG  015454           3278    3281#
OLDBNK  000572            822#   3296*   3350    3352
PATCH1= 000000           3219#   3222
PATCH2= 000000           3220#   3223
PATCH3= 000000           3221#   3224
PC    =x000007            597#   1789    1801    3217#
PFAIL   016634            733     839    3458#
PRFLG   016530           3403*   3410*   3418    3420*   3425*   3430#
PRINT   016164           3225    3367#
PROCT   016354           3381    3384    3387    3390    3401#
PRTON   016352            906*   3367    3370*   3394*   3398#
PSR   = 177776            586#    905*   1010*   1015*   1017*   1129*   1139*   3267*   3285*   3294*   3371*   3378*
PTEMP1  016532           3380*   3383*   3386*   3389*   3405    3408*   3409*   3422*   3423*   3424*   3426    3431#
PTEMP2  016534           3404*   3407*   3413    3426*   3427*   3428*   3432#
PTEMP3= 016360           3401*   3402#   3414*
P.CNT1  016446           3415    3417#
P.WAIT  016422           3411#   3412    3429
R     = 004000            954    1263#   1318
RB    = 000002            954    1260#   1318    1332    1378
RD    = 000004           1258#   1371
REF   = 013602           2946#   3012*   3013*   3019    3022    3115*   3117    3121*
REFF    013602           2911*   2912*   2914    2918    2940    2944#   2946    2949*   2950*   2953    2956    2978    3003
                         3015
RENDZ   004010           1301    1312#   1344
RENDI   004040           1315    1318#
RESTRT  016656           3460    3463#
RETURN  014740            903*   1801*   1802*   3160    3163*   3167#   3389
RFCAR   000446            779#    946*   1207*
RFCSR   000450            780#    940     947*   1209*   1211    1215    1217
RFCSRH  000452            781#    944*   1206*
RFDAE   000440            776#   1228
RFDAR   000442            777#   1230
RFFUNC  003576            943*    947    1209    1220*   1232*   1234#
RFST    000456            783#    942*
RFSTAR  003442           1206#   1214    1221    1223    1227    1233
RFVC    000454            782#    941*
RFWC    000444            778#    945*   1208*   1224
RF1     003446           1207#   1229    1231
RKBAR   000466            787#    926*   1189*
RKCSR   000470            788#    921     928*   1191*   1193
RKCSRH  000472            789#
RKDAE   000462            785#    925*   1188*   1197
RKDAH   000460            784#   1199
RKFUNC  003440            924*    928    1191    1201*   1203#
RKST    000476            791#    923*
RKSTAR  003346           1188#   1196    1202
RKVC    000474            790#    922*
RKWC    000464            786#    927*   1190*
RK1     003352           1189#   1198    1200
ROTALL  013472           2913    2918#
```

DFKTGA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
ST3     001362            915     918#
ST3A    001336            912     914#
ST4     001452            920     929#
ST5     001516            931     937#
ST6     001604            939     948#
ST7     001644            950     955#
ST8     001754            960     962     970#
SUBR1   014604           3136#
SUBR2   014606           3137#   3139
SUBR3   014612           3139#   3141
SUBR4   014620           3141#   3143
SUBR5   014626           3143#   3145
SUBR6   014634           2796    3145#
SUBBA   014534           3116#   3123
SUBFG   000176            747#    748     853
TBBBK   000614            835#    870*    879     887*    892
TCBA    000562            818#   1325*   1370*
TCCM    000552            814#    954*   1273*   1276*   1278*   1280    1291*   1295    1307*   1316*   1318*   1326*   1328
                         1332*   1335    1345*   1348*   1352    1364*   1371*   1374    1378*
TCDT    000556            816#   1285    1300    1303    1340    1357    1360
TCEXPE  003610           1267#   1277*   1285    1302*   1303    1313*   1340    1359*   1360
TCFIRS  003604           1265#   1277    1357
TCF1    003664           1275    1280#
TCF1A   003656           1278#   1286
TCF2    003716           1287    1290#
TCF3    003732           1290    1295#   1331
TCF4    004000           1307#   1333
TCIV    000564            819#    952*   1270*   1275*   1290*   1312*   1319*   1323*   1331*   1347*   1368*   1377*
TCLAST  003606           1266#   1300    1313
TCOM    014170           3033#   3040
TCOM2   014236           3046#   3053
TCOM3   014304           3059#   3066
TCRBK   004270           1363    1368#
TCRBUF  004420           1370    1387    1388    1402#
TCRB1   004326           1368    1374#
TCR1    004136           1319    1335#
TCR1A   004172           1342    1345#
TCR2    004200           1341    1347#
TCR3    004214           1347    1352#   1377
TCR4    004262           1364#   1379
TCSR  = 000410            584#   3321    3411    3435    3443    3449    3452
TCST    000554            815#    951    1271    1314
TCSTA   000566            820#    953#
TCWBK   004056           1306    1323#
TCWBUF  004420           1325    1401#
TCWB1   004110           1323    1328#
TCWC    000560            817#   1324#   1369#
TC1     004354           1372    1383#
TC2     004374           1389#   1394
TDBR  = 000412            585#   3323#   3413#   3437#   3445#   3451#   3454#
TEMP    014774           1846#   1847    1853#   1860#   1862#   1863    1869#   1870#   1871    1876#   1878#   1883#   1892#
                         1895    1900#   1903    1908#   1911    1916#   1919    1924#   1927    1932#   1935    1940#   1943
                         1948#   1952    1957#   1961    1966#   1970    1975#   1979    2023#   2024    2043#   2044#   2045
                         2065#   2066#   2071#   2072#   2073    2086#   2087#   2088    2093#   2094#   2095    2101#   2102#
                         2103    2108#   2109#   2110    2115#   2116#   2117    2122#   2123#   2124    2129#   2130#   2131
                         2160#   2161    2180#   2181#   2182    2201#   2202#   2207#   2208#   2209    2222#   2223#   2224
```

```
                        2229* 2230* 2231  2237* 2238* 2239  2244* 2245* 2246  2251* 2252* 2253  2258*
                        2259* 2260  2265* 2266* 2267  2272* 2274* 2275  2309* 2309* 2310* 2311*
                        2312  2319* 2328* 2401* 2402  2408* 2409  2415* 2422* 2423  2429* 2431* 2432
                        2437* 2439* 2440  2445* 2447* 2448  2454* 2455* 2456  2462* 2465  2470* 2473
                        2478* 2481  2486* 2489  2494* 2497  2502* 2505  2510* 2513  2518* 2521  2526*
                        2530  2535* 2539  2563* 2564  2570* 2571* 2572  2577* 2578* 2579  2584* 2585*
                        2586  2591* 2592* 2593  2598* 2599* 2600* 2601  2626* 2627  2646* 2647* 2648
                        2661* 2662* 2663  2668* 2669* 2670  2675* 2676* 2677  2682* 2683* 2684  2689*
                        2691* 2692  2695  2700* 2702* 2703  2724* 2725* 2726  2733* 2768* 2810* 2811*
                        2816  2822* 2823* 2828  2834* 2835* 2840  2846* 2847* 2852  2858* 2859* 2864
                        2870* 2871* 2876  3031* 3032* 3033* 3034* 3035  3038* 3039* 3044* 3045* 3046*
                        3047* 3048  3051* 3052* 3057* 3058* 3059* 3060* 3061  3064* 3065* 3070* 3071
                        3078* 3079  3165* 3186  3187  3188
TEST    013604          2918* 2919* 2920* 2921* 2922* 2923* 2924* 2940  2945* 2956* 2957* 2958* 2959*
                        2960* 2961* 2962* 2978  2982* 2983* 2984* 2985* 2986* 2987* 3003  3019* 3020*
                        3021* 3028  3100* 3101* 3106* 3114* 3116* 3117  3120* 3122*
TIME    003152          1126* 1127* 1135* 1136  1140  1146*
TJSR1   012766          2779* 2780
TJSR2   012770          2778  2780*
TJSR3   013002          2777  2784* 2788
TMEMEX  001124          876   885*
TRCSR   000406          763*
TRPB    000602          826*  970*  3238* 3329*
TRTRP   016162          3241  3332  3363*
TSCOMB  014346          3071* 3080
TSROT   013450          2912* 2915
TSROT2  013614          2950* 2954
TSRT2A  013606          2916  2949*
TTCSR   000410          584   764*  917*  1117
TTDBR   000412          585   765*  1115*
TTPST   000416          767*
TTPVC   000414          766*  916*
TTSAV   000420          768*  1117* 1118
TYOUT   002764          1113* 1123
TYOUTR  003000          916   1117*
TYOUT1  002770          1115* 1124
UBUFF   000400          761*  1014  3293
UPAR0   000510          796*  994   1006  3277  3344
UPAR1   000512          797*
UPAR7   000514          798*  3272  3348*
UPDR0   000502          793*  1002* 1007  3345
UPDR1   000504          794*
UPDR7   000506          795*  3349*
USEALL  002146          993   1002*
USER    016676          973   3470*
WAIT4   014454          3089  3096*
WD    = 000014          1259* 1326
WORDCT  003602          927   945   1190  1208  1236*
XFENDZ  004006          1309* 1358
XFER12  002616          1073  1091*
XFER16  002606          1075  1089*
XFER20  002576          1077  1087*
XFER24  002566          1079  1085*
XFER28  002556          1081  1083*
XFER8   002626          1071  1093*
.     = 017762          601*  602   604   606   608   610   612   614   616   618   620   622   624
```

C07

TNCV   2889#   2925   2963   2988

E07

DFKTGA.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

```
ADC     1043  1045  1047  1049  1051  1053  1951  1960  2274  3410  3425
ADCB    2529  2691
ADD      887   988   997  1058  1063  1389  1390  1802  1986  1993  2080  2087  2094  2216  2223
        2230  3020  3078  3214  3216  3274  3275  3281  3282  3287  3297
ASL      838   929   937   948   955  3298
ASLB    2871
ASR     1794  1795  3341
ASRB    2859
BCC      889  2326  2330  2334  2338  2339  2343  3299
BCS     2803  2812  2821  2826  2830  2860  2872
BEQ      860   912   957   971   992  1038  1123  1141  1160  1162  1167  1171  1181  1218  1287
        1301  1304  1321  1328  1331  1391  1807  1813  1819  1825  1832  1839  1848  1855  1864
        1872  1879  1886  1894  1904  1912  1920  1928  1936  1944  1953  1962  1971  1980  2002
        2007  2012  2019  2026  2031  2039  2046  2053  2061  2067  2074  2082  2089  2096  2104
        2111  2118  2125  2132  2139  2141  2149  2156  2162  2168  2176  2183  2190  2197  2203
        2210  2218  2225  2232  2240  2247  2254  2261  2268  2276  2284  2291  2297  2304  2313
        2321  2330  2337  2344  2351  2357  2363  2369  2376  2381  2388  2395  2403  2410  2417
        2424  2433  2441  2448  2457  2466  2474  2482  2490  2498  2506  2514  2522  2531  2540
        2547  2556  2564  2573  2580  2587  2594  2602  2610  2615  2622  2628  2634  2642
        2649  2656  2664  2671  2678  2685  2693  2696  2704  2711  2718  2727  2735  2741  2747
        2753  2761  2770  2781  2789  2799  2817  2829  2841  2853  2865  2877  2884  2893  2900
        2903  2941  2979  3004  3023  3036  3049  3062  3072  3089  3104  3118  3150  3231  3246
        3249  3252  3255  3258  3261  3273  3278  3308  3319  3336  3351  3368  3373  3419  3442
BGE     1342  3074
BGT     1194
BHIS    1137
BIC      885   896  1010  1027  1134  1138  1139  1144  1163  1276  1790  1791  1862  1870  2037
        2044  2051  2174  2181  2188  2311  2319  2328  3233  3267  3324  3337  3427
BICB    2431  2439  2447  2455  2640  2647  2654  2725  2733  2768
BIS      878   913   917   936   958  1009  1013  1015  1025  1128  1129  1792  3240  3285  3294
        3331  3428
BIT      914   919   930   938   949   959   975   980   991  1011  1020  1033  1037  1161  1193
        1197  1217  1290  1295  1335  1352  2892  3088  3149  3153  3155  3230  3236  3242  3245
        3248  3251  3254  3257  3260  3268  3270  3318  3327  3335  3372  3441
BLE     3076  3203
BLOS    1231
BLT     1286
BMI     1119  1132  1155  1158  1212  1272  1315  2797  3107
BNE      893   915   920   931   939   950   960   976  1012  1021  1035  1066  1198  1200  1229
        1283  1298  1338  1355  1394  2915  2954  3016  3040  3053  3066  3080  3109  3123  3154
        3156  3237  3243  3269  3271  3291  3303  3328  3415
BPL     1143  1179  1216  1225  1281  1296  1329  1336  1353  1375  2925  2963  2988  3102  3158
        3239  3322  3330  3392  3406  3412  3426  3444  3450  3453
BR       841   852   863   884  1001  1018  1055  1068  1072  1074  1076  1078  1080  1082  1124
        1145  1173  1175  1183  1185  1196  1202  1214  1221  1223  1227  1233  1306  1309  1333
        1344  1363  1379  2779  2[illegible]  2916  2929  2933  2936  2955  2967  2971  2974  2992  2996
        2999  3017  3094  3374  3429
BVC     2826  2862  2874  2927  2937  2965  2975  2990  3000
BVS     2801  2814  2838  2850  2931  2934  2969  2972  2994  2997
CCC     2786  2795  2809  2833  2857
CLC     1042  3417
CLR      651   862   870   877   900   904   906   909   910   925   935   970   971   984   995
        1061  1108  1113  1127  1176  1189  1386  1894  2079  2086  2102  2115  2123  2215  2222
        2238  2251  2258  2584  2591  2598  2668  2675  2889  2897  2898  3031  3032  3044  3045
        3057  3058  3070  3114  3115  3162  3200  3235  3279  3280  3310  3326  3338  3348  3349
        3356  3394  3403  3420
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F07

DFKTG-A MACY11 27(732) 10-SEP-76 09:51 PAGE 66
DFKTGA.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

CLRB	2464	2472	2480	2498	2571	2662	2759	3215							
CMP	854	886	892	1065	1122	1136	1140	1166	1170	1180	1230	1285	1300	1303	1340
	1357	1360	1393	1806	1812	1818	1824	1831	1838	1847	1854	1863	1871	1935	1943
	2001	2006	2011	2018	2024	2030	2038	2045	2052	2060	2081	2088	2095	2110	2117
	2124	2131	2138	2143	2148	2155	2161	2167	2175	2182	2189	2196	2217	2224	2231
	2246	2253	2260	2267	2290	2296	2303	2312	2320	2329	2473	2481	2521	2530	2572
	2579	2586	2593	2601	2692	2740	2746	2760	2769	2816	2828	2840	2852	2864	2876
	2883	2899	2902	2914	2940	2953	2978	3003	3015	3022	3035	3079	3117	3151	3157
	3202	3272	3277	3302	3350	3377	3465								
CMPB	1199	1228	2338	2344	2350	2356	2362	2368	2375	2380	2387	2394	2402	2409	2416
	2423	2432	2440	2448	2456	2546	2551	2558	2564	2609	2614	2621	2627	2633	2641
	2648	2655	2670	2677	2684	2710	2717	2726	2734	2752	2780	2788	3048	3061	3071
COM	1902	2109	2245	[illegible]	[illegible]	3087	3238	3329							
COMB	2496	2578	3046	3051	3059	3064									
DEC	1369	1918	1926	2123	2259	3034	3047	3060	3290	3414					
DECB	2512	2592	2676	2702											
HALT	603	605	607	609	611	613	615	617	619	621	623	625	627	629	631
	633	635	637	639	641	643	645	647	649	651	653	655	657	659	661
	663	665	667	669	671	673	675	677	679	681	683	685	687	689	691
	693	695	697	699	701	703	705	707	709	711	713	715	717	719	721
	723	725	727	729	3317	3393	3461								
INC	856	1121	1135	1168	1172	1182	1302	1910	2116	2252	2904	2905	2912	2950	3013
	3039	3121	3159	3370	3407										
INCB	944	1206	1273	1278	1291	1307	1316	1345	1348	1364	2504	2585	2669	3052	3065
	3122														
JMP	753	755	757	1022	1059	1987	1994	2894	3152	3467					
JSR	866	898	973	974	977	1071	1073	1075	1077	1079	1081	1084	1086	1088	1090
	1092	1094	1372	2778	2787	2796	2913	2951	2952	3014	3139	3141	3143	3145	3232
	3292	3313	3320	3379	3381	3382	3384	3385	3387	3388	3390				
MFPI	3212	3276													
MOV	838	839	845	846	847	848	849	850	853	855	857	858	865	867	868
	869	871	872	873	874	875	876	879	890	891	894	895	897	899	901
	902	903	905	908	916	918	922	923	924	926	927	933	934	941	942
	943	945	946	952	953	954	962	963	964	965	966	967	968	969	972
	978	[illegible]	982	983	985	986	990	993	994	996	998	1002	1003	1004	1005
	1006	1007	1008	1014	1017	1032	1040	1041	1056	1062	1064	1083	1085	1087	1089
	1091	1093	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1109
	1115	1117	1150	1153	1174	1177	1184	1189	1190	1207	1208	1270	1275	1277	1290
	1312	1313	1318	1319	1323	1324	1325	1331	1347	1368	1369	1370	1377	1383	1384
	1385	1387	1388	1395	1396	1397	1789	1796	1801	1803	1805	1811	1817	1823	1829
	1830	1836	1837	1845	1846	1852	1853	1860	1861	1868	1869	1876	1877	1883	1884
	1842	1893	1900	1901	1908	1909	1916	1917	1924	1925	1932	1933	1940	1941	1948
	1949	1957	1958	1966	1967	1975	1976	1985	1992	2017	2023	2029	2036	2043	2050
	2058	2065	2071	2093	2101	2108	2129	2154	2160	2166	2173	2180	2187	2194	2201
	2207	2229	2237	2244	2265	2272	2280	2289	2295	2301	2302	2309	2310	2317	2318
	2325	2326	2327	2337	2343	2349	2355	2361	2367	2373	2374	2385	2386	2392	2393
	2400	2407	2414	2421	2429	2430	2437	2438	2445	2446	2453	2454	2462	2463	2470
	2471	2478	2479	2486	2487	2494	2495	2502	2503	2510	2511	2518	2519	2526	2527
	2535	2536	2570	2577	2639	2646	2653	2661	2682	2689	2700	2709	2715	2716	2723
	2724	2731	2732	2739	2745	2751	2757	2758	2765	2766	2767	2775	2810	2822	2834
	2846	2858	2870	2911	2918	2949	2956	3011	3012	3019	3083	3086	3097	3100	3125
	3160	3163	3192	3193	3194	3195	3197	3198	3204	3205	3206	3213	3217	3234	3241
	3244	3247	3250	3253	3256	3259	3262	3263	3265	3276	3283	3284	3293	3296	3300
	3301	3304	3305	3306	3307	3311	3323	3325	3332	3333	3334	3339	3340	3342	3344
	3345	3346	3347	3352	3353	3354	3355	3358	3359	3371	3375	3376	3378	3380	3383
	3386	3389	3401	3404	3413	3426	3437	3445	3451	3454	3458	3459	3460	3463	3464

G07

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DFKTG-A MACY11 27(732)  10-SEP-76  09:51  PAGE 87
DFKTGA.P11      CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

MOVB      840   928   947  1191  1209  1326  1332  1371  1378  2401  2408  2415  2422  2557  2563
         2599  2620  2626  2632  3229
MTPI     1016  3288  3295
NEG      1934  1942  2130  2266
NEGB     2520  2600  2683
NOP      1044  1046  1048  1050  1052  1054  1069  1070  1989  1996  3133  3314  3315  3316
RESET     907  3309
ROL      2922  2923  2924  3408  3409  3422  3423  3424
ROLB     2835  2847  2960  2961  2962  2985  2986  2987
ROR      2919  2920  2921
RORB     2811  2823  2957  2958  2959  2982  2983  2984
RTI      1028  1116  1130  1156  1164  1192  1210  1274  1279  1292  1308  1317  1320  1327  1346
         1349  1365  1373  3161  3164  3264  3266  3289  3312  3360  3369  3395
RTS      1036  1039  1067  1095  1110  1398  2783  2943  2981  3006  3026  3136  3138  3140  3142
         3144  3146  3207  3416  3438  3446  3455  3470
RTT      3363
SBC      1969  1978  2282
SBCB     2538
SCC      2821  2845  2869  3137
SEC      1950  1959  1968  1977  2273  2281  2528  2537  2690  2701  3421
SOB       989  1000  3201  3343  3357
SUB      1026  1878  1885  2059  2066  2072  2195  2202  2208  3021  3211
SWAB     1201  1220  1232  1793  3101  3106  3116  3120
TRAP      583
TST       851   859   880   881   882   883   911   921   932   940   951   956   961   987   999
         1057  1159  1215  1224  1271  1314  1328  1374  1895  1903  1911  1919  1927  1952  1961
         1970  1979  2073  2103  2209  2239  2275  2283  2539  2703  2791  3367  3391  3405  3418
TSTB     1118  1131  1142  1154  1157  1178  1211  2465  2489  2497  2505  2513  2663  2695  3321
         3411  3435  3443  3449  3452
WAIT     1019  3090  3091  3092  3093
.ABS      540
.DSABL    540
.END     3474
.LIST       1   540
.MACR    2889
.NLIST      1   540
.REM        1
.REPT     602  1404  1596
.SBTTL    540   599  1798
.TITLE    540

  ERRORS DETECTED:  0
  DEFAULT GLOBALS GENERATED:  0

  @DFKTGA,DFKTGA.SEQ/SOL/CRF/DS:ERFZ/EN:ABS=DSKM:DFKTGA.P11
  RUN-TIME:  8 19.4 SECONDS
  RUN-TIME RATIO:  48/33=1.4
  CORE USED:  10K  (19 PAGES)
```