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.

G01

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 DET1 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.

N01

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
```

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644  000126  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
645  000130  000132                .+2                 ;TRAP ENTRANCE
646  000132  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
647  000134  000136                .+2                 ;TRAP ENTRANCE
648  000136  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
649  000140  000142                .+2                 ;TRAP ENTRANCE
650  000142  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
651  000144  000146                .+2                 ;TRAP ENTRANCE
652  000146  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
653  000150  000152                .+2                 ;TRAP ENTRANCE
654  000152  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
655  000154  000156                .+2                 ;TRAP ENTRANCE
656  000156  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
657  000160  000162                .+2                 ;TRAP ENTRANCE
658  000162  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
659  000164  000166                .+2                 ;TRAP ENTRANCE
660  000166  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
661  000170  000172                .+2                 ;TRAP ENTRANCE
662  000172  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
663  000174  000176                .+2                 ;TRAP ENTRANCE
664  000176  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
665  000200  000202                .+2                 ;TRAP ENTRANCE
666  000202  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
667  000204  000206                .+2                 ;TRAP ENTRANCE
668  000206  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
669  000210  000212                .+2                 ;TRAP ENTRANCE
670  000212  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
671  000214  000216                .+2                 ;TRAP ENTRANCE
672  000216  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
673  000220  000222                .+2                 ;TRAP ENTRANCE
674  000222  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
675  000224  000226                .+2                 ;TRAP ENTRANCE
676  000226  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
677  000230  000232                .+2                 ;TRAP ENTRANCE
678  000232  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
679  000234  000236                .+2                 ;TRAP ENTRANCE
680  000236  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
681  000240  000242                .+2                 ;TRAP ENTRANCE
682  000242  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
683  000244  000246                .+2                 ;TRAP ENTRANCE
684  000246  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
685  000250  000252                .+2                 ;TRAP ENTRANCE
686  000252  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
687  000254  000256                .+2                 ;TRAP ENTRANCE
688  000256  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
689  000260  000262                .+2                 ;TRAP ENTRANCE
690  000262  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
691  000264  000266                .+2                 ;TRAP ENTRANCE
692  000266  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
693  000270  000272                .+2                 ;TRAP ENTRANCE
694  000272  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
695  000274  000276                .+2                 ;TRAP ENTRANCE
696  000276  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
697  000300  000302                .+2                 ;TRAP ENTRANCE
698  000302  000000                HALT                ;TRAPPED TO PREVIOUS LOCATION
699  000304  000306                .+2                 ;TRAP ENTRANCE
```

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 000306  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000310  000312                           .+2                    ;TRAP ENTRANCE
 000312  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000314  000316                           .+2                    ;TRAP ENTRANCE
 000316  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000320  000322                           .+2                    ;TRAP ENTRANCE
 000322  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000324  000326                           .+2                    ;TRAP ENTRANCE
 000326  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000330  000332                           .+2                    ;TRAP ENTRANCE
 000332  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000334  000336                           .+2                    ;TRAP ENTRANCE
 000336  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000340  000342                           .+2                    ;TRAP ENTRANCE
 000342  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000344  000346                           .+2                    ;TRAP ENTRANCE
 000346  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000350  000352                           .+2                    ;TRAP ENTRANCE
 000352  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000354  000356                           .+2                    ;TRAP ENTRANCE
 000356  000360                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000360  000362                           .+2                    ;TRAP ENTRANCE
 000362  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000364  000366                           .+2                    ;TRAP ENTRANCE
 000366  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000370  000372                           .+2                    ;TRAP ENTRANCE
 000372  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION
 000374  000376                           .+2                    ;TRAP ENTRANCE
 000376  000000                           HALT                   ;TRAPPED TO PREVIOUS LOCATION

                          ;LOAD VECTOR AREA
         000024                           .=24
 000024  016634                           PFAIL          ;POWER FAIL TRAP
 000026  000340                           340
         000030                           .=30
 000030  015050                           EMTSRV                 ;EMT CALLS
 000032  000340                           340                    ;HIGHEST PRIORITY
         000034                           .=34
 000034  014642                           SCOPEC                 ;USER TRAP
 000036  000000                           0
         000046                           .=46
 000046  015662                           LOGICAL
         000052                           .=52
 000052  040000                           40000
         000174                           .=174
 000174  000000           MMOPT:  0                      ;MEMORY MANAG OPTION SEL.
 000176  000000           SWREG:  0                      ;SOFTWARE SWITCH REG
         000176           SREG2=SWREG


                          ;LOAD STARTING AREA
         000200                           .=200
 000200  000137  000640                   JMP     @#START
         000300                           .=300
 000300  000137  000640                   JMP     @#START
         000310                           .=310
```

```
  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                SRD:    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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813  000550  177571                  SRH:    177571          ;HIGH BYTE SWITCH REG POINTER
814  000552  177342                  TCCM:   177342                  ;CONTROL AND FUNCTION
815  000554  177340                  TCST:   177340                  ;GENERAL STATUS
816  000556  177350                  TCDT:   177350                  ;DATA
817  000560  177344                  TCWC:   177344                  ;WORD COUNT
818  000562  177346                  TCBA:   177346                  ;BUS ADDRESS
819  000564  000214                  TCIV:   214                     ;DECTAPE INTERRUPT VECTOR
820  000566  000216                  TCSTA:  216
821  000570  000000                  CURBNK: 0                       ;SAF TO POINT TO CURRENT BANK
822  000572  000000                  OLDBNK: 0
823  000574  000000                  CURPAR: 0                       ;ADDRESS OF CURRENT ISAR
824  000576  000000                  CURPDR:0
825  000600  000000                  BNKSTR: 0                       ; PC TO POINT TO BEGIN THRU CURRENT SEGMENT
826  000602  000000                  TRPB:   0
827                                  ;THE NEXT TWO WORDS ARE THE MEMORY MAP. THE FIRST WORD REPRESENTS
828                                  ;0-64K WITH ONE BIT REPRESENTING A 4K CONTIGUOUS BLOCK. IF THE
829                                  ;BIT=1 THAT 4K BLOCK IS PRESENT. THE LSB REPRESENTS 0-4K, THE NEXT
830                                  ;SIGNIFICANT BIT REPRESENTS 4-8K ANS SO ON.
831  000604  177777                  MEM0:   177777                  ;0-64K
832  000606  077777                  MEM1:   77777                   ;64-124K
833  000610  000001                  COREPT: 1
834  000612  000604                  MEMUT:  MEM0
835  000614  000000                  TBANK:  0
836
837                                  ;RESTART ADD USING INITIAL SR SETTINGS
838  000616  012706  017760          RSTRT:  MOV     #KSTACK,R6
839  000622  012737  016634  000024          MOV     #PFAIL,@#24
840  000630  117737  17:714  000177          MOVB    @SRH,@#SREG2+1
841  000636  000452                  BR      START1
842
843                                  ;START UP FOR MINI MONITOR
844
845  000640  012706  017760  START:  MOV     #KSTACK,R6              ;SET UP STACK
846  000644  012737  000137  000200  MOV     #137,@#200              ;RESTORE 200 IF START AT 300
847  000652  012737  000640  000202  MOV     #START,@#202
848  000660  013746  000004          MOV     @#4,-(SP)       ;;SAVE ERROR VECTOR
849  000664  013746  000006          MOV     @#6,-(SP)
850  000670  012767  000704  177106  MOV     #1$,4           ;;SET UP TIME OUT VECTOR
851  000676  005777  177644          TST     @SR             ;;TRY TO REFERENCE HARDWARE SWR
852  000702  000404                  BR      2$              ;;BRANCH IF NO TIMEOUT TRAP OCCURS
853  000704  012767  000176  177634  1$:     MOV     #SWREG,SR       ;;POINT TO SOFTWARE SWR
854  000712  022626                  CMP     (SP)+,(SP)+     ;;RESTORE STACK
855  000714  016767  177626  177626  2$:     MOV     SR,SRH
856  000722  005267  177622          INC     SRH             ;POINT TO HIGH BYTE OF SR
857  000726  012637  000006          MOV     (SP)+,@#6       ;;RESTORE ERROR VECTOR
858  000732  012637  000004          MOV     (SP)+,@#4
859  000736  005737  000042          TST     @#42                    ;CHECK FOR MONITOR OPERATION
860  000742  001405                  BEQ     STARTX
861  000744  005037  000174          CLR     @#MMOPT                 ;RUN ALL SW DOWN IF MONITOR
862  000750  005037  000176          CLR     @#SREG2
863  000754  000403                  BR      START1
864  000756                  STARTX:
865  000756  017737  177564  000176  MOV     @SR,@#SREG2
866  000764  004767  014016  START1: JSR     %7,NRALL
867  000770  012777  077406  177520  MOV     #77406,@KPDR0
868  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  000604  177544          MOV     #MEM0,MEMUT
  875  001046  012777  077406  177446          MOV     #77406,@KPDR2   ;BEING CHECKED FOR
  876  001054  012737  001124  000004          MOV     #TMEMEX,@#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  046777  177460  177460  TMEMEX: BIC     COREPT,@MEMUT   ;NO, BLOCK NOT PRESENT
  886  001132  022626                  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  015352                  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  015050  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 003056 176724   MOV     #LK3,@KWLVC
934  001476 012777 000300 176720   MOV     #300,@KWLST
935  001504 005067 001442          CLR     TIME            ;NO, INITIALIZE COUNT
936  001510 052777 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          ST8:    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     KPAR0,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,@KPDR0           ;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     UPAR0,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,@UPDR0           ;MAP USER ASR0 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     UPAR0,CURPAR            ;CURRENT SEGMENT REGISTER ADDRESSES
 1007  002204  016767  176272  176364        MOV     UPDR0,CURPDR
 1008  002212  012767  005452  176360        MOV     #BEGIN,BNKSTR           ;CURRENT STARTING PC
 1009  002220  052777  000001  176252  SETSEG: BIS     #1,@SR0                 ;SET MEMORY MANAG. BIT
 1010  002226  042737  000340  177776  MODE:   BIC     #340,@#PSR              ;PRIORITY LEVEL 0
 1011  002234  032737  000002  000174        BIT     #2,@#MMOPT              ;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,MMOPT                ;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      MOD4                    ;START 4K MODIFY
1073  002520  004767  000072                  JSR     %7,XFER12               ;START 12K TRANSFER
1074  002524  000475                          BR      MOD8                    ;START 8K MODIFY
1075  002526  004767  000054                  JSR     %7,XFER16               ;START 16K TRANSFER
1076  002532  000464                          BR      MOD12                   ;START 12K MODIFY
1077  002534  004767  000036                  JSR     %7,XFER20               ;START 20K TRANSFER
1078  002540  000453                          BR      MOD16                   ;START 16K MODIFY
1079  002542  004767  000020                  JSR     %7,XFER24               ;START 24K TRANSFER
1080  002546  000442                          BR      MOD20                   ;START 20K MODIFY
1081  002550  004767  000002          STRT28: JSR     %7,XFER28               ;START 28K TRANSFER
1082  002554  000431                          BR      MOD24                   ;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
```

```
 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     ;DIS ABLE 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
```

```
1205
1206  003442  105277  175004          ;RF11 DISK
                      175004  RFSTART:        INCB    @RFCSRH         ;INITIALIZE DISK - DAR-DAE
1207  003446  013777  003600  174772  RFI:    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  FENDZ:  MOV     #FENDZ,@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     RENDZ                           ;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          XFENDZ: BR      FENDZ                           ;INDIRECT LINK
1310
1311                                    ;MOVE TAPE TO REVERSE END ZONE
1312    004010  012777  004010  174546  RENDZ:  MOV     #RENDZ,@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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 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+WD+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                INCB    @TCCM           ;SET DO
 1349  004212  000002                        RTI                     ;WAIT FOR NEXT BLOCK TO INTERRUPT
 1350
 1351                                ;FIND SEQUENTIAL BLOCK IN REVERSE DIRECTION
 1352  004214  032777  100200  174330 TCR3:   BIT     #100200,@TCCM   ;TEST FOR READ AND ERROR
 1353  004222  100001                        BPL     .+4
 1354  004224  104006                        HLT                     ;ERROR READING SEQUENTIAL BLOCK IN REVERSE
 1355  004226  001001                        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     %1,-(6)         ;SAVE THESE ON THE STACK
1384  004356  010246                  MOV     %2,-(6)
1385  004360  010346                  MOV     %3,-(6)
1386  004362  005003                  CLR     %3              ;SUM OF DATA
1387  004364  012701  004420          MOV     #TCRBUF,%1      ;ADDRESS OF READ BUFFER
1388  004370  012702  005420          MOV     #TCRBUF+1000,%2 ;END OF READ BUFFER
1389  004374  062103          TC2:    ADD     (1)+,%3         ;EVEN ADD
1390  004376  062103                  ADD     (1)+,%3         ;ODD ADD -2'S COMPLIMENT
1391  004400  001401                  BEQ     .+4
1392  004402  104006                  HLT                     ;DATA ERROR TC-11
1393  004404  020102                  CMP     %1,%2           ;AT END OF BUFFER?
1394  004406  001372                  BNE     TC2             ;NO - SUM THE REST
1395  004410  012603                  MOV     (6)+,%3         ;RESTORE THE REGISTERS
1396  004412  012602                  MOV     (6)+,%2
1397  004414  012601                  MOV     (6)+,%1
1398  004416  000207                  RTS     %7              ;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
1586                    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
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1709  005246  000033                  N                   ;DEC TAPE WRITE BUFFER
1710          000032                  N=N-1
1711  005250  177746                  -N
1712  005252  000032                  N                   ;DEC TAPE WRITE BUFFER
1713          000031                  N=N-1
1714  005254  177747                  -N
1715  005256  000031                  N                   ;DEC TAPE WRITE BUFFER
1716          000030                  N=N-1
1717  005260  177750                  -N
1718  005262  000030                  N                   ;DEC TAPE WRITE BUFFER
1719          000027                  N=N-1
1720  005264  177751                  -N
1721  005266  000027                  N                   ;DEC TAPE WRITE BUFFER
1722          000026                  N=N-1
1723  005270  177752                  -N
1724  005272  000026                  N                   ;DEC TAPE WRITE BUFFER
1725          000025                  N=N-1
1726  005274  177753                  -N
1727  005276  000025                  N                   ;DEC TAPE WRITE BUFFER
1728          000024                  N=N-1
1729  005300  177754                  -N
1730  005302  000024                  N                   ;DEC TAPE WRITE BUFFER
1731          000023                  N=N-1
1732  005304  177755                  -N
1733  005306  000023                  N                   ;DEC TAPE WRITE BUFFER
1734          000022                  N=N-1
1735  005310  177756                  -N
1736  005312  000022                  N                   ;DEC TAPE WRITE BUFFER
1737          000021                  N=N-1
1738  005314  177757                  -N
1739  005316  000021                  N                   ;DEC TAPE WRITE BUFFER
1740          000020                  N=N-1
1741  005320  177760                  -N
1742  005322  000020                  N                   ;DEC TAPE WRITE BUFFER
1743          000017                  N=N-1
1744  005324  177761                  -N
1745  005326  000017                  N                   ;DEC TAPE WRITE BUFFER
1746          000016                  N=N-1
1747  005330  177762                  -N
1748  005332  000016                  N                   ;DEC TAPE WRITE BUFFER
1749          000015                  N=N-1
1750  005334  177763                  -N
1751  005336  000015                  N                   ;DEC TAPE WRITE BUFFER
1752          000014                  N=N-1
1753  005340  177764                  -N
1754  005342  000014                  N                   ;DEC TAPE WRITE BUFFER
1755          000013                  N=N-1
1756  005344  177765                  -N
1757  005346  000013                  N                   ;DEC TAPE WRITE BUFFER
1758          000012                  N=N-1
1759  005350  177766                  -N
1760  005352  000012                  N                   ;DEC TAPE WRITE BUFFER
1761          000011                  N=N-1
1762  005354  177767                  -N
1763  005356  000011                  N                   ;DEC TAPE WRITE BUFFER
1764          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
```

D04


```
 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
```

E04


```
  2032  006664  104006                          HLT
```

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

```
 2037  006674  C43700  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     @#B,@#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     @#B,%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     B,@#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     @#B,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     @#B,%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     @#B,@#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     @#B,@#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    D(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  014774        MOV     #-1,@#TEMP
2471  011230  012700  177770                MOV     #-10,%0
2472  011234  105060  015004                CLRB    D(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    D(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                TSTB    @#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    D(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  105260  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
```

```
2553  011612  104006                          HLT
2554  011614  104400                          SCOPE
2555
2556                                  ;TEST MOVE INSTRUCTIONS
2557  011616  113700  014742                   MOVB    @#8,%0
2558  011622  122700  000252                   CMPB    #000252,%0
2559  011626  001401                           BEQ     .+4
2560  011630  104006                          HLT
2561  011632  104400                          SCOPE
2562
2563  011634  112737  125252  014774           MOVB    #125252,@#TEMP
2564  011642  126737  003074  014774           CMPB    B,@#TEMP
2565  011650  001401                           BEQ     .+4
2566  011652  104006                          HLT
2567  011654  104400                          SCOPE
2568
2569                                  ;TEST UNARYS INDIRECT
2570  011656  012737  177777  014774           MOV     #-1,@#TEMP
2571  011664  105037  014774                   CLRB    @#TEMP
2572  011670  023727  014774  177400           CMP     @#TEMP,#177400
2573  011676  001401                           BEQ     .+4
2574  011700  104006                          HLT
2575  011702  104400                          SCOPE
2576
2577  011704  012737  125252  014774           MOV     #125252,@#TEMP
2578  011712  105137  014775                   COMB    @#TEMP+1
2579  011716  022737  052652  014774           CMP     #052652,@#TEMP
2580  011724  001401                           BEQ     .+4
2581  011726  104006                          HLT
2582  011730  104400                          SCOPE
2583
2584  011732  005037  014774                   CLR     @#TEMP
2585  011736  105237  014775                   INCB    @#TEMP+1
2586  011742  022737  000400  014774           CMP     #400,@#TEMP
2587  011750  001401                           BEQ     .+4
2588  011752  104006                          HLT
2589  011754  104400                          SCOPE
2590
2591  011756  005037  014774                   CLR     @#TEMP
2592  011762  105377  003010                   DECB    @TEMP+2
2593  011766  023727  014774  000377           CMP     @#TEMP,#377
2594  011774  001401                           BEQ     .+4
2595  011776  104006                          HLT
2596  012000  104400                          SCOPE
2597
2598  012002  005037  014774                   CLR     @#TEMP
2599  012006  112737  000001  014775           MOVB    #1,@#TEMP+1
2600  012014  105437  014775                   NEGB    @#TEMP+1
2601  012020  022737  177400  014774           CMP     #177400,@#TEMP
2602  012026  001401                           BEQ     .+4
2603  012030  104006                          HLT
2604  012032  104400                          SCOPE
2605
2606                                  ;TEST INDIRECT ADDRESSING WITH INDEXING
2607                                  ;TEST COMPARE INSTRUCTION
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,%0
2621  012070  122700  125252                  CMPB    #125252,%0
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  001401                          BEQ     .+4
2635  012142  104006                          HLT
2636  012144  104400                          SCOPE
2637
2638                                  ;TEST BIC INSTRUCTION INDIRECT WITH INDEXING
2639  012146  012700  177777                  MOV     #-1,%0
2640  012152  147700  002566                  BICB    @B+2,%0
2641  012156  120027  052525                  CMPB    %0,#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  025067  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
2778  012762  004767  000002          ;TEST JSR INSTRUCTION
2779  012766  000405                      JSR     %7,TJSR2        ;PLACE PC ON STACK
2780  012770  121627  012766  TJSR1:  BR      TJSR3           ;RETURN HERE ON RTS %19
2781  012774  001401  TJSR2:  CMPB    @%6,#TJSR1      ;CHECK FOR CORRECT PC ON STACK
2782  012776  104006              BEQ     .+4
2783  013000  000207              HLT                     ;INCORRECT PC ON STACK
2784  013002  104400              RTS     %7              ;RETURN TO IMST AFTER JSR
2785                      TJSR3:  SCOPE
2786  013004  000257
2787  013006  004717              CCC
2788  013010  121627  013010      JSR     %7,@%7          ;INSTRUCTION UNDER TEST
2789  013014  001401              CMPB    @%6,#TJSR3+6            ;TEST THE STACK
2790  013016  104006              BEQ     .+4
2791  013020  005726              HLT                     ;PC OF JSR DID NOT GO TO STACK
2792  013022  104400              TST     (6)+            ;REPOSITION THE STACK
2793                              SCOPE
2794
2795  013024  000257          ;TEST NESTED SUBROUTINES
2796  013026  004767  001602      CCC                     ;CLEAR CONDITION CODES
2797  013032  100401              JSR     %7,SUBR6
2798  013034  104006              BMI     .+4
2799  013036  001401              HLT                     ;JSR OR RTS FAILED
2800  013040  104006              BEQ     .+4
2801  013042  102401              HLT                     ;JSR OR RTS FAILED
2802  013044  104006              BVS     .+4
2803  013046  103401              HLT                     ;JSR OR RTS FAILED
2804  013050  104006              BCS     .+4
2805  013052  104400              HLT                     ;JSR OR RTS FAILED
2806                              SCOPE
2807
2808  013054  104400          ;TEST ROTATE ODD BYTE
2809  013056  000257              SCOPE
2810  013060  012767  123456  001706  CCC                 ;CLEAR "C"
2811  013066  106067  001703      MOV     #123456,TEMP
2812  013072  103401              RORB    TEMP+1          ;ROTATE ODD BYTE
2813  013074  104006              BCS     .+4
2814  013076  102401              HLT                     ;C NOT SET
2815  013100  104006              BVS     .+4
2816  013102  022767  051456  001664  HLT                 ;V NOT SET
2817  013110  001401              CMP     #051456,TEMP
2818  013112  104006              BEQ     .+4
2819  013114  104400              HLT                     ;ROTATE FAILED
2820                              SCOPE
2821  013116  000277
2822  013120  012767  123456  001646  SCC                 ;SET C
2823  013126  106067  001643      MOV     #123456,TEMP
2824  013132  103401              RORB    TEMP+1
2825  013134  104006              BCS     .+4
2826  013136  102001              HLT                     ;C NOT SET
2827  013140  104006              BVC     .+4
2828  013142  022767  151456  001624  HLT                 ;V NOT CLEARED
2829  013150  001401              CMP     #151456,TEMP
2830  013152  104006              BEQ     .+4
2831  013154  104400              HLT                     ;ROTATE FAILED
2832                              SCOPE
```

```
2833  013156  000257                  CCC
2834  013160  012767  123456  001606  MOV     #123456,TEMP
2835  013166  106167  001603          ROLB    TEMP+1
2836  013172  103401                  BCS     .+4
2837  013174  104006                  HLT                     ;C NOT SET
2838  013176  102401                  BVS     .+4
2839  013200  104006                  HLT                     ;V NOT SET
2840  013202  022767  047056  001564  CMP     #047056,TEMP
2841  013210  001401                  BEQ     .+4
2842  013212  104006                  HLT                     ;ROTATE BYTE FAILED
2843  013214  104400                  SCOPE
2844
2845  013216  000277                  SCC                     ;SET C
2846  013220  012767  123456  001546  MOV     #123456,TEMP
2847  013226  106167  001543          ROLB    TEMP+1
2848  013232  103401                  BCS     .+4
2849  013234  104006                  HLT                     ;C NOT SET
2850  013236  102401                  BVS     .+4
2851  013240  104006                  HLT                     ;V NOT SET
2852  013242  022767  047456  001524  CMP     #047456,TEMP
2853  013250  001401                  BEQ     .+4
2854  013252  104006                  HLT                     ;ROTATE ODD BYTE FAILED
2855  013254  104400                  SCOPE
2856
2857  013256  000257                  CCC                     ;CLEAR C
2858  013260  012767  177777  001506  MOV     #-1,TEMP
2859  013266  106267  001503          ASRB    TEMP+1
2860  013272  103401                  BCS     .+4
2861  013274  104006                  HLT                     ;C NOT SET
2862  013276  102001                  BVC     .+4
2863  013300  104006                  HLT                     ;V NOT CLEARED
2864  013302  026727  001466  177777  CMP     TEMP,#-1
2865  013310  001401                  BEQ     .+4
2866  013312  104006                  HLT                     ;SHIFT FAILED
2867  013314  104400                  SCOPE
2868
2869  013316  000277                  SCC
2870  013320  012767  177777  001446  MOV     #-1,TEMP
2871  013326  106367  001443          ASLB    TEMP+1
2872  013332  103401                  BCS     .+4
2873  013334  104006                  HLT                     ;C NOT SET
2874  013336  102001                  BVC     .+4
2875  013340  104006                  HLT                     ;V NOT CLEARED
2876  013342  026727  001426  177377  CMP     TEMP,#177377
2877  013350  001401                  BEQ     .+4
2878  013352  104006                  HLT                     ;SHIFT BYTE FAILED
2879  013354  104400                  SCOPE
2880
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  020027  177777                  CMP     %0,#-1                  ;AT UPPER LIMIT
2903  013426  001403                          BEQ     CMP2                    ;YES EXIT
2904  013430  005200                          INC     %0                      ;INCREMENT TO NEXT NUMBER
2905  013432  005201                          INC     %1
2906  013434  000767                          BR      CMP1
2907  013436  104400                  CMP2:   SCOPE
2908
2909                                  ;TEST ROTATING ALL NUMBERS
2910  013440  104400                          SCOPE
2911  013442  012767  177777  000132          MOV     #-1,REFF                ;INITIALIZE BASE NUMBER
2912  013450  005267  000126          TSROT:  INC     REFF                    ;INCREMENT NUMBER
2913  013454  004767  000012                  JSR     %7,ROTALL               ;GO TO COMPARE ROUTINE
2914  013460  026727  000116  177777          CMP     REFF,#-1                ;TEST ALL VALUES
2915  013466  001370                          BNE     TSROT                   ;NO TEST THEM ALL
2916  013470  000446                          BR      TSRT2A                  ;WE ARE DONE
2917
2918  013472  016767  000104  000104  ROTALL: MOV     REFF,TEST
2919  013500  006067  000100                  ROR     TEST
2920  013504  006067  000074                  ROR     TEST
2921  013510  006067  000070                  ROR     TEST
2922  013514  006167  000064                  ROL     TEST
2923  013520  006167  000060                  ROL     TEST
2924  013524  006167  000054                  ROL     TEST
2925  013530  100004                          BPL     .+12
2926  013532  103007                          BCC     .+20                    ;Z=1
2927  013534  102013                          BVC     .+30                    ;Z=1, C=1
2928  013536  104006                          HLT                             ;Z=C, BUT V=1
2929  013540  000411                          BR      .+24
2930  013542  103006                          BCC     .+16                    ;Z=0
2931  013544  102407                          BVS     .+20                    ;Z=0, C=1
2932  013546  104006                          HLT                             ;Z NOT EQUAL C, V=1
2933  013550  000405                          BR      .+14
2934  013552  102404                          BVS     .+12                    ;Z=1, C=0
2935  013554  104006                          HLT                             ;Z NOT EQUAL C, V=1
2936  013556  000402                          BR      .+6
2937  013560  102001                          BVC     .+4                     ;Z=0, C=0
2938  013562  104006                          HLT                             ;Z=C, BUT V=1
2939  013564  104400                          SCOPE
2940  013566  026767  000012  000006          CMP     TEST,REFF
2941  013574  001401                          BEQ     .+4
2942  013576  104006                          HLT                             ;INITIAL NOT EQUAL TO FINAL
2943  013600  000207                          RTS     %7
2944  013602  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     #0200,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     SCOPEF          ;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  0000;0          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     #IPDRTAB,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,#IPDREND     ;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  012601                          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     @#SREG2,R1
3245  015232  032767  000002  163344          BIT     #2,MEMO
3246  015240  001402                          BEQ     DSW1
3247  015242  010137  020176                  MOV     R1,@#SREG2+20000
3248  015246  032767  000004  163330  DSW1:   BIT     #4,MEMO
3249  015254  001402                          BEQ     DSW2
3250  015256  010137  040176                  MOV     R1,@#SREG2+40000
3251  015264  032767  000010  163314  DSW2:   BIT     #10,MEMO
3252  015270  001402                          BEQ     DSW3
3253  015272  010137  060176                  MOV     R1,@#SREG2+60000
3254  015276  032767  000020  163300  DSW3:   BIT     #20,MEMO
3255  015304  001402                          BEQ     DSW4
3256  015306  010137  100176                  MOV     R1,@#SREG2+100000
3257  015312  032767  000040  163264  DSW4:   BIT     #40,MEMO
3258  015320  001402                          BEQ     DSW5
3259  015322  010137  120176                  MOV     R1,@#SREG2+120000
3260  015326  032767  000100  163250  DSW5:   BIT     #100,MEMO
3261  015334  001402                          BEQ     E081B
3262  015336  010137  140176                  MOV     R1,@#SREG2+140000
3263  015342  012716  005420          E081B:  MOV     #BEGINX,(SP)
3264  015346  000002                          RTI
3265  015350  012716  005452          E081C:  MOV     #BEGIN,(SP)
3266  015354  000002                          RTI
3267  015356  042737  000340  177776  E082:   BIC     #340,@#PSR
3268  015364  032767  000002  162602          BIT     #2,MMOPT        ;USER/KERNEL INHIBITED?
3269  015372  001262                          BNE     E081            ;YES - SET PC AND RETURN
3270  015374  032767  000004  162572          BIT     #4,MMOPT        ;NO--INHIBIT 4K AS 32K?
3271  015402  001256                          BNE     E081            ;YES - SET PC AND RETURN
3272  015404  026767  163164  163102          CMP     CURPAR,UPAR7    ;LAST USER ASR DONE?
3273  015412  001444                          BEQ     NXTBNK          ;YES - GO FIND NEXT BANK
3274  015414  062737  020000  000034          ADD     #20000,@#34     ;UPDATE SCOPE VECTOR ADDRESS IN BANK 0
3275  015422  062767  020000  163150          ADD     #20000,BNKSTR   ;UPDATE BANK START TO REFERENCE CURRENT ASR
3276  015430  016716  163144                  MOV     BNKSTR,(SP)
3277  015434  026767  163050  163132          CMP     UPAR0,CURPAR
3278  015442  001404                          BEQ     NXTSEG
3279  015444  005077  163124                  CLR     @CURPAR         ;SET PREVIOUS ASR TO NR, BANK 0
3280  015450  005077  163122                  CLR     @CURPDR
3281  015454  062767  000002  163112  NXTSEG: ADD     #2,CURPAR       ;UPDATE POINTERS TO NEXT SEGMENT
3282  015462  062767  000002  163106          ADD     #2,CURPDR
3283  015470  012777  077406  163100          MOV     #77406,@CURPDR  ;SET NEXT SEGMENT RW, 4K
3284  015476  016777  163066  163070          MOV     CURBNK,@CURPAR  ;MAP NEXT SEGMENT TO CURRENT BANK
3285  015504  052737  030000  177776          BIS     #30000,@#PSR    ;SET PREVIOUS MODE TO USER
3286  015512  006506                          MFPI    R6              ;PICK UP USER STACK POINTER
3287  015514  062716  020000                  ADD     #20000,@R6      ;MAP IT TO NEXT ASR
3288  015520  006606                          MTPI    R6              ;PUT IT BACK
3289  015522  000002                          RTI                     ;GO BACK TO MAINLINE
3290  015524  005327  000000  NXTBNK: DEC     #0                      ;STALL SO DOUBLE BELL NOTED
3291  015530  001375                          BNE     .-4
3292  015532  004767  001016                  JSR     %7,BELL
3293  015536  012746  000400                  MOV     #UBUFF,-(SP)
3294  015542  052737  030000  177776          BIS     #30000,@#PSR
3295  015550  006606                          MTPI    R6
3296  015552  013737  000570  000572          MOV     @#CURBNK,@#OLDBNK       ;SAVE PREV BANK ADDRESS
```

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3297  015550  062767  000200  163002  BNKTST: ADD     #200,CURBNK
3298  015556  006367  163016                  ASL     COREPT
3299  015562  103006                          BCC     1$
3300  015564  012767  000001  163006          MOV     #1,COREPT
3301  015572  012767  000606  163002          MOV     #MEM1,MEMUT
3302  015600  022767  007600  162752  1$:     CMP     #7600,CURBNK    ;CHECK FOR EXTERNAL BANK
3303  015606  001067                          BNE     E083            ;IF NOT, TEST FOR ITS PRESENCE
3304  015610  012767  000000  162742          MOV     #0,CURBNK       ;START OVER, TESTING BANK 0
3305  015616  012767  000001  162754          MOV     #1,COREPT
3306  015624  012767  000604  162750          MOV     #MEMO,MEMUT
3307  015632  013701  000042          LOGIC:  MOV     @#42,R1
3308  015636  001412                          BEQ     BNKT
3309  015640  000005                          RESET
3310  015642  005046                          CLR     -(SP)           ;CLEAR TBTT VIA RTI
3311  015644  012746  015662                  MOV     #LOGICAL,-(SP)
3312  015650  000002                          RTI
3313  015652  004711                  LOGICAL:JSR     X7,@R1
3314  015654  000240                          NOP
3315  015656  000240                          NOP
3316  015660  000240                          NOP
3317  015662  000000                          HALT
3318  015664  032737  000001  000176  BNKT:   BIT     #1,@#SREG2      ;TTY OUT SELECTED
3319  015672  001410                          BEQ     BNKT1           ;YES, NO ASTERISK
3320  015674  004767  000672                  JSR     X7,CRLF
3321  015700  105777  162474                  TSTB    @TCSR           ;WAIT FOR TELETYPE
3322  015704  100375                          BPL     .-4
3323  015706  012777  000252  162466          MOV     #252,@TDBR      ;OUTPUT ASTERISK TO SIGNAL END OF PASS
3324  015714  042766  000020  000006  BNKT1:  BIC     #20,6(SP)       ;CLEAR TRACE BIT OF STATUS ON STACK
3325  015722  012737  000016  000014          MOV     #16,@#14
3326  015730  005037  000016                  CLR     @#16
3327  015734  032777  010000  162574          BIT     #10000,@SR
3328  015742  001011                          BNE     E083
3329  015744  005167  162622                  COM     TRPB
3330  015750  100006                          BPL     E083
3331  015752  052766  000020  000006          BIS     #20,6(SP)
3332  015760  012737  016162  000014          MOV     #TRTRP,@#14
3333  015766  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                                  ;RTI 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  026646                          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  000254                  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  162264  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  1885  2094  2189  2230  2290
                2296  2303  2311  2328  2338  2344  2350  2356  2362  2368  2375  2380  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  1885*  1894*  1902*  1926*  1942*  1960*  1978*  2029*  2030  2050*  2051*  2052
                2166*  2167  2187*  2188*  2189  2318*  2320  2325*  2329  2416  2488*  2504*  2520*
                2538*  2632*  2633  2653*  2654*  2655  2732*  2734  2757  2758*  2760  2765*  2769
                3182#  3183  3184
CK      016330  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#
CURBNK  000570   821#  1003*  1796*  3284  3296  3297*  3302  3304*  3333  3346  3386
CURPAR  000574   823#  1006*  3272  3277  3279*  3281*  3284*  3344*  3346*
CURPAT= 003160   965*  1151#  1153  1170  1172*  1174*
CURPDR  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#
ERROK    003536            1216    1224#
ERRSET   003532            1218    1222#
FENDZ    003612             952    1270#   1309
FEND1    003634            1272    1275#
HLT    = 104006             587#   1120    1133    1165    1195    1213    1219    1222    1226    1282    1284    1288    1297
                           1299    1305    1330    1337    1339    1343    1354    1356    1362    1376    1392    1808    1814
                           1820    1826    1833    1840    1849    1856    1865    1873    1880    1887    1897    1905    1913
                           1921    1929    1937    1945    1954    1963    1972    1981    1988    1995    2003    2008    2013
                           2020    2026    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    2285
                           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    2738    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    2868    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
IPOREN   000544             811#   3202
IPORTA   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

```
LPINTR  003200              967    1157#
LPST    000436             775#     968*
LPVC    000434             774#     967*
LP1     003154            1150#    1183     1185
LP2     003162            1153#    1173     1175
LP3     003270            1171     1174#
LP4     003300            1167     1176#
LP5     003336            1181     1184#
LP6     003236            1155     1158     1166#
LP7     003234            1160     1162     1165#
MAIN    002276            1012     1019#    1021     3152
MAP1    001074             879#     893
MAP2    001164             889      892#
MEMUT   000612             834#     874*     885*     891*     895*     1005*    3301*    3306*    3335
MEM0    000604             831#     834      871*     874      895      1005     3245     3248     3251     3254     3257     3260     3306
MEM1    000606             832#     872*     891      3301
MMOPT   000174             746#     861*     975      980      991      1011     1033     1037     3230     3242     3268     3270
MODE    002226             976     1010#
MOD12   002704            1076     1102#
MOD16   002670            1078     1100#
MOD20   002654            1080     1098#
MOD24   002640            1082     1096#
MOD4    002734            1072     1106#
MOD8    002720            1074     1104#
MOVE    002464            1061#    1084     1086     1088     1090     1092     1094
MOVEPT  001134             884      887#
N     = 000001            1403#    1404     1405     1406#    1407     1408     1409#    1410     1411     1412#    1413     1414     1415#
                          1416     1417     1418#    1419     1420     1421#    1422     1423     1424#    1425     1426     1427#    1428
                          1429     1430#    1431     1432     1433#    1434     1435     1436#    1437     1438     1439#    1440     1441
                          1442#    1443     1444     1445#    1446     1447     1448#    1449     1450     1451#    1452     1453     1454#
                          1455     1456     1457#    1458     1459     1460#    1461     1462     1463#    1464     1465     1466#    1467
                          1468     1469#    1470     1471     1472#    1473     1474     1475#    1476     1477     1478#    1479     1480
                          1481#    1482     1483     1484#    1485     1486     1487#    1488     1489     1490#    1491     1492     1493#
                          1494     1495     1496#    1497     1498     1499#    1500     1501     1502#    1503     1504     1505#    1506
                          1507     1508#    1509     1510     1511#    1512     1513     1514#    1515     1516     1517#    1518     1519
                          1520#    1521     1522     1523#    1524     1525     1526#    1527     1528     1529#    1530     1531     1532#
                          1533     1534     1535#    1536     1537     1538#    1539     1540     1541#    1542     1543     1544#    1545
                          1546     1547#    1548     1549     1550#    1551     1552     1553#    1554     1555     1556#    1557     1558
                          1559#    1560     1561     1562#    1563     1564     1565#    1566     1567     1568#    1569     1570     1571#
                          1572     1573     1574#    1575     1576     1577#    1578     1579     1580#    1581     1582     1583#    1584
                          1585     1586#    1587     1588     1589#    1590     1591     1592#    1593     1594     1595#    1596#    1597
                          1598     1599#    1600     1601     1602#    1603     1604     1605#    1606     1607     1608#    1609     1610
                          1611#    1612     1613     1614#    1615     1616     1617#    1618     1619     1620#    1621     1622     1623#
                          1624     1625     1626#    1627     1628     1629#    1630     1631     1632#    1633     1634     1635#    1636
                          1637     1638#    1639     1640     1641#    1642     1643     1644#    1645     1646     1647#    1648     1649
                          1650#    1651     1652     1653#    1654     1655     1656#    1657     1658     1659#    1660     1661     1662#
                          1663     1664     1665#    1666     1667     1668#    1669     1670     1671#    1672     1673     1674#    1675
                          1676     1677#    1678     1679     1680#    1681     1682     1683#    1684     1685     1686#    1687     1688
                          1689#    1690     1691     1692#    1693     1694     1695#    1696     1697     1698#    1699     1700     1701#
                          1702     1703     1704#    1705     1706     1707#    1708     1709     1710#    1711     1712     1713#    1714
                          1715     1716#    1717     1718     1719#    1720     1721     1722#    1723     1724     1725#    1726     1727
                          1728#    1729     1730     1731#    1732     1733     1734#    1735     1736     1737#    1738     1739     1740#
                          1741     1742     1743#    1744     1745     1746#    1747     1748     1749#    1750     1751     1752#    1753
                          1754     1755#    1756     1757     1758#    1759     1760     1761#    1762     1763     1764#    1765     1766
                          1767#    1768     1769     1770#    1771     1772     1773#    1774     1775     1776#    1777     1778     1779#
                          1780     1781     1782#    1783     1784     1785#    1786     1787
```

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
REND1   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#
```

```
ROTBE   013642          2951    2956#
ROTBO   013752          2952    2982#
ROTEN1  014054          2955    3007#
RSTRT   000616           757     838#  3467
R0      =%000000         589#    918*   929*   937*   948*   955*   958   1025   2883
R1      =%000001         590#    982*   989*   993*  1000*  1789*  1790*  1792  1793*  1794*  1795*  1796   3192
                        3195*   3198   3202   3206*  3244*  3247   3250   3253   3256   3259   3262   3307*  3313
                        3338*   3342   3354*  3356*
R2      =%000002         591#    983*   985*   986*   987    994*   996*   998*   999   1058*  1059   3193   3198*
                        3200*   3205*  3339*  3342*
R3      =%000003         592#    984*   985     988*   995*   996    997*   3194   3197*  3201*  3204*  3340*  3341*
                        3343*   3355*  3357*
R4      =%000004         593#
R5      =%000005         594#
R6      =%000006         596#    838*   845*  1014*  3192*  3193*  3194*  3204   3205   3206   3286   3287*  3288*
                        3295*
SAVPC   016346          3375*   3380    3396#
SAVPSR  016350          3376*   3383    3397#
SAVR6   016654          3459*   3462#   3463
SCOPE = 104400           583#   1809    1815   1821   1827   1834   1841   1850   1857   1866   1874   1881   1888
                        1898    1906    1914   1922   1930   1938   1946   1955   1964   1973   1982   1990   1997
                        2004    2009    2014   2021   2027   2033   2041   2048   2055   2063   2069   2076   2084
                        2091    2098    2106   2113   2120   2127   2134   2141   2146   2151   2158   2164   2170
                        2178    2185    2192   2199   2205   2212   2220   2227   2234   2242   2249   2256   2263
                        2270    2278    2286   2293   2299   2306   2315   2323   2332   2341   2347   2353   2359
                        2365    2371    2378   2383   2390   2397   2405   2412   2419   2426   2435   2443   2451
                        2459    2468    2476   2484   2492   2500   2508   2516   2524   2533   2542   2549   2554
                        2561    2567    2575   2582   2589   2596   2604   2612   2617   2624   2630   2636   2644
                        2651    2658    2666   2673   2680   2687   2698   2706   2713   2720   2729   2737   2743
                        2749    2755    2763   2772   2784   2792   2805   2808   2819   2831   2843   2855   2867
                        2879    2886    2907   2910   2939   2977   3002   3007   3018   3025   3028   3041   3054
                        3067    3081    3096   3111   3124
SCOPEB  014714          3154    3160#
SCOPEC  014642           739     899    3149#
SCOPEF  014736           904*   3157    3159*  3162*  3166#
SCOPEG  014722          3156    3158    3162#
SEGM1   002074           981     990#
SETEX   002054           985#    989
SETSEG  002220          1001    1009#
SETUSE  002124           996#   1000
SOLPAT= 003156           963*   1152#   1180   1182*  1184*
SP      =%000006         595#    596    848*   849*   854    857    858    886   1016*  1026*  1027*  3151   3160*
                        3211*   3212    3213   3214*  3233*  3240*  3263*  3265*  3276*  3293*  3310*  3311*  3324*
                        3331*   3358*   3359   3465
SPACE   016536          3382    3385    3388   3435#
SR      000546           812#    851    853*   855    865    3327   3372   3391
SREG2 = 000176           748#    840*   862*   865*   913*   914    919    930    938    949    958*   959    1020
                        1025*   2892    3086   3149   3153   3155   3229*  3236   3244   3247*  3250*  3253*  3256*
                        3259*   3262*   3318   3441
SRH     000550           813#    840    855*   856*   3229
SR0     000500           792#    878*   896*  1009*
START   000640           753     755    845#   847
STARTX  000756           860     864#
START1  000764           841     863    866#
STRT28  002550          1055    1081#
STRT4   002504          1058    1068#
```

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#
SWABA   014534             3116#   3123
SWREG   000176              747#    748     853
TBANK   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   2280*  2282*  2283   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   3185*  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*  3022   3100*  3101*  3106*  3114*  3116*  3117   3120*  3122*
TIME     003152      935*  1127*  1135*  1136   1140   1146*
TJSR1    012766     2779*  2780
TJSR2    012770     2778   2780*
TJSR3    013002     2779   2784*  2788
TMEMEX   001124      876    885*
TRCSR    000406      763*
TRP8     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      992   1002*
USER     016676      973   3470*
WAIT4    014454     3089   3096*
WD     = 000014     1259*  1326
WORDCT   003602      927    945   1190   1208   1236*
XFEND2   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

DFKTGA.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

626 628 630 632 634 636 638 640 642 644 646 648 650
652 654 656 658 660 662 664 666 668 670 672 674 676
678 680 682 684 686 688 690 692 694 696 698 700 702
704 706 708 710 712 714 716 718 720 722 724 726 728
732# 735# 738# 741# 743# 745# 752# 754# 756# 760# 762# 1018 1035
1066 1114 1119 1132 1143 1151 1152 1169 1179 1194 1212 1225 1281
1283 1296 1298 1304 1329 1336 1338 1353 1355 1361 1375 1391 1807
1813 1819 1825 1832 1839 1848 1855 1864 1872 1879 1886 1896 1904
1912 1920 1928 1936 1944 1953 1962 1971 1980 2002 2007 2012 2019
2025 2031 2035 2045 2053 2061 2067 2074 2082 2085 2096 2104 2111
2118 2125 2132 2138 2144 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 2339 2345 2351 2357 2363 2369 2376 2381
2388 2395 2403 2410 2417 2424 2433 2441 2449 2457 2466 2474 2482
2490 2498 2506 2514 2522 2531 2540 2547 2552 2559 2565 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 2797 2799 2801 2803 2812 2814 2817 2824 2826 2829
2836 2838 2841 2848 2850 2853 2860 2862 2865 2872 2874 2877 2884
2900 2925 2926 2927 2928 2930 2931 2933 2934 2936 2937 2941 2963
2964 2965 2967 2968 2969 2971 2972 2974 2975 2979 2988 2989 2990
2992 2993 2994 2996 2997 2999 3000 3004 3023 3036 3049 3062 3072
3074 3076 3094 3102 3104 3107 3109 3118 3150 3173# 3176# 3184# 3187#
3201 3291 3322 3368 3373 3392 3402 3406 3419 3436 3444 3450 3453
3472#

TNCV   2889#   2925   2963   2988

E07

F07


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CLRB    2464  2472  2480  2488  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
        2247  2253  2260  2267  2290  2296  2303  2312  2320  2329  2473  2481  2521  2530  2572
        2579  2586  2593  2601  2608  2740  2746  2760  2769  2816  2828  2840  2852  2864  2876
        2883  2890  2902  2914  2940  2953  2978  3003  3015  3022  3035  3079  3117  3151  3157
        3202  3272  3277  3302  3350  3377  3465
CMPB    1198  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  3033  3038  3087  3238  3329
COMB    2496  2578  3046  3051  3059  3064
DEC     1359  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  3286
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   979   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
        1892  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
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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)
```