IDENTIFICATION

PRODUCT CODE:	MAINDEC-11-D0QD
PRODUCT NAME:	T17 SYSTEM EXERCISER (WITH CORE EXPANSION)
DATE CREATED:	FEB. 1971
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	JOHN HITTELL

ABSTRACT

THIS PROGRAM IS A CORE EXPANDABLE INTERACTIVE BUS EXERCISER FOR A PAPER TAPE ORIENTED PDP-11/20. IT PERFORMS A TEST OF INSTRUCTIONS AND CONCURRENT OPERATIONS OF I/O EQUIPMENT SIMULTANEOUSLY. IT MAY ALSO PERFORM THE SAME OPERATION INDEPENDENTLY. 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.

REQUIREMENTS

EQUIPMENT

PDP-11/20 STANDARD COMPUTER

OPTIONAL HARDWARE THAT THE PROGRAM WILL EXERCISE

MM11	UP TO 28KW OF MEMORY
RF11	DISK (256K)
TC11	DECTAPE-TRANSPORT ZERO
KE11	EXTENDED ARITHMETIC UNIT
KW11L	LINE CLOCK
PC11	HIGH SPEED READER/PUNCH
KL11	ASR33 OR ASR35 TELEPRINTER
LP11	LINE PRINTER

STORAGE

PROGRAM STORAGE - THE ROUTINE USES MEMORY FROM 0000 TO 17476.

LOADING PROCEDURE

METHOD

PROCEDURE FOR NORMAL ABSOLUTE TAPES SHOULD BE FOLLOWED.

4. STARTING PROCEDURE

4.1 CONTROL SWITCH SETTING

STARTING AT SA 200 ALL SWITCHES SHOULD BE SET AS INDICATED.

4.2 STARTING ADDRESS OR ADDRESSES

(A) 200 = SR = 000777 TEST PROCESSOR ONLY-WITH CORE EXPANSION
(B) 200 = SR = 001777 TEST PROCESSOR ONLY-4K-INHIBIT
CORE EXPANSION
(C) 200 = SR = 002XXX TEST I/O ONLY
(D) 200 = SR = 000000 -CORE EXPAND AND TEST ALL AVAILABLE
I/O DEVICES

SW0 = 1 INHIBIT TTY OUTPUT
SW1 = 1 INHIBIT TTY INPUT
SW2 = 1 INHIBIT HSP
SW3 = 1 INHIBIT HSR
SW4 = 1 INHIBIT LINE CLOCK
SW5 = 1 INHIBIT RF11 DISK (256K)
SW6 = 1 INHIBIT TC11 DECTAPE
SW7 = 1 INHIBIT LINE PRINTER --- IF LINE PRINTER IS USED,
MUST RESTART AT 400
IF EAE EXIST IT WILL BE AUTOMATICALLY SELECTED

4.3 PROGRAM AND/OR OPERATOR ACTION

LOAD PROGRAM INTO MEMORY.
SET SWITCH REGISTER TO STARTING ADDRESS.
LOAD ADDRESS.
SET SWITCHES TO INHIBIT NON EXISTANT DEVICES
PRESS START.
THE PROGRAM WILL LOOP AND
BELL WILL RING ONCE PER PASS OF THE PROGRAM.
A MINIMUM OF TWO PASSES SHOULD
ALWAYS BE RUN.

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

5.1.1 AT SA 200 .. THE INSTRUCTION AND LOGIC TEST. WITH ALL SWITCHES DOWN THE PROGRAM WILL TEST ALL DEVICES AND PRINT OUT ON ERRORS AND CONTINUE IN TEST. (BELL WILL RING AT COMPLETION OF A PASS)

5.1.2 SWITCH SETTINGS ARE

SW15 = 1 OR UP ... HALT ON ERROR
SW14 = 1 OR UP ... SCOPE LOOP
SW13 = 1 OR UP ... INHIBIT PRINTOUT
SW12 = 1 OR UP ... INHIBIT TRACE TRAPPING
SW11 = 1 OR UP ... INHIBIT ITERATION LOOP
SW10 = 1 OR UP ... INHIBIT PROCESSOR TEST
SW09 = 1 OR UP ... INHIBIT VARIABLE CORE EXPANSION

5.1.3

5.2. SUBROUTINE ABSTRACTS

5.2.1 BEGIN SA 200

5.2.2 SCOPE

THIS SUBROUTINE CALL IS PLACED BETWEEN EACH SUBTEST IN THE INSTRUCTION SECTION. IT RECORDS THE STARTING ADDRESS OF EACH SUB-TEST 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 SCOPE LOOP IS NOT REQUESTED, THERE WILL BE EITHER A FIXED OR RANDOM NUMBER OF ITERATIONS ON THAT SUB-TEST BEFORE THE NEXT SUBTEST IS ENTERED. SWITCH 11 ON A 1 INHIBITS ITERATION OF SUBTESTS.

5.2.3 HLT

IS A ROUTINE THAT PRINTS-OUT AN ADDRESS THAT TAGS THE FAILING SUBTEST, AND THE STATUS REGISTER AT THE TIME OF THE FAILURE.

5.2.4 TRTRAP

THIS ROUTINE WILL ALLOW THE TRACE BIT TRAP TO BE SET AFTER FIRST LOOP OF THE PROGRAM. UNDER NORMAL TESTING THE TRACE BIT WILL BE SET ON ALTERNATE LOOPS OF THE PROGRAM. WHEN SET IT CAUSES A TRAP AFTER EACH INSTRUCTION. THE FIRST INSTRUCTION EXECUTED UPON TRAPPING IS AN "RTI" WHICH RETURNS TO THE INTERRUPTED SEQUENCE OF INSTRUCTION. THIS SEQUENCE IS CONTINUED TILL THE END OF THE PROGRAM LOOP IS REACHED.

(5. OPERATING PROCEDURE CONT'D)

5.2.5 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.

THE PRINCIPAL OF THIS ROUTINE IS: THE VECTOR ENTRANCE ADDRESS POINTS TO THE NEXT SEQUENTIAL WORD WHICH CONTAINS A HALT (00000). (THIS LOCATION IS ALSO THE STATUS FOR THAT VECTOR ENTRANCE, BUT THIS HAS NO EFFECT ON IT ALSO BEING THE NEXT INSTRUCTION).

IF A HALT OCCURS IN THE TRAP OR INTERRUPT VECTOR AREA, REGISTER SIX SHOULD BE EXAMINED TO DETERMINE ITS CONTENTS, THEN USE REGISTER SIX CONTENTS AS AN ADDRESS TO DETERMINE THE LOCATION WHERE THE PROGRAM WAS AT, WHEN THE INTERRUPT OR TRAP OCCURRED. (MEMORY AS SPECIFIED BY R6 CONTAINS THE PC OF THE INSTRUCTION FOLLOWING THE INSTRUCTION WHERE THE TRAP OCCURRED).

5.2.6 TTYIN1 (TTY INPUT)

THIS ROUTINE OPERATES IN THE INTERRUPT MODE AND CHECKS FOR A COUNT PATTERN IN THE READER OF THE TTY. THE ROUTINE WILL ACCEPT AN INFINITE NUMBER OF ZERO BYTES (BLANK TAPE), BUT THE FIRST BYTE THAT IS NOT A ZERO MUST BE A ONE AND ALL SEQUENTIAL BYTES MUST BE ONE GREATER. IF THE ROUTINE DETECTS AN ERROR IN THE COUNT PATTERN, IT CHECKS TO SEE IF IT IS A 207 (BELL). IF SO IT IS IGNORED, IF NOT A COMPARSION ERROR IS FLAGED.

5.2.7 TYOUT (TTY OUTPUT)

THIS IS A ROUTINE THAT OUTPUTS A COUNT PATTERN IN THE INTERRUPT MODE TO THE TELEPRINTER. IF A PAPER TAPE IS PUNCHED IT MAY HAVE 207'S (BELLS) IN IT. PUNCHED WHEN THE BELL FOR PASS COMPLETE RINGS.

5.2.8 RFSTART (RF-11 DISK)

THIS ROUTINE PERFORMS A WRITE AND A WRITE CHECK OF THE DISK. THE DATA THAT IS WRITTEN ON THE DISK IS PART OF TEST PROGRAM CODE THAT IS NEVER MODIFIED. THIS SEGMENT OF CORE IS WRITTEN IN CONTIGUOUS BLOCK 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 CORE). THERE IS A LOCATION IN THE PROGRAM THAT IF MODIFIED WILL ALLOW EXERCISING UP TO EIGHT DISKS.

5.2.9 FENDZ (TC11 FORWARD END ZONE)

FENDZ IS THE FIRST ADDRESS IN THE DECTAPE INTERRUPT VECTOR (214). THIS ROUTINE WILL READ, IN REVERSE, BLOCK NUMBERS UNTIL THE REVERSE END ZONE IS FOUND. AT THIS POINT THE INTERRUPT VECTOR AND COMMAND REGISTER ARE MODIFIED TO READ ALL BLOCK NUMBERS IN THE FORWARD DIRECTION. EACH BLOCK NUMBER READ IS COMPARED WITH THE EXPECTED BLOCK NUMBER COUNT AND MISCOMPARISONS REPORTED. WHEN EACH BLOCK IS FOUND (WITH THE EXCEPTION OF BLOCK 0) A BLOCK (400 WORDS) OF TEST DATA IS WRITTEN ONTO TAPE. AFTER ALL BLOCK NUMBERS HAVE BEEN READ THE TAPE IS DRIVEN INTO THE FORWARD END ZONE. HERE THE DIRECTION IS REVERSED AND ALL BLOCK NUMBERS ARE READ IN REVERSE. STARTING WITH BLOCK 1100 THROUGH BLOCK 1 THE DATA IS READ FROM TAPE. THE SAME BUFFER IS USED FOR BOTH READ AND WRITE OPERATIONS. THE DATA IN THE BUFFER IS CHECK-SUMMED DURING THE READ OPERATION. IF THE DATA-BUFFER IS DESTROYED DURING A READ OPERATION IT MAY BE NECESSARY TO RELOAD THE PROGRAM.

5.2.10 LCLK (LINE CLOCK)

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

5.2.11 LP1 (LINE PRINTER)

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

5.2.12 HSRIN1 (PC11 INPUT)

THIS ROUTINE OPERATES IN THE INTERRUPT MODE AND CHECKS FOR A COUNT PATTERN IN THE PC11 READER. THE ROUTINE WILL ACCEPT AN INFINITE NUMBER OF ZERO BYTES (BLANK TAPE). BUT THE FIRST BYTE THAT IS NOT A ZERO MUST BE A ONE AND ALL SEQUENTIAL BYTES MUST BE ONE GREATER. IF THE ROUTINE DETECTS AN ERROR IN THE COUNT PATTERN, A DATA ERROR IS FLAGED.

5.2.13 HPOUT (PC11 OUTPUT)

THIS IS A ROUTINE THAT OUTPUTS A COUNT PATTERN IN THE INTERRUPT MODE TO THE HIGH SPEED PUNCH.

5.2.14 CORE EXPANSION (DET1)

THIS ROUTINE IS CONTROLLED BY SWITCH 9. THE PROCESSOR MAINLINE CODE WILL BE EITHER 4KW OR EXPANDS TO THE MAXIMUM CORE THAT IS AVAILABLE. THE ROUTINE DETERMINES THE MAXIMUM CORE SIZE BY DOING A "DATO" TO A LOCATION IN EACH BANK. IF THE BANK DOES NOT EXIST, A TIME OUT WILL OCCUR. WHEN CORE SIZE IS DETERMINED AN IMAGE OF BANK Ø IS TRANSFERRED TO EACH EXISTING BANK. THEN THE CODE IN EACH BANK IS MODIFIED SO THAT, WHEN THE LAST SUB TEST IN A MEMORY BANK IS EXECUTED THERE IS A JUMP INSERTED TO THE FIRST SUB TEST OF THE NEXT BANK. WHEN IN THE LAST BANK THE MODIFIED INSTRUCTION WILL TRANSFER YOU TO BANK Ø.

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

5.3 PROGRAM AND/OR OPERATOR ACTION

5.3.1 LOADING AND STARTING AT 200 WITH ALL SWITCHES DOWN IS WORSE CASE TESTING. IF AN ERROR IS DETECTED HERE, THERE WILL BE A PRINTOUT. WHEN AN ERROR IS DETECTED AND IT IS NECESSARY TO SCOPE ON IT, PLACE SW15 UP TO HALT ON ERROR, THEN SW14 UP TO LOOP ON ERROR, THEN SW13 UP TO DELETE PRINTOUTS. WHEN TESTING THE HSR OR TTY READER THE TAPE MUST HAVE A COUNT PATTERN AND BE LOCATED ON THE LEADER PORTION WHEN STARTING TEST.

6. ERRORS

6.1 ERROR PRINTOUT

ARE IN A TWO WORD FORMAT, THE 1ST IS PC+2 OF THE DETECED ERROR, THE 2ND. IS THE STATUS REGISTER, REFER TO THE LISTING FOR DETAILED INFORMATION.

6.2 ERROR RECOVERY

FOR TTY READER AND HSR, TAPE MUST BE REPOSITIONED TO LEADER BEFORE RESTARTING TEST.

7. RESTRICTIONS

7.1 STARTING RESTRICTION

IF LINE PRINTER IS USED RESTART ADDRESS MUST BE 400
FOR HSR AND TTY READER, TAPE MUST BE ON LEADER.

7.2 OPERATIONAL RESTRICTION

NONE

8. MISCELLANEOUS

TRACKING DOWN UNUSUAL FAILURES

FAILURES THAT MAY OCCUR BECAUSE OF A FALSE ENTRY INTO A SUBTEST, OR A FAILURE IN A CONTROL ROUTINE RATHER THAN A SUBTEST. DETECTION OF THESE MAY BE ACCOMPLISHED BY SEVERAL PROCEDURES. THERE IS A LOCATION CALLED "RETURN" THAT RECORDS THE LAST SUCCESSFUL SUBTEST COMPLETED. THERE IS ANOTHER LOCATION CALLED "SCOPEF" THAT SHOWS HOW MANY TIMES THE SUBTEST HAS BEEN EXECUTED. THERE IS ANOTHER LOCATION CALLED "ICOUNT" THAT CONTAINS THE ITERATION COMPARISON VALUE. THE STACK "R6" SHOULD BE EQUAL TO "BUFF" WHEN THE FIRST INSTRUCTION OF THE SUBTEST IS ENTERED. TO REDUCE INSTRUCTION EXECUTION IN CONFUSING SITUATION, THE "SCOPE" LOCATION FOLLOWING THE SUBTEST SHOULD BE CHANGED TO A BRANCH TO THE FIRST INSTRUCTION OF THE SUBTEST (THE FIRST LOCATION FOLLOWING THE PREVIOUS SCOPE LOCATION) AND THE "HLT" LOCATION MAY BE REPLACED WITH A "NOP".

A USER MAY ADD A UNIQUE ROUTINE TO THIS TEST TO EXERCISE A NON DEC OPTION, FOR CHECKING BUS INTERACTION WITH HIS EXISTING DEC OPTIONS.

FOR TROUBLE FREE INTERACTION THERE ARE A FEW GROUND RULES THAT SHOULD BE FOLLOWED.

1. USE NO REGISTERS.

2. THE ROUTINE SHOULD BE STAND ALONE.

3. THE EXISTING "HLT" SHOULD BE USED FOR ERROR DETECTION.

4. CODE IN THE PRIMING AREA SHOLD SET INTERRUPT ENABLE, INITIALIZE DATA AND RAISE A FLAG IF NECESSARY.

5. THE INTERRUPT VECTOR STATUS WORD SHOULD CONTAIN THE PRIORITY LEVEL OF THE DEVICE.

6. THE INTERRUPT VECTOR SHOULD POINT TO YOUR STAND ALONE ROUTINE.

7. THE STAND ALONE ROUTINE WHEN COMPLETING ALL HOUSE KEEPING OPERATION AND DATA COMPARISONS SHOULD THEN EXECUTE A "RTI" TO RETURN TO MAINLINE CODE.

INSERTION OF USER I/O ROUTINES

1. MAY BE INSERTED IN BANK ZERO WHERE I/O ROUTINES EXIST. FOR DEVICES THAT THE USER DOES NOT HAVE, IF CORE EXPANSION IS TO BE INHIBITED, THE USER MAY OVERLAY THE EXPANSION CODE.

2. IF THE USER HAS MORE THAN 4KW OF CORE, THE ROUTINE MAY BE PLACED IN ANY OF THE EXTRA BANKS AND CORE EXPANSION BE INHIBITED.

3. IN THE PRIMING CODE SEVERAL INSTRUCTIONS BEFORE THE TAG "MAINLINE" THERE IS AN INSTRUCTION JSR %7,@#USER. THE SECOND WORD OF THAT INSTRUCTION IS AN ABSOLUTE ADDRESS THAT THE USER MAY CHANGE TO POINT TO HIS ROUTINE. THE USER SHOULD EXIT HIS PRIMING ROUTINE WITH A RTS %7 INSTRUCTION.

8.1 EXECUTION TIME

EXECUTION VARIES WITH NUMBER OF DEVICES, FOR 4KW SYSTEMS WITH TTY AND HSR ONLY, ABOUT 1 MINUTE WITH THE TRACE BIT CLEARED ABOUT 1.5 MINUTES WITH THE TRACE BIT SET.

WITH 28KW SYSTEMS USING TTY AND HSR WITH TRACE BIT CLEARED AND WITH TRACE BIT SET.

9. PROGRAM DESCRIPTION

THE DESIGN OF THIS SYSTEM EXERCISER IS PREDICATED UPON IT BEING PRIMARILY INTENDED FOR A PAPER TAPE SYSTEM WITH FOUR KW OF CORE, AND THAT IT BE EASY TO RUN AND UNDERSTAND. ALSO, THAT IT MAY BE MODIFIED EASILY TO EXERCISE A WIDE MULTITUDE OF PERIPHERALS, INCLUDING THOSE OF THE CUSTOMER'S OWN DESIGN. THE CONCEPT IS TO HAVE ALL DESIRED I/O RUNNING CONCURRENTLY WITH THE PROCESSOR TEST FOR BACKGROUND. THE DECISION WHICH I/O DEVICES TO BE USED IS MADE AT START UP TIME. THE DATA PATTERNS USED IN THE EXERCISER ARE FIXED. FOR MECHANICAL DEVICES, SUCH AS THE TTY READER, THERE IS NO AUTOMATIC RE-SYNCHRONIZATION IF IT'S TAPE BECOMES OUT OF PHASE WITH THE DATA. IT WILL BECOME NECESSARY TO STOP THE EXERCISER AND MANUALLY RESYNCHRONIZE THE TAPE AND RESTART THE EXERCISER.

THERE IS NO MONITOR IN THE CONVENTIONAL SENSE. EACH DEVICE THAT IS TO BE EXERCISED HAS IT'S 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. THE PRIMER AREA 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. THEN, THE PRIMER JUMPS TO THE PROCESSOR TEST WHERE THE INDIVIDUAL DEVICES ARE SERVICED AT THE INTERRUPT RATE.

9. PROGRAM DESCRIPTION

THE INSTRUCTION EXERCISER IS A STRAIGHT LINE TEST OF INSTRUCTIONS. THE SEQUENCE IN WHICH THEY ARE EXECUTED IS THE SAME SEQUENCE IN WHICH THEY ARE SHOWN IN THE LISTING. EACH AREA OF CODE FROM "SCOPE TO SCOPE" IS AN INDIVIDUAL SUB-TEST. WITH SWITCH 11 UP THE SUB-TEST IS EXECUTED ONE TIME AND THEN THE NEXT SUB-TEST IS EXECUTED, AND SO ON TILL ALL SUB-TESTS ARE EXECUTED. HOWEVER IF SWITCH 11 IS DOWN THE SUB-TEST WILL BE EXECUTED SOME "N" NUMBER OF TIMES BEFORE ENTERING THE NEXT SUB-TEST. IF SWITCH 14 IS UP YOU WILL NEVER LEAVE THE CURRENT SUB-TEST YOU ARE IN. THIS USE IS INTENDED FOR TROUBLE SHOOTING A MALFUNCTION IN A SUB-TEST. THE FIRST GROUP OF SUB-TESTS ARE THE BINARYS AND UNARYS. THOSE INSTRUCTIONS ARE TESTED IN THE INDEX MODE: SOURCE ONLY, DESTINATION ONLY, THEN BOTH SOURCE AND DESTINATION. THE SAME INSTRUCTIONS ARE THEN TESTED USING THE IMMEDIATE MODE INDIRECT. THESE MODES ARE TESTED AGAINST OTHER MODES; WHICH MAY USE A REGISTER OR MEMORY LOCATION. THESE WILL BE SWAPPED BETWEEN SOURCE AND DESTINATION.

AFTER THE MODES AND INSTRUCTION HAVE BEEN PROVEN IN THE WORD MODE, THEY ARE THEN TESTED IN THE BYTE MODE. OTHER TESTING IS ALSO DONE WHERE THE "JSR" INSTRUCTION IS TESTED IN NESTED COMBINATIONS. ALL COMBINATIONS OF NUMBERS ARE TESTED USING THE COMPARE, ROTATE, ADD AND COMPLIMENT INSTRUCTIONS. THERE IS ALSO A MINIMUM TEST OF POWER FAIL AND AUTO RECOVERY, WHICH IS NOT ENABLED UNTIL AFTER THE FIRST PASS OF THE PROGRAM. THE PROGRAM REQUIRES TWO BELLS ON THE TTY TO MAKE ONE TRUE PASS OF THE PROGRAM. THE FIRST BELL OCCURS AFTER ONE PASS OF THE INSTRUCTION TEST WITH THE TRACE BIT CLEARED. THE SECOND BELL MARKS THE END OF AN INSTRUCTION TEST PASS WITH THE TRACE BIT SET. THE REASON FOR EXECUTING ALL INSTRUCTIONS WITH THE TRACE BIT SET IS TO TAKE US INTO SERVICE AT THE END OF EACH INSTRUCTION.

THE CORE LAYOUT IS BROKEN INTO FIVE DISTINCT PARTS:

(1) THE TRAP CATCHER,
(2) THE SET UP AND I/O PRIMER AREA AND I/O TEST ROUTINES,
(3) THE PROCESSOR TESTS AND
(4) CONTROL AND UTILITY ROUTINES.
(5) CORE DETECTOR AND EXPANSION ROUTINE.

10. LISTING

11. FLOW CHART(S)

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                        ;TST 17 SYSTST
                        ;COPYRIGHT 1970, DIGITAL EQUIPMENT CORPORATION, MAYNARD MASS. 01754
                        ;PDP11 PRELIMINARY SYSTEM TEST --- TTY-PC11-LINE CLOCK-LP11,RF11,TC11 AND KE11
                        ;TEST SIMULTANEOUS RUNNING OF I/O, WITH PROCESSOR INSTRUCTION TEST AND WITH
                        ;WITH TRACE BIT ENABLED TO BE CONSIDER MAINLINE CODE
  000240                        NOP=240                 ;SYSTEM NULL OPERATION
  104000                        HLT=EMT         ;TRAP USED FOR ERROR PRINTOUT
  104400                        SCOPE=TRAP              ;TRAP USED SCOPE LOOP AND ITERATION OF SUB PROBLEMS
  177776                        CC=177776
  016034                        TDSR=TCSR
  016756                        BUFF=FIN
  177570                        SR=177570
  000000                        .=0
  000040                        .REPT 40
                                .+2                             ;TRAP ENTRANCE
                                HALT                            ;TRAPPED TO PREVIOUS LOCATION
                                .ENDR
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
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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
000126  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000130  000132                  .+2                     ;TRAP ENTRANCE
000132  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000134  000136                  .+2                     ;TRAP ENTRANCE
000136  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000140  000142                  .+2                     ;TRAP ENTRANCE
000142  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000144  000146                  .+2                     ;TRAP ENTRANCE
000146  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000150  000152                  .+2                     ;TRAP ENTRANCE
000152  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000154  000156                  .+2                     ;TRAP ENTRANCE
000156  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000160  000162                  .+2                     ;TRAP ENTRANCE
000162  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000164  000166                  .+2                     ;TRAP ENTRANCE
000166  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000170  000172                  .+2                     ;TRAP ENTRANCE
000172  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
000174  000176                  .+2                     ;TRAP ENTRANCE
000176  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
        000014                  .=14
000014  000016                  .+2
000016  000000                  HALT                    ;FALSE TRACE TRAP
        000030                  .=30
000030  015616                  PRINT                   ;FOR HALT TRAPS
000032  000340                  340                     ;HIGHEST PRIORITY
        000034                  .=34
000034  016350                  SCOPEC                  ;USER TRAP
000036  000000                  0

        000200                  .=200
                        ;(R6) IS THE STACK POINTER
                        ;((R6)) IS THE PC+2 OF LOCATION WHERE THE TRAP ORIGINATED
                        ;FOR NORMAL OPERATION RUN WITH ALL SWITCHES DOWN
                        ;SR 15=1OR UP---HALT ON ERROR
                        ;SR 14=1OR UP---SCOPE LOOP
                        ;SR 13=1OR UP---INHIBIT PRINT OUT
                        ;SR 12=1OR UP---INHIBIT TRACE TRAPPING
                        ;SR 11=1OR UP---INHIBIT SUB-PROBLEM ITERATION
                        ;SR 10=1OR UP---INHIBIT PROCESSOR TEST
                        ;SR 09=1 OR UP INHIBIT VARIABLE CORE EXPANSION
                        ;SPECIAL DELETE SWITCHES-SET RESPECTIVE SWITCH TO A 1 TO INHIBIT INITIATION OF DEVICE

                        ;SW 0=1 INHIBIT TTY OUTPUT
                        ;SW 1=1 INHIBIT TTY INPUT
                        ;SW 2=1 INHIBIT HSP
                        ;SW 3=1 INHIBIT HSR
                        ;SW 4=1 INHIBIT LINE CLOCK
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                        ;SW 5=1 INHIBIT RF1   ISK
                        ;SW 6=1 INHIBIT TC11 DECTAPE
                        ;SW 7=1 INHIBIT LINE PRINTER --- IF LINE PRINTER IS USED, MUST RESTART AT 400
                        ;IF EAE EXIST IT WILL BE AUTOMATICALLY SELECTED.

                        ;PDP11 SIMULTANEOUS I/O
        000060                  .=60
000060  001242                  TTYINR                          ;TTY IN INTERRUPT VECTOR
000062  000200                  0
000064  001340                  TYOUTR                          ;TTY OUT INTERRUPT VECTOR
000066  000000                  0
000070  001404                  HSRINR                          ;HSR INTERRUPT VECTOR
000072  000200                  200
000074  001472                  HPOUTR                          ;HSP INTERRUPT VECTOR
000076  000000                  0
        000100                  .=100
000100  001604                  LK3                             ;INTERRUPT VECTOR LINE CLOCK
000102  000300                  300                             ;LEVEL SIX PRIORITY

        000200                  .=200
000200  000137  000400          JMP     @#START
        000204                  .=204
000204  002104                  IRF                             ;RF11 DISK
000206  000240                  240                             ;LEVEL 5

        000214                  .=214
000214  002206                  FENDZ                           ;DEC TAPE
000216  000300                  300                             ;LEVEL 6

        177776          STATUS=177776
000220  177560          TRCSR:  177560
000222  177562          TRDR:   177562
000224  177564          TTCSR:  177564
000226  177566          TTDBR:  177566
000230  177550          HRCSR:  177550
000232  177552          HRDBR:  177552
000234  177554          HPCSR:  177554
000236  177556          HPDBR:  177556
000240  177546          LKCSR:  177546
000242  177514          LPCSR:  177514
000244  177516          LPDBR:  177516
000246  177470          RFDAE:  177470          ;DISK ADDRESS AND ERROR
000250  177472          RFDBR:  177472          ;DATA BUFFER REGISTER
000252  177466          RFDAR:  177466          ;DISK ADDRESS REGISTER
000254  177462          RFWC:   177462          ;WORD COUNT REGISTER
000256  177464          RFCAR:  177464          ;CURRENT ADDRESS REGISTER
000260  177460          RFCSR:  177460          ;STATUS REGISTER
000262  177461          RFCSRH: 177461          ;HIGH BYTE ADDRESS OR CSR
000264  177304          MQ:     177304          ;EAE LOCATIONS
000266  177302          AC:     177302
000270  177310          SC:     177310
000272  177311          SRE:    177311
000274  177306          MUL:    177306
000276  177300          DIV:    177300
000300  177312          NOR:    177312
```

```
000302  177314                  LSH:    177314
000304  177316                  ASH:    177316

                                ;DECTAPE ADDRESSES
        177340                  TC=177340
000306  177342                  TCCM:   TC+2                    ;CONTROL AND FUNCTION
000310  177340                  TCST:   TC                      ;GENERAL STATUS
000312  177350                  TCDT:   TC+10                   ;DATA
000314  177344                  TCWC:   TC+4                    ;WORD COUNT
000316  177346                  TCBA:   TC+6                    ;BUS ADDRESS
000320  000214                  TCIV:   214                     ;DECTAPE INTERRUPT VECTOR
                                ;THIS ROUTINE CHECKS THE READ DATA BUFFER TC11
                                ;BY DOING A CHECK SUM ON THE DATA
000322  010146                  TC1:    MOV     %1,-(6)         ;SAVE THESE ON THE STACK
000324  010246                          MOV     %2,-(6)
000326  010346                          MOV     %3,-(6)
000330  005003                          CLR     %3              ;SUM OF DATA
000332  012701  002750                  MOV     #TCRBUF,%1      ;ADDRESS OF READ BUFFER
000336  012702  003750                  MOV     #TCRBUF+1000,%2 ;END OF READ BUFFER
000342  062103                  TC2:    ADD     (1)+,%3         ;EVEN ADD
000344  062103                          ADD     (1)+,%3         ;ODD ADD -2'S COMPLIMENT
000346  001401                          BEQ     .+4
000350  104000                          HLT                     ;DATA ERROR TC-11
000352  020102                          CMP     %1,%2           ;AT END OF BUFFER?
000354  001372                          BNE     TC2             ;NO - SUM THE REST
000356  012603                          MOV     (6)+,%3         ;RESTORE THE REGISTERS

000360  012602                          MOV     (6)+,%2
000362  012601                          MOV     (6)+,%1
000364  000207                          RTS     %7              ;EXIT
000366  012767  000240  014462  NOEAE:  MOV     #240,EAESRT     ;BRANCH AROUND EAE ROUTINE
000374  000002                          RTI                     ;JUMP OVER EAE SECTION


        000400                          .=400
                                ;START UP FOR MINI MONITOR

000400  012767  000001  016012  START:  MOV     #1,ICOUNT
000406  012706  016756                  MOV     #BUFF,%6        ;SET UP STACK
000412  012767  000440  016004          MOV     #START2,RETURN
000420  005067  015776                  CLR     SCOPEF
000424  012767  000340  177344          MOV     #340,STATUS             ;LOCK OUT INTERRUPTS
000432  005067  015156                  CLR     PRFLAG                  ;PRINT ROUTINE BUSY
000436  104400                          SCOPE
000440  052777  000100  177556  START2: BIS     #100,@TTCSR
000446  000005                          RESET
000450  032777  000100  177546          BIT     #100,@TTCSR             ;INTERRUPT ENABLE
000456  001401                          BEQ     .+4
000460  104000                          HLT                             ;RESET DID NOT CLEAR INTERRUPT ENABLE
000462  104400                          SCOPE
                                ;DOES "RESET" ON THE BUS LAST TOO LONG
000464  012706  016756                  MOV     #BUFF,%6                ;SET UP STACK
000470  000005                          RESET
000472  052777  000100  177524          BIS     #100,@TTCSR             ;SET A BIT
000500  032777  000100  177516          BIT     #100,@TTCSR             ;IS IT SET
```

```
000506  001001                          BNE     .+4
000510  104000                          HLT                             ;RESET IS ON BUS TOO LONG
000512  104400                          SCOPE
000514  000005                          RESET
000516  012767  003750  015700          MOV     #BEGIN,RETURN
000524  012767  000366  000004          MOV     #NOEAE,@#4              ;TEST FOR EAE
000532  005777  177526                  TST     @MQ                     ;TRAP IF NONEXISTANT
000536  012767  000006  177240          MOV     #6,4                    ;.+2=HALT
000544  012767  000002  177234          MOV     #2,6                            ;AN RTI FOR NON EXISTENT I/O
000552  012767  000001  000540          MOV     #1,DATA1                        ;BASE DATA FOR TTY READER OR KEYBOARD
000560  012767  000000  000600          MOV     #0,DATA2                        ;BASE DATA FOR TTY PUNCH OR TELEPRINTER
000566  012767  000001  000656          MOV     #1,DATA3                        ;BASE DATA FOR HSR
000574  012767  000000  000752          MOV     #0,DATA4                        ;BASE DATA FOR HSP
000602  012706  016756                  MOV     #BUFF,%6
000606  005067  000746                  CLR     DELAY                           ;FOR READER STALL - HSR -
000612  012767  000340  177156          MOV     #340,STATUS                     ;LOCK OUT INTERRUPTS
000620  036727  176744  000001          BIT     SR,#1
000626  001003                          BNE     ST1
000630  052777  000100  177366          BIS     #100,@TTCSR                     ;TTY OUT
000636  036727  176726  000002  ST1:    BIT     SR,#2
000644  001003                          BNE     ST2
000646  052777  000101  177344          BIS     #101,@TRCSR                     ;TTY IN
000654  005777  177354          ST2:    TST     @HPCSR                          ;TEST FOR OUT OF TAPE
000660  100407                          BMI     ST3
000662  036727  176702  000004          BIT     SR,#4
000670  001003                          BNE     ST3
000672  052777  000100  177334          BIS     #100,@HPCSR                     ;HSP
000700  005777  177324          ST3:    TST     @HRCSR                          ;TEST FOR OUT OF TAPE
000704  100412                          BMI     ST4
000706  036727  176656  000010          BIT     SR,#10
000714  001006                          BNE     ST4
000716  012767  000100  000634          MOV     #100,DELAY                      ;FOR STALL HSR
000724  052777  000101  177276          BIS     #101,@HRCSR                     ;HSR

000732  036727  176632  000020  ST4:    BIT     SR,#20
000740  001005                          BNE     ST5
000742  005067  000732                  CLR     TIME
000746  052777  000100  177264          BIS     #100,@LKCSR                     ;LINE CLOCK 50 OR 60 CYCLES
000754  036727  176610  000040  ST5:    BIT     SR,#40
000762  001016                          BNE     ST6
000764  012767  043503  001176          MOV     #43503,FUNCTION                 ;WRITE CHECK/WRITE
000772  105277  177264                  INCB    @RFCSRH                 ,INITIALIZE DISK-DAR,DAE
000776  016777  001172  177250          MOV     WORDCT,@RFWC                    ;LENGTH OF TRANSFER
001004  016777  001162  177244          MOV     LLIMIT,@RFCAR                   ;CORE ADDRESS OF START OF TRANSFER
001012  116777  001152  177240          MOVB    FUNCTION,@RFCSR                 ;TELL DISK TO READ OR WRITE
001020  036727  176544  000100  ST6:    BIT     SR,#100                         ;2ND NPR TEST OR
001026  001011                          BNE     ST7
001030  012767  002176  001146          MOV     #TCFIRST,TCEXPE                 ;FIRST BLOCK SHOULD BE ZERO
001036  012777  002206  177254          MOV     #FENDZ,@TCIV                    ;GO TO END ZONE ON INTERRUP
001044  012777  004103  177234          MOV     #R+IE+RB+DO,@TCCM               ;MOVE REVERSE
001052  036727  176512  000200  ST7:    BIT     SR,#200                         ;LINE PRINTER
001060  001030                          BNE     ST8
001062  012767  001142  176714          MOV     #ST8,4                          ;DON'T CHANGE 200
001070  012767  000137  000752          MOV     #137,SOLPAT                     ;RESET FOR START OF LINE PATTERN
001076  012767  000117  000746          MOV     #79.,CLINCT                      LINE COUN
```

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001104  012767  000137  000734          MOV     #137,CURPAT
001112  012737  001726  000200          MOV     #LPINTR,@#200           ;INTERRUPT VECTOR
001120  012777  000014  177116          MOV     #14,@LPDBR              ;LINE FEED TO POSITION BUFFER
001126  012737  000200  000202          MOV     #200,@#202              ;PROCESSOR LEVEL 4
001134  012777  000100  177100          MOV     #100,@LPCSR             ;INTERRUPT ENABLE
001142  005067  176640          ST8:    CLR     6                       ;HALT FOR BUS ERROR
001146  012767  000006  176630          MOV     #6,4                    ;SET UP TIME OUT
001154  005037  015542                  CLR     @#TRPB                  ;NO "T" BIT FIRST PASS
001160  004737  016760                  JSR     %7,@#USER               ;FOR USER I/O PROGRAM
001164  004767  015572                  JSR     %7,DET1                 ;CHECK FOR CORE EXPANSION
001170  042767  000340  176600          BIC     #340,STATUS             ;ALLOW INTERRUPTS
001176  016767  176366  000020          MOV     SR,REG1                 ;SAVE SWITCH
001204  000401                  BEGIN:  BR      .+4
001206  000001          MAINLINE:       WAIT                            ;WAIT HERE FOR INTERRUPTS
001210  036727  176354  002000          BIT     SR,#2000                ;INHIBIT PROCESSOR TEST
001216  001373                  BNE     MAINLINE
001220  000167  002524                  JMP     BEGIN
001224  000000          REG1:   0                                       ;STATUS OF SELECTED DEVICES

                                ;TTY RECEIVER VALUES 0 TO 377

001226  012767  000001  000064  TTYIN1: MOV     #1,DATA1                ;BASE DATA
001234  005277  176760          TTYIN2: INC     @TRCSR                  ;START READER
001240  000002                  RTI                                     ;RETURN TO MAINLINE
001242  105777  176752          TTYINR: TSTB    @TRCSR                  ;IS DONE SET
001246  100401                  BMI     .+4
001250  104000                  HLT                                     ;FALSE RETURN FROM MAINLINE
001252  105777  176744                  TSTB    @TRDR                   ;TEST DATA FOR LEADER
001256  001766                  BEQ     TTYIN2                  ;IF LEADER GO BACK
001260  127767  176736  000032          CMPB    @TRDR,DATA1             ;NOT LEADER TEST FOR DATA
001266  001405                  BEQ     TTYIN3
001270  022777  000207  176724          CMP     #207,@TRDR              ;BELL?
001276  001403                  BEQ     TTYIN4
001300  104000                  HLT                                     ;DATA COMPARISON ERROR
001302  005267  000012          TTYIN3: INC     DATA1                   ;INCREMENT DATA
001306  022767  000400  000004  TTYIN4: CMP     #400,DATA1              ;TEST FOR UPPER LIMIT
001314  001347                  BNE     TTYIN2
001316  000743                  BR      TTYIN1

001320  000240          DATA1:  240

                                ;TTY TRANSMITTER PRINT VALUES 0 TO 377

001322  012767  000000  000036  TYOUT:  MOV     #0,DATA2                ;INITAL DATA
001330  016777  000032  176670  TYOUT1: MOV     DATA2,@TTDBR            ;OUTPUT TO DEVICE
001336  000002                  RTI                                     ;RETURN TO MAINLINE
001340  105777  176660          TYOUTR: TSTB    @TTCSR                  ;TEST FOR DONE
001344  100401                  BMI     .+4                     ;BRANCH IF FLAG FOUND
001346  104000                  HLT                                     ;FALSE INTERRUPT RETURN
001350  005267  000012                  INC     DATA2                   ;INCREMENT DATA
001354  022767  000400  000024          CMP     #400,DATA2              ;TEST DATA FOR UPPER LIMIT
001362  001757                  BEQ     TYOUT                   ;AT UPPER LIMIT START OVER
001364  000761                  BR      TYOUT1                  ;FINISH REST OF DATA

001366  000240          DATA2:  240
```

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                                ;HSR SECTION VALUES 0 TO 377

001370  012767  000001  000054  HSRIN1: MOV     #1,DATA3                ;BASE DATA
001376  005277  176626          HSRIN2: INC     @HRCSR                  ;START READER
001402  000002                          RTI                             ;RETURN TO MAINLINE
001404  105777  176620          HSRINR: TSTB    @HRCSR                  ;IS DONE SET
001410  100401                          BMI     .+4
001412  104000                          HLT                             ;FALSE RETURN FROM MAINLINE
001414  105777  176612                  TSTB    @HRDBR                  ;TEST DATA FOR LEADER
001420  001766                          BEQ     HSRIN2                  ;IF LEADER GO BACK
001422  127767  176604  000022          CMPB    @HRDBR,DATA3            ;NOT LEADER TEST FOR DATA
001430  001401                          BEQ     .+4
001432  104000                          HLT                             ;DATA COMPARISON ERROR
001434  005267  000012                  INC     DATA3                   ;INCREMENT DATA
001440  022767  000400  000004          CMP     #400,DATA3              ;TEST FOR UPPER LIMIT
001446  001353                          BNE     HSRIN2
001450  000747                          BR      HSRIN1

001452  000240                  DATA3:  240

                                ;HS PUNCH SECTION, VALUES 0 TO 377
                                ;ENABLE READER ON FIX COUNT OF PUNCH ONLY (14 TIMES)
001454  012767  000000  000072  HPOUT:  MOV     #0,DATA4                ;INITAL DATA
001462  016777  000066  176546  HPOUT1: MOV     DATA4,@HPDBR            ;OUTPUT TO DEVICE
001470  000002                          RTI                             ;RETURN TO MAINLINE
001472  105777  176536          HPOUTR: TSTB    @HPCSR                  ;TEST FOR DONE
001476  100401                          BMI     .+4                     ;BRANCH IF FLAG FOUND
001500  104000                          HLT                             ;FALSE INTERRUPT RETURN
001502  046777  000052  176520          BIC     DELAY,@HRCSR            ;CLEAR HSR INTERRUPT ENABLE
001510  005267  000042                  INC     INTCNT                  ;COUNT INTERRUPTS
001514  026727  000036  000014          CMP     INTCNT,#14              ;SAVE TO TURN READER ON?
001522  001005                          BNE     HPOUT2                  ;NO-NEED MORE TIME
001524  005067  000026                  CLR     INTCNT                  ;YES RESET COUNTER
001530  056777  000024  176472          BIS     DELAY,@HRCSR            ;SET READER INT ENABLE
001536  005267  000012          HPOUT2: INC     DATA4                   ;INCREMENT DATA
001542  022767  000400  000004          CMP     #400,DATA4              ;TEST DATA FOR UPPER LIMIT
001550  001741                          BEQ     HPOUT                   ;AT UPPER LIMIT START OVER
001552  000743                          BR      HPOUT1                  ;FINISH REST OF DATA

001554  000240                  DATA4:  240
001556  000000                  INTCNT: 0
001560  000000                  DELAY:  0                               ;EQUAL 100 IF HSR RUNNING

                                ;TEST OF LINE CLOCK, INTERRUPT FOR 55 SECONDS THEN STALL FOR 5 SECONDS.
001562  005067  000112          LK1:    CLR     TIME                    ;CLEAR LINE CLOCK TIMES
001566  052777  000100  176444          BIS     #100,@LKCSR
001574  052767  000100  176174          BIS     #100,STATUS
001602  000002                  LK2:    RTI                             ;RETURN TO MAINLINE
001604  105777  176430          LK3:    TSTB    @LKCSR                  ;TEST FOR DONE
001610  100401                          BMI     .+4
001612  104000                          HLT                             ;FALSE INTERRUPT
001614  042777  000200  176416          BIC     #200,@LKCSR
001622  005267  000052          LK4:    INC     TIME                    ;ON INTERUPTS ENTER HERE
001626  022767  006344  000044          CMP     #3300.,TIME             ;A LAPS OF 55 SECONDS
```

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001634  103362                          BHIS    LK2                     ;BRANCH IF TIME LESS THAN 55 SECONDS
001636  042777  000100  176374          BIC     #100,@LKCSR
001644  042767  000100  176124          BIC     #100,STATUS             ;LOWER PRIORITY
001652  022767  007020  000020          CMP     #3600.,TIME             ;ONE MINUTE UP
001660  001740                          BEQ     LK1                     ;YES-RESET TIMER
001662  105777  176352                  TSTB    @LKCSR                  ;NO-SKIP ON FLAG TILL IT IS.
001666  100375                          BPL     .-4
001670  042777  000200  176342          BIC     #200,@LKCSR             ;CLEARS THE FLAG
001676  000751                          BR      LK4                     ;FOUND FLAG GO INCREMENT COUNTER
001700  000000                  TIME:   0

                                ;LINE PRINTER SHOULD RAISE PROCESSOR PRIORITY TO LEVEL OF LINE PRINTER
                                ;INTERRUPT VECTOR IS 200

001702  016767  000142  000136  LP1:    MOV     SOLPAT,CURPAT           ;START OF LINE TO CURRENT
001710  016777  000132  176326  LP2:    MOV     CURPAT,@LPDBR           ;CURRENT PATTERN TO LINE PRINTER
001716  105777  176320                  TSTB    @LPCSR
001722  100405                          BMI     LP6
001724  000002                          RTI                             ;RETURN TO MAIN LINE
001726  105777  176310          LPINTR: TSTB    @LPCSR                  ;TEST FOR FLAG
001732  100401                          BMI     .+4
001734  104000                          HLT                             ;FALSE RETURN FROM MAIN LINE
001736  026727  000110  000117  LP6:    CMP     CLINCT,#79.             ;TEST FOR END OF LINE
001744  001415                          BEQ     LP4                     ;GO GENERATE CR/LF
001746  005267  000100                  INC     CLINCT                  ;INCREMENT LINE POSITION COUNT
001752  026727  000070  000137          CMP     CURPAT,#137             ;TEST FOR MAXIMUM PATTERN
001760  001403                          BEQ     LP3                     ;YES - GO TO LP3 AND RESET
001762  005267  000060                  INC     CURPAT                  ;NO - INCREMENT TO NEXT PATTERN
001766  000750                          BR      LP2                     ;GO SEND IT TO LINE PRINTER
001770  012767  000040  000050  LP3:    MOV     #40,CURPAT              ;RESET PATTERN AND SEND TO PRINTER
001776  000744                          BR      LP2                     ;SENT TO LINE PRINTER
002000  005067  000046          LP4:    CLR     CLINCT                  ;RESET LINE COUNT
002004  012777  000012  176232          MOV     #12,@LPDBR              ;LINE FEED
002012  105777  176224                  TSTB    @LPCSR
002016  100375                          BPL     .-4
002020  026727  000024  000137          CMP     SOLPAT,#137             ;START OF LINE PATTERN
002026  001403                          BEQ     LP5
002030  005267  000014                  INC     SOLPAT                  ;INCREMENT START OF LINE
002034  000722                          BR      LP1
002036  012767  000040  000004  LP5:    MOV     #40,SOLPAT              ;RESET START OF LINE
002044  000716                          BR      LP1                     ;PRINT
002046  000000                  CURPAT: 0                               ;CURRENT CHARACTER BEING PRINTED
002050  000000                  SOLPAT: 0                               ;START OF LINE CHARACTER
002052  000000                  CLINCT: 0                               ;POSITION OF LINE

                                ;RF11 DISK
002054  105277  176202          RFSTART:        INCB    @RFCSRH         ;INITIALIZE DISK - DAR-DAE
002060  016777  000106  176170  RF1:    MOV     LLIMIT,@RFCAR           ;CORE BASE
002066  016777  000102  176160          MOV     WORDCT,@RFWC            ;LENGTH OF TRANSFER
002074  116777  000070  176156          MOVB    FUNCTION,@RFCSR         ;WRITE OR WRITE CHECK TO DISK
002102  000002                          RTI                             ;RETURN TO MAINLINE CODE
002104  105777  176150          IRF:    TSTB    @RFCSR                  ;INTERRUPT VECTOR POINTS HERE
002110  100402                          BMI     .+6
002112  104000                          HLT                             ;RF11 READY NOT UP
```

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 002114  000757                          BR      RFST
 002116  005777  176136                  TST     @RFCSR
 002122  100002                          BPL     .+6
 002124  104000                          HLT                             ;RF-11 ERROR FLAG UP
 002126  000752                          BR      RFSTART
 002130  005777  176120                  TST     @RFWC
 002134  100002                          BPL     .+6
 002136  104000                          HLT                             ;RF-11 WORD COUNT NOT ZERO
 002140  000745                          BR      RFSTART
 002142  122777  000003  176076          CMPB    #3,@RFDAE               ;DISK AT UPPER LIMIT? 7=2, 17=4, 37=8
 002150  001343                          BNE     RF1                     ;NO
 002152  027727  176074  174000          CMP     @RFDAR,#174000          ;AS FAR ON DISK AS WE CAN GO
 002160  101737                          BLOS    RF1                     ;NO
 002162  000367  000002                  SWAB    FUNCTION                ;CHANGE COMMAND
 002166  000732                          BR      RFSTART                 ;RESTART NEW TRANSFER OF DISK
 002170  000000          FUNCTION:       0                               ;DISK COMMAND
 002172  003750          LLIMIT: BEGIN                                   ;FIRST CORE ADDRESS OF TRANSFER
 002174  176000          WORDCT: -2000                                   ;LENGTH OF TRANSFER
                         ;DT11 DEC TAPE
         000004          RD=4                            ;READ DATA
         000014          WD=14                           ;WRITE DATA
         000002          RB=2
         000002          BR=2                            ;READ BLOCK
         000000          F=0                             ;FORWARD
         000100          IE=100                          ;INTERRUPT ENABLE
         000001          DO=1                            ;DO - THE FUNCTION
         004000          R=4000                          ;REVERSE

 002176  000000          TCFIRST:        0               ;FIRST BLOCK TO BE SEARCHED FOR
 002200  001101          TCLAST: 577.                    ;LAST BLOCK TO BE SEARCHED FOR
 002202  000000          TCBLK:  0                       ;CURRENT BLOCK FOUND
 002204  000000          TCEXPE: 0                       ;THE BLOCK THAT IS EXPECTED

                         ;GO TO FORWARD END ZONE
 002206  012777  002206  176104  FENDZ:  MOV     #FENDZ,@TCIV    ;END ZONE VECTOR SETUP
 002214  005777  176070          TST     @TCST           ;TEST FOR END ZONE
 002220  100403                  BMI     FEND1           ;AT END ZONE?
 002222  105277  176060          INCB    @TCCM           ;SET DO - NO DELAY
 002226  000002                  RTI                     ;NO - WAIT SOME MORE
 002230  012777  002260  176062  FEND1:  MOV     #TCF1,@TCIV     ;YES - NEW VECTOR
 002236  042777  104000  176042          BIC     #104000,@TCCM   ;SEARCH BLOCK FOWARD
 002244  016767  177726  177732          MOV     TCFIRST,TCEXPE  ;COUNT WHEN THIS BLOCK IS FOUND
 002252  105277  176030          TCF1A:  INCB    @TCCM           ;SET DO
 002256  000002                  RTI                     ;RETURN ON NEXT BLOCK
 002260  032777  100200  176020  TCF1:   BIT     #100200,@TCCM   ;ANY ERROR ON READ?
 002266  100001                  BPL     .+4
 002270  104000                  HLT                     ;TC ERROR SET - FORWARD READ BLOCK
 002272  001001                  BNE     .+4             ;DONE FLAG UP?
 002274  104000                  HLT                     ;FALSE INTERRUPT
 002276  027767  176210  177700          CMP     @TCDT,TCEXPE    ;IS THIS OUR BLOCK FOR SYNC
 002304  002762                  BLT     TCF1A           ;NO-READ SOME MORE BLOCKS
 002306  001401                  BEQ     TCF2            ;YES
 002310  104000                  HLT                     ;WE PASSED THE BLOCK

 002312  012777  002326  176000  TCF2:   MOV     #TCF3,@TCIV     ;VECTOR FOR SEQUENTIAL READS
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002320  105277  175762          INCB    @TCCM           ;SET DO
002324  000002                  RTI                     ;RETURN AND TEST SEQENTIAL BLOCKS

                        ;FIND SEQUENTIAL BLOCK AT FOWARD DIRECTION
002326  032777  100200  175752  TCF3:   BIT     #100200,@TCCM   ;TEST ERROR AND READY
002334  100001                  BPL     .+4
002336  104000                  HLT                     ;FOWARD READ ERROR TC-11
002340  001001                  BNE     .+4
002342  104000                  HLT                     ;FALSE INTERRUPT ON TC-11
002344  027767  175742  177626          CMP     @TCDT,TCLAST    ;HAVE WE TESTED ALL BLOCKS
002352  001414                  BEQ     REND2           ;YES DRIVE UNIT IN END ZONE TO START OVER
002354  005267  177624          INC     TCEXPE          ;NO-INCREMENT EXPECTED COUNT
002360  027767  175726  177616          CMP     @TCDT,TCEXPE    ;IS CURRENT BLOCK CORRECT
002366  001401                  BEQ     .+4
002370  104000                  HLT                     ;FAILED IN FOWARD READ TO FIND NEXT BLOCK
002372  000427                  BR      TCWBK           ;THIS ROUTINE WRITES A BLOCK
002374  105277  175706  TCF4:   INCB    @TCCM           ;SET DO
002400  000002                  RTI
002402  000701          XFEND2: BR      FEND2           ;INDIRECT LINK

                        ;MOVE TAPE TO REVERSE END ZONE
002404  012777  002424  175706  REND2:  MOV     #REND2,@TCIV    ;END ZONE VECTOR SETUP
002412  016767  177562  177564          MOV     TCLAST,TCEXPE   ;SET UP FOR REVERSE SEARCH
002420  005777  175664          TST     @TCST           ;IN END ZONE
002424  100403                  BMI     REND1           ;YES - START TO TURN UNIT AROUND
002426  105277  175654          INCB    @TCCM           ;SET DO
002432  000002                  RTI                     ;NO - WAIT TILL WE ARE
002434  012777  004103  175644  REND1:  MOV     #R+IE+RB+DO,@TCCM ;FUNCTION = READ BLOCK, REVERSE AND GO
002442  012777  002532  175650          MOV     #TCR1,@TCIV     ;SET UP NEW INTERRUPT VECTOR
002450  000002                  RTI
                        ;WRITE FORWARD ALL BLOCKS EXCEPT 0

002452  012777  002504  175640  TCWBK:  MOV     #TCWB1,@TCIV    ;INTERRUPT VECTOR FOR WRITE
002460  012777  177400  175626          MOV     #-400,@TCWC     ;ONE BLOCK
002466  012777  002750  175622          MOV     #TCWBUF,@TCBA   ;THE WRITE BUFFER ADDRESS
002474  112777  000115  175604          MOVB    #IE+WD+DO,@TCCM ;WRITE THE BLOCK
002502  000002                  RTI                     ;RETURN WHEN BLOCK IS WRITTEN
002504  005777  175576  TCWB1:  TST     @TCCM           ;ANY ERRORS
002510  100001                  BPL     .+4
002512  104000                  HLT
002514  012777  002326  175576          MOV     #TCF3,@TCIV     ;SEARCH BLOCK VECTOR
002522  112777  000102  175556          MOVB    #IE+RB,@TCCM    ;READ BLOCK
002530  000721                  BR      TCF4            ;FIND THE NEXT BLOCK

002532  032777  100200  175546  TCR1:   BIT     #100200,@TCCM   ;TEST FOR ERROR AND READY
002540  100001                  BPL     .+4
002542  104000                  HLT                     ;DECTAPE ERROR ON READ BLOCK REVERSE
002544  001001                  BNE     .+4
002546  104000                  HLT                     ;FALSE INTERRUPT FROM DECTAPE
002550  027767  175536  177426          CMP     @TCDT,TCEXPE    ;IS IT OUR FIRST BLOCK
002556  001406                  BEQ     TCR2            ;YES - GO TEST THE REST
002560  002002                  BGE     TCR1A           ;NO - HAVE WE PASSED THE BLOCK
002562  104000                  HLT                     ;WE PASS OUR BLOCK
002564  000727                  BR      REND2           ;GO TO END ZONE AND TRY AGAIN
002566  105277  175514  TCR1A:  INCB    @TCCM           ;SET DO
```

```
002572  000002                          RTI                     ;WE FOUND OUR FIRST BLOCK
002574  012777  002610  175516  TCR2:   MOV     #TCR3,@TCIV     ;SET UP INTERRUPT TO TEST ALL BLOCKS
002602  105277  175500                  INCB    @TCCM           ;SET DO
002606  000002                          RTI                     ;WAIT FOR NEXT BLOCK TO INTERRUPT

                                ;FIND SEQUENTIAL BLOCK IN REVERSE DIRECTION
002610  032777  100200  175470  TCR3:   BIT     #100200,@TCCM   ;TEST FOR READ AND ERROR
002616  100001                          BPL     .+4
002620  104000                          HLT                     ;ERROR READING SEQUENTIAL BLOCK IN REVERSE
002622  001001                          BNE     .+4
002624  104000                          HLT                     ;FALSE DECTAPE INTERRUPT
002626  026777  177344  175456          CMP     TCFIRST,@TCDT   ;DID WE DO ALL THE BLOCKS
002634  001662                          BEQ     XFENDZ          ;YES - GO TO END ZONE TO RESTART
002636  005367  177342                  DEC     TCEXPE          ;NO - DECREMENT BLOCK NUMBER
002642  027767  175444  177334          CMP     @TCDT,TCEXPE    ;TEST SEQUENTAIL BLOCK IN REVERSE
002650  001401                          BEQ     .+4
002652  104000                          HLT                     ;TEST SEQUENTIAL READ BLOCK IN REVERSE FAILED
002654  000403                          BR      TCRBK           ;THIS ROUTINE READ A BLOCK
002656  105277  175424          TCR4:   INCB    @TCCM           ;SET DO
002662  000002                          RTI                     ;LETS TRY A NEW BLOCK

                                ;READ REVERSE ALL BLOCK EXCEPT BLOCK 1101
002664  012777  002722  175426  TCRBK:  MOV     #TCRB1,@TCIV    ;SET UP INTERRUPT VECTOR
002672  012777  177400  175414          MOV     #-400,@TCWC     ;READ ONE BLOCK
002700  012777  002750  175410          MOV     #TCRBUF,@TCBA   ;WHERE BUFFER IS
002706  112777  000105  175372          MOVB    #IE+RD+DO,@TCCM ;READ THE BLOCK
002714  004767  175402                  JSR     %7,TC1          ;CHECK DATA BUFFER
002720  000002                          RTI                     ;EXIT - RETURN WHEN BLOCK IS READ
002722  005777  175360          TCRB1:  TST     @TCCM           ;AND ERRORS
002726  100001                          BPL     .+4
002730  104000                          HLT                     ;DECTAPE ERROR
002732  012777  002610  175360          MOV     #TCR3,@TCIV     ;NEW VECTOR FOR BLOCK SEARCH
002740  112777  000102  175340          MOVB    #IE+RB,@TCCM    ;READ BLOCK FUNCTION
002746  000743                          BR      TCR4            ;RETURN TO BLOCK SEARCH

                                ;THIS WRITE BUFFER LOOK THE SAME FORWARD OR REVERSE
                                TCWBUF:
                                TCRBUF:
        000001                          N=1
        000100                          .REPT   100
                                        N                       ;DECTAPE WRITE BUFFER
                                        -N
                                        N=N+1
                                        .ENDR
002750  000001                          N                       ;DECTAPE WRITE BUFFER
002752  177777                          -N
        000002                          N=N+1
002754  000002                          N                       ;DECTAPE WRITE BUFFER
002756  177776                          -N
        000003                          N=N+1
002760  000003                          N                       ;DECTAPE WRITE BUFFER
002762  177775                          -N
        000004                          N=N+1
002764  000004                          N                       ;DECTAPE WRITE BUFFER
002766  177774                          -N
```

```
                000005                  N=N+1
002770  000005                          N                       ;DECTAPE WRITE BUFFER
002772  177773                          -N
                000006                  N=N+1
002774  000006                          N                       ;DECTAPE WRITE BUFFER
002776  177772                          -N
                000007                  N=N+1
003000  000007                          N                       ;DECTAPE WRITE BUFFER
003002  177771                          -N
                000010                  N=N+1
003004  000010                          N                       ;DECTAPE WRITE BUFFER
003006  177770                          -N
                000011                  N=N+1
003010  000011                          N                       ;DECTAPE WRITE BUFFER
003012  177767                          -N
                000012                  N=N+1
003014  000012                          N                       ;DECTAPE WRITE BUFFER
003016  177766                          -N
                000013                  N=N+1
003020  000013                          N                       ;DECTAPE WRITE BUFFER
003022  177765                          -N
                000014                  N=N+1
003024  000014                          N                       ;DECTAPE WRITE BUFFER
003026  177764                          -N
                000015                  N=N+1
003030  000015                          N                       ;DECTAPE WRITE BUFFER
003032  177763                          -N
                000016                  N=N+1
003034  000016                          N                       ;DECTAPE WRITE BUFFER
003036  177762                          -N
                000017                  N=N+1
003040  000017                          N                       ;DECTAPE WRITE BUFFER
003042  177761                          -N
                000020                  N=N+1
003044  000020                          N                       ;DECTAPE WRITE BUFFER
003046  177760                          -N
                000021                  N=N+1
003050  000021                          N                       ;DECTAPE WRITE BUFFER
003052  177757                          -N
                000022                  N=N+1
003054  000022                          N                       ;DECTAPE WRITE BUFFER
003056  177756                          -N
                000023                  N=N+1
003060  000023                          N                       ;DECTAPE WRITE BUFFER
003062  177755                          -N
                000024                  N=N+1
003064  000024                          N                       ;DECTAPE WRITE BUFFER
003066  177754                          -N
                000025                  N=N+1
003070  000025                          N                       ;DECTAPE WRITE BUFFER
003072  177753                          -N
                000026                  N=N+1
003074  000026                          N                       ;DECTAPE WRITE BUFFER
003076  177752                          -N
                000027                  N=N+1
```

```
003100  000027                    N                       ;DECTAPE WRITE BUFFER
003102  177751                    -N
        000030                    N=N+1
003104  000030                    N                       ;DECTAPE WRITE BUFFER
003106  177750                    -N
        000031                    N=N+1
003110  000031                    N                       ;DECTAPE WRITE BUFFER
003112  177747                    -N
        000032                    N=N+1
003114  000032                    N                       ;DECTAPE WRITE BUFFER
003116  177746                    -N
        000033                    N=N+1
003120  000033                    N                       ;DECTAPE WRITE BUFFER
003122  177745                    -N
        000034                    N=N+1
003124  000034                    N                       ;DECTAPE WRITE BUFFER
003126  177744                    -N
        000035                    N=N+1
003130  000035                    N                       ;DECTAPE WRITE BUFFER
003132  177743                    -N
        000036                    N=N+1
003134  000036                    N                       ;DECTAPE WRITE BUFFER
003136  177742                    -N
        000037                    N=N+1
003140  000037                    N                       ;DECTAPE WRITE BUFFER
003142  177741                    -N
        000040                    N=N+1
003144  000040                    N                       ;DECTAPE WRITE BUFFER
003146  177740                    -N
        000041                    N=N+1
003150  000041                    N                       ;DECTAPE WRITE BUFFER
003152  177737                    -N
        000042                    N=N+1
003154  000042                    N                       ;DECTAPE WRITE BUFFER
003156  177736                    -N
        000043                    N=N+1
003160  000043                    N                       ;DECTAPE WRITE BUFFER
003162  177735                    -N
        000044                    N=N+1
003164  000044                    N                       ;DECTAPE WRITE BUFFER
003166  177734                    -N
        000045                    N=N+1
003170  000045                    N                       ;DECTAPE WRITE BUFFER
003172  177733                    -N
        000046                    N=N+1
003174  000046                    N                       ;DECTAPE WRITE BUFFER
003176  177732                    -N
        000047                    N=N+1
003200  000047                    N                       ;DECTAPE WRITE BUFFER
003202  177731                    -N
        000050                    N=N+1
003204  000050                    N                       ;DECTAPE WRITE BUFFER
003206  177730                    -N
        000051                    N=N+1
003210  000051                    N                       ;DECTAPE WRITE BUFFER
```

```
003212  177727                          -N
        000052                          N=N+1
003214  000052                          N                       ;DECTAPE WRITE BUFFER
003216  177726                          -N
        000053                          N=N+1
003220  000053                          N                       ;DECTAPE WRITE BUFFER
003222  177725                          -N
        000054                          N=N+1
003224  000054                          N                       ;DECTAPE WRITE BUFFER
003226  177724                          -N
        000055                          N=N+1
003230  000055                          N                       ;DECTAPE WRITE BUFFER
003232  177723                          -N
        000056                          N=N+1
003234  000056                          N                       ;DECTAPE WRITE BUFFER
003236  177722                          -N
        000057                          N=N+1
003240  000057                          N                       ;DECTAPE WRITE BUFFER
003242  177721                          -N
        000060                          N=N+1
003244  000060                          N                       ;DECTAPE WRITE BUFFER
003246  177720                          -N
        000061                          N=N+1
003250  000061                          N                       ;DECTAPE WRITE BUFFER
003252  177717                          -N
        000062                          N=N+1
003254  000062                          N                       ;DECTAPE WRITE BUFFER
003256  177716                          -N
        000063                          N=N+1
003260  000063                          N                       ;DECTAPE WRITE BUFFER
003262  177715                          -N
        000064                          N=N+1
003264  000064                          N                       ;DECTAPE WRITE BUFFER
003266  177714                          -N
        000065                          N=N+1
003270  000065                          N                       ;DECTAPE WRITE BUFFER
003272  177713                          -N
        000066                          N=N+1
003274  000066                          N                       ;DECTAPE WRITE BUFFER
003276  177712                          -N
        000067                          N=N+1
003300  000067                          N                       ;DECTAPE WRITE BUFFER
003302  177711                          -N
        000070                          N=N+1
003304  000070                          N                       ;DECTAPE WRITE BUFFER
003306  177710                          -N
        000071                          N=N+1
003310  000071                          N                       ;DECTAPE WRITE BUFFER
003312  177707                          -N
        000072                          N=N+1
003314  000072                          N                       ;DECTAPE WRITE BUFFER
003316  177706                          -N
        000073                          N=N+1
003320  000073                          N                       ;DECTAPE WRITE BUFFER
003322  177705                          -N
```

```
        000074                          N=N+1
003324  000074                          N                       ;DECTAPE WRITE BUFFER
003326  177704                          -N
        000075                          N=N+1
003330  000075                          N                       ;DECTAPE WRITE BUFFER
003332  177703                          -N
        000076                          N=N+1
003334  000076                          N                       ;DECTAPE WRITE BUFFER
003336  177702                          -N
        000077                          N=N+1
003340  000077                          N                       ;DECTAPE WRITE BUFFER
003342  177701                          -N
        000100                          N=N+1
003344  000100                          N                       ;DECTAPE WRITE BUFFER
003346  177700                          -N
        000101                          N=N+1
        000100                          .REPT   100
                                        N=N-1
                                        -N
                                        N                       ;DEC TAPE WRITE BUFFER
                                        .ENDR
        000100                          N=N-1
003350  177700                          -N
003352  000100                          N                       ;DEC TAPE WRITE BUFFER
        000077                          N=N-1
003354  177701                          -N
003356  000077                          N                       ;DEC TAPE WRITE BUFFER
        000076                          N=N-1
003360  177702                          -N
003362  000076                          N                       ;DEC TAPE WRITE BUFFER
        000075                          N=N-1
003364  177703                          -N
003366  000075                          N                       ;DEC TAPE WRITE BUFFER
        000074                          N=N-1
003370  177704                          -N
003372  000074                          N                       ;DEC TAPE WRITE BUFFER
        000073                          N=N-1
003374  177705                          -N
003376  000073                          N                       ;DEC TAPE WRITE BUFFER
        000072                          N=N-1
003400  177706                          -N
003402  000072                          N                       ;DEC TAPE WRITE BUFFER
        000071                          N=N-1
003404  177707                          -N
003406  000071                          N                       ;DEC TAPE WRITE BUFFER
        000070                          N=N-1
003410  177710                          -N
003412  000070                          N                       ;DEC TAPE WRITE BUFFER
        000067                          N=N-1
003414  177711                          -N
003416  000067                          N                       ;DEC TAPE WRITE BUFFER
        000066                          N=N-1
003420  177712                          -N
003422  000066                          N                       ;DEC TAPE WRITE BUFFER
        000065                          N=N-1
```

```
003424  177713                          -N
003426  000065                          N                       ;DEC TAPE WRITE BUFFER
        000064                          N=N-1
003430  177714                          -N
003432  000064                          N                       ;DEC TAPE WRITE BUFFER
        000063                          N=N-1
003434  177715                          -N
003436  000063                          N                       ;DEC TAPE WRITE BUFFER
        000062                          N=N-1
003440  177716                          -N
003442  000062                          N                       ;DEC TAPE WRITE BUFFER
        000061                          N=N-1
003444  177717                          -N
003446  000061                          N                       ;DEC TAPE WRITE BUFFER
        000060                          N=N-1
003450  177720                          -N
003452  000060                          N                       ;DEC TAPE WRITE BUFFER
        000057                          N=N-1
003454  177721                          -N
003456  000057                          N                       ;DEC TAPE WRITE BUFFER
        000056                          N=N-1
003460  177722                          -N
003462  000056                          N                       ;DEC TAPE WRITE BUFFER
        000055                          N=N-1
003464  177723                          -N
003466  000055                          N                       ;DEC TAPE WRITE BUFFER
        000054                          N=N-1
003470  177724                          -N
003472  000054                          N                       ;DEC TAPE WRITE BUFFER
        000053                          N=N-1
003474  177725                          -N
003476  000053                          N                       ;DEC TAPE WRITE BUFFER
        000052                          N=N-1
003500  177726                          -N
003502  000052                          N                       ;DEC TAPE WRITE BUFFER
        000051                          N=N-1
003504  177727                          -N
003506  000051                          N                       ;DEC TAPE WRITE BUFFER
        000050                          N=N-1
003510  177730                          -N
003512  000050                          N                       ;DEC TAPE WRITE BUFFER
        000047                          N=N-1
003514  177731                          -N
003516  000047                          N                       ;DEC TAPE WRITE BUFFER
        000046                          N=N-1
003520  177732                          -N
003522  000046                          N                       ;DEC TAPE WRITE BUFFER
        000045                          N=N-1
003524  177733                          -N
003526  000045                          N                       ;DEC TAPE WRITE BUFFER
        000044                          N=N-1
003530  177734                          -N
003532  000044                          N                       ;DEC TAPE WRITE BUFFER
        000043                          N=N-1
003534  177735                          -N
```

```
003536  000043                          N                       ;DEC TAPE WRITE BUFFER
        000042                          N=N-1
003540  177736                          -N
003542  000042                          N                       ;DEC TAPE WRITE BUFFER
        000041                          N=N-1
003544  177737                          -N
003546  000041                          N                       ;DEC TAPE WRITE BUFFER
        000040                          N=N-1
003550  177740                          -N
003552  000040                          N                       ;DEC TAPE WRITE BUFFER
        000037                          N=N-1
003554  177741                          -N
003556  000037                          N                       ;DEC TAPE WRITE BUFFER
        000036                          N=N-1
003560  177742                          -N
003562  000036                          N                       ;DEC TAPE WRITE BUFFER
        000035                          N=N-1
003564  177743                          -N
003566  000035                          N                       ;DEC TAPE WRITE BUFFER
        000034                          N=N-1
003570  177744                          -N
003572  000034                          N                       ;DEC TAPE WRITE BUFFER
        000033                          N=N-1
003574  177745                          -N
003576  000033                          N                       ;DEC TAPE WRITE BUFFER
        000032                          N=N-1
003600  177746                          -N
003602  000032                          N                       ;DEC TAPE WRITE BUFFER
        000031                          N=N-1
003604  177747                          -N
003606  000031                          N                       ;DEC TAPE WRITE BUFFER
        000030                          N=N-1
003610  177750                          -N
003612  000030                          N                       ;DEC TAPE WRITE BUFFER
        000027                          N=N-1
003614  177751                          -N
003616  000027                          N                       ;DEC TAPE WRITE BUFFER
        000026                          N=N-1
003620  177752                          -N
003622  000026                          N                       ;DEC TAPE WRITE BUFFER
        000025                          N=N-1
003624  177753                          -N
003626  000025                          N                       ;DEC TAPE WRITE BUFFER
        000024                          N=N-1
003630  177754                          -N
003632  000024                          N                       ;DEC TAPE WRITE BUFFER
        000023                          N=N-1
003634  177755                          -N
003636  000023                          N                       ;DEC TAPE WRITE BUFFER
        000022                          N=N-1
003640  177756                          -N
003642  000022                          N                       ;DEC TAPE WRITE BUFFER
        000021                          N=N-1
003644  177757                          -N
003646  000021                          N                       ;DEC TAPE WRITE BUFFER
```

```
        000020                          N=N-1
003650  177760                          -N
003652  000020                          N                       ;DEC TAPE WRITE BUFFER
        000017                          N=N-1
003654  177761                          -N
003656  000017                          N                       ;DEC TAPE WRITE BUFFER
        000016                          N=N-1
003660  177762                          -N
003662  000016                          N                       ;DEC TAPE WRITE BUFFER
        000015                          N=N-1
003664  177763                          -N
003666  000015                          N                       ;DEC TAPE WRITE BUFFER
        000014                          N=N-1
003670  177764                          -N
003672  000014                          N                       ;DEC TAPE WRITE BUFFER
        000013                          N=N-1
003674  177765                          -N
003676  000013                          N                       ;DEC TAPE WRITE BUFFER
        000012                          N=N-1
003700  177766                          -N
003702  000012                          N                       ;DEC TAPE WRITE BUFFER
        000011                          N=N-1
003704  177767                          -N
003706  000011                          N                       ;DEC TAPE WRITE BUFFER
        000010                          N=N-1
003710  177770                          -N
003712  000010                          N                       ;DEC TAPE WRITE BUFFER
        000007                          N=N-1
003714  177771                          -N
003716  000007                          N                       ;DEC TAPE WRITE BUFFER
        000006                          N=N-1
003720  177772                          -N
003722  000006                          N                       ;DEC TAPE WRITE BUFFER
        000005                          N=N-1
003724  177773                          -N
003726  000005                          N                       ;DEC TAPE WRITE BUFFER
        000004                          N=N-1
003730  177774                          -N
003732  000004                          N                       ;DEC TAPE WRITE BUFFER
        000003                          N=N-1
003734  177775                          -N
003736  000003                          N                       ;DEC TAPE WRITE BUFFER
        000002                          N=N-1
003740  177776                          -N
003742  000002                          N                       ;DEC TAPE WRITE BUFFER
        000001                          N=N-1
003744  177777                          -N
003746  000001                          N                       ;DEC TAPE WRITE BUFFER
```

;BINARY INSTRUCTIONS

```
                        ;INDEX, AND INDIRECT TEST OF PDP-11
003750  012767  003750  012446  BEGIN:  MOV     #BEGIN,RETURN           ;FOR SCOPING
003756  104400                        SCOPE
003762  012737  004000  016420        MOV     #4000,@#ICOUNT          ;ITERATION COUNT
                        ;TEST COMPARE INSTRUCTION INDEXED
003766  012700  177770                MOV     #-10,%0                 ;MINUS 10 TO REG 0
003772  026027  016622  125252        CMP     A(0),#125252            ;(A INDEX BY MINUS 10) TO #125252
004000  001401                        BEQ     .+4
004002  104000                        HLT                             ;COMPARE WITH INDEX FAILED
004004  104400                        SCOPE

004006  012700  177770                MOV     #-10,%0                 ;FOR INDEX
004012  022760  125252  016622        CMP     #125252,A(0)            ;A INDEXED
004020  001401                        BEQ     .+4
004022  104000                        HLT
004024  104400                        SCOPE

004026  012700  000010                MOV     #10,%0                  ;INDEX
004032  026027  016622  052525        CMP     A(0),#052525
004040  001401                        BEQ     .+4
004042  104000                        HLT
004044  104400                        SCOPE

004046  012700  000010                MOV     #10,%0
004052  022760  052525  016622        CMP     #052525,A(0)
004060  001401                        BEQ     .+4
004062  104000                        HLT
004064  104400                        SCOPE

004066  012700  177770                MOV     #-10,%0
004072  026060  016622  016622        CMP     A(0),A(0)
004100  001401                        BEQ     .+4
004102  104000                        HLT
004104  104400                        SCOPE

004106  012700  000010                MOV     #+10,%0
004112  026060  016622  016622        CMP     A(0),A(0)
004120  001401                        BEQ     .+4
004122  104000                        HLT
004124  104400                        SCOPE

004126  012700  177770                MOV     #-10,%0
004132  012701  000004                MOV     #+4,%1
004136  026061  016622  016622        CMP     A(0),A(1)
004144  001401                        BEQ     .+4
004146  104000                        HLT
004150  104400                        SCOPE

004152  026160  016622  016622        CMP     A(1),A(0)
004160  001401                        BEQ     .+4
004162  104000                        HLT
004164  104400                        SCOPE

004166  012700  177774                MOV     #-4,%0
004172  012701  000010                MOV     #+10,%1
```

```
004176  026061  016622  016622          CMP     A(0),A(1)
004204  001401                          BEQ     .+4
004206  104000                          HLT
004210  104400                          SCOPE
004212  012700  177774                  MOV     #-4,%0
004216  012701  000010                  MOV     #10,%1
004222  026160  016622  016622          CMP     A(1),A(0)
004230  001401                          BEQ     .+4
004232  104000                          HLT
004234  104400                          SCOPE

                                ;TEST MOVE INSTRUCTION FOR INDEX

004236  012700  177770                  MOV     #-10,%0
004242  016067  016622  012374          MOV     A(0),TEMP
004250  026727  012370  125252          CMP     TEMP,#125252
004256  001401                          BEQ     .+4
004260  104000                          HLT
004262  104400                          SCOPE

004264  012700  000010                  MOV     #+10,%0
004270  016067  016622  012346          MOV     A(0),TEMP
004276  026727  012342  052525          CMP     TEMP,#052525
004304  001401                          BEQ     .+4
004306  104000                          HLT
004310  104400                          SCOPE

004312  012700  177770                  MOV     #-10,%0
004316  012760  125252  016644          MOV     #125252,TEMP(0)
004324  023727  016634  125252          CMP     @#C,#125252
004332  001401                          BEQ     .+4
004334  104000                          HLT
004336  104400                          SCOPE

004340  012700  000010                  MOV     #+10,%0
004344  012760  052525  016644          MOV     #052525,TEMP(0)
004352  023727  016654  052525          CMP     @#TEMP+10,#052525
004360  001401                          BEQ     .+4
004362  104000                          HLT
004364  104400                          SCOPE

                                ;TEST AND INSTRUCTION FOR INDEXING
004366  012767  177777  012250          MOV     #-1,TEMP
004374  012700  177770                  MOV     #-10,%0
004400  046067  016622  012236          BIC     A(0),TEMP
004406  026727  012232  052525          CMP     TEMP,#052525
004414  001401                          BEQ     .+4
004416  104000                          HLT
004420  104400                          SCOPE

004422  012767  177777  012214          MOV     #-1,TEMP
004430  012700  000010                  MOV     #10,%0
004434  046067  016622  012202          BIC     A(0),TEMP
004442  026727  012176  125252          CMP     TEMP,#125252
004450  001401                          BEQ     .+4
```

```
004452  104000                          HLT
004454  104400                          SCOPE

004456  012737  177777  016654          MOV     #-1,@#TEMP+10
004464  012700  000010                  MOV     #10,%0
004470  042760  125252  016644          BIC     #125252,TEMP(0)
004476  023727  016654  052525          CMP     @#TEMP+10,#52525
004504  001401                          BEQ     .+4
004506  104000                          HLT
004510  104400                          SCOPE

004512  012700  177770                  MOV     #-10,%0
004516  012767  177777  012110          MOV     #-1,TEMP-10
004524  042767  052525  012102          BIC     #052525,TEMP-10
004532  026727  012076  125252          CMP     TEMP-10,#125252
004540  001401                          BEQ     .+4
004542  104000                          HLT
004544  104400                          SCOPE

                                ;TEST SUBTRACT INSTRUCTION FOR INDEXING
004546  012767  125252  012070          MOV     #125252,TEMP
004554  012700  177770                  MOV     #-10,%0
004560  166067  016622  012056          SUB     A(0),TEMP
004566  001401                          BEQ     .+4
004570  104000                          HLT
004572  104400                          SCOPE

004574  012737  125252  016644          MOV     #125252,@#TEMP
004602  012700  177770                  MOV     #-10,%0
004606  166760  012000  016654          SUB     B,TEMP+10(0)
004614  001401                          BEQ     .+4
004616  104000                          HLT
004620  104400                          SCOPE

004622  012767  052525  012014          MOV     #052525,TEMP
004630  012700  000010                  MOV     #10,%0
004634  166067  016622  012002          SUB     A(0),TEMP
004642  001401                          BEQ     .+4
004644  104000                          HLT
004646  104400                          SCOPE

004650  012737  052525  016644          MOV     #052525,@#TEMP
004656  012700  000010                  MOV     #10,%0
004662  166760  011744  016634          SUB     A+10,C(0)
004670  001401                          BEQ     .+4
004672  104000                          HLT
004674  104400                          SCOPE

                                ;TEST UNARYS INDEXED
004676  012737  177777  016644          MOV     #-1,@#TEMP
004704  012700  177770                  MOV     #-10,%0
004710  005060  016654                  CLR     D(0)
004714  005737  016644                  TST     @#TEMP
004720  001401                          BEQ     .+4
004722  104000                          HLT
```

```
004724  104400                          SCOPE

004726  012737  177777  016644          MOV     #-1,@#TEMP
004734  012700  000010                  MOV     #+10,%0
004740  005060  016634                  CLR     C(0)
004744  005737  016644                  TST     @#TEMP
004750  001401                          BEQ     .+4
004752  104000                          HLT
004754  104400                          SCOPE

004756  012737  177777  016644          MOV     #-1,@#TEMP
004764  012700  177770                  MOV     #-10,%0
004770  005160  016654                  COM     D(0)
004774  005737  016644                  TST     @#TEMP
005000  001401                          BEQ     .+4
005002  104000                          HLT
005004  104400                          SCOPE

005006  012737  177777  016644          MOV     #-1,@#TEMP
005014  012700  000010                  MOV     #10,%0
005020  005160  016634                  COM     C(0)
005024  005737  016644                  TST     @#TEMP
005030  001401                          BEQ     .+4
005032  104000                          HLT
005034  104400                          SCOPE

005036  012737  177777  016644          MOV     #-1,@#TEMP
005044  012700  177770                  MOV     #-10,%0
005050  005260  016654                  INC     D(0)
005054  005737  016644                  TST     @#TEMP
005060  001401                          BEQ     .+4
005062  104000                          HLT
005064  104400                          SCOPE

005066  012737  177777  016644          MOV     #-1,@#TEMP
005074  012700  000010                  MOV     #+10,%0
005100  005260  016634                  INC     C(0)
005104  005737  016644                  TST     @#TEMP
005110  001401                          BEQ     .+4
005112  104000                          HLT
005114  104400                          SCOPE

005116  012737  000001  016644          MOV     #1,@#TEMP
005124  012700  177770                  MOV     #-10,%0
005130  005360  016654                  DEC     D(0)
005134  005737  016644                  TST     @#TEMP
005140  001401                          BEQ     .+4
005142  104000                          HLT
005144  104400                          SCOPE

005146  012737  000001  016644          MOV     #1,@#TEMP
005154  012700  000010                  MOV     #10,%0
005160  005360  016634                  DEC     C(0)
005164  005737  016644                  TST     @#TEMP
005170  001401                          BEQ     .+4
```

```
005172  104000                          HLT
005174  104400                          SCOPE

005176  012737  000001  016644          MOV     #1,@#TEMP
005204  012700  177770                  MOV     #-10,%0
005210  005460  016654                  NEG     D(0)
005214  022737  177777  016644          CMP     #-1,@#TEMP
005222  001401                          BEQ     .+4
005224  104000                          HLT
005226  104400                          SCOPE

005230  012737  000001  016644          MOV     #1,@#TEMP
005236  012700  000010                  MOV     #+10,%0
005242  005460  016634                  NEG     C(0)
005246  022737  177777  016644          CMP     #-1,@#TEMP
005254  001401                          BEQ     .+4
005256  104000                          HLT
005260  104400                          SCOPE

005262  012737  177777  016644          MOV     #-1,@#TEMP
005270  012700  177770                  MOV     #-10,%0
005274  000261                          SEC
005276  005560  016654                  ADC     D(0)
005302  005737  016644                  TST     @#TEMP
005306  001401                          BEQ     .+4
005310  104000                          HLT
005312  104400                          SCOPE

005314  012737  177777  016644          MOV     #-1,@#TEMP
005322  012700  000010                  MOV     #+10,%0
005326  000261                          SEC
005330  005560  016634                  ADC     C(0)
005334  005737  016644                  TST     @#TEMP
005340  001401                          BEQ     .+4
005342  104000                          HLT
005344  104400                          SCOPE


005346  012737  000001  016644          MOV     #1,@#TEMP
005354  012700  177770                  MOV     #-10,%0
005360  000261                          SEC
005362  005660  016654                  SBC     D(0)
005366  005737  016644                  TST     @#TEMP
005372  001401                          BEQ     .+4
005374  104000                          HLT
005376  104400                          SCOPE

005400  012737  000001  016644          MOV     #1,@#TEMP
005406  012700  000010                  MOV     #+10,%0
005412  000261                          SEC
005414  005660  016634                  SBC     C(0)
005420  005737  016644                  TST     @#TEMP
005424  001401                          BEQ     .+4
005426  104000                          HLT
005430  104400                          SCOPE
```

```
                                ;TEST JMP INDIRECT
005432  010700                        MOV     %7,%0
005434  062700  000010                ADD     #10,%0
005440  000110                        JMP     @%0
005442  104000                        HLT
005444  000240                        NOP
005446  104400                        SCOPE

005450  010700                        MOV     %7,%0
005452  062700  000010                ADD     #10,%0
005456  000110                        JMP     @%0
005460  104000                        HLT
005462  000240                        NOP
005464  104400                        SCOPE

                                ;TEST INDIRECT ADDRESSING
                                ;TEST COMPARE INSTRUCTION
005466  023727  016612  125252        CMP     @#B,#125252
005474  001401                        BEQ     .+4
005476  104000                        HLT
005500  104400                        SCOPE

005502  022737  125252  016612        CMP     #125252,@#B
005510  001401                        BEQ     .+4
005512  104000                        HLT
005514  104400                        SCOPE

005516  023737  016612  016612        CMP     @#B,@#B
005524  001401                        BEQ     .+4
005526  104000                        HLT
005530  104400                        SCOPE

                                ;TEST MOVE INSTRUCTIONS
005532  013700  016612                MOV     @#B,%0
005536  022700  125252                CMP     #125252,%0
005542  001401                        BEQ     .+4
005544  104000                        HLT
005546  104400                        SCOPE

005550  012737  125252  016644        MOV     #125252,@#TEMP
005556  023737  016612  016644        CMP     @#B,@#TEMP
005564  001401                        BEQ     .+4
005566  104000                        HLT
005570  104400                        SCOPE

005572  013737  016612  016634        MOV     @#B,@#C
005600  023737  016612  016634        CMP     @#B,@#C
005606  001401                        BEQ     .+4
005610  104000                        HLT
005612  104400                        SCOPE

                                ;TEST BIC INSTRUCTION INDIRECT
005614  012700  177777                MOV     #-1,%0
005620  043700  016612                BIC     @#B,%0
```

```
005624  020027  052525                  CMP     %0,#052525
005630  001401                          BEQ     .+4
005632  104000                          HLT
005634  104400                          SCOPE

005636  012737  177777  016644          MOV     #-1,@#TEMP
005644  042737  125252  016644          BIC     #125252,@#TEMP
005652  022737  052525  016644          CMP     #052525,@#TEMP
005660  001401                          BEQ     .+4
005662  104000                          HLT
005664  104400                          SCOPE

005666  012737  177777  016634          MOV     #-1,@#C
005674  043737  016612  016634          BIC     @#B,@#C
005702  023727  016634  052525          CMP     @#C,#52525
005710  001401                          BEQ     .+4
005712  104000                          HLT
005714  104400                          SCOPE

                                ;TEST SUBTRACT INSTRUCTION
005716  012700  125252                  MOV     #125252,%0
005722  163700  016612                  SUB     @#B,%0
005726  020027  000000                  CMP     %0,#0
005732  001401                          BEQ     .+4
005734  104000                          HLT
005736  104400                          SCOPE

005740  012737  125252  016644          MOV     #125252,@#TEMP
005746  166737  010640  016644          SUB     B,@#TEMP
005754  001401                          BEQ     .+4
005756  104000                          HLT
005760  104400                          SCOPE

005762  012767  125252  010654          MOV     #125252,TEMP
005770  163767  016612  010646          SUB     @#B,TEMP
005776  005767  010642                  TST     TEMP
006002  001401                          BEQ     .+4
006004  104000                          HLT
006006  104400                          SCOPE

                                ;TEST ADD INDIRECT
006010  005000                          CLR     %0
006012  063700  016612                  ADD     @#B,%0
006016  022700  125252                  CMP     #125252,%0
006022  001401                          BEQ     .+4
006024  104000                          HLT
006026  104400                          SCOPE

006030  005037  016644                  CLR     @#TEMP
006034  062737  125252  016644          ADD     #125252,@#TEMP
006042  022737  125252  016644          CMP     #125252,@#TEMP
006050  001401                          BEQ     .+4
006052  104000                          HLT
006054  104400                          SCOPE
006056  012737  125252  016644          MOV     #125252,@#TEMP
```

```
006264  067737  010540  016644          ADD     @A+6,@#TEMP
006272  023727  016644  177777          CMP     @#TEMP,#-1
006100  001401                          BEQ     .+4
006102  104000                          HLT
006104  104400                          SCOPE

                                ;TEST UNARYS INDIRECT
006106  012737  177777  016644          MOV     #-1,@#TEMP
006114  005037  016644                  CLR     @#TEMP
006120  005737  016644                  TST     @#TEMP
006124  001401                          BEQ     .+4
006126  104000                          HLT
006130  104400                          SCOPE

006132  012737  125252  016644          MOV     #125252,@#TEMP
006140  005137  016644                  COM     @#TEMP
006144  022737  052525  016644          CMP     #052525,@#TEMP
006152  001401                          BEQ     .+4
006154  104000                          HLT
006156  104400                          SCOPE

006160  005037  016644                  CLR     @#TEMP
006164  005237  016644                  INC     @#TEMP
006170  022737  000001  016644          CMP     #1,@#TEMP
006176  001401                          BEQ     .+4
006200  104000                          HLT
006202  104400                          SCOPE

006204  005037  016644                  CLR     @#TEMP
006210  005377  010432                  DEC     @TEMP+2
006214  023727  016644  177777          CMP     @#TEMP,#-1
006222  001401                          BEQ     .+4
006224  104000                          HLT
006226  104400                          SCOPE

006230  012737  000001  016644          MOV     #1,@#TEMP
006236  005437  016644                  NEG     @#TEMP
006242  022737  177777  016644          CMP     #-1,@#TEMP
006250  001401                          BEQ     .+4
006252  104000                          HLT
006254  104400                          SCOPE

                                ;TEST INDIRECT ADDRESSING WITH INDEXING
                                ;TEST COMPARE INSTRUCTION
006256  027727  010332  125252          CMP     @B+2,#125252
006264  001401                          BEQ     .+4
006266  104000                          HLT
006270  104400                          SCOPE

006272  022777  125252  010314          CMP     #125252,@B+2
006300  001401                          BEQ     .+4
006302  104000                          HLT
006304  104400                          SCOPE

006306  027777  010332  012300          CMP     @B+2,@B+2
```

```
006314  001401                          BEQ     .+4
006316  104000                          HLT
006320  104400                          SCOPE


                                ;TEST MOVE INSTRUCTIONS
006322  017700  010266                  MOV     @B+2,%0
006326  022700  125252                  CMP     #125252,%0
006332  001401                          BEQ     .+4
006334  104000                          HLT
006336  104400                          SCOPE

006340  012777  125252  010300          MOV     #125252,@TEMP+2
006346  023737  016612  016644          CMP     @#B,@#TEMP
006354  001401                          BEQ     .+4
006356  104000                          HLT
006360  104400                          SCOPE

006362  017777  010226  010246          MOV     @B+2,@C+2
006370  023737  016612  016634          CMP     @#B,@#C
006376  001401                          BEQ     .+4
006400  104000                          HLT
006402  104400                          SCOPE

                                ;TEST BIC INSTRUCTION INDIRECT WITH INDEXING
006404  012700  177777                  MOV     #-1,%0
006410  047700  010200                  BIC     @B+2,%0
006414  020027  052525                  CMP     %0,#52525
006420  001401                          BEQ     .+4
006422  104000                          HLT
006424  104400                          SCOPE

006426  012737  177777  016644          MOV     #-1,@#TEMP
006434  042777  125252  010204          BIC     #125252,@TEMP+2
006442  022737  052525  016644          CMP     #52525,@#TEMP
006450  001401                          BEQ     .+4
006452  104000                          HLT
006454  104400                          SCOPE

006456  012737  177777  016634          MOV     #-1,@#C
006464  047777  010124  010144          BIC     @B+2,@C+2
006472  026737  010134  016634          CMP     A+10,@#C
006500  001401                          BEQ     .+4
006502  104000                          HLT
006504  104400                          SCOPE

006506  012700  125252                  MOV     #125252,%0
006512  167700  010076                  SUB     @B+2,%0
006516  020027  000000                  CMP     %0,#0
006522  001401                          BEQ     .+4
006524  104000                          HLT
006526  104400                          SCOPE

006530  012737  125252  016644          MOV     #125252,@#TEMP
006536  166777  010050  010102          SUB     B,@TEMP+2
```

```
006544  001401                          BEQ     .+4
006546  104000                          HLT
006550  104400                          SCOPE

006552  012737  125252  016644          MOV     #125252,@#TEMP
006562  167777  010030  010060          SUB     @B+2,@TEMP+2
006566  005737  016644                  TST     @#TEMP
006572  001401                          BEQ     .+4
006574  104000                          HLT
006576  104400                          SCOPE


                                ;TEST ADD INDIRECT WITH INDEXING
006600  005000                          CLR     %0
006602  067700  010006                  ADD     @B+2,%0
006606  022700  125252                  CMP     #125252,%0
006612  001401                          BEQ     .+4
006614  104000                          HLT
006616  104400                          SCOPE

006620  005037  016644                  CLR     @#TEMP
006624  062777  125252  010014          ADD     #125252,@TEMP+2
006632  022737  125252  016644          CMP     #125252,@#TEMP
006640  001401                          BEQ     .+4
006642  104000                          HLT
006644  104400                          SCOPE
006646  012737  125252  016644          MOV     #125252,@#TEMP
006654  067777  007750  007764          ADD     @A+6,@TEMP+2
006662  023727  016644  177777          CMP     @#TEMP,#-1
006670  001401                          BEQ     .+4
006672  104000                          HLT
006674  104400                          SCOPE

                                ;TEST UNARYS INDIRECT WITH INDEXING
006676  012737  177777  016644          MOV     #-1,@#TEMP
006704  005077  007736                  CLR     @TEMP+2
006710  005737  016644                  TST     @#TEMP
006714  001401                          BEQ     .+4
006716  104000                          HLT
006720  104400                          SCOPE

006722  012737  125252  016644          MOV     #125252,@#TEMP
006730  005177  007712                  COM     @TEMP+2
006734  022737  052525  016644          CMP     #052525,@#TEMP
006742  001401                          BEQ     .+4
006744  104000                          HLT
006746  104400                          SCOPE

006750  005037  016644                  CLR     @#TEMP
006754  005277  007666                  INC     @TEMP+2
006760  022737  000001  016644          CMP     #1,@#TEMP
006766  001401                          BEQ     .+4
006770  104000                          HLT
006772  104400                          SCOPE
```

```
006774  005037  016644                 CLR     @#TEMP
007000  005377  007642                 DEC     @TEMP+2
007004  023727  016644  177777         CMP     @#TEMP,#-1
007012  001401                         BEQ     .+4
007014  104000                         HLT
007016  104400                         SCOPE

007020  012737  000001  016644         MOV     #1,@#TEMP
007026  005477  007614                 NEG     @TEMP+2
007032  022737  177777  016644         CMP     #-1,@#TEMP
007040  001401                         BEQ     .+4
007042  104000                         HLT
007044  104400                         SCOPE


007046  012737  177777  016644         MOV     #-1,@#TEMP
007054  000261                         SEC
007056  005577  007564                 ADC     @TEMP+2
007062  005737  016644                 TST     @#TEMP
007066  001401                         BEQ     .+4
007070  104000                         HLT
007072  104400                         SCOPE

007074  012737  000001  016644         MOV     #1,@#TEMP
007102  000261                         SEC
007104  005677  007536                 SBC     @TEMP+2
007110  005737  016644                 TST     @#TEMP
007114  001401                         BEQ     .+4
007116  104000                         HLT
007120  104400                         SCOPE

                                ;TEST OF COMBINED INDEXING AND INDIRECT
007122  012700  177772                 MOV     #-6,%0
007126  027027  016622  125252         CMP     @A(0),#125252
007134  001401                         BEQ     .+4
007136  104000                         HLT
007140  104400                         SCOPE

007142  012700  177772                 MOV     #-6,%0
007146  022770  125252  016622         CMP     #125252,@A(0)
007154  001401                         BEQ     .+4
007156  104000                         HLT
007160  104400                         SCOPE

007162  012700  177772                 MOV     #-6,%0
007166  012701  000002                 MOV     #+2,%1
007172  027071  016622  016622         CMP     @A(0),@A(1)
007200  001401                         BEQ     .+4
007202  104000                         HLT
007204  104400                         SCOPE

                                ;TEST BIC INSTRUCTION
007206  012700  000006                 MOV     #+6,%0
007212  012767  177777  007424         MOV     #-1,TEMP
007220  047067  016622  007416         BIC     @A(0),TEMP
```

```
007226  022767  125252  007410          CMP     #125252,TEMP
007234  001401                          BEQ     .+4
007236  104000                          HLT
007240  104400                          SCOPE

007242  012700  177772                  MOV     #-6,%0
007246  012737  177777  016634          MOV     #-1,@#C
007254  042770  125252  016644          BIC     #125252,@TEMP(0)
007262  023727  016634  052525          CMP     @#C,#052525
007270  001401                          BEQ     .+4
007272  104000                          HLT
007274  104400                          SCOPE

007276  012737  177777  016634          MOV     #-1,@#C
007304  012700  177772                  MOV     #-6,%0
007310  012701  177772                  MOV     #-6,%1
007314  047071  016622  016644          BIC     @A(0),@TEMP(1)
007322  022737  052525  016634          CMP     #052525,@#C
007330  001401                          BEQ     .+4
007332  104000                          HLT
007334  104400                          SCOPE

                        ;BINARY INSTRUCTIONS
                        ;INDEX, AND INDIRECT TEST OF PDP-11
                        ;TEST COMPARE INSTRUCTION INDEXED
007336  012700  177770                  MOV     #-10,%0         ;MINUS 10 TO REG 0
007342  126027  016622  000252          CMPB    A(0),#000252    ;(A INDEX BY MINUS 10) TO #125252
007350  001401                          BEQ     .+4
007352  104000                          HLT                     ;COMPARE WITH INDEX FAILED
007354  104400                          SCOPE

007356  012700  177770                  MOV     #-10,%0         ;FOR INDEX
007362  122760  000252  016622          CMPB    #000252,A(0)    ;A INDEXED
007370  001401                          BEQ     .+4
007372  104000                          HLT
007374  104400                          SCOPE

007376  012700  000010                  MOV     #10,%0          ;INDEX
007402  126027  016622  000125          CMPB    A(0),#000125
007410  001401                          BEQ     .+4
007412  104000                          HLT
007414  104400                          SCOPE

007416  012700  000010                  MOV     #10,%0
007422  122760  000125  016622          CMPB    #000125,A(0)
007430  001401                          BEQ     .+4
007432  104000                          HLT
007434  104400                          SCOPE

007436  012700  177770                  MOV     #-10,%0
007442  126060  016622  016622          CMPB    A(0),A(0)
007450  001401                          BEQ     .+4
007452  104000                          HLT
007454  104400                          SCOPE
```

```
007456  012700  000010              MOV     #+10,%0
007462  126060  016622  016622      CMPB    A(0),A(0)
007470  001401                      BEQ     .+4
007472  104000                      HLT
007474  104400                      SCOPE

007476  012700  177770              MOV     #-10,%0
007502  012701  000004              MOV     #+4,%1
007506  126061  016622  016622      CMPB    A(0),A(1)
007514  001401                      BEQ     .+4
007516  104000                      HLT
007520  104400                      SCOPE

007522  126160  016622  016622      CMPB    A(1),A(0)
007530  001401                      BEQ     .+4
007532  104000                      HLT
007534  104400                      SCOPE

007536  012700  177774              MOV     #-4,%0
007542  012701  000010              MOV     #+10,%1
007546  126061  016622  016622      CMPB    A(0),A(1)
007554  001401                      BEQ     .+4
007556  104000                      HLT
007560  104400                      SCOPE

007562  012700  177774              MOV     #-4,%0
007566  012701  000010              MOV     #10,%1
007572  126160  016622  016622      CMPB    A(1),A(0)
007600  001401                      BEQ     .+4
007602  104000                      HLT
007604  104400                      SCOPE

                                ;TEST MOVE INSTRUCTION FOR INDEX

007606  012700  177770              MOV     #-10,%0
007612  116067  016622  007024      MOVB    A(0),TEMP
007620  126727  007020  000252      CMPB    TEMP,#000252
007626  001401                      BEQ     .+4
007630  104000                      HLT
007632  104400                      SCOPE

007634  012700  000010              MOV     #+10,%0
007640  116067  016622  006776      MOVB    A(0),TEMP
007646  126727  006772  000125      CMPB    TEMP,#000125
007654  001401                      BEQ     .+4
007656  104000                      HLT
007660  104400                      SCOPE

007662  012700  177770              MOV     #-10,%0
007666  112760  125252  016644      MOVB    #125252,TEMP(0)
007674  123727  016634  125252      CMPB    @#C,#125252
007702  001401                      BEQ     .+4
007704  104000                      HLT
007706  104400                      SCOPE
```

```
007710  012700  000010                  MOV     #+10,%0
007714  112760  052525  016644          MOVB    #052525,TEMP(0)
007722  123727  016654  052525          CMPB    @#TEMP+10,#052525
007730  001401                          BEQ     .+4
007732  104000                          HLT
007734  104400                          SCOPE

                                ;TEST BIC INSTRUCTION FOR INDEXING
007736  012767  177777  006700          MOV     #-1,TEMP
007744  012700  177770                  MOV     #-10,%0
007750  146067  016622  006666          BICB    A(0),TEMP
007756  126727  006662  177525          CMPB    TEMP,#177525
007764  001401                          BEQ     .+4
007766  104000                          HLT
007770  104400                          SCOPE

007772  012767  177777  006644          MOV     #-1,TEMP
010000  012700  000010                  MOV     #10,%0
010004  146067  016622  006632          BICB    A(0),TEMP
010012  126727  006626  007652          CMPB    TEMP,#007652
010020  001401                          BEQ     .+4
010022  104000                          HLT
010024  104400                          SCOPE

010026  012737  177777  016654          MOV     #-1,@#TEMP+10
010034  012700  000010                  MOV     #10,%0
010040  142760  125252  016644          BICB    #125252,TEMP(0)
010046  123727  016654  002525          CMPB    @#TEMP+10,#2525
010054  001401                          BEQ     .+4
010056  104000                          HLT
010060  104400                          SCOPE

010062  012700  177770                  MOV     #-10,%0
010066  012767  177777  006540          MOV     #-1,TEMP-10
010074  142767  052525  006532          BICB    #052525,TEMP-10
010102  126727  006526  125252          CMPB    TEMP-10,#125252
010110  001401                          BEQ     .+4
010112  104000                          HLT
010114  104400                          SCOPE


                                ;TEST UNARYS INDEXED
010116  012737  177777  016644          MOV     #-1,@#TEMP
010124  012700  177770                  MOV     #-10,%0
010130  105060  016654                  CLRB    D(0)
010134  105737  016644                  TSTB    @#TEMP
010142  001401                          BEQ     .+4
010142  104000                          HLT
010144  104400                          SCOPE

010146  012737  177777  016644          MOV     #-1,@#TEMP
010154  012700  177770                  MOV     #-10,%0
010160  105060  016654                  CLRB    D(0)
010164  023727  016644  177400          CMP     @#TEMP,#177400
010172  001401                          BEQ     .+4
```

```
010174  104000                    HLT
010176  104400                    SCOPE

010200  012737  177777  016644    MOV     #-1,@#TEMP
010206  012700  177771            MOV     #-7,%0
010212  105060  016654            CLRB    D(0)
010216  023727  016644  000377    CMP     @#TEMP,#000377
010224  001401                    BEQ     .+4
010226  104000                    HLT
010230  104400                    SCOPE

010232  012737  177777  016644    MOV     #-1,@#TEMP
010240  012700  000010            MOV     #+10,%0
010244  105060  016634            CLRB    C(0)
010250  105737  016644            TSTB    @#TEMP
010254  001401                    BEQ     .+4
010256  104000                    HLT
010260  104400                    SCOPE

010262  012737  177777  016644    MOV     #-1,@#TEMP
010270  012700  177770            MOV     #-10,%0
010274  105160  016654            COMB    D(0)
010300  105737  016644            TSTB    @#TEMP
010304  001401                    BEQ     .+4
010306  104000                    HLT
010310  104400                    SCOPE

010312  012737  177777  016644    MOV     #-1,@#TEMP
010320  012700  000010            MOV     #10,%0
010324  105160  016634            COMB    C(0)
010330  105737  016644            TSTB    @#TEMP
010334  001401                    BEQ     .+4
010336  104000                    HLT
010340  104400                    SCOPE

010342  012737  177777  016644    MOV     #-1,@#TEMP
010350  012700  177770            MOV     #-10,%0
010354  105260  016654            INCB    D(0)
010360  105737  016644            TSTB    @#TEMP
010364  001401                    BEQ     .+4
010366  104000                    HLT
010370  023727  016644  177400    CMP     @#TEMP,#177400
010376  001401                    BEQ     .+4
010400  104000                    HLT
010402  104400                    SCOPE

010404  012737  177777  016644    MOV     #-1,@#TEMP
010412  012700  000010            MOV     #+10,%0
010416  105260  016634            INCB    C(0)
010422  105737  016644            TSTB    @#TEMP
010426  001401                    BEQ     .+4
010430  104000                    HLT
010432  104400                    SCOPE

010434  012737  000001  016644    MOV     #1,@#TEMP
```

```
010442  012700  177770          MOV     #-10,%0
010446  105360  016654          DECB    D(0)
010452  105737  016644          TSTB    @#TEMP
010456  001401                  BEQ     .+4
010460  104000                  HLT
010462  104400                  SCOPE

010464  012737  000001  016644  MOV     #1,@#TEMP
010472  012700  000010          MOV     #10,%0
010476  105360  016634          DECB    C(0)
010502  105737  016644          TSTB    @#TEMP
010506  001401                  BEQ     .+4
010510  104000                  HLT
010512  104400                  SCOPE

010514  012737  000001  016644  MOV     #1,@#TEMP
010522  012700  177770          MOV     #-10,%0
010526  105460  016654          NEGB    D(0)
010532  023727  016644  000377  CMP     @#TEMP,#377
010540  001401                  BEQ     .+4
010542  104000                  HLT
010544  104400                  SCOPE

010546  012737  000001  016644  MOV     #1,@#TEMP
010554  012700  000010          MOV     #+10,%0
010560  105460  016634          NEGB    C(0)
010564  023727  016644  000377  CMP     @#TEMP,#377
010572  001401                  BEQ     .+4
010574  104000                  HLT
010576  104400                  SCOPE

010600  012737  177777  016644  MOV     #-1,@#TEMP
010606  012700  177770          MOV     #-10,%0
010612  000261                  SEC
010614  105560  016654          ADCB    D(0)
010620  023727  016644  177400  CMP     @#TEMP,#177400
010626  001401                  BEQ     .+4
010630  104000                  HLT
010632  104400                  SCOPE

010634  012737  177777  016644  MOV     #-1,@#TEMP
010642  012700  000010          MOV     #+10,%0
010646  000261                  SEC
010650  105560  016634          ADCB    C(0)
010654  023727  016644  177400  CMP     @#TEMP,#177400
010662  001401                  BEQ     .+4
010664  104000                  HLT
010666  104400                  SCOPE


010670  012737  000401  016644  MOV     #401,@#TEMP
010676  012700  177771          MOV     #-7,%0
010702  000261                  SEC
010704  105660  016654          SBCB    D(0)
010710  022737  000001  016644  CMP     #1,@#TEMP
```

```
010716  001401                          BEQ     .+4
010720  104000                          HLT
010722  104400                          SCOPE

010724  012737  000001  016644          MOV     #1,@#TEMP
010732  012720  000010                  MOV     #.+10,(0)
010736  000261                          SEC
010740  105660  016634                  SBCB    C(0)
010744  005737  016644                  TST     @#TEMP
010750  001401                          BEQ     .+4
010752  104000                          HLT
010754  104400                          SCOPE


                                ;TEST INDIRECT ADDRESSING
                                ;TEST COMPARE INSTRUCTION
010756  123727  016612  000252          CMPB    @#B,#000252
010764  001401                          BEQ     .+4
010766  104000                          HLT
010770  104400                          SCOPE

010772  123727  016613  000252          CMPB    @#B+1,#252
011000  001401                          BEQ     .+4
011002  104000                          HLT
011004  104400                          SCOPE


011006  122737  125252  016612          CMPB    #125252,@#B
011014  001401                          BEQ     .+4
011016  104000                          HLT
011020  104400                          SCOPE

011022  123737  016612  016612          CMPB    @#B,@#B
011030  001401                          BEQ     .+4
011032  104000                          HLT
011034  104400                          SCOPE

                                ;TEST MOVE INSTRUCTIONS
011036  113700  016612                  MOVB    @#B,(0)
011042  122700  000252                  CMPB    #000252,(0)
011046  001401                          BEQ     .+4
011050  104000                          HLT
011052  104400                          SCOPE

011054  112737  125252  016644          MOVB    #125252,@#TEMP
011062  126737  005524  016644          CMPB    B,@#TEMP
011070  001401                          BEQ     .+4
011072  104000                          HLT
011074  104400                          SCOPE

011076  113737  016612  016634          MOVB    @#B,@#C
011104  126737  005502  016634          CMPB    B,@#C
011112  001401                          BEQ     .+4
011114  104000                          HLT
011116  104400                          SCOPE
```

```
                                ;TEST UNARYS INDIRECT
011120  012737  177777  016644           MOV     #-1,@#TEMP
011126  105037  016644                   CLRB    @#TEMP
011132  023727  016644  177400           CMP     @#TEMP,#177400
011140  001421                           BEQ     .+4
011142  104000                           HLT
011144  104400                           SCOPE

011146  012737  125252  016644           MOV     #125252,@#TEMP
011154  105137  016644                   COMB    @#TEMP
011160  022737  125125  016644           CMP     #125125,@#TEMP
011166  001401                           BEQ     .+4
011170  104000                           HLT
011172  104400                           SCOPE

011174  012737  125252  016644           MOV     #125252,@#TEMP
011202  105137  016645                   COMB    @#TEMP+1
011206  022737  052652  016644           CMP     #052652,@#TEMP
011214  001401                           BEQ     .+4
011216  104000                           HLT
011220  104400                           SCOPE

011222  005037  016644                   CLR     @#TEMP
011226  105237  016645                   INCB    @#TEMP+1
011232  022737  000400  016644           CMP     #400,@#TEMP
011240  001401                           BEQ     .+4
011242  104000                           HLT
011244  104400                           SCOPE

011246  005037  016644                   CLR     @#TEMP
011252  105377  005370                   DECB    @TEMP+2
011256  023727  016644  000377           CMP     @#TEMP,#377
011264  001401                           BEQ     .+4
011266  104000                           HLT
011270  104400                           SCOPE

011272  005037  016644                   CLR     @#TEMP
011276  112737  000001  016645           MOVB    #1,@#TEMP+1
011304  105437  016645                   NEGB    @#TEMP+1
011310  022737  177400  016644           CMP     #177400,@#TEMP
011316  001401                           BEQ     .+4
011320  104000                           HLT
011322  104400                           SCOPE

                                ;TEST INDIRECT ADDRESSING WITH INDEXING
                                ;TEST COMPARE INSTRUCTION
011324  127727  005264  125252           CMPB    @B+2,#125252
011332  001401                           BEQ     .+4
011334  104000                           HLT
011336  104400                           SCOPE

011340  122777  125252  005246           CMPB    #125252,@B+2
011346  001401                           BEQ     .+4
011350  104000                           HLT
```

```
011352  104400                          SCOPE

011354  127777  005234  005232          CMPB    @B+2,@B+2
011362  001401                          BEQ     .+4
011364  104000                          HLT
011366  104400                          SCOPE

                                ;TEST MOVE INSTRUCTIONS
011370  117700  005220                  MOVB    @B+2,%0
011374  122700  125252                  CMPB    #125252,%0
011400  001401                          BEQ     .+4
011402  104000                          HLT
011404  104400                          SCOPE

011406  112777  125252  005232          MOVB    #125252,@TEMP+2
011414  126737  005172  016644          CMPB    B,@#TEMP
011422  001401                          BEQ     .+4
011424  104000                          HLT
011426  104400                          SCOPE

011430  117777  005160  005200          MOVB    @B+2,@C+2
011436  126737  005150  016634          CMPB    B,@#C
011444  001401                          BEQ     .+4
011446  104000                          HLT
011450  104400                          SCOPE

                                ;TEST BIC INSTRUCTION INDIRECT WITH INDEXING
011452  012700  177777                  MOV     #-1,%0
011456  147700  005132                  BICB    @B+2,%0
011462  120027  052525                  CMPB    %0,#52525
011466  001401                          BEQ     .+4
011470  104000                          HLT
011472  104400                          SCOPE

011474  012737  177777  016644          MOV     #-1,@#TEMP
011502  142777  125252  005136          BICB    #125252,@TEMP+2
011510  122737  052525  016644          CMPB    #52525,@#TEMP
011516  001401                          BEQ     .+4
011520  104000                          HLT
011522  104400                          SCOPE

011524  012737  177777  016634          MOV     #-1,@#C
011532  147777  005056  005076          BICB    @B+2,@C+2
011540  126737  005066  016634          CMPB    A+10,@#C
011546  001401                          BEQ     .+4
011550  104000                          HLT
011552  104400                          SCOPE

                                ;TEST UNARYS INDIRECT WITH INDEXING
011554  012737  177777  016644          MOV     #-1,@#TEMP
011562  105077  005060                  CLRB    @TEMP+2
011566  105737  016644                  TSTB    @#TEMP
011572  001401                          BEQ     .+4
011574  104000                          HLT
011576  104400                          SCOPE
```

```
011600  012737  125252  016644          MOV     #125252,@#TEMP
011606  105177  005034                  COMB    @TEMP+2
011612  122737  052525  016644          CMPB    #052525,@#TEMP
011620  001401                          BEQ     .+4
011622  104000                          HLT
011624  104400                          SCOPE

011626  005037  016644                  CLR     @#TEMP
011632  105277  005010                  INCB    @TEMP+2
011636  122737  000001  016644          CMPB    #1,@#TEMP
011644  001401                          BEQ     .+4
011646  104000                          HLT
011650  104400                          SCOPE

011652  005037  016644                  CLR     @#TEMP
011656  105377  004764                  DECB    @TEMP+2
011662  123727  016644  177777          CMPB    @#TEMP,#-1
011670  001401                          BEQ     .+4
011672  104000                          HLT
011674  104400                          SCOPE

011676  012737  000001  016644          MOV     #1,@#TEMP
011704  105477  004736                  NEGB    @TEMP+2
011710  122737  177777  016644          CMPB    #-1,@#TEMP
011716  001401                          BEQ     .+4
011720  104000                          HLT
011722  104400                          SCOPE


011724  012737  177777  016644          MOV     #-1,@#TEMP
011732  000261                          SEC
011734  105577  004706                  ADCB    @TEMP+2
011740  022737  177400  016644          CMP     #177400,@#TEMP
011746  001401                          BEQ     .+4
011750  104000                          HLT
011752  105737  016644                  TSTB    @#TEMP
011756  001401                          BEQ     .+4
011760  104000                          HLT
011762  104400                          SCOPE

011764  012737  000001  016644          MOV     #1,@#TEMP
011772  000261                          SEC
011774  105377  004646                  DECB    @TEMP+2
012000  005737  016644                  TST     @#TEMP
012004  001401                          BEQ     .+4
012006  104000                          HLT
012010  104400                          SCOPE

                                ;TEST OF COMBINED INDEXING AND INDIRECT
012012  012700  177772                  MOV     #-6,%0
012016  127027  016622  125252          CMPB    @A(0),#125252
012024  001401                          BEQ     .+4
012026  104000                          HLT
012030  104400                          SCOPE
```

```
012032  012700  177772                MOV     #-6,%0
012036  122770  125252  016622        CMPB    #125252,@A(0)
012044  001401                        BEQ     .+4
012046  104000                        HLT
012050  104400                        SCOPE

012052  012700  177772                MOV     #-6,%0
012056  012701  000002                MOV     #+2,%1
012062  127071  016622  016622        CMPB    @A(0),@A(1)
012070  001401                        BEQ     .+4
012072  104000                        HLT
012074  104400                        SCOPE

                        ;TEST BIC INSTRUCTION
012076  012700  000006                MOV     #+6,%0
012102  012767  177777  004534        MOV     #-1,TEMP
012110  147067  016622  004526        BICB    @A(0),TEMP
012116  122767  125252  004520        CMPB    #125252,TEMP
012124  001401                        BEQ     .+4
012126  104000                        HLT
012130  104400                        SCOPE

012132  012700  177772                MOV     #-6,%0
012136  012737  177777  016634        MOV     #-1,@#C
012144  142770  125252  016644        BICB    #125252,@TEMP(0)
012152  123727  016634  000125        CMPB    @#C,#000125
012160  001401                        BEQ     .+4
012162  104000                        HLT
012164  104400                        SCOPE

012166  012700  016614                MOV     #B+2,%0         ;ADDRESS OF ADDRESS OF B
012172  023067  004414                CMP     @(0)+,B
012176  001401                        BEQ     .+4
012200  104000                        HLT
012202  104400                        SCOPE

012204  012700  016616                MOV     #B+4,%0
012210  025067  004376                CMP     @-(0),B
012214  001401                        BEQ     .+4
012216  104000                        HLT
012220  104400                        SCOPE

012222  012700  016616                MOV     #B+4,%0
012226  125067  004360                CMPB    @-(0),B
012232  001401                        BEQ     .+4
012234  104000                        HLT
012236  104400                        SCOPE

012240  012700  016640                MOV     #C+4,%0
012244  012737  177777  016634        MOV     #-1,@#C
012252  105050                        CLRB    @-(0)
012254  023727  016634  177400        CMP     @#C,#177400
012262  001401                        BEQ     .+4
012264  104000                        HLT
```

```
012266  104400                          SCOPE

012270  012737  177777  016634          MOV     #-1,@#C
012276  012700  177772                  MOV     #-6,%0
012302  012701  177772                  MOV     #-6,%1
012306  147071  016622  016644          BICB    @A(0),@TEMP(1)
012314  022737  177525  016634          CMP     #177525,@#C
012322  001401                          BEQ     .+4
012324  104000                          HLT
012326  104400                          SCOPE
                                ;TEST THAT R0 IS NOT DESTROYED BY FALSE SELECTION
012330  012700  052525                  MOV     #52525,%0       ;THIS IS CHECK LATER IN PROGRAM
                                ;TEST JSR INSTRUCTION

012334  004767  000002                  JSR     %7, TJSR2       ;PLACE PC ON STACK
012340  000405                  TJSR1:  BR      TJSR3           ;RETURN HERE ON RTS %19
012342  121627  012340          TJSR2:  CMPB    @%6,#TJSR1      ;CHECK FOR CORRECT PC ON STACK
012346  001401                          BEQ     .+4
012350  104000                          HLT                     ;INCORRECT PC ON STACK
012352  000207                          RTS     %7              ;RETURN TO IMST AFTER JSR
012354  104400                  TJSR3:  SCOPE

012356  000257                          CCC
012360  004717                          JSR     %7,@%7          ;INSTRUCTION UNDER TEST
012362  121627  012362                  CMPB    @%6,#TJSR3+6            ;TEST THE STACK
012366  001401                          BEQ     .+4
012370  104000                          HLT                     ;PC OF JSR DID NOT GO TO STACK
012372  005726                          TST     (6)+            ;REPOSITION THE STACK
012374  104400                          SCOPE
                                ;TEST NESTED SUBROUTINES

012376  000257                          CCC                     ;CLEAR CONDITION CODES
012400  004767  004052                  JSR     %7,SUBR6
012404  100401                          BMI     .+4
012406  104000                          HLT                     ;JSR OR RTS FAILED
012410  001401                          BEQ     .+4
012412  104000                          HLT                     ;JSR OR RTS FAILED
012414  102401                          BVS     .+4
012416  104000                          HLT                     ;JSR OR RTS FAILED
012420  103401                          BCS     .+4
012422  104000                          HLT                     ;JSR OR RTS FAILED
012424  104400                          SCOPE
                                ;TEST ROTATE ODD BYTE
012426  104400                          SCOPE
012430  000257                          CCC                             ;CLEAR "C"
012432  012767  123456  004204          MOV     #123456,TEMP
012440  106067  004201                  RORB    TEMP+1                  ;ROTATE ODD BYTE
012444  103401                          BCS     .+4
012446  104000                          HLT                             ;C NOT SET
012450  102401                          BVS     .+4
012452  104000                          HLT                             ;V NOT SET
012454  022767  051456  004162          CMP     #051456,TEMP
012462  001401                          BEQ     .+4
012464  104000                          HLT                             ;ROTATE FAILED
012466  104400                          SCOPE
```

```
012470  000277                          SCC                             ;SET C
012472  012767  123456  004144          MOV     #123456,TEMP
012500  106067  004141                  RORB    TEMP+1
012504  103401                          BCS     .+4
012506  104000                          HLT                             ;C NOT SET
012510  102001                          BVC     .+4
012512  104000                          HLT                             ;V NOT CLEARED
012514  022767  151456  004122          CMP     #151456,TEMP
012522  001401                          BEQ     .+4
012524  104000                          HLT                             ;ROTATE FAILED
012526  104400                          SCOPE

012530  000257                          CCC
012532  012767  123456  004104          MOV     #123456,TEMP
012540  106167  004101                  ROLB    TEMP+1
012544  103401                          BCS     .+4
012546  104000                          HLT                             ;C NOT SET
012550  102401                          BVS     .+4
012552  104000                          HLT                             ;V NOT SET
012554  022767  047056  004062          CMP     #047056,TEMP
012562  001401                          BEQ     .+4
012564  104000                          HLT                             ;ROTATE BYTE FAILED
012566  104400                          SCOPE

012570  000277                          SCC                             ;SET C
012572  012767  123456  004044          MOV     #123456,TEMP
012600  106167  004041                  ROLB    TEMP+1
012604  103401                          BCS     .+4
012606  104000                          HLT                             ;C NOT SET
012610  102401                          BVS     .+4
012612  104000                          HLT                             ;V NOT SET
012614  022767  047456  004022          CMP     #047456,TEMP
012622  001401                          BEQ     .+4
012624  104000                          HLT                             ;ROTATE ODD BYTE FAILED
012626  104400                          SCOPE

012630  000257                          CCC                             ;CLEAR C
012632  012767  177777  004004          MOV     #-1,TEMP
012640  106267  004001                  ASRB    TEMP+1
012644  103401                          BCS     .+4
012646  104000                          HLT                             ;C NOT SET
012650  102001                          BVC     .+4
012652  104000                          HLT                             ;V NOT CLEARED
012654  026727  003764  177777          CMP     TEMP,#-1
012662  001401                          BEQ     .+4
012664  104000                          HLT                             ;SHIFT FAILED
012666  104400                          SCOPE

012670  000277                          SCC
012672  012767  177777  003744          MOV     #-1,TEMP
012700  106367  003741                  ASLB    TEMP+1
012704  103401                          BCS     .+4
012706  104000                          HLT                             ;C NOT SET
012710  102001                          BVC     .+4
```

```
012712  104000                          HLT                             ;V NOT CLEARED
012714  026727  003724  177377          CMP     TEMP,#177377
012722  001401                          BEQ     .+4
012724  104000                          HLT                             ;SHIFT BYTE FAILED
012726  104400                          SCOPE

                                ;TEST COMBINATION OF N, C AND V
                                        .MACR   TNCV
                                        BPL     .+12
                                        BCC     .+20                    ;Z=1
                                        BVC     .+30                    ;Z=1, C=1
                                        HLT                             ;Z=C, BUT V=1
                                        BR      .+24
                                        BCC     .+16                    ;Z=0
                                        BVS     .+20                    ;Z=0, C=1
                                        HLT                             ;Z NOT EQUAL C, V=1
                                        BR      .+14
                                        BVS     .+12                    ;Z=1, C=0
                                        HLT                             ;Z NOT EQUAL C, V=1
                                        BR      .+6
                                        BVC     .+4                     ;Z=0, C=0
                                        HLT                             ;Z=C, BUT V=1
                                        SCOPE
                                        .ENDM
012730  005037  016420                  CLR     @#ICOUNT                        ;NO ITERATION
                                ;TEST ALL COMBINATIONS OF NUMBERS WITH COMPARE INSTRUCTION
012734  005000                  COMPAR: CLR     %0                      ;INIT %0
012736  005001                          CLR     %1                      ;INIT %1
012740  020001                  CMP1:   CMP     %0,%1                   ;ARE THE EQUAL
012742  001401                          BEQ     .+4
012744  104000                          HLT                             ;R0 AND R1 DID NOT COMPARE
012746  020027  177777                  CMP     %0,#-1                  ;AT UPPER LIMIT
012752  001403                          BEQ     CMP2                    ;YES EXIT
012754  005200                          INC     %0                      ;INCREMENT TO NEXT NUMBER
012756  005201                          INC     %1
012760  000767                          BR      CMP1
012762  104400                  CMP2:   SCOPE

                                ;TEST ROTATING ALL NUMBERS
012764  104400                          SCOPE
012766  012767  177777  000132          MOV     #-1,REFF                ;INITIALIZE BASE NUMBER
012774  005267  000126          TSROT:  INC     REFF                    ;INCREMENT NUMBER
013000  004767  000012                  JSR     %7,ROTALL               ;GO TO COMPARE ROUTINE
013004  026727  000116  177777          CMP     REFF,#-1                ;TEST ALL VALUES
013012  001370                          BNE     TSROT                   ;NO TEST THEM ALL
013014  000446                          BR      TSRT2A                  ;WE ARE DONE

013016  016767  000104  000104  ROTALL: MOV     REFF,TEST
013024  006067  000120                  ROR     TEST
013030  006067  000074                  ROR     TEST
013034  006067  000070                  ROR     TEST
013040  006167  000064                  ROL     TEST
013044  006167  000060                  ROL     TEST
013050  006167  000054                  ROL     TEST
                                        TNCV
```

```
013054  100004                          BPL     .+12
013056  103007                          BCC     .+20                    ;Z=1
013060  102013                          BVC     .+30                    ;Z=1, C=1
013062  104000                          HLT                             ;Z=C, BUT V=1
013064  000411                          BR      .+24
013066  103006                          BCC     .+16                    ;Z=0
013070  102407                          BVS     .+20                    ;Z=0, C=1
013072  104000                          HLT                             ;Z NOT EQUAL C, V=1
013074  000405                          BR      .+14
013076  102404                          BVS     .+12                    ;Z=1, C=0
013100  104000                          HLT                             ;Z NOT EQUAL C, V=1
013102  000402                          BR      .+6
013104  102001                          BVC     .+4                     ;Z=0, C=0
013106  104000                          HLT                             ;Z=C, BUT V=1
013110  104400                          SCOPE
013112  026767  000012  000006         CMP     TEST,REFF
013120  001401                          BEQ     .+4
013122  104000                          HLT                             ;INITIAL NOT EQUAL TO FINAL
013124  000207                          RTS     %7
013126  000000                  REFF:   0
013130  000000                  TEST:   0

        013126                          REF=REFF
                                ;TEST ROTATING BYTE EVEN/ODD, ALL NUMBERS
013132  012767  177777  177766 TSRT2A: MOV     #-1,REFF
013140  005267  177762         TSROT2: INC     REFF
013144  004767  000016                 JSR     %7,ROTBE
013150  004767  000122                 JSR     %7,ROTBO
013154  022767  177777  177744         CMP     #-1,REFF
013162  001366                          BNE     TSROT2
013164  000505                          BR      ROTEN1
013166  016767  177734  177734 ROTBE:  MOV     REFF,TEST
013174  106067  177730                 RORB    TEST                    ;ROTATE BYTE EVEN
013200  106067  177724                 RORB    TEST
013204  106067  177720                 RORB    TEST
013210  106167  177714                 ROLB    TEST
013214  106167  177710                 ROLB    TEST
013220  106167  177704                 ROLB    TEST
                                        TNCV
013224  100004                          BPL     .+12
013226  103007                          BCC     .+20                    ;Z=1
013230  102013                          BVC     .+30                    ;Z=1, C=1
013232  104000                          HLT                             ;Z=C, BUT V=1
013234  000411                          BR      .+24
013236  103006                          BCC     .+16                    ;Z=0
013240  102407                          BVS     .+20                    ;Z=0, C=1
013242  104000                          HLT                             ;Z NOT EQUAL C, V=1
013244  000405                          BR      .+14
013246  102404                          BVS     .+12                    ;Z=1, C=0
013250  104000                          HLT                             ;Z NOT EQUAL C, V=1
013252  000402                          BR      .+6
013254  102001                          BVC     .+4                     ;Z=0, C=0
013256  104000                          HLT                             ;Z=C, BUT V=1
013260  104400                          SCOPE
013262  026767  177642  177636         CMP     TEST,REFF
```

```
013270  001401                        BEQ     .+4
013272  104000                        HLT
013274  000207                        RTS     %7
013276  106067  177627        ROTBO:  RORB    TEST+1                  ;ROTATE BYTE ODD
013302  106067  177623                RORB    TEST+1
013306  106067  177617                RORB    TEST+1
013312  106167  177613                ROLB    TEST+1
013316  106167  177607                ROLB    TEST+1
013322  106167  177603                ROLB    TEST+1
                                      TNCV
013326  100004                        BPL     .+12
013330  103007                        BCC     .+20                    ;Z=1
013332  102013                        BVC     .+30                    ;Z=1, C=1
013334  104000                        HLT                             ;Z=C, BUT V=1
013336  000411                        BR      .+24
013340  103006                        BCC     .+16                    ;Z=0
013342  102407                        BVS     .+20                    ;Z=0, C=1
013344  104000                        HLT                             ;Z NOT EQUAL C, V=1
013346  000405                        BR      .+14
013350  102404                        BVS     .+12                    ;Z=1, C=0
013352  104000                        HLT                             ;Z NOT EQUAL C, V=1
013354  000402                        BR      .+6
013356  102001                        BVC     .+4                     ;Z=0, C=0
013360  104000                        HLT                             ;Z=C, BUT V=1
013362  104400                        SCOPE
013364  026767  177540  177534        CMP     TEST,REFF
013372  001401                        BEQ     .+4
013374  104000                        HLT
013376  000207                        RTS     %7
013400  104400                ROTEN1: SCOPE

                                      ;ADD AND SUBTRACT ALL NUMBERS AGAINST FIXED NUMBERS
                                      ;A+B=C, C-A=B, BF SHOULD EQUAL BI
013402  011667  000072        TSTARI: MOV     @%6,NUMA
013406  012767  000001  177512        MOV     #1,REF
013414  005267  177506        ARITST: INC     REF
013420  004767  000014                JSR     %7,ADSUB
013424  022767  177777  177474        CMP     #-1,REFF
013432  001370                        BNE     ARITST
013434  000422                        BR      ARIEND
013436  104400                        SCOPE
013440  016767  177462  177462  ADSUB:  MOV     REF,TEST
013446  066767  000026  177454        ADD     NUMA,TEST
013454  166767  000020  177446        SUB     NUMA,TEST
013462  026767  177440  177440        CMP     REF,TEST
013470  001401                        BEQ     .+4
013472  104000                        HLT
013474  104400                        SCOPE
013476  000207                        RTS     %7
013500  000000                NUMA:   0
013502  104400                ARIEND: SCOPE

                                      ;TEST COMPLIMENTING ALL NUMBERS
013504  005067  003134                CLR     TEMP            ;BASE DATA
013510  005067  003134                CLR     TEMP+4          ;BASE REFERENCE
```

```
013[illegible] 005167 003124          TCOM:   COM     TEMP            ;COMPLIMENT DATA
013520 005367 003124                  DEC     TEMP+4          ;DECREMENT REFERENCE
013524 026767 003114  003116          CMP     TEMP,TEMP+4     ;COMPARE
013532 001401                         BEQ     .+4             ;TEST
013534 104000                         HLT                     ;COMPLIMENT OR DECREMENT FAILED
013536 005167 [illegible]             COM     TEMP
013542 005267 [illegible]             INC     TEMP            ;INCREMENT AND TEST FOR DONE
013546 001362                         BNE     TCOM            ;NOT FINISHED GO LOOP
013550 104400                         SCOPE

                                      ;TEST COMB (EVEN BYTE)
013552 005067 003066                  CLR     TEMP            ;BASE DATA
013556 005067 003066                  CLR     TEMP+4          ;REFERENCE DATA
013562 105167 003056          TCOM2:  COMB    TEMP
013566 005367 003056                  DEC     TEMP+4
013572 126767 003046  003050          CMPB    TEMP,TEMP+4     ;COMPARE
013600 001401                         BEQ     .+4
013602 104000                         HLT                     ;COMPLIMENT OR INCREMENT BYTE FAILED
013604 105167 003034                  COMB    TEMP
013610 105267 003030                  INCB    TEMP
013614 001362                         BNE     TCOM2
013616 104400                         SCOPE

                                      ;TEST COMB (ODD BYTE)
013620 005067 003020                  CLR     TEMP            ;BASE DATA
013624 005067 003020                  CLR     TEMP+4          ;REFERENCE DATA
013630 105167 003011          TCOM3:  COMB    TEMP+1          ;ODD BYTE
013634 005367 003010                  DEC     TEMP+4
013640 126767 003001  003002          CMPB    TEMP+1,TEMP+4
013646 001401                         BEQ     .+4
013650 104000                         HLT                     ;COMPLIMENT BYTE FAILED
013652 105167 002767                  COMB    TEMP+1
013656 105267 002763                  INCB    TEMP+1
013662 001362                         BNE     TCOM3
013664 104400                         SCOPE

                                      ;TEST COMPARE ALL VALUE EVEN BYTE WITH ODD
013666 005067 002752                  CLR     TEMP            ;BASE VALUE
013672 126767 002746  002745  TSCOMB: CMPB    TEMP,TEMP+1     ;COMPARE
013700 001401                         BEQ     .+4
013702 104000                         HLT                     ;COMPARE FAILED
013704 002001                         BGE     .+4
013706 104000                         HLT                     ;V IS NOT = TO N
013710 003401                         BLE     .+4
013712 104000                         HLT                     ;V IS SET
013714 062767 000401  002722          ADD     #401,TEMP
013722 022767 177777  002714          CMP     #-1,TEMP
013730 001360                         BNE     TSCOMB
013732 104400                         SCOPE
013734 012737 004000  016420          MOV     #4000,@#ICOUNT
013742 052737 000340  177776          BIS     #340,@#STATUS
013750 042737 000340  177776          BIC     #340,@#STATUS
013756 052737 000300  177776          BIS     #300,@#STATUS
013764 042737 000300  177776          BIC     #300,@#STATUS
013772 052737 000240  177776          BIS     #240,@#STATUS
```

```
014000  042737  000240  177776          BIC     #240,@#STATUS
014006  052737  000200  177776          BIS     #200,@#STATUS
014014  042737  000200  177776          BIC     #200,@#STATUS
014022  052737  000140  177776          BIS     #140,@#STATUS
014030  042737  000140  177776          BIC     #140,@#STATUS
014036  052737  000100  177776          BIS     #100,@#STATUS
014044  042737  000100  177776          BIC     #100,@#STATUS
014052  052737  000040  177776          BIS     #40,@#STATUS
014060  042737  000040  177776          BIC     #40,@#STATUS
014066  104400                          SCOPE

                                ;TEST THAT A WAIT INSTRUCTION IS TERMINATED BY A
                                ;TRACE TRAP

014070  032737  000020  177776          BIT     #20,@#STATUS    ;TEST OF TRACE BIT
014076  001404                          BEQ     WAIT3           ;BRANCH IF NOT FOUND
014100  000001                          WAIT                    ;TRACE SHOULD PASS US
014102  000001                          WAIT                    ;THROUGH THE WAIT INSTRUCTION
014104  000001                          WAIT
014106  000001                          WAIT
014110  104400                  WAIT3:  SCOPE
014112  012737  000010  016420          MOV     #10,@#ICOUNT

                                ;TEST TO SEE IF I/O DEVICES WERE SELECTED
014120  123727  001224  000377          CMPB    @#REG1,#377     ;SELECTED DEVICES STORED IN REG1
014126  001404                          BEQ     WAIT4           ;BRANCH IF NO DEVICES SELECTED
014130  000001                          WAIT                    ;INTERRUPTS WILL OCCUR
014132  000001                          WAIT                    ;IF DEVICES ARE SELECTED
014134  000001                          WAIT
014136  000001                          WAIT
014140  104400                  WAIT4:  SCOPE
014142  012737  004000  016420          MOV     #4000,@#ICOUNT

                                ;TEST SWAB
014150  012767  000200  176752          MOV     #0200,TEST
014156  000367  176746                  SWAB    TEST
014162  100001                          BPL     .+4
014164  104000                          HLT
014166  001401                          BEQ     .+4
014170  104000                          HLT
014172  000367  176732                  SWAB    TEST
014176  100401                          BMI     .+4
014200  104000                          HLT
014202  001001                          BNE     .+4
014204  104000                          HLT
014206  104400                          SCOPE
014210  005037  016420                  CLR     @#ICOUNT

                                ;TEST ALL COMBINATIONS OF SWAB
014214  005067  176710                  CLR     TEST            ;NUMBER UNDER TEST
014220  005067  176702                  CLR     REF             ;REFERENCE NUMBER
014224  000367  176700          SWABA:  SWAB    TEST            ;OPERATION UNDER TEST
014230  026767  176674  176670          CMP     TEST,REF        ;TEST SWAB INSTRUCTION
014236  001401                          BEQ     .+4
014240  104000                          HLT                     ;SWAB FAILED
```

```
014   000367  176662                  SWAB    TEST
014246  005267  176654                  INC     REF                     ;INCREMENT REFERENCE NUMBER
014252  105267  176653                  INCB    TEST+1                  ;INC TEST NUMBER
014256  001362                          BNE     SWABA                   ;LOOP TILL DONE
014260  104400                          SCOPE
014262  012737  004000  016420          MOV     #4000,@#ICOUNT

        000240                  NOP=240
        177776                  CC=177776

                                ;MACRO FOR TESTING CONDITION CODES

                                        .MACR   TSCC
                                        BMI     .+4
                                        HLT                             ;N IS NOT SET
                                        BVS     .+4
                                        HLT                             ;V IS NOT SET
                                        BCS     .+4
                                        HLT                             ;C IS NOT SET
                                        BEQ     .+4
                                        HLT                             ;Z IS NOT SET
                                        SCOPE
                                        .ENDM

                                        .MACR   TCCC
                                        BPL     .+4
                                        HLT                             ;N IS NOT CLEARED
                                        BVC     .+4
                                        HLT                             ;V IS NOT CLEARED
                                        BCC     .+4
                                        HLT                             ;C IS NOT CLEARED
                                        BNE     .+4
                                        HLT                             ;Z IS NOT CLEARED
                                        SCOPE
                                        .ENDM

                                ;TEST MOV

014270  012737  000017  177776  CCT1:   MOV     #17,@#CC
                                        TSCC
014276  100401                          BMI     .+4
014300  104000                          HLT                             ;N IS NOT SET
014302  102401                          BVS     .+4
014304  104000                          HLT                             ;V IS NOT SET
014306  103401                          BCS     .+4
014310  104000                          HLT                             ;C IS NOT SET
014312  001401                          BEQ     .+4
014314  104000                          HLT                             ;Z IS NOT SET
014316  104400                          SCOPE

014320  012737  000000  177776          MOV     #0,@#CC
                                        TCCC
014326  100001                          BPL     .+4
014330  104000                          HLT                             ;N IS NOT CLEARED
014332  102001                          BVC     .+4
```

```
014334  104000                          HLT                     ;V IS NOT CLEARED
014336  103001                          BCC     .+4
014340  104000                          HLT                     ;C IS NOT CLEARED
014342  001001                          BNE     .+4
014344  104000                          HLT                     ;Z IS NOT CLEARED
014346  104400                          SCOPE

014350  000257                          CCC
014352  062737  000017  177776          ADD     #17,@#CC
                                        TSCC
014360  100401                          BMI     .+4
014362  104000                          HLT                     ;N IS NOT SET
014364  102401                          BVS     .+4
014366  104000                          HLT                     ;V IS NOT SET
014370  103401                          BCS     .+4
014372  104000                          HLT                     ;C IS NOT SET
014374  001401                          BEQ     .+4
014376  104000                          HLT                     ;Z IS NOT SET
014400  104400                          SCOPE

014402  000277                          SCC
014404  162737  000017  177776          SUB     #17,@#CC
                                        TCCC
014412  100001                          BPL     .+4
014414  104000                          HLT                     ;N IS NOT CLEARED
014416  102001                          BVC     .+4
014420  104000                          HLT                     ;V IS NOT CLEARED
014422  103001                          BCC     .+4
014424  104000                          HLT                     ;C IS NOT CLEARED
014426  001001                          BNE     .+4
014430  104000                          HLT                     ;Z IS NOT CLEARED
014432  104400                          SCOPE

014434  000257                          CCC
014436  162737  177761  177776          SUB     #-17,@#CC
                                        TSCC
014444  100401                          BMI     .+4
014446  104000                          HLT                     ;N IS NOT SET
014450  102401                          BVS     .+4
014452  104000                          HLT                     ;V IS NOT SET
014454  103401                          BCS     .+4
014456  104000                          HLT                     ;C IS NOT SET
014460  001401                          BEQ     .+4
014462  104000                          HLT                     ;Z IS NOT SET
014464  104400                          SCOPE

014466  000277                          SCC
014470  042737  000000  177776          BIC     #0,@#CC
                                        TSCC
014476  100401                          BMI     .+4
014500  104000                          HLT                     ;N IS NOT SET
014502  102401                          BVS     .+4
014504  104000                          HLT                     ;V IS NOT SET
014506  103401                          BCS     .+4
014510  104000                          HLT                     ;C IS NOT SET
```

```
014512  001401                          BEQ     .+4
014514  104000                          HLT                     ;Z IS NOT SET
014516  104400                          SCOPE

014520  000277                          SCC
014522  042737  177757  177776          BIC     #177757,@#CC
                                        TCCC
014530  100001                          BPL     .+4
014532  104000                          HLT                     ;N IS NOT CLEARED
014534  102001                          BVC     .+4
014536  104000                          HLT                     ;V IS NOT CLEARED
014540  103001                          BCC     .+4
014542  104000                          HLT                     ;C IS NOT CLEARED
014544  001001                          BNE     .+4
014546  104000                          HLT                     ;Z IS NOT CLEARED
014550  104400                          SCOPE

014552  000257                          CCC
014554  052737  000017  177776          BIS     #17,@#CC
                                        TSCC
014562  100401                          BMI     .+4
014564  104000                          HLT                     ;N IS NOT SET
014566  102401                          BVS     .+4
014570  104000                          HLT                     ;V IS NOT SET
014572  103401                          BCS     .+4
014574  104000                          HLT                     ;C IS NOT SET
014576  001401                          BEQ     .+4
014600  104000                          HLT                     ;Z IS NOT SET
014602  104400                          SCOPE

014604  000277                          SCC
014606  052737  000000  177776          BIS     #0,@#CC
                                        TSCC
014614  100401                          BMI     .+4
014616  104000                          HLT                     ;N IS NOT SET
014620  102401                          BVS     .+4
014622  104000                          HLT                     ;V IS NOT SET
014624  103401                          BCS     .+4
014626  104000                          HLT                     ;C IS NOT SET
014630  001401                          BEQ     .+4
014632  104000                          HLT                     ;Z IS NOT SET
014634  104400                          SCOPE

014636  000277                          SCC
014640  005037  177776                  CLR     @#CC
                                        TCCC
014644  100001                          BPL     .+4
014646  104000                          HLT                     ;N IS NOT CLEARED
014650  102001                          BVC     .+4
014652  104000                          HLT                     ;V IS NOT CLEARED
014654  103001                          BCC     .+4
014656  104000                          HLT                     ;C IS NOT CLEARED
014660  001001                          BNE     .+4
014662  104000                          HLT                     ;Z IS NOT CLEARED
014664  104400                          SCOPE
```

```
014666  000257                          CCC
014670  000261                          SEC
014672  005337  177776                  DEC     @#CC
                                        TCCC
014676  100001                          BPL     .+4
014700  104000                          HLT                     ;N IS NOT CLEARED
014702  102001                          BVC     .+4
014704  104000                          HLT                     ;V IS NOT CLEARED
014706  103001                          BCC     .+4
014710  104000                          HLT                     ;C IS NOT CLEARED
014712  001001                          BNE     .+4
014714  104000                          HLT                     ;Z IS NOT CLEARED
014716  104400                          SCOPE

014720  000257                          CCC
014722  000261                          SEC
014724  005637  177776                  SBC     @#CC
                                        TCCC
014730  100001                          BPL     .+4
014732  104000                          HLT                     ;N IS NOT CLEARED
014734  102001                          BVC     .+4
014736  104000                          HLT                     ;V IS NOT CLEARED
014740  103001                          BCC     .+4
014742  104000                          HLT                     ;C IS NOT CLEARED
014744  001001                          BNE     .+4
014746  104000                          HLT                     ;Z IS NOT CLEARED
014750  104400                          SCOPE
014752  012737  177357  177776          MOV     #177357,@#STATUS
014760  013767  177776  001656          MOV     @#STATUS,TEMP
014766  026727  001652  000357          CMP     TEMP,#357
014774  001401                          BEQ     .+4
014776  104000                          HLT
015000  005037  177776                  CLR     @#STATUS
015004  104400                          SCOPE
015006  005737  015542                  TST     @#TRPB                  ;T BIT FLAG
015012  100003                          BPL     .+10
015014  052737  000020  177776          BIS     #20,@#STATUS            ;SET THE T BIT

015022  012767  177777  001614          MOV     #-1,TEMP
015030  000261                          SEC
015032  105567  001607                  ADCB    TEMP+1
015036  103401                          BCS     .+4
015040  104000                          HLT
015042  022767  000377  001574          CMP     #377,TEMP
015050  001401                          BEQ     .+4
015052  104000                          HLT
015054  104400                          SCOPE
015056  000402          EAESRT: BR      .+6                     ;NOP IF NO EAE
015060  000167  000362                  JMP     ENDEAE
                        ;TEST LEFT SHIFT
015064  104400                          SCOPE                   ;TEST OF LOGICAL SHIFT
015066  005077  163172                  CLR     @MQ             ;LOAD MQ WITH 0
015072  012777  125252  163166          MOV     #125252,@AC     ;LOAD AC WITH 125252
015100  012777  177760  163174          MOV     #-16.,@LSH      ;LOAD SHIFT COUNT (LSH) WITH -16
```

```
015106  005777  163154                TST     @AC             ;COMPARE AC WITH 0
015112  001401                        BEQ     .+4             ;GO TO HLT IF BAD
015114  104000                        HLT
015116  022777  125252  163140        CMP     #125252,@MQ     ;COMPARE MQ WITH 125252
015124  001401                        BEQ     .+4             ;GO TO HLT IF BAD
015126  104000                        HLT
015130  122777  000020  163134        CMPB    #20,@SRE                ;COMPARE SR WITH 2
015136  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
015140  104000                        HLT                     ;HALT ON ERROR (LEFT SHIFT)

                              ;TEST RIGHT SHIFT
015142  104400                        SCOPE                   ;TEST OF ARITHMETIC SHIFT
015144  005077  163114                CLR     @MQ             ;LOAD MQ WITH 0
015150  012777  177777  163110        MOV     #-1,@AC         ;LOAD AC WITH -1
015156  012777  000020  163120        MOV     #16.,@ASH       ;LOAD SHIFT COUNT (ASH) WITH 16.
015164  005777  163076                TST     @AC             ;COMPARE AC WITH 100000
015170  100401                        BMI     .+4             ;SKIP HLT IF GOOD
015172  104000                        HLT                     ;HALT ON ERROR
015174  005777  163064                TST     @MQ             ;COMPARE MQ WITH 0
015200  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
015202  104000                        HLT                     ;HALT ON ERROR
015204  122777  000110  163060        CMPB    #110,@SRE       ;COMPARE SR WITH 10
015212  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
015214  104000                        HLT                     ;HALT ON ERROR (RIGHT SHIFT)

                              ;TEST NORMALIZE
015216  104400                        SCOPE                   ;TEST OF NORMALIZE
015220  012777  125252  163036        MOV     #125252,@MQ     ;LOAD MQ WITH 125252
015226  012777  170000  163032        MOV     #170000,@AC     ;LOAD AC WITH 170000
015234  005077  163040                CLR     @NOR            ;START NORMALIZE
015240  022777  100005  163020        CMP     #100005,@AC     ;COMPARE AC WITH 100005
015246  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
015250  104000                        HLT                     ;HALT ON ERROR
015252  022777  052520  163004        CMP     #52520,@MQ      ;COMPARE MQ WITH 52520
015260  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
015262  104000                        HLT                     ;HALT ON ERROR
015264  122777  000003  162776        CMPB    #3,@SC          ;COMPARE SC WITH 3
015272  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
015274  104000                        HLT                     ;HALT ON ERROR (NORMALIZE)
                              ;TEST MULTIPLY
015276  104400                        SCOPE                   ;TEST OF MULTIPLY
015300  012777  125252  162756        MOV     #125252,@MQ     ;LOAD MQ WITH 125252
015306  012777  040000  162760        MOV     #40000,@MUL     ;LOAD MUL WITH 40000
015314  022777  165252  162744        CMP     #165252,@AC     ;COMPARE AC WITH 1652
015322  001401                        BEQ     .+4             ;SKIP IF GOOD
015324  104000                        HLT                     ;HALT ON ERROR
015326  005777  162732                TST     @MQ             ;COMPARE MQ WITH 10000
015332  100401                        BMI     .+4             ;SKIP HLT IF GOOD
015334  104000                        HLT                     ;HALT ON ERROR
015336  122777  000300  162726        CMPB    #300,@SRE       ;COMPARE SR WITH 300
015344  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
015346  104000                        HLT                     ;HALT ON ERROR (MULTIPLY)

                              ;TEST DIVIDE
015350  104400                        SCOPE                   ;TEST OF DIVIDE
```

```
015352  012777  125252  162704          MOV     #125252,@MQ     ;LOAD MQ WITH 125252
015360  012777  177777  162700          MOV     #-1,@AC         ;LOAD AC WITH -1
015366  012777  000002  162702          MOV     #2,@DIV         ;LOAD DIV WITH 2 AND DIVIDE
015374  005777  162666                  TST     @AC             ;COMPARE AC WITH 0 (QUOTIANT)
015400  001401                          BEQ     .+4             ;SKIP HLT IF GOOD
015402  104000                          HLT                     ;HALT ON ERROR
015404  022777  152525  162652          CMP     #152525,@MQ     ;COMPARE MQ WITH 152525
015412  001401                          BEQ     .+4             ;SKIP HLT IF GOOD
015414  104000                          HLT                     ;DIVIDE ERROR
015416  104400                          SCOPE

015420  012767  177777  001216          MOV     #-1,TEMP
015426  000261                          SEC
015430  105667  001211                  SBCB    TEMP+1
015434  022767  177377  001202          CMP     #177377,TEMP
015442  001401                          BEQ     .+4
015444  104000                          HLT
015446  104400                  ENDEAE: SCOPE
015450  012737  016464  000024          MOV     #PFAIL,@#24             ;POWER FAIL VECTOR
015456  012737  000340  000026          MOV     #340,@#26                       ;PROCESSOR PRIORITY

015464  000401                  SKPBEL: BR      .+4                     ;SKIP OVER BELL-NOP ON CORE EXPANSION
015466  000423                          BR      TRPA
015470  012737  000200  177776          MOV     #200,@#CC                       ;LOCK OUT TTY INTERRUPTS
015476  105777  000332                  TSTB    @TCSR                   ;WAIT FOR FLAG; MAKE SURE NOT BUSY
015502  100375                          BPL     .-4

                                ;BELL ON PASS COMPLETE
015504  012777  000207  000320  BELL:   MOV     #207,@TDBR
015512  105777  000316                  TSTB    @TCSR
015516  100375                          BPL     .-4
                                ;ROUTINE TO CHECK FOR TRACE TRAP TO BE RUN WITH PROGRAM
015520  032737  010000  177570  TRTRAP: BIT     #10000,@#SR             ;SHOULD WE RUN WITH TRACE TRAP
015526  001406                          BEQ     YESTR                   ;YES
015530  042737  000360  177776          BIC     #360,@#CC                       ;CLEAR TRACE TRAP
015536  000137  003750          TRPA:   JMP     @#BEGIN                 ;START OF TEST WITH TRACE OFF
015542  000000          TRPB:   0

                                ;SAVE OLD CONTENTS, SET UP FOR TRACE TRAP
015544  012737  015610  000014  YESTR:  MOV     #YESRT,@#14             ;NEW TRAP VECTOR
015552  005037  000016                  CLR     @#16                    ;NEW CONDITION CODES
015556  042737  000360  177776          BIC     #360,@#CC
015564  005137  015542                  COM     @#TRPB
015570  100003                          BPL     .+10
015572  052737  000020  177776          BIS     #20,@#CC                        ;SET TRACE TRAP
015600  000167  177732                  JMP     TRPA                    ;START OF TEST WITH TRACE ON

015604  000000          YESTR1: 0                               ;STORAGE FOR ODT PC
015606  000000          YESTR2: 0                               ;STORAG FOR ODT STATUS
015610  000002          YESRT:  RTI                             ;RETURN TO PROGRAM FROM TRAP
015612  000000                  HALT                            ;RTI FAILED
015614  000000          PRFLAG: 0                               ;PRINT ROUTINE BUSY IF NOT ZERO

                                ;ENTERED WITH SYSTEM TRAP CALL(HLT)
                                ;PRINT OUT THE ERROR PC AND STATUS REGISTER
```

```
015616  005767  177772          PRINT:  TST     PRFLAG                  ;IS ROUTINE BUSY
015622  001401                          BEQ     .+4
015624  000002                          RTI                             ;YES EXIT
015626  005267  177762                  INC     PRFLAG                  ;NO SET FLAG
015632  036727  161732  020000          BIT     SR,#20000               ;TEST FOR INHIBIT PRINT OUT
015640  001401                          BEQ     .+4                     ;BRANCH TO PRINT
015642  000461                          BR      PRINT1                  ;INHIBIT, RETURN TO MAIN STREAM
015644  012667  000166                  MOV     (6)+,SAVPC              ;PC OF FAILING ROUTINE
015650  012667  000164                  MOV     (6)+,SAVCC              ;CC OF ERROR CONDITION
015654  024646                          CMP     -(6),-(6)               ;REPOSITION THE STACK
015656  042767  000140  162112          BIC     #140,STATUS
015664  105777  000144                  TSTB    @TCSR           ;WAIT FOR FLAG
015670  100375                          BPL     .-4
015672  012777  000215  000132          MOV     #215,@TDBR              ;CR
015700  105777  000130                  TSTB    @TCSR
015704  100375                          BPL     .-4
015706  012777  000212  000116          MOV     #212,@TDBR              ;LINE FEED
015714  105777  000114                  TSTB    @TCSR
015720  100375                          BPL     .-4
015722  010267  000076                  MOV     %2,SAVR2                ;SAVE R2
015726  010367  000074                  MOV     %3,SAVR3                ;SAVE R3
015732  010467  000072                  MOV     %4,SAVR4                ;SAVE R4
015736  016702  000074                  MOV     SAVPC,%2
015742  004767  000074                  JSR     %7,PRTAB                ;PRINT OCTAL NUMBER
015746  012777  000240  000056          MOV     #240,@TDBR
015754  105777  000054                  TSTB    @TCSR                   ;SPACE BETWEEN WORDS
015760  100375                          BPL     .-4
015762  016702  000052                  MOV     SAVCC,%2
015766  004767  000050                  JSR     %7,PRTAB                ;PRINT OCTAL NUMBER
015772  016702  000026                  MOV     SAVR2,%2                ;RESTORE REGISTERS
015776  016703  000024                  MOV     SAVR3,%3
016002  016704  000022                  MOV     SAVR4,%4
016006  005767  161556          PRINT1: TST     SR                      ;TEST FOR HALT SWITCH
016012  100001                          BPL     .+4
016014  000000                          HALT                            ;HALT ON ERROR SET
016016  005067  177572                  CLR     PRFLAG                  ;CLEAR FLAG WHEN DONE
016022  000002                          RTI                             ;RETURN TO MAIN STREAM

016024  000000          SAVR2:  0
016026  000000          SAVR3:  0
016030  000000          SAVR4:  0
016032  177566          TDBR:   177566                                  ;DATA
016034  177564          TCSR:   177564                                  ;STATUS
016036  000000          SAVPC:  0
016040  000000          SAVCC:  0
        016756                  BUFF=FIN                                ;END OF PROGRAM-SP AREA.

016042  005067  000252  PRTAB:  CLR     BINCT
016046  005067  000244          CLR     WGTCT
016052  012704  016324          MOV     #LIST,%4                        ;GET LIST ADDRESS
016056  012767  000005  000236  MOV     #5,ASCNT
016064  012767  000007  000220  MOV     #7,SEVEN
016072  012767  000001  000214  MOV     #1,DECML
016100  105777  177730  WAIT1:  TSTB    @TCSR
016104  100375                  BPL     WAIT1
```

```
016106  005702                          TST     %2
016110  100404                          BMI     MINUS                   ;NEG SIGN PRINT 1
016112  012777  000260  177712          MOV     #260,@TDBR              ;POS SIGN PRINT 0
016120  000403                          BR      STAR
016122  012777  000261  177702  MINUS:  MOV     #261,@TDBR
016130  016703  000156          STAR:   MOV     SEVEN,%3                ;PUT MASK IN R3
016134  010267  000150                  MOV     %2,TOODLE               ;GET READY TO DOODLE NUMBER IN TOODLE
016140  005167  000144                  COM     TOODLE                  ;COMPENSATES FOR COMPLEMENT DURING BIC
016144  046703  000140                  BIC     TOODLE,%3               ;AND IN OCTAL CHARACTER
016150  001410                          BEQ     WRTOC                   ;ZERO, WRITE 0 IN LIST
016152  066767  000136  000136  MKNUM:  ADD     DECML,WGTCT             ;COUNT UP TO
016160  005267  000134                  INC     BINCT                   ;AND RECORD
016164  026703  000126                  CMP     WGTCT,%3                ;SAME BINARY WEIGHT
016170  001370                          BNE     MKNUM                   ;KEEP COUNTN
016172  062767  000260  000120  WRTOC:  ADD     #260,BINCT              ;ADD ASCII PREFIX
016200  016724  000114                  MOV     BINCT,(4)+              ;WRITE ASCII CHAR IN LIST
016204  066767  000102  000102          ADD     SEVEN,DECML             ;EXPAND BINARY WEIGHT
016212  005067  000100                  CLR     WGTCT
016216  005067  000076                  CLR     BINCT
016222  005367  000074                  DEC     ASCNT
016226  001410                          BEQ     XLIST                   ;5 CHAR IN LIST
016230  012703  000003                  MOV     #3,%3                   ;SET X3 FOR ADD LOOP
016234  066767  000052  000050  MOADD:  ADD     SEVEN,SEVEN             ;MAKING SEVENTY BY SEVEN
016242  005303                          DEC     %3
016244  001373                          BNE     MOADD
016246  000730                          BR      STAR                    ;NX SEVEN SET GET NX OCTAL
016250  012767  000005  000044  XLIST:  MOV     #5,ASCNT                ;SEND 5 CHAR TO TTY
016256  105777  177552          WAIT2:  TSTB    @TCSR
016262  100375                          BPL     WAIT2
016264  014477  177542                  MOV     -(4),@TDBR
016270  005367  000026                  DEC     ASCNT
016274  001401                          BEQ     HDFHM                   ;FINISH PRINTING GET NXT NUM
016276  000767                          BR      WAIT2
016300  105777  177530          HDFHM:  TSTB @TCSR
016304  100375                          BPL     .-4
016306  000207                          RTS     %7                      ;HEAD FOR HOME
016310  000000                  TOODLE: 0
016312  000000                  SEVEN:  0
016314  000000                  DECML:  0
016316  000000                  WGTCT:  0
016320  000000                  BINCT:  0
016322  000000                  ASCNT:  0
016324  000000                  LIST:   0
016326  000000                          0
016330  000000                          0
016332  000000                          0
016334  000000                          0
                                ;SCOPE LOOP ROUTINE ENTERED BY USER TRAP
016336  022606                  SCOPEB: CMP     (6)+,%6                 ;REPOSITION THE STACK
016340  012667  161432                  MOV     (6)+,CC                 ;FOR WHEN TRACE IS ACTIVE.
016344  000177  000054                  JMP     @RETURN                 ;SCOPE RETURN

                                ;SCOPE OR/AND ITERATION LOOP FOR EACH TEST 4000 TIMES
016350  032767  042000  161212  SCOPEC: BIT     #42000,SR               ;TEST SR FOR SCOPE
016356  001367                          BNE     SCOPEB                  ;YES SCOPE
```

```
016360  032767  004000  161202          BIT     #4000,SR                ;NO - TEST FOR ITERATION
016366  001007                          BNE     SCOPEG                  ;INHIBIT ITERATION
016370  026767  000026  000022          CMP     SCOPEF,ICOUNT
016376  001403                          BEQ     SCOPEG                  ;EXIT - DONE
016400  005267  000016                  INC     SCOPEF                  ;INCREMENT COUNT
016404  000754                          BR      SCOPEB                  ;LOOP SOME MORE
016406  005067  000010          SCOPEG: CLR     SCOPEF                  ;CLEAR COUNT
016412  011667  000006                  MOV     @%6,RETURN              ;SAVE SCOPE RETURN POINTER
016416  000002                          RTI                             ;RETURN INLINE-NEXT TEST
016420  004000                  ICOUNT: 4000
016422  000000                  SCOPEF: 0                               ;COUNT LOCATION FOR ITERATION LOOP
016424  003750                  RETURN: BEGIN                           ;ADDRESS OF LAST TEST

                                ;GROUP OF NESTED SUBROUTINES
016426  000207                  SUBR1:  RTS     %7              ;ONE INSTRUCTION
016430  000277                  SUBR2:  SCC                     ;ONE DEEP
016432  000207                          RTS     %7
016434  004767  177770          SUBR3:  JSR     %7,SUBR2        ;TWO DEEP
016440  000207                          RTS     %7
016442  004767  177766          SUBR4:  JSR     %7,SUBR3        ;THREE DEEP
016446  000207                          RTS     %7
016450  004767  177766          SUBR5:  JSR     %7,SUBR4        ;FOUR DEEP
016454  000207                          RTS     %7
016456  004767  177766          SUBR6:  JSR     %7,SUBR5        ;FIVE DEEP
016462  000207                          RTS     %7

                                ;ENTER HERE OR POWER FAIL

016464  010046                  PFAIL:  MOV     %0,-(6)                 ;SAVE REGISTER OR STACK
016466  010146                          MOV     %1,-(6)                 ;WHEN POWERING DOWN
016470  010246                          MOV     %2,-(6)
016472  010346                          MOV     %3,-(6)
016474  010446                          MOV     %4,-(6)
016476  010546                          MOV     %5,-(6)
016500  016746  161320                  MOV     24,-(6)
016504  012737  000002  000006          MOV     #RTI,@#6                ;IN SAVE OF NE EAE
016512  013746  000266                  MOV     @#AC,-(6)
016516  013746  000264                  MOV     @#MQ,-(6)
016522  013746  000270                  MOV     @#SC,-(6)
016526  010667  000010                  MOV     %6,SAVR6                ;STORE STACK POSITION
016532  012767  016544  161264          MOV     #RESTART,24
016540  000000                          HALT                            ;HALT ON POWER DOWN NORMAL
016542  000000                  SAVR6:  0                               ;STACK IS SAVED HERE
016544  016706  177772          RESTART:        MOV     SAVR6,%6        ;RESTORE REGISTER OFF STACK
016550  012637  000270                  MOV     (6)+,@#SC
016554  012637  000264                  MOV     (6)+,@#MQ               ;MQ MUST BE LOADED BEFORE AC
016560  012637  000266                  MOV     (6)+,@#AC
016564  005037  000006                  CLR     @#6                     ;RESTORE TIME OUT
016570  012667  161230                  MOV     (6)+,24                 ;WHEN POWERING UP
016574  012605                          MOV     (6)+,%5
016576  012604                          MOV     (6)+,%4
016600  012603                          MOV     (6)+,%3
016602  012602                          MOV     (6)+,%2
016604  012601                          MOV     (6)+,%1
016606  012600                          MOV     (6)+,%0
```

```
016610  000002                  RTI                             ;RETURN TO MAIN LINE

016612  125252          B:      125252
                        ;FIXED VALUES FOR USE IN TEST
016614  016612                  B                               ;ADDRESS OF B
016616  052525                  052525

        016622          .=B+10
016622  177777          A:      -1
016624  016626                  A+4

        016626          .=A+4
016626  125252                  125252
016630  016632                  A+10                            ;ADDRESS OF A+10
016632  052525                  052525
                        ;FOR STORAGE
016634  000000          C:      0
016636  016634                  C                               ;ADDRESS OF C

        016644          .=C+10
016644  000000          TEMP:   0
016646  016644                  TEMP                            ;ADDRESS OF TEMP

        016652          .=TEMP+6
016652  016654                  TEMP+10                         ;ADDRESS OF TEMP+10 OR "D"
016654  000000          D:      0
        016756          .=.+100
016756  000000          FIN:    0                               ;BUFFER FOR SP
016760  000207          USER:   RTS     %7                      ;OVERLAY USER ROUTINE HERE IF 4KW, USE BANK1 IF 8KW

                        ;PDP-11 MEMORY DETERMINATION AND SETUP
                        ;USE WITH VARIABLE CORE QUANTITY SYSTEMS
        016762                  .=FIN + 4                       ;APPLICABLE TO SYSTEM TEST 21
016762  012767  003750  176550  DET1:   MOV     #BEGIN,TRPA+2
016770  012767  000401  176466          MOV     #401,SKPBEL     ;BR .+4
016776  032767  001000  160564          BIT     #1000,SR        ;CHECK VARIABLE CORE SWITCH
017004  001401                  BEQ     DET4                    ;USE VARIABLE CORE ROUTINE
017006  000207                  RTS     %7                      ;4K ONLY
017010  016746  160770          DET4:   MOV     4,-(6)          ;SAVE TRAP VECTOR
017014  016746  160766          MOV     6,-(6)                  ;SAVE TRAP STATUS
017020  012767  017102  160756          MOV     #DET2,4         ;TRAP VECTOR SETUP
017026  012767  000340  160752          MOV     #340,6          ;TRAP STATUS SETUP
017034  013737  037770  037770  EIGHT:  MOV     @#37770,@#37770 ;CHECK FOR 8K
017042  013737  057770  057770  TWELVE: MOV     @#57770,@#057770        ;CHECK FOR 12K
017050  013737  077770  077770  SXTEEN: MOV     @#077770,@#077770       ;CHECK FOR 16K
017056  013737  117770  117770  TWENTY: MOV     @#117770,@#117770       ;CHECK FOR 20K
017064  013737  137770  137770  TWOFOR: MOV     @#137770,@#137770       ;CHECK FOR 24K
017072  013737  157770  157770  TWOEIG: MOV     @#157770,@#157770       ;CHECK FOR 28K
017100  000442                  BR      STRT28
017102  012602          DET2:   MOV     (6)+,%2                 ;RETRIEVE TRAP PC
017104  005726                  TST     (6)+                    ;DISCARD TRAP STATUS WORD
017106  022702  017740          CMP     #EIGHT+4,%2
017112  001420                  BEQ     DET3                    ;4K
017114  022702  017746          CMP     #TWELVE+4,%2
017120  001463                  BEQ     STRT8                           ;8K
```

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017122  022702  017054                  CMP     #SIXTEEN+4,%2
017126  001453                          BEQ     STRT12          ;12K
017130  022702  017762                  CMP     #TWENTY+4,%2
017134  001443                          BEQ     STRT16          ;16K
017136  022702  017070                  CMP     #TWOFOR+4,%2
017142  001433                          BEQ     STRT20          ;20K
017144  022702  017076                  CMP     #TWOEIG+4,%2
017150  001423                          BEQ     STRT24          ;24K
017152  000415                          BR      STRT28          ;28K
017154  012667  160626          DET3:   MOV     (6)+,6          ;RESTORE TRAP VECTOR
017160  012667  160620                  MOV     (6)+,4          ;RESTORE TRAP STATUS
017164  000207                          RTS     %7              ;COMMENCE PROGRAM
017166  005000                  MOVE:   CLR     %0              ;SET UP MAIN CORE CURRENT
017170  010102                          MOV     %1,%2
017172  062702  016760                  ADD     #FIN+2,%2       ;SET UP MAX CORE MOVE
017176  012021                          MOV     (0)+,(1)+       ;MOVE WORD
017200  020201                          CMP     %2,%1           ;MOVE COMPLETE?
017202  001375                          BNE     .-4             ;MOVE ANOTHER WORD
017204  000207                          RTS     %7              ;MOVE COMPLETE
017206  004767  000070          STRT28: JSR     %7,XFER28       ;START 28K TRANSFER
017212  004767  000146                  JSR     %7,MOD24        ;START 24K MODIFY
017216  000756                          BR      DET3
017220  004767  000066          STRT24: JSR     %7,XFER24       ;START 24K TRANSFER
017224  004767  000150                  JSR     %7,MOD20        ;START 20K MODIFY
017230  000751                          BR      DET3
017232  004767  000064          STRT20: JSR     %7,XFER20       ;START 20K TRANSFER
017236  004767  000152                  JSR     %7,MOD16        ;START 16K MODIFY
017242  000744                          BR      DET3
017244  004767  000062          STRT16: JSR     %7,XFER16       ;START 16K TRANSFER
017250  004767  000154                  JSR     %7,MOD12        ;START 12K MODIFY
017254  000737                          BR      DET3

017256  004767  000060          STRT12: JSR     %7,XFER12       ;START 12K TRANSFER
017262  004767  000156                  JSR     %7,MOD8         ;START 8K MODIFY
017266  000732                          BR      DET3
017270  004767  000056          STRT8:  JSR     %7,XFER8        ;START 8K TRANSFER
017274  004767  000160                  JSR     %7,MOD4         ;START 4K MODIFY
017300  000725                          BR      DET3
017302  012701  140000          XFER28: MOV     #140000,%1      ;SET UP MOVE START LOCATION
017306  004767  177654                  JSR     %7,MOVE         ;GO TO MOVE SUBROUTINE
017312  012701  120000          XFER24: MOV     #120000,%1
017316  004767  177644                  JSR     %7,MOVE
017322  012701  100000          XFER20: MOV     #100000,%1
017326  004767  177634                  JSR     %7,MOVE
017332  012701  060000          XFER16: MOV     #60000,%1
017336  004767  177624                  JSR     %7,MOVE
017342  012701  040000          XFER12: MOV     #40000,%1
017346  004767  177614                  JSR     %7,MOVE
017352  012701  020000          XFER8:  MOV     #20000,%1
017356  004767  177604                  JSR     %7,MOVE
017362  000207                          RTS     %7              ;RETURN FROM TRANSFERS
017364  012767  143756  116146  MOD24:  MOV     #BEGIN+140006,TRPA+120002
017372  012767  000240  116064          MOV     #NOP,SKPBEL+120000
017400  012767  123756  076132  MOD20:  MOV     #BEGIN+120006,TRPA+100002
017406  012767  000240  076050          MOV     #NOP,SKPBEL+100000
```

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017414  012767  103756  056116  MOD16:  MOV     #BEGIN+100006,TRPA+60002
017422  012767  000240  056034          MOV     #NOP,SKPBEL+60000
017430  012767  063756  036102  MOD12:  MOV     #BEGIN+60006,TRPA+40002
017436  012767  000240  036020          MOV     #NOP,SKPBEL+40000
017444  012767  043756  016066  MOD8:   MOV     #BEGIN+40006,TRPA+20002
017452  012767  000240  016004          MOV     #NOP,SKPBEL+20000
017460  012767  023756  176052  MOD4:   MOV     #BEGIN+20006,TRPA+2
017466  012767  000240  175770          MOV     #NOP,SKPBEL
017474  000207                          RTS     %7              ;RETURN FROM MODIFY
        000001                          .END
```

A	016622	HSRIN1	001370	REG1	001224	STRT8	017270
AC	000266	HSRIN2	001376	REND1	002434	SUBR1	016426
ADSUB	013440	HSRINR	001404	REND2	002404	SUBR2	016430
ARIEND	013502	ICOUNT	016420	RESTAR	016544	SUBR3	016434
ARITST	013414	IE	000100	RETURN	016424	SUBR4	016442
ASCNT	016322	INTCNT	001556	RF1	002060	SUBR5	016450
ASH	000304	IRF	002104	RFCAR	000256	SUBR6	016456
B	016612	LIST	016324	RFCSR	000260	SWABA	014224
BEGIN	003750	LK1	001562	RFCSRH	000262	SXTEEN	017050
BELL	015504	LK2	001602	RFDAE	000246	TC	177340
BINCT	016320	LK3	001604	RFDAR	000252	TC1	000322
BR	000002	LK4	001622	RFDBR	000250	TC2	000342
BUFF	016756	LKCSR	000240	RFSTAR	002054	TCBA	000316
C	016634	LLIMIT	002172	RFWC	000254	TCBLK	002202
CC	177776	LP1	001702	ROTALL	013016	TCCM	000306
CCT1	014270	LP2	001710	ROTBE	013166	TCDT	000312
CLINCT	002052	LP3	001770	ROTBO	013276	TCEXPE	002204
CMP1	012740	LP4	002000	ROTEN1	013400	TCF1	002260
CMP2	012762	LP5	002036	SAVCC	016040	TCF1A	002252
COMPAR	012734	LP6	001736	SAVPC	016036	TCF2	002312
CURPAT	002046	LPCSR	000242	SAVR2	016024	TCF3	002326
D	016654	LPDBR	000244	SAVR3	016026	TCF4	002374
DATA1	001320	LPINTR	001726	SAVR4	016030	TCFIRS	002176
DATA2	001366	LSH	000302	SAVR6	016542	TCIV	000320
DATA3	001452	MAINLI	001206	SC	000270	TCLAST	002200
DATA4	001554	MINUS	016122	SCOPE	104400	TCOM	013514
DECML	016314	MKNUM	016152	SCOPEB	016336	TCOM2	013562
DELAY	001560	MOADD	016234	SCOPEC	016350	TCOM3	013630
DET1	016762	MOD12	017430	SCOPEF	016422	TCR1	002532
DET2	017102	MOD16	017414	SCOPEG	016406	TCR1A	002566
DET3	017154	MOD20	017400	SEVEN	016312	TCR2	002574
DET4	017010	MOD24	017364	SKPBEL	015464	TCR3	002610
DIV	000276	MOD4	017460	SOLPAT	002050	TCR4	002656
DO	000001	MOD8	017444	SR	177570	TCRB1	002722
EAESRT	015056	MOVF	017166	SRE	000272	TCRBK	002664
EIGHT	017034	MQ	000264	ST1	000636	TCRBUF	002750
ENDEAE	015446	MUL	000274	ST2	000654	TCSR	016034
F	000000	N	000001	ST3	000700	TCST	000310
FEND1	002230	NOEAE	000366	ST4	000732	TCWB1	002504
FEND2	002206	NOP	000240	ST5	000754	TCWBK	002452
FIN	016756	NOR	000300	ST6	001020	TCWBUF	002750
FUNCTI	002170	NUMA	013500	ST7	001052	TCWC	000314
HDFHM	016300	PFAIL	016464	ST8	001142	TDBR	016032
HLT	104000	PRFLAG	015614	STAR	016130	TDSR	016034
HPCSR	000234	PRINT	015616	START	000400	TEMP	016644
HPDBR	000236	PRINT1	016006	START2	000440	TEST	013130
HPOUT	001454	PRTAB	016042	STATUS	177776	TIME	001700
HPOUT1	001462	R	004000	STRT12	017256	TJSR1	012340
HPOUT2	001536	RB	000002	STRT16	017244	TJSR2	012342
HPOUTR	001472	RD	000004	STRT20	017232	TJSR3	012354
HRCSR	000230	REF	013126	STRT24	017220	TOODLE	016310
HRDBR	000232	REFF	013126	STRT28	017206	TRCSR	000220

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TRDR    000222
TRPA    015536
TRPB    015542
TRTRAP  015520
TSCOMB  013672
TSROT   012774
TSROT2  013140
TSRT2A  013132
TSTARI  013402
TTCSR   000224
TTDBR   000226
TTYIN1  001226
TTYIN2  001234
TTYIN3  001302
TTYIN4  001306
TTYINR  001242
TWELVE  017042
TWENTY  017056
TWOEIG  017072
TWOFOR  017064
TYOUT   001322
TYOUT1  001330
TYOUTR  001340
USER    016760
WAIT1   016100
WAIT2   016256
WAIT3   014110
WAIT4   014140
WD      000014
WGTCT   016316
WORDCT  002174
WRTOC   016172
XFENDZ  002402
XFER12  017342
XFER16  017332
XFER20  017322
XFER24  017312
XFER28  017302
XFER8   017352
XLIST   016250
YESRT   015610
YESTR   015544
YESTR1  015604
YESTR2  015606
```

ERRORS DETECTED: 0

RUN-TIME: 22 SECONDS

5K CORE USED