1. ABSTRACT

THIS PROGRAM IS A MEMORY 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.

IN THIS VERSION THE INTERRUPT SERVICE ROUTINE FOR THE DISKS, KW11L, PLUS THE STACK AND THE NPR DATA BUFFERS ARE RELOCATED TO THE CURRENT BANK.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11/20 STANDARD COMPUTER

2.1.1 OPTIONAL HARDWARE THAT THE PROGRAM WILL EXERCISE

MM11	UP TO 28KW OF MEMORY
RC11	DISK
RK11	DISK
RP11	DISK
RF11	DISK (256K)
TC11	DECTAPE-TRANSPORT ZERO
KE11	EXTENDED ARITHMETIC UNIT
KW11L	LINE CLOCK
PC11	HIGH SPEED READER/PUNCH
KL11	ASR33 OR ASR35 TELEPRINTER-LC11,VT05
LP11	LINE PRINTER

2.2 STORAGE

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

3. LOADING PROCEDURE

3.1 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, RK11, RC11 AND RP11 DISK(S)
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
SW08 = 1 OR UP ... RESTART ON ERROR

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 2, 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 POIN'S TO THE NEXT SEQUENTIAL WORD WHICH CONTAINS A HALT (000000). (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. THE INTERRUPT SERVICE ROUTINE AND DATA BUFFER IS TRANSFERRED TO THE CURRENT BANK THAT INSTRUCTIONS ARE BEING EXECUTED IN.

5.2.9 FEND2 (TC11 FORWARD END ZONE)

FEND2 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 RKSTART (RK-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 HAS BEEN WRITTEN, A WRITE CHECK IS USED TO VERFIY 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). THE INTERRUPT SERVICE ROUTINE AND DATA BUFFER ARE TRANSFERRED TO THE CURRENT BANK THAT INSTRUCTIONS ARE BEING EXECUTED IN.

5.2.15 RESTART (RE-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 FOUR DISKS. THE INTERRUPT SERVICE ROUTINE AND DATA BUFFER IS TRANFERRED TO THE CURRENT BANK THAT INSTRUCTIONS ARE BEING EXECTUTED IN.

5.2.16 RPSTART (RP-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). THE INTERRUPT SERVICE ROUTINE AND DATA BUFFER IS TRANSFERRED TO THE CURRENT BANK THAT INSTRUCTIONS ARE BEING EXECUTED IN.

5.2.17 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 0 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 0.

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

5.3 PROGRAM AND/OR OPERATOR ACTION

5.3.1 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.

(8. CONT'D)

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 THEMSELVES. THEN, THE PRIMER JUMPS TO THE PROCESSOR TEST WHERE THE INDIVIDUAL DEVICES ARE SERVICED AT THE INTERRUPT RATE.

9. PROGRAM DESCRIPTION - CONTINUED

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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                                        .ENDR
                                        .LIST   SEQ,ME
                                        .ABS

                                ;COPYRIGHT 1971, 1972, DIGITAL EQUIPMENT CORPORATION, MAYNARD MASS. 01754
                                ;PDP11 PRELIMINARY SYSTEM TEST --- TTY-PC11-LP11,RF11,TC11,KW11L,RK11,RC11,RP11 AND K-11
                                ;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
  016022                        TDSR=TCSR
  016676                        BUFF=FIN
  177570                        SR=177570
  000000                        R100=%0
  000001                        R101=%1
  000002                        RSR=%2
  176000                        RKWORDCT=-2000
  176000                        RPWORDCT=-2000
  176040                        RCWORDCT=-2000+40
  176040                        RFWORDCT=-2000+40
  000000                        XX=0
  000000                        .=0
                                .REPT 100
                                .+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
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  614  000064  000066                .+2             ;TRAP ENTRANCE
  615  000066  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  616  000070  000072                .+2             ;TRAP ENTRANCE
  617  000072  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  618  000074  000076                .+2             ;TRAP ENTRANCE
  619  000076  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  620  000100  000102                .+2             ;TRAP ENTRANCE
  621  000102  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  622  000104  000106                .+2             ;TRAP ENTRANCE
  623  000106  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  624  000110  000112                .+2             ;TRAP ENTRANCE
  625  000112  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  626  000114  000116                .+2             ;TRAP ENTRANCE
  627  000116  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  628  000120  000122                .+2             ;TRAP ENTRANCE
  629  000122  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  630  000124  000126                .+2             ;TRAP ENTRANCE
  631  000126  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  632  000130  000132                .+2             ;TRAP ENTRANCE
  633  000132  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  634  000134  000136                .+2             ;TRAP ENTRANCE
  635  000136  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  636  000140  000142                .+2             ;TRAP ENTRANCE
  637  000142  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  638  000144  000146                .+2             ;TRAP ENTRANCE
  639  000146  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  640  000150  000152                .+2             ;TRAP ENTRANCE
  641  000152  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  642  000154  000156                .+2             ;TRAP ENTRANCE
  643  000156  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  644  000160  000162                .+2             ;TRAP ENTRANCE
  645  000162  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  646  000164  000166                .+2             ;TRAP ENTRANCE
  647  000166  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  648  000170  000172                .+2             ;TRAP ENTRANCE
  649  000172  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  650  000174  000176                .+2             ;TRAP ENTRANCE
  651  000176  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  652  000200  000202                .+2             ;TRAP ENTRANCE
  653  000202  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  654  000204  000206                .+2             ;TRAP ENTRANCE
  655  000206  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  656  000210  000212                .+2             ;TRAP ENTRANCE
  657  000212  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  658  000214  000216                .+2             ;TRAP ENTRANCE
  659  000216  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  660  000220  000222                .+2             ;TRAP ENTRANCE
  661  000222  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  662  000224  000226                .+2             ;TRAP ENTRANCE
  663  000226  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  664  000230  000232                .+2             ;TRAP ENTRANCE
  665  000232  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
  666  000234  000236                .+2             ;TRAP ENTRANCE
  667  000236  000000                HALT            ;TRAPPED TO PREVIOUS LOCATION
```

```
   668  000240  000242                  .+2                     ;TRAP ENTRANCE
   669  000242  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   670  000244  000246                  .+2                     ;TRAP ENTRANCE
   671  000246  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   672  000250  000252                  .+2                     ;TRAP ENTRANCE
   673  000252  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   674  000254  000256                  .+2                     ;TRAP ENTRANCE
   675  000256  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   676  000260  000262                  .+2                     ;TRAP ENTRANCE
   677  000262  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   678  000264  000266                  .+2                     ;TRAP ENTRANCE
   679  000266  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   680  000270  000272                  .+2                     ;TRAP ENTRANCE
   681  000272  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   682  000274  000276                  .+2                     ;TRAP ENTRANCE
   683  000276  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   684  000300  000302                  .+2                     ;TRAP ENTRANCE
   685  000302  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   686  000304  000306                  .+2                     ;TRAP ENTRANCE
   687  000306  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   688  000310  000312                  .+2                     ;TRAP ENTRANCE
   689  000312  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   690  000314  000316                  .+2                     ;TRAP ENTRANCE
   691  000316  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   692  000320  000322                  .+2                     ;TRAP ENTRANCE
   693  000322  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   694  000324  000326                  .+2                     ;TRAP ENTRANCE
   695  000326  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   696  000330  000332                  .+2                     ;TRAP ENTRANCE
   697  000332  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   698  000334  000336                  .+2                     ;TRAP ENTRANCE
   699  000336  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   700  000340  000342                  .+2                     ;TRAP ENTRANCE
   701  000342  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   702  000344  000346                  .+2                     ;TRAP ENTRANCE
   703  000346  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   704  000350  000352                  .+2                     ;TRAP ENTRANCE
   705  000352  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   706  000354  000356                  .+2                     ;TRAP ENTRANCE
   707  000356  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   708  000360  000362                  .+2                     ;TRAP ENTRANCE
   709  000362  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   710  000364  000366                  .+2                     ;TRAP ENTRANCE
   711  000366  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   712  000370  000372                  .+2                     ;TRAP ENTRANCE
   713  000372  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   714  000374  000376                  .+2                     ;TRAP ENTRANCE
   715  000376  000000                  HALT                    ;TRAPPED TO PREVIOUS LOCATION
   716          000014                  .=14
   717  000014  000016                  .+2
   718  000016  000000                  HALT                    ;FALSE TRACE TRAP
   719          000030                  .=30
   720  000030  015540                  PRINT                   ;FOR HALT TRAPS
   721  000032  000340                  340                     ;HIGHEST PRIORITY
```

```
                000034                          .=34
000034  016324                                  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=1 OR UP---HALT ON ERROR
                                        ;SR 14=1 OR UP---SCOPE LOOP
                                        ;SR 13=1 OR UP---INHIBIT PRINT OUT
                                        ;SR 12=1 OR UP---INHIBIT TRACE TRAPPING
                                        ;SR 11=1 OR UP---INHIBIT SUB-PROBLEM ITERATION
                                        ;SR 10=1 OR UP---INHIBIT PROCESSOR TEST
                                        ;SR 09=1 OR UP INHIBIT VARIABLE CORE EXPANSION
                                        ;SR 08=1 OR UP RESTART ON ERROR
                                        ;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
                                        ;SW 5=1 INHIBIT RC, RF, RK, RP DISKS
                                        ;SW 6=1 INHIBIT TC11 DECTAPE
                                        ;SW 7=1 INHIBIT LINE PRINTER --- IF LINE PRINTER IS USED, MUST RESTART AT 50
                                        ;IF EAE EXIST IT WILL BE AUTOMATICALLY SELECTED,
                                        ;PDP11 SIMULTANEOUS I/O
                000060                          .=60
000060  001364                                  TTYINR                          ;TTY IN INTERRUPT VECTOR
000062  000200                                  200
000064  001440                                  TYOUTR                          ;TTY OUT INTERRUPT VECTOR
000066  000200                                  200
000070  001466                                  HSRINR                          ;HSR INTERRUPT VECTOR
000072  000200                                  200
000074  001560                                  HPOUTR                          ;HSP INTERRUPT VECTOR
000076  000200                                  200
                000100                          .=100
000100  001664                                  LK3                             ;INTERRUPT VECTOR LINE CLOCK
000102  000300                                  300                             ;LEVEL SIX PRIORITY

                000200                          .=200
000200  000137  000502                          JMP     @#START
                000204                          .=204
000204  002450                                  IRF                             ;RF11 DISK
000206  000240                                  240                             ;LEVEL 5
000210  002352                                  IRC                             ;RC DISK
000212  000240                                  240

                000214                          .=214
000214  002534                                  FEND2                           ;DEC TAPE
000216  000300                                  300                             ;LEVEL 6
                000220                          .=220
000220  002164                                  IRK                             ;RK DISK
```

```
776  000222  000240                        240
777
778          000254                        .=254
779  000254  002266                        IRP                          ;RP DISK
780  000256  000240                        240
781
782          177776              STATUS=177776
783  000260  177560              TRCSR:  177560
784  000262  177562              TRDR:   177562
785  000264  177564              TTCSR:  177564
786  000266  177566              TTDBR:  177566
787  000270  177550              HRCSR:  177550
788  000272  177552              HRDBR:  177552
789  000274  177554              HPCSR:  177554
790  000276  177556              HPDBR:  177556
791  000300  177546              LKCSR:  177546
792  000302  177514              LPCSR:  177514
793  000304  177516              LPDBR:  177516
794  000306  177470              RFDAE:  177470          ;DISK ADDRESS AND ERROR
795  000310  177466              RFDAR:  177466          ;DISK ADDRESS REGISTER
796  000312  177462              RFWC:   177462          ;WORD COUNT REGISTER
797  000314  177464              RFCAR:  177464          ;CURRENT ADDRESS REGISTER
798  000316  177460              RFCSR:  177460          ;STATUS REGISTER
799  000320  177461              RFCSRH: 177461          ;HIGH BYTE ADDRESS OR CSR
800  000322  177442              RCDAR:  177442          ;DISK ADDRESS REGISTER
801  000324  177450              RCWC:   177450          ;WORD COUNT REGISTER
802  000326  177452              RCBAR:  177452          ;CURRENT ADDRESS REGISTER
803  000330  177446              RCCSR:  177446          ;STATUS REGISTER
804  000332  177447              RCCSRH: 177447          ;HIGH BYTE ADDRESS OR CSR
805  000334  177413              RKDAH:  177413          ;HIGH BYTE OF DISK ADDRESS
806  000336  177412              RKDAE:  177412          ;DISK ADDRESS REGISTER
807  000340  177406              RKWC:   177406          ;WORD COUNT REGISTER
808  000342  177410              RKBAR:  177410          ;CURRENT ADDRESS REGISTER
809  000344  177404              RKCSR:  177404          ;STATUS REGISTER
810  000346  177405              RKCSRH: 177405          ;HIGH BYTE ADDRESS OR CSR
811  000350  177304              MQ:     177304          ;EAE LOCATIONS
812  000352  177302              AC:     177302
813  000354  177310              SC:     177310
814  000356  177311              SRE:    177311
815  000360  177306              MUL:    177306
816  000362  177300              DIV:    177300
817  000364  177312              NOR:    177312
818  000366  177314              LSH:    177314
819  000370  177316              ASH:    177316
820
821                              ;DECTAPE ADDRESSES
822          177340              TC=177340
823  000372  177342              TCCM:   TC+2            ;CONTROL AND FUNCTION
824  000374  177340              TCST:   TC              ;GENERAL STATUS
825  000376  177350              TCDT:   TC+10
826  000400  000440                      BR      START   ;DATA
827  000402  177344              TCWC:   TC+4            ;WORD COUNT
828  000404  177346              TCBA:   TC+6            ;BUS ADDRESS
829  000406  000214              TCIV:   214             ;DECTAPE INTERRUPT VECTOR
```

```
  830  000410  176722                    RPCA:   176722                  ;CYLINDER ADDRESS RP11 DISK
  831  000412  176725                    RPDAH:  176725                  ;HIGH BYTE OF DISK ADDRESS
  832  000414  176724                    RPDAE:  176724                  ;DISK ADDRESS
  833  000416  176710                    RPDSR:  176710                  ;DRIVE STATUS REGISTER
  834  000420  176724                    RPDAR:  176724                  ;DISK ADDRESS REGISTER
  835  000422  176716                    RPWC:   176716                  ;WORD COUNT REGISTER
  836  000424  176720                    RPBAR:  176720                  ;CURRENT ADDRESS REGISTER
  837  000426  176714                    RPCSR:  176714                  ;STATUS REGISTER
  838  000430  176715                    RPCSRH: 176715                  ;HIGH BYTE ADDRESS OR CSR
  839  000432  000000                    RPFUNCTION:     0               ;DISK COMMAND
  840                                     ;THIS ROUTINE CHECKS THE READ DATA BUFFER TC11
  841                                     ;BY DOING A CHECK SUM ON THE DATA
  842  000434  010146                    TC1:    MOV     %1,-(6)         ;SAVE THESE ON THE STACK
  843  000436  010346                            MOV     %3,-(6)
  844  000440  005003                            CLR     %3              ;SUM OF DATA
  845  000442  012701  003256                    MOV     #TCRBUF,%1      ;ADDRESS OF READ BUFFER
  846  000446  062103                    TC2:    ADD     (1)+,%3         ;EVEN ADD
  847  000450  062103                            ADD     (1)+,%3         ;ODD ADD -2'S COMPLIMENT
  848  000452  001775                            BEQ     TC2
  849  000454  020127  004256                    CMP     %1,#TCRBUF+1000         ;AT END OF BUFFER?
  850  000460  101001                            BHI     .+4             ;YES BRANCH
  851  000462  104000                            HLT                     ;DATA ERROR
  852  000464  012603                            MOV     (6)+,%3         ;RESTORE THE REGISTERS
  853  000466  012601                            MOV     (6)+,%1
  854  000470  000207                            RTS     %7              ;EXIT
  855  000472  012767  000240  014206    NOEAE:  MOV     #240,EAESRT     ;BRANCH AROUND EAE ROUTINE
  856  000500  000002                            RTI                     ;JUMP OVER EAE SECTION
  857
  858                                     ;START UP FOR MINI MONITOR
  859
  860  000502  016767  177062  000652    START:  MOV     SR,REG1         ;MOV SR TO REGISTER
  861  000510  005067  015654            ESTART: CLR     ICOUNT
  862  000514  012706  016676                    MOV     #BUFF,%6        ;SET UP STACK
  863  000520  012767  000566  015656            MOV     #START2,RETURN
  864  000526  005067  015650                    CLR     SCOPEF
  865  000532  012767  000340  177236            MOV     #340,STATUS             ;LOCK OUT INTERRUPTS
  866  000540  005067  014772                    CLR     PRFLAG                  ;PRINT ROUTINE BUSY
  867  000544  016702  000612                    MOV     REG1,R5R                ;SAVE SWITCHES
  868  000550  005067  177014                    CLR     SR                      ;FOR 11/45 DISPLAY
  869  000554  012700  000100                    MOV     #100,R100               ;INTERRUPT ENABLE
  870  000560  012701  000101                    MOV     #101,R101               ;INTERRUPT ENABLE AND GO
  871  000564  104400                            SCOPE
  872  000566  050077  177456    START2: BIS     R100,@TRCSR
  873  000572  000005                            RESET
  874  000574  030077  177450                    BIT     R100,@TRCSR             ;INTERRUPT ENABLE
  875  000600  001401                            BEQ     .+4
  876  000602  104000                            HLT                             ;RESET DID NOT CLEAR INTERRUPT ENABLE
  877  000604  104400                            SCOPE
  878                                     ;DOES "RESET" ON THE BUS LAST TOO LONG
  879  000606  012706  016676                    MOV     #BUFF,%6                ;SET UP STACK
  880  000612  000005                            RESET
  881  000614  050077  177444                    BIS     R100,@TTCSR             ;SET A BIT
  882  000620  030077  177440                    BIT     R100,@TTCSR             ;IS IT SET
  883  000624  001001                            BNE     .+4
```

```
  884  000626  104000                          HLT                             ;RESET IS ON BUS TOO LONG
  885  000630  104400                          SCOPE
  886  000632  050077  177426                  BIS     R100,@TTCSR
  887  000636  005077  177422                  CLR     @TTCSR                  ;IF BUS HANG, CHECK NO SACK TIMEOUT
  888  000642  104400                          SCOPE
  889  000644  000005                          RESET
  890  000646  012767  004272  015530          MOV     #BEGIN,RETURN
  891  000654  012737  000472  000004          MOV     #NOEAE,@#4              ;TEST FOR EAE
  892  000662  005777  177462                  TST     @MQ                     ;TRAP IF NONEXISTANT
  893  000666  012767  000006  177110          MOV     #6,4                    ;.+2=HALT
  894  000674  012767  000002  177104          MOV     #2,6                    ;AN RTI FOR NON EXISTENT I/O
  895  000702  012767  000001  000526          MOV     #1,DATA1                ;BASE DATA FOR TTY READER OR KEYBOARD
  896  000710  005067  000550                  CLR     DATA2                   ;BASE DATA FOR TTY PUNCH OR TELEPRINTER
  897  000714  012767  000001  000616          MOV     #1,DATA3                ;BASE DATA FOR HSR
  898  000722  005067  000706                  CLR     DATA4                   ;BASE DATA FOR HSP
  899  000726  012706  016676                  MOV     #BUFF,%6
  900  000732  005067  000702                  CLR     DELAY                   ;FOR READER STALL - HSR -
  901  000736  012767  000340  177032          MOV     #340,STATUS             ;LOCK OUT INTERRUPTS
  902  000744  030227  000001                  BIT     RSR,#1
  903  000750  001002                          BNE     ST1
  904  000752  050077  177306                  BIS     R100,@TTCSR             ;TTY OUT
  905  000756  030227  000002          ST1:    BIT     RSR,#2
  906  000762  001002                          BNE     ST2
  907  000764  050177  177270                  BIS     R101,@TRCSR             ;TTY IN
  908  000770  005777  177300          ST2:    TST     @HPCSR                  ;TEST FOR OUT OF TAPE
  909  000774  100405                          BMI     ST3
  910  000776  030227  000004                  BIT     RSR,#4
  911  001002  001002                          BNE     ST3
  912  001004  050077  177264                  BIS     R100,@HPCSR             ;HSP
  913  001010  005777  177254          ST3:    TST     @HRCSR                  ;TEST FOR OUT OF TAPE
  914  001014  100407                          BMI     ST4
  915  001016  030227  000010                  BIT     RSR,#10
  916  001022  001004                          BNE     ST4
  917  001024  010067  000610                  MOV     R100,DELAY              ;FOR STALL HSR
  918  001030  050177  177234                  BIS     R101,@HRCSR             ;HSR
  919  001034  030227  000020          ST4:    BIT     RSR,#20
  920  001040  001004                          BNE     ST5
  921  001042  005067  000712                  CLR     TIME
  922  001046  050077  177226                  BIS     R100,@LKCSR             ;LINE CLOCK 50 OR 60 CYCLES
  923  001052  030227  000040          ST5:    BIT     RSR,#40
  924  001056  001050                          BNE     ST6
  925  001060  012767  001122  176716          MOV     #ST5A,4
  926  001066  105777  177334                  TSTB    @RPCSR                  ;WAIT FOR CONTROLLER READY
  927  001072  100375                          BPL     .-4
  928  001074  012777  000015  177324          MOV     #15,@RPCSR              ;RESET DRIVE
  929  001102  105777  177320                  TSTB    @RPCSR                  ;WAIT FOR CONTROLLER READY
  930  001106  100375                          BPL     .-4
  931  001110  005777  177302                  TST     @RPDSR                  ;WAIT FOR ACCESS READY
  932  001114  100375                          BPL     .-4
  933  001116  005077  177274                  CLR     @RPDSR                  ;CLR ATTENTION
  934  001122  012767  000006  176654  ST5A:   MOV     #6,4
  935  001130  012767  043503  001362          MOV     #43503,RFFUNCTION       ;WRITE CHECK/WRITE RF
  936  001136  012767  043503  001244          MOV     #43503,RCFUNCTION
  937  001144  012767  043503  001054          MOV     #43503,RKFUNCTION
```

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   938  001152  012767  043523  177252          MOV     #43523,RPFUNCTION
   939  001160  110077  177132                  MOVB    R100,@RFCSR             ;TELL DISK TO READ OR WRITE
   940  001164  110077  177154                  MOVB    R100,@RKCSR
   941  001170  110077  177134                  MOVB    R100,@RCCSR
   942  001174  110077  177226                  MOVB    R100,@RPCSR
   943  001200  030200                  ST6:    BIT     RSR,R100                ;TEST FOR DECTAPE
   944  001202  001011                          BNE     ST7
   945  001204  012767  002524  001320          MOV     #TCFIRST,TCEXPE         ;FIRST BLOCK SHOULD BE ZERO
   946  001212  012777  002534  177166          MOV     #FEND2,@TCIV            ;GO TO END ZONE ON INTERRUPT
   947  001220  012777  004103  177144          MOV     #R+IE+RB+DO,@TCCM       ;MOVE REVERSE
   948  001226  105702                  ST7:    TSTB    RSR                     ;LINE PRINTER
   949  001230  100427                          BMI     ST8
   950  001232  012767  001310  176544          MOV     #ST8,4                  ;DON'T CHANGE 200
   951  001240  012767  000137  000662          MOV     #137,SOLPAT             ;RESET FOR START OF LINE PATTERN
   952  001246  012767  000117  000656          MOV     #79,,CLINCT             ;LINE COUNT
   953  001254  012767  000137  000644          MOV     #137,CURPAT
   954  001262  012777  000014  177014          MOV     #14,@LPDBR              ;LINE FEED TO POSITION BUFFER
   955  001270  012737  002006  000200          MOV     #LPINTR,@#200           ;INTERRUPT VECTOR
   956  001276  012737  000200  000202          MOV     #200,@#202              ;PROCESSOR LEVEL 4
   957  001304  010077  176772                  MOV     R100,@LPCSR             ;INTERRUPT ENABLE
   958  001310  005037  015524          ST8:    CLR     @#TRPB                  ;NO "T" BIT FIRST PASS
   959  001314  004737  016700                  JSR     %7,@#USER               ;FOR USER I/O PROGRAM
   960  001320  004767  015356                  JSR     %7,DFT1                 ;CHECK FOR CORE EXPANSIO
   961  001324  005067  176456                  CLR     6                       ;HALT FOR BUS ERROR
   962  001330  012767  000006  176446          MOV     #6,4                    ;FOR USER I/O PROGRAM
   963  001336  005067  176434                  CLR     STATUS                  ;ALLOW INTERRUPTS
   964  001342  000401                          BR      .+4
   965  001344  000001          MAINLINE:       WAIT                            ;WAIT HERE FOR INTERRUPTS
   966  001346  036727  176216  002000          BIT     SR,#2000                ;INHIBIT PROCESSOR TEST
   967  001354  001373                          BNE     MAINLINE
   968  001356  000167  002710                  JMP     BEGIN
   969  001362  000000          REG1:   0                                       ;STATUS OF SELECTED DEVICES
   970                           ;TTY RECEIVER VALUES 0 TO 377
   971
   972  001364  105777  176670  TTYINR: TSTB    @TRCSR                          ;IS DONE SET
   973  001370  100401                  BMI     .+4
   974  001372  104000                  HLT                                     ;FALSE RETURN FROM MAINLINE
   975  001374  105777  176662          TSTB    @TRDR                           ;TEST DATA FOR LEADER
   976  001400  001413                  BEQ     TTYIN2                          ;IF LEADER GO BACK
   977  001402  127767  176654  000026  CMPB    @TRDR,DATA1                     ;NOT LEADER TEST FOR DATA
   978  001410  001401                  BEQ     TTYIN3
   979  001412  104000                  HLT                                     ;DATA COMPARISON ERROR
   980  001414  105267  000016  TTYIN3: INCB    DATA1                           ;INCREMENT DATA
   981  001420  001003          TTYIN4: BNE     TTYIN2
   982  001422  012767  000001  000006  TTYIN1: MOV     #1,DATA1                ;BASE DATA
   983  001430  005277  176624  TTYIN2: INC     @TRCSR                          ;START READER
   984  001434  000002                  RTI                                     ;RETURN TO MAINLINE
   985
   986  001436  000000          DATA1:  XX                                      ;EXPECTED DATA
   987
   988                           ;TTY TRANSMITTER PRINT VALUES 0 TO 377
   989
   990  001440  105777  176620  TYOUTR: TSTB    @TTCSR                          ;TEST FOR DONE
   991  001444  100401                  BMI     .+4                             ;BRANCH IF FLAG FOUND
```

```
  992  001446  104000                          HLT                             ;FALSE INTERRUPT RETURN
  993  001450  105267  000010                  INCB    DATA2                   ;INCREMENT DATA
  994  001454  016777  000004  176604  TYOUT1: MOV     DATA2,@TTDBR            ;OUTPUT TO DEVICE
  995  001462  000002                          RTI                             ;RETURN TO MAINLINE
  996
  997  001464  000000                  DATA2:  XX                              ;TRANSMITTED DATA
  998                                   ;HSR SECTION VALUES 0 TO 377
  999
 1000  001466  105777  176576          HSRINR: TSTB    @HRCSR                  ;IS DONE SET
 1001  001472  100401                          BMI     .+4
 1002  001474  104000                          HLT                             ;FALSE RETURN FROM MAINLINE
 1003  001476  105777  176570                  TSTB    @HRDBR                  ;TEST DATA FOR LEADER
 1004  001502  001413                          BEQ     HSRIN2                  ;IF LEADER GO BACK
 1005  001504  127767  176562  000026          CMPB    @HRDBR,DATA3            ;NOT LEADER TEST FOR DATA
 1006  001512  001401                          BEQ     .+4
 1007  001514  104000                          HLT                             ;DATA COMPARISON ERROR
 1008  001516  105267  000016                  INCB    DATA3                   ;INCREMENT DATA
 1009  001522  001003                          BNE     HSRIN2
 1010  001524  012767  000001  000006  HSRIN1: MOV     #1,DATA3                ;BASE DATA
 1011  001532  005277  176532          HSRIN2: INC     @HRCSR                  ;START READER
 1012  001536  000002                          RTI                             ;RETURN TO MAINLINE
 1013
 1014  001540  000000                  DATA3:  XX                              ;EXPECTED DATA
 1015
 1016                                   ;HS PUNCH SECTION, VALUES 0 TO 377
 1017                                   ;ENABLE READER ON FIX COUNT OF PUNCH ONLY (14 TIMES)
 1018  001542  012767  000000  000064  HPOUT:  MOV     #0,DATA4                ;INITAL DATA
 1019  001550  016777  000060  176520  HPOUT1: MOV     DATA4,@HPDBR            ;OUTPUT TO DEVICE
 1020  001556  000002                          RTI                             ;RETURN TO MAINLINE
 1021  001560  105777  176510          HPOUTR: TSTB    @HPCSR                  ;TEST FOR DONE
 1022  001564  100401                          BMI     .+4                     ;BRANCH IF FLAG FOUND
 1023  001566  104000                          HLT                             ;FALSE INTERRUPT RETURN
 1024  001570  046777  000044  176472          BIC     DELAY,@HRCSR            ;CLEAR HSR INTERRUPT ENABLE
 1025  001576  005267  000034                  INC     INTCNT                  ;COUNT INTERRUPTS
 1026  001602  026727  000030  000014          CMP     INTCNT,#14              ;SAVE TO TURN READER ON?
 1027  001610  001005                          BNE     HPOUT2                  ;NO-NEED MORE TIME
 1028  001612  005067  000020                  CLR     INTCNT                  ;YES RESET COUNTER
 1029  001616  056777  000016  176444          BIS     DELAY,@HRCSR            ;SET READER INT ENABLE
 1030  001624  105267  000004  HPOUT2: INCB    DATA4                   ;INCREMENT DATA
 1031  001630  001744                          BEQ     HPOUT                   ;AT UPPER LIMIT START OVER
 1032  001632  000746                          BR      HPOUT1                  ;FINISH REST OF DATA
 1033
 1034  001634  000000                  DATA4:  XX
 1035  001636  000000                  INTCNT: 0
 1036  001640  000000                  DELAY:  0                               ;EQUAL 100 IF HSR RUNNING
 1037
 1038                                   ;TEST OF LINE CLOCK, INTERRUPT FOR 55 SECONDS THEN STALL FOR 5 SECONDS.
 1039  001642  005037  001760          LK1:    CLR     @#TIME                  ;CLEAR LINE CLOCK TIMER
 1040  001646  052777  000100  176424          BIS     #100,@LKCSR
 1041  001654  052767  000100  176114          BIS     #100,STATUS
 1042  001662  000002                  LK2:    RTI                             ;RETURN TO MAINLINE
 1043  001664  105777  176410          LK3:    TSTB    @LKCSR                  ;TEST FOR DONE
 1044  001670  100401                          BMI     .+4
 1045  001672  104000                          HLT                             ;FALSE INTERRUPT
```

```
1046  001674  042777  000200  176376          BIC     #200.@LKCSR
1047  001702  005237  001760          LK4:    INC     @#TIME                  ;ON INTERUPTS ENTER HERE
1048  001706  022737  006344  001760          CMP     #3300.,@#TIME           ;A LAPS OF 55 SECONDS
1049  001714  103362                          BHIS    LK2                     ;BRANCH IF TIME LESS THAN 55 SECONDS
1050  001716  042777  000100  176354          BIC     #100,@LKCSR
1051  001724  042767  000100  176044          BIC     #100,STATUS             ;LOWER PRIORITY
1052  001732  022737  007020  001760          CMP     #3600.,@#TIME           ;ONE MINUTE UP
1053  001740  001740                          BEQ     LK1                     ;YES-RESET TIMER
1054  001742  105777  176332                  TSTB    @LKCSR                  ;NO-SKIP ON FLAG TILL IT IS.
1055  001746  100375                          BPL     .-4
1056  001750  042777  000200  176322          BIC     #200,@LKCSR             ;CLEARS THE FLAG
1057  001756  000751                          BR      LK4                     ;FOUND FLAG GO INCREMENT COUNTER
1058  001760  000000              TIME:       0
1059
1060                                ;LINE PRINTER SHOULD RAISE PROCESSOR PRIORITY TO LEVEL OF LINE PRINTER
1061                                ;INTERRUPT VECTOR IS 200
1062
1063  001762  016767  000142  000136  LP1:     MOV     SOLPAT,CURPAT           ;START OF LINE TO CURRENT
1064  001770  016777  000132  176306  LP2:     MOV     CURPAT,@LPDBR           ;CURRENT PATTERN TO LINE PRINTER
1065  001776  105777  176300                  TSTB    @LPCSR
1066  002002  100405                          BMI     LP6
1067  002004  000002                          RTI                             ;RETURN TO MAIN LINE
1068  002006  105777  176270          LPINTR: TSTB    @LPCSR                  ;TEST FOR FLAG
1069  002012  100401                          BMI     .+4
1070  002014  104000                          HLT                             ;FALSE RETURN FROM MAIN LINE
1071  002016  026727  000110  000117  LP6:     CMP     CLINCT,#79.             ;TEST FOR END OF LINE,
1072                                                                           ;CHANGE THIS VALUE FOR 132 COLUMN PRINTER
1073  002024  001415                          BEQ     LP4                     ;GO GENERATE CR/LF
1074  002026  005267  000100                  INC     CLINCT                  ;INCREMENT LINE POSITION COUNT
1075  002032  026727  000070  000137          CMP     CURPAT,#137             ;TEST FOR MAXIMUM PATTERN
1076  002040  001403                          BEQ     LP3                     ;YES = GO TO LP3 AND RESET
1077  002042  005267  000060                  INC     CURPAT                  ;NO = INCREMENT TO NEXT PATTERN
1078  002046  000750                          BR      LP2                     ;GO SEND IT TO LINE PRINTER
1079  002050  012767  000040  000050  LP3:     MOV     #40,CURPAT              ;RESET PATTERN AND SEND TO PRINTER
1080  002056  000744                          BR      LP2                     ;SENT TO LINE PRINTER
1081  002060  005067  000046          LP4:    CLR     CLINCT                  ;RESET LINE COUNT
1082  002064  012777  000012  176212          MOV     #12,@LPDBR              ;LINE FEED
1083  002072  105777  176204                  TSTB    @LPCSR
1084  002076  100375                          BPL     .-4
1085  002100  026727  000024  000137          CMP     SOLPAT,#137             ;START OF LINE PATTERN
1086  002106  001403                          BEQ     LP5
1087  002110  005267  000014                  INC     SOLPAT                  ;INCREMENT START OF LINE
1088  002114  000722                          BR      LP1
1089  002116  012767  000040  000004  LP5:     MOV     #40,SOLPAT              ;RESET START OF LINE
1090  002124  000716                          BR      LP1                     ;PRINT
1091  002126  000000              CURPAT: 0                                   ;CURRENT CHARACTER BEING PRINTED
1092  002130  000000              SOLPAT: 0                                   ;START OF LINE CHARACTER
1093  002132  000000              CLINCT: 0                                   ;POSITION OF LINE
1094
1095                                ;RK11 DISK TEST INTERRUPT LEVEL 5, 2000 WORD TRANSFERS
1096  002134  005077  176176          RKSTART:        CLR     @RKDAE          ;INITIALIZE DISK = DAR-DAE
1097  002140  016777  000356  176174  RK1:     MOV     LLIMIT,@RKBAR           ;CORE BASE
1098  002146  012777  176000  176164          MOV     #RKWORDCT,@RKWC         ;LENGTH OF TRANSFER
1099  002154  113777  002226  176162          MOVB    @#RKFUNCTION,@RKCSR     ;WRITE OR WRITE CHECK TO DISK
```

```
1100  002162  000002                          RTI                             ;RETURN TO MAINLINE CODE
1101  002164  032777  100200  176152  IRK:    BIT     #100200,@RKCSR          ;INTERRUPT VECTOR POINTS HERE
1102  002172  003002                          BGT     .+6
1103  002174  104000                          HLT                             ;RK-11 ERROR FLAG UP OR READY NOT UP
1104  002176  000756                          BR      RKSTART
1105  002200  032777  000037  176130          BIT     #37,@RKDAE              ;DISK AT UPPER LIMIT?
1106  002206  001354                          BNE     RK1             ;NO
1107  002210  122777  000031  176116          CMPB    #31,@RKDAH
1108  002216  001350                          BNE     RK1                     ;NO
1109  002220  000337  002226                  SWAB    @#RKFUNCTION            ;CHANGE COMMAND
1110  002224  000743                          BR      RKSTART                 ;RESTART NEW TRANSFER OF DISK
1111
1112  002226  000000                  RKFUNCTION:     0                       ;DISK COMMAND
1113                                  ;RP11 DISK SERVICE ROUTINE
1114  002230  105277  176172          RPSTART:        INCB    @RPCSR          ;INITIALIZE DISK - DAR=DAE
1115  002234  105777  176166                  TSTB    @RPCSR
1116  002240  100375                          BPL     .-4
1117  002242  016777  000254  176154  RP1:    MOV     LLIMIT,@RPBAR           ;INITIAL CORE ADDRESS
1118  002250  012777  176000  176144          MOV     #RPWORDCT,@RPWC         ;LENGTH OF TRANSFER
1119  002256  113777  000432  176142          MOVB    @#RPFUNCTION,@RPCSR     ;WRITE OR WRITE CHECK TO DISK
1120  002264  000002                          RTI                             ;RETURN TO MAINLINE CODE
1121  002266  032777  100200  176132  IRP:    BIT     #100200,@RPCSR                 ;INTERRUPT VECTOR POINTS HERE
1122  002274  003002                          BGT     .+6
1123  002276  104000                          HLT                             ;RP11 READY NOT UP OR ERROR
1124  002300  000753                          BR      RPSTART
1125  002302  122777  000312  176100          CMPB    #312,@RPCA              ;CYLINDER NO. 312
1126  002310  001354                          BNE     RP1                     ;NO
1127  002312  000367  176114                  SWAB    RPFUNCTION              ;CHANGE COMMAND
1128  002316  000744                          BR      RPSTART                 ;RESTART NEW TRANSFER OF DISK
1129                                  ;RC11 DISK SERVICE ROUTINE
1130  002320  012777  000040  175774  RCSTART: MOV     #40,@RCDAR              ;INITIALIZE DISK - DAR=DAE
1131  002326  016777  000170  175772  RC2:    MOV     LLIMIT,@RCBAR           ;CORE BASE
1132  002334  012777  176040  175762          MOV     #RCWORDCT,@RCWC         ;LENGTH OF TRANSFER
1133  002342  113777  002410  175760          MOVB    @#RCFUNCTION,@RCCSR     ;WRITE OR WRITE CHECK TO DISK
1134  002350  000002                          RTI                             ;RETURN TO MAINLINE CODE
1135  002352  037727  175752  100200  IRC:    BIT     @RCCSR,#100200          ;INTERRUPT VECTOR POINTS HERE
1136  002360  003002                          BGT     .+6
1137  002362  104000                          HLT                             ;RC11 READY NOT UP OR ERROR IS UP
1138  002364  000755                          BR      RCSTART
1139  002366  005277  175730                  INC     @RCDAR                  ;TO INCREASE XFER RATE
1140  002372  022777  002000  175722          CMP     #2000,@RCDAR            ;DISK AT UPPER LIMIT, 4000=2, 6000=3, 10000=4
1141  002400  001352                          BNE     RC2                     ;NO
1142  002402  000337  002410                  SWAB    @#RCFUNCTION            ;CHANGE COMMAND
1143  002406  000744                          BR      RCSTART                 ;RESTART NEW TRANSFER OF DISK
1144  002410  000000                  RCFUNCTION:     0                       ;DISK COMMAND
1145                                  ;RF11 DISK
1146  002412  105277  175702          RFSTART:        INCB    @RFCSRH         ;INITIALIZE DISK - DAR=DAE
1147  002416  062777  000040  175664          ADD     #40,@RFDAR              ;INCREASE DUTY CYCLE
1148  002424  016777  000072  175662  RF1:    MOV     LLIMIT,@RFCAR           ;CORE BASE
1149  002432  012777  176040  175652          MOV     #RFWORDCT,@RFWC         ;LENGTH OF TRANSFER
1150  002440  113777  002520  175650          MOVB    @#RFFUNCTION,@RFCSR     ;WRITE OR WRITE CHECK TO DISK
1151  002446  000002                          RTI                             ;RETURN TO MAINLINE CODE
1152  002450  037727  175642  100200  IRF:    BIT     @RFCSR,#100200          ;INTERRUPT VECTOR POINTS HERE
1153  002456  003002                          BGT     .+6
```

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1154  002460  104000                          HLT                     ;RF11 READY NOT UP OR ERROR UP
1155  002462  000753                          BR      RFSTART
1156  002464  062777  000040  175616          ADD     #40,@RFDAR      ;INCREASE DUTY CYCLE
1157  002472  122777  000003  175606          CMPB    #3,@RFDAE       ;DISK AT UPPER LIMIT? 7=2, 17=4, 37=8
1158  002500  001351                          BNE     RF1             ;NO
1159  002502  027727  175602  174000          CMP     @RFDAR,#174000  ;AS FAR ON DISK AS WE CAN GO
1160  002510  101745                          BLOS    RF1             ;NO
1161  002512  000337  002520                  SWAB    @#RFFUNCTION    ;CHANGE COMMAND
1162  002516  000735                          BR      RFSTART         ;RESTART NEW TRANSFER OF DISK
1163  002520  000000              RFFUNCTION: 0                       ;DISK COMMAND
1164  002522  004272              LLIMIT: BEGIN                       ;FIRST CORE ADDRESS OF TRANSFER
1165                              ;DT11 DEC TAPE
1166          000004              RD=4                        ;READ DATA
1167          000014              WD=14                       ;WRITE DATA
1168          000002              RB=2
1169          000002              BR=2                        ;READ BLOCK
1170          000000              F=0                         ;FORWARD
1171          000100              IE=100                      ;INTERRUPT ENABLE
1172          000001              DO=1                        ;DO - THE FUNCTION
1173          004000              R=4000                      ;REVERSE
1174
1175  002524  000000              TCFIRST:    0               ;FIRST BLOCK TO BE SEARCHED FOR
1176  002526  001101              TCLAST: 577.                ;LAST BLOCK TO BE SEARCHED FOR
1177  002530  000000              TCBLK:  0                   ;CURRENT BLOCK FOUND
1178  002532  000000              TCEXPE: 0                   ;THE BLOCK THAT IS EXPECTED
1179
1180                              ;GO TO FORWARD END ZONE
1181  002534  012777  002534  175644  FENDZ:  MOV     #FENDZ,@TCIV    ;END ZONE VECTOR SETUP
1182  002542  005777  175626          TST     @TCST           ;TEST FOR END ZONE
1183  002546  100403                  BMI     FEND1           ;AT END ZONE?
1184  002550  105277  175616          INCB    @TCCM           ;SET DO - NO DELAY
1185  002554  000002                  RTI                     ;NO - WAIT SOME MORE
1186  002556  012777  002606  175622  FEND1:  MOV     #TCF1,@TCIV     ;YES - NEW VECTOR
1187  002564  042777  104000  175600          BIC     #104000,@TCCM   ;SEARCH BLOCK FOWARD
1188  002572  016767  177726  177732          MOV     TCFIRST,TCEXPE  ;COUNT WHEN THIS BLOCK IS FOUND
1189  002600  105277  175566          TCF1A:  INCB    @TCCM           ;SET DO
1190  002604  000002                  RTI                     ;RETURN ON NEXT BLOCK
1191  002606  032777  100200  175556  TCF1:   BIT     #100200,@TCCM   ;ANY ERROR ON READ?
1192  002614  003001                  BGT     .+4
1193  002616  104000                  HLT                     ;TC ERROR SET - FORWARD READ BLOCK
1194  002620  027767  175552  177704          CMP     @TCDT,TCEXPE    ;IS THIS OUR BLOCK FOR SYNC
1195  002626  002764                  BLT     TCF1A           ;NO-READ SOME MORE BLOCKS
1196  002630  001401                  BEQ     TCF2            ;YES
1197  002632  104000                  HLT                     ;WE PASSED THE BLOCK
1198
1199  002634  012777  002650  175544  TCF2:   MOV     #TCF3,@TCIV     ;VECTOR FOR SEQUENTIAL READS
1200  002642  105277  175524          INCB    @TCCM           ;SET DO
1201  002646  000002                  RTI                     ;RETURN AND TEST SEQENTIAL BLOCKS
1202
1203                              ;FIND SEQUENTIAL BLOCK AT FOWARD DIRECTION
1204  002650  032777  100200  175514  TCF3:   BIT     #100200,@TCCM   ;TEST ERROR AND READY
1205  002656  003001                  BGT     .+4
1206  002660  104000                  HLT                     ;FALSE INTERRUPT ON TC-11
1207  002662  027767  175510  177636          CMP     @TCDT,TCLAST    ;HAVE WE TESTED ALL BLOCKS
```

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1208  002670  001414                          BEQ     RENDZ           ;YES DRIVE UNIT IN END ZONE TO START OVER
1209  002672  005267  177634                  INC     TCEXPE          ;NO-INCREMENT EXPECTED COUNT
1210  002676  027767  175474  177626          CMP     @TCDT,TCEXPE    ;IS CURRENT BLOCK CORRECT
1211  002704  001401                          BEQ     .+4
1212  002706  104000                          HLT                     ;FAILED IN FOWARD READ TO FIND NEXT BLOCK
1213  002710  000427                          BR      TCWBK           ;THIS ROUTINE WRITES A BLOCK
1214  002712  105277  175454          TCF4:   INCB    @TCCM           ;SET DO
1215  002716  000002                          RTI
1216  002720  000705                  XFENDZ: BR      FENDZ           ;INDIRECT LINK
1217
1218                                  ;MOVE TAPE TO REVERSE END ZONE
1219  002722  012777  002722  175456  RENDZ:  MOV     #RENDZ,@TCIV    ;END ZONE VECTOR SETUP
1220  002730  016767  177572  177574          MOV     TCLAST,TCEXPE   ;SET UP FOR REVERSE SEARCH
1221  002736  005777  175432                  TST     @TCST           ;IN END ZONE
1222  002742  100403                          BMI     REND1           ;YES - START TO TURN UNIT AROUND
1223  002744  105277  175422                  INCB    @TCCM           ;SET DO
1224  002750  000002                          RTI                     ;NO - WAIT TILL WE ARE
1225  002752  012777  004103  175412  REND1:  MOV     #R+IE+RB+DO,@TCCM ;FUNCTION = READ BLOCK, REVERSE AND GO
1226  002760  012777  003050  175420          MOV     #TCR1,@TCIV     ;SET UP NEW INTERRUPT VECTOR
1227  002766  000002                          RTI
1228                                  ;WRITE FORWARD ALL BLOCKS EXCEPT 0
1229
1230  002770  012777  003022  175410  TCWBK:  MOV     #TCWB1,@TCIV    ;INTERRUPT VECTOR FOR WRITE
1231  002776  012777  177400  175376          MOV     #-400,@TCWC     ;ONE BLOCK
1232  003004  012777  003256  175372          MOV     #TCWBUF,@TCBA   ;THE WRITE BUFFER ADDRESS
1233  003012  112777  000115  175352          MOVB    #IE+WD+DO,@TCCM ;WRITE THE BLOCK
1234  003020  000002                          RTI                     ;RETURN WHEN BLOCK IS WRITTEN
1235  003022  005777  175344          TCWB1:  TST     @TCCM           ;ANY ERRORS
1236  003026  100001                          BPL     .+4
1237  003030  104000                          HLT
1238  003032  012777  002650  175346          MOV     #TCF3,@TCIV     ;SEARCH BLOCK VECTOR
1239  003040  112777  000102  175324          MOVB    #IE+RB,@TCCM    ;READ BLOCK
1240  003046  000721                          BR      TCF4            ;FIND THE NEXT BLOCK
1241
1242  003050  032777  100200  175314  TCR1:   BIT     #100200,@TCCM   ;TEST FOR ERROR AND READY
1243  003056  003001                          BGT     .+4
1244  003060  104000                          HLT                     ;DECTAPE ERROR ON READ BLOCK REVERSE
1245  003062  027767  175310  177442          CMP     @TCDT,TCEXPE    ;IS IT OUR FIRST BLOCK
1246  003070  001406                          BEQ     TCR2            ;YES - GO TEST THE REST
1247  003072  002002                          BGE     TCR1A           ;NO - HAVE WE PASSED THE BLOCK
1248  003074  104000                          HLT                     ;WE PASS OUR BLOCK
1249  003076  000711                          BR      RENDZ           ;GO TO END ZONE AND TRY AGAIN
1250  003100  105277  175266          TCR1A:  INCB    @TCCM           ;SET DO
1251  003104  000002                          RTI                     ;WE FOUND OUR FIRST BLOCK
1252  003106  012777  003122  175272  TCR2:   MOV     #TCR3,@TCIV     ;SET UP INTERRUPT TO TEST ALL BLOCKS
1253  003114  105277  175252                  INCB    @TCCM           ;SET DO
1254  003120  000002                          RTI                     ;WAIT FOR NEXT BLOCK TO INTERRUPT
1255
1256                                  ;FIND SEQUENTIAL BLOCK IN REVERSE DIRECTION
1257  003122  032777  100200  175242  TCR3:   BIT     #100200,@TCCM   ;TEST FOR READ AND ERROR
1258  003130  003001                          BGT     .+4
1259  003132  104000                          HLT                     ;ERROR READING SEQUENTIAL BLOCK IN REVERSE
1260  003134  026777  177364  175234          CMP     TCFIRST,@TCDT   ;DID WE DO ALL THE BLOCKS
1261  003142  001666                          BEQ     XFENDZ          ;YES - GO TO END ZONE TO RESTART
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1262  003144  005367  177362                  DEC     TCEXPE          ;NO - DECREMENT BLOCK NUMBER
1263  003150  027767  175222  177354          CMP     @TCCT,TCEXPE    ;TEST SEQUENTAIL BLOCK IN REVERSE
1264  003156  001401                          BEQ     .+4
1265  003160  104000                          HLT                     ;TEST SECUENTIAL READ BLOCK IN REVERSE FAILED
1266  003162  000403                          BR      TCRBK           ;THIS ROUTINE READ A BLOCK
1267  003164  105277  175202          TCR4:   INCB    @TCCM           ;SET DO
1268  003170  000002                          RTI                     ;LETS TRY A NEW BLOCK
1269
1270                                  ;READ REVERSE ALL BLOCK EXCEPT BLOCK 1101
1271  003172  012777  003230  175206  TCRBK:  MOV     #TCR1,@TCIV     ;SET UP INTERRUPT VECTOR
1272  003200  012777  177400  175174          MOV     #-400,@TCWC     ;READ ONE BLOCK
1273  003206  012777  003256  175170          MOV     #TCRBUF,@TCBA   ;WHERE BUFFER IS
1274  003214  112777  000105  175150          MOVB    #IE+RD+DO,@TCCM ;READ THE BLOCK
1275  003222  004767  175206                  JSR     %7,TC1          ;CHECK DATA BUFFER
1276  003226  000002                          RTI                     ;EXIT - RETURN WHEN BLOCK IS READ
1277  003230  005777  175136          TCR81:  TST     @TCCM           ;AND ERRORS
1278  003234  100001                          BPL     .+4
1279  003236  104000                          HLT                     ;DECTAPE ERROR
1280  003240  012777  003122  175140          MOV     #TCR3,@TCIV     ;NEW VECTOR FOR BLOCK SEARCH
1281  003246  112777  000102  175116          MOVB    #IE+RB,@TCCM    ;READ BLOCK FUNCTION
1282  003254  000743                          BR      TCR4            ;RETURN TO BLOCK SEARCH
1283
1284                                  ;THIS WRITE BUFFER LOOK THE SAME FORWARD OR REVERSE
1285  003256                          TCWBUF:
1286  003256                          TCRBUF:
1287          000001                          N=1
1288                                          .REPT   100
1289                                          N                       ;DECTAPE READ/WRITE BUFFER
1290                                          -N
1291                                          N=N+1
1292                                          .ENDR
1293  003256  000001                          N                       ;DECTAPE READ/WRITE BUFFER
1294  003260  177777                          -N
1295          000002                          N=N+1
1296  003262  000002                          N                       ;DECTAPE READ/WRITE BUFFER
1297  003264  177776                          -N
1298          000003                          N=N+1
1299  003266  000003                          N                       ;DECTAPE READ/WRITE BUFFER
1300  003270  177775                          -N
1301          000004                          N=N+1
1302  003272  000004                          N                       ;DECTAPE READ/WRITE BUFFER
1303  003274  177774                          -N
1304          000005                          N=N+1
1305  003276  000005                          N                       ;DECTAPE READ/WRITE BUFFER
1306  003300  177773                          -N
1307          000006                          N=N+1
1308  003302  000006                          N                       ;DECTAPE READ/WRITE BUFFER
1309  003304  177772                          -N
1310          000007                          N=N+1
1311  003306  000007                          N                       ;DECTAPE READ/WRITE BUFFER
1312  003310  177771                          -N
1313          000010                          N=N+1
1314  003312  000010                          N                       ;DECTAPE READ/WRITE BUFFER
1315  003314  177770                          -N
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 1316            000011                          N=N+1
 1317  003316    000011                          N                       ;DECTAPE READ/WRITE BUFFER
 1318  003320    177767                          -N
 1319            000012                          N=N+1
 1320  003322    000012                          N                       ;DECTAPE READ/WRITE BUFFER
 1321  003324    177766                          -N
 1322            000013                          N=N+1
 1323  003326    000013                          N                       ;DECTAPE READ/WRITE BUFFER
 1324  003330    177765                          -N
 1325            000014                          N=N+1
 1326  003332    000014                          N                       ;DECTAPE READ/WRITE BUFFER
 1327  003334    177764                          -N
 1328            000015                          N=N+1
 1329  003336    000015                          N                       ;DECTAPE READ/WRITE BUFFER
 1330  003340    177763                          -N
 1331            000016                          N=N+1
 1332  003342    000016                          N                       ;DECTAPE READ/WRITE BUFFER
 1333  003344    177762                          -N
 1334            000017                          N=N+1
 1335  003346    000017                          N                       ;DECTAPE READ/WRITE BUFFER
 1336  003350    177761                          -N
 1337            000020                          N=N+1
 1338  003352    000020                          N                       ;DECTAPE READ/WRITE BUFFER
 1339  003354    177760                          -N
 1340            000021                          N=N+1
 1341  003356    000021                          N                       ;DECTAPE READ/WRITE BUFFER
 1342  003360    177757                          -N
 1343            000022                          N=N+1
 1344  003362    000022                          N                       ;DECTAPE READ/WRITE BUFFER
 1345  003364    177756                          -N
 1346            000023                          N=N+1
 1347  003366    000023                          N                       ;DECTAPE READ/WRITE BUFFER
 1348  003370    177755                          -N
 1349            000024                          N=N+1
 1350  003372    000024                          N                       ;DECTAPE READ/WRITE BUFFER
 1351  003374    177754                          -N
 1352            000025                          N=N+1
 1353  003376    000025                          N                       ;DECTAPE READ/WRITE BUFFER
 1354  003400    177753                          -N
 1355            000026                          N=N+1
 1356  003402    000026                          N                       ;DECTAPE READ/WRITE BUFFER
 1357  003404    177752                          -N
 1358            000027                          N=N+1
 1359  003406    000027                          N                       ;DECTAPE READ/WRITE BUFFER
 1360  003410    177751                          -N
 1361            000030                          N=N+1
 1362  003412    000030                          N                       ;DECTAPE READ/WRITE BUFFER
 1363  003414    177750                          -N
 1364            000031                          N=N+1
 1365  003416    000031                          N                       ;DECTAPE READ/WRITE BUFFER
 1366  003420    177747                          -N
 1367            000032                          N=N+1
 1368  003422    000032                          N                       ;DECTAPE READ/WRITE BUFFER
 1369  003424    177746                          -N
```

```
1370            000033                  N=N+1
1371  003426    000033                  N               ;DECTAPE READ/WRITE BUFFER
1372  003430    177745                  -N
1373            000034                  N=N+1
1374  003432    000034                  N               ;DECTAPE READ/WRITE BUFFER
1375  003434    177744                  -N
1376            000035                  N=N+1
1377  003436    000035                  N               ;DECTAPE READ/WRITE BUFFER
1378  003440    177743                  -N
1379            000036                  N=N+1
1380  003442    000036                  N               ;DECTAPE READ/WRITE BUFFER
1381  003444    177742                  -N
1382            000037                  N=N+1
1383  003446    000037                  N               ;DECTAPE READ/WRITE BUFFER
1384  003450    177741                  -N
1385            000040                  N=N+1
1386  003452    000040                  N               ;DECTAPE READ/WRITE BUFFER
1387  003454    177740                  -N
1388            000041                  N=N+1
1389  003456    000041                  N               ;DECTAPE READ/WRITE BUFFER
1390  003460    177737                  -N
1391            000042                  N=N+1
1392  003462    000042                  N               ;DECTAPE READ/WRITE BUFFER
1393  003464    177736                  -N
1394            000043                  N=N+1
1395  003466    000043                  N               ;DECTAPE READ/WRITE BUFFER
1396  003470    177735                  -N
1397            000044                  N=N+1
1398  003472    000044                  N               ;DECTAPE READ/WRITE BUFFER
1399  003474    177734                  -N
1400            000045                  N=N+1
1401  003476    000045                  N               ;DECTAPE READ/WRITE BUFFER
1402  003500    177733                  -N
1403            000046                  N=N+1
1404  003502    000046                  N               ;DECTAPE READ/WRITE BUFFER
1405  003504    177732                  -N
1406            000047                  N=N+1
1407  003506    000047                  N               ;DECTAPE READ/WRITE BUFFER
1408  003510    177731                  -N
1409            000050                  N=N+1
1410  003512    000050                  N               ;DECTAPE READ/WRITE BUFFER
1411  003514    177730                  -N
1412            000051                  N=N+1
1413  003516    000051                  N               ;DECTAPE READ/WRITE BUFFER
1414  003520    177727                  -N
1415            000052                  N=N+1
1416  003522    000052                  N               ;DECTAPE READ/WRITE BUFFER
1417  003524    177726                  -N
1418            000053                  N=N+1
1419  003526    000053                  N               ;DECTAPE READ/WRITE BUFFER
1420  003530    177725                  -N
1421            000054                  N=N+1
1422  003532    000054                  N               ;DECTAPE READ/WRITE BUFFER
1423  003534    177724                  -N
```

```
 1424            000055                  N=N+1
 1425  003536    000055                  N               ;DECTAPE READ/WRITE BUFFER
 1426  003540    177723                  -N
 1427            000056                  N=N+1
 1428  003542    000056                  N               ;DECTAPE READ/WRITE BUFFER
 1429  003544    177722                  -N
 1430            000057                  N=N+1
 1431  003546    000057                  N               ;DECTAPE READ/WRITE BUFFER
 1432  003550    177721                  -N
 1433            000060                  N=N+1
 1434  003552    000060                  N               ;DECTAPE READ/WRITE BUFFER
 1435  003554    177720                  -N
 1436            000061                  N=N+1
 1437  003556    000061                  N               ;DECTAPE READ/WRITE BUFFER
 1438  003560    177717                  -N
 1439            000062                  N=N+1
 1440  003562    000062                  N               ;DECTAPE READ/WRITE BUFFER
 1441  003564    177716                  -N
 1442            000063                  N=N+1
 1443  003566    000063                  N               ;DECTAPE READ/WRITE BUFFER
 1444  003570    177715                  -N
 1445            000064                  N=N+1
 1446  003572    000064                  N               ;DECTAPE READ/WRITE BUFFER
 1447  003574    177714                  -N
 1448            000065                  N=N+1
 1449  003576    000065                  N               ;DECTAPE READ/WRITE BUFFER
 1450  003600    177713                  -N
 1451            000066                  N=N+1
 1452  003602    000066                  N               ;DECTAPE READ/WRITE BUFFER
 1453  003604    177712                  -N
 1454            000067                  N=N+1
 1455  003606    000067                  N               ;DECTAPE READ/WRITE BUFFER
 1456  003610    177711                  -N
 1457            000070                  N=N+1
 1458  003612    000070                  N               ;DECTAPE READ/WRITE BUFFER
 1459  003614    177710                  -N
 1460            000071                  N=N+1
 1461  003616    000071                  N               ;DECTAPE READ/WRITE BUFFER
 1462  003620    177707                  -N
 1463            000072                  N=N+1
 1464  003622    000072                  N               ;DECTAPE READ/WRITE BUFFER
 1465  003624    177706                  -N
 1466            000073                  N=N+1
 1467  003626    000073                  N               ;DECTAPE READ/WRITE BUFFER
 1468  003630    177705                  -N
 1469            000074                  N=N+1
 1470  003632    000074                  N               ;DECTAPE READ/WRITE BUFFER
 1471  003634    177704                  -N
 1472            000075                  N=N+1
 1473  003636    000075                  N               ;DECTAPE READ/WRITE BUFFER
 1474  003640    177703                  -N
 1475            000076                  N=N+1
 1476  003642    000076                  N               ;DECTAPE READ/WRITE BUFFER
 1477  003644    177702                  -N
```

```
1478            000077                  N=N+1
1479  003646    000077                  N                       ;DECTAPE READ/WRITE BUFFER
1480  003650    177701                  -N
1481            000100                  N=N+1
1482  003652    000100                  N                       ;DECTAPE READ/WRITE BUFFER
1483  003654    177700                  -N
1484            000101                  N=N+1
1485                                    .REPT   100
1486                                    N=N-1
1487                                    -N
1488                                    N                       ;DEC TAPE READ/WRITE BUFFER
1489                                    .ENDR
1490            000100                  N=N-1
1491  003656    177700                  -N
1492  003660    000100                  N                       ;DEC TAPE READ/WRITE BUFFER
1493            000077                  N=N-1
1494  003662    177701                  -N
1495  003664    000077                  N                       ;DEC TAPE READ/WRITE BUFFER
1496            000076                  N=N-1
1497  003666    177702                  -N
1498  003670    000076                  N                       ;DEC TAPE READ/WRITE BUFFER
1499            000075                  N=N-1
1500  003672    177703                  -N
1501  003674    000075                  N                       ;DEC TAPE READ/WRITE BUFFER
1502            000074                  N=N-1
1503  003676    177704                  -N
1504  003700    000074                  N                       ;DEC TAPE READ/WRITE BUFFER
1505            000073                  N=N-1
1506  003702    177705                  -N
1507  003704    000073                  N                       ;DEC TAPE READ/WRITE BUFFER
1508            000072                  N=N-1
1509  003706    177706                  -N
1510  003710    000072                  N                       ;DEC TAPE READ/WRITE BUFFER
1511            000071                  N=N-1
1512  003712    177707                  -N
1513  003714    000071                  N                       ;DEC TAPE READ/WRITE BUFFER
1514            000070                  N=N-1
1515  003716    177710                  -N
1516  003720    000070                  N                       ;DEC TAPE READ/WRITE BUFFER
1517            000067                  N=N-1
1518  003722    177711                  -N
1519  003724    000067                  N                       ;DEC TAPE READ/WRITE BUFFER
1520            000066                  N=N-1
1521  003726    177712                  -N
1522  003730    000066                  N                       ;DEC TAPE READ/WRITE BUFFER
1523            000065                  N=N-1
1524  003732    177713                  -N
1525  003734    000065                  N                       ;DEC TAPE READ/WRITE BUFFER
1526            000064                  N=N-1
1527  003736    177714                  -N
1528  003740    000064                  N                       ;DEC TAPE READ/WRITE BUFFER
1529            000063                  N=N-1
1530  003742    177715                  -N
1531  003744    000063                  N                       ;DEC TAPE READ/WRITE BUFFER
```

```
1532            000062                  N=N-1
1533  003746    177716                  -N
1534  003750    000062                  N                       ;DEC TAPE READ/WRITE BUFFER
1535            000061                  N=N-1
1536  003752    177717                  -N
1537  003754    000061                  N                       ;DEC TAPE READ/WRITE BUFFER
1538            000060                  N=N-1
1539  003756    177720                  -N
1540  003760    000060                  N                       ;DEC TAPE READ/WRITE BUFFER
1541            000057                  N=N-1
1542  003762    177721                  -N
1543  003764    000057                  N                       ;DEC TAPE READ/WRITE BUFFER
1544            000056                  N=N-1
1545  003766    177722                  -N
1546  003770    000056                  N                       ;DEC TAPE READ/WRITE BUFFER
1547            000055                  N=N-1
1548  003772    177723                  -N
1549  003774    000055                  N                       ;DEC TAPE READ/WRITE BUFFER
1550            000054                  N=N-1
1551  003776    177724                  -N
1552  004000    000054                  N                       ;DEC TAPE READ/WRITE BUFFER
1553            000053                  N=N-1
1554  004002    177725                  -N
1555  004004    000053                  N                       ;DEC TAPE READ/WRITE BUFFER
1556            000052                  N=N-1
1557  004006    177726                  -N
1558  004010    000052                  N                       ;DEC TAPE READ/WRITE BUFFER
1559            000051                  N=N-1
1560  004012    177727                  -N
1561  004014    000051                  N                       ;DEC TAPE READ/WRITE BUFFER
1562            000050                  N=N-1
1563  004016    177730                  -N
1564  004020    000050                  N                       ;DEC TAPE READ/WRITE BUFFER
1565            000047                  N=N-1
1566  004022    177731                  -N
1567  004024    000047                  N                       ;DEC TAPE READ/WRITE BUFFER
1568            000046                  N=N-1
1569  004026    177732                  -N
1570  004030    000046                  N                       ;DEC TAPE READ/WRITE BUFFER
1571            000045                  N=N-1
1572  004032    177733                  -N
1573  004034    000045                  N                       ;DEC TAPE READ/WRITE BUFFER
1574            000044                  N=N-1
1575  004036    177734                  -N
1576  004040    000044                  N                       ;DEC TAPE READ/WRITE BUFFER
1577            000043                  N=N-1
1578  004042    177735                  -N
1579  004044    000043                  N                       ;DEC TAPE READ/WRITE BUFFER
1580            000042                  N=N-1
1581  004046    177736                  -N
1582  004050    000042                  N                       ;DEC TAPE READ/WRITE BUFFER
1583            000041                  N=N-1
1584  004052    177737                  -N
1585  004054    000041                  N                       ;DEC TAPE READ/WRITE BUFFER
```

```
1586            000040                  N=N-1
1587  004056    177740                  -N
1588  004060    000040                  N                       ;DEC TAPE READ/WRITE BUFFER
1589            000037                  N=N-1
1590  004062    177741                  -N
1591  004064    000037                  N                       ;DEC TAPE READ/WRITE BUFFER
1592            000036                  N=N-1
1593  004066    177742                  -N
1594  004070    000036                  N                       ;DEC TAPE READ/WRITE BUFFER
1595            000035                  N=N-1
1596  004072    177743                  -N
1597  004074    000035                  N                       ;DEC TAPE READ/WRITE BUFFER
1598            000034                  N=N-1
1599  004076    177744                  -N
1600  004100    000034                  N                       ;DEC TAPE READ/WRITE BUFFER
1601            000033                  N=N-1
1602  004102    177745                  -N
1603  004104    000033                  N                       ;DEC TAPE READ/WRITE BUFFER
1604            000032                  N=N-1
1605  004106    177746                  -N
1606  004110    000032                  N                       ;DEC TAPE READ/WRITE BUFFER
1607            000031                  N=N-1
1608  004112    177747                  -N
1609  004114    000031                  N                       ;DEC TAPE READ/WRITE BUFFER
1610            000030                  N=N-1
1611  004116    177750                  -N
1612  004120    000030                  N                       ;DEC TAPE READ/WRITE BUFFER
1613            000027                  N=N-1
1614  004122    177751                  -N
1615  004124    000027                  N                       ;DEC TAPE READ/WRITE BUFFER
1616            000026                  N=N-1
1617  004126    177752                  -N
1618  004130    000026                  N                       ;DEC TAPE READ/WRITE BUFFER
1619            000025                  N=N-1
1620  004132    177753                  -N
1621  004134    000025                  N                       ;DEC TAPE READ/WRITE BUFFER
1622            000024                  N=N-1
1623  004136    177754                  -N
1624  004140    000024                  N                       ;DEC TAPE READ/WRITE BUFFER
1625            000023                  N=N-1
1626  004142    177755                  -N
1627  004144    000023                  N                       ;DEC TAPE READ/WRITE BUFFER
1628            000022                  N=N-1
1629  004146    177756                  -N
1630  004150    000022                  N                       ;DEC TAPE READ/WRITE BUFFER
1631            000021                  N=N-1
1632  004152    177757                  -N
1633  004154    000021                  N                       ;DEC TAPE READ/WRITE BUFFER
1634            000020                  N=N-1
1635  004156    177760                  -N
1636  004160    000020                  N                       ;DEC TAPE READ/WRITE BUFFER
1637            000017                  N=N-1
1638  004162    177761                  -N
1639  004164    000017                  N                       ;DEC TAPE READ/WRITE BUFFER
```

```
 1640            000016                          N=N-1
 1641  004166    177762                          -N
 1642  004170    000016                          N                       ;DEC TAPE READ/WRITE BUFFER
 1643            000015                          N=N-1
 1644  004172    177763                          -N
 1645  004174    000015                          N                       ;DEC TAPE READ/WRITE BUFFER
 1646            000014                          N=N-1
 1647  004176    177764                          -N
 1648  004200    000014                          N                       ;DEC TAPE READ/WRITE BUFFER
 1649            000013                          N=N-1
 1650  004202    177765                          -N
 1651  004204    000013                          N                       ;DEC TAPE READ/WRITE BUFFER
 1652            000012                          N=N-1
 1653  004206    177766                          -N
 1654  004210    000012                          N                       ;DEC TAPE READ/WRITE BUFFER
 1655            000011                          N=N-1
 1656  004212    177767                          -N
 1657  004214    000011                          N                       ;DEC TAPE READ/WRITE BUFFER
 1658            000010                          N=N-1
 1659  004216    177770                          -N
 1660  004220    000010                          N                       ;DEC TAPE READ/WRITE BUFFER
 1661            000007                          N=N-1
 1662  004222    177771                          -N
 1663  004224    000007                          N                       ;DEC TAPE READ/WRITE BUFFER
 1664            000006                          N=N-1
 1665  004226    177772                          -N
 1666  004230    000006                          N                       ;DEC TAPE READ/WRITE BUFFER
 1667            000005                          N=N-1
 1668  004232    177773                          -N
 1669  004234    000005                          N                       ;DEC TAPE READ/WRITE BUFFER
 1670            000004                          N=N-1
 1671  004236    177774                          -N
 1672  004240    000004                          N                       ;DEC TAPE READ/WRITE BUFFER
 1673            000003                          N=N-1
 1674  004242    177775                          -N
 1675  004244    000003                          N                       ;DEC TAPE READ/WRITE BUFFER
 1676            000002                          N=N-1
 1677  004246    177776                          -N
 1678  004250    000002                          N                       ;DEC TAPE READ/WRITE BUFFER
 1679            000001                          N=N-1
 1680  004252    177777                          -N
 1681  004254    000001                          N                       ;DEC TAPE READ/WRITE BUFFER
 1682
 1683  004256    122727  000000  000001          CMPB    #0,#1                   ;T7 FIX
 1684  004264    002401                          BLT     .+4
 1685  004266    104000                          HLT                             ;CMPB FAILED
 1686  004270    104400                          SCOPE
 1687  004272    012767  004272  012104  BEGIN:  MOV     #BEGIN,RETURN           ;FOR SCOPING
 1688  004300    104400                          SCOPE
 1689  004302    012737  004000  016400          MOV     #4000,@#ICOUNT          ;ITERATION COUNT
 1690                                    ;TEST COMPARE INSTRUCTION INDEXED
 1691  004310    012700  177770                  MOV     #-10,%0                 ;MINUS 10 TO REG 0
 1692  004314    026027  016602  125252          CMP     A(0),#125252            ;(A INDEX BY MINUS 10) TO #125252
 1693  004322    001401                          BEQ     .+4
```

```
 1694  004324  104000                          HLT                             ;COMPARE WITH INDEX FAILED
 1695  004326  104400                          SCOPE
 1696
 1697  004330  012700  177770                  MOV     #-10.,%0                ;FOR INDEX
 1698  004334  022760  125252  016602          CMP     #125252,A(0)            ;A INDEXED
 1699  004342  001401                          BEQ     .+4
 1700  004344  104000                          HLT                             ;COMPARE FAILED DESTINATION INDEX
 1701  004346  104400                          SCOPE
 1702                                  ;SET "ISR" FOR DISKS AND KW11L TO CURRENT BANK
 1703  004350  010700                          MOV     %7,%0                   ;CURRENT BANK
 1704  004352  042700  007777                  BIC     #007777,%0              ;LEAVE ONLY BANK BITS
 1705  004356  062700  001654                  ADD     #LK3.,%0                ;ADD IN CLOCK ENTRANCE
 1706  004362  010037  000100                  MOV     %0,@#100                ;LINE CLOCK, KW11L
 1707  004366  042700  007777                  BIC     #007777,%0
 1708  004372  062700  002450                  ADD     #IRF.%0
 1709  004376  010037  000204                  MOV     %0,@#204                ;RF11 ISR
 1710  004402  042700  007777                  BIC     #007777,%0
 1711  004406  062700  002352                  ADD     #IRC,%0
 1712  004412  010037  000210                  MOV     %0,@#210                ;RC11, ISR
 1713  004416  042700  007777                  BIC     #007777,%0
 1714  004422  062700  002154                  ADD     #IRK,%0
 1715  004426  010037  000220                  MOV     %0,@#220                ;RK11 ISR
 1716  004432  042700  007777                  BIC     #7777,%0
 1717  004436  062700  002256                  ADD     #IRP,%0
 1718  004442  010037  000254                  MOV     %0,@#254                ;RP11 ISR
 1719  004446  042700  007777                  BIC     #007777,%0
 1720  004452  063700  002522                  ADD     @#LLIMIT,%0
 1721  004456  010067  176040                  MOV     %0,LLIMIT               ;CHANGE DISK NPR BUFFER
 1722  004462  042700  007777                  BIC     #007777,%0
 1723  004466  062700  016676                  ADD     #BUFF,%0
 1724  004472  010006                          MOV     %0,%6                   ;CHANGE STACK TO EXISTING BANK
 1725
 1726  004474  012700  000010                  MOV     #10,%0                  ;INDEX
 1727  004500  026027  016602  052525          CMP     A(0).#052525
 1728  004506  001401                          BEQ     .+4
 1729  004510  104000                          HLT                             ;COMPARE FAILED
 1730  004512  104400                          SCOPE
 1731
 1732  004514  012700  000010                  MOV     #10,%0
 1733  004520  022760  052525  016602          CMP     #052525,A(0)
 1734  004526  001401                          BEQ     .+4
 1735  004530  104000                          HLT                             ;COMPARE FAILED
 1736  004532  104400                          SCOPE
 1737
 1738  004534  012700  177770                  MOV     #-10,%0
 1739  004540  026060  016602  016602          CMP     A(0),A(0)
 1740  004546  001401                          BEQ     .+4
 1741  004550  104000                          HLT                             ;COMPARE FAILED
 1742  004552  104400                          SCOPE
 1743
 1744  004554  012700  000010                  MOV     #+10,%0
 1745  004560  026060  016602  016602          CMP     A(0),A(0)
 1746  004566  001401                          BEQ     .+4
 1747  004570  104000                          HLT                             ;COMPARE FAILED
```

```
1748  004572  104400                          SCOPE
1749
1750  004574  012700  177770                  MOV     #-10,%0
1751  004600  012701  000004                  MOV     #+4,%1
1752  004604  026061  016602  016602          CMP     A(0),A(1)
1753  004612  001401                          BEQ     .+4
1754  004614  104000                          HLT                             ;COMPARE FAILED
1755  004616  104400                          SCOPE
1756
1757  004620  026160  016602  016602          CMP     A(1),A(0)
1758  004626  001401                          BEQ     .+4
1759  004630  104000                          HLT                             ;COMPARE FAILED
1760  004632  104400                          SCOPE
1761
1762  004634  012700  177774                  MOV     #-4,%0
1763  004640  012701  000010                  MOV     #+10,%1
1764  004644  026061  016602  016602          CMP     A(0),A(1)
1765  004652  001401                          BEQ     .+4
1766  004654  104000                          HLT                             ;CMP FAILED
1767  004656  104400                          SCOPE
1768  004660  012700  177774                  MOV     #-4,%0
1769  004664  012701  000010                  MOV     #10,%1
1770  004670  026160  016602  016602          CMP     A(1),A(0)
1771  004676  001401                          BEQ     .+4
1772  004700  104000                          HLT                             ;COMPARE FAILED
1773  004702  104400                          SCOPE
1774                                  ;TEST MOVE INSTRUCTION FOR INDEX
1775
1776  004704  012700  177770                  MOV     #-10,%0
1777  004710  016067  016602  011706          MOV     A(0),TEMP
1778  004716  026727  011702  125252          CMP     TEMP,#125252
1779  004724  001401                          BEQ     .+4
1780  004726  104000                          HLT                             ;COMPARE FAILED
1781  004730  104400                          SCOPE
1782
1783  004732  012700  000010                  MOV     #+10,%0
1784  004736  016067  016602  011660          MOV     A(0),TEMP
1785  004744  026727  011654  052525          CMP     TEMP,#052525
1786  004752  001401                          BEQ     .+4
1787  004754  104000                          HLT                             ;MOV FAILED
1788  004756  104400                          SCOPE
1789
1790  004760  012700  177770                  MOV     #-10,%0
1791  004764  012760  125252  016624          MOV     #125252,TEMP(0)
1792  004772  023727  016614  125252          CMP     @#C,#125252
```

```
 1793  005000  001401                          BEQ     .+4
 1794  005002  104000                          HLT                                     ;MOV FAILED
 1795  005004  104400                          SCOPE
 1796
 1797  005006  012700  000010                  MOV     #+10,%0
 1798  005012  012760  052525  016624          MOV     #052525,TEMP(0)
 1799  005020  023727  016634  052525          CMP     @#TEMP+10,#052525
 1800  005026  001401                          BEQ     .+4
 1801  005030  104000                          HLT                                     ;MOV FAILED
 1802  005032  104400                          SCOPE
 1803
 1804                                  ;TEST BIC INSTRUCTION FOR INDEXING
 1805  005034  012767  177777  011562          MOV     #-1,TEMP
 1806  005042  012700  177770                  MOV     #-10,%0
 1807  005046  046067  016602  011550          BIC     A(0),TEMP
 1808  005054  026727  011544  052525          CMP     TEMP,#052525
 1809  005062  001401                          BEQ     .+4
 1810  005064  104000                          HLT                                     ;BIC FAILED
 1811  005066  104400                          SCOPE
 1812
 1813  005070  012767  177777  011526          MOV     #-1,TEMP
 1814  005076  012700  000010                  MOV     #10,%0
 1815  005102  046067  016602  011514          BIC     A(0),TEMP
 1816  005110  026727  011510  125252          CMP     TEMP,#125252
 1817  005116  001401                          BEQ     .+4
 1818  005120  104000                          HLT                                     ;BIC FAILED
 1819  005122  104400                          SCOPE
 1820
 1821  005124  012737  177777  016634          MOV     #-1,@#TEMP+10
 1822  005132  012700  000010                  MOV     #10,%0
 1823  005136  042760  125252  016624          BIC     #125252,TEMP(0)
 1824  005144  023727  016634  052525          CMP     @#TEMP+10,#52525
 1825  005152  001401                          BEQ     .+4
 1826  005154  104000                          HLT                                     ;BIC FAILED
 1827  005156  104400                          SCOPE
 1828
 1829  005160  012700  177770                  MOV     #-10,%0
 1830  005164  012767  177777  011422          MOV     #-1,TEMP-10
 1831  005172  042767  052525  011414          BIC     #052525,TEMP-10
 1832  005200  026727  011410  125252          CMP     TEMP-10,#125252
 1833  005206  001401                          BEQ     .+4
 1834  005210  104000                          HLT                                     ;BIC FAILED
 1835  005212  104400                          SCOPE
 1836                                  ;TEST SUBTRACT INSTRUCTION FOR INDEXING
 1837  005214  012767  125252  011402          MOV     #125252,TEMP
 1838  005222  012700  177770                  MOV     #-10,%0
 1839  005226  166067  016602  011370          SUB     A(0),TEMP
 1840  005234  001401                          BEQ     .+4
 1841  005236  104000                          HLT                                     ;SUB FAILED
 1842  005240  104400                          SCOPE
 1843
 1844  005242  012737  125252  016624          MOV     #125252,@#TEMP
 1845  005250  012700  177770                  MOV     #-10,%0
 1846  005254  166760  011312  016634          SUB     B,TEMP+10(0)
```

```
 1847  005262  001401                          BEQ     .+4
 1848  005264  104000                          HLT                                     ;SUB FAILED
 1849  005266  104400                          SCOPE
 1850
 1851  005270  012767  052525  011326          MOV     #052525,TEMP
 1852  005276  012700  000010                  MOV     #10,%0
 1853  005302  166067  016602  011314          SUB     A(0),TEMP
 1854  005310  001401                          BEQ     .+4
 1855  005312  104000                          HLT                                     ;SUB FAILED
 1856  005314  104400                          SCOPE
 1857
 1858  005316  012737  052525  016624          MOV     #052525,@#TEMP
 1859  005324  012700  000010                  MOV     #10,%0
 1860  005330  166760  011256  016614          SUB     A+10.C(0)
 1861  005336  001401                          BEQ     .+4
 1862  005340  104000                          HLT                                     ;SUB FAILED
 1863  005342  104400                          SCOPE
 1864
 1865                                  ;TEST UNARYS INDEXED
 1866  005344  012737  177777  016624          MOV     #-1,@#TEMP
 1867  005352  012700  177770                  MOV     #-10.,%0
 1868  005356  005060  016634                  CLR     D(0)
 1869  005362  005737  016624                  TST     @#TEMP
 1870  005366  001401                          BEQ     .+4
 1871  005370  104000                          HLT                                     ;CLR FAILED
 1872  005372  104400                          SCOPE
 1873
 1874  005374  012737  177777  016624          MOV     #-1,@#TEMP
 1875  005402  012700  000010                  MOV     #+10.,%0
 1876  005406  005060  016614                  CLR     C(0)
 1877  005412  005737  016624                  TST     @#TEMP
 1878  005416  001401                          BEQ     .+4
 1879  005420  104000                          HLT                                     ;CLR FAILED
 1880  005422  104400                          SCOPE
 1881
 1882  005424  012737  177777  016624          MOV     #-1,@#TEMP
 1883  005432  012700  177770                  MOV     #-10.,%0
 1884  005436  005160  016634                  COM     D(0)
 1885  005442  005737  016624                  TST     @#TEMP
 1886  005446  001401                          BEQ     .+4
 1887  005450  104000                          HLT                                     ;COM FAILED
 1888  005452  104400                          SCOPE
 1889
 1890  005454  012737  177777  016624          MOV     #-1,@#TEMP
 1891  005462  012700  000010                  MOV     #10,%0
 1892  005466  005160  016614                  COM     C(0)
 1893  005472  005737  016624                  TST     @#TEMP
 1894  005476  001401                          BEQ     .+4
 1895  005500  104000                          HLT                                     ;COM FAILED
 1896  005502  104400                          SCOPE
 1897  005504  012737  177777  016624          MOV     #-1,@#TEMP
 1898  005512  012700  177770                  MOV     #-10.,%0
 1899  005516  005260  016634                  INC     D(0)
 1900  005522  005737  016624                  TST     @#TEMP
```

```
 1901  005526  001401                          BEQ     .+4
 1902  005530  104000                          HLT                             ;INC FAILED
 1903  005532  104400                          SCOPE
 1904
 1905  005534  012737  177777  016624          MOV     #-1,@#TEMP
 1906  005542  012700  000010                  MOV     #+10.,%0
 1907  005546  005260  016614                  INC     C(0)
 1908  005552  005737  016624                  TST     @#TEMP
 1909  005556  001401                          BEQ     .+4
 1910  005560  104000                          HLT                             ;INC FAILED
 1911  005562  104400                          SCOPE
 1912
 1913  005564  012737  000001  016624          MOV     #1,@#TEMP
 1914  005572  012700  177770                  MOV     #-10.,%0
 1915  005576  005360  016634                  DEC     D(0)
 1916  005602  005737  016624                  TST     @#TEMP
 1917  005606  001401                          BEQ     .+4
 1918  005610  104000                          HLT                             ;DEC FAILED
 1919  005612  104400                          SCOPE
 1920
 1921  005614  012737  000001  016624          MOV     #1,@#TEMP
 1922  005622  012700  000010                  MOV     #10.,%0
 1923  005626  005360  016614                  DEC     C(0)
 1924  005632  005737  016624                  TST     @#TEMP
 1925  005636  001401                          BEQ     .+4
 1926  005640  104000                          HLT                             ;DEC FAILED
 1927  005642  104400                          SCOPE
 1928
 1929  005644  012737  000001  016624          MOV     #1,@#TEMP
 1930  005652  012700  177770                  MOV     #-10.,%0
 1931  005656  005460  016634                  NEG     D(0)
 1932  005662  022737  177777  016624          CMP     #-1,@#TEMP
 1933  005670  001401                          BEQ     .+4
 1934  005672  104000                          HLT                             ;NEG FAILED
 1935  005674  104400                          SCOPE
 1936
 1937  005676  012737  000001  016624          MOV     #1,@#TEMP
 1938  005704  012700  000010                  MOV     #+10.,%0
 1939  005710  005460  016614                  NEG     C(0)
 1940  005714  022737  177777  016624          CMP     #-1,@#TEMP
 1941  005722  001401                          BEQ     .+4
 1942  005724  104000                          HLT                             ;NEG FAILED
 1943  005726  104400                          SCOPE
 1944
 1945  005730  012737  177777  016624          MOV     #-1,@#TEMP
 1946  005736  012700  177770                  MOV     #-10.,%0
 1947  005742  000261                          SEC
 1948  005744  005560  016634                  ADC     D(0)
 1949  005750  005737  016624                  TST     @#TEMP
 1950  005754  001401                          BEQ     .+4
 1951  005756  104000                          HLT                             ;ADC FAILED
 1952  005760  104400                          SCOPE
 1953
 1954  005762  012737  177777  016624          MOV     #-1,@#TEMP
```

```
 1955  005770  012700  000010                MOV     #+10,%0
 1956  005774  000261                        SEC
 1957  005776  005560  016614                ADC     C(0)
 1958  006002  005737  016624                TST     @#TEMP
 1959  006006  001401                        BEQ     .+4
 1960  006010  104000                        HLT                             ;ADC FAILED
 1961  006012  104400                        SCOPE
 1962
 1963  006014  012737  000001  016624        MOV     #1,@#TEMP
 1964  006022  012700  177770                MOV     #-10.,%0
 1965  006026  000261                        SEC
 1966  006030  005660  016634                SBC     D(0)
 1967  006034  005737  016624                TST     @#TEMP
 1968  006040  001401                        BEQ     .+4
 1969  006042  104000                        HLT                             ;SBC FAILED
 1970  006044  104400                        SCOPE
 1971
 1972  006046  012737  000001  016624        MOV     #1,@#TEMP
 1973  006054  012700  000010                MOV     #+10,%0
 1974  006060  000261                        SEC
 1975  006062  005660  016614                SBC     C(0)
 1976  006066  005737  016624                TST     @#TEMP
 1977  006072  001401                        BEQ     .+4
 1978  006074  104000                        HLT                             ;SBC FAILED
 1979  006076  104400                        SCOPE
 1980
 1981                          ;TEST JMP INDIRECT
 1982  006100  010700                        MOV     %7,%0
 1983  006102  062700  000010                ADD     #10,%0
 1984  006106  000110                        JMP     @%0
 1985  006110  104000                        HLT                             ;JMP FAILED
 1986  006112  000240                        NOP
 1987  006114  104400                        SCOPE
 1988
 1989  006116  010600                        MOV     %6,%0
 1990  006120  010001                        MOV     %0,%1
 1991  006122  010102                        MOV     %1,%2
 1992  006124  010203                        MOV     %2,%3
 1993  006126  010304                        MOV     %3,%4
 1994  006130  010405                        MOV     %4,%5
 1995  006132  020605                        CMP     %6,%5
 1996  006134  001401                        BEQ     .+4
 1997  006136  104000                        HLT                             ;MOV REGISTOR FAILED
 1998  006140  104400                        SCOPE
 1999                          ;TEST INDIRECT ADDRESSING
 2000                          ;TEST COMPARE INSTRUCTION
 2001  006142  023727  016572  125252        CMP     @#B,#125252
 2002  006150  001401                        BEQ     .+4
 2003  006152  104000                        HLT                             ;CMP FAILED
 2004  006154  104400                        SCOPE
 2005
 2006  006156  022737  125252  016572        CMP     #125252,@#B
 2007  006164  001401                        BEQ     .+4
 2008  006166  104000                        HLT                             ;CMP FAILED
```

```
2059  006170  104400                          SCOPE
2060
2061  006172  023737  016572  016572          CMP     @#B,@#B
2062  006200  001401                          BEQ     .+4
2063  006202  104000                          HLT                             ;CMP FAILED
2064  006204  104400                          SCOPE
2065
2066                                  ;TEST MOVE INSTRUCTIONS
2067  006206  013700  016572                  MOV     @#B,%0
2068  006212  022700  125252                  CMP     #125252,%0
2069  006216  001401                          BEQ     .+4
2070  006220  104000                          HLT                             ;MOV FAILED
2071  006222  104400                          SCOPE
2072
2073  006224  012737  125252  016624          MOV     #125252,@#TEMP
2074  006232  023737  016572  016624          CMP     @#B,@#TEMP
2075  006240  001401                          BEQ     .+4
2076  006242  104000                          HLT                             ;MOV FAILED
2077  006244  104400                          SCOPE
2078
2079  006246  013737  016572  016614          MOV     @#B,@#C
2080  006254  023737  016572  016614          CMP     @#B,@#C
2081  006262  001401                          BEQ     .+4
2082  006264  104000                          HLT                             ;MOV FAILED
2083  006266  104400                          SCOPE
2084                                  ;TEST BIC INSTRUCTION INDIRECT
2085  006270  012700  177777                  MOV     #-1,%0
2086  006274  043700  016572                  BIC     @#B,%0
2087  006300  020027  052525                  CMP     %0,#052525
2088  006304  001401                          BEQ     .+4
2089  006306  104000                          HLT                             ;BIC FAILED
2090  006310  104400                          SCOPE
2091
2092  006312  012737  177777  016624          MOV     #-1,@#TEMP
2093  006320  042737  125252  016624          BIC     #125252,@#TEMP
2094  006326  022737  052525  016624          CMP     #052525,@#TEMP
2095  006334  001401                          BEQ     .+4
2096  006336  104000                          HLT                             ;BIC FAILED
2097  006340  104400                          SCOPE
2098
2099  006342  012737  177777  016614          MOV     #-1,@#C
2100  006350  043737  016572  016614          BIC     @#B,@#C
2101  006356  023727  016614  052525          CMP     @#C,#52525
2102  006364  001401                          BEQ     .+4
2103  006366  104000                          HLT                             ;BIC FAILED
2104  006370  104400                          SCOPE
2105
2106                                  ;TEST SUBTRACT INSTRUCTION
2107  006372  012700  125252                  MOV     #125252,%0
2108  006376  163700  016572                  SUB     @#B,%0
2109  006402  020027  000000                  CMP     %0,#0
2110  006406  001401                          BEQ     .+4
2111  006410  104000                          HLT                             ;SUB FAILED
2112  006412  104400                          SCOPE
```

```
 2063
 2064  006414  012737  125252  016624          MOV     #125252,@#TEMP
 2065  006422  166737  010144  016624          SUB     B,@#TEMP
 2066  006430  001401                          BEQ     .+4
 2067  006432  104000                          HLT                             ;SUB FAILED
 2068  006434  104400                          SCOPE
 2069
 2070  006436  012767  125252  010160          MOV     #125252,TEMP
 2071  006444  163767  016572  010152          SUB     @#B,TEMP
 2072  006452  005767  010146                  TST     TEMP
 2073  006456  001401                          BEQ     .+4
 2074  006460  104000                          HLT                             ;SUB FAILED
 2075  006462  104400                          SCOPE
 2076                                  ;TEST ADD INDIRECT
 2077  006464  005000                          CLR     %0
 2078  006466  063700  016572                  ADD     @#B,%0
 2079  006472  022700  125252                  CMP     #125252,%0
 2080  006476  001401                          BEQ     .+4
 2081  006500  104000                          HLT                             ;ADD FAILED
 2082  006502  104400                          SCOPE
 2083
 2084  006504  005037  016624                  CLR     @#TEMP
 2085  006510  062737  125252  016624          ADD     #125252,@#TEMP
 2086  006516  022737  125252  016624          CMP     #125252,@#TEMP
 2087  006524  001401                          BEQ     .+4
 2088  006526  104000                          HLT                             ;CLR OR ADD FAILED
 2089  006530  104400                          SCOPE
 2090  006532  012737  125252  016624          MOV     #125252,@#TEMP
 2091  006540  067737  010044  016624          ADD     @A+6,@#TEMP
 2092  006546  023727  016624  177777          CMP     @#TEMP,#-1
 2093  006554  001401                          BEQ     .+4
 2094  006556  104000                          HLT                             ;ADD FAILED
 2095  006560  104400                          SCOPE
 2096                                  ;TEST UNARYS INDIRECT
 2097  006562  012737  177777  016624          MOV     #-1,@#TEMP
 2098  006570  005037  016624                  CLR     @#TEMP
 2099  006574  005737  016624                  TST     @#TEMP
 2100  006600  001401                          BEQ     .+4
 2101  006602  104000                          HLT                             ;TST FAILED
 2102  006604  104400                          SCOPE
 2103
 2104  006606  012737  125252  016624          MOV     #125252,@#TEMP
 2105  006614  005137  016624                  COM     @#TEMP
 2106  006620  022737  052525  016624          CMP     #052525,@#TEMP
 2107  006626  001401                          BEQ     .+4
 2108  006630  104000                          HLT                             ;COM FAILED
 2109  006632  104400                          SCOPE
 2110
 2111  006634  005037  016624                  CLR     @#TEMP
 2112  006640  005237  016624                  INC     @#TEMP
 2113  006644  022737  000001  016624          CMP     #1,@#TEMP
 2114  006652  001401                          BEQ     .+4
 2115  006654  104000                          HLT                             ;INC FAILED
 2116  006656  104400                          SCOPE
```

```
 2117
 2118  006660  005037  016624                  CLR     @#TEMP
 2119  006664  005377  007736                  DEC     @TEMP+2
 2120  006670  023727  016624  177777          CMP     @#TEMP,#-1
 2121  006676  001401                          BEQ     .+4
 2122  006700  104000                          HLT                                     ;DEC FAILED
 2123  006702  104400                          SCOPE
 2124
 2125  006704  012737  000001  016624          MOV     #1,@#TEMP
 2126  006712  005437  016624                  NEG     @#TEMP
 2127  006716  022737  177777  016624          CMP     #-1,@#TEMP
 2128  006724  001401                          BEQ     .+4
 2129  006726  104000                          HLT                                     ;NEG FAILED
 2130  006730  104400                          SCOPE
 2131
 2132                                  ;TEST INDIRECT ADDRESSING WITH INDEXING
 2133                                  ;TEST COMPARE INSTRUCTION
 2134  006732  027727  007636  125252          CMP     @B+2,#125252
 2135  006740  001401                          BEQ     .+4
 2136  006742  104000                          HLT                                     ;CMP FAILED
 2137  006744  104400                          SCOPE
 2138
 2139  006746  022777  125252  007620          CMP     #125252,@B+2
 2140  006754  001401                          BEQ     .+4
 2141  006756  104000                          HLT                                     ;CMP FAILED
 2142  006760  104400                          SCOPE
 2143
 2144  006762  027777  007606  007604          CMP     @B+2,@B+2
 2145  006770  001401                          BEQ     .+4
 2146  006772  104000                          HLT                                     ;CMP FAILED
 2147  006774  104400                          SCOPE
 2148
 2149                                  ;TEST MOVE INSTRUCTIONS
 2150  006776  017700  007572                  MOV     @B+2,%0
 2151  007002  022700  125252                  CMP     #125252,%0
 2152  007006  001401                          BEQ     .+4
 2153  007010  104000                          HLT                                     ;MOV FAILED
 2154  007012  104400                          SCOPE
 2155
 2156  007014  012777  125252  007604          MOV     #125252,@TEMP+2
 2157  007022  023737  016572  016624          CMP     @#B,@#TEMP
 2158  007030  001401                          BEQ     .+4
 2159  007032  104000                          HLT                                     ;MOV FAILED
 2160  007034  104400                          SCOPE
 2161
 2162  007036  017777  007532  007552          MOV     @B+2,@C+2
 2163  007044  023737  016572  016614          CMP     @#B,@#C
 2164  007052  001401                          BEQ     .+4
 2165  007054  104000                          HLT
 2166  007056  104400                          SCOPE
 2167
 2168                                  ;TEST BIC INSTRUCTION INDIRECT WITH INDEXING
 2169  007060  012700  177777                  MOV     #-1,%0
 2170  007064  047700  007504                  BIC     @B+2,%0
```

```
 2171  007070  020027  052525                CMP     %0,#52525
 2172  007074  001401                        BEQ     .+4
 2173  007076  104000                        HLT                             ;BIC FAILED
 2174  007100  104400                        SCOPE
 2175
 2176  007102  012737  177777  016624        MOV     #-1,@#TEMP
 2177  007110  042777  125252  007510        BIC     #125252,@TEMP+2
 2178  007116  022737  052525  016624        CMP     #52525,@#TEMP
 2179  007124  001401                        BEQ     .+4
 2180  007126  104000                        HLT                             ;BIC FAILED
 2181  007130  104400                        SCOPE
 2182
 2183  007132  012737  177777  016614        MOV     #-1,@#C
 2184  007140  047777  007430  007450        BIC     @B+2,@C+2
 2185  007146  026737  007440  016614        CMP     A+10,@#C
 2186  007154  001401                        BEQ     .+4
 2187  007156  104000                        HLT                             ;BIC FAILED
 2188  007160  104400                        SCOPE
 2189
 2190  007162  012700  125252                MOV     #125252,%0
 2191  007166  167700  007402                SUB     @B+2,%0
 2192  007172  020027  000000                CMP     %0,#0
 2193  007176  001401                        BEQ     .+4
 2194  007200  104000                        HLT                             ;SUB FAILED
 2195  007202  104400                        SCOPE
 2196
 2197  007204  012737  125252  016624        MOV     #125252,@#TEMP
 2198  007212  166777  007354  007406        SUB     B,@TEMP+2
 2199  007220  001401                        BEQ     .+4
 2200  007222  104000                        HLT                             ;SUB FAILED
 2201  007224  104400                        SCOPE
 2202
 2203  007226  012737  125252  016624        MOV     #125252,@#TEMP
 2204  007234  167777  007334  007364        SUB     @B+2,@TEMP+2
 2205  007242  005737  016624                TST     @#TEMP
 2206  007246  001401                        BEQ     .+4
 2207  007250  104000                        HLT                             ;SUB FAILED
 2208  007252  104400                        SCOPE
 2209
 2210                                ;TEST ADD INDIRECT WITH INDEXING
 2211  007254  005000                        CLR     %0
 2212  007256  067700  007312                ADD     @B+2,%0
 2213  007262  022700  125252                CMP     #125252,%0
 2214  007266  001401                        BEQ     .+4
 2215  007270  104000                        HLT                             ;ADD FAILED
 2216  007272  104400                        SCOPE
 2217
 2218  007274  005037  016624                CLR     @#TEMP
 2219  007300  062777  125252  007320        ADD     #125252,@TEMP+2
 2220  007306  022737  125252  016624        CMP     #125252,@#TEMP
 2221  007314  001401                        BEQ     .+4
 2222  007316  104000                        HLT                             ;ADD FAILED
 2223  007320  104400                        SCOPE
 2224  007322  012737  125252  016624        MOV     #125252,@#TEMP
```

```
 2225  007330  067777  007254  007270          ADD     @A+6,@TEMP+2
 2226  007336  023727  016624  177777          CMP     @#TEMP,#-1
 2227  007344  001401                          BEQ     .+4
 2228  007346  104000                          HLT                             ;ADD FAILED
 2229  007350  104400                          SCOPE
 2230
 2231                                  ;TEST UNARYS INDIRECT WITH INDEXING
 2232  007352  012737  177777  016624          MOV     #-1,@#TEMP
 2233  007360  005077  007242                  CLR     @TEMP+2
 2234  007364  005737  016624                  TST     @#TEMP
 2235  007370  001401                          BEQ     .+4
 2236  007372  104000                          HLT                             ;TST FAILED
 2237  007374  104400                          SCOPE
 2238
 2239  007376  012737  125252  016624          MOV     #125252,@#TEMP
 2240  007404  005177  007216                  COM     @TEMP+2
 2241  007410  022737  052525  016624          CMP     #052525,@#TEMP
 2242  007416  001401                          BEQ     .+4
 2243  007420  104000                          HLT                             ;COM FAILED
 2244  007422  104400                          SCOPE
 2245
 2246  007424  005037  016624                  CLR     @#TEMP
 2247  007430  005277  007172                  INC     @TEMP+2
 2248  007434  022737  000001  016624          CMP     #1,@#TEMP
 2249  007442  001401                          BEQ     .+4
 2250  007444  104000                          HLT                             ;INC FAILED
 2251  007446  104400                          SCOPE
 2252
 2253  007450  005037  016624                  CLR     @#TEMP
 2254  007454  005377  007146                  DEC     @TEMP+2
 2255  007460  023727  016624  177777          CMP     @#TEMP,#-1
 2256  007466  001401                          BEQ     .+4
 2257  007470  104000                          HLT                             ;DEC FAILED
 2258  007472  104400                          SCOPE
 2259
 2260  007474  012737  000001  016624          MOV     #1,@#TEMP
 2261  007502  005477  007120                  NEG     @TEMP+2
 2262  007506  022737  177777  016624          CMP     #-1,@#TEMP
 2263  007514  001401                          BEQ     .+4
 2264  007516  104000                          HLT                             ;NEG FAILED
 2265  007520  104400                          SCOPE
 2266
 2267  007522  012737  177777  016624          MOV     #-1,@#TEMP
 2268  007530  000261                          SEC
 2269  007532  005577  007070                  ADC     @TEMP+2
 2270  007536  005737  016624                  TST     @#TEMP
 2271  007542  001401                          BEQ     .+4
 2272  007544  104000                          HLT                             ;ADC FAILED
 2273  007546  104400                          SCOPE
 2274
 2275  007550  012737  000001  016624          MOV     #1,@#TEMP
 2276  007556  000261                          SEC
 2277  007560  005677  007042                  SBC     @TEMP+2
 2278  007564  005737  016624                  TST     @#TEMP
```

```
 2279  007570  001401                          BEQ     .+4
 2280  007572  104000                          HLT                                     ;SBC FAILED
 2281  007574  104400                          SCOPE
 2282
 2283                                  ;TEST OF COMBINED INDEXING AND INDIRECT
 2284  007576  012700  177776                  MOV     #-6,%0
 2285  007602  027027  016602  125252          CMP     @A(0),#125252
 2286  007610  001401                          BEQ     .+4
 2287  007612  104000                          HLT                                     ;CMP FAILED
 2288  007614  104400                          SCOPE
 2289
 2290  007616  012700  177776                  MOV     #-6,%0
 2291  007622  022770  125252  016602          CMP     #125252,@A(0)
 2292  007630  001401                          BEQ     .+4
 2293  007632  104000                          HLT                                     ;CMP FAILED
 2294  007634  104400                          SCOPE
 2295
 2296  007636  012700  177776                  MOV     #-6,%0
 2297  007642  012701  000002                  MOV     #+2,%1
 2298  007646  027071  016602  016602          CMP     @A(0),@A(1)
 2299  007654  001401                          BEQ     .+4
 2300  007656  104000                          HLT                                     ;CMP FAILED
 2301  007660  104400                          SCOPE
 2302
 2303                                  ;TEST BIC INSTRUCTION
 2304  007662  012700  000006                  MOV     #+6,%0
 2305  007666  012767  177777  006730          MOV     #-1,TEMP
 2306  007674  047067  016602  006722          BIC     @A(0),TEMP
 2307  007702  022767  125252  006714          CMP     #125252,TEMP
 2308  007710  001401                          BEQ     .+4
 2309  007712  104000                          HLT                                     ;BIC FAILED
 2310  007714  104400                          SCOPE
 2311
 2312  007716  012700  177776                  MOV     #-6,%0
 2313  007722  012737  177777  016614          MOV     #-1,@#C
 2314  007730  042770  125252  016624          BIC     #125252,@TEMP(0)
 2315  007736  023727  016614  052525          CMP     @#C,#052525
 2316  007744  001401                          BEQ     .+4
 2317  007746  104000                          HLT                                     ;BIC FAILED
 2318  007750  104400                          SCOPE
 2319  007752  012737  177777  016614          MOV     #-1,@#C
```

```
 2320  007760  012700  177772          MOV     #-6,%0
 2321  007764  012701  177772          MOV     #-6,%1
 2322  007770  047071  016602  016624  BIC     @A(0),@TEMP(1)
 2323  007776  022737  052525  016614  CMP     #052525,@#C
 2324  010004  001401                  BEQ     .+4
 2325  010006  104000                  HLT                             ;BIC FAILED
 2326  010010  104400                  SCOPE
 2327
 2328  010012  122727  000000  000001  CMPB    #0,#1           ;T7 FIX
 2329  010020  002401                  BLT     .+4
 2330  010022  104000                  HLT                     ;CMPB FAILED
 2331  010024  104400                  SCOPE
 2332                          ;TEST COMPARE INSTRUCTION INDEXED
 2333  010026  012700  177770          MOV     #-10,%0                 ;MINUS 10 TO REG 0
 2334  010032  126027  016602  000252  CMPB    A(0),#000252            ;(A INDEX BY MINUS 10) TO #125252
 2335  010040  001401                  BEQ     .+4
 2336  010042  104000                  HLT                             ;COMPARE WITH INDEX FAILED
 2337  010044  104400                  SCOPE
 2338
 2339  010046  012700  177770          MOV     #-10,%0                 ;FOR INDEX
 2340  010052  122760  000252  016602  CMPB    #000252,A(0)            ;A INDEXED
 2341  010060  001401                  BEQ     .+4
 2342  010062  104000                  HLT                             ;CMPB FAILED
 2343  010064  104400                  SCOPE
 2344
 2345  010066  012700  000010          MOV     #10,%0                  ;INDEX
 2346  010072  126027  016602  000125  CMPB    A(0),#000125
 2347  010100  001401                  BEQ     .+4
 2348  010102  104000                  HLT                             ;CMPB FAILED
 2349  010104  104400                  SCOPE
 2350
 2351  010106  012700  000010          MOV     #10,%0
 2352  010112  122760  000125  016602  CMPB    #000125,A(0)
 2353  010120  001401                  BEQ     .+4
 2354  010122  104000                  HLT                             ;CMPB FAILED
 2355  010124  104400                  SCOPE
 2356
 2357  010126  012700  177770          MOV     #-10,%0
 2358  010132  126060  016602  016602  CMPB    A(0),A(0)
 2359  010140  001401                  BEQ     .+4
 2360  010142  104000                  HLT                             ;CMPB FAILED
 2361  010144  104400                  SCOPE
 2362
 2363  010146  012700  000010          MOV     #+10,%0
 2364  010152  126060  016602  016602  CMPB    A(0),A(0)
 2365  010160  001401                  BEQ     .+4
 2366  010162  104000                  HLT                             ;CMPB FAILED
 2367  010164  104400                  SCOPE
 2368
 2369  010166  012700  177770          MOV     #-10,%0
 2370  010172  012701  000004          MOV     #+4,%1
 2371  010176  126061  016602  016602  CMPB    A(0),A(1)
 2372  010204  001401                  BEQ     .+4
 2373  010206  104000                  HLT                             ;CMPB FAILED
```

```
2374  010210  104400                          SCOPE
2375
2376  010212  126160  016602  016602          CMPB    A(1),A(0)
2377  010220  001401                          BEQ     .+4
2378  010222  104000                          HLT                             ;CMPB FAILED
2379  010224  104400                          SCOPE
2380
2381  010226  012700  177774                  MOV     #-4,%0
2382  010232  012701  000010                  MOV     #+10,%1
2383  010236  126061  016602  016602          CMPB    A(0),A(1)
2384  010244  001401                          BEQ     .+4
2385  010246  104000                          HLT                             ;CMPB FAILED
2386  010250  104400                          SCOPE
2387
2388  010252  012700  177774                  MOV     #-4,%0
2389  010256  012701  000010                  MOV     #10,%1
2390  010262  126160  016602  016602          CMPB    A(1),A(0)
2391  010270  001401                          BEQ     .+4
2392  010272  104000                          HLT                             ;CMPB FAILED
2393  010274  104400                          SCOPE
2394                                  ;TEST MOVE INSTRUCTION FOR INDEX
2395
2396  010276  012700  177770                  MOV     #-10,%0
2397  010302  116067  016602  006314          MOVB    A(0),TEMP
2398  010310  126727  006310  000252          CMPB    TEMP,#000252
2399  010316  001401                          BEQ     .+4
2400  010320  104000                          HLT                             ;MOVB FAILED
2401  010322  104400                          SCOPE
2402
2403  010324  012700  000010                  MOV     #+10,%0
2404  010330  116067  016602  006266          MOVB    A(0),TEMP
2405  010336  126727  006262  000125          CMPB    TEMP,#000125
2406  010344  001401                          BEQ     .+4
2407  010346  104000                          HLT                             ;MOVB FAILED
2408  010350  104400                          SCOPE
2409
2410  010352  012700  177770                  MOV     #-10,%0
2411  010356  112760  125252  016624          MOVB    #125252,TEMP(0)
2412  010364  123727  016614  125252          CMPB    @#C,#125252
2413  010372  001401                          BEQ     .+4
2414  010374  104000                          HLT                             ;MOVB FAILED
2415  010376  104400                          SCOPE
2416
2417  010400  012700  000010                  MOV     #+10,%0
2418  010404  112760  052525  016624          MOVB    #052525,TEMP(0)
2419  010412  123727  016634  052525          CMPB    @#TEMP+10,#052525
2420  010420  001401                          BEQ     .+4
2421  010422  104000                          HLT                             ;MOVB FAILED
2422  010424  104400                          SCOPE
2423
2424                                  ;TEST BIC INSTRUCTION FOR INDEXING
2425  010426  012767  177777  006170          MOV     #-1,TEMP
2426  010434  012700  177770                  MOV     #-10,%0
2427  010440  146067  016602  006156          BICB    A(0),TEMP
```

```
2428  010446  126727  006132  177525          CMPB    TEMP,#177525
2429  010454  001401                          BEQ     .+4
2430  010456  104000                          HLT                             ;BICB FAILED
2431  010460  104400                          SCOPE
2432
2433  010462  012767  177777  006134          MOV     #-1,TEMP
2434  010470  012700  000010                  MOV     #10,%0
2435  010474  146067  016602  006122          BICB    A(0),TEMP
2436  010502  126727  006116  007652          CMPB    TEMP,#007652
2437  010510  001401                          BEQ     .+4
2438  010512  104000                          HLT                             ;BICB FAILED
2439  010514  104400                          SCOPE
2440
2441  010516  012737  177777  016634          MOV     #-1,@#TEMP+10
2442  010524  012700  000010                  MOV     #10,%0
2443  010530  142760  125252  016624          BICB    #125252,TEMP(0)
2444  010536  123727  016634  002525          CMPB    @#TEMP+10,#2525
2445  010544  001401                          BEQ     .+4
2446  010546  104000                          HLT                             ;BICB FAILED
2447  010550  104400                          SCOPE
2448
2449  010552  012700  177770                  MOV     #-10,%0
2450  010556  012767  177777  006030          MOV     #-1,TEMP-10
2451  010564  142767  052525  006022          BICB    #052525,TEMP-10
2452  010572  126727  006016  125252          CMPB    TEMP-10,#125252
2453  010600  001401                          BEQ     .+4
2454  010602  104000                          HLT                             ;BICB FAILED
2455  010604  104400                          SCOPE
2456
2457                                  ;TEST UNARYS INDEXED
2458  010606  012737  177777  016624          MOV     #-1,@#TEMP
2459  010614  012700  177770                  MOV     #-10,%0
2460  010620  105060  016634                  CLRB    D(0)
2461  010624  105737  016624                  TSTB    @#TEMP
2462  010630  001401                          BEQ     .+4
2463  010632  104000                          HLT                             ;CLRB FAILED
2464  010634  104400                          SCOPE
2465
2466  010636  012737  177777  016624          MOV     #-1,@#TEMP
2467  010644  012700  177770                  MOV     #-10,%0
2468  010650  105060  016634                  CLRB    D(0)
2469  010654  023727  016624  177400          CMP     @#TEMP,#177400
2470  010662  001401                          BEQ     .+4
2471  010664  104000                          HLT                             ;CLRB FAILED
2472  010666  104400                          SCOPE
2473
2474  010670  012737  177777  016624          MOV     #-1,@#TEMP
2475  010676  012700  177771                  MOV     #-7,%0
2476  010702  105060  016634                  CLRB    D(0)
2477  010706  023727  016624  000377          CMP     @#TEMP,#000377
2478  010714  001401                          BEQ     .+4
2479  010716  104000                          HLT                             ;CLRB FAILED
2480  010720  104400                          SCOPE
2481
```

```
 2482  010722  012737  177777  016624          MOV     #-1,@#TEMP
 2483  010730  012700  000010                  MOV     #+10,%0
 2484  010734  105060  016614                  CLRB    C(0)
 2485  010740  105737  016624                  TSTB    @#TEMP
 2486  010744  001401                          BEQ     .+4
 2487  010746  104000                          HLT                             ;CLRB FAILED
 2488  010750  104400                          SCOPE
 2489
 2490  010752  012737  177777  016624          MOV     #-1,@#TEMP
 2491  010760  012700  177770                  MOV     #-10,%0
 2492  010764  105160  016634                  COMB    D(0)
 2493  010770  105737  016624                  TSTB    @#TEMP
 2494  010774  001401                          BEQ     .+4
 2495  010776  104000                          HLT                             ;COMB FAILED
 2496  011000  104400                          SCOPE
 2497
 2498  011002  012737  177777  016624          MOV     #-1,@#TEMP
 2499  011010  012700  000010                  MOV     #10,%0
 2500  011014  105160  016614                  COMB    C(0)
 2501  011020  105737  016624                  TSTB    @#TEMP
 2502  011024  001401                          BEQ     .+4
 2503  011026  104000                          HLT                             ;COMB FAILED
 2504  011030  104400                          SCOPE
 2505  011032  012737  177777  016624          MOV     #-1,@#TEMP
 2506  011040  012700  177770                  MOV     #-10.%0
 2507  011044  105260  016634                  INCB    D(0)
 2508  011050  105737  016624                  TSTB    @#TEMP
 2509  011054  001401                          BEQ     .+4
 2510  011056  104000                          HLT                             ;INCB FAILED
 2511  011060  023727  016624  177400          CMP     @#TEMP,#177400
 2512  011066  001401                          BEQ     .+4
 2513  011070  104000                          HLT                             ;INCB FAILED
 2514  011072  104400                          SCOPE
 2515
 2516  011074  012737  177777  016624          MOV     #-1,@#TEMP
 2517  011102  012700  000010                  MOV     #+10,%0
 2518  011106  105260  016614                  INCB    C(0)
 2519  011112  105737  016624                  TSTB    @#TEMP
 2520  011116  001401                          BEQ     .+4
 2521  011120  104000                          HLT                             ;INCB FAILED
 2522  011122  104400                          SCOPE
 2523
 2524  011124  012737  000001  016624          MOV     #1,@#TEMP
 2525  011132  012700  177770                  MOV     #-10,%0
 2526  011136  105360  016634                  DECB    D(0)
 2527  011142  105737  016624                  TSTB    @#TEMP
 2528  011146  001401                          BEQ     .+4
 2529  011150  104000                          HLT                             ;DECB FAILED
 2530  011152  104400                          SCOPE
 2531
 2532  011154  012737  000001  016624          MOV     #1,@#TEMP
 2533  011162  012700  000010                  MOV     #10,%0
 2534  011166  105360  016614                  DECB    C(0)
 2535  011172  105737  016624                  TSTB    @#TEMP
```

```
2536  011176  001401                          BEQ     .+4
2537  011200  104000                          HLT                             ;DECB FAILED
2538  011202  104400                          SCOPE
2539
2540  011204  012737  000001  016624          MOV     #1,@#TEMP
2541  011212  012700  177770                  MOV     #-10,%0
2542  011216  105460  016634                  NEGB    D(0)
2543  011222  023727  016624  000377          CMP     @#TEMP,#377
2544  011230  001401                          BEQ     .+4
2545  011232  104000                          HLT                             ;NEGB FAILED
2546  011234  104400                          SCOPE
2547
2548  011236  012737  000001  016624          MOV     #1,@#TEMP
2549  011244  012700  000010                  MOV     #+10,%0
2550  011250  105460  016614                  NEGB    C(0)
2551  011254  023727  016624  000377          CMP     @#TEMP,#377
2552  011262  001401                          BEQ     .+4
2553  011264  104000                          HLT                             ;NEGB FAILED
2554  011266  104400                          SCOPE
2555
2556  011270  012737  177777  016624          MOV     #-1,@#TEMP
2557  011276  012700  177770                  MOV     #-10,%0
2558  011302  000261                          SEC
2559  011304  105560  016634                  ADCB    D(0)
2560  011310  023727  016624  177400          CMP     @#TEMP,#177400
2561  011316  001401                          BEQ     .+4
2562  011320  104000                          HLT                             ;ADCB FAILED
2563  011322  104400                          SCOPE
2564
2565  011324  012737  177777  016624          MOV     #-1,@#TEMP
2566  011332  012700  000010                  MOV     #+10,%0
2567  011336  000261                          SEC
2568  011340  105560  016614                  ADCB    C(0)
2569  011344  023727  016624  177400          CMP     @#TEMP,#177400
2570  011352  001401                          BEQ     .+4
2571  011354  104000                          HLT                             ;ADCB FAILED
2572  011356  104400                          SCOPE
2573
2574  011360  012737  000401  016624          MOV     #401,@#TEMP
2575  011366  012700  177771                  MOV     #-7,%0
2576  011372  000261                          SEC
2577  011374  105660  016634                  SBCB    D(0)
2578  011400  022737  000001  016624          CMP     #1,@#TEMP
2579  011406  001401                          BEQ     .+4
2580  011410  104000                          HLT                             ;SBCB FAILED
2581  011412  104400                          SCOPE
2582
2583  011414  012737  000001  016624          MOV     #1,@#TEMP
2584  011422  012700  000010                  MOV     #+10,%0
2585  011426  000261                          SEC
2586  011430  105660  016614                  SBCB    C(0)
2587  011434  005737  016624                  TST     @#TEMP
2588  011440  001401                          BEQ     .+4
2589  011442  104000                          HLT                             ;SBCB FAILED
```

```
2590  011444  104400                          SCOPE
2591
2592                                  ;TEST INDIRECT ADDRESSING
2593                                  ;TEST COMPARE INSTRUCTION
2594  011446  123727  016572  000252          CMPB    @#B,#000252
2595  011454  001401                          BEQ     .+4
2596  011456  104000                          HLT                             ;CMPB FAILED
2597  011460  104400                          SCOPE
2598
2599  011462  123727  016573  000252          CMPB    @#B+1,#252
2600  011470  001401                          BEQ     .+4
2601  011472  104000                          HLT                             ;CMPB FAILED
2602  011474  104400                          SCOPE
2603
2604
2605  011476  122737  125252  016572          CMPB    #125252,@#B
2606  011504  001401                          BEQ     .+4
2607  011506  104000                          HLT                             ;CMPB FAILED
2608  011510  104400                          SCOPE
2609
2610  011512  123737  016572  016572          CMPB    @#B,@#B
2611  011520  001401                          BEQ     .+4
2612  011522  104000                          HLT                             ;CMPB FAILED
2613  011524  104400                          SCOPE
2614
2615                                  ;TEST MOVE INSTRUCTIONS
2616  011526  113700  016572                  MOVB    @#B,%0
2617  011532  122700  000252                  CMPB    #000252,%0
2618  011536  001401                          BEQ     .+4
2619  011540  104000                          HLT                             ;MOVB FAILED
2620  011542  104400                          SCOPE
2621
2622  011544  112737  125252  016624          MOVB    #125252,@#TEMP
2623  011552  126737  005014  016624          CMPB    B,@#TEMP
2624  011560  001401                          BEQ     .+4
2625  011562  104000                          HLT                             ;MOVB FAILED
2626  011564  104400                          SCOPE
2627
2628  011566  113737  016572  016614          MOVB    @#B,@#C
2629  011574  126737  004772  016614          CMPB    B,@#C
2630  011602  001401                          BEQ     .+4
2631  011604  104000                          HLT                             ;MOVB FAILED
2632  011606  104400                          SCOPE
2633                                  ;TEST UNARYS INDIRECT
2634  011610  012737  177777  016624          MOV     #-1,@#TEMP
2635  011616  105037  016624                  CLRB    @#TEMP
2636  011622  023727  016624  177400          CMP     @#TEMP,#177400
2637  011630  001401                          BEQ     .+4
2638  011632  104000                          HLT                             ;CLRB FAILED
2639  011634  104400                          SCOPE
2640
2641  011636  012737  125252  016624          MOV     #125252,@#TEMP
2642  011644  105137  016624                  COMB    @#TEMP
2643  011650  022737  125125  016624          CMP     #125125,@#TEMP
```

```
 2644  011656  001401                          BEQ     .+4
 2645  011660  104000                          HLT                             ;COMB FAILED
 2646  011662  104400                          SCOPE
 2647
 2648  011664  012737  125252  016624          MOV     #125252,@#TEMP
 2649  011672  105137  016625                  COMB    @#TEMP+1
 2650  011676  022737  052652  016624          CMP     #052652,@#TEMP
 2651  011704  001401                          BEQ     .+4
 2652  011706  104000                          HLT                             ;COMB FAILED
 2653  011710  104400                          SCOPE
 2654
 2655  011712  005037  016624                  CLR     @#TEMP
 2656  011716  105237  016625                  INCB    @#TEMP+1
 2657  011722  022737  000400  016624          CMP     #400,@#TEMP
 2658  011730  001401                          BEQ     .+4
 2659  011732  104000                          HLT                             ;INCB FAILED
 2660  011734  104400                          SCOPE
 2661
 2662  011736  005037  016624                  CLR     @#TEMP
 2663  011742  105377  004660                  DECB    @TEMP+2
 2664  011746  023727  016624  000377          CMP     @#TEMP,#377
 2665  011754  001401                          BEQ     .+4
 2666  011756  104000                          HLT                             ;DECB FAILED
 2667  011760  104400                          SCOPE
 2668
 2669  011762  005037  016624                  CLR     @#TEMP
 2670  011766  112737  000001  016625          MOVB    #1,@#TEMP+1
 2671  011774  105437  016625                  NEGB    @#TEMP+1
 2672  012000  022737  177400  016624          CMP     #177400,@#TEMP
 2673  012006  001401                          BEQ     .+4
 2674  012010  104000                          HLT                             ;NEGB FAILED
 2675  012012  104400                          SCOPE
 2676
 2677                                  ;TEST INDIRECT ADDRESSING WITH INDEXING
 2678                                  ;TEST COMPARE INSTRUCTION
 2679  012014  127727  004554  125252          CMPB    @B+2,#125252
 2680  012022  001401                          BEQ     .+4
 2681  012024  104000                          HLT                             ;CMPB FAILED
 2682  012026  104400                          SCOPE
 2683
 2684  012030  122777  125252  004536          CMPB    #125252,@B+2
 2685  012036  001401                          BEQ     .+4
 2686  012040  104000                          HLT                             ;CMPB FAILED
 2687  012042  104400                          SCOPE
 2688
 2689  012044  127777  004524  004522          CMPB    @B+2,@B+2
 2690  012052  001401                          BEQ     .+4
 2691  012054  104000                          HLT                             ;CMPB FAILED
 2692  012056  104400                          SCOPE
 2693                                  ;TEST MOVE INSTRUCTIONS
 2694  012060  117700  004510                  MOVB    @B+2,%0
 2695  012064  122700  125252                  CMPB    #125252,%0
 2696  012070  001401                          BEQ     .+4
 2697  012072  104000                          HLT                             ;MOVB FAILED
```

```
 2698  012074  104400                          SCOPE
 2699
 2700  012076  112777  125252  004522          MOVB    #125252,@TEMP+2
 2701  012104  126737  004462  016624          CMPB    B,@#TEMP
 2702  012112  001401                          BEQ     .+4
 2703  012114  104000                          HLT                             ;MOVB FAILED
 2704  012116  104400                          SCOPE
 2705
 2706  012120  117777  004450  004470          MOVB    @B+2,@C+2
 2707  012126  126737  004440  016614          CMPB    B,@#C
 2708  012134  001401                          BEQ     .+4
 2709  012136  104000                          HLT                             ;MOVB FAILED
 2710  012140  104400                          SCOPE
 2711
 2712                                  ;TEST BIC INSTRUCTION INDIRECT WITH INDEXING
 2713  012142  012700  177777                  MOV     #-1,%0
 2714  012146  147700  004422                  BICB    @B+2,%0
 2715  012152  120027  052525                  CMPB    %0,#52525
 2716  012156  001401                          BEQ     .+4
 2717  012160  104000                          HLT                             ;BICB FAILED
 2718  012162  104400                          SCOPE
 2719
 2720  012164  012737  177777  016624          MOV     #-1,@#TEMP
 2721  012172  142777  125252  004426          BICB    #125252,@TEMP+2
 2722  012200  122737  052525  016624          CMPB    #52525,@#TEMP
 2723  012206  001401                          BEQ     .+4
 2724  012210  104000                          HLT                             ;BICB FAILED
 2725  012212  104400                          SCOPE
 2726
 2727  012214  012737  177777  016614          MOV     #-1,@#C
 2728  012222  147777  004346  004366          BICB    @B+2,@C+2
 2729  012230  126737  004356  016614          CMPB    A+12,@#C
 2730  012236  001401                          BEQ     .+4
 2731  012240  104000                          HLT                             ;BICB FAILED
 2732  012242  104400                          SCOPE
 2733                                  ;TEST UNARYS INDIRECT WITH INDEXING
 2734  012244  012737  177777  016624          MOV     #-1,@#TEMP
 2735  012252  105077  004350                  CLRB    @TEMP+2
 2736  012256  105737  016624                  TSTB    @#TEMP
 2737  012262  001401                          BEQ     .+4
 2738  012264  104000                          HLT                             ;CLRB FAILED
 2739  012266  104400                          SCOPE
 2740
 2741  012270  012737  125252  016624          MOV     #125252,@#TEMP
 2742  012276  105177  004324                  COMB    @TEMP+2
 2743  012302  122737  052525  016624          CMPB    #052525,@#TEMP
 2744  012310  001401                          BEQ     .+4
 2745  012312  104000                          HLT                             ;COMB FAILED
 2746  012314  104400                          SCOPE
 2747
 2748  012316  005037  016624                  CLR     @#TEMP
 2749  012322  105277  004300                  INCB    @TEMP+2
 2750  012326  122737  000001  016624          CMPB    #1,@#TEMP
 2751  012334  001401                          BEQ     .+4
```

```
 2752  012336  104000                          HLT                                     ;INCB FAILED
 2753  012340  104400                          SCOPE
 2754
 2755  012342  005037  016624                  CLR     @#TEMP
 2756  012346  105377  004254                  DECB    @TEMP+2
 2757  012352  123727  016624  177777          CMPB    @#TEMP,#-1
 2758  012360  001401                          BEQ     .+4
 2759  012362  104000                          HLT                                     ;DECB FAILED
 2760  012364  104400                          SCOPE
 2761
 2762  012366  012737  000001  016624          MOV     #1,@#TEMP
 2763  012374  105477  004226                  NEGB    @TEMP+2
 2764  012400  122737  177777  016624          CMPB    #-1,@#TEMP
 2765  012406  001401                          BEQ     .+4
 2766  012410  104000                          HLT                                     ;NEGB FAILED
 2767  012412  104400                          SCOPE
 2768
 2769  012414  012737  177777  016624          MOV     #-1,@#TEMP
 2770  012422  000261                          SEC
 2771  012424  105577  004176                  ADCB    @TEMP+2
 2772  012430  022737  177400  016624          CMP     #177400,@#TEMP
 2773  012436  001401                          BEQ     .+4
 2774  012440  104000                          HLT                                     ;ADCB FAILED
 2775  012442  105737  016624                  TSTB    @#TEMP
 2776  012446  001401                          BEQ     .+4
 2777  012450  104000                          HLT                                     ;TSTB FAILED
 2778  012452  104400                          SCOPE
 2779
 2780  012454  012737  000001  016624          MOV     #1,@#TEMP
 2781  012462  000261                          SEC
 2782  012464  105377  004136                  DECB    @TEMP+2
 2783  012470  005737  016624                  TST     @#TEMP
 2784  012474  001401                          BEQ     .+4
 2785  012476  104000                          HLT                                     ;DECB FAILED
 2786  012500  104400                          SCOPE
 2787
 2788                                  ;TEST OF COMBINED INDEXING AND INDIRECT
 2789  012502  012700  177772                  MOV     #-6,%0
 2790  012506  127027  016002  125252          CMPB    @A(0),#125252
 2791  012514  001401                          BEQ     .+4
 2792  012516  104000                          HLT                                     ;CMPB FAILED
 2793  012520  104400                          SCOPE
 2794
 2795  012522  012700  177772                  MOV     #-6,%0
 2796  012526  122770  125252  016002          CMPB    #125252,@A(0)
 2797  012534  001401                          BEQ     .+4
 2798  012536  104000                          HLT                                     ;CMPB FAILED
 2799  012540  104400                          SCOPE
 2800
 2801  012542  012700  177772                  MOV     #-6,%0
 2802  012546  012701  000002                  MOV     #+2,%1
 2803  012552  127071  016002  016002          CMPB    @A(0),@A(1)
 2804  012560  001401                          BEQ     .+4
 2805  012562  104000                          HLT                                     ;CMPB FAILED
```

```
 2806  012564  104400                          SCOPE
 2807                                ;TEST BIC INSTRUCTION
 2808  012566  012700  000006                  MOV     #.+6,%0
 2809  012572  012767  177777  004024          MOV     #-1,TEMP
 2810  012600  147067  016602  004016          BICB    @A(0),TEMP
 2811  012606  122767  125252  004010          CMPB    #125252,TEMP
 2812  012614  001401                          BEQ     .+4
 2813  012616  104000                          HLT                                     ;BICB FAILED
 2814  012620  104400                          SCOPE
 2815
 2816  012622  012700  177772                  MOV     #-6,%0
 2817  012626  012737  177777  016614          MOV     #-1,@#C
 2818  012634  142770  125252  016624          BICB    #125252,@TEMP(0)
 2819  012642  123727  016614  000125          CMPB    @#C,#000125
 2820  012650  001401                          BEQ     .+4
 2821  012652  104000                          HLT                                     ;BICB FAILED
 2822  012654  104400                          SCOPE
 2823
 2824  012656  012700  016674                  MOV     #B+2,%0         ;ADDRESS OF ADDRESS OF B
 2825  012662  023067  003704                  CMP     @(0)+,B
 2826  012666  001401                          BEQ     .+4
 2827  012670  104000                          HLT                                     ;CMP FAILED
 2828  012672  104400                          SCOPE
 2829
 2830  012674  012700  016676                  MOV     #B+4,%0
 2831  012700  025067  003656                  CMP     @-(0),B
 2832  012704  001401                          BEQ     .+4
 2833  012706  104000                          HLT                                     ;CMP FAILED
 2834  012710  104400                          SCOPE
 2835
 2836  012712  012700  016676                  MOV     #B+4,%0
 2837  012716  125067  003650                  CMPB    @-(0),B
 2838  012722  001401                          BEQ     .+4
 2839  012724  104000                          HLT                                     ;CMPB FAILED
 2840  012726  104400                          SCOPE
 2841
 2842  012730  012700  016620                  MOV     #C+4,%0
 2843  012734  012737  177777  016614          MOV     #-1,@#C
 2844  012742  105050                          CLRB    @-(0)
 2845  012744  023727  016614  177400          CMP     @#C,#177400
 2846  012752  001401                          BEQ     .+4
 2847  012754  104000                          HLT                                     ;CLRB FAILED
 2848  012756  104400                          SCOPE
 2849  012760  012737  177777  016614          MOV     #-1,@#C
 2850  012766  012700  177772                  MOV     #-6,%0
 2851  012772  012701  177772                  MOV     #-6,%1
 2852  012776  147071  016602  016624          BICB    @A(0),@TEMP(1)
 2853  013004  022737  177525  016614          CMP     #177525,@#C
 2854  013012  001401                          BEQ     .+4
 2855  013014  104000                          HLT                                     ;BICB FAILED
 2856  013016  104400                          SCOPE
 2857                                ;TEST THAT R0 IS NOT DESTROYED BY FALSE SELECTION
 2858  013020  012700  052525                  MOV     #52525,%0       ;THIS IS CHECK LATER IN PROGRAM
 2859                                ;TEST JSR INSTRUCTION
```

```
 2860
 2861  013024  004767  000002          JSR     %7, TJSR2       ;PLACE PC ON STACK
 2862  013030  000405          TJSR1:  BR      TJSR3           ;RETURN HERE ON RTS %7
 2863  013032  121627  013030  TJSR2:  CMPB    @%6,#TJSR1      ;CHECK FOR CORRECT PC ON STACK
 2864  013036  001401                  BEQ     .+4
 2865  013040  104000                  HLT                     ;INCORRECT PC ON STACK
 2866  013042  000207                  RTS     %7              ;RETURN TO INST AFTER JSR
 2867  013044  104400          TJSR3:  SCOPE
 2868
 2869  013046  000257                  CCC
 2870  013050  004717                  JSR     %7,@%7          ;INSTRUCTION UNDER TEST
 2871  013052  121627  013052          CMPB    @%6,#TJSR3+6            ;TEST THE STACK
 2872  013056  001401                  BEQ     .+4
 2873  013060  104000                  HLT                     ;PC OF JSR DID NOT GO TO STACK
 2874  013062  005726                  TST     (6)+-           ;REPOSITION THE STACK
 2875  013064  104400                  SCOPE
 2876                          ;TEST NESTED SUBROUTINES
 2877
 2878  013066  000257                  CCC                     ;CLEAR CONDITION CODES
 2879  013070  004767  003342          JSR     %7,SUBR6
 2880  013074  100401                  BMI     .+4
 2881  013076  104000                  HLT                     ;JSR OR RTS FAILED
 2882  013100  001401                  BEQ     .+4
 2883  013102  104000                  HLT                     ;JSR OR RTS FAILED
 2884  013104  102401                  BVS     .+4
 2885  013106  104000                  HLT                     ;JSR OR RTS FAILED
 2886  013110  103401                  BCS     .+4
 2887  013112  104000                  HLT                     ;JSR OR RTS FAILED
 2888  013114  104400                  SCOPE
 2889                          ;TEST ROTATE ODD BYTE
 2890  013116  104400                  SCOPE
 2891  013120  000257                  CCC                             ;CLEAR "C"
 2892  013122  012767  123456  003474  MOV     #123456,TEMP
 2893  013130  106067  003471          RORB    TEMP+1                  ;ROTATE ODD BYTE
 2894  013134  103401                  BCS     .+4
 2895  013136  104000                  HLT                             ;C NOT SET
 2896  013140  102401                  BVS     .+4
 2897  013142  104000                  HLT                             ;V NOT SET
 2898  013144  022767  051456  003452  CMP     #051456,TEMP
 2899  013152  001401                  BEQ     .+4
 2900  013154  104000                  HLT                             ;ROTATE FAILED
 2901  013156  104400                  SCOPE
 2902  013160  000277                  SCC                             ;SET C
 2903  013162  012767  123456  003434  MOV     #123456,TEMP
 2904  013170  106067  003431          RORB    TEMP+1
 2905  013174  103401                  BCS     .+4
 2906  013176  104000                  HLT                             ;C NOT SET
 2907  013200  102001                  BVC     .+4
 2908  013202  104000                  HLT                             ;V NOT CLEARED
 2909  013204  022767  151456  003412  CMP     #151456,TEMP
 2910  013212  001401                  BEQ     .+4
 2911  013214  104000                  HLT                             ;ROTATE FAILED
 2912  013216  104400                  SCOPE
 2913
```

```
 2914  013220  000257                        CCC
 2915  013222  012767  123456  003374        MOV     #123456,TEMP
 2916  013230  106167  003371                ROLB    TEMP+1
 2917  013234  103401                        BCS     .+4
 2918  013236  104000                        HLT                             ;C NOT SET
 2919  013240  102401                        BVS     .+4
 2920  013242  104000                        HLT                             ;V NOT SET
 2921  013244  022767  047056  003352        CMP     #047056,TEMP
 2922  013252  001401                        BEQ     .+4
 2923  013254  104000                        HLT                             ;ROTATE BYTE FAILED
 2924  013256  104400                        SCOPE
 2925
 2926  013260  000277                        SCC                             ;SET C
 2927  013262  012767  123456  003334        MOV     #123456,TEMP
 2928  013270  106167  003331                ROLB    TEMP+1
 2929  013274  103401                        BCS     .+4
 2930  013276  104000                        HLT                             ;C NOT SET
 2931  013300  102401                        BVS     .+4
 2932  013302  104000                        HLT                             ;V NOT SET
 2933  013304  022767  047456  003312        CMP     #047456,TEMP
 2934  013312  001401                        BEQ     .+4
 2935  013314  104000                        HLT                             ;ROTATE ODD BYTE FAILED
 2936  013316  104400                        SCOPE
 2937
 2938  013320  000257                        CCC                             ;CLEAR C
 2939  013322  012767  177777  003274        MOV     #-1,TEMP
 2940  013330  106267  003271                ASRB    TEMP+1
 2941  013334  103401                        BCS     .+4
 2942  013336  104000                        HLT                             ;C NOT SET
 2943  013340  102001                        BVC     .+4
 2944  013342  104000                        HLT                             ;V NOT CLEARED
 2945  013344  026727  003254  177777        CMP     TEMP,#-1
 2946  013352  001401                        BEQ     .+4
 2947  013354  104000                        HLT                             ;SHIFT FAILED
 2948  013356  104400                        SCOPE
 2949
 2950  013360  000277                        SCC
 2951  013362  012767  177777  003234        MOV     #-1,TEMP
 2952  013370  106367  003231                ASLB    TEMP+1
 2953  013374  103401                        BCS     .+4
 2954  013376  104000                        HLT                             ;C NOT SET
 2955  013400  102001                        BVC     .+4
 2956  013402  104000                        HLT                             ;V NOT CLEARED
 2957  013404  026727  003214  177377        CMP     TEMP,#177377
 2958  013412  001401                        BEQ     .+4
 2959  013414  104000                        HLT                             ;SHIFT BYTE FAILED
 2960  013416  104400                        SCOPE
 2961                          ;TEST COMBINATION OF N, C AND V
 2962                                  .MACR   TNCV
 2963                                  BPL     .+12
 2964                                  BCC     .+20                            ;Z=1
 2965                                  BVC     .+30                            ;Z=1, C=1
 2966                                  HLT                                     ;Z=C, BUT V=1
 2967                                  BR      .+24
```

```
 2968                                           BCC     .+16                    ;Z=0
 2969                                           BVS     .+20                    ;Z=0, C=1
 2970                                           HLT                             ;Z NOT EQUAL C, V=1
 2971                                           BR      .+14
 2972                                           BVS     .+12                    ;Z=1, C=0
 2973                                           HLT                             ;Z NOT EQUAL C, V=1
 2974                                           BR      .+6
 2975                                           BVC     .+4                     ;Z=0, C=0
 2976                                           HLT                             ;Z=C, BUT V=1
 2977                                           SCOPE
 2978                                           .ENDM
 2979  013420  005037  016400                   CLR     @#ICOUNT                        ;NO ITERATION
 2980                                  ;TEST ALL COMBINATIONS OF NUMBERS WITH COMPARE INSTRUCTION
 2981  013424  005002                  COMPAR: CLR     %2                      ;INIT %2
 2982  013426  005001                          CLR     %1                      ;INIT %1
 2983  013430  020201                  CMP1:   CMP     %2,%1                   ;ARE THE EQUAL
 2984  013432  001401                          BEQ     .+4
 2985  013434  104000                          HLT                             ;R0 AND R1 DID NOT COMPARE
 2986  013436  020227  177777                  CMP     %2,#-1                  ;AT UPPER LIMIT
 2987  013442  001403                          BEQ     CMP2                    ;YES EXIT
 2988  013444  005202                          INC     %2                      ;INCREMENT TO NEXT NUMBER
 2989  013446  005201                          INC     %1
 2990  013450  000767                          BR      CMP1
 2991  013452  104400                  CMP2:   SCOPE
 2992
 2993                                  ;TEST ROTATING ALL NUMBERS
 2994  013454  104400                          SCOPE
 2995  013456  012767  177777  000132          MOV     #-1,REFF                ;INITIALIZE BASE NUMBER
 2996  013464  005267  000126          TSROT:  INC     REFF                    ;INCREMENT NUMBER
 2997  013470  004767  000012                  JSR     %7,ROTALL               ;GO TO COMPARE ROUTINE
 2998  013474  026727  000116  177777          CMP     REFF,#-1                ;TEST ALL VALUES
 2999  013502  001370                          BNE     TSROT                   ;NO TEST THEM ALL
 3000  013504  000446                          BR      TSRT2A                  ;WE ARE DONE
 3001
 3002  013506  016767  000104  000104  ROTALL: MOV     REFF,TEST
 3003  013514  006067  000100                  ROR     TEST
 3004  013520  006067  000074                  ROR     TEST
 3005  013524  006067  000070                  ROR     TEST
 3006  013530  006167  000064                  ROL     TEST
 3007  013534  006167  000060                  ROL     TEST
 3008  013540  006167  000054                  ROL     TEST
 3009  013544                                  TNCV
 3010  013544  100004                          BPL     .+12
 3011  013546  103007                          BCC     .+20                    ;Z=1
 3012  013550  102013                          BVC     .+30                    ;Z=1, C=1
 3013  013552  104000                          HLT                             ;Z=C, BUT V=1
 3014  013554  000411                          BR      .+24
 3015  013556  103006                          BCC     .+16                    ;Z=0
 3016  013560  102407                          BVS     .+20                    ;Z=0, C=1
 3017  013562  104000                          HLT                             ;Z NOT EQUAL C, V=1
 3018  013564  000405                          BR      .+14
 3019  013566  102404                          BVS     .+12                    ;Z=1, C=0
 3020  013570  104000                          HLT                             ;Z NOT EQUAL C, V=1
 3021  013572  000402                          BR      .+6
```

```
3022  013574  102001                          BVC     .+4                     ;Z=0, C=0
3023  013576  104000                          HLT                             ;Z=C, BUT V=1
3024  013600  104400                          SCOPE
3025  013602  026767  000012  000006          CMP     TEST,REFF
3026  013610  001401                          BEQ     .+4
3027  013612  104000                          HLT                             ;INITIAL NOT EQUAL TO FINAL
3028  013614  000207                          RTS     %7
3029  013616  000000                  REFF:   0                               ;GOOD DATA
3030  013620  000000                  TEST:   0                               ;BAD DATA
3031          013616                          REF=REFF
3032                                  ;TEST ROTATING BYTE EVEN/ODD, ALL NUMBERS
3033  013622  012767  177777  177766  TSRT2A: MOV     #-1,REFF
3034  013630  005267  177762          TSROT2: INC     REFF
3035  013634  004767  000016                  JSR     %7,ROTBE
3036  013640  004767  000122                  JSR     %7,ROTBO
3037  013644  022767  177777  177744          CMP     #-1,REFF
3038  013652  001366                          BNE     TSROT2
3039  013654  000505                          BR      ROTEN1
3040  013656  016767  177734  177734  ROTBE:  MOV     REFF,TEST
3041  013664  106067  177730                  RORB    TEST                    ;ROTATE BYTE EVEN
3042  013670  106067  177724                  RORB    TEST
3043  013674  106067  177720                  RORB    TEST
3044  013700  106167  177714                  ROLB    TEST
3045  013704  106167  177710                  ROLB    TEST
3046  013710  106167  177704                  ROLB    TEST
3047  013714                                  TNCV
3048  013714  100004                          BPL     .+12
3049  013716  103007                          BCC     .+20                    ;Z=1
3050  013720  102013                          BVC     .+30                    ;Z=1, C=1
3051  013722  104000                          HLT                             ;Z=C, BUT V=1
3052  013724  000411                          BR      .+24
3053  013726  103006                          BCC     .+16                    ;Z=0
3054  013730  102407                          BVS     .+22                    ;Z=0, C=1
3055  013732  104000                          HLT                             ;Z NOT EQUAL C, V=1
3056  013734  000405                          BR      .+14
3057  013736  102404                          BVS     .+12                    ;Z=1, C=0
3058  013740  104000                          HLT                             ;Z NOT EQUAL C, V=1
3059  013742  000402                          BR      .+6
3060  013744  102001                          BVC     .+4                     ;Z=0, C=0
3061  013746  104000                          HLT                             ;Z=C, BUT V=1
3062  013750  104400                          SCOPE
3063  013752  026767  177642  177636          CMP     TEST,REFF
3064  013760  001401                          BEQ     .+4
3065  013762  104000                          HLT
3066  013764  000207                          RTS     %7
3067  013766  106067  177627          ROTBO:  RORB    TEST+1                  ;ROTATE BYTE ODD
3068  013772  106067  177623                  RORB    TEST+1
3069  013776  106067  177617                  RORB    TEST+1
3070  014002  106167  177613                  ROLB    TEST+1
3071  014006  106167  177607                  ROLB    TEST+1
3072  014012  106167  177603                  ROLB    TEST+1
3073  014016                                  TNCV
3074  014016  100004                          BPL     .+12
3075  014020  103007                          BCC     .+20                    ;Z=1
```

```
3076  014022  102013                          BVC     .+30                    ;Z=1, C=1
3077  014024  104000                          HLT                             ;Z=C, BUT V=1
3078  014026  000411                          BR      .+24
3079  014030  103006                          BCC     .+16                    ;Z=0
3080  014032  102407                          BVS     .+20                    ;Z=0, C=1
3081  014034  104000                          HLT                             ;Z NOT EQUAL C, V=1
3082  014036  000405                          BR      .+14
3083  014040  102404                          BVS     .+12                    ;Z=1, C=0
3084  014042  104000                          HLT                             ;Z NOT EQUAL C, V=1
3085  014044  000402                          BR      .+6
3086  014046  102001                          BVC     .+4                     ;Z=0, C=0
3087  014050  104000                          HLT                             ;Z=C, BUT V=1
3088  014052  104400                          SCOPE
3089  014054  026767  177540  177534          CMP     TEST,REFF
3090  014062  001401                          BEQ     .+4
3091  014064  104000                          HLT
3092  014066  000207                          RTS     %7
3093  014070  104400                  ROTEN1: SCOPE
3094                                  ;ADD AND SUBTRACT ALL NUMBERS AGAINST FIXED NUMBERS
3095                                  ;A+B=C, C-A=B, BF SHOULD EQUAL BI
3096  014072  011667  000072          TSTART: MOV     @%6,NUMA
3097  014076  012767  000001  177512          MOV     #1,REF
3098  014104  005267  177506          ARITST: INC     REF
3099  014110  004767  000014                  JSR     %7,ADSUB
3100  014114  022767  177777  177474          CMP     #-1,REFF
3101  014122  001370                          BNE     ARITST
3102  014124  000422                          BR      ARIEND
3103  014126  104400                          SCOPE
3104  014130  016767  177462  177462  ADSUB:  MOV     REF,TEST
3105  014136  066767  000026  177454          ADD     NUMA,TEST
3106  014144  166767  000020  177446          SUB     NUMA,TEST
3107  014152  026767  177440  177440          CMP     REF,TEST
3108  014160  001401                          BEQ     .+4
3109  014162  104000                          HLT
3110  014164  104400                          SCOPE
3111  014166  000207                          RTS     %7
3112  014170  000000                  NUMA:   0
3113  014172  104400                  ARIEND: SCOPE
3114
3115                                  ;TEST COMPLIMENTING ALL NUMBERS
3116  014174  005067  002424                  CLR     TEMP            ;BASE DATA
3117  014200  005067  002424                  CLR     TEMP+4          ;BASE REFERENCE
3118  014204  005167  002414          TCOM:   COM     TEMP            ;COMPLIMENT DATA
3119  014210  005367  002414                  DEC     TEMP+4          ;DECREMENT REFERENCE
3120  014214  026767  002404  002406          CMP     TEMP,TEMP+4     ;COMPARE
3121  014222  001401                          BEQ     .+4             ;TEST
3122  014224  104000                          HLT                     ;COMPLIMENT OR DECREMENT FAILED
3123  014226  005167  002372                  COM     TEMP
3124  014232  005267  002366                  INC     TEMP            ;INCREMENT AND TEST FOR DONE
3125  014236  001362                          BNE     TCOM            ;NOT FINISHED GO LOOP
3126  014240  104400                          SCOPE
3127
3128                                  ;TEST COMB (EVEN BYTE)
3129  014242  005067  002356                  CLR     TEMP            ;BASE DATA
```

```
3130  014246  005067  002356                CLR     TEMP+4          ;REFERENCE DATA
3131  014252  105167  002346          TCOM2: COMB    TEMP
3132  014256  005367  002346                DEC     TEMP+4
3133  014262  126767  002336  002340        CMPB    TEMP,TEMP+4     ;COMPARE
3134  014270  001401                        BEQ     .+4
3135  014272  104000                        HLT                     ;COMPLIMENT OR INCREMENT BYTE FAILED
3136  014274  105167  002324                COMB    TEMP
3137  014300  105267  002320                INCB    TEMP
3138  014304  001362                        BNE     TCOM2
3139  014306  104400                        SCOPE
3140                                ;TEST COMB (ODD BYTE)
3141  014310  005067  002310                CLR     TEMP            ;BASE DATA
3142  014314  005067  002310                CLR     TEMP+4          ;REFERENCE DATA
3143  014320  105167  002301          TCOM3: COMB    TEMP+1          ;ODD BYTE
3144  014324  005367  002300                DEC     TEMP+4
3145  014330  126767  002271  002272        CMPB    TEMP+1,TEMP+4
3146  014336  001401                        BEQ     .+4
3147  014340  104000                        HLT                     ;COMPLIMENT BYTE FAILED
3148  014342  105167  002257                COMB    TEMP+1
3149  014346  105267  002253                INCB    TEMP+1
3150  014352  001362                        BNE     TCOM3
3151  014354  104400                        SCOPE
3152
3153                                ;TEST COMPARE ALL VALUE EVEN BYTE WITH ODD
3154  014356  005067  002242                CLR     TEMP            ;BASE VALUE
3155  014362  126767  002236  002235  TSCOMB: CMPB  TEMP,TEMP+1     ;COMPARE
3156  014370  001401                        BEQ     .+4
3157  014372  104000                        HLT                     ;COMPARE FAILED
3158  014374  002001                        BGE     .+4
3159  014376  104000                        HLT                     ;V IS NOT = TO N
3160  014400  003401                        BLE     .+4
3161  014402  104000                        HLT                     ;V IS SET
3162  014404  062767  000401  002212        ADD     #401,TEMP
3163  014412  022767  177777  002204        CMP     #-1,TEMP
3164  014420  001360                        BNE     TSCOMB
3165  014422  104400                        SCOPE
3166  014424  012737  004000  016400        MOV     #4000,@#ICOUNT
3167  014432  104400                  WAIT3: SCOPE
3168  014434  005767  002062                TST     SAVR6           ;SET ON POWER FAIL
3169  014440  001405                        BEQ     WAIT5           ;SKIP OVER IF CLEAR
3170  014442  005067  002054                CLR     SAVR6
3171  014446  104000                        HLT                     ;POWER FAIL OCCURRED
3172  014450  000137  000510                JMP     @#ESTART
3173  014454                          WAIT5:
3174  014454  012737  000010  016400        MOV     #10,@#ICOUNT
3175
3176                                ;TEST TO SEE IF I/O DEVICES WERE SELECTED
3177  014462  123727  001362  000377        CMPB    @#REG1,#377     ;SELECTED DEVICES STORED IN REG1
3178  014470  001404                        BEQ     WAIT4           ;BRANCH IF NO DEVICES SELECTED
3179  014472  000001                        WAIT                    ;INTERRUPTS WILL OCCUR
3180  014474  000001                        WAIT                    ;IF DEVICES ARE SELECTED
3181  014476  000001                        WAIT
3182  014500  000001                        WAIT
3183  014502  104400                  WAIT4: SCOPE
```

```
3184  014504  012737  004000  016400          MOV     #4000,@#ICOUNT
3185
3186                                  ;TEST SWAB
3187  014512  012767  000200  177100          MOV     #0200,TEST
3188  014520  000367  177074                  SWAB    TEST
3189  014524  100001                          BPL     .+4
3190  014526  104000                          HLT
3191  014530  001401                          BEQ     .+4
3192  014532  104000                          HLT
3193  014534  000367  177060                  SWAB    TEST
3194  014540  100401                          BMI     .+4
3195  014542  104000                          HLT
3196  014544  001001                          BNE     .+4
3197  014546  104000                          HLT
3198  014550  104400                          SCOPE
3199  014552  005037  016400                  CLR     @#ICOUNT
3200
3201                                  ;TEST ALL COMBINATIONS OF SWAB
3202  014556  005067  177036                  CLR     TEST            ;NUMBER UNDER TEST
3203  014562  005067  177030                  CLR     REF             ;REFERENCE NUMBER
3204  014566  000367  177026          SWABA:  SWAB    TEST            ;OPERATION UNDER TEST
3205  014572  026767  177022  177016          CMP     TEST,REF        ;TEST SWAB INSTRUCTION
3206  014600  001401                          BEQ     .+4
3207  014602  104000                          HLT                     ;SWAB FAILED
3208  014604  000367  177010                  SWAB    TEST
3209  014610  005267  177002                  INC     REF             ;INCREMENT REFERENCE NUMBER
3210  014614  105267  177001                  INCB    TEST+1          ;INC TEST NUMBER
3211  014620  001362                          BNE     SWABA           ;LOOP TILL DONE
3212  014622  104400                          SCOPE
3213  014624  012737  004000  016400          MOV     #4000,@#ICOUNT
3214          000240                  NOP=240
3215          177776                  CC=177776
3216
3217  014632  012767  177777  001764          MOV     #-1,TEMP
3218  014640  000261                          SEC
3219  014642  105567  001757                  ADCB    TEMP+1
3220  014646  103401                          BCS     .+4
3221  014650  104000                          HLT                     ;ADCB FAILED
3222  014652  022767  000377  001744          CMP     #377,TEMP
3223  014660  001401                          BEQ     .+4
3224  014662  104000                          HLT                     ;ADCB FAILED
3225  014664  104400                          SCOPE
3226  014666  005737  016522                  TST     @#SAVR6         ;POWER FAIL FLAG
3227  014672  001405                          BEQ     EAE$RT
3228  014674  005037  016522                  CLR     @#SAVR6
3229  014700  104000                          HLT                     ;POWER FAIL OCCURRED
3230  014702  000137  001034                  JMP     @#ST4           ;RESTART PROGRAM
3231  014706  000402                  EAESRT: BR      .+6             ;NOP IF NO EAE
3232  014710  000167  000362                  JMP     ENDEAE
3233                                  ;TEST LEFT SHIFT
3234  014714  104400                          SCOPE                   ;TEST OF LOGICAL SHIFT
3235  014716  005077  163426                  CLR     @MQ             ;LOAD MQ WITH 0
3236  014722  012777  125252  163422          MOV     #125252,@AC     ;LOAD AC WITH 125252
3237  014730  012777  177760  163430          MOV     #-16.,@LSH      ;LOAD SHIFT COUNT (LSH) WITH -16
```

```
 3238  014736  005777  163410                TST     @AC             ;COMPARE AC WITH 0
 3239  014742  001401                        BEQ     .+4             ;GO TO HLT IF BAD
 3240  014744  104000                        HLT
 3241  014746  022777  125252  163374        CMP     #125252,@MQ     ;COMPARE MQ WITH 125252
 3242  014754  001401                        BEQ     .+4             ;GO TO HLT IF BAD
 3243  014756  104000                        HLT
 3244  014760  122777  000020  163370        CMPB    #20,@SRE                ;COMPARE SR WITH 2
 3245  014766  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
 3246  014770  104000                        HLT                     ;HALT ON ERROR (LEFT SHIFT)
 3247
 3248                                  ;TEST RIGHT SHIFT
 3249  014772  104400                        SCOPE                   ;TEST OF ARITHMETIC SHIFT
 3250  014774  005077  163350                CLR     @MQ             ;LOAD MQ WITH 0
 3251  015000  012777  177777  163344        MOV     #-1,@AC         ;LOAD AC WITH -1
 3252  015006  012777  000020  163354        MOV     #16.,@ASH       ;LOAD SHIFT COUNT (ASH) WITH 16.
 3253  015014  005777  163332                TST     @AC             ;COMPARE AC WITH 100000
 3254  015020  100401                        BMI     .+4             ;SKIP HLT IF GOOD
 3255  015022  104000                        HLT                     ;HALT ON ERROR
 3256  015024  005777  163320                TST     @MQ             ;COMPARE MQ WITH 0
 3257  015030  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
 3258  015032  104000                        HLT                     ;HALT ON ERROR
 3259  015034  122777  000110  163314        CMPB    #110,@SRE       ;COMPARE SR WITH 10
 3260  015042  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
 3261  015044  104000                        HLT                     ;HALT ON ERROR (RIGHT SHIFT)
 3262
 3263                                  ;TEST NORMALIZE
 3264  015046  104400                        SCOPE                   ;TEST OF NORMALIZE
 3265  015050  012777  125252  163272        MOV     #125252,@MQ     ;LOAD MQ WITH 125252
 3266  015056  012777  170000  163266        MOV     #170000,@AC     ;LOAD AC WITH 170000
 3267  015064  005077  163274                CLR     @NOR            ;START NORMALIZE
 3268  015070  022777  100005  163254        CMP     #100005,@AC     ;COMPARE AC WITH 100005
 3269  015076  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
 3270  015100  104000                        HLT                     ;HALT ON ERROR
 3271  015102  022777  052520  163240        CMP     #52520,@MQ      ;COMPARE MQ WITH 52520
 3272  015110  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
 3273  015112  104000                        HLT                     ;HALT ON ERROR
 3274  015114  122777  000003  163232        CMPB    #3,@SC          ;COMPARE SC WITH 3
 3275  015122  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
 3276  015124  104000                        HLT                     ;HALT ON ERROR (NORMALIZE)
 3277                                  ;TEST MULTIPLY
 3278  015126  104400                        SCOPE                   ;TEST OF MULTIPLY
 3279  015130  012777  125252  163212        MOV     #125252,@MQ     ;LOAD MQ WITH 125252
 3280  015136  012777  040000  163214        MOV     #40000,@MUL     ;LOAD MUL WITH 40000
 3281  015144  022777  165252  163200        CMP     #165252,@AC     ;COMPARE AC WITH 1652
 3282  015152  001401                        BEQ     .+4             ;SKIP IF GOOD
 3283  015154  104000                        HLT                     ;HALT ON ERROR
 3284  015156  005777  163156                TST     @MQ             ;COMPARE MQ WITH 10000
 3285  015162  100401                        BMI     .+4             ;SKIP HLT IF GOOD
 3286  015164  104000                        HLT                     ;HALT ON ERROR
 3287  015166  122777  000300  163162        CMPB    #300,@SRE       ;COMPARE SR WITH 300
 3288  015174  001401                        BEQ     .+4             ;SKIP HLT IF GOOD
 3289  015176  104000                        HLT                     ;HALT ON ERROR (MULTIPLY)
 3290
 3291                                  ;TEST DIVIDE
```

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  3292  015200  104400                          SCOPE                   ;TEST OF DIVIDE
  3293  015202  012777  125252  163140          MOV     #125252,@MQ     ;LOAD MQ WITH 125252
  3294  015210  012777  177777  163134          MOV     #-1,@AC         ;LOAD AC WITH -1
  3295  015216  012777  000002  163136          MOV     #2,@DIV         ;LOAD DIV WITH 2 AND DIVIDE
  3296  015224  005777  163122                  TST     @AC             ;COMPARE AC WITH 0 (QUOTIANT)
  3297  015230  001401                          BEQ     .+4             ;SKIP HLT IF GOOD
  3298  015232  104000                          HLT                     ;HALT ON ERROR
  3299  015234  022777  152525  163106          CMP     #152525,@MQ     ;COMPARE MQ WITH 152525
  3300  015242  001401                          BEQ     .+4             ;SKIP HLT IF GOOD
  3301  015244  104000                          HLT                     ;DIVIDE ERROR
  3302  015246  104400                          SCOPE
  3303  015250  012767  177777  001346          MOV     #-1,TEMP
  3304  015256  000261                          SEC
  3305  015260  105667  001341                  SBCB    TEMP+1
  3306  015264  022767  177377  001332          CMP     #177377,TEMP
  3307  015272  001401                          BEQ     .+4
  3308  015274  104000                          HLT
```

```
3309  015276  104400                  ENDEAE: SCOPE
3310  015300  022700  052525                  CMP     #52525,%0
3311  015304  001401                          BEQ     .+4
3312  015306  104000                          HLT                             ;SOME OPERATION DESTROYED %0
3313  015310  012737  016444  000024          MOV     #PFAIL,@#24             ;POWER FAIL VECTOR
3314  015316  012737  000340  000026          MOV     #340,@#26                       ;PROCESSOR PRIORITY
3315
3316  015324  000401                  SKPBEL: BR      .+4                     ;SKIP OVER BELL=NOP ON CORE EXPANSION
3317  015326  000501                          BR      TRPA
3318  015330  032777  000100  162726          BIT     #100,@TTCSR
3319  015336  001006                          BNE     SBELL                   ;DON'T RING BELL IF TTY IS BUSY
3320                                  ;BELL ON PASS COMPLETE
3321  015340  012777  000207  000452  BELL:   MOV     #207,@TDBR
3322  015346  105777  000450                  TSTB    @TCSR
3323  015352  100375                          BPL     .-4
3324  015354  005237  177570          SBELL:  INC     @#177570
3325  015360  005227  000000                  INC     #0                      ;PASS COUNT LOCATION
3326  015364  010700                          MOV     %7,%0                   ;SET UP RESERVED INSTRUCTION
3327  015366  042730  017777                  BIC     #17777,%0               ;OFFSET
3328  015372  062700  015416                  ADD     #BEG20,%7                .
3329  015376  010037  000010                  MOV     %0,@#10
3330  015402  006701                          6701                            ;ATTEMPT TO EXECUTE SIGN EXTEND
3331  015404  000240                          NOP
3332  015406  012737  000006  015526          MOV     #6,@#YESRT              ;NO TRAP, PROCESSOR IS NOT=20,15,05
3333  015414  000403                          BR      BEGANY
3334  015416  012737  000002  015526  REG20:  MOV     #2,@#YESRT              ;TRAP OCCURRED
3335  015424  012737  000012  000010  BEGANY: MOV     #12,@#10                ;RESTORE HALT FOR RESERVED INC
3336                                  ;ROUTINE TO CHECK FOR TRACE TRAP TO BE RUN WITH PROGRAM
3337
3338                                  ;SAVE OLD CONTENTS, SET UP FOR TRACE TRAP
3339  015432  005016                  YESTR:  CLR     (6)
3340  015434  032737  010000  177570          BIT     #10000,@#SR             ;INHIBIT "T" TRAP IF SET
3341  015442  001010                          BNE     YESTR1
3342  015444  012737  015526  000014          MOV     #YESRT,@#14             ;T TRAP VECTOR
3343  015452  005167  000046                  COM     TRPB
3344  015456  100005                          BPL     LINKER
3345  015460  012716  000020                  MOV     #20,(6)                 ;SET TRACE TRAP
3346  015464  012746  004272          YESTR1: MOV     #BEGIN,-(6)             ;START OF TEST WITH TRACE ON
3347  015470  000002                  YESTR2: RTI
3348  015472  005737  000042          LINKER: TST     @#42                    ;SHOULD PROGRAM GO TO MONITOR
3349  015476  001406                          BEQ     LOGICAL                 ;BR IF NO
3350  015500  012737  015514  000014          MOV     #LOGICAL,@#14           ;TO BANK ZERO
3351  015506  000005                          RESET                           ;CLR T BIT IF SET FOR MONITORS
3352  015510  013707  000042                  MOV     @#42,%7                 ;GO TO MONITOR OR ACTII SYSTEM
3353  015514  000763                  LOGICAL:        BR      YESTR1                  ;CONTINUE
3354  015516  000240                          NOP                             ;FOR ACT 11
3355  015520  000240                          NOP
3356  015522  000240                          NOP
3357  015524  000000                  TRPB:   0
3358  015526  000002                  YESRT:  RTI                             ;RETURN TO PROGRAM FROM TRAP - CAN BE AN RTT
3359  015530  000000                          HALT                            ;RTI FAILED
3360  015532  000137  004272          TRPA:   JMP     @#BEGIN                 ;BEGIN MODIFY BY EXPANSION
3361  015536  000000                  PRFLAG: 0                               ;PRINT ROUTINE BUSY IF NOT ZERO
3362
```

```
 3363                                   ;ENTERED WITH SYSTEM TRAP CALL(HLT)
 3364                                   ;PRINT OUT THE ERROR PC AND STATUS REGISTER
 3365  015540  005767  177772          PRINT:  TST     PRFLAG                  ;IS ROUTINE BUSY
 3366  015544  001401                          BEQ     .+4
 3367  015546  000002                          RTI                             ;YES EXIT
 3368  015550  005267  177762                  INC     PRFLAG                  ;NO SET FLAG
 3369  015554  005227  000000                  INC     #0                      ;ERROR COUNT LOCATION
 3370  015560  036727  162004  020000        BIT     SR,#20000               ;TEST FOR INHIBIT PRINT OUT
 3371  015566  001401                          BEQ     .+4                     ;BRANCH TO PRINT
 3372  015570  000473                          BR      PRINT1                  ;INHIBIT, RETURN TO MAIN STREAM
 3373  015572  012667  000226                  MOV     (6)+,SAVPC              ;PC OF FAILING ROUTINE
 3374  015576  012667  000224                  MOV     (6)+,SAVCC              ;CC OF ERROR CONDITION
 3375  015602  024646                          CMP     -(6),-(6)               ;REPOSITION THE STACK
 3376  015604  042767  000140  162164        BIC     #140,STATUS
 3377  015612  105777  000234                  TSTB    @TCSR           ;WAIT FOR FLAG
 3378  015616  100375                          BPL     .-4
 3379  015620  012777  000215  000172        MOV     #215,@TDBR              ;CR
 3380  015626  105777  000170                  TSTB    @TCSR
 3381  015632  100375                          BPL     .-4
 3382  015634  012777  000212  000156        MOV     #212,@TDBR              ;LINE FEED
 3383  015642  105777  000154                  TSTB    @TCSR
 3384  015646  100375                          BPL     .-4
 3385  015650  010267  000136                  MOV     %2,SAVR2                ;SAVE R2
 3386  015654  010367  000134                  MOV     %3,SAVR3                ;SAVE R3
 3387  015660  010467  000132                  MOV     %4,SAVR4                ;SAVE R4
 3388  015664  016702  000134                  MOV     SAVPC,%2
 3389  015670  004767  000134                  JSR     %7,PRTAB                ;PRINT OCTAL NUMBER
 3390  015674  012777  000240  000116        MOV     #240,@TDBR
 3391  015702  105777  000114                  TSTB    @TCSR                   ;SPACE BETWEEN WORDS
 3392  015706  100375                          BPL     .-4
 3393  015710  016702  000112                  MOV     SAVCC,%2
 3394  015714  004767  000110                  JSR     %7,PRTAB                ;PRINT OCTAL NUMBER
 3395  015720  012777  000240  000072        MOV     #240,@TDBR
 3396  015726  105777  000070                  TSTB    @TCSR
 3397  015732  100375                          BPL     .-4
 3398  015734  016702  000444                  MOV     RETURN,%2               ;WHERE CPU TEST IS AT
 3399  015740  004767  000054                  JSR     %7,PRTAB
 3400  015744  016702  000042                  MOV     SAVR2,%2                ;RESTORE REGISTERS
 3401  015750  016703  000040                  MOV     SAVR3,%3
 3402  015754  016704  000036                  MOV     SAVR4,%4
 3403  015760  005767  161624          PRINT1: TST     SR                      ;TEST FOR HALT SWITCH
 3404  015764  100001                          BPL     .+4
 3405  015766  000000                          HALT                            ;HALT ON ERROR SET
 3406  015770  005067  177542                  CLR     PRFLAG                  ;CLEAR FLAG WHEN DONE
 3407  015774  032767  000400  161566        BIT     #400,SR
 3408  016002  001402                          BEQ     EXPRINT
 3409  016004  000167  162520                  JMP     ESTART                  ;RESTART ON ERROR
 3410  016010  000002                  EXPRINT: RTI                            ;RETURN TO MAIN STREAM
 3411  016012  000000                  SAVR2:  0
 3412  016014  000000                  SAVR3:  0
 3413  016016  000000                  SAVR4:  0
 3414  016020  177566                  TDBR:   177566                          ;DATA
 3415  016022  177564                  TCSR:   177564                          ;STATUS
 3416  016024  000000                  SAVPC:  0
```

```
3417  016026  000000                SAVCC:  0
3418          016676                        BUFF=FIN                        ;END OF PROGRAM-SP AREA.
3419
3420  016030  005067  000252        PRTAB:  CLR     BINCT
3421  016034  005067  000244                CLR     WGTCT
3422  016040  012704  016512                MOV     #LIST,%4                ;GET LIST ADDRESS
3423  016044  012767  000005  000236        MOV     #5,ASCNT
3424  016052  012767  000007  000220        MOV     #7,SEVEN
3425  016060  012767  000001  000214        MOV     #1,DECML
3426  016066  105777  177730        WAIT1:  TSTB    @TCSR
3427  016072  100375                        BPL     WAIT1
3428  016074  005702                        TST     %2
3429  016076  100404                        BMI     MINUS                   ;NEG SIGN PRINT 1
3430  016100  012777  000260  177712        MOV     #260,@TDBR              ;POS SIGN PRINT 0
3431  016106  000403                        BR      STAR
3432  016110  012777  000261  177702  MINUS:  MOV     #261,@TDBR
3433  016116  016703  000156        STAR:   MOV     SEVEN,%3                ;PUT MASK IN R3
3434  016122  010267  000150                MOV     %2,TOODLE               ;GET READY TO DOODLE NUMBER IN TOODLE
3435  016126  005167  000144                COM     TOODLE                  ;COMPENSATES FOR COMPLEMENT DURING BIC
3436  016132  046703  000140                BIC     TOODLE,%3               ;AND IN OCTAL CHARACTER
3437  016136  001410                        BEQ     WRTOC                   ;ZERO, WRITE 0 IN LIST
3438  016140  066767  000136  000136  MKNUM:  ADD     DECML,WGTCT             ;COUNT UP TO
3439  016146  005267  000134                INC     BINCT                   ;AND RECORD
3440  016152  026703  000126                CMP     WGTCT,%3                ;SAME BINARY WEIGHT
3441  016156  001370                        BNE     MKNUM                   ;KEEP COUNTN
3442  016160  062767  000260  000120  WRTOC:  ADD     #260,BINCT              ;ADD ASCII PREFIX
3443  016166  016724  000114                MOV     BINCT,(4)+              ;WRITE ASCII CHAR IN LIST
3444  016172  066767  000102  000102        ADD     SEVEN,DECML             ;EXPAND BINARY WEIGHT
3445  016200  005067  000100                CLR     WGTCT
3446  016204  005067  000076                CLR     BINCT
3447  016210  005367  000074                DEC     ASCNT
3448  016214  001410                        BEQ     XLIST                   ;5 CHAR IN LIST
3449  016216  012703  000003                MOV     #3,%3                   ;SET X3 FOR ADD LOOP
3450  016222  066767  000052  000050  MOADD:  ADD     SEVEN,SEVEN             ;MAKING SEVENTY BY SEVEN
3451  016230  005303                        DEC     %3
3452  016232  001373                        BNE     MOADD
3453  016234  000730                        BR      STAR                    ;NX SEVEN SET GET NX OCTAL
3454  016236  012767  000005  000044  XLIST:  MOV     #5,ASCNT                ;SEND 5 CHAR TO TTY
3455  016244  105777  177552        WAIT2:  TSTB    @TCSR
3456  016250  100375                        BPL     WAIT2
3457  016252  014477  177542                MOV     -(4),@TDBR
3458  016256  005367  000026                DEC     ASCNT
3459  016262  001401                        BEQ     HDFHM                   ;FINISH PRINTING GET NXT NUM
3460  016264  000767                        BR      WAIT2
3461  016266  105777  177530        HDFHM:  TSTB    @TCSR
3462  016272  100375                        BPL     .-4
3463  016274  000207                        RTS     %7                      ;HEAD FOR HOME
3464  016276  000000                TOODLE: 0
3465  016300  000000                SEVEN:  0
3466  016302  000000                DECML:  0
3467  016304  000000                WGTCT:  0
3468  016306  000000                BINCT:  0
3469  016310  000000                ASCNT:  0
3470  016312  000000                LIST:   0
```

```
3471  016314  000000                          0
3472  016316  000000                          0
3473  016320  000000                          0
3474  016322  000000                          0
3475                                ;SCOPE LOOP ROUTINE ENTERED BY USER TRAP
3476
3477                                ;SCOPE OR/AND ITERATION LOOP FOR EACH TEST 4000 TIMES
3478  016324  032767  040000  161236 SCOPEC: BIT     #40000,SR               ;TEST SR FOR SCOPE
3479  016332  001012                        BNE     SCOPEB                  ;YES SCOPE
3480  016334  032767  004000  161226        BIT     #4000,SR                ;NO - TEST FOR ITERATION
3481  016342  001011                        BNE     SCOPEG                  ;INHIBIT ITERATION
3482  016344  026767  000032  000026        CMP     SCOPEF,ICOUNT
3483  016352  001405                        BEQ     SCOPEG                  ;EXIT = DONE
3484  016354  005267  000022                INC     SCOPEF                  ;INCREMENT COUNT
3485  016360  016716  000020  SCOPEB: MOV     RETURN,@#6              ;REPOSITION THE STACK
3486  016364  000002                        RTI                             ;SCOPE RETURN
3487  016366  005067  000010  SCOPEG: CLR     SCOPEF                  ;CLEAR COUNT
3488  016372  011667  000006                MOV     @#6,RETURN              ;SAVE SCOPE RETURN POINTER
3489  016376  000002                        RTI                             ;RETURN INLINE-NEXT TEST
3490  016400  004000  ICOUNT: 4000
3491  016402  000000  SCOPEF: 0                                            ;COUNT LOCATION FOR ITERATION LOOP
3492  016404  004272  RETURN: BEGIN                                        ;ADDRESS OF LAST TEST
3493
3494                                ;GROUP OF NESTED SUBROUTINES
3495  016406  000207  SUBR1:  RTS     %7              ;ONE INSTRUCTION
3496  016410  000277  SUBR2:  SCC                     ;ONE DEEP
3497  016412  000205                RTS     %5
3498  016414  004537  016410  SUBR3:  JSR     %5,@#SUBR2      ;TWO DEEP
3499  016420  000204                RTS     %4
3500  016422  004467  177766  SUBR4:  JSR     %4,SUBR3        ;THREE DEEP
3501  016426  000203                RTS     %3
3502  016430  004367  177766  SUBR5:  JSR     %3,SUBR4        ;FOUR DEEP
3503  016434  000202                RTS     %2
3504  016436  004267  177766  SUBR6:  JSR     %2,SUBR5        ;FIVE DEEP
3505  016442  000207                RTS     %7
3506                                ;ENTER HERE OR POWER FAIL
3507
3508  016444  010046  PFAIL:  MOV     %0,-(6)                 ;SAVE REGISTER OR STACK
3509  016446  010146                MOV     %1,-(6)                 ;WHEN POWERING DOWN
3510  016450  010246                MOV     %2,-(6)
3511  016452  010346                MOV     %3,-(6)
3512  016454  010446                MOV     %4,-(6)
3513  016456  010546                MOV     %5,-(6)
3514  016460  016746  161340        MOV     24,-(6)
3515  016464  012737  000002  000006        MOV     #RTI,@#6                ;IN CASE OF NO EAE
3516  016472  013746  000352                MOV     @#AC,-(6)
3517  016476  013746  000350                MOV     @#MQ,-(6)
3518  016502  013746  000354                MOV     @#SC,-(6)
3519  016506  010667  000010                MOV     %6,SAVR6                ;STORE STACK POSITION, POWER FAIL FLAG
3520  016512  012767  016524  161304        MOV     #RESTART,24
3521  016520  000000                HALT                            ;HALT ON POWER DOWN NORMAL
3522  016522  000000  SAVR6:  0                                     ;STACK IS SAVED HERE
3523  016524  016706  177772  RESTART:        MOV     SAVR6,%6        ;RESTORE REGISTER OFF STACK
3524  016530  012637  000354                MOV     (6)+,@#SC
```

```
3525  016534  012637  000350                  MOV     (6)+,@#MQ               ;MQ MUST BE LOADED BEFORE AC
3526  016540  012637  000352                  MOV     (6)+,@#AC
3527  016544  005037  000006                  CLR     @#6                     ;RESTORE TIME OUT
3528  016550  012667  161250                  MOV     (6)+,24                 ;WHEN POWERING UP
3529  016554  012605                          MOV     (6)+,%5
3530  016556  012604                          MOV     (6)+,%4
3531  016560  012603                          MOV     (6)+,%3
3532  016562  012602                          MOV     (6)+,%2
3533  016564  012601                          MOV     (6)+,%1
3534  016566  012600                          MOV     (6)+,%0
3535  016570  000002                          RTI                             ;RETURN TO MAIN LINE
3536  016572  125252                  B:      125252
3537                                  ;FIXED VALUES FOR USE IN TEST
3538  016574  016572                          B                               ;ADDRESS OF B
3539  016576  052525                          052525
3540
3541          016602                  .=B+10
3542  016602  177777                  A:      -1
3543  016604  016606                          A+4
3544
3545          016606                  .=A+4
3546  016606  125252                          125252
3547  016610  016612                          A+10                    ;ADDRESS OF A+10
3548  016612  052525                          052525
3549                                  ;FOR STORAGE
3550  016614  000000                  C:      0
3551  016616  016614                          C                       ;ADDRESS OF C
3552
3553          016624                  .=C+10
3554  016624  000000                  TEMP:   0
3555  016626  016624                          TEMP                    ;ADDRESS OF TEMP
3556
3557          016632                  .=TEMP+6
3558  016632  016634                          TEMP+10                 ;ADDRESS OF TEMP+10 OR "D"
3559  016634  000000                  D:      0
3560          016676                  .=.+40
3561  016676  000000                  FIN:    0                       ;BUFFER FOR SP
3562  016700  000207                  USER:   RTS     %7              ;OVERLAY USER ROUTINE HERE IF 4KW, USE BANK1 IF >4KW
3563                                  ;PDP-11 MEMORY DETERMINATION AND SETUP
3564                                  ;USE WITH VARIABLE CORE QUANTITY SYSTEMS
3565          016702                          .=FIN + 4               ;APPLICABLE TO SYSTEM TEST 21
3566  016702  012767  004272  176624  DET1:   MOV     #BEGIN,TRPA+2
3567  016710  012767  000401  176406          MOV     #401,SKPREL     ;BR .+4
3568  016716  023727  000042  016702          CMP     @#42,#DET1      ;CHECK FOR DDP1
3569  016724  101401                          BLOS    .+4
3570  016726  000207                          RTS     %7              ;NO CORE EXPANSION WITH DDP1
3571  016730  032767  001000  160632          BIT     #1000,SR        ;CHECK VARIABLE CORE SWITCH
3572  016736  001401                          BEQ     DET4            ;USE VARIABLE CORE ROUTINE
3573  016740  000207                          RTS     %7              ;4K ONLY
3574  016742  012767  017010  161034  DET4:   MOV     #DET2,4         ;TRAP VECTOR SETUP
3575  016750  012767  000340  161030          MOV     #340,6          ;TRAP STATUS SETUP
3576  016756  005537  037770          EIGHT:  ADC     @#37770         ;CHECK FOR 8K
3577  016762  005537  057770          TWELVE: ADC     @#57770         ;CHECK FOR 12K
3578  016766  005537  077770          SXTEEN: ADC     @#077770        ;CHECK FOR 16K
```

```
3579  016772  005537  117770          TWENTY: ADC     @#117770        ;CHECK FOR 20K
3580  016776  005537  137770          TWOFOR: ADC     @#137770        ;CHECK FOR 24K
3581  017002  005537  157770          TWOEIG: ADC     @#157770        ;CHECK FOR 28K
3582  017006  000430                          BR      STRT28
3583  017010  012602                  DET2:   MOV     (6)+,%2         ;RETRIEVE TRAP PC
3584  017012  005726                          TST     (6)+            ;DISCARD TRAP STATUS WORD
3585  017014  022702  016762                  CMP     #EIGHT+4,%2
3586  017020  001542                          BEQ     DET3            ;4K
3587  017022  022702  016766                  CMP     #TWELVE+4,%2
3588  017026  001437                          BEQ     STRT8                   ;8K
3589  017030  022702  016772                  CMP     #SXTEEN+4,%2
3590  017034  001431                          BEQ     STRT12          ;12K
3591  017036  022702  016776                  CMP     #TWENTY+4,%2
3592  017042  001423                          BEQ     STRT16          ;16K
3593  017044  022702  017002                  CMP     #TWOFOR+4,%2
3594  017050  001415                          BEQ     STRT20          ;20K
3595  017052  000411                          BR      STRT24          ;24K
3596  017054  005000                  MOVE:   CLR     %0              ;SET UP MAIN CORE CURRENT
3597  017056  012021                          MOV     (0)+,(1)+       ;MOVE WORD
3598  017060  020027  016700                  CMP     %0,#FIN+2       ;MOVE COMPLETE?
3599  017064  001374                          BNE     .-6             ;MOVE ANOTHER WORD
3600  017066  000207                          RTS     %7              ;MOVE COMPLETE
3601  017070  004767  000040          STRT28: JSR     %7,XFER28       ;START 28K TRANSFER
3602  017074  000450                          BR      MOD24           ;START 24K MODIFY
3603  017076  004767  000042          STRT24: JSR     %7,XFER24       ;START 24K TRANSFER
3604  017102  000453                          BR      MOD20           ;START 20K MODIFY
3605  017104  004767  000044          STRT20: JSR     %7,XFER20       ;START 20K TRANSFER
3606  017110  000456                          BR      MOD16           ;START 16K MODIFY
3607  017112  004767  000046          STRT16: JSR     %7,XFER16       ;START 16K TRANSFER
3608  017116  000461                          BR      MOD12           ;START 12K MODIFY
3609  017120  004767  000050          STRT12: JSR     %7,XFER12       ;START 12K TRANSFER
3610  017124  000464                          BR      MOD8            ;START 8K MODIFY
3611  017126  004767  000052          STRT8:  JSR     %7,XFER8        ;START 8K TRANSFER
3612  017132  000467                          BR      MOD4            ;START 4K MODIFY
3613  017134  012701  140000          XFER28: MOV     #140000,%1      ;SET UP MOVE START LOCATION
3614  017140  004767  177710                  JSR     %7,MOVE         ;GO TO MOVE SUBROUTINE
3615  017144  012701  120000          XFER24: MOV     #120000,%1
3616  017150  004767  177700                  JSR     %7,MOVE
3617  017154  012701  100000          XFER20: MOV     #100000,%1
3618  017160  004767  177670                  JSR     %7,MOVE
3619  017164  012701  060000          XFER16: MOV     #60000,%1
3620  017170  004767  177650                  JSR     %7,MOVE
3621  017174  012701  040000          XFER12: MOV     #40000,%1
3622  017200  004767  177650                  JSR     %7,MOVE
3623  017204  012701  020000          XFER8:  MOV     #20000,%1
3624  017210  004767  177640                  JSR     %7,MOVE
3625  017214  000207                          RTS     %7              ;RETURN FROM TRANSFERS
3626  017216  012767  144300  116310  MOD24:  MOV     #BEGIN+140006,TRPA+120002
3627  017224  012767  000240  116072          MOV     #NOP,SKPBEL+120000
3628  017232  012767  124300  076274  MOD20:  MOV     #BEGIN+120006,TRPA+100002
3629  017240  012767  000240  076056          MOV     #NOP,SKPBEL+100000
3630  017246  012767  104300  056260  MOD16:  MOV     #BEGIN+100006,TRPA+60002
3631  017254  012767  000240  056042          MOV     #NOP,SKPBEL+60000
3632  017262  012767  064300  036244  MOD12:  MOV     #BEGIN+60006,TRPA+40002
```

```
 3633  017270  012767  000240  036026          MOV     #NOP,SKPREL+40000
 3634  017276  012767  044300  016230  MOD8:   MOV     #BEGIN+40006,TRPA+20002
 3635  017304  012767  000240  016012          MOV     #NOP,SKPREL+20000
 3636  017312  012767  024300  176214  MOD4:   MOV     #BEGIN+20006,TRPA+2
 3637  017320  012767  000240  175776          MOV     #NOP,SKPREL
 3638  017326  000207                  DET3:   RTS     %7              ;RETURN FROM MODIFY
 3639          000001                          .END
```

```
A       016602          AC      000352          ADSUB   014130          ARIEND  014172
ARITST  014104          ASCNT   016310          ASH     000370          B       016572
BEGANY  015424          BEGIN   004272          BEG20   015416          BELL    015340
BINCT   016306          BR    = 000002          BUFF  = 016676          C       016614
CC    = 177776          CLINCT  002132          CMP1    013430          CMP2    013452
COMPAR  013424          CURPAT  002126          D       016634          DATA1   001436
DATA2   001464          DATA3   001540          DATA4   001634          DECML   016302
DELAY   001640          DET1    016702          DET2    017010          DET3    017326
DET4    016742          DIV     000362          DO    = 000001          EAESRT  014706
EIGHT   016756          ENDEAE  015276          ESTART  000510          EXPRIN  016010
F     = 000000          FEND2   002534          FEND1   002556          FIN     016676
HDFHM   016266          HLT   = 104000          HPCSR   000274          HPDBR   000276
HPOUT   001542          HPOUTR  001560          HPOUT1  001550          HPOUT2  001624
HRCSR   000270          HRDBR   000272          HSRINR  001466          HSRIN1  001524
HSRIN2  001532          ICOUNT  016400          IE    = 000100          INTCNT  001636
IRC     002352          IRF     002450          IRK     002164          IRP     002266
LINKER  015472          LIST    016312          LKCSR   000300          LK1     001642
LK2     001662          LK3     001664          LK4     001702          LLIMIT  002522
LOGICA  015514          LPCSR   000302          LPDBR   000304          LPINTR  002006
LP1     001762          LP2     001770          LP3     002050          LP4     002060
LP5     002116          LP6     002016          LSH     000366          MAINLI  001344
MINUS   016110          MKNUM   016140          MOADD   016222          MOD12   017262
MOD16   017246          MOD20   017232          MOD24   017216          MOD4    017312
MOD8    017276          MOVE    017054          MQ      000350          MUL     000360
N     = 000001          NOEAE   000472          NOP   = 000240          NOR     000364
NUMA    014170          PFAIL   016444          PRFLAG  015536          PRINT   015540
PRINT1  015760          PRTAB   016030          R     = 004000          RB    = 000002
RCBAR   000326          RCCSR   000330          RCCSRH  000332          RCDAR   000322
RCFUNC  002410          RCSTAR  002320          RCWC    000324          RCWORD = 176040
RC2     002326          RD    = 000004          REF   = 013616          REFF    013616
REG1    001362          REND2   002722          REND1   002752          RESTAR  016524
RETURN  016404          RFCAR   000314          RFCSR   000316          RFCSRH  000320
RFDAE   000306          RFDAR   000310          RFFUNC  002520          RFSTAR  002412
RFWC    000312          RFWORD = 176040         RF1     002424          RKBAR   000342
RKCSR   000344          RKCSRH  000346          RKDAE   000336          RKDAH   000334
RKFUNC  002226          RKSTAR  002134          RKWC    000340          RKWORD = 176000
RK1     002140          ROTALL  013506          ROTBE   013656          ROTBO   013766
ROTEN1  014070          RPBAR   000424          RPCA    000410          RPCSR   000426
RPCSRH  000430          RPDAE   000414          RPDAH   000412          RPDAR   000420
RPDSR   000416          RPFUNC  000432          RPSTAR  002230          RPWC    000422
RPWORD = 176000         RP1     002242          RSR   =%000002         R100  =%000000
R101  =%000001          SAVCC   016026          SAVPC   016024          SAVR2   016012
SAVR3   016014          SAVR4   016016          SAVR6   016522          SBELL   015354
SC      000354          SCOPE   104400          SCOPEB  016360          SCOPEC  016324
SCOPEF  016402          SCOPEG  016366          SEVEN   016300          SKPBEL  015324
SOLPAT  002130          SR    = 177570          SRE     000356          STAR    016116
START   000502          START2  000566          STATUS = 177776         STRT12  017120
STRT16  017112          STRT20  017104          STRT24  017076          STRT28  017070
STRT8   017126          ST1     000756          ST2     000770          ST3     001010
ST4     001034          ST5     001052          ST5A    001122          ST6     001200
ST7     001226          ST8     001310          SUBR1   016406          SUBR2   016410
SUBR3   016414          SUBR4   016422          SUBR5   016430          SUBR6   016436
SWABA   014566          SXTEEN  016766          TC    = 177340          TCBA    000404
TCBLK   002530          TCCM    000372          TCDT    000376          TCEXPE  002532
```

TCFIRS	002524	TCF1	002606	TCF1A	002600	TCF2	002634
TCF3	002650	TCF4	002712	TCIV	000406	TCLAST	002526
TCOM	014204	TCOM2	014252	TCOM3	014320	TCRBK	003172
TCRBUF	003256	TCRB1	003230	TCR1	003050	TCR1A	003100
TCR2	003106	TCR3	003122	TCR4	003164	TCSR	016022
TCST	000374	TCWBK	002770	TCWBUF	003256	TCWB1	003022
TCWC	000402	TC1	000434	TC2	002446	TDBR	016023
TDSR =	016022	TEMP	016624	TEST	013620	TIME	001760
TJSR1	013030	TJSR2	013032	TJSR3	013044	TOODLE	016276
TRCSR	000260	TRDR	000262	TRPA	015532	TRPB	015524
TSCOMB	014362	TSROT	013464	TSROT2	013530	TSRT2A	013622
TSTART	014072	TTCSR	000264	TTDBR	000266	TTYINR	001364
TTYIN1	001422	TTYIN2	001430	TTYIN3	001414	TTYIN4	001420
TWELVE	016762	TWENTY	016772	TWOEIG	017002	TWOFOR	016776
TYOUTR	001440	TYOUT1	001454	USER	016700	WAIT1	016066
WAIT2	016244	WAIT3	014432	WAIT4	014502	WAIT5	014454
WD =	000014	WGTCT	016304	WRTOC	016160	XFEND2	002720
XFER12	017174	XFER16	017164	XFER20	017154	XFER24	017144
XFER28	017134	XFER8	017204	XLIST	016236	XX =	000000
YESRT	015526	YESTR	015432	YESTR1	015464	YESTR2	015470
. =	017330						

ERRORS DETECTED: 0

```
*T17QE4,T17QE4/SOL=T1/QE4
RUN-TIME:  15 30  0 SECONDS
CORE USED:  9K
```