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096-000146-06

PROGRAM

ARITHMETIC TEST

TAPE

095-000037-06

ABSTRACT

ARITHMETIC TEST IS A MAINTENANCE PROGRAM DESIGNED TO EXERCISE THE ARITHMETIC AND LOGICAL INSTRUCTIONS OF THE NOVA COMPUTERS. THE PROGRAM ADJUSTS ITS PARAMETERS TO THE SIZE OF MEMORY AND RELOCATES ITSELF TO VARIOUS AREAS OF MEMORY.

0001 .MAIN

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/ NAME: ARITHYST,SR PART NUMBER: 094-000097
/ DESCRIPTION: ARITHMETIC TEST
/ REVISION HISTORY:
/ REV. DATE
/ 00 11/30/70
/ 01 01/25/74
/ 02 06/07/74
/ 03 04/10/75
/ 04 XX/XX/XX
/ 05 XX/XX/XX
/ 06 06/11/76
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/ 1974, 1975, 1976
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/*****

A 0002 .MAIN

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ARITHMETIC TEST

11. ABSTRACT
/ ARITHMETIC TEST IS A MAINTENANCE PROGRAM
/ DESIGNED TO EXERCISE THE ARITHMETIC AND
/ LOGICAL INSTRUCTIONS OF THE NOVA COMPUTERS.
/ THE PROGRAM ADJUST IT'S PARAMETERS TO THE
/ SIZE OF MEMORY AND RELOCATES ITSELF TO VAR-
/ IOUS AREAS OF MEMORY.

12. MACHINE REQUIREMENTS
12.1 NOVA FAMILY PROCESSOR
12.2 2K READ/WRITE MEMORY
12.3 TELETYPE

13. SWITCH SETTINGS
13.1 STARTING ADDRESS #000002
13.2 SWITCH 1(1) #PROCEED FROM ERROR
13.3 SWITCH 2(1) #INHIBIT ERROR PRINTOUT TO TTY
13.4 SWITCH 3(1) #PRINT FAILURE RATE
13.5 SWITCH 5(1) #PRINT TO LPT

14. OPERATING PROCEDURE
14.1 LOAD THE PROGRAM VIA THE BINARY LOADER
14.2 SET THE SWITCHES TO 000002
14.3 PRESS START. CAUTION!
/ SEE SECTION 7.0 FOR RESTART PROCEDURE.
14.4 UPON STARTING, THE PROGRAM WILL PRINT
/ THE MESSAGE "LAST LOCATION IN MEMORY IS XXXXX".
/ THE OPERATOR SHOULD CHECK THE VALUE PRINTED
/ WITH THE SYSTEM MEMORY SIZE. IF THEY DO NOT
/ AGREE, A ERROR HAS OCCURED.
14.5 THE PROGRAM WILL RUN UNTILL MANUALLY STOPPED.
/ AT THE END OF EACH PROGRAM ITERATION THE WORD
/ "PASS" WILL BE PRINTED AND THE PROGRAM WILL
/ RELOCATE ITSELF TO ANOTHER AREA OF MEMORY.

A 0003 .MAIN

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15. PROGRAM OUTPUT/ERROR DESCRIPTION
15.1 WHEN A ERROR IS DETECTED BY THE PROGRAM THE
    FOLLOWING WILL BE PRINTED:
15.1.1 ABS PC THE MEMORY LOCATION OF THE
    ERROR SUBROUTINE CALL.
15.1.2 LIST PC WHERE TO LOOK IN THE LISTING
    TO FIND THE FAILING ROUTINE.
15.1.3 ORIGINAL THE ACCUMULATOR VALUES AS
    ACP,AC1,AC2 DETERMINED VIA THE RANDOM
    NUMBER GENERATOR.
15.1.4 RESULT THE RESULT IN THE ACCUMULATORS
    ACP,AC1,AC2 PRIOR TO THE ERROR CALL
15.2 AFTER THE PRINTOUT THE PROGRAM WILL ITERATE THE
    FAILING ROUTINE WITH THE SAME NUMBERS AS PRINTED.
    CONSOLE SWITCH 3(1) MAY BE USED TO DETERMINE THE
    RATE OF FAILURE. SWITCH 1(1) WILL CAUSE THE
    PROGRAM TO PROCEED TO THE NEXT TEST.
15.3 A IOPLS (A74) IS ISSUED ONE INSTRUCTION PRIOR
    TO THE EXIT FROM THE RANDOM NUMBER GENERATOR
    (RANDOM) FOR A SCOPE SYNC.

16. PROGRAM DESCRIPTION
16.1 THIS PROGRAM CONSIST OF A NUMBER OF SUBROUTINES
    PERFORMING VARIOUS OPERATIONS ON SETS OF PSEUDO
    RANDOM NUMBERS. SOME ROUTINES PERFORM MORE THEN
    ONE OPERATION, SUCH AS TAKING THE SQUARE ROOT OF
    A SQUARED NUMBER. WHEN THE OPERATOR QUESTIONS
    WHICH RESULT IS CORRECT, THE OPERATIONS MAY BE
    PERFORMED WITH PENCIL AND PAPER ON THE ORIGINAL
    NUMBERS.
16.2 AT THE END OF EACH PROGRAM ITERATION THE PROGRAM
    RELOCATES ITSELF TO ANOTHER AREA OF MEMORY FOR
    EXECUTION AT THAT SPOT. THIS RELOCATION PLACES
    DIFFERENT OPERATING CONDITIONS ON THE PROCESSOR
    REGISTERS SUCH AS, THE MEMORY ADDRESS REGISTER
    AND THE PROGRAM COUNTER.
16.3 BECAUSE THIS PROGRAM IS USED AS A FINAL TEST OF
    THE ARITHMETIC AND LOGICAL INSTRUCTIONS IT IS
    COMPLEX AND DIFFICULT TO TROUBLE SHOOT. IT IS
    THEREFOR SUGGESTED THAT THIS PROGRAM BE RUN
    AFTER OTHER PROCESSOR TEST.

17. MISC
    IF THIS PROGRAM IS MANUALLY STOPPED WHEN IN THE
    PROCESS OF RELOCATION, IT CANNOT...BE RESTARTED.

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A 0004 .MAIN

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000000 .LOC 0
000000 002221 DIRTY
000001 000000 0
000002 000120 JMP SIZIT
000003 000120 JMP SIZIT
000004 177770 M81 -10
000005 177760 M201 -20
000006 002164 SHIGH1 LAST
000007 000500 SLOW1 FIRST
000008 .LOC 45
000009 000040 EGGS
000010 000000 EGGS1 0
000011 000000 0
000012 000000 0
000013 000000 0
000014 000000 0
000015 000000 0
000016 000000 0
000017 000000 0
000018 000000 0
000019 000000 CALRET1 0
000020 000000 CAL21 0
000021 000000 RELOC1 0
000022 000000 ERRET1 0
000023 000000 ERTEM1 0
000024 000000 LOOPR1 0
000025 000000 ERCT1 0
000026 000000 CYCRET1 0
000027 000000 ITRCTR1 0
000028 000000 MSIZE1 0
000029 000000 MOVTEM1 0
000030 000000 RANRET1 0
000031 000000 KDATA1 ESWIT-1
000032 000144 ITR1 144
000033 000072 170314 PSIZE1 FIRST-LAST
000034 000073 000400 K4001 400
000035 000074 000377 K3771 377
000036 000075 000240 K2401 240
000037 000076 000000 K001 00
000038 000077 000200 K2001 200
000039 001000 002000 K20001 2000
000040 001001 000000 CALTEM1 0
000041 001002 000500 K5001 500
000042 001003 000007 K71 7
000043 001004 000000 NORES1 0
000044 001005 000000 PASS1 0
000045 001006 054054 CAL1 STA 3,CALRET
000046 001007 050055 STA 2,CAL2
000047 001100 030056 LDA 2,RELOC
000048 001101 030054 LDA 3,CALRET
000049 001102 010054 ISZ CALRET
000050 001103 157000 ADD 2,3
000051 001104 030055 LDA 2,CAL2
000052 001105 054101 STA 3,CALTEM
000053 001106 034054 LDA 3,CALRET
000054 001107 002101 JMP CALTEM
000055 002054 RETURN=JMP CALRET
000056 004106 CALL=JSR CAL

;DTOS DIRT BLK PNTR
;PROGRAM STARTS HERE
;DTOS EGGS BLK PNTR
;DTOS AUTO MODE SW
;DEVICE CODE
;CAT SWITCH
;# OF PASSES THIS RUN
;DTOS RTH ADDR
;SWITCH REGISTER
;WHERE LAST SUBROUTINE CALLED FROM
;C(AC2) AT THAT TIME
;CURRENT RELOCATION
;WHERE ERROR WAS ENTERED.
;ADDRESS OF LAST EXECUTED TEST
;ERROR COUNTER
;ADDRESS WHERE LAST "LOOP" EXECUTED
;ITERATION COUNTER
;MEMORY SIZE
;RETURN FOR RANDOM NUMBER
;ROUTINE ITERATION CONSTANT
;PROGRAM SIZE
;"CALL" SUBROUTINE AT
;ADDRESS...
;THIS ROUTINE WILL FIND
;THE CALLED SUBROUTINE.
;C(AC3) WILL CONTAIN THE
;RETURN, RETURN VIA
;J(JMP CALRET) IS ALSO
;POSSIBLE.
;EXIT TO SUBROUTINE.

```

A 0005 .MAIN

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01
02 00120 030100 SIZIT: LOA 2,K2000 ;FIND THE SIZE OF MEMORY.
03 00121 155001 MOV 2,3,SKP
04 00122 157000 ADD 2,3
05 00123 175132 MOVZLN 3,3,SZC
06 00124 000133 JMP ,+7
07 00125 021400 LDA 0,0,3
08 00126 055400 STA 3,0,3
09 00127 025400 LDA 1,0,3
10 00130 041400 STA 0,0,3
11 00131 130415 SUBW 1,3,SNR
12 00132 000122 JMP SIZIT+2
13 00133 120000 ADC 1,1 ;END OF MEMORY FOUND.
14 00134 107000 ADD 3,1
15 00135 044005 STA 1,MSIZE
16 00136 010104 ISZ NORES ;IF PROGRAM STOPED IN
17 00137 000142 JMP ,+3 ;MIDDLE OF MOVE,CANIT
18 00140 063077 HALT ;BE RESTARTED... RELOAD IT.
19 00141 000140 JMP ,+1
20 00142 024046 LDA 1,EGGS
21 00143 125004 MOV 1,1,SZR
22 00144 000153 JMP ,+7
23 00145 004106 CALL
24 00146 001712 MESS
25 00147 002140 WORLD
26 00150 024005 LDA 1,MSIZE
27 00151 004106 CALL
28 00152 001773 POCTAL ;PRINT HIGHTEST MEMORY LOC.
29 00153 020077 LOA 0,K200
30 00154 034050 LOA 3,EGGS+2
31 00155 175004 MOV 3,3,SZR
32 00156 020100 LOA 0,K2000
33 00157 024005 LDA 1,MSIZE
34 00160 106400 SUB P,1
35 00161 044005 STA 1,MSIZE
36 00162 020073 LOA 0,K400
37 00163 107000 ADD 0,1
38 00164 120400 INC 1,1
39 00165 175004 MOV 3,3,SZR
40 00166 044171 STA 1,ICAT
41 00167 004106 CALL
42 00170 000500 FIRST
43
44 00171 000321 ICAT: MOVE
45
46 00172 054057 ERR: STA 3,ERRET ;ERROR SUBROUTINE.
47 00173 010002 ISZ ERRET ;INCREMENT ERROR COUNTER.
48 00174 034035 LOA 3,ESWIT
49 00175 175004 MOV 3,3,SZR
50 00176 002057 JMP 0ERRET
51 00177 050244 STA 2,SAV2
52 00200 044243 STA 1,SAV1
53 00201 040242 STA 0,SAV0
54
55 00202 004106 ERR1: CALL
56 00203 001712 MESS
57 00204 002074 HEADER
58 00205 034057 LOA 3,ERRET
59 00206 054035 STA 3,ESWIT

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0006 .MAIN

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01 00207 014235 OSZ ESWIT ;THE ABSOLUTE PC SETTING.
02 00210 024050 LOA 1,RELOC
03 00211 130000 ADC 1,3
04 00212 054236 STA 3,LSTPC ;PC FROM THE LISTING.
05 00213 020004 LOA 0,M0
06 00214 040000 STA 0,ERTEM
07 00215 020070 LOA 0,M0DATA
08 00216 040022 STA 0,22

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A 0007 .MAIN
01
02 00017 026022 LDA 1,022 PRINT VALUES.
03 00020 004106 CALL
04 00021 001773 POCTAL
05 00022 010000 ISZ ERYEM
06 00023 000217 JMP -4
07 00024 020242 LDA 0,SAV0
08 00025 024243 LDA 1,SAV1
09 00026 030244 LDA 2,SAV2
10 00027 034040 LDA 3,EGGS
11 00028 175000 MOV 3,3,SNR
12 00029 000057 JMP 0ERRET
13 00030 035404 LDA 3,4,3
14 00031 060077 IORST
15 00032 001400 JMP 0,3
16
17 00033 000000 ESWIT: 0
18 00034 000000 LSTPC: 0
19 00035 000000 OAC0: 0
20 00036 000000 OAC1: 0
21 00037 000000 OAC2: 0
22 00038 000000 SAV0: 0
23 00039 000000 SAV1: 0
24 00040 000000 SAV2: 0
25
26 00041 054001 ENTER: STA 3,LOOPR
27 00042 034071 LDA 3,ITR
28 00043 054004 STA 3,ITRCTR
29 00044 176000 SUB 3,3
30 00045 054235 STA 3,ESWIT
31 00046 054062 STA 3,ERRCT
32 00047 000001 JMP 0LOOPR
33
34 00048 054003 CYCLE: STA 3,CYCRET
35 00049 034235 LDA 3,ESWIT
36 00050 175004 MOV 3,3,SNR
37 00051 000263 JMP CYC1
38 00052 014004 DSZ ITRCTR
39 00053 000001 JMP 0LOOPR
40 00054 000003 JMP 0CYCRET
41
42 00055 050244 CYC1: STA 2,SAV2
43 00056 044243 STA 1,SAV1
44 00057 040242 STA 0,SAV0
45 00058 014004 DSZ ITRCTR
46 00059 000314 JMP CYC4
47 00060 030071 LDA 2,ITR
48 00061 050064 STA 2,ITRCTR
49 00062 070477 READS 2
50 00063 153120 ADDZL 2,2
51 00064 153113 ADDLW 2,2,SNR
52 00065 000307 JMP CYC3

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A 0008 .MAIN
01
02 00076 004100 CYC2: CALL PRINT THE FAILURE RATE
03 00077 001712 MESS
04 00078 002134 CRLF
05 00079 024002 LDA 1,ERRCT
06 00080 004100 CALL PRINT ERROR COUNTER.
07 00081 001745 POECI
08 00082 004100 CALL
09 00083 001712 MESS
10 00084 002136 PCENT MESSAGE "X"
11
12 00085 102400 CYC3: SUB 0,0 RESET ERROR COUNTER
13 00086 040002 STA 0,ERRCT
14 00087 020242 LDA 0,SAV0 RESTORE ACS.
15 00088 024243 LDA 1,SAV1
16 00089 030244 LDA 2,SAV2
17
18 00090 074477 CYC4: READS 3 IF SWITCH 1(1)
19 00091 177113 ADDLW 3,3,SNR PROCEED, OTHERWISE
20 00092 000001 JMP 0LOOPR ITERATE THIS TEST.
21 00093 000003 JMP 0CYCRET
22
23 00094 000171 JSR 0ICAT
24 00095 004370 MOVE: RANDOM RELOCATE THIS PROGRAM.
25 00096 111220 MOVZ 0,2 JAC0 = RANDOM LOCATION.
26 00097 024000 LDA 1,MSIZE J(MSIZE)=TOP OF USEABLE MEMORY.
27 00098 132423 SUBZ 1,2,SNR
28 00099 133001 ADD 1,2,SNR J(AC2) WILL BE WITHIN THE RANGE
29 00100 000324 JMP -2 JOF 0 TO TOP OF MEMORY.
30
31 00101 155000 MOVE1: MOV 2,3 J(AC2-ACS)=TRIAL TOP AND
32 00102 024072 LDA 1,PSIZE JBOTTEM OF PROGRAM DESTINATION.
33 00103 044000 STA 1,MOVTEM J(MOVTEM)=NUMBER OF WORDS
34 00104 137000 ADD 1,3 JIN THE PROGRAM.
35 00105 020102 LDA 0,K500 JIF DESTINATION BOTTEM IS
36 00106 116512 SUBLW 0,3,SNR J<500, GET ANOTHER NUMBER.
37 00107 000321 JMP MOVE
38 00108 102000 ADC 0,0 JAC2=DESTINATION TOP
39 00109 040104 STA 0,NORE8 JAC3= DESTINATION BOTTEM.
40
41 00110 020000 MOVE2: LDA 0,SHIGH JAC0-1 = LOCATION OF THE
42 00111 024007 LDA 1,SLOW PROGRAM NOW...
43 00112 050000 STA 2,SHIGH JUPDATA FOR NEW DESTINATION.
44 00113 054007 STA 3,SLOW
45 00114 142433 SURZ 2,0,SNR
46 00115 000357 JMP MOVE4

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A 0000 .MAIN
01
02 00346 044020 MOVE3: STA 1,20      ;DESTINATION ADDRESS < SOURCE
03 00347 014020      DSZ 20      ;ADDRESS.
04 00350 054021      STA 3,21      ;C(20)=BOTTEM OF SOURCE.
05 00351 014021      LSZ 21      ;C(21)=BOTTEM OF DESTINATION.
06 00352 022020      LDA 0,020    ;MOVE THE PROGRAM FROM
07 00353 042021      STA 0,021    ;BOTTEM TO TOP.
08 00354 010060      ISZ MOVTEM
09 00355 000352      JMP .-3
10 00356 000357      JMP MOVE5
11
12 00357 040030 MOVE4: STA 0,30      ;DESTINATION ADDRESS > SOURCE
13 00360 010030      ISZ 30      ;ADDRESS.
14 00361 050031      STA 2,31      ;C(30)=TOP OF SOURCE.
15 00362 010031      ISZ 31
16 00363 022030      LDA 0,030    ;C(31)=TOP OF DESTINATION.
17 00364 042031      STA 0,031    ;MOVE FROM TOP TO BOTTEM.
18 00365 010060      ISZ MOVTEM
19 00366 000363      JMP .-3
20
21 00367 136400 MOVE5: SUB 1,3
22 00370 030000      LDA 2,RELOC
23 00371 173000      ADD 3,2
24 00372 050056      STA 2,RFLOC
25 00373 050100      STA 2,NORES
26 00374 004100      CALL
27 00375 000501      FIRST+1
28
29 00376 054067 RAND: STA 3,RANRET ;THE RANDOM NUMBER.
30 00377 034235      LDA 3,ESWIT
31 00400 175024      MOVZ 3,3,SZR
32 00401 000414      JMP RAND1
33 00402 004417      JSR .RAND
34 00403 000240      OAC1
35 00404 040237      STA 0,OAC0
36 00405 004414      JSR .RAND
37 00406 000237      OAC0
38 00407 024240      LDA 1,OAC1
39 00410 130700      NESS 1,2
40 00411 112000      ADC 0,2
41 00412 050241      STA 2,OAC2
42 00413 060300      NIOP 0
43 00414 000206      JMP 0RANRET
44
45 00415 020237 RAND1: LDA 0,OAC0
46 00416 024240      LDA 1,OAC1
47 00417 030241      LDA 2,OAC2
48 00420 000773      JMP RAND1-2
49
50 004172 ERROR=JSR ERR
51 004245 SETUP=JSR ENTER
52 004254 LOOP=JSR CYCLE
53 004376 RANDOM=JSR RAND
54 000300 SYNC=NIOP 0

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A 0010 .MAIN
01
02      ; RANDOM NUMRER GENERATOR
03      ; GENERATES A (PSEUDO) RANDOM SEQUENCE OF INTEGERS
04      ; IN THE RANGE 0<= N <= 2**16-1
05
06      ; INPUT:      ADDRESS OF OLD VALUE POINTED TO BY WORD
07      ;              AFTER JSR
08
09      ; OUTPUT:     16-BIT NEW RANDOM NUMBER IN ACR
10      ;              AND IN STORAGE REPLACING OLD VALUE
11
12      ; CALLING SEQUENCE:
13      ;      JSR .RAND
14      ;      ADDRESS OF OLD VALUE
15      ;      RETURN
16
17      ; METHOD:      GENERATES A LINEAR CONGRUENTIAL
18      ;              SEQUENCE OF THE FORM:
19      ;              X(N+1) = (X(N)+A+C)MOD 2**16
20
21      ; CAUTION:    IF A K-BIT RANDOM NUMBER (AS OPPOSED
22      ;              TO A 16- BIT NUMBER) IS NEEDED,
23      ;              USE THE MOST SIGNIFIGANT
24      ;              K-BITS (THE LEAST SIGNIFIGANT K-BITS
25      ;              ARE NOT AS RANDOM).
26      ;              FOR EXAMPLE, TO OBTAIN RANDOM N MOD 2,
27      ;              USE THE SIGN BIT OF THE RESULT
28
29      ; UNCHANGED:  AC1, AC2
30      ; DESTROYED:  ACR, AC3, CARRY
31
32
33
34 00421 054432 .RAND: STA 3,.H003      ; SAVE RETURN
35 00422 010431      ISZ .UD03      ; BUMP PAST ADDRESS CONSTANT
36 00423 044420      STA 1,.UD01      ; +SAVE AC1
37 00424 050420      STA 2,.UD02      ; +SAVE AC2
38 00425 031400      LDA 2,0,3      ; GET ADDRESS OF OLD VALUE
39 00426 021000      LDA 0,0,2      ; OLD VALUE TO ACR
40 00427 004407      JSR .UD50      ; N=A
41 00430 034425      LDA 3,.UD20      ; GET INCREMENT, C
42 00431 163000      ADD 3,0      ; (N+A+C) MOD 2**16
43 00432 041000      STA 0,0,2      ; STORE IT
44 00433 024410      LDA 1,.UD01      ; +RESTORE AC1
45 00434 030416      LDA 2,.UD02      ; +RESTORE AC2
46 00435 002416      JMP 0,UD03      ; RETURN

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A 0011 .MAIN
01
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05      I COMPUTE N*(2**11+2**2+1)
06
07 00436 024420 .UD5H: LDA 1,.UD21      I GET COUNT, X
08 00437 044415      STA 1,.UD10      I FOR ITERATION
09 00440 105120      MOVZL 0,1      I N=2***(X+1)
10 00441 125120      MOVZL 1,1
11 00442 014412      DSZ .UD10
12 00443 000776      JMP .-2
13 00444 107000      ADD 0,1
14 00445 125120      MOVZL 1,1
15 00446 125120      MOVZL 1,1      I 2**2*(N+2***(X+1)+N)
16 00447 123000      ADD 1,P
17 00450 001400      JMP 0,3      I N+N+2**2+N+2***(X+3)
18
19
20
21
22 00451 000000 .UD01: 0      I *SAVE AC1
23 00452 000000 .UD02: 0      I *SAVE AC2
24 00453 000000 .UD03: 0      I SAVE RETURN
25
26 00454 000000 .UD10: 0      I ITERATION COUNT
27
28 00455 033031 .UD20: 33031      I INCREMENT
29 00456 000010 .UD21: 10      I ITERATION COUNT, X
30

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A 0012 .MAIN
01
02
03      M60500 .LOC 500
04 00500 101000 FIRST: MOV 0,P
05
06 00501 004245 MS1:  SETUP      I MISC TEST OF NEG/COM
07 00502 004370      RANDOM
08 00503 104700      NEG0 0,1
09 00504 130340      COM05 1,2,SZR
10 00505 142014      ADC00 2,0,SZR
11 00506 004172      ERROR
12 00507 004254      LOOP
13
14 00510 004245 MS2:  SETUP      I MISC TEST OF INC SWAPPED.
15 00511 004370      RANDOM
16 00512 111700      INCS 0,2
17 00513 140320      MOVZS 2,1,SNC
18 00514 100314      ADC00 0,1,SZR
19 00515 004172      ERROR
20 00516 004254      LOOP
21
22 00517 004245 MS3:  SETUP      I MISC NEG TEST
23 00520 102400      SUB 0,0
24 00521 100644      NEG00 0,0,SZR
25 00522 004172      ERROR
26 00523 100664      NEG00 0,0,SZR
27 00524 004172      ERROR
28 00525 100664      NEG00 0,0,SZR
29 00526 004172      ERROR
30 00527 004254      LOOP
31
32
33 00530 004245 ROT1:  SETUP      I TEST ROTATE LEFT
34 00531 004370      RANDOM
35 00532 105000      MOV 0,1
36 00533 101100      MOVL 0,0
37 00534 111100      MOVL 0,2
38 00535 151100      MOVL 2,2
39 00536 151100      MOVL 2,2
40 00537 155100      MOVL 2,3
41 00540 175100      MOVL 3,3
42 00541 175100      MOVL 3,3
43 00542 161100      MOVL 3,0
44 00543 101100      MOVL 0,0
45 00544 101100      MOVL 0,0
46 00545 101100      MOVL 0,0
47 00546 101100      MOVL 0,0
48 00547 101100      MOVL 0,0
49 00550 101100      MOVL 0,0
50 00551 101100      MOVL 0,0
51 00552 101100      MOVL 0,0
52 00553 101100      MOVL 0,0
53 00554 100414      SUB0 0,1,SZR
54 00555 004172      ERROR
55 00556 004254      LOOP

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A 0013 .MAIN

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01
02
03 00557 004245 ROT2: SETUP      ITEST ROTATE RIGHT
04 00560 004376      RANDOM
05 00561 131000      MOV 1,2
06 00562 121200      MOVR 1,0
07 00563 101200      MOVR 0,0
08 00564 101200      MOVR 0,0
09 00565 101200      MOVR 0,0
10 00566 101200      MOVR 0,0
11 00567 101200      MOVR 0,0
12 00570 101200      MOVR 0,0
13 00571 101200      MOVR 0,0
14 00572 101200      MOVR 0,0
15 00573 101200      MOVR 0,0
16 00574 105200      MOVK 0,1
17 00575 125200      MOVR 1,1
18 00576 135200      MOVR 1,3
19 00577 175200      MOVR 3,3
20 00600 175200      MOVR 3,3
21 00601 161200      MOVR 3,0
22 00602 101200      MOVR 0,0
23 00603 112414      SUB# 0,2,SZR
24 00604 004172      ERROR
25 00605 004254      LOOP
26
27 00606 004245 AND0:  SETUP      IANY NUMBER ANDED WITH
28 00607 004376      RANDOM      ITSELF SHOULD NOT
29 00610 131000      MOV 1,2      BE CHANGED.
30 00611 127700      ANDS 1,1
31 00612 127700      ANDS 1,1
32 00613 127700      ANDS 1,1
33 00614 127700      ANDS 1,1
34 00615 127700      ANDS 1,1
35 00616 135300      MOVS 1,3
36 00617 177700      ANDS 3,3
37 00620 177700      ANDS 3,3
38 00621 161300      MOVS 3,0
39 00622 103700      ANDS 0,0
40 00623 112414      SUB# 0,2,SZR
41 00624 004172      ERROR
42 00625 004254      LOOP
43
44 00626 004245 AND1:  SETUP      I A NUMBER ANDED WITH ITS
45 00627 004376      RANDOM      COMPLIMENT SHOULD
46 00630 104042      COM0 0,1,SZC
47 00631 123704      ANDS 1,0,SZR
48 00632 004172      ERROR
49 00633 004254      LOOP
50

```

A 0014 .MAIN

```

01
02 00634 004245 AND3:  SETUP      IPERFORM A AND INSTRUCTION
03 00635 004376      RANDOM      WITH THE RESULT IN AC2.
04 00636 176620      SUBZR 3,3    ISIMULATE THE AND VIA
05 00637 131000      MOV 1,2      ILOOKING FOR ADDER CARRY.
06 00640 113400      AND 0,2
07 00641 101113      MOVL# 0,0,SNC
08 00642 000403      JMP .+3
09 00643 125112      MOVL# 1,1,SZC
10 00644 101141      MOVL 0,0,SKP
11 00645 101121      MOVZL 0,0,SKP
12 00646 125141      MOVL 1,1,SKP
13 00647 125120      MOVZL 1,1
14 00650 175224      MOVR 3,3,SZR
15 00651 000770      JMP AND3+5
16 00652 106415      SUB# 0,1,SNR      ICHECK IF AC0=1 ARE
17 00653 132414      SUB# 1,2,SZR    ITHE SAME AND IF THEY
18 00654 004172      ERROR      IARGE WITH INST.
19 00655 004254      LOOP
20
21      ITEST PROCESSOR VIA EXCLUSIVE OR ROUTINES.
22
23 00656 004245 X1:    SETUP      IC(AC1) IS SAVED IN C(AC2).
24 00657 004376      RANDOM      IAC0 IS EXCLUSIVE CRED
25 00660 131000      MOV 1,2      WITH AC1 TWICE, THE SECOND
26 00661 004106      CALL      IEXCLUSIVE OR SHOULD
27 00662 001640      XOR      IRESTORE AC1 TO ITS
28 00663 004106      CALL      IORIGINAL CONTENTS.
29 00664 001640      XOR
30 00665 132414      SUB# 1,2,SZR
31 00666 004172      ERROR
32 00667 004254      LOOP
33
34 00670 004245 X2:    SETUP      ITHE FIRST EXCLUSIVE OR
35 00671 004376      RANDOM      ROUTINE EXCHANGES THE
36 00672 004106      CALL      ICONTENTS
37 00673 001654      XOR2      IOF AC0 AND AC1, IT ALSO
38 00674 004106      CALL      IFORMS THE EXCLUSIVE OR
39 00675 001645      XOR1      IIN AC2, THE SECOND EXCLUSIVE
40 00676 112414      SUB# 0,2,SZR    IOR FORMS THE RESULT
41 00677 004172      ERROR      IOF AC0-AC1 IN AC0.
42 00678 004254      LOOP

```

A 0015 .MAIN

```

01
02 00701 004245 X3: SETUP      ;SAVE C(AC1) NEGATED IN
03 00702 004376 RANDOM      IC(AC2). EXCLUSIVE OR C(AC0) TO
04 00703 130400 NEG 1,2      IC(AC1). EXCLUSIVE OR THE
05 00704 004100 CALL      ;RESULT BACK TO AC0.
06 00705 001640 XOR        ;CHECK VIA ADDITION TO
07 00706 004100 CALL      ;COMPLIMENT OF ORIGINAL
08 00707 001645 XOR1       ;NUMBER.
09 00710 113014 ADD# 0,2,SZR
10 00711 004172 ERROR
11 00712 004254 LOOP

12
13 00713 004245 X4: SETUP      ;EXCLUSIVE OR C(AC0) TO
14 00714 004376 RANDOM      ;ALL ZEROS IN C(AC1).
15 00715 120400 SUB 1,1
16 00716 004100 CALL
17 00717 001640 XOR
18 00720 100414 SUB# 0,1,SZR
19 00721 004172 ERROR
20 00722 004254 LOOP

21
22 00723 004245 X5: SETUP      ;EXCLUSIVE OR C(AC1) TO
23 00724 004376 RANDOM      ;ALL ZEROS IN C(AC0).
24 00725 102400 SUB 0,0
25 00726 004100 CALL
26 00727 001645 XOR1
27 00730 100414 SUB# 0,1,SZR
28 00731 004172 ERROR
29 00732 004254 LOOP

30
31 00733 004245 X6: SETUP      ;EXCLUSIVE OR C(AC1) TO
32 00734 004376 RANDOM      ;(-1) IN C(AC0).
33 00735 102000 ADC 0,0      ;THE COMPLIMENT OF
34 00736 004100 CALL      ;THIS RESULT SHOULD
35 00737 001645 XOR1       ;EQUAL C(AC1).
36 00740 110000 COM 0,2
37 00741 100414 SUB# 2,1,SZR
38 00742 004172 ERROR
39 00743 004254 LOOP

```

A 0016 .MAIN

```

01
02 00744 004245 X7: SETUP      ;C(AC1) IS SET EQUAL TO
03 00745 004376 RANDOM      ;C(AC0), C(AC0) AND C(AC1)
04 00746 105000 MOV 0,1      ;ARE EXCLUSIVE ORED WITH
05 00747 004100 CALL      ;THE RESULT GOING TO AC2.
06 00750 001654 XOR2
07 00751 151004 MOV 2,2,SZR
08 00752 004172 ERROR
09 00753 004254 LOOP

10
11 00754 004245 X8: SETUP      ;C(AC0) IS SET TO THE
12 00755 004376 RANDOM      ;COMPLIMENT OF C(AC1). THE
13 00756 120000 COM 1,0      ;RESULT OF A EXCLUSIVE OR
14 00757 004100 CALL      ;SHOULD BE ALL BITS
15 00760 001654 XOR2       ;SET (-1).
16 00761 150014 COM# 2,2,SZR
17 00762 004172 ERROR
18 00763 004254 LOOP

19
20 00764 004245 X9: SETUP      ;EXCLUSIVE OR ALL ONES
21 00765 102300 ADCS 0,0      ;TO ALL ONES. THE
22 00766 120000 ADC 1,1      ;RESULT SHOULD BE
23 00767 004100 CALL      ;ALL ZEROS.
24 00770 001640 XOR
25 00771 127704 ANDS 1,1,SZR
26 00772 004172 ERROR
27 00773 004254 LOOP

28
29 00774 004245 X10: SETUP      ;EXCLUSIVE OR ALL ZEROS
30 00775 102700 SUBS 0,0      ;TO ALL ZEROS. THE
31 00776 120400 SUB 1,1      ;RESULT SHOULD BE
32 00777 004100 CALL      ;ALL ZEROS IN C(AC1).
33 01000 001640 XOR
34 01001 107314 ADDS# 0,1,SZR
35 01002 004172 ERROR
36 01003 004254 LOOP

```

A 0017 .MAIN

```

01
02 01004 004245 X111 SETUP
03 01005 004376 RANDOM
04 01006 004106 CALL
05 01007 001054 XOR2
06 01010 004106 CALL
07 01011 001040 XOR
08 01012 004106 CALL
09 01013 001040 XOR
10 01014 004106 CALL
11 01015 001040 XOR
12 01016 004106 CALL
13 01017 001040 XOR
14 01020 004106 CALL
15 01021 001040 XOR
16 01022 004106 CALL
17 01023 001040 XOR
18 01024 004106 CALL
19 01025 001040 XOR
20 01026 132414 SUB# 1,2,SZR
21 01027 004172 ERROR
22 01030 004254 LOOP
23
24 01031 004245 A11 SETUP
25 01032 004376 RANDOM
26 01033 145000 MOV 2,1
27 01034 112400 SUB 0,2
28 01035 113000 ADD 0,2
29 01036 146414 SUB# 2,1,SZR
30 01037 004172 ERROR
31 01040 004254 LOOP
32
33 01041 004245 A21 SETUP
34 01042 004376 RANDOM
35 01043 122000 ADC 0,0
36 01044 123000 ADD 1,0
37 01045 111400 INC 0,2
38 01046 146414 SUB# 2,1,SZR
39 01047 004172 ERROR
40 01050 004254 LOOP

```

IFORM EXCLUSIVE OF FUNCTION
 IIN C(AC2).
 ICALL ANOTHER EXCLUSIVE
 IOR FUNCTION SEVEN TIMES.
 ITHE RESULT SHOULD BE THE
 ISAME AS THE FIRST XOR

ISAVE C(AC2) IN C(AC1).
 IADD AND ADD C(AC0) TO
 IC(AC2). THE VALUE IN
 IAC2 SHOULD NOT BE
 ICHANGED.

A 0018 .MAIN

```

01
02 01051 004245 A31 SETUP
03 01052 004376 RANDOM
04 01053 131400 INCC 1,2
05 01054 102300 ADCCS 0,0
06 01055 143000 ADCC 2,0
07 01056 106414 SUB# 0,1,SZR
08 01057 004172 ERROR
09 01060 004254 LOOP
10
11 01061 004245 A41 SETUP
12 01062 004376 RANDOM
13 01063 121020 MOVZ 1,0
14 01064 127200 ADDR 1,1
15 01065 127200 ADDR 1,1
16 01066 127200 ADDR 1,1
17 01067 127200 ADDR 1,1
18 01070 127200 ADDR 1,1
19 01071 127200 ADDR 1,1
20 01072 127200 ADDR 1,1
21 01073 127200 ADDR 1,1
22 01074 127200 ADDR 1,1
23 01075 127200 ADDR 1,1
24 01076 127200 ADDR 1,1
25 01077 127200 ADDR 1,1
26 01100 127200 ADDR 1,1
27 01101 127200 ADDR 1,1
28 01102 106454 SUB# 0,1,SZR
29 01103 004172 ERROR
30 01104 004254 LOOP
31
32 01105 004245 A51 SETUP
33 01106 004376 RANDOM
34 01107 115400 INC 0,3
35 01110 120000 ADC 1,1
36 01111 137000 ADD 1,3
37 01112 175400 INC 3,3
38 01113 137000 ADD 1,3
39 01114 171400 INC 3,2
40 01115 133000 ADD 1,2
41 01116 151400 INC 2,2
42 01117 133000 ADD 1,2
43 01120 142414 SUB# 2,0,SZR
44 01121 004172 ERROR
45 01122 004254 LOOP

```

INCREMENT THE VALUE IN
 IAC1 AND ADD THAT VALUE
 ITO (-1). THE RESULT
 ISHOULD BE THE ORIGINAL
 INUMBER.

ISAVE THE C(AC1) IN C(AC0).
 IA "ADDR" INSTRUCTION SHOULD
 INOT CHANGE THE VALUE OF
 ITHE AC.

ITHE RANDOM NUMBER IN
 IC(AC0) IS INCREMENTED VIA "INC"
 IAND DECREMENTED VIA "ADD".
 ITHE FINAL RESULT IN C(AC2)
 ISHOULD BE EQUAL TO THE
 IORIGINAL NUMBER IN C(AC0).

```

A 0019 .MAIN
01
02 01123 004245 A61 SETUP ;THE SUM OF AC0-1 IS
03 01124 004376 RANDOM ;CHECKED WITH THE SIMULATED
04 01125 135000 MOV 1,3 ;SUM.
05 01126 117000 ADD 0,3
06 01127 054421 STA 3,ADDEM ;SUM VIA ADD INSTRUCTION.
07 01130 131000 MOV 1,2
08 01131 004106 CALL
09 01132 001640 XOR ;SIMULATE THE ADD VIA
10 01133 143524 ANDZL 2,0,SZR ;EXCLUSIVE OR, C(AC2)=
11 01134 000774 JMP ,=4 ;RIPPLE CARRY,C(AC1)=RESULT.
12 01135 020413 LDA 0,ADDEM
13 01136 122414 SUB# 1,0,SZR
14 01137 004172 ERROR
15 01140 004254 LOOP
16
17 01141 004245 A71 SETUP ;ADDITION OF NEGATED
18 01142 004376 RANDOM ;NUMBERS SHOULD PRODUCE
19 01143 110440 NEG0 0,2 ;ZERO AND A CARRY.
20 01144 143204 ADDR 2,0,SZR
21 01145 004172 ERROR
22 01146 004254 LOOP
23
24 01147 101001 MOV 0,P,SKP
25 01150 177777 ADDEM: -1
26
27 01151 004245 A81 SETUP ;ADD TEST.
28 01152 004376 RANDOM
29 01153 152520 SUBIL 2,2 ;=(+1)
30 01154 151300 MOV3 2,2 ;=(400)
31 01155 150400 NEG 2,2 ;=(177400)
32 01156 143700 AND3 2,0 ;SAVE HIGH ORDER 8 BITS.
33 01157 105320 MOV33 0,1 ;SAME 8 BITS TO C(AC1)L.
34 01160 103100 ADDL 0,0 ;MOVE C(AC0) LEFT VIA
35 01161 103100 ADDL 0,0 ;ADD SHIFT.
36 01162 103100 ADDL 0,0
37 01163 103100 ADDL 0,0
38 01164 106414 SUB# 0,1,SZR
39 01165 004172 ERROR
40 01166 004254 LOOP
41

```

```

A 0020 .MAIN
01
02
03 01167 101001 MOV 0,0,SKP
04 01170 177400 M400: -400
05 01171 004245 AR11 SETUP ;THE ORIGINAL CONTENTS OF
06 01172 004376 RANDOM ;AC1, BITS 0-7 ARE SQUARED
07 01173 030775 LDA 2,M400 ;VIA MULTIPLY, THE SQUARE
08 01174 133700 AND3 1,2 ;ROOT OF THE PRODUCT SHOULD
09 01175 145000 MOV 2,1 ;EQUAL THE ORIGINAL.
10 01176 004106 CALL
11 01177 001611 ,MPYU ;SEE SYSTEM REFERENCE
12 01200 121000 MOV 1,0 ;MANUAL FOR FURTHER INFORMATION
13 01201 004106 CALL ;ON MULTIPLY/SQ ROOT
14 01202 001607 SQRT ;PROGRAMS.
15 01203 112414 SUB# 0,2,SZR
16 01204 004172 ERROR
17 01205 004254 LOOP
18
19 01206 004245 AR21 SETUP ;TAKE THE SQUARE ROOT
20 01207 004376 RANDOM ;OF A NUMBER. THE SQUARE
21 01210 004106 CALL ;ROOT OF THE RESULT SQUARED
22 01211 001607 SQRT ;SHOULD BE THE SAME AS THE
23 01212 105000 MOV0 0,1 ;ORIGINAL ROOT.
24 01213 131000 MOVC 1,2
25 01214 004106 CALL
26 01215 001611 ,MPYU
27 01216 121000 MOV 1,0
28 01217 004106 CALL ;SQUARED NOW TAKE ROOT.
29 01220 001676 SQ
30 01221 112714 SUB# 0,2,SZR
31 01222 004172 ERROR
32 01223 004254 LOOP
33
34 01224 004245 AR31 SETUP ;FIND SQUARE ROOT VIA
35 01225 004376 RANDOM ;DIFFERENT SUBROUTINES.
36 01226 141000 MOV 2,0
37 01227 004106 CALL
38 01230 001607 SQRT
39 01231 105000 MOV 0,1 ;SAVE FIRST RESULT IN AC1
40 01232 141000 MOV 2,0
41 01233 004106 CALL
42 01234 001676 SQ ;RESULT IN AC0.
43 01235 106714 SUB# 0,1,SZR
44 01236 004172 ERROR
45 01237 004254 LOOP

```

A 0021 ,MAIN

```
01
02 01240 004245 AR41 SETUP      ;THE CONTENTS OF AC2 IS
03 01241 004376 RANDOM      ;DIVIDED INTO AC0-1,
04 01242 142432 SUBZM 2,0,SZC ;THIS RESULT MULTIPLIED
05 01243 004776 JMP ,=2      ;BY AC2 SHOULD PRODUCE
06 01244 004106 CALL        ;THE ORIGINAL NUMBERS,
07 01245 001626 ,DIVU
08 01246 004106 CALL
09 01247 001612 ,MPYA
10 01250 034241 LDA 3,OAC2
11 01251 150414 SUBM 2,3,SZR
12 01252 004172 ERROR      ;AC2 CHANGED?
13 01253 034240 LDA 3,OAC1
14 01254 130714 SUBSM 1,3,SZR
15 01255 004172 ERROR      ;AC1 CHANGED,
16 01256 034237 LDA 3,OAC0
17 01257 110714 SUBSM 0,3,SZR
18 01260 004172 ERROR      ;AC0 CHANGED,
19 01261 004254 LOOP
20
21 01262 004245 AR51 SETUP      ;USE INC TO FORM
22 01263 152440 SUBO 2,2      ;THE NUMBER 177400
23 01264 151504 INCL 2,2,SZR ;IN AC1 AND 400 IN AC2,
24 01265 151504 INCL 2,2,SZR
25 01266 151504 INCL 2,2,SZR
26 01267 151504 INCL 2,2,SZR
27 01270 151507 INCL 2,2,SNB ;THE "SNB/SZR" SHOULD
28 01271 151507 INCL 2,2,SNB ;NOT CAUSE A SKIP,
29 01272 151507 INCL 2,2,SNB
30 01273 145707 INCS 2,1,SNB
31 01274 151407 INC 2,2,SNB
32 01275 151400 INC 2,2
33 01276 133014 ADDM 1,2,SZR
34 01277 004172 ERROR
35 01300 004254 LOOP
36
37 01301 004245 AR61 SETUP      ;USE THE INCR INSTRUCTION
38 01302 120420 SUBZ 1,1      ;TO FORM THE NUMBER
39 01303 125000 INCR 1,1,SEZ ;177400, THIS NUMBER
40 01304 125000 INCR 1,1,SEZ ;COMPLIMENTED AND SWAPPED
41 01305 125000 INCR 1,1,SEZ ;SHOULD BE THE SAME
42 01306 125000 INCR 1,1,SEZ ;NUMBER,
43 01307 125000 INCR 1,1,SEZ ;THE "SEZ" SHOULD NEVER
44 01310 125000 INCR 1,1,SEZ ;CAUSE A SKIP,
45 01311 125000 INCR 1,1,SEZ
46 01312 125000 INCR 1,1,SEZ
47 01313 130304 COMS 1,2,SZR
48 01314 132714 SUBSM 1,2,SZR
49 01315 004172 ERROR
50 01316 004254 LOOP
```

A 0022 ,MAIN

```
01
02 01317 004245 AR71 SETUP      ;100000 NEGATED IS
03 01320 102025 SUBZR 0,0,SNR ;STILL 100000,
04 01321 004172 ERROR
05 01322 104400 NEG 0,1,SEZ ;C(CARRY)=0
06 01323 004172 ERROR
07 01324 124402 NEG 1,1,SZC
08 01325 004172 ERROR
09 01326 124403 NEGCL 1,1,SNR ;C(CARRY)=1
10 01327 004172 ERROR
11 01330 124407 NEG 1,1,SNB
12 01331 004172 ERROR
13 01332 124405 NEGCL 1,1,SNR ;C(1)=100000
14 01333 004172 ERROR
15 01334 124405 NEGCL 1,1,SNR
16 01335 004172 ERROR
17 01336 124407 NEG 1,1,SNB
18 01337 004172 ERROR
19 01340 124407 NEG 1,1,SNB
20 01341 004172 ERROR
21 01342 100414 SUBM 0,1,SZR
22 01343 004172 ERROR
23 01344 004254 LOOP
24
25 01345 004245 AR81 SETUP      ;NEGATION OF ZERO
26 01346 102440 SUBO 0,0      ;SHOULD PRODUCE ZERO
27 01347 100702 NEGCS 0,0,SZC ;AND A CARRY,
28 01350 004172 ERROR
29 01351 100702 NEGCS 0,0,SZC
30 01352 004172 ERROR
31 01353 100700 NEGCS 0,0,SEZ
32 01354 004172 ERROR
33 01355 100700 NEGCS 0,0,SEZ
34 01356 004172 ERROR
35 01357 100544 NEGOL 0,0,SZR
36 01360 004172 ERROR
37 01361 100403 NEG 0,0,SNR
38 01362 004172 ERROR
39 01363 100544 NEGOL 0,0,SZR
40 01364 004172 ERROR
41 01365 104704 NEGS 0,1,SZR
42 01366 004172 ERROR
43 01367 130704 NEGS 1,2,SZR
44 01370 004172 ERROR
45 01371 004254 LOOP
```

```

A 0023 .MAIN
01
02 01372 004245 AR01  SETUP      JC(AC1)*R+C(ACR) SHOULD
03 01373 004376          RANDOM    IPLACE ACR IN AC1, SEE
04 01374 152400          SUB 2,2    ISYSTEM REFFERENCE MANUAL
05 01375 004106          CALL      IFOR FURTHER INFORMATION.
06 01376 001012          .MPYA
07 01377 034237          LDA 3,0ACR
08 01400 166414          SUB# 3,1,SZR
09 01401 004172          ERROR
10 01402 004254          LOOP
11
12 01403 004245 AR101  SETUP      ITEST "COM/INC" SWAPPED.
13 01404 102300          ADCS 0,0
14 01405 105705          INCS 0,1,SNR
15 01406 130304          COMS 1,2,SZR
16 01407 145705          INCS 2,1,SNR
17 01410 124346          COMOS 1,1,SEZ
18 01411 131707          INCS 1,2,SNR
19 01412 150304          COMS 2,2,SZR
20 01413 151704          INCS 2,2,SZR
21 01414 004172          ERROR
22 01415 004254          LOOP
23
24 01416 004245 AR111  SETUP      ICOMPLIMENT AND INCREMENT
25 01417 004376          RANDOM    I SHOULD BE THE SAME AS
26 01420 110400          NEG 0,2    INEGATE
27 01421 104000          COM 0,1
28 01422 125400          INC 1,1
29 01423 132414          SUB# 1,2,SZR
30 01424 004172          ERROR
31 01425 004254          LOOP
32
33 01426 004245 AR121  SETUP      ITEST COM LEFT AND RIGHT.
34 01427 004376          RANDOM
35 01430 110100          COML 0,2
36 01431 144200          COMCR 2,1
37 01432 106714          SUBS# 0,1,SZR
38 01433 004172          ERROR
39 01434 004254          LOOP

```

```

A 0024 .MAIN
01
02 01435 004245 AR131  SETUP      IFORM THE PARITY OF
03 01436 105000          MOVZ 0,1  IC(AC0) IN DIFFIRENT
04 01437 170000          ADC 3,3    IROUTINES. CHECK THAT
05 01440 117000          ADD 0,3    ITHE RESULTS ARE EQUAL.
06 01441 103704          ANDS 3,0,SZR
07 01442 000775          JMP -3
08 01443 102600          SUBCR 0,0  ISAVE PARITY IN BIT 0.
09 01444 176620          SUBZR 3,3
10 01445 125102          MOVL 1,1,SZC
11 01446 101400          INC 0,0    IBIT 15 WILL CONTAIN
12 01447 175224          MOVZR 3,3,SZR I THE PARITY.
13 01450 000775          JMP -3
14 01451 115200          MOVR 0,3  ICHECK TO SEE IF BITS
15 01452 103012          ADD# 0,0,SZC IARE LIKE.
16 01453 004172          ERROR
17 01454 004254          LOOP
18
19 01455 004245 AR151  SETUP      IMISC TEST OF SUB LEFT
20 01456 004376          RANDOM    IAND RIGHT.
21 01457 131000          MOV 1,2
22 01460 100500          SUBL 0,1
23 01461 127000          ANDR 1,1
24 01462 107000          ADD 0,1
25 01463 106500          SUBL 0,1
26 01464 127000          ANDR 1,1
27 01465 107000          ADD 0,1
28 01466 132414          SUB# 1,2,SZR
29 01467 004172          ERROR
30 01470 004254          LOOP
31
32 01471 004245 AR161  SETUP      IMISC TEST OF AND RIGHT.
33 01472 004376          RANDOM
34 01473 131040          MOVO 1,2
35 01474 113000          ANDR 0,2
36 01475 107400          AND 0,1
37 01476 151100          MOVL 2,2
38 01477 140414          SUB# 2,1,SZR
39 01500 004172          ERROR
40 01501 004254          LOOP

```

A 0025 .MAIN

```

01
02 01502 004245 AR17: SETUP          MISC ADD SWAPPED TEST.
03 01503 004376          RANDOM
04 01504 131000          MOV 1,2
05 01505 113000          ADD R,2
06 01506 107300          ADDS 0,1
07 01507 125300          MOVS 1,1
08 01510 132414          SUB# 1,2,SZR
09 01511 004172          ERROR
10 01512 004254          LOOP
11
12 01513 004245 AR18: SETUP          CHECK ADC LEFT.
13 01514 004376          RANDOM
14 01515 131000          MOV 1,2
15 01516 112120          ADCZL 0,2
16 01517 100000          COM 0,0
17 01520 107120          ADDZL 0,1
18 01521 132414          SUB# 1,2,SZR
19 01522 004172          ERROR
20 01523 004254          LOOP
21
22 01524 004245 AR19: SETUP          TEST ADC RIGHT.
23 01525 004376          RANDOM
24 01526 131000          MOV 1,2
25 01527 112220          ADCZR 0,2
26 01530 100000          COM 0,0
27 01531 107220          ADDZR 0,1
28 01532 132414          SUB# 1,2,SZR
29 01533 004172          ERROR
30 01534 004254          LOOP
31
32 01535 004245 AR20: SETUP          TEST SUB RIGHT.
33 01536 004376          RANDOM
34 01537 131000          MOV 1,2
35 01540 100020          SUBZR 0,1
36 01541 100420          NEGZ 0,0
37 01542 113200          ADDR 0,2
38 01543 132414          SUB# 1,2,SZR
39 01544 004172          ERROR
40 01545 004254          LOOP

```

A 0026 .MAIN

```

01
02
03 01546 004245 ARJSR: SETUP          TEST THAT INDEX WITH
04 01547 004401          JSR ,+1          SIGN BIT SET DOES
05 01550 171122          MOVZL 3,2,SZC      NOT LOAD INTO PC ON JSR.
06 01551 004172          ERROR
07 01552 151240          MOVOR 2,2
08 01553 005004          JSR 4,2          GO TO NEXT LOCATION
09 01554 004401          JSR ,+1
10 01555 105000          MOV 3,1          JSR SHOULD NEVER
11 01556 125112          MOVLW 1,1,SZC      STORE THE SIGN BIT.
12 01557 004172          ERROR
13 01560 004254          LOOP
14
15 01561 024046 AREND: LDA 1,EGGS          END OF TEST.
16 01562 125004          MOV 1,1,SZR
17 01563 000411          JMP ENDER
18 01564 010105          ISZ PASS
19 01565 020105          LDA 0,PASS
20 01566 024103          LDA 1,K7
21 01567 107414          AND# 0,1,SZR
22 01570 000404          JMP ENDER
23 01571 004106          CALL
24 01572 001712          MESS
25 01573 002157          PMES
26
27 01574 024046 ENDER: LDA 1,EGGS
28 01575 125005          MOV 1,1,SNR
29 01576 000410          JMP ,+0.
30 01577 010051          OSZ EGGS+3
31 01600 000406          JMP ,+0
32 01601 034052          LDA 3,EGGS+4
33 01602 020051          LDA 0,EGGS+3
34 01603 002677          IGRST
35 01604 041776          STA 0,-2,3
36 01605 001400          JMP 0,3
37 01606 010050          ISZ EGGS+2
38 01607 000321          JMP MOVE
39 01610 000320          JMP MOVE-1

```

```

A 0027 .MAIN
01
02 01611 102400 .MPYU: SUBC 0,0
03 01612 054411 .MPYA: STA 3,.CB03
04 01613 034411 LDA 3,.CB20
05 01614 125203 .CR99: MOVR 1,1,SNC
06 01615 101201 MOVR 0,0,SKP
07 01616 143220 ADDZ 2,0
08 01617 175404 INC 3,3,SZR
09 01620 000774 JMP .CB99
10 01621 125200 MOVC 1,1
11 01622 002401 JMP 0,CB03
12 01623 000000 .CB03: 0
13 01624 177700 .CB20: -20
14
15 01625 102400 .DIVI: SUB 0,0
16 01626 054775 .DIVU: STA 3,.CB03
17 01627 034775 LDA 3,.CB20
18 01630 125120 MOVZL 1,1
19 01631 101100 .CC98: MOVL 0,0
20 01632 142412 SUB# 2,0,SZC
21 01633 142400 SUB 2,0
22 01634 125100 MOVL 1,1
23 01635 175404 INC 3,3,SZR
24 01636 000773 JMP .CC98
25 01637 002764 JMP 0,CB03
26
27 01640 135000 XOR: MOV 1,3
28 01641 117520 ANDZL 0,3
29 01642 107000 ADD 0,1
30 01643 106400 SUB 3,1
31 01644 002054 RETURN
32
33 01645 135000 XOR1: MOV 1,3
34 01646 117400 AND 0,3
35 01647 174000 COM 3,3
36 01650 163400 AND 3,0
37 01651 123000 ADD 1,0
38 01652 103400 AND 3,0
39 01653 002054 RETURN
40
41 01654 034005 XOR2: LDA 3,M20
42 01655 054434 STA 3,XORTEM
43 01656 115000 MOV 0,3
44 01657 137200 ADDR 1,3
45 01660 151200 MOVR 2,2
46 01661 101220 MOVZ 0,0
47 01662 125200 MOVR 1,1
48 01663 103200 ADDR 0,0
49 01664 010425 ISZ XORTEM
50 01665 000771 JMP XOR2+2
51 01666 002054 RETURN

```

```

JC(AC1)*C(AC2)
RESULT IN AC0,AC1.
SEE SYSTEM REFERENCE
MANUAL FOR FURTHER
INFORMATION.

```

```

JC(AC0),C(AC1)/C(AC2).
AC0=REMAINDER
AC1=QUOTIENT
SEE SYSTEM REFERENCE
MANUAL.

```

```

EXCLUSIVE OR C(AC0),C(AC1).
RESULT IS IN C(AC1).

```

```

EXCLUSIVE OR C(AC0),C(AC1).
RESULT IS IN C(AC0).

```

```

EXCLUSIVE OR C(AC0),C(AC1).
RESULT IN C(AC2).
THE CONTENTS OF AC0 AND
AC1 ARE EXCHANGED.

```

```

A 0028 .MAIN
01
02 01667 126520 SORT: SURZL 1,1
03 01670 135120 MOVZL 1,3
04 01671 122422 SURZ 1,0,SZC
05 01672 167001 ADD 3,1,SKP
06 01673 121221 MOVR 1,0,SKP
07 01674 000775 JMP -3
08 01675 002054 RETURN
09
10 01676 176400 SQ: SUB 3,3
11 01677 054411 STA 3,SQTEM
12 01700 162023 ADCZ 3,0,SNC
13 01701 000405 JMP SQ1
14 01702 010405 ISZ SQTEM
15 01703 010405 ISZ SQTEM
16 01704 034404 LDA 3,SQTEM
17 01705 000773 JMP -5
18 01706 101200 SQ1: MOVR 3,0
19 01707 002054 RETURN
20
21 01710 000000 SQTEM: 0
22 01711 000000 XORTEM: 0
23
24 01712 021400 MESS: LDA 0,0,3
25 01713 030056 LDA 2,RELOC
26 01714 113000 ADD 0,2
27 01715 024074 LDA 1,K377
28 01716 021000 MESS1: LDA 0,0,2
29 01717 125112 MOVL# 1,1,SZC
30 01720 123701 ANDS 1,0,SKP
31 01721 123401 AND 1,0,SKP
32 01722 151400 INC 2,2
33 01723 124000 COM 1,1
34 01724 004424 JSR CHAR
35 01725 000771 JMP MESS1
36 01726 010054 ISZ CALRET
37 01727 002054 JMP 0,CALRET
38
39 01730 001730 KTABL: .
40 01731 100000 100000
41 01732 010000 10000
42 01733 001000 1000
43 01734 000100 100
44 01735 000010 10
45 01736 000001 1
46 01737 001737 KTAB: .
47 01740 023420 10000.
48 01741 001730 1000.
49 01742 000144 100.
50 01743 000012 10.
51 01744 000001 1.
52
53 01745 020075 PDECI: LDA 0,K240
54 01746 030771 LDA 2,KTAB
55 01747 000426 JMP POCTAL+2

```

```

FIND SQ ROOT OF C(AC0).
SEE THE SYSTEM REFERENCE
MANUAL.
RESULT IN AC0.
AC1 DESTROYED.

```

```

FIND SQ ROOT OF C(AC0).
SAME RESULT AS PREVIOUS
TEST BUT CODE IS
DIFFERENT.

```

```

RESULT WILL BE IN AC0.

```

```

PRINT A ASCII MESSAGE
AS DEFINED BY THE
ASSEMBLER.

```

```

PRINT C(AC0)R

```

```

RETURN TO CALL

```

```

OCTAL TABLE

```

```

DECIMAL TABLE

```

```

DECIMAL PRINT C(1).

```

```

A 0020 ,MAIN
01
02 01750 054415 CHAR: STA 3,CHARET      IPRINT C(ACB)R
03 01751 101325      MOVZS 0,0,SNR      IWITH EVEN PARITY.
04 01752 001401      JMP 1,3            IEND OF MESSAGE.
05 01753 040413      STA 0,CHATEM
06 01754 170000      ADC 3,3
07 01755 117000      ADD 0,3
08 01756 103404      AND 3,0,8ZR
09 01757 000775      JMP ,=3
10 01760 020400      LDA 0,CHATEM
11 01761 103200      ADDR 0,0
12 01762 101300      MOVZS 0,0
13 01763 004443      JSR TYPE          IGO TO PRINT
14 01764 002401      JMP 0CHARET
15
16 01765 000000 CHARET: 0
17 01766 000000 CHATEM: 0
18 01767 000000 ZSUPP: 0
19 01770 000000 OCTRET: 0
20
21 01771 020075 ZOCTAL: LDA 0,K240      IPRINT C(AC1) WITH ZERO SUPPRESS.
22 01772 101001      MOV 0,0,8KP
23 01773 020070 POCTAL: LDA 0,K0P      IPRINT C(AC1) IN OCTAL.
24 01774 030734      LDA 2,KTABL
25 01775 040772      STA 0,ZSUPP
26 01776 054772      STA 3,OCTRET
27 01777 034050      LDA 3,RELOC
28 02000 173000      ADD 3,2
29 02001 050027      STA 2,27
30 02002 032027      LDA 2,027
31 02003 034704      LDA 3,ZSUPP      IZERO SUPPRESS FLAG.
32 02004 102400      SUB 0,0
33 02005 140512 DECOT:  SUBLN 2,1,8ZC
34 02006 000405      JMP DECP
35 02007 140400      SUB 2,1
36 02010 034070      LDA 3,K00
37 02011 101400      INC 0,0          IFORM THE DIGIT
38 02012 000773      JMP DECOT
39 02013 151235 DECP:  MOVZRN 2,2,SNR
40 02014 034070      LDA 3,K00
41 02015 054752      STA 3,ZSUPP
42 02016 103000      ADD 3,0
43 02017 004731      JSR CHAR          IPRINT C(ACB)R
44 02020 151224      MOVZRN 2,2,8ZR
45 02021 000701      JMP DECOT-3
46 02022 020075      LDA 0,K240
47 02023 004725      JSR CHAR          IPRINT 2 SPACE CHARACTERS.
48 02024 004724      JSR CHAR
49 02025 002743      JMP 0OCTRET      IEXIT

```

```

A 0030 ,MAIN
01
02 02026 054443 TYPE: STA 3,TYPRET      ITYPE THE C(0)R IF
03 02027 074477      READS 3          ISWITCH 2(P).
04 02030 175100      MOVL 3,3
05 02031 177122      ADDZL 3,3,8ZC
06 02032 000421      JMP TYPE2
07 02033 001111      DOAS 0,TTO
08 02034 003511      SKPBZ TTO
09 02035 000777      JMP ,=1
10 02036 000211      NIOC TTO
11 02037 000414      JMP TYPE2
12 02040 034432 TYPE1: LDA 3,P,377
13 02041 175220      MOVZP 3,3
14 02042 103400      AND 3,0
15 02043 110043      ADCO 0,3,8NC
16 02044 034424      LDA 3,P,C40
17 02045 102432      SUBZN 3,0,8ZC
18 02046 010425      ISZ CHORZ
19 02047 034417      LDA 3,P,C15
20 02050 110445      SUBO 0,3,8NR
21 02051 054422      STA 3,CHORZ
22 02052 002417      JMP 0TYPRET
23 02053 175100 TYPE2: MOVL 3,3
24 02054 177103      ADDL 3,3,8NC
25 02055 000703      JMP TYPE1
26 02056 001117      DOAS 0,LPT
27 02057 003517      SKPBZ LPT
28 02060 000777      JMP ,=1
29 02061 000217      NIOC LPT
30 02062 000756      JMP TYPE1
31 02063 000007 P,C7:  7
32 02064 000011 P,C11: 11
33 02065 000012 P,C12: 12
34 02066 000015 P,C15: 15
35 02067 000240 P,C40: 240
36 02070 000040 P,C40: 40
37 02071 000000 TYPRET: 0
38 02072 000377 P,377: 377
39 02073 000000 CHORZ: 0

```

ITYPE THE C(0)R IF
ISWITCH 2(P).

IYES,GO TO LPT
INO,GO TO TTO

ISKIP NON-PRINTING CHAR

ICLR HORZ POS

A 0031 .MAIN

01

02 HEADER: ,TXTE 1<215><212>

03 02074 005215 ABS PC LIST PC ORIGINAL AC0,AC1,AC2 RESULT AC0,AC1,AC2 <215>

02076 120123

02077 141520

02100 120240

02101 144714

02102 152123

02103 050240

02104 120303

02105 151317

02106 043711

02107 047311

02110 146101

02111 120240

02112 040640

02113 030303

02114 040654

02115 130703

02116 040654

02117 131303

02120 120240

02121 142722

02122 052523

02123 152314

02124 040640

02125 030303

02126 040654

02127 130703

02130 040654

02131 131303

02132 040640

02133 000012

04

05 CRLF: ,TXTE 1<215><212>

02134 005215

02135 000000

06

07 PCENT: ,TXTE 1 X 1

02136 122040

02137 000240

08

09 WORLD: ,TXTE 1<215><212>

02140 005215

10 02141 040714 LAST LOCATION IN MEMORY IS 1

02142 152123

02143 140240

02144 141717

02145 152101

02146 147711

02147 120110

02150 047311

02151 040640

02152 040705

02153 151317

02154 120131

02155 051711

02156 000240

0032 .MAIN

01

02

03

04

05 PHES: ,TXTE 1<215><212> PASS 1

02157 005215

02160 050240

02161 051501

02162 120123

02163 000000

06

07 02164 000000 LAST: 0

08

09 ,TXT /COPYRIGHT(C)OGC,1970,71,73,74,75,76

02165 047503

02166 054520

02167 044522

02170 044107

02171 024124

02172 024503

02173 043504

02174 020103

02175 031461

02176 030067

02177 033454

02200 020001

02201 031467

02202 033454

02203 020004

02204 032407

02205 033454

10 02206 040406 ALL RIGHTS RESERVED/

02207 040114

02210 051040

02211 043511

02212 052110

02213 020123

02214 042522

02215 042523

02216 053122

02217 042105

02220 000000

11

12 DIRT: ,TXTE 1ARITH TST061

02221 151101

02222 152311

02223 120110

02224 051724

02225 030324

02226 000066

13 02227 000000 000000

14 02230 000002 000002

15 02231 002007 2007

16 02232 000000 000000

17 02233 000000 000000

18 02234 000000 000000

19 02235 000000 000000

20 02236 000000 000000

21

0033 .MAIN

82

END

0034 .MAIN

A1	RR1831	17/24								
A2	RR1841	17/33								
A3	RR1851	18/02								
A4	RR1861	18/11								
A5	RR1185	18/32								
A6	RR1123	19/02								
A7	RR1141	19/17								
A8	RR1151	19/27								
ADDTTE	RR1158	19/06	19/12	19/25						
AND0	RR0606	13/27								
AND1	RR0626	13/44								
AND3	RR0634	14/02	14/15							
AR1	RR1171	20/05								
AR10	RR1403	23/12								
AR11	RR1416	23/24								
AR12	RR1426	23/33								
AR13	RR1435	24/02								
AR15	RR1455	24/19								
AR16	RR1471	24/32								
AR17	RR1502	25/02								
AR18	RR1513	25/12								
AR19	RR1524	25/22								
AR2	RR1206	20/19								
AR20	RR1535	25/32								
AR3	RR1224	20/34								
AR4	RR1240	21/02								
AR5	RR1262	21/21								
AR6	RR1301	21/37								
AR7	RR1317	22/02								
AR8	RR1345	22/25								
AR9	RR1372	23/02								
AREND	RR1561	26/15								
ARJSR	RR1546	26/03								
CAL	RR0106	4/45	4/56							
CAL2	RR0P55	4/20	4/46	4/51						
CALL	RR4106	4/56	5/23	5/27	5/41	5/55	7/03	8/02	8/06	
		8/06	9/26	14/26	14/28	14/36	14/38	15/05	15/07	
		15/16	15/25	15/34	16/05	16/14	16/23	16/32	17/04	
		17/06	17/08	17/10	17/12	17/14	17/16	17/18	19/06	
		20/10	20/13	20/21	20/25	20/26	20/37	20/41	21/06	
		21/06	23/05	26/23						
CALRE	RR0054	4/19	4/45	4/48	4/49	4/53	4/55	20/36	20/37	
CALTE	RRF101	4/48	4/52	4/54						
CHAR	RR1750	20/34	29/02	29/43	29/47	29/48				
CHARE	RR1765	29/02	29/14	29/16						
CHATE	RR1766	29/05	29/10	29/17						
CHORZ	RR2073	30/18	30/21	30/39						
CRLF	RR2134	8/04	31/05							
CYC1	RR0263	7/37	7/42							
CYC2	RR0276	8/02								
CYC3	RR0307	7/52	8/12							
CYC4	RR0314	7/46	8/16							
CYCLE	RR0254	7/34	9/52							
CYCRO	RR0063	4/26	7/34	8/21						
DECOT	RR2005	29/33	29/38	29/45						
DECP	RR2013	29/34	29/39							
DIRT	RR2221	4/03	30/12							
EGG3	RR0046	4/12	4/13	5/20	5/30	7/10	26/15	26/27		

		26/17	26/22	29/27										
ENDER	R01574													
ENTER	R00245	7/26	9/51											
ERR	R00172	5/46	9/50											
ERR1	R00202	5/55												
ERRCT	R00062	4/25	5/47	7/31	8/05	8/13								
ERRET	R00057	4/22	5/46	5/50	5/58	7/12								
ERROR	R04172	9/50	12/11	12/19	12/25	12/27	12/29	12/54	13/24					
		13/41	13/40	14/16	14/31	14/41	15/10	15/19	15/20					
		15/30	16/00	16/17	16/26	16/35	17/21	17/30	17/39					
		18/00	18/29	18/44	19/14	19/21	19/39	20/10	20/31					
		20/44	21/12	21/15	21/18	21/34	21/49	22/04	22/06					
		22/00	22/10	22/12	22/14	22/16	22/10	22/20	22/22					
		22/20	22/30	22/32	22/34	22/36	22/30	22/40	22/42					
		22/44	23/09	23/21	23/30	23/30	24/16	24/29	24/39					
		25/09	25/19	25/99	25/39	26/06	26/12							
ERTEM	R00060	4/23	6/06	7/05										
ESWIT	R00235	4/31	5/40	5/59	6/01	7/17	7/30	7/35	9/30					
FIRST	R00500	4/10	4/33	5/42	9/27	12/04								
HEADE	R02074	5/57	31/02											
ICAT	R00171	5/40	5/44	8/23										
ITR	R00071	4/32	7/27	7/47										
ITRCT	R00064	4/27	7/20	7/30	7/45	7/40								
K200	R00077	4/30	5/29											
K2000	R00100	4/39	5/02	5/32										
K240	R00075	4/36	20/53	29/21	29/46									
K377	R00074	4/35	20/27											
K400	R00073	4/34	5/36											
K500	R00102	4/41	8/35											
K60	R00076	4/37	29/23	29/36	29/40									
K7	R00103	4/42	26/20											
KDATA	R00070	4/31	6/07											
KTAB	R01737	20/46	20/54											
KTABL	R01730	20/39	20/24											
LAST	R02164	4/09	4/33	32/07										
LOOP	R04254	9/52	12/12	12/20	12/30	12/55	13/25	13/42	13/49					
		14/19	14/32	14/42	15/11	15/20	15/29	15/39	16/09					
		16/10	16/27	16/36	17/22	17/31	17/40	18/09	18/30					
		18/45	19/15	19/22	19/40	20/17	20/32	20/45	21/19					
		21/35	21/50	22/23	22/45	23/10	23/22	23/31	23/39					
		24/17	24/30	24/40	25/10	25/20	25/30	25/40	26/13					
			7/26	7/32	7/39	8/20								

OACB	000237	7/19	9/35	9/37	9/45	21/16	23/97			
OAC1	000240	7/20	9/34	9/36	9/46	21/13				
OAC2	000241	7/21	9/41		9/47	21/10				
OCTRE	001774	29/19	29/26	29/49						
PASS	000105	4/44	26/18	26/19						
PCENT	002136	8/10	31/07							
PDFCI	001745	8/07	28/53							
PMFS	002157	26/25	32/05							
POCTA	001773	5/28	7/04	20/55	29/23					
P5IZE	000072	4/33	0/32							
P.240	002067	30/35								
P.377	002072	30/12	30/38							
P.C11	002064	30/32								
P.C12	002065	30/33								
P.C15	002066	30/19	30/34							
P.C40	002070	30/16	30/36							
P.C7	002063	30/31								
RAND	000376	9/29	9/53							
RAND1	000415	9/32	9/45	9/48						
RAND0	004376	8/24	9/53	12/07	12/15	12/34	13/04	13/08	13/45	
		14/03	14/24	14/35	15/03	15/14	15/23	15/32	16/03	
		16/12	17/03	17/25	17/34	18/03	18/12	18/33	19/03	
		19/18	19/28	20/06	20/20	20/35	21/03	21/03	21/25	
		23/34	24/20	24/33	25/03	25/13	25/23	25/33		
RANRE	000067	4/30	9/20	9/43						
RELOC	000056	4/21	4/47	6/02	9/22	9/24	20/25	20/27		
RETUR	002054	4/55	27/31	27/39	27/51	28/00	28/10			
ROT1	000530	12/33								
ROT2	000557	13/03								
SAV0	000242	5/53	7/07	7/22	7/44	8/14				
SAV1	000243	5/52	7/06	7/23	7/43	8/15				
SAV2	000244	5/51	7/09	7/24	7/42	8/16				
SETUP	004245	9/51	12/06	12/14	12/22	12/33	13/03	13/27	13/44	
		14/02	14/23	14/34	15/02	15/13	15/22	15/31	16/02	
		16/11	16/20	16/29	17/02	17/24	17/33	18/02	18/11	
		18/32	19/02	19/17	19/27	20/05	20/10	20/34	21/02	
		21/21	21/37	22/02	22/25	23/02	23/12	23/24	23/33	
		24/02	24/10	24/32	25/02	25/12	25/22	25/32	26/03	
SHIGH	000006	4/09	8/41	8/43						
SIZIT	000120	4/05	4/06	5/02	5/12					
SLOW	000007	4/10	8/42	8/44						
S0	001676	20/29	20/42	20/10						
S01	001706	20/13	20/18							
S0RT	001667	20/14	20/22	20/30	20/02					
S0TEM	001710	20/11	20/14	20/15	20/16	20/21				
SYNC	000300	9/54								
TYPE	002026	29/13	30/02							
TYPE1	002040	30/12	30/25	30/30						
TYPE2	002053	30/06	30/11	30/23						
TYPRE	002071	30/02	30/22	30/37						
WORLD	002140	5/25	31/09							

0037 .MAIN

X7	000744	16/02							
X8	000754	16/11							
X9	000764	16/20							
XOR	001640	14/27	14/29	15/06	15/17	16/24	16/33	17/07	17/09
		17/11	17/13	17/15	17/17	17/19	18/09	27/27	
XOR1	001645	14/39	15/08	15/26	15/35	27/33			
XOR2	001654	14/37	16/06	16/15	17/05	27/41	27/50		
XORTE	001711	27/42	27/49	28/22					
ZOCTA	001771	29/21							
ZSUPP	001767	29/18	29/25	29/31	29/41				
.CB03	001623	27/03	27/11	27/12	27/16	27/25			
.CB20	001624	27/04	27/13	27/17					
.CB99	001614	27/05	27/09						
.CC08	001631	27/10	27/24						
.DIVI	001625	27/15							
.DIVU	001626	21/07	27/16						
.HPYA	001612	21/09	23/06	27/03					
.HPYU	001611	26/11	26/26	27/02					
.RAND	000421	9/33	9/36	10/34					
.UD01	000451	10/36	10/44	11/22					
.UD02	000452	10/37	10/45	11/23					
.UD03	000453	10/34	10/35	10/46	11/24				
.UD10	000454	11/08	11/11	11/26					
.UD20	000455	10/41	11/28						
.UD21	000456	11/07	11/29						
.UD50	000436	10/40	11/07						