

LISTING

096-000154-10

PROGRAM

REAL TIME CLOCK TEST

TAPE

095-000011-10

ABSTRACT

THE REAL TIME CLOCK TEST IS A MAINTENANCE PROGRAM DESIGNED TO TEST THE REAL TIME CLOCK LOGIC. IF THE PROGRAM IS USED WITHOUT A TTY, THE CRYSTAL FREQUENCY IS NOT CHECKED FOR ACCURACY. THE PROGRAM IS DESIGNED FOR EITHER 50 OR 60 HERTZ LINE INTERRUPTS.

0001 MAIN MACRO REV R4.00

03:39:50 06/10/76

```

*****
NAME: RTCTST.SR          PART NUMBER: 004-000-010
DESCRIPTION: REAL TIME CLOCK TEST
REVISION HISTORY:
REV.      DATE
00      04/07/70
01      09/15/70
02      07/08/71
03      08/31/72
04      05/23/73
05      02/15/74
06      06/07/74
07      10/25/74
08      NONE
09      NONE
10      06/11/76
*****
COPYRIGHT (C) DATA GENERAL CORPORATION, 1970,1971,1972,1973,
1974,1976
ALL RIGHTS RESERVED.
*****

```

0002 MAIN

```

01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58

REAL TIME CLOCK TEST
11. ABSTRACT
THE REAL TIME CLOCK TEST IS A MAINTENANCE
PROGRAM DESIGNED TO TEST THE REAL TIME
CLOCK LOGIC. IF THE PROGRAM IS USED WITH-
OUT A TELETYPE THE CRYSTAL FREQUENCY IS
NOT CHECKED FOR ACCURACY. THE PROGRAM IS
DESIGNED FOR EITHER 50 OR 60 HERTZ LINE
INTERUPTS.

12. MACHINE REQUIREMENTS
12.1 ANY NOVA/ECLIPSE PROCESSOR
12.2 REAL TIME CLOCK OPTION
12.3 TELETYPE... DESIRABLE BUT NOT ESSENTIAL

13. SWITCH SETTINGS
13.1 STARTING ADDRESS      #2 OR 200
13.2 SWITCH 1(1)          #PROCEED FROM ERROR
13.3 SWITCH 2(1)          #IMMEDIATE PRINTOUT TO TTY
13.4 SWITCH 3(1)          #POINT 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 SWITCHES TO 000002 OR 200
14.3 PRESS START
14.4 THE PROGRAM WILL RUN UNTIL MANUALLY STOPPED
OR AN ERROR IS DETECTED.

15. PROGRAM OUTPUT/ERROR DESCRIPTION
15.1 IF A MALFUNCTION IS DETECTED THE PROGRAM
WILL HALT AT LOCATION "ERR1+1". THE OPERATOR
MAY CHANGE SWITCH SETTINGS AT THIS TIME
IF DESIRED. IF SWITCHES 0 AND 1 ARE ZERO
PRESSING CONTINUE WILL CAUSE A PRINTOUT
OF THE ERROR LOCATION. THE ROUTINE WILL
ENTER A LOOP SUITABLE FOR SCOPING.
WHEN THE PROGRAM IS IN A SCOPED LOOP SETTING
SWITCH 3(1) WILL CAUSE THE FAILURE RATE TO
BE PRINTED. SETTING SWITCH 1(1) WILL CAUSE
THE PROGRAM TO PROCEED TO THE NEXT TEST.

16. PROGRAM DESCRIPTION/THEORY OF OPERATION
16.1 "SETUP" THIS ROUTINE IS EXECUTED PRIOR TO THE
TEST PORTION OF EVERY TEST ROUTINE. IT
PROVIDES AN ADDRESS FOR THE LOOP ROUTINE
TO ITERATE TO. IT RESETS PROGRAMMED ERROR
SWITCHES, THE ITERATION COUNT, AND ISSUES A
I/O RESET PULSE.
16.2 "LOOP" THIS ROUTINE IS EXECUTED AT THE END OF
EVERY TEST. WHEN NO ERRORS HAVE OCCURRED IT IS
USED ONLY TO ITERATE THE TEST 100 TIMES.
WHEN AN ERROR HAS OCCURRED IT IS USED TO INTERRUPT
GATE CONSOLE SWITCHES 0 AND 2. THE ROUTINE
ISSUES A I/O RESET PULSE PRIOR TO RETURNING
TO THE TEST.

```

10000 MAIN

```

01
02
03
04 16.3 "FHALT" THIS ROUTINE IS EXECUTED WHENEVER
05      A ERROR HAS BEEN DETECTED. THE ROUTINE WILL
06      HALT, SET PROGRAMMED ERROR SWITCHES, AND
07      PRINT THE ERROR LOCATION.
08 16.4 "TIME" THIS ROUTINE WILL RECORD THE TIME
09      IT TAKES THE INSTRUCTION FOLLOWING THE CALL
10      TO SKIP. THE RETURN IS TO CALL+2. IF THE
11      INSTRUCTION FOLLOWING THE CALL NEVER SKIPS
12      THE ROUTINE WILL RETURN WITH THE CARRY FLAG SET.
13
14 17. RESTRICTIONS/MISC
15 17.1 EXECUTION TIME FOR 1 PASS IS 67 SECONDS.
16 17.2 THE INSTRUCTION TIMING TEST SHOULD BE RUN
      PRIOR TO THIS TEST.

```

10000 MAIN

```

01
02      000000 LOC 2
03 000000 002314 DIRT 10TOS DIRT BIK PNTD
04 000001 000000 0
05 000002 002003 JMP 0.+1
06 000003 000500 BEGIN 1STARTS AT PFGIN
07
08      000045 LOC 45
09 000045 000046 FGGS 10TOS FGGS BIK PNTD
10 000046 000000 FGGS: 10TOS AUTO MOOF SW
11 000047 000000 0 10DEVICE CODE
12 000051 000000 0 10CAT SWITCH
13 000051 000000 0 10M OF PASSES
14 000052 000000 0 10TOS RETURN ADDRESS
15 000053 000000 0 10SWITCH REGISTER
16
17
18 000054 000005 C5: 5
19 000055 001373 SETUP: ENTER
20 000056 001415 LOOP: CYCLE
21 000057 001464 FR: FRP
22 000060 000004 C4: 4
23 000061 000000 CALIRR: 0
24 000062 001154 TIME: DELAY
25 000063 001542 WHQ: TIMEF
26 000064 003420 C23420: 23420
27 000065 000000 TIMEXI: 0
28 000066 000152 C152: 152
29 000067 003406 C0000: 23406
30 000070 003432 C10010: 23432
31 000071 000000 CLKTIME: 0
32 000072 002167 YICRLF: CRLF
33 000073 002064 XIPDFC: PDFC
34 000074 002042 XIMESS: MESS
35 000075 001137 C10IV: 10IV
36 000076 000012 C12: 12
37 000077 000144 C144: 144
38 000057 FHALTJSR 0ER
39
40      1
41      1 STANDARD BLOCK AT 200
42      1
43
44      000200 LOC 200
45
46 002001 002002 DTOSB: JMP 00GNADR
47 002001 000000 HELP: 0
48 002002 000000 0GNADR: BEGIN
49 002003 000000 PASS: 0
50
51      1
52 002004 002042 TMFSS: MESS
53 002005 002140 TCHAF: CHAR
54 002006 002211 TTYPE: TYPE
55 002007 002167 TCRLF: CRLF
56 002010 002061 TPDCY: PDCT
57 002011 002064 TPDEC: PDCE
58

```

10CURRENT TEST ADDR
1
1PASS COUNT

10005 .MAIN

01			
02	000500	.LOC 500	
03			
04	00500 102400	REGINI	SUR 0,0
05	00501 040200		STA 0,PASS
06			
07	00502 006055	ADR1	JSR #SETUP
08	00503 003514		SKPB7 RTC
09	00504 006057		EHALT
10	00505 006056		JSR #LOOP
11			
12	00506 006055	ADR2	JSR #SETUP
13	00507 003714		SKPD7 RTC
14	00510 006057		EHALT
15	00511 006056		JSR #LOOP
16			
17	00512 006055	ADR4	JSR #SETUP
18	00513 000114		NINS RTC
19	00514 006062		JSR #TIME
20	00515 003514		SKPB7 RTC
21	00516 100012		MOVW 0,0,SZC
22	00517 006057		EHALT
23	00520 006056		JSR #LOOP
24			
25	00521 006055	ADR5	JSR #SETUP
26	00522 000114		NINS RTC
27	00523 0060514		NINC RTC
28	00524 003514		SKPB7 RTC
29	00525 006057		EHALT
30	00526 006056		JSR #LOOP

ICLEAR PASS COUNTER

INITIALIZE AND I/O RESET
IBUSY SHOULD BE ZERO.
ICHECK E05 4-5-6 TO
PRODUCE SELB (AR2)

INITIALIZE AND I/O RESET
IDONE SHOULD BE 0
ICHECK E05 8-9-10 TO
PRODUCE SELD (AR0)

IFSET BUSY,SEE IF 64 CYC
IMILI CLEAR IT. CHECK
ISFLA (AR2),CLK BUSY FLOP
IE54 AND OF (CLKP(0),
ICLK1(0) AND LINE FREQ
INPUT. IS THE BOARD IN
ISLOT "3"? CHECK 6-08.

IFSET BUSY,THEN TEST
ICLEAR. CHECK CLK BUSY
IFLOP,THE CLEAR INPUT.
ICHECK THE CLEAR SIGNAL.

10006 .MAIN

01			
02	00527 006055	ADR1	JSR #SETUP
03	00530 000114		NINS RTC
04	00531 006077		TOPST
05	00532 003514		SKPB7 RTC
06	00533 006057		EHALT
07	00534 006056		JSR #LOOP
08			
09	00535 006055	ADR1	JSR #SETUP
10	00536 000114		NINS RTC
11	00537 006062		JSR #TIME
12	00540 003514		SKPB7 RTC
13	00541 000114		NINS RTC
14	00542 003514		SKPHN RTC
15	00543 006057		EHALT
16	00544 006056		JSR #LOOP
17			
18	00545 006055	ADR2	JSR #SETUP
19	00546 000114		NINS N
20	00547 003514		SKPB7 RTC
21	00550 006057		EHALT
22	00551 006056		JSR #LOOP
23			
24	00552 007422		LDA 0,K40
25	00553 007422		STA 0,XORDEV
26	00554 006055	ADR1	JSR #SETUP
27	00555 007421		LDA 0,CNINS
28	00556 004417		LDA 1,XORDEV
29	00557 131200		MOV 1,2
30	00560 113520		ANDZL 0,2
31	00561 107200		ADD 0,1
32	00562 146400		SUR 0,1
33	00563 044401		STA 1,0+1
34	00564 000000		0
35	00565 003514		SKPB7 RTC
36	00566 006057		EHALT
37	00567 006056		JSR #LOOP
38	00570 000400		LDA 0,XORDEV
39	00571 101224		MOVZU 0,0,520
40	00572 000761		JMP A14-1
41	00573 000424		JMP .+4
42	00574 000040	K40:	0
43	00575 000000	XORDEV:	0
44	00576 000114	CNINS:	NINS RTC

IFSET BUSY, CHECK
IF THAT IT IS CLEARED.
IFBY I/O RESET
IFSCOPE I/O RESET

IFSET IF IT IS
IFPOSSIBLE TO SET
IF THE CLOCK BUSY FLOP
IF FIRST SYNC ,THEN TRY
ITO SET.
ICHECK START.CLK SELECT

ICHECK THAT A
I START PULSE TO A
IDFVICE OTHER THAN
IRTC WILL NOT AFFECT
ITHE CLOCK.

ICHECK DEVICE SELECTION

10007 .MAIN

```

01
02 00577 000055 A201 JSR #SETUP
03 00578 000114 NIOS RTC
04 00579 000055 SKPR7 RTC
05 00580 000055 FHALT
06 00581 000055 JSR #LOOP
07
08 00582 000055 A201 JSR #SETUP
09 00583 000114 NIOS RTC
10 00584 000055 JSR #TIME
11 00585 000055 SKPR7 RTC
12 00586 000114 NIOS RTC
13 00587 000055 NIO RTC
14 00588 000055 SKPRN RTC
15 00589 000055 FHALT
16 00590 000055 JSR #LOOP
17
18 00591 000055 A301 JSR #SETUP
19 00592 000114 NIOS RTC
20 00593 000055 JSR #TIME
21 00594 000055 SKPR7 RTC
22 00595 000114 NIOS RTC
23 00596 000055 NINC N
24 00597 000055 SKPRN RTC
25 00598 000055 FHALT
26 00599 000055 JSR #LOOP
27
28 00600 000055 A301 JSR #SETUP
29 00601 000114 NIOS RTC
30 00602 000055 JSR #TIME
31 00603 000055 SKPR7 RTC
32 00604 000055 SKPRN RTC
33 00605 000055 FHALT
34 00606 000055 JSR #LOOP
35
36 00607 000055 A341 JSR #SETUP
37 00608 000114 NIOS RTC
38 00609 000055 SKPR7 R
39 00610 000055 FHALT
40 00611 000055 JSR #LOOP
41
42 00612 000055 A301 JSR #SETUP
43 00613 000114 NIOS RTC
44 00614 000055 JSR #TIME
45 00615 000055 SKPR7 RTC
46 00616 000055 SKPRN RTC
47 00617 000055 FHALT
48 00618 000055 JSR #LOOP
49

```

1A COMMAND TO RTC
1B SHOULD NOT SET IT
1C BUSY FLOP WITHOUT
1A START PULSE.

1SYNC THE CLOCK
1THEN CHECK THAT
1A COMMAND TO THE
1CLOCK WITHOUT A
1CLEAR PULSE DOES NOT
1CLEAR THE BUSY FLOP

1SYNC THE CLOCK
1THEN CHECK THAT A
1COMMAND TO DEVICE
1B WITH A CLEAR PULSE
1DOES NOT AFFECT THE
1REAL TIME CLOCK.

1START THE CLOCK AND
1WAIT UNTILL BUSY
1GOES TO ZERO. THIS SHOULD
1SET DONE. CLK DONE FAILED
1TO SET OR SELD GATE
1FAILED TO GROUND BUS.

1CHECK THAT BUSY IS
1NOT GATED TO SELB
1AT TIMES OTHER THAN
1CLK SELECT.

1CHECK THAT CLK DONE
1IS NOT GATED TO SELD
1AT TIMES OTHER THAN
1CLK SELECT.

10008 .MAIN

```

01
02 00651 000055 A301 JSR #SETUP
03 00652 000114 NIOS RTC
04 00653 000055 JSR #TIME
05 00654 000055 SKPR7 RTC
06 00655 000055 INPST
07 00656 000055 SKPD7 RTC
08 00657 000055 FHALT
09 00658 000055 JSR #LOOP
10
11 00659 000055 A401 JSR #SETUP
12 00660 000114 NIOS RTC
13 00661 000055 JSR #TIME
14 00662 000055 SKPR7 RTC
15 00663 000055 NINC RTC
16 00664 000055 SKPD7 RTC
17 00665 000055 FHALT
18 00666 000055 JSR #LOOP
19
20 00667 000055 A401 JSR #SETUP
21 00668 000114 NIOS RTC
22 00669 000055 JSR #TIME
23 00670 000055 SKPR7 RTC
24 00671 000055 NIOS RTC
25 00672 000055 SKPD7 RTC
26 00673 000055 FHALT
27 00674 000055 JSR #LOOP
28
29 00675 000055 A441 JSR #SETUP
30 00676 000055 SURZR 0,0
31 00677 000055 NIOS CPU
32 00678 000055 STA 0,1
33 00679 000055 SKPRN CPU
34 00680 000055 FHALT
35 00681 000055 JSR #LOOP
36
37 00682 000055 A401 JSR #SETUP
38 00683 000055 SURZR 0,0
39 00684 000055 STA 0,1
40 00685 000055 NINC CPU
41 00686 000055 LDA 0,C4
42 00687 000055 MSKU 6
43 00688 000055 NIOS CPU
44 00689 000055 NIOS RTC
45 00690 000055 JSR #TIME
46 00691 000055 SKPR7 RTC
47 00692 000055 SKPRN CPU
48 00693 000055 FHALT
49 00694 000055 JSR #LOOP
50

```

1A TEST TO INSURE
1THAT I/O RESET WILL
1CLEAR THE DONE FLAG.
1SYNC THE CLOCK
1I/O RESET. LOOK FOR
1DONE A ZERO.

1A TEST TO INSURE
1THAT CLEAR WILL
1RESET THE DONE FLAG.
1CHECK THE 4 INPUT
1OR GATE, TO CLEAR
1SIDE OF CLK DONE.

1A TEST TO INSURE
1THAT START WILL
1RESET THE DONE FLAG.
1CHECK 4 INPUT
1OR GATE, TO CLEAR
1SIDE OF CLK DONE.

1A CHECK THAT NO
1INTERRUPT OCCURES WHEN
1INTERRUPTS ARE ENABLED.
1CHECK INTR LINE(020).

1TEST THAT SETTING
1CLK INT DISABLE WILL
1PREVENT INTERRUPTS. THE
1TEST IS PERFORMED BY
1TESTING CPU INTERRUPT
1ENABLE FLAG. IF A
1INTERRUPT OCCURS THIS
1FLAG IS CLEARED.
1WAIT FOR RTC DONE TO
1SET. THEN CHECK IF
1A INTERRUPT OCCURRED.
1CHECK MSKU,INT CLK DISABLE
1FLOP,CLK INT REQ.

IRRRD .MAIN

```

01
02 00725 102020 A481 SURZR 0,0
03 00726 040001 STA 0,1
04 00727 000055 JSR #SETUP
05 00730 000277 NIOC CPU
06 00731 000114 NIOS RTC
07 00732 000262 JSR #TIME
08 00733 003514 SKPH7 RTC
09 00734 000177 NIOS CPU
10 00735 000401 JMP .+1
11 00736 003577 SKPB7 CPU
12 00737 000057 EHALL
13 00740 000354 JSR #LOOP
14
15 00741 000055 A5P1 JSR #SETUP
16 00742 000277 NIOC CPU
17 00743 102400 SUR 0,0
18 00744 000277 MSKO 0
19 00745 000114 NIOS RTC
20 00746 000262 JSR #TIME
21 00747 003514 SKPH7 RTC
22 00750 000177 NIOS CPU
23 00751 000401 JMP .+1
24 00752 003577 SKPB7 CPU
25 00753 000057 EHALL
26 00754 000354 JSR #LOOP
27
28 00755 000255 A521 JSR #SETUP
29 00756 000277 NIOC CPU
30 00757 000114 NIOS RTC
31 00758 000262 JSR #TIME
32 00761 003514 SKPH7 RTC
33 00762 000177 NIOS CPU
34 00763 000214 NIOC RTC
35 00764 000401 JMP .+1
36 00765 003577 SKPB7 CPU
37 00766 000057 EHALL
38 00767 000354 JSR #LOOP
39
40 00770 000055 A541 JSR #SETUP
41 00771 000277 NIOC CPU
42 00772 000262 LDA 0,C4
43 00773 000277 MSKO 0
44 00774 000277 INRST
45 00775 000114 NIOS RTC
46 00776 000262 JSR #TIME
47 00777 003514 SKPB7 RTC
48 01000 000177 NIOS CPU
49 01001 000401 JMP .+1
50 01002 003577 SKPB7 CPU
51 01003 000057 EHALL
52 01004 000354 JSR #LOOP

```

ICHECK THAT CLK DONE
I WILL CAUSE INTERRUPTS.
IC(LOC 1)=RETURN TO
IPROGRAM.

WAIT FOR RTC CLOCK
ITO SET DONE
IENARLF INTERRUPTS

INTERRUPT ENARLF WILL
IBF ZERO IF INTERRUPT
IOCCURED.

ICHECK THAT MSKO
IWITHOUT BIT 13 DOES
I NOT PREVENT INTERRUPTS.
ICHECK DATA 13 TO
ICLK INT DISABLE.

ICHECK THE CLEAR
INPUT TO CLK INT
IREQ FLOP

IENARLF INTERRUPTS TO CPU.
ITRY TO CLEAR INT REQ.

ISFE IF INTERRUPT OCCURED.

IA TFST TO INSURE
I THAT I/O RESET
ICLEAR THE CLK INT
IDISABLE FLOP.
ICHECK THE CLEAR INPUT.

IRRIIP .MAIN

```

01
02 01005 000055 A561 JSR #SETUP
03 01006 102020 SURZI 0,0
04 01007 101140 MOVZI 0,0
05 01010 001114 DDAS 0,RTC
06 01011 000262 JSR #TIME
07 01012 003514 SKPH7 RTC
08 01013 101212 MOVV 0,0,SZC
09 01014 000257 EHALL
10 01015 000354 JSR #LOOP
11
12 01016 000055 A581 JSR #SETUP
13 01017 102020 SURZI 0,0
14 01020 101120 MOVZI 0,0
15 01021 001114 DDAS 0,RTC
16 01022 000262 JSR #TIME
17 01023 003514 SKPH7 RTC
18 01024 101212 MOVV 0,0,SZC
19 01025 000257 EHALL
20 01026 000354 JSR #LOOP
21
22 01027 000055 A601 JSR #SETUP
23 01030 102020 SURZI 0,0
24 01031 001114 DDAS 0,RTC
25 01032 000262 JSR #TIME
26 01033 003514 SKPH7 RTC
27 01034 101212 MOVV 0,0,SZC
28 01035 000257 EHALL
29 01036 000354 JSR #LOOP
30
31 01037 000055 TTIME: JSR #HMO
32 01040 125004 MOV 1,1,SNR
33 01041 000524 JMP NEXT
34 01042 000051 STA 1,CALIBR
35

```

ISFE IF THE BUSY
IFLAG WILL BE CLEARED
IBY SELECT 1000 AND
I1000 HERTZ.

ICHECK THESE INPUTS
ITO CLK BUSY.
IC(CARRY)=1 IF TIME
IOVERFLOW

ISFE IF THE BUSY
IFLAG WILL BE CLEARED.
IBY SELECT 100,AND
I100 HERTZ.
ICHECK THESE INPUTS
ITO CLOCK BUSY
IC(CARRY)=1 IF TIME
IOVERFLOW.

ISFE IF THE BUSY
IFLAG WILL BE CLEARED
IBY SELECT 10 AND 10 HZ.
ICHECK THESE INPUTS
ITO CLK BUSY.
IC(CARRY)=1 IF TIME
IOVERFLOW.

INITIALIZE THE TIME
IVIA THE TELETYPE CLOCK.
IUNABLE TO IDENTIFY THE CPU
IC(1)=100MS

10011 MAIN

```

01
02 01043 000000 FREQ1 JSR #SETUP
03 01044 102000 SUR71 0,R
04 01045 001114 00AS 0,RTC
05 01046 003514 SKPR7 RTC
06 01047 000777 JMP .-1
07 01048 001114 00AS 0,RTC
08 01049 000000 JSR #TIME
09 01050 003514 SKPR7 RTC
10 01051 000000 LDA 0,C23420
11 01052 024005 LDA 1,TIMEX
12 01053 004450 JSR MULT
13 01054 032001 LDA 0,CALTR
14 01055 004451 JSR YDIV
15 01056 020000 LDA 0,C0000
16 01057 030070 LDA 0,C10010
17 01058 100030 SUR70 0,1.5ZC
18 01059 140030 ANDZM 2.1.5ZC
19 01060 000000 JMP .+3
20 01061 000000 JSR #LOOP
21 01062 000001 JMP NEXT
22
23 01063 044071 STA 1,CLKTIM
24 01064 000000 EMALT
25 01065 000072 JSR #XICRLF
26 01066 000074 JSR #XIMESS
27 01067 001077 HEADY
28 01068 024071 LDA 1,CLKTIM
29 01069 000073 JSR #XIPDEC
30 01070 000075 JMP FREQ1
31
32 01071 044074 HEADY1 .TXT TIME IN TENS OF MICROSECONDS FOR 10 HERTZ !
33 042515
34 044440
35 020114
36 042524
37 051510
38 047440
39 020100
40 044515
41 051100
42 051517
43 041505
44 047117
45 051504
46 043040
47 051117
48 030440
49 020000
50 042510
51 052122
52 020132
53 000000

```

ICHECK THE ACCURACY
OF THE REAL TIME CLOCK.

ISYNC THE CLOCK

ICALCULATE THE TIME

10000 DECIMAL

TIME TIME COUNT

IMULTIPLY

10000 COUNT

IDIVIDE

ICHECK FOR TO SMALL

ICHECK FOR TO BIG

IFERROR

IF A TIMING ERROR AT 1007
THAS OCCURED.

ITIME IN TENS OF MICROS

10012 MAIN

```

01 01120 102400 MULTI: SURC 0,0
02 01121 054425 STA 3,MSAV
03 01122 034423 LDA 3,MDCTR
04 01123 125003 MLOOP: MOVV 1,1,SNC
05 01124 101201 MOVV 0,0,SXP
06 01125 143220 ADDZM 2,0
07 01126 175404 INC 3,3,SZR
08 01127 000774 JMP MLOOP
09 01128 125003 MOVV 1,1
10 01129 002415 JMP #MSAV
11
12 01130 102400 IDIVI: SUR 0,0
13 01131 054413 YDIVI: STA 3,MSAV
14 01132 034411 LDA 3,MDCTR
15 01133 125120 MOVZ 1,1
16 01134 101120 MLOOP: MOVV 0,0
17 01135 142412 SURM 2,0,SZC
18 01136 142400 SUR 0,0
19 01137 125100 MOVV 1,1
20 01138 175404 INC 3,3,SZR
21 01139 000773 JMP MLOOP
22 01140 002402 JMP #MSAV
23 01141 177760 MDCTR: -20
24 01142 000000 MSAV: 0
25
26 01143 021400 DELAY: LDA 0,0.3
27 01144 040000 STA 0,0.6
28 01145 102000 ADDC 0,0
29 01146 140000 STA 0,TIMEX
30 01147 101000 MOV 0,0
31 01148 101000 INC 0,0.9ZC
32 01149 001401 JMP 1,3
33 01150 000000 0
34 01151 000774 JMP .-4
35 01152 040005 STA 0,TIMEX
36 01153 001401 JMP 1,3
37

```

IMULTIPLY C(1)+C(2)
IF RESULT TO C(1),C(1)

IDIVIDE C(1),C(1)/C(2)
IC(0)=REMAINDER
IC(1)=QUOTIENT

ICALL VIA JSR #TIME
IF SKIP INST TO BE TIMED,
ITIME STORED IN

IFREGISTER TIMEX.
IC(CARRY)=0 IF NO TIME
OVERFLOW OCCURED.
IC(CARRY)=1 FOR OVERFLOW

10013 .MATN

```

01
02 01167 102520 NEXTI SURZI 0,0 ISET CALIBRATION
03 01170 061114 DDAS W,RTC ITO 100MS VIA
04 01171 063514 SKPR7 RTC IREAL TIME CLOCK.
05 01172 000777 JMP -1
06 01173 060114 NIOS RTC
07 01174 000062 JSR @TIME
08 01175 063514 SKPRZ RTC
09 01176 040061 STA 0,CALIRR

10
11 01177 000055 A611 JSR #SETUP WHEN DONE EQUAL W
12 01200 061477 INTA W AND BITS SHOULD BE READ
13 01201 101024 MOV 0,0,SZR
14 01202 000057 EHALL
15 01203 000056 JSR #LOOP
16
17 01204 000055 A611 JSR #SETUP ICHECK THAT THE DEVICE
18 01205 060114 NIOS RTC ICODE IS READ BACK
19 01206 063514 SKPRZ RTC WHEN DONE IS SET.
20 01207 000777 JMP -1
21 01210 020471 LDA 0,XX14
22 01211 065477 INTA 1
23 01212 106414 SURW 0,1,SZR
24 01213 006057 EHALL
25 01214 006056 JSR #LOOP

```

10014 .MATN

```

01
02 01215 000055 A621 JSR #SETUP ICHECK THAT
03 01216 102520 SURZI 0,0 ISELECT 100 IS
04 01217 101120 MOVZI 0,0 ITEN TIMES FASTER
05 01220 061114 DDAS W,RTC ISEL 10
06 01221 063514 SKPR7 RTC
07 01222 000777 JMP -1
08 01223 060114 NIOS RTC
09 01224 000062 JSR @TIME
10 01225 063514 SKPRZ RTC
11 01226 024061 LDA 1,CALIRR
12 01227 030065 LDA 2,TIMEY
13 01230 000075 JSR @CTDIV
14 01231 020476 LDA 0,C10
15 01232 106414 SURW 0,1,SZR
16 01233 006057 EHALL
17 01234 006056 JSR #LOOP
18
19 01235 000055 A641 JSR #SETUP ICHECK THAT
20 01236 102520 SURZI 0,0 ISELECT 1000 IS
21 01237 101140 MOVZI 0,0 ITEN TIMES FASTER
22 01240 061114 DDAS W,RTC ITMAN SELECT 10.
23 01241 063514 SKPR7 RTC
24 01242 000777 JMP -1
25 01243 060114 NIOS RTC
26 01244 000062 JSR @TIME
27 01245 063514 SKPRZ RTC
28 01246 024061 LDA 1,CALIRR
29 01247 030065 LDA 2,TIMEY
30 01250 000075 JSR @CTDIV
31 01251 020477 LDA 0,C144
32 01252 030066 LDA 2,C152
33 01253 106432 SURW 0,1,SZR
34 01254 146032 ANOZ 2,1,SZR
35 01255 006057 EHALL
36 01256 006056 JSR #LOOP
37
38 01257 000055 A661 JSR #SETUP ICHECK THAT 5 OR 6
39 01260 102410 SUR 0,0 ICLOCK PULSES
40 01261 061114 DDAS W,RTC IEQUAL 10 HERTZ.
41 01262 063514 SKPR7 RTC IMAY USE EITHER 50/60
42 01263 000777 JMP -1 IMERTZ POWER.
43 01264 060114 NIOS RTC
44 01265 000062 JSR @TIME
45 01266 063514 SKPRZ RTC
46 01267 024061 LDA 1,CALIBRATION
47 01270 030065 LDA 2,TIMEY
48 01271 000075 JSR @CTDIV
49 01272 020454 LDA 0,C0
50 01273 102555 SURORW 1,0,SNR
51 01274 020473 JMP -1
52 01275 106414 ANOZ 0,1,SZR
53 01276 006057 EHALL
54 01277 006056 JSR #LOOP
55
56 01300 101301 MOV 0,0,SKP
57 01301 000214 XX14: 14

```

IPRIS MAIN

```

01
02 01302 000000 ARR1 JSR #SETHP      CHECK THAT CLK
03 01303 000000      SUBR1 0,0      RESET CLEARS
04 01304 001140      MOV01 0,0
05 01305 001114      DDAS 0,RTC      CLKA AND CLKI
06 01306 000000      INRST
07 01307 000114      NIOS KTC
08 01308 000114      SKPR7 RTC
09 01309 000000      JMP -1
10 01310 000114      NIOS KTC
11 01311 000000      JSR #TIME
12 01312 000114      SKPR7 RTC
13 01313 000000      LDA 1,CALIMR
14 01314 000000      LDA 2,TIMEY
15 01315 000000      JSR #CICDTV
16 01316 000000      LDA 0,C5
17 01317 000000      SUBR0 1,0,SNW
18 01318 000000      JMP -3
19 01319 000000      ADDW 0,1,5ZR
20 01320 000000      EHALL
21 01321 000000      JSR #LOOP
22
23 01322 000000 ARR1 JSR #SETHP      CHECK TO INSURE
24 01323 000000      SUBR1 0,0      THAT A "DGA" TO
25 01324 000000      MOV01 0,0      JA DEVICE OTHER THAN
26 01325 000000      DDAS 0,0      RTC DOES NOT
27 01326 000000      NIOS KTC      AFFECT RTC.
28 01327 000000      SKPR7 RTC
29 01328 000000      JMP -1
30 01329 000000      NIOS KTC
31 01330 000000      JSR #TIME
32 01331 000000      SKPR7 RTC
33 01332 000000      LDA 1,CALIMR
34 01333 000000      LDA 2,TIMEY
35 01334 000000      JSR #CICDTV
36 01335 000000      LDA 0,C5
37 01336 000000      SUBR0 1,0,SNW
38 01337 000000      JMP -3
39 01338 000000      ADDW 0,1,5ZR
40 01339 000000      EHALL
41 01340 000000      JSR #LOOP
42
43 01341 000000 PASER1 TSZ PASS      END OF A PASS
44 01342 000000      JMP -1
45 01343 000000      JSR #ICMIF      IC/R AND L/F
46 01344 000000      JSR #IMESS      IPASS MESSAGE
47 01345 000000      PAS-PS
48 01346 000000      LDA 1,PASS      1
49 01347 000000      JSR #IPDPC      1
50 01348 000000      LDA 1,EGGS
51 01349 000000      MOV 1,1,5NR
52 01350 000000      JMP 0,0,0
53 01351 000000      DSZ EGGS+3
54 01352 000000      JMF 0,0,0
55 01353 000000      LDA 3,EGGS+4
56 01354 000000      LDA 2,EGGS+3
57 01355 000000      STA 0,-2,3
58 01356 000000      INRST
59 01357 000000      JMP 0,3
60 01358 000000      END

```

0014 MAIN

```

01
02
03 01373 000000 ENTER: STA 3,100PR      FLOOR TESTATE REGION
04 01374 000000      STA 3,HELP      SAVE IN HELP LOCATION
05 01375 000000      LDA 3,TPR      THIS ROUTINE INITIALIZES
06 01376 000000      STA 3,TPR      LEACH TEST
07 01377 000000      SHR 3,3
08 01378 000000      STA 3,FSWIT
09 01379 000000      STA 3,FWPCT
10 01380 000000      DTC 0,0,0
11 01381 000000      JMP #LOOP
12
13 01400 000000 TPR: 144
14 01401 000000 TPRCT: 0
15 01402 000000 FSWIT: 0
16 01403 000000 FWPCT: 0
17 01404 000000 RETURN: 0
18 01405 000000 SAV2: 0
19 01406 000000 SAV1: 0
20 01407 000000 SAV0: 0
21 01408 000000 INCR: 0
22
23 01415 000000 CYCLE: STA 3,RETURN      END OF TEST ITERATION
24 01416 000000      STA 2,SAV2      ROUTINE
25 01417 000000      STA 1,SAV1      SAVE THE ACS
26 01418 000000      STA 0,SAV0
27 01419 000000      DSZ TPRCT
28 01420 000000      JMP CYCLES      NOT 100 TIMES ITERATED
29
30 01421 000000      LDA 3,TPR      RESET ITERATION CNT
31 01422 000000      STA 3,TPRCT
32 01423 000000      READS 3
33 01424 000000      LDA 2,FSWIT      IF SWITCH 3=11
34 01425 000000      MOV01 3,3      AND A ERROR HAS OCCURED
35 01426 000000      ADDL 3,3      THE ERROR RATE WILL
36 01427 000000      MOV 0,2,5NR      BE PRINTED
37 01428 000000      JMP NOEX
38 01429 000000      MOV01 3,3,5NR
39 01430 000000      JMP PCFNT-1
40
41 01431 000000      JSR #ICMIF      PRINT CARRIAGE
42 01432 000000      LDA 1,FWPCT
43 01433 000000      JSR #IPDPC      PRINT VALUE
44 01434 000000      JSR #IMESS      INPUT X
45 01435 000000      PERCEX      1
46 01436 000000      JMP PCFNT-1
47
48 01443 000000 ADEX: LDA 2,SAV0      NORMAL EXIT, NO END
49 01444 000000      LDA 1,SAV1
50 01445 000000      LDA 0,SAV2
51 01446 000000      JMP #RETURN
52

```

10017 MAIN

```

01
02 01447 102401 SUB R,P,SKP
03 01450 000245 PCFNT: 245
04 01451 040734 STA R,ERRCT
05 01452 020741 CVCTS: LDA R,SAV0
06 01453 024737 LDA 1,SAV1
07 01454 030735 LDA 2,SAV2
08 01455 034731 LDA 3,ESWIT
09 01456 175004 MOV 3,3,SZR
10 01457 074477 READS 3
11 01458 062477 DJC R,CPII
12 01461 177113 ADDLM 3,3,SNC
13 01462 002732 JMP @LOOPR
14 01463 002725 JMP @RETURN
15
16
17 01464 054724 FRR1: STA 3,RETURN
18 01465 050724 STA 2,SAV2
19 01466 044724 STA 1,SAV1
20 01467 040724 STA 0,SAV0
21
22 01470 034716 LDA 3,ESWIT
23 01471 175005 MOV 3,3,SZR
24 01472 000407 JMP FRR1
25 01473 030716 FRR1: LDA 2,SAV2
26 01474 024716 LDA 1,SAV1
27 01475 020716 LDA 0,SAV0
28 01476 010711 ISZ FRRCT
29 01477 000401 JMP .+1
30 01500 002710 JMP @RETURN
31
32 01501 034707 FRR1: LDA 3,RETURN
33 01502 004404 JSR AUTOER
34 01503 054703 STA 3,ESWIT
35 01504 004417 JSR FPRINT
36 01505 000706 JMP FRET
37
38 01506 054414 AUTOER: STA 3,AA03
39 01507 024046 LDA 1,EGGS
40 01510 125004 MOV 1,1,SZR
41 01511 000405 JMP .+5
42 01512 024700 LDA 1,SAV1
43 01513 034075 LDA 3,RETURN
44 01514 063077 HALT
45 01515 002405 JMP @AA03
46 01516 004405 JSR FPRINT
47 01517 002077 IORST
48 01520 034052 LDA 3,EGGS+4
49 01521 001400 JMP R,3
50 01522 000000 .AA03: 0

```

```

1 CHARACTER
1 RESET ERROR COUNT
1 RESTORE ACS

```

```

1 I/O RESET
1 SWITCH 1
1 (1)=LOOP ROUTINE
1 (0)=PROCEED TO NEXT TEST

```

1 ERROR SUBROUTINE

1 RESTORE ACS

```

1 COUNT
1 ERRORS, I/O RESET
1 EXIT

```

```

1 ERROR, C(3)=PC
1 OPERATOR, SET SWITCH#1

```

1 GO TO PRINT ERROR DATA

10018 MAIN

```

01
02
03 01523 054403 FPRINT: STA 3,ESWIT
04 01524 006207 JSR @ICRLF
05 01525 006204 JSR @IMESS
06 01526 001535 HEADER
07 01527 022061 LDA 0,RETURN
08 01530 126002 ADD 1,1
09 01531 107000 ADD R,1
10 01532 006210 JSR @IPOCT
11 01533 002053 JMP @ESWIT
12 01534 000045 PERCENT: .TXT 1%
13 001535 HEADFR: .TXT 1
14 01535 041520 PC 1
15 000011
16 01537 040520 PASHFS: .TXTE 1PASS 1
17 051523
18 000240

```

```

1 ERROR MESSAGE PRINTED
1 PRINT CARRIAGE
1 AND HEADER

```

```

1 PC OF ERROR
1 RETURN TO CALL

```

10010 MAIN

```

01
02      ;PROCESSOR IDENTIFICATION SUBROUTINE. THIS SUBROUTINE
03      ;IS CALLED WHENEVER IT IS NECESSARY TO IDENTIFY
04      ;THE COMPUTER( IN WHICH THE PROGRAM RESIDES) FOR TIMING
05      ;PURPOSES. IT NORMALLY THE INTENT OF THE CALLING PROGRAM
06      ;TO USE THE PROCESSORS MEAN TIME BASE (FOR EXECUTING
07      ;SPECIFIC INSTRUCTIONS) AS A TIMING CALIBRATION FOR TIMING
08      ;OTHER PERIPHERAL CONTROL FUNCTIONS, ONCE THE PROCESSOR
09      ;HAS BEEN IDENTIFIED, THE PACKAGE LOADS AC1 WITH A CALI-
10      ;BRATION COUNT WHICH WOULD HAVE BEEN CALCULATED BY THE
11      ;FOLLOWING PROCEEDURE IF A MOOFL 33 OR 35 TTY WERE
12      ;USED FOR THE CONSOLE I/O DEVICE.
13
14      ;
15      ;      SUBR R.0
16      ;      DOAS 0,TT0
17      ;      SKPR7 TTD
18      ;      JMP .-1
19      ;      DOAS 0,TT0
20      ;      JSP 0,TIME
21      ;      SKPR7 TTD
22
23
24      ;      DELAY: LDA 0,0,3
25      ;              STA 0,0,0
26      ;              ADDU 0,0
27      ;              STA 0,TIMEY
28      ;              MOV 0,0
29      ;              INC 0,0,92C
30      ;              JMP 1,3
31      ;              0
32      ;              JMP .-4
33      ;              STA 0,TIMEY
34      ;              JMP 1,3
35
36      ;      TIME: DELAY
37
38      ;THE SUBROUTINE IS CALLED BY "TIMER", AND (C) AC1 IS SET TO
39      ;ZERO ON THE RETURN WHENEVER THE ATTEMPT TO IDENTIFY THE
40      ;PROCESSOR IS UNSUCCESSFUL.THEREFORE (C) AC1 SHOULD BE
41      ;CHECKED ON RETURN FOR THIS ERROR INDICATOR (AC1=0).

```

10020 MAIN

```

01
02 01542 054540 TIMER: STA 3,SVTIME
03 01543 020540 LDA 0,XYTIME
04 01544 040001 STA 0,01
05 01545 020537 LDA 0,XINST
06 01546 040020 STA 0,0V
07 01547 152440 SUBR 2,2
08 01550 050004 STA 0,24
09 01551 071111 DOAS 2,TT0
10 01552 063511 SKPR7 TTD
11 01553 000777 JMP .-1
12 01554 152440 TIME: SUBR 2,2
13 01555 141000 MOV 0,0
14 01556 026000 LDA 1,020
15 01557 125015 MOVW 1,1,SNR
16 01558 000527 JMP SCORE
17 01561 034450 LDA 3,0,SKP
18 01562 137400 AND 1,3
19 01563 175123 MOVZ1 3,3,SNR
20 01564 000403 JMP .+3
21 01565 175004 MOV 3,3,5ZR
22 01566 000411 JMP TIME
23 01567 044403 STA 1,0,3
24 01570 071111 DOAS 2,TT0
25 01571 151400 INC 2,2
26 01572 000704 0
27 01573 063511 SKPR7 TTD
28 01574 000777 JMP .-3
29 01575 052001 TIME: STA 2,021
30 01576 000740 JMP TIME
31 01577 044403 TIME: STA 1,0,3
32 01600 071111 DOAS 2,TT0
33 01601 151400 INC 2,2
34 01602 000000 0
35 01603 000401 JMP .+1
36 01604 063511 SKPR7 TTD
37 01605 000777 JMP .-4
38 01606 000747 JMP TIME
39
40 01607 000000 CRPNT: 0
41 01610 100000 7POINT: 00
42 01611 001573 INSWT: TIME+17
43

```

```

;GET ADDR OF TIME TABLE.
;STORE IN AUTO POINTER.
;GET ADDR OF INSTRUCTION TABLE.
;STORE IN AUTO POINTER.
;CLEAN AC2 AND
;INITIALIZE 24 FOR LDA INSTR.
;SEND CHARACTER
;TO SYNCHRONIZE PROGRAM
;WITH TTY CLOCK.
;CLEAR AC2
;CLEAR AC2 ALSO.
;GET INSTRUCTION FROM LIST.
;ZERO MARKS END OF INSTR. TABLE.

```

```

;GET ALC-SKP MASK AND
;AND WITH INSTRUCTION.
;CHK BIT 0, THE ALC BIT.
;BIT 0=0 MEANS NO ALC CODE.
;CHK 3 LSH'S FOR SKP CODE.
;FOUND ALC-SKP.
;STORE INSTR. IN TIME LOOP.
;SEND NULL CHARACTER.
;THESE *****
; INSTRUCTIONS*****
; FORM THE *****
; TIMING LOOP *****
;STORE COUNT INTO TIME TABLE.
;LOOP.
;STORE ALC-SKP INTO TIME LOOP.
;SEND NULL CHARACTER.
;THESE *****
; INSTRUCTIONS*****
; FORM THE *****
; TIMING *****
; LOOP *****
;FOR ALC-SKP INSTRUCTIONS.

```

10021 :MATH

```

01
02
03 01612 101000 INSTR: MOV R,R
04 01613 103000 ADD R,R
05 01614 103401 AND R,R,SKP
06 01615 020000 LDA R,R
07 01616 040000 STA R,R
08 01617 010415 ISZ Tyme
09 01620 000401 JMP INSTA
10 01621 004401 INSTAT JSR INSTR
11 01622 022000 INSTR: LDA R,R
12 01623 022004 LDA R,R+4
13 01624 022415 LDA R,R+Tyme+R
14 01625 060400 DIA R,R
15 01626 061000 DOA R,R
16 01627 061477 INTA R
17 01630 063400 SKPBN R
18 01631 060100 NIOS R
19 01632 000000 R
20 01633 100007 CSKP: 100007
21 01634 000000 Tyme: .BLK 20
22 01634 000000 ENTyme: R
23 01635 000000 .C20: 20
24 01636 000000 RANK: .BLK 20
25 01636 000000 FRANK: R
26 01637 000000 YX16: R
27
28 01700 000000 ORDINAL: R
29 01701 000000 FRFLG: R
30 01702 000000 SVTyme: R
31 01703 001633 YTYME: Tyme-1
32 01704 001611 XINST: INSTR-1
33 01705 001655 YRANK: RANK-1
34 01706 000000 RVTMP: R
35

```

THIS IS THE 14 INSTRUCTION
LIST, SELECTED TO DEVELOP
AN IDENTITY PROFILE OF THE
PROCESSOR IN THE COURSE OF
BEING EXECUTED.

END OF INSTRUCTION LIST MARKER.

END OF TIME LIST MARKER.

END OF RANK LIST MARKER.

10022 :MATH

```

01
02 01707 102520 SCORE: SUBZL R,R
03 01710 040770 STA R,ORDINAL
04 01711 020770 SCOR: LDA R,XTyme
05 01712 040001 STA R,21
06 01713 020742 LDA R,.C20
07 01714 040763 STA R,XX16
08 01715 022021 LDA R,R+21
09 01716 105720 MOV R,1
10 01717 022021 SCOR: LDA R,R+21
11 01720 106033 ADCZM R,1,SNR
12 01721 105700 MOV R,1
13 01722 014755 DSZ XX16
14 01723 004774 JMP SCOR
15
16
17 01724 125015 REVU: MOVW 1,1,SNR
18 01725 000433 JMP KEYS
19 01726 020755 LDA R,XTyme
20 01727 040757 STA R,RVTMP
21 01730 020755 LDA R,YRANK
22 01731 040022 STA R,22
23 01732 020723 LDA R,.C20
24 01733 040744 STA R,XX16
25 01734 010752 REVU: ISZ RVTMP
26 01735 022751 LDA R,RVTMP
27 01736 100415 SUBW R,1,SNR
28 01737 020414 JMP REVU
29 01740 101400 INC R,R
30 01741 100415 SUBW R,1,SNR
31 01742 020411 JMP REVU
32 01743 121400 INC R,R
33 01744 100415 SUBW R,1,SNR
34 01745 020406 JMP REVU
35 01746 022022 LDA R,R+22
36
37 01747 014730 REVU: DSZ XX16
38 01750 000764 JMP REVU
39 01751 010727 ISZ ORDINAL
40 01752 020737 JMP SCOR
41 01753 030725 REVU: LDA R,ORDINAL
42 01754 052022 STA R,22
43 01755 176440 SUBC 3,3
44 01756 050730 STA 3,RVTMP
45 01757 000770 JMP REVU
46

```

SET
THE ORDINAL COUNTER TO +1.
GET Tyme LIST INITIAL
ADDRESS FOR AUTO 21.
SET UP THE X16 COUNTER
WITH A COUNT OF 16 (DECML).
GET Tyme ENTRY AND
PUT IT INTO AC1 AS 1ST BIG Tyme.
CHECK MAGNITUDE OF 4V Tyme ENTRY.
SKIPS IF 0 < 1.
AC1 > 0? = AC1.
COUNT DOWN X16.
STILL MORE Tymes, SO LOOP.
REVIEW CLEARS ALL BIG Tymes (LOC'S
AC1) TO THE (C) OF ORDINAL COUNTER.
IF A SCORE PASS IS COMPLETED WITH
AC1=0, Tyme IS CLEAR, SO GO FOR KEY.
REINITIALIZE RVTMP WITH
1 Tyme -1.
INITIALIZE AUTO 20 WITH
RANK-1.
RESET X16 COUNTER
BACK TO 16 DECIMAL.
INC Tymes LIST POINTER.
GET Tyme ENTRY AND
COMPARE WITH LARGEST Tyme ENTRY.
IF ENTRY IS > BIG Tyme, STORE ORDINAL.
ADD +1 AND
COMPARE AGAIN WITH BIG Tyme.
IF ENTRY > BIG Tyme, STORE ORDINAL.
ADD +1 AND
COMPARE AGAIN WITH BIG Tyme.
IF ENTRY > BIG Tyme, STORE ORDINAL.
ENTRY OUT OF RANGE, INCRMT THE RANK
POINTER.
DECREMENT THE X16 COUNTER.
STILL MORE TIMES, SO LOOP.
INC ORDINAL COUNT.
GO TO SCOR TO FIND NX BIG Tyme.
GET ORDINAL COUNT
AND STORE IT IN PRESENT RANK LOC.
CLEARING AC3
CLEARS LOCATION IN Tyme LIST.

10023 MAIN

```

01
02
03 01760 020722 KEYS: LDA R,XRANK
04 01761 040722 STA 2,22
05 01762 120529 SURZI 1,1
06
07 01763 022022 KEYS: LDA R,022
08 01764 101223 MOVZP R,0,5NC
09 01765 002404 JMP KEYS
10 01766 125122 MOVZ 1,1,5ZC
11 01767 002405 JMP SESAME
12 01772 0024773 JMP KEYS
13 01771 125142 KEYS: MOVZ 1,1,5ZC
14 01772 002405 JMP SESAME
15 01773 0024773 JMP KEYS
16
17 01774 034413 SESAME: LDA 3,TUMBLER
18 01775 031404 LDA 2,0,3
19 01776 151115 MOVW 2,2,5NR
20 01777 002404 JMP SESOUT
21 02004 132435 SURZW 1,2,5NR
22 02001 003411 JMP 01,3
23 02002 175400 INC 3,3
24 02003 175400 INC 3,3
25 02004 0024771 JMP SESAME+1
26 02005 126440 SESOUT: SURZI 1,1
27 02006 002474 JMP #SVTIME
28
29 02007 022010 TUMBLER: LOCK
30 02010 064450 LOCK: R64450
31 02011 002023 MOVW
32 02012 016137 R16137
33 02013 002025 N1200
34 02014 034174 R34174
35 02015 002027 N000
36 02016 002544 R22544
37 02017 002031 SN0VA
38 02018 007120 R07120
39 02021 002033 SNVSC
40 02022 002000 R
41
42 02023 024412 MOVW: LDA 1,CNOVA
43 02024 002556 JMP #SVTIME
44 02025 024411 N1200: LDA 1,CN1200
45 02026 002554 JMP #SVTIME
46 02027 024410 N000: LDA 1,CN000
47 02028 002552 JMP #SVTIME
48 02031 024407 SN0VA: LDA 1,CNOVA
49 02032 002550 JMP #SVTIME
50 02033 024406 SNVSC: LDA 1,CNSVC
51 02034 002548 JMP #SVTIME
52
53 02035 012566 CNOVA: 5404.
54 02036 030442 CN1200: 12578.
55 02037 000000 CN000: 25000.
56 02040 000011 CSNOV: 16393.
57 02041 055327 CSNSC: 23255.

```

INITIALIZE RANK LIST
 INTO INC POINTER.
 INPUT A 1 IN BIT 15 AS END OF KEY NUMBER.

GET ORDINAL COUNT FROM RANK LIST.
 IF NO. IS ODD OR EVEN.
 EVEN
 ROTATE R INTO BIT 15 FOR ODD ORDINAL.
 ICARRY BIT SET MEANS END OF KEY.
 MORE-ON-KEY.
 ROTATE 1 INTO BIT 15 FOR EVEN ORDINAL.
 ICARRY SET MEANS END OF KEY.
 MORE-ON-KEY.

GET ADDR OF LOCK TABLE.
 GET KEY FROM TABLE.
 IF END OF TABLE MARK MEANS THE KEY
 FAILED TO FIND PROCESSOR IN THE TABLE.
 COMPARE KEY WITH LOCK ENTRY.
 IF HIT: GO POST CALLER. IN AC1.
 IF NOT HIT YET: DOUBLE INCREMENT
 TO NEXT LOCK ENTRY.
 IF AND LOOP.
 CLEAR AC1 AS KEY INDICATOR.
 AND RETURN TO PROGRAM.

NOVA KEY.
 NOVA EXIT.
 NOVA 1200 KEY.
 NOVA 1200 EXIT.
 NOVA 000 KEY.
 NOVA 000 EXIT.
 SUPERNOVA KEY.
 SUPERNOVA EXIT.
 SUPERNOVA SC KEY.
 SUPERNOVA SC EXIT.
 END OF TABLE.

10024 MAIN

```

01
02
03
04
05
06
07
08
09
10
11
12
13 02042 054470 MESS: STA 3,MESSR
14 02043 010471 IS7 MESSR
15 02044 031400 LDA 2,0,3
16 02045 024470 LDA 1,C377
17 02046 021200 LDA 0,0,2
18 02047 125112 MOVW 1,1,5ZC
19 02048 123701 ANDS 1,0,5XP
20 02049 123701 AND 1,0,5XP
21 02050 151400 INC 2,2
22 02051 124000 COM 1,1
23 02052 024464 JSR CHAW
24 02053 0024771 JMP MESS+4
25 02054 002454 JMP #MESS4
26
27 02057 020527 70CT: LDA 0,CH240
28 02058 101001 MOV 2,0,5XP
29
30 02061 020527 70CT: LDA 0,C0P
31 02062 030433 LDA 2,0CTAR
32 02063 002403 JMP +3
33 02064 030441 70CT: LDA 2,0CTAR
34 02065 020527 LDA 2,CH240
35 02066 034401 STA 3,RADREF
36 02067 040447 STA 0,ZSUPP
37 02068 030401 STA 2,-1
38 02071 002000 DECOCT: R
39 02072 010777 IS7 -1
40 02073 034444 LDA 3,RADREF
41 02074 020545 LDA 0,CH2AR
42 02075 151205 MOV 2,2,5NR
43 02076 020442 JMP CHAW
44 02077 034437 LDA 3,ZSUPP
45 02078 102400 SUR 0,0
46 02079 140512 DECOCT: SURW 2,1,5ZC
47 02080 002405 JMP DECP
48 02081 140400 SUR 2,1
49 02082 034404 LDA 3,C0P
50 02083 111400 INC 0,0
51 02084 020777 JMP DECOCT
52 02087 151235 DECP: MOVZP 2,2,5NR
53 02088 034400 LDA 3,C0P
54 02089 054425 STA 3,ZSUPP
55 02090 163030 ADD 3,0
56 02091 002425 JSR CHAW
57 02092 002455 JMP DECOCT
58

```

TO NON INTERRUPT PACKAGE
 MESS PRINTS ASCII MESSAGES AS SPECIFIED BY ASSEMBLER
 MCHAR PRINTS ASCII CHARACTER, C(0),C(1), MUST BE 0
 UNTIL RETURN +2 IF C(0)=0, CORRECTS THE PARITY, 33 SIMULATE
 MTYPE PRINTS C(0), MUST HAVE PROPER PARITY. RETURN IS
 TO CALL +1, REPLACE THIS ROUTINE WITH INTERRUPT TYPE IF DESIRED.
 MCRIF PRINTS A CARRIAGE RETURN
 MPOCT PRINTS C(1) IN OCTAL FOLLOWED BY A TAB
 MPOEC PRINTS C(1) IN DECIMAL, LEADING ZEROS SUPPRESSED,
 FOLLOWED BY A TAB.

PRINT A TEXT MESSAGE

IC(2) POINTS TO MESSAGE

IA 8 BIT MASK

IC(2)=DATA WORD

IC(0)=DATA CHARACTER RIGHT

INC TO NEXT WORD

FLIP MASK

PRINT

ANOTHER

LAST

PRINT C(1) IN OCTAL

PRINT C(1) IN DECIMAL

SUPPRESS LEADING ZEROS

BOTH ENTRIES PRINT NUMBER

THEN TAB TO NEXT POSITION

IA "LDA 2, TABLE" INSTRUCTION

SETUP "TAB" AT END

IF TABLE ENTRY=0

EXIT WITH TAB

IF ZEROS SUPPRESS STOP

FROM THE DIGIT

IC(0)=DIGIT

MAKE ASCII

PRINT

GET NEXT DIGIT

0025 .MAIN

```

01
02
03 02115 030425 OCTAR: LDA 2.,+1.,=DECOCT
04 02116 100000 100000
05 02117 010000 100000
06 02120 001000 100000
07 02121 000100 100000
08 02122 000010 100000
09 02123 000001 100000
10 02124 000000 100000
11
12 02125 030435 DECTAR: LDA 2.,+1.,=DECOCT
13 020012 .NDX 10
14 02126 023420 100000
15 02127 001750 100000
16 02130 000144 100000
17 02131 000012 100000
18 02132 000001 100000
19 02133 000000 100000
20 020010 .NDX 0
21
22 02134 000000 MESSR: 0
23 02135 000377 C377: 377
24 02136 000300 75UPP: 0
25 02137 000000 RANRET: 0
26
27 02140 054442 CHAR: STA 3,CHRET 1PRINT C(0) RIGHT
28 02141 121325 MOVZS 0,0,SNR 1RETURN +2 IF NULL
29 02142 001401 JMP 1,3
30 02143 040440 STA 0,CHSAV
31 02144 170000 ADC 3,3 1COMPUTE THE PARITY
32 02145 117000 ADD 0,3
33 02146 163404 AND 3,0,SNR
34 02147 000775 JMP 1,3 1COMPRIND PARITY WITH CHAR
35 02150 170000 SUBCR 3,3
36 02151 020432 LDA 0,CHSAV
37 02152 163300 ADDS 3,0
38
39 02153 034425 CHAR1: LDA 3,CHTAR 1IS THIS A TAR
40 02154 110405 SUB 0,3,SNR
41 02155 000403 JMP 1,3 1YES
42 02156 004433 JSR TYPE 1NO PRINT IT
43 02157 002423 JMP 0CHRET 1EXIT
44
45 02160 020424 LDA 0,CHORZ 1SIMULATE A TAR
46 02161 034424 LDA 3,CHAR7 1VIA 1 TO 0 SPACES
47 02162 117405 AND 0,3,SNR
48 02163 002417 JMP 0CHRET
49 02164 020422 LDA 0,CH240
50 02165 004424 JSR TYPE
51 02166 000772 JMP 1,0
52
53
54
55 02167 054420 CRLF: STA 3,CHLFR 1SAVE RETURN
56 02170 020410 LDA 0,C215
57 02171 004747 JSR CHAR 1PRINT CARRIAGE AND LF
58 02172 020405 LDA 0,C212
59 02173 004745 JSR CHAR
60 02174 102400 SUB 0,0

```

0026 .MAIN

```

01 02175 040407 STA 0,CHORZ 1CLEAR ORZ POSITION
02 02176 022411 JMP 0CRLF 1EXIT
03
04 02177 000212 C212: 212
05 02200 000215 C215: 215
06 02201 000211 CHTAR: 11
07 02202 000000 CHRET: 0
08 02203 000000 CHSAV: 0
09 02204 000000 CHORZ: 0
10 02205 000007 CHAR7: 7
11 02206 000040 CH240: 240
12 02207 000000 CRLF: 0
13 02210 000000 C00: 0

```

10027 .MAIN

```

01
02 02211 054443 TYPE1 STA 3.TYPRY
03 02212 074477 READS 3
04 02213 175130 MOVL 3.3
05 02214 177122 ADDZ1 3.3.SZC
06 02215 000421 JMP TYPE2
07 02216 061111 DOAS P.TTO
08 02217 063511 SKPH7 TTD
09 02218 020777 JMP -1
10 02219 000211 NINC TTD
11 02220 000414 JMP TYPE2
12 02221 034432 TYPE1: LDA 3.P.377
13 02222 175220 MOVZR 3.3
14 02223 163440 AND 3.0
15 02224 110243 ARCO 0.3.SNC
16 02225 034424 LDA 3.P.C40
17 02226 162432 SHRZM 3.0.SZC
18 02227 010753 IS7 CHORZ
19 02228 134417 LDA 3.P.C15
20 02229 110445 SHRO 0.3.SNR
21 02230 054750 STA 3.CHORZ
22 02231 002417 JMP 0.TYPRY
23 02232 175130 TYPE2: MOVL 3.3
24 02233 177103 ADDL 3.3.SNC
25 02234 000763 JMP TYPE1
26 02235 061117 DOAS 0.LPT
27 02236 063517 SKPH7 LPT
28 02237 000777 JMP -1
29 02238 060217 NINC LPT
30 02239 000755 JMP TYPE1
31 02240 000007 P.C7: 7
32 02241 000011 P.C11: 11
33 02242 000012 P.C12: 12
34 02243 000015 P.C15: 15
35 02244 000020 P.C20: 20
36 02245 000040 P.C40: 40
37 02246 000010 TYPRY: P
38 02247 000377 P.377: 377

```

1TYPE TYP C(0) IF
1SWITCH 2(0).

1YES GO TO LPT
1NO GO TO TTD

1SKIP NON-PRINTING CHAR

1CLR MORT POS

10028 .MAIN

```

01 02256 047503 .TXT /COPYRIGHT (C) DEC.1970,71,72,73,74,75,76
02 054520
03 044522
04 044107
05 020124
06 041450
07 020051
08 043514
09 020133
10 034441
11 030007
12 033454
13 026001
14 031067
15 033454
16 026003
17 032007
18 033454
19 026003
20 033007
21 02302 ALL RIGHTS RESERVED/
22 020114
23 044522
24 044107
25 051524
26 051000
27 051505
28 051105
29 040000
30 000104
31
32 02314 152322 DIRTY .TXTF IRTC TST 10:
33 120103
34 051724
35 121324
36 130600
37 000000
38 02302 000000 000000
39 02303 000000 000000
40 02304 000000 000000
41 02305 000010 000010
42 02306 000010 000000
43 02307 000000 000000
44 02308 000000 000000
45 02309 000014 000014
46
47 .END

```

000000 TOTAL ERRORS. PASS 1 ERRORS

RRPO .MATN

ARR	RRP5P2	5/27	15/20						
ARR	RRP5P6	5/12							
ARR	RRP512	5/17							
ARR	RRP521	5/25							
ARR	RRP527	6/02							
ARR	RRP535	6/00							
ARR	RRP545	6/18							
ARR	RRP554	6/26	6/40						
ARR	RRP577	7/02							
ARR	RRP604	7/08							
ARR	RRP615	7/14							
ARR	RRP626	7/24							
ARR	RRP635	7/36							
ARR	RRP642	7/42							
ARR	RRP651	8/02							
ARR	RRP661	8/11							
ARR	RRP671	8/24							
ARR	RRP701	8/20							
ARR	RRP710	8/37							
ARR	RRP725	9/02							
ARR	RRP741	9/15							
ARR	RRP755	9/28							
ARR	RRP770	9/40							
ARR	RRP1005	10/02							
ARR	RRP1016	10/12							
ARR	RRP1027	10/22							
ARR	RRP1177	13/11							
ARR	RRP1204	13/17							
ARR	RRP1215	14/02							
ARR	RRP1235	14/10							
ARR	RRP1257	14/30							
ARR	RRP1302	15/02							
ARR	RRP1326	15/23							
ARR	RRP1506	17/33	17/38						
ARR	RRP1504	4/06	4/48	5/04					
ARR	RRP2002	4/46	4/48						
ARR	RRP0070	4/30	11/16						
ARR	RRP0076	4/36	14/14						
ARR	RRP0077	4/37	14/31						
ARR	RRP0086	4/28	14/32						
ARR	RRP2177	25/58	26/04						
ARR	RRP2200	25/56	26/05						
ARR	RRP2064	4/26	11/10						
ARR	RRP2135	24/16	25/23						
ARR	RRP0064	4/22	8/41	9/42					
ARR	RRP0054	4/14	14/40	15/16	15/36				
ARR	RRP2210	24/30	24/40	24/53	26/13				
ARR	RRP0067	4/29	11/15						
ARR	RRP0061	4/23	10/34	11/13	13/09	14/11	14/28	14/46	
ARR		15/13	15/33						
ARR	RRP2206	24/27	24/34	25/40	26/11				
ARR	RRP2140	4/53	24/23	24/43	24/56	25/27	25/57	25/59	
ARR	RRP2153	25/39							
ARR	RRP2205	25/46	26/10						
ARR	RRP2204	25/45	26/01	26/09	27/10	27/21			
ARR	RRP2202	25/27	25/43	25/48	26/07				
ARR	RRP2203	25/30	25/36	26/08					
ARR	RRP2201	24/41	25/39	26/05					
ARR	RRP0075	4/35	14/13	14/30	14/48	15/15	15/35		

RRPO .MATN

RRPNT	RRP1007	20/41							
RRPNT	RRP271	4/31	11/23	11/28					
RRPNT	RRP236	23/44	23/54						
RRPNT	RRP237	23/46	23/55						
RRPNT	RRP576	6/27	6/44						
RRPNT	RRP235	23/42	23/53						
RRPNT	RRP2167	4/32	4/55	25/55					
RRPNT	RRP2207	25/55	26/02	26/12					
RRPNT	RRP1633	23/17	21/20						
RRPNT	RRP2042	23/48	23/54						
RRPNT	RRP2041	23/50	23/57						
RRPNT	RRP1415	4/22	16/23						
RRPNT	RRP1452	16/28	17/05						
RRPNT	RRP2071	24/38	24/57	25/03	25/12				
RRPNT	RRP2101	24/46	24/51						
RRPNT	RRP2127	24/47	24/52						
RRPNT	RRP2125	24/33	25/12						
RRPNT	RRP1154	4/24	12/26						
RRPNT	RRP2314	4/03	28/32						
RRPNT	RRP1143	12/16	12/21						
RRPNT	RRP2201	4/45	28/39						
RRPNT	RRP2046	4/09	4/10	15/50	15/53	15/55	15/56	17/39	
RRPNT		17/48							
RRPNT	RRP2057	4/30	5/09	5/14	5/22	5/29	6/06	6/15	
RRPNT		6/21	6/36	7/25	7/15	7/25	7/33	7/39	
RRPNT		7/47	8/08	8/17	8/26	8/34	8/48	9/12	
RRPNT		9/25	9/37	9/51	10/09	10/19	10/28	11/24	
RRPNT		13/14	13/24	14/16	14/35	14/53	15/22	15/40	
RRPNT	RRP1676	21/25							
RRPNT	RRP1373	4/10	16/03						
RRPNT	RRP1654	21/22							
RRPNT	RRP1523	17/35	17/46	18/23					
RRPNT	RRP0057	4/21	4/38						
RRPNT	RRP1473	17/25	17/36						
RRPNT	RRP1701	21/24							
RRPNT	RRP1464	4/21	17/17						
RRPNT	RRP1521	17/24	17/32						
RRPNT	RRP1407	16/09	16/16	16/42	17/04	17/28			
RRPNT	RRP1406	16/08	16/15	16/33	17/08	17/22	17/34	18/03	
RRPNT		18/11							
RRPNT	RRP1243	11/02							
RRPNT	RRP1065	11/20	11/30						
RRPNT	RRP1535	18/06	18/13						
RRPNT	RRP1077	11/27	11/32						
RRPNT	RRP0001	4/47	16/04						
RRPNT	RRP0005	4/53							
RRPNT	RRP2007	4/55	15/45	16/41	18/04				
RRPNT	RRP1137	4/35	12/12						
RRPNT	RRP2004	4/52	15/46	16/44	18/05				
RRPNT	RRP1021	21/09	21/10						
RRPNT	RRP1022	21/10	21/11						
RRPNT	RRP1612	21/03	21/32						
RRPNT	RRP1611	20/42							
RRPNT	RRP211	4/57	15/49	16/43					
RRPNT	RRP213	4/56	18/10						
RRPNT	RRP1237	12/31							
RRPNT	RRP1404	16/05	16/13	16/32					
RRPNT	RRP1405	16/06	16/14	16/27	16/31				

0032 ,MAIN

	7/42	8/02	8/11	8/20	8/29	8/37	9/23
	9/15	9/20	9/29	10/02	10/12	10/22	11/02
	13/11	13/17	14/22	14/10	14/19	15/02	15/23
SNOWA 002031	23/37	23/44					
SNVSC 002033	23/30	23/30					
SVTIM 001702	20/02	21/30	23/27	23/43	23/45	23/47	23/49
	23/51						
TIMA 001554	20/12	20/30	20/42				
TIME 001577	20/22	20/31					
TIME 001575	20/29	20/38					
TIME 000062	4/24	5/19	5/11	7/13	7/20	7/30	7/44
	8/04	8/13	8/22	8/45	9/07	9/22	9/31
	9/46	10/06	10/15	10/25	11/08	13/27	14/09
	14/26	14/44	15/11	15/31			
TIMER 001542	4/25	20/02					
TIMEY 000045	4/27	11/11	12/29	12/35	14/12	14/29	14/47
	15/14	15/34					
TUMHI 002007	23/17	23/29					
TYME 001634	21/08	21/13	21/21	21/31			
TYPE 002211	4/54	25/42	25/50	27/02			
TYPE1 002223	27/12	27/25	27/38				
TYPE2 002236	27/06	27/11	27/23				
TYPHF 002254	27/02	27/22	27/37				
WHN 000063	4/25	10/31					
YDITV 001140	11/14	12/13					
YICHI 000072	4/32	11/25					
YIMFS 000074	4/34	11/26					
YINST 001704	23/05	21/32					
YIPHF 000073	4/33	11/29					
YDRGF 000575	6/25	6/28	8/38	6/43			
YRANK 001705	21/33	22/21	23/03				
YTYMF 001703	20/03	21/31	22/04	22/19			
YX14 001301	13/21	14/57					
YX15 001077	21/26	22/07	22/13	22/24	22/37		
ZOFT 002057	24/27						
ZPNTA 001610	22/41						
ZSIPP 002130	24/30	24/44	24/54	25/24			
ZAAV3 001522	17/30	17/45	17/53				
ZC23 001655	21/23	22/06	22/20				