```
;*****************************************************************
; CTTY.SR                                    PART NUMBER: 094-000302
;
;DESCRIPTION: CASSETTE TELETYPE TEST
;
; REVISION HISTORY:
;
;        REV.            DATE
;
;        00              09/01/72
;        01              08/23/74
;                        01/10/75
;
;
; COP   YRIGHT (C) DATA GENERAL CORPORATION, 1972, 1974,1975
; ALL   RIGHTS RESERVED.
;*****************************************************************
```

```
^ 0002  .MAIN

          ;                     CASSETTE TELETYPE TEST

          ;*****  AUTO-RUN AUTO-LOAD MODIFIED 2/10/72

          ;1.     ABSTRACT
          ;          TELETYPE TEST IS A MAINTENANCE PROGRAM DESIGN
          ;          TO DETECT MALFUNCTIONS IN THE TELETYPE LOGIC,
          ;          INTERRUPT SYSTEM, AND THE I/O BUS LOGIC. THE
          ;          PROGRAM MAY BE USED TO TEST TELETYPE MODELS
          ;          4010A-B-C AND 4023B. THE PROGRAM CONTAINS
          ;          ROUTINES TO PUNCH AND READ RANDOM DATA, ECHO
          ;          TYPED KEYS, PUNCH FROM THE SWITCH REGISTER, E

          ;2.     MACHINE REQUIREMENTS
          ;2.1       NOVA FAMILY PROCESSOR
          ;2.2       2K READ/WRITE MEMORY
          ;2.3       TELETYPE

          ;3.     SWITCH SETTINGS
          ;3.0       000005     =NEW DEVICE CODE STARTING ADDRESS
          ;3.1       000400     =DIAGNOSTIC STARTING ADDRESS
          ;3.2       000401     =PRINT C(SWITCHS)R ON TELETYPE
          ;3.3       000402     =ECHO TYPED INPUT
          ;3.4       000403     =PRINT CHARACTOR SET
          ;3.5       000404     =PUNCH AND READ RANDOM DATA
          ;3.6       000405     =PUNCH AND READ COUNTER
          ;3.7       SWITCH 0(1) =PROCEED FROM A ERROR
          ;3.8       SWITCH 1(1) =SET FOR TELETYPES WITHOUT READER
          ;3.9       SWITCH 2(1) =DON'T CHECK KEYBOARD PARITY

          ;4.     OPERATING PROCEDURE
          ;4.0       LOAD THE PROGRAM VIA THE BINARY LOADER, USE
          ;          THE HIGH SPEED READER IF AVAILABLE.

          ;4.1       IF THE DEVICE CODES OF THE UNIT UNDER
          ;             TEST ARE NOT 10 AND 11; ENTER THE EVEN NU
          ;             IN LOCATION 000004, AND START AT 000005.
          ;             THE PROGRAM WILL MODIFY ITSELF AND HALT
          ;             READY FOR THE NEXT STEP.

          ;4.2       TESTING A ASR33 TELETYPE
          ;4.2.1        SET THE TELETYPE TO THE LOCAL POSITION
          ;4.2.2        PRESS THE TAPE PUNCH ON BUTTON
          ;4.2.3        PRESS THE "HERE IS" KEY. THE PUNCH SHOULD
          ;             FEED BLANK TAPE.
          ;4.2.4        PRESS THE "REPT" KEY, THEN THE "RUB OUT"
          ;             KEY. EXAMINE THE TAPE FOR ALL HOLES .
          ;4.2.5        PERFORM THE ABOVE TWO STEPS UNTILL ABOUT
          ;             18 INCHES OF TAPE HAVE BEEN PUNCHED.
          ;4.2.6        SET THE TELETYPE SWITCH TO LINE.
          ;4.2.7        PLACE THE END OF THE PUNCHED TAPE IN THE
          ;             READER. A TAPE LOOP ABOUT ONE FOOT LONG
          ;             IS THUS FORMED BETWEEN THE READER AND
          ;             THE PUNCH.
          ;4.2.8        SET THE READER SWITCH TO THE START POSITI
```

```
01
02              /4,2,9          SET THE SWITCH REGISTER TO 000400
03              /4,2,10         PRESS START
04              /4,2,11         THE PROGRAM WILL RUN UNTILL MANUALLY
05              /               STOPPED OR A ERROR IS DETECTED, THE WORD
06              /               "PASS" WILL BE PRINTED AT THE END OF EACH
07              /               PASS, OTHER INDETERMINATE CODES WILL ALSO
08              /               BE PRINTED,
09
10              /4,2,12         WHEN THE PROGRAM HAS COMPLETED SEVERAL
11              /               PASSES SET THE DATA SWITCHES TO 000403,
12              /4,2,13         PRESS RESET
13              /4,2,14         SET THE READER SWITCH TO FREE,
14              /4,2,15         PRESS THE PUNCH OFF BUTTON
15              /4,2,16         PRESS START
16              /4,2,17         A SUBSET OF THE ASCII CHARACTOR SET WILL
17              /               BE PRINTED, THE SET BEGINS WITH THE SEQ-
18              /               UENCE "MMM" TO PERMIT CARRIAGE RETURN
19              /               ADJUSTMENTS ON A WIDE LETTER,
20              /4,2,18         AFTER SEVERAL LINES HAVE BEEN PRINTED
21              /               PRESS RESET AND EXAMINE THE PRINTED DATA,
22              /4,2,19         SET THE DATA SWITCHES TO 000402
23              /4,2,20         PRESS START
24              /4,2,21         STRIKE EACH KEY ON THE KEYBOARD AND CHECK
25              /               TO INSURE THAT IT IS ECHOED PROPERLY,
26              /4,2,22         SET THE DATA SWITCHES TO 000404
27              /4,2,23         PRESS RESET,
28              /4,2,24         REMOVE THE PUNCHED TAPE FROM THE
29              /               READER AND PUNCH,
30              /4,2,25         PRESS THE PUNCH ON BUTTON
31              /4,2,26         PRESS START
32              /4,2,27         INSERT THE LEADER OF ALL ZEROS INTO
33              /               THE READER,
                /4,2,28         SET THE READER SWITCH TO START,
                /4,2,29         THE PROGRAM SHOULD PUNCH AND READ RANDOM
                /               DATA UNTILL MANUALLY STOPPED OR A ERROR
                                IS DETECTED,
                        TELETYPES WHICH DO NOT CONTAIN THE READER AND
                        PUNCH OPTIONS MAY BE TESTED BY SETTING DATA
                        SWITCH 1(1) AND OMITTING THOSE STEPS PERTAIN-
                        ING TO THE READING AND PUNCHING OF TAPE,

                    PROGRAM OUTPUT/ERROR DESCRIPTION
                            ERROR IS DETECTED BY THE DIAGNOSTIC
                                IL HALT AT LOCATION ERR+6,
                                    AIN THE ADDRESS OF THE

                                        TO DETERMINE THE CAUSE

                                          CAUSE THE PROGRAM
                                            SUITABLE FOR SCOPING,
                                              CAUSE THE PROGRAM

                                                OUTINES OTHER
                                                HE LISTING FOR
```



```
01
02              /5,3            PUNCH SWITCHES ROUTINE (START ADDRESS 401)
03              /               THIS ROUTINE MAY BE USED FOR SCOPING THE
04              /               TELETYPE OUTPUT LOGIC, THE ROUTINE TRANS-
05              /               MITTS A CHARACTOR  INDEPENDENT
06              /               OF THE TELETYPE BUSY OR DONE FLAG, THE
07              /               CHARACTOR TRANSMITTED IS A FUNCTION OF THE
08              /               RIGHT HALF DATA SWITCHES,
09              /5,4            TERMINATING A LINE INPUTTED IN THE ECHO
10              /               TEST WITH "CTRL Z" WILL CAUSE THE LINE TO
11              /               BE REPEATED UNTILL ANOTHER KEY IS STRUCK,
12              /               THIS PERMITS SPECIAL CODE COMBINATIONS,
13              /               FOR MECHANICAL ADJUSTMENTS, TO BE TYPED,
14
15              /6,     PROGRAM DESCRIPTION/THEORY OF OPERATION
16              /6,1        TELETYPE DIAGNOSTIC (START ADDRESS 400)
17              /           THIS ROUTINE WILL TEST THE TELETYPE INTER-
18              /           FACE LOGIC, THE ROUTINE WILL ALSO TEST
19              /           INPUT-OUTPUT BUS AND INTERRUPT LOGIC
20              /           CONTAINED IN THE CPU, AT THE END OF EACH
21              /           PROGRAM PASS THE WORD PASS IS PRINTED,
22              /           IF AFTER A FEW MINUTES THE WORD PASS IS
23              /           NOT PRINTED THE PROGRAM MAY BE IN A LOOP
24              /           OR THERE MAY BE A TELETYPE MALFUNCTION,
25              /6,2        PUNCH SWITCHES (START ADDRESS 401)
26              /           THE PUNCH SWITCHES ROUTINE PERMITS THE
27              /           OPERATOR TO SCOPE THE TELETYPE OUTPUT
28              /           LOGIC, THE ROUTINE ISSUES A I/O RESET
29              /           PULSE, SENDS THE CONTENTS OF THE SWITCHES
30              /           RIGHT HALF, WAITS , AND ITERATES THE
31              /           SEQUENCE,
32              /6,3        ECHO TEST (START ADDRESS 402)
33              /           THE ECHO TEST PROVIDES A MEANS OF DETER-
34              /           MINING IF THE CODES PRODUCED BY THE KEY-
35              /           BOARD ARE CORRECT, WHEN THE OPERATOR STRIKES
36              /           A KEY THE PROGRAM RECEIVES THE CHARACTOR AND
37              /           CHECKS IT FOR EVEN PARITY.... THE CHARAC-
38              /           TOR IS STORED IN A BUFFER AND ECHOED BACK
39              /           TO THE OPERATOR, IF A TAB HAS BEEN TYPED
40              /           A RUBOUT IS ALSO ECHOED, THE OPERATOR MUST
41              /           CHECK THE CHARACTOR PRINTED TO BE THE SAME
42              /           AS THE KEY DEPRESSED, WHEN THE CARRIAGE
43              /           RETURN KEY IS STRUCK THE PROGRAM CLEARS
44              /           THE BUFFER AND ECHOES A CARRIAGE RETURN
45              /           LINE FEED SEQUENCE, IF THE OPERATOR TERMIN-
46              /           ATES A LINE WITH A "CTRL Z" KEY THE PROGRAM
47              /           WILL INSERT A CARRIAGE RETURN AND ECHO THE
48              /           LINE UNTILL ANOTHER KEY IS STRUCK,
```

```
▲ 0005  .MAIN
01
02
03                /          THE CHARACTER IS READ IN THROUGH EACH
04                /          MEMORY BOARD IN THE SYSTEM, THESE CHARACTERS
05                /          ARE CHECKED WITH THE CHARACTER READ VIA
06                /          MEMORY MODULE 0, THE CHARACTER ECHOED IS
07                /          SEQUENCED THROUGH EACH MEMORY IN THE SYSTEM,
08                /          THUS IF EVERY THIRD CHARACTER IN A 12K
09                /          SYSTEM FAILS TO ECHO PROPERLY THE MEMORY IS
10                /          AT FAULT.
11                /5.4       PRINT CHARACTOR SET (START ADDRESS 403)
12                /          A PORTION OF THE ASCII CHARACTOR SET IS
13                /          REPEATLY TYPED.
14                /5.5       PUNCH AND READ RANDOM (START ADDRESS 464)
15                /          THIS IS THE PRIME TEST OF  THE TELETYPE
16                /          READER AND PUNCH IN FULL DUPLEX OPERATION,
17                /          THE MSKO INSTRUCTION AND THE INTERRUPT SYS-
18                /          TEM ARE USED TO PROVIDE RANDOM START-STOP
19                /          SEQUENCES TO THE READER AND PUNCH, THE DATA
20                /          PUNCHED IS EVEN PARITY,,, RANDOM NUMBERS,
21                /5.6       PUNCH AND READ COUNT (START ADDRESS 465)
22                /          THIS TEST IS SIMULAR TO THE PREVIOUS TEST
23                /          EXCEPT THAT A COUNT PATTERN IS USED.
24
25                /7         RESTRICTIONS/MISC
26                /7.1           THE DIAGNOSTIC ROUTINE WILL PRINT VARIOUS
27                /              INDETERMINATE CHARACTORS.
28
29
```

```
▲ 0006  .MAIN
01
02          000001 .LOC 1
03 00001 000662            INTR            /INTERRUPT SERVICE ADDRESS
04
05          000004 .LOC 4
06 00004 000010 XSAV:      10              /DEVICE CODE
07 00005 002006            JMP @.+1
08 00006 000400            START
09          000045         .LOC 45
10 00045 002741            EGGS
11
12 00046 050010 CDVCD:     050010
13 00047 000010 DVCD:      10
14 00050 050010 C50K:      050010
15 00051 000400 FIRST:     START
16 00052 003275 LAST:      C212
17 00053 000000 DEVRET:    0
18 00054 160077 CIOT:      160077
19 00055 177700 M100:      -100
20 00056 177634 CM100:     -144
21 00057 100004 IND4:      #4
22 00060 003010 ER:        ERR
23          000060 EMALT=JSR @ER
24
25 00061 002774 .E:        ENTER
26          000061 SETUP=JSR @.E
27 00062 003047 .C:        CYCLE
28          000062 LOOP=JSR @.C
29 00063 002762 .T:        TIMER
30          000063 TIME=JSR @.T
31 00064 000040 K40:       40
32 00065 000000 TEM:       0
33 00066 000077 K77:       77
34 00067 001065 TTY...:    TTY00
35 00070 000000 TIMEX:     0
36 00071 000000 PASS:      0
37 00072 000776 MAINR:     MAIN
38 00073 000777 MAINC:     MAIN+1
39 00074 003121 ALPHA:     ALPH
40 00075 001063 BEG:       BEGIN
41 00076 000000 SAV0:      0
42 00077 000000 SAV1:      0
43 00100 000000 SAV2:      0
44 00101 000000 SAV3:      0
45 00102 000000 SAVC:      0
46 00103 000011 T94A:      .TTO
47 00104 000011 TIO:       .TTO
48 00105 000010 TIOX:      .TTI
49 00106 000000 TINCH:     0
50 00107 135525 C1355:     135525
51 00110 000000 RANI:      0
52 00111 000000 BROKEN:    0
53 00112 000000 ICTR:      0
54 00113 000000 CRA:       0
55 00114 001040 RAND:      XRAND
56 00115 000000 OCTR:      0
```

```
▲ 0007  .MAIN
01
02 00116 000000 RAND:   0
03 00117 000100 LT:     100
04 00120 000000 TYD:    0
05 00121 000000 TIMDEL: 0
06 00122 000004 C4:     4
07 00123 000177 C177:   177
08 00124 000000 MESSR:  0
09 00125 000377 C377:   377
10 00126 000015 CR15:   15
11 00127 000215 C215:   215
12 00130 000012 C12:    12
13 00131 004000 C4000:  4000
14 00132 000662 CINTR:  INTR
15 00133 003404 CTABL:  TABLE+100
16 00134 003304 CTABF:  TABLE
17 00135 000000 CNTR:   0
18 00136 000032 C232:   32
19 00137 020000 C20K:   20000
20 00140 003113 ICRLF:  CRLF
21 00141 003070 IMESS:  MESS
22 00142 000010 C10:    10
23 00143 000011 C11:    11
24 00144 000011 U20A:   11
25 00145 000465 SWIT:   SWITCH
26 00146 000402 K402:   402
27 00147 000477 ECH:    ECHO
28       000011 .TTO=11
29       000010 .TTI=10
30
31 00150 030045 HERE:   LDA 2,45
32 00151 025000         LDA 1,0,2
33 00152 125005         MOV 1,1,SNR
34 00153 002075         JMP @BEG
35 00154 025001         LDA 1,1,2
36 00155 020142         LDA 0,C10
37 00156 106415         SUB# 0,1,SNR
38 00157 002075         JMP @BEG
39 00160 044004         STA 1,XSAV
40 00161 002162         JMP @.+1
41 00162 000406         START
```

```
▲ 0008  .MAIN
01
02       000400         .LOC 400
03
04 00400 002075         JMP @BEG        ;DIAGNOSTIC
05 00401 002145         JMP @SWIT       ;PRINT FROM SWITCHES
06 00402 002147         JMP @ECH        ;ECHO INPUT
07 00403 002074         JMP @ALPHA      ;PRINT CHARACTER SET
08 00404 002072         JMP @MAINR      ;RANDOM READ/PUNCH
09 00405 002073         JMP @MAINC      ;COUNTER READ/PUNCH
10
11 00406 030004 START:  LDA 2,XSAV
12 00407 151400         INC 2,2
13 00410 024050         LDA 1,C60K
14 00411 125400         INC 1,1
15 00412 044046         STA 1,CDVCD
16 00413 050144         STA 2,U20A
17 00414 050103         STA 2,T94A
18 00415 050104         STA 2,TIO
19 00416 050047         STA 2,DVCD
20 00417 004422         JSR DEVCD       ;CHANGE THE .TTO DEVICE CODES
21
22 00420 024050         LDA 1,C60K
23 00421 044046         STA 1,CDVCD
24 00422 030004         LDA 2,XSAV
25 00423 050105         STA 2,TIOX
26 00424 050047         STA 2,DVCD
27 00425 004414         JSR DEVCD       ;CHANGE THE .TTI DEVICE CODES
28
29 00426 024055         LDA 1,M100
30 00427 020050         LDA 0,C60K      ;CHANGE CONSTANTS FOR NEXT RUN.
31 00430 123400         AND 1,0
32 00431 024047         LDA 1,DVCD
33 00432 123000         ADD 1,0
34 00433 040050         STA 0,C60K
35 00434 030045         LDA 2,45
36 00435 025000         LDA 1,0,2
37 00436 125005         MOV 1,1,SNR
38 00437 063077         HALT
39 00440 002075         JMP @BEG
40
41 00441 054053 DEVCD:  STA 3,DEVRET
42 00442 030051         LDA 2,FIRST     ;FIX DEVICE CODE
43 00443 021000         LDA 0,0,2
44 00444 024054         LDA 1,CIOT
45 00445 123400         AND 1,0
46 00446 024046         LDA 1,CDVCD     ;060010 INITIAL VALUE
47 00447 106415         SUB# 0,1,SNR
48 00450 000406         JMP DEVC2       ;A .TTX INSTRUCTION
```

```
▲ 0009  .MAIN
01
02 00451 151400 DEVC1:  INC 2,2
03 00452 020852          LDA 0,LAST
04 00453 112414          SUB# 0,2,SZR
05 00454 000767          JMP DEVCD+2
06 00455 002053          JMP @DEVRET
07 00456 021000 DEVC2:   LDA 0,0,2        ;CHANGE INSTRUCTION
08 00457 024055          LDA 1,M100
09 00460 123400          AND 1,0          ;MASK DEVICE CODE
10 00461 024047          LDA 1,DVCD
11 00462 123000          ADD 1,0          ;NEW DEVICE CODE
12 00463 041000          STA 0,0,2
13 00464 000765          JMP DEVC1
14
15 00465 062677 SWITCH:  IORST            ;TYPE FROM SWITCHES
16 00466 102400          SUB 0,0
17 00467 060000          NIO 0
18 00470 060000          NIO 0
19 00471 063600          SKPDN 0          ;DELAY ABOUT 102 MS
20 00472 101404          INC 0,0,SZR
21 00473 000774          JMP .-4
22 00474 074477          READS 3
23 00475 075111          DOAS 3,.TTO      ;SEND C(SWITCH)R TO
24 00476 000770          JMP SWITCH+1     ;THE TELETYPE.
25
26 00477 060277 ECHO:    INTDS
27 00500 000140          JSR @ICRLF       ;ECHO ON OUTPUT THE
28 00501 030133          LDA 2,CTABL      ;CHARACTORS RECEIVED
29 00502 034134          LDA 3,CTABF      ;ON INPUT.
30 00503 102400          SUB 0,0
31 00504 041400          STA 0,0,3
32 00505 175400          INC 3,3
33 00506 156414          SUB# 2,3,SZR
34 00507 000775          JMP .-3
35 00510 030134          LDA 2,CTABF
36 00511 040135          STA 0,CNTR       ;SET COUNTER TO 0
37
38 00512 004436 ECHO1:   JSR TIN          ;LOOK FOR INPUT
39 00513 024126          LDA 1,CR15
40 00514 106405          SUB  0,1,SNR
41 00515 000762          JMP ECHO         ;CARRIAGE TYPED
42 00516 024136          LDA 1,C232
43 00517 106414          SUB# 0,1,SZR
44 00520 000407          JMP ECHO3        ;STORE THE CHARACTOR
45
46 00521 000140 ECHO2:   JSR @ICRLF       ;CNTL Z TYPED
47 00522 063710          SKPDZ .TTI       ;KEEP SENDING THE
48 00523 000423          JMP ECHO4        ;LINE TYPED UNTILL
49 00524 000141          JSR @IMESS       ;A KEY IS STRUCK.
50 00525 003304          TABLE
51 00526 000773          JMP ECHO2
52
53
```

```
▲ 0010  .MAIN
01 00527 024125 ECHO3:   LDA 1,C377       ;STORE THE CHARACTOR
02 00530 030135          LDA 2,CNTR
03 00531 010135          ISZ CNTR
04 00532 034134          LDA 3,CTABF      ;BEGIN OF TABLE
05 00533 151225          MOVZR 2,2,SNC
06 00534 123401          AND 1,0,SKP
07 00535 123700          ANDS 1,0
08 00536 157000          ADD 2,3
09 00537 025400          LDA 1,0,3
10 00540 107000          ADD 0,1
11 00541 045400          STA 1,0,3
12 00542 030133          LDA 2,CTABL
13 00543 156414          SUB# 2,3,SZR     ;CHECK FOR
14 00544 000746          JMP ECHO1        ;BUFFER FULL
15 00545 000732          JMP ECHO
16 00546 060210 ECHO4:   NIOC .TTI
17 00547 000730          JMP ECHO
18
19 00550 054456 TIN:     STA 3,TINRET     ;INPUT A CHARACTER FROM
20 00551 063610          SKPDN .TTI       ;THE KEYBOARD.
21 00552 000777          JMP .-1
22 00553 102460          SUBC 0,0
23 00554 062077          MSKO 0
24 00555 061477          INTA 0
25 00556 101005          MOV 0,0,SNR
26 00557 063077          HALT             ;TTI DONE FAILS TO GIVE D.C.
27
28 00560 060610 .TIN1:   DIAC 0,.TTI      ;CHARACTER TO C(AC0).
29 00561 063710          SKPDZ .TTI       ;TEST RESET TO DONE FLOP.
30 00562 063077          HALT
31 00563 040444          STA 0,MEM0
32 00564 152400          SUB 2,2
33 00565 050443          STA 2,MEMNEX
34 00566 024443 .TIN2:   LDA 1,K10K       ;TRY TO FIND ANOTHER
35 00567 030441          LDA 2,MEMNEX     ;MEMORY MODULE.
36 00570 133000          ADD 1,2
37 00571 050437          STA 2,MEMNEX
38 00572 020766          LDA 0,.TIN1
39 00573 041002          STA 0,2,2
40 00574 025002          LDA 1,2,2
41 00575 151113          MOVL# 2,2,SNC
42 00576 106414          SUB# 0,1,SZR
43 00577 000410          JMP .TIN3        ;LAST MEMORY
44 00600 020432          LDA 0,K14M       ;STORE A RETURN,
45 00601 041003          STA 0,3,2        ;EXECUTE A "DIA" IN
46 00602 003002          JSR 2,2          ;THE MEMORY SPECIFIED
47 00603 024424          LDA 1,MEM0       ;BY C(AC2). AC0=RESULT
48 00604 106414          SUB# 0,1,SZR     ;C(AC1)=RESULT FROM DIA
49 00605 063077          HALT             ;IN MEMORY 0. CHECK
50 00606 000760          JMP .TIN2        ;MULTX SWITCH IN MEMORY.
51
52
```

```
▲ 0011  .MAIN
01
02 00607 024422 .TIN3:  LDA 1,K10K      ;THE INPUT CHARACTER
03 00610 030423         LDA 2,MEMECH    ;IS ECHOED FROM OTHER
04 00611 133001         ADD 1,2,SKP     ;MEMORY MODULES.
05 00612 152400 .TIN4:  SUB 2,2
06 00613 050420         STA 2,MEMECH
07 00614 020420         LDA 0,KDOAS
08 00615 041002         STA 0,2,2       ;STORE A DOAS INSTRUCTION.
09 00616 025002         LDA 1,2,2
10 00617 106414         SUB# 0,1,SZR
11 00620 000772         JMP .TIN4       ;BACK TO MODULE 0
12 00621 020411         LDA 0,K14H
13 00622 041003         STA 0,3,2
14 00623 020404         LDA 0,MEM0
15 00624 005002         JSR 2,2         ;GO DO A DOAS INSTRUCTION.
16 00625 000410         JMP .TIN5
17
18 00626 000000 TINRET: 0
19 00627 000000 MEM0:   0
20 00630 000000 MEMNEX: 0
21 00631 010000 K10K:   10000
22 00632 001400 K14H:   1400
23 00633 000000 MEMECH: 0
24 00634 061111 KDOAS:  DOAS 0,.TTO
25 00635 111020 .TIN5:  MOVZ 0,2
26 00636 126000         ADC 1,1
27 00637 147000         ADD 2,1
28 00640 133404         AND 1,2,SZR
29 00641 000775         JMP .-3
30 00642 024137         LDA 1,C20K      ;LOOK AT SWITCH 2
31 00643 070477         READS 2
32 00644 133404         AND 1,2,SZR
33 00645 000403         JMP .+3         ;DONT CHECK PARITY.
34 00646 101012         MOV# 0,0,SZC    ;C(0)=CHARACTOR
35 00647 063077         HALT
36 00650 024123         LDA 1,C177      ;STRIP THE PARITY BIT.
37 00651 123400         AND 1,0
38 00652 024143         LDA 1,C11
39 00653 106414         SUB# 0,1,SZR    ;CHECK FOR TAB
40 00654 002752         JMP @TINRET     ;EXIT NOT A TAB.
41 00655 126000         ADC 1,1
42 00656 063611         SKPDN .TTO      ;INSERT A RUBOUT
43 00657 000777         JMP .-1
44 00660 065111         DOAS 1,.TTO
45 00661 002745         JMP @TINRET
46
47
```

```
▲ 0012  .MAIN
01
02 00662 040076 INTR:   STA 0,SAV0      ;INTERRUPT SERVICE
03 00663 044077         STA 1,SAV1
04 00664 050100         STA 2,SAV2
05 00665 054101         STA 3,SAV3
06 00666 175200         MOVR 3,3
07 00667 054102         STA 3,SAVC      ;SAVE AC+CARRY.
08 00670 063777         SKPDZ CPU
09 00671 063077         HALT            ;POWER FAIL FLAG?
10 00672 024104         LDA 1,TIO
11 00673 071477         INTA 2
12 00674 132415         SUB# 1,2,SNR
13 00675 000447         JMP TYPE        ;OUTPUT
14 00676 024105         LDA 1,TIOX
15 00677 132414         SUB# 1,2,SZR
16 00700 063077         HALT            ;UNKOWN INTERRUPT; SEE C(2)
17
18 00701 063610 XTIN:   SKPDN .TTI      ;READER INPUT
19 00702 063077         HALT            ;RD DONE FLAG FAILED.
20 00703 064510         DIAS 1,.TTI     ;GET CHARACTOR
21 00704 063710         SKPDZ .TTI
22 00705 063077         HALT            ;FLAG CHECK
23 00706 063410         SKPBN .TTI
24 00707 063077         HALT            ;FLAG CHECK
25 00710 044106         STA 1,TINCH     ;SAVE INPUT CHARACTOR.
```

```
A 0013  .MAIN
01
02 00711 125004 TIN1:   MOV 1,1,SZR
03 00712 000410          JMP TIN2
04 00713 020107          LDA 0,C1355     ;ON ZERO INPUT
05 00714 040110          STA 0,RANI      ;INIT RANDOM NUMBER
06 00715 010111          ISZ BROKEN      ;IF TO MUCH LEADER
07 00716 102401          SUB 0,0,SKP     ;OR ALL CHARACTORS 0
08 00717 063077          HALT            ;ERROR.
09 00720 040112          STA 0,ICTR      ;INIT COUNT PATTERN.
10 00721 000507          JMP DISMIS      ;EXIT INTERRUPT.
11 00722 030056 TIN2:    LDA 2,CM100
12 00723 050111          STA 2,BROKEN
13 00724 034113          LDA 3,CRA
14 00725 175005          MOV 3,3,SNR
15 00726 000410          JMP TIN3        ;RANDOM DATA
16 00727 010112          ISZ ICTR        ;COUNTER
17 00730 000401          JMP .+1
18 00731 020112          LDA 0,ICTR
19 00732 106414          SUB# 0,1,SZR    ;C(0)=GOOD,C(1)=BAD
20 00733 063077          HALT            ;READ OR PUNCH ERROR.
21 00734 044112          STA 1,ICTR      ;RESET COUNTER
22 00735 000473          JMP DISMIS      ;EXIT INTERRUPT.
23 00736 006114 TIN3:    JSR @RAND
24 00737 000110          RANI
25 00740 024106          LDA 1,TINCH
26 00741 106414          SUB# 0,1,SZR    ;C(0)=GOOD,C(1)=BAD
27 00742 063077          HALT            ;READ OR PUNCH ERROR.
28 00743 000465          JMP DISMIS
29
30 00744 063611 TYPE:    SKPON .TTO      ;OUTPUT COUNT OR RANDOM
31 00745 063077          HALT            ;PATTERN. FLAG CHECK.
32 00746 034113          LDA 3,CRA       ;SWITCH
33 00747 175005          MOV 3,3,SNR
34 00750 000405          JMP TYPE1       ;RANDOM
35 00751 010115          ISZ OCTR        ;INC OUT COUNTER
36 00752 000401          JMP .+1
37 00753 020115          LDA 0,OCTR
38 00754 000403          JMP .+3
39
40 00755 006114 TYPE1:   JSR @RAND
41 00756 000116          RAND
42 00757 024117          LDA 1,LT        ;LEADER CHECK
43 00760 030120          LDA 2,TYO
44 00761 132032          ADCZ# 1,2,SZC
45 00762 000406          JMP TYPE2
46 00763 020107          LDA 0,C1355     ;RESET RANDOM IN LEADER
47 00764 040116          STA 0,RAND
48 00765 010120          ISZ TYO         ;+1 TO LEADER COUNT
49 00766 102400          SUB 0,0
50 00767 040115          STA 0,OCTR
51
52 00770 061111 TYPE2:   DOAS 0,.TTO     ;SEND THE CHARACTOR
53 00771 063411          SKPBN .TTO
54 00772 063077          HALT            ;FLAG CHECK
55 00773 063711          SKPDZ .TTO
56 00774 063077          HALT            ;FLAG CHECK
57 00775 000433          JMP DISMIS      ;EXIT INTERRUPT.
```

```
A 0014  .MAIN
01
02 00776 102401 MAIN:    SUB 0,0,SKP     ;READ/PUNCH RANDOM
03 00777 102000          ADC 0,0         ;READ/PUNCH COUNTER
04 01000 040113          STA 0,CRA       ;INITAILIZE
05 01001 062677          IORST
06 01002 020056          LDA 0,CM100
07 01003 040111          STA 0,BROKEN
08 01004 102400          SUB 0,0
09 01005 040120          STA 0,TYO
10 01006 024132          LDA 1,CINTR
11 01007 044001          STA 1,1
12 01010 060177          INTEN           ;ENABLE INTERRUPTS
13 01011 061111          DOAS 0,.TTO
14 01012 060510          DIAS 0,.TTI
15
16 01013 006114 MAIN1:   JSR @RAND       ;MAIN LOOP CNTL
17 01014 000121          TIMDEL          ;OF READER/PUNCH
18 01015 152400          SUB 2,2         ;INTERRUPT.
19 01016 104300          COMS 0,1
20 01017 060277          INTDS
21 01020 072077          MSKO 2
22 01021 060177          INTEN
23 01022 125404          INC 1,1,SZR
24 01023 000777          JMP .-1
25 01024 151400          INC 2,2
26 01025 151237          MOVZR# 2,2,SBN
27 01026 000770          JMP MAIN1+3
28 01027 000764          JMP MAIN1
29
30 01030 020076 DISMIS:  LDA 0,SAV0      ;DISMISS A INTERRUPT
31 01031 024077          LDA 1,SAV1      ;RESTORE MACHINE STATE.
32 01032 030100          LDA 2,SAV2
33 01033 034102          LDA 3,SAVC
34 01034 175100          MOVL 3,3
35 01035 034101          LDA 3,SAV3
36 01036 060177          INTEN
37 01037 002000          JMP @0
38
39 01040 027400 XRAND:   LDA 1,@0,3      ;GENERATE A 8 BIT
40 01041 020123          LDA 0,C177      ;EVEN PARITY RANDOM
41 01042 131120          MOVZL 1,2       ;NUMBER.
42 01043 151120          MOVZL 2,2
43 01044 133000          ADD 1,2
44 01045 024403          LDA 1,.+3
45 01046 147000          ADD 2,1
46 01047 101300          MOVS 0,0
47 01050 123725          ANDZS 1,0,SNR
48 01051 000770          JMP XRAND+1
49 01052 047400          STA 1,@0,3      ;STORE A 16 BIT RANDOM
50 01053 111300          MOVS 0,2
51 01054 126000          ADC 1,1         ;PARITY GENERATOR
52 01055 107000          ADD 0,1
53 01056 123404          AND 1,0,SZR
54 01057 000775          JMP .-3
55 01060 101200          MOVR 0,0
56 01061 143300          ADDS 2,0        ;C(0)R=EVEN PARITY#
57 01062 001401          JMP 1,3
58
```

```
A 0015  .MAIN
01
02
03
04                      ; TELETYPE DIAGNOSTIC .......
05
06 01063 102400 BEGIN:  SUB     0,0
07 01064 040071         STA     0,PASS
08 01065 102620 TTY00:  SUBZR   0,0             ; INIT FOR PASSABLE
09 01066 040001         STA     0,1             ; INTERRUPT.
10 01067 006061         SETUP
11 01070 063500         SKPBZ   0               ; THE SELB LINE IS
12 01071 006060         EHALT                   ; GROUNDED CHECK (A82).
13 01072 006062         LOOP                    ; CHECK SKIP LOGIC.
14
15 01073 006061 TTY01:  SETUP
16 01074 063700         SKPDZ   0               ; THE SELD LINE IS
17 01075 006060         EHALT                   ; GROUNDED.  CHECK (A82).
18 01076 006062         LOOP                    ; CHECK SKIP LOGIC.
19
20 01077 006061 TTY02:  SETUP                   ; TTO SHOULD NOT BE BUSY
21 01100 060211         NIOC    TTO             ; IT'S BEEN CLEARED IN
22 01101 062677         IORST                   ; DIFFERENT WAYS.  CHECK
23 01102 063511         SKPBZ   TTO             ; TTO BUSY (1) INPUT
24 01103 006060         EHALT                   ; TO SELB LINE (A82).
25 01104 006062         LOOP
26
27 01105 006061 TTY03:  SETUP                   ; TROUBLE IN CPU,
28 01106 063411         SKPBN   TTO             ; SELECTION OF SKIP SEX,
29 01107 101001         MOV     0,0,SKP         ; CHECK SKIP LOGIC
30 01110 006060         EHALT
31 01111 006062         LOOP
32
33 01112 006061 TTY04:  SETUP                   ; TTI SHOULD NOT BE BUSY,
34 01113 060210         NIOC    TTI             ; IT HAS BEEN CLEARED IN
35 01114 062677         IORST                   ; TWO WAYS.  CHECK TTI INPUT
36 01115 063510         SKPBZ   TTI             ; TO SELB LINE (A82).
37 01116 006060         EHALT                   ; CHECK THE FLOP.
38 01117 006062         LOOP
39
```

```
A 0016  .MAIN
01
02
03
04 01120 006061 TTY05:  SETUP                   ; TTO SHOULD NOT BE
05 01121 060211         NIOC    TTO             ; DONE, IT HAS BEEN
06 01122 062677         IORST                   ; CLEARED IN TWO WAYS,
07 01123 063711         SKPDZ   TTO             ; CHECK TTO INPUT TO
08 01124 006060         EHALT                   ; SELD (A80), ALSO THE
09 01125 006062         LOOP                    ; TTO DONE FLOP.
10
11 01126 006061 TTY06:  SETUP                   ; TTI SHOULD NOT BE
12 01127 060210         NIOC    TTI             ; DONE, IT HAS BEEN
13 01130 062677         IORST                   ; CLEARED IN TWO WAYS,
14 01131 063710         SKPDZ   TTI             ; CHECK TTI INPUT TO SELD
15 01132 006060         EHALT                   ; (A80), ALSO THE TTI
16 01133 006062         LOOP                    ; DONE FLOP.
17
18 01134 006061 TTY07:  SETUP                   ; CHECK SKIP LOGIC IN
19 01135 063610         SKPDN TTI               ;CPU, TTI DONE IS
20 01136 101001         MOV     0,0,SKP         ; ZERO.
21 01137 006060         EHALT
22 01140 006062         LOOP
23
24 01141 006061 TTY08:  SETUP                   ; TRY TO RESET TTO BUSY
25 01142 060111         NIOS    TTO             ; VIA I/O RESET.  CHECK
26 01143 062677         IORST                   ; RESET PULSE INPUT INTO
27 01144 063511         SKPBZ   TTO             ; OR GATE FEEDING
28 01145 006060         EHALT                   ; CLEAR TTO BUSY
29 01146 006062         LOOP
30
31 01147 006061 TTY09:  SETUP                   ; A "C" PULSE FAILED
32 01150 060111         NIOS    TTO             ; TO CLEAR THE TTO BUSY
33 01151 060211         NIOC    TTO             ; FLOP.  CHECK AND GATE
34 01152 063511         SKPBZ   TTO             ; (TTO SEL, FCLR), AND THE
35 01153 006060         EHALT                   ; FOLLOWING OR GATE.
36 01154 006062         LOOP
37
38 01155 006061 TTY10:  SETUP                   ; SELECTING TTO WITHOUT
39 01156 060011         NIO     TTO             ; A "S" PULSE SET TTO BUSY,
40 01157 063511         SKPBZ   TTO             ; CHECK AND GATE (TTO SEL,
41 01160 006060         EHALT                   ; FSTRT).
42 01161 006062         LOOP
43
```

```
▲ 0017  .MAIN
01
02
03
04 01162 006061 TTY11:  SETUP                   ; A "S" PULSE TO DEVICE 0
05 01163 061100          DOAS    0,0            ; SHOULD NOT SET THE TTO
06 01164 063511          SKPBZ   TTO            ; BUSY FLOP.  CHECK AND
07 01165 006060          EHALT                  ; GATE (TTO SEL, FSTRT).
08 01166 006062          LOOP
09
10 01167 006061 TTY12:  SETUP                   ; AN I/O RESET PULSE
11 01170 060110          NIOS    TTI            ; FAILED TO CLEAR TTI
12 01171 062677          IORST                  ; BUSY.  CHECK RESET INPUT
13 01172 063510          SKPBZ   TTI            ; IN THE TTI BUSY/DONE
14 01173 006060          EHALT                  ; LOGIC.
15 01174 006062          LOOP
16
17 01175 006061 TTY13:  SETUP                   ; THE TTI BUSY FLOP
18 01176 060110          NIOS    TTI            ; WAS NOT RESET VIA
19 01177 062210          NIOC    TTI            ; AND GATE (FCLR, TTI SEL).
20 01200 063510          SKPBZ   TTI
21 01201 006060          EHALT
22 01202 006062          LOOP
23
24 01203 006061 TTY14:  SETUP                   ; TTI BUSY WAS SET
25 01204 060010          NIO     TTI            ; WITHOUT A "S" PULSE.
26 01205 063510          SKPBZ   TTI            ; CHECK AND (FSTRT, TTI SEL).
27 01206 006060          EHALT
28 01207 006062          LOOP
29
30 01210 006061 TTY15:  SETUP                   ; TTI BUSY WAS SET
31 01211 060100          NIOS    0              ; WHEN A "S" PULSE TO
32 01212 063510          SKPBZ   TTI            ; DEVICE 0 WAS ISSUED.
33 01213 006060          EHALT
34 01214 006062          LOOP
35
36 01215 006061 TTY16:  SETUP                   ; SETTING TTO BUSY
37 01216 061111          DOAS    0,TTO          ; GROUNDS THE SELB LINE
38 01217 063500          SKPBZ   0              ; WITHOUT TTO SEL BEING
39 01220 006060          EHALT                  ; PRESENT.  CHECK 0,C, GATE
40 01221 006062          LOOP                   ; (TTO BUSY, TTO SEL).
41
```

```
▲ 0018  .MAIN
01
02
03
04 01222 006061 TTY17:  SETUP                   ; SETTING TTI BUSY
05 01223 060110          NIOS    TTI            ; GROUNDS THE SELB LINE
06 01224 063500          SKPBZ   0              ; WITHOUT TTI SEL BEING
07 01225 006060          EHALT                  ; PRESENT.  CHECK 0,C,
08 01226 006062          LOOP                   ; GATE (TTO BUSY, TTO SEL).
09
10 01227 006061 TTY18:  SETUP                   ; START AND TTO SELECT
11 01230 061111          DOAS    0,TTO          ; FAILED TO SET TTO BUSY.
12 01231 063411          SKPBN   TTO            ; CHECK SELB (A82) 0,C, GATE,
13 01232 006060          EHALT          ; BUSY FLOP, ETC, ETC.
14 01233 006062          LOOP
15
16 01234 006061 TTY19:  SETUP                   ; START AND TTI SELECT
17 01235 060110          NIOS    TTI            ; FAILED TO SET TTI BUSY.
18 01236 063410          SKPBN   TTI            ; CHECK SELB (A82) 0,C, GATE,
19 01237 006060          EHALT                  ; BUSY FLOP, ETC.
20 01240 006062          LOOP
21
22 01241 006061 TTY20:  SETUP                   ; A "C" PULSE TO DEVICE 0
23 01242 060110          NIOS    TTI            ; RESET THE TTI BUSY FLOP,
24 01243 060200          NIOC    0              ; CHECK AND GATE (FCLR, TTI SEL)
25 01244 063410          SKPBN   TTI
26 01245 006060          EHALT
27 01246 006062          LOOP
28
29 01247 006061 TTY21:  SETUP                   ; SELECTING DEVICE TTI RESET
30 01250 060110          NIOS    TTI            ; THE TTI BUSY FLOP,
31 01251 060010          NIO     TTI            ; CHECK AND GATE
32 01252 063410          SKPBN   TTI            ; (TTI SEL, FCLR).
33 01253 006060          EHALT
34 01254 006062          LOOP
35
36 01255 006061 TTY22:  SETUP                   ; SELECTING DEVICE 0 AND
37 01256 061111          DOAS    0,TTO          ; ISSUE OF A "C" PULSE
38 01257 060200          NIOC    0              ; RESET THE TTO BUSY FLOP,
39 01260 063411          SKPBN   TTO            ; CHECK AND GATE (TTO SEL, FCLR)
40 01261 006060          EHALT
41 01262 006062          LOOP
42
```

```
▲ 0019  .MAIN
01
02
03
04 01263 006061 TTY23:  SETUP
05 01264 051111          DOAS    0,TTO          ; A NIO INSTRUCTION TO
06 01265 060011          NIO     TTO            ; THE TTO WITHOUT A
07 01266 063411          SKPBN   TTO            ; CLR PULSE RESET THE
08 01267 006060          EHALT                  ; TTO BUSY FLOP.
09 01270 006062          LOOP
10
11 01271 020064 TTY24:   LDA     0,K40          ; A TEST TO INSURE THAT
12 01272 040065          STA     0,TEM          ; DEVICE TTO RESPONDS TO
13 01273 006061          SETUP                  ; ONLY ONE DEVICE CODE.
14 01274 061111          DOAS    0,TTO
15 01275 006063          TIME                   ; SYNC THE SETTING OF
16 01276 063511          SKPBZ   TTO            ; TTO DONE
17 01277 061111          DOAS    0,TTO          ; SEND A CHARACTER
18 01300 020416          LDA     0,TTY25
19 01301 024065          LDA     1,TEM
20 01302 131000          MOV     1,2
21 01303 113520          ANDZL   0,2
22 01304 107000          ADD     0,1
23 01305 146400          SUB     2,1            ; ISSUE A "C" PULSE TO A
24 01306 044401          STA     1,.+1          ; DEVICE CODE WITH ONE
25 01307 000000          0                      ; BIT DIFFERENT THEN TTO
26 01310 063411          SKPBN   TTO            ; DEVICE CODE.  IF TTO BUSY
27 01311 006060          EHALT                  ; RESETS WITH THIS INSTRUCTION
28 01312 006062          LOOP                   ; AN ERROR IS PRESENT IN THE
29 01313 020065          LDA     0,TEM          ; DEVICE SELECT LOGIC.
30 01314 101224          MOVZR   0,0,SZR
31 01315 000755          JMP     TTY24+1        ; C(AC1)=NIOC TO DEVICE
32
33 01316 060211 TTY25:   NIOC    TTO            ; OTHER THAN TTO.
34
```

```
▲ 0020  .MAIN
01
02
03
04 01317 006061 TTY26:   SETUP
05 01320 061111          DOAS    0,TTO          ; DEVICE TTI SHOULD
06 01321 063510          SKPBZ   TTI            ; NOT RESPOND TO DEVICE
07 01322 006060          EHALT                  ; CODE TTO.  CHECK AND
08 01323 006062          LOOP                   ; GATE PRODUCING TTI SEL.
09
10 01324 006061 TTY27:   SETUP
11 01325 060100          NIOS    0              ; DEVICE TTI SHOULD NOT
12 01326 063510          SKPBZ   TTI            ; RESPOND TO A "S" PULSE
13 01327 006060          EHALT                  ; FOR DEVICE 0.
14 01330 006062          LOOP
15
16 01331 006061 TTY28:   SETUP                  ; TTI SHOULD NOT BE DONE,
17 01332 063710          SKPDZ   TTI            ; YET SKIP ON DONE RESPONDS.
18 01333 006060          EHALT                  ; CHECK D,C, GATE TO SELD
19 01334 006062          LOOP                   ; LINE, THE TTI DONE INPUTS.
20
21 01335 006061 TTY29:   SETUP                  ; SETTING TTO DONE CAUSED
22 01336 061111          DOAS    0,TTO          ; ALL DONE FLAG TESTING
23 01337 006063          TIME                   ; TO SKIP.  DONE IS GATED
24 01340 063511          SKPBZ   TTO            ; ONTO SELD LINE (A88)
25 01341 063700          SKPDZ   0              ; WITHOUT DEVICE SELECT,
26 01342 006060          EHALT                  ; CHECK D,C, GATE ON
27 01343 006062          LOOP                   ; TTO DONE FLOP.
28
29 01344 006061 TTY30:   SETUP                  ; SETTING TTI DONE CAUSED
30 01345 060110          NIOS    TTI            ; ALL DONE FLAG TESTING TO
31 01346 006063          TIME                   ; SKIP.  DONE IS GATED
32 01347 063510          SKPBZ   TTI            ; ONTO SELD LINE (A88)
33 01350 063700          SKPDZ   0              ; WITHOUT DEVICE SELECT,
34 01351 006060          EHALT                  ; CHECK D,C, GATE ON
35 01352 006062          LOOP                   ; TTI DONE FLOP.
36
```

```
A 0021  .MAIN
01
02
03
04 01353 006061 TTY31:  SETUP                   ; BOTH A CLEAR PULSE
05 01354 061111          DOAS    0,TTO          ; AND AN I/O RESET FAILED
06 01355 006063          TIME                   ; TO CLEAR THE TTO DONE
07 01356 063511          SKPBZ   TTO            ; FLAG.  CHECK THE 2 INPUT
08 01357 060211          NIOC    TTO            ; OR GATE PRODUCING
09 01360 062877          IORST                  ; (CLR TTO DN) LEVEL.  ALSO
10 01361 063711          SKPDZ   TTO            ; CHECK THE DONE FLOP
11 01362 006060          EHALT                  ; ITSELF
12 01363 006062          LOOP
13
14 01364 006061 TTY32:  SETUP                   ; AN I/O RESET FAILED
15 01365 061111          DOAS    0,TTO          ; TO CLEAR THE TTO
16 01366 006063          TIME                   ; DONE FLOP.  THE 2
17 01367 063511          SKPBZ   TTO            ; INPUT OR GATE PRODUCING
18 01370 062877          IORST                  ; (CA TTO DN) LEVEL
19 01371 063711          SKPDZ   TTO            ; FAILED.
20 01372 006060          EHALT
21 01373 006062          LOOP
22
23 01374 006061 TTY33:  SETUP                   ; A "S" PULSE TO DEVICE
24 01375 061111          DOAS    0,TTO          ; TTO SHOULD CLEAR ITS
25 01376 006063          TIME                   ; DONE FLAG.
26 01377 063511          SKPBZ   TTO
27 01400 060111          NIOS    TTO
28 01401 063711          SKPDZ   TTO
29 01402 006060          EHALT
30 01403 006062          LOOP
31
32 01404 006061 TTY34:  SETUP                   ; A "DOA" PULSE TO DEVICE
33 01405 061111          DOAS    0,TTO          ; TTO FAILED TO SET ITS
34 01406 006063          TIME                   ; DONE FLAG
35 01407 063511          SKPBZ   TTO            ; CHECK FOR A (SET TTO
36 01410 063611          SKPDN   TTO            ; DONE) LEVEL FROM PIN 22
37 01411 006060          EHALT                  ; OF TELETYPE CHIP.
38 01412 006062          LOOP                   ; ALSO TTO OUTPUT
39
```

```
A 0022  .MAIN
01
02
03
04 01413 006061 TTY35:  SETUP                   ; THE SETTING OF TTO DONE
05 01414 061111          DOAS    0,TTO          ; FAILED TO RESET TTO
06 01415 006063          TIME                   ; BUSY.  CHECK THE "C"
07 01416 063611          SKPDN   TTO            ; INPUT TO THE TO BUSY
08 01417 063511          SKPBZ   TTO            ; FLOP
09 01420 006060          EHALT
10 01421 006062          LOOP
11
12 01422 006061 TTY36:  SETUP                   ; THE C(AC0) WAS NOT
13 01423 102000          ADC     0,0            ; CHANGED VIA INTA,
14 01424 061477          INTA    0              ; CHECK CPU I/O LOGIC
15 01425 100015          COMM    0,0,SNR
16 01426 006060          EHALT
17 01427 006062          LOOP
18
19 01430 006061 TTY37:  SETUP                   ; AN INSTRUCTION TO DEVICE 0
20 01431 061100          DOAS    0,0            ; SHOULD NOT CHANGE STATE
21 01432 006063          TIME                   ; OF TTO DONE FLAG,
22 01433 063611          SKPDN   TTO
23 01434 063711          SKPDZ   TTO
24 01435 006060          EHALT
25 01436 006062          LOOP
26
27 01437 006061 TTY38:  SETUP                   ; A "DOC" INSTRUCTION TO
28 01440 063111          DOCS    0,TTO          ; DEVICE TTO SHOULD NOT
29 01441 006063          TIME                   ; SET TTO DONE,
30 01442 063511          SKPBZ   TTO
31 01443 063711          SKPDZ   TTO
32 01444 006060          EHALT
33 01445 006062          LOOP
34
35 01446 006061 TTY39:  SETUP                   ; SEND A CHARACTER, THEN
36 01447 061111          DOAS    0,TTO          ; RESET BUSY.  THE DONE FLOP
37 01450 060211          NIOC    TTO            ; SHOULD NOT SET WITH
38 01451 006063          TIME                   ; BUSYZ ZERO, CHECK "D"
39 01452 063611          SKPDN   TTO            ; INPUT TO DONE FLOP,
40 01453 063711          SKPDZ   TTO
41 01454 006060          EHALT
42 01455 006062          LOOP
43
```

```
▲ 0023  .MAIN
01
02
03
04 01456 006061 TTY40:  SETUP                   ; SET TTO DONE,
05 01457 061111         DOAS    0,TTO           ; THEN PERFORM A DOAS
06 01460 006063         TIME                    ; WITHOUT A "S" PULSE,
07 01461 063611         SKPDN   TTO             ; DONE SHOULD RESET
08 01462 061011         DOA     0,TTO           ;
09 01463 006063         TIME                    ; CHECK "D" INPUT TO
10 01464 063600         SKPDN   0               ; DONE,
11 01465 063711         SKPDZ   TTO
12 01466 006060         EHALT
13 01467 006062         LOOP
14
15 01470 006061 TTY41:  SETUP                   ; THE CPU FAILED TO
16 01471 102000         ADC     0,0             ; READ ANYTHING ON
17 01472 061477         INTA    0               ; INTA,  CHECK CPU,
18 01473 100015         COM#    0,0,SNR
19 01474 006060         EHALT
20 01475 006062         LOOP
21
22 01476 006061 TTY42:  SETUP                   ; BIT 15 WAS READ BACK
23 01477 126520         SUBZL   1,1             ; ON INTA,  CHECK O,C,
24 01500 061477         INTA    0               ; GATE TO DATA BIT 15,
25 01501 107414         AND#    0,1,SZR
26 01502 006060         EHALT
27 01503 006062         LOOP
28
29 01504 006061 TTY43:  SETUP                   ; AFTER I/O RESET
30 01505 061477         INTA    0               ; (ISSUED BY SETUP) INTA
31 01506 101004         MOV     0,0,SZR         ; SHOULD READ BACK NO
32 01507 006060         EHALT                   ; BITS, INTERRUPT PRIORITY
33 01510 006062         LOOP                    ; CHAIN FAILED
34
35 01511 006061 TTY44:  SETUP                   ; SETTING TTO DONE
36 01512 061111         DOAS    0,TTO           ; SHOULD CAUSE "INTA" TO
37 01513 006063         TIME                    ; RESPOND WITH DEVICE CODE,
38 01514 063511         SKPBZ   TTO             ; CHECK INTP IN, INTP OUT
39 01515 061477         INTA    0               ; LEVELS,  CHECK INTA
40 01516 101005         MOV     0,0,SNR         ; LOGIC ETC, ETC,
41 01517 006060         EHALT
42 01520 006062         LOOP
43
```

```
▲ 0024  .MAIN
01
02
03
04 01521 006061 TTY45:  SETUP                   ; SETTING TTO DONE
05 01522 061111         DOAS    0,TTO           ; SHOULD CAUSE A BIT
06 01523 006063         TIME                    ; TO BE READ BACK ON
07 01524 063511         SKPBZ   TTO             ; "INTA,"
08 01525 061477         INTA    0               ; CHECK O,C, GATE TO
09 01526 101213         MOVR#   0,0,SNC         ; I/O BUS IN THE INTA
10 01527 006060         EHALT                   ; LOGIC, ETC,
11 01530 006062         LOOP
12
13 01531 006061 TTY46:  SETUP                   ; SET TTO DONE FLOP,
14 01532 061111         DOAS    0,TTO           ; INTA SHOULD READ
15 01533 006063         TIME                    ; BACK TTO DEVICE CODE,
16 01534 063511         SKPBZ   TTO
17 01535 020777         LDA     0,.-1
18 01536 024066         LDA     1,K77
19 01537 123400         AND     1,0
20 01540 065477         INTA    1
21 01541 106414         SUB#    0,1,SZR         ; C(AC0) = CORRECT DEVICE CODE,
22 01542 006060         EHALT                   ; C(AC1) = INTA RESULT,
23 01543 006062         LOOP                    ; CHECK INTA LOGIC,
24
25 01544 006061 TTY47:  SETUP                   ; SET TTO DIS FLOP,
26 01545 102000         ADC     0,0             ; THEN RESET IT VIA I/O
27 01546 062077         MSKO    0               ; RESET,  INTA SHOULD
28 01547 052677         IORST                   ; READ BACK THE DEVICE
29 01550 061111         DOAS    0,TTO           ; CODE,
30 01551 006063         TIME
31 01552 063511         SKPBZ   TTO             ; CHECK RESET INPUT TO
32 01553 061477         INTA    0               ; TTO DIS FLOP,
33 01554 101005         MOV     0,0,SNR
34 01555 006060         EHALT
35 01556 006062         LOOP
36
```

```
▲ 0025  .MAIN
01
02
03
04 01557 006061 TTY48:  SETUP                   ; ZERO LOADED INTO THE
05 01560 102400         SUB     0,0             ; TTO DIS FLOP SHOULD
06 01561 062077         MSKO    0               ; ALLOW INTA RESPONSE
07 01562 061111         DOAS    0,TTO           ; ON TTO DONE.
08 01563 006063         TIME
09 01564 063511         SKPBZ   TTO             ; CHECK DATA IS INPUT
10 01565 061477         INTA    0               ; TO TTO DIS FLOP.
11 01566 101005         MOV     0,0,SNR
12 01567 006060         EHALT
13 01570 006062         LOOP
14
15 01571 006061 TTY49:  SETUP                   ; TO TTO DIS FLOP
16 01572 102000         ADC     0,0             ; LOAD (ONE) THEN (ZERO).
17 01573 062077         MSKO    0               ; INTA SHOULD RESPOND
18 01574 102400         SUB     0,0             ; WITH THE DEVICE CODE.
19 01575 062077         MSKO    0
20 01576 061111         DOAS    0,TTO           ; CHECK THE LOADING OF
21 01577 006063         TIME                    ; TTO DIS FLOP
22 01600 063511         SKPBZ   TTO
23 01601 061477         INTA    0
24 01602 101005         MOV     0,0,SNR
25 01603 006060         EHALT
26 01604 006062         LOOP
27
28 01605 006061 TTY50:  SETUP                   ; SET TTO DIS FLOP.
29 01606 102000         ADC     0,0             ; THIS SHOULD PREVENT
30 01607 062077         MSKO    0               ; INTA RESPONSE ON TTO
31 01610 061111         DOAS    0,TTO           ; DONE.  CHECK TTO DIS
32 01611 006063         TIME                    ; FLOP, AND 2 INPUT
33 01612 063511         SKPBZ   TTO             ; AND GATE TO TTO INT
34 01613 061477         INTA    0               ; FLOP.
35 01614 101004         MOV     0,0,SZR
36 01615 006060         EHALT
37 01616 006062         LOOP
38
```

```
▲ 0026  .MAIN
01
02
03
04 01617 006061 TTY51:  SETUP                   ; TTO DIS FLOP FAILED
05 01620 102000         ADC     0,0             ; SEE PREVIOUS TEST
06 01621 062077         MSKO    0               ; NOTE: TTO DIS LOADED
07 01622 062077         MSKO    0                       ; TWICE!
08 01623 061111         DOAS    0,TTO
09 01624 006063         TIME
10 01625 063611         SKPDN   TTO
11 01626 061477         INTA    0
12 01627 101004         MOV     0,0,SZR
13 01630 006060         EHALT
14 01631 006062         LOOP
15
16 01632 006061 TTY52:  SETUP                   ; THE MSKO LEVEL WAS
17 01633 102520         SUBZL   0,0             ; RAISED AT DTOB TIME
18 01634 062000         DOB     0,0             ; EVEN THOUGH IT WAS
19 01635 061111         DOAS    0,TTO           ; NOT A CPU INSTRUCTION.
20 01636 006063         TIME                    ; CHECK MSKO (A38)
21 01637 063511         SKPBZ   TTO
22 01640 061477         INTA    0
23 01641 101005         MOV     0,0,SNR
24 01642 006060         EHALT
25 01643 006062         LOOP
26
27 01644 006061 TTY53:  SETUP                   ; THE MSKO LEVEL WAS
28 01645 102520         SUBZL   0,0             ; RAISED AT CPU TIME
29 01646 060077         NIO     CPU             ; EVEN THOUGH NO
30 01647 061111         DOAS    0,TTO           ; "DOB" WAS GIVEN.
31 01650 006063         TIME
32 01651 063511         SKPBZ   TTO
33 01652 061477         INTA    0
34 01653 101005         MOV     0,0,SNR
35 01654 006060         EHALT
36 01655 006062         LOOP
37
```

```
▲ 0027  .MAIN
01
02
03
04 01656 006061 TTY54:  SETUP                   ; THE INTA LEVEL (A40)
05 01657 061111         DOAS    0,TTO           ; WAS RAISED AT "DIB"
06 01660 006063         TIME                    ; TIME EVEN THOUGH NO
07 01661 063511         SKPBZ   TTO             ; CPU INSTRUCTION WAS
08 01662 061400         DIB     0,0             ; GIVEN.
09 01663 101004         MOV     0,0,SZR
10 01664 006060         EHALT
11 01665 006062         LOOP
12
13 01666 006061 TTY55:  SETUP                   ; A "P" PULSE SET THE
14 01667 060377         NIOP    CPU             ; ION FLOP.
15 01670 063377         SKPBZ   CPU
16 01671 006060         EHALT
17 01672 006062         LOOP
18
19 01673 006061 TTY56:  SETUP                   ; A CLR PULSE TO
20 01674 102620         SUBZR   0,0             ; THE CPU FAILED TO
21 01675 040001         STA     0,1             ; CLEAR THE ION FLOP.
22 01676 060177         NIOS    CPU
23 01677 060277         NIOC    CPU
24 01700 063577         SKPBZ   CPU
25 01701 006060         EHALT
26 01702 006062         LOOP
27
28 01703 006061 TTY57:  SETUP                   ; A START PULSE TO THE
29 01704 060177         NIOS    CPU                     ; CPU FAILED TO SET
30 01705 063477         SKPBN   CPU                     ; THE ION FLOP.
31 01706 006060         EHALT
32 01707 060277         NIOC    CPU
33 01710 006062         LOOP
34
```

```
▲ 0028  .MAIN
01
02
03
04 01711 006061 TTY58:  SETUP                   ; THE ION FLOP IS
05 01712 060277         NIOC    CPU             ; RESET TO ZERO.  THE
06 01713 102000         ADC     0,0             ; INTR LINE IS THEN
07 01714 040000         STA     0,0             ; GROUNDED VIA THE
08 01715 061111         DOAS    0,TTO           ; DONE FLAG.  NO INTERRUPT
09 01716 063511         SKPBZ   TTO             ; SHOULD OCCUR
10 01717 000777         JMP     .-1             ; LOCATION 0 WAS CHANGED
11 01720 024000         LDA     1,0             ; INDICATING AN INTERRUPT.
12 01721 106414         SUB#    0,1,SZR
13 01722 006060         EHALT                   ; PROGRAM MAY HANG IN
14 01723 006062         LOOP                    ; INTERRUPT LOOP.
15
16 01724 020405 TTY59:  LDA     0,TTY60         ; SETUP THE INTERRUPT
17 01725 040001         STA     0,1             ; RETURN STUFF.
18 01726 020404         LDA     0,TTY60+1
19 01727 040002         STA     0,2
20 01730 000403         JMP     .+3
21 01731 100003 TTY60:  COM     0,0,SNC         ; CONSTANT ... 100003
22 01732 002003         JMP     @3
23
24 01733 006061 TTY61:  SETUP                   ; THIS ROUTINE TEST THE
25 01734 060277         NIOC    CPU     ; CLEARING OF MA ON A PT
26 01735 020421         LDA     0,TTY63         ; CYCLE.  IF THE MA IS NOT
27 01736 040003         STA     0,3             ; CLEARED THE PROGRAM
28 01737 020146         LDA     0,K402          ; COUNTER WILL BE STORED
29 01740 044406         STA     1,TTY62+2       ; AT THE CURRENT MA SETTING.
30 01741 061111         DOAS    0,TTO
31 01742 063511         SKPBZ   TTO
32 01743 000777         JMP     .-1             ; AND/OR GATE (PI SETS PTRS)
33 01744 060177         INTEN                   ; IN THE 1200 OR SIMILAR
34 01745 102020         ADCZ    0,0             ; GATE IN OTHER PROCESSORS.
35 01746 000000         0                       ; INITIALIZE TO (JMP .+2)
36 01747 100003         @3
37 01750 030776 TTY62:  LDA     2,.,+2          ; SEE IF PROGRAM WAS CHANGED
38 01751 060277         NIOC    CPU             ; BY THE INTERRUPT.
39 01752 132414         SUB#    1,2,SZR
40 01753 006060         EHALT
41 01754 006062         LOOP                    ; LOC 1=@3
42 01755 000402         JMP     .+2             ; LOC 2=JMP @.+1
43 01756 001750 TTY63:  TTY62                   ; LOC 3=RETURN
44
```

```
▲ 0029  ,MAIN
01
02
03
04 01757 006061 TTY64:  SETUP                   ; THIS ROUTINE CHECKS TO
05 01760 060277          NIOC    CPU            ; INSURE THAT THE DEFER
06 01761 020416          LDA     0,TTY66        ; STATE IS ENTERED VIA
07 01762 040003          STA     0,3            ; A PI CYCLE.  IF DEFER
08 01763 102000          ADC     0,0            ; FAILS TO SET C(LOC 1)
09 01764 061111          DOAS    0,TTO          ; WILL BE TAKEN AS AN
10 01765 063511          SKPBZ   TTO            ; INSTRUCTION NOT AN ADDRESS.
11 01766 000777          JMP     .-1            ; THIS INSTRUCTION WOULD
12 01767 060177          INTEN                  ; CHANGE THE CONTENTS OF
13 01770 102440          SUBO    0,0            ; AC0.
14 01771 000402          JMP     .+2
15 01772 001773          .+1
16 01773 060277 TTY65:   NIOC    CPU
17 01774 101004          MOV     0,0,SZR
18 01775 006060          EMALT
19 01776 102001          ADC     0,0,SKP
20 01777 001773 TTY66:   TTY65
21 02000 006062          LOOP
22
23 02001 006061 TTY67:   SETUP                  ; TEST TO INSURE THE
24 02002 060277          NIOC    CPU            ; PI DEFER CYCLE WILL
25 02003 020415          LDA 0,TTY69            ; BE THROUGH LOCATION 1
26 02004 040003          STA     0,3            ; NOT THROUGH THE LOCATION
27 02005 102000          ADC     0,0            ; AT THE STORED PROGRAM
28 02006 061111          DOAS    0,TTO          ; COUNTER +1.
29 02007 063511          SKPBZ   TTO
30 02010 000777          JMP     .-1
31 02011 060177          INTEN
32 02012 102440          SUBO    0,0
33 02013 000403          JMP     .+3            ; INTERRUPT OCCURS HERE.
34 02014 002015          .+1
35 02015 006060          EMALT
36 02016 060277 TTY68:   NIOC    CPU
37 02017 102001          ADC     0,0,SKP
38 02020 002016 TTY69:   TTY68
39 02021 006062          LOOP
40
41
```

```
▲ 0030  ,MAIN
01
02
03
04 02022 006061 TTY70:  SETUP                   ; REQUEST AN INTERRUPT
05 02023 060277          NIOC    CPU            ; VIA TTO DONE FLAG.
06 02024 020410          LDA     0,TTY71
07 02025 040003          STA     0,3            ; IF THE PI LEVEL FAILS
08 02026 102000          ADC     0,0            ; TO SET, NO INTERRUPT
09 02027 061111          DOAS    0,TTO          ; WILL OCCUR AND THE
10 02030 063511          SKPBZ   TTO            ; TEST WILL HALT.
11 02031 000777          JMP     .-1
12 02032 060177          INTEN
13 02033 102001          ADC     0,0,SKP
14 02034 002037 TTY71:   TTY72
15 02035 060277          NIOC    CPU            ; CHECK LOGIC ON INTR LINE,
16 02036 006060          EMALT                  ; ETC.
17 02037 060277 TTY72:   NIOC    CPU
18 02040 006062          LOOP
19
20 02041 006061 TTY73:   SETUP                  ; A TEST TO INSURE THAT
21 02042 060277          NIOC    CPU            ; ANOTHER INSTRUCTION IS
22 02043 020411          LDA     0,TTY74        ; EXECUTED AFTER THE
23 02044 040003          STA     0,3            ; INTERRUPT IS ENABLED.
24 02045 102000          ADC     0,0
25 02046 061111          DOAS    0,TTO
26 02047 063511          SKPBZ   TTO
27 02050 000777          JMP     .-1
28 02051 102400          SUB     0,0            ; CHECK THE (INSTRUCTIO FETCH)
29 02052 060177          INTEN                  ; INPUT TO THE ION FLOP LOGIC.
30 02053 102001          ADC     0,0,SKP
31 02054 002055 TTY74:   .+1
32 02055 100014          COM#    0,0,SZR
33 02056 006060          EMALT
34 02057 006062          LOOP
35
```

```
▲ 0031  .MAIN
01
02
03
04 02060 006061 TTY75:  SETUP
05 02061 060277         NIOC    CPU             ; AN INTERRUPT SHOULD NOT
06 02062 024406         LDA     1,TTY76         ; OCCUR UNTIL AN INSTRUCTION
07 02063 044003         STA     1,3             ; IS COMPLETE.  THE EXECUTE
08 02064 061111         DOAS    0,TTO           ; CYCLE OF THE "LDA" FAILED
09 02065 063511         SKPBZ   TTO             ; TO LOAD AC1 CORRECTLY.
10 02066 000777         JMP     .-1
11 02067 102001         ADC     0,0,SKP
12 02070 002074 TTY76:  TTY77
13 02071 040000         STA     0,0
14 02072 060177         INTEN
15 02073 024000         LDA     1,0
16 02074 106414 TTY77:  SUB#    0,1,SZR
17 02075 006060         EHALT
18 02076 006062         LOOP
19
20 02077 006061 TTY78:  SETUP                   ; THE PROGRAM COUNTER STORED
21 02100 060277         NIOC    CPU             ; BY THE INTERRUPT IS ONE OR
22 02101 020407         LDA     0,TTY79         ; TWO LOCATIONS HIGHER THAN
23 02102 040003         STA     0,3             ; EXPECTED.
24 02103 102000         ADC     0,0
25 02104 061111         DOAS    0,TTO
26 02105 063511         SKPBZ   TTO
27 02106 000777         JMP     .-1
28 02107 102001         ADC     0,0,SKP
29 02110 002113 TTY79:  TTY80
30 02111 060177         INTEN
31 02112 004401         JSR     .+1
32 02113 024000 TTY80:  LDA     1,0
33 02114 166255         ADCOR#  3,1,SNR
34 02115 006060         EHALT
35 02116 006062         LOOP
36
```

```
▲ 0032  .MAIN
01
02
03
04 02117 006061 TTY81:  SETUP                   ; THE INSTRUCTION PRIOR TO
05 02120 060277         NIOC    CPU             ; INTERRUPTING SHOULD
06 02121 020410         LDA     0,TTY82         ; INCREMENT PC AND THUS
07 02122 040003         STA     0,3             ; PC STORED SHOULD BE
08 02123 102000         ADC     0,0             ; ONE GREATER THAN WITH NO
09 02124 061111         DOAS    0,TTO           ; SKIP.
10 02125 063511         SKPBZ   TTO
11 02126 000777         JMP     .-1
12 02127 060177         INTEN
13 02130 102001         ADC     0,0,SKP
14 02131 002132 TTY82:  .+1
15 02132 030777         LDA     2,.-1
16 02133 024000         LDA     1,0
17 02134 132015         ADC#    1,2,SNR
18 02135 006060         EHALT
19 02136 006062         LOOP
20
21 02137 006061 TTY83:  SETUP                   ; TEST THE VALUE OF THE
22 02140 060277         NIOC    CPU             ; PROGRAM COUNTER STORED
23 02141 020414         LDA     0,TTY85         ; VIA THE INTERRUPT.
24 02142 040003         STA     0,3
25 02143 102000         ADC     0,0
26 02144 061111         DOAS    0,TTO
27 02145 063511         SKPBZ   TTO
28 02146 000777         JMP     .-1
29 02147 060177         INTEN
30 02150 004401         JSR     .+1
31 02151 024000 TTY84:  LDA     1,0             ; C(AC3)=CORRECT
32 02152 136414         SUB#    1,3,SZR         ; C(AC1)=PC STORED
33 02153 006060         EHALT
34 02154 102001         ADC     0,0,SKP
35 02155 002151 TTY85:  TTY84
36 02156 006062         LOOP
37
```

```
A 0033  .MAIN
01
02
03
04 02157 006061 TTY86:  SETUP                    ; CHECK THE PC STORED IN
05 02160 060277          NIOC    CPU             ; LOCATION 0 WHEN A
06 02161 020410          LDA     0,TTY87         ; INTERRUPT FOLLOWS A SKIP.
07 02162 040003          STA     0,3
08 02163 102000          ADC     0,0
09 02164 061111          DOAS    0,TTO
10 02165 063511          SKPBZ   TTO
11 02166 000777          JMP     .-1
12 02167 060177          INTEN
13 02170 102001          ADC     0,0,SKP
14 02171 002172 TTY87:   .+1
15 02172 024000          LDA     1,0
16 02173 030776          LDA     2,.-2
17 02174 132414          SUB#    1,2,SZR
18 02175 006060          EHALT
19 02176 006062          LOOP
20
21 02177 006061 TTY88:   SETUP                    ; CHECK TO INSURE THE
22 02200 060277          NIOC    CPU             ; INDIRECT CYCLES OCCUR
23 02201 024407          LDA     1,TTY89         ; PRIOR TO THE INTERRUPT.
24 02202 044003          STA     1,3
25 02203 102000          ADC     0,0
26 02204 061111          DOAS    0,TTO
27 02205 063511          SKPBZ   TTO
28 02206 000777          JMP     .-1
29 02207 102001          ADC     0,0,SKP
30 02210 002220 TTY89:   TTY90
31 02211 040000          STA     0,0
32 02212 060177          INTEN
33 02213 026402          LDA     1,@.+2
34 02214 000404          JMP     TTY90
35 02215 102216          @.+1
36 02216 102217          @.+1
37 02217 000000          0
38 02220 122414 TTY90:   SUB#    1,0,SZR
39 02221 006060          EHALT
40 02222 006062          LOOP
41
```

```
A 0034  .MAIN
01
02
03
04 02223 006061 TTY91:   SETUP                    ; INTERRUPT SHOULD COME
05 02224 060277          NIOC    CPU             ; BEFORE THE "SUB" INSTRUCTION.
06 02225 020411          LDA     0,TTY92
07 02226 040003          STA     0,3
08 02227 126000          ADC     1,1
09 02230 061111          DOAS    1,TTO
10 02231 063511          SKPBZ   TTO
11 02232 000777          JMP     .-1
12 02233 060177          INTEN
13 02234 102000          ADC     0,0
14 02235 102401          SUB     0,0,SKP
15 02236 002237 TTY92:   .+1
16 02237 100014          COM#    0,0,SZR
17 02240 006060          EHALT
18 02241 006062          LOOP
19
20 02242 006061 TTY93:   SETUP                    ; ISZ INSTRUCTION SHOULD
21 02243 060277          NIOC    CPU             ; BE EXECUTED AND SKIP
22 02244 020413          LDA     0,TTY94         ; PRIOR TO INTERRUPT.
23 02245 040003          STA     0,3
24 02246 102000          ADC     0,0
25 02247 061111          DOAS    0,TTO
26 02250 063511          SKPBZ   TTO
27 02251 000777          JMP     .-1
28 02252 040000          STA     0,0
29 02253 060177          INTEN
30 02254 010000          ISZ     0
31 02255 006060          EHALT
32 02256 101001          MOV     0,0,SKP
33 02257 002260 TTY94:   .+1
34 02260 006062          LOOP
35
```

```
▲ 0035  .MAIN
01
02
03
04 02261 006061 TTY95:  SETUP                   ; ISZ INSTRUCTION SHOULD
05 02262 060277          NIOC    CPU            ; CAUSE A SKIP PRIOR
06 02263 020411          LDA     0,TTY96        ; TO INTERRUPT.
07 02264 040003          STA     0,3
08 02265 102000          ADC     0,0            ; CHECK PC STORED VIA
09 02266 061111          DOAS    0,TTO          ; THE INTERRUPT.
10 02267 063511          SKPBZ   TTO
11 02270 000777          JMP     .-1
12 02271 040000          STA     0,0
13 02272 060177          INTEN
14 02273 010000          ISZ     0
15 02274 002275 TTY96:   .+1
16 02275 024777          LDA     1,.-1
17 02276 030000          LDA     2,0
18 02277 132414          SUB#    1,2,SZR        ;C(AC1)=CORRECT PC,
19 02300 006060          EHALT                  ; C(AC2)=ERROR C(LOC 0).
20 02301 006062          LOOP
21
22 02302 006061 TTY97:   SETUP                  ; EXECUTE A "JSR INDIRECT"
23 02303 060277          NIOC    CPU            ; INSTRUCTION JUST PRIOR TO
24 02304 020410          LDA     0,TTY98        ; INTERRUPT.  CHECK THE
25 02305 040003          STA     0,3            ; PC STORED IN LOC 0,
26 02306 102000          ADC     0,0            ; AND THE PC STORED IN
27 02307 061111          DOAS    0,TTO          ; C(AC3).
28 02310 063511          SKPBZ   TTO
29 02311 000777          JMP     .-1
30 02312 060177          INTEN
31 02313 006401          JSR     @.+1
32 02314 002315 TTY98:   .+1
33 02315 020777          LDA     0,.-1
34 02316 024000          LDA     1,0
35 02317 171000          MOV     3,2
36 02320 106415          SUB#    0,1,SNR        ; AC0=CORRECT
37 02321 146014          ADC#    2,1,SZR        ; AC1=PC STORED IN LOC 0
38 02322 006060          EHALT                  ; AC2=PC STORED VIA JSR.
39 02323 006062          LOOP
40
```

```
▲ 0036  .MAIN
01
02
03
04 02324 006061 TTY99:  SETUP                   ; CHECK THE PC STORED IN
05 02325 060277          NIOC    CPU            ; LOC 0 AND AC3 WHEN AN
06 02326 020410          LDA     0,.+10         ; INTERRUPT FOLLOWS A
07 02327 040003          STA     0,3            ; JSR INSTRUCTION.
08 02330 102000          ADC     0,0
09 02331 061111          DOAS    0,TTO
10 02332 063511          SKPBZ   TTO
11 02333 000777          JMP     .-1
12 02334 060177          INTEN
13 02335 004402          JSR     .+2
14 02336 002337          .+1
15 02337 024777          LDA     1,.-1
16 02340 030000          LDA     2,0
17 02341 161000          MOV     3,0
18 02342 106015          ADC#    0,1,SNR
19 02343 132414          SUB#    1,2,SZR
20 02344 006060          EHALT
21 02345 006062          LOOP
22
23 02346 006061 TTY,0:  SETUP                   ; MISC TEST
24 02347 004401          JSR     .+1
25 02350 171120          MOVZL   3,2            ; SIGN BIT SHOULD
26 02351 151240          MOVOR   2,2            ; NEVER GET STORED
27 02352 005003          JSR     3,2            ; ON JSR.
28 02353 004401          JSR     .+1
29 02354 161000          MOV     3,0
30 02355 101112          MOVL#   0,0,SZC
31 02356 006060          EHALT
32 02357 006062          LOOP
33
```

```
A 0037  .MAIN
01
02
03
04 02360 006061 TTY,1:  SETUP                   ; TEST PC STORED ON
05 02361 060277          NIOC    CPU            ; INTERRUPT AFTER A
06 02362 020410          LDA     0,TTY,2        ; I/O SKIP INSTRUCTION,
07 02363 040003          STA     0,3
08 02364 102000          ADC     0,0
09 02365 061111          DOAS    0,TTO
10 02366 063511          SKPBZ   TTO
11 02367 000777          JMP     .-1
12 02370 060177          INTEN
13 02371 063700          SKPDZ   0
14 02372 002373 TTY,2:   .+1
15 02373 024777          LDA     1,.-1
16 02374 030000          LDA     2,0
17 02375 132414          SUB#    1,2,SZR
18 02376 006060          EHALT
19 02377 006062          LOOP
20
21 02400 074477 TTY,3:   READS   3              ; IF KSR TELETYPE DON!T
22 02401 177112          ADDL#   3,3,SZC        ; DO THIS SYSTEM,
23 02402 002402          JMP     .+2            ; SWITCH 1(1),
24 02403 101001          MOV     0,0,SKP
25 02404 002644          TTY,S
26
```

```
A 0038  .MAIN
01
02
03
04 02405 006061 TTY,A:   SETUP                  ; STARTING THE PAPER TAPE
05 02406 060110          NIOS    TTI            ; READER DID NOT CAUSE
06 02407 006063          TIME                   ; TTI DONE TO BE SET,
07 02410 063510          SKPBZ   TTI            ; IS THE READER IN THE
08 02411 063610          SKPDN   TTI            ; START POSITION?  TAPE
09 02412 006060          EHALT                  ; IN READER?  SWITCH IN
10 02413 006062          LOOP                   ; THE LINE POSITION?
11
12 02414 006061 TTY,B:   SETUP                  ; THE TTI DONE FLOP
13 02415 060110          NIOS    TTI            ; GROUNDED THE SELD
14 02416 006063          TIME                   ; LINE WHEN TTI WAS
15 02417 063510          SKPBZ   TTI            ; NOT SELECTED,  CHECK
16 02420 063700          SKPDZ   0              ; D,C, GATE TO SELD
17 02421 006060          EHALT                  ; LINE,
18 02422 006062          LOOP
19
20 02423 006061 TTY,C:   SETUP                  ; SETTING TTI DONE
21 02424 060110          NIOS    TTI            ; FAILED TO RESET
22 02425 006063          TIME                   ; TTI BUSY,  CHECK
23 02426 063510          SKPBZ   TTI            ; THE "C" INPUT TO
24 02427 063510          SKPBZ   TTI            ; TTI BUSY,  "D" INPUT
25 02430 006060          EHALT                  ; SHOULD FLOAT,
26 02431 006062          LOOP
27
28 02432 006061 TTY,D:   SETUP                  ; I/O RESET FAILED
29 02433 060110          NIOS    TTI            ; TO CLEAR THE TTI
30 02434 006063          TIME                   ; DONE FLOP,  CHECK
31 02435 063510          SKPBZ   TTI            ; 2 INPUT OR GATE
32 02436 062677          IORST                  ; PRODUCING THE
33 02437 063710          SKPDZ   TTI            ; (CLR TTI DN) LEVEL,
34 02440 006060          EHALT
35 02441 006062          LOOP
36
```

```
▲ 0039  .MAIN
01
02
03
04 02442 006061 TTY,E:  SETUP                   ; A "C" PULSE FAILED
05 02443 060110          NIOS    TTI            ; TO CLEAR THE TTI
06 02444 006063          TIME                   ; DONE FLOP.
07 02445 063510          SKPBZ   TTI
08 02446 060210          NIOC    TTI
09 02447 063710          SKPDZ   TTI
10 02450 006060          EHALT
11 02451 006062          LOOP
12
13 02452 006061 TTY,F:  SETUP                   ; A "S" PULSE FAILED
14 02453 060110          NIOS    TTI            ; TO CLEAR THE TTI
15 02454 006063          TIME                   ; DONE FLOP.
16 02455 063510          SKPBZ   TTI
17 02456 060110          NIOS    TTI
18 02457 063710          SKPDZ   TTI
19 02460 006060          EHALT
20 02461 006062          LOOP
21
22 02462 006061 TTY,G:  SETUP                   ; WITH TTI DONE (1),
23 02463 060110          NIOS    TTI            ; INTA SHOULD READ
24 02464 006063          TIME                   ; BACK A DEVICE CODE,
25 02465 063510          SKPBZ   TTI
26 02466 061477          INTA    0              ; CHECK TTI INT FLOP
27 02467 101005          MOV     0,0,SNR        ; ETC,
28 02470 006060          EHALT
29 02471 006062          LOOP
30
31 02472 006061 TTY,H:  SETUP                   ; AFTER I/O RESET NO
32 02473 061477          INTA    0              ; DEVICE CODE SHOULD BE
33 02474 101004          MOV     0,0,SZR        ; READ BACK VIA INTA.
34 02475 006060          EHALT
35 02476 006062          LOOP
36
37 02477 102620 TTY,I:  SUBZR   0,0            ; SET UP INTERRUPT SYSTEM,
38 02500 040001          STA     0,1
39
```

```
▲ 0040  .MAIN
01
02
03
04 02501 006061 TTY,J:  SETUP                   ; A TEST TO INSURE
05 02502 102000          ADC     0,0            ; I/O RESET ABILITY TO
06 02503 062077          MSKO    0              ; CLEAR TTI DIS FLOP,
07 02504 062577          IORST                  ; CHECK RESET INPUT TO
08 02505 060110          NIOS    TTI            ; THE 8271.
09 02506 006063          TIME
10 02507 063510          SKPBZ   TTI
11 02510 061477          INTA    0
12 02511 101005          MOV     0,0,SNR
13 02512 006060          EHALT
14 02513 006062          LOOP
15
16 02514 006061 TTY,K:  SETUP                   ; A TEST TO INSURE
17 02515 102400          SUB     0,0            ; THAT A ZERO MAY BE
18 02516 062077          MSKO    0              ; LOADED INTO TTI DIS
19 02517 060110          NIOS    TTI            ; FLOP.
20 02520 006063          TIME
21 02521 063510          SKPBZ   TTI
22 02522 061477          INTA    0              ; CHECK TTI DIS FLOP,
23 02523 101005          MOV     0,0,SNR        ; DATA 14 INPUT AND
24 02524 006060          EHALT                  ; GATE TO TTI INT
25 02525 006062          LOOP                   ; FLOP.
26
27 02526 006061 TTY,L:  SETUP                   ; SAME AS PREVIOUS TEST
28 02527 102000          ADC     0,0            ; EXCEPT TTI DIS WAS
29 02530 062077          MSKO    0              ; PREVIOUSLY (1).
30 02531 102400          SUB     0,0
31 02532 062077          MSKO    0
32 02533 060110          NIOS    TTI
33 02534 006063          TIME
34 02535 063510          SKPBZ   TTI
35 02536 061477          INTA    0
36 02537 101005          MOV     0,0,SNR
37 02540 006060          EHALT
38 02541 006062          LOOP
39
```

```
▲ 0041  .MAIN
01
02
03
04 02542 006061 TTY.M:  SETUP                   ; WITH TTI DIS FLOP (1)
05 02543 102000          ADC     0,0            ; INTA SHOULD NOT
06 02544 062077          MSKO    0              ; RESPOND.
07 02545 060110          NIOS    TTI
08 02546 006063          TIME
09 02547 063510          SKPBZ   TTI             ; CHECK TTI DIS FLOP,
10 02550 061477          INTA    0              ; AND TTI INT FLOP
11 02551 101004          MOV     0,0,SZR        ; INPUTS.
12 02552 006060          EHALT
13 02553 006062          LOOP
14
15 02554 006061 TTY.N:  SETUP                   ; SAME AS PREVIOUS
16 02555 102000          ADC     0,0            ; TEST EXCEPT "MSKO"
17 02556 062077          MSKO    0              ; USED TWICE.
18 02557 062077          MSKO    0
19 02560 060110          NIOS    TTI
20 02561 006063          TIME
21 02562 063510          SKPBZ   TTI
22 02563 061477          INTA    0
23 02564 101004          MOV     0,0,SZR
24 02565 006060          EHALT
25 02566 006062          LOOP
26
27 02567 006061 TTY.P:  SETUP                   ; CHECK DEVICE CODE
28 02570 060110          NIOS    TTI            ; RETURNED BY TTI
29 02571 006063          TIME                   ; INTA COMMAND.
30 02572 063610          SKPDN   TTI
31 02573 024777          LDA     1,.-1
32 02574 020066          LDA     0,K77
33 02575 107400          AND     0,1
34 02576 061477          INTA    0
35 02577 106414          SUB#    0,1,SZR
36 02600 006060          EHALT
37 02601 006062          LOOP
38
39 02602 006061 TTY.U:  SETUP                   ; SHOULD GET A TTI
40 02603 060177          INTEN                  ; INTERRUPT.
41 02604 060110          NIOS TTI
42 02605 006063          TIME
43 02606 063510          SKPBZ TTI
44 02607 063577          SKPBZ CPU
45 02610 006060          EHALT                  ; CHECK FOR INPUT OR
46 02611 060277          NIOC CPU               ; GATE IN LOGIC FEEDING
47 02612 006062          LOOP                   ; INTR LINE.
48
```

```
▲ 0042  .MAIN
01
02
03
04 02613 006061 TTY.Q:  SETUP                   ; SET BOTH TTI AND TTO
05 02614 060110          NIOS    TTI            ; DONE FLAGS,  THE RESPONSE
06 02615 061111          DOAS    0,TTO          ; FROM INTA SHOULD BE
07 02616 006063          TIME                   ; FROM TTI ONLY.
08 02617 063610          SKPDN   TTI            ; CHECK INTA PRIORITY
09 02620 063511          SKPBZ   TTO            ; CHAIN.
10 02621 000777          JMP     .-1
11 02622 024772          LDA     1,TTY.Q+1
12 02623 020066          LDA     0,K77
13 02624 107400          AND     0,1
14 02625 061477          INTA    0
15 02626 106414          SUB#    0,1,SZR
16 02627 006060          EHALT
17 02630 006062          LOOP
18
19 02631 006061 TTY.R:  SETUP                   ; TEST CLR TTI DN
20 02632 060110          NIOS    TTI            ; LEVEL'S ABILITY TO
21 02633 060277          NIOC    CPU            ; RESET THE TTI INT
22 02634 006063          TIME                   ; FLOP.  TURN ON INTERRUPT
23 02635 063610          SKPDN   TTI            ; SYSTEM, THEN RESET.
24 02636 060177          INTEN
25 02637 062477          DIC     0,CPU
26 02640 063477          SKPBN   CPU            ; CHECK DIRECT CLEAR INPUT
27 02641 006060          EHALT                  ; TO TTI INT FLOP.
28 02642 060277          NIOC    CPU
29 02643 006062          LOOP
30
31 02644 102620 TTY.S:  SUBZR 0,0
32 02645 040001          STA 0,1
33 02646 006061          SETUP                  ; TEST CLR TTO DN
34 02647 060277          NIOC    CPU            ; LEVEL'S ABILITY TO
35 02650 061111          DOAS    0,TTO          ; RESET TTO INT FLOP,
36 02651 006063          TIME                   ; NO INTERRUPT SHOULD
37 02652 063611          SKPDN   TTO            ; OCCUR.
38 02653 060177          INTEN
39 02654 062477          DIC     0,CPU
40 02655 063477          SKPBN   CPU
41 02656 006060          EHALT                  ; CHECK DIRECT CLEAR INPUT
42 02657 060277          NIOC    CPU            ; TO TTO INT FLOP
43 02660 006062          LOOP
44
```

```
▲ 0043  .MAIN
01
02
03
04 02661 006061 TTY.T:  SETUP                   ; NO DONE FLAGS,
05 02662 060177          INTEN                  ; NO INTERRUPT SHOULD
06 02663 101000          MOV     0,0            ; OCCUR
07 02664 063477          SKPBN   CPU
08 02665 006060          EHALT
09 02666 060277          NIOC    CPU
10 02667 006062          LOOP
11
12
13 02670 006061 TTY.V:   SETUP                   ; SHOULD GET A TTO
14 02671 060177          INTEN                  ; INTERRUPT,
15 02672 061111          DOAS    0,TTO
16 02673 006063          TIME
17 02674 063511          SKPBZ   TTO
18 02675 063577          SKPBZ   CPU             ; CHECK FOR INPUT OR GATE
19 02676 006060          EHALT                  ; IN LOGIC FEEDING
20 02677 060277          NIOC    CPU            ; INTR LINE,
21 02700 006062          LOOP
22
23 02701 006061 TTY.W:   SETUP                   ; "DIA" TO DEVICE 0
24 02702 060110          NIOS    TTI            ; SHOULD ALWAYS READ 0,
25 02703 006063          TIME                   ; CHECK AND GATE PRODUCING
26 02704 063510          SKPBZ   TTI            ; TTI DATA,
27 02705 060400          DIA     0,0
28 02706 101004          MOV     0,0,SZR
29 02707 006060          EHALT
30 02710 006062          LOOP
31
```

```
▲ 0044  .MAIN
01
02
03
04 02711 006061 TTY.X:   SETUP                   ; "DIC" TO DEVICE 0
05 02712 060110          NIOS    TTI            ; SHOULD ALWAYS READ 0,
06 02713 006063          TIME
07 02714 063510          SKPBZ   TTI
08 02715 062410          DIC     0,TTI
09 02716 101004          MOV     0,0,SZR
10 02717 006060          EHALT
11 02720 006062          LOOP
12
13 02721 006140 TTY.Z:   JSR     @ICRLF         ; END OF DIAGNOSTIC PASS...
14 02722 006141          JSR     @IMESS
15 02723 003172          PMESS
16 02724 006140          JSR     @ICRLF
17 02725 006140          JSR @ICRLF
18 02726 030045          LDA     2,45
19 02727 025000          LDA     1,0,2
20 02730 125005          MOV     1,1,SNR
21 02731 002067          JMP     @TTY..         ; ITERATE
22 02732 015003          DSZ     3,2
23 02733 002067          JMP     @TTY..         ; ITERATE
24 02734 063611          SKPDN   TTO
25 02735 000777          JMP     .-1
26 02736 060277          INTDS
27 02737 035004          LDA     3,4,2          ; EXIT
28 02740 001400          JMP     0,3
29
30 02741 000000 EGGS:    0                      ; HEN FLAG
31 02742 000000          0                      ; DEVICE CODE THIS PASS
32 02743 000000          0                      ; NOT USED
33 02744 000000          0                      ; # OF PASSES
34 02745 000000          0                      ; RETURN ADDRESS,
35
36
37
38
39                NAME:  .TXTE |CAS TTO|
   02746 040703
   02747 120123
   02750 152324
   02751 000317
40 02752 000010          10
41 02753 000150          HERE
42 02754 000002          2
43 02755 000300          300
44 02756 000000          0
45 02757 000000          0
46 02760 000000          0
47 02761 100010          100010
48
```

```
01
02 02762 021400 TIMER:  LDA 0,0,3       ;TIME THE INST
03 02763 040405         STA 0,.+5       ;FOLLOWING THE CALL.
04 02764 102040         ADCO 0,0
05 02765 101000         MOV 0,0
06 02766 101402         INC 0,0,SZC
07 02767 001401         JMP 1,3
08 02770 000000         0
09 02771 000774         JMP .-4
10 02772 040070         STA 0,TIMEX
11 02773 001401         JMP 1,3
12
13 02774 054413 ENTER:  STA 3,LOOPR     ;ITERATION RETURN
14 02775 034406         LDA 3,ITR       ;THIS TEST INITIALIZES
15 02776 054406         STA 3,ITRCT     ;EACH ROUTINE.
16 02777 176400         SUB 3,3
17 03000 054405         STA 3,ESWIT
18 03001 002677         IORST           ;I/O RESET
19 03002 002405         JMP @LOOPR
20
21 03003 000003 ITR:    3
22 03004 000000 ITRCT:  0
23 03005 000000 ESWIT:  0
24 03006 000000 RETURN: 0
25 03007 000000 LOOPR:  0
26
27 03010 054776 ERR:    STA 3,RETURN    ;ERROR
28 03011 034774         LDA 3,ESWIT
29 03012 175004         MOV 3,3,SZR
30 03013 002773         JMP @RETURN     ;NOT FIRST ERROR
31 03014 034772         LDA 3,RETURN    ;SET ERROR SWITCH
32 03015 054770         STA 3,ESWIT     ;C(3)=PC+1 OF THE
33 03016 030045         LDA 2,45
34 03017 044426         STA 1,FOO
35 03020 025000         LDA 1,0,2
36 03021 124440         NEGO 1,1
37 03022 024423         LDA 1,FOO
38 03023 125003         MOV 1,1,SNC
39 03024 003077         HALT
40 03025 125003         MOV 1,1,SNC
41 03026 002750         JMP @RETURN
42 03027 024757         LDA 1,RETURN
43 03030 004406         JSR EPRINT
44 03031 002677         IORST
45 03032 002277         INTDS
46 03033 030045         LDA 2,45
47 03034 035004         LDA 3,4,2
48 03035 001400         JMP 0,3
49
50 03036 054747 EPRINT: STA 3,ESWIT
51 03037 006140         JSR @ICRLF
52 03040 121000         MOV 1,0
53 03041 125000         ADC 1,1
54 03042 107000         ADD 0,1
55 03043 006403         JSR @IPOCT
56 03044 002741         JMP @ESWIT
57
58 03045 000000 FOO:    0
59 03046 003173 IPOCT:  POCT
```

```
A 0047  .MAIN
01
02 03047 054737 CYCLE:  STA 3,RETURN     ;ITERATION ROUTINE
03 03050 014734         DSZ ITRCT        ;END OF EACH TEST,
04 03051 000416         JMP CYCTS        ;NOT 10 ITERATIONS
05 03052 034731         LDA 3,ITR        ;RESET ITERATION
06 03053 054731         STA 3,ITRCT      ;COUNTER, IF ERROR
07 03054 034731         LDA 3,ESWIT      ;OCCURED STAY IN LOOP,
08 03055 062677         IORST
09 03056 175004         MOV 3,3,SZR
10 03057 002730         JMP @LOOPR       ;ITERATE PROGRAM
11 03060 002726         JMP @RETURN      ;GO TO NEXT PROG,
12
13 03061 034724 CYCTS:  LDA 3,ESWIT      ;IF A ERROR
14 03062 175004         MOV 3,3,SZR      ;LOOK AT SWITCH 0
15 03063 074477         READS 3
16 03064 062677         IORST            ;IF SWITCH SET  PROCEED,
17 03065 175113         MOVL# 3,3,SNC
18 03066 002721         JMP @LOOPR       ;ITERATE
19 03067 002717         JMP @RETURN      ;NEXT TEST,
20
21 03070 054124 MESS:   STA 3,MESSR      ;PRINT A TEXT MESSAGE
22 03071 010124         ISZ MESSR
23 03072 031400         LDA 2,0,3        ;C(2) POINTS TO MESSAGE
24 03073 024125         LDA 1,C377       ;8 BIT MASK
25 03074 021000         LDA 0,0,2        ;C(2)=DATA WORD
26 03075 125112         MOVL# 1,1,SZC
27 03076 123701         ANDS 1,0,SKP
28 03077 123401         AND 1,0,SKP      ;C(0)=DATA CHARACTOR
29 03100 151400         INC 2,2          ;INC TO NEXT WORD
30 03101 124000         COM 1,1          ;FLIP MASK
31 03102 004403         JSR CHAR         ;PRINT
32 03103 000771         JMP MESS+4       ;ANOTHER
33 03104 002124         JMP @MESSR       ;LAST
34
35 03105 101005 CHAR:   MOV 0,0,SNR      ;PRINT A CHARACTOR FROM
36 03106 001401         JMP 1,3          ;C(0)R, EXIT +2 IF NULL
37 03107 063511         SKPBZ .TTO
38 03110 000777         JMP .-1          ;WAIT IF TTO BUSY
39 03111 061111         DOAS 0,.TTO      ;XMITT CHARACTOR
40 03112 001400         JMP 0,3 ;EXIT +1
41
42 03113 054124 CRLF:   STA 3,MESSR      ;PRINT A CARRIAGE
43 03114 020127         LDA 0,C215       ;RETURN AND A LINE
44 03115 004770         JSR CHAR         ;FEED SEQUENCE,
45 03116 020130         LDA 0,C12
46 03117 004766         JSR CHAR
47 03120 002124         JMP @MESSR
48
49 03121 006140 ALPH:   JSR @CRLF        ;ALPHA TEST MESSAGE
50 03122 006141         JSR @MESS
51 03123 003125         ALP              ;MESSAGE STORAGE AREA
52 03124 000775         JMP ALPH
```

```
A 0048  .MAIN
01
02                      ALP:    .TXTE |
03 03125 046515 MMM,"#$%&'()*
   03126 027115
   03127 121442
   03130 122444
   03131 023646
   03132 124450
04 03133 025652 +,-./01234
   03134 026654
   03135 127456
   03136 130460
   03137 031662
05 03140 032664 56789:;<=
   03141 133466
   03142 034670
   03143 135472
06 03144 037675 ?@ABCDEFGHIJ
   03145 040700
   03146 141502
   03147 142504
   03150 043706
   03151 144510
07 03152 045712 KLMNOPQRST
   03153 046714
   03154 147516
   03155 150520
   03156 051722
08 03157 052724 UVWXYZ[\]^_
   03160 153526
   03161 054730
   03162 156532
   03163 116333
09 03164 057736 `a?b?c?d?e?f?g|
   03165 037700
   03166 037700
   03167 037700
   03170 037700
   03171 000300
10
11                      PMESS:  .TXTE |PASS|
   03172 040520
   03173 051523
   03174 000000
12
13
```

```
* 0049  .MAIN
01
02 03175 020443 POCT:   LDA 0,C60
03 03176 030430         LDA 2,OCTAB
04 03177 054440         STA 3,RADRET
05 03200 040436         STA 0,ZSUPP
06 03201 050401         STA 2,.+1
07 03202 000000 DECOCT: 0
08 03203 010777         ISZ .-1
09 03204 034433         LDA 3,RADRET
10 03205 020471         LDA 0,CHTAB
11 03206 151005         MOV 2,2,SNR
12 03207 000432         JMP ICHAR
13 03210 034426         LDA 3,ZSUPP
14 03211 102400         SUB 0,0
15 03212 146512 DECOT:  SUBL# 2,1,SZC
16 03213 000405         JMP DECP
17 03214 146400         SUB 2,1
18 03215 034423         LDA 3,C60
19 03216 101400         INC 0,0
20 03217 000773         JMP DECOT
21 03220 151235 DECP:   MOVZR# 2,2,SNR
22 03221 034417         LDA 3,C60
23 03222 054414         STA 3,ZSUPP
24 03223 163000         ADD 3,0
25 03224 004415         JSR ICHAR
26 03225 000755         JMP DECOCT
27
28 03226 030425 OCTAB:  LDA 2,.+1+.-DECOCT
29 03227 100000         100000
30 03230 010000         10000
31 03231 001000         1000
32 03232 000100         100
33 03233 000010         10
34 03234 000001         1
35 03235 000000         0
36
37 03236 000000 ZSUPP:  0
38 03237 000000 RADRET: 0
39 03240 000060 C60:    60
40 03241 054436 ICHAR:  STA 3,CHRET
41 03242 101325         MOVZS 0,0,SNR
42 03243 001401         JMP 1,3
43 03244 040434         STA 0,CHSAV
44 03245 176000         ADC 3,3
45 03246 117000         ADD 0,3
46 03247 163404         AND 3,0,SZR
47 03250 000775         JMP .-3
48 03251 175660         SUBCR 3,3
49 03252 020426         LDA 0,CHSAV
50 03253 163300         ADDS 3,0
51 03254 034422         LDA 3,CHTAB
52 03255 116405         SUB 0,3,SNR
53 03256 000403         JMP .+3
54 03257 004411         JSR ITYPE
55 03260 002417         JMP @CHRET
56 03261 020420         LDA 0,CHORZ
57 03262 034420         LDA 3,CHAR7
58 03263 117405         AND 0,3,SNR
```

```
* 0050  .MAIN
01
02 03264 002413         JMP @CHRET
03 03265 020416         LDA 0,CH240
04 03266 004402         JSR ITYPE
05 03267 000772         JMP .-6
06
07 03270 010411 ITYPE:  ISZ CHORZ
08 03271 063511         SKPBZ TTO
09 03272 000777         JMP .-1
10 03273 061111         DOAS 0,TTO
11 03274 001400         JMP 0,3
12
13 03275 000212 C212:   212
14 03276 000011 CHTAB:  11
15 03277 000000 CHRET:  0
16 03300 000000 CHSAV:  0
17 03301 000000 CHORZ:  0
18 03302 000007 CHAR7:  7
19 03303 000240 CH240:  240
20
21
22 03304 000000 TABLE:  0
23
24                      .TXT    /COPYRIGHT (C) DGC, 1972,73,74,75
   03305 047503
   03306 054520
   03307 044522
   03310 044107
   03311 020124
   03312 041450
   03313 020051
   03314 043504
   03315 026103
   03316 030440
   03317 033471
   03320 026062
   03321 031467
   03322 033454
   03323 026064
   03324 032457
25 03325 046101 ALL RIGHTS RESERVED/
   03326 020114
   03327 044522
   03330 044107
   03331 051524
   03332 051040
   03333 051505
   03334 051105
   03335 042526
   03336 000104
26
27
28              .END
  0051  .MAIN

ALP     003125      47/51   48/02
ALPH    003121       6/39   47/49   47/52
ALPHA   000074       6/39    8/07
BEG     000075       6/40    7/34    7/38    8/04    8/39
BEGIN   001003       6/40   15/06
BROKE   000111       6/52   13/06   13/12   14/07
```

NAME	002746	44/39							
OCTAB	003226	49/03	49/28						
OCTR	000115	6/56	13/35	13/37	13/50				
PASS	000071	6/36	13/07						
PMESS	003172	44/15	48/11						
POCT	003175	45/59	49/02						
RADRE	003237	49/04	49/09	49/38					
RAND	000114	6/55	13/23	13/40	14/16				
RANI	000110	6/51	13/05	13/24					
RAND	000116	7/02	13/41	13/47					
RETUR	003006	45/24	45/27	45/30	45/31	45/41	45/42	47/02	47/11
		47/19							
SAV0	000076	6/41	12/02	14/30					
SAV1	000077	6/42	12/03	14/31					
SAV2	000100	6/43	12/04	14/32					
SAV3	000101	6/44	12/05	14/35					
SAVC	000102	6/45	12/07	14/33					
SETUP	006061	6/26	15/10	15/15	15/26	15/27	15/33	16/04	16/11
		16/18	16/24	16/31	16/36	17/04	17/10	17/17	17/24
		17/30	17/36	18/04	18/10	18/16	18/22	18/29	18/36
		19/04	19/13	20/04	20/10	20/16	20/21	20/30	21/04
		21/14	21/23	21/32	22/04	22/12	22/19	22/27	22/35
		23/04	23/15	23/22	23/29	23/35	24/04	24/13	24/25
		25/04	25/15	25/28	26/04	26/16	26/27	27/04	27/13
		27/19	27/28	28/04	28/24	29/04	29/25	30/04	30/20
		31/04	31/20	32/04	32/21	33/04	33/21	34/04	34/20
		35/04	35/22	36/04	36/23	37/04	38/04	38/12	38/20
		38/28	39/04	39/13	39/22	39/31	40/04	40/16	40/27
		41/04	41/15	41/27	41/39	42/04	42/19	42/33	43/04
		43/13	43/23	44/04					
START	000406	6/08	6/15	7/41	8/11				
SWIT	000145	7/25	8/05						
SWITC	000465	7/25	9/15	9/24					
T94A	000103	6/46	8/17						
TABLE	003304	7/15	7/16	9/50	30/22				
TEM	000065	6/32	19/12	19/19	19/29				
TIMDE	000121	7/05	14/17						
TIME	006063	6/30	19/15	20/23	20/31	21/06	21/16	21/25	21/34
		22/06	22/21	22/29	22/38	23/06	23/09	23/37	24/06
		24/15	24/30	25/08	25/21	25/32	26/09	26/20	26/31
		27/06	38/06	38/14	38/22	38/30	39/06	39/15	39/24
		40/09	40/20	40/33	41/08	41/20	41/29	41/42	42/07
		42/22	42/36	43/16	43/25	44/06			
TIMER	002762	6/29	45/02						
TIMEX	000070	6/35	45/10						
TIN	000550	9/30	10/19						
TIN1	000711	13/02							
TIN2	000722	13/03	13/11						
TIN3	000736	13/15	13/23						
TINCH	000106	6/49	12/25	13/25					
TINRE	000026	10/19	11/18	11/46	11/45				
TIO	000104	6/47	8/18	12/10					
TIOX	000105	6/48	8/25	12/14					
TTY00	001065	6/34	15/08						
TTY01	001073	15/15							
TTY02	001077	15/20							
TTY03	001105	15/27							
TTY04	001112	15/33							
TTY05	001120	16/04							

TTY06	001126	16/11		
TTY07	001134	16/18		
TTY08	001141	16/24		
TTY09	001147	16/31		
TTY10	001155	16/38		
TTY11	001162	17/04		
TTY12	001167	17/10		
TTY13	001175	17/17		
TTY14	001203	17/24		
TTY15	001210	17/30		
TTY16	001215	17/36		
TTY17	001222	18/04		
TTY18	001227	18/10		
TTY19	001234	18/16		
TTY20	001241	18/22		
TTY21	001247	18/29		
TTY22	001255	18/36		
TTY23	001263	19/04		
TTY24	001271	19/11	19/31	
TTY25	001316	19/18	19/33	
TTY26	001317	20/04		
TTY27	001324	20/10		
TTY28	001331	20/16		
TTY29	001335	20/21		
TTY30	001344	20/29		
TTY31	001353	21/04		
TTY32	001364	21/14		
TTY33	001374	21/23		
TTY34	001404	21/32		
TTY35	001413	22/04		
TTY36	001422	22/12		
TTY37	001430	22/19		
TTY38	001437	22/27		
TTY39	001446	22/35		
TTY40	001456	23/04		
TTY41	001470	23/15		
TTY42	001476	23/22		
TTY43	001504	23/29		
TTY44	001511	23/35		
TTY45	001521	24/04		
TTY46	001531	24/13		
TTY47	001544	24/25		
TTY48	001557	25/04		
TTY49	001571	25/15		
TTY50	001605	25/28		
TTY51	001617	26/04		
TTY52	001632	26/16		
TTY53	001644	26/27		
TTY54	001656	27/04		
TTY55	001666	27/13		
TTY56	001673	27/19		
TTY57	001703	27/28		
TTY58	001711	28/04		
TTY59	001724	28/16		
TTY60	001731	28/16	28/18	28/21
TTY61	001733	28/24		
TTY62	001750	28/29	28/37	28/43
TTY63	001756	28/26	28/43	
TTY64	001757	29/04		

TTY65	001773	29/16	29/20	
TTY66	001777	29/06	29/20	
TTY67	002001	29/23		
TTY68	002015	29/36	29/38	
TTY69	002020	29/25	29/38	
TTY70	002022	30/04		
TTY71	002034	30/06	30/14	
TTY72	002037	30/14	30/17	
TTY73	002041	30/20		
TTY74	002054	30/22	30/31	
TTY75	002060	31/04		
TTY76	002070	31/06	31/12	
TTY77	002074	31/12	31/16	
TTY78	002077	31/20		
TTY79	002110	31/22	31/29	
TTY80	002113	31/29	31/32	
TTY81	002117	32/04		
TTY82	002131	32/06	32/14	
TTY83	002137	32/21		
TTY84	002151	32/31	32/35	
TTY85	002155	32/23	32/35	
TTY86	002157	33/04		
TTY87	002171	33/06	33/14	
TTY88	002177	33/21		
TTY89	002210	33/23	33/30	
TTY90	002220	33/30	33/34	33/38
TTY91	002223	34/04		
TTY92	002236	34/06	34/15	
TTY93	002242	34/20		
TTY94	002257	34/22	34/33	
TTY95	002261	35/04		
TTY96	002274	35/06	35/15	
TTY97	002302	35/22		
TTY98	002314	35/24	35/32	
TTY99	002324	36/04		
TTY.0	002346	36/23		
TTY.1	002360	37/04		
TTY.2	002372	37/06	37/14	
TTY.3	002400	37/21		
TTY.A	002405	38/04		
TTY.B	002414	38/12		
TTY.C	002423	38/20		
TTY.D	002432	38/28		
TTY.E	002442	39/04		
TTY.F	002452	39/13		
TTY.G	002462	39/22		
TTY.H	002472	39/31		
TTY.I	002477	39/37		
TTY.J	002501	40/04		
TTY.K	002514	40/16		
TTY.L	002526	40/27		
TTY.M	002542	41/04		
TTY.N	002554	41/15		
TTY.P	002567	41/27		
TTY.Q	002613	42/04	42/11	
TTY.R	002631	42/19		
TTY.S	002644	37/25	42/31	
TTY.T	002661	43/04		
TTY.U	002602	41/39		

TTY.V	002670	43/13							
TTY.W	002701	43/23							
TTY.X	002711	44/04							
TTY.Z	002721	44/13							
TTY..	000067	6/34	44/21	44/23					
TYO	000120	7/04	13/43	13/48	14/09				
TYPE	000744	12/13	13/30						
TYPE1	000755	13/34	13/40						
TYPE2	000770	13/45	13/52						
U20A	000144	7/24	8/16						
XRAND	001040	6/55	14/39	14/48					
XSAV	000004	6/06	7/39	8/11	8/24				
XTIN	000701	12/18							
ZSUPP	003236	49/05	49/13	49/23	49/37				
.C	000062	6/27	6/28						
.E	000061	6/25	6/26						
.T	000063	6/29	6/30						
.TIN1	000560	10/28	10/38						
.TIN2	000566	10/34	10/50						
.TIN3	000607	10/43	11/02						
.TIN4	000612	11/05	11/11						
.TIN5	000635	11/16	11/25						
.TTI	000010	6/48	7/29	9/47	10/16	10/26	10/28	10/29	12/18
		12/20	12/21	12/23	14/14				
.TTO	000011	6/46	6/47	7/28	9/23	11/24	11/42	11/44	13/30
		13/52	13/53	13/55	14/13	47/37	47/39		